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Comparative evaluation of the development of labour-intensive works technology programme in Namibia

Mvungi, Charles Nyero

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11. APPENDICES

APPENDIX 1: LABOUR BASED ROADWORKS IN OWAMBO: PILOT PROJECT PHASE 1 BUDGET ESTIMATE

Construction-related disbursements can be projected in two ways, firstly on the basis of projected output times projected unit costs, and secondly on the basis of maximum projected costs irrespective of output.

At full production, cost per km is expected to be about R55,000. If annual output is 22km (allowing for effects of rain and occasional breakdowns), then projected annual cost is R1.2m.

At full production, monthly equipment costs are around R65,000, while monthly staff and labour costs are around R82,000. If these are assumed to comprise 90% of total costs, then maximum projected expenditure will be R1.96m.

Expenditure has shown that actual expenditure is usually between these two projections. For long-term budgeting purposes it can therefore be assumed that the annual construction costs associated with a full unit will be about R1.5m, equivalent to R125, 000 per month of peak production.

Assuming start-up in early August, and an optimistic period of only 3 months to reach full strength, the Pilot project will only be at full production for an equivalent of 7.5 months. On this basis, and on the planned introduction of additional units as shown tentatively in Figure 5, the construction budget can be forecast as follows (based on an April to March financial year).

		1991/92	1992/93	1993/94
Pilot Project	Months	7.5	12	12
Cost		875,000	1,500,000	1,500,000
Site 2	Months	-	5	12
Cost		-	625,000	1,500,000
Site 3	Months	-	-	9
Cost		-	-	1,125,000
TOTALS		875,000 (SEK 2.0m)	2,125,000 (SEK 4.9m)	4,125,000 (SEK 9.6m)

If the initial capital purchases of equipment are included, this will add up to about R750,000 into Financial Year 1991/92, but will then result in a decrease of at least 20% in subsequent total costs charged to the pilot project, resulting in very little change in the final cumulative cost.

	NUMBER	UNIT PURCHASE PRICE	TOTAL PURCHASE PRICE
OFFICE EQUIPMENT			
Tables	3	450	1350
Chairs	6	100	600
Filing Cabinet	1	500	500
Computer	1	6000	6000
Printer	1	1500	1500
Stationery			1000

		Sub-total	10950
HAND TOOLS (for 250 workers)			
Hoes	180	20	3600
Pick Axes	100	20	2000
Shovels	200	20	4000
Crowbars	5	40	200
Wheelbarrows	25	150	3750
Sledgehammers	4	25	200
Pangas	20	50	1000
Axes	10	25	250
Earth rammers	20	20	400
Rakes (reinforced)	30	35	1050
Buckets	5	15	75
Watering cans	10	15	150

		Sub-total	16695
MISCELLANEOUS			
Protective clothing			700
Carpentry tools			700
Forge	1	350	350
Timber			750
Fencing			1000
Consumables (see below)			2000
Minor items (see below)			3000

		Sub-total	8500
			==========
		TOTAL	36145
			==========

CONSUMABLES

Coal for forge	White spirit
Timber for general use	Staples
String for setting out	Torch batteries
Timber pegs for setting out	Pens
Paints	Forms
Paint brushes	Cleaning items

ADDITIONAL MINOR ITEMS

Spirit levels	2	Boning rods	10
Oilstones	2	Ranging rods	5
Camber boards	4	12v Batteries	2
30m tapes	5	First aid kit	1
2m tapes	3	Jerry cans	2
Ditch templates	8	2001 drums	4
Torches	4	Running boards	20

(Source: Department of Transport)

APPENDIX 2: LABOUR BASED ROADWORKS IN OWAMBO: PILOT PROJECT PHASE 1: PROPOSED BOQ AND COSTS

APPROXIMATE BILL OF QUANTITIES AND COST ESTIMATE FOR 1.0 TYPICAL KM

ACTIVITY	Output Unit	Input Unit	Prod Quant	Output	Inputs wds	tds	rds	bds
FORMATION								
Setting out	linm	wd		20	1000			50
Stripping and grubbing	m2	wd		200	10000			50
Tree and stump removal	limn	wd	0	10	33			
Levelling/compacting	m3	wd	2	60	40			
ET ordinary soil	m3	wd	3	600	200			
ET hard soil	m3	wd	2	370	247			
Haul common fill	m3	wd	3	150	50			
Form camber	m3	wd	12	900	75			
Haul water for formation	m3	td	18	80	4	4		
Compact formation	limn	rd	100	1000	10			
Repair formation								100
	Sub-totals			845	4 10	4		200
GRAVEL								
Exc & remove overburden	m3	wd	2	300	200			
Excavate gravel	m3	wd	2	825	413			
Load gravel	m3	wd	4	900	225			
Haul gravel 10 - 100m	m3	wd	3	100	33			
Haul gravel 100-150m	m3	wd	2	100	50			
Haul gravel 0.2 - 2km	m3	td	25	300		12		
Haul gravel 2-3 km	m3	td	20	300		15		
Haul gravel 3-4 km	m3	td	15	75		5		
Haul gravel 4-5 km	m3	td	10	25		3		
Haul water for gravel	m3	td	18	100	6		6	
Spread and water gravel	m3	wd	8	900	113			
Compact gravel	m3	rd	80	900			11	
			Sub-totals		1039	35	11	6

DRAINAGE

Install culverts	limn	wd				22		
Install drifts		wd				25		
Haul materials	m3	td	30		30		-	
Excavate mitre drains	m3	wd	4		15	4		
					---	---	---	---
				Sub-totals	51	- 0	0	
					==========			
				TOTALS	1935	40	21	10

DIRECT COST (per km)				Unit Cost	Cost per km
TOTALS:	Workerdays	=	1935	10	19350
	Tractordays	=	40	375	15000
	Rollerdays	=	11	200	2200
	Bowserdays	=	10	100	1000
	Materials	=			900

				Sub-total	38450

FIXED (per month)
OVERHEADS:

	Casual Lab	=	7090	(assume	3223
	Casual staff	=	12800	2.2 km/month)	5818
	Perm staff	=	7510		3414
	Camp/Office	=	3000		1364
	Misc equip't	=	1800		818
	Vehicles	=	5000		2273
	Tools	=	2000		909
			---		---
Per month s-t		=	39200	Sub-total	17818
					==========

At full production, TOTAL: 56268 per km
==========

At 50% production rate, cost will rise to 74086 per km
At 125% production rate, cost will fall to 52705 per km

At full production, summary is:

Labour	22569	40 %
Casual Staff	5818	10 %
Staff	3414	7 %
Equipment	19018	34 %
Transport	2273	4 %
Camp + Tools	2273	4 %
Materials	900	1 %
	---	---
TOTAL:	56265	100 %

BUILD UP OF UNIT COSTS AND RATES

ITEM	No.	Unit Purchase Price	Total Purchase Price	Unit Purchase Tariff	Unit Tariff (pcm)	Fixed 50% of (pcm)	Variable Rate Var tar'f		Fuel, Cost %	O,L Utilis'n Monthly
Construction equipment										
Tractors 60hp, 2x4	3	82000	246000		850	5104	2552		80	20924
Hydraulic 3m3 trailers	6	1	3000	78000		250	1000		70	5700
Towed 3000 l water bowser	1	25000	25000		119	7920			25	2099
Towed 7000 l water bowser	3	4000	12000		19	2640			60	4809
Towed 3000 l fuel bowser	1	28000	28000		134	12144			100	12278
1 tonne vibrating roller	1	20000	20000		1300	6160			50	4380
Tractor-drawn roller	1	15000	15000		150	100			50	200
Land Rover (3000k/mth)	1			0	.89c/km	2670	1335		80	3204
Bakkie (3000 k/mth)	1			0	.71c/km	2130	1065		80	2556
Land Cruiser (ILO Engineer)	1				1.28c/km	3840	1920		80	4608
ATV (4-wheeler)	1	10000	10000		200	800	400		60	920
			---						---	
	Sub-total		434000			Monthly s-total				61678

CAMP EQUIPMENT

Generator set 20kVA, 220V	1	17000	17000		103	1000	500	10	253
Radio telephone	1	3000	3000						
Office	1	22000	22000		87	45		100	132
Luxury caravans (2 berths)	3	45000	135000		328	35		100	1089
Standard caravans (2 berths)	2	30000	60000		218	35		100	506
Bunkhouse (4 berths)	1	32000	Available		233	35		100	268
Stores (4x8) Galv	2	8000	16000		46	32		100	156
Showers	2	1600	3200		9	11		100	40
Pit latrines	3	400	1200		8	11		100	57
			---						---	
	S-total		257400			Monthly s-total			2501	

Thus approx total for capital purchases = 691400 Rand

Approx cost per tractor day (including 1.5 trailers)= 375 Rand
Approx cost per roller day (vibrating) = 200 Rand
Approx cost per bowser day = 100 Rand

COST ESTIMATE FOR STAFF SALARIES, ALLOWANCES AND LABOUR WAGES

Post	Monthly salary	Bonus	Allowances	Pension	No	Monthly Cost
STAFF (including casual staff)						
Engineer	3170	265	500	500	1	4435
Technician	2100	175	400	400	1	3075
Site Clerk	850	-	-	-	1	850
Storekeeper	850	-	-	-	1	850
Mech/operator	1000	-	-	-	1	1000
Technical Assistant	850	-	-	-	6	5100
Driver	1000 (incl overtime)		-	-	5	5000
			TOTAL STAFF COSTS:			20310
SKILLED LABOUR						
Watchman	1000				2	2000
Senior Labourer	335				14	4690
Mason / Carpenter	400				1	400
			TOTAL SKILLED LABOUR COSTS:			7090
UNSKILLED LABOUR						
Labourer	220				250	55000
			TOTAL UNSKILLED LABOUR COSTS:			55000

THUS MONTHLY STAFF & LABOUR COSTS = 82400, initially made up of 7510 established staff plus 74890 casual staff and labour.

(Source: Department of Transport)

APPENDIX 3.: LABOUR BASED ROADWORKS IN OWAMBO: PILOT PROJECT PHASE II PROPOSED BUDGET

(Assumed Exchange Rates: US$1 = R3.18 = Sek7.74: 1995 Rates)

	ITEM		QUANTITY	AVERAGE INCLUSIVE RATE	AMOUNT RAND	EQUIVALENT AMOUNT SEK
A	**PREPARATORY**					
	1	Planning & Reporting Manual System	3 manweeks	R10,000	30,000	73,019
	2 #	Computerisation of Physical & Financial Planning & Reporting System	Lumpsum	R60,000	60,000	146,038
	3 #	Interim Technical Manual	5 manweeks	R10,000	50,000	121,698
	4 #	Administration & Management Manual	4 manweeks	R10,000	40,000	97,358
	5 #	Structures System, Design & Test	3 manweeks	R13,000	39,000	94,924
			4 manweeks	R 5,000	20,000	48,679
	6 #	Equipment Desigs & Specifications	9 manweeks	R13,000	117,000	284,773
	7 #	Initial Training & Training Programme*	6 manweeks	R15,000	90,000	219,056
	8	Interim Maintenance Recommendations	1 manweek	R13,000	13,000	31,641
	#	Initiatives with benefits outside Namibia		SUBTOTALS	459,000	1,117,188
B	**SITE WORKS**					
1	New Equipment					
	Tractor Hitches		6 no	R 3,000	1,800	4,381
	Hopper Trailers		4 no	R 50,000	200,000	486,792
	Ribbed Deadweight Roller		1 no	R 50,000	50,000	121,698
	Disc Harrow & Mouldboard		1 no	R 40,000	40,000	97,358
	Water Bowser		2 no	R 35,000	70,000	170,377
	Light Towed Grader (2 tonne)		1 no	R 40,000	40,000	97,358
	Heavy Towed Grader (4 tonne)		1 no	R125,000	125,000	304,245
	Wheelbarrow (new design)		100 no	R 200	20,000	48,679
	Miscellaneous Handtools		Lumpsum	R 25,000	25,000	60,849
	Initial stock of spares		Lumpsum	R 25,000	25,000	60,849
2	Local Labour (25 km @ 2,400md/km) (including junior supervision)		-	R 13	780,000	1,898,489
3	Local Supervisory & Permanent Employees		Estimate		700,000	1,703,772
4	Construction Costs (for 25 km)					
	Materials			R 22,500	562,500	1,369,103
	Equipment Hire Charges			R 12,500	312,500	760,613
	Transport			R 1,400	35,000	85,189
5	Camp Running Costs (for 25 km)			R 8,250	206,250	502,004
6	Consultancy (Design & Supervision) @ 16% of items 1-5		3,193,050		510,888	1,243,481
				SUBTOTALS	3,703,938	9,015,237
C	**REVIEW & WORKSHOP****		10 manweeks	R 13,500	135,000	328,585
				GRAND TOTAL	4,297,938	10,461,009

NOTES: Items A & C considered as an investment in future efficiency, if spread over 500 km, represents a cost of R1200 per km.

(Source: Department of Transport)

APPENDIX 4: DEPARTMENT OF TRANSPORT: PLANT HIRE RATES FOR LABOUR-BASED ROAD PROJECTS (December 1995)

	Plant & Equipment Type	Plant & Equipment Description	Normal Tariff		With fuel No Operator		With fuel & Operator		Total Cost Operator and fuel	Total Cost Fuel only No Operator
			Fixed Component	Running Component	Fixed Component	Running Component	Fixed Component	Running Component		
			N$ / Mth	N$ / hour	N$ / Mth	N$ / hour	N$ / Mth	N$ / hour	N$ / hour	N$ / hour
1	Tractor to 5 ton	John Deere	483.00	25.00	744.00	37.50	744.00	43.75	48.40	42.15
2	Tractor, 5-10t	Fiat, 4x4	1085.00	58.00	1670.00	87.00	1670.00	101.50	111.94	97.44
3		AGRICO, 2x4	1516.00	48.00	2333.00	72.00	2333.00	84.00	98.58	86.58
4	Truck	Water 10000L	253.00	1.73	390.00	1.73	390.00	2.16	4.60	4.17
5	Rollers	Drawn; Tamping	527.00	2.19	812.00	3.28	812.00	3.83	8.90	8.36
6	Rollers	Drawn; Vibrating	67.00	0.94	104.00	0.94	104.00	1.17	1.82	1.59
7	Implement	Harrow Rotating	27.00	0.94	43.00	1.41	43.00	1.64	1.91	1.68
8	Mixer	Concrete, 150-200L	187.00	9.75	288.00	14.63	288.00	14.63	16.43	16.43
9	Pump unit	Centrifugal 100mm	70.00	6.25	108.00	9.38	108.00	9.38	10.05	10.05
10	Pump unit	Centrifugal 50mm	117.00	7.81	180.00	11.72	180.00	11.72	12.84	12.84
11	Pump unit	Centrifugal 75mm	77.00	0.28	119.00	0.28	119.00	0.35	1.09	1.03
12	Trailers	Water, 3000-5000L	12.00	0.09	19.00	0.09	19.00	0.11	0.23	0.21
13	Trailers	Water, 700L	87.00	0.43	134.00	0.43	134.00	0.54	1.38	1.27
14	Trailers	Fuel, 3000-5000L	40.00	0.21	62.00	0.27	62.00	0.33	0.72	0.66
15	Trailers	Platform, 5 ton	39.00	0.75	60.00	0.75	60.00	0.94	1.31	1.13
16	Trailers	Tipping, $3m^3$	32.00	0.63	50.00	0.63	50.00	0.78	1.09	0.94
17	Trailers	Tools shed	539.00	0.22	539.00	0.33	539.00	0.38	3.75	3.69
18	Compactor	Twin drum	65.00	0.50	100.00	0.75	100.00	1.09	1.72	1.38
19	Compactor	4 Wheeler cycle								
20	Vehicles									

Note Conversions: Monthly rate / 20 = daily rate; Conversions: Daily rate / 8 = hourly rate

(Source: Department of Transport)

APPENDIX 5: EMPLOYMENT FORMS

(Source: Department of Transport)

5.1 Employment Agreement

REPUBLIC OF NAMIBIA

MINISTRY OF WORKS, TRANSPORT AND COMMUNICATION
DEPARTMENT OF TRANSPORT
LABOUR-BASED PROJECTS
EMPLOYMENT AGREEMENT

Mr/Mrs/Miss _____ ID Number _____

Village _____ Employment Number _____

You have been employed as an Occasional Worker on a Labour-Based project with effect from _____

The following are your conditions of Employment
Employment is temporary and may be terminated at any time.
The maximum employment period is three (3) months
You will be given one (1) week notice on termination of employment
You will be required to work on a task work basis
A task is equal to one days work
You will be paid only for tasks completed
Your wage is N$ _____ / task
You will not be paid for days not worked because of rain, ill health etc.
You will not be paid for public holidays
The cost of treatment for injuries sustained on duty will be covered
Wages not claimed on pay-day may only be claimed the following pay-day

_____ _____
Site Engineer Date

I accept this appointment and agree to the above conditions of employment.

_____ _____
Employee Date

5.2 Typical Payment Envelope

81/74115
E. 19A

19
No. ..... Mnr/Mr .....

	R	c			R	c	
Januarie January	.....	.....		Julie July	.....	.....	
Februarie February	.....	.....		Augustus August	.....	.....	
Maart March	.....	.....		September September	.....	.....	
April April	.....	.....		Oktober October	.....	.....	
Mei May	.....	.....		November November	.....	.....	
Junie June	.....	.....		Desember December	.....	.....	

Aangesien foute nie later reggemaak kan word nie, moet die inhoud van hierdie koevert noukeurig nagegaan word in die teenwoordigheid van die uitbetaalbeampte.

The contents of this envelope must be carefully examined in the presence of the Paying Officer, as errors cannot be rectified afterwards.

5.3 Typical copy of a warning letter

COMPANY LETTER HEAD AND ADDRESS

Tel: _____ P O Box _____

Fax: _____ City

Telex: _____ COUNTRY

Our Ref. _____ Your Ref. _____

LABOUR BASED PROJECT: CONSTRUCTION OR ROAD DR 3608.

LETTER OF WARNING

Date _____

To. _____ Employee Number _____

This letter is to warn you that your conduct has been unsatisfactory in the following way(s):

You have come to work late
You have not come to work regularly
You have been disobedient or insulting to your supervisor
You have been fighting
You have been drunk at work

If your performance/conduct does not improve you will be dismissed after two of these warning letters have been issued to you.

_____
Site Engineer

_____
Employee

5.4 Typical copy of a termination and testimonial letter

COMPANY LETTERHEAD AND ADDRESS

Tel: _____

Fax: _____

Telex: _____

..... Tel Our Ref.: Your Ref.:

Date _____19_____

LETTER OF TERMINATION AND TESTIMONIAL

To _____ Number _____

This letter is to inform you that your last day of work will be _____

The section of the Project you are working on no longer requires your services.

During your employment you have been reliable and hard working and this letter may be used as a testimonial for future employment.

Signed _____
Engineer

Received by _____ (Mark)

Original to Employee
Copy to Engineer
Copy to Personnel Office.

APPENDIX 6: LABOUR-BASED PROJECT REPORTING FORMS

(Source: Department of Transport)

6.1 DESCRIPTION OF STORE FORMS

1. SITE ISSUE/RECEIPT FORM FOR TOOLS

   This form is used when tools are issued to the casual labourers. When they return the tools, the tools are signed back. This is usually applies only for spades, mattocks, picks and shovels.

2. FUEL ISSUING FORM

   When fuel is received on site it is noted on this form. The every day use of diesel is also recorded on this form as is petrol and all other lubricants. Each item is recorded on a separate form and filed in separate files.

3. GOODS RECEIVING FORM - EXTERNAL

   All items delivered to site are noted on this form, whether it is a tractor or a bag of cement.

4. GOODS ISSUING FORM - EXTERNAL

   This form is completed when items are sent off-site e.g. when broken tools are sent to Windhoek. Everything that is sent off-site has to be noted on this form, including equipment that is sent away for repairs.

5. GOODS ISSUED FOR REPAIR

   All equipment that is sent off site for repairs is recorded on this form, where it is sent to, the person who is taking it and when it is returned.

6. ISSUE FORM FOR TOOLS AND EQUIPMENT (DAILY SHEET)

   This form is used for tools that are issued and returned daily e.g. Hammers, spirit levels, pliers etc.

7. REGISTER OF SPOILED TOOLS

   All tools that are damaged or worn out are recorded on this form.

8. SITE STORE STOCK CARD

This form is used for consumable items only e.g. washing powder, batteries, patches etc. Amount received, issued and the actual balances are kept up dated.

9. ISSUE / RECEIPT VOUCHER

Every item that is received on site or set off site is accompanied by this form.

10. EQUIPMENT AND TOOL RECORD

This form is completed for all non consumable items i.e. Tools and equipment on site. It is similar to the stock card where additions and reductions as well as stock on hand is shown.

11. PLANT USAGE – HOURLY TARIFF PLANT

This form is completed by the drivers every day for all the equipment in use on that day. This information is carried over to the plant return.

12. PLANT RETURN

This form is completed by the storeman. The information to complete this form is taken from the plant usage form. The plant return is completed on the 15th of every month and then sent to Heavy Plant and Equipment Division, DOT, Windhoek. The site is charged according to the plant return forms. Plant return forms are only completed for hourly tariff equipment.

13. PLANT RETURN FOR MONTHLY TARIFF ITEMS

Plant that are charged on a monthly basis e.g. Caravans, centrifugal pumps, stores etc., are completed on this form and together with the plant return for hourly terrified plant sent to Windhoek.

14. MATERIAL CONTROL

This form is used to control the consumable material that is sent to the field e.g. cement and reinforcement steel. The quantity received, used and the balance is completed by the supervisor and checked by the storeman.

15. TOOLS LOST – AMOUNT TO BE RECOVERED

This form is completed by the storeman. It is used to control the amount of money that has to be deducted for tools lost.

All the above forms are completed by the storeman, except if indicated otherwise.

6.2 DESCRIPTION OF ADMINISTRATION FORMS

1. LETTER OF EMPLOYMENT

On employment each labourer receives this letter of employment which also lists the conditions of employment.

2. LETTER OF TERMINATION

Each labourer is supplied which such a letter as soon as his employment is terminated. This letter also serves as a testimonial.

3. LETTER OF WARNING

When a labourer's conduct is not satisfactory, he may receive a warning letter. When a labourer receives a third warning letter his services may be terminated.

4. NOTICE OF TERMINATION

A week prior to the lay off date of the labourers, each of them receives a note saying that their services will be terminated on a given date.

5. ATTENDANCE REGISTER

An attendance register is kept in the office which contains information that is collected from the field attendance register. The pay roll is compiled from this register.

6. PAY ROLL

A pay roll is compiled from the attendance register, containing the following information: wage rate per day, amount of days worked, deductions, arrears and the total amount to pay. The labourer signs this form after he/she received his/her money.

7. ESTIMATION

At the beginning of every month a wage estimation is made, which is required to request money for wages from DOT. The money is needed to pay the labourers at the end of the month.

8. WAGES SUMMARY

After all the labourers have been paid a wages summary is made indicating the amount of money that has been over estimated as well as any unclaimed wages. This money left over is then paid back to Treasury.

9. TOOLS LOST – AMOUNT RECOVERED

Used in conjunction with the tools lost – amount to be recovered form to control the money that has to be deducted for lost tools. This is completed by site administrator.

10. MONTHLY EXPENDITURE

At the end of every month the payments made by DOT on behalf of the project for goods ordered are received from Tsumeb. A summary is made which indicates the Vote No, descriptions of items purchased and the amount spent under each Vote No. is stated. The total amount spent is recorded monthly in the Site Minutes. This form is completed by the site administrator.

6.3 DESCRIPTION OF FIELD FORMS

1. CALCULATION FORM

The road builders do their daily planning on this form. The planned production and labour is taken from these calculations and carried forward to the task control from under planned output and number of labourers.

2. TASK CONTROL

The task control form is completed by the road builders and the assistant road builders on a daily basis. The activity and task as well as the names of the labourers involved in the task and their starting and completion time is noted on this form. The output for the day and the actual mandays used is also recorded on this form. Should there be a variance it is also noted as well as the reason for this variance e.g. loading was not completed because a trailer broke.

3. DETAIL PLANNING FORM – TASK LEVEL

This form is completed by the senior road builder with information taken from the calculation and task control forms. It contains planned and actual number of labourers as well as planned and actual output. It is completed weekly.

4. WEEKLY ACTIVITY SUMMARY

This form is completed weekly by the senior road builder with information from the detail planning form. Actual mandays and output is shown as previous, this week and cumulative total. The actual rate achieved as well as the length completed is shown.

5. MONTHLY PROJECT REPORT

This form is attached to the monthly construction report compiled from information from weekly activity summary. It is completed by site engineer/technician.

6. FIELD ATTENDANCE REGISTER

The field attendance register is compiled by the road builders with information taken from the task control forms. The field attendance register is compiled weekly with information taken from the task control forms.