

MODEL INFRASTRUCTURE IMPROVEMENT WORKS  
FOR  
HORTICULTURAL DEVELOPMENT PROJECT

TECHNICAL SPECIFICATIONS

1. GENERAL

- a. No interruption or disturbance to the research work at NHRS.
- b. No use of the site for any purpose other than carrying out the Works.
- c. The Contractor shall, with due care and diligence, execute and complete the Works and remedy any defects therein in accordance with the provisions of the Contract. The Contractor shall provide all superintendence, labor, materials, Plant, Contractor's Equipment and all other things, whether of a temporary or permanent nature, required in and for such design, execution, completion and remedying of any defects, so far as the necessity for providing the same is specified in or is reasonably to be inferred from the Contract.
- d. The Contractor shall take full responsibility for the adequacy, stability and safety of all Site operations and methods of construction. Provided that the Contractor shall not be responsible for the design or specification of the Works.

## 2. FENCE WORK

### 2-1 POSTS AND STRUTS

a CONCRETE POSTS AND STRUTS GENERALLY: to BS 1722: Part 1, Appendix A, manufactured generally as specified in F08 and F09: Precast Concrete Units, and of approved manufacture. The concrete is to be Class 20/(10 mm)(1:2:4 mix, aggregate 10 mm maximum).

b REINFORCEMENT OF CONCRETE POSTS AND STRUTS:

1. Intermediate posts over 2.45m 4×8 mm bars
2. Straining posts over 2.45m 4×10 mm
3. Struts over 2.45m 4×8 mm

Bars are to be made up into a prefabricated cage, with stirrups 2.65 mm dia. (12 swg) at centres not exceeding 380 mm. Bars must extend to within 25 mm of the ends of the posts, and have a minimum cover of 16 mm.

c CONCRETE POSTS AND STRUTS FOR CHAINLINK FENCES: to BS 1722: Part 1, Table 3.

Holes for wires	Intermediate length	Intermediate base	Straining posts length	Straining posts section	Struts length	Struts section
3	1.60m	100 x 100	1.6	125 x 125	1.50	100 x 75
3	1.87m	125 x 125	1.87	125 x 125	1.82	100 x 75
3	2.07m	125 x 125	2.07	125 x 125	1.98	100 x 75
3	2.63m	125 x 125	2.63	125 x 125	2.59	100 x 85
6	3.04m*	125 x 125	3.04	125 x 125	2.59	100 x 85

\* length measured on centre line. The top 0.45m of posts is cranked inwards at 45 degrees, giving an overall height of 3.10m. Intermediate posts are to taper to the top, 75×75 mm for 100×100 mm base, 100×100 mm for 125×125 mm base.

Straining posts and struts must be morticed and tenoned, and struts must be holed on the rake for wires.

**d CONCRETE POSTS AND STRUTS FOR STRAINED WIRE FENCES: to BS 1722:**

Part 3, Table 2:

Holes for wires	length	Intermediate base	Straining posts length	base	Struts length	base
3	1.50m	100 x 100	1.50	100 x 100	1.45	75 x 75
5	1.67m	100 x 100	1.82	125 x 125	1.50	100 x 75
6	1.90m	125 x 125	2.02	125 x 125	1.80	100 x 75
8	2.70m	125 x 125	2.22	125 x 125	1.98	100 x 75

Straining posts and struts must be morticed and tenoned, and struts must be holed on the rake for wires.

**2-2 WIRE AND MESH**

**a GALVANISED LINE WIRE FOR CHAINLINK FENCING: to BS 4102, of the following diameters:**

Chainlink pattern	Line wire diameter
Medium	3.00 mm

**b GALVANISED TYING WIRE: to BS 4102, 2.00 diameter.**

**c GALVANISED CHAINLINK: to BS 4102, Table 6, of the pattern specified or shown on the drawings and of 50 mm mesh.**

Pattern	Wire diameter
Medium	2.50 mm

**2-3 FITTINGS**

**a EXTENSION ARMS for barbed wire: mild steel to BS 1722: Part 1, cranked at 45 degrees, slotted for three strands of barbed wire at centres not exceeding 150 mm.**

To concrete and timber straining posts: 50x50x6.3 mm mild steel angle.

**b GALVANISED STEEL EYE BOLT STRAINERS AND WINDING BRACKETS: to BS 1722.**

**c BOLTS, NUTS AND WASHERS: ISO metric to BS 4190.**

- d GALVANISED WIRE STAPLES: to BS 1494: Part 2, 3.7 mm (9 swg)×32 mm.

#### 2-4 SUNDRIES

- a CONCRETE is specified in F02: Concrete Work.
- b BLACK BITUMEN COATING SOLUTION: to BS 3461, Type 1.
- c METALWORK for gates and posts is specified in P02: Metalwork Generally.

#### 2-5 PREPARING POSTS

- a TIMBER POSTS: drill for line wire at the heights specified. Coat bottom end with bitumen to a height of 300 mm above ground level. Notch straining posts for struts in the top third of post exposed above ground level.
- b STEEL POSTS: drill straining posts and struts for connection by two bolts 10 mm diameter at a point in the top third of post exposed above ground level.

#### 2-6 FIXING POSTS

- a SET OUT posts to the approval of the Supervisor. Do not commence excavation or fixing until the post layout has been approved. The top of the fencing is to follow the profile of the ground, but without abrupt changes of level, unless otherwise directed or shown on the drawings.
- b STRAINING POSTS are to be provided at all ends and corners, at changes in direction or acute changes in level, and at intervals not exceeding 50 m.
- c STRUTS: fit to straining posts in the direction of each line of fencing secured to them.
- d INTERMEDIATE POSTS are to be provided at intervals not exceeding 3 m.

e POST HOLES: posts and struts are to be set into the ground to the following depths:

1. Fence height exceeding 1.4m 0.75m deep.

Excavate holes for posts and struts not less than 450×450 mm in plan.

f FIXING POSTS AND STRUTS: insert post or strut, support in position, fill excavation with concrete Class Q (1:3:6) to not less than half its depth and compact. Backfill with suitable excavated materials well compacted.

## 2-7 FIXING WIRES AND MESH

a TIMING: do not strain wires until at least seven days after fixing posts.

b FIXING LINE WIRES:

1. Thred through holes in posts and connect to eye bolt strainers at ends and angles.
2. Strain taut to the approval of the Supervisor.

c FIXING BARBED WIRE:

1. Slot into steel extension arms and strain taut to the approval of the Supervisor.
2. Staple to timber posts, straining taut as the work proceeds.
3. Wire firmly to concrete posts, straining taut as the work proceeds.

d FIXING CHAINLINK: wire firmly to each line wire at horizontal centres not exceeding 600 mm.

## 2-8 FABRICATING AND HANGING GATES

a FABRICATE metal gates and posts as specified in P03: Metalwork Generally "Workmanship"

b HANG GATES true to line and level on posts fixed as specified for steel fenceposts.

### 3. METAL WORKS (GATES)

#### 3-1 GENERALLY

- a MATERIALS AND WORKMANSHIP for the following are specified in P02 and P03:

Metalwork generally:

Plates, bars, sections, and tubes

Sheet metal

Wire mesh and expanded metal

Composite units.

- b SUNDRIES are specified with the constructions in which they occur.

- c COMPOSITE STANDARD UNITS: include for assembling and jointing.

#### 3-2 MATERIALS GENERALLY

- a MATERIALS specified in this section may be applicable to any or all of the subsequent subtrades in Metalwork.

- b SUPPLIES: obtain all materials from suppliers approved by the Supervisor.

- c STANDARDS: produce the manufacturer's certificate of compliance with the standards specified if so requested by the Supervisor.

- d FINISHERS: metal commodities for making components must be either prefinished or suitable to receive the finishes specified.

#### 3-3 SECTIONS

- a HOT ROLLED STEEL SECTIONS except equal and unequal angles: to BS 4: Part 1, made from steel to BS 4360: Part 2.

- b HOT ROLLED EQUAL AND UNEQUAL ANGLES: to BS 4: Part 1 (metric converted from imperial dimensions) or to BS 4848: Part 4 (coordinated metric dimensions). Do not substitute sections of dimensions other than those specified without the prior approval of the Supervisor.
- c HOT ROLLED HOLLOW STEEL SECTIONS: to BS 4: Part 2, made from steel to BS 4360: Part 2.
- d HOT ROLLED STEEL BARS: to BS 4449.
- e COLD ROLLED STEEL SECTIONS: to BS 2994, made from steel to BS 1449: Part 1B (HR, CR, HS or CS quality unless otherwise specified or shown on the drawings).
- f STEEL TUBES AND TUBULARS: to BS 1387, Medium thickness unless otherwise specified. If steel tubes to BS 1775 are required, they will be specified or shown on the drawings.

### 3-4 MESH

- a STEEL MESH FABRIC: to BS 4483, welded type, and of square, structural or long mesh as specified or shown on the drawings.

### 3-5 PLATE, SHEET AND STRIP

- a STEEL PLATE for welding: to BS 4360, Section 2 unless otherwise specified. Steel to this Standard is equally suitable for bolting and rivetting, and may be used unless steel plate to BS 1449 is specified.
- b STEEL PLATE, SHEET AND STRIP to BS 1449: Use only if specified or shown on the drawings.

### 3-6 SUNDRIES

- a ELECTRODES for metal-arc welding mild and medium tensile steels: to BS 639.

- b FILLER RODS AND WIRES for gas welding of steel, copper, aluminium and alloys: to BS 1453.
- c FILLER METALS FOR BRAZING: to BS 1845.
- d FASTENINGS FOR GALVANISED STEEL: galvanised unless otherwise specified.
- e FASTENINGS FOR PLATED METALS: plated to match unless otherwise specified.
- f BOLTS, SCREWS AND NUTS: ISO metric black hexagon to BS 4190 unless otherwise specified or shown on the drawings. Bolts and screws generally are to be of a length such that two complete threads will produce through the nut after tightening.
- g WASHERS: black steel to BS 4320 unless otherwise specified or shown on the drawings, and of diameters recommended for the sizes of bolts in use.
- h MACHINE SCREWS AND NUTS: ISO metric to BS 4183, or other approved.
- i RIVETS: to BS 4620 or BS 641 as appropriate for the application.
- j STEEL RIVETS FOR COLD CLOSING: to BS 1109.
- k MASTIC FOR BEDDING JOINTS IN COMPONENTS: of approved manufacture and type, suitable for the application.

### 3-7 WORKMANSHIP GENERALLY

- a WORKMANSHIP specified in this section may be applicable to any or all of the subsequent subtrades in Metalwork.
- b APPROVED SUPPLIERS: if so specified or directed by the Supervisor, metalwork is to be fabricated by an approved supplier.



- c SAMPLES: if so specified or directed by the Supervisor, submit samples of fabricated metalwork and obtain his approval before ordering or manufacturing in bulk.

### 3-8 FABRICATING

- a PROTECT during fabrication all surfaces which will be visible in completed work.
- b COLD FORMED WORK: to be free from warping, buckling and fractures.
- c CORNERS: mitre junctions of identical sections unless otherwise specified.
- d HOLES: from without distortion of the surrounding metal. Clearance holes for bolts are to be to BS 4186.
- e MOVING PARTS: when assembled all moving parts must move freely and without binding.
- f CLEANING: remove all burrs and sharp arrises which would be visible after fixing or dangerous to the user.
- g JOINTS:
  - 1. Rivetted joints are to be drawn tightly together, with rivets closed to completely fill the holes.
  - 2. Mechanical joints are to be tight with no visible gaps.
  - 3. Mechanical joints of components which are to be located externally must be bedded in mastic, including all mating surfaces, cleats and other fixings.
  - 4. Connect cleats to frames with countersunk machine screws unless otherwise specified or approved.

### 3-9 WELDING AND BRAZING

a PREPARATION: remove grease, dirt, moisture and oxide from edges to be welded. Remove scale and residue from arc and powder cutting by machining or hand grinding.

b ACCURACY:

1. Ensure accurate fit, using clamps and jigs where practicable.
2. If approved by the Supervisor, use tack welds for temporary attachment where jiggling is not practical.

c TACK WELDS: use only for temporary attachment unless otherwise specified.

d WELDS: make joints with parent and weld metal fully fused throughout, with no holes, porosity or cracks.

e SPATTER: prevent weld spatter falling on surfaces of materials which will be self finished and visible in completed work. Ensure complete removal of flux residues and slag.

f BUTT WELDS which will be visible in completed work are to be finished smooth and flush adjacent surfaces.

g WELDING OF STEEL to be by one of the following methods:

1. Mild steel: gas welding to BS 693.
2. Mild steel: metal-arc welding to BS 1856.
3. Steel tubes to BS 1775: metal-arc welding to BS 938.
4. Steel (carbon content not exceeding 0.12 percent): projection welding to BS 2630.
5. Mild steel sheets of total thickness not exceeding 8 mm: seam welding to BS 2937.
6. Other method approved by the Supervisor.

### 3-10 FINISHING METALWORK

a SAMPLES: submit samples of specified finished for the approval of the Supervisor.

b APPROVED SUPPLIER: all metal coatings are to be applied by a specialist firm approved by the Supervisor.

c METAL COATINGS:

1. Apply after fabrication is complete and all fixing holes have been drilled, unless otherwise specified.
2. Before applying coating, remove all welding slag, spatter, paints, grease, flux, rust, burrs and sharp arrises.
3. Make good all defects which would show after application of coating, and finish surfaces smooth.

d CHROMIUM PLATING: to BS 1224, Service Condition No.2, bring finish, unless otherwise specified.

e GALVANISING AND SHERARDISING: to BS 729.

f ZINK AND ALUMINIUM SPRAYING of ferrous metals: to BS 2569: Part 1.

g VITREOUS ENAMELLING: to BS 3830.

h ANODISING:

1. Pretreat surfaces before anodising to produce the final specified finish.
2. Anodise in accordance with BS 3987.
3. Obtain certification from the anodiser that the specification grade has been applied, and submit to the Supervisor.

### 3' SUBTRADE P10: STANDARD UNITS \*MATERIAL\*

#### 3' -1 GENERAL

- a MATERIALS AND SUNDRIES GENERALLY are specified in P02 Metalwork Generally \*Material\*

#### 3' -2 COMPONENTS

- a DELIVERY: do not deliver to site any components which cannot be unloaded immediately into suitable storage conditions.
- b UNLOADED AND HANDLE components in accordance with manufacturer's recommendations. Do not damage or distort.
- c FIREPROOF DOORS AND SHUTTERS: provide evidence that doors and shutters specified as fireproof or fire resisting meet the specified standards of fire resistance.
- d STEEL CASEMENT WINDOWS AND DOORS: to BS 990: Part 2, but with red oxide dipped finish unless galvanising is specified. Obtain from an approved manufacturer. Windows and doors are to be complete with lugs, fixing screws, hinges and brass handles. Windows are to be fitted with stays, and doors with bolts, turnbuckles and mortice locks. Provide glazing cleats or clips.
- e ALUMINIUM WINDOWS AND DOORS: materials, fabrication and detailed design to BS 4873, and of approved manufacture.

#### 3' -3 SUNDRIES

- a FIXING AND FASTENINGS: obtain from manufacturer of component being fixed.
- b WOOD SCREWS: steel to BS 1210.
- c BOLTS, SCREWS, NUTS AND WASHERS are specified in P02: Metalwork generally

- d PLUGS: approved proprietary plugs of plastic or wood fibre. Do not use timber plugs.
- e SELF-TAPPING SCREWS: to BS 4174, with anti-corrosive finish unless otherwise specified.
- f BLACK BITUMEN COATING SOLUTIONS for cold application: to BS 3416, Type 1, of approved manufacture.
- g JOINT BACKING STRIP: a type recommended by the joint sealant manufacturer for the application specified.
- h BEDDING COMPOUND: of approved type and manufacture.
- i POINTING SEALANT: of approved type and manufacture, suitable for use in tropical conditions.

### 3" SUBTRADE P11: STANDARD UNITS \*WORKMANSHIP\*

#### 3" -1 GENERALLY

- a HANDLE AND STORE components in accordance with manufacturer's recommendations. Make good immediately any damage to protective coatings.
- b PROPRIETARY COMPONENTS: fix in accordance with manufacturer's recommendations.
- c PROTECTION:
  1. Retain protective coverings in place during fixing wherever practicable.
  2. Provide additional protection as necessary to prevent marking of surfaces which will be visible in completed work.
  3. Remove protection on completion.

### 3" -2 PREPARATION AND FIXING

- a SUB-FRAMES: before fixing metal frames, prime timber sub-frames which are to be painted, including rebates.
- b CORROSION PROTECTION: before fixing, ensure that concealed and contact surfaces of metal components are protected against corrosion. Inspect steel components and make good any damaged protective coatings to the approval of the Supervisor. Aluminium (including anodised aluminium) which will be in contact with timber treated with preservatives, with cedar, iron, steel, copper alloys, concrete, mortar, plaster, rendering or soil must be treated with two coats of bitumen solution before fixing.
- c LOADING: window and door frames must not carry any structural loads. When fixing, ensure that adequate provision is made for the deflection of beams and lintols.
- d OPENING LIGHTS: keep closed and secured during all operations until fixed. Retain any clamping devices in position. Provide packing between light and frame to maintain correct clearances.
- e PLACING: position and maintain frames and linings plumb, level and square, and in correct relation to wall faces and damp proof courses as shown on the drawings. Avoid displacement of damp proof courses.
- f COMPOSITE ASSEMBLIES: all mating surfaces of metal-to-metal joints are to be bedded in mastic.
- g SITE WELDING: do not weld on site without the prior approval of the Supervisor.
- h LUGS: pack out with shims at fixing points when necessary.
- i BUILDING IN: support and brace frames as necessary to prevent distortion of frames during erection of adjacent structure.

j PREPARED OPENINGS: pack joints to maintain specified widths, including positions where fixings tighten frame against structure.

k TIGHTENING: do not distort frames when tightening fixings.

### 3" -3 SEALING JOINTS

a PREPARATION: ensure that joints are dry. Remove all loose material, dust and grease. Prepare joints in accordance with sealant manufacturer's recommendations, using recommended solvents and primers where necessary. Mask adjoining surfaces.

b BACKING: insert backing strips in all joints to be pointed with sealant. Do not leave gaps, and do not reduce depth of joint for sealant to less than the minimum recommended by the sealant manufacturer.

c POINTING: fill joint cavity with sealant in accordance with manufacturer's recommendations. Tool sealant to form a smooth flat bead.

d FINISHING: remove excess sealant from adjoining surfaces, using cleaning materials recommended by the sealant manufacturer. Leave clean to the approval of the Supervisor. Replace if directed any materials permanently contaminated with sealant.

#### 4. FARM ROAD IMPROVEMENT WORKS

##### 4-1 GENERALLY

- a REQUIREMENTS AND CONDITIONS for excavation and earthworks generally are specified in D01: Genral, D04: Excavation \*Material\* and D06: Hard fill \*Material\* and apply equally to Access Roads. The contracor's attention is drawn particularly to the following subsections:

0600	Generally
0700	Filling materials
0710	Plants and sundries
0810	Hard filling materials generally

##### 4-2 HARD FILLING MATERIALS FOR ROADS

- a MURRAM: naturally occuring lateritic gravels, either loose form or cemented, provided the cemented material can be broken up during excavation or compaction to pass a 37.5 mm sieve.
- b STONE GENERALLY: clean, hard crushed rock, free from clay and other soft or deleterious matter, graded as specified for the application.
- c CRUSHED STONE FOR BASES and sub-bases: maximum aize 75 mm, well graded between 75 mm and 0.075 mm, with 60% to 80% passing a 20 mm sieve. The Supervisor may require the grading to be varied within these limits to allow maximum compaction.
- d REQUIREMENTS AND CONDITIONS for excavation and earthworks generally are specified in D01: General, D03: Site preparation \*Workmanship\* D05: Excavation \*Workmanship\* and D07: Hard fill \*Worlmanship\* and apply equally to Access Roads. The contractor's attention is drawn particularly to the following subsections:
- |      |                                      |
|------|--------------------------------------|
| 0600 | Excavation and earthwork generally   |
| 0630 | Classification of excavation         |
| 0680 | Site preparation generally           |
| 0720 | Excavation and backfilling generally |



0760	Obstructions
0770	Disposal of water
0780	Disposal of materials
0790	Planting
0850	Hard filling generally
0860	Placing and compaction of hard fill.

#### 4-3 EXCAVATION

- a EXCAVATE by hand or using approved plant. Do not disturb the subgrade surface.
- b TRIM EXCAVATIONS accurately to levels, cross falls and longitudinal falls. Remove all loose materials.
- c COMPACT SUBGRADE to the Supervisor's approval, using an approved smooth steel wheeled roller of 4 to 8 Mg or a 2 to 4 Mg vibrating roller. A vibrating plate compactor may be used for the subgrade to footpaths and light access roads.
- d SUBGRADE IN EMBANKMENTS: where the drawing show the subgrade to be above natural ground level, form embankments as shown on the drawings or instructed by the Supervisor, laid and compacted in layers not exceeding 250 mm deep.

#### 4-4 LAYING AND COMPACTING BASES AND SUB-BASES

- a SUBGRADE: treatment of subgrade is specified in D05: Excavation  
 \*Workmanship\* Ensure that subgrade has been trimmed to the levels, longitudinal and cross falls specified, and has been compacted as specified.
- b SUB-BASE COURSES, where specified, shown on the drawings or directed by the Supervisor, are to comply with the specified

- c MURRAM BASE: spread in a layer of uniform thickness across the whole width of the road, including such additional width as may be shown on the drawings. Wet and roll to achieve compaction of 98% of compaction at optimum moisture content. Where the total base course thickness exceeds 150 mm, spread and compact in separate layers not exceeding 150 mm thickness each. Remove hard particles exceeding 75 mm maximum dimension.
- d CRUSHED STONE BASE: mix in an approved mechanical mixer, adding water as necessary to achieve the specified compaction. Spread without segregating the constituents in layers not exceeding 200 mm compacted thickness, and roll with a 4 to 8 Mg roller to 98% of maximum compaction.

## 5. TRELLIS WORKS

### 5-1 PIPES AND FITTINGS

a **GENERALLY:** where hot and/or cold water services are specified or shown on the drawings as galvanised mild steel tubing and fittings, the contractor will be permitted to execute the work using copper, UPVC or polythene pipes and fittings provided:

1. The prior approval of the Supervisor is obtained.
2. The installation complies in every respect with the requirements of the specification and any additional requirements of the Supervisor.
3. The materials substituted is suitable for the applications specified or shown on the drawings.
4. UPVC or polythene pipes are not used for hot water services.
5. The whole of the work is carried out at the rates and for the prices included in the tender. Any additional fittings, coupling and the like which may be required must be provided and fixed at the contractor's expense.

The substitution of galvanised steel piping and fittings for any other material specified or shown on the drawings will not be permitted.

b **GALVANISED STEEL PIPES:** to BS 1387, with screwed and socketted joints to BS 21, of approved manufacture.

1. Medium gauge (for general use): to Table 2.
2. Heavy gauge (for pipework below ground): to Table 3.

Tubes must be cleanly finished, with smooth surfaces, free from defects and scale. Tubes must be supplied with clean, well-cut taper threads and with one screwed socket.

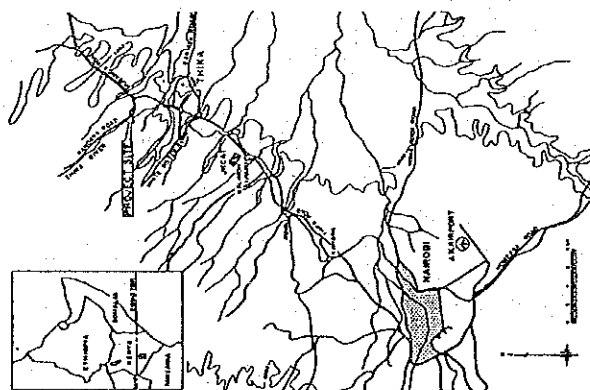
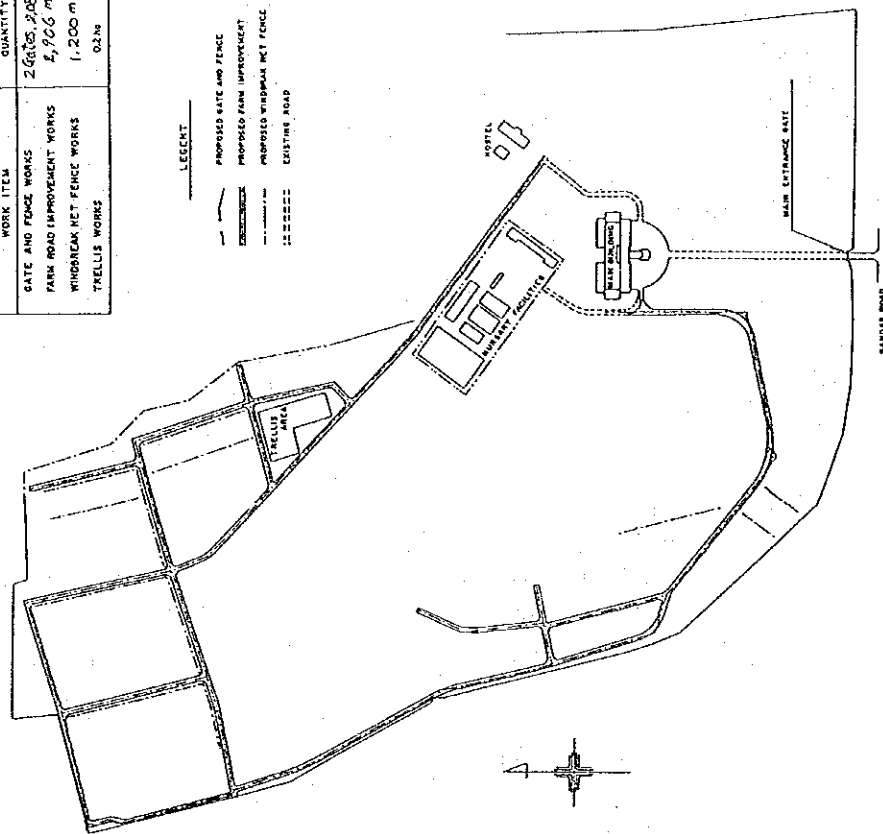
c **GALVANISED MALLEABLE CAST IRON PIPE FITTINGS** for use with galvanised steel pipes to BS 1387: to BS 143 and 1256, of approved manufacture. Castings must be smooth and free from blowholes, pitting, sand and other defects. Galvanising is to be to BS 729.

GENERAL PLAN OF WORKS (S-1/250,000)

WORK ITEM	QUANTITY
GATE AND FENCE WORKS	280m x 2.00m
PARK ROAD IMPROVEMENT WORKS	5,900 m
WINDBREAK NET FENCE WORKS	1,200 m
TRELLIS WORKS	0.2ha

LEGEND

PROPOSED SITE AND FENCE  
 PROPOSED PARK IMPROVEMENT  
 PROPOSED WINDBREAK NET FENCE  
 EXISTING ROAD

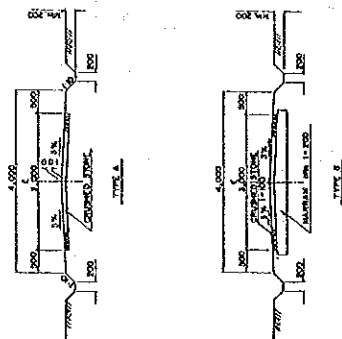


LOCATION MAP (S-1/250,000)

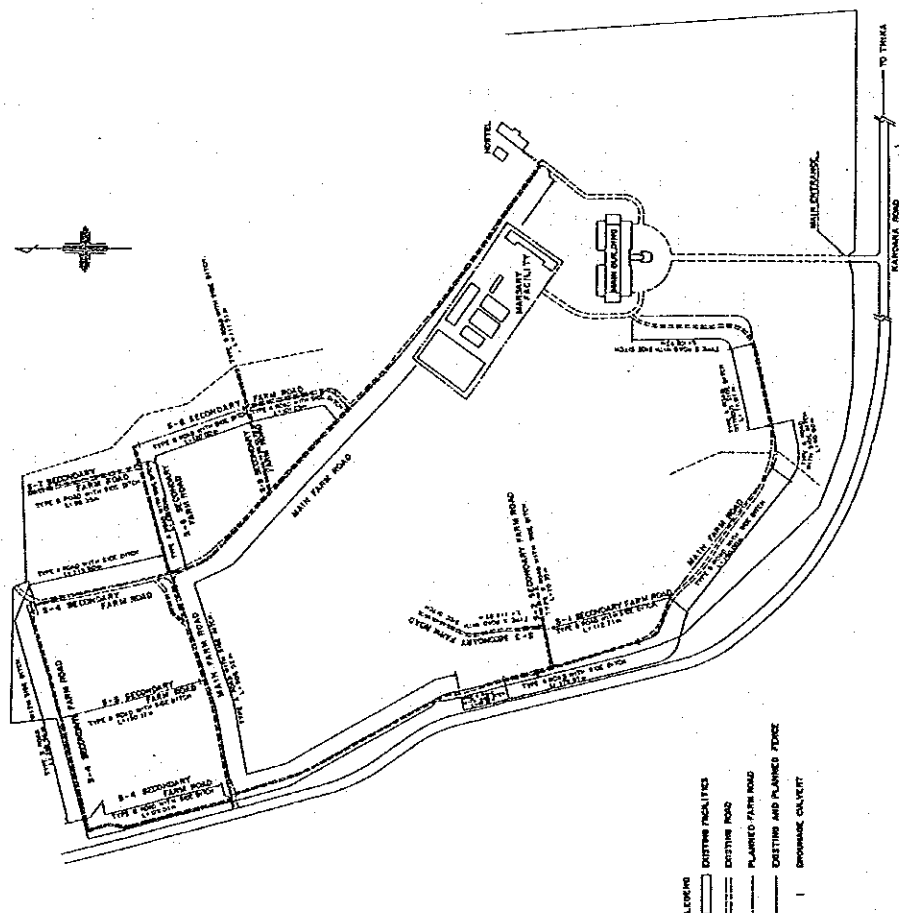
REPUBLIC OF LYCH
MINISTRY OF AGRICULTURE
MOORE INTERNATIONAL CORPORATION
THE MOORE INTERNATIONAL DEVELOPMENT PROJECT
LOCATION MAP AND
GENERAL PLAN OF THE WORKS
DATE APR. 1981 DRAWING NO. C-1
MOORE INTERNATIONAL CORPORATION AGENT
(S-1/250,000)

# FENCE LENGTH

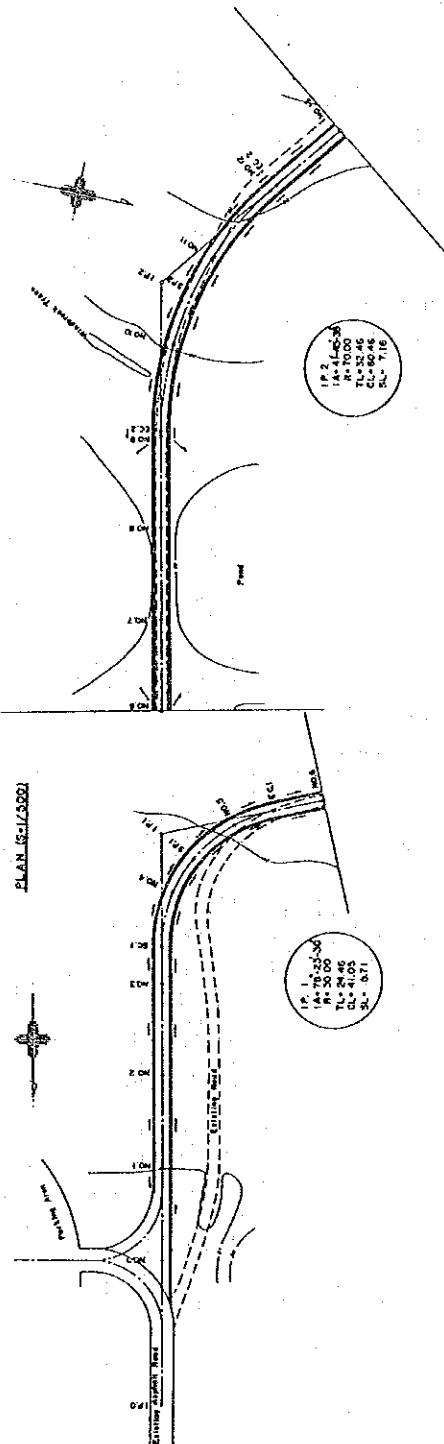
STATION	COORDINATES	DISTANCE
P1	211.27	245.42
P2	271.05	249.50
P3	305.61	174.20
P4	335.40	209.29
P5	365.31	56.11
P6	388.48	55.37
P7	413.40	56.11
P8	438.40	56.11
P9	463.40	56.11
P10	488.40	56.11
P11	513.40	56.11
P12	538.40	56.11
P13	563.40	56.11
P14	588.40	56.11
P15	613.40	56.11
P16	638.40	56.11
P17	663.40	56.11
P18	688.40	56.11
P19	713.40	56.11
P20	738.40	56.11
P21	763.40	56.11
P22	788.40	56.11
P23	813.40	56.11
P24	838.40	56.11
P25	863.40	56.11
P26	888.40	56.11
P27	913.40	56.11
P28	938.40	56.11
P29	963.40	56.11
P30	988.40	56.11
P31	1013.40	56.11
P32	1038.40	56.11
P33	1063.40	56.11
P34	1088.40	56.11
P35	1113.40	56.11
P36	1138.40	56.11
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P38	1188.40	56.11
P39	1213.40	56.11
P40	1238.40	56.11
P41	1263.40	56.11
P42	1288.40	56.11
P43	1313.40	56.11
P44	1338.40	56.11
P45	1363.40	56.11
P46	1388.40	56.11
P47	1413.40	56.11
P48	1438.40	56.11
P49	1463.40	56.11
P50	1488.40	56.11
P51	1513.40	56.11
P52	1538.40	56.11
P53	1563.40	56.11
P54	1588.40	56.11
P55	1613.40	56.11
P56	1638.40	56.11
P57	1663.40	56.11
P58	1688.40	56.11
P59	1713.40	56.11
P60	1738.40	56.11
P61	1763.40	56.11
P62	1788.40	56.11
P63	1813.40	56.11
P64	1838.40	56.11
P65	1863.40	56.11
P66	1888.40	56.11
P67	1913.40	56.11
P68	1938.40	56.11
P69	1963.40	56.11
P70	1988.40	56.11
P71	2013.40	56.11
P72	2038.40	56.11
P73	2063.40	56.11
P74	2088.40	56.11
P75	2113.40	56.11
P76	2138.40	56.11
P77	2163.40	56.11
P78	2188.40	56.11
P79	2213.40	56.11
P80	2238.40	56.11
P81	2263.40	56.11
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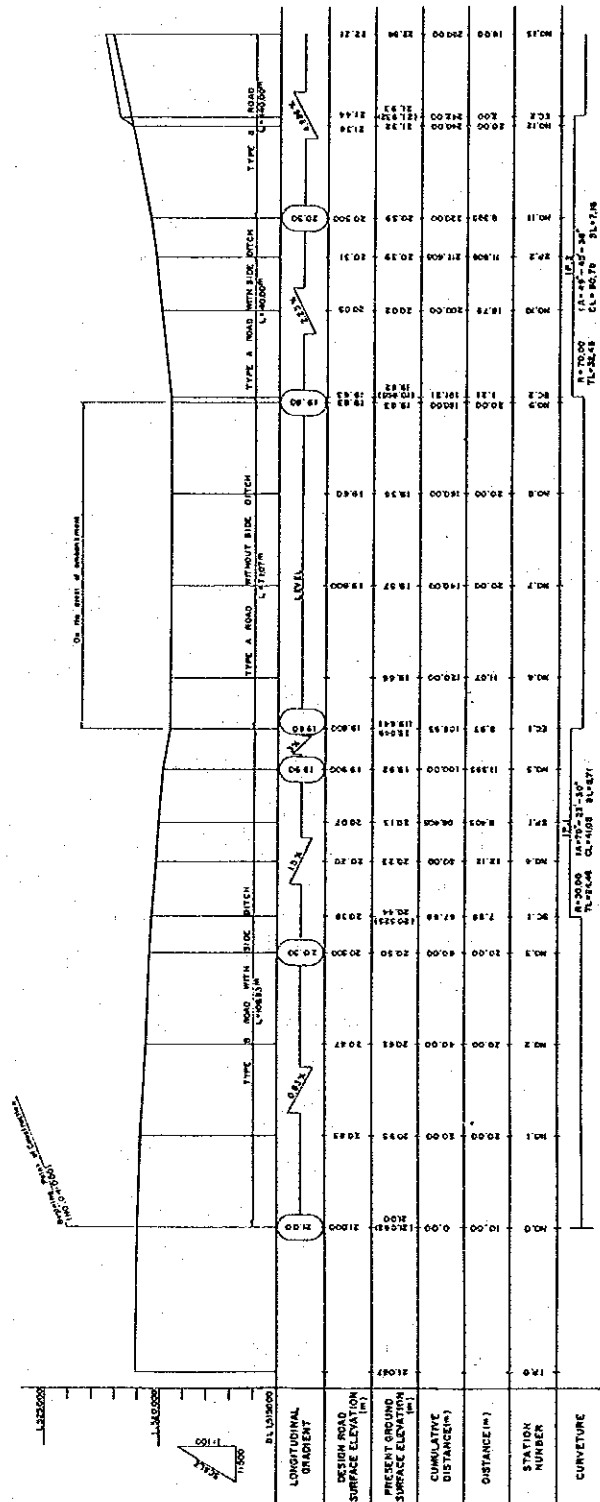
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PLAN (S-1/300)



PROFILE (S-1/100)

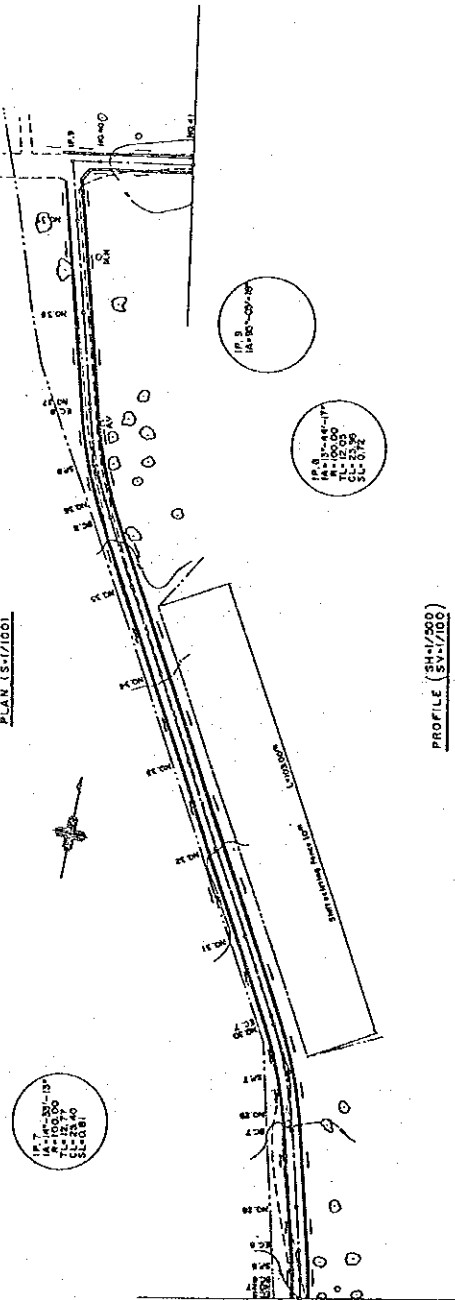


REPUBLIC OF KENYA
MINISTRY OF AGRICULTURE
MODEL OF INFRASTRUCTURAL IMPROVEMENT
THE INFRASTRUCTURAL IMPROVEMENT PROJECT
MAIRI FARM ROAD
PLAN AND PROFILE (1/50)
DATE: APRIL 1981
SCALE: HORIZONTAL 1:1000, VERTICAL 1:100
JAWA INTERNATIONAL CONSULTING AGENCY

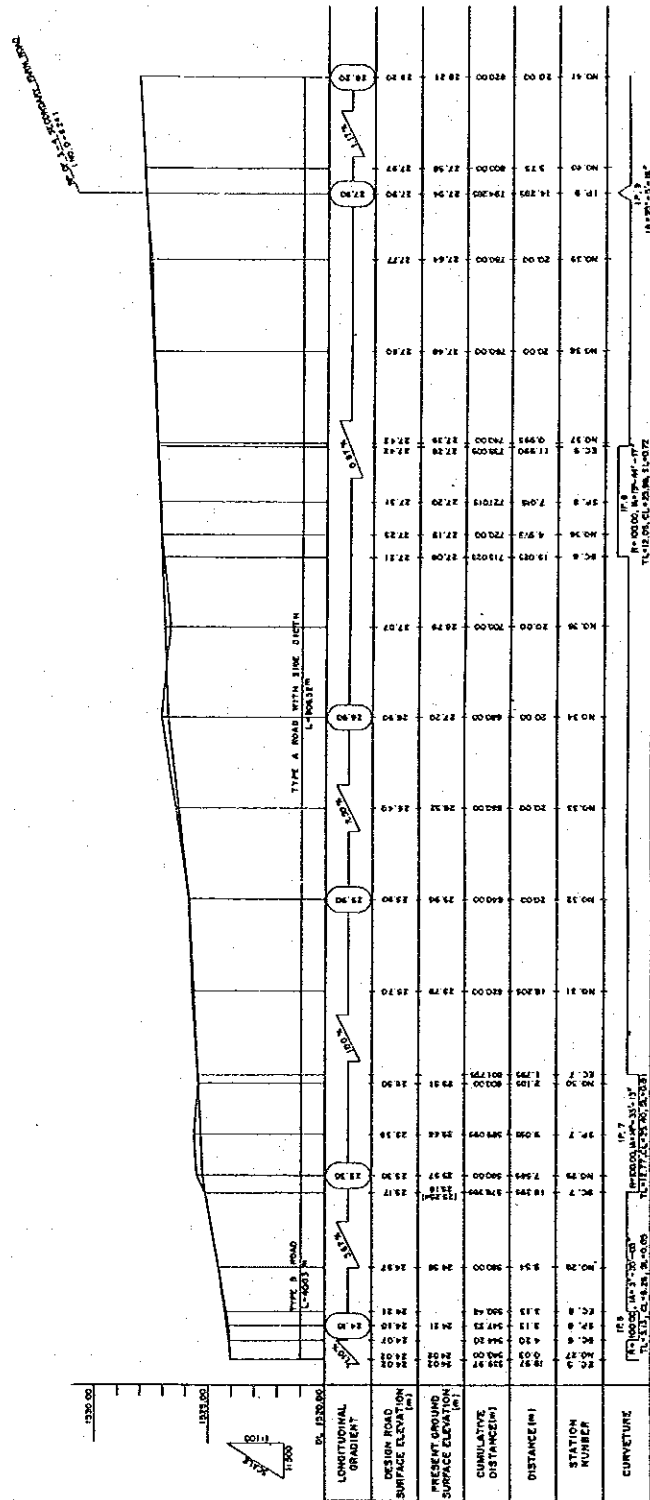




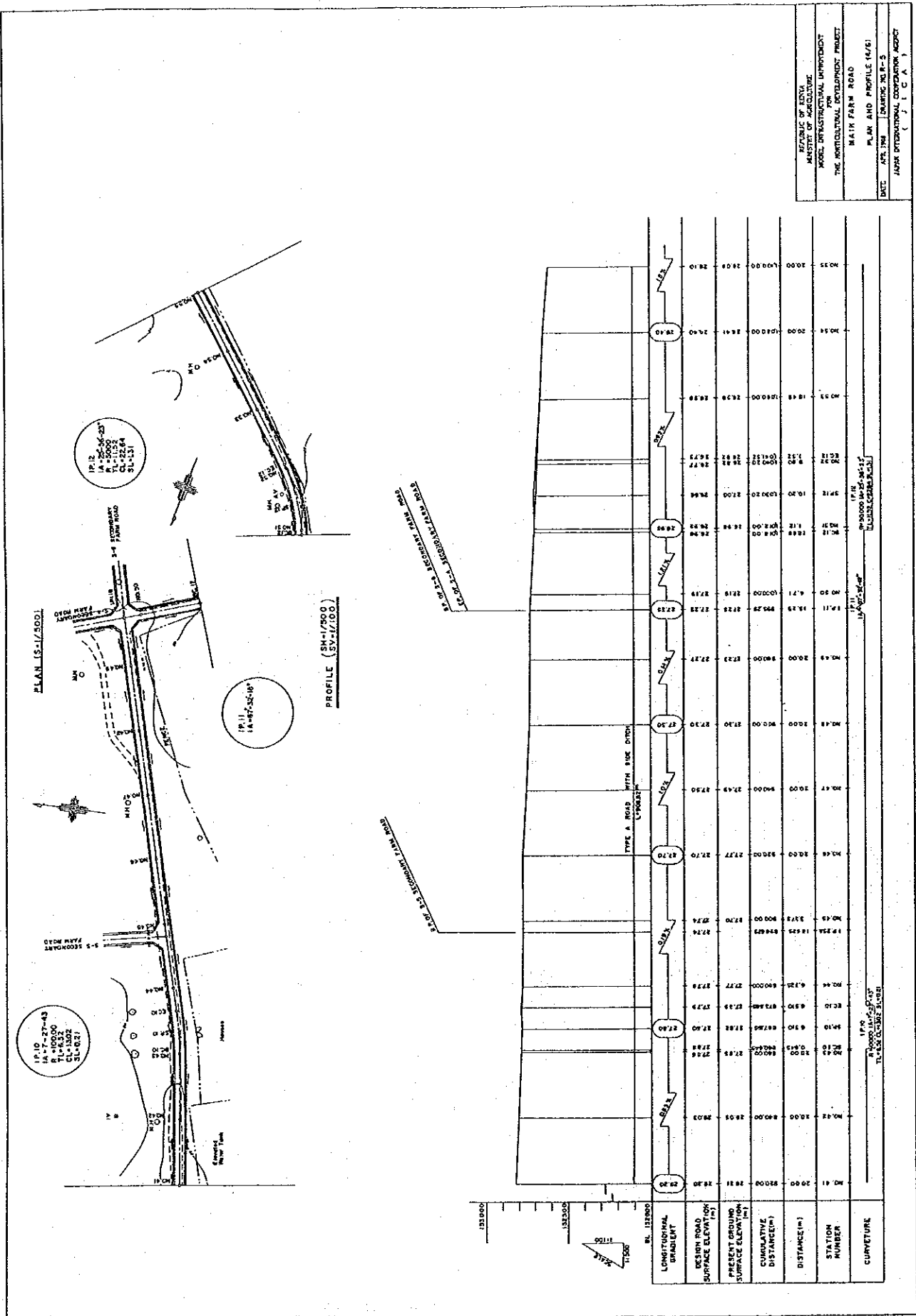
PLAN (S-1/100)



PROFILE (S-1/100)

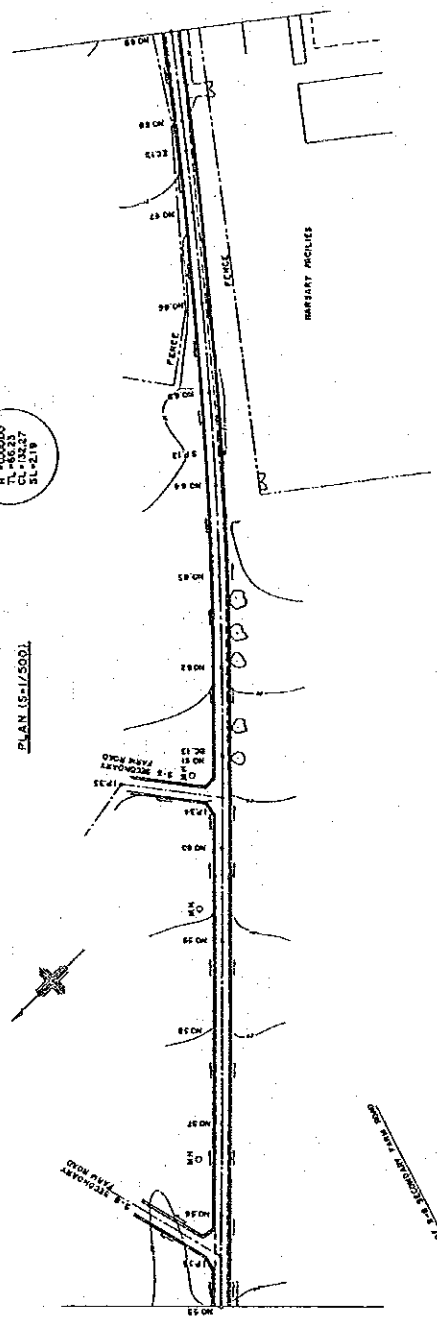


REPUBLIC OF KENYA
MINISTRY OF AGRICULTURE
ROD INFRASTRUCTURE IMPROVEMENT
THE INFRASTRUCTURE DEVELOPMENT PROJECT
MAIN FARM ROAD
PLAN AND PROFILE (S-1)
DATE: APR. 1991
DRAWING NO: S-1
SCALE: 1:100
DESIGNED BY: J. J. C. A.

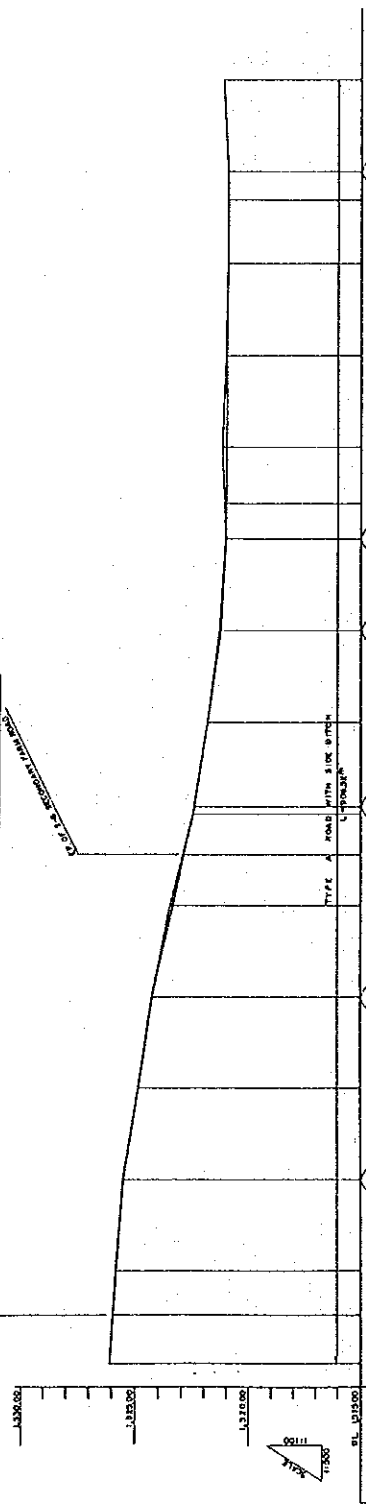


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TL 80.23  
CL 132.27  
SL 2.19

PLAN (S-1/500)

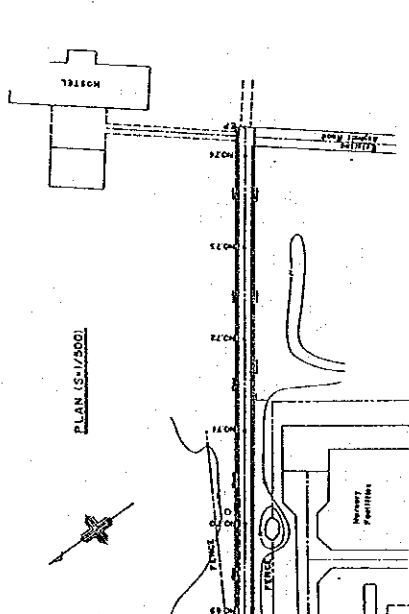


PROFILE (S-1/500)



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0+30	131500	131500	131500	131500
0+40	131500	131500	131500	131500
0+50	131500	131500	131500	131500
0+60	131500	131500	131500	131500
0+70	131500	131500	131500	131500
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REPUBLIC OF KENYA  
MINISTRY OF AGRICULTURE  
MODEL INFRASTRUCTURAL IMPROVEMENT  
THE HORTICULTURAL DEVELOPMENT PROJECT  
MAIN FARM ROAD  
PLAN AND PROFILE (S/76)  
DATE APR 1981 DRAWING NO. S-1  
JAWA INTERNATIONAL CONSULTING AGENCY  
(1/2/1/0/1/1)



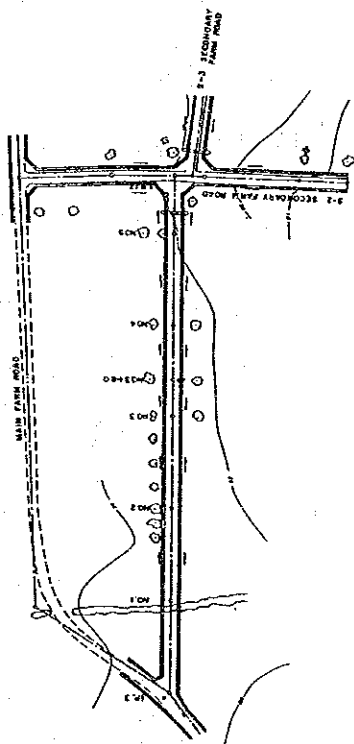
PROFILE (S=1/100)



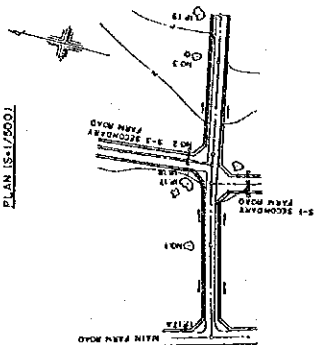
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PRESENT GROUND SURFACE ELEVATION (ft)	1322.00	1332.00	1342.00	1352.00	1362.00	1372.00
CUMULATIVE DISTANCE (ft)	0.00	20.00	40.00	60.00	80.00	100.00
DISTANCE (ft)	0.00	20.00	40.00	60.00	80.00	100.00
STATION NUMBER	12+00	12+20	12+40	12+60	12+80	13+00
CURVE						

MINISTRY OF AGRICULTURE MINISTRY OF AGRICULTURE MODEL INFRASTRUCTURAL IMPROVEMENT FOR THE AGRICULTURAL DEVELOPMENT PROJECT MAIN FARM ROAD
PLAN AND PROFILE (S=1/100)
DATE APR 1981 DRAWING NO. R-7
JAYAS INTERNATIONAL CORPORATION AGENT J. J. C. A.

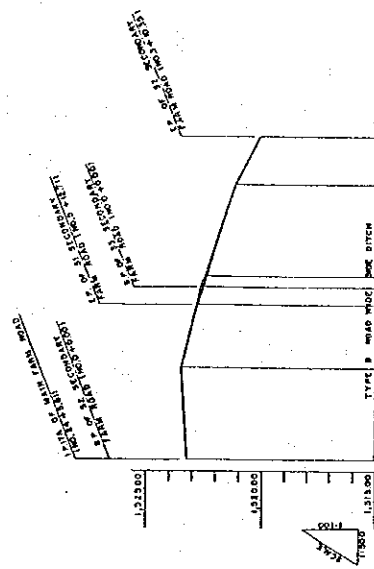
PLAN (S = 1/300)



S2 SECONDARY FARM ROAD

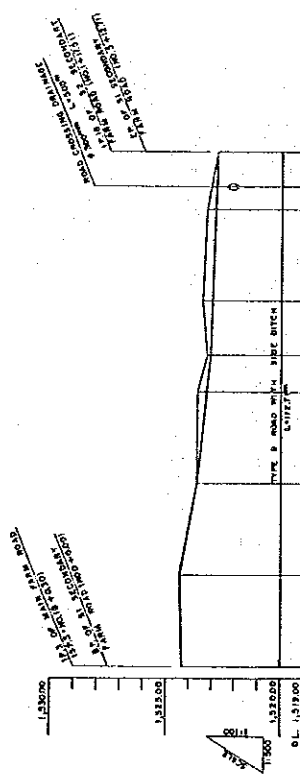


PROFILE (SH-1/300)  
(SV-1/100)



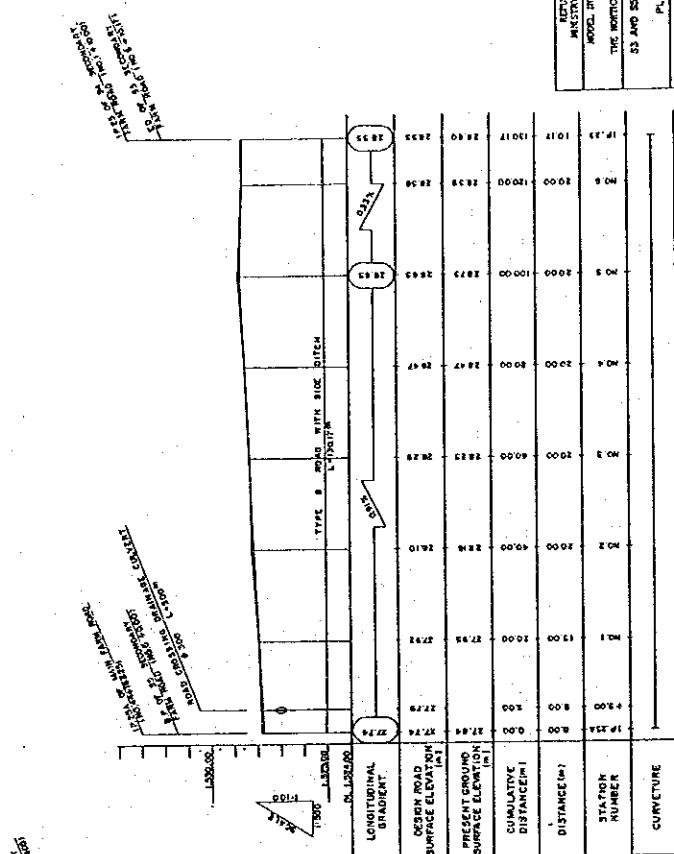
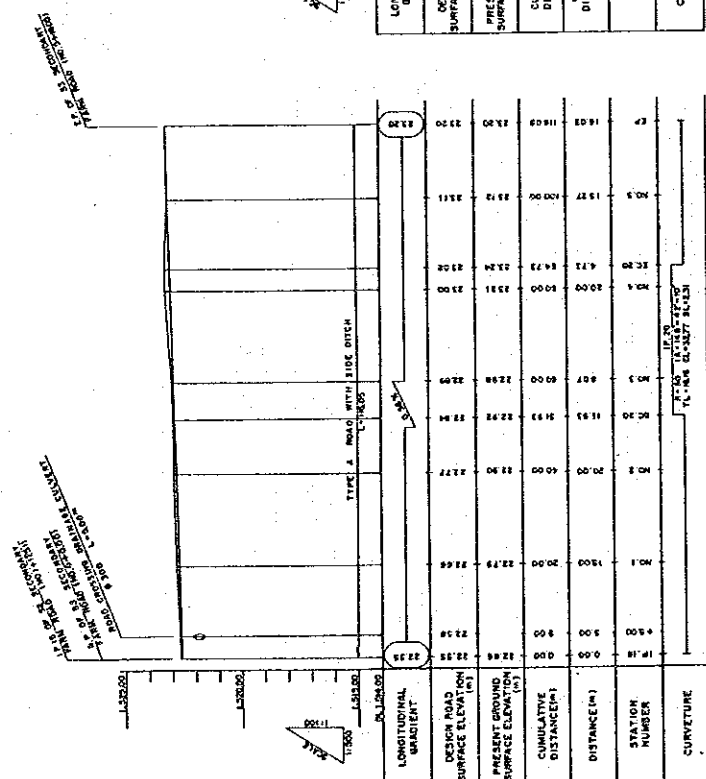
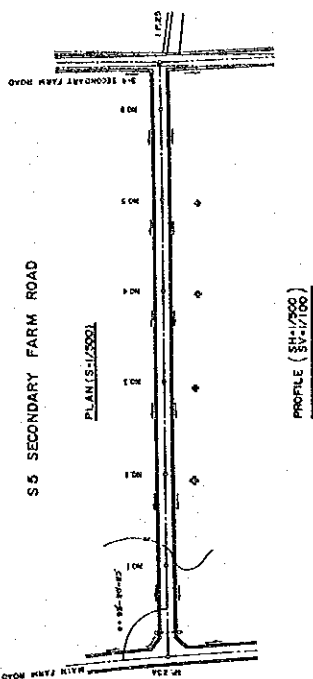
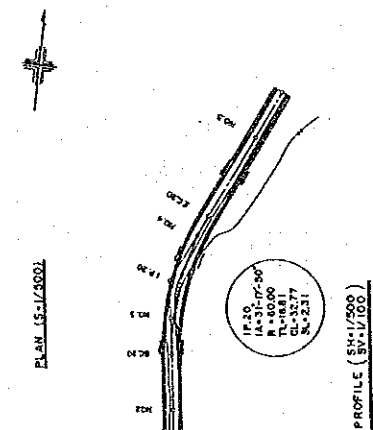
STATION NUMBER	DISTANCE (m)	CUMULATIVE DISTANCE (m)	PRES. GROUND SURFACE ELEVATION (m)	DESIGN ROAD SURFACE ELEVATION (m)	LONGITUDINAL GRADIENT	PLAN VIEW
1+17.4	0.00	0.00	25.23	23.20		
18.1	20.00	20.00	23.46	23.45	13.45	
19.1	18.51	38.51	22.83	22.80	22.80	
20.3	2.49	40.00	22.46	22.40	22.40	
20.3	0.00	40.00	22.46	22.40	22.40	
20.3	20.00	60.00	21.15	21.15	21.15	
20.3	70.53	70.53	20.12	20.10	20.10	
20.3	10.33	80.86	19.10	19.10	19.10	
20.3	20.00	100.86	18.10	18.10	18.10	
20.3	10.33	111.19	17.10	17.10	17.10	

PROFILE (SH-1/500)  
(SV-1/100)



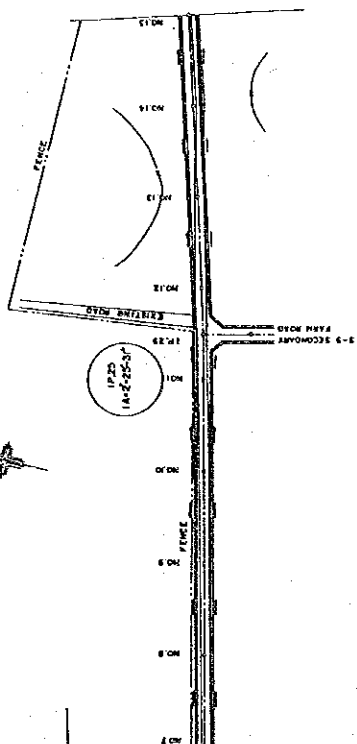
STATION NUMBER	CUMULATIVE DISTANCE (ft.)	PRESENT GROUND SURFACE ELEVATION (ft.)	DESIGN ROAD SURFACE ELEVATION (ft.)	LONGITUDINAL GRADIENT (%)
10.0	0.00	24.34	24.30	0.00
10.1	20.00	24.44	24.40	0.50
10.2	40.00	24.70	24.70	1.00
10.3	60.00	24.61	24.77	2.63
10.4	80.00	25.23	25.10	2.50
10.5	100.00	25.94	25.92	2.82
10.6	120.00	26.30	26.30	1.34
10.7	140.00	26.84	26.80	2.00
10.8	160.00	27.11	27.12	1.00
10.9	180.00	27.28	27.28	0.62
11.0	200.00	27.30	27.30	0.07

REPUBLIC OF KENYA MINISTRY OF AGRICULTURE MODERN INFRASTRUCTURAL TECHNOLOGY FOR THE NORTHERN DEVELOPMENT PROJECT 31 AND 32 SECONDARY FARM ROAD PLAN AND PROFILE	DATE APR 1981 DRAWING NO. R-8 JAPAN INTERNATIONAL COOPERATION AGENCY ( JICA )
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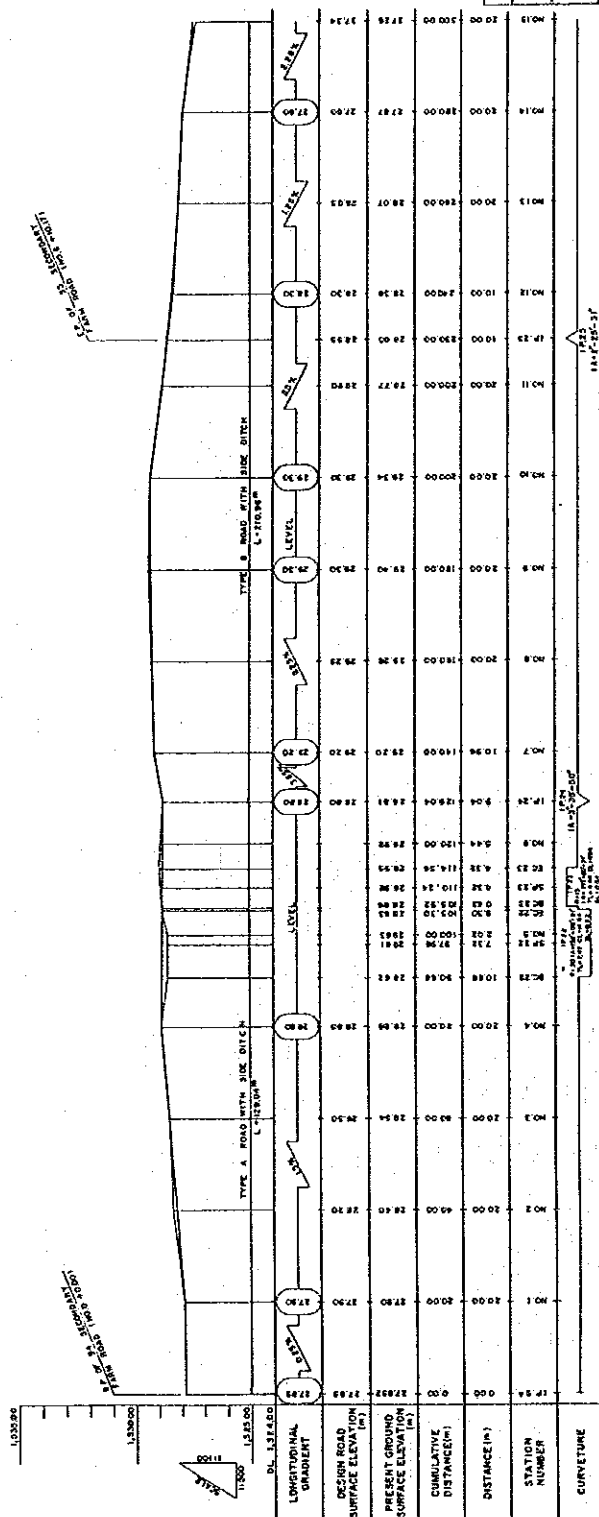


REPUBLIC OF KENYA	DATE	1985
MINISTRY OF AGRICULTURE	REMARKS	
MODEL INFRASTRUCTURAL IMPROVEMENT FOR THE HORTICULTURAL DEVELOPMENT PROJECT	PLAN AND PROFILE	
SS AND SS SECONDARY FARM ROAD	STATIONING	0+00 TO 2+00

PLAN (\$=1/500)

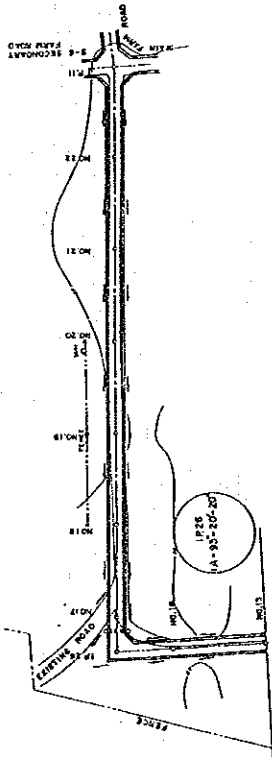


PROFILE (SM=1/500)  
(SV=1/100)

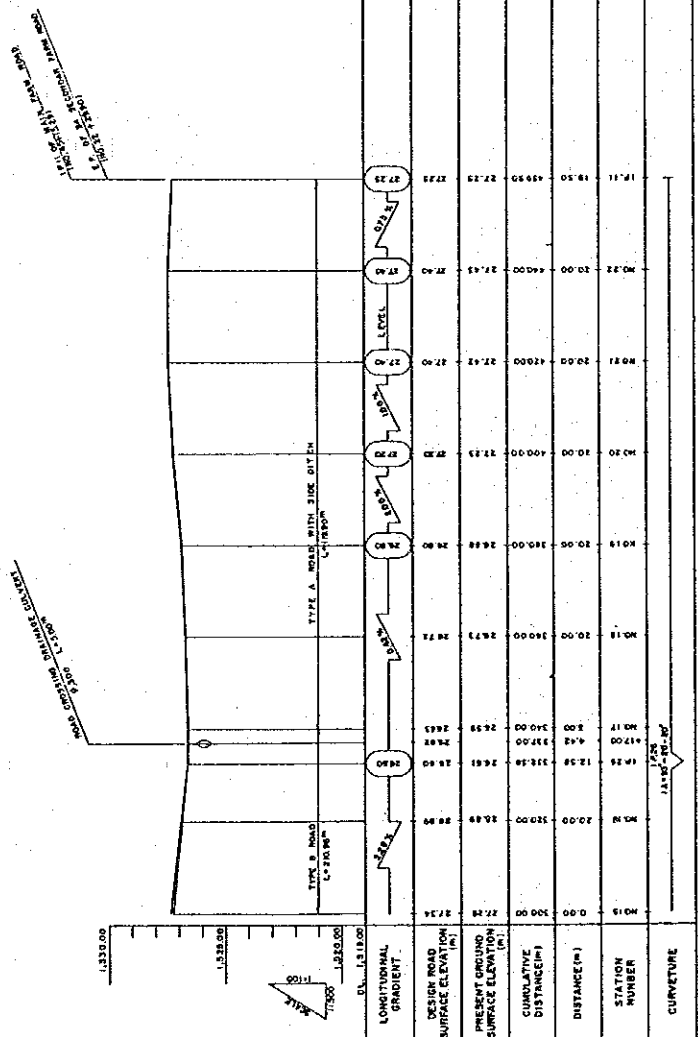


REPUBLIC OF JORDIA	PLAN AND PROFILE (UZI)
MINISTRY OF AGRICULTURE	DATE APR 1984
MODEL INFRASTRUCTURAL IMPROVEMENT	DISTRICT NO. R-10
FOR	
THE HORTICULTURAL DEVELOPMENT PROJECT	
34 SECONDARY FARM ROAD	
	JAPAN INTERNATIONAL COOPERATION AGENCY
	( J I C A )

PLAN (S-1/500)



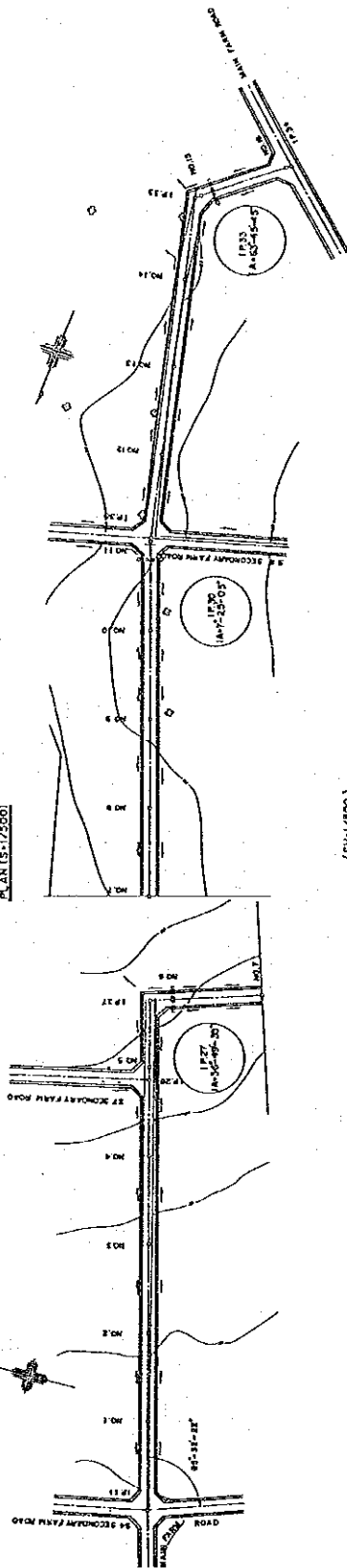
PROFILE (SH-1/500)



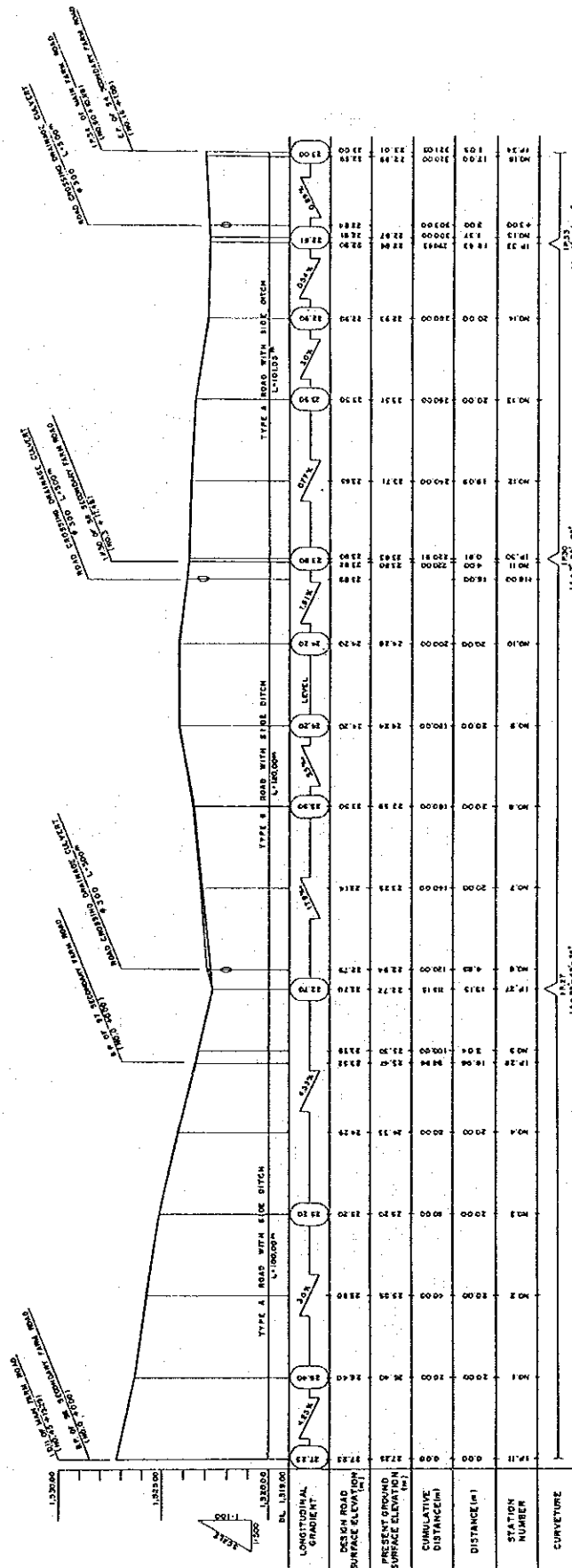
MINISTRY OF AGRICULTURE  
MINISTRY OF AGRICULTURE  
MODEL INFRASTRUCTURAL IMPROVEMENT  
THE AGRICULTURAL DEVELOPMENT PROJECT  
54 SECONDARY FARM ROAD  
PLAN AND PROFILE (2/2)  
DATE APR 1998 DRAWING NO R-11  
JAPAN INTERNATIONAL COOPERATION AGENCY  
( J I C A )



PLAN IS-1/2000

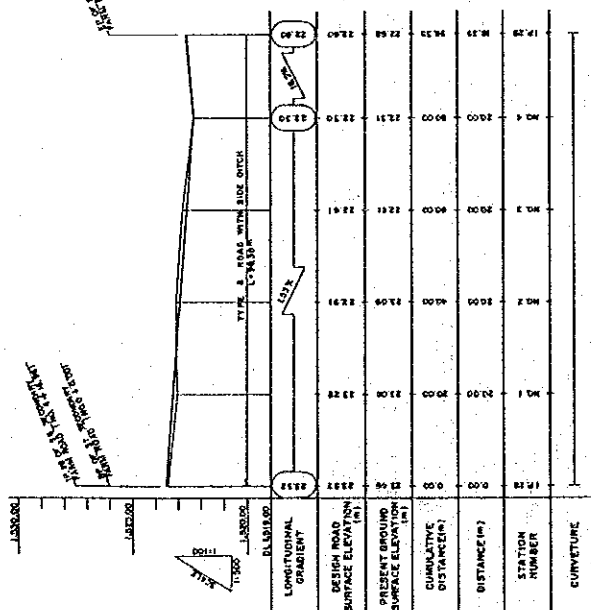
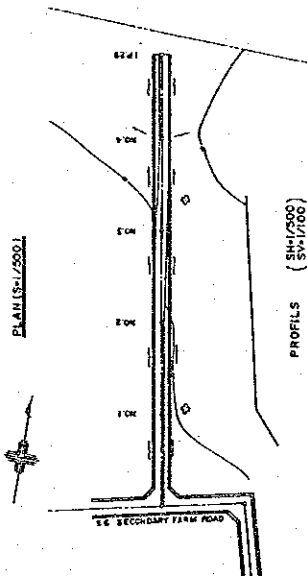


PROFILE (SM-1/500)  
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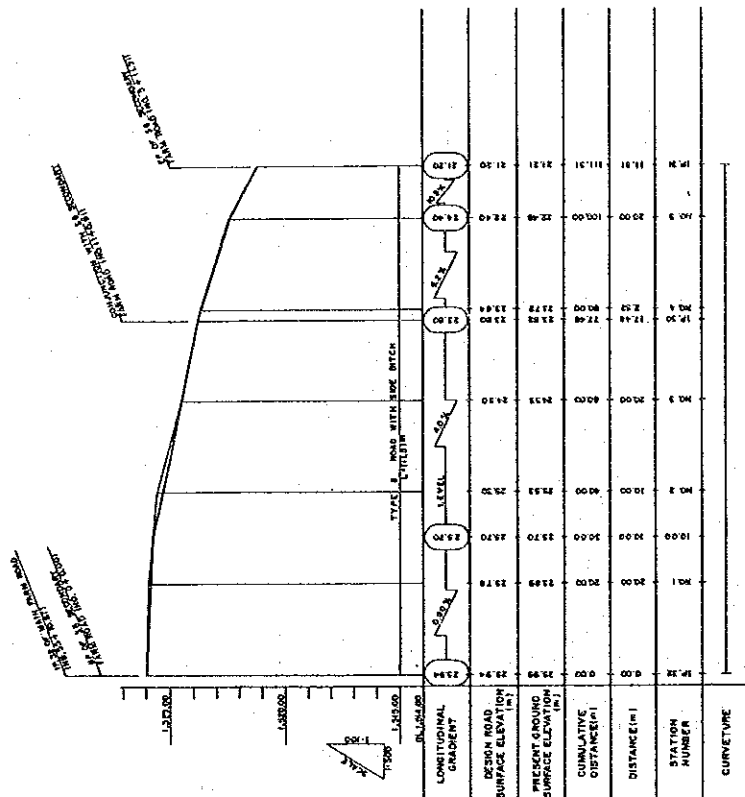
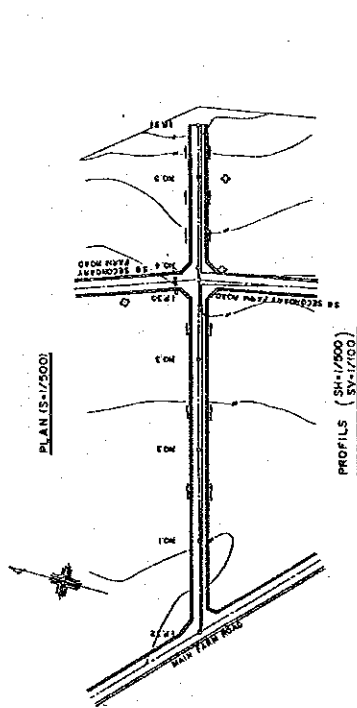


REPUBLIC OF INDIA
MINISTRY OF AGRICULTURE
MOEL INFRASTRUCTURAL IMPROVEMENT
THE PORTUGAL DEVELOPMENT PROJECT
56 SECONDARY FARM ROAD
PLAN AND PROFILE
DATE APR 1981 DRAWING NO. R-12
JAWAH INTERNATIONAL CONTRACTING AGENT
( J I C A )

# S-7 SECONDARY FARM ROAD

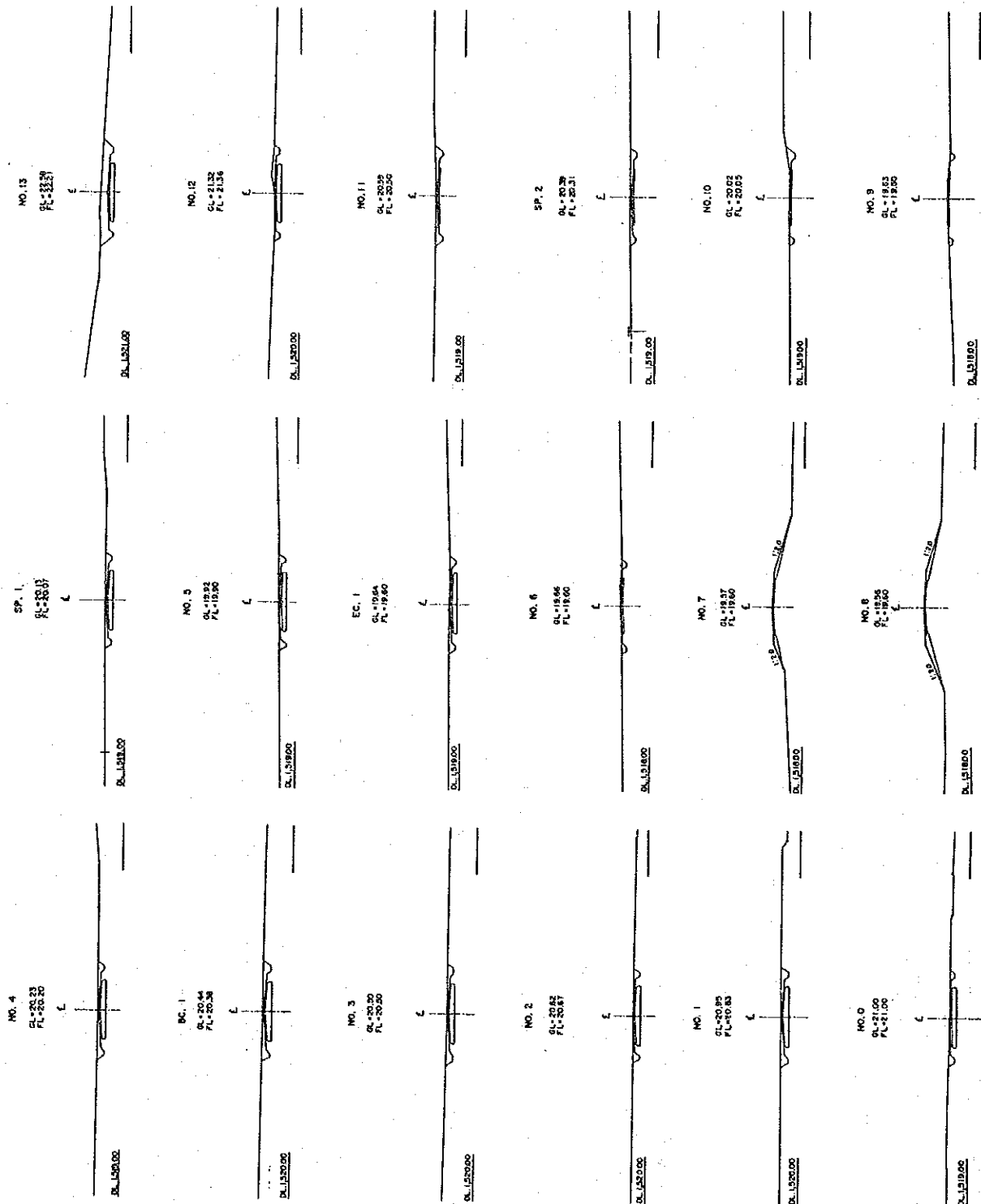


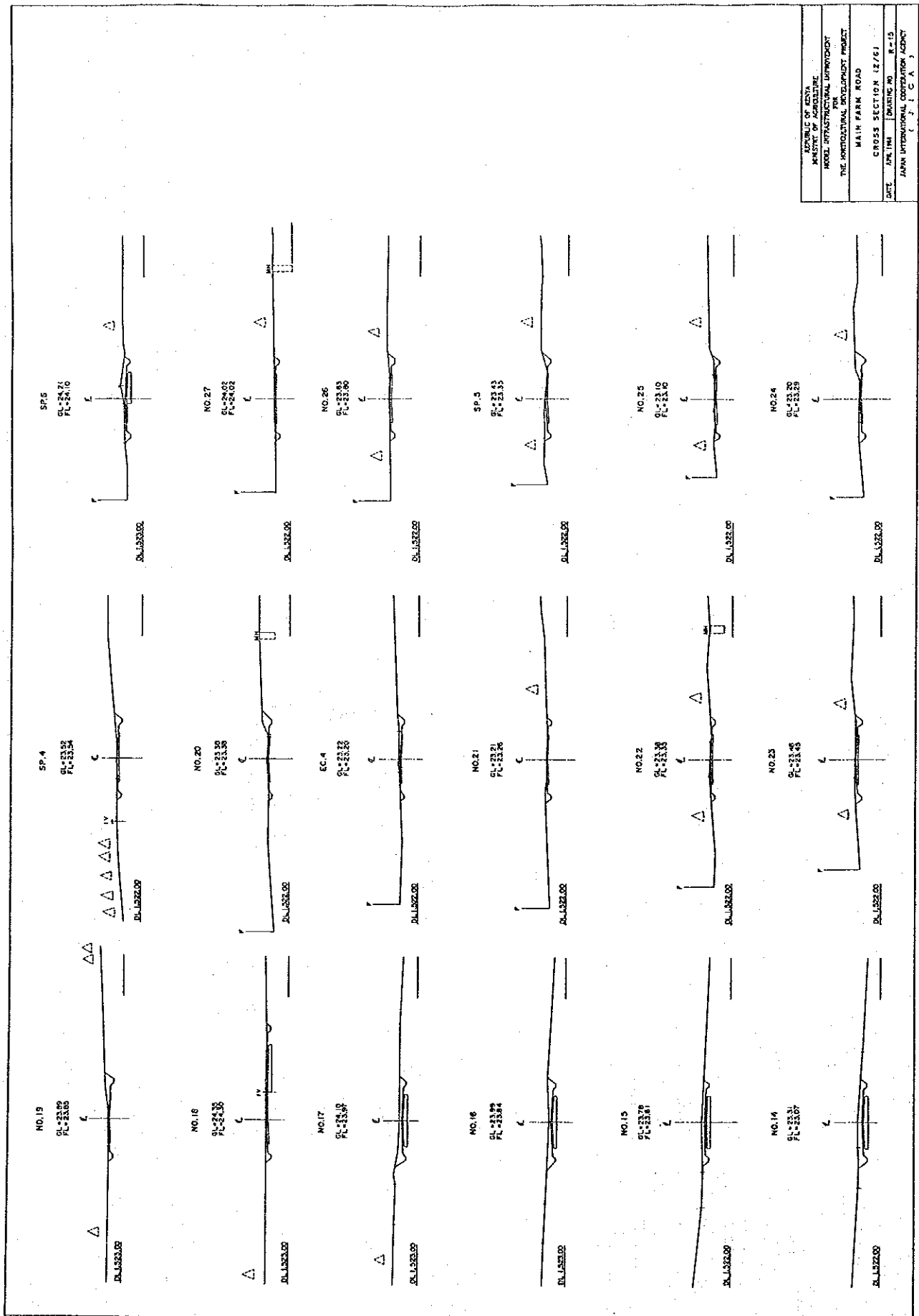
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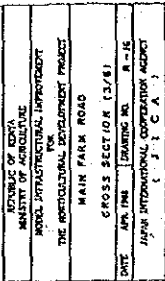
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MINISTRY OF LANDS  
NATIONAL INFRASTRUCTURE DEVELOPMENT  
THE INFRASTRUCTURE DEVELOPMENT PROJECT  
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PLAN AND PROFILE  
DATE APR 1984 DRAWING NO. R-13  
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( J I C A )

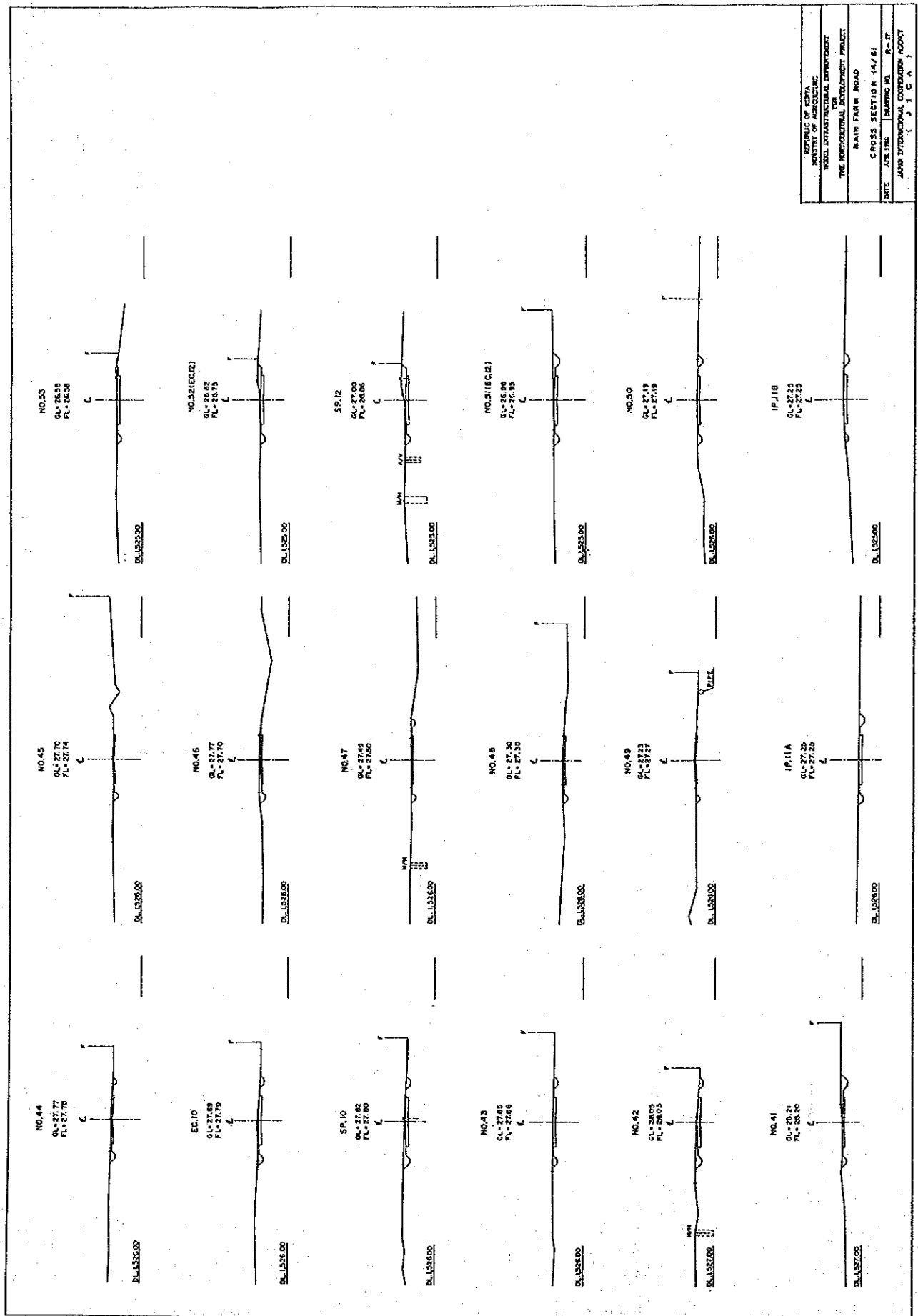
GOVERNMENT OF JAPAN MINISTRY OF AGRICULTURE AND FORESTRY FOR THE INTERNATIONAL DEVELOPMENT PROJECT MAIN FARM ROAD
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DATE: APR 1981 DRAWING NO. R-14
JAPAN INTERNATIONAL COOPERATION AGENCY ( J I C A )



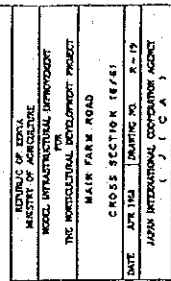


MINISTRY OF AGRICULTURE MINISTRY OF INFRASTRUCTURE
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DATE JAN 1961 DRAWING NO. R-15
JAPAN INTERNATIONAL COOPERATION AGENCY ( J I C A )

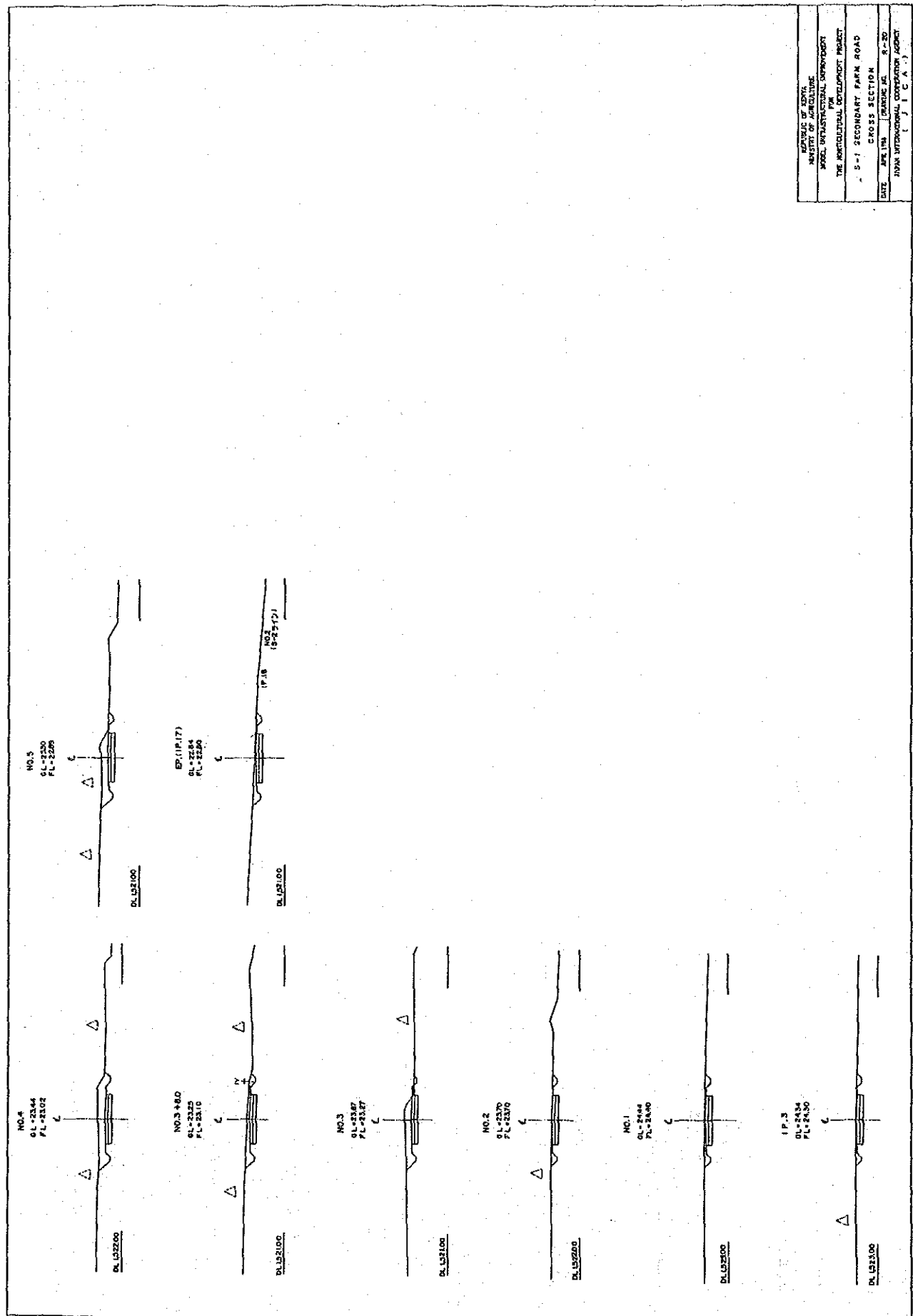




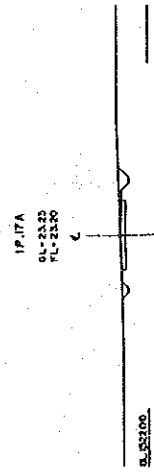
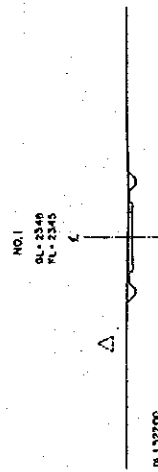
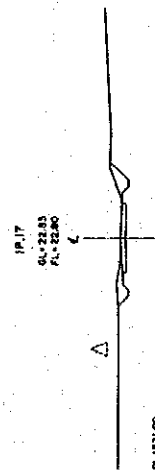
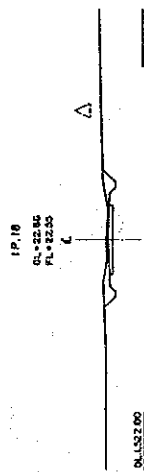
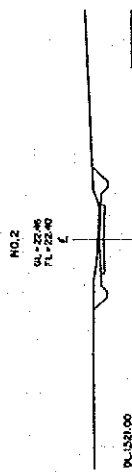
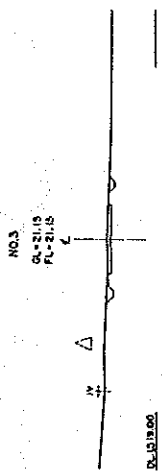
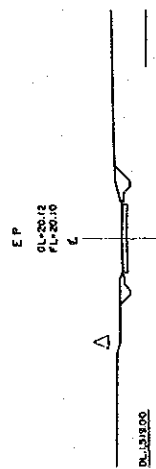




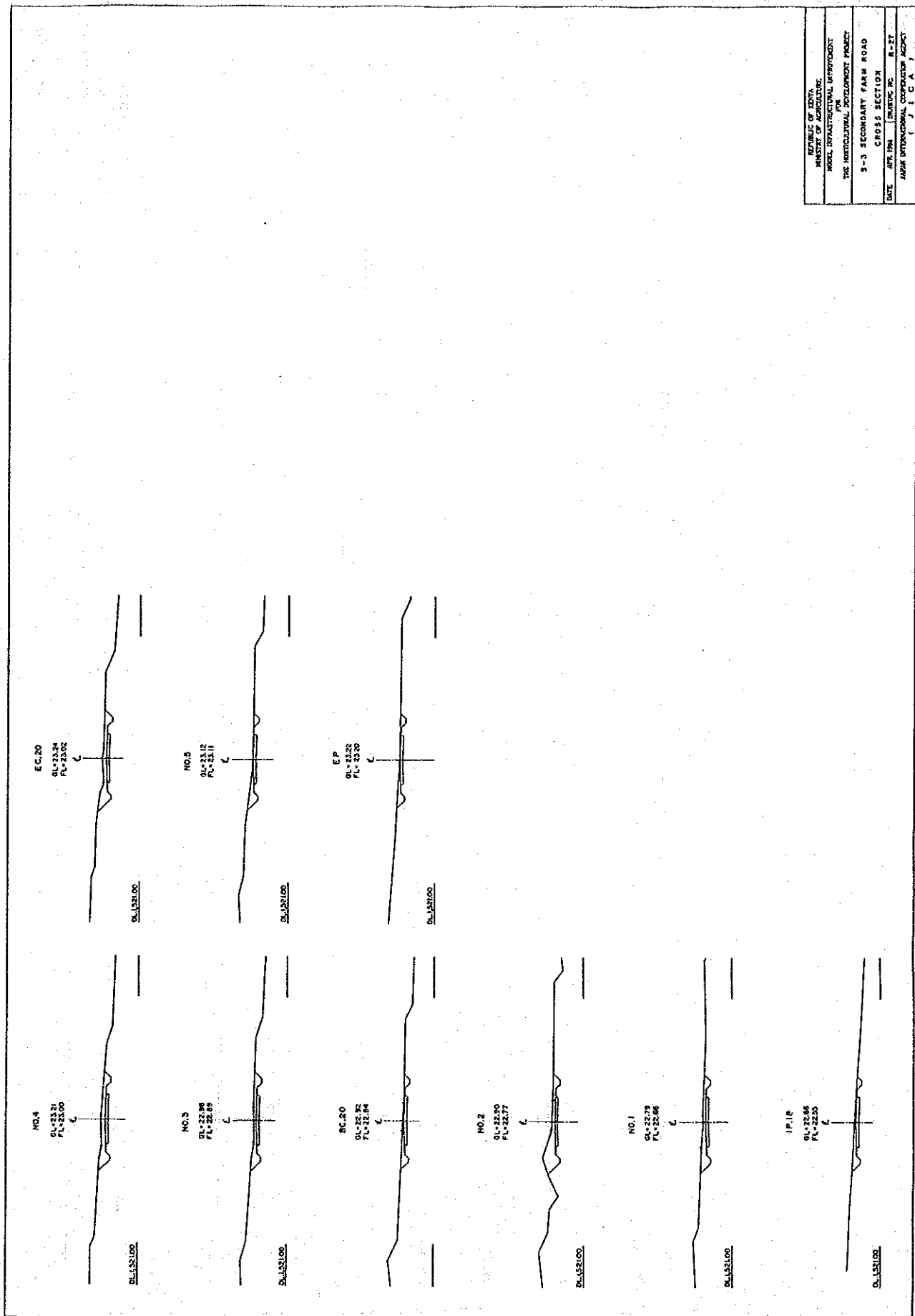




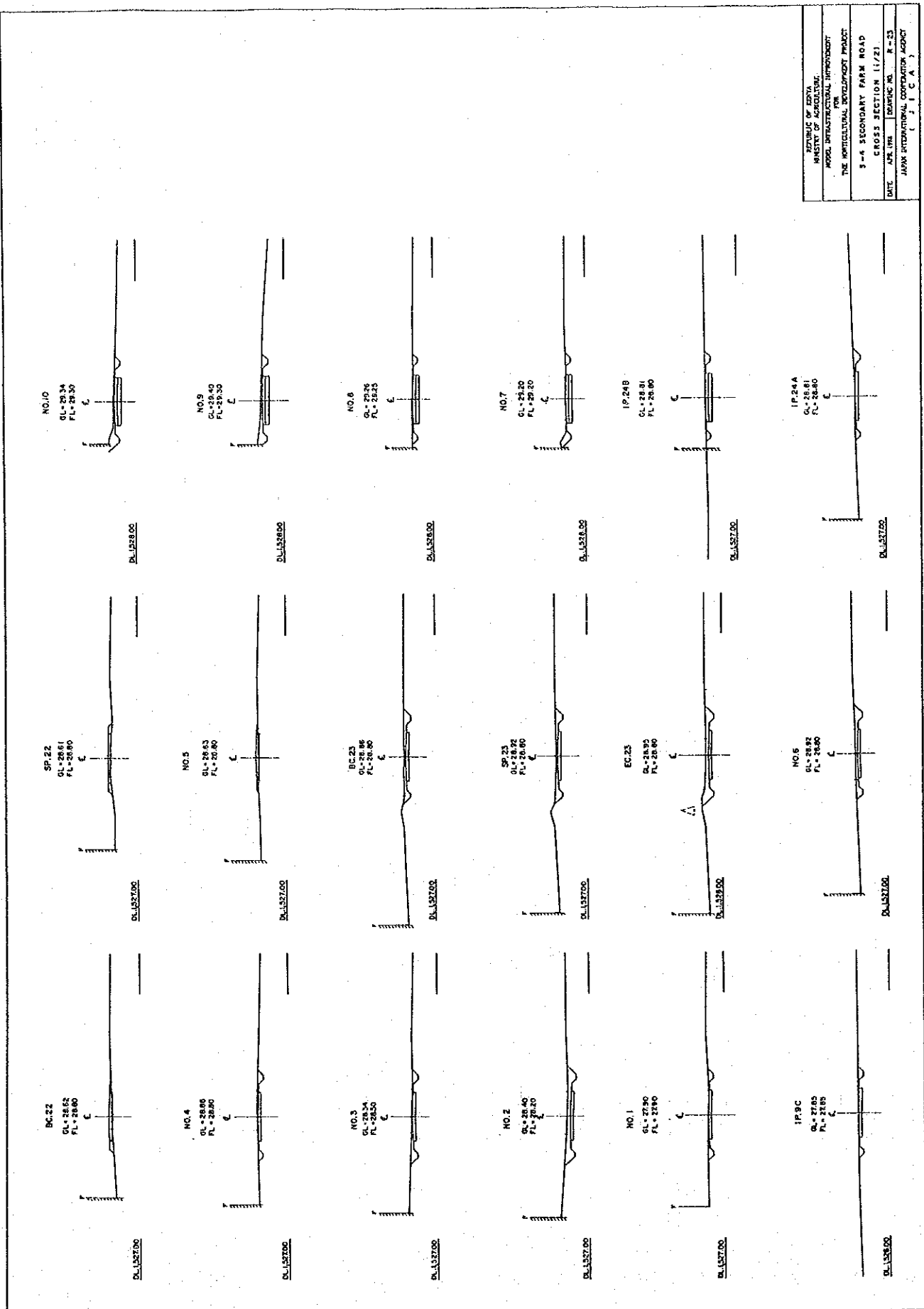
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MINISTRY OF AGRICULTURE	
KRAIO INFRASTRUCTURE DEVELOPMENT	
THE AGRICULTURAL DEVELOPMENT PROJECT	
S-1 SECONDARY FARM ROAD	
CROSS SECTION	
DATE	APR 1981
SCALE	1:100
DRAWN BY: J. C. A.	

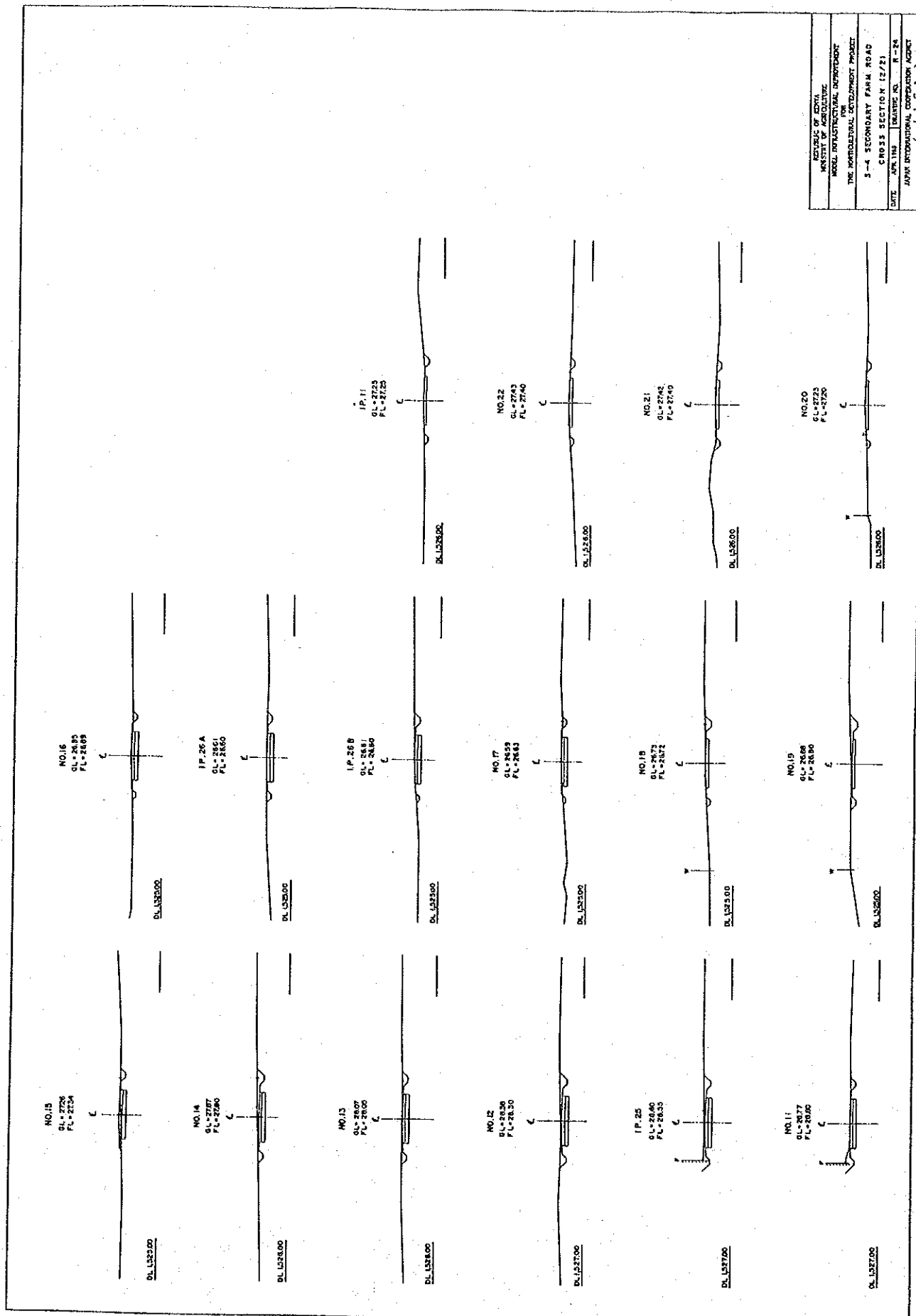


REPUBLIC OF KENYA	
MINISTRY OF AGRICULTURE	
NATIONAL INFRASTRUCTURE DEVELOPMENT	
THE AGRICULTURAL DEVELOPMENT PROJECT	
3-2 SECONDARY FARM ROAD	
DATE	APR 1984
DRAWING NO.	R-21
JAWA INTERNATIONAL CORPORATION	
( J I C A )	

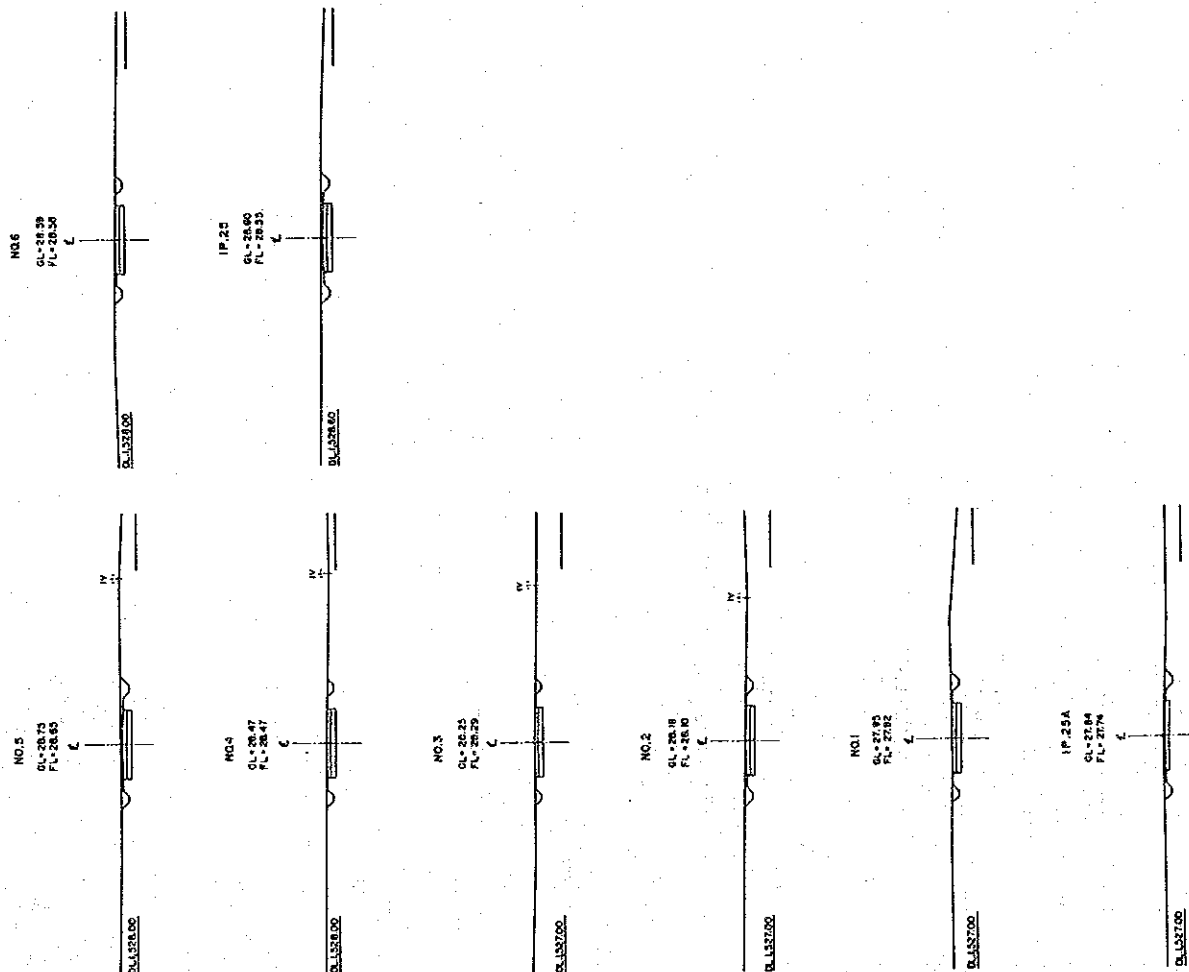


REPUBLIC OF INDIA	
MINISTRY OF AGRICULTURE	
NATIONAL INFRASTRUCTURAL DEVELOPMENT	
THE INFRASTRUCTURAL DEVELOPMENT PROJECT	
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CROSS SECTION	
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DRAWN BY	RAJENDRA
CHECKED BY	RAJENDRA
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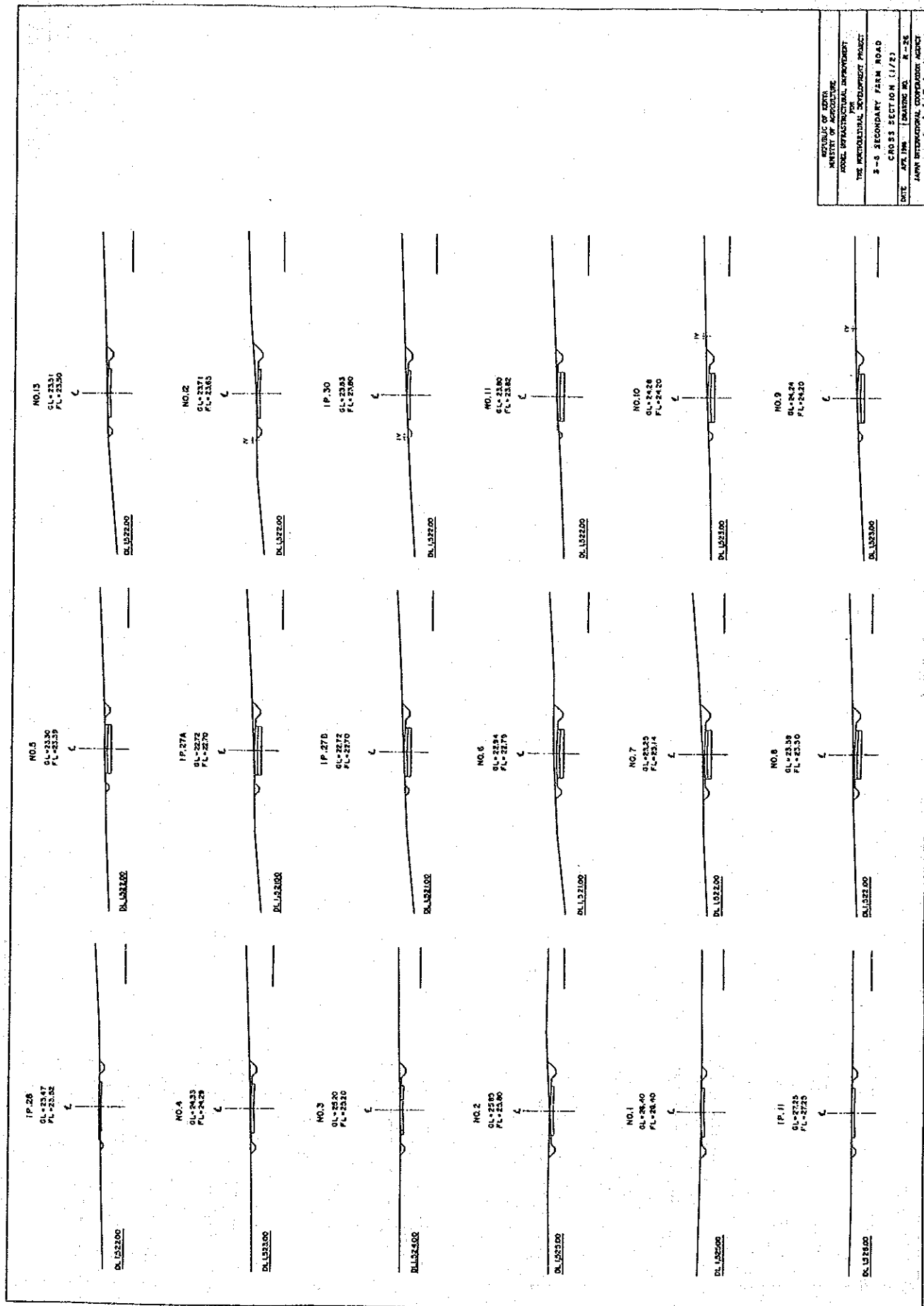




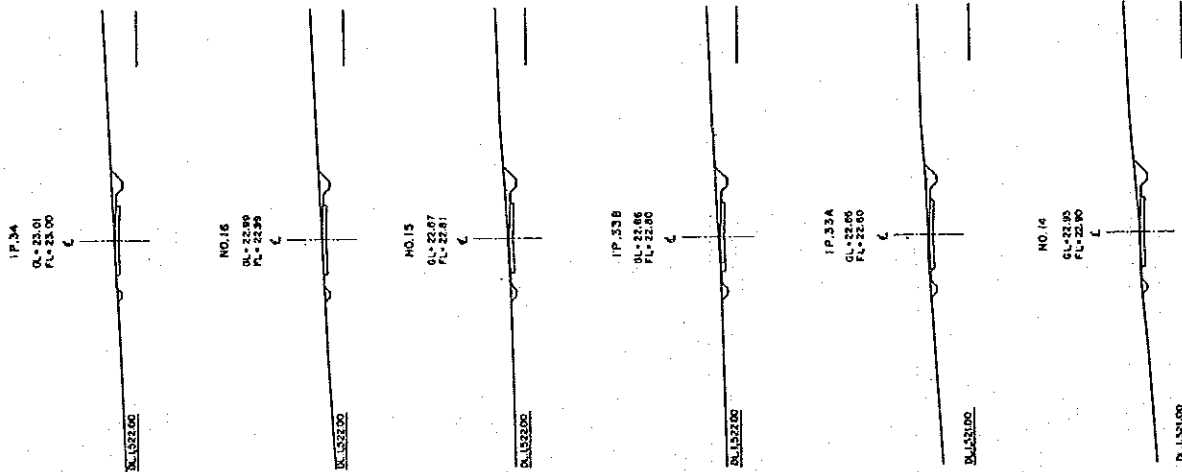
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MINISTRY OF AGRICULTURE
MODEL INFRASTRUCTURAL IMPROVEMENT
THE HORTICULTURAL DEVELOPMENT PROJECT
3-4 SECONDARY FARM ROAD
CROSS SECTION (2/2)
DATE APR 1980 DRAWING NO. R-24
JAPAN INTERNATIONAL COOPERATION AGENCY
( J I C A )



REPUBLIC OF KOTA
MINISTRY OF AGRICULTURE
MODEL DEPARTMENTAL IMPROVEMENT
THE AGRICULTURAL DEVELOPMENT PROJECT
S-3 SECONDARY FARM ROAD
CROSS SECTION
DATE: APR 1981 DRAWING NO: R-23
JAWA INTERNATIONAL CORPORATION AGENT
( J I C A )



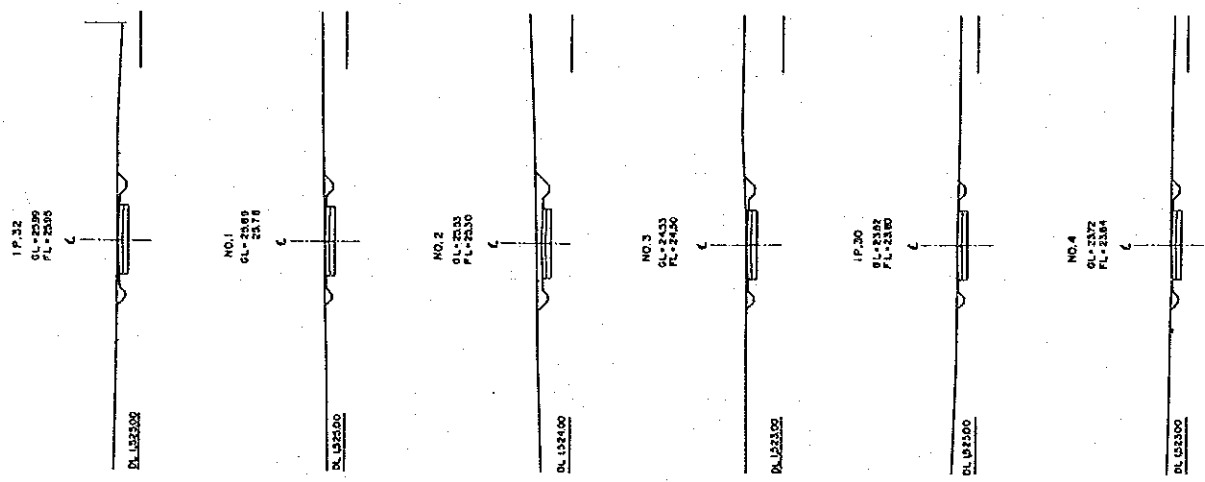
MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT
FOR THE AGRICULTURAL DEVELOPMENT PROJECT
2-8 SECONDARY FARM ROAD
CROSS SECTION (1/2)
DATE: APR 1981 DRAWING NO. R-26
BY: INTERAGRIAL CONSULTING AGENCY
( J I C A )



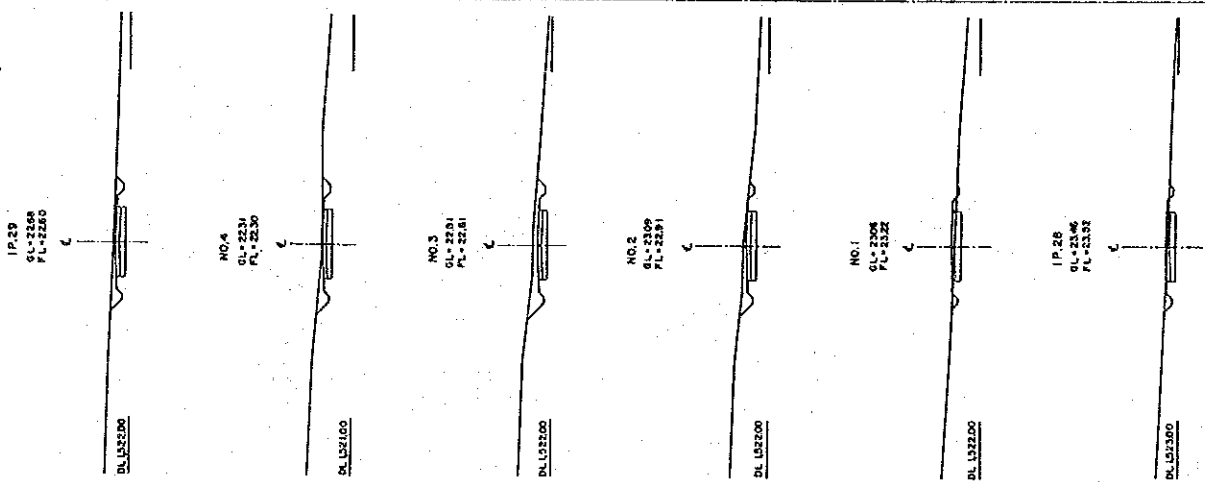
MINISTRY OF AGRICULTURE AND RURAL DEVELOPMENT GENERAL INVESTIGATIONS DIVISION FOR THE AGRICULTURAL DEVELOPMENT PROJECT
S-8 SECONDARY FARM ROAD CROSS SECTION (2/2)
DATE APR. 1961 DRAWING NO. R-27 JAWA INTERNATIONAL COOPERATION AGENCY ( J I C A )



# S-8 SECONDARY FARM ROAD



# S-7 SECONDARY FARM ROAD

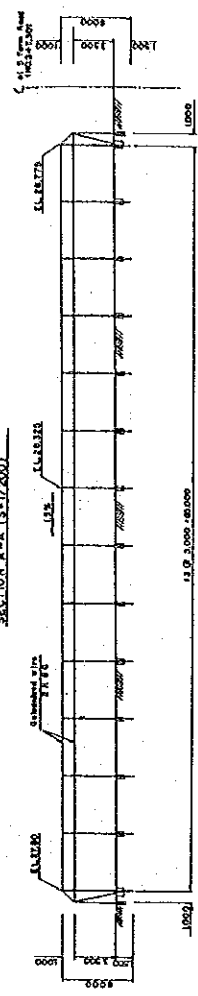


REPUBLIC OF COSTA RICA	MINISTRY OF AGRICULTURE	MODEL INFRASTRUCTURAL IMPROVEMENT	FOR
THE HORTICULTURAL DEVELOPMENT PROJECT	37 AND S-8 SECONDARY FARM ROAD	CROSS SECTION	R-28
DATE	APR 1981	DRAWING NO.	R-28
JUNIOR INTERNATIONAL CORPORATION ADVERT			( J I C A )

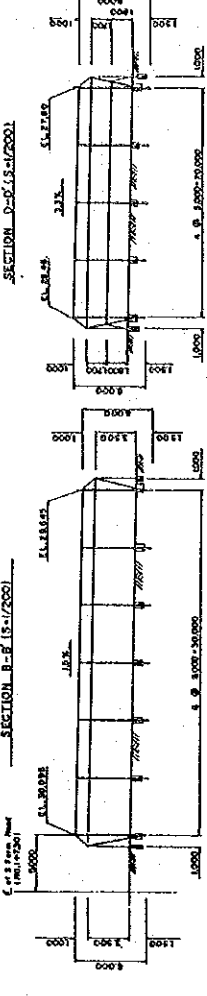


REPUBLIC OF INDIA
MINISTRY OF DEFENCE
ARMY ENGINEERING CORPS
THE NORTH CENTRAL DEVELOPMENT PROJECT
TAELIS WORKS
GENERAL PLAN AND SECTIONS
DATE APR 1981 (DRAFTING NO. T-01)
ARMY INTERNATIONAL COOPERATION AGENCY
( 3 1 1 )

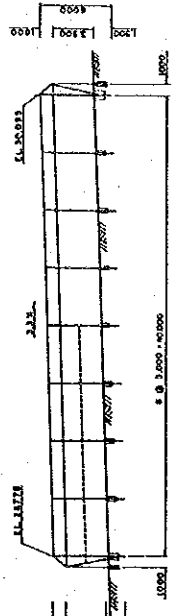
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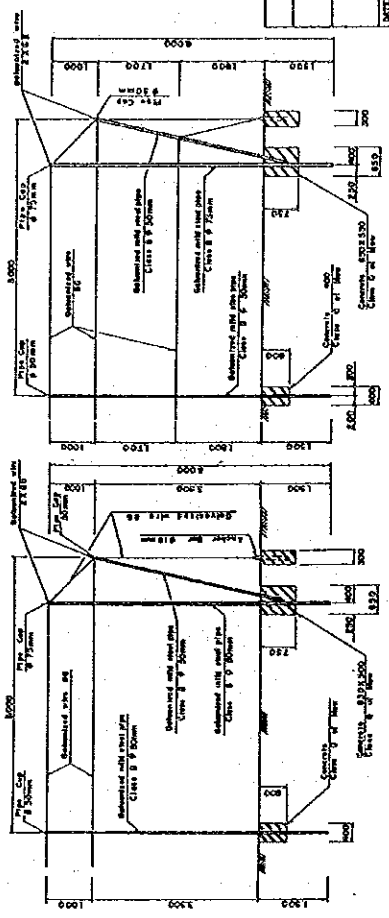
SECTION B-B (S-1/200)



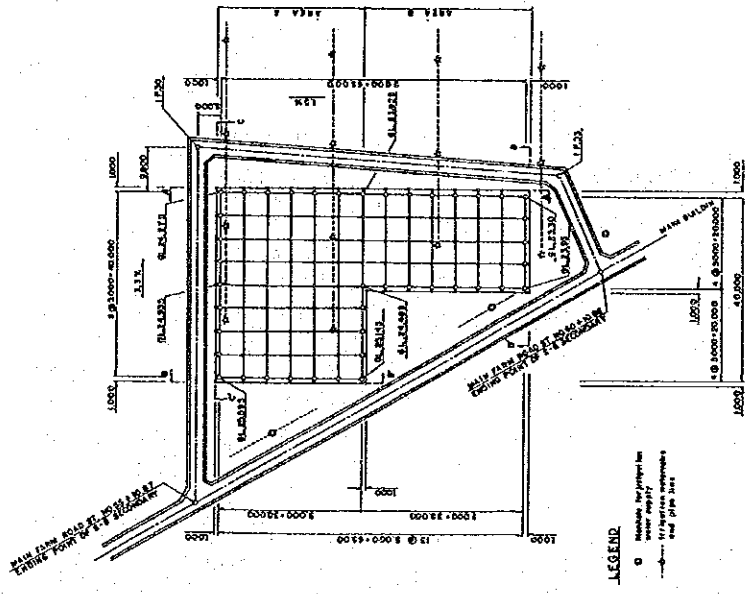
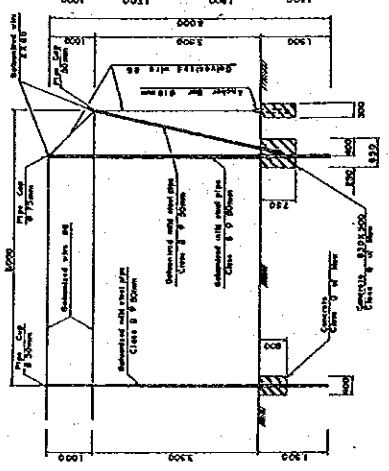
SECTION C-C (S-1/200)



AREA B (S-1/50)



AREA A (S-1/50)



LEGEND

- 12.000 mm diameter bars
- 100 mm spacing
- 100 mm spacing
- 100 mm spacing



A-4 その他

A-4-1 団長レター

JAPAN INTERNATIONAL COOPERATION AGENCY  
(JICA)  
DETAIL DESIGN SURVEY TEAM  
FOR  
THE HORTICULTURAL DEVELOPMENT PROJECT  
IN  
THE REPUBLIC OF KENYA

16th March, 1988

The Permanent Secretary  
Ministry of Agriculture  
P.O. Box 30028  
NAIROBI.

ATTENTION: DIRECTOR OF AGRICULTURE

Dear Sir,

RE: The infrastructure improvement program for the  
Horticultural Development Project in the Republic of Kenya

We, the Detail Design Survey Team, have been organized by JICA for the purpose of promoting infrastructure improvement program which is as stipulated in the clause IV of the Attached Document to the Record of Discussions between the Japanese Implementation Survey Team and the Authorities concerned of the government of the Republic of Kenya on the Japanese Technical Cooperation for the Horticultural Development Project in the Republic of Kenya signed on 4th December, 1985.

The team has, so far, made a series of site reconnaissances and discussions with your staff concerned in order to fix and determine the scales and sizes of expected facilities.

We would like to hereby confirm the matters which were mutually understood and agreed through discussions and site reconnaissances as per the attachment.

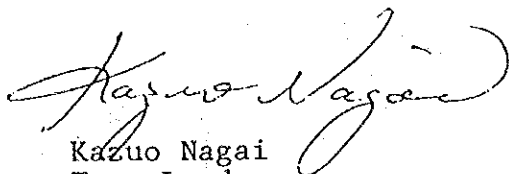
In accordance with above confirmed items, we will proceed with your staff to further field surveys and investigations at the site and to make the detail design on the basis of the result of those surveys. After the completion of detail design and assessment of its costs estimated by JICA, you will be informed its result through the JICA Kenya Office.

Further, for the timely commencement of the construction we would like to request you to take the necessary action and procedure for implementation in due consultation with the Japanese experts and JICA Kenya Office.

...../2

Lastly, we would like to appreciate for kind cooperation of your staff during our stay.

Yours sincerely,



Kazuo Nagai  
Team Leader  
Detail Design  
Survey Team  
JICA

c.c.     Director of Research  
         Ministry of Agriculture  
         KARI Secretariat  
         Kenya Huse  
         P.O. Box 57811  
         NAIROBI.

         Mr. N. Horie  
         Embassy of Japan  
         P.O. Box 60202  
         NAIROBI.

         Mr. K. Kumagishi  
         Resident Representative  
         JICA, Kenya Office  
         NAIROBI.

         The Director  
         National Horticultural Research  
         Station (NHRS)  
         P.O. Box 220  
         THIKA.

         Mr. Shoji Hiramata  
         Japanese Team Leader  
         Horticultural Development Project  
         P.O. Box 220  
         THIKA.

         Mr. K.M.S. Kigen  
         Ministry of Finance  
         P.O. Box 30007  
         NAIROBI.

         The Permanent Secretary  
         Ministry of Foreign Affairs  
         P.O. Box 30511  
         NAIROBI.

Att: Mr. F.K. Mwangi

## ATTACHMENT 1

### MODEL INFRASTRUCTURE WORKS FOR HORTICULTURE DEVELOPMENT PROJECT

#### 1. Fence and Gates

In order to protect the entrance of animals into Horticultural Development Project, the existing fence around Horticultural Development Project will be improved by the following specifications;

- Type: 1.8 m-high chainlink fencing along with 150-mm x 100-mm concrete post at an interval of 2.5 m.
- Length: A total of approx. 1,700 meters.

#### 2. Farm roads

Farm roads in the center have no permanent facilities, i.e., gravel or asphalt roads, except the access road to the main building from the highway.

The farm road is divided into two categories and they will be constructed by the following specifications;

##### (1) Main Farm Road

It starts from the west end of the main building through the orchard and comes back to the front of the hostel totalling approx. 1,550 meters.

- Pavement: 4-meter-width gravel pavement with thickness 150 mm and 50 cm-shoulder on both sides of pavement.
- Side ditch: Side ditch on both sides of farm road are provided.
- Road crossing drain: Pipe culverts will be provided if they are required from road drain view points.
- Asphalt pavement: About 300-m around the embankment and steep portion, and about 200-m along the nursery facilities portion are recommended to the asphalt paved if financial allows. This is to provide the

stability of road and to prevent dust which affect the nursery works.

### (2) Secondary Farm Road

Farm roads in each experimental field will be constructed to provide the smooth research works. They are totalling approx. 1,450 meters by the following specifications;

Pavement: 3-meter-width gravel pavement with 150-mm thick. 50-cm-shoulder and side ditch on both sides are provided.

### 3. Windbreak

Windbreak forests are being established by the Government of the Republic of Kenya, but they are still young to protect the young macadamian trees, therefore windbreak fence will be constructed by the following specifications;

Type of fence: Concrete post and covered with double fishers-nets.  
Height: 2.0 meters  
Intervals: 40 meters max.  
Construction Length: 1,460 meters

Note: north-east end windbreak line is expected to be installed with fishers-net on the chainlink wire mesh.

### 4. Trellis

About 0.3 ha of trellis will be constructed to conduct breeding works and variety trails for macademia nut and newly introduced temperate fruit trees. whole trellis will be covered completely with net to protect trees from animals, wind and strong sunshine.

Trellis are constructed by galvanized steel pipe with an interval of 5 meters and they are jointed by galvanized wire with a height of 4.5-5.0 meters.





ATTACHMENT 2

OUTLINE OF THE SCHEDULE ON  
WORK OF INFRASTRUCTURE IMPROVEMENT PROGRAM

1988	【 Japanese Side 】	【 Kenyan Side 】
March	:Detail Design Survey Team ↓ Basic Plan of Work (Mar.16) ↓ Field report of the team (information of outline on the construction work) -- Mar.31 --	
April	:Detail Designing in Japan   Apr. 4   Apr. 27	:Preparation and process of the FORM A1 for experts on supervising of the construction through official channel.
May		:Request of Const- ruction work --middle in May. ↓ through JICA Office --late in May.-
	←----- 【 JICA HDQ 】 ←-----	FORM A1 ←----- --middle in May.-
June	: Consultation with Ministry of Foreign Affairs - middle in Jun.-- ↓	Exchange of Verbal Note --late in Jun.--
July	:Dispatch of Supervising Experts :Remittance of Budget --early in Jul.--	
August	:Process for Contract :Start of Construction work --early in Aug.--	

Ref: No. 62-1550.....



JAPAN INTERNATIONAL  
COOPERATION AGENCY (JICA)  
KENYA OFFICE  
P. O. BOX 50572 NAIROBI, KENYA.  
TELEPHONE 724121/2/3/4/877  
TELEX 22145  
FAX No - 724878

DATE 23rd March, 1988

Permanent Secretary  
Ministry of Works Housing  
& Physical Planning  
P.O. Box 30260  
NAIROBI.

Dear Sir,

RE: REQUEST FOR RECOMMENDATION OF CONTRACTORS FOR THE  
SHORT-LISTED TENDERING FOR MODEL INFRASTRUCTURE  
IMPROVEMENT WORKS ON HORTICULTURE DEVELOPMENT PROJECT

Based on the official request from the Government of the Republic of Kenya (hereinafter referred to as "the GOK"), The Government of Japan through Japan International Cooperation Agency (hereinafter referred to as "th JICA) decided to conduct the Model Infrastructure Improvement Works on the Horticulture Development Project (hereinafter referred to as "the Work").

The site of the Work is located in the Macadamia Unit of National Horticultural Research Station, Thika.

The scope of work is shown in ATTACHMENT and it is preliminaril estimated at 2,500,000 Kshs, with 3 months construction period.

The work shall be constructed by a Local Contractor with a short-listed tendering. And the employer of the Works is the JICA represented by Mr. Kenji KUMAGISHI and supervised by Japanese experts.

We would like to request you to recommend approximately five (5) Local Contractors who are able to perform the Work within the short construction period and have enough technical and financial background.

The most important factor for the selection of the Contractor is that it complete the Work on schedule which is tightly governed by the fisical year of the Japanese Government.

...../2

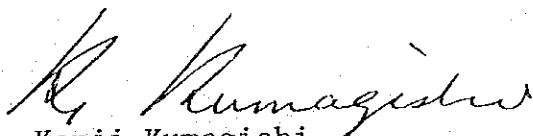
Until now we unofficially contacted the following contractors:-

1. Dien Builders Limited: who constructed small library building in the Work site and showed a good performance.
2. Sumitomo Construction Co. Ltd.: who has similar project in Kenya and constructed main facilities of the Project which was financed by Japanese Grant Aid.
3. Karuri Civil Engineering Ltd. : who has many construction works which are similar to the Work and now is working in the National Youth Service Construction Work.

They show their interest on the Work and they are expecting to be listed on your recommendation list if they are judged to have enough ability to perform the Work.

I appreciate your early recommendation on the above mentioned matter.

Yours sincerely,



Kenji Kumagishi  
Resident Representative  
JICA, Kenya Office

c.c. Mr. K. Matsumoto  
Ag. Leader of Model Infrastructure  
Improvement Study Team  
NAIROBI.

Mr. S. Hirama  
Japanese Team Leader  
HDP  
THIKA.

## ATTACHMENT

### MODEL INFRASTRUCTURE WORKS FOR HORTICULTURE DEVELOPMENT PROJECT

#### 1. Fence and Gates

In order to protect the entrance of animals into Horticultural Development Project, the existing fence around Horticultural Development Project will be improved by the following specifications;

Type: 1.8 m-high chainlink fencing along with 150-mm x 100-mm concrete post at an interval of 2.5 m.  
Length: A total of approx. 1,700 meters.

#### 2. Farm roads

Farm roads in the center have no permanent facilities, i.e., gravel or asphalt roads, except the access road to the main building from the highway.

The farm road is divided into two categories and they will be constructed by the following specifications;

##### (1) Main Farm Road

It starts from the west end of the main building through the orchard and comes back to the front of the hostel totalling approx. 1,550 meters.

Pavement: 4-meter-width gravel pavement with thickness 150 mm and 50 cm-shoulder on both sides of pavement.

Side ditch: Side ditch on both sides of farm road are provided.

Road crossing drain: Pipe culverts will be provided if they are required from road drain view points.

Asphalt pavement: About 300-m around the embankment and steep portion, and about 200-m along the nursery facilities portion are recommended to the asphalt paved if financial allows. This is to provide the

stability of road and to prevent dust which affect the nursery works.

## (2) Secondary Farm Road

Farm roads in each experimental field will be constructed to provide the smooth research works. They are totalling approx. 1,450 meters by the following specifications;

Pavement:	3-meter-width gravel pavement with 150-mm thick. 50-cm-shoulder and side ditch on both sides are provided.
-----------	---

## 3. Windbreak

Windbreak forests are being established by the Government of the Republic of Kenya, but they are still young to protect the young macadamian trees, therefore windbreak fence will be constructed by the following specifications;

Type of fence:	Concrete post and covered with double fishers-nets.
Height:	2.0 meters
Intervals:	40 meters max.
Construction Length:	1,460 meters

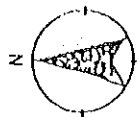
Note: north-east end windbreak line is expected to be installed with fishers-net on the chainlink wire mesh.

## 4. Trellis

About 0.3 ha of trellis will be constructed to conduct breeding works and variety trails for macademia nut and newly introduced temperate fruit trees. whole trellis will be covered completely with net to protect trees from animals, wind and strong sunshine.

Trellis are constructed by galvanized steel pipe with an interval of 5 meters and they are jointed by galvanized wire with a height of 4.5-5.0 meters.

# GENERAL LAYOUT OF WORKS

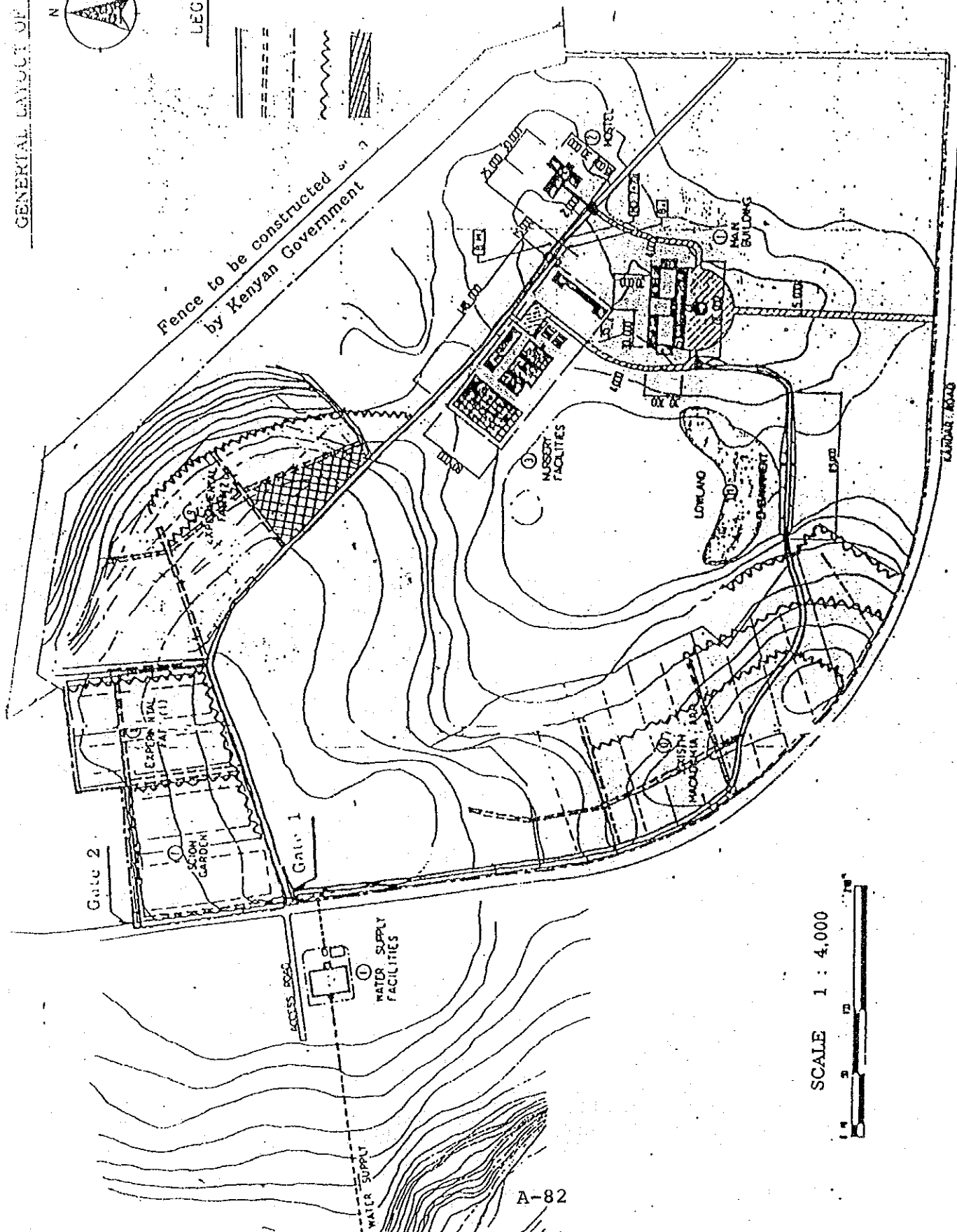


## LEGEND

- ===== New Farm Road
- ===== Secondary Farm Road
- - - - - Fence
- ~~~~~ Windbreak Fence
- ||||| Trellis

Fence to be constructed by Kenyan Government

- ① MAIN BUILDING
- ② HOSTEL
- ③ NURSERY FACILITIES
- ④ WATER SUPPLY FACILITIES
- ⑤ INDIAN FACILITIES
- ⑥ DAM
- ⑦ STOCK GARAGE
- ⑧ EXPERIMENTAL LADY (11)
- ⑨ EXPERIMENTAL FARM (22)
- ⑩ EXISTING MACADAM ROAD
- ⑪ LORUANG AND CHAKRE



MINISTRY OF WORKS, HOUSING AND PHYSICAL PLANNING

Telegrams: "MINWORKS", Nairobi  
Telephone: Nairobi 723101  
If calling or telephoning ask for



QUANTITIES AND CONTRACTS BRANCH  
HEAD OFFICE

P.O. Box 30260  
NAIROBI

When replying please quote

Ref. No. Q29/035/(108)  
and date

29th March, 1988

M/s JIKA Kenya Office,  
P. O. Box 50572,  
NAIROBI.

Dear Sirs,

MODEL INFRASTRUCTURE IMPROVEMENT WORKS AT NATIONAL  
HORTICULTURAL RESEARCH STATION - THIKA

Reference is made to your letter reference 62-1550 of 23/3/88 requesting for recommendation of contractors to be invited to tender for the above works.

We would recommend that the following firms be invited to tender for the works.

The first three being the firms unofficially contacted by yourselves and for whom we would have no objection.

1. M/S Dien Builders
2. M/s Sumitomo Construction Co. Ltd.,
3. M/s Karuri Civil Engineering Co. Ltd.
4. M/s Miharati Investments.
5. M/s Njama Limited.

Yours faithfully,

(FRED MWAURA)  
FOR: CHIEF QUANTITY SURVEYOR  
FOR: PERMANENT SECRETARY



FIELD REPORT  
ON  
MODEL INFRASTRUCTURE IMPROVEMENT STUDY  
FOR  
THE HORTICULTURAL DEVELOPMENT PROJECT  
IN  
KENYA

31st MARCH, 1988

JAPAN INTERNATIONAL COOPERATION AGENCY  
( J I C A )



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- 3 : STANDARD CROSS SECTION OF FARM ROAD
- 4 : STANDARD DRAWING OF TRELLIS
- 5 : TANTATIVE PROJECT IMPLEMENTATION SCHEDULE

## 1. INTRODUCTION

In response to the official request from the Government of the Republic of Kenya (hereinafter referred to as "GOK"), the JICA Detail Design Survey Team (hereinafter referred to as "the Team") was arrived in Kenya on 7th March, 1988. The Team members are as follows:

Name	Assignment	Assignment period
K.Nagai	Team Leader	5/March/1988~20/March/1988
K.Matsumoto	Facilities Design	5/March/1988~3/April/1988
S.Hasegawa	Road Design	5/March/1988~3/April/1988

After the arrival of the Team at Nairobi, series of site reconnaissances, and discussions with the staff concerned were made. Then the scale and size of the expected facilities were determined and they were reported to the GOK by the Team Leader of the Team on 16th March, 1988.

Facilities to be constructed by the Project are the following four(4);

- Gates and Fencing : to protect the entrance of animals into the Horticultural Development Project Area. The existing fence and gates are required to be replaced by the permanent fence and gates.
- Farm road : to provide the smooth field research works, the existing temporary farm road is required to improve to the permanent road.
- Windbreak : untill the planted windbreak trees grow up, the net type windbreak is required to be installed.
- Trellis : to conduct breeding works and variety trails of trees, the installation of the trellis is required.

Based on the determined scale and size of the expected facilities, the Team prepared the detailed field survey untill 30th March, 1988. The specific layout of facilities and problems for the installation of the proposed facilities are discussed and confirmed

between the staff concerned and the Team on the site. These field survey results will be carefully studies, and based on these results, the detailed design and other documents for the construction will be prepared in Japan by the end of April, 1988.

## 2. BASIC CONCEPT OF FACILITIES

- Basic concept of facilities to be prepared for the detailed design and to be constructed by the Project are described in this section.

### 2-1 Gates and fences

The existing fences around the boundary of the Project site except the portion which is going to be nearly installed by the GOK will be replaced by the new concrete posted permanent fences. And a gate at the entrance from the water supply facility and the national highway, and a gate at the north-west corner of the Project site will be installed by the Project.

- Type of the fence and gate is similar to which was installed around the nursery facility.
- Alignment of the fences and gates shall be same as the existing alignment.
- Existing chainlink of the fence shall be removed carefully and they will be reused for another area of the Horticultural Development Project by the GOK later.
- As a result of the detailed field survey, the total length is estimated 1,730 meters.

## 2-2 Farm road

The farm road is divided into two categories by its function.

**Main Farm Road :** linked road to travel around the Project Area, which starts from and comes back to the main building of the Project.

**Secondary Farm Road :** farm road divered from the main farm road or other secondary road and to be provided for research works in each experimental field.

- ① Pavement width of farm road is 3.0 meters and paved by gravel with thickness of 100 mm.
- ② A 0.5-meter-width shoulder is installed on both sides of pavement.
- ③ Based on the drainage condition, side ditch and road crossing drain culvert will be provided, if they are required.
- ④ Radius of curve at turning and junction points shall be determined based on the topographic condition and planted trees, it shall be more than 30 meters. If the minimum radius of curve can not be adopted, an appropriate widened road shall be provided for the smooth traffic turning.
- ⑤ Western edge of the fence surrounding the grape experimental field can be shifted inside 1 meter, if it is required.
- ⑥ Farm road which is aligned on the existing road shall be cleared, leveled and compacted before pavement, after that new gravel pavement shall be installed.
- ⑦ Farm road which is newly planned in the experimental field and has no installation of gravel previously, the murrn which is available adjacent as a base course above this gravel pavement shall be installed.

- ⑧ About 300 meters around the embankment and a steep portion, and about 200 meters along the nursery facilities portion of the main farm road are recommended to be asphalt paved road if the finance of the Project allows.

According to the detailed field survey results, the length of the main farm road is estimated 1,490 meters, and the secondary farm road has eight(8) lines and the total length is estimated 1,430 meters.

### 2-3 Windbreak

Net fence type windbreak which is similar to the chainlink fencing with concrete posts in concrete surround shall be installed, but chainlink is replaced by tygan netting mesh and concrete post is straight as shown in ATTACHMENT 2.

- windbreak shall be 2-meter-high and be provided with 20-meter-interval of their line.
- planted trees shall not be on or near the windbreak line.
- in the outer line of windbreak at north-east experimental field, the windbreak shall be also functioned as a fence to protect the entrance of small animals.

According to the detailed field survey results it has 12 lines and about 1,580 meters in length.

### 2-4 Trellis

Trellis shall be installed in the north-east experimental field with about 0.3 ha.

- trellis will be constructed by galvanaized steel pipes with an interval of 5 meters and they are jointed by anchored galvanized wire. The height is 4.5 meters and whole trellis will be covered completely by the fishnet 210/4 ply with mesh size of 10 mm

### 3. FURTHER STUDIES BEFORE CONSTRUCTION

Based on the detailed field survey results and basic concept of facilities as described previous section, the detail design and report including required tender documents for the construction will be prepared in Japan. And the final report will be send to the GOK through JICA Kenya Office in May, 1988.

### 4. TENDERING AND CONSTRUCTION

#### 4-1 JICA expert for tendering and construction

In order to assist JICA Kenya Office for tendering and contracting, also supervising the construction works, a JICA expert will be required to assign. His assignment period is estimated five(5) months from July to December, 1988. Therefore the GOK requires to prepare the FORM A1 for his assignment.

#### 4-2 Tendering and Contracting for the Construction Works

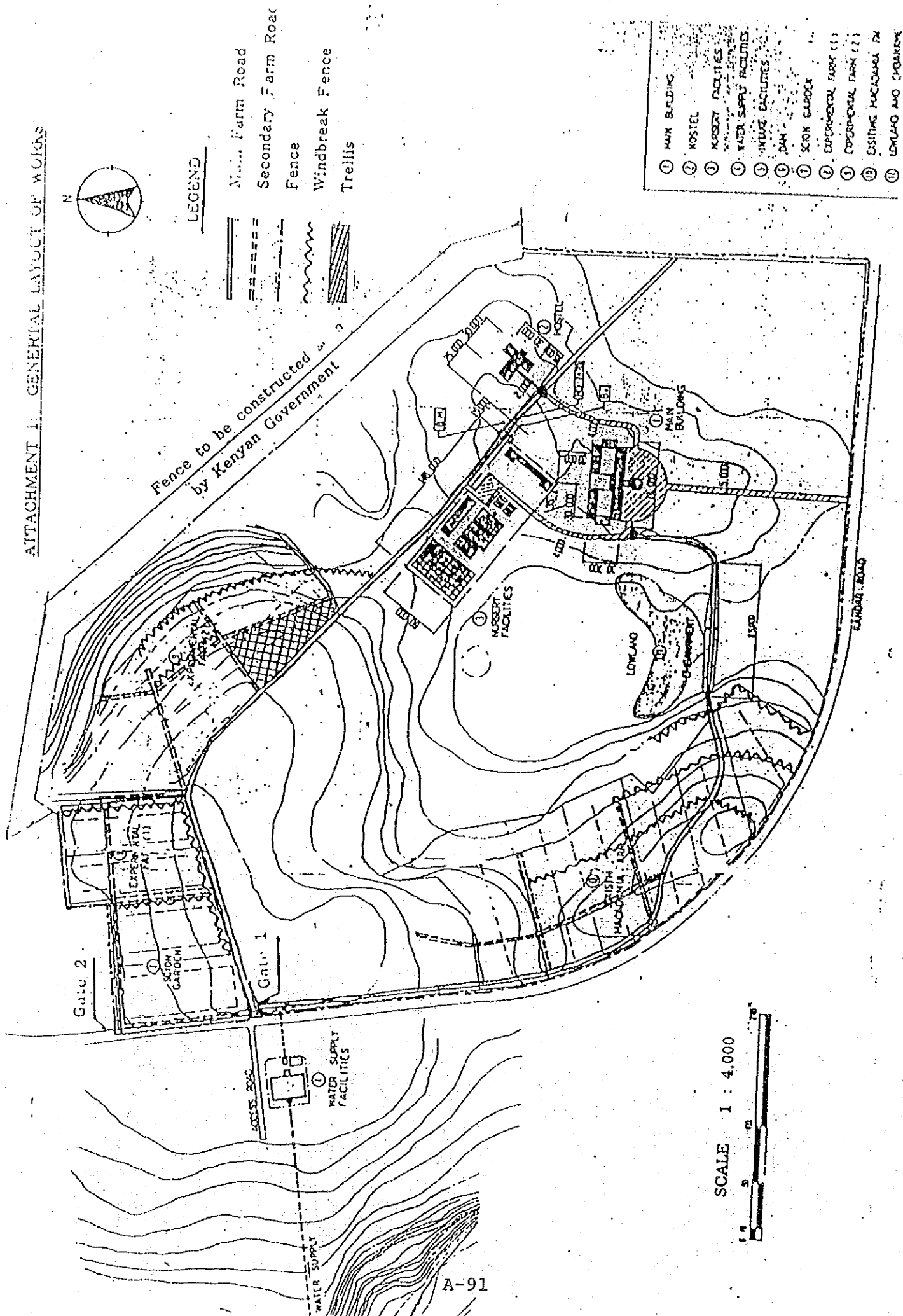
The owner of the contract is JICA Kenya Office represented by Mr. Kenji Kumagishi, and the contractor will be selected by local tendering among the short-listed contractors. Recommended contractors' list through the Ministry of Works, Housing and Physical Planning, totalling five(5) contractors, was recieved by the Team on 29th March, 1988. Invitation of tendering to these contractors will be conducted after an arrival of JICA Expert for the tendering and construction supervisory works, and it expected in the begining of July, 1988.

#### 4-3 Construction Schedule

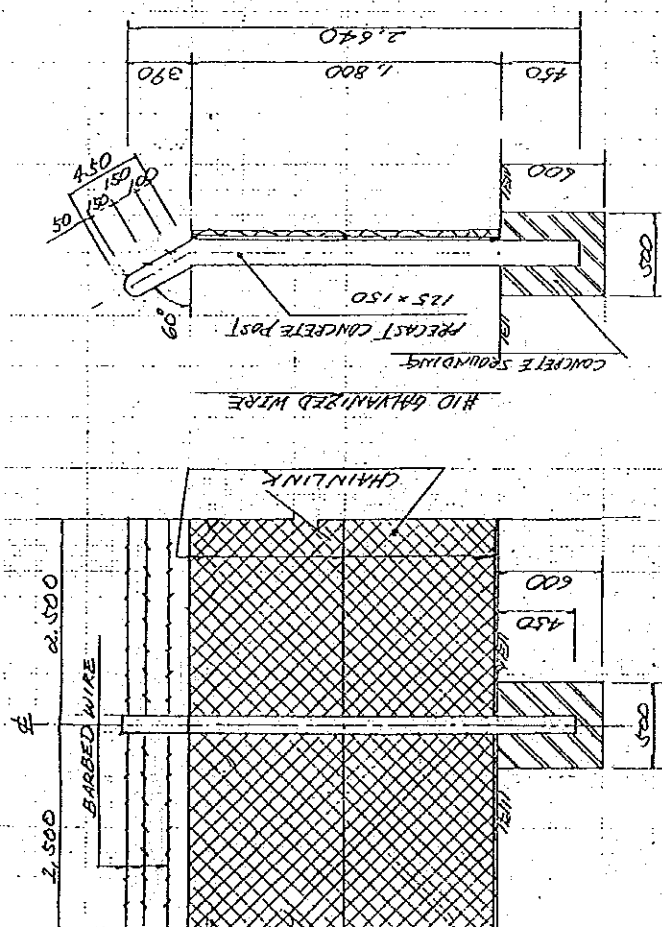
The construction period of the works is expected about four(4) months including mobilization and demobilization after the sign of the contract.



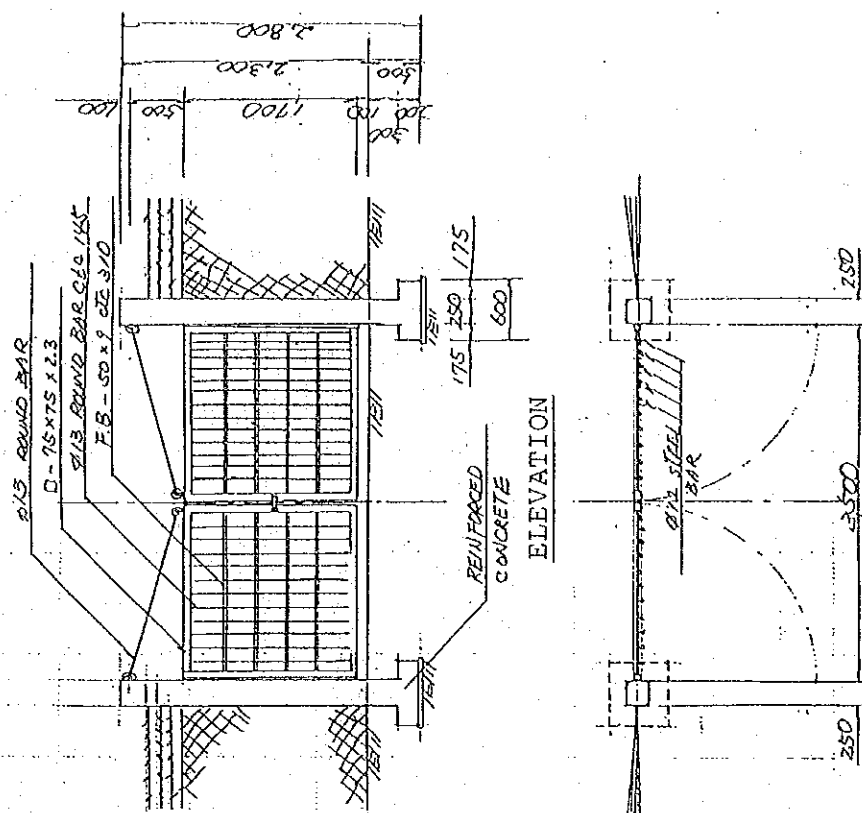
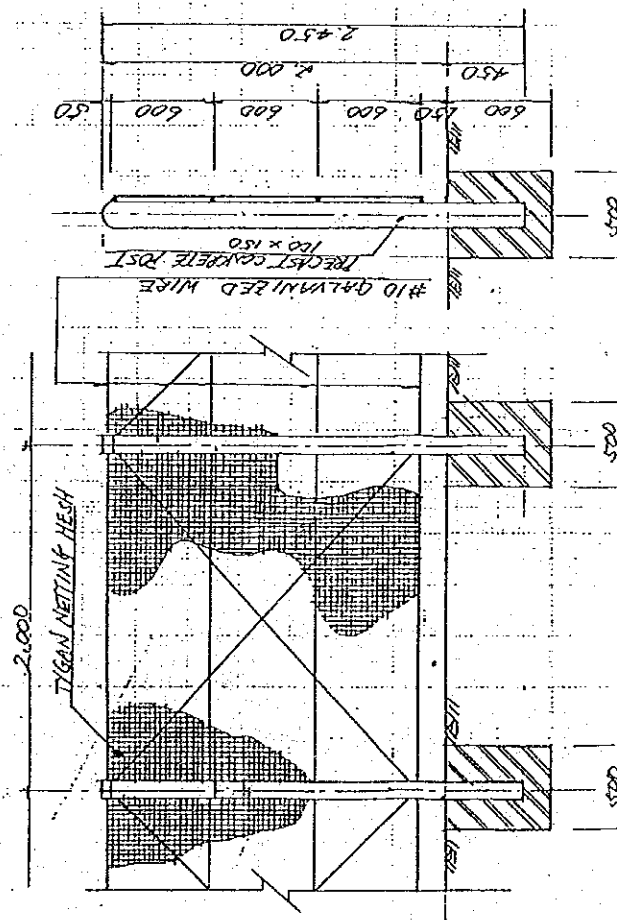
ATTACHMENT 1: GENERAL LAYOUT OF WORKS



# STANDARD DRAWING OF GATE

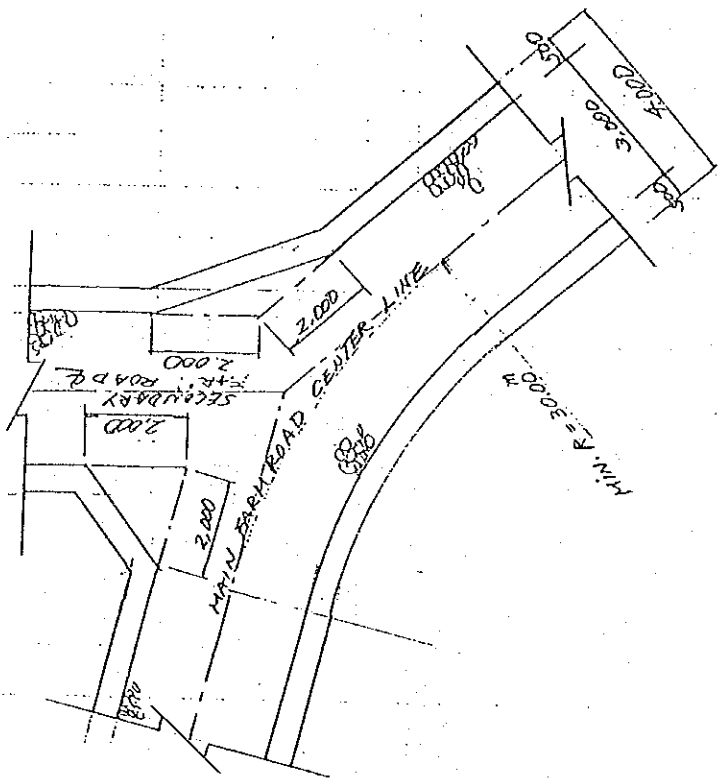
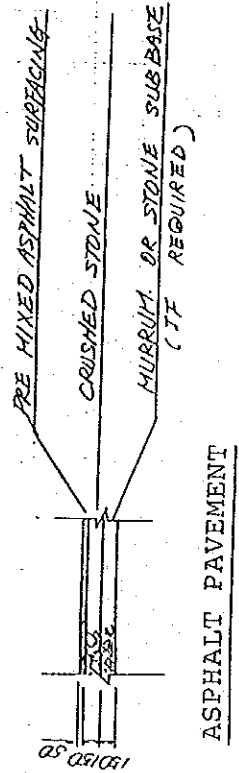
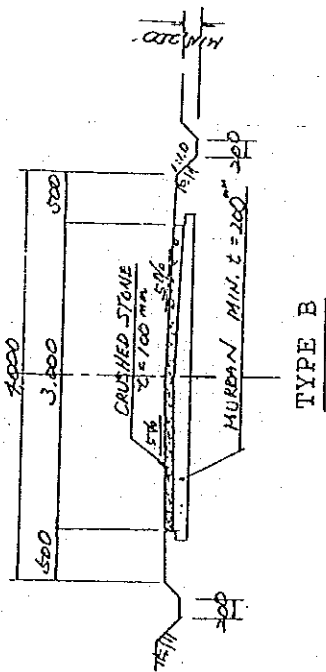
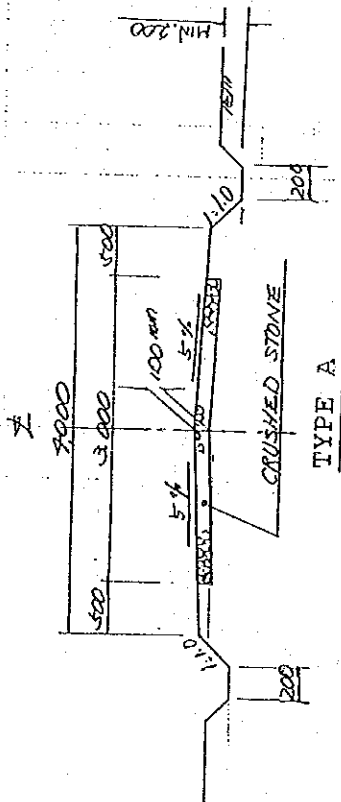


# STANDARD DRAWING OF WINDBREAK



ATTACHMENT 2: STANDARD DRAWING OF FENCING AND WINDBREAK

# STANDARD CROSS SECTION OF FARM ROAD



## ENLARGEMENT OF ROAD AT CONJUNCTION POINT

### ATTACHMENT 3 : STANDARD CROSS SECTION OF FARM ROAD



# ATTACHMENT 5: TANTATIVE PROJECT IMPLEMENTATION SCHEDULE

ITEM	1988											Remarks
	MAR	APR	MAY	JUN	JUL	AUG	SEP	OCT	NOV	DEC		
Field Survey												
Basic Plan of Works	△											
- Field Report		△										
Preparation of												
Detailed Design												
- Final Report on			△									
Detailed Design												
Official Request of			△									
Construction by												
GOK												
			JICA/KNY									
			JICA/HQ									
Consultation with MOF				△								
of GOJ												
Submission of FORM A1			△									For requiring
by GOK												JICA experts
Exchange of Verbal Note				△								
JICA expert for												
Construction Supervision												
Tendering & Contracting												
Construction												
- Farm roads												
- Fencing												
- Trellis												
- Windbreak												

Notes, GOK : Government of the Republic of Kenya

JICA/KNY : JICA Kenya Office

GOJ : Government of Japan

JICA/HQ : JICA Headquater, Tokyo

MOF : Ministry of Foreign Affairs





JICA