DEPARTMENT OF LOCAL GOVERNMENT
UPLAND ACCESS PROJECT

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Rehabilitation of Provincial Roads Serving Upland Areas

FIELD MANUAL

May 1987

REPUBLIC OF THE PHILIPPINES

DEPARTMENT OF LOCAL GOVERNMENT

UPLAND ACCESS PROJECT

REHABILITATION OF PROVINCIAL ROADS SERVING UPLAND AREAS

FIELD MANUAL

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1. WORK PLANNING AND SITE ORGANISATION ..... PLAN

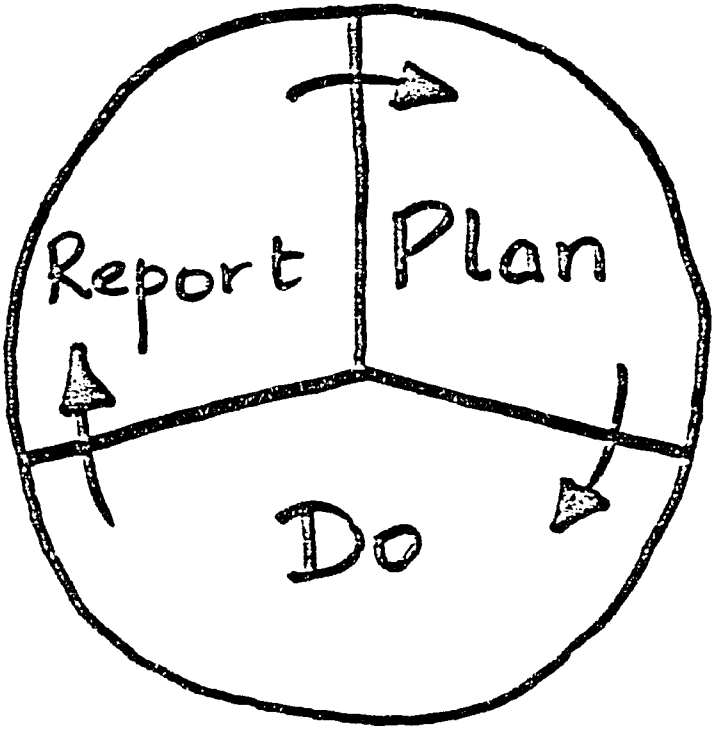
A Project for your province has been approved. The money has been received. What do you do next? The purpose of this Field Manual is to take you step by step through the process of site management.

There are really three aspects of site management.

Planning

Doing

Reporting



A plan is prepared. The work is done according to this plan. The work is then reported which gives important information on the assumptions made in the plan. Using the reports which reflect experience, a raised plan for the next phase of work can then be produced and the process begins again.

Work planning is the first step.

On a new project the Overall Barchart for the job is the guide you are given. This and the cost estimate tell you:

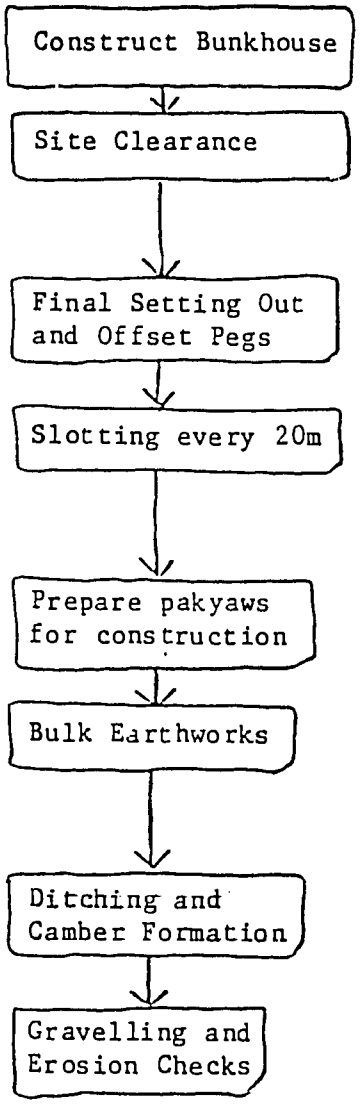
* how many labourers are required and when
* how many rollers, trucks vehicles are needed and when
* what materials are required
* how much the job should cost
* how long the job should take to complete.

The Overall Barchart has been drawn up to give overall estimates of time resources and costs. It is not detailed enough to organise the construction on the site.

You need to use the Overall Barchart as a guide to help you produce detailed plans for each stage of the works.

First of all you should know the sequence of events on your project. The Logic Network will tell you this. In a more simple form the sequence is shown below.

THE SEQUENCE OF EVENTS



Using pakyaw for labour

By pakyaw for <u>whole length</u> ("horizontal slicing")

(Bush Clearing First)

Duty of engineer: for <u>whole length</u>

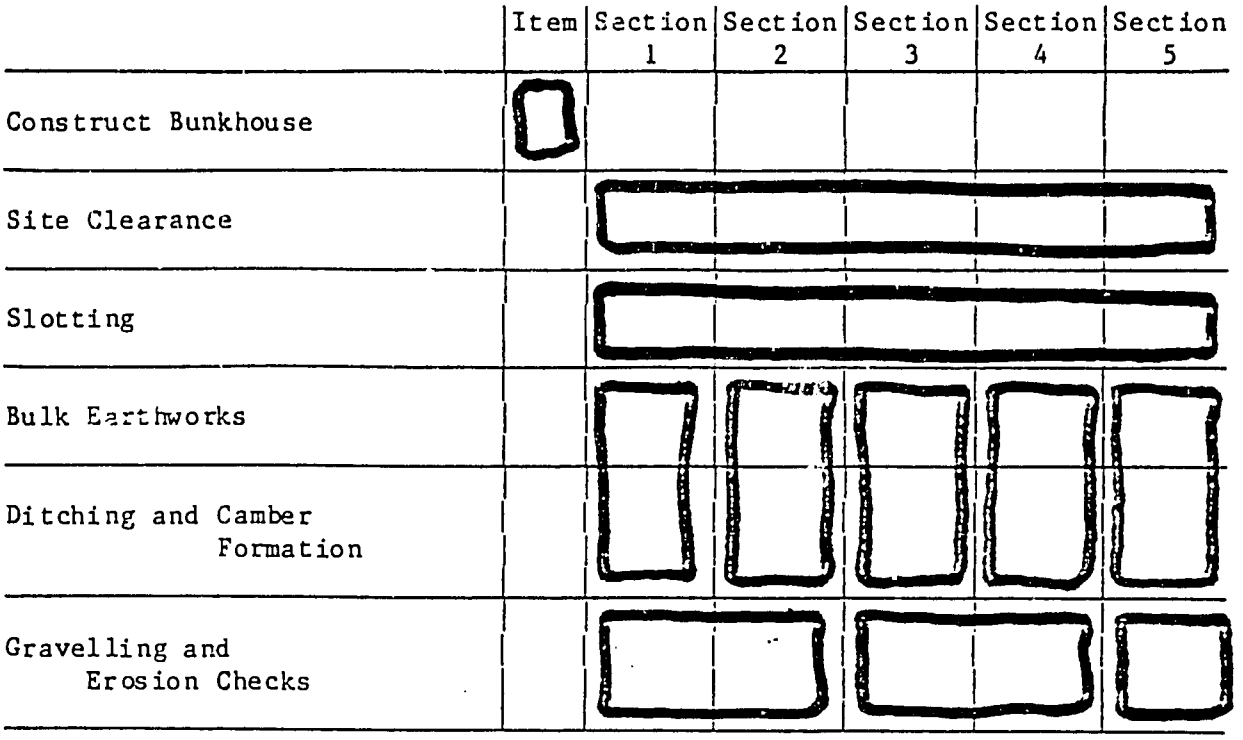
By pakyaw for <u>whole length</u> slots 1m width (volume is 1/20 or 5% of bulk earthworks volume)

Usually 20 labourers and one month's work

From here pakyaws can include all operations except gravelling for a given length ("vertical slicing")

Separate pakyaws ("horizontal slicing")

"Slicing" mentioned above is the process of dividing up the work of construction into contracts for pakyaw.



All the site clearance is usually done under one pakyaw "horizontal slicing" this is - it should be done before slotting starts.

Slotting likewise is all done under one contract (or maybe two on a long road job) as it must all be finished before the bulk earthworks can being. Again slotting is horizontal slicing.

Bulk earthworks and ditchings and camber formation should be done together. Because this is the major part of the work, the contracts should be let for sections of the road. These contracts are "vertical slicing'. Gravelling and erosion checks are let as separate contracts for sections of the road (horizontal slicing because only one construction operation is involved).

Based on the "slicing" and the sequence of events it is now possible to draw up the first monthly plan.

Example

4 week plan commencing 1/8					Pakyaw Group
Operation/Activity	Week 1	Week 2	Week 3	Week 4	
SITE CLEARANCE					
(WHOLE ROUTE)					
Bush Clearing					
L					Group 1 (25 labourers)
M					
H					
Tree and Stump Rem					
Grubbing					

The total number of mandays for Site Clearance and the activities come from the overall barchart, and the Calculation of Quantities. You cannot change the total mandays but you may wish to change the size of the pakyaw group or groups assumed - perhaps you would like two groups of 20 instead of one of 25 so that the work will be finished sooner. As long as the total mandays for the operation is allowed for you can choose group sizes to suit the local situation.

In that case you would prepare a separate part of the barchart for each section of the works where a pakyaw group was to be employed.

The same process is followed for the Slotting.

The total quantity for slotting is 5% of the Bulk Earthworks on a project where there is cut to spoil and 2½% of Bulk Earthworks on a project where the cut and fill are balanced. (The slots are 1m wide and every 20m).

So depending on the length of the road, the slotting will be let as one pakyaw contract or divided so that the work is completed in one month or less. Of course this contract can be let before the site clearance is finished, so long as there is enough cleared length to allow the slotting work to proceed unimpeded.

The Slotting gives you the information you need to draw up the plans and pakyaws for the bulk earthworks:

Slotting is a very important part of the construction planning.

* Slotting <u>investigates</u> the soil conditions
* Slotting <u>demonstrates</u> the excavation (and filling) involved (and allows amendment and improvement)
* Slotting <u>indicates</u> the work necessary for the labourers in a direct way.

Once the slots have been formed, you should go along the road with the Site Survey forms and check the soil types and backslopes that have been assumed in the survey. Make a note of any changes in soil type or backslope and then altera the quantities in the Earthworks Computations.

Once the slotting is completed, the work planning for the bulk earthworks begins. Slotting takes away most of the uncertainty about soil type and so the pakyaws can be more accurate and the problems reduced.

The bulk earthworks now to be excavated is the total less the volume excavated in the slotting.

Plan for the bulk earthworks and ditching and camber formation all together and in sections along the road. The individual pakyaw contracts should be for about 20 men and about one month's work. This way, no interim payments are necessary.

UPLAND ACCESS PROJECT

SITE PLANNING FORM

PROJECT NAME:

Operation/Activity	Total md	WEEK			
		1	2	3	4

For example: let's say the Bulk Earthworks, Ditching and Camber Formation operations from the overall barchart look like this

		Output	Prod	Input md
Bulk Earthworks	S	11 400 m^3	3.5	3 258
	HS	2 800 m^3	2.5	1 120
	R	800 m^3	0.5	1 600
Ditching Camber Formation	S	2 500	3.5	715
	HS	500	2.5	200
	R	125	0.5	200

If the route is in steep sidelong ground, 5% of the total volume of each soil type will have been excavated already in the slotting. Recalculate the inputs required.

Bulk Earthworks

Excavate and throw	S	10 830	3.5	3 095	
	HS	2 660	2.5	1 064	
	R	760	0.5	1 520	
Haul		1 425	3.5	408	6206 md
Spread and water		1 425	12	119	
Compact		1 425	250		

Ditching and Camber Formation

Excavate and throw	S	2 500	3.5	715	
	HS	500	2.5	200	1426
	R	125	0.5	250	
Spread and water		3 125	12	261	
Compact		3 125	250	13	

So the total mandays for the work is 6206 + 1426 = 7632 md.

Lets suppose the overall barchart allows 4 months for this work.

Then number of labourers required = $\frac{7632}{4 \times 21 \times 0.8}$ = 114

at an average daily attendance of 80%.

So if you have SIX groups of 20 each the work will be completed in approximately:

$$\frac{7632}{6 \times 20 \times 0.8} = \underline{3.8 \text{ months}} \text{ or } \underline{16 \text{ weeks}}$$

This keeps you within programme.

Each pakyaw contract should be for only 4 weeks so you now look at the quantities for each section of the work and let the contract for "pakyaw" of around $\underset{\text{days}}{20} \times \underset{\text{men attend}}{20} \times 0.8 = \underline{320}$ md.

To complete in 16 weeks you need SIX groups working simultanteously ie 1920 md per 4 weeks.

So <u>six</u> sections of the road will be worked on at once. Your plans should show this.

Operation/Activity	Total md	WEEK 1	2	3	4
Section 1:km a-b					
Bulk Earthworks	•••				
Ditching and Camber Formation					
Section 2					
Bulk Earthworks					
Ditching and Camber Formation					
Section 3					
Bulk Earthworks					
Ditching and Camber Formation					
Section 4					
Bulk Earthworks					
Ditching and Camber Formation					
Section 5					
Bulk Earthworks					
Ditching and Camber Formation					
Section 6					
Bulk Earthworks					
Ditching and Camber Formation					

Of course each section will not be exactly 4 weeks work and the programme reflects this. All construction operations can be dealt with in this way.

The standard Pakyaw contract is shown overleaf.

OFFICE OF THE GOVERNOR

Province of _____

PAKYAW AGREEMENTS FOR: _____

FROM STA _____ TO STA _____

KNOW ALL MEN BY THESE PRESENTS:

This AGREEMENT, made this _____ day of _____, 19 ____ by and between the Province of _____, represented by the Provincial Governor as party of the First Part and Pakyaw Leader (signature below) as part of the Second Part.

WITNESSETH: That for and in consideration of the payment hereinafter mentioned to be made by the party of the First Part, the party of the Second Part agrees to furnish the labour and complete the items of work described herein in accordance with GENERAL CONDITIONS provided at the back hereof, plans and specification, program of work and the items of this agreement and provided further:

That the construction method to be employed shall be generally in accordance with labour intensive method under the directions and/or instructions of the Engineer-in-charge or his duly authorised representative;

That the Pakyaw Leader shall at all times take all reasonable precautions to prevent any disorderly conduct by or among the Pakyaw group member under him. The said Provincial/Project Engineer may require the Pakyaw Leader to remove forthwith from the works any labourer who in the opinion of the said Engineer is incompetent or is guilty of misconduct.

3) That the party of the First Part reserves the right to suspend or stop the work at any time he deems it necessary, compensating proportionately whatever partial accomplishment has been rendered.

4) That partial payments every "QUINCENA" may be allowed based on actual accomplishments duly accepted and evaluated by the party of the First Part.

5) That the government shall not be held liable for any oblgiations arising out of injury, sickness, disability or death of any labourers under the Pakyaw Leader.

6) Schedule of Works

Item No	Description	Quantity	Unit Cost	Amount
			TOTAL	

IN WITNESS HEREOF THE PARTIES HERETO HAVE SIGNED THIS AGREEMENT ON THE DATE INDICATED ABOVE.

Party of the First Part: Party of the Second Part

Governor

Pakyaw Leader

Witness

OK AS TO FUND

OK AS TO PROGRAM

Provincial Engineer

Treasurer/Accountant

Resident Engineer

GENERAL CONDITIONS UNDER WHICH THE WORK

SHALL BE UNDERTAKEN

1. All work contemplated under this Agreement shall be constructed in accordance with the plans and specification, copies of which are on file in the Office of the Provincial Engiener and can be obtained from said office upon request. Change from plans and specification shall not be valid unless approved by the UAU and concurred by USAID.

2. All works shall be completed within _____ working days or before _____.

3. Works shall begin immediately upon the execution of the Agreement and the government reserves the right to cancel the Agreement if in his (government) opinion the work is not done in accordance with the plans and specification and unnecessary delay and the work will not be completed within the stipulated time. Upon cancellation of the Agreement no claim for payment beyond what has been certified by PEO and all money or reserved percentage due to become due by reason of this Agreement shall be and become forfeited by the government.

4. The "PAKYAW LEADER" shall without fail to pay all his pakyaw group members their just compensation in accordance with the computed equivalent share of each member and all other debt that may become due to the group members in connection with this pakyaw agreement within twenty four (24) hours from the time the money is paid to him by the government.

5. Whenever this Agreement, in the opinion of the Provincial Engineer shall have completely performed on the part of the pakyaw leader, the Provincial Engineer or his duly authroised representative shall proceed

promptly to measure the work and prepare the estimate and certificate of acceptance. He shall prepare the necessary voucher for payment to the pakyaw leader, and deducting therefrom 10% retention for handtools accoutnability and which shall be paid upon the completion of work and the returning of all the issued handtools.

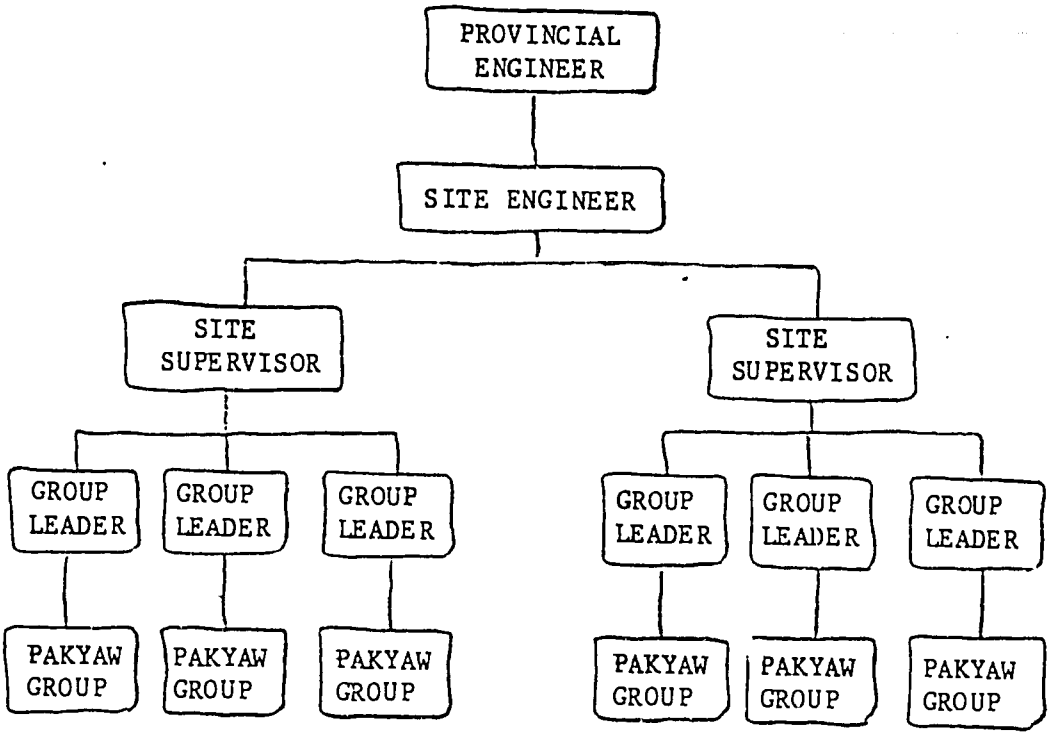
6. The quantities and amount entered into this Agreement is only an estimated quantities, hence payment shall be based on actual work or quantity accomplished.

7. The pakyaw leader must have a minimum of _____ labourers, _____ carabaos, and _____ ploughs and will have to work under the supervision of a foreman/Engineer-in-charge directly employed by the government. The labourers will use only such work methods as specified in the plans or as directed by the Foreman/ Engineer-in-charge.

8. The tools and equipment for use of the labourers will be provided by the government except carts, plough and carabaos which will have to do secured by the pakyaw group. The labourers will have to take care of all the tools of the government without any negligence and the cost of loss of tools will be recovered against the pakyaw amount which the Pakyaw Group is entitled to received.

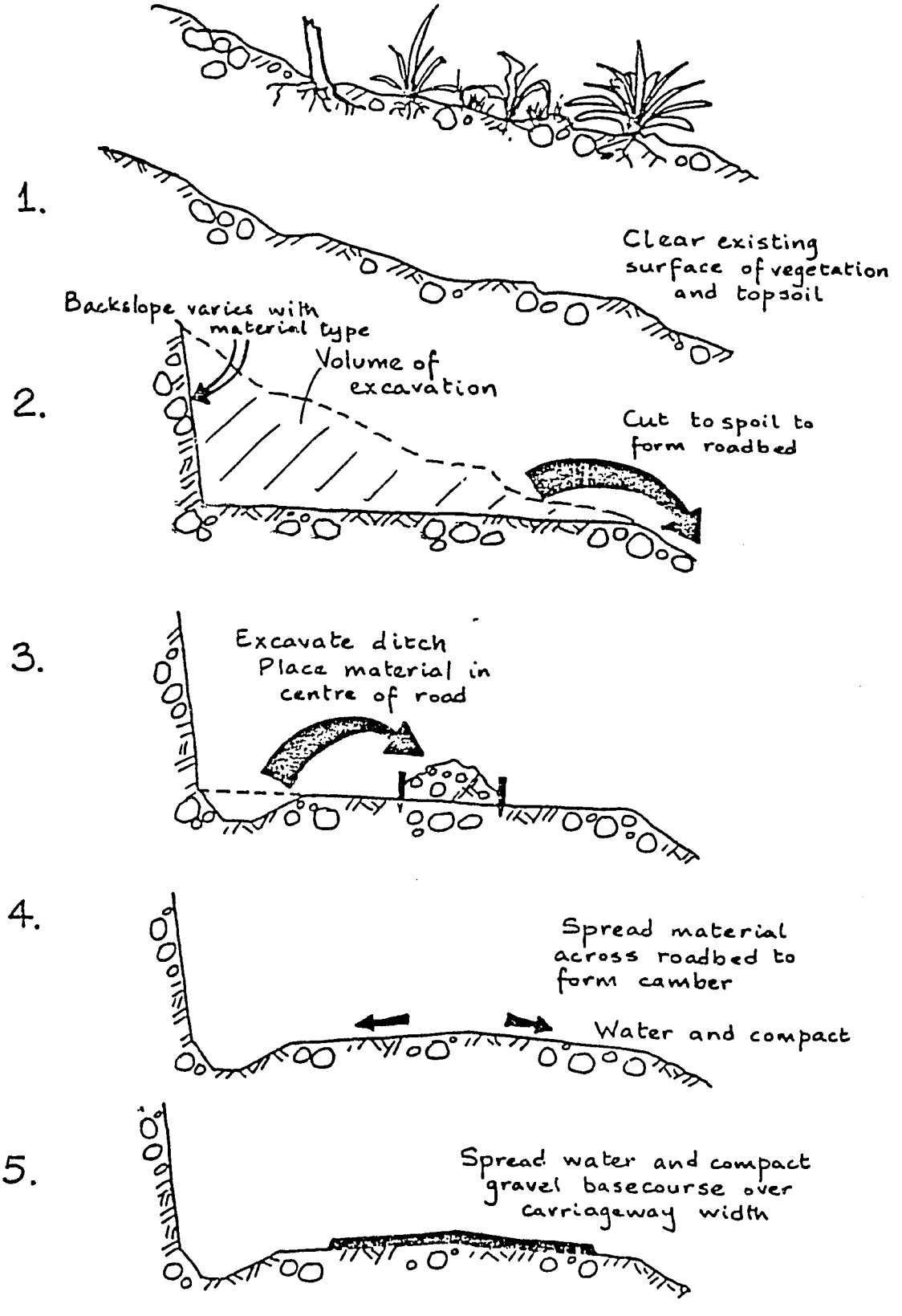
SITE ORGANISATION

SITE MANAGEMENT STRUCTURE



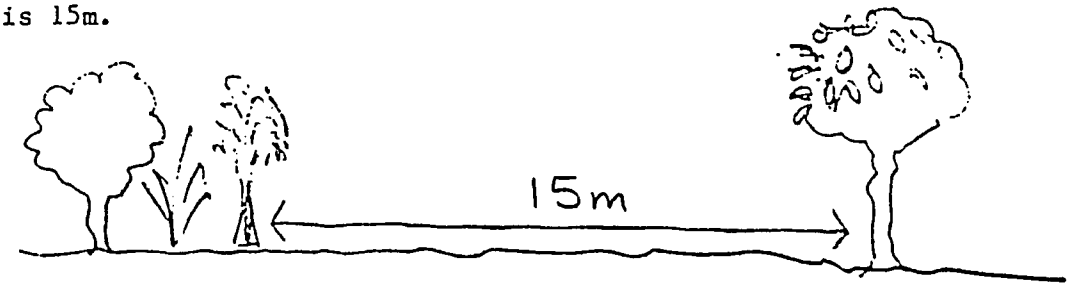
This structure is important. It will only work properly if each person concerned works according the hierarchy shown: the Provincial Engineer should work through his Site Engineer, he should be careful not to interfere directly with the day-to-day activites of the Group Leaders for instance. In the same way Pakyaw group members should first discuss any problems they may have with their group leader and not go straight to the Site Engineer, say.

CONSTRUCTION OF A ROAD IN STEEP SIDELONG GROUND



Description

Site Clearance is the clearing of all trees crops bushes and grasses and topsoil from the roadway. On this project, for provincial roads the cleared widths is 15m.



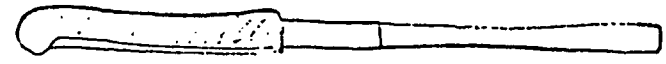
Description

Bush Clearing is the cutting and removal of all bushes crops and grasses from the roadway.

Tools Bolo

Brush hook

Rake



Tips Bush clearing can be dangerous - labourers should be on the lookout for bee hives and snakes in particular thorns and cut stumps of bamboo can also cause injury.

Productivity Norms

Bush Clearing	(light)	200 m^2/md
	(medium)	100 m^2/md
	(heavy)	50 m^2/md

Description

Tree and Stump Removal is the fell and disposal of trees and the rmeoval of roots from the cleared width.

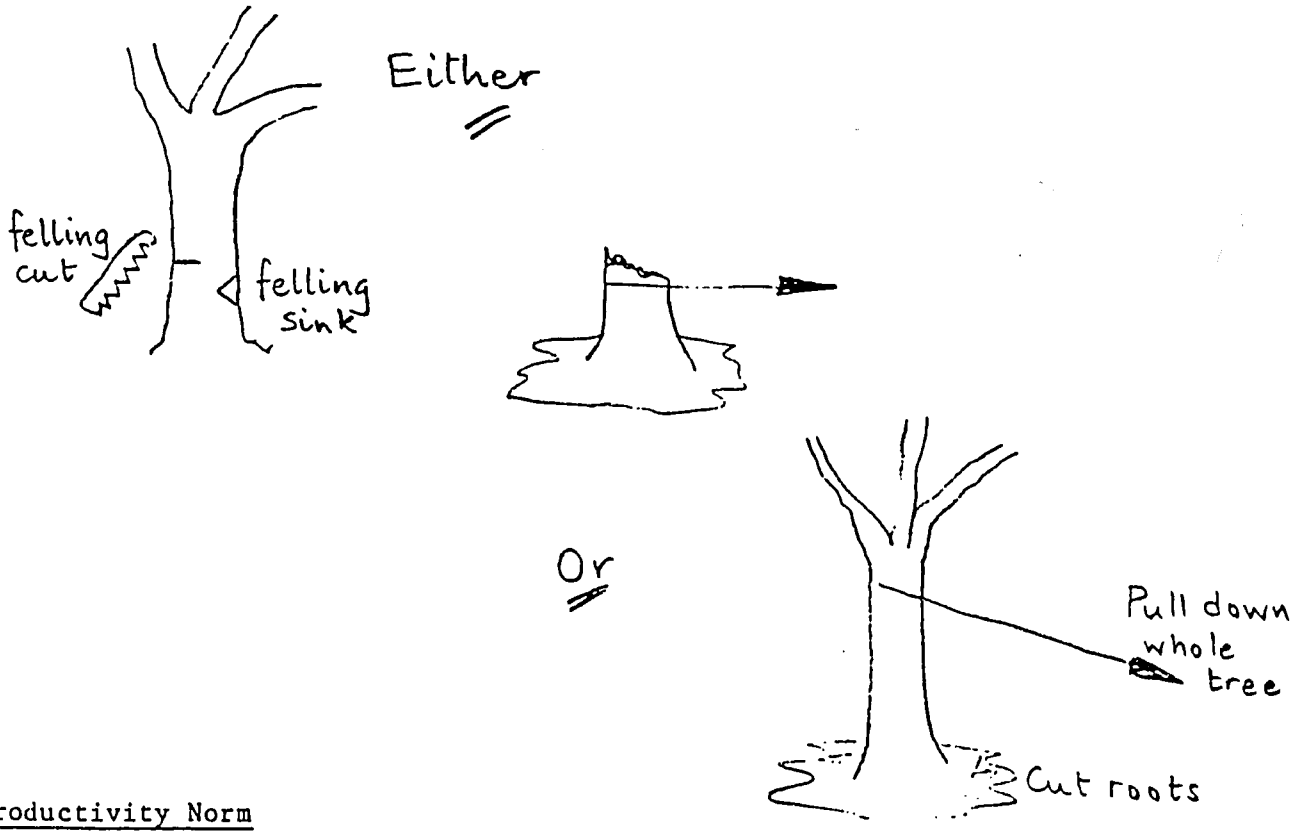
Tools Axe

Bow Saw

Mattock

Spade

Bolo



Productivity Norm

This is very difficult to standardise : trees are very variable in hardness, root systems and so on. A rough guide is to measure the diameter at the base of the tree say 1m above ground level and allow a productivity norm of

Tree + Stump Removal 0.25 lin m dia/md.

Description

Grubbing is the removal of all roots and topsoil from the roadway width, where this is necessary. If the topsoil is the same as the material below it then it should not be removed.

Tools Mattock

Hoe

Shovel

Rake

Tips Make sure the labourers know how deep to go - it should generally be about 0.10m

- spread the topsoil evenly outside the roadway: don't leave it in a heap - it will be washed back into the ditches.

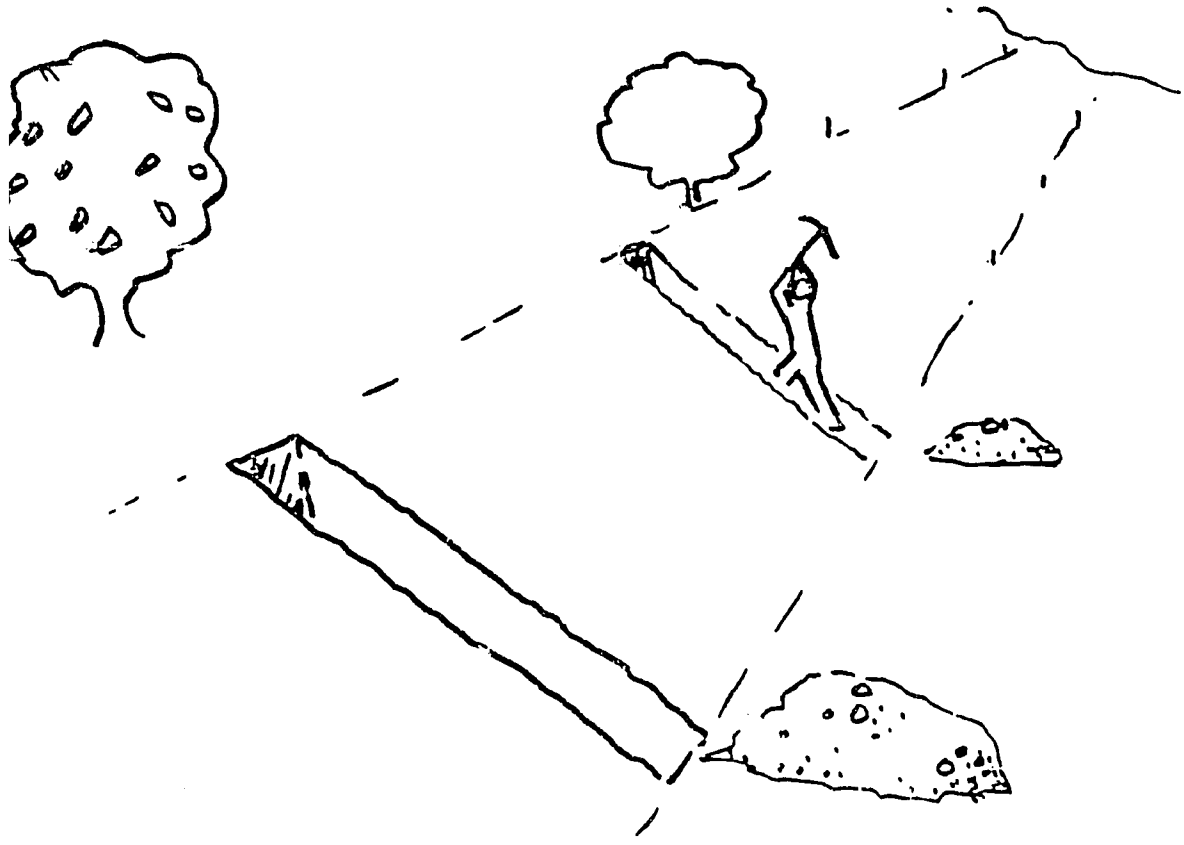
Productivity

Grubbing: .50 m^2/md

Description

Slotting is the process of making profiles of the formation at intervals along the route generally 1m wide at 20m spacing.

The purpose is to finalise the vertical alignment by using boning rods and an abney level and to check that the soil type is as it appears on the surface. From the slotting information the pakyaw contracts for the bulk earthworks can be more acurately determined which leads to fewer problems with extra work.



Productivity Norm

Excavate and throw soil $3.5m^3/md$

Hard soil $2.5m^3/md$

BULK EARTHWORKS

EXCAVATE AND THROW
EXCAVATE AND LOAD
SOIL AND HARD SOIL

Description

Bulk Earthworks is the process of excavating and moving material to form the roadbed that is the platform on which the roadway will be made. There are several activities involved.

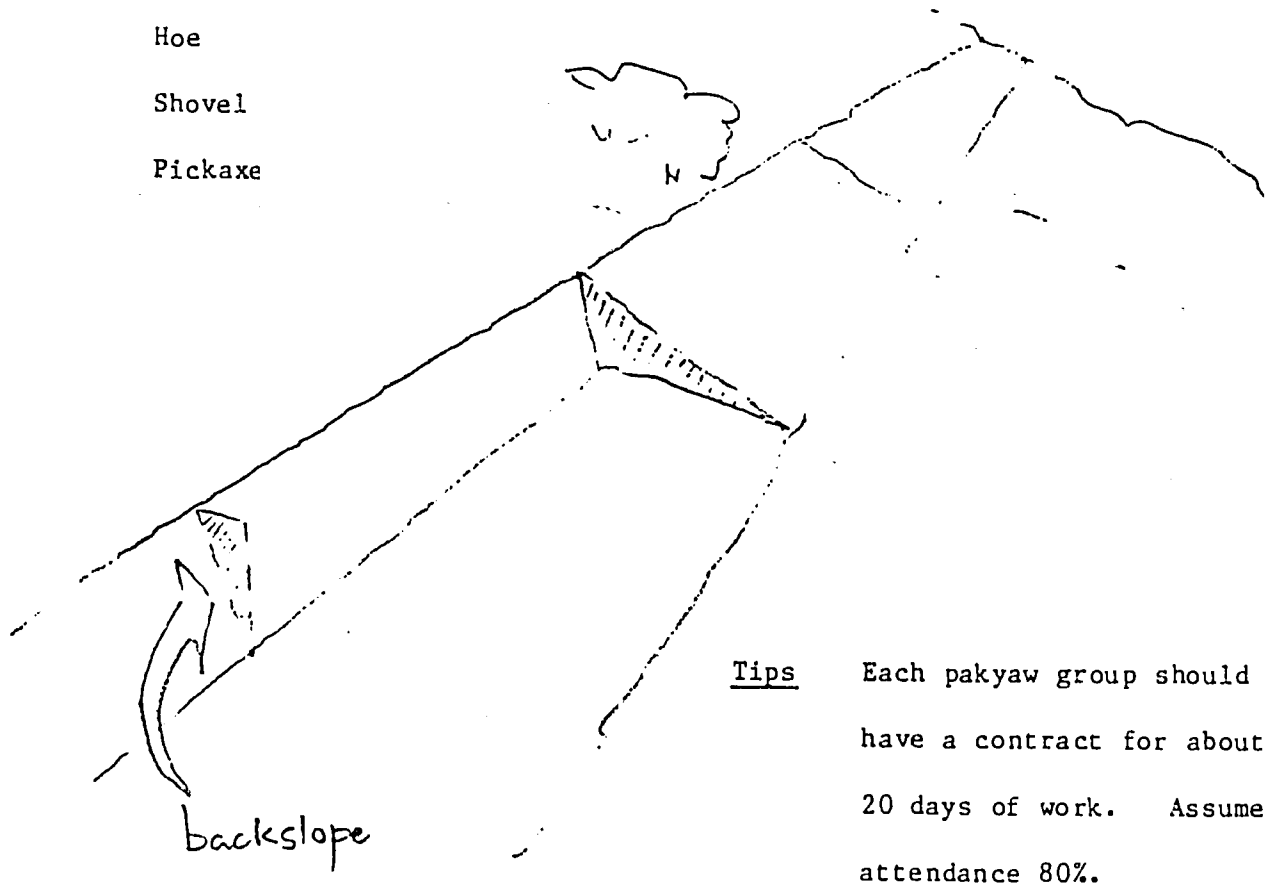
Excavate and throw/load (of soil or hard soil) is the primary activity (Rock is dealt with separately)

Tools Mattock

Hoe

Shovel

Pickaxe



Tips Each pakyaw group should have a contract for about 20 days of work. Assume attendance 80%.

Productivity Norm

Excavate and throw/load	Soil	3.5 m^3/md
	Hard soil	2.5 m^3/md

Description

Excavation of rock is very different than in soil or hard soil. Because it is very difficult, the amount of excavation in rock should be minimised.

Tools Pickaxe

Crowbar

Chisel

Siedgehammer

Stone breaking hammer

Feather and wedge set

Tips There are several methods

Boulders can be split up by fire and water:

Light a fire for at least 12 hours under the boulder and then pour on cold water; the rock will split

MASSIVE ROCK

Excavate with chisels and feather and wedge sets. Always keep a vertical face in excavate.

Make lines of hole rather than single holes.

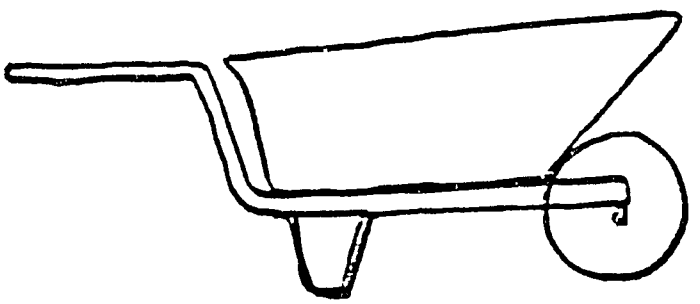
Productivity Norm

Excavate rock 0.5 m^3/md.

Description

Haulage of material is kept to minimum as it is expensive. The activity does not include loading but does include loading but does include unloading. Haul distance by wheelbarrow must be less than 50 m.

Tools Wheelbarrow



Wheels can be solid (low maintenance) pneumatic (more efficient but need more maintenance/spares)

Body can be

Deep (concrete) wheelbarrow

or Shallow (earth) wheelbarrow

Capacity is about $0.05m^3$

Tips Prepare for any haulage : choose the route carefully clear the haul route of any obstacles, bumps etc.

Fill any soft spots.

Get the labourers to work in harmony - groups of them should work together to get a rhythm into the work.

Remember there are about 20 wheelbarrow loads per m^3 - so each man must haul 3.5 x 20 = 70 loads each day to meet the target.

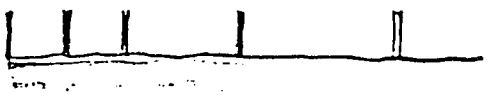
Productivity Norm

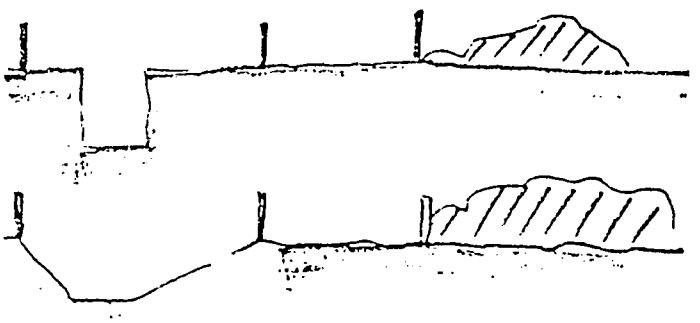
Haul by wheelbarrow up to 50 m = $3.5m^3$/md

Spread and water = $12m^3$/md

DITCHING EXCAVATE AND THROW S HS R

Description: Whatever the soil type, the ditching operation is the same. The ditch is pegged out.





The rectangular furrow is excavated first and the material is thrown to the centre of the road

The slopes are cut to form the trapezoidal shape. The material is thrown into the centre of the road.

Tools	Soil	Hard Soil	Rock
	Hoe	Mattock	Pickaxe
	Forked hoe	Pickaxe	Chisel
	Mattock	Crowbar	Feather and wedge
	Shovel	Shovel	Sledgehammer

Equipment

Use a ditch template to check the shape and size of the ditch

Productivty Norm

Exacavate and throw	S	3.5 m^3/md
	HS	2.5 m^3/md
	R	0.5 m^3/md

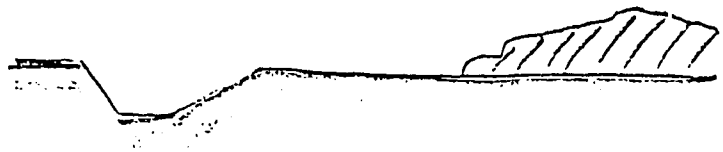
DITCHING AND CAMBER FORMATION

SPREAD AND WATER COMPACT

Description

Tools Shovel

Spreader

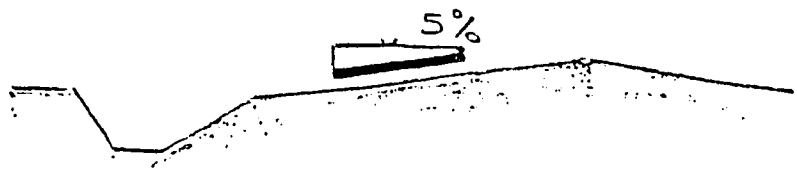


Material from the ditches stockpiled in the centre of the road is spread to the sides to form the camber at 5%.

Camber

Board

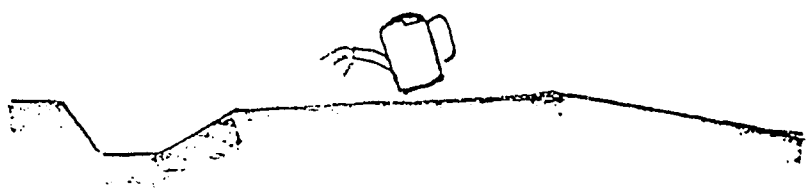
Spirit level



Boning Rods for longitudinal control

Water cans

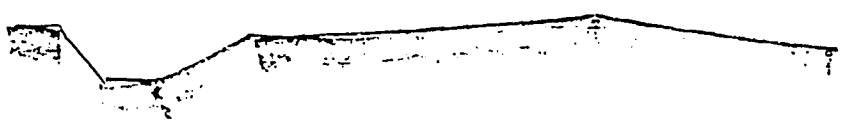
Water bowsers



The surface is watered to achieve optimum moisture content.

Roller

Rake



The surface is rolled by a roller - ideally a vibrating roller which is pedestrian operated.

This is a crucial stage of road construction because this is the formation of the road base. The slope and camber must be right - they affect the riding quality of the road and the strength of the road.

Do not rely on gravelling to get the shape right!

Productivity Norm

Spread and water	12 m^3/md
Compact	250 m3/rollerday

Description

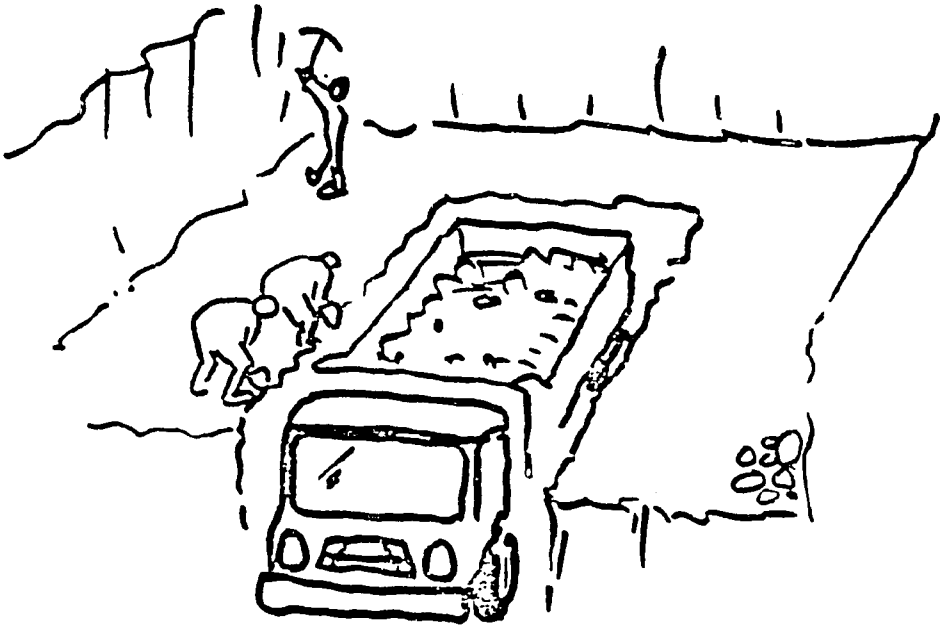
Gravelling is he process of placing a layer of compacted gravel on the road to make it passable in all weathers.

A good gravel needs to have

- STRENGTH
- COHESION
- NON SLIPPERY SURFACE FOR TRAFFIC

Generally such a gravel will have up to 10% clay and will be about 50% gravel size particles (larger than 2mm). It should not contain any stones larger than about 75mm for gravel to be laid in layers of 150mm thickness. The clay content is critical : river sand and gravel dc not have sufficient clay and are generally unsuitable as road gravel.

Excavation of the road gravel at the quarry should be done by gangs of between 15 and 25 men. The quarry should be organised to minimise the effort of loading the tippers or trailers.



Productivity Norm

Excavate and load gravel 2.5m^3/md

Description

In general gravel will need to be hauled over some distance. If the distance is more than about 100m, mechanical hauling will be required. Tipping trucks, or tractor and trailer combinations are usually efficient. These often represent a MAJOR element of cost on the project and efficient use must be made of them.

So

1. Make sure you have enough labourers in each quarry to load the truck/trailer efficiently and quickly.

2. Make sure you never have trucks/trailers standing waiting.

3. Arrange the unloading so that the truck/trailer does not have to wait while the gravel is spread.

Productivity Norm for Haul and Unload has to be calculated from

* Journey time Quarry-site-quarry
* Loading time
* Unloading time

Description

Spread water gravel is a crucial activity in the road construction and rehabilitation process. If it is done well and compaction is good, the running quality of the road will be of a high standard.

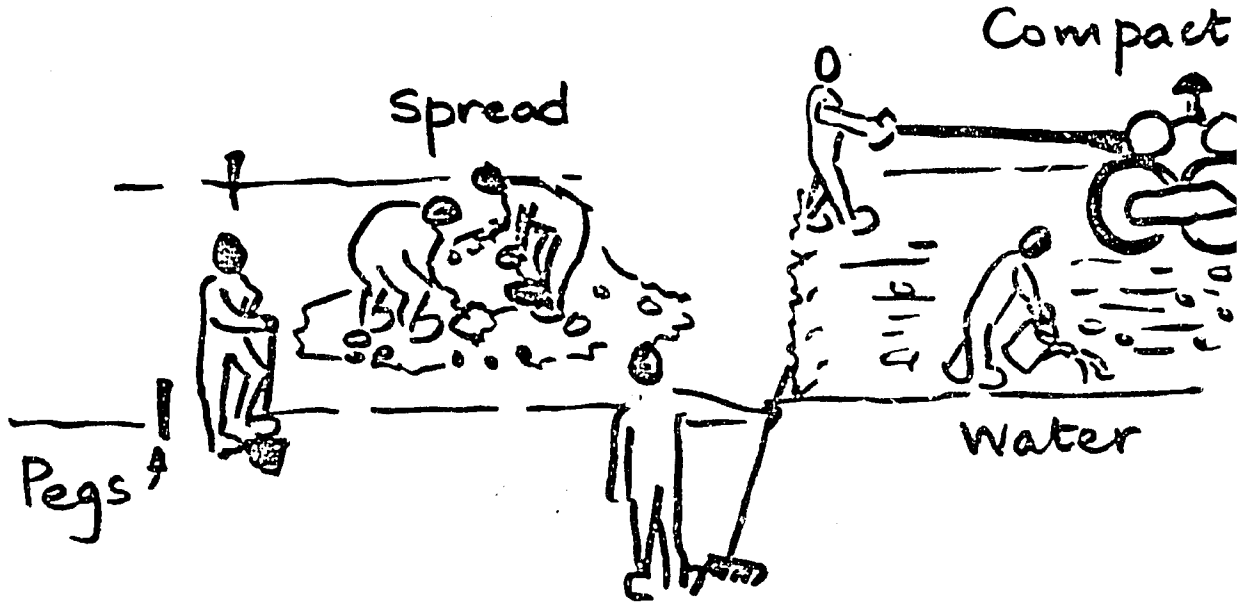
Tools Shovel

Rake/Spreader

Watering Cans

Camber Board

Spirit Level



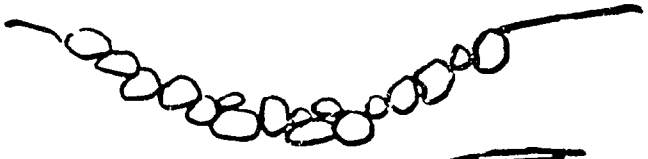
Productivity Norm

Spread and water	$12m^3$/md (compacted volume)
Compact	$250m^3$/md

Description

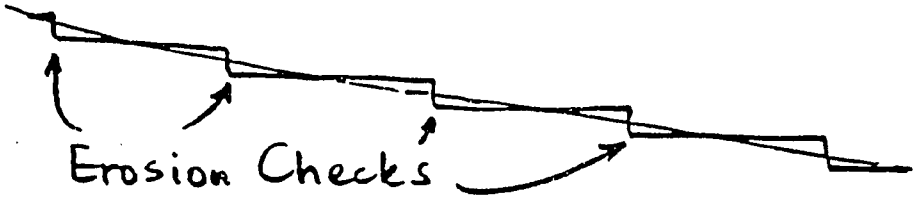
Erosion of soil will occur if water is flowing fast enough to transport the soil particles. Erosion checks are installed as a device to reduce the speed of water flowing in the ditches.

They can be of stones



timber

and would in long section form a "staircase" effect



Spacing

Gradient of road	spacing of corrosion checks
10%	5m
5-10%	10m
3-5%	20m
0-3%	Do not use

Productivity Norm

Construct Erosion Checks 10 no/md

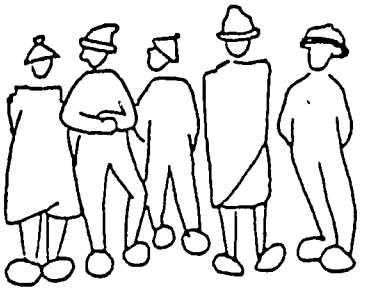
Installation The activity "Instal culvert" includes

Excavation of trench

Placing pipes in the trench

Backfilling and compaction around the pipes.

Tools Crowbars, Pickaxes, Shovels, Rammers



It takes 5 men to instal a 300, 450 or 600 mm diameter culvert of up to 8 metres long.

You need a SIXTH man for a 900mm culvert up to 8 metres long.

Method

Step 1 Excavate a trench 0.6m deeper and wider (minimum) than the diameter of the culvert.

Step 2 Trim the bottom of the trench so that it is gently sloping in the direction of flow. Now put 50mm of loose soil over the whole base of the trench-this is bedding for the pipe.

Step 3 Very gently drop the pipes into the trench and using crowbars making the pipes join PERFECTLY all round.

Step 4 Put back soil into the trench in layers of 0.15m and use rammers to compact this soil.

Step 5 Leave a slight hump of soil about 0.03m (30mm) high over the trench.

Step 6 Remove excess soil. TIDY UP THE SITE.

Instal 300, 450, 600mm culvert	task up to 1.6m/manday
Instal 900mm culvert	task up to 1.3m/manday

What are fords? Fords are structures which allow water to cross the the road on the surface.

Because of this they are used only for very small flows of water or where rock makes deeper excavation (for a culvert) difficult.

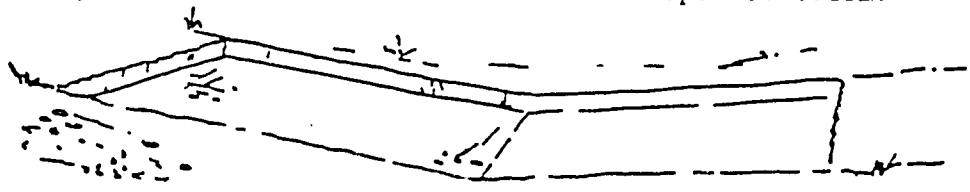
Construction

Method

Step 1 Set out the ford according to the dimensions given.

Step 2 Make a diversion for traffic.

Step 3 Excavate for the ford to a depth of 0.15m.



Step 4 Place concrete in excavation to a depth of 0.10m.

Step 5 Place weldmesh on this concrete.

Step 6 Place concrete on this weldmesh so that the total thickness of concrete is 0.15m.

Put the finish on the concrete as shown in Concrete Technology Chapter.

Step 7 Cover concrete at the end of the shift with SAND 25 to 50mm thick.

TIDY UP THE SITE

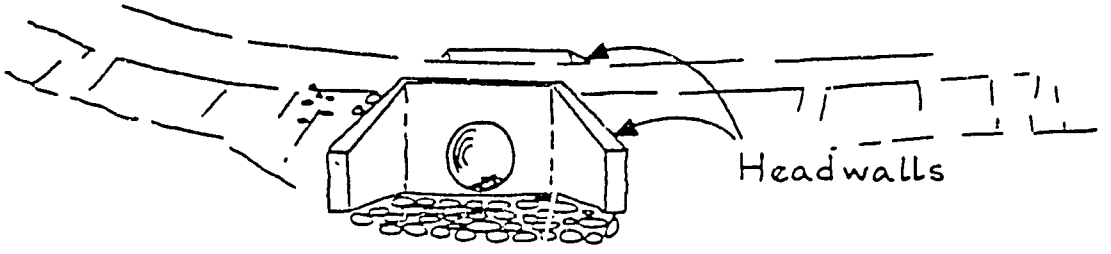
Step 8 Next day water the sand twice a day. Do this every day for two weeks.

Step 9 TWO WEEKS after the ford has been made brush off the sand (it can be used again if convenient) and OPEN THE FORD TO TRAFFIC.

Step 10 Close the diversion and remove roadsigns.

| Mix and place concrete task 1.0 m^3/manday |

What do headwalls do? Headwalls hold up the soil and gravel at the ends of a culvert and protect the culvert from being washed away.



Materials Cement, stones, sand, water.

Tools Mason's trowels, hammers, spirit level, string, shovels.

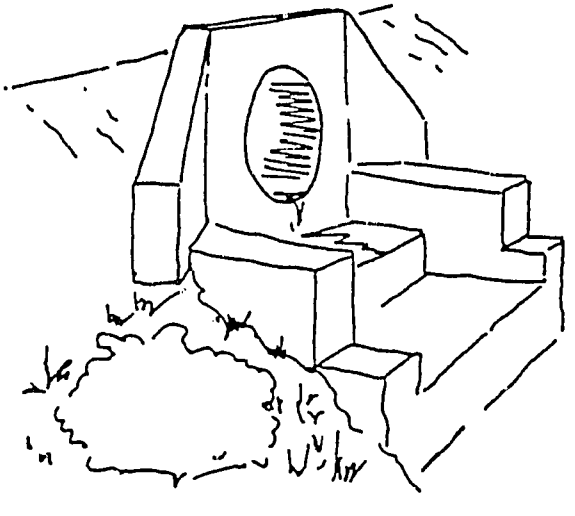
Method

Step 1 Make certain you have the tools and materials you need.

Step 2 Build a cement masonry wall around the pipe using the correct Standard Drawing for the culvert size. Calculate the volume and set the task.

Step 3 Put dry masonry as a floor around each end of the culvert.

If the culvert is flowing into steep ground, some downstream erosion protection may be necessary.



It may have to be as much masonry as this, but the engineer or STO/PTO will decide the exact shape and size. Work like this would be done as a separate activity.

Erect cement masonry	task 1.0m^3/manday

3. REPORTING AND CONTROL

The purpose of reporting is to give you the engineer the necessary information:

a) to CHECK that work is on schedule and within budget

b) to CHECK that the work is of adequate quality

c) to REVISE assumptions made in the initial planning

d) to PLAN the next phase of the work.

Reporting may seem like closing the door after the horse has bolted but it is an essential part of any construction project.

Reports cover

Stores (materials tools equipment)

Labour (pakyaw contracts, daily paid employers)

Rentals (equipment on hire)

Construction (progress, quality control)

Finance (expenditure)

Stores

The normal procedures for site stores (requisitions, receipt at site, transfers, spoiled equipment and so on) can be followed without amendment. Wherever possible use existing prcedures rather than developing new ones.

Labour

Daily paid employees can be dealt with in the same way as other employees of the Province. They will form only a very small percentage of the labour force.

Pakyaw groups. The pakyaw groups will be the major part of the labour force. The report forms are to meet two separate needs:

1) to determine who has attended work so that payment can be based on attendance
2) to determine how many labourers have worked on each activity to monitor productivity.

Weekly Site Record

Week ending ..... 198 .

Pakyaw Group |____|

Operation/ Activity	M	T	W	T	F	S	TOTAL
	Output Mandays	Output Mandays	Output Mandays	Output Mandays	Output Mandays	Output Mandays	Output Mandays
Bunkhouse							
SITE CLEARANCE							
Bush Clearing L							
M							
H							
Tree + stump rem.							
Grubbing							
BULK EARTHWORKS							
Exc + throw S							
HS							
R							
Haul by Wheelbarrow							
Spread and water							
Compact							
DITCHING & CAMFORM							
Excavation S							
HS							
R							
Spreadwater							
Compact							
GRAVELLING							
Excav & load HS							
Haul by truck							
Unload spread water							
Compact							
Erosion checks							
CULVERTS							
Install 600mm							
Install 900mm							
Grouted riprap							

Pakyaw Group |____

	DAY																				
Name	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	TOTAL
1																					
2																					
3																					
4																					
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PROVINCE OF

UPLAND ACCESS PROJECT

REHABILITATION OF PROVINCIAL ROADS

FORM

MONTHLY REPORT/1

Project No ___ ___ ___ ___
Prov Mun Type Seq

Project Name

Monthly Report for _____ 19 ___

Length _____ km

Number of working days (a)	
Total mandays this month (b)	
Total mandays cumulative (c)	
Average daily attendance (b) ÷ (a)	
Length of road completed this month	
Length of road cumulative	
Truck days this month	
Truck days cumulative	

Comments on Weather
Tools
Stores
Payment of Labour
Visitors to Site
Other Comments

41

Operation/Activity	Output Unit	Ouput this month	Input this month	Cum Output	Cum Input	Productivity	
						This month	Cumulative
Bunkhouse	Item						
SITE CLEARANCE							
Bush Clearing L	m^2						
M	m^2						
H	m^2						
Tree+stump removal	m dia						
Grubbing	m^2						
BULK EARTHWORKS							
Excavation + throw							
S	m^3						
HS	m^3						
R	m^3						
Haul by w/barrow	m^3						
Spread + water	m^3						
Compact	m^3						
DITCHING + CAM FORM							
Excavate + throw							
S	m^3						
HS	m^3						
R	m^3						
Spread + water	m^3						
Compact	m^3						
GRAVELLING							
Excavate + load HS	m^3						
Haul by truck	m^3						
Unload spread+water	m^3						
Compact	m^3						
Erosion checks	no						
CULVERTS							
Install 600mmø	lin m						
Install 900mmø	lin m						
Grouted riprap							

Item	This Month P	Cumulative P
DIRECT COSTS		
Labour payments		
Materials		
POL		
Equipment Hire		
Tools		
Sub Total Direct Costs		
INDIRECT COSTS		
Staff Salaries		
Administration		
Logistics		
Total Costs		