Valley in this district have many tributaries (over 160 tributaries in 2,805 acres (1,135 ha.)) and as the length of the stream in the basin for the culverts of the forest road is short, it is considered proper to design a water flow section for 10 minutes' rainfall. If the ratio of 10 minutes rainfall to 60 minutes rainfall is 3, designed rainfall = 47 x 3 = 150 mm/h in conversion of 60 minutes is estimated (150 mm/h ÷ 6"/h).

(4) Geology and Topographic Feature

The base rock near the Chaungtha forest is composed of shale (shale, mudstone and silt stone) and some sand stone. The top of the base rock is the soil horizon which seems a laterized horizon and 30 - 100 ft (10 - 30 m) thick. This surface soil horizon is eroded by much of the rainfall and many valleys are intricately branched like trees. These valleys develop to form close ridges and the slope of hill is an upward type and between the valleys, flat ridges are linked together like a line. As it is close to the Bengal Bay, the altitude of valley is 30 - 100 ft (10 - 30 m) and the altitude of the ridges 130 - 400 ft (40 - 120 m). (See map of creek system.)

3-1-3 General Standards

(1) Classification of Forest Road and Feeder Road

Forest road planning has close relation with forest area and cut volume. Forest road should be proper in its standards and structure depending upon the objective of use.

Forest road and feeder road in the model operation forest shall be classified and planned as:

Main forest road
Branch forest road
Feeder road
(See Table 3-2.)

(2) Standards and Structure of Forest Road and Feeder Road

While there are few rocks to cause any problems for the construction of the forest road in this model operation forest, and cutting by bulldozeris easy, the road surfaceis muddy in the rainy season. If the road is going to be used in rainy season, a lot of ballast is required and the road must be constructed as to provide drains for road surface, maintenance of side gutter and drain for cross section by ditches.

Considering the costs of construction and maintenance and control, the following structure and standards seem to be reasonable.

Table 3-2 Division of Road and Its Utility

		Main Forest Road	Branch Forest Road	Feeder Road
Covering forest area	over 500 ac	○	△	×
	500 – 50 ac	—	○	△
	under 50 ac	—	—	○
Usable year	over 10 year	○	×	×
	10 – 3 year	△	○	×
	under 5 year	—	—	○
Purpose	Management planting	○	△	×
	General traffic	○	△	×
	Long distance log transportation	○	×	×
	Short distance log transportation	—	○	○
	Yarding	○	○	○
	Transportation of materials for construction	○	○	○
Structure	for all season and long use	○	×	×
	for all season and short use	—	○	×
	for dry season only	—	—	○

Remarks: ○ ..... fit
△ ..... sometimes fit
× ..... unfit
— ..... uncommon

Standard of Forest Road

	Width			Side gutter	Depth of gravel	Minimum radius length	Longitudinal slope		Stnadard transverse slope
	Gravel width	Shoulder	Total width	Size x Depth			Max.	Min.	
	ft (m)	ft (m)	ft (m)	ft (m)	inch (m)	ft (m)	%	%	
Main forest road	11 (3.3)	3 (0.9)	14 (4.2)	2.5 x 1.0 (0.75 x 0.3)	Upper 4 (0.1) Lower 8 (0.2)	100 (3.0)	8.5	0.3	6%
Branch forest road	9 (2.7)	2 (0.6)	11 (3.3)	1.3 x 0.5 (0.4 x 0.15)	6 (0.15)	40 (12)	10.0	0.3	6%
Feeder road	-	-	-	-	-	27 (8)	14.0	-	-

1. In order to make maintenance and management better, small step of 1.3 - 2.0 feet (0.4 - 0.6 m) wide is provided outside of side gutter.

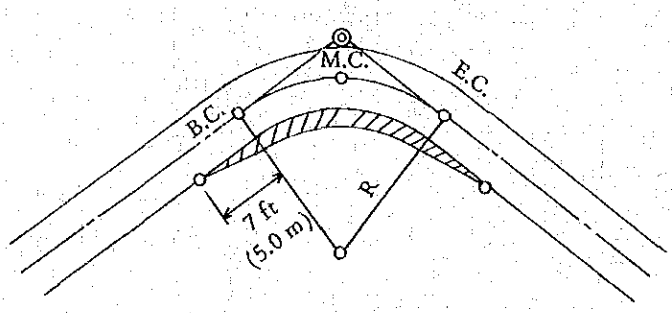
2. Special spot may not be subject to this standard under the consideration of hinderances to management and maintenance.

Widening at Curve

Radius ft (m)	M.C. point ft (m)	B.C. or E.C. point ft (m)
40 – 50 (12 – 15)	4.0 (1.2)	3.3 (1.0)
51 – 60 (16 – 18)	3.3 (1.0)	2.6 (0.8)
61 – 82 (19 – 25)	2.6 (0.8)	2.0 (0.6)

1. Transition length is 17 ft (5 m) as standard.
2. Widening is spread inside curve.

Widening at Curve



3-1-4 Location of Route and its Idea

(1) Idea of Route Planning

As stated in 3-1-2; natural condition, while this district is under the unfavorable condition of having a lot of concentrated rainfall, closely situated valleys and erodible soil which are demerits for maintenance and control, it has some favorable conditions concerning the construction of a road in so far as that topography is moderate, there is no hard rock and little rain in the dry season. When the new forest road is constructed, considerations are to be paid to the following points:

Select the route where the structures like ditches are comparatively less.
Unreasonable longitudinal slope is not desirable.

Although the distance is more or less longer, if the cost of maintenance and management is considered, this would be better in most cases.

Route planning of forest road by each section is as follows:

Main Forest Road:

At the location of main line of forest management, the main forest road is to be set up along the ridges which are located between the branching valleys.

Branch Forest Road:

Going ahead one year of the annual cutting, construction of branch forest road is planned.
The interval of branch forest road is 0.31 miles (500 meters) for the longest yarding distance. Location of route, as in the case of main forest road, is set up avoiding valleys as much as possible. It is planned that the branch forest road goes down from the main forest road along the branch ridge to the valley where collection of logs is convenient.

Feeder Road:

The feeder road serves as a subsidiary to main forest road and branch forest road and is constructed according to the progress of cutting operation. Construction of feeder road by bulldozer in dry season is not difficult.

(2) Overall Plan of Forest Road

Based on (1) of preceding section, the forest road plan in model operation forest is shown attached map.

Annual plan of construction is shown in Table 3-3.

Table 3-3 Forest Road Plan

	Route No.	Mile	Km	Passing through compartment	Proposed year of construction
Main line	Access road outside forest	(2.2)	(3.6)	21, 22	1978
	Access road in forest	0.2	0.3	24	1978
	1	2.7	4.3	24, 25	1979
	2	1.7 0.8	2.7 1.3	25, 27, 26	1979 1980
	3	2.2	3.5	25, 28	1980
	4	1.4	2.3	25, 26	1980
	Total	(2.2) 9.0	(3.6) 14.4		
Branch line	1	0.1	0.2	24	1979
	2	0.3	0.5	24	1979
	3	0.4	0.6	24	1979
	4	0.4	0.6	24	1979
	5	0.5	0.8	25	1980
	6	0.4	0.7	25	1980
	7	0.6	1.0	25, 28	1980
	8	0.7	1.1	25, 28	1981
	9	0.4	0.6	28	1981
	10	0.5	0.8	27	1981
	11	0.6	1.0	25, 26	1981
	12	0.5	0.8	26	1981
	13	0.5	0.8	26	1981
	14	0.3	0.4	26	1981
	Total	6.2	9.9		
Total		(2.2) 15.2	(3.6) 24.3	( ) forest road outside forest	

Road density in forest:

24,300 m/1,135 ha = 21.4 m/ha = 15.2 mile/2,805 acre = 0.542 mile/100 acre

(3) Important Matters for Setting Up Route

The topographical map of scale 1/63,360 is available but as it is too small in scale, the map is enlarged to 1/10,000 for this survey.

There is no distinct structure or article as a target in the topography and similar topographies are linked. In the jungle, undergrowth is so dense that the range of vision is quite short and we should be careful not to misunderstand the field conditions.

When we undertook the field survey, we confirmed the location with the topography map, magnet and altimeter and we did bush cutting. We used hand level for cutting to know the altitude of the points where the forest road is going to pass. We proceeded along the slope assuming the longitudinal slope according to the following manner:

$$\text{Expecting longitudinal slope} = \frac{\text{Altitude of location of target} - \text{Altitude of present location}}{\text{Horizontal distance}} \times 100\% < \text{Steepest slope to regulate}$$

As it is rare to find out an ideal route by one cutting, it is done as many time as the case demands.

3-1-5 Important Matters for the Work

The fundamental matters on design and work are as follows:

(1) Survey for Construction Work

For the construction work based on the design map, center marking pile is the standard of implementation of the work and it should not be lost.

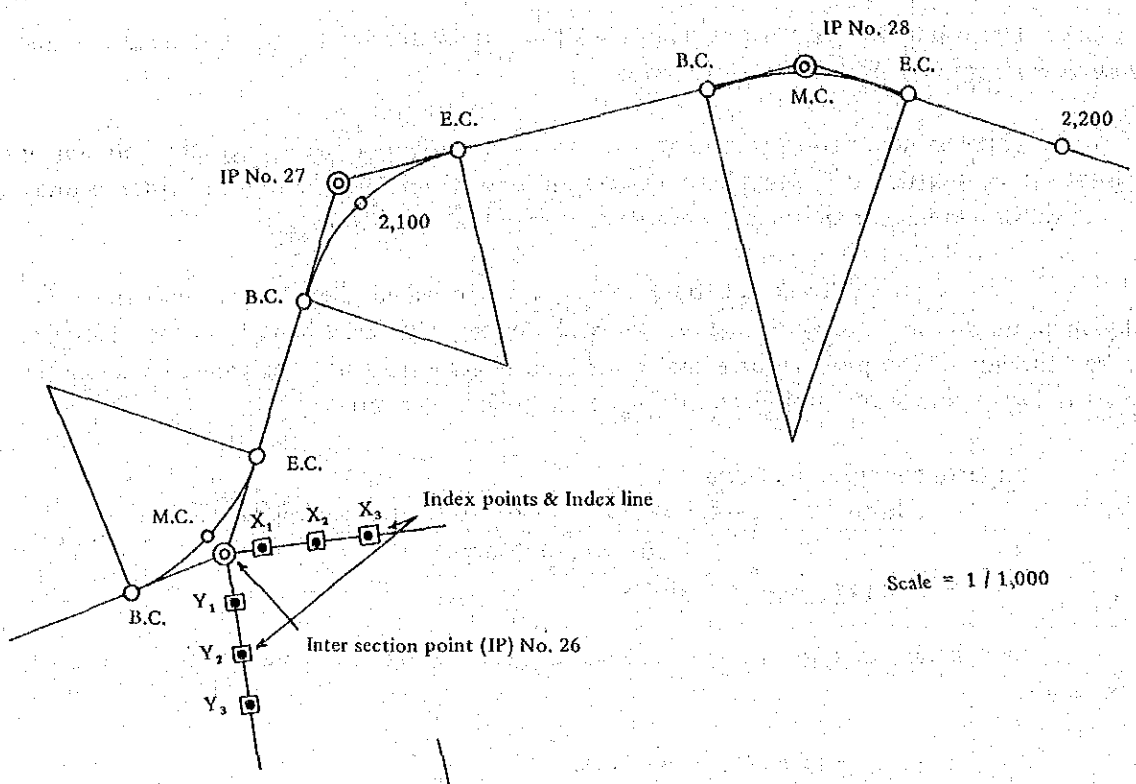
Prior to the start of the work by bulldozer, the following survey is done:

(i) Setting up of index point of I.P. pile
(ii) Setting up of bench mark
(iii) Setting up of finishing stake

(2) Setting up of Index Point of Intersection Point

(i) Index points are set up to clarify the location of intersection point
(ii) The line to connect index point is called index line. The index line has two or more directions.
(iii) The index line has three or more index point piles and the position on the index line is made clear by nailing the head of pile.
(iv) The direction angle of index line and distance between index points are stated in the field note.

Example of Index Line of P.I. Pile (IP 26)



CURVE LIST

Unit: meter

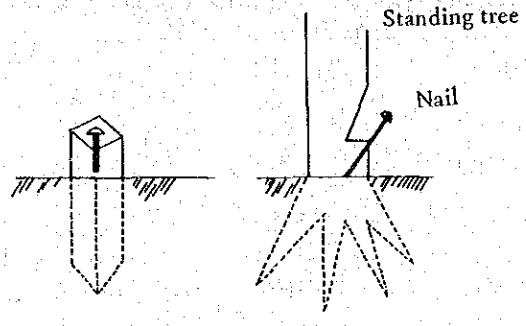
IP No.	25	26	27	28
Angle	261°-10'	210°-30'	269°-00'	300°-30'
I.A.		50°-40'	58°-30'	31°-30'
R		30.0	30.0	50.0
T.L.		14.20	16.80	14.10
S.L.		3.19	4.38	1.95
C.L.		26.5	30.6	27.5
B.C.		2,035.4	2,084.3	2,149.9
M.C.		2,048.6	2,099.6	2,163.6
E.C.		2,061.9	2,114.9	2,177.4
Dis		81.3	53.4	65.9

(3) **Setting up of Bench Mark**

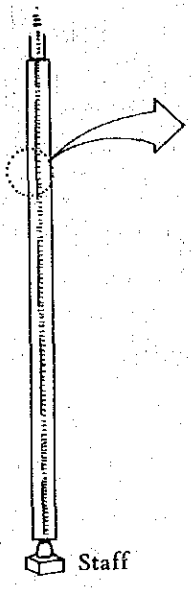
(i) Bench mark is surveying point which is the standard of height indicated in the design map.

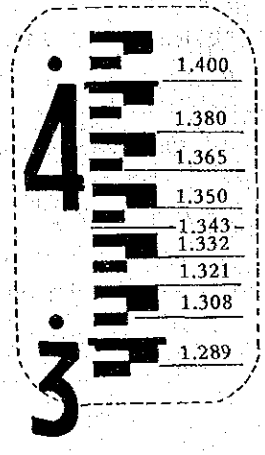
(ii) In general, bench mark is set up at the interval of 0.13 – 0.19 mile (200 – 300 meters).

(iii) Backsight (B.S.) and foresight (F.S.) of Turning point (T.P.) and Ground height (G.H.) are read by staff up to millimeter. (See the below)



Setting up of bench mark





Degree mark on staff

(iv) Example of statement of field note of levelling and how to determine the height of bench mark is shown in the following table.

Example of Indication of Bench Mark
(when height of BM_2 is determined from known height BM_1)

Station	B.S.	I.H.	F.S.	G.H.	Note
	m	m	m	m	
BM_1	3.261	13.261		10.000	10,000 of G.H. of BM_1 is known value
No. 1			1.85	11.41	
No. 1 + 15.5			2.21	11.05	
(T.P.) No. 2	3.144	14.363	2.042	11.219	
No. 3			2.82	11.54	
No. 4			2.30	12.06	
(T.P.) No. 5	2.567	14.977	1.953	12.410	
No. 5 + 12.3			3.15	11.83	
No. 6			3.13	11.85	
(T.P.) No. 7	2.812	14.688	3.101	11.876	
BM_2			1.903	12.785	Difference in height = 2.785 m (BM_2-BM_1)

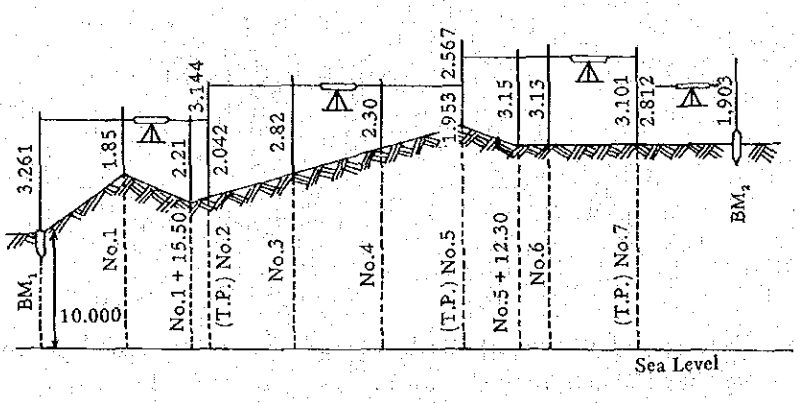
Difference of elevation of BM_1 and BM_2 = Σ B.S. − Σ F.S.

Σ B.S. = 3.261 + 3.144 + 2.567 + 2.812 = 11.784

Σ F.S. = 2.042 + 1.953 + 3.101 + 1.903 = 8.999

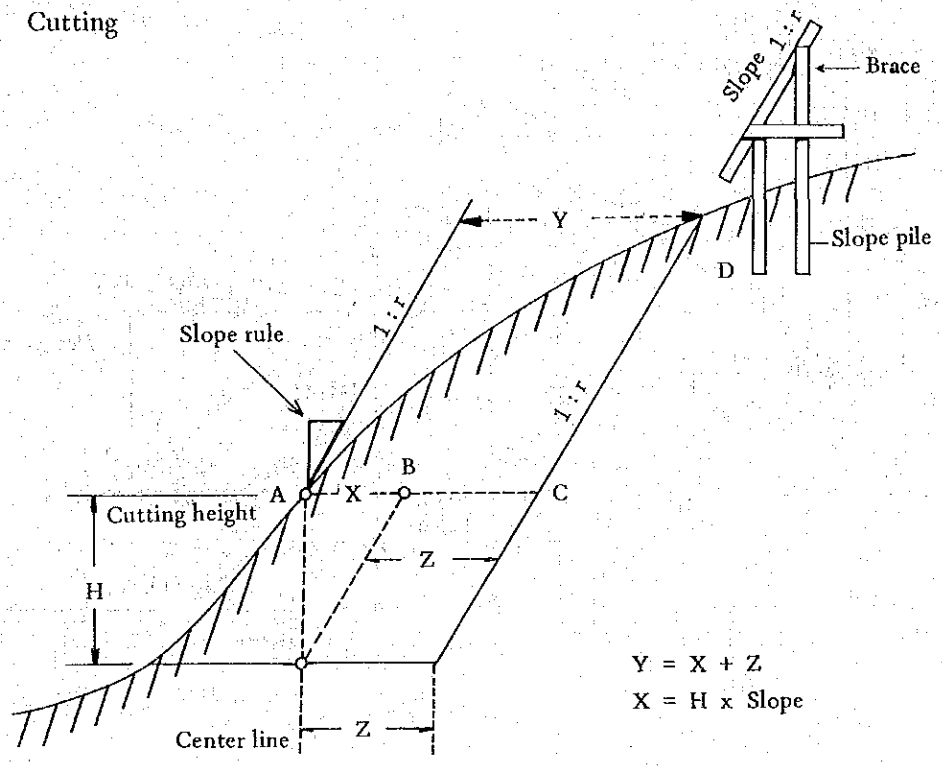
Difference of elevation = 11.784 − 8.999 = 2.785 m ..... O.K.

B.S. = Backsight I.H. = Instrument height F.S. = Foresight G.H. = Ground height

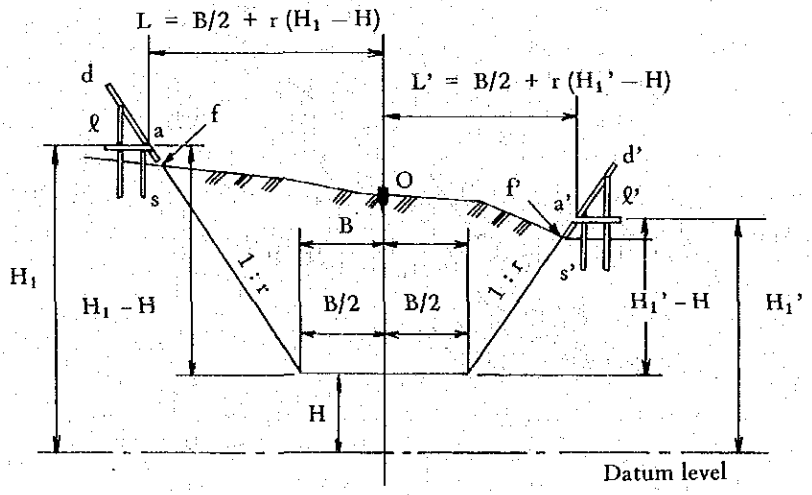


(4) Setting up of Finishing Stake

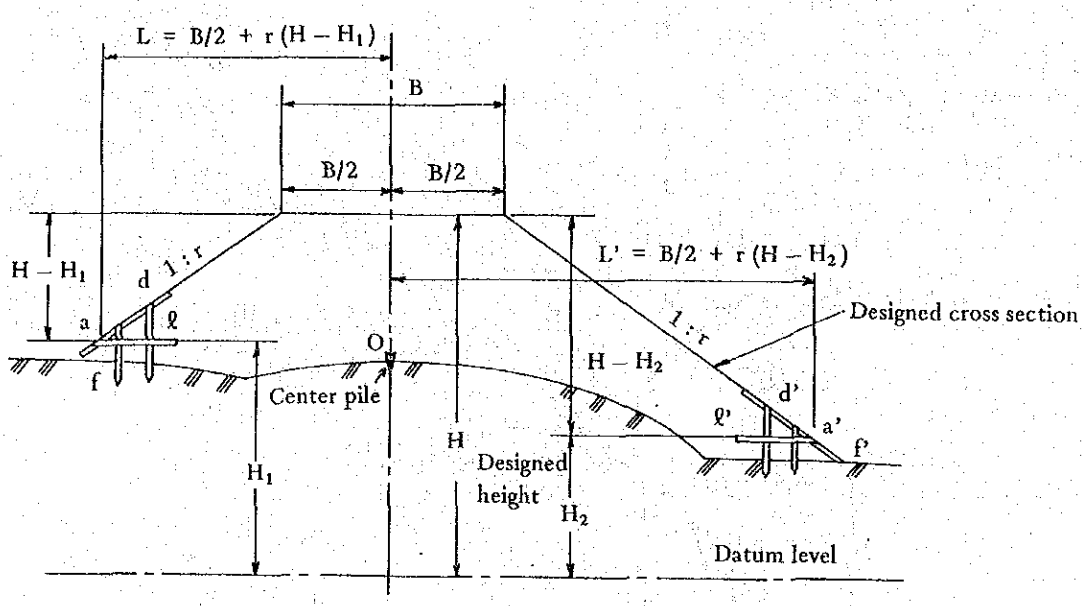
1) Cutting



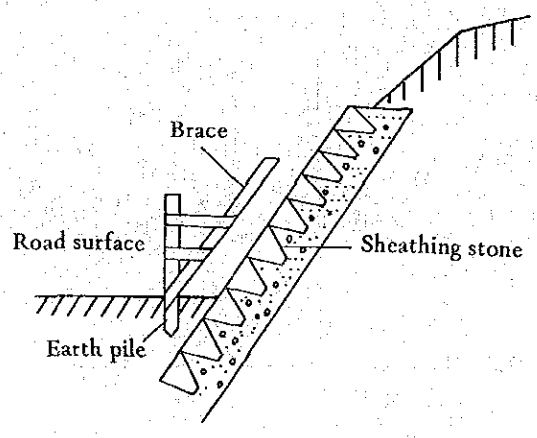
2) Digging



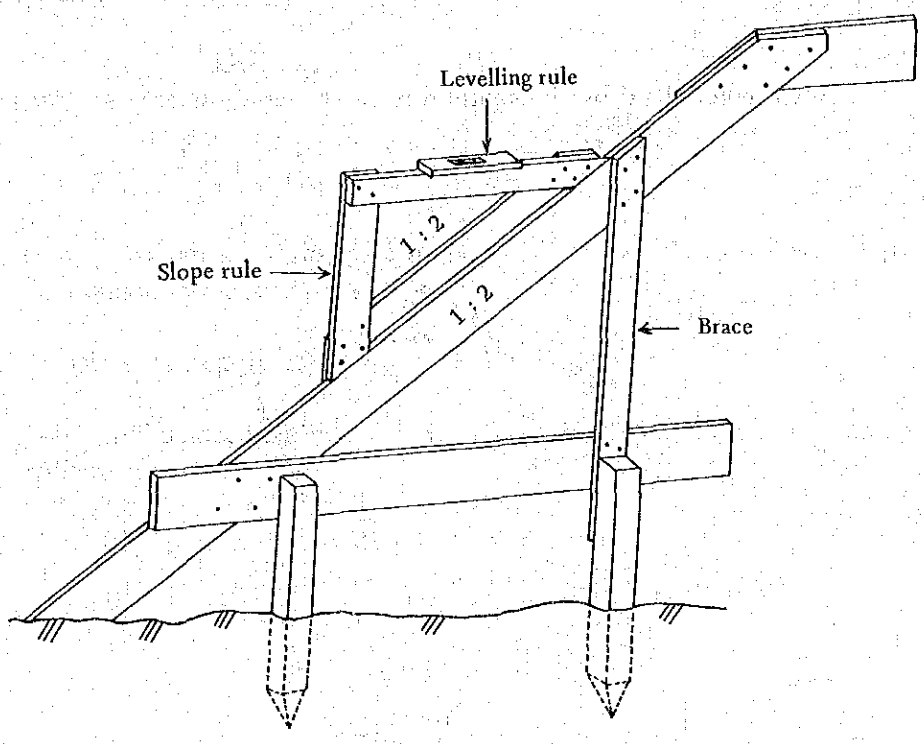
3) Banking



4) Masonry



5) Details of Finishing Stake



Prior to start of construction work, finishing stake is set up.

The important points are as follows:

(i) Interval of setting up of finishing stake
Straight line 30 - 100 ft (10 - 30 m)
Curve 15 - 30 ft (5 - 10 m)

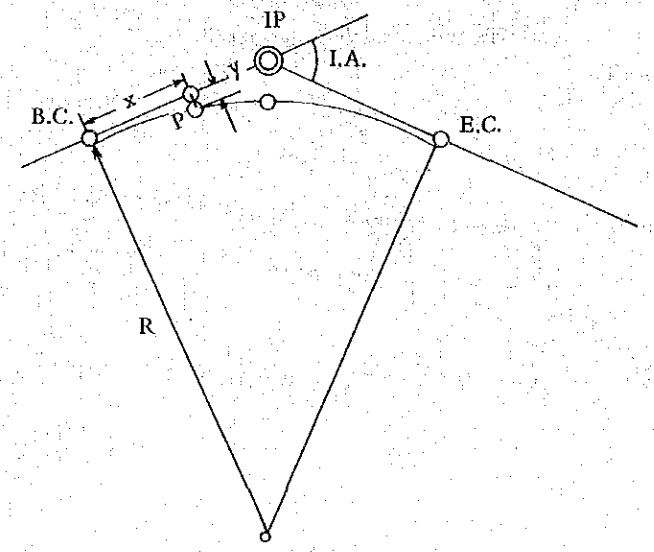
(ii) Location which needs setting up of finishing stake on curve
Beside B.C. (beginning of curve), M.C. (middle of curve) and E.C. (end of curve), and other needed locations

(iii) Survey for setting up of finishing stake
Finishing stake is set up on the center line of forest road. For setting up of finishing stake, following survey is needed. Center line of forest road at the setting point is determined.
In case of straight line, from fore and rear survey points,
In case of curve, from B.C. and E.C. the center line is determined.

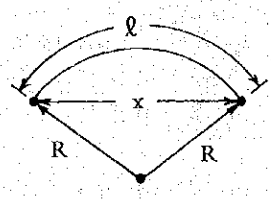
A method to determine center point in the curve:

B.C. (or E.C.) is extended to I.P. and distance is x. $y = x^2/2R$, y is calculated. point P of $y \perp x$ is on the circumference of radius R and length of circular of B.C. $\sim$ P $\fallingdotseq$ x.

Point P determined by this method is on the circumference at distance x from B.C. or E.C.



Reference: Difference between ℓ of length of circular arc and x of length of chord length is $\ell - x = \ell^3/24R^2$ which is minor and may be neglected.



o Direction of finishing stake
Finishing stake is set up correctly at right angle to center line.
In case of curve, it is set up correctly to the direction of radius (direction of right angle to tangent).

o Method to determine the direction of finishing stake of curve by transit. In the diagram, the angle of ∠ CAB is called deflection angle expressed δ.

$\delta = \ell/2R$ (rad) $\quad \overset{\frown}{AB} = \ell$

$1 \text{ rad} = \frac{180^\circ}{\pi}$ then,

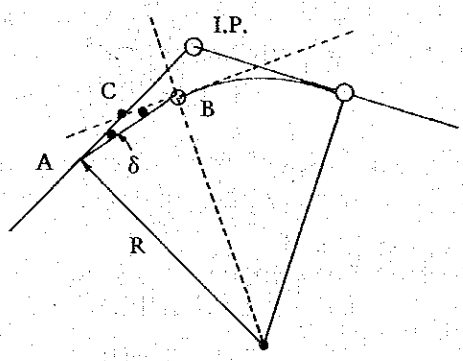
$$\delta \fallingdotseq 28.65^\circ \times \ell/R \quad \ldots\ldots\ldots\ldots \quad (1)$$
$$\fallingdotseq 1719' \times \ell/R \quad \ldots\ldots\ldots\ldots \quad (1)'$$

In diagram, since ∠ ABC = δ , the direction of finishing stakes on the point B is determined as follows:

Transit is set at point B,

Point A is pointed and by shifting angle to the left $90^\circ - \delta^\circ$, the direction is determined.

$$90^\circ - \delta^\circ = 90^\circ - 28.65^\circ \times \ell/R$$



o Method to determine the direction of finishing stake of curve by surveyor's compass (when the curve is clockwise).

Azimuth angle of I.P. line + 2 δ + 90°
= Azimuth angle of I.P. line + $(57.3 \times \ell/R)^\circ$ + 90°

if exceed 360°, the angle reduced 360°

o Method to determine the direction of finishing stake of curve by surveyor's compass (in case of un-clockwise curve).

Azimuth angle of I.P. line − 2 δ − 90°
= Azimuth angle of I.P. line − $(57.3 \times \ell/R)^\circ$ − 90°

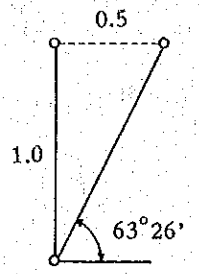
if minus angle, the angle is plus 360°

o Others

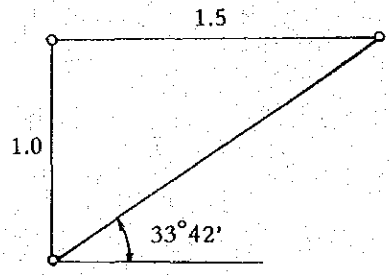
Expression of slope of cutting and banking

Slope of cutting and banking is expressed as 1 : horizontal distance (1 is height)

Standard slope of cutting = 1 : 0.5



Standard slope of banking = 1 : 1.5



(5) Compaction of Banking

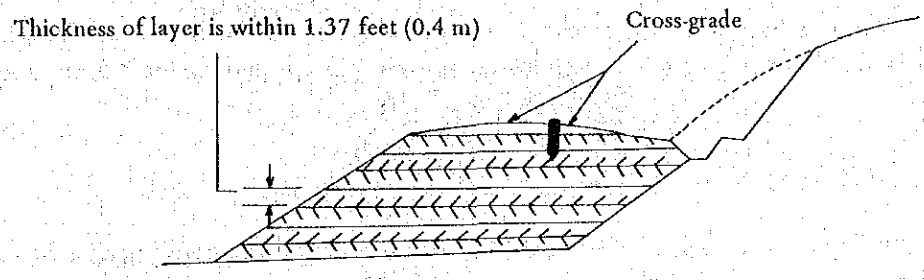
When soil is rolled repeatedly by bulldozer, air in soil is forced out and both density of soil and strength of soil increases and eventually deformed value as sinking reduces.

When banking is done by bulldozer, if thick layer is rolled at once, the effectiveness of compaction is slight. In general, compaction is effective with rolling of 5 returns of a given thickness of sheet (within 40 cm). In many cases, fully compacted banking has higher density than natural earth. In other words, loose natural earth of 1 m^3 is removed and compacted. Then volume of banking is less than 1 m^3.

If such banking of layer is done, soil is strengthened and penetration of rain water into soil is reduced and stabilized road bed remains secure even in the rainy season.

Where ballast for shovel-packing is planned, it is important that prior to input of gravel, full rolling is done to finish the prescribed road bed.

In case of compaction in such a layer, as sinking after banking is quite minor, there is no need for extra-banking.



(6) Slope Tamping

Surface of banking is not built steeper than stabilized slope of cutting and banking (standard slope is 1 : 1.5 but if 1 : 2.0, the stability is higher). Tapping and compacting of surface of banking is called slope tamping.

The slope is stepped by man-power on the surface of banking of 1.3 feet thick and the surface is struck by thick board and fully compacted. Fully compacted slope increase resistance to erosion from rain water in rainy season. On compacted slope, as soil grain on the surface is stable, natural introduction of vegetation is quick and we can expect greening in short period. Beside compaction by manpower, compaction is also carried out by backet of back-hoe.

(7) Sunken Ground like Valley

If the surface of the ground is sunken in places, surface water is stayed in rainy season and the water penetrates into the ground and the strength of soil is reduced. Banking is done near the forest road prevent sunken areas in the surface and surface water is naturally drained on mild slope of 1 ~ 5%.

(8) Reinforced Concrete Pipe or Hume Pipe

The foundation of reinforced concrete pipe is exactly built as shown in the design map with setting up the finishing stake. Banking on the pipe is done at the same height on right and left sides of pipe.

(9) Ballst for Shovel Packing

Ballast for shovel packing is done in uniform thickness. For this purpose, it is necessary that surface of banking is provided with cross grade as shown cross section of design map.

Thickness of ballast is based on design map but it is better to grasp the required thickness by changing thickness of ballast experimentally at the beginning of the construction.

Where ballast is not so thick, prior to muddy, thickness is to be increased. Muddy ballast is useless. Diameter of gravel is selected as over 7.5 cm and under 7.5 cm and they are never mixed.

(10) Sand Bag

In Japan, sand bag of chemical fiber has been used for construction of forest road recently. Size of most sand bag is 2.3 feet x 1.6 feet (70 cm x 48 cm) and the price is moderate (1 pc. 2 kgs (¥60)). The point of soil bag piling is to pack the sand compactly and evenly in the bag. The number of bag per 10.8 ft^2 (1 m^2) is as follows:

Slope of cutting & banking	Required bags	Volume of soil per bag is 1.1 ft^3 (0.03 m^3)
1 : 0.5	15.0	
1 : 0.6	14.5	
1 : 0.7	13.8	
1 : 0.8 – 1 : 1.0	13.0	

Where mild water flows such as side gutter of forest road, soil bag piling is recommendable.

(11) Collection of Gravel

The requirement of gravel in forest road planning per miles is:

Main forest road:

[width (11.0 + 0.5) ft x thickness 1.0 ft] x 1.2 x 5,280 ft
= 72,864 ft^3

Branch forest road:

[width (9.0 + 0.5) ft x thickness 0.5] x 1.2 x 5,280 ft
= 30,096 ft^3

Per meter,

Main forest road:

width (3.3 m + 0.2 m) x thickness 0.30 m x 1.2 = 1.26 m^3/m

Branch forest road:

width (2.7 m + 0.2 m) x thickness 0.15 m x 1.2 = 0.522 m^3/m

0.2 m is for turnout and 1.2 is variation ratio by rolling.

In total,

Main forest road:

729 (100 ft^3) x 11.3 mile = 8.238 (100 ft^3)

Branch forest road:

301 (100 ft^3) x 6.2 mile = 1.866 (100 ft^3)

Total: 10.104 (100 ft^3)

Per meter,

Main forest road:

1.26 m^3/m x 18,000 m = 22,680 m^3

Branch forest road:

0.522 m^3/m x 9,900 m = 5,168 m^3

Total: 27,848 m^3

And other subsidiary materials as ditch is 836 x 100 ft^3 (3,000 m^3) totaling 10,940 x 100 ft^3 (31,000 m^3) are to be secured.

Acquisition of gravel is as follows:

(i) Purchase from Myaungmya
Cost is 470 ks per 100 ft^3.

(ii) Collect from Seikkyi
Good quality and suitable for structure. Quarrying by dynamite is difficult and takes much time.

(iii) Collect from tributary near job site
Soft quality but suitable for lower layer.

(iv)* Collect from main Shawbya river
It is necessary to construct a feeder road for gravel collection. Excavation is made under water with back hoe and collection site is surveyed from up river to down river to collect gravel systematically. So that a large amount of cheap gravel is collected.

As gravel in this river includes those of too large diameter for ballast, a crusher is needed in order to secure large amount of gravel. Quarrying by crusher requires the following machines:

Machine	Specification	Number
Back-hoe	Backet capacity; 0.25 m^3 (weight 6 t)	one
Crusher	Single toggle type 16" x 10"	one
Diesel engine for crusher	50 HP	one
Dump track	4 t	one

* (iv) is the most recommendable.

Labor and Cost by Year

	Main forest road			Branch forest road			Total		
	Distance	Cost	Labor	Distance	Cost	Labor	Distance	Cost	Labor
	mile (km)	1,000 Ks	100 men	mile (km)	1,000 Ks	100 men	mile (km)	1,000 Ks	100 men
1978	2.4 (3.9)	816	430	–	–	–	2.4 (3.9)	816	430
1979	4.4 (7.0)	968	560	1.2 (1.9)	148	86	5.6 (8.9)	1,116	646
1980	4.4 (7.1)	968	568	1.5 (2.5)	185	113	5.9 (9.6)	1,153	681
1981	–	–	–	3.5 (5.5)	432	248	3.5 (5.5)	432	248
Total	11.2 (18.0)	2,752	1,558	6.2 (9.9)	765	447	17.4 (27.9)	3,517	2,005

Main forest road per 0.621 mile & 1 mile

Per 0.621 mile	Construction cost	136,667 Ks	Labor	8,000 man-day
Per 1 mile	Construction cost	219,897 Ks	Labor	12,900 man-day

Breakdown of per 0.621 mile (1 km)

Work	Quantity	Unit	Unit price	Amount	Labor per unit	Labor
Earthwork:						
Cutting	15,000	m^3	1.73 Ks	25,950 Ks	0.144 men	2,160 men
Banking	5,000	m^3	1.00 Ks	5,000 Ks	0.073 men	365 men
Side gutter	1,400	m	0.27 Ks	378 Ks	0.03 men	42 men
Shouldering	2,000	m	0.73 Ks	1,460 Ks	0.08 men	160 men
Banking & Sloping finish	1,500	m^2	0.47 Ks	705 Ks	0.05 men	75 men
Sub-total				33,493 Ks		2,802 men
Road Surface:						
Ballast	3,500	m^2	18.67 Ks	65,345 Ks	1.056 men	3,696 men
Sub-total				65,345 Ks		
Ditch:						
Reinforced concrete hume pipe, 24'ϕ	56	m	285.67 Ks	15,998 Ks	2.973 men	166 men
Sub-total				15,998 Ks		
Total				114,836 Ks		6,664 men
Preparation expenses	20%			21,831 Ks		1,336 men
Grand Total				136,667 Ks		8,000 men

Branch forest road per 0.621 mile & 1 mile

Per 0.621 mile	Construction cost	76,667 Ks	Labor	4,500 man·day
Per 1 mile	Construction cost	123,357 Ks	Labor	7,200 man·day

Breakdown per 0.621 mile (1 km)

Work	Quantity	Unit	Unit price	Amount	Labor per unit	Labor
Earthwork:						
Cutting	10,500	m^3	1.73 Ks	18,165 Ks	0.144 men	1,512 men
Banking	3,500	m^3	1.00 Ks	3,500 Ks	0.073 men	256 men
Side gutter	1,400	m	0.27 Ks	378 Ks	0.03 men	42 men
Banking & Sloping finish	1,050	m^2	0.47 Ks	494 Ks	0.05 men	53 men
Sub-total				22,537 Ks		1,863 men
Road surface:						
Ballast	3,000	m^2	10.0 Ks	30,000 Ks	0.615 men	1,845 men
Sub-total				30,000 Ks		1,845 men
Ditch:						
Reinforced concrete hume pipe, 24'ϕ	48	m	285.67 Ks	13,712 Ks	2.973 men	143 men
Sub-total				13,712 Ks		143 men
Total				66,249 Ks		3,851 men
Preparation cost				10,418 Ks		649 men
Grand Total				76,667 Ks		4,500 men

Temporary forest road per 0.621 mile & 1 mile

Per 0.621 mile	Construction cost	3,333 Ks	Labor	40 man·day
Per 1 mile	Construction cost	5,363 Ks	Labor	60 man·day

Breakdown per 0.621 mile (1 km)

Work	Quantity	Unit	Unit price	Amount	Labor per unit	Labor
Earthwork:						
Bulldozer operation	36	hr.	70 Ks	2,520 Ks	0.543 men	20 men
Assist. worker	10	man	8.67 Ks	87 Ks		10 men
Sub-total				2,607 Ks		30 men
Miscellaneous expenses	5%			126 Ks		
Total				2,733 Ks		30 men
Preparation cost	20%			600 Ks		10 men
Grand Total				3,333 Ks		40 men

3-2 Design of Main Forest Road for the First Year

3-2-1 Route Planning

The model operation forest is composed of 5 compartments of No. 24 ~ No. 28 covering 2.805 acre (1,135 ha.). For the first year, the route branches form highway to No. 24 compartment at the entrance of model operation forest serving as access road. The access road is to be set up at timber collection area where it will facilitate traffic to Shawbya Timber Yard and the route is the shortest from Shawbya.

The covering area of this route is, from a geographical point of view, not only for the model operation forest but also for the following compartments in future. After completion of the logging in the model operation forest, the main forest road could be used for management of forest in this area.

No. of compartment

21, 22, ½ of 20, 23, ½ of 29, ½ of 30, ½ of 31, 32, 33, 34, 35, 36, 6, 7, 8, 9, 10, 11, 12, 17, 18 and 48.

The outline of route plan is as follows:

On north side of this operation forest, there is a highway of 12 mile (20 km) to east-west. Timbers from model operation forest pass along a part of this highway and are collected Shawbya Timber Yard and carried to the market by lafts from Shawbya. Shawbya Timber Yard is 50 ft (15 meter) above sea level and the highway goes up the hill from Shawbya and through the hill at an altitude of 330 feet (100 meter), and then goes down to the Bengal Bay. Model operation forest is located in the water system of river flowing into the Bengal Bay (see Map of Water System) and a great many intricated tributaries are to be found like dense branches of trees (According to the water system map, there are more than 160 tributaries in model operation forest). The altitude of these rivers is 33 - 130 ft (10 - 40 meter) above sea level.

The locality of highway which is the shortest distance to the model operation forest from Shawbya is 160 ft (50 meter) in altitude and there is an upward slope from here to the mountain. As the altitude of the model operation forest is 33 - 230 ft (70 meter), 130 ft (40 meter) on average, it is proper that the nearest point on the highway above mentioned is the starting point of the access road. In this survey, the implementation design of 2.4 mile (3.9 km) to No. 24 compartment of the model operation forest was made in such a way that starting from above point of 160 ft (50 meter) of main forest road as an access road, we can approach near the model operation forest on a downward slope.

This structure was designed as main forest road shown in general standard of 3-1-3.

3-2-2 Arrangement and Important Points of Design

Although a topographical map of scale 1/63,360 is available as data for the design, the scale is too small. It was enlarged to 1/100,000.

As a feeder road of 1.8 miles (2.9 km) was being constructed by bulldozer to the direction of the model operation forest from above starting point by State Timber Corporation, when we made reconnaissance of the position, we found it is suitable as an access road and we made a plan of section as reconstruction of temporary forest road. As to the road 1.8 mile (2.9 km) away, with magnet and altimeter, and checking with topography map, we assumed the direction of route and longitudinal slope and with assumed longitudinal slope, we made clearance of center line with hand level.

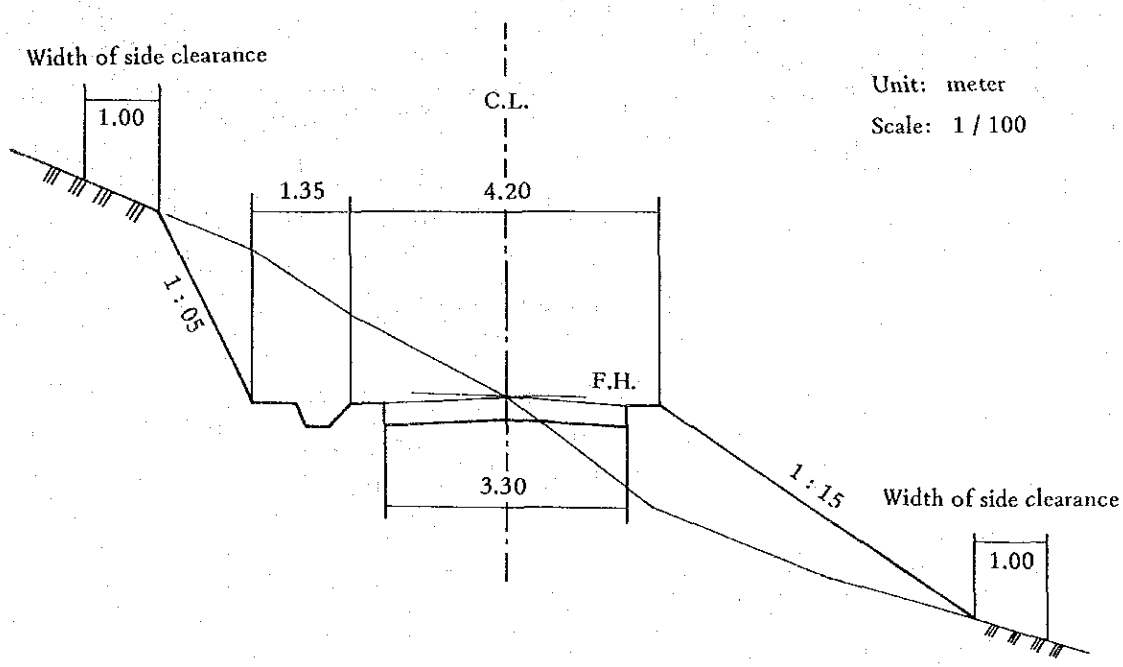
In jungles, undergrowth grows sick and clearance work was difficult but with cooperation of State Timber Corporation, we carried out the work and widened the line by bulldozer. After clearance, along the line, we set up I.P. pile and center pile according to standard of main forest road and made levelling and cross section survey of forest road.

3-2-3 Standard of Structures

Since the forest road is structured so as to withstand rainy season, available materials in Burma are used and the following standard of structure is adapted.

(1) Roadway Diagraph and Standard Map

Fig. 3-3 Roadway Diagraph



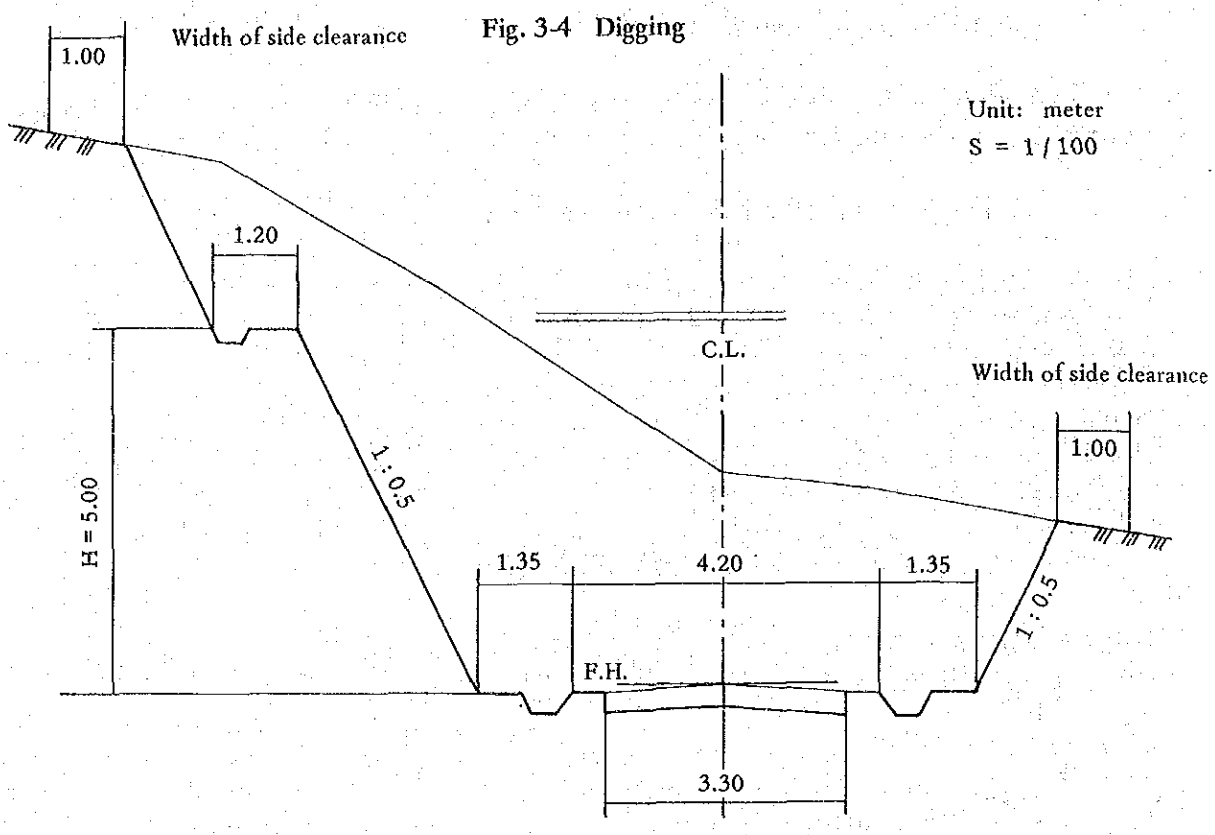


Fig. 3-4 Digging

Fig. 3-5 Detail of Cutting Step

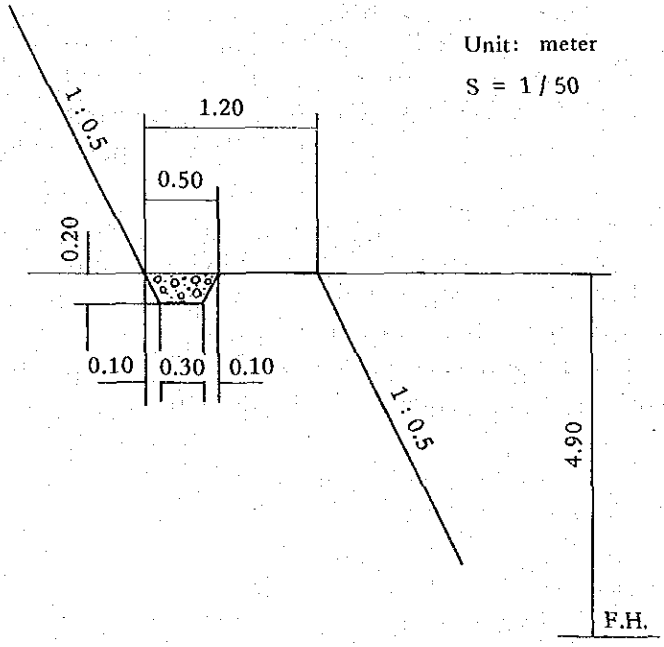


Fig. 3-6 Ballast and Side Gutter

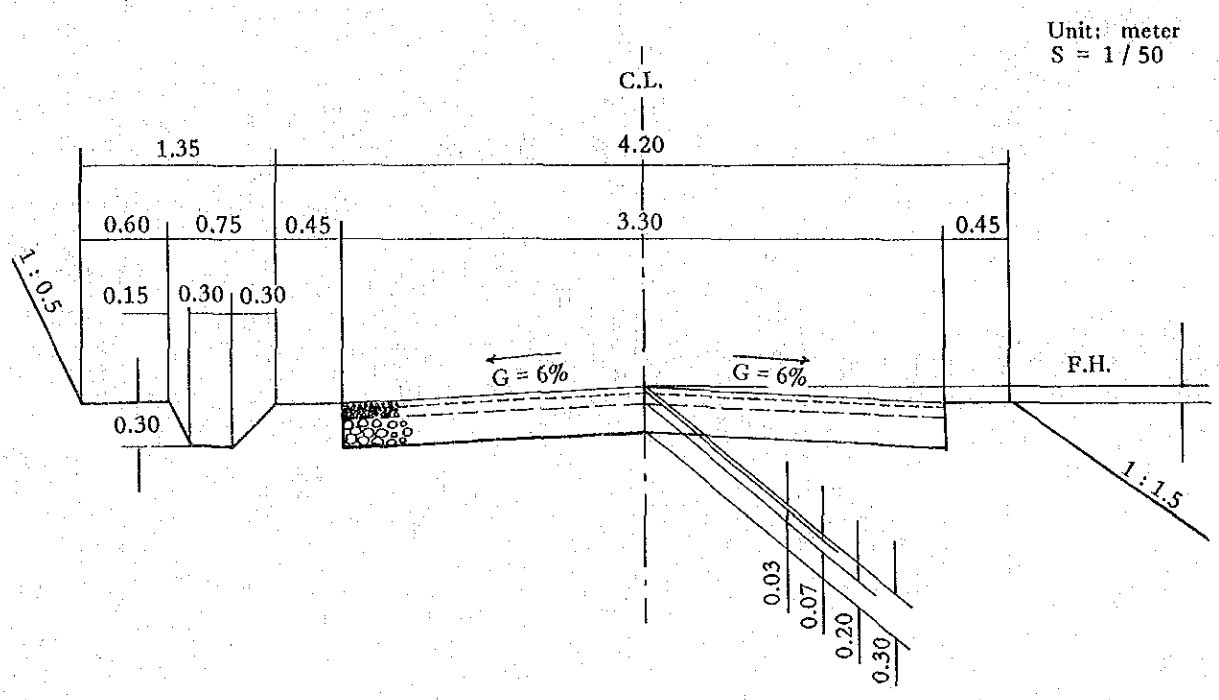


Fig. 3-7 Banking

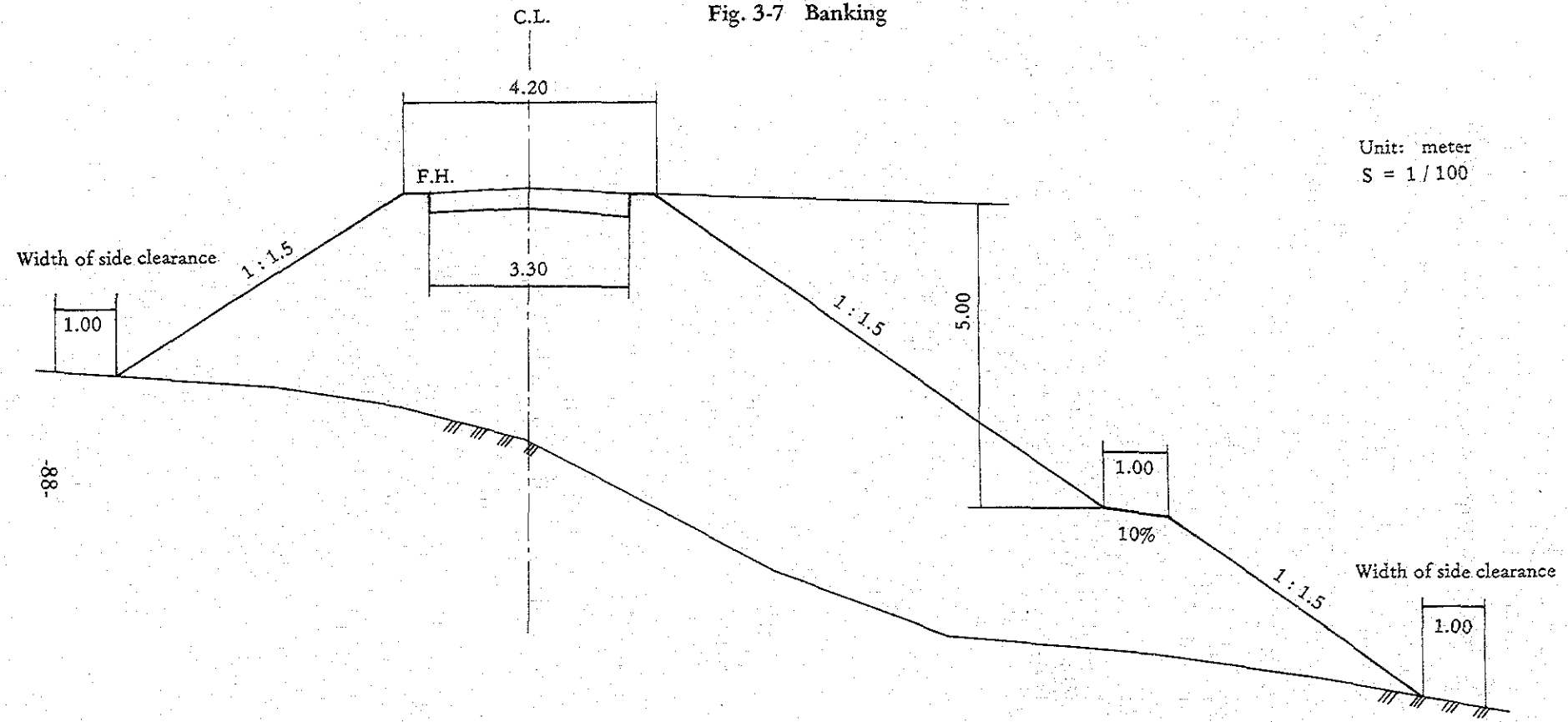
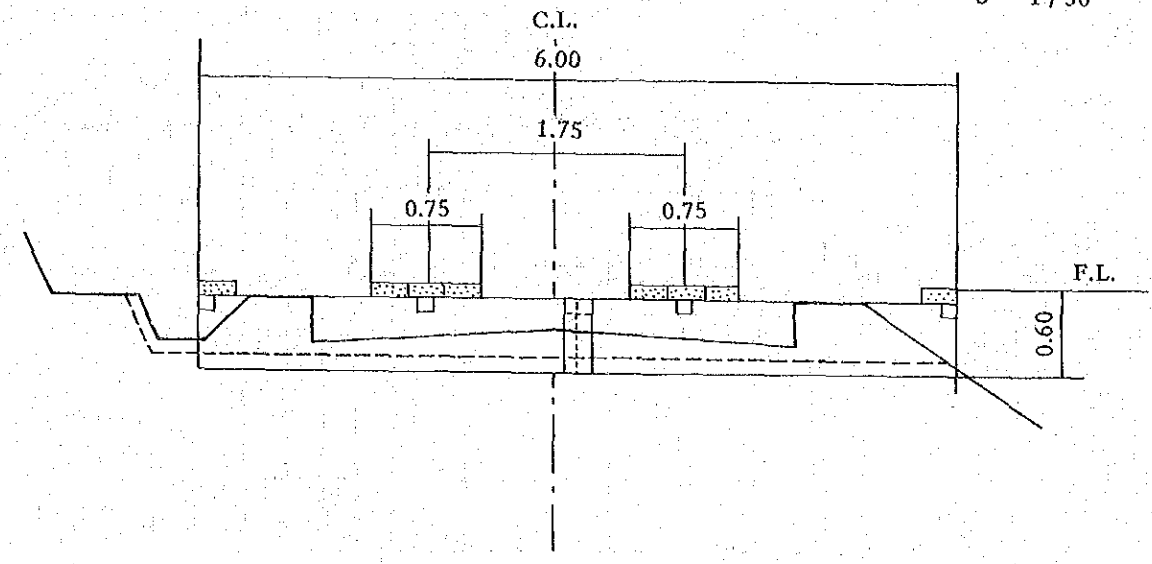


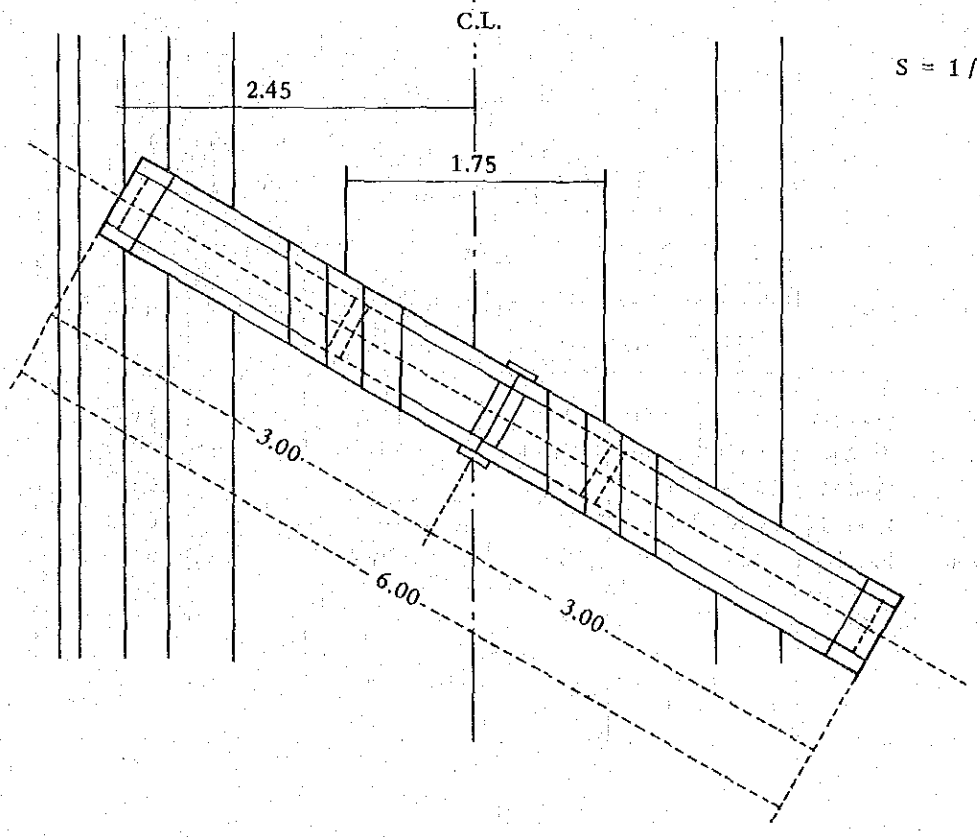
Fig. 3-8 Standard Figure of Wooden Open Drain

Side View:

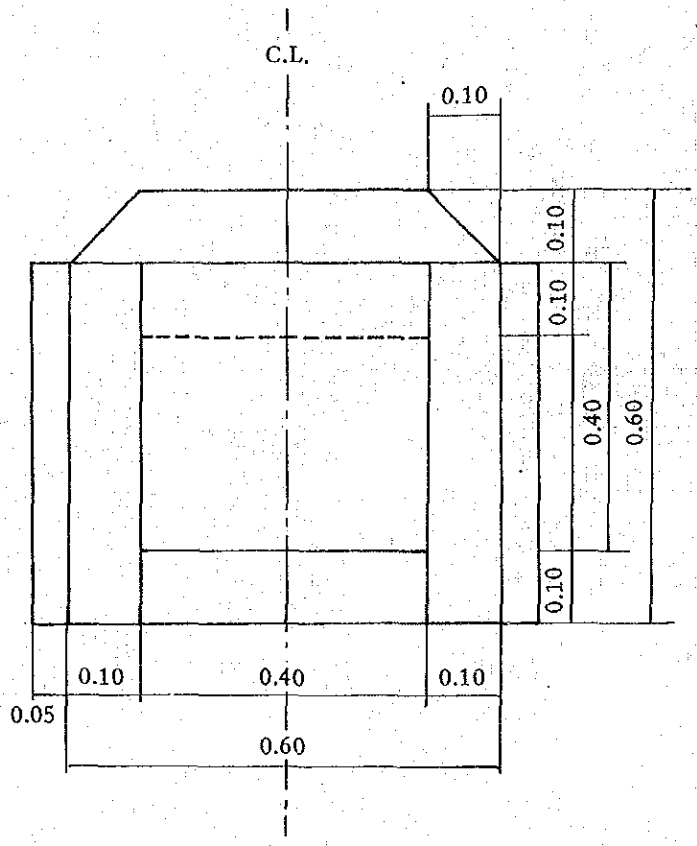
Unit: meter
S = 1 / 50



Plan:



Section



Unit: meter
S = 1 / 10

Materials List
(Per One Site)

Name	Spec.	Size			Volume per one pc.	Number	Total volume	Remarks
		Width	*Thick*	*Length*				
Side plate	Pyinkado	0.50	0.10	3.00	0.150	4	0.600	21.2 ft³
Bottom plate	Pyinkado	0.40	0.10	3.00	0.120	2	0.240	8.5 ft³
Plate	Pyinkado	0.25	0.10	0.60	0.015	8	0.120	4.2 ft³
Plate	Pyinkado	0.10	0.10	0.40	0.004	6	0.024	0.8 ft³
Gusset plate	Pyinkado	0.20	0.05	0.50	0.005	2	0.010	0.4 ft³
							0.994	35.1 ft³
Nail			6 #	15 cm	per 100 pc. 2.666	210	5.5986 kg	12.3 pounds

(2) Bridge and Wooden Structure

Designed load of bridge is considered to be equivalent to truck loads and heavy machines as bulldozer. Truck load of 30,860 pound (14 ton) drives larger bending moment than medium size bulldozer and design load is adopted as shown in picture.

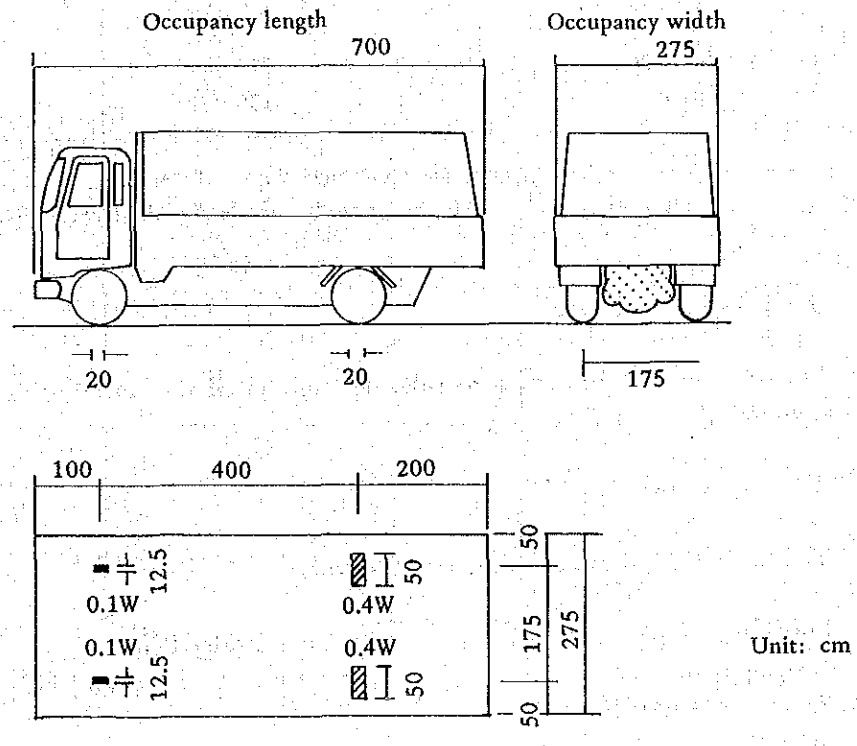
When a bridge is designed as wooden bridge, PYINKADO is preferred as it's nature is of excellent quality. Safe working stress of PYINKADO is as follows:

T Load

Load	Total load W	Fore-wheel load 0.1 W	Rear-wheel load 0.4 W	Fore-wheel width b_1	Rear-wheel width b_2	Wheel earth length a
T-14	14 t	1,400 kg	5,600 kg	12.5 cm	50 cm	20 cm
	30,860 lb	3,086 lb	12,344 lb	4.92 in	19.69 in	7.87 in

(1) One car loading to longitudinal direction.

(2) Factor of impact = 0.3



Unit: cm

Table 3-4 Safe Working Stress for Green or Partially Seasoned Timber

PYINKADO

1.	Weight in lb per c.f. at 12% M.C.	57 lb	913 kg/m^3
2.	Bending and tension extreme fiber		
	a) inside location	3,100 lb/□"	218 kg/cm^2
	b) wet location	2,050 lb/□"	144 kg/cm^2
3.	Shear horizontal along grain		
	a) all locations	190 lb/□"	13 kg/cm^2
	b) all locations	275 lb/□"	19 kg/cm^2
4.	Compression parallel to grain		
	a) inside location	2,000 lb/□"	140 kg/cm^2
	b) wet location	1,450 lb/□"	102 kg/cm^2
5.	Compression perpendicular to grain		
	a) inside location	970 lb/□"	68 kg/cm^2
	b) wet location	620 lb/□"	43 kg/cm^2

Source of information: Royal Engineers Reconnaissance Pocket Book 1944

Note: Above safe working stress are for standard grade structural No. 2

3-2-4 Labour and Cost

Stated in 3-1-6. According to this, the amount of the labourers and the cost in the 1st year is shown in Tables 3-5, 3-6.

3-2-5 Attached Map

The title of the attached maps are as follows:

Position Map (Forest road)
Logging Map
Roadway Diagraph
Standard View
Plan
Ploffile
Wooden Bridge Plan
Structures (Under Drain) Plan

Table 3-5 Labour and Cost in the 1st Year for the Main Forest Road

Work item	Quantity	Unit	Price	Sum	Labors per Unit	Labors Total
(Detail Cost of Work)						
Earth Work:						
Clearance	313	$100m^2$	9.00 Ks	2,817 Ks	1.00	313
Stump removal	20	pc.	9.90	198	0.20	4
Soil cutting and banking	66,929	m^3	2.70	180,708	0.11	7,362
Banking slope completion	552	m^2	4.50	2,484	0.50	276
Drain work of cutting step	688	m	9.40	6,467	0.80	550
Drain work of road surface	24	place	30.00	720	0.90	32
Shoulder setting	793	10m	9.00	7,137	1.35	1,071
Side ditch completion	518	10m	4.00	2,072	0.45	233
Sum				202,603		9,841
Ballasting:	14,061	m^2	14.50	203,885	0.45	6,328
Sub Total				406,488		16,169
Drain Work:						
Wooden open drain	17	place	809.00	13,753	1.20	20
Hume pipe, 18"ϕ	4	place	273.17	3,330	5.50	67
	12.19	m				
Hume pipe, 24"ϕ	21	place	373.50	23,900	9.20	589
	63.99	m				
Hume pipe, 30"ϕ	4	place	496.31	6,050	10.50	128
	12.19	m				
Hume pipe, 36"ϕ	21	place	541.80	34,670	11.40	730
	63.99	m				
Hume pipe, 48"ϕ	32	place	738.31	72,000	14.55	1,419
	97.52	m				
Hume pipe, 54"ϕ	50	place	931.29	141,900	18.50	2,819
	152.37	m				
Sum				295,603		5,772
Wooden bridge work:	1	complete set		57,500		619
Sub Total				759,591		22,560
Cost of indirect work:	1	complete set		57,050		4,510
Grand Total				816,641 Ks		27,070

Table 3-6 Materials List

Classification	Expression		Quantity
Hume pipe, 18"ϕ	ℓ = 10' t = 1½"	4 pieces	
Hume pipe, 24"ϕ	ℓ = 10' t = 1¾"	21 pieces	
Hume pipe, 30"ϕ	ℓ = 10' t = 2"	4 pieces	
Hume pipe, 36"ϕ	ℓ = 10' t = 2"	21 pieces	
Hume pipe, 48"ϕ	ℓ = 10' t = 2½"	32 pieces	
Hume pipe, 54"ϕ	ℓ = 10' t = 2¾"	50 pieces	
Cement	Concrete	52.14	
	Mortar	1.19	
		53.4 ÷ 40 kg	1,335 bag
Sand	Aggregate	127.7	
	Ballasting	421.8	
	Mortar	2.3	
		551.8	552 m^2
Crushed stone	Aggregate	255.5	
	Masonly	116.7	
		372.2	373 m^3
River gravel	Ballasting	3,796.5	
	Back filling	175.0	
	Side ditch gravel	76.6	
	Foundation	318.0	
		4,366.1	4,366 m^3
Light oil	Bulldozer	4,136	
	Dump truck	13,650	
		17,786 ÷ 4,546 = 3,912.5	3,913 gallon
General timber	Mold form:		
	Plate timber	4.6	
	Squared timber	19.0	
	Open drain	16.9	
		40.5	41 m^3
Pyinkado timber	Bridge	45.8	46 m^3
Nail	Bridge	202.0	
	Open drain	95.2	
	Mold form	91.2	
		388.4	389 kg
Bolt	Bridge	391.9	
	Mold form	494.0	
		885.9	886 kg

4. The Training Plan for the Technical Cooperation Center

4-1 The Plan for Training Facilities

Land preparation of a required site of the training center covering 10,476 m^2 has been offered by the Burmese side in Okkyin, a suburb of Rangoon City has been completed.

The installation of a model cable and machine store-house are under way but office and class room, lodging, dining room and shower room which are also required for the training have been completed.

Maps of the design and location of the buildings are referred to Fig. 4-1 – Fig. 4-6.

4-2 Training Plan

4-2-1 Logging Management Course

(1)	Orientation	0.5 day
(2)	Introduction of Japanese logging technics	0.5 day
(3)	Foundation of cable logging operation	3.0 day
(4)	Survey (I) – Cable logging	2.0 day
(5)	Design of cable logging	2.0 day
(6)	Wire splice	3.0 day
(7)	Operation standard and safety operation	1.0 day
(8)	Field exercise of cable logging	7.0 day
(9)	Survey (II) – Forest road designing	4.0 day
(10)	Evaluation	0.5 day
	Total	23.5 day

4-2-2 Logging Course

A. Logging Course (for staff)

(1)	Orientation	(0.5 day)
(2)	Machine special technics	(14.5 day)
a.	Foundation of cable logging	3.0 day
b.	Physics of cable logging	2.0 day
c.	Operational standard	2.0 day
d.	Safety operation	1.0 day
e.	Wire rope	1.5 day
f.	Design of cable stretching	5.0 day
(3)	Technical development and preparation of plan	(8.0 day)
a.	Production plan	3.0 day
b.	Yarder operation and tractor operation	2.0 day
c.	Road network preparation plan	3.0 day

(4)	Cable operation technics	(11.0 day)
a.	Logging method	2.0 day
b.	Cabling method	1.0 day
c.	Tools of machine logging device	2.0 day
d.	Assembling and dismantling of logging device	4.0 day
e.	Principle of inspection	1.0 day
f.	Tractor logging	1.0 day
(5)	Field exercise	(58.0 day)
a.	Wire splice	5.0 day
b.	Simulation (Cable logging)	7.0 day
c.	Simulation (Felling & bucking)	3.0 day
d.	Cable and operation	27.0 day
e.	Survey	12.5 day
f.	Felling and bucking	3.0 day
g.	Tractor logging	0.5 day
(6)	Evaluation	(0.5 day)
	Total	92.5 day

B. Logging Course (for workers)

(1)	Orientation	(0.5 day)
(2)	Machine special technics	(9.5 day)
a.	Foundation of cable logging	3.0 day
b.	Physics of cable logging	2.0 day
c.	Operational standard	2.0 day
d.	Safety operation	1.0 day
e.	Wire rope	1.5 day
(3)	Cable operation technics	(11.0 day)
a.	Logging method	2.0 day
b.	Cabling method	1.0 day
c.	Tools of machine logging device	2.0 day
d.	Assembling and dismantling of machine logging device	4.0 day
e.	Principle of inspection	1.0 day
f.	Tractor logging	1.0 day
(4)	Field exercise	(71.0 day)
a.	Wire splice	10.0 day
b.	Simulation (Cable logging)	15.0 day
c.	Simulation (Felling and bucking)	6.0 day
d.	Cable and operation	30.0 day
e.	Felling and bucking	5.0 day
f.	Tractor logging	5.0 day
(5)	Evaluation	(0.5 day)
	Total	92.5 day

4-2-3 Maintenance and Repair Coruse

(1)	Outline of management and control of heavy machine repair plant	(3.0 day)
a.	Machine repair system	1.0 day
b.	Parts and materials management	1.0 day
c.	Machine works management	1.0 day
(2)	Yarder Y-52E	(13.0 day)
a.	Structure and function	1.0 day
b.	Principle of dismantling and assembling	10.5 day
c.	Diagnosis of troubles	1.5 day
(3)	Skidder T-50	(6.0 day)
a.	Structure and function	1.0 day
b.	Principle of dismantling and assembling	4.0 day
c.	Diagnosis of troubles	1.0 day
(4)	Tractor D60A-6	(10.0 day)
a.	Structure and function	1.0 day
b.	Principle of dismantling and assembling	8.0 day
c.	Diagnosis of troubles	1.0 day
(5)	Tractor D6D	(5.0 day)
a.	Structure and function	1.0 day
b.	Principle of dismantling and assembling	3.0 day
c.	Diagnosis of troubles	1.0 day
(6)	Periodical Periodical maintenance	(3.0 day)
a.	Meaning and classification of periodical maintenance	1.0 day
b.	Inspection and repair plan	2.0 day
	Total	40.0 day

4-2-4 Yearly Training Plan

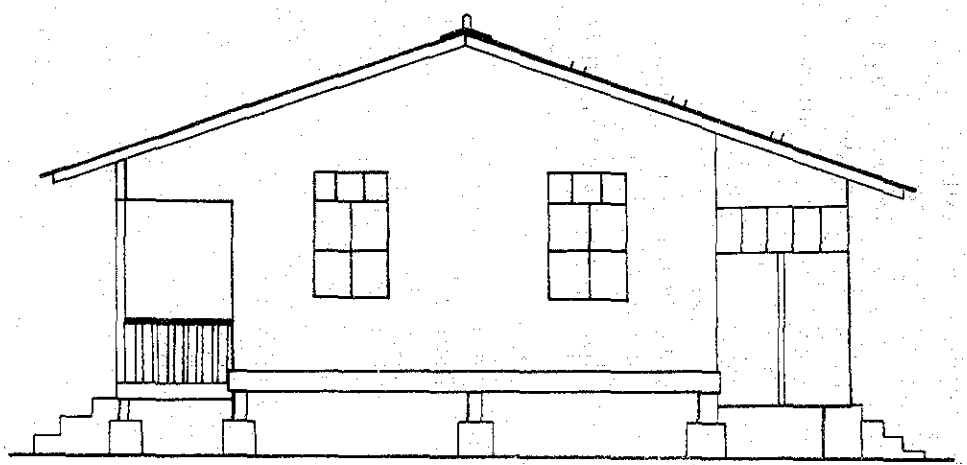
Training plan by year is shown in Table 4-1.

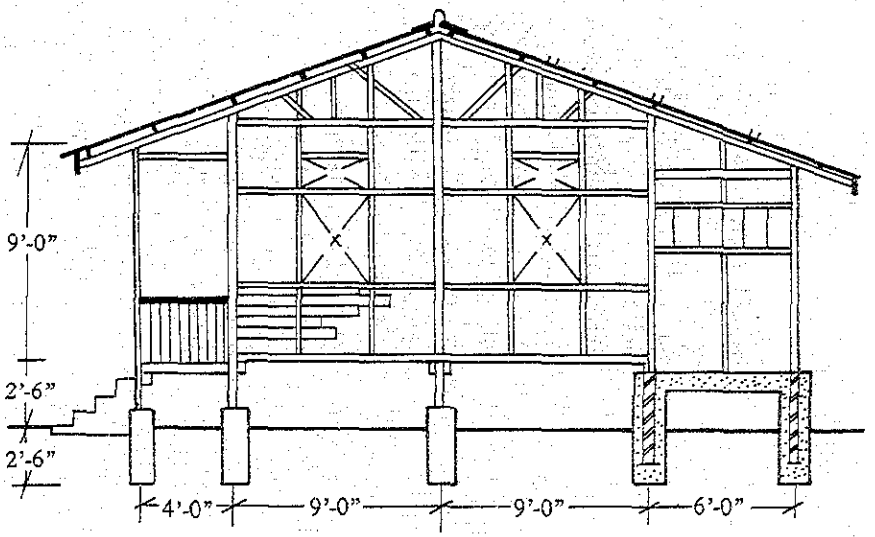
Fig. 4-1 Office and Class Room

(1) Front View

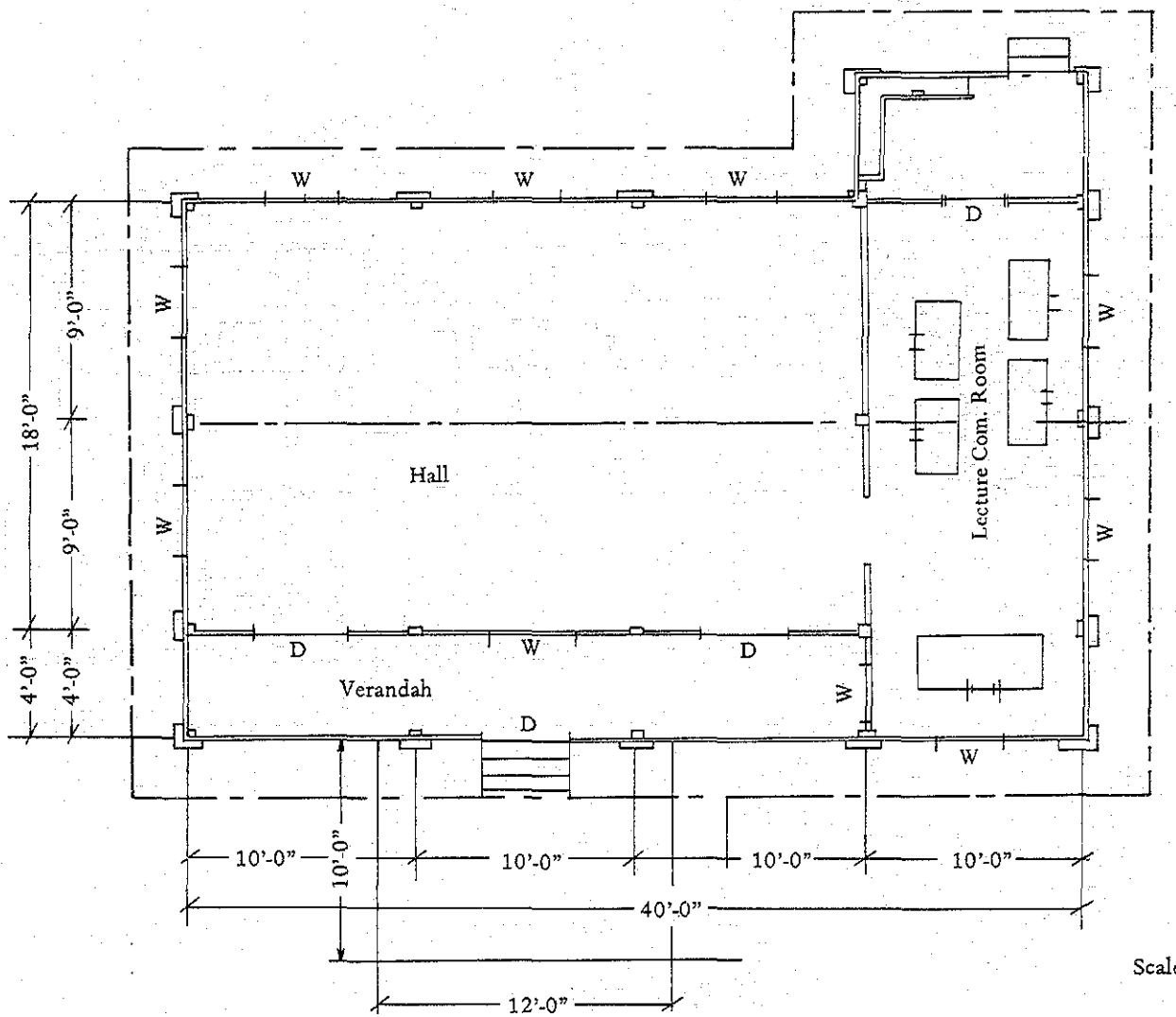
(2) Side View

Scale: 1 / 8" = 1'-0"





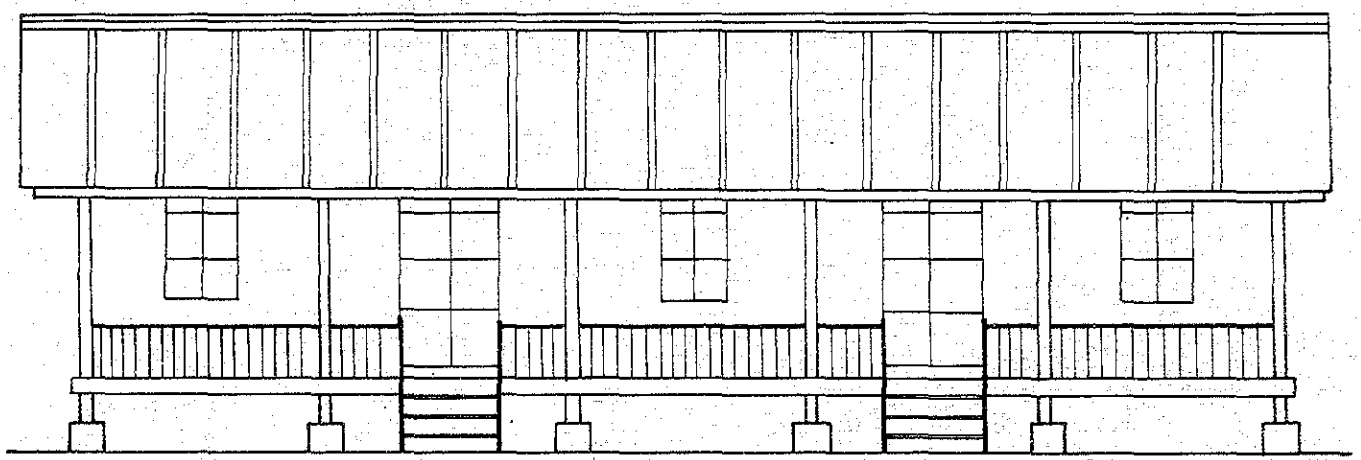
(3) Plane



Scale: 1 / 8" = 1'-0"

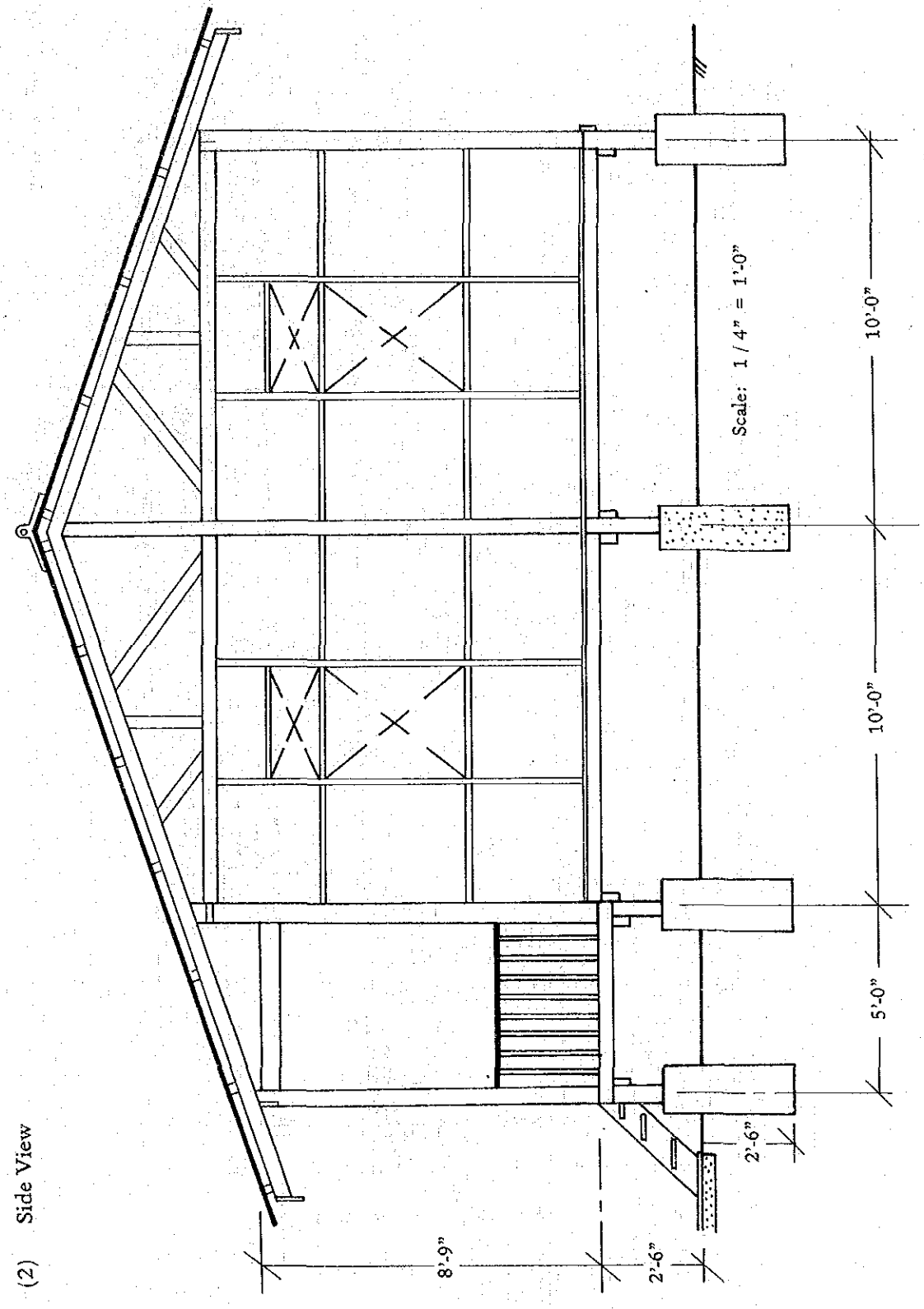
Fig. 4-2 Lodging

(1) Front View

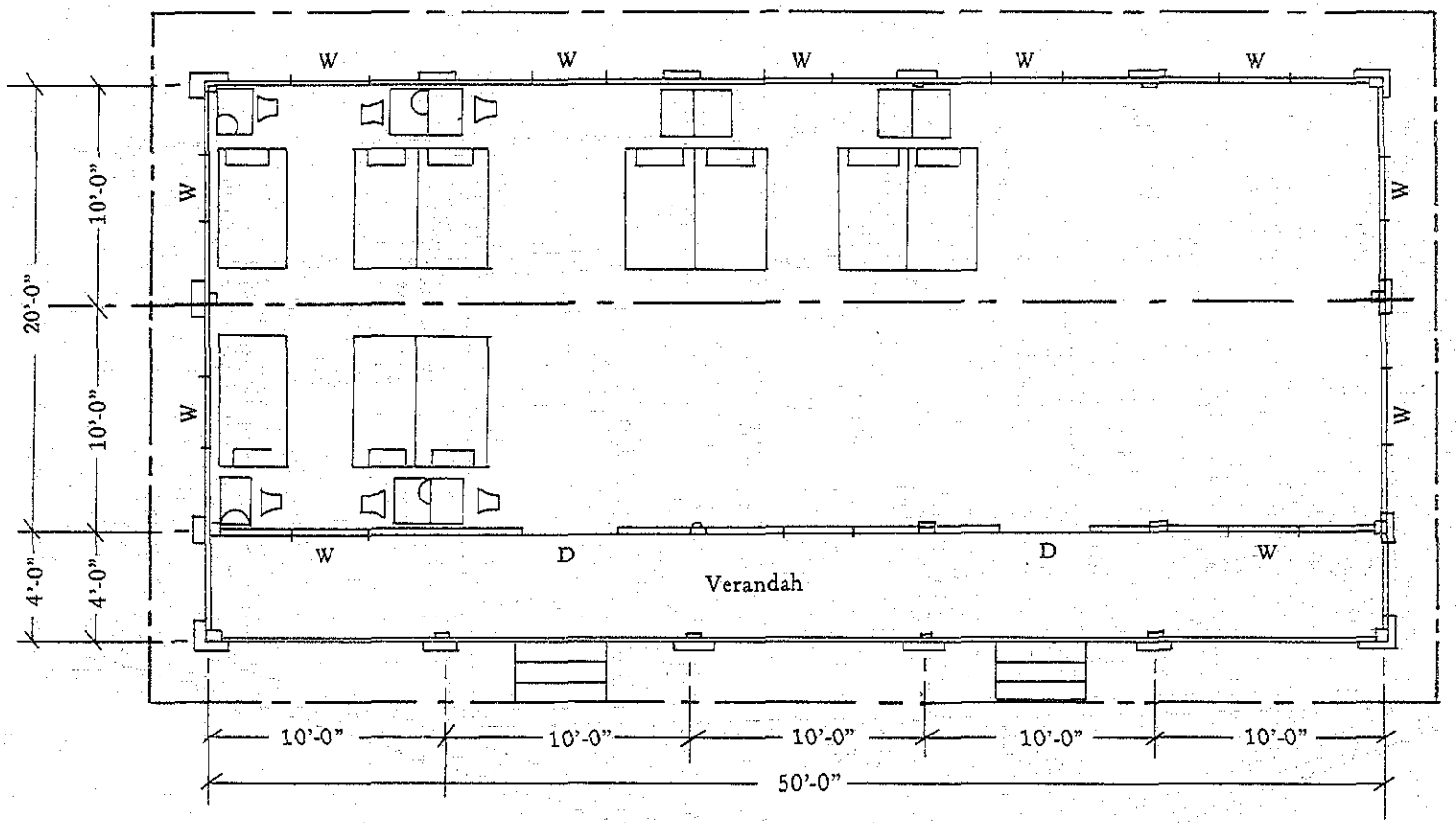


Scale: 1 / 8" = 1'-0"

(2) Side View



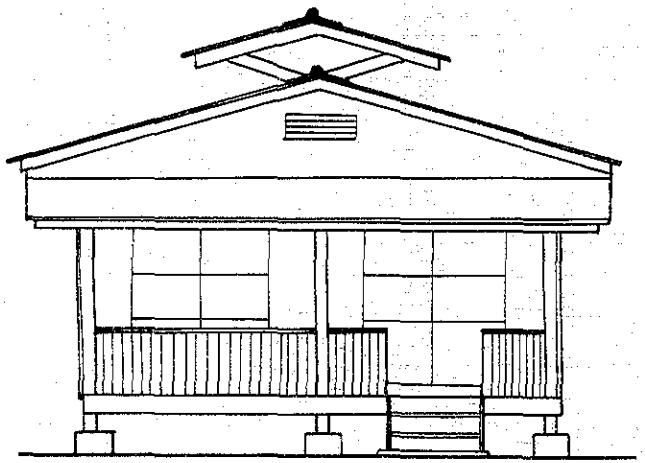
(3) Plane



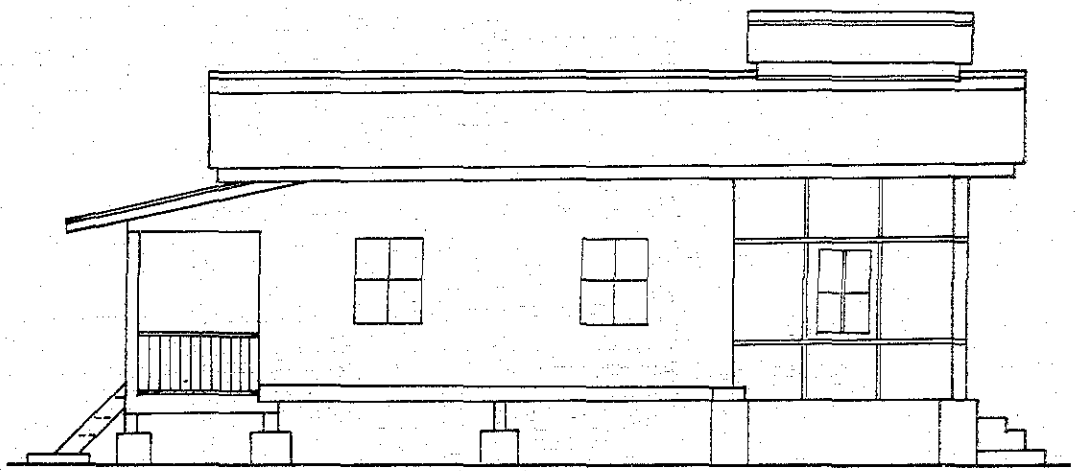
Scale: 1 / 8" = 1'-0"

Fig. 4-3 Dinning Room

(1) Front View

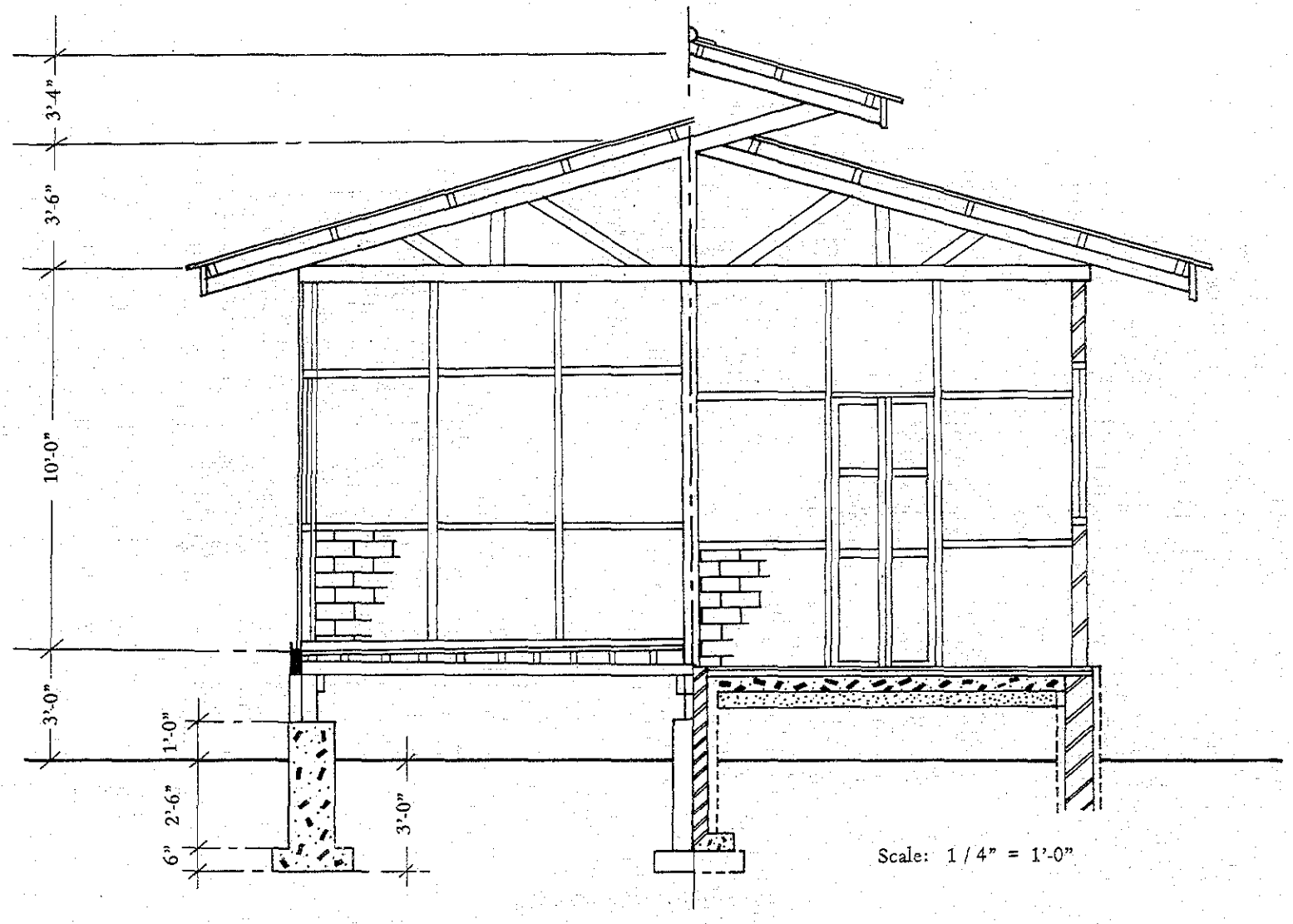


(2) Side View (A)



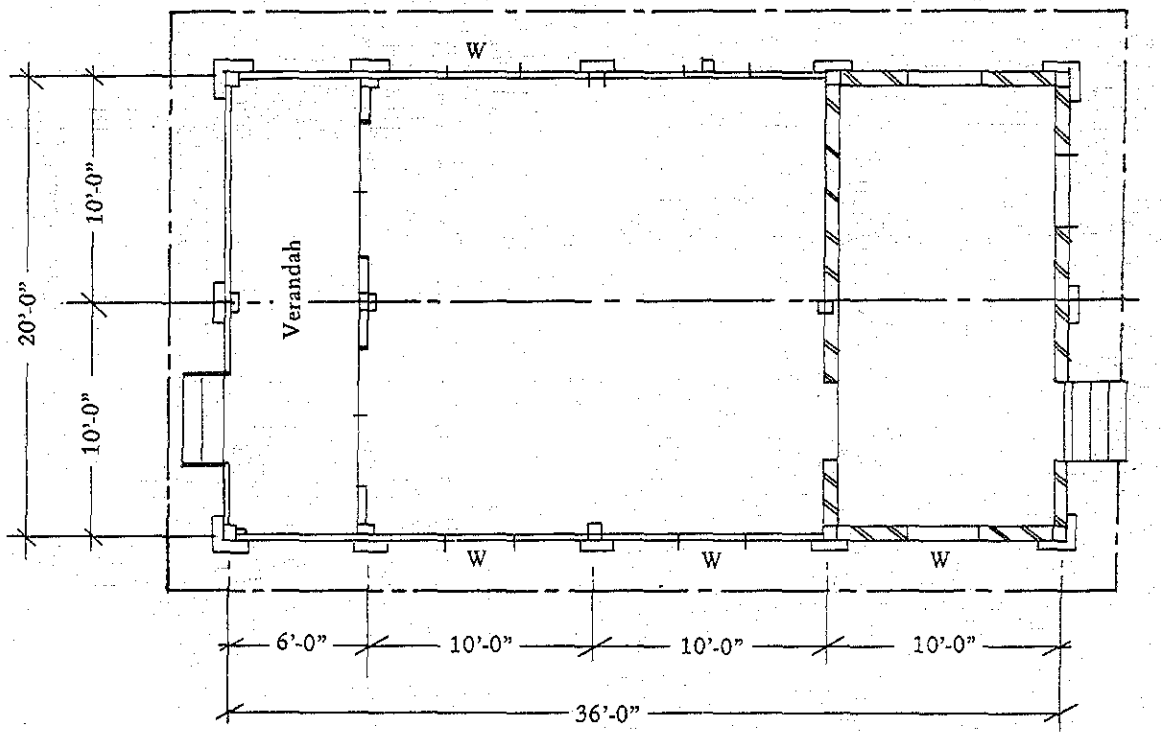
Scale: 1 / 8" = 1'-0"

(2) Side View (B)



Scale: 1 / 4" = 1'-0"

(3) Plane

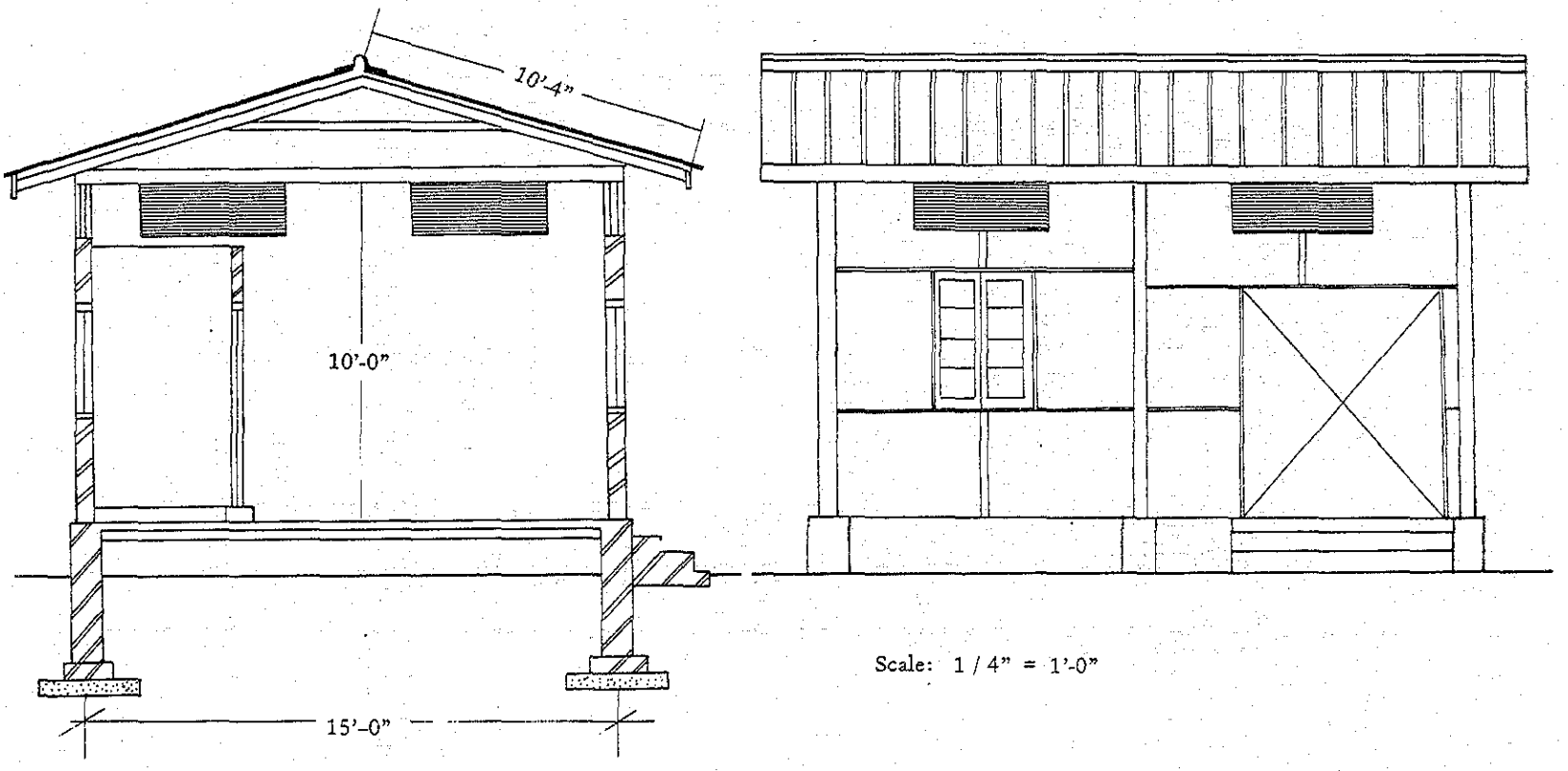


Scale: 1 / 8" = 1'-0"

Fig. 4-4 Shower Room

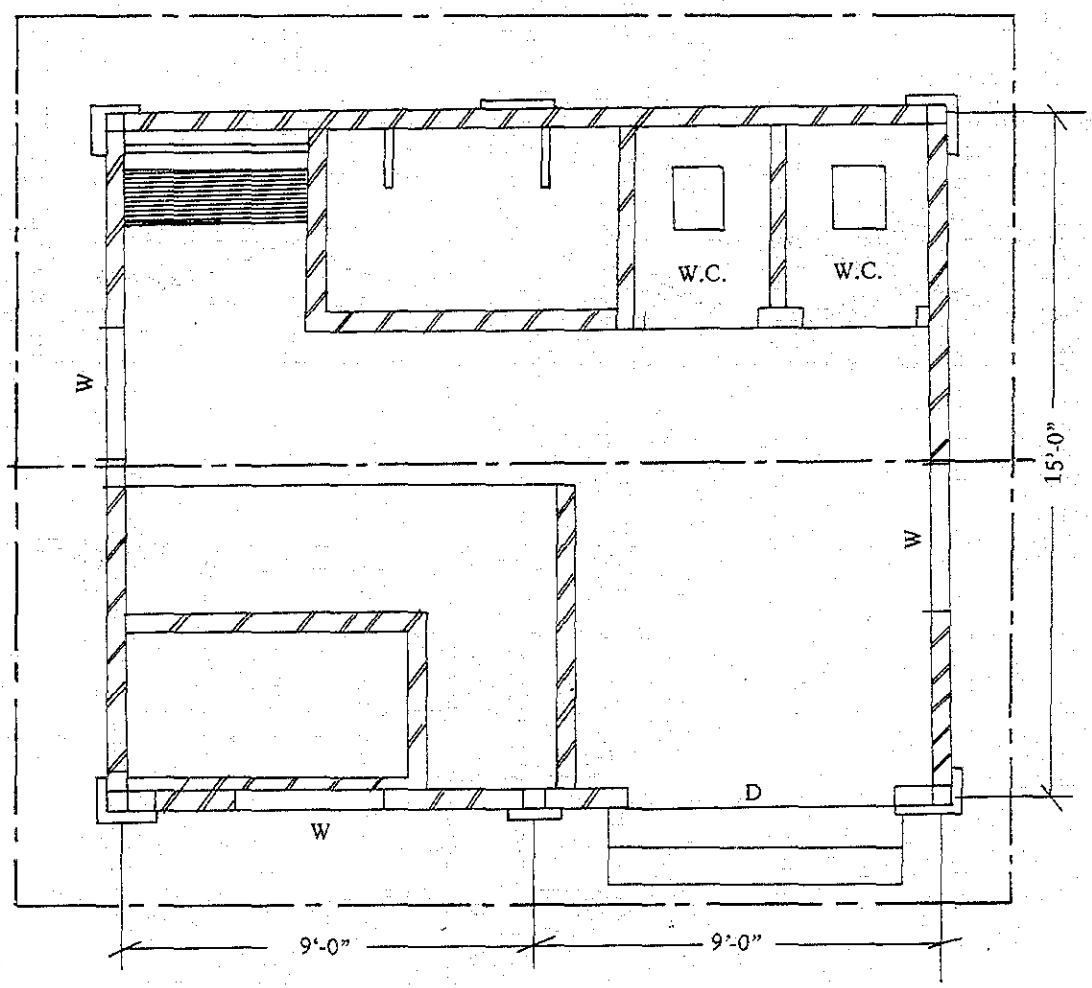
(1) Front View

(2) Side View



Scale: 1 / 4" = 1'-0"

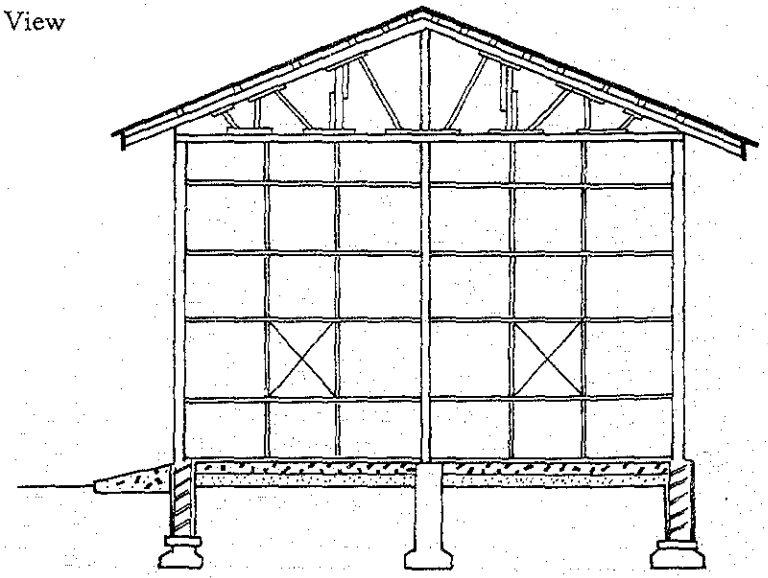
(3) Plane



Scale: 1 / 4" = 1'-0"

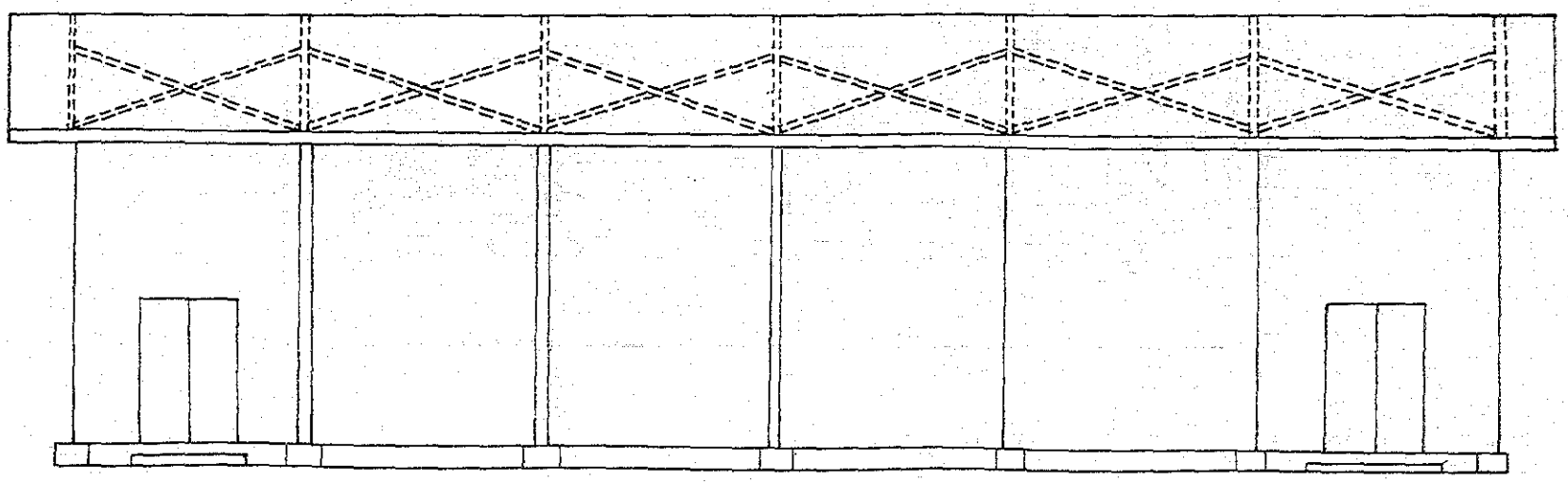
Fig. 4-5 Machine Storehouse

(1) Front View



Scale: 1 / 8" = 1'-0"

(2) Side View



(3) Plane

Scale: 1 / 8" = 1'-0"

Fig. 4-6 Facilities for the Technical Cooperation Center

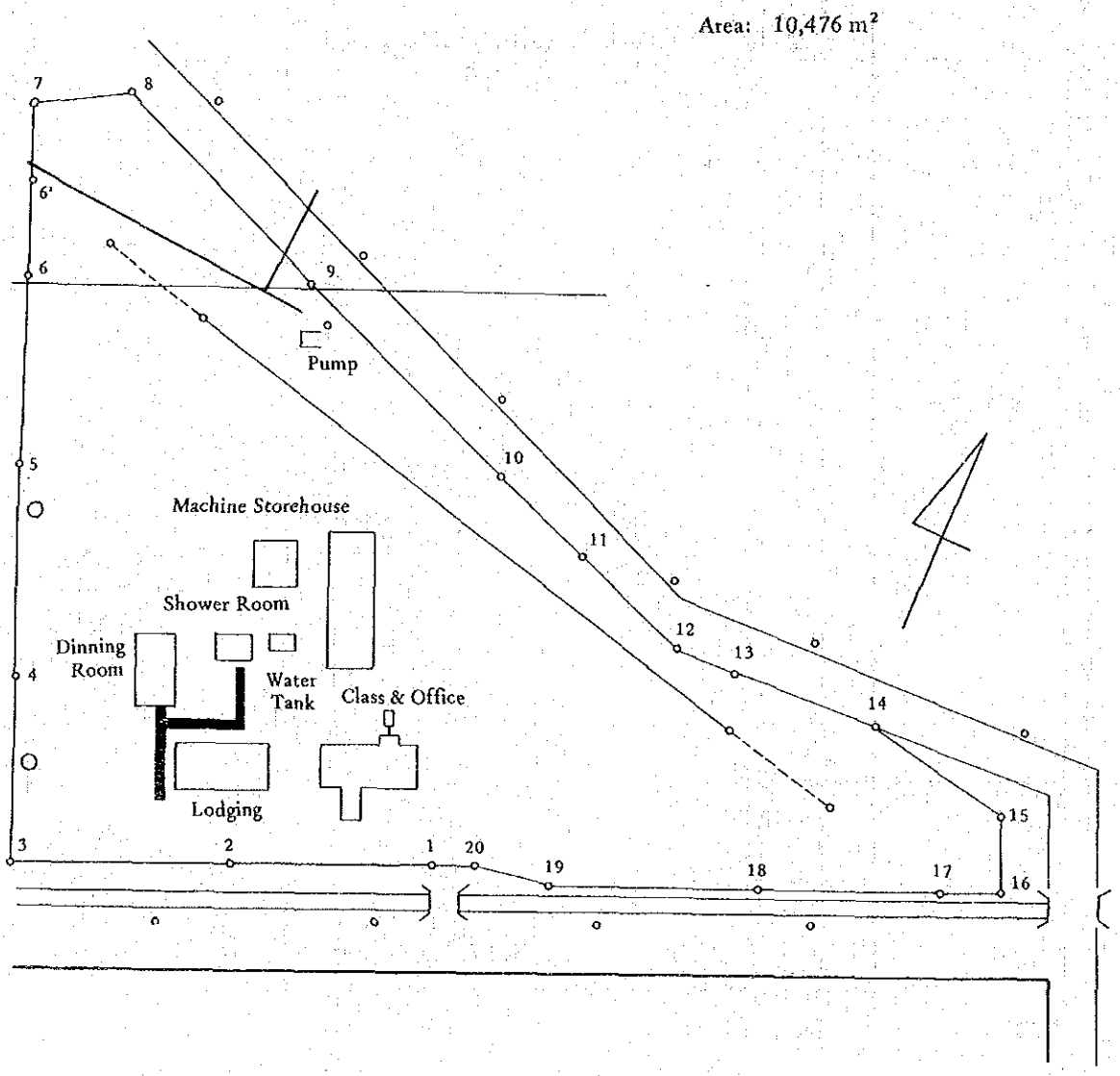


Table 4-1 Training Plan by Year

Year	Items \ Month	Jan.	Feb.	Mar.	Apr.	May	Jun.	Jul.	Aug.	Sep.	Oct.	Nov.	Dec.
1979	Logging management Course				⇨								
	Logging Course (A)					⇨	→	→	→	→	⇨		
	Logging Course (B)											⇨	⇨
	Maintenance and Repair Course											⇨	⇨
1980 ~ 1082	Logging management Course		⇨	⇨									
	Logging Course (A)					⇨	→	→	→	→	⇨		
	Logging Course (B)	⇨	→	→	→	⇨	⇢	⇢	⇢	⇢	⇨	⇨	⇨
	Maintenance and Repair Course											⇨	⇨

5. Yearly Plan for Machine to Supply

For 1978, we supplied various machines for training plan in Okkyin and for following year and after, machines for exercise in model operation forest are supplied in proportion to progress of plan.

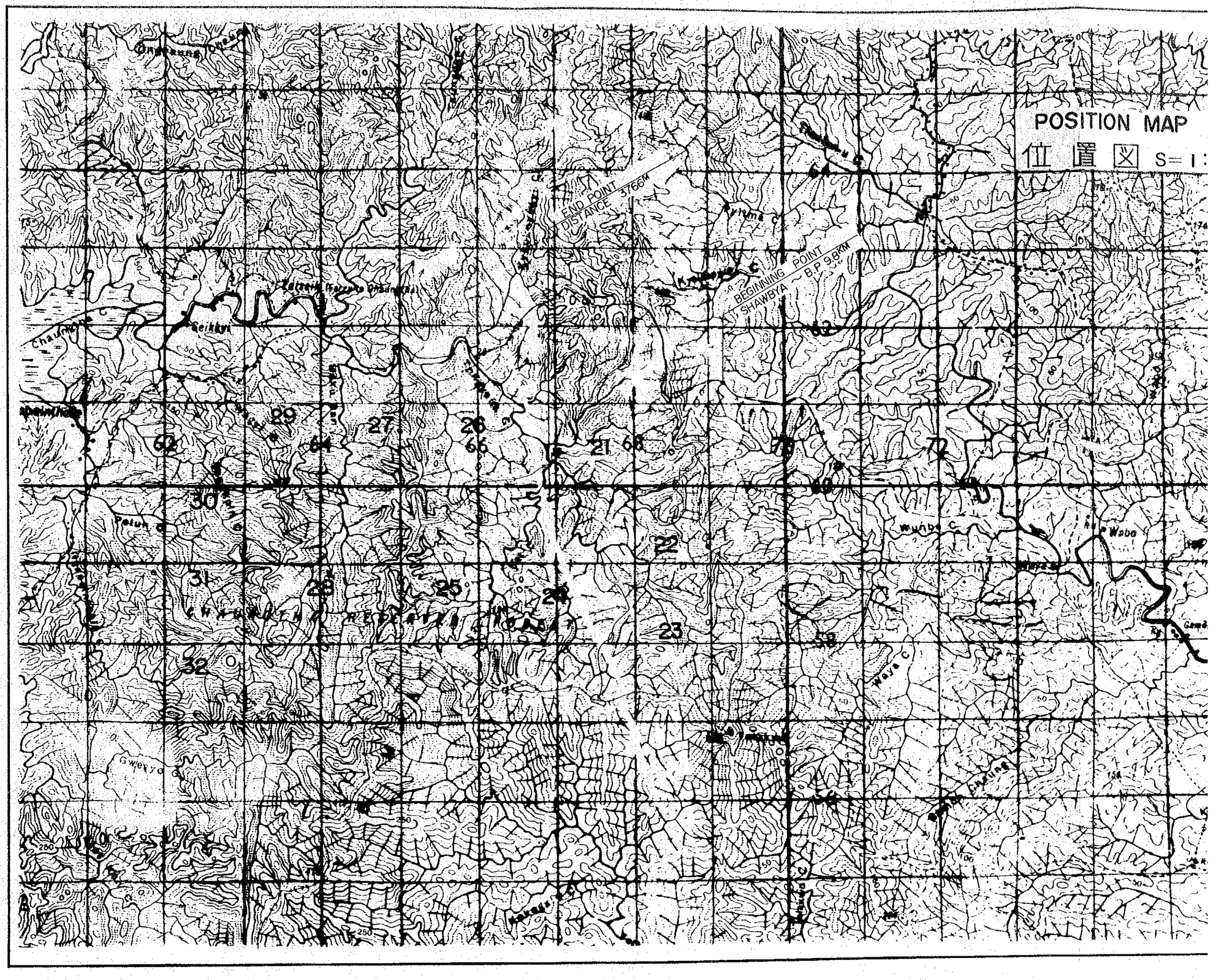
The quantity by year, use and machine are shown in Table 5-1.

Table 5-1 Machine to Supply Plan by Year

	Achievements	Plan			Total	Remarks
	1978	1979	1980	1981		
1. For exercise						
Yarder (Y – 52)	1	1	1	1	4	Including tool set and wire rope
Yarder (Y – 33)				2	2	Including tool set and wire rope
Wheel tractor	1	3	3	3	10	
Crawler tractor	1		1	1	3	
Chainsaw	3	10	10	10	33	
Bush cleaner		5	5	5	15	
Others	1		1		2	
2. For construction of forest road						
Bulldozer (16 ton)	1				1	
Back hoe		1			1	
Set of rock-drill		1	1		2	
Set of crusher		1	1		2	
Others		1			1	
3. For repair shop						
Machine for repair	1	1			2	
Tools		1			1	
Parts		1	1	1	3	
Measurement instruments	1	1			2	
Service car				1	1	
4. For training						
Yarder (Y - 33)		1			1	
Yarder (Y - 12)	1				1	
Video set and others	1				1	
Set of model	1				1	
Tools for repair	1				1	
Machines	1				1	
Wire rope		1			1	
Others			1	1	2	
5. For management						
Jeep	2	2			4	
Wireless device	3	1			4	
Speed boat	1	1			2	
Light burden car	1	1			2	
Copying machine	1	1			2	
Other office utensils	1	1	1	1	4	
Micro-bus		1			1	

ATTACHED MAPS

Position Map (Forest Road)	1 sheet
Logging Map	1 sheet
Roadway Diagraph	Design No. 1
Standard View	Design No. 2
Plan	Design No. 3, 4, 5, 6
Profile	Design No. 7, 8, 9
Wooden Bridge Plan	Design No. 10, 11
Structures (Under Drain) Plan	Design No. 12


POSITION MAP
位置図
S=1:
END POINT
DISTANCE 37.66KM
BEGINNING POINT
SHAWBYA ~ B.P 98KM
Wabe
Gwelya
Petun
Kelkay
Chaluma

POSITION MAP

位置図 S=1:42,000

END POINT
DISTANCE 37.66KM

BEGINNING POINT
SHAWBYA B.P 98KM

Wabo

Shawbya

Thabaung

Kwethe C.

Shan

MODEL OPERATION FOREST
LOGGING PLAN MAP
(FOREST ROAD. FEEDER ROAD. CABLE LINE)
伐 出 計 画 図
(林道・作業道・索道)

S= 1:20,0000

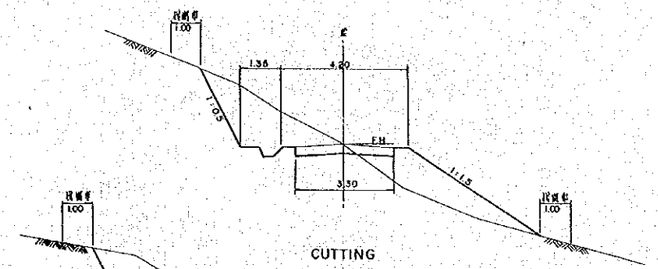
ROADWAY DIAGRAPH

土工定規図

S = 1 : 200

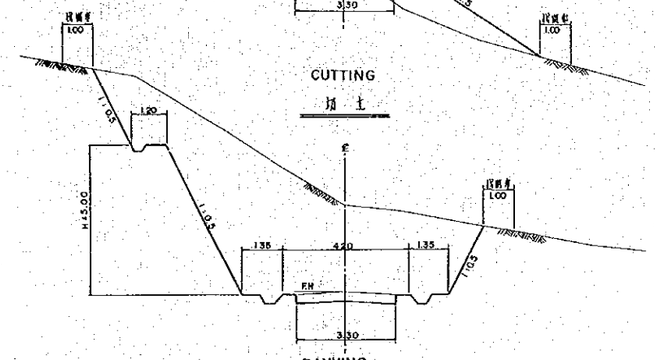
ONE SIDE CUTTING AND BANKING

片切盛



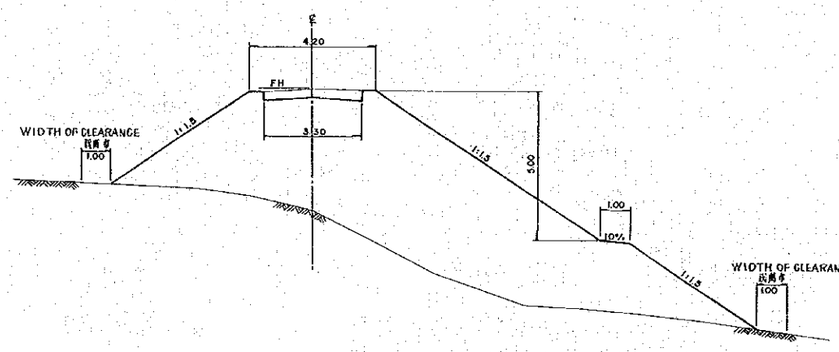
CUTTING

切土



BANKING

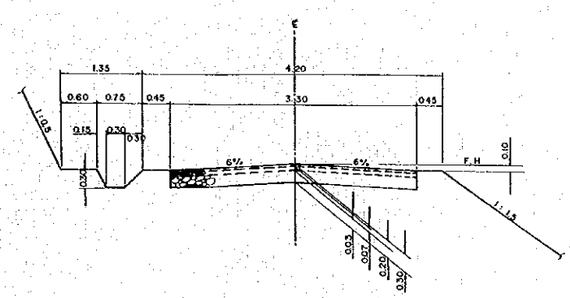
盛土



BALLAST AND SIDE - DITCH

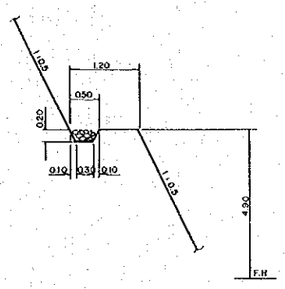
軌道利及び側溝

S = 1 : 100



STEP OF CUTTING DETAIL

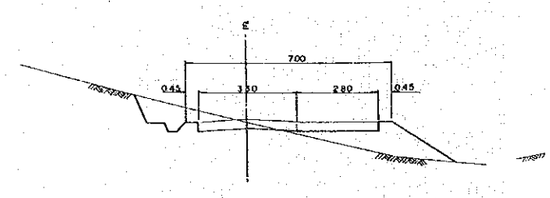
切土小段詳細

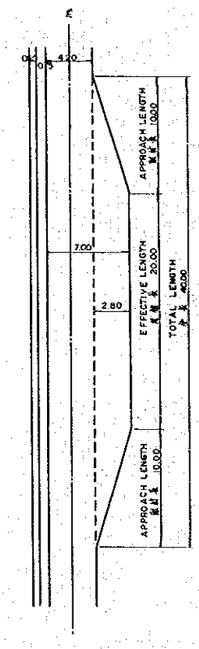


TURN OUT

待避所

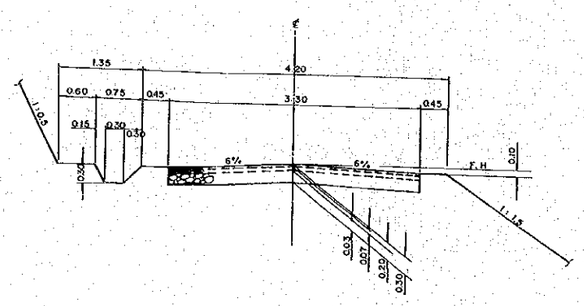
S = 1 : 200
1 : 500



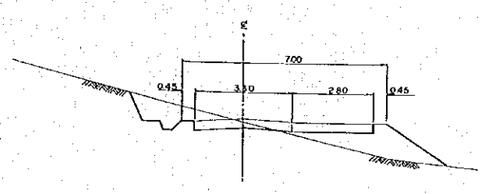


S = 1 : 200
G

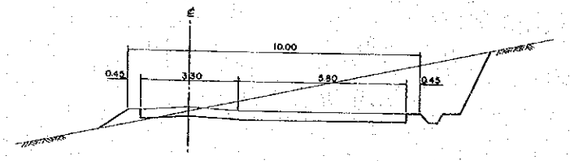
BALLAST AND SIDE - DITCH
敷砂利及び側溝 S = 1 : 100



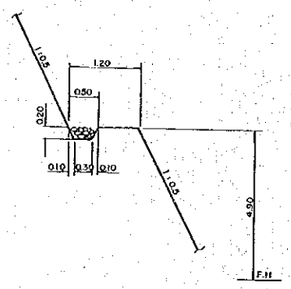
TURN OUT
停避所 S = 1 : 200 / 1 : 500

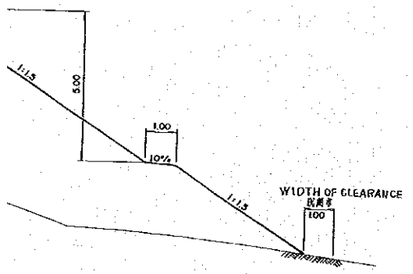


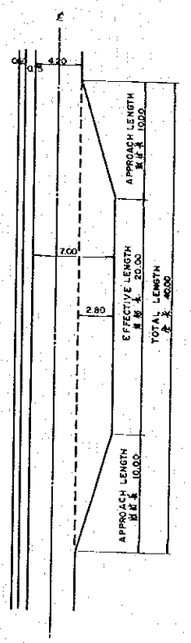
TURN AROUND
車廻し S = 1 : 200 / 1 : 500

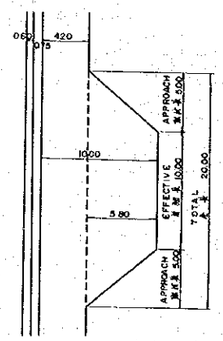


STEP OF CUTTING DETAIL
切土小段詳細



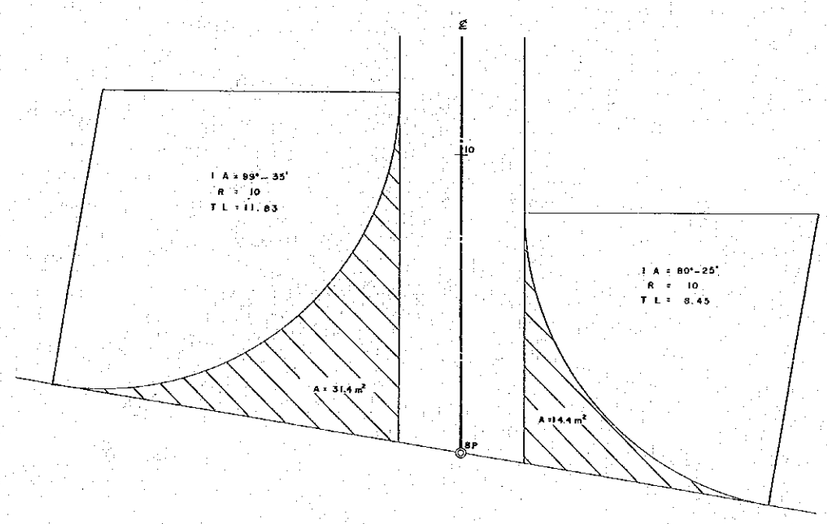






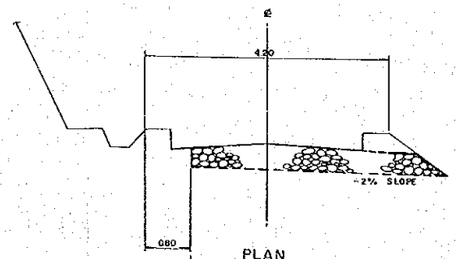
工事名	FOREST ROAD CONSTRUCTION WORK FOR JICA FORESTRY PROJECT	1 / 12
図面名	ROADWAY DIAGRADH	縮尺
検閲	(紀)北星コンサルタンツ / (紀)北星コンサルタンツ	昭和 年度

APPROACH OF BEGGNING
起点取付図
S = 1 : 200



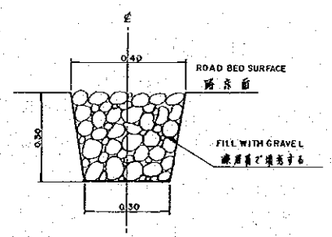
SUBGRADE UNDER DRAIN
路床暗渠

SIDE VIEW
側面図
S = 1 : 100



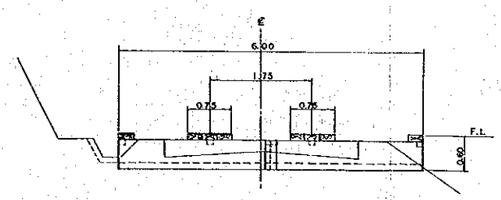
PLAN
平面図
S = 1 : 100

SECTIONAL VIEW
断面図
S = 1 : 20

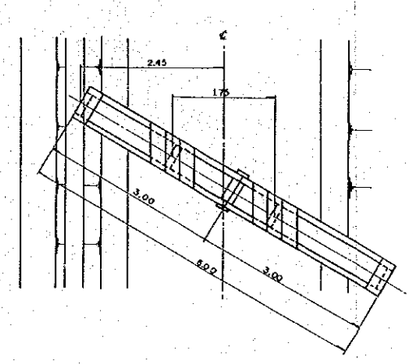


PLAN OF WOODEN
木造側渠

SIDE VIEW
側面図
S = 1 : 100



PLAN
平面図
S = 1 : 100



I② MATERIALS LIST
1ヶ所当り材料表

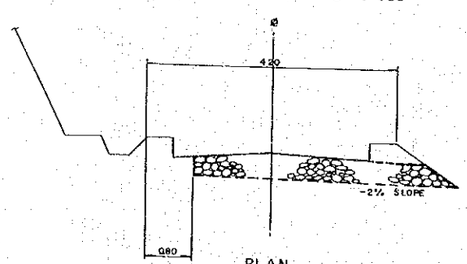
ITEM 名称	QUANTITY 数量
GRAVEL 礫砂利	0.9 m³
EXCAVATION OF FOUNDATION 床掘	0.9 m³

200

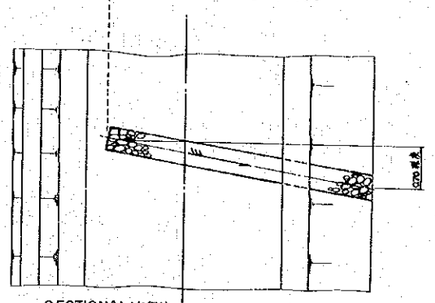
I A = 80°-25'
R = 10
T L = 8.45

SUBGRADE UNDER DRAIN
路床暗渠

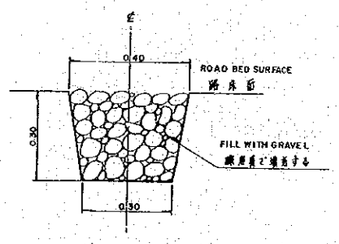
SIDE VIEW
側面図 S = 1 : 100



PLAN
平面図 S = 1 : 100



SECTIONAL VIEW
断面図 S = 1 : 20

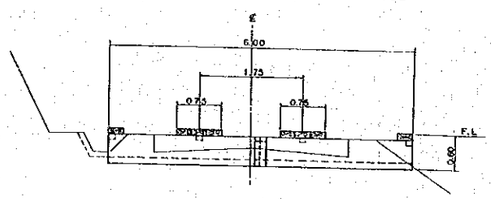


I㎡ MATERIALS LIST
1ヶ所当り材料表

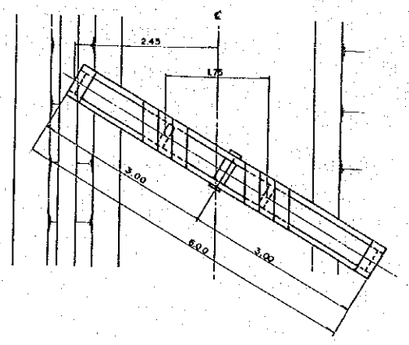
ITEM 名称	QUANTITY 数量
GRAVEL 礫層	0.9 m³
EXCAVATION OF FOUNDATION 床掘	0.9 m³

PLAN OF WOODEN OPEN DRAIN
木造開渠図

SIDE VIEW
側面図 S = 1 : 100



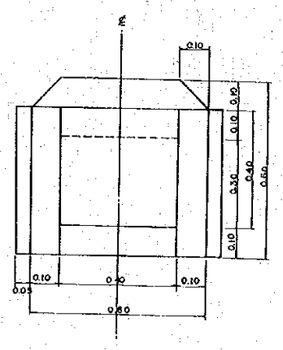
PLAN
平面図 S = 1 : 100



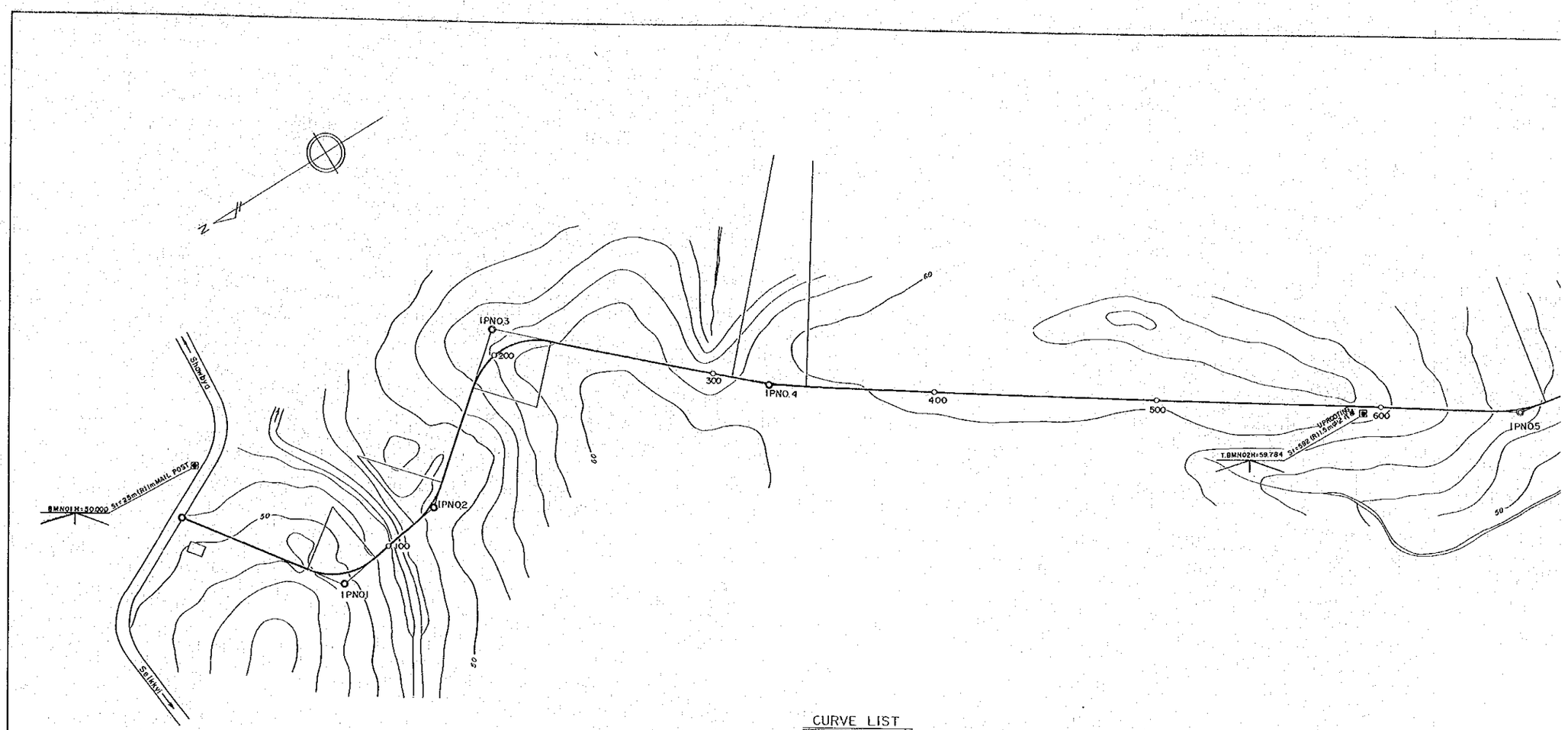
MATERIALS LIST
材料表 I㎡ 1ヶ所当り

ITEM 名称	QUALITY 材質	SIZE 寸法 W	t	L	I㎡当り材積	QUANTITY 員数	AMOUNT 総計積	NOTE 摘要
SIDE PLATE 側板		0.50	0.10	3.00	0.150	4	0.600	
BED PLATE 底板		0.40	0.10	3.00	0.120	2	0.240	
SURFACE PLATE 敷板		0.25	0.10	0.60	0.015	8	0.120	
SPLICE BAR 添木		0.10	0.10	0.40	0.004	6	0.024	
SPLICE PLATE 継板		0.20	0.05	0.50	0.005	2	0.010	
TOTAL 計							0.994 m³	
NAIL 洋釘			6 mm		15 cm 100本当り 2.666	210	5.5986 kg	

SECTIONAL VIEW
断面図 S = 1 : 20

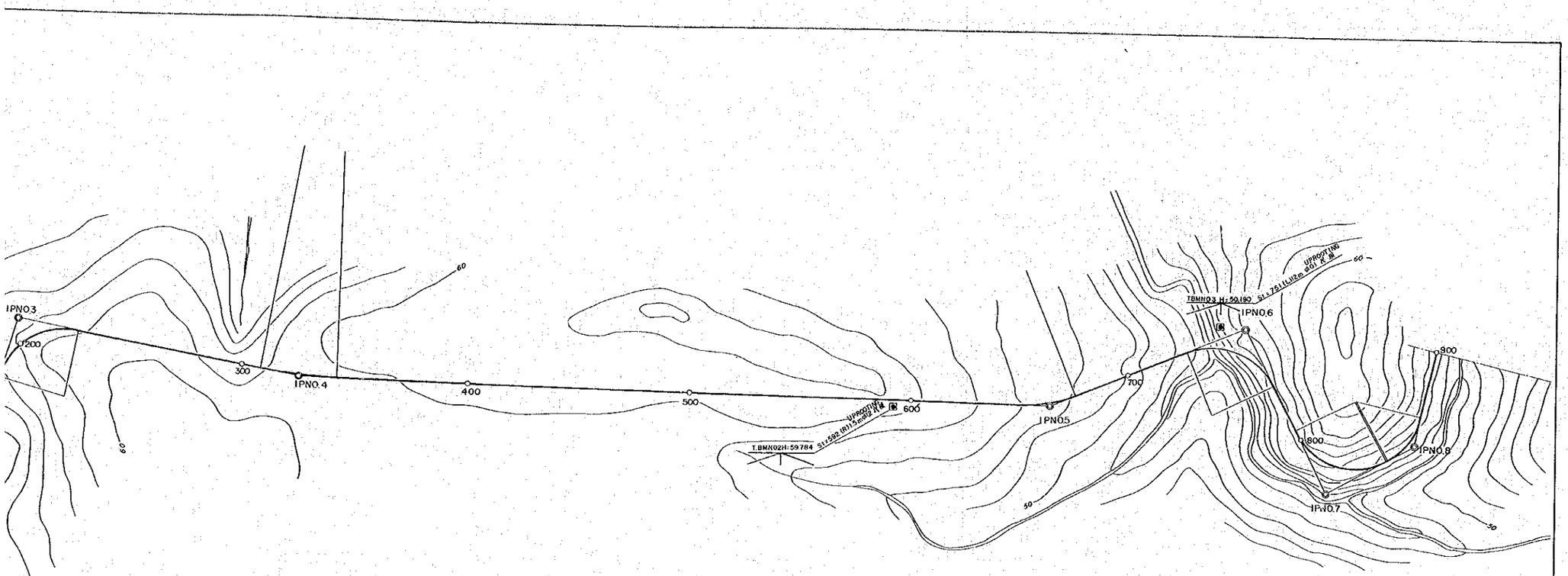


工事名	FOREST ROAD CONSTRUCTION WORK FOR JICA FORESTRY PROJECT			2/12
図面名	STANDERD VIEW			縮尺
検閲		(財)国際協力事業団 林野庁	(財)林業土木コンサルタンツ	昭和 年度



CURVE LIST

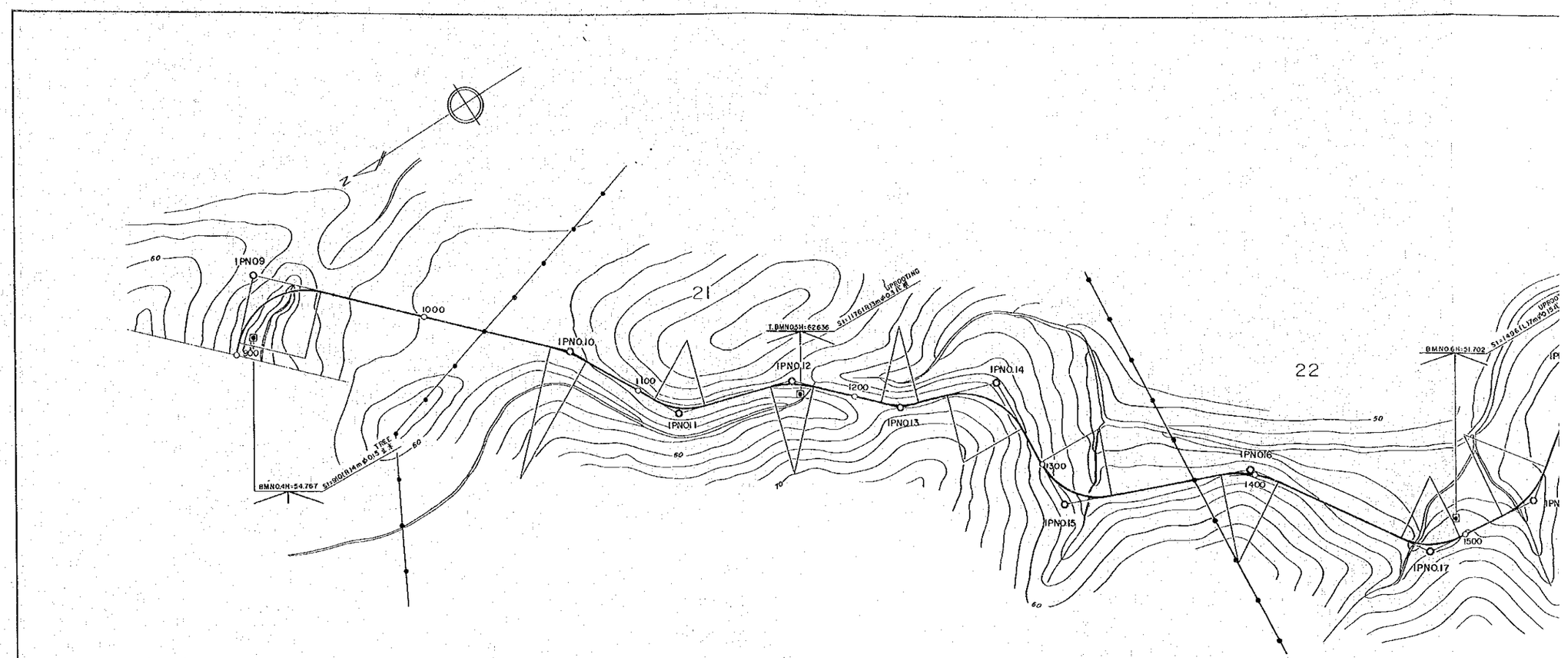
IPNO	1	2	3	4	5	6	7	8
A	117°~25'	148°~15'	263°~35'	170°~20'	156°~25'	269°~35'	87°~30'	131°~45'
I A	62°~35'	31°~45'	83°~35'	9°~40'	23°~35'	89°~35'	92°~30'	48°~15'
R	30	40	30	200	60	30	30	30
T.L	18.23	11.38	26.82	16.91	12.53	27.77	31.34	13.44
S.C	5.11	1.59	10.24	0.71	1.29	10.88	13.38	2.87
C.L	32.77	22.17	43.76	33.74	24.70	44.81	48.43	25.26
B.C	59.67	115.37	182.38	308.49	650.47	728.55	795.81	844.46
M.C	76.06	126.46	204.26	325.36	662.82	750.96	820.03	857.09
E.C	92.44	137.54	226.14	342.23	675.17	773.36	844.24	869.72
D.I.S	77.90	52.54	83.04	126.08	337.68	93.68	81.56	45.00



CURVE LIST

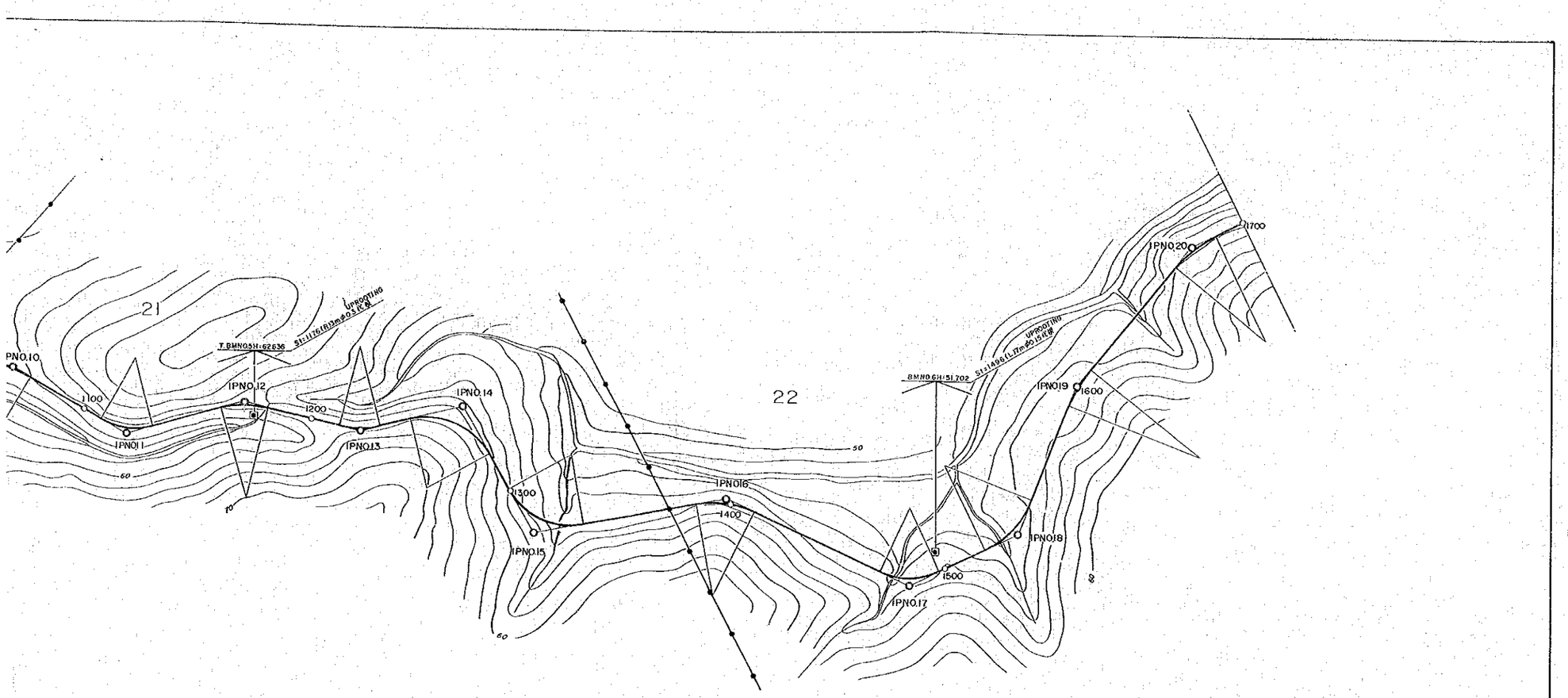
IPNO	1	2	3	4	5	6	7	8
A	117°~25'	148°~15'	263°~35'	170°~20'	156°~25'	265°~35'	87°~30'	131°~45'
I.A	62°~35'	31°~45'	83°~35'	9°~40'	23°~35'	89°~35'	92°~30'	48°~15'
R	30	40	30	200	60	30	30	30
T.L	18.23	11.38	26.82	16.91	12.53	27.77	31.34	13.44
S.L	5.11	1.59	10.24	0.71	1.29	10.88	13.38	2.87
C.L	32.77	22.17	43.76	33.74	24.70	44.81	48.43	25.26
B.C	59.67	115.37	182.38	308.49	650.47	728.55	795.81	844.46
M.C	76.06	126.46	204.26	325.36	662.82	750.96	820.03	857.09
E.C	92.44	137.54	226.14	342.23	675.17	773.36	844.24	869.72
DIs	77.90	52.54	83.04	126.08	337.68	93.68	81.56	45.00

工事名	FOREST ROAD CONSTRUCTION WORK FOR JICA FORESTRY PROJECT	3 / 12
図面名	PLAN	縮尺 1:2000
検 閲	(株)○○林業コンサルタンツ / (株)○○建設コンサルタンツ	昭和 年度



CURVE LIST

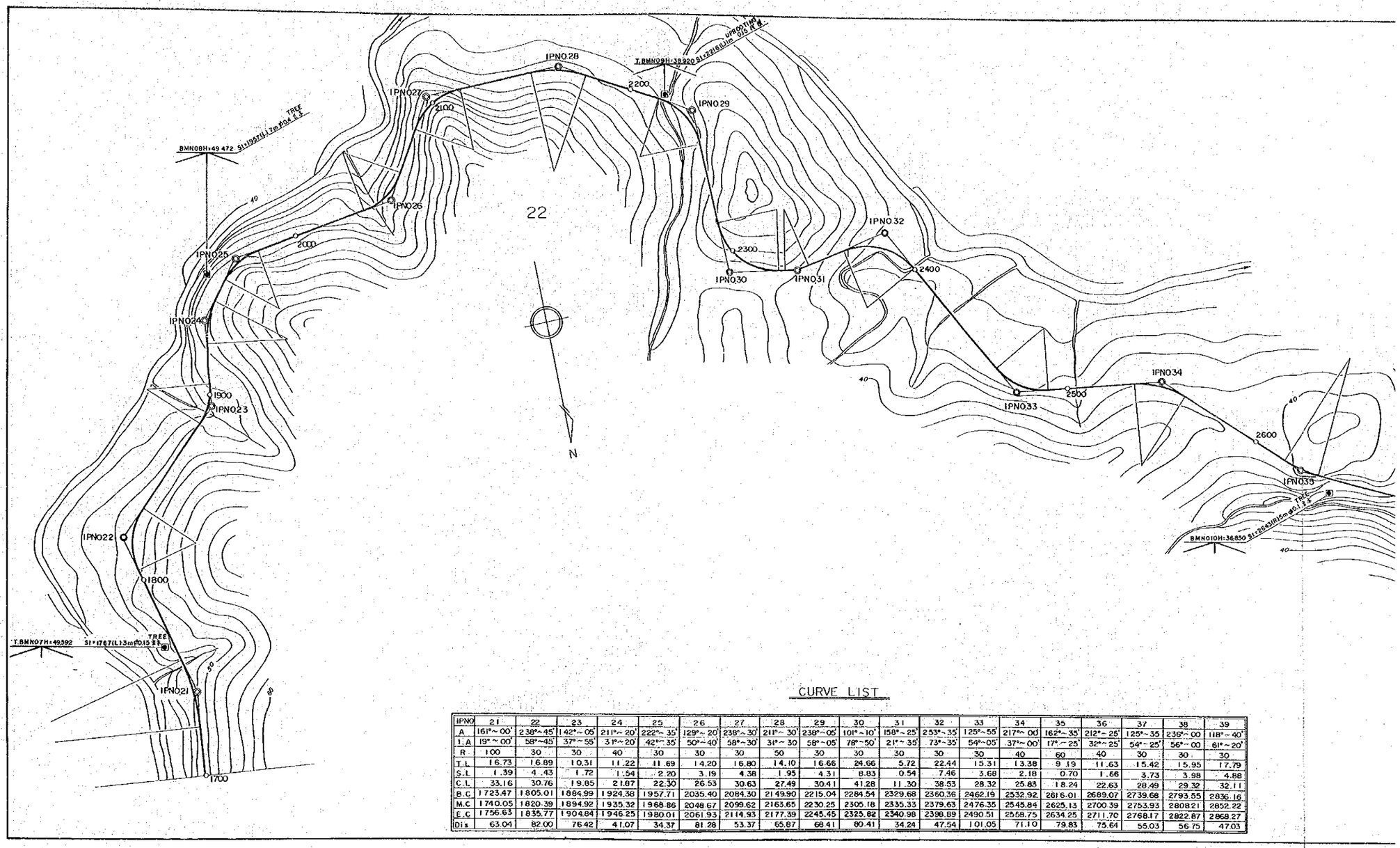
IPNO	9	10	11	12	13	14	15	16	17	18	19	20
I.A	271°~15'	196°~20'	134°~25'	208°~50'	153°~00'	254°~35'	108°~50'	215°~30'	129°~30'	137°~25'	197°~15'	204°~30'
I.A	91°~15'	16°~20'	45°~35'	28°~50'	27°~00'	74°~35'	71°~10'	35°~30'	50°~30'	42°~35'	17°~15'	24°~30'
R	30	60	30	40	35	30	30	40	30	40	60	50
T.L	30.66	8.61	12.61	10.28	8.40	22.85	21.46	12.80	14.15	15.59	9.10	10.86
S.L	12.90	0.61	2.54	1.30	0.99	7.71	6.89	2.00	3.17	2.93	0.69	1.16
C.L	47.78	17.10	23.87	20.13	16.49	39.05	37.26	24.78	26.44	29.73	18.06	21.38
B.C	904.84	1056.59	1108.19	1160.92	1212.60	1242.35	1299.14	1385.70	1469.95	1518.11	1591.70	1666.64
M.C	928.73	1065.14	1120.13	1170.99	1220.85	1261.88	1317.77	1398.09	1483.17	1532.98	1600.73	1677.33
E.C	952.62	1073.69	1132.06	1181.05	1229.09	1281.40	1336.40	1410.48	1496.39	1547.84	1609.76	1688.02
D/s	79.22	143.24	55.72	51.75	50.23	44.51	62.05	83.56	86.42	51.46	68.55	76.84



CURVE LIST

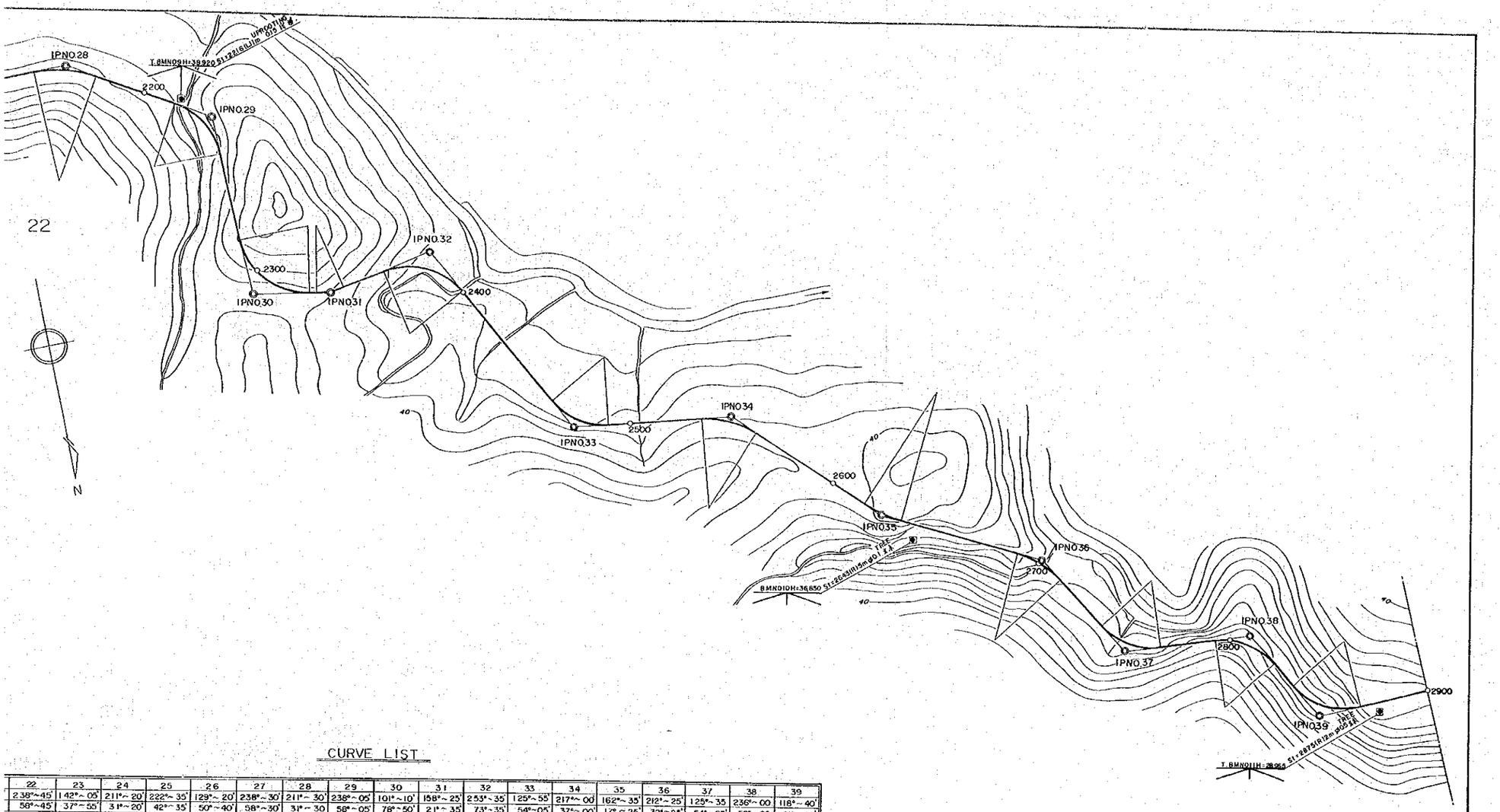
IPNO	9	10	11	12	13	14	15	16	17	18	19	20
I.A	271°~15'	196°~20'	134°~25'	208°~50'	153°~00'	254°~35'	108°~50'	215°~30'	129°~30'	137°~25'	197°~15'	204°~30'
R	30	60	30	40	35	30	30	40	30	40	60	50
T.L	30.66	8.61	12.61	10.28	8.40	22.85	21.46	12.80	14.15	15.59	9.10	10.86
S.L	12.90	0.61	2.54	1.30	0.99	7.71	6.89	2.00	3.17	2.93	0.69	1.18
C.L	47.78	17.10	23.87	20.13	16.49	39.05	37.26	24.78	26.44	29.73	18.06	21.38
B.C	904.84	1056.59	1108.19	1160.92	1212.60	1242.35	1299.14	1385.70	1469.95	1518.11	1591.70	1666.84
M.C	928.73	1065.14	1120.13	1170.99	1220.85	1261.88	1317.77	1398.09	1483.17	1532.98	1600.73	1677.35
E.C	952.62	1073.69	1132.06	1181.05	1229.09	1281.40	1336.40	1410.48	1496.39	1547.84	1609.76	1688.02
DIs	79.22	143.24	55.72	51.75	50.23	44.51	62.05	83.56	86.42	51.46	68.55	78.84

工事名	FOR ST ROAD CONSTRUCTION WORK FOR JICA FORESTRY PROJECT	4/12
図面名	PLAN	縮尺 1:2000
検 閲	(財)林業土木コンサルタンツ / (財)林業土木コンサルタンツ	昭和 年度



CURVE LIST

IPNO	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
A	161°~00'	238°~45'	142°~05'	211°~20'	222°~35'	129°~20'	238°~30'	211°~30'	238°~05'	101°~10'	158°~25'	253°~35'	125°~55'	217°~00'	162°~35'	212°~25'	125°~35'	236°~00'	118°~40'
I.A	19°~00'	58°~45'	37°~55'	31°~20'	42°~35'	50°~40'	58°~30'	31°~30'	58°~05'	78°~50'	21°~35'	73°~35'	54°~05'	37°~00'	17°~25'	32°~25'	54°~25'	56°~00'	61°~20'
R	100	30	30	40	30	30	30	50	30	30	30	30	30	40	60	40	30	30	30
T.L	16.73	16.89	10.31	11.22	11.69	14.20	16.80	14.10	16.66	24.66	5.72	22.44	15.31	13.38	9.19	11.63	15.42	15.95	17.79
S.L	1.39	4.43	1.72	1.54	2.20	3.19	4.38	1.95	4.31	8.83	0.54	7.46	3.68	2.18	0.70	1.66	3.73	3.98	4.88
C.L	33.16	30.76	19.85	21.87	22.30	26.53	30.63	27.49	30.41	41.28	11.30	38.53	28.32	25.83	18.24	22.63	28.49	29.32	32.11
B.C	1723.47	1805.01	1884.99	1924.38	1957.71	2035.40	2084.30	2149.90	2215.04	2284.54	2329.68	2360.36	2462.19	2532.92	2616.01	2689.07	2739.68	2793.55	2836.16
M.C	1740.05	1820.39	1894.92	1935.32	1968.86	2048.67	2099.62	2163.65	2230.25	2305.18	2335.33	2379.63	2476.35	2545.84	2625.13	2700.39	2753.93	2808.21	2852.22
E.C	1756.63	1835.77	1904.84	1946.25	1980.01	2061.93	2114.93	2177.39	2245.45	2325.82	2340.98	2398.89	2490.51	2558.75	2634.25	2711.70	2768.17	2822.87	2868.27
Dis	63.04	82.00	76.42	41.07	34.37	81.28	53.37	65.87	68.41	80.41	34.24	47.54	101.05	71.10	79.83	75.64	55.03	56.75	47.03



22

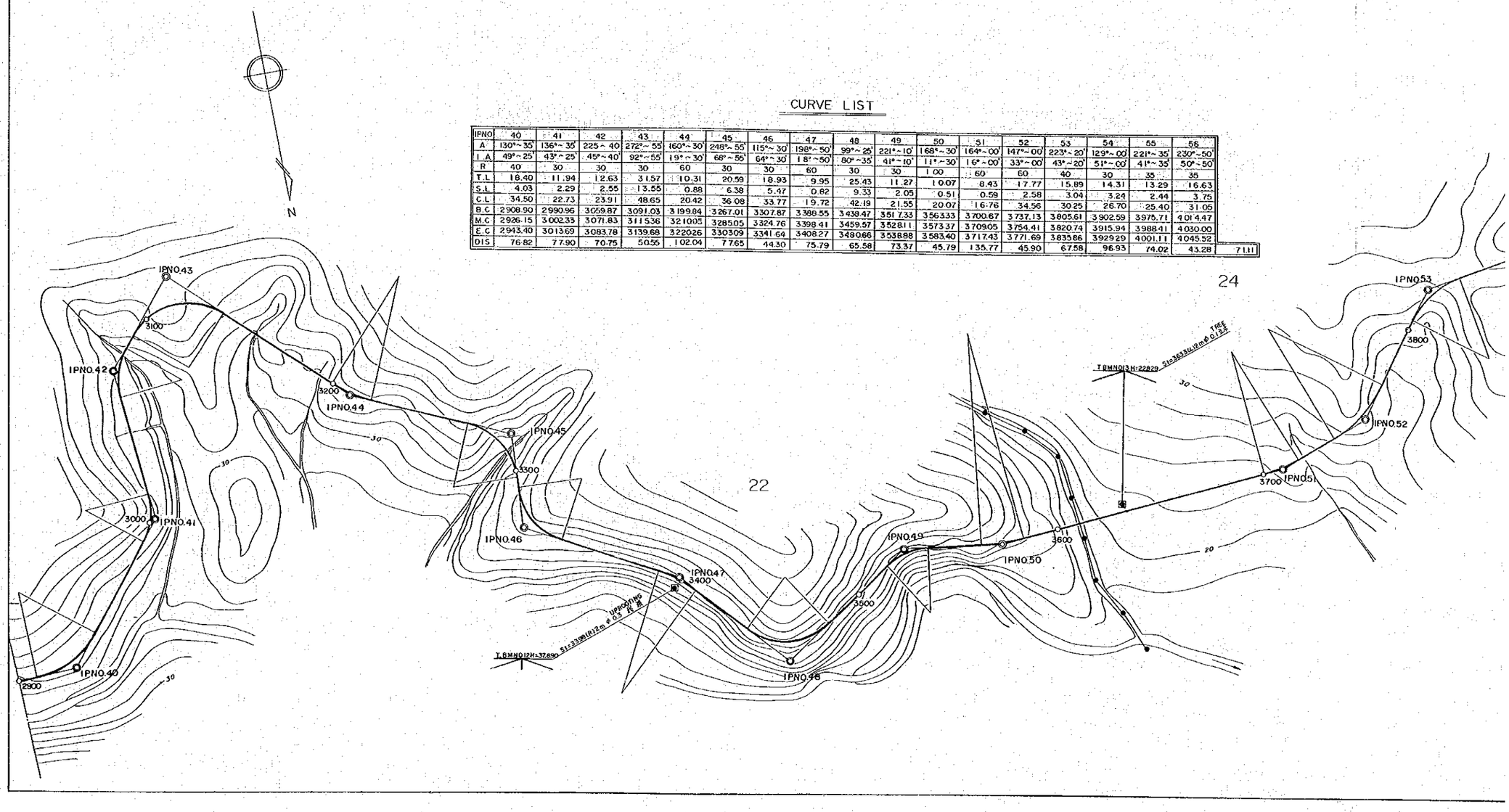
CURVE LIST

22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39
238°~45'	142°~05'	211°~20'	222°~35'	129°~20'	238°~30'	211°~30'	238°~05'	101°~10'	158°~25'	253°~35'	125°~55'	217°~00'	162°~35'	212°~25'	125°~35'	236°~00'	118°~40'
58°~45'	37°~55'	31°~20'	42°~35'	50°~40'	58°~30'	31°~30	58°~05'	78°~50'	21°~35'	73°~35'	54°~05'	37°~00'	17°~25'	32°~25'	54°~25'	56°~00	61°~20'
30	30	40	30	30	30	50	30	30	30	30	30	40	60	40	30	30	30
16.89	10.31	11.22	11.69	14.20	16.80	14.10	16.65	24.66	5.72	22.44	15.31	13.38	9.19	11.63	15.42	15.95	17.79
4.43	1.72	1.54	2.20	3.19	4.38	1.95	4.31	8.83	0.54	7.16	3.68	2.18	0.70	1.66	3.73	3.98	4.88
30.76	19.85	21.87	22.30	26.53	30.63	27.49	30.41	41.28	11.30	38.53	28.32	25.83	18.24	22.63	28.49	29.32	32.11
1805.01	1884.99	1924.38	1957.71	2035.40	2084.30	2149.90	2215.04	2284.54	2329.68	2360.36	2462.19	2532.92	2616.01	2689.07	2739.68	2793.55	2836.16
1820.39	1894.92	1935.32	1968.86	2048.67	2099.62	2163.65	2230.25	2305.18	2335.33	2379.63	2476.35	2545.84	2625.13	2700.39	2753.93	2808.21	2852.22
1835.77	1904.84	1946.25	1980.01	2061.93	2114.93	2177.39	2245.45	2325.82	2340.98	2398.89	2490.51	2558.75	2634.25	2711.70	2768.17	2822.87	2868.27
82.00	76.42	41.07	34.37	81.28	53.37	65.87	68.41	80.41	34.24	47.54	101.05	71.10	79.83	75.64	55.03	56.75	47.03

工事名	FOREST ROAD CONSTRUCTION WORK FOR JICA FORESTRY PROJECT	5/12
図面名	PLAN	縮尺 1:2000
校閲	(株)小堀組 東川ボックスカルバート / (有)春土 重量ボックスカルバート	縮角 年度

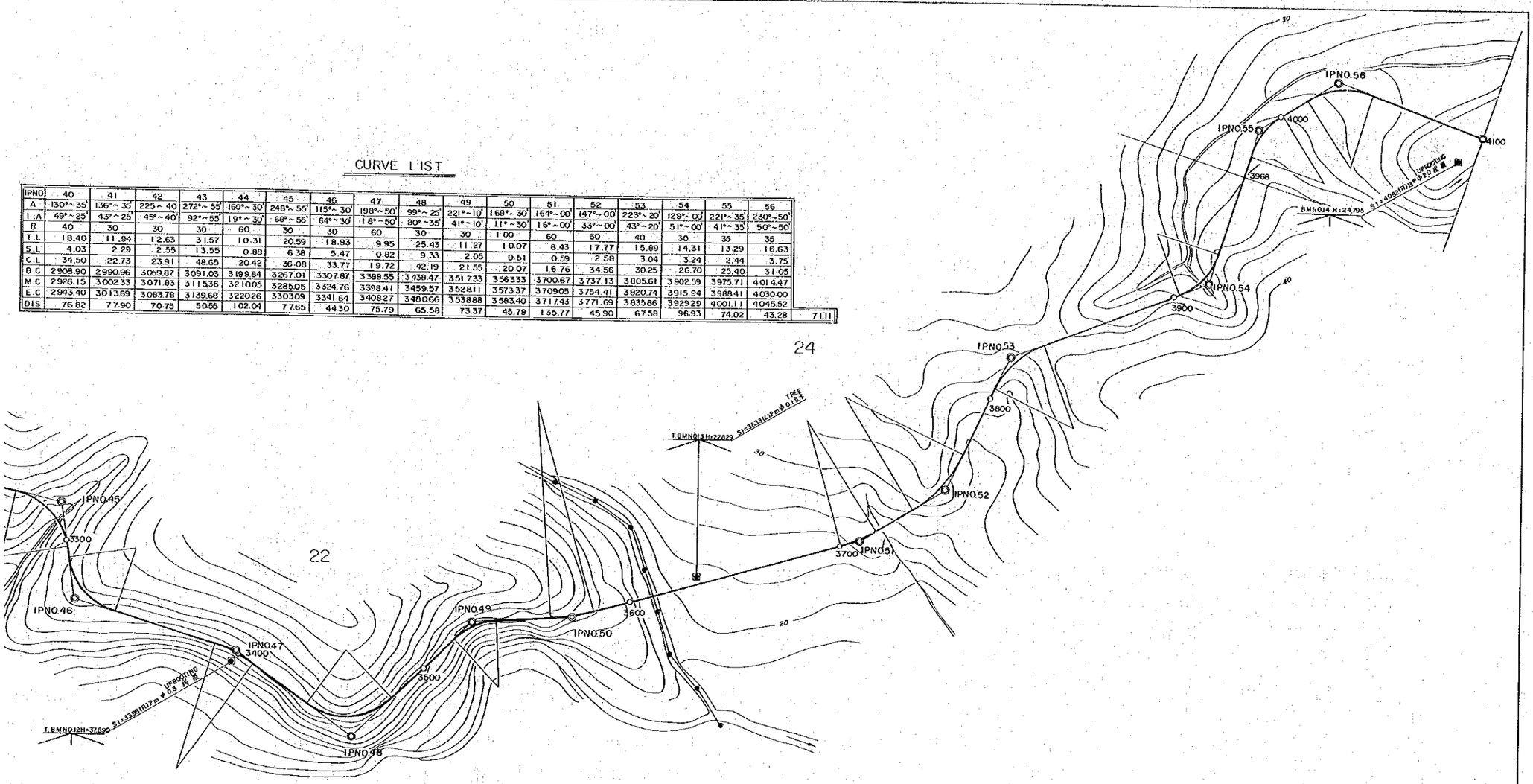
CURVE LIST

IPNO	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56
A	130°~35'	136°~35'	225°~40'	272°~55'	160°~30'	248°~55'	115°~30'	198°~50'	99°~25'	221°~10'	168°~30'	164°~00'	147°~00'	223°~20'	129°~00'	221°~35'	230°~50'
I.A	49°~25'	43°~25'	45°~40'	92°~55'	19°~30'	68°~55'	64°~30'	18°~50'	80°~35'	41°~10'	11°~30'	16°~00'	33°~00'	43°~20'	51°~00'	41°~35'	50°~50'
R	40	30	30	30	60	30	30	60	30	30	100	60	60	40	30	35	35
T.L	18.40	11.94	12.63	31.57	10.31	20.59	18.93	9.95	25.43	11.27	10.07	8.43	17.77	15.89	14.31	13.29	16.63
S.L	4.03	2.29	2.55	13.55	0.88	6.38	5.47	0.82	9.33	2.05	0.51	0.59	2.58	3.04	3.24	2.44	3.75
C.L	34.50	22.73	23.91	48.65	20.42	36.08	33.77	19.72	42.19	21.55	20.07	16.76	34.56	30.25	26.70	25.40	31.05
B.C	2908.90	2990.96	3059.87	3091.03	3199.84	3267.01	3307.87	3388.55	3438.47	3517.33	3563.33	3700.67	3737.13	3805.61	3902.59	3975.71	4014.47
M.C	2926.15	3002.33	3071.83	3115.36	3210.05	3285.05	3324.76	3398.41	3459.57	3528.11	3573.37	3709.05	3754.41	3820.74	3915.94	3988.41	4030.00
E.C	2943.40	3013.69	3083.78	3139.68	3220.26	3300.39	3341.64	3408.27	3480.66	3533.88	3583.40	3717.43	3771.69	3835.86	3929.29	4001.11	4045.52
DIS	76.82	77.90	70.75	50.55	102.04	77.65	44.30	75.79	65.58	73.37	45.79	135.77	45.90	67.58	96.93	74.02	43.28	71.11

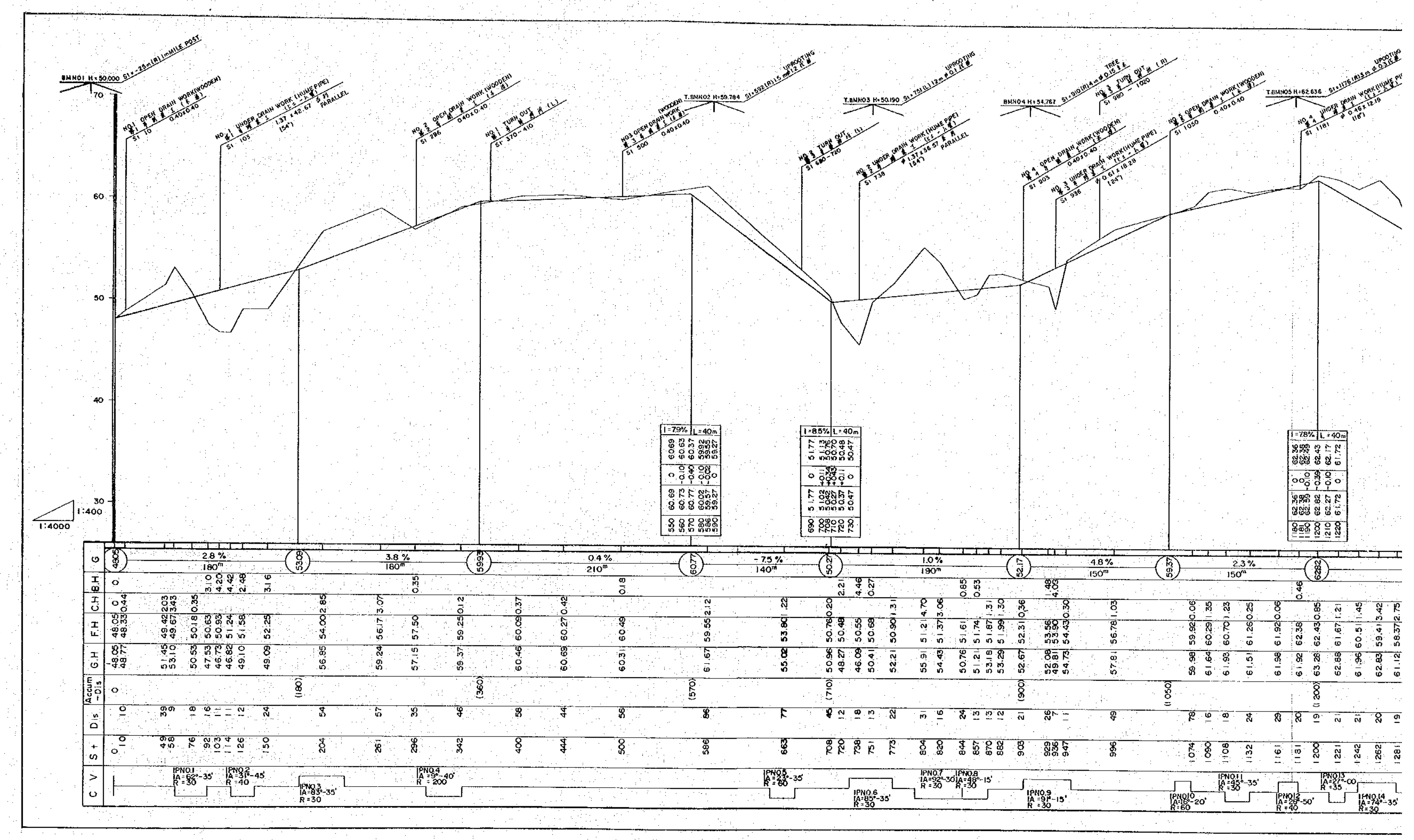


CURVE LIST

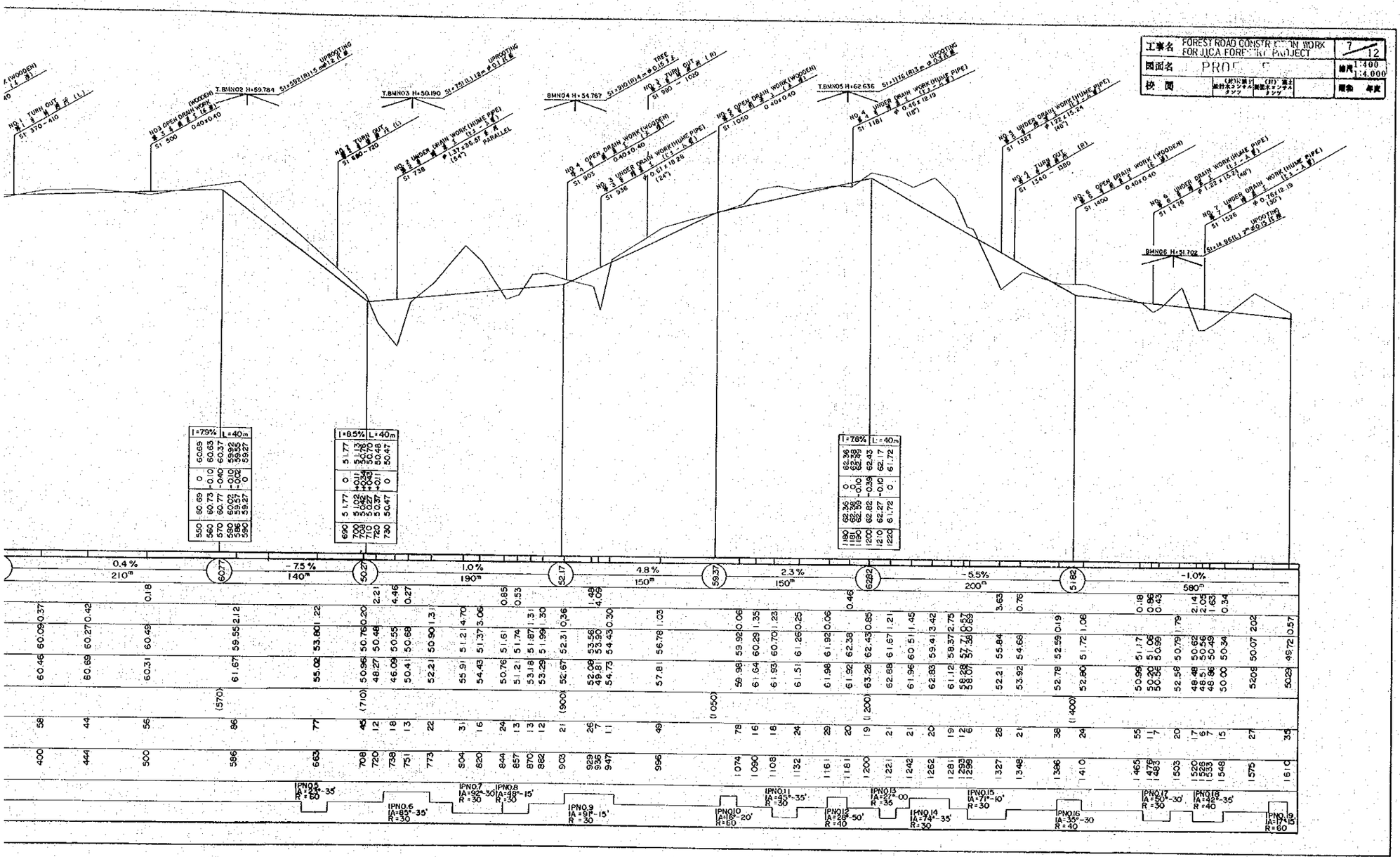
IPNO	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	
A	130°~35'	136°~35'	225°~40'	272°~55'	160°~30'	248°~55'	115°~30'	198°~50'	99°~25'	221°~10'	168°~30'	164°~00'	147°~00'	223°~20'	129°~00'	221°~35'	230°~50'	
I.A	49°~25'	43°~25'	45°~40'	92°~55'	19°~30'	68°~55'	64°~30'	18°~50'	80°~35'	41°~10'	11°~30'	16°~00'	33°~00'	43°~20'	51°~00'	41°~35'	50°~50'	
R	40	30	30	30	60	30	30	60	30	30	100	60	60	40	30	35	35	
T.L	18.40	11.94	12.63	31.57	10.31	20.59	18.93	9.95	25.43	11.27	10.07	8.43	17.77	15.69	14.31	13.29	16.63	
S.L	4.03	2.29	2.55	13.55	0.88	6.38	5.47	0.82	9.33	2.05	0.51	0.59	2.58	3.04	3.24	2.44	3.75	
C.L	34.50	22.73	23.91	48.65	20.42	36.08	33.77	19.72	42.19	21.55	20.07	16.76	34.56	30.25	26.70	25.40	31.05	
B.C	2908.90	2990.96	3059.87	3091.03	3199.84	3267.01	3307.87	3388.55	3438.47	351733	356333	3700.67	3737.13	3805.61	3902.59	3975.71	401447	
M.C	2926.15	3002.33	3071.83	3115.36	3210.05	3285.05	3324.76	3398.41	3459.57	352811	357337	370905	3754.41	3820.74	3915.94	398841	4030.00	
E.C	2943.40	3013.69	3083.78	3139.68	322026	330309	3341.64	340827	3480.66	353888	3583.40	371743	3771.69	3835.86	3929.29	4001.11	4045.52	
DIS	76.82	77.90	70.75	50.55	102.04	77.65	44.30	75.79	65.58	73.37	45.79	135.77	45.90	67.58	96.93	74.02	43.28	71.11

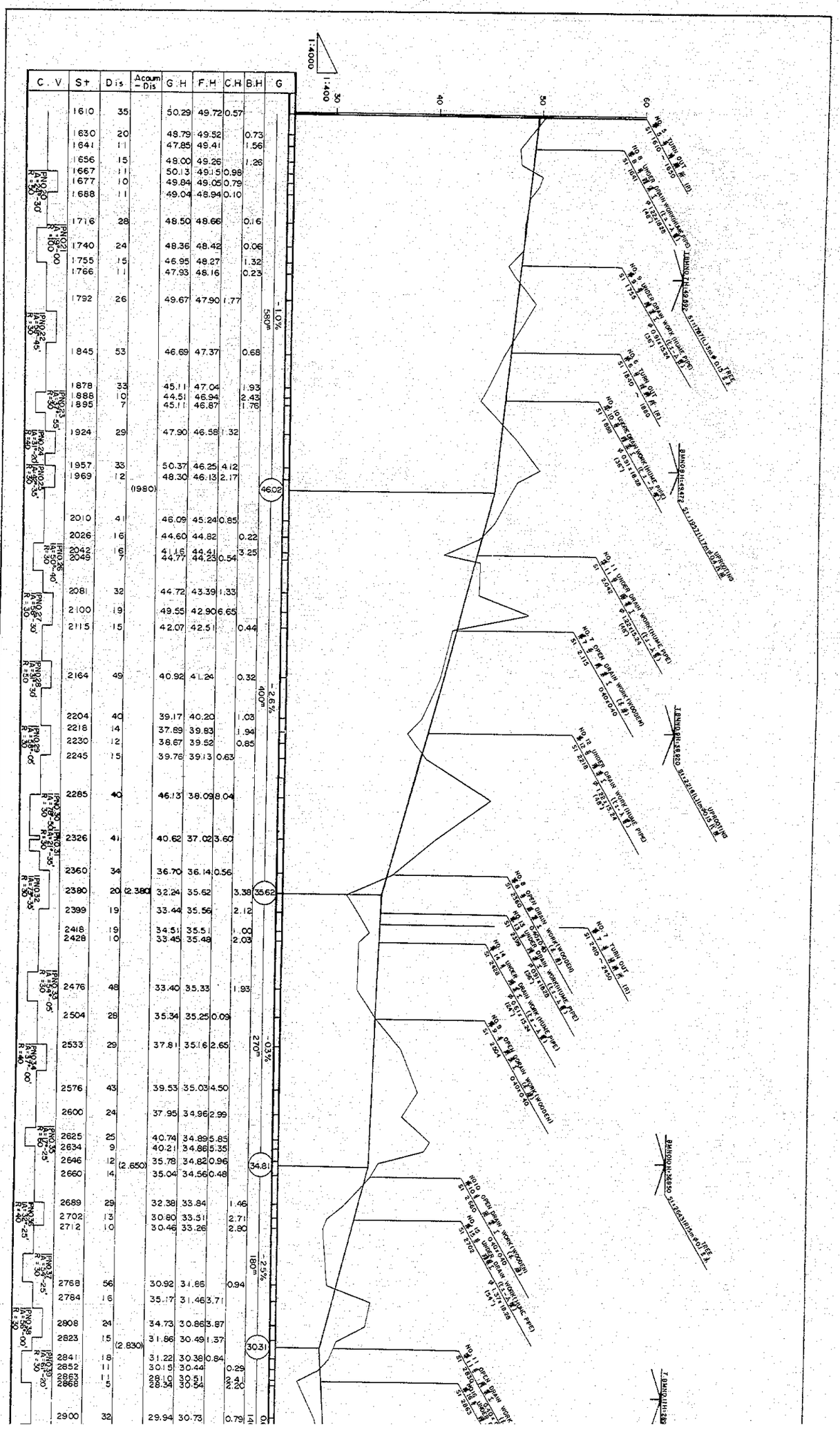


工事名	FOREST ROAD CONSTRUCTION WORK FOR JICA FORESTRY PROJECT	6/12
図面名	PLAN	縮尺 1:2000
検 閲	(株)日本技術開発 (株)日本技術開発	製図 中垣

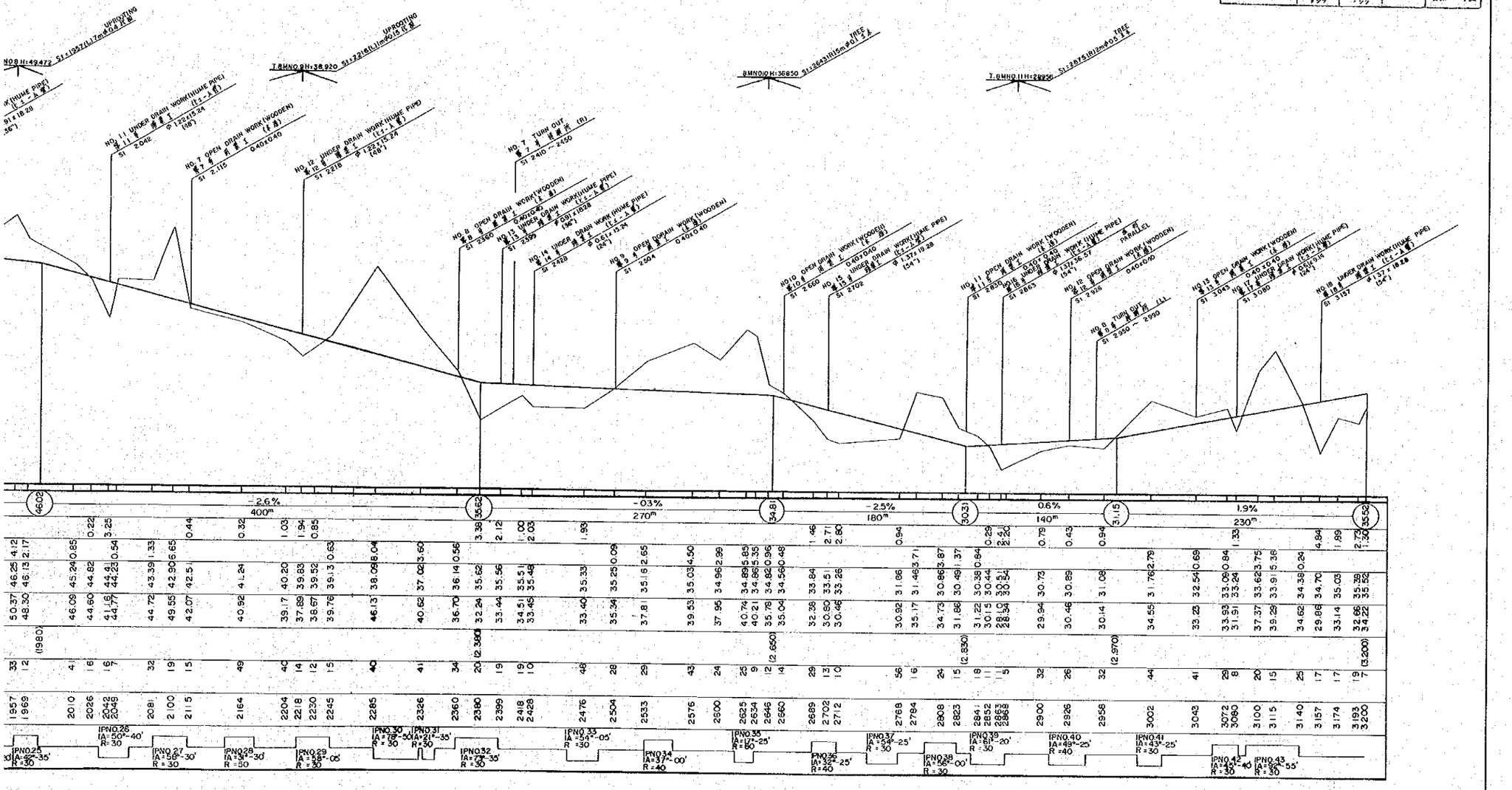

BMNO1 H=50.000 St=-25m(R) MILE POST
NO.1 OPEN DRAIN WORK (WOODEN) St 10 0.40×0.40
NO.1 UNDER DRAIN WORK (HUME PIPE) St 103 1.37×42.67 PARALLEL (54")
NO.2 OPEN DRAIN WORK (WOODEN) St 286 0.40×0.40
NO.1 TURN OUT (L) St 370~410
NO3 OPEN DRAIN WORK (WOODEN) St 500 0.40×0.40
T.BMNO2 H=59.784 St=592(R)1.5m φ1.2 UPROOTING
NO.2 TURN OUT (L) St 680~720
T.BMNO3 H=50.190 St=751(L)12m φ0.1 UPROOTING
NO.2 UNDER DRAIN WORK (HUME PIPE) St 738 φ1.37×36.57 PARALLEL (54")
BMNO4 H=54.767 St=910(R)4m φ0.15 TREE
NO.3 TURN OUT (R) St 980~1020
NO.4 OPEN DRAIN WORK (WOODEN) St 903 0.40×0.40
NO.3 UNDER DRAIN WORK (HUME PIPE) St 936 φ0.61×18.28 (24")
NO.5 OPEN DRAIN WORK (WOODEN) St 1050 0.40×0.40
T.BMNO5 H=62.636 St=1176(R)3m φ0.3 UPROOTING
NO.4 UNDER DRAIN WORK (HUME PIPE) St 1181 φ0.46×12.19 (18")
70
60
50
40
30
1:400
1:4000
I=7.9% L=40m
I=8.5% L=40m
I=7.8% L=40m
G
B.H
C.H
F.H
G.H
Accum-Dis
Dis
S+
CV
2.8% 180m
3.8% 180m
0.4% 210m
-7.5% 140m
1.0% 190m
4.8% 150m
2.3% 150m
IPNO.1 IA=62°-35' R=30
IPNO.2 IA=31°-45' R=40
IPNO.3 IA=83°-35' R=30
IPNO.4 IA=9°-40' R=200
IPNO.5 IA=23°-35' R=60
IPNO.6 IA=85°-35' R=30
IPNO.7 IA=92°-30' R=30
IPNO.8 IA=48°-15' R=30
IPNO.9 IA=91°-15' R=30
IPNO.10 IA=16°-20' R=60
IPNO.11 IA=45°-35' R=30
IPNO.12 IA=28°-50' R=40
IPNO.13 IA=27°-00 R=35
IPNO.14 IA=74°-35' R=30

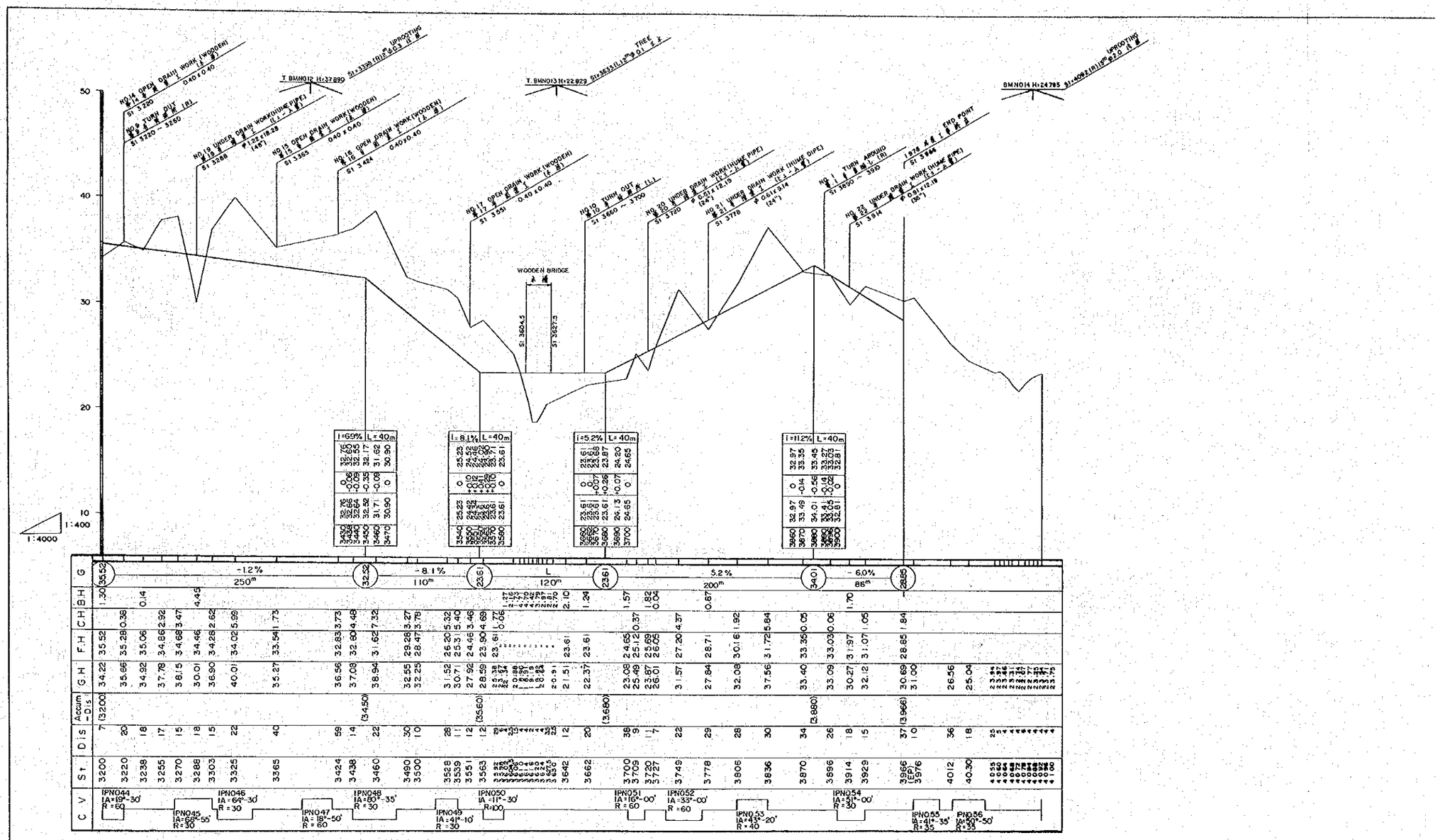
工事名	FOREST ROAD CONSTRUCTION WORK FOR JICA FORESTRY PROJECT	7 / 12
図面名	PROFILE	縮尺 1:400 1:4,000
校閲		昭和 年度



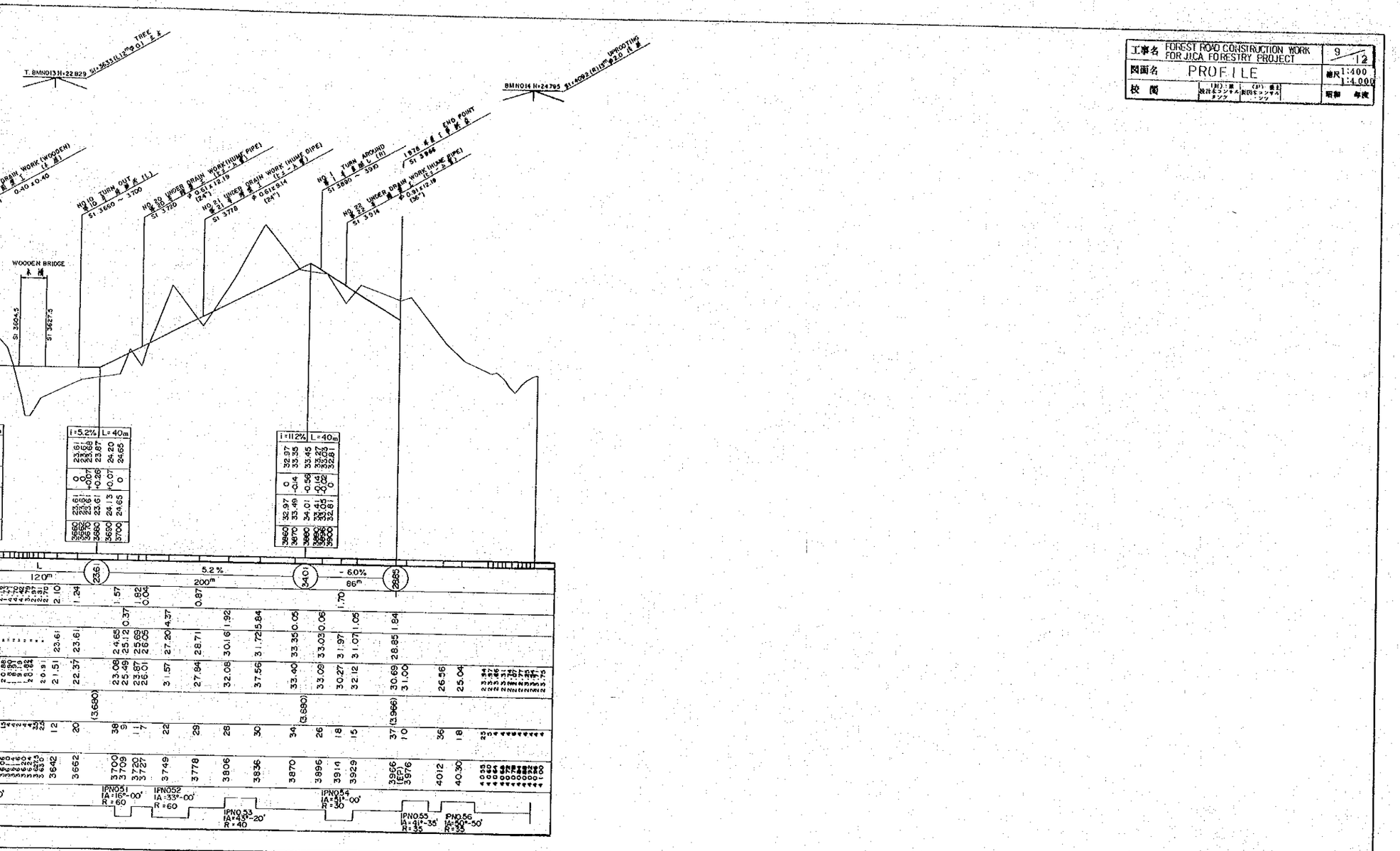

1:4000
1:400
30
40
50
60
-1.0%
580m
-2.6%
400m
-03%
270m
-2.5%
180m
46.02
35.62
34.81
30.31
C. V
St
Dis
Acoum - Dis
G.H
F.H
C.H
B.H
G
1610 35 50.29 49.72 0.57
1630 20 48.79 49.52 0.73
1641 11 47.85 49.41 1.56
1656 15 48.00 49.26 1.26
1667 11 50.13 49.15 0.98
1677 10 49.84 49.05 0.79
1688 11 49.04 48.94 0.10
1716 28 48.50 48.66 0.16
1740 24 48.36 48.42 0.06
1755 15 46.95 48.27 1.32
1766 11 47.93 48.16 0.23
1792 26 49.67 47.90 1.77
1845 53 46.69 47.37 0.68
1878 33 45.11 47.04 1.93
1888 10 44.51 46.94 2.43
1895 7 45.11 46.87 1.76
1924 29 47.90 46.58 1.32
1957 33 50.37 46.25 4.12
1969 12 48.30 46.13 2.17
(1980)
2010 41 46.09 45.24 0.85
2026 16 44.60 44.82 0.22
2040 15 41.16 44.41 3.25
2049 7 44.77 44.23 0.54
2081 32 44.72 43.39 1.33
2100 19 49.55 42.90 6.65
2115 15 42.07 42.51 0.44
2164 49 40.92 41.24 0.32
2204 40 39.17 40.20 1.03
2218 14 37.89 39.83 1.94
2230 12 38.67 39.52 0.85
2245 15 39.76 39.13 0.63
2285 40 46.13 38.09 8.04
2326 41 40.62 37.02 3.60
2360 34 36.70 36.14 0.56
2380 20 (2.380) 32.24 35.52 3.38
2399 19 33.44 35.56 2.12
2418 19 34.51 35.51 1.00
2428 10 33.45 35.48 2.03
2476 48 33.40 35.33 1.93
2504 28 35.34 35.25 0.09
2533 29 37.81 35.16 2.65
2576 43 39.53 35.03 4.50
2600 24 37.95 34.96 2.99
2625 25 40.74 34.89 5.85
2634 9 40.21 34.86 5.35
2646 12 35.78 34.82 0.96
2660 14 (2.650) 35.04 34.56 0.48
2689 29 32.38 33.84 1.46
2702 13 30.80 33.51 2.71
2712 10 30.46 33.26 2.80
2768 56 30.92 31.65 0.94
2784 16 35.17 31.46 3.71
2808 24 34.73 30.86 3.87
2823 15 31.86 30.49 1.37
(2.830)
2841 18 31.22 30.38 0.84
2852 11 30.15 30.44 0.29
2863 11 28.10 30.51 2.41
2868 5 28.34 30.54 2.20
2900 32 29.94 30.73 0.79
PN020 R=30 A=30°
PN021 R=180 A=6°00'
PN022 R=30 A=45°
PN023 R=30 A=55°
PN024 R=30 A=30°
PN025 R=30 A=30°
PN026 R=30 A=50°-00'
PN027 R=30 A=90°
PN028 R=30 A=90°
PN029 R=30 A=90°
PN030 R=30 A=48°-54'-30"
PN031 R=30 A=35°
PN032 R=30 A=35°
PN033 R=30 A=90°
PN034 R=30 A=90°
PN035 R=30 A=25°
PN036 R=30 A=25°
PN037 R=30 A=25°
PN038 R=30 A=90°
PN039 R=30 A=90°
No. 5 TURN OUT (8) ST. 1610 ~ 1630
No. 6 UNDER DRAIN WORK (RUBBLE MASONRY) (1.2 x 1.2 m) ST. 1641 ~ 1825 (184m)
No. 7 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 1825 ~ 1840 (15m)
No. 8 TURN OUT (8) ST. 1840 ~ 1860
No. 9 UNDER DRAIN WORK (RUBBLE MASONRY) (1.2 x 1.2 m) ST. 1868 ~ 2042 (174m)
No. 11 UNDER DRAIN WORK (RUBBLE MASONRY) (1.2 x 1.2 m) ST. 2042 ~ 2115 (73m)
No. 12 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2115 ~ 2245 (130m)
No. 13 UNDER DRAIN WORK (RUBBLE MASONRY) (1.2 x 1.2 m) ST. 2245 ~ 2360 (115m)
No. 14 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2360 ~ 2380 (20m)
No. 15 UNDER DRAIN WORK (RUBBLE MASONRY) (1.2 x 1.2 m) ST. 2380 ~ 2399 (19m)
No. 16 UNDER DRAIN WORK (RUBBLE MASONRY) (1.2 x 1.2 m) ST. 2399 ~ 2418 (19m)
No. 17 TURN OUT (10) ST. 2418 ~ 2428
No. 18 UNDER DRAIN WORK (RUBBLE MASONRY) (1.2 x 1.2 m) ST. 2428 ~ 2476 (48m)
No. 19 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2476 ~ 2504 (28m)
No. 20 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2504 ~ 2533 (29m)
No. 21 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2533 ~ 2576 (43m)
No. 22 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2576 ~ 2600 (24m)
No. 23 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2600 ~ 2625 (25m)
No. 24 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2625 ~ 2634 (9m)
No. 25 UNDER DRAIN WORK (RUBBLE MASONRY) (1.2 x 1.2 m) ST. 2634 ~ 2660 (26m)
No. 26 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2660 ~ 2689 (29m)
No. 27 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2689 ~ 2712 (23m)
No. 28 UNDER DRAIN WORK (RUBBLE MASONRY) (1.2 x 1.2 m) ST. 2712 ~ 2784 (72m)
No. 29 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2784 ~ 2808 (24m)
No. 30 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2808 ~ 2823 (15m)
No. 31 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2823 ~ 2841 (18m)
No. 32 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2841 ~ 2852 (11m)
No. 33 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2852 ~ 2863 (11m)
No. 34 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2863 ~ 2868 (5m)
No. 35 OPEN DRAIN WORK (WOODEN) (1.2 x 1.2 m) ST. 2868 ~ 2900 (32m)
BRIDGE No. 1 (2.5m) ST. 1792
BRIDGE No. 2 (2.5m) ST. 1957
BRIDGE No. 3 (2.5m) ST. 1969
BRIDGE No. 4 (2.5m) ST. 2049
BRIDGE No. 5 (2.5m) ST. 2164
BRIDGE No. 6 (2.5m) ST. 2285
BRIDGE No. 7 (2.5m) ST. 2326
BRIDGE No. 8 (2.5m) ST. 2380
BRIDGE No. 9 (2.5m) ST. 2625
BRIDGE No. 10 (2.5m) ST. 2646
BRIDGE No. 11 (2.5m) ST. 2768
BRIDGE No. 12 (2.5m) ST. 2784
BRIDGE No. 13 (2.5m) ST. 2808
BRIDGE No. 14 (2.5m) ST. 2823
BRIDGE No. 15 (2.5m) ST. 2841

工事名	FOREST ROAD CONSTRUCTION WORK FOR JICA FORESTRY PROJECT	8 / 12
図面名	PROFILE	縮尺 1:400 1:4,000
校 閲	(設計) 青木 (作図) 青木	昭和 年度

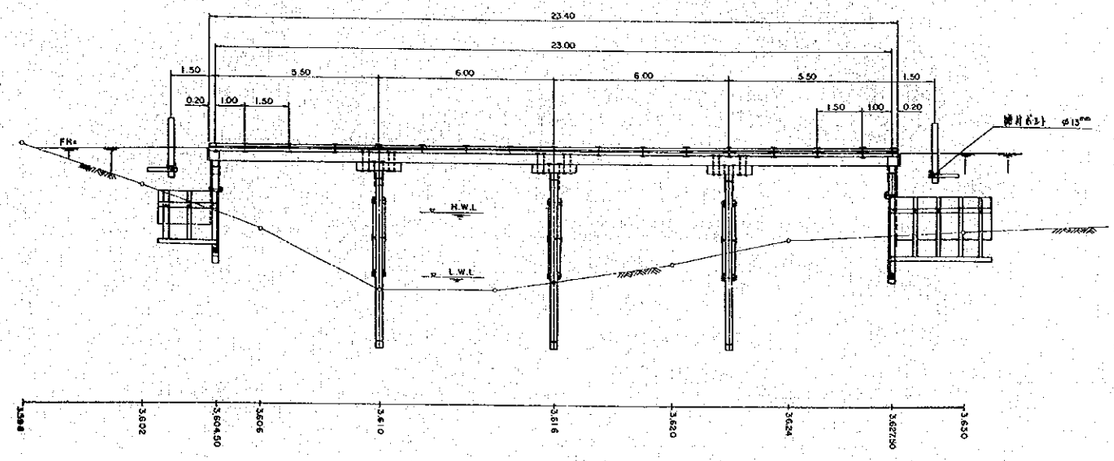



T. BM NO12 H:37.899
T. BM NO13 H:22.829
BM NO14 H:24.785
WOODEN BRIDGE
1:400
1:4000
-12%
250m
-8.1%
110m
L
120m
5.2%
200m
-6.0%
85m
i=6.9% L=40m
i=8.1% L=40m
i=5.2% L=40m
i=11.2% L=40m
G
B.H
C.H
F.H
G.H
Accum_Dis
Dis
St
C V

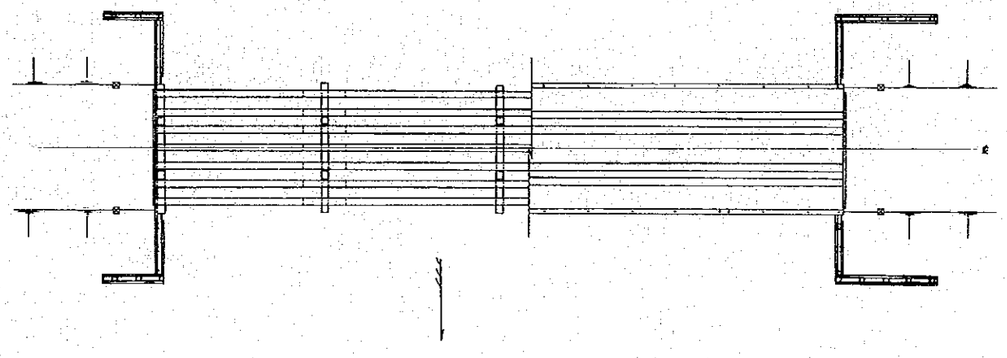
工事名	FOREST ROAD CONSTRUCTION WORK FOR JICA FORESTRY PROJECT	9 / 12
図面名	PROFILE	縦尺 H 1:400 V 1:4,000
校 閲	(M.D.) 課長 (P.) 係長	昭和 年度



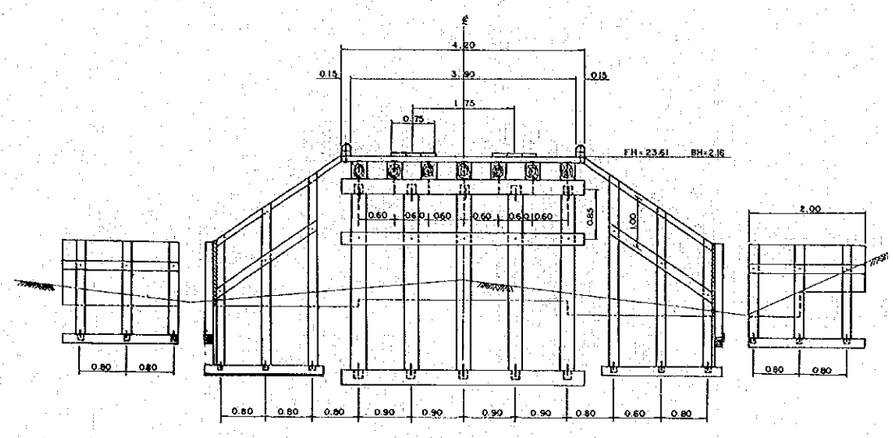
SIDE VIEW
側面図 S=1:200



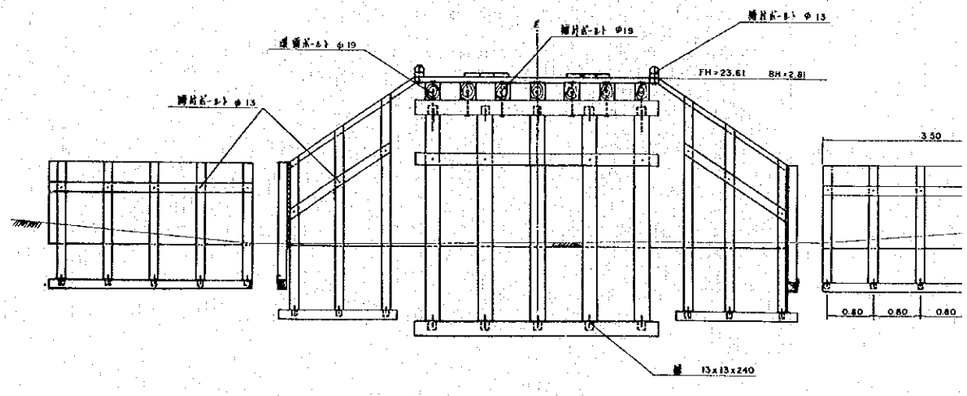
PLAN
平面図



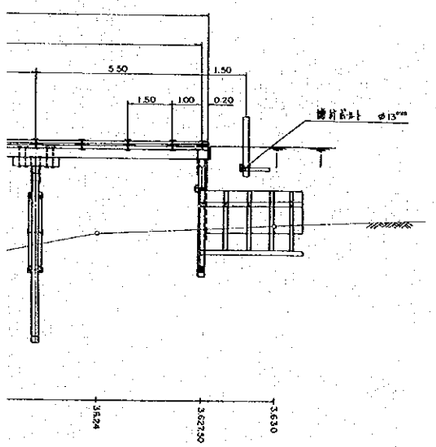
NO.1 ABUTMENT
第1橋台



NO.2 ABUTMENT
第2橋台

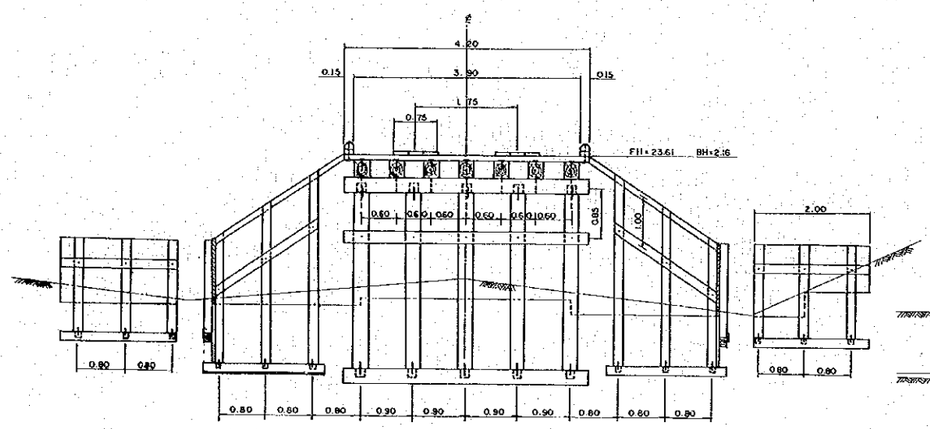


200

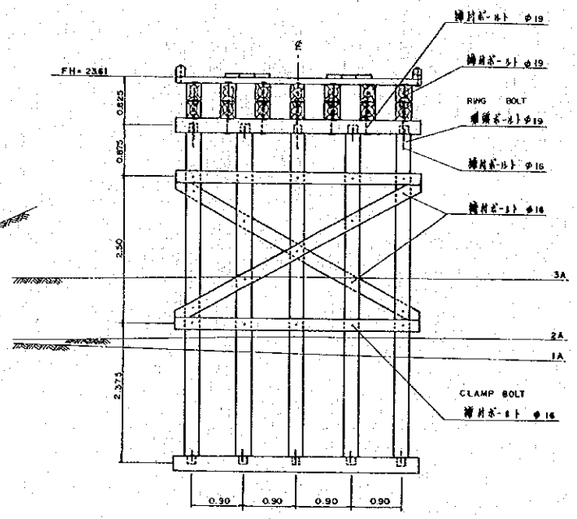


FRONT VIEW
正面図
S=1:100

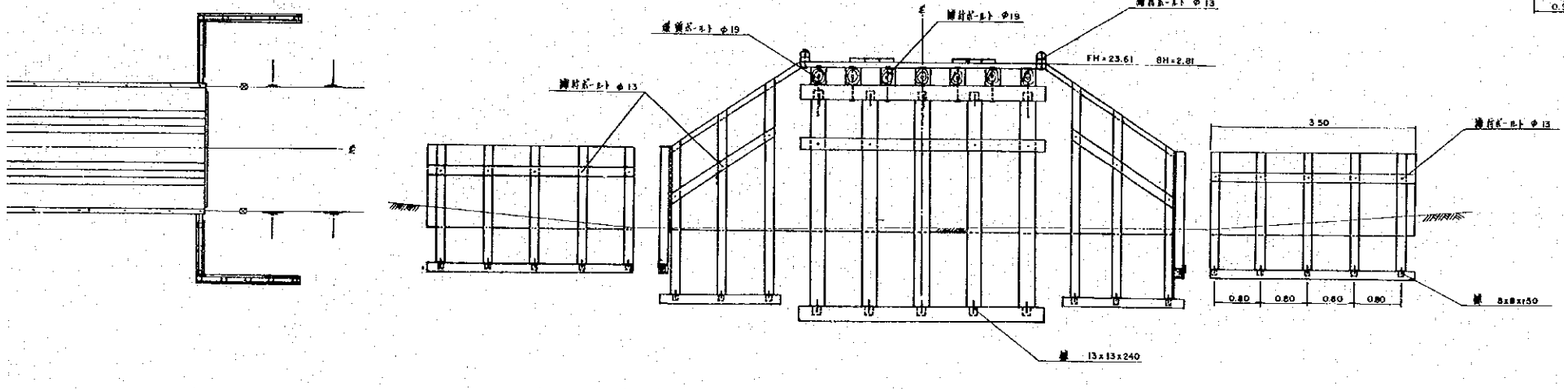
NO 1 ABUTMENT
第1橋台



NO 1.2.3 PIER
第1.2.3 橋脚



NO2 ABUTMENT
第2橋台



工事名	FOREST ROAD CONSTRUCTION WORK FOR JICA FORESTRY PROJECT		10 / 12
図面名	WOODEN BRIDGE		縮尺
検閲	(東)K建コンサルタンツ 設計次長	(P)・(監)K建コンサルタンツ 監理次長	原寸 年度

MATERIALS LIST
材 料 表

JAPANESE 名称	ENGLISH ITEM	QUALITY 材質	SIZE 寸法 W	SIZE 寸法 t	SIZE 寸法 L	@ 単材積	QUANTITY 員数	AMOUNT 総材積	NOTE 備考
車除	CAR AVOIDANCE BAR	PYnKob0	0.20 Cm	0.20 Cm	2.00 m	0.080 m3	4	0.320 m3	
根太	BED PLATE		0.10	0.10	1.00	0.010	8	0.080	
地覆木	RAILING		0.10	0.12	2.80	0.28	4	0.112	
〃			0.15	0.12	3.20	0.58	12	0.696	
水切木	DRIPPLATE		0.15	0.06	0.45	0.004	34	0.136	
縦板	SURFACE PLATE		0.25	0.06	3.00	0.045	47	2.115	
敷板	PLANKS		0.25	0.10	4.20	0.105	94	9.870	
主桁	MAIN GIRDER		0.25	0.30	5.50	0.413	14	5.782	
〃			0.25	0.30	6.00	0.450	14	6.300	
桁受	CROSS GIRDER		0.25	0.25	4.20	0.263	5	1.315	
継木	SPLICE GIRDER		0.25	0.30	1.50	0.113	21	2.373	
横杭	CROSS PILE		0.20	0.10	4.20	0.084	14	1.176	ABUTMENT PIER 橋台. 橋脚
〃			0.20	0.06	2.00	0.024	2	0.048	SHEETING PLATE 土留板
〃			〃	〃	2.20	0.026	4	0.104	〃
〃			〃	〃	3.50	0.042	2	0.084	〃
筋違	BRACING		0.20	0.10	4.80	0.096	6	0.576	PIER 橋脚
橋杭	COLUMN		0.25	0.25	3.30	0.206	5	1.030	NO.1 ABUTMENT 第1橋台
〃			〃	〃	3.80	0.238	5	1.190	NO.2 ABUTMENT 第2橋台
〃			〃	〃	5.80	0.363	15	5.445	NO.1.2.3 PIER 第1.2.3橋脚
土留杭	SHEETING PILE		0.15	0.15	3.30	0.074	2	0.148	NO.1 ABUTMENT 第1橋台
〃			〃	〃	2.80	0.063	2	0.126	〃
〃			〃	〃	2.20	0.050	2	0.100	〃
〃			〃	〃	1.65	0.037	6	0.222	〃
〃			〃	〃	3.75	0.084	2	0.168	NO.2 ABUTMENT 第2橋台
〃			〃	〃	3.30	0.074	2	0.148	〃
〃			〃	〃	2.70	0.061	2	0.122	〃
〃			〃	〃	2.10	0.047	10	0.470	〃
土台木	BED PLATE		0.25	0.25	4.20	0.263	5	1.315	ABUTMENT PIER 橋台. 橋脚
〃			0.15	0.15	2.05	0.046	4	0.184	SHEETING 土留
〃			〃	〃	2.00	0.045	2	0.090	〃
〃			〃	〃	3.50	0.09	2	0.158	〃
土留板	SHEETING PLATE		0.25	0.06	平均長 3.00	0.045	75	3.375	56 m²
底面土板	BED PLATE		0.40	0.06	4.20	0.101	2	0.202	
土留受木	PROTELTION BAR		0.10	0.10	5.30	0.053	4	0.212	
計	TOTAL							45.792 m³	

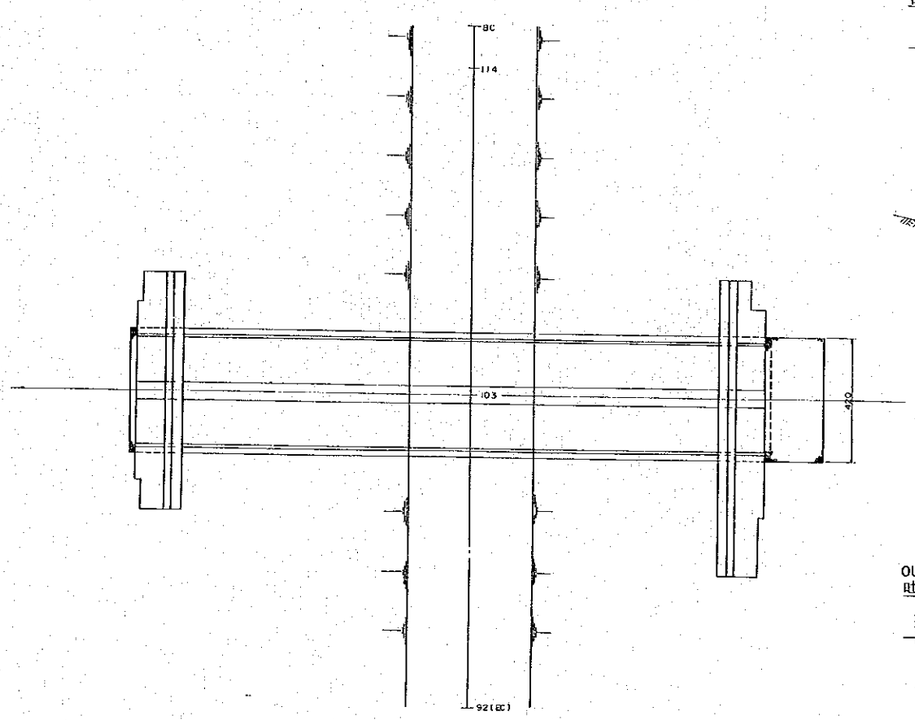
STEAL MATERIALS LIST
金物材料表

JAPANESE 名称	ENGLISH ITEM	SIZE 寸法 φ	SIZE 寸法 EFFECTIV LENGTH	@ 単重量	QUANTITY 員数	AMOUNT 総重量	FIXING POSITION 使用箇所 JAPANESE	FIXING POSITION 使用箇所 ENGLISH	NOTE 備考
環頭ボールト	RING BOLT	19 mm	800 mm	2.33 kg	24	55.92 kg	本桁・継桁・橋杭	MAIN GIRDER CROSS GIRDER COLUMN	
締付ボールト	CLAMP BOLT	13	300	0.51	8	4.08	車除 根太	CAR AVOIDANCE BAR BED PLATE	
〃		〃	280	0.49	34	16.66	地覆木 水切木 敷板	RAILING DRIP PLATE PLANKS	
〃		19	540	1.74	20	34.80	桁 桁受 継桁 筋違	MAIN GIRDER CROSS GIRDER CROSS GIRDER, SPLICE GIRDER	
〃		〃	600	1.87	84	157.08	桁 継木	MAIN GIRDER SPLICE GIRDER	
〃		16	260	0.76	15	11.40	環頭ボールト	RING BOLT	
〃		〃	340	0.89	34	30.26	桁受 橋杭 筋違 橋杭	CROSS PILE, COLUMN BRACING, COLUMN	ABUTMENT PIER 橋台 橋脚
〃		〃	440	1.05	33	34.65	桁受 橋杭	CROSS PILE, COLUMN	PIER 橋脚
〃		13	200	0.41	28	11.48	横桟 土留杭	CROSS PILE, SHEETING PILE	
鎹	CRAMP	8	150	0.10	56	5.60	土留杭 土台木	SHEETING PILE, BED PLATE	
〃		16	240	0.60	50	30.00	橋杭 土台木	COLUMN, BED PLATE	
皆折釘	BRAD	9	200	0.13	1.316	171.08	敷板	PLANKS	又は打込ボールト
〃		9	120	0.08	282	22.56	縦板	SURFACE PLATE	〃
洋釘	NAIL	5	150	0.15 kg/cm²	56 m²	8.40	土留板	SHEETING PLATE	
計	TOTAL			(BOLT) (BRAD) (NAIL)	ボールト 皆折釘 洋釘	391.93 193.64 8.40			

工事名	FOREST ROAD CONSTRUCTION WORK FOR J.I.C.A FORESTRY PROJECT		11 / 12
図面名	WOODEN BRIDGE		縮尺
校閲	(財)林業土木コンサルタンツ	(財)林業土木コンサルタンツ	昭和 年度

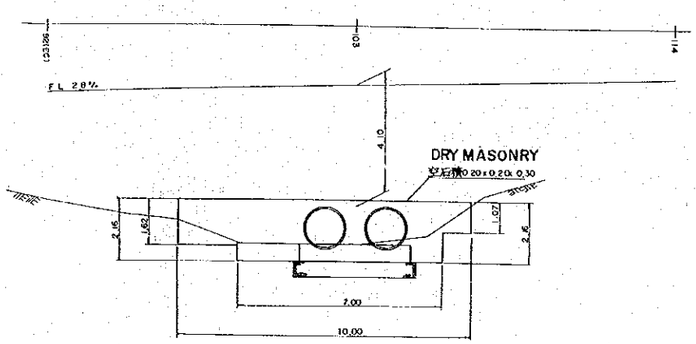
NO.1 UNDER DRAIN WORK HUME PIPE
第1号暗渠工 〔ヒューム管〕 SP=103 ø54" L=42.672

PLAN
平面図
S=1:200

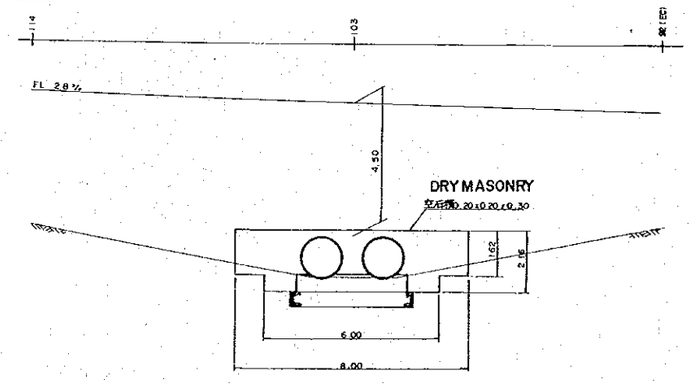


FRONT VIEW
正面図
S=1:200

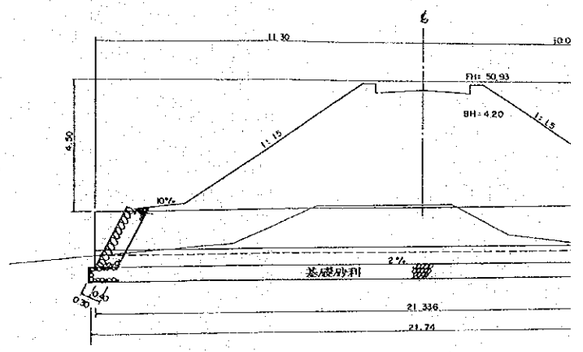
INLET
呑口



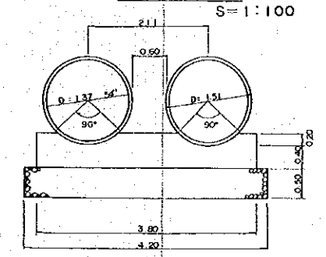
OUTLET
吐口



CROSS SECTIONAL VIEW
横断面図
S=1



DETAIL
詳細図
S=1:100

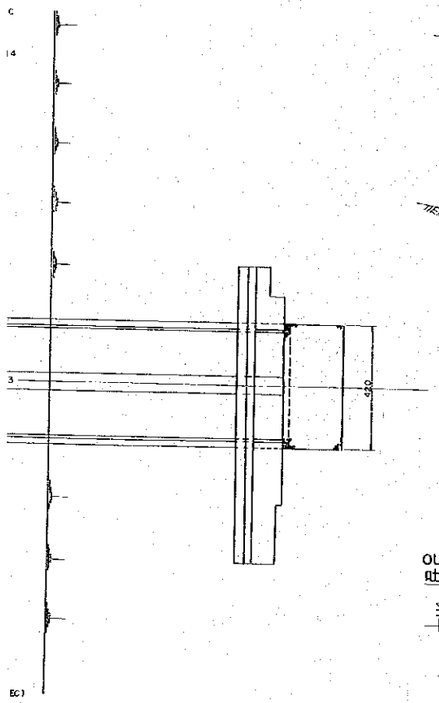


MATE
材

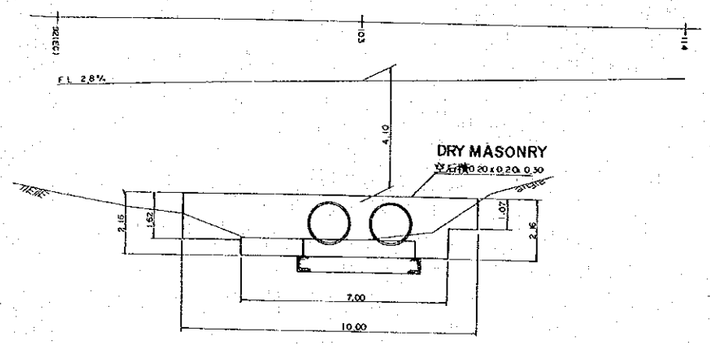
名	
HUM	
ヒ	
CON	
コン	
MOR	
型	
ST	
石	
BACK F	
基	
FOUNDA	
基	

NO.1 UNDER DRAIN WORK HUME PIPE
第1号暗渠工 (ヒューム管) SP=103 ø54" L=42.672

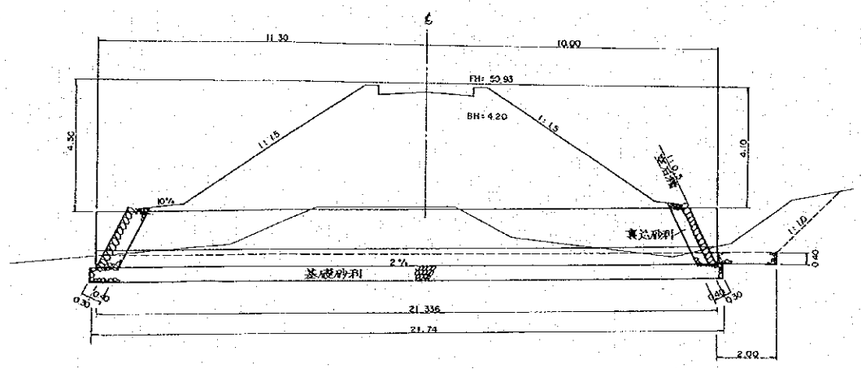
PLAN
平面図
S=1:200



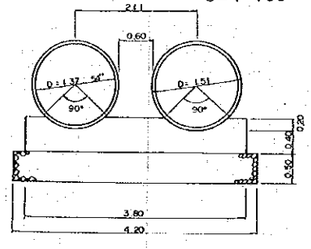
FRONT VIEW
正面図
S=1:200



CROSS SECTIONAL VIEW
横断面図
S=1:200



DETAIL
詳細図
S=1:100



MATERIALS LIST
材料表

ITEM 名称	SPECIFICATIONS 規格寸法	QUANTITY 数量	NOTE 備考
HUME PIPE ヒューム管	ø54" l=10' =2 3/4"	42.67 m	
CONCRETE コンクリート		4.9 m³	
MOLD FORM 型枠		29.5 m²	
STONE 石材	0.20×0.20×0.30	24.6 m³	
BACK FILLING BALLAST 裏込砂利		11.1 m³	
FOUNDATION BALLAST 基礎砂利		49.0 m³	

工事名	FOREST ROAD CONSTRUCTION WORK FOR JICA FORESTRY PROJECT		12/12
図面名	STRUCTURES PLAN		縮尺
検図	(財)林業土木コンサルタンツ	(財)林業土木コンサルタンツ	昭和 年度