Appendix 8–2

SOIL BORING LOG RECORDS

BORING LOG RECORD

Location : Jct. ALFONSO to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 1 Boring No. 1

Date : November 27, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Subgrade Sample

Sand

Silt

Clay

Organic Soil

* Sample No.	Depth from surface in Cm.		Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
		5		Brown gravelly silty sand	Gravel surface
	10				
	20				
	30	40		Brown sandy silt	Subgrade
	40				
1	50				
	60				
	70	50		Gray brown silty sand	
	80				
	90				
				End of Auger	
	100				
	110				
	120				
	130				

Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : Jct. ALFONSO to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 1 Boring No. 2

Date : November 27, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand

Silt

Clay

Organic Soil

Subgrade Sample

Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10		Gray brown gravel sand and cobbles	Gravel surface
	20	25		
	30			
	40			
	50		Brown clayey silt	Subgrade
	60	65		
2	70			
	80			
	90			
	100	10	Dark brown silty clay	
	110		End of Auger	
	120			
	130			

Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : Jct. ALFONSO to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 1 Boring No. 3

Date : November 27, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	5		Silty gravel and sand	Gravel surface
	10			
	20			
	30			
3	40	70	Brown silty sand	Subgrade
	50			
	60			
	70			
	80			
	90	20	Wet , Brown sand silt and clay	
	100			
	110			
	120			
	130			

Submitted by :

(Soil Engineer)

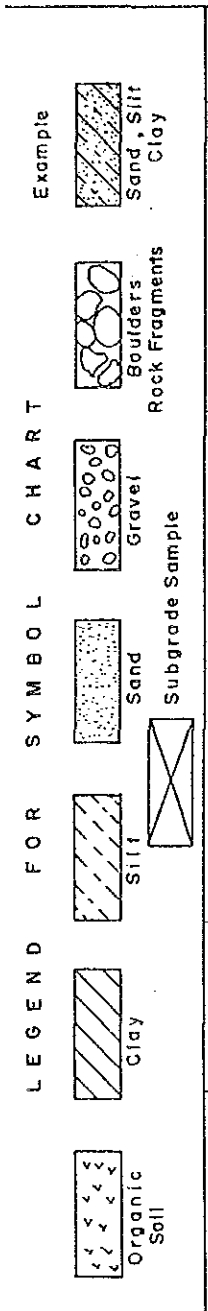
Sheet No. 4 of 8

BORING LOG RECORD

Location : Jct. ALFONSO to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 1 Boring No. 4

Date : November 27, 1989 Water Table : Did not noticed



Sample No. *	Depth from surface in Cm.		Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10	20		Gray gravelly sand with some cobbles and boulders	Gravel surface
	20				
	30				
	40				
4	50	60		Brown silty clay	Subgrade
	60				
	70				
	80				
	90	20		Light brown and wet silty clay	
	100			End of Auger	
	110				
	120				
	130				

Submitted by :

(Soil Engineer)

Sheet No. 5 of 8

BORING LOG RECORD

Location : Jct. ALFONSO to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 1 Boring No. 5

Date : November 27, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example — Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand — Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.		Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10	15		Gray gravel and sand with some cobbles	Gravel surface
	20				
	30	30		Brown sandy clay silt	Subgrade
	40				
	50				
	60				
5	70	50		Brown silty sand	
	80				
	90				
	100				
	110				
	120				
	130				

Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : Jct. ALFONSO to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 1 Boring No. 6

Date : November 27, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 – 20 (20)		Gray gravel and sand with some cobbles	Gravel surface
6	20 – 130 (85)		Dark clayey silt	Subgrade
			End of Auger	

Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : Jct. ALFONSO to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 1 Boring No. 7

Date : November 27, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand

Silt

Clay

Organic Soil

Subgrade Sample

* Sample No.	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 (10)		Gray gravel and sand with some cobbles	Gravel surface
	20, 30, 40 (35)		Gray clayey silt	Subgrade
7	50, 60, 70, 80 (60)		Dark brown clayey silt	
	90, 100, 110, 120, 130		End of Auger	

Submitted by :

(Soil Engineer)

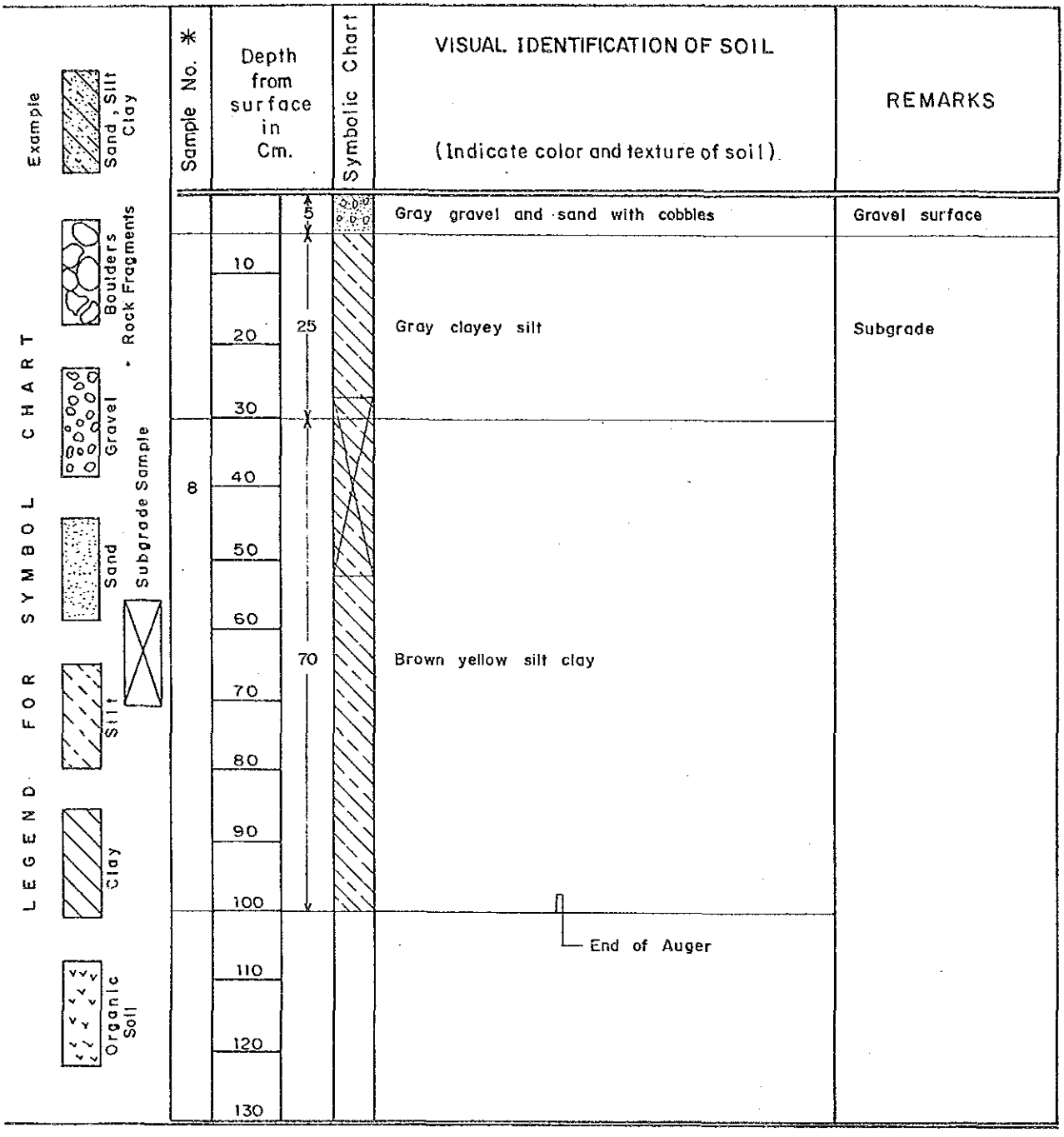
Sheet No. 8 of 8

BORING LOG RECORD

Location : Jct. ALFONSO to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 1 Boring No. 8

Date : November 27, 1989 Water Table : Did not noticed



Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : MARAGONDON to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 2 Boring No. 1

Date : November 25, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example — Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10	17	Silty gravel and sand	Gravel surface
	20			
	30	23	Sandy silt (dark brown)	Subgrade
	40			
1	50			
	60			
	70			
	80	65	Light brown silty clay	
	90			
	100			
	110		End of Auger	
	120			
	130			

Submitted by :

(Soil Engineer)

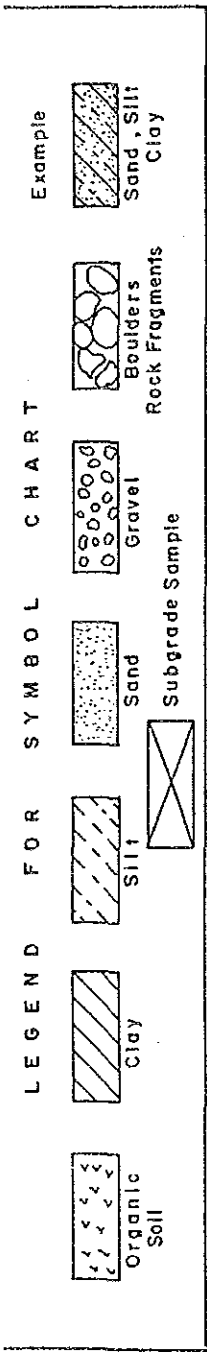
Sheet No. 2 of 8

BORING LOG RECORD

Location : MARAGONDON to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 2 Boring No. 2

Date : November 25, 1989 Water Table : Did not noticed



Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 (10)		Gravelly sand and silt with some cobbles	Gravel surface
	20, 30, 40 (30)		Yellowish brown sand, silt with some gravel	Subgrade
2	50, 60, 70, 80, 90, 100 (60)		*Dark gray silty sand*	
	110, 120, 130		End of Auger	

Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : MARAGONDON to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 2 Boring No. 3

Date : November 25, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.		Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10	20		Brown gravel sand and some silt	Gravel surface
	20				
	30	25		Sandy silt (grayish brown)	Subgrade
	40				
3	50				
	60				
	70	55		Silty clay (yellowish brown) with some sand	
	80				
	90				
	100				
	110			End of Auger	
	120				
	130				

Submitted by :

(Soil Engineer)

Sheet No. 4 of 8

BORING LOG RECORD

Location : MARAGONDON to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 2 Boring No. 4

Date : November 25, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example — Sand, Silt Clay

Boulders Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.		Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10	20		Gravel sand with silt	Gravel surface
	20				
	30	30		Light brown silt	Subgrade
	40				
	50				
4	60	55		Grayish brown silty clay	
	70				
	80				
	90				
	100				
	110			End of Auger	
	120				
	130				

Submitted by :

(Soil Engineer)

Sheet No. 5 of 8

BORING LOG RECORD

Location : MARAGONDON to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 2 Boring No. 5

Date : November 27, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example — Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 – 20 (20)		Gravel sand and silt with some cobbles	Gravel surface
	30 – 50 (30)		Light brown silty sand with some cobbles	Subgrade
5	60 – 100 (55)		Dark brown silty clay	
	110 – 130		End of Auger	

Submitted by :

(Soil Engineer)

Sheet No. 6 of 8

BORING LOG RECORD

Location : MARAGONDONG to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 2 Boring No. 6

Date : November 27, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example — Sand, Silt Clay

Boulders Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 – 20 (20)		Gravel sand and silt	Gravel surface
6	20 – 30 – 40 – 50 – 60 – 70 – 80 – 90 – 100 (85)		Dark gray silty clay	Subgrade
	110 – 120 – 130		End of Auger	

Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : MARAGONDON to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 2 Boring No. 7

Date : November 27, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example — Sand, Silt Clay

Boulders Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 – 20 (20)		Gray brown natural gravel, sand and cobbles	Gravel surface
7	20 – 110 (90)		A mixture of brown sand, silt and clay	Subgrade
			End of Auger Sign of water table	
	120 130			

Submitted by :

(Soil Engineer)

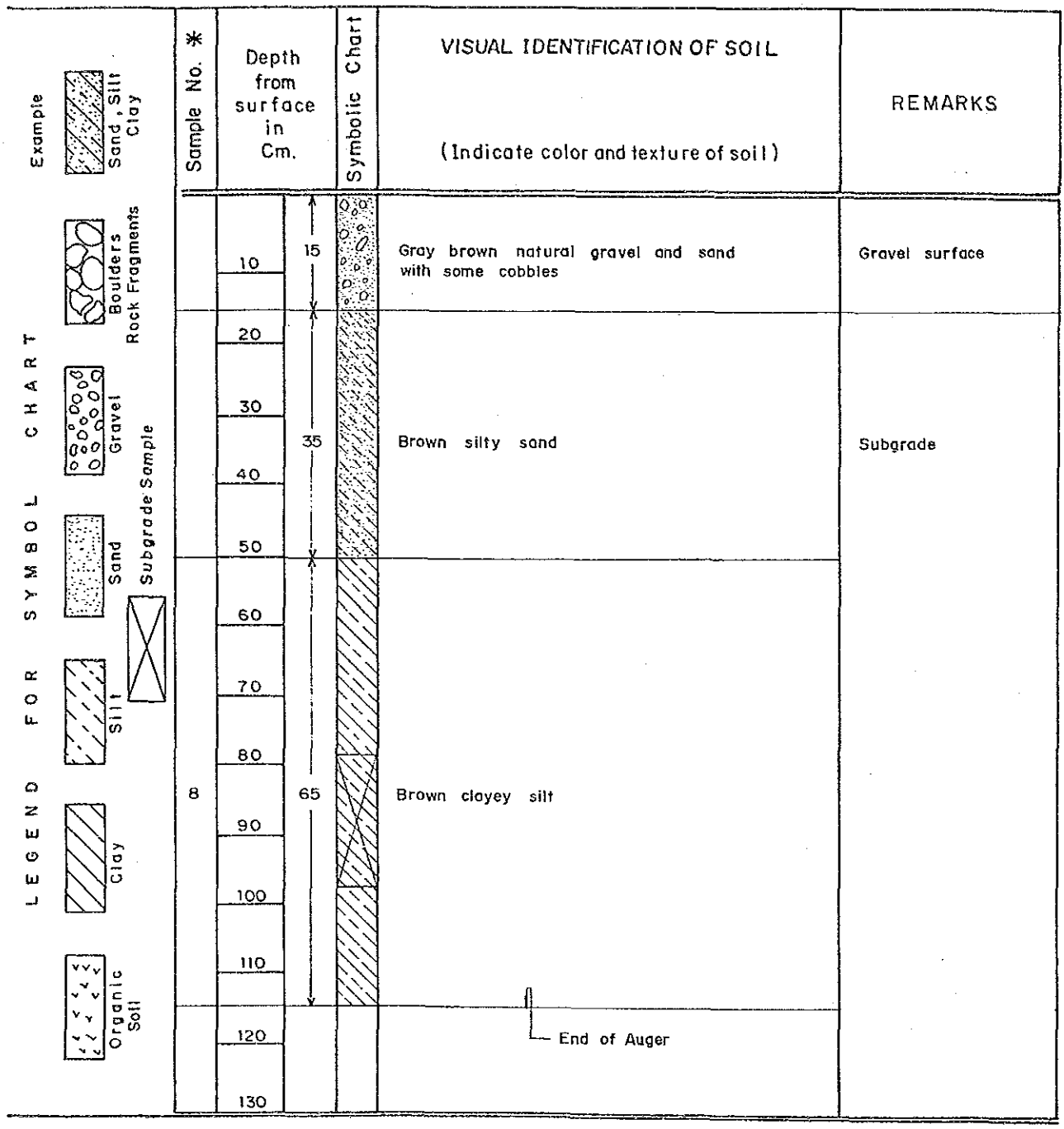
Sheet No. 8 of 8

BORING LOG RECORD

Location : MARAGONDON to MAGALLANES

Road Classification : Provincial Experimental Pavement Section No. 2 Boring No. 8

Date : November 27, 1989 Water Table : Did not noticed



Submitted by :

(Soil Engineer)

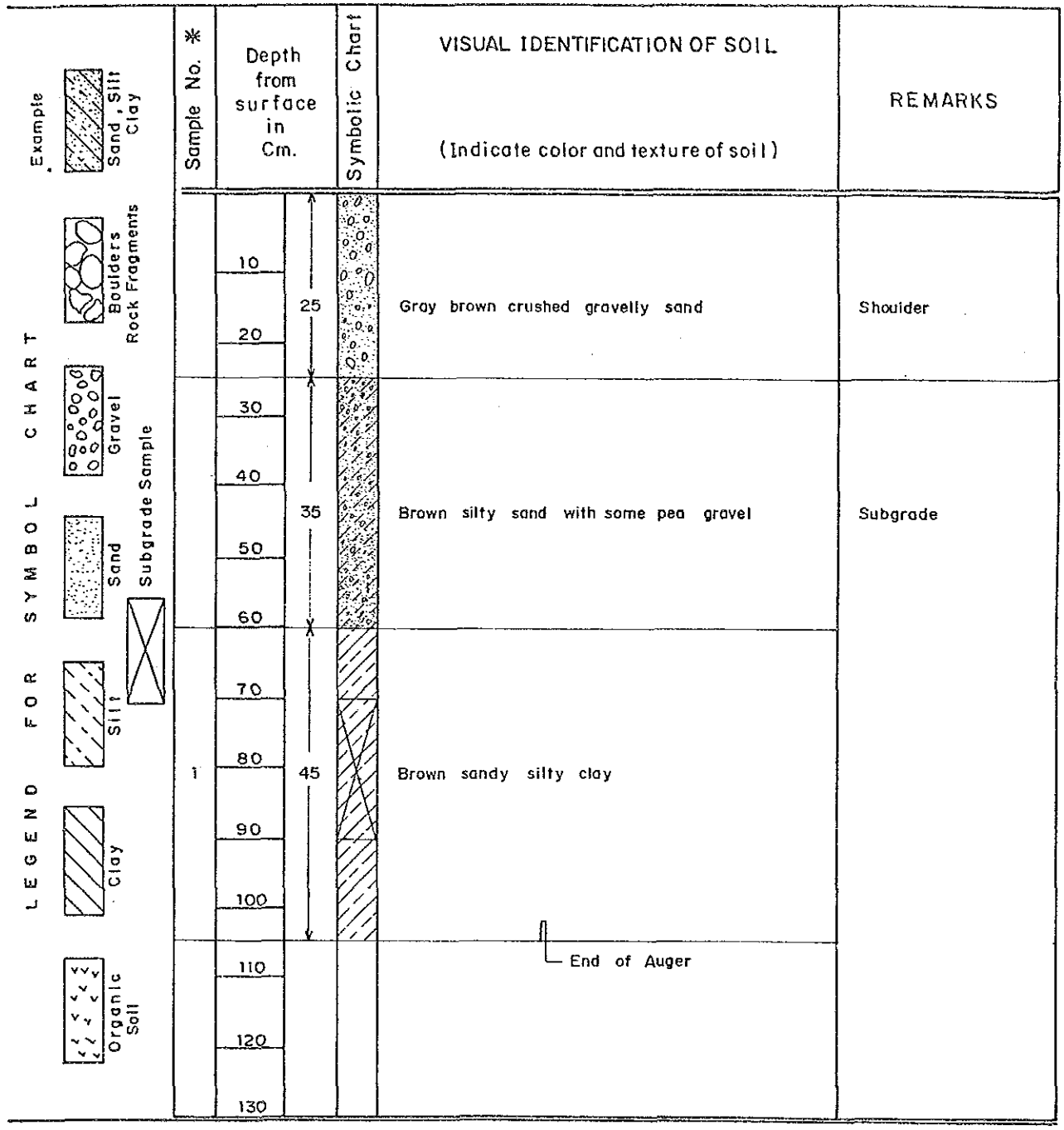
Sheet No. 1 of 8

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 3 Boring No. 1

Date : November 23, 1989 Water Table : Did not noticed



Submitted by :

(Soil Engineer)

Sheet No. 2 of 8

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 3 Boring No. 2

Date : November 23, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt, Clay

Boulders, Rock Fragments

Gravel

Sand

Silt

Clay

Organic Soil

Subgrade Sample

Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 – 20 (25)		Brown crushed gravelly sand	Shoulder
	30 – 40 (20)		*Brown clayey silty sand with some pea gravel*	Subgrade
2	50 – 60 – 70 – 80 – 90 – 100 (55)		Brown silty sand	
	110 – 120 – 130		End of Auger	

Submitted by :

(Soil Engineer)

Sheet No. 3 of 8

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 3 Boring No. 3

Date : November 23, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt, Clay

Boulders, Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 – 20 – 30 (30)		Brown crushed gravelly sand	Shoulder
	40 – 50 (20)		Brown silty sand with some pea gravel	Subgrade
3	60 – 70 – 80 – 90 – 100 (50)		Brown silty sand	
			End of Auger	
	110 – 120 – 130			

Submitted by :

(Soil Engineer)

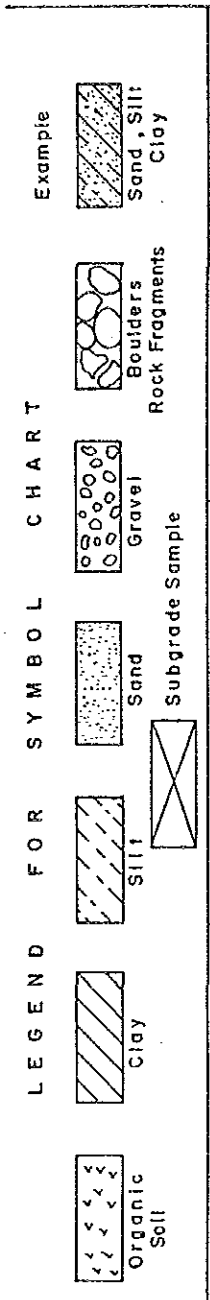
Sheet No. 4 of 8

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 3 Boring No. 4

Date : November 23, 1989 Water Table : Did not noticed



Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 / 20 / 30 (30)		Brown gravelly sand	Shoulder
	40 / 50 (20)		Brown silty sand with some pea gravel	Subgrade
4	60 / 70 / 80 (30)		Brown sandy silt	
	90 / 100 / 110		Brown sandy clayey silt	
	120 / 130		End of Auger	

Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 3 Boring No. 5

Date : November 23, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand

Silt

Clay

Organic Soil

Subgrade Sample

Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10, 20, 30 (30)		Brown crushed gravelly sand	Shoulder
5	40, 50, 60, 70 (40)		Brown clayey silt	Subgrade
	80, 90, 100 (30)		Brown silty clay	
	110, 120, 130		End of Auger	

Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 3 Boring No. 6

Date : November 23, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 – 20 (22)		Gray brown crushed gravelly sand	Shoulder
6	30 – 60 (38)		Brown silty clay	Subgrade
	70 – 110 (50)		Yellowish brown clay	Soil very wet may be sign of water table elevation.
	120 – 130		End of Auger	

Submitted by :

(Soil Engineer)

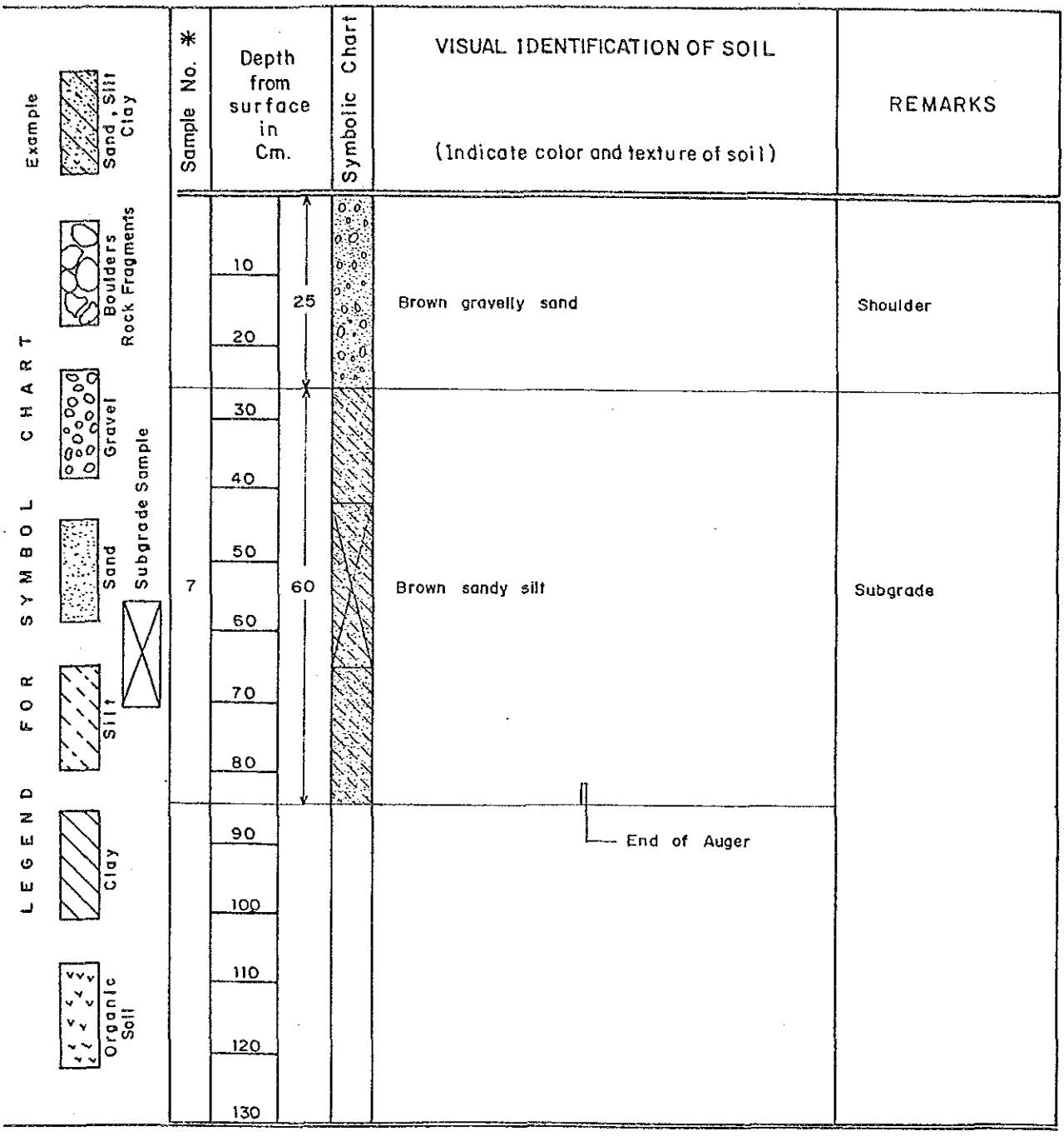
Sheet No. 7 of 8

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 3 Boring No. 7

Date : November 23, 1989 Water Table : Did not noticed



Submitted by :

(Soil Engineer)

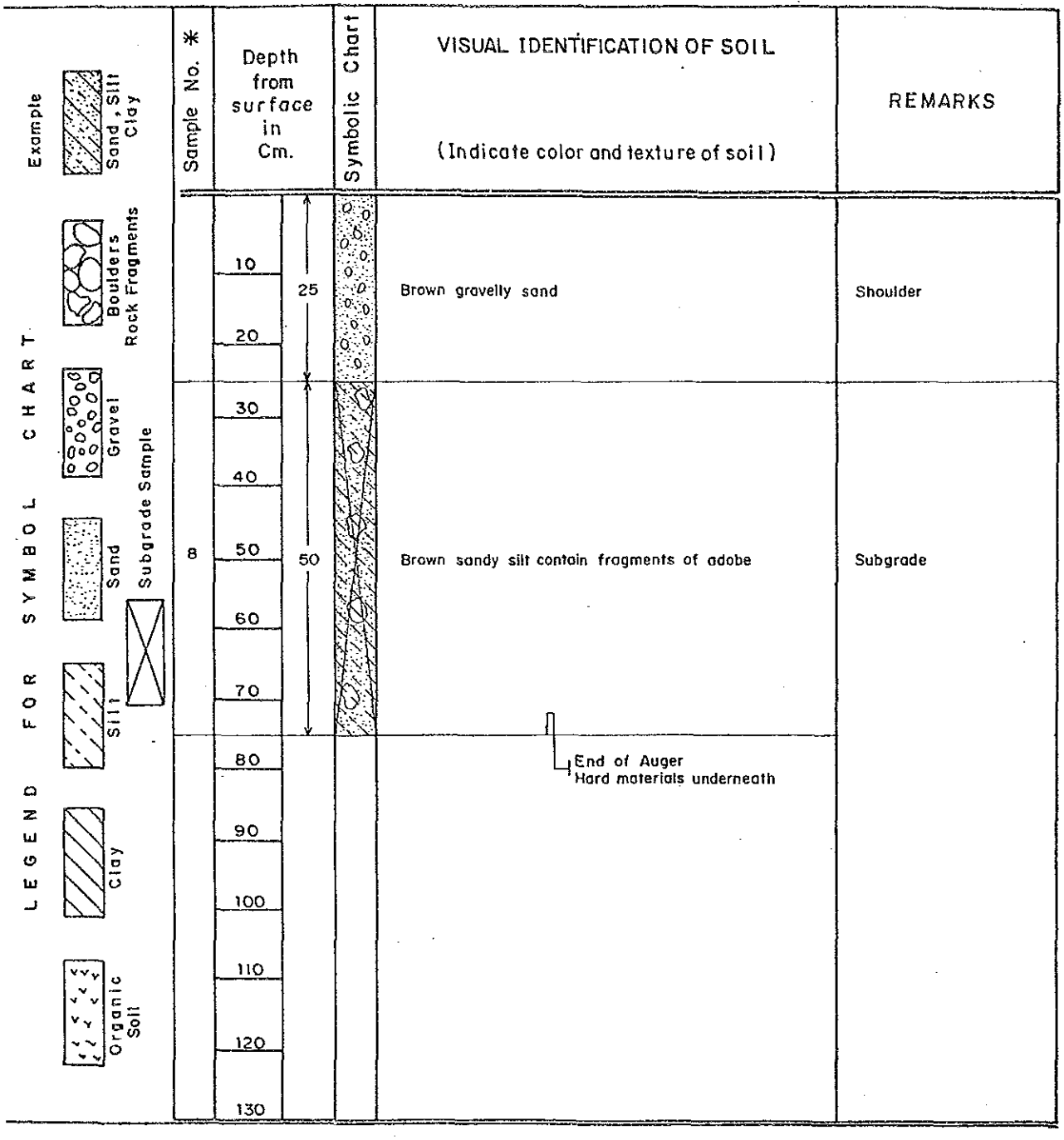
Sheet No. 8 of 8

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 3 Boring No. 8

Date : November 23, 1989 Water Table : Did not noticed



Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 4 Boring No. 1

Date : November 21, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.		Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10	20		Gray crushed gravel with sand	Shoulder
	20				
	30				
	40	30		Gray brown pea gravel and sand	Subbase
	50				
1	60				
	70	30		Brown sandy silty clay	Subgrade
	80				
	90				
	100	20		Gray silty clay	
	110			End of Auger	
	120				
	130				

Submitted by :

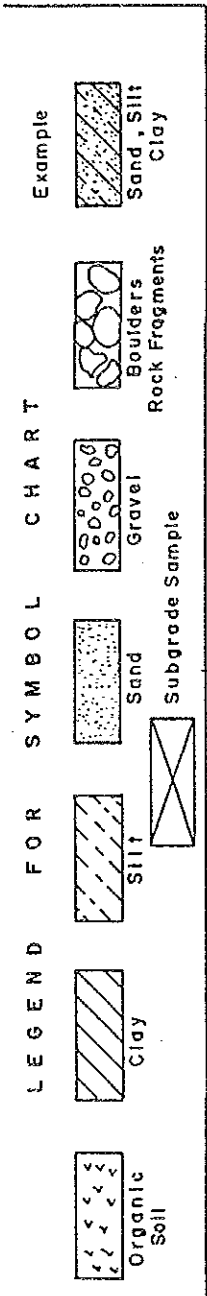
(Soil Engineer)

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 4 Boring No. 2

Date : November 21, 1989 Water Table : Did not noticed



Sample No. *	Depth from surface in Cm.		Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
1	10	12		Gray brown crushed gravel and sand (max. size 40 mm)	According to some residents in the area, during rainy season water at the ricefield rise about 40 cm.
2	20 30 40 50	38		Brown clayey silt and sand	
3	60 70 80 90	40		Gray brown sandy silty clay	
				End of Auger	
	100 110 120 130				

Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 4 Boring No. 3

Date : November 21, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand

Silt

Clay

Organic Soil

Subgrade Sample

Sample No. *	Depth from surface in Cm.		Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10	12		Gray brown gravelly sand	Shoulder
	20	16		Brown silty sand with some gravel	Subgrade
3	30				
	40	32		Yellow brown clayey silt	
	50				
	60				
	70				
	80	40		Gray brown silty clay	
	90				
	100				
	110			End of Auger	
	120				
	130				

Submitted by :

(Soil Engineer)

Sheet No. 4 of 8

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 4 Boring No. 4

Date : November 23, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example — Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand — Subgrade Sample

Silt

Clay

Organic Soil

* Sample No.	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 / 20 / 30 / 40 (40)		Gray brown crushed gravelly sand	Shoulder
4	50 / 60 / 70 (35)		Brown silty clay	Subgrade
	80 / 90 / 100 (25)		Gray clay	
	110 / 120 / 130		(Soil is getting wet) End of Auger	

Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 4 Boring No. 5

Date : November 23, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

* Sample No.	Depth from surface in Cm.		Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10	20		Gray brown gravelly sand	Shoulder
	20				
	30	28		Brown silty sand with some pea gravel	Subgrade
	40				
5	50	28		Brown clayey silt	
	60				
	70				
	80	24		Yellowish brown clay	
	90				
	100			End of Auger	
	110				
	120				
	130				

Submitted by :

(Soil Engineer)

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 4 Boring No. 6

Date : November 23, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt Clay

Boulders, Rock Fragments

Gravel

Sand

Subgrade Sample

Silt

Clay

Organic Soil

Sample No. *	Depth from surface in Cm.		Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10				
		25		Gray brown gravelly sand	Shoulder
	20				
	30				
		15		Brown sandy silt and some gravel	Subgrade
	40				
6	50				
		25		A mixture of brown sand silt and clay	
	60				
	70				
		35		Yellowish brown clay (Soil very soft)	
	80				
	90				
	100				
				End of Auger	
	110				
	120				
	130				

Submitted by :

(Soil Engineer)

Sheet No. 7 of 8

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 4 Boring No. 7

Date : November 23, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt, Clay

Boulders, Rock Fragments

Gravel

Sand

Silt

Clay

Organic Soil

Subgrade Sample

* Sample No.	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 – 20 (25)		Brown sandy silt with gravel	Shoulder
	30 – 70 (45)		Brown silty sand	Subgrade
7	80 – 110 (40)		Brown clayey silt	
	120 – 130			

Submitted by :

(Soil Engineer)

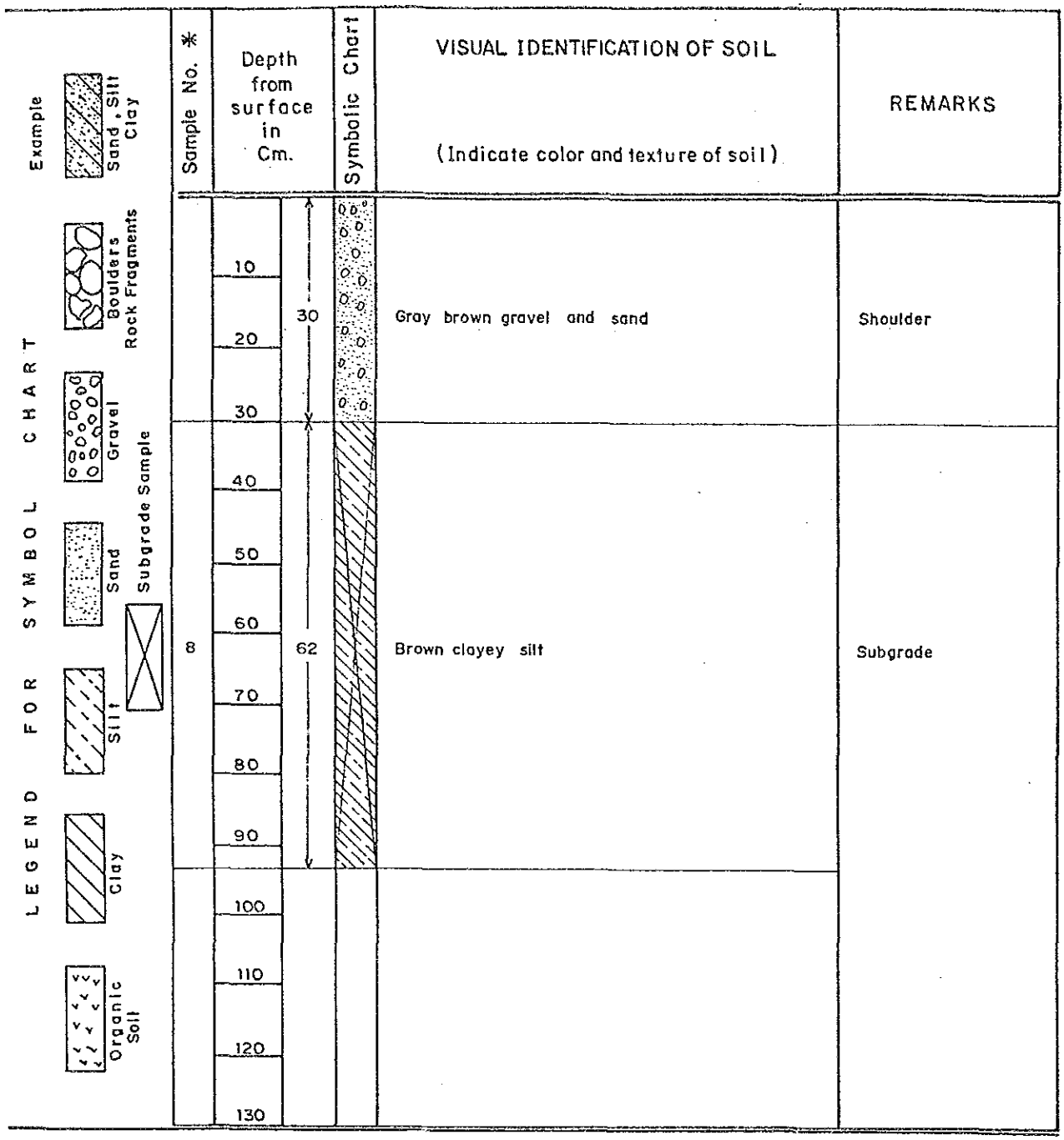
Sheet No. 8 of 8

BORING LOG RECORD

Location : GEN. TRIAS to AMADEO

Road Classification : Provincial Experimental Pavement Section No. 4 Boring No. 8

Date : November 23, 1989 Water Table : Did not noticed



Submitted by :

(Soil Engineer)

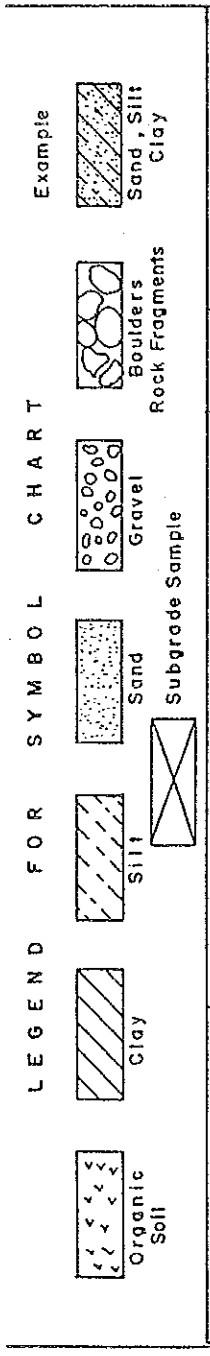
Sheet No. 1 of 4

BORING LOG RECORD

Location : TRECE MARTIRES to GEN. M. ALVARES

Road Classification : National Experimental Pavement Section No. 5 Boring No. 1

Date : November 24, 1989 Water Table : Did not noticed



Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	8		Asphalt Concrete	Surface
	10 – 20 (12)		Gray brown crushed gravel with a mixture of silty sand	Base
1	20 – 90 (70)		A mixture of brown sandy silty clay	Subgrade
	90		End of Auger	
	100 – 130			

Submitted by :

(Soil Engineer)

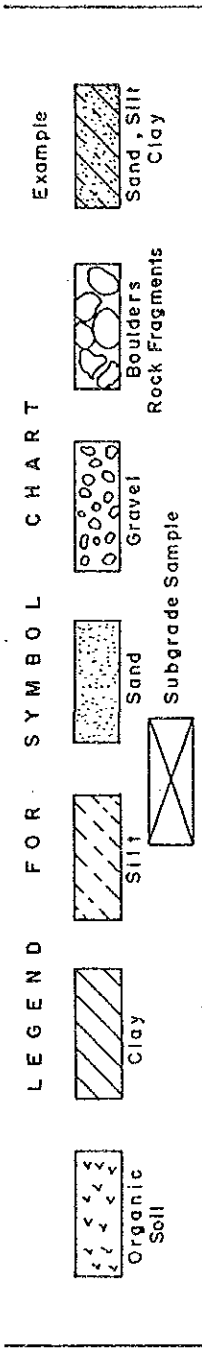
Sheet No. 2 of 4

BORING LOG RECORD

Location : TRECE MARTIRES to GEN. M. ALVARES

Road Classification : National Experimental Pavement Section No. 5 Boring No. 2

Date : November 24, 1989 Water Table : Did not noticed



Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 (10)		Asphalt Concrete	Surface
	20 (12)		Brown crushed gravel and sand	Base
	30 (15)		Brown pea gravel and sandy silt	Subbase
2	40 / 50 / 60 / 70 / 80 / 90 (53)		A mixture of brown sand, silt and clay	Subgrade
			End of Auger	
	100 / 110 / 120 / 130			

Submitted by :

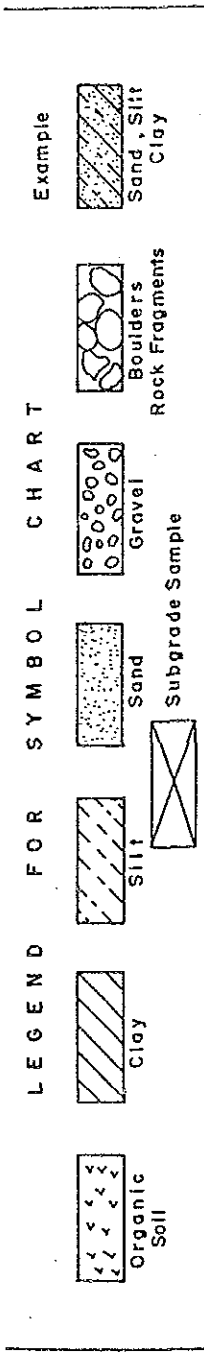
(Soil Engineer)

BORING LOG RECORD

Location : TRECE MARTIRES to GEN. M. ALVARES

Road Classification : National Experimental Pavement Section No. 5 Boring No. 3

Date : November 24, 1989 Water Table : Did not noticed



Sample No. *	Depth from surface in Cm.		Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10	12		Asphalt Concrete Overlaid	Surface
	20	10		Brown crushed gravel and sand	Base
	30	18		Brown sandy silt and pea gravel	Subbase
	40				
	50				
	60				
3	70	50		Brown clayey silt	Subgrade
	80				
	90				
	100	10		Grey clay	
	110			End of Auger	
	120				
	130				

Submitted by :

(Soil Engineer)

Sheet No. 4 of 4

BORING LOG RECORD

Location : TRECE MARTIRES to GEN. M. ALVARES

Road Classification : National Experimental Pavement Section No. 5 Boring No. 4

Date : November 24, 1989 Water Table : Did not noticed

LEGEND FOR SYMBOL CHART

Example: Sand, Silt, Clay

Boulders, Rock Fragments

Gravel

Sand

Silt

Clay

Organic Soil

Subgrade Sample

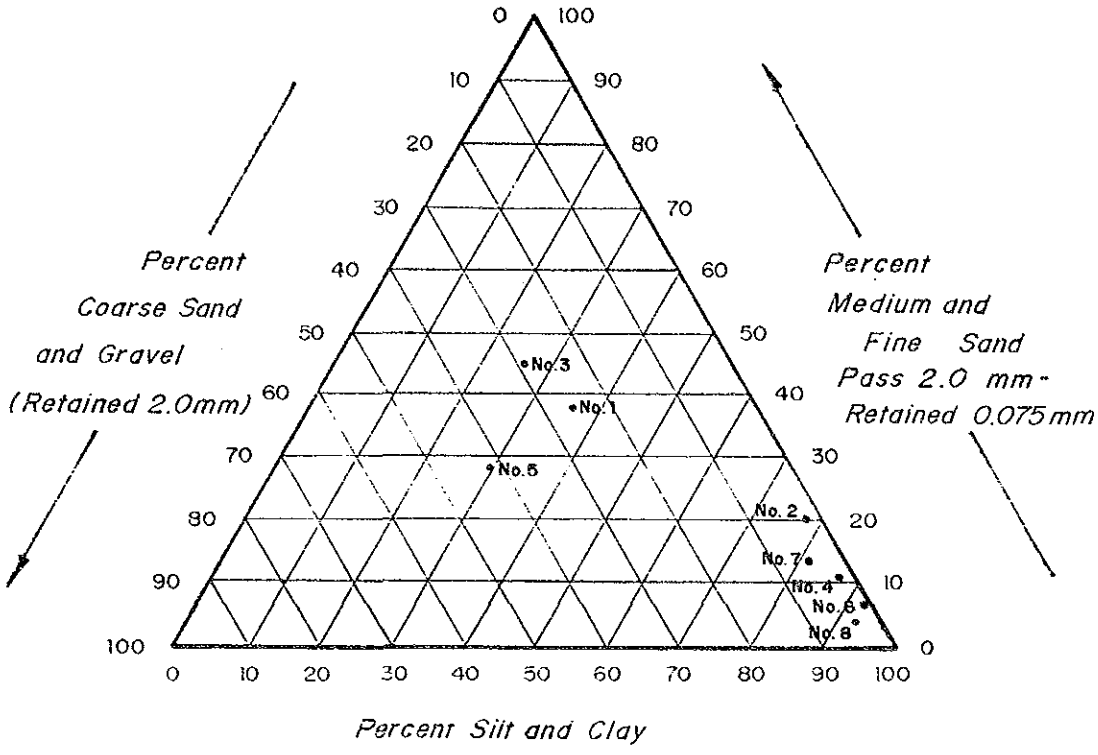
Sample No. *	Depth from surface in Cm.	Symbolic Chart	VISUAL IDENTIFICATION OF SOIL (Indicate color and texture of soil)	REMARKS
	10 (15)		Asphalt Concrete Overlaid	Surface
	20 (10)		Brown crushed gravelly sand	Base
4	30, 40, 50, 60 (70)		Brown clayey silt	Subgrade
	70, 80, 90, 100, 110, 120, 130		End of Auger	

Submitted by :

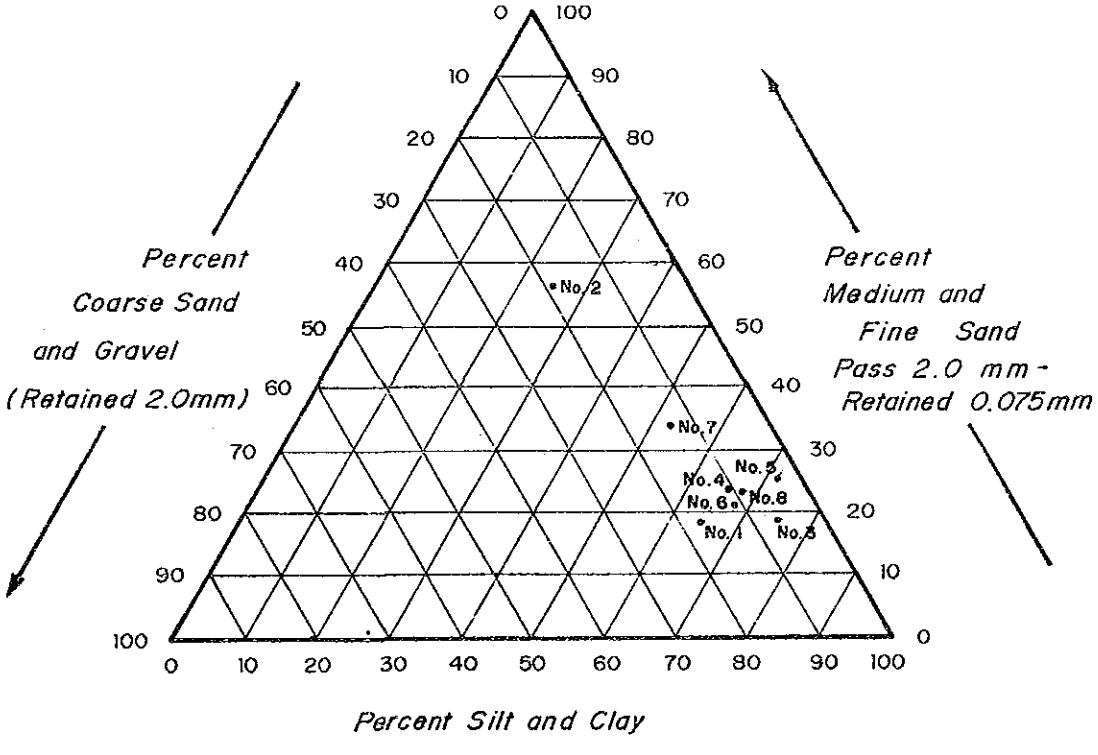
(Soil Engineer)

Appendix 8–3

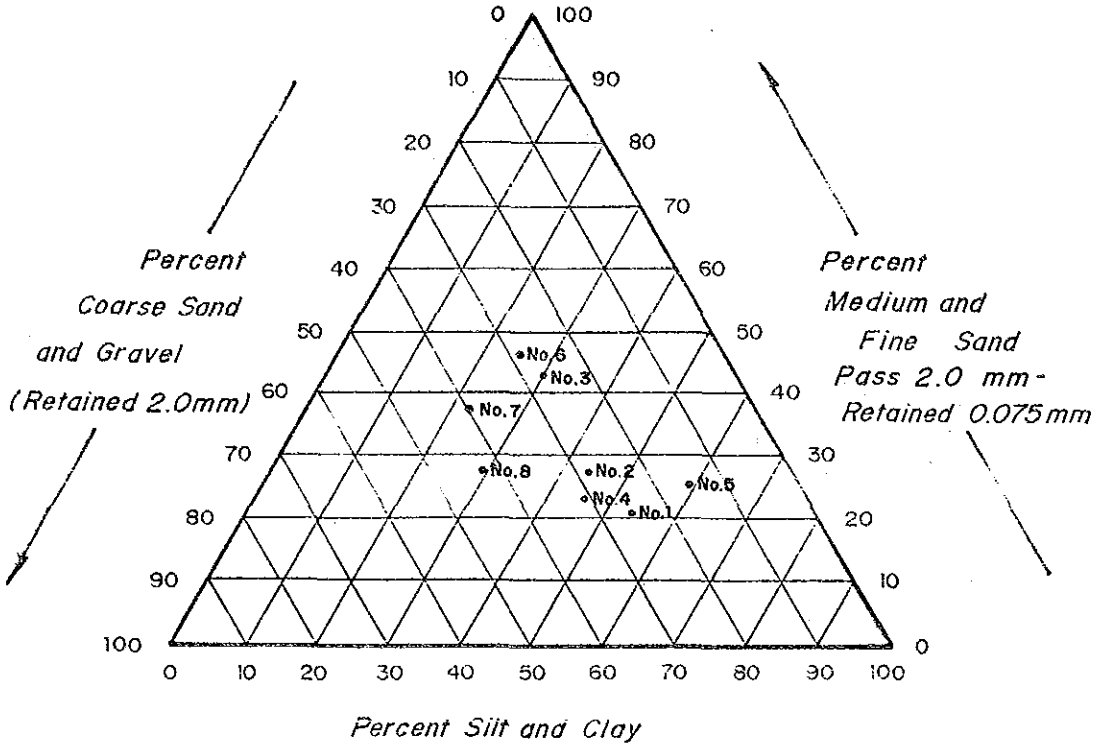
SOIL SIEVE ANALYSIS RESULTS BY TRIANGULAR GRADATION CHARTS



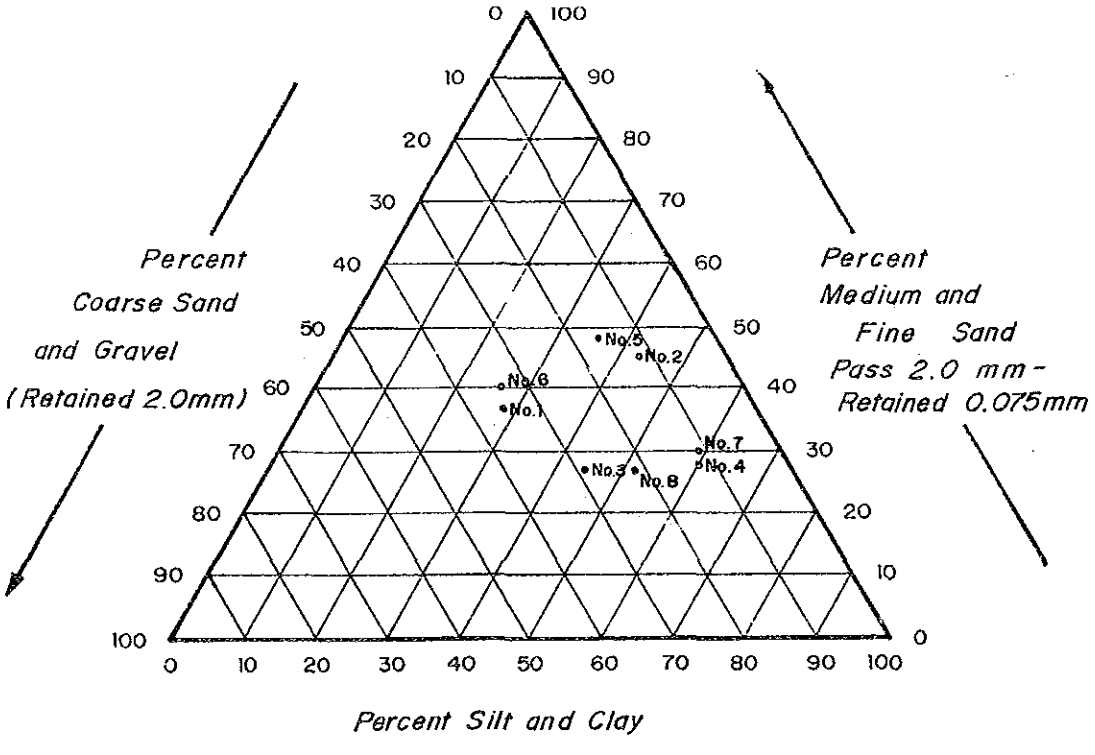
TRIANGULAR GRADATION CHART
EPC Section No. 1



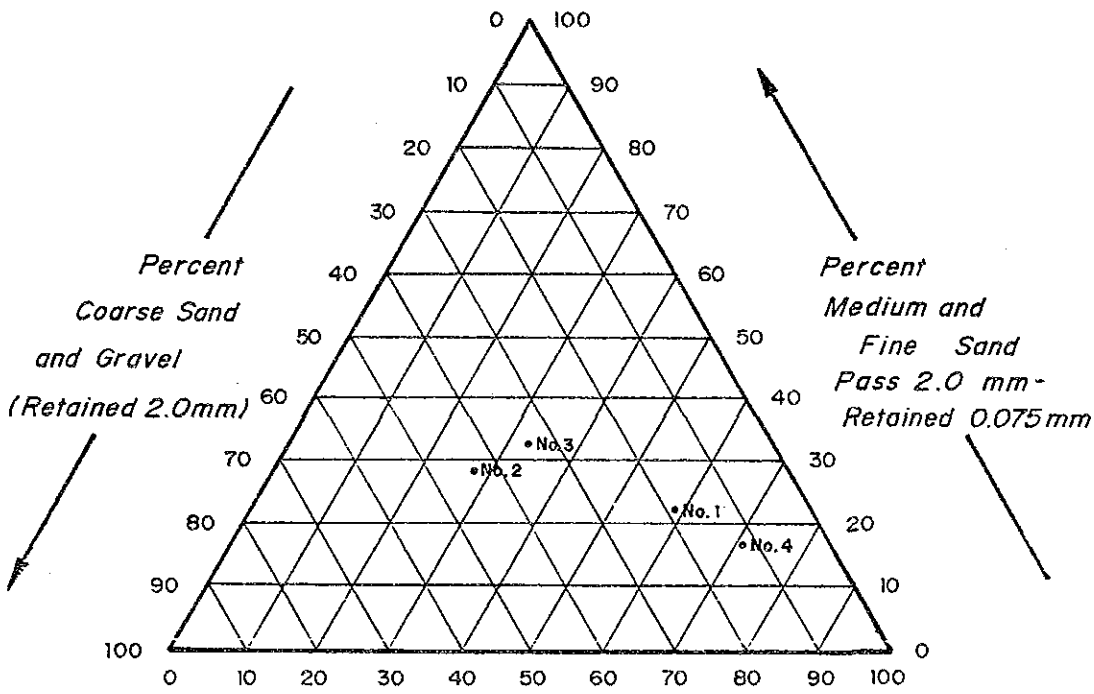
TRIANGULAR GRADATION CHART
EPC Section No. 2



TRIANGULAR GRADATION CHART
EPC Section No. 3



TRIANGULAR GRADATION CHART
EPC Section No. 4



TRIANGULAR GRADATION CHART

EPC Section No. 5

Appendix 8–4

TEST RESULTS OF PAVEMENT MATERIALS

Table 8.4-1 Base Course Aggregate

Materials : Blended Crushed Aggregate
Source : Puray Quarry, Montalban, Rizal
Proposed Use : Base Course

Test Items		Test Results	Specification Item 202
Sieve Analysis (% Passing)			
Sieve Size			
37.5 mm	%	100	100
25.0 mm	%	75	-
19.0 mm	%	62	60-85
12.5 mm	%	54	-
9.5 mm	%	49	-
4.75 mm	%	40	30-55
2.00 mm	%	31	-
0.425 mm	%	13	8-25
0.075 mm	%	7	2-14
Liquid Limit		NP	<25
Plasticity Index		NP	< 6
Moisture Density Relation (AASHTO T-180 C)			
Maximum Dry Density	kg/m^3	2368	
Optimum Moisture Content	%	5.8	
California Bearing Ratio (At MDD)	%	131	>80
Swell	%	0	

Remarks : Sample meets Specification Requirements

Table 8.4-2 Subbase Course Aggregate

Materials : River-run Sandy Gravel
Source : Mamba Quarry, Cavite Mamba River
Proposed Use : Subbase Course

Test Items		Test Results	Specification Item 200
Sieve Analysis (% Passing)			
Sieve Size			
50.0 mm	%	100	100
37.5 mm	%	94	-
25.0 mm	%	75	55-85
19.0 mm	%	66	-
12.5 mm	%	57	-
9.5 mm	%	52	40-75
4.75 mm	%	43	
2.00 mm	%	33	-
0.425 mm	%	14	
0.075 mm	%	7	0-12
Liquid Limit		NP	<35
Plasticity Index		NP	<12
Moisture Density Relation (AASHTO T-180 C)			
Maximum Dry Density	kg/m^3	1963	
Optimum Moisture Content	%	10.2	
California Bearing Ratio (At MDD)	%	109	>25
Swell	%	0.07	

Remarks : Sample meets Specification Requirements

Table 8.4-3 Fine Aggregate for PCC

Materials : Sand
Source : Betonval Concrete Aggregate
Proposed Use : Portland Cement Concrete

Test Items		Test Results		Specification Item 311
Sieve Analysis (% Passing)				
Sieve Size				
				-
				-
9.5	mm	%		100
4.75	mm	%	90	95-100
2.36	mm	%	80	
1.18	mm	%	65	45-80
0.600	mm	%	34	
0.300	mm	%	12	5-30
0.150	mm	%	2	0-10
0.075	mm	%	0.3	-
Fineness Modulus		%	3.21	
Bulk Specific Gravity (SSD)		%	2.55	
Absorbtion		%	2.83	
Moisture Content		%	4.0	

Remarks : Sample meets Specification Requirements

Table 8.4-4 Coarse Aggregate for PCC

Materials : Blended Crushed Aggregate
Source : Betonval Concrete Aggregate
Proposed Use : Portland Cement Concrete

Test Items		Test Results		Specification Item 311
Sieve Analysis (% Passing)				Grading C
Sieve Size				
50.0	mm	%	100	95-100
37.5	mm	%	97	-
25.0	mm	%	67	35-70
19.0	mm	%	53	-
12.5	mm	%	24	10-30
9.5	mm	%	12	-
4.75	mm	%	3	0-5
0.075	mm	%	0.8	
Bulk Specific Gravity (SSD)			2.79	
Absorbtion		%	1.33	
Moisture Content		%	0.37	

Remarks : Sample meets Specification Requirements

Table 8.4-5 Aggregates for Asphalt Concrete

1. Material : 20 mm Max. size Crushed Stone
   Source : Puray Quarry, Montalban, Rizal

Test Items			Test Results
Sieve Analysis (% Passing)			
Sieve Size			
19	mm	%	100
12.5	mm	%	71
9.5	mm	%	54
4.75	mm	%	23
2.36	mm	%	15
1.18	mm	%	10
0.600	mm	%	9
0.300	mm	%	8
0.150	mm	%	5
0.075	mm	%	4

2. Material : Fine Aggregate (Sand)
   Source : Puray Quarry, Montalban, Rizal

Test Items			Test Results	Specification Item 311
Sieve Analysis (% Passing)				
Sieve Size				Grading
12.5	mm	%	100	-
9.5	mm	%	100	-
4.75	mm	%	93	80-100
2.36	mm	%	70	65-100
1.18	mm	%	49	40-80
0.600	mm	%	30	20-65
0.300	mm	%	13	7-40
0.150	mm	%	5	2-20
0.075	mm	%	3	0-10
Specific Gravity			2.82	-
Absorbtion			2.98	-

Remarks : Sample meets Specification Requirements

3. Grading of Composite Aggregate

Aggregate Proportion

20 mm Max. size Crushed Stone	50%
Fine Aggregate (Sand)	50%

Grading of Composite Aggregate

Sieve Size		Cumulative % Passing	Specification Grading Range: 310 Type F
19	mm	100	100
12.5	mm	85	-
9.5	mm	77	-
4.75	mm	58	45-60
2.36	mm	43	33-53
1.18	mm	30	-
0.06	mm	19	-
0.300	mm	11	10-20
0.150	mm	5	-
0.075	mm	4	3-8

Remarks : Sample meets Specification Requirements

Table 8.4-6 Design of Concrete Mixture

A. Mixing Proportion Per Bag of Cement

Cement	40.0 kg.
Coarse Agg.	154.36 kg.
Fine Agg.	62.37 kg.
Water	18.51 kg.

B. *Properties of Concrete Mix*

1. Cement factor	9.1 bags/m^3
2. Water Cement Ratio	0.42
3. Slump	63.5 mm (2.5")

C. *Strength of Concrete*

1. Flexural strength (at 14 days), MPa (Psi)

Sample #1	3.92	(569)
#2	4.52	(656)
Average	4.22	(612)

Remarks : Gradation for Coarse and Fine Aggregates are shown in Tables 8.1-13 and 8.1-14. The Flexural strength meets Specification Requirements (550 psi).

Table 8.4-7

Materials : Straight Asphalt 60-70
Source : Petrophil
Proposed Use : Asphalt Concrete Mixture

Test Items		Test Results	Specification
Penetration at 25 c 100 g, 5 sec		68	60-70
Flush Point COP	C	307	>232
Ductility 25 c	cm	>100	>100
Loss of heating	%	0.1	<0.8
Solubility in trichloethylene	%	99.9	>99.0
Residue			
Penetration % of original		87	>54
Ductility 25 cm/min, cm		>100	>50
Spot Test		Negative	Negative
Specific Gravity		1.01	

Remarks : Sample meets Specification Requirements
Note : BRS Laboratory No. 688-89

Table 8.4-8

Materials : Cub-Back Asphalt MC-70
Source : Petrophil
Proposed Use : Prime Coat

Test Items		Test Results	Specification AASHTO M-82
Distilate, % by volume of			
total distilate to 360 C			
to 190 C	%	0	0
to 225 C	%	11	0-20
to 315 C	%	68	65-90
Kinetic Viscocity at 60 C	cs	78	70-140
Flush Point TOC	^{o}C	-	›38
Spot Test		Negative	Negative
Residue by distilation at 360 C	%	63	›55
Specific Gravity		0.93	
Residue			
Penetration, 25 C		169	120-250
Ductility, 25 C	cm	›100	›50
Solubility in trichlo-ethelen	%	99.9	›99.0

Remarks : Sample meets Specification Requirements
Note : BRS Laboratory No. 12459-88

Table 8.4-9

Materials : Emulsified Asphalt SS-1
Source : Petrophil
Proposed Use : Tack Coat

Test Items		Test Results	Specification AASHTO M-140
Viscosity			
(Saybolt furol) 25 C	s	36	20-100
Stability	%	0.6	<1.0
Cement mixing	%	1.3	<2.0
Sieve test	%	0.1	>0.1
Residue by distilation	%	59	>57
Residue			
Penetration, 25 C, 100g, 5 sec		163	100-200
Ductility 25 C	cm	>100	>40
Solubility in tricloethlene	%	99.9	>97.5
Specific Gravity		1.02	

Remarks : Sample meets Specification Requirements
Note : BRS Laboratory No. 690-89

Table 8.4-10

Materials : Cement
Source : Betonval Readyconcrete Inc.
Proposed Use : Portland Cement Concrete

Test Items		Test Results	Specification
Fineness:			
Residue on No. 200, sieve	%	95	
Specific Gravity 3.15;			
Normal consistency	%	25	
Soundness:			
Autoclave expansion	%	-	0.8 Max.
Pat Test		Passed	
Time of setting:			
Initial set, minutes		135	60 Min.
Final set, hours		3.5	10 Max.
Air Content of Mortar,			
% by volume		6.0	12 Max.
Compressive strength,			
Avg. mortar cubes,			
kg/cm^2: (Flow,%)		112	
1 day in moist air,			
2 days in water		175	126 Min.
1 day in moist air,			
6 days in water		230	196 Min.
1 day in moist air,			
27 days in water		to follow	
Loss on ignition	%	1.65	3.0 Max.
Insoluble residue	%	0.50	0.75 Max.
Sulfur trioxide (S03)	%	2.0	3.0 Max.
Magnesium oxide (MgO)	%	2.40	5.0 Max.

Remarks : Sample meets Specification Requirements

Appendix 8–5

DESIGN EQUATION AND DESIGN CHART

AASHTO Basic Design Equation for Flexible Pavement

The basic design equation based on serviceability-performance concept for flexible pavement of the AASHTO Guide for Design of Pavement Structures, 1986, is as follows:

$$\log_{10}(W_{18}) = Z_R \times S_0 + 9.36 \times \log_{10}(SN+1) - 0.20 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.2-1.5}\right]}{0.40 + \frac{1094}{(SN+1)^{5.19}}} + 2.32 \times \log_{10}(M_R) - 8.07$$

Where:

W_{18} = predicted number of 18-kip equivalent single axle load application.

Z_R = standard normal deviate

S_0 = combined standard error of the traffic prediction and performance prediction.

ΔPSI = difference between the initial design serviceability index, P_0, and the design terminal serviceability index P_t, and

M_R = resilient modulus (psi)

SN = structural number

$$SN = a_1 D_1 + a_2 D_2 m_2 + a_3 D_3 m_3$$

where

a_i = i^{th} layer coefficient,

D_i = i^{th} layer thickness (inches) and

m_i = i^{th} layer drainage coefficient.

AASHTO Basic Design Equation for Flexible Pavement

The basic design equation based on serviceabitility performance concept for rigid pavement of the AASHTO Guide for Pavement Structures, 1986 , is as follows ;

$$\log_{10}(W_{18}) = Z_R \times S_o + 7.35 \times \log_{10}(D+1) - 0.06 + \frac{\log_{10}\left[\frac{\Delta PSI}{4.5-1.5}\right]}{1+\frac{1.624\times10^7}{(D+1)^{8.46}}} + (4.22-0.32\times p_t) \times \log_{10}\left[\frac{S'_c \times C_d \times (D^{0.75}-1.132)}{215.63 \times J\left[D^{0.75}-\frac{18.42}{(E_c/k)^{0.25}}\right]}\right] \quad (1.2.2)$$

where

W_{18} = predicted number of 18-kip equivalent single axle load applications,

Z_R = standard normal deviate,

S_o = combined standard error of the traffic prediction and performance prediction,

D = thickness (inches) of pavement slab,

ΔPSI = difference between the initial design serviceability index, p_o, and the design terminal serviceability index, p_t,

S'_c = modulus of rupture (psi) for portland cement concrete used on a specific project,

J = load transfer coefficient used to adjust for load transfer characteristics of a specific design,

C_d = drainage coefficient,

E_c = modulus of elasticity (psi) for portland cement concrete, and

k = modulus of subgrade reaction (pci).

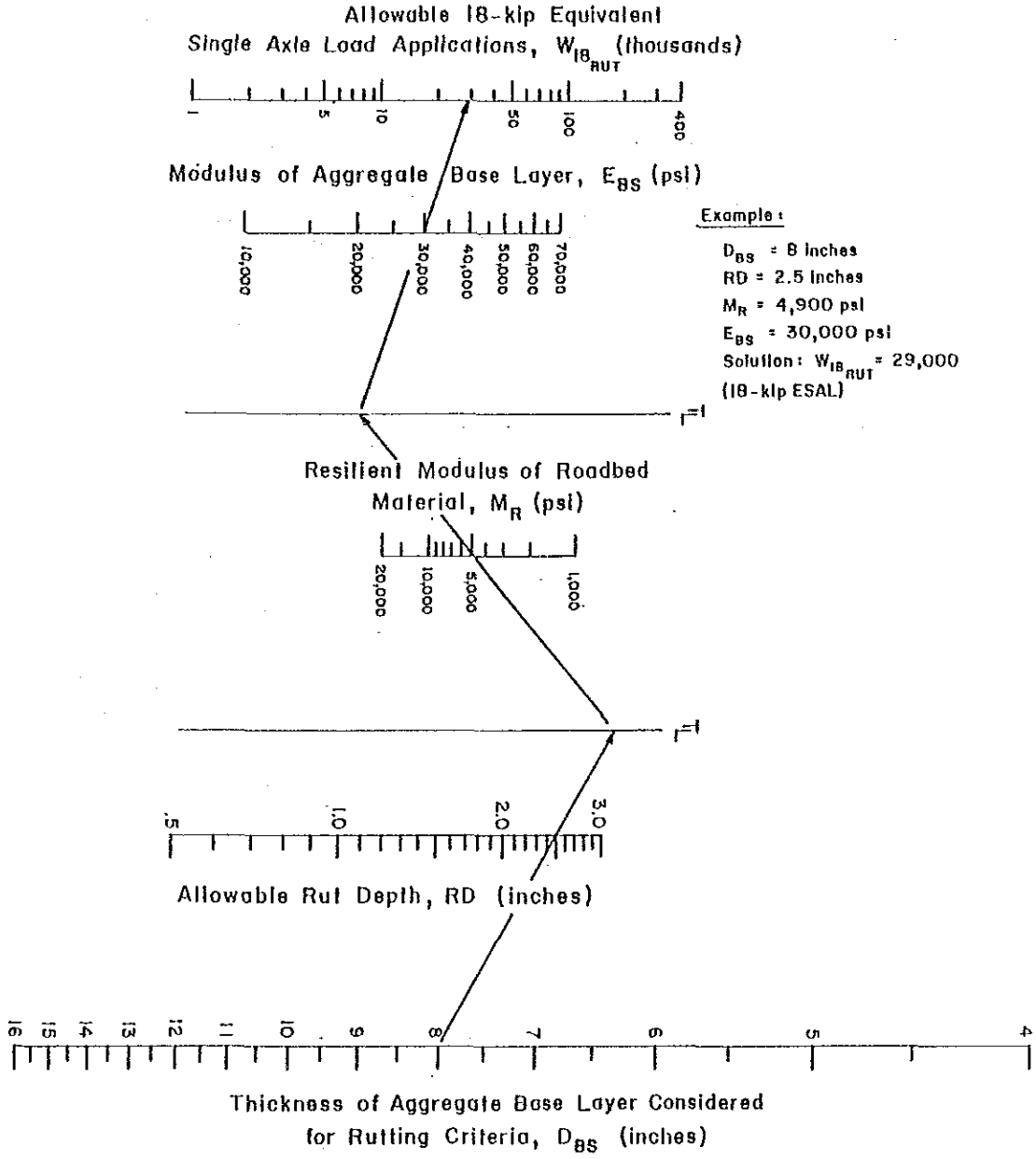


Figure 4.3. Design chart for aggregate-surfaced roads considering allowable rutting.

AASHTO Guide for Design of Pavement Structures 1986 ,
Part II , Chapter 4 Low-Volume Road Design

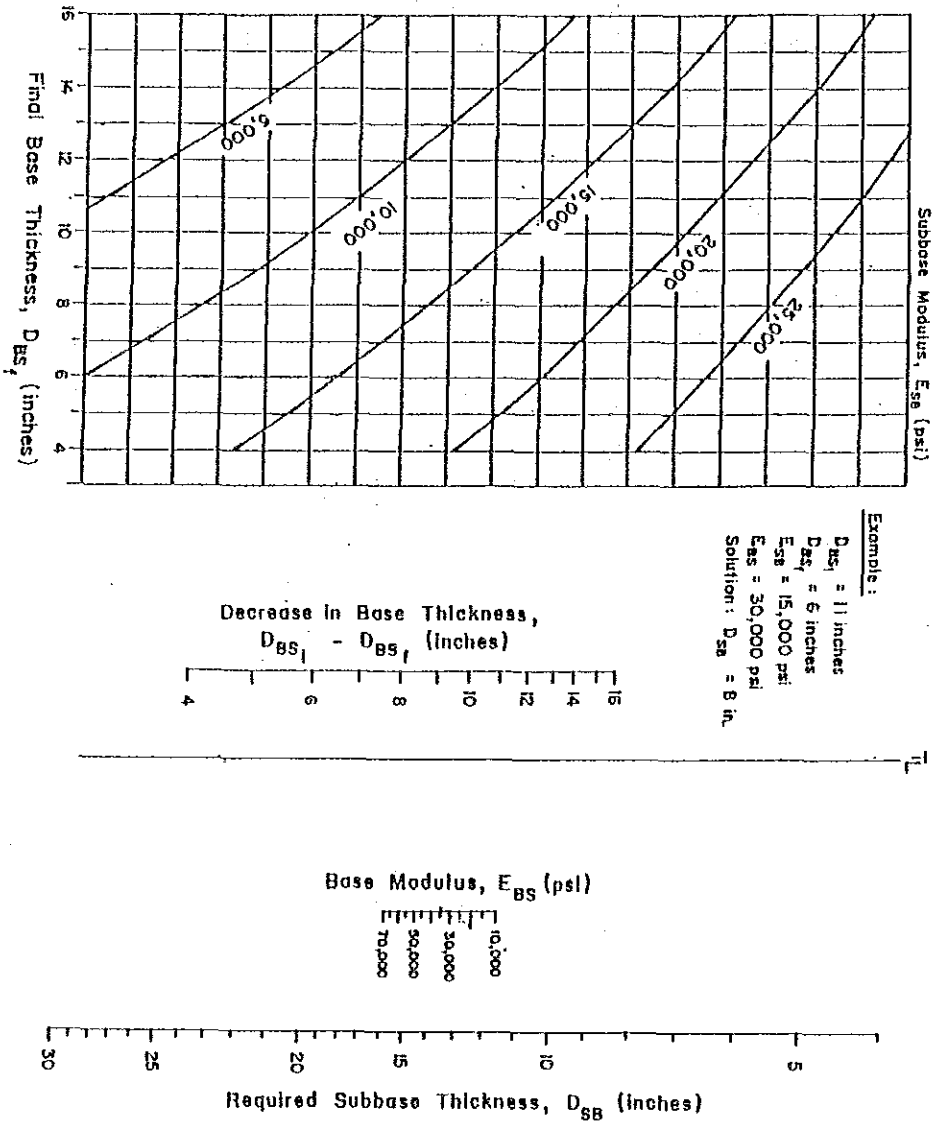
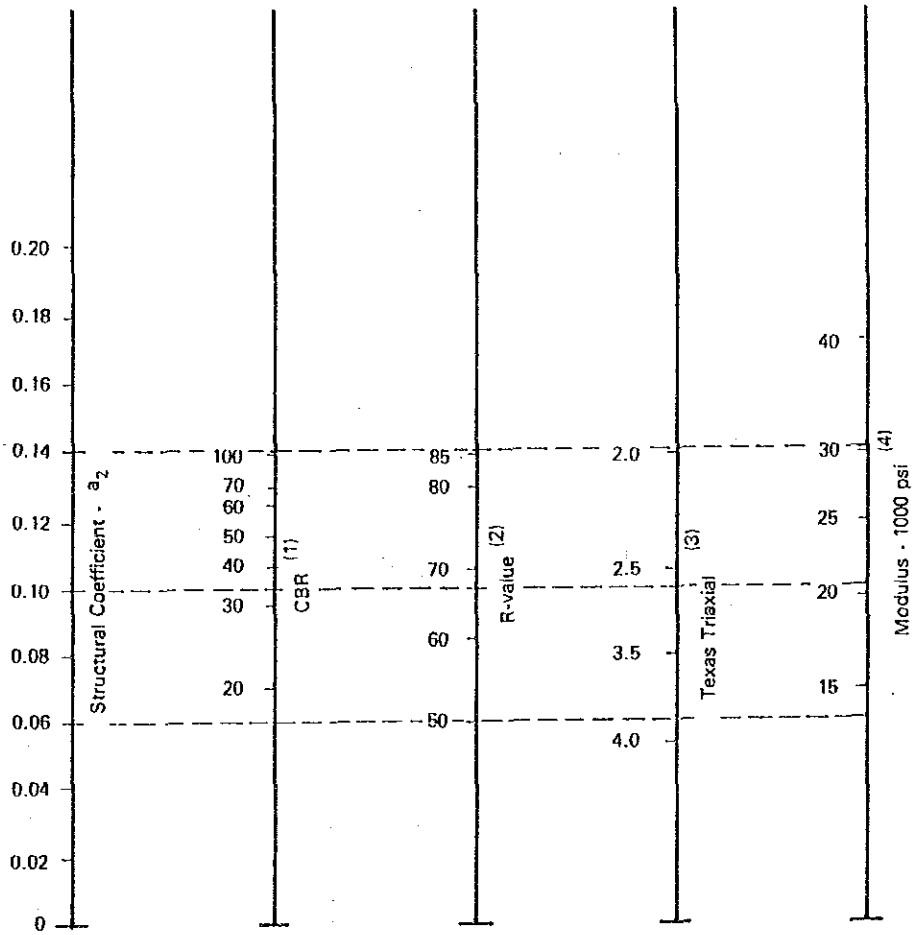


Figure 4.6. Chart to convert a portion of the aggregate base layer thickness to an equivalent thickness of subbase.

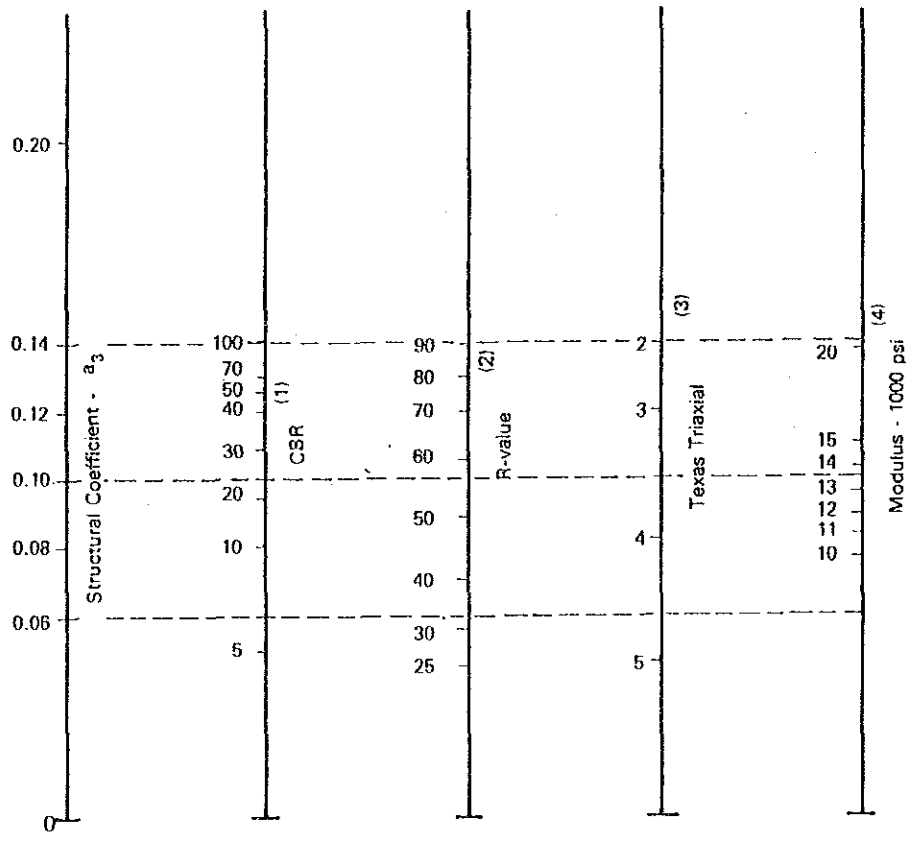
AASHTO Guide for Design of Pavement Structures 1986,
Part II , Chapter 4 Low-Volume Road Design



(1) Scale derived by averaging correlations obtained from Illinois.
(2) Scale derived by averaging correlations obtained from California, New Mexico and Wyoming.
(3) Scale derived by averaging correlations obtained from Texas.
(4) Scale derived on NCHRP project *(3)*.

Figure 2.6. Variation in granular base layer coefficient (a_2) with various base strength parameters (3).

AASHTO Guide for Design of Pavement Structures 1986,
Part II , Chapter 2 Design Requirments



(1) Scale derived from correlations from Illinois.

(2) Scale derived from correlations obtained from The Asphalt Institute, California, New Mexico and Wyoming.

(3) Scale derived from correlations obtained from Texas.

(4) Scale derived on NCHRP project *(3)*.

Figure 2.7. Variation in granular subbase layer coefficient (a_3) with various subbase strength parameters (3).

AASHTO Guide for Design of Pavement Structures 1986,
Part II , Chapter 2 Design Requirments

Appendix 8–6

STRUCTURAL DESIGN OF EXPERIMENTAL PAVEMENT MODELS

Structural Design of Gravel Surfaced Road

Design Method

AASHTO Guide for Design of Pavement Structure 1986, Chapter 4 Low-Volume Road Design, Figure 4.3 Design Chart for aggregate surfaced roads considering allowable rutting.

Section No. 1 Model No. 1 GR Surfaced Road

Design Condition

Number of heavy vehicles at initial year	: 7/day-direction
Vehicle load factor	: 0.503
Traffic growth rate	: 3 percent p.a.
Design period	: 5 years
Subgrade CBR	: 4%
CBR of gravel layer	: 50%

Structural Design

(1) Required gravel surface layer thickness (D_{BS})

D_{BS} = 6.0 in

was obtained from the above mentioned design chart as shown in Figure 4.3 with the following design input data.

W : ESAL for 5 years = $7 \times 0.503 \times (1.03^5 - 1.0)/0.03$
$= 6.28 \times 10^3$
E_{BS} : 24,000 psi for gravel layer of CBR %
M_R : 6,000 psi for subgrade of CBR 4%
Allowable rut depth : 2.5 in
where
E_{BS} : Elastic modulus of gravel layer (the above value was obtained from Figure 2.6 chart.
M_R : Resilience modulus of subgrade (M_R = 1500 x CBR)

(2) Gravel loss

Following equation based on Kenya Transport Cost Study was used.

$$AGL = f\{(T^2/T^2+50)\}(4.2+0.927T+3.50R^2+1.88VC)$$

where, AGL = annual gravel loss, in mm
T = annual traffic volume in both directions, in thousands of vehicles
R = annual rainfall, in mm
Vc = average percentage gradient of road
f = 0.94 for lateritic gravels
1.1 for quartizitic gravels
0.7 for volcanic gravels
1.5 for coral gravels

In this design, the following values are adopted.

T = 180 x 365/1000 = 6.37
(180 Vehicles/day)
R = 2.92/100 = 2.09
(average rainfall in Cavite Province from 1984 to 1988 was 2.092 mm)
Vc = 3.0
(Actual gradient of Model No. 1 road section is about 3%.)
f = 1.1
AGL = 13.6 mm and GL (5 years) = 68mm = 2.68 in

(3) Required gravel surface layer thickness including aggregate loss assuming 50% of GL will be recovered by regrading and regravelling maintenance operation.
Required total gravel layer thickness
= D_{BS} + 0.5 x GL = 6.0 x 1.34 = 7.34 in = 18.6 cm

(4) Thickness of gravel surface layer and subbase layer

A 15 cm gravel surface was adopted for the experimental model. Remaining 3.6 cm portion of the gravel layer (18.6 cm - 15.0 cm = 3.6 cm) was converted to a equivalent thickness of subbase by using the design chart in AASHTO Guide for Design of Pavement Structures 1986, Chapter 4 Low-volume Design shown in Figure 4.5 Design Chart.

From this chart, 3.6 cm (1.4 in) is equivalent to 5 cm (2 in) was obtained.

where,
E_{BS} : 24,000 psi for gravel layer of CBR 50%
E_{SB} : 14,000 psi for subbase of CBR 25% (Figure 2.7 Chart)

Therefore, the design thickness is :
Gravel Surface layer = 15 cm
Subbase layer = 5 cm

Section No. 2 Model No. 5 GR Surfaced Road

Design Condition
Number of heavy vehicles at initial year: 7/day-direction
Vehicle load factor : 0.503
Design period : 5 years
Subgrade CBR : 3.0%
Other conditions are same as Model No. 1.

Structural Design

(1) Required gravel surface layer thickness (D_{BS})

D_{BS} = 6.7 in

was obtained from the design chart for
W = 6.82×10^3
E_{BS} = 24,000 psi
M_R = 4,500 psi for subgrade of CBR 3%
allowable rut depth : 2.5 in

(2) Gravel loss

AGL = 9.7 mm was obtained from AGL formula.

where, T = 140 x 365/1,000 = 5.11 (140 Vehicles/day)
R = 2.09
Vc = 3.0
f = 1.1
GL (5 years) = 49 mm = 1.93 in

(3) Required gravel surface layer thickness including aggregate loss assuming 50% of GL will be recovered by regrading and gravelling maintenance operation.
Required total gravel layer thickness
= D_{BS} + 0.5 x GL = 6.7 + 0.97 = 7.67 in = 19.5 cm

Thickness of Gravel Layer and Subbase Layer 15 cm gravel surface was adopted.
Remaining 4.5 cm (19.5 cm - 15.0 cm) portion of the gravel layer is equal to 8 cm subbase was obtained from same method, as Model No. 1.

The design thickness is:
Gravel Surface Layer = 15 cm
Subbase Layer = 8 cm

Structural Design of Asphalt Pavement

Design Method

AASHTO Guide for Design of Pavement Structures (1986)
The Basic Design Equation for Flexible Pavements

Section No. 1

ESAL at initial year
= Number of Heavy Vehicles / day-direction x Vehicle Load Factor x 365
= 7(Truck) x 0.503 x 365 = 1.29×10^3

Model No. 2 SBST Pavement

Design Subgrade CBR = 4.0% (MR = 1,500 x CBR = 6,000 psi)

Pavement Structure and SN

Layer	Materials	t_i(cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	0.5	0.25	-	0.125
Base	Crushed Stone	15	0.135	0.9	1.8225
Subbase	Sandy Gravel	8	0.10	0.9	0.72
		23.5 cm			SN = 2.71/2.6675 = 1.050

w: Predicted number of ESAL
for SN = 1.050, MR = 6,000 psi and p_t = 1.5 $W = 2.59 \times 10^3$

n : Predicted performance period
for initiaL year ESAL = 1.29×10^3, traffic growth
rate 3.0% p.a. and $W = 2.59 \times 10^3$ n = 2.0 years
2 years

Model No. 3 DBST Pavement

Design Subgrade CBR = 4.0% (MR = 1,500 x CBR = 6,000 psi)

Pavement Structure and SN

Layer	Materials	t_i(cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	1.5	0.25	-	0.375
Base	Crushed Stone	15	0.135	0.9	1.8225
Subbase	Sandy Gravel	9	0.10	0.9	0.81
		25.5 cm			SN = 3.0075/2.54 = 1.184

w: Predicted number of ESAL
for SN = 1.184, MR = 6,000 psi and p_t = 1.5 $W = 4.71 \times 10^3$

n : Predicted performance period
for initial year ESAL = 1.29×10^3, traffic growth
rate 3.0% p.a. and $W = 4.71 \times 10^3$ n = 3.5 years
4 years

Model No. 4 BMP Pavement

Design Subgrade CBR = 4.0%

Pavement Structure and SN

Layer	Materials	t_i(cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	5	0.25	-	0.30
Base	Crushed Stone	15	0.135	0.9	1.8225
Subbase	Sandy Gravel	5	0.10	0.9	0.45
		25 cm			SN = 3.5225/2.54 = 1.387

w: Predicted number of ESAL
for SN = 1.387, MR = 6,000 psi and p_t = 1.5 $W = 1.08 \times 10^4$

n : Predicted performance period
for initial year ESAL = 1.29×10^3, traffic growth
rate 3.0% p.a. and $W = 1.08 \times 10^4$ n = 7.5 years
8 years

Section No. 2

ESAL at initial year
= Number of Heavy Vehicles / day-direction x Vehicle Load Factor x 365
= 7(Truck) x 0.503 x 365 = 1,285

Model No. 6 SBST Pavement

Design Subgrade CBR = 3.0% (MR = 1,500 x CBR = 4,500 psi)

Pavement Structure and SN

Layer	Materials	t_i(cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	0.5	0.25	-	0.125
Base	Crushed Stone	15	0.1335	0.9	1.8225
Subbase	Sandy Gravel	12	0.10	0.9	1.08
		27.5 cm			SN = 3.0275/2.54 = 1.192

w: Predicted number of ESAL
for SN = 1.192, MR = 4,500 psi and p_t = 1.5 W = 2.52×10^3
n : Predicted performance period
for initial year ESAL = 1.29×10^3 traffic growth
rate 3.0% p.a. and W = 2.52×10^3 n = 1.9 years
2 years

Model No. 7 DBST Pavement

Design Subgrade CBR = 3.0% (MR = 1,500 x CBR = 4,500 psi)

Pavement Structure and SN

Layer	Materials	t_i(cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	1.5	0.25	-	0.375
Base	Crushed Stone	15	0.135	0.9	1.8225
Subbase	Sandy Gravel	14	0.10	0.9	1.26
		20.5 cm			SN = 3.4575/2.54 = 1.361

w: Predicted number of ESAL
for SN = 1.361, MR = 4,500 psi and p_t = 1.5 W = 4.99×10^3
n : Predicted performance period
for initial year ESAL = 1.29×10^3, traffic growth
rate 3.0% p.a. and W = 4.99×10^3 n = 3.7 years
4 years

Model No. 8 BMP Pavement

Design Subgrade CBR = 3.0% (MR = 1,500 x CBR = 4,500 psi)

Pavement Structure and SN

Layer	Materials	t_i(cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	5.0	0.25	-	1.25
Base	Crushed Stone	15	0.135	0.9	1.8225
Subbase	Sandy Gravel	10	0.10	0.9	0.90
		30 cm		SN = 3.9725/2.54 = 1.564	

w: Predicted number of ESAL
for SN = 1.564, MR = 4,500 psi and p_t = 1.5 W = 1.08×10^4

n : Predicted performance period
for initial year ESAL = 1.29×10^3, traffic growth rate 3.0% p.a. and W = 1.08×10^4 n = 7.6 years
8 years

Section No. 3 and Section No. 4

ESAL at initial year
= Number of Heavy Vehicles / day-direction x Vehicle Load Factor x 365
= [24(Truck) x 0.992 + 2(Bus) x 0.038] x 365 = 8,718

Model No. 9 DBST Pavement

Design Subgrade CBR = 3.0% (MR = 1,500 x CBR = 4,500 psi)

Pavement Structure and SN

Layer	Materials	t_i(cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	1.5	0.25	-	0.375
Base	Crushed Stone	15	0.135	0.9	1.8225
Subbase	Sandy Gravel	30	0.10	0.9	2.70
		46.5 cm		SN = 4.8925/2.54 = 1.928	

w: Predicted number of ESAL
for SN = 1.928, MR = 4,500 psi and p_t = 1.5 W = 3.74×10^4

n : Predicted performance period
for initial year ESAL = 8.71×10^3, traffic growth rate 3.0% p.a. and W = 3.74×10^4 n = 4.1 years
4 years

Model No. 10 BMP Pavement

Design Subgrade CBR = 3.0% (MR = 1,500 x CBR = 12,000 psi)

Pavement Structure and SN

Layer	Materials	t_i (cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	BMP	5	0.25	-	1.250
Base	Crushed Stone	15	0.135	0.9	1.8225
Subbase	Sandy Gravel	26	0.90	0.9	2.34
		46 cm		SN = 5.4125/2.54 = 2.131	

w: Predicted number of ESAL
for SN = 2.131, MR = 4,500 psi and p_t = 1.5 $W = 7.00 \times 10^4$

n : Predicted performance period
for initial year ESAL = 8.27×10^3, traffic growth rate 3.0% p.a. and $W = 7.00 \times 10^4$ n = 7.3 years
7 years

Model No. 11 AC (4 cm) Pavement

Design Subgrade CBR = 8.0% (MR = 1,500 x CBR = 12,000 psi)

Pavement Structure and SN

Layer	Materials	t_i (cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	AC	4	0.20	-	1.56
Base	Crushed Stone	12	0.14	0.9	1.458
Subbase	Sandy Gravel	8	0.10	0.9	0.72
		24 cm		SN = 3.738/2.54 = 1.472	

w: Predicted number of ESAL
for SN = 1.472, MR = 12,000 psi and p_t = 2.01.5 $W = 7.31 \times 10^4$

n : Predicted performance period
for initial year ESAL = 8.27×10^3, traffic growth rate 3.0% p.a. and $W = 7.31 \times 10^4$ n = 7.6 years
8 years

Model No. 12 AC (5 cm) Pavement

Design Subgrade CBR = 8.0% (MR = 1,500 x CBR = 12,000 psi)

Pavement Structure and SN

Layer	Materials	t_i(cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	5	0.39	-	1.95
Base	Crushed Stone	12	0.135	0.9	1.458
Subbase	Sandy Gravel	6	0.10	0.9	0.54
		23 cm			SN = 3.948/2.54 = 1.554

w: Predicted number of ESAL
for SN = 1.554, MR = 12,000 psi and p_t = 2.0 $W = 9.90 \times 10^4$

n : Predicted performance period
for initial year ESAL = 8.72×10^3, traffic growth rate 3.0% p.a. and $W = 9.90 \times 10^4$ n = 9.9 years
9 years

Model No. 13 DBST Pavement

Design Subgrade CBR = 8.0% (MR = 1,500 x CBR = 12,000 psi)

Pavement Structure and SN

Layer	Materials	t_i(cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	1.5	0.25	-	0.375
Base	Crushed Stone	15	0.135	0.9	1.822
Subbase	Sandy Gravel	13	0.10	0.9	1.17
		29.5 cm			SN = 3.3675/2.54 = 1.326

w: Predicted number of ESAL
for SN = 1.326, MR = 12,000 psi and p_t = 1.5 $W = 4.22 \times 10^4$

n : Predicted performance period
for initial year ESAL = 8.27×10^3, traffic growth rate 3.0% p.a. and $W = 4.22 \times 10^4$ n = 4.6 years
5 years

Model No. 14 BMP Pavement

Design Subgrade CBR = 5.0% (MR = 1,500 x CBR = 7,500 psi)

Pavement Structure and SN

Layer	Materials	t_i(cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	5	0.25	-	1.250
Base	Crushed Stone	15	0.135	0.9	1.8225
Subbase	Sandy Gravel	16	0.10	0.9	1.44
		36 cm			SN = 4.425/2.54 = 1.742

w: Predicted number of ESAL
for SN = 1.742, MR = 7,500 psi and p_t = 1.5 $W = 6.61 \times 10^4$

n : Predicted performance period
for initial year ESAL = 8.27×10^3, traffic growth rate 3.0% p.a. and $W = 6.61 \times 10^4$ n = 6.9 years
7 years

Model No. 15 AC (4 cm) Pavement

Design Subgrade CBR = 3.0% (MR = 1,500 x CBR = 4,500 psi)

Pavement Structure and SN

Layer	Materials	t_i (cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	4	0.39	-	1.56
Base	Crushed Stone	15	0.135	0.9	1.8225
Subbase	Sandy Gravel	23	0.10	0.9	2.07
		42 cm			SN = 5.4525/2.54 = 2.147

w: Predicted number of ESAL
for SN = 2.147, MR = 4,500 psi and p_t = 2.0 $W = 6.89 \times 10^4$

n : Predicted performance period
for initial year ESAL = 8.72×10^3, traffic growth rate 3.0% p.a. and $W = 6.89 \times 10^4$ n = 7.2 years
7 years

Model No. 16 AC (5 cm) Pavement

Design Subgrade CBR = 3.0% (MR = 1,500 x CBR = 4,500 psi)

Pavement Structure and SN

Layer	Materials	t_i (cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	5	0.39	-	1.95
Base	Crushed Stone	15	0.135	0.9	1.8225
Subbase	Sandy Gravel	21	0.10	0.9	1.89
		41 cm			SN = 5.6625/2.54 = 2.229

w: Predicted number of ESAL
for SN = 2.229, MR = 4,500 psi and p_t = 2.0 $W = 8.70 \times 10^4$

n : Predicted performance period
for initial year ESAL = 8.72×10^3, traffic growth rate 3.0% p.a. and $W = 8.70 \times 10^4$ n = 8.9 years
9 years

Section No. 5

ESAL at initial year
= Number of Heavy Vehicles / day-direction x Vehicle Load Factor x 365
= [137(Truck) x 1.233 + 59(Bus) x 0.613 x 365 = 74,857

Model No. 17 AC (5 cm) Pavement

Design Subgrade CBR = 5.0% (MR = 1,500 x CBR = 7,500 psi)

In order to investigate the serviceability of medium-traffic, type 5 cm AC with 15 cm Base Course pavement with in the 5 years of follow-up survey period, the accelerated procedure for accumulation of this heavy traffic of this road was planned. Following AC pavement structure was designed.

AC 5 cm, Base 15 cm, Subbase 15 cm

The predicted performance period (up to terminal serviceability index pt = 2.0 level) is 3 years.

Pavement Structure and SN

Layer	Materials	t_i (cm)	a_i	m_i	$t_i \times a_i \times m_i$
Surface	SBST	5	0.39	-	1.95
Base	Crushed Stone	15	0.135	0.9	1.8225
Subbase	Sandy Gravel	19	0.10	0.9	1.71
		39 cm			SN = 5.4825/2.54 = 2.158

w: Predicted number of ESAL
for SN = 2.158 MR = 7,500 psi and p_t = 2.0 $W = 2.33 \times 10^6$

n : Predicted performance period
for initial year ESAL = 7.48×10^4, traffic growth rate 3.0% p.a. and $W = 2.33 \times 10^6$ n = 2.8 years
3 years

This pavement structure has the predicted performance period of 10 to 12 years if applied for medium-traffic condition such as shown in Table A.

TABLE A. PREDICTED PERFORMANCE PERIOD OF MODEL NO. 17 PAVEMENT, AC 5 CM. BASE 15 CM, SUBBASE 19 CM, SUBGRADE CBR = 5%

Road and Traffic Application	Performance Period (pt = 2.0)	Cumulative Number of ESAL
This road section Heavy-traffic Number of heavy vehicles 196/day-direction (Truck 137, Bus 59) Vehicle Load Factor average = 1.051	3 years	2.33×10^6 Traffic growth rate 5% p.a.
Medium-traffic road Number of heavy vehicles 55/day-direction 45/day-direction Vehicle Load Factor = 1.0	10 years 12 years	2.30×10^6 2.33×10^6 Traffic growth rate 3% p.a.

Structural Design of Portland Cement Concrete Pavement

Model No. 18 PCC (18 cm) Pavement

Design Subgrade CBR = 5.0%

To investigate the service performance of medium-traffic type 18 cm PCC pavement within 5 years of follow-up survey period, the accelerated procedure for accumulating heavy traffic of this road was planned and the following pavement structure was designed.

PCC 18 cm. Subbase 20 cm
the predicted performance period (up to terminal serviceability index pt = 2.0 level) is 8 years.

Predicted W was computed from AASHTO Basic Design Equation for Rigid Pavements (1986) from the following design data.

W = 7.56×10^6 (up to $p_t = 2.0$)
n = 7.9 years (predicted performance period for traffic
= 8 years growth rate 5.0%)

D = PCC Slab thickness : 7.087 in (18 cm)
pt = 2.0
Δpsi = 4.2 - pt = 2.2
Sc = Modulus of rupture for PCC : 580 psi
E = Modulus of elasticity for PCC : 3.28×10^6 psi
J = Joint load transfer coefficient : 4.2
Cd = Drainage coefficient : 0.9
k = Modulus subgrade reaction for Subgrade CBR = 5% and 20 cm Subbase : 170 pci
Z_R = Standard normal deviate
So = Combined standard error of the traffic prediction and performance prediction
$Z_R \times So = 0$

This pavement structure has the predicted performance period of 15 to 20 years if applied for medium-traffic condition such as shown in Table B.

TABLE B. PREDICTED PERFORMANCE PERIOD OF MODEL NO. 18 PAVEMENT, PCC18 CM, SUBBASE 20 CM, SUBGRADE CBR = 5%

Road and Traffic Application	Performance Period (pt = 2.0)	Cumulative Number of ESAL
This road section Heavy-traffic Number of heavy vehicles 196/day-direction Vehicle Load Factor average = 1.120	8 years	7.56×10^5 Traffic growth rate 5% p.a.
Medium-traffic road Number of heavy vehicles 120/day-direction 95/day-direction 80/day-direction Vehicle Load Factor = 1.0	15 years 18 years 20 years	8.1×10^5 8.1×10^5 7.8×10^5 Traffic growth rate 3% p.a.

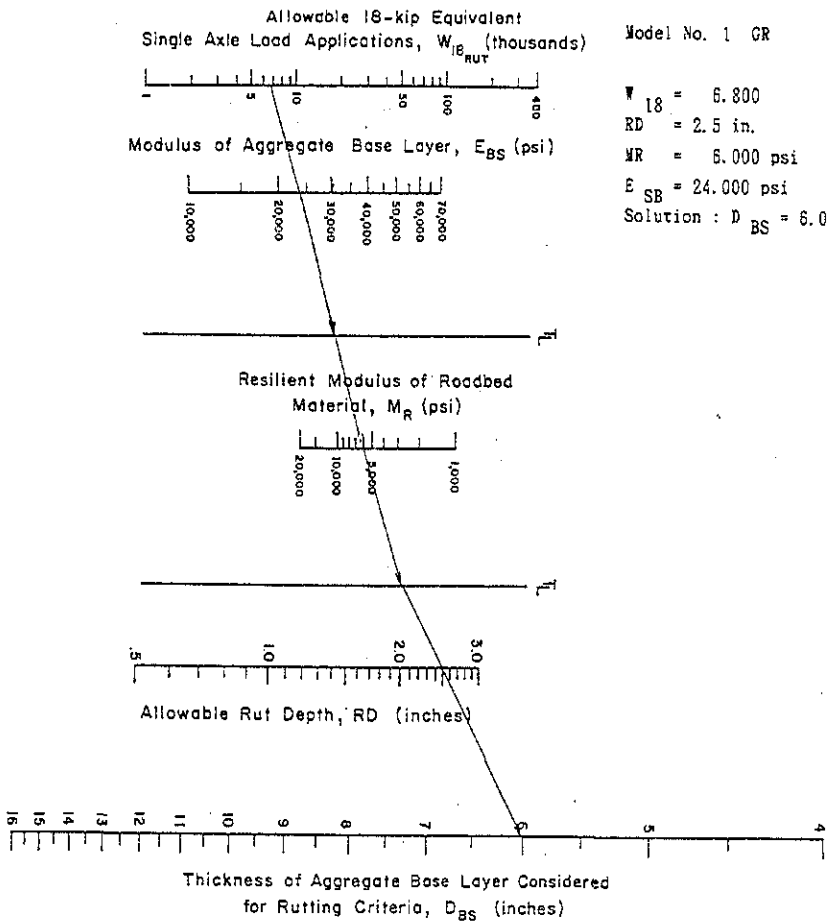


Figure 4.3. Design chart for aggregate-surfaced roads considering allowable rutting.

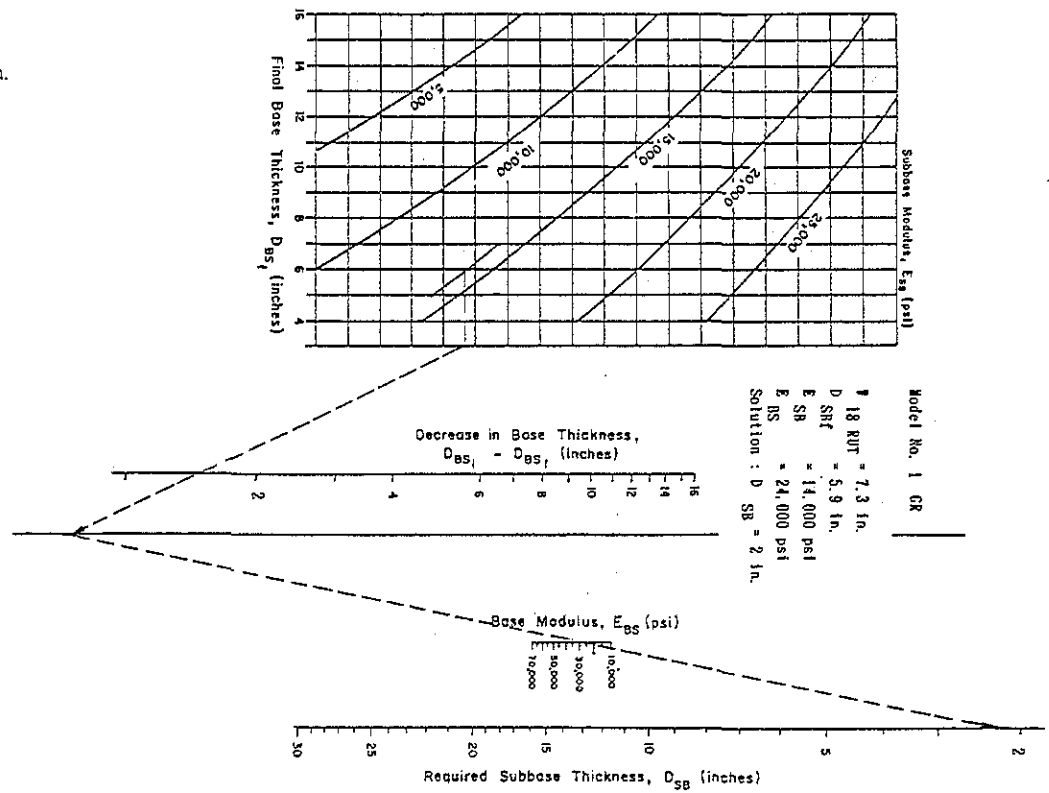
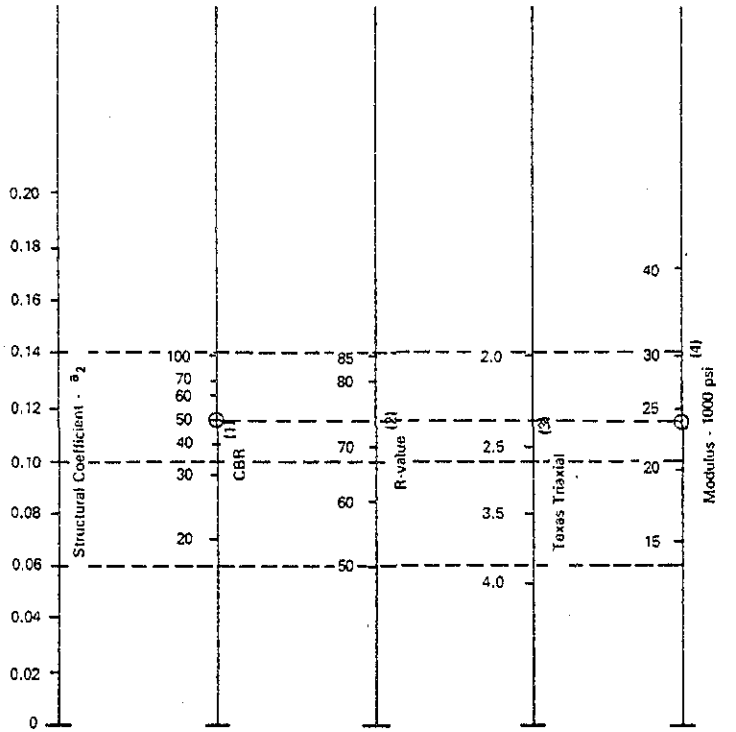
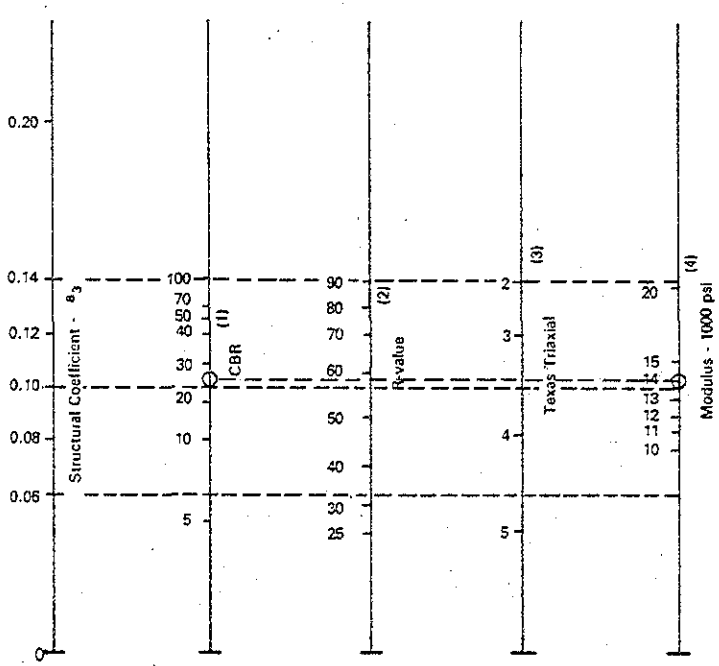


Figure 4.5. Chart to convert a portion of the aggregate base layer thickness to an equivalent thickness of subbase.



(1) Scale derived by averaging correlations obtained from Illinois.
(2) Scale derived by averaging correlations obtained from California, New Mexico and Wyoming.
(3) Scale derived by averaging correlations obtained from Texas.
(4) Scale derived on NCHRP project *(3)*.

Figure 2.6. Variation in granular base layer coefficient (a_2) with various base strength parameters (3).



(1) Scale derived from correlations from Illinois.
(2) Scale derived from correlations obtained from The Asphalt Institute, California, New Mexico and Wyoming.
(3) Scale derived from correlations obtained from Texas.
(4) Scale derived on NCHRP project *(3)*.

Figure 2.7. Variation in granular subbase layer coefficient (a_3) with various subbase strength parameters (3).

Determination of Design Subgrade CBR Value

The Subgrade CBR Values are calculated according to the following formula:

Design CBR Value = mean value of individual CBR Value
- Standard Deviation

$= \bar{X} - \sigma$

Section No. 1

For the whole length of 800 m section, the following CBR test values are obtained to determine the design subgrade CBR value.

Boring No.	No. 2	No. 4	No. 6	No. 7	No. 8
CBR test value (%)	5	3	7	6	5

Using the above CBR test results, the following values were computed, $n = 5$ $\bar{x} = 5.2$ $\sigma = 1.32$ $\bar{x} - \sigma = 3.88$

Then, Design CBR = 4.0%

Section No. 2

For the whole length of 800 m section, the following CBR test values are obtained to determine the design subgrade CBR value.

Boring No.	No. 2	No. 4	No. 6	No. 7	No. 8	No. 7
CBR test value (%)	4	2	10	11	3	10

Using the above CBR test results, the following values were computed, $n = 6$ $\bar{x} = 6.7$ $\sigma = 3.72$ $\bar{x} - \sigma = 2.98$

Then, Design CBR = 3.0%

Determination of Design Subgrade CBR Value

Sections No. 3 and 4

1) For the first 400 m length, (Sta. 0 + 000 to Sta. 0 + 400 of Section No. 3), the following CBR test values were obtained to determine the design subgrade CBR value.

	(Section No. 3)			
Boring No.	No. 1	No. 2	No. 3	No. 4
CBR test value (%)	3	8	4	4

Using the above CBR test results, the following values were computed, $n = 4$ $\bar{x} = 4.75$ $\sigma = 1.92$ $\bar{x} - \sigma = 2.83$

Then, Design CBR = 3.0%

2) For the next 600 m , (Sta. 0 + 400 to Sta. 0 + 800 of Section No. 3), the following CBR test values were obtained to determine the design subgrade CBR value.

	(Section No. 3)		(Section No. 4)	
Boring No.	No. 5	No. 6	No. 1	No. 2
CBR test value (%)	10	7	12	11

Using the above CBR test results, the following values were computed, $n = 4$ $\bar{x} = 9.75$ $\sigma = 1.79$ $\bar{x} - \sigma = 7.96$

Then, Design CBR = 8.0%

3) And for the next 200 m , (Sta. 0 + 200 to Sta. 0 + 400 of Section No. 4), the following CBR test values were obtained to determine the design subgrade CBR value.

	(Section No. 4)	
Boring No.	No. 3	No. 4
CBR test value (%)	8	5

Using the above CBR test results, the following values were computed, $n = 2$ $\bar{x} = 6.50$ $\sigma = 1.50$ $\bar{x} - \sigma = 5.0$

Then, Design CBR = 5.0%

Determination of Design Subgrade CBR Value

Sections No. 3 and 4

1) For the last 400 m length, (Sta. 0 + 400 to Sta. 0 + 800 of Section No. 4), the following CBR test values were obtained to determine the design subgrade CBR value.

	(Section No. 4)		
Boring No.	No. 5	No. 7	No. 8
CBR test value (%)	3	5	5

From the above CBR test results, the following values were computed, $n = 3$ $\bar{x} = 4.33$ $\sigma = 0.94$ $\bar{x} - \sigma = 3.39$

Then, Design CBR = 3.0%

Section No. 5

For the whole length of 400 m section, the following CBR test values were obtained to determine the design subgrade CBR value.

Boring No.	No. 1	No. 3	No. 4
CBR test value (%)	4	7	8

From the above CBR test results, the following values were computed, $n = 3$ $\bar{x} = 6.33$ $\sigma = 1.70$ $\bar{x} - \sigma = 4.63$

Then, Design CBR = 5.0%

Appendix 8–7

COST FOR EXPERIMENTAL PAVEMENT CONSTRUCTION

Summary of Unit Price Analysis

Pay Item No.	D E S C R I P T I O N	Unit	Unit Price
102(2)	Surplus Common Excavation	P/m^3	58.27
102(5)	Surplus Excavation of Existing Pavement, Section 3 and 4	P/m^3	71.96
102(6)	Surplus Excavation of Existing Pavement, Section 5	P/m^3	71.96
104(3)	Selection Borrow for Topping, Case 2	P/m^3	101.40
104(5)	Embankment for Shoulder w/ Materials Obtained from Excavation of Existing Pavement	P/m^3	54.98
105	Subgrade Preparation	P/m^2	5.33
108	Re-Shaping of Existing Shoulder	P/m^2	5.31
200	Aggregate Sub-Base Course	P/m^3	306.04
202	Crushed Aggregate Base Course	P/m^3	437.53
300(2)	Crushed Aggregate Surface Course	P/m^3	443.78
301(1)	Bit. Prime Coat, MC-70 Cut-Back Asphalt	P/MT	11479.18
303(1)	Bituminous Seal Coat, Aggregate Type 2	P/MT	416.14
303(2)	Bit. Seal Coat, MC-800 Cut-Back Asphalt	P/MT	11050.28
304(1)a	Bit. Surface Treatment, Aggregate Grading A	P/MT	626.68
304(1)b	Bit. Surface Treatment, Aggregate Grading B	P/MT	626.68
304(4)	Bit.Surface Treatment,MC-800 Cut-Back Asphalt	P/MT	11168.79
305(1)	Aggregate for Bit. Penetration Macadam	P/MT	565.85
305(3)	MC-800 Cut-Back Asphalt for Bituminous Penetration Macadam Pavement	P/MT	11376.12
310	Bit. Concrete Surface Course, Hot Laid	P/MT	1666.23
311(1)	Portland Cement Concrete Surface, Plain (t = 18 cm.)	P/M^2	347.50
504	Grouted Riprap Side Ditch	P/LM.	618.77

UNIT PRICE ANALYSIS

Pay Item No. 102(2) Surplus Common Excavations

			Unit Rate	Amount
A.	Equipment	Unit		
	1 - Bulldozer,140 Hp	P/hr.	786.17	786.17
	0.5 - Wheel Loader,100 Hp	P/hr.	436.97	218.49
	1 - Dump Truck,100 Hp	P/hr.	174.96	174.96
	Total A	P/hr.		1179.62
B.	Labor			
	1 - Foreman	P/hr.	22.44	22.44
	1.5 - H.E. Optr.	P/hr.	15.55	23.33
	1 - Driver	P/hr.	14.30	14.30
	5 - Unskilled Laborer	P/hr.	13.82	55.28
	Total B	P/hr.		115.35
	Total A + B	P/hr.		1294.96
C.	Output: 30 m^3/hr.			
	1294.96/30	P/m^3		43.17
D.	VAT 10% of A & B	P/m^3		4.32
E.	Overhead and Profit, 25%	P/m^3		10.79
F.	Unit Price	P/m^3		58.27

Pay Item No. 102(5) Surplus Excavation (Existing Pavement)
Section 3 and 4

A. Equipment		Unit	Unit Rate	Amount
1	- Pavement Breaker,5 Hp	P/hr.	47.91	47.91
0.5	- Wheel Loader,100 Hp	P/hr.	436.97	218.49
1	- Dump Truck,100 Hp	P/hr.	174.96	174.96
	Total A	P/hr.		441.36
B. Labor				
1	- Foreman	P/hr.	22.44	22.44
1.5	- H.E. Optr.	P/hr.	15.55	23.33
1	- Driver	P/hr.	14.30	14.30
10	- Unskilled Laborer	P/hr.	13.82	138.20
	Total B	P/hr.		198.27
	Total A + B	P/hr.		639.62
C. Output:	12 m^3/hr.			
	639.62/12	P/m^3		53.30
D.	VAT 10% of A & B	P/m^3		5.33
E.	Overhead and Profit, 25%	P/m^3		13.33
F.	Unit Price	P/m^3		71.96

Pay Item No. 102(6) Surplus Excavation (Existing Pavement)
Section 5

A. Equipment		Unit	Unit Rate	Amount
1	- Pavement Breaker,5 Hp	P/hr.	47.91	47.91
0.5	- Wheel Loader,100 Hp	P/hr.	436.97	218.49
1	- Dump Truck,100 Hp	P/hr.	174.96	174.96
	Total A	P/hr.		441.36
B. Labor				
1	- Foreman	P/hr.	22.44	22.44
1.5	- H.E. Optr.	P/hr.	15.55	23.33
1	- Driver	P/hr.	14.30	14.30
10	- Unskilled Laborer	P/hr.	13.82	138.20
	Total B	P/hr.		198.27
	Total A + B	P/hr.		639.62
C. Output:	12 m^3/hr.			
	639.62/12	P/m^3		53.30
D. VAT 10% of A & B		P/m^3		5.33
E. Overhead and Profit, 25%		P/m^3		13.33
F. Unit Price		P/m^3		71.96

Pay Item No. 104(3) Selection Borrow for Topping, Case 2

A. Equipment		Unit	Unit Rate	Amount
1	- Motor Grader,125 Hp	P/hr.	518.65	518.65
1	- Wheel Loader,100 Hp	P/hr.	436.97	436.97
1	- Pneumatic Roller,85 Hp	P/hr.	322.86	322.86
0.5	- Water Truck,120 Hp	P/hr.	246.05	123.03
1	- Vibro. Drum Roller,125 Hp	P/hr.	440.54	440.54
2	- Dump Truck,100 Hp	P/hr.	174.96	349.92
1	- Bulldozer	P/hr.	786.17	786.17
	Total A	P/hr.		2978.14
B. Labor				
1	- Foreman	P/hr.	22.44	22.44
4	- H.E. Optr.	P/hr.	15.55	62.20
1	- L.E. Optr.	P/hr.	14.86	14.86
2.5	- Driver	P/hr.	14.30	35.75
2	- Skilled Laborer	P/hr.	14.30	28.60
6	- Unskilled Laborer	P/hr.	13.82	82.92
	Total B	P/hr.		246.77
	Total A + B	P/hr.		3224.91
C. Output:	50 m^3/hr.			
	3224.91/50	P/m^3		64.50
D. Materials				
	Cost at Quarry	P/m^3		14.33
D.	VAT 10% of A & B	P/m^3		6.45
E.	Overhead and Profit, 25%	P/m^3		16.12
F.	Unit Price	P/m^3		101.40

Pay Item No. 104(5) Embankment (Construction of Shoulder Using Existing Pavement Material)

A. Equipment		Unit	Unit Rate	Amount
1	- Motor Grader,125 Hp	P/hr.	518.65	518.65
0.5	- Wheel Loader,100 Hp	P/hr.	436.97	218.49
1	- Pneumatic Roller,85 Hp	P/hr.	322.86	322.86
0.5	- Water Truck,120 Hp	P/hr.	246.05	123.03
1	- Vibro. Drum Roller,125 Hp	P/hr.	440.54	440.54
1	- Dump Truck,100 Hp	P/hr.	174.96	174.96
	Total A	P/hr.		1623.56
B. Labor				
1	- Foreman	P/hr.	22.44	22.44
2.5	- H.E. Optr.	P/hr.	15.55	38.88
1	- L.E. Optr.	P/hr.	14.86	14.86
1.5	- Driver	P/hr.	14.30	21.45
2	- Skilled Laborer	P/hr.	14.30	28.60
6	- Unskilled Laborer	P/hr.	13.82	82.92
	Total B	P/hr.		209.15
	Total A + B	P/hr.		1832.71
C. Output: 45 m^3/hr.				
	1832.71/45	P/m^3		40.73
D. VAT 10% of A & B		P/m^3		4.07
E. Overhead and Profit, 25%		P/m^3		10.18
F. Unit Price		P/m^3		54.98

Pay Item No. 105 Subgrade Preparation

A. Equipment	Unit	Unit Rate	Amount
1 - Motor Grader,125 Hp	P/hr.	518.65	518.65
0.5 - Pneumatic Roller,85 Hp	P/hr.	322.86	161.43
0.5 - Water Truck,120 Hp	P/hr.	246.05	123.03
0.5 - Vibro. Drum Roller,125 Hp	P/hr.	440.54	220.27
Total A	P/hr.		1023.38
B. Labor			
1 - Foreman	P/hr.	22.44	22.44
1.5 - H.E. Optr.	P/hr.	15.55	23.33
0.5 - L.E. Optr.	P/hr.	14.86	7.43
0.5 - Driver	P/hr.	14.30	7.15
1 - Skilled Laborer	P/hr.	14.30	14.30
2 - Unskilled Laborer	P/hr.	13.82	27.64
Total B	P/hr.		102.29
Total A + B	P/hr.		1125.66
C. Output: 285 m^2/hr.			
1125.66/285	P/m^2		3.95
D. VAT 10% of A & B	P/m^2		0.39
E. Overhead and Profit, 25%	P/m^2		0.99
F. Unit Price	P/m^2		5.33

Pay Item No. 108 Re-Shaping of Existing Shoulder

		Unit	Unit Rate	Amount
A.	Equipment			
1	- Motor Grader,125 Hp	P/hr.	518.65	518.65
0.5	- Pneumatic Roller,85 Hp	P/hr.	322.86	161.43
0.5	- Water Truck,120 Hp	P/hr.	246.05	123.03
0.5	- Vibro. Drum Roller,125 Hp	P/hr.	440.54	220.27
	Total A	P/hr.		1023.38
B.	Labor			
1	- Foreman	P/hr.	22.44	22.44
1.5	- H.E. Optr.	P/hr.	15.55	23.33
0.5	- L.E. Optr.	P/hr.	14.86	7.43
0.5	- Driver	P/hr.	14.30	7.15
1	- Skilled Laborer	P/hr.	14.30	14.30
4	- Unskilled Laborer	P/hr.	13.82	82.92
	Total B	P/hr.		157.57
	Total A + B	P/hr.		1180.94
C.	Output: 300 m^2/hr.			
	1180.94/300	P/m^2		3.94
D.	VAT 10% of A & B	P/m^2		0.39
E.	Overhead and Profit, 25%	P/m^2		0.98
F.	Unit Price	P/m^2		5.31

Pay Item No. 200 Aggregate Sub-Base Course

			Unit	Unit Rate	Amount
A.	Equipment				
	1	- Motor Grader,125 Hp	P/hr.	518.65	518.65
	3	- Pneumatic Roller,85 Hp	P/hr.	322.86	968.58
	1	- Water Truck,120 Hp	P/hr.	246.05	246.05
	1	- Vibro. Drum Roller,125 Hp	P/hr.	368.29	368.29
		Total A	P/hr.		2101.57
B.	Labor				
	1	- Foreman	P/hr.	22.44	22.44
	3	- H.E. Optr.	P/hr.	15.55	46.65
	3	- L.E. Optr.	P/hr.	14.86	44.58
	1	- Driver	P/hr.	14.30	14.30
	1	- Skilled Laborer	P/hr.	14.30	14.30
	4	- Unskilled Laborer	P/hr.	13.82	55.28
		Total B	P/hr.		197.55
		Total A + B	P/hr.		2299.12
C.	Output:	100 m^3/hr.			
		2299.12/100	P/m^3		22.99
D.	Materials	Qty. Unit Cost			
	Coarse Aggregate	1 275	P/m^3		275.00
E.	VAT 10% of A & B		P/m^3		2.30
F.	Overhead and Profit, 25%		P/m^3		5.75
G.	Unit Price		P/m^3		306.04

Pay Item No. 202 Crushed Aggregate Base Course

			Unit	Unit Rate	Amount
A.	Equipment				
	1	- Motor Grader,125 Hp	P/hr.	518.65	518.65
	2	- Pneumatic Roller,85 Hp	P/hr.	322.86	645.72
	1	- Water Truck,120 Hp	P/hr.	246.05	246.05
	1	- Vibro. Tandem Roller,68 Hp	P/hr.	368.29	368.29
		Total A	P/hr.		1778.71
B.	Labor				
	1	- Foreman	P/hr.	22.44	22.44
	2	- H.E. Optr.	P/hr.	15.55	31.10
	2	- L.E. Optr.	P/hr.	14.86	29.72
	1	- Driver	P/hr.	14.30	14.30
	2	- Skilled Laborer	P/hr.	14.30	14.30
	4	- Unskilled Laborer	P/hr.	13.82	55.28
		Total B	P/hr.		167.14
		Total A + B	P/hr.		1945.85
C.	Output: 70 m^3/hr.				
		1945.85/70	P/m^3		27.80
D.	Materials	Qty. Unit Cost			
	Crushed Aggregate	1 400	P/m^3		400.00
E.	VAT 10% of A & B		P/m^3		2.78
F.	Overhead and Profit, 25%		P/m^3		6.95
G.	Unit Price		P/m^3		437.53

Pay Item No. 300(2) Crushed Aggregate Surface Course

A.	Equipment	Unit	Unit Rate	Amount
1	- Motor Grader,125 Hp	P/hr.	518.65	518.65
2	- Pneumatic Roller,85 Hp	P/hr.	322.86	645.72
1	- Water Truck,120 Hp	P/hr.	246.05	246.05
1	- Vibro. Tandem Roller,68.Hp	P/hr.	368.29	368.29
	Total A	P/hr.		1778.71
B.	Labor			
1	- Foreman	P/hr.	22.44	22.44
2	- H.E. Optr.	P/hr.	15.55	31.10
2	- L.E. Optr.	P/hr.	14.86	29.72
1	- Driver	P/hr.	14.30	14.30
1	- Skilled Laborer	P/hr.	14.30	14.30
4	- Unskilled Laborer	P/hr.	13.82	55.28
	Total B	P/hr.		167.14
	Total A + B	P/hr.		1945.85
C.	Output: 60 m^3/hr.			
	1945.85/60	P/m^3		32.43
D.	Materials Qty. Unit Cost			
	Coarse Aggregate 1 400	P/m^3		400.00
E.	VAT 10% of A & B	P/m^3		3.24
F.	Overhead and Profit, 25%	P/m^3		8.11
G.	Unit Price	P/m^3		443.78

Pay Item No. 301(1) Bituminous Prime Coat, MC-70 Cut-Back Asphalt

A. Equipment	Unit	Unit Rate	Amount
1 - Asphalt Distributor,100 Hp	P/hr.	338.55	338.55
0.5 - Power Broom,Towed,90 Hp	P/hr.	135.64	67.82
0.5 - Water Truck,120 Hp	P/hr.	246.05	123.03
0.5 - Pick-Up,70 Hp	P/hr.	111.77	55.89
Total A			585.28
B. Labor			
1 - Foreman	P/hr.	22.44	22.44
1 - H.E. Optr.	P/hr.	15.55	15.55
0.5 - L.E. Optr.	P/hr.	14.86	7.43
1 - Driver	P/hr.	14.30	14.30
1 - Skilled Laborer	P/hr.	14.30	14.30
5 - Unskilled Laborer	P/hr.	13.82	69.10
Total B	P/hr.		143.12
Total A + B	P/hr.		728.40
C. Output: 0.80 Ton/hr.			
728.40/0.80	P/ton		910.50

D. Materials	Qty.	Unit Cost		
Cut-Back Asphalt (MC-70)	1	10250	P/ton	10250.00
E. VAT 10% of A & B				91.05
F. Overhead and Profit, 25%				227.63
G. Unit Price				11479.18

Pay Item No. 303(1) Bituminous Seal Coat, Aggregate Type 2

			Unit Rate	Amount
A.	Equipment	Unit		
	1 - Aggregate Spreader,140 Hp	P/hr.	169.80	169.80
	1 - Vibro. Tandem Roller,68 Hp	P/hr.	368.29	368.29
	Total A	P/hr.		538.09
B.	Labor			
	1 - Foreman	P/hr.	22.44	22.44
	1 - H.E. Optr.	P/hr.	15.55	15.55
	1 - L.E. Optr.	P/hr.	14.86	14.86
	2 - Skilled Laborer	P/hr.	14.30	28.60
	10 - Unskilled Laborer	P/hr.	13.82	138.20
	Total B	P/hr.		219.65
	Total A + B	P/hr.		757.74
C.	Output: 7.0 Tons/hr.			
	757.74/7	P/ton		108.25
D.	Materials Qty. Unit Cost			
	Cover Aggregate 1 270	P/ton		270.00
E.	VAT 10% of A & B	P/ton		10.82
F.	Overhead and Profit, 25%	P/ton		27.06
G.	Unit Price	P/ton		416.14

Pay Item No. 303(2) Bituminous Seal Coat, MC-800 Cut-Back Asphalt

A. Equipment		Unit	Unit Rate	Amount
1	- Asphalt Distributor,100 Hp	P/hr.	338.55	338.55
	Total A	P/hr.		338.55
B. Labor				
1	- Foreman	P/hr.	22.44	22.44
1	- H.E. Optr.	P/hr.	15.55	15.55
2	- Skilled Laborer	P/hr.	14.30	28.60
4	- Unskilled Laborer	P/hr.	13.82	69.10
	Total B	P/hr.		135.69
	Total A + B	P/hr.		474.24
C. Output:	0.80 Ton/hr.			
	474.24/0.80	P/ton		592.80

D. Materials	Qty.	Unit Cost		
Cut-Back Asphalt	1	10250	P/ton	10250.00
E. VAT 10% of A & B			P/ton	59.28
F. Overhead and Profit, 25%			P/ton	148.20
G. Unit Price			P/ton	11050.28

Pay Item No. 304(1)a Bituminous Surface Treatment,
Aggregate Grading A

A. Equipment	Unit	Unit Rate	Amount
1 - Aggregate Spreader,140 Hp	P/hr.	169.80	169.80
1 - Vibro. Tandem Roller,68 Hp	P/hr.	368.29	368.29
0.5 - Pneumatic Roller,85 Hp	P/hr.	322.86	161.43
Total A	P/hr.		699.52
B. Labor			
1 - Foreman	P/hr.	22.44	22.44
1 - H.E. Optr.	P/hr.	15.55	15.55
1.5 - L.E. Optr.	P/hr.	14.86	22.29
1 - Skilled Laborer	P/hr.	14.30	14.30
10 - Unskilled Laborer	P/hr.	13.82	138.20
Total B	P/hr.		212.78
Total A + B	P/hr.		912.30
C. Output: 8 Tons/hr.			
912.30/8	P/ton		114.04

D. Materials	Qty.	Unit Cost		
Coarse Aggregate	0.97	479	P/ton	464.63
Fine Aggregate	0.03	270	P/ton	8.10
E. VAT 10% of A & B			P/ton	11.40
F. Overhead and Profit, 25%			P/ton	28.51
G. Unit Price			P/ton	626.68

Pay Item No. 304(1)b Bituminous Surface Treatment,
Aggregate Grading B

A.	Equipment	Unit	Unit Rate	Amount
	1 - Aggregate Spreader,140 Hp	P/hr.	169.80	169.80
	1 - Vibro. Tandem Roller,68 Hp	P/hr.	368.29	368.29
	0.5 - Pneumatic Roller,85 Hp	P/hr.	322.86	161.43
	Total A	P/hr.		699.52
B.	Labor			
	1 - Foreman	P/hr.	22.44	22.44
	1 - H.E. Optr.	P/hr.	15.55	15.55
	1.5 - L.E. Optr.	P/hr.	14.86	22.29
	1 - Skilled Laborer	P/hr.	14.30	14.30
	10 - Unskilled Laborer	P/hr.	13.82	138.20
	Total B	P/hr.		212.78
	Total A + B	P/hr.		912.30
C.	Output: 8 Tons/hr.			
	912.30/8	P/ton		114.04

D.	Materials	Qty.	Unit Cost			
	Coarse Aggregate	0.97	479	P/ton		464.63
	Fine Aggregate	0.03	270	P/ton		8.10
E.	VAT 10% of A & B			P/ton		11.40
F.	Overhead and Profit, 25%			P/ton		28.51
G.	Unit Price			P/ton		626.68

Pay Item No. 304(4) Bituminous Surface Treatment,
MC-800 Cut-Back Asphalt

			Unit Rate	Amount
A.	Equipment	Unit		
	1 - Asphalt Distributor,100 Hp	P/hr.	338.55	338.55
	0.5 - Power Broom,Towed,90 Hp	P/hr.	135.64	67.82
	0.5 - Pick-Up,70 Hp	P/hr.	111.77	55.89
	Total A	P/hr.		462.26
B.	Labor			
	1 - Foreman	P/hr.	22.44	22.44
	1 - H.E. Optr.	P/hr.	15.55	15.55
	0.5 - L.E. Optr.	P/hr.	14.86	7.43
	0.5 - Driver	P/hr.	14.30	7.15
	2 - Skilled Laborer	P/hr.	14.30	28.60
	5 - Unskilled Laborer	P/hr.	13.82	69.10
	Total B	P/hr.		150.27
	Total A + B	P/hr.		612.53
C.	Output: 0.9 Ton/hr.			
	612.53/0.9	P/ton		680.58
D.	Materials Qty. Unit Cost			
	Cut-Back Asphalt MC-800 1 10250	P/ton		10250.00
E.	VAT 10% of A & B	P/ton		68.06
F.	Overhead and Profit, 25%	P/ton		170.15
G.	Unit Price	P/ton		11168.79

Pay Item No. 305(1) Aggregate for Bituminous Pen. Macadam

			Unit	Unit Rate	Amount
A.	Equipment				
	1	- Aggregate Spreader,140 Hp	P/hr.	169.80	169.80
	1	- Vibro. Tandem Roller,68 Hp	P/hr.	368.29	368.29
	1	- Pneumatic Roller,85 Hp	P/hr.	322.86	322.86
		Total A	P/hr.		860.95
B.	Labor				
	1	- Foreman	P/hr.	22.44	22.44
	1	- H.E. Optr.	P/hr.	15.55	15.55
	2	- L.E. Optr.	P/hr.	14.86	29.72
	1	- Skilled Laborer	P/hr.	14.30	14.30
	10	- Unskilled Laborer	P/hr.	13.82	138.20
		Total B	P/hr.		220.21
		Total A + B	P/hr.		1081.16
C.	Output: 15 Tons/hr.				
		1081.16/15	P/ton		72.08

D.	Materials	Qty.	Unit Cost		
				P/ton	
	Coarse Aggregate	0.95	479	P/ton	455.05
	Fine Aggregate	0.05	270	P/ton	13.50

E.	VAT 10% of A & B	P/ton	7.21
F.	Overhead and Profit, 25%	P/ton	18.02
G.	Unit Price	P/ton	565.85

Pay Item No. 305(3) MC-800 Cut-Back Asphalt for Bituminous Penetration Macadam Pavement

			Unit Rate	Amount
A.	Equipment	Unit		
	1 - Asphalt Distributor,100 Hp	P/hr.	338.55	338.55
	0.5 - Power Broom,90 Hp	P/hr.	135.64	67.82
	0.5 - Pick-Up,70 Hp	P/hr.	111.77	55.89
	Total A	P/hr.		462.26
B.	Labor			
	1 - Foreman	P/hr.	22.44	22.44
	1 - H.E. Optr.	P/hr.	15.55	15.55
	0.5 - L.E. Optr.	P/hr.	14.86	7.43
	0.5 - Driver	P/hr.	14.30	7.15
	1 - Skilled Laborer	P/hr.	14.30	14.30
	5 - Unskilled Laborer	P/hr.	13.82	138.20
	Total B	P/hr.		205.07
	Total A + B	P/hr.		667.33
C.	Output: 0.80 Ton/hr.			
	667.33/0.8	P/ton		834.16
D.	Materials Qty. Unit Cost			
	MC-800 Asphalt 1 10250	P/ton		10250.00
E.	VAT 10% of A & B	P/ton		83.42
F.	Overhead and Profit, 25%	P/ton		208.54
G.	Unit Price	P/ton		11376.12

Pay Item No. 310 Bituminous Concrete Surface Course, Hot Laid

			Unit	Unit Rate	Amount
A.	Equipment				
	1	- Asphalt Paver,130 Hp	P/hr.	819.15	819.15
	1	- Vibro. Tandem Roller,68 Hp	P/hr.	368.29	368.29
	2	- Pneumatic Roller,85 Hp	P/hr.	322.86	645.72
	4	- Dump Trucks,100 Hp	P/hr.	174.96	699.84
		Total A	P/hr.		2533.00
B.	Labor				
	1	- Foreman	P/hr.	22.44	22.44
	2	- H.E. Optr.	P/hr.	15.55	31.10
	2	- L.E. Optr.	P/hr.	14.86	29.72
	4	- Driver	P/hr.	14.30	57.20
	5	- Skilled Laborer	P/hr.	14.30	71.50
	10	- Unskilled Laborer	P/hr.	13.82	138.20
		Total B	P/hr.		350.16
		Total A + B	P/hr.		2883.16
C.	Output: 10 Tons/hr.				
		2883.16/10	P/ton		288.32
D.	Materials	Qty. Unit Cost			
	Bit. Conc. Mixed	.1 1277	P/ton		1277.00
E.	VAT 10% of A & B		P/ton		28.83
F.	Overhead and Profit, 25%		P/ton		72.08
G.	Unit Price		P/ton		1666.23

Pay Item No. 311(1) Portland Cement Concrete Surface, Plain (t = 18 cm.)

				Unit Rate	Amount
A.	Equipment		Unit		
	1	- Conc. Batching Plant,75 Hp	P/hr.	314.12	314.12
	1	- Wheel Loader,100 Hp	P/hr.	436.97	436.97
	3	- Transit Mixers,200 Hp	P/hr.	484.02	1452.06
	1	- Water Truck,120 Hp	P/hr.	246.05	246.05
	1	- Concrete Cutter,30 Hp	P/hr.	69.26	69.26
		Misc. Tools 10% of Above	P/hr.		251.85
		Total A	P/hr.		2770.31
B.	Labor				
	1	- Foreman	P/hr.	22.44	22.44
	1	- Asst. Foreman	P/hr.	18.81	18.81
	2	- H.E. Optr.	P/hr.	15.55	31.10
	4	- Driver	P/hr.	14.30	57.20
	15	- Skilled Laborer	P/hr.	14.30	214.50
	25	- Unskilled Laborer	P/hr.	13.82	345.50
		Total B	P/hr.		689.55
		Total A + B	P/hr.		3459.86
C.	Output: 100 m^2/hr.				
		3459.86/100	P/m^2		32.95

D.	Materials	Qty.	Unit Cost		
	Portland Cement	1.72	100	P/m^2	172.00
	Rein. Bars	0.40	20	P/m^2	8.00
	Lumber	0.60	25	P/m^2	15.00
	C.W. Nails	0.002	30	P/m^2	0.06
	Fine Aggregate	0.08	200	P/m^2	16.00
	Crushed Agg.	0.16	400	P/m^2	64.00
	Water	0.054	7.5	P/m^2	0.41
	Incidentals 10% of Above			P/m^2	27.55
E.	VAT 10% of A & B			P/m^2	3.30
F.	Overhead and Profit, 25%			P/m^2	8.24
G.	Unit Price			P/m^2	347.50

Pay Item No. 504 Grouted Riprap Side Ditch

A.	Equipment	Unit	Unit Rate	Amount
	1 - Minor Tools	P/hr.	21.78	21.78
	Total A	P/hr.		21.78
B.	Labor			
	1 - Foreman	P/hr.	22.44	22.44
	4 - Skilled Laborer	P/hr.	14.30	57.20
	10 - Unskilled Laborer	P/hr.	13.82	138.20
	Total B	P/hr.		217.84
	Total A + B	P/hr.		239.62
C.	Output: 1.2 lm./hr.			
	239.62/1.2	P/lm.		199.68

D.	Materials	Qty.	Unit Cost		
	Riprap	0.38	450	P/lm.	171.00
	Cement Grout	0.11	1620	P/lm.	178.20
E.	VAT 10% of A & B			P/lm.	19.97
F.	Overhead and Profit, 25%			P/lm.	49.92
G.	Unit Price			P/lm.	618.77

Construction Cost Estimate

Section No. 1 to 4

Pay Item No.	DESCRIPTION	Unit	Estimated Quantity	Unit Price	Total Price
102(2)	Surplus Common Excavation	P/m^3	3025.00	58.27	176266.75
102(5)	Surplus Excavation of Existing Pavement, Section 3 and 4	P/m^3	1818.80	71.96	130880.85
104(3)	Selection Borrow for Topping, Case 2	P/m^3	595.60	101.40	60393.84
104(5)	Embankment for Shoulder w/ Materials Obtained from Excavation of Existing Pavement	P/m^3	970.70	54.98	53369.09
105	Subgrade Preparation	P/m^2	21522.05	5.33	114712.53
108	Re-Shaping of Existing Shoulder	P/m^2	337.00	5.31	1789.47
200	Aggregate Sub-Base Course	P/m^3	2877.87	306.04	880743.33
202	Crushed Aggregate Base Course	P/m^3	2800.10	437.53	1225127.75
300(2)	Crushed Aggregate Surface Course	P/m^3	363.28	443.78	161216.40
301(1)	Bit. Prime Coat, MC-70 Cut-Back Asphalt	P/MT	17.18	11479.18	197212.31
303(1)	Bituminous Seal Coat, Aggregate Type 2	P/MT	29.42	416.14	12242.84
303(2)	Bit. Seal Coat, MC-800 Cut-Back Asphalt	P/MT	3.92	11050.28	43317.10
304(1)a	Bit. Surface Treatment, Aggregate Grading A	P/MT	133.36	626.68	83574.04
304(1)b	Bit. Surface Treatment, Aggregate Grading B	P/MT	87.14	626.68	54608.90
304(4)	Bit.Surface Treatment,MC-800 Cut-Back Asphalt	P/MT	17.80	11168.79	198804.46
305(1)	Aggregate for Bit. Penetration Macadam	P/MT	585.60	565.85	331361.76
305(3)	MC-800 Cut-Back Asphalt for Bituminous Penetration Macadam Pavement	P/MT	34.56	11376.12	393158.71
310	Bit. Concrete Surface Course, Hot Laid	P/MT	563.03	1666.23	938137.48
504	Grouted Riprap Side Ditch	P/LM	1280.00	618.77	792025.60
SP-2	Laboratory Improvement and Apparatus	Lump Sum	1.00	308000.00	308000.00
SP-3	Laboratory Staff	Lump Sum	1.00	100000.00	100000.00
SP-6	Vehicles for the Engineer's Staff	Lump Sum	1.00	225000.00	225000.00
SP-7	Informatory Signs	Each	8.00	4500.00	36000.00
SP-8	Photographs	Each	684.00	50.00	34200.00
	TOTAL				6552143.21

Construction Cost Estimate

Section No. 5

Pay Item No.	DESCRIPTION	Unit	Estimated Quantity	Unit Price	Total Price
102(6)	Surplus Excavation of Existing Pavement, Section No.5	P/m^3	522.50	71.96	37599.10
104(5)	Embankment for Shoulder w/ Materials Obtained from Excavation of Existing Pavement	P/m^3	458.30	54.98	25197.33
105	Subgrade Preparation	P/m^2	2920.00	5.33	15563.60
200	Aggregate Sub-Base Course	P/m^3	569.40	306.04	174259.18
202	Crushed Aggregate Base Course	P/m^3	225.00	437.53	98444.25
301(1)	Bit. Prime Coat, MC-70 Cut-Back Asphalt	P/MT	1.34	11479.18	15382.10
310	Bit. Concrete Surface Course, Hot Laid	P/MT	167.50	1666.23	279093.53
311	Portland Cement Concrete Surface, Plain (t = 18 cm.)	P/lm.	1340.00	347.50	465650.00
SP-2	Laboratory Apparatus	Lump Sum	1.00	100000.00	100000.00
SP-3	Laboratory Staff	Lump Sum	1.00	53000.00	53000.00
SP-6	Vehicles for the Engineer's Staff	Lump Sum	1.00	112500.00	112500.00
SP-7	Informatory Signs	Each	2.00	4500.00	9000.00
SP-8	Photographs	Each	60.00	50.00	3000.00
	TOTAL				1388689.09

ESTIMATED CONSTRUCTION COST OF EACH PAVEMENT MODEL

(Unit : ₱)

ITEM	SECTION NO. 1 Carriageway Width = 6.00 m Length = 4× 200 = 800m				SECTION NO. 2 Carriageway Width = 6.00 m Length = 4× 200 = 800m				SECTION NO. 3 Carriageway Width = 6.00 m Length = 4× 200 = 800m				SECTION NO. 4 Carriageway Width = 6.00 m Length = 4× 200 = 800m				SECTION No. 1 ~ 4	SECTION NO. 5 CW Width = 6.70 m Length = 2× 200 = 400m		SECTION No. 5
	GRAVEL	SBST	DBST	BMP	GRAVEL	SBST	DBST	BMP	DBST	BMP	AC (4cm)	AC (5cm)	DBST	BMP	AC (4cm)	AC (5cm)	TOTAL	AC (5cm)	PCC (18cm)	TOTAL
102 (2) Surplus Common Excavation	18, 992. 77	22. 503. 87	24, 306. 42	24, 306. 42	18, 113. 24	21. 562. 61	23. 287. 61	23. 287. 61									172, 866. 75			
102 (5) Surplus Excavation of Existing Pavement for Section NO. 3 and 4									25, 63. 00	25. 699. 00	13. 234. 16	13. 234. 16	10. 806. 10	12. 720. 29	14. 849. 67	14. 849. 67	130. 880. 85			
102 (6) Surplus Excavation of Existing Pavement for Section NO. 5																		18. 799. 55	18. 799. 55	37. 599. 10
104 (3) Selected Borrow for Topping, Case 2	7. 615. 14	7. 615. 14	7. 615. 14	7. 615. 14	7. 483. 32	7. 483. 32	7. 483. 32	7. 483. 32									60. 393. 84			
104 (5) Embankment for Shoulder with Materials obtained from Excavation of Existing Pavement									5. 259. 09	5. 259. 09	5. 259. 09	5. 256. 09	8. 886. 10	8. 886. 10	8. 886. 10	8. 886. 10	53. 369. 09	12. 598. 87		25. 197. 33
108 Re-shaping of Existing Shoulder									319. 93	319. 93	319. 93	319. 93	127. 44	127. 44	127. 44	127. 43	1. 789. 47			
105 (11) Subgrade Preparation (Common Material)	7. 035. 60	7. 189. 26	7. 189. 26	7. 035. 60	7. 152. 38	7. 1332. 22	7. 431. 57	7. 035. 60	7. 035. 60	7. 035. 60	7. 258. 18	7. 258. 18	7. 035. 60	7. 035. 60	7. 035. 60	7. 818. 60	114. 212. 53	7. 781. 80	7. 781. 80	15. 383. 60
200 Aggregate Subbase Course	29. 159. 64	35. 298. 46	37. 159. 29	29. 159. 64	32. 853. 39	50. 521. 06	58. 339. 61	40. 387. 24	121. 161. 64	105. 032. 93	33. 339. 18	25. 006. 53	52. 516. 46	64. 635. 65	92. 913. 24	91. 840. 44	880. 743. 33	84. 895. 50	89. 369. 60	174. 259. 10
202 Crushed Aggregate Base Course		88. 783. 59	89. 399. 62	88. 256. 12		98. 546. 83	92. 292. 58	88. 256. 12	88. 893. 45	89. 256. 12	73. 598. 92	74, 121. 96	87. 418. 49	88. 256. 12	88. 731. 88	98. 409. 74	1, 225, 127. 75	98. 444. 25		98. 444. 25
300 (2) Crushed Aggregate Surface Course	79. 888. 40				81. 336. 88												161. 218. 40			
301 (1) Bituminous Prime Coat, MC-70 Cut-back Asphalt		14. 119. 39	14. 119. 39	13. 775. 82		14. 483. 77	14. 578. 58	13. 775. 82	13. 775. 82	13. 775. 82	14. 234. 18	14. 234. 18	13. 775. 82	13. 775. 82	13. 775. 82	15. 457. 78	193. 212. 35	15. 382. 19		15. 382. 19
303 (1) Bituminous Seal Coat, Cover Aggregate, Type 2			3. 866. 95				3. 183. 47		2. 988. 21				2. 986. 21				12. 242. 84			
303 (2) Bituminous Prime Coat, MC-800 Cut-back Asphalt			10. 828. 27				11. 271. 29		10. 808. 27				10. 808. 27				43. 317. 10			
304 (1) a Bituminous Surface Treatment Cover Aggregate Grading-A			26. 843. 85				21. 720. 73		26. 454. 84				20. 454. 82				83. 574. 84			
304 (1) bBituminous Surface Treatment Cover Aggregate Grading-B		10. 471. 82	8. 378. 71			10. 703. 69	8. 685. 78		8. 184. 44				8. 184. 46				54. 608. 90			
304 (4) Bituminous Surface Treatment MC-800 Cut-back Asphalt		18. 651. 88	40. 319. 33			19. 998. 63	41. 882. 96		38. 425. 83				38. 425. 83				196. 804. 46			
305 (1) Bituminous Penetration Macadam Pavement, Aggregate				82. 840. 44				82. 840. 44		82. 840. 44				82. 840. 44			333. 361. 76			
305 (3) Bituminous Penetration Macadam Pavement, MC-800 Cut-back Asphalt				98. 289. 68				98. 289. 68		98. 289. 68				98. 289. 67			393. 158. 71			
310 Bituminous Concrete Surface Course, Hot-Laid											206. 912. 44	258. 832. 22			199. 947. 60	272. 945. 22	938. 137. 48	279. 093. 53		279. 093. 53
311 (1) Portland Cement Concrete Pavement, Plain (t=18cm)																			485. 650. 00	485. 650. 00
504 Grouted Riprap Side Ditch									178. 285. 76	247. 500. 00	247. 500. 00	110. 803. 84					781. 825. 60			
SP-1 Laboratory Apparatus	19. 250. 00	19. 250. 00	19. 250. 00	19. 250. 03	19. 250. 00	19. 250. 00	19. 250. 00	19. 250. 00	19. 250. 00	19. 250. 00	19. 250. 00	19. 250. 00	19. 250. 00	19. 250. 00	19. 250. 00	19. 250. 00	308. 000. 00	25. 000. 00	25. 000. 00	50. 000. 000
SP-3 Laboratory Staff	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	6. 250. 00	100. 000. 00	50. 000. 00	50. 000. 00	100. 000. 00
SP-6 Vehicles for the Engineer's Staff	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	14. 062. 50	225. 000. 00	56. 250. 00	56. 250. 00	112. 500. 00
SP-7 Information Signs	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	2. 250. 00	36. 000. 00	4. 500. 00	45. 000. 00	9. 000. 00
SP-8 Photograph	2. 000. 00	2. 000. 00	2. 000. 00	2. 000. 00	2. 000. 00	2. 000. 00	2. 000. 00	2. 000. 00	2. 500. 00	2. 000. 00	2. 000. 00	2. 000. 00	2. 500. 00	2. 000. 00	2. 000. 000	2. 000. 00	34. 000. 00	1. 000. 00	1. 200. 00	3. 000. 00
Cost of Each Pavement Model	174, 645. 85	246, 355. 85	307, 037. 44	387, 127. 56	190. 750. 83	265. 524. 85	335. 368. 38	406. 172. 57	564, 340. 79	719. 415. 31	645, 471. 50	580. 679. 58	385. 548. 18	421. 166. 91	469. 278. 83	550. 278. 83	6. 552. 143. 21	661. 345. 40	727. 343. 80	1. 388. 689. 09
Pavement Unit Cost, Peso/m²	147. 87	208. 46	249. 86	322. 61	156. 11	211. 46	265. 18	338. 48	470. 29	599. 51	539. 89	451. 52	254. 32	351. 00	391. 97	429. 49		413. 54	542. 78	

Construction Cost

Section No. 1 to 4

Price Unit: Peso

Pay Item No.	Description	Unit	Estimated Quantity	Unit Price	Total Price
102(2)	Surplus Common Excavation	P/m³	3,025.00	48.74	147,589.75
102(5)	Surplus Excavation of Existing Pavement Section 3 and 4	P/m³	1,818.80	74.18	134,918.58
104(3)	Section Borrow for Topping, Case 2	P/m³	595.60	104.77	62,401.01
104(5)	Embankment for Shoulder w/Materials Obtained from Excavation of Existing Pavement	P/m³	970.70	53.51	51,748.02
105	Subgrade Preparation	P/m²	21,522.05	5.22	112,345.10
108	Re-Shaping of Existing Shoulder	P/m²	337.00	5.28	1,779.36
200	Aggregate Sub-Base Course	P/m³	2,877.87	153.22	438,385.94
202	Crushed Aggregate Base Course	P/m³	2,800.10	531.63	1,488,617.16
300(2)	Crushed Aggregate Surface Course	P/m³	363.28	601.08	218,360.34
301(1)	Bit. Prime Coat, MC-70 Cut-Back Asphalt	P/MT	17.18	11,635.41	199,896.34
303(1)	Bituminous Seal Coat, Aggregate Type 2	P/MT	29.42	495.71	14,583.79
303(2)	Bit. Seal Coat, MC-800 Cut-Back Asphalt	P/MT	3.92	10,985.86	43,064.57
304(1)a	Bit. Surface Treatment, Aggregate Grading A	P/MT	133.36	599.23	79,913.31
304(1)b	Bit. Surface Treatment, Aggregate Grading B	P/MT	87.14	599.23	52,216.90
304(4)	Bit. Surface Treatment, MC-800 Cut-Back Asphalt	P/MT	17.80	11,157.75	198,607.95
305(1)	Aggregate for Bit. Penetration Macadam	P/MT	585.60	575.65	337,100.64
305(3)	MC-800 Cut-Back Asphalt for Bituminous Penetration Macadam Pavement	P/MT	34.56	11,165.47	385,878.64
310	Bit. Concrete Surface Course, Hot Laid	P/MT	563.03	1,608.58	905,678.80
504	Grouted Riprap Side Ditch	P/LM	1,280.00	618.07	791,129.60
SP-2	Laboratory Improvement and Apparatus	Lump Sum	1.00	323,859.07	323,859.07
SP-3	Laboratory Staff	Lump Sum	1.00	106,668.49	106,668.49
SP-6	Vehicles for the Engineer's Staff	Lump Sum	1.00	225,000.00	225,000.00
SP-7	Informatory Signs	Each	8.00	4,513.97	36,111.76
SP-8	Photographs	Each	684.00	51.71	35,369.64
Total					6,391,224.76

Construction Cost

Section No. 5

Price Unit: Peso

Pay Item No.	Description	Unit	Estimated Quantity	Unit Price	Total Price
102(6)	Surplus Excavation of Pavement, Section No. 5	P/m³	522.50	151.68	79,252.80
104(5)	Embankment for shoulder w/Materials Obtained from Excavation of Existing Pavement	P/m³	458.30	229.45	105,156.94
105	Subgrade Preparation	P/m²	2,920.00	4.72	13,782.40
200	Aggregate Sub-Base Course	P/m³	569.40	240.89	137,162.77
202	Crushed Aggregate Base Course	P/m³	225.00	405.66	91,275.50
301(1)	Bit. Prime Coat, MC-70 Cut-Back Asphalt	P/MT	1.34	18,560.00	24,870.40
310	Bit. Concrete Surface Course, Hot Laid	P/MT	167.50	1,510.40	252,992.00
311	Portland Cement Concrete Surface, Plain (t=18cm)	P/LM	1,340.00	388.19	520,174.60
SP-1	Demountable Field Office	2 Unit		18,758.40	37,516.80
SP-6	Vehicles for the Engineer's Staff	Lump Sum	1.00	86,470.66	86,470.66
SP-7	Informatory Signs	Each	2.00	3,548.80	7,097.60
Total					1,355,750.47

CONSTRUCTION COST OF EACH PAVEMENT MODEL

(Unit : ₱)

ITEM	SECTION NO. 1 Carriageway Width = 6.00 m Length = 4× 200 = 800m				SECTION NO. 2 Carriageway Width = 6.00 m Length = 4× 200 = 800m				SECTION NO. 3 Carriageway Width = 6.00 m Length = 4× 200 = 800m				SECTION NO. 4 Carriageway Width = 6.00 m Length = 4× 200 = 800m				SECTION No. 1 ~ 4 .	SECTION NO. 5 CW Width = 6.70 m Length = 2× 200 = 400m		SECTION No. 5
	GRAVEL	SBST	OBST	BMP	GRAVEL	SBST	OBST	BMP	OBST	BMP	AC (4cm)	AC (5cm)	OBST	BMP	AC (4cm)	AC (5cm)	TOTAL	AC (5cm)	PCC (18cm)	TOTAL
102 (2) Surplus Common Excavation	15, 827. 48	18, 842. 70	20, 350. 31	20, 350. 31	15, 166. 37	18, 054. 74	19, 498. 92	19, 498. 92									147, 589. 75			
102 (5) Surplus Excavation of Existing Pavement for Section NO. 3 and 4									26, 481. 52	26, 481. 52	13, 642. 44	13, 642. 44	18, 934. 14	13, 128. 96	15, 309. 78	15, 307. 78	134, 918. 58			
102 (6) Surplus Excavation of Existing Pavement for Section NO. 5																		39, 626. 40	39, 626. 40	79, 252. 80
104 (3) Selected Borrow for Topping, Case 2	7, 868. 23	7, 868. 23	7, 868. 23	7, 868. 23	7, 732. 03	7, 732. 03	7, 732. 03	7, 732. 03									62, 401. 01			
104 (5) Embankment for Shoulder with Materials obtained from Excavation of Existing Pavement									5, 096. 44	5, 096. 44	5, 096. 44	5, 096. 44	7, 840. 57	7, 840. 57	7, 840. 57	7, 840. 55	51, 748. 02	52, 578. 47	52, 578. 47	105, 156. 94
108 Re-shaping of Existing Shoulder									318. 12	318. 12	318. 12	318. 12	126. 72	126. 72	126. 72	126. 72	1, 729. 36			
105 (11) Subgrade Preparation (Common Material)	6, 890. 40	7, 040. 89	7, 040. 89	6, 890. 40	7, 004. 27	7, 180. 89	7, 228. 18	6, 890. 46	6, 890. 40	6, 890. 40	7, 108. 39	7, 108. 39	6, 890. 40	6, 890. 40	6, 890. 40	7, 459. 49	112, 345. 10	6, 891. 20	6, 891. 20	13, 782. 40
200 Aggregate Subbase Course	10, 053. 78	16, 529. 33	18, 491. 34	10, 053. 78	16, 352. 63	25, 146. 64	29, 734. 82	20, 107. 56	60, 322. 68	52, 279. 66	16, 594. 83	12, 446. 88	26, 139. 83	32, 172. 10	48, 247. 39	45, 712. 89	438, 385. 94	86, 822. 89	79, 339. 88	137, 162. 77
202 Crushed Aggregate Base Course		107, 878. 36	108, 516. 32	108, 452. 52		110, 928. 83	12, 142. 83	108, 452. 50	105, 581. 72	108, 452. 52	88, 425. 48	98, 863. 44	106, 219. 87	108, 452. 52	107, 814. 56	117, 144. 67	1, 498, 617. 16	91, 273. 50		91, 273. 50
308 (2) Crushed Aggregate Surface Coure	108, 194. 40				110, 165. 94												218, 360. 34			
301 (1) Bituminous Prime Coat, MC-70 Cut-back Asphalt		14, 311. 55	14, 311. 55	13, 962. 49		14, 668. 62	14, 776. 97	13, 962. 49	13, 962. 49	13, 962. 49	14, 427. 91	14, 427. 91	13, 962. 49	13, 962. 49	13, 962. 49	15, 242. 40	199, 896. 34	24, 870. 40		27, 870. 40
303 (1) Bituminous Seal Coat, Cover Aggregate, Type 2			3, 653. 38				3, 792. 18		3, 569. 11				3, 569. 12				14, 583. 79			
303 (2) Bituminous Prime Coat, MC-800 Cut-back Asphalt			10, 766. 14				11, 205. 58		10, 546. 43				10, 546. 42				43, 064. 57			
304 (1) a Bituminous Surface Treatment Cover Aggregate Grading-A			20, 026. 27				20, 769. 31		19, 558. 87				19, 558. 86				79, 913. 31			
304 (1) b Bituminous Surface Treatment Cover Aggregate Grading-B		19, 013. 13	8, 911. 71			18, 234. 85	8, 305. 33		7, 825. 94				7, 825. 94				52, 216. 90			
304 (1) Bituminous Surface Treatment MC-800 Cut-back Asphalt		18, 633. 44	40, 279. 48			19, 879. 75	41, 841. 56		39, 386. 86				39, 386. 86				198, 607. 95			
305 (1) Bituminous Penetration Macadam Pavement, Aggregate				84, 275. 16				84, 275. 16		84, 275. 16				84, 275. 16			337, 100. 64			
305 (3) Bituminous Penetration Macadam Pavement, MC-800 Cut-back Asphalt				6, 469. 66				96, 469. 66		96, 469. 66				96, 469. 66			385, 878. 64			
310 Bituminous Concrete Surface Course, Hot-Laid											199, 753. 16	249, 683. 79			193, 029. 80	263, 211. 95	905, 678. 80	252, 992. 00		252, 992. 00
311 (1) Portland Cement Concrete Pavement, Plain (t=18cm)																			520, 174. 60	520, 174. 60
506 Grouted Riprap Side Ditch									178, 004. 16	247, 228. 00	247, 228. 00	518, 669. 44					791, 129. 60			
SP-1 Laboratory Apparatus	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 19	20, 241. 22	323, 859. 07	18, 758. 40	18, 758. 40	37, 516. 80
SP-3 Laboratory Staff	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	6, 666. 78	5, 666. 79	106, 668. 49			
SP-6 Vehicles for the Engineer's Staff	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	14, 062. 50	225, 000. 00	43, 235. 33	43, 235. 33	86, 470. 66
SP-7 Information Signs	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	2, 257. 36	36, 117. 76	3, 548. 80	3, 548. 80	7, 097. 60
SR-5 Photograph	2, 068. 40	2, 068. 40	2, 068. 40	2, 068. 40	2, 068. 40	2, 068. 40	2, 068. 40	2, 068. 40	2, 535. 50	2, 688. 92	2, 068. 40	2, 068. 40	2, 585. 50	2, 688. 92	2, 068. 40	2, 068. 40	35, 369. 64			
Cost of Each Pavement Model	194, 130. 52	246, 413. 86	304, 611. 85	393, 688. 38	201, 717. 97	257, 406. 58	332, 373. 15	402, 684. 94	523, 358. 97	687, 370. 72	638, 891. 39	556, 753. 08	298, 811. 35	409, 227. 33	517, 342. 52	517, 342. 52	6, 391, 224. 76	600, 597. 39	755, 155. 08	1, 355, 750. 47
Pavement Unit Cost, Peso/m²	161. 77	205. 33	247. 89	328. 02	165. 08	205. 08	260. 83	335. 57	436. 13	572. 81	514. 58	448. 36	249. 01	341. 02	395. 21	395. 21		448. 21	563. 55	

Appendix 8–8

PROGRESS CHART OF EXPERIMENTAL PAVEMENT CONSTRUCTION

PROGRESS OF EXPERIMENTTAL PAVEMENT CONSTRUCTION : SECTION No. 1 to No. 5

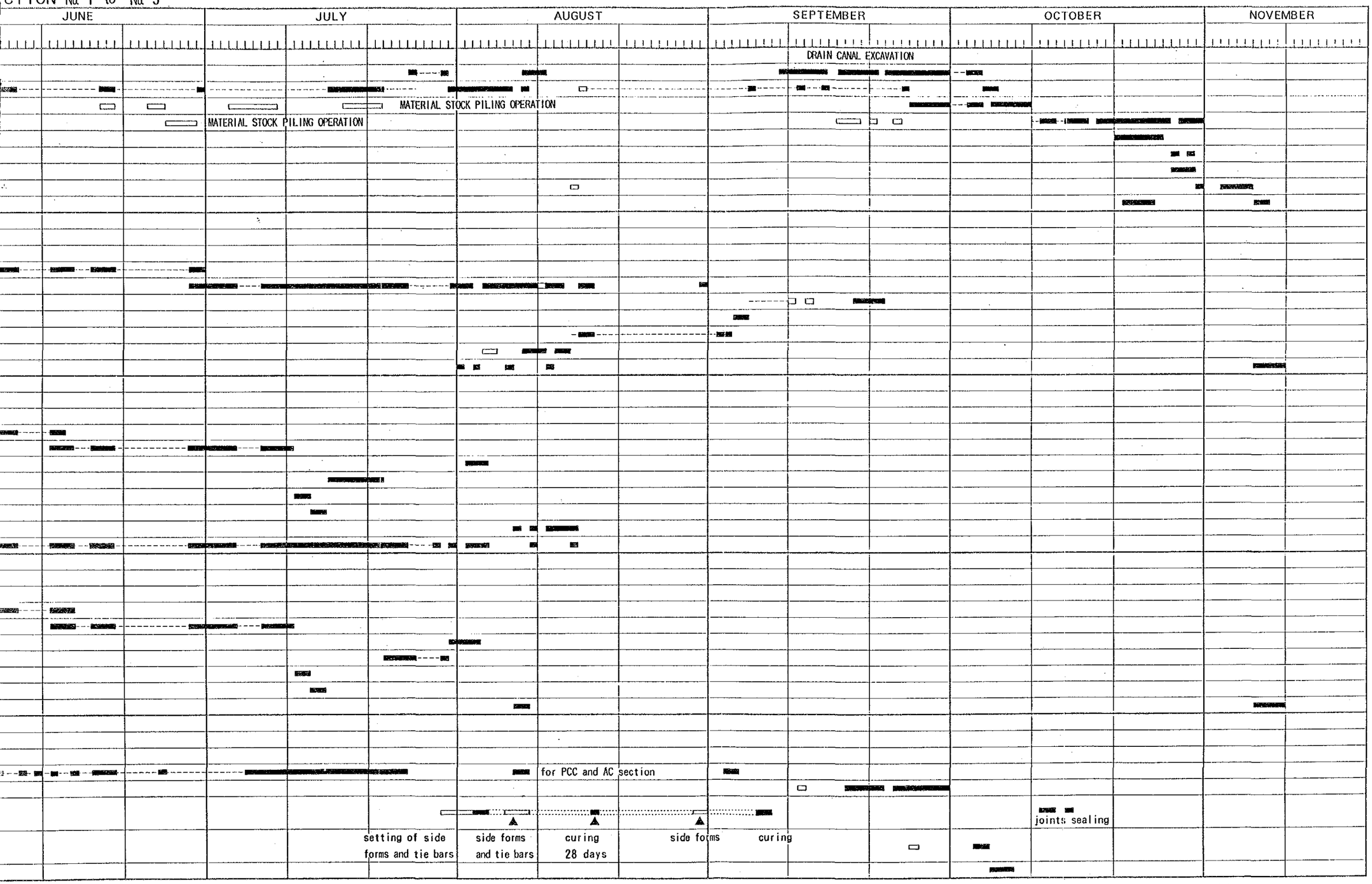
ITEMS			APRIL	MAY	JUNE	JULY	AUGUST	S
SECTION 1	MOBILIZATION							
	EXCAVATION							
	SUBGRADE PREPARATRION							
	SUBBASE COURSE					MATERIAL STOCK PILING OPERATION		
	BASE COURSE					MATERIAL STOCK PILING OPERATION		
	SURFACE COURSE	GRAVEL						
		SBST						
		DBST						
		BMP						
	SHOULDER							
SECTION 2	MOBILIZATION							
	EXCAVATION							
	SUBGRADE PREPARATRION							
	SUBBASE COURSE							
	BASE COURSE							
	SURFACE COURSE	GRAVEL						
		SBST						
		DBST						
		BMP						
	SHOULDER							
SECTION 3	MOBILIZATION							
	EXCAVATION							
	SUBGRADE PREPARATRION							
	SUBBASE COURSE							
	BASE COURSE							
	SURFACE COURSE	DBST						
		BMP						
		AC (4cm)						
		AC (5cm)						
	SHOULDER							
	SIDE DITCH							
SECTION 4	MOBILIZATION							
	EXCAVATION							
	SUBGRADE PREPARATRION							
	SUBBASE COURSE							
	BASE COURSE							
	SURFACE COURSE	DBST						
		BMP						
		AC (4cm)						
		AC (5cm)						
	SHOULDER							
SECTION 5	MOBILIZATION							
	EXCAVATION							
	SUBGRADE PREPARATRION			for PCC and AC section				
	SUBBASE COURSE						for PCC and AC section	
	BASE COURSE							
	SURFACE COURSE	PPC (18cm)						
		AC (5cm)				setting of side forms and tie bars	side forms and tie bars	curing 28 days / side forms / curing
	SHOULDER							

WORK

SUSPENSION DUE TO RAIN AND / OR WET CONDITION

MATERIAL STOCK PILING OPERATION

CTION No. 1 to No. 5



Appendix 8–9

WEATHER RECORDS OF EXPERIMENTAL PAVEMENT CONSTRUCTION

Rainfall Record: Month of May 1990

Location : Sangley Point, Cavite City

Date	Rainfall (mm)	Weather	Remarks
May 1	0	Fair	
2	0	Fair	
3	0	Fair	
4	32.00	Cloudy/Rainy	
5	0	Fair	
6	0	Fair	
7	0	Fair	
8	0	Fair	
9	0	Fair	
10	0	Fair	
11	0	Fair	
12	0	Fair	
13	9.00	Fair/Rainy	
14	0	Fair	
15	0	Fair	
16	0	Fair	
17	0.40	Fair/Rain	
18	0	Fair	
19	34.30	Cloudy/Rainy	
20	0.20	Fair/Rain	
21	15.40	Cloudy/Rainy	
22	1.40	Cloudy/Rain	
23	18.40	Fair/Rainy	
24	11.40	Fair/Rainy	
25	2.50	Fair/Rain	
26	0	Fair	
27	0.40	Fair/Rain	
28	3.10	Fair/Rain	
29	22.60	Fair/Rainy	
30	23.20	Fair/Rainy	
31	5.60	Fair/Rain	
Total	179.9		

Rainfall Record: Month of June 1990

Location : Trece Martires, Cavite
DPWH, District Office

Date	Rainfall (mm)	Weather	Remarks
June 1	11.18	Rainy/Cloudy	
2	30.73	Fair/Rainy	
3	26.92	Fair/Rainy	
4	0	Fair	
5	0	Fair	
6	0	Fair	
7	9.14	Fair/Rainy	
8	0.25	Rainy/Cloudy	
9	6.60	Fair/Rainy	
10	4.32	Fair/Rainy	
11	.51	Fair/Rainy	
12	.51	Fair/Rainy	
13	16.76	Fair/Rainy	June 13-15 Typhoon Akang
14	48.77	Cloudy/Rainy	
15	5.33	Cloudy/Rainy	
16	0	Cloudy/Rainy	
17	0	Fine	
18	13.97	Fair/Rainy	June 18-23 Typhoon Bising
19	11.68	Cloudy/Rainy	
20	17.78	Cloudy/Rainy	
21	139.70	Rainy	
22	27.94	Rainy	
23	1.78	Cloudy/Rainy	
24	0.25	Cloudy/Rainy	June 24-28 Typhoon Klaring
25	17.02	Cloudy/Rainy	
26	3.81	Cloudy/Rainy	
27	12.70	Cloudy/Rainy	
28	28.45	Cloudy/Rainy	
29	0	Fair	
30	0	Fair	
Total	436.1		

Rainfall Record: Month of July 1990

Location : Trece Martirez, Cavite
DPWH., District Office

Date	Rainfall (mm)	Weather	Remarks
July 1	0.76	Fair/Cloudy/Rain	
2	2.54	Cloudy/Rain	
3	0.54	Fair/Cloudy/Rain	
4	0	Fair	
5	0	Fair	
6	13.70	Fair/Rainy	July 6-15 Typhoon Deling
7	13.50	Fair/Rainy	
8	0	Fair	
9	3.30	Fair/Cloudy/Rain	
10	0.76	Fair/Cloudy/Rain	
11	1.78	Fair/Cloudy/Rain	
12	2.54	Cloudy/Rain	
13	2.54	Cloudy/Fair/Rain	
14	0	Fair	
15	30.99	Cloudy/Rainy	
16	5.08	Cloudy/Rain/Fair	
17	6.86	Fair/Cloudy/Rain	
18	0	Fair	
19	0	Fair	
20	6.35	Fair/Rain	
21	16.26	Fair/Rainy	
22	12.45	Fair/Rainy	
23	8.38	Fair/Rain	
24	25.40	Fair/Rainy	
25	49.28	Rainy	
26	82.80	Cloudy/Rainy	
27	19.81	Fair/Cloudy/Rainy	
28	54.10	Cloudy/Rainy	July 28 Typhoon Emang
29	15.49	Fair/Cloudy/Rainy	
30	3.05	Fair/Cloudy/Rain	
31	0.76	Fair/Rain	
Total	379.02		

Rainfall Record: Month of August 1990

Location : Trece Martirez, Cavite
DPWH., District Office

Date	Rainfall (mm)	Weather	Remarks
Aug. 1	2.29	Fair/Rain	
2	0	Fair	
3	0.25	Fair/Rain	
4	0	Fair	
5	0	Fair	
6	0.51	Fair/Cloudy/Rainy	
7	0	Fair	
8	2.29	Fair/Rain	
9	0	Fair	
10	2.54	Fair/Rain	
11	0	Fair	
12	12.95	Cloudy/Rainy	
13	25.40	Fair/Rainy	
14	2.79	Fair/Rain	
15	17.27	Fair/Cloudy/Rainy	Aug. 15-20 Typhoon Gading
16	40.39	Fair/Cloudy/Rainy	
17	78.74	Rainy	
18	38.05	Fair/Rainy	
19	14.61	Fair/Cloudy/Rainy	
20	8.76	Fair/Cloudy/Rainy	
21	19.81	Rainy	
22	39.37	Rainy	
23	32.36	Rainy	
24	199.14	Rainy	Aug. 24-27 Typhoon Heling
25	20.32	Fair/Rainy	
26	33.02	Fair/Rainy	
27	13.46	Fair/Cloudy/Rainy	
28	13.21	Fair/Rain	Aug. 28 Typhoon Iliang
29	0	Fair	
30	17.53	Fair/Rain	
31	0.76	Fair/Rain	
Total	632.72		

Rainfall Record: Month of September 1990

Location : Trece Martirez, Cavite
DPWH, District Office

Date	Rainfall (mm)	Weather	Remarks
Sept. 1	95.25	Rainy	
2	2.54	Fair/Rain	
3	10.67	Fair/Rain	
4	8.89	Fair/Rain	
5	6.10	Fair/Rain	
6	13.72	Fair/Rainy	Sept. 6 - 7 Typhoon Loleng
7	72.39	Fair/Rainy	
8	13.72	Fair/Rainy	
9	0	Fair	
10	0	Fair	
11	0	Fair	
12	0	Fair	
13	25.40	Fair/Rainy	
14	10.12	Fair/Rain	
15	11.94	Fair/Rain	
16	0	Fair	
17	0	Fair	
18	0	Fair	
19	19.05	Fair/Rain	
20	0	Fair	
21	1.52	Fair/Rain	
22	2.03	Fair/Rain	
23	5.08	Fair/Rain	
24	1.27	Fair/Rain	
25	0	Fair	
26	5.60	Fair/Rain	
27	2.29	Fair/Rain	
28	1.27	Fair/Rain	
29	3.30	Fair/Rain	
30	1.80	Fair/Rain	
Total	313.95		

Rainfall record: Month of October 1990

Location : Section No. 1 EPC Project
Magallanes, Cavite

Date	Rainfall (mm)	Weather	REMARKS
Oct. 01	0	Fair	
02	0	Fair	
03	0	Fair	
04	0	Fair	
05	0	Fair	
06	0	Fair	
07	0	Fair	
08	3.30	Fair/Rain	
09	0.76	Fair/Rain	
10	15.24	Fair/rainy	
11	3.81	Fair/Rain	
12	1.02	Fair/Rain	Almost whole
13	50.08	Fair/Rain	night rainy.
14	2.03	Fair/Rain	
15	18.54	Fair/Rain	
16	36.83	Fair/Rain	
17	25.40	Fair/Rain	
18	0	Fair	
19	10.92	Cloudy/Rainy	
20	27.94	Cloudy/Rainy	
21	0.25	Fair/Rain Shower	
22	0	Fair	
23	0	Fair	
24	0	Fair	
25	0	Fair	
26	0	Fair	
27	0	Fair	
28	2.54	fair/Rain	
29	6.10	Fair/Rain	
30	0	Fair	
31	0	Fair	
Total	204.76		

Rainfall record: Month of November 1990

Location : Section No. 1 EPC Project
Magallanes, Cavite

Date	Rainfall (mm)	Weather	REMARKS
Nov. 01	0	Fair	
02	0	Fair	
03	6.35	Fair/Rain	
04	35.00	Fair/Rainy	
05	0	Fair	
06	0	Fair	Const. finished Sec. No. 1
Total	41.35		

Appendix 8–10

MATERIAL TEST RESULTS OF EXPERIMENTAL PAVEMENT CONSTRUCTION

Table No. 1 to Table No. 13
Test Results of Materials used in Section No. 1, 2, 3, and 4

TABLE 1 AGGREGATE FOR SUBBASE COURSE
USED IN SECTION NO. 1 AND NO. 2

Materials : River-run Sandy Gravel
Source : Mobato Quarry, Cavite

Test Items		Test Results	Specification Item 200
Sieve Analysis (% Passing)			
Sieve Size			
50.0 mm	%	100	100
25.0 mm	%	69	55 - 85
9.5 mm	%	70	40 - 75
0.075 mm	%	2	0 - 12
Liquid Limit		NP	<35
Plasticity Index		NP	<12
Abrasion Loss	%	43	<50
Moisture Density Relation (AASHTO T-180 C)			
Maximum Dry Density	Kg/m^3	1,940	
Optimum Moisture Content	%	16.6	
California Bearing Ratio (At MDD)	%	50	>25
Swell	%	0	

Remarks: Sample meets Specification Requirements.

TABLE 2 AGGREGATE FOR SUBBASE COURSE
USED IN SECTION NO. 3 AND NO. 4

Materials : River-run Sandy Gravel
Source : Mamba Quarry, Cavite Mamba River

Test Items		Test Results	Specification Item 200
Sieve Analysis (% Passing)			
Sieve Size			
50.0 mm	%	100	100
25.0 mm	%	69	55 - 85
9.5 mm	%	58	40 - 75
0.075 mm	%	9	0 - 12
Liquid Limit		29	<35
Plasticity Index		5	<12
Abrasion Loss	%	41	<50
Moisture Density Relation (AASHTO T-180 C)			
Maximum Dry Density	Kg/m^3	1,963	
Optimum Moisture Content	%	10.2	
California Bearing Ratio (At MDD)	%	53	>25
Swell	%	0.87	

Remarks: Sample meets Specification Requirements.

TABLE 3 AGGREGATE FOR BASE COURSE USED IN SECTION NO. 1

Materials : Crushed Stone
Source : Unirock Quarry, Antipolo, Rizal

Test Items		Test Results	Specification Item 202
Sieve Analysis (% Passing)			
Sieve Size			
37.5 mm	%	100	100
25.0 mm	%	-	-
19.0 mm	%	79	60 - 85
9.5 mm	%	-	-
4.75 mm	%	55	30 - 55
0.425 mm	%	13	8 - 25
0.075 mm	%	5	2 - 14
Liquid Limit		NP	<25
Plasticity Index		NP	< 6
Abrasion Loss	%	-	<45
Moisture Density Relation (AASHTO T-180 C)			
Maximum Dry Density	Kg/m^3	1,940	
Optimum Moisture Content	%	12.0	
California Bearing Ratio (At MDD)	%	-	>80
Swell	%	-	

Remarks: Abrasion Loss and CBR were not tested.

TABLE 4 AGGREGATE FOR BASE COURSE USED IN SECTION NO. 2, NO. 3 AND NO. 4

Materials : Crushed Stone
Source : Unirock Quarry, Antipolo, Rizal

Test Items		Test Results	Specification Item 202
Sieve Analysis (% Passing)			
Sieve Size			
37.5 mm	%	100	100
25.0 mm	%	81	-
19.0 mm	%	71	60 - 85
9.5 mm	%	15	-
4.75 mm	%	38	30 - 55
0.425 mm	%	15	8 - 25
0.075 mm	%	10	2 - 14
Liquid Limit		23	<25
Plasticity Index		4	< 6
Abrasion Loss	%	35	<45
Moisture Density Relation (AASHTO T-180 C)			
Maximum Dry Density	Kg/m^3	2,277	
Optimum Moisture Content	%	5.8	
California Bearing Ratio (At MDD)	%	117	>80
Swell	%	0.09	

Remarks: Sample meets Specification Requirements.

TABLE 5 AGGREGATE FOR AGGREGATE SURFACE COURSE USED IN SECTION NO. 1

Materials : Blended Crushed Stone
Source : Urto Interprizes, Batangus

Test Items		Test Results	Specification Item 300
Sieve Analysis (% Passing)			Grading A
Sieve Size			
50.0 mm	%	100	100
9.5 mm	%	68	55 - 85
4.75 mm	%	52	25 - 65
2.00 mm	%	38	25 - 50
0.425 mm	%	18	15 - 30
0.075 mm	%	10	5 - 20
Liquid Limit		14	<35
Plasticity Index		7	4 - 9
Abrasion Loss	%	-	<45
Moisture Density Relation (AASHTO T-180°C)			
Maximum Dry Density	kg/cm^3	1,920	
Optimum Moisture Content	%	14.3	

Remarks: Sample meets Specification Requirements.
Abrasion Loss was not tested.

TABLE 6 AGGREGATE FOR AGGREGATE SURFACE COURSE USED IN SECTION NO. 1

Materials : Blended Crushed Stone
Source : Unirock quarry, Antipolo, Rizal

Test Items		Test Results	Specification Item 300
Sieve Analysis (% Passing)			Grading A
Sieve Size			
50.0 mm	%	100	100
9.5 mm	%	57	55 - 85
4.75 mm	%	45	25 - 65
2.00 mm	%	31	25 - 50
0.425 mm	%	16	15 - 30
0.075 mm	%	9	5 - 20
Liquid Limit		29	<35
Plasticity Index		8	4 - 9
Abrasion Loss	%	35	<45
Moisture Density Relation (AASHTO T-180°C)			
Maximum Dry Density	kg/cm^3	2,360	
Optimum Moisture Content	%	7.4	

Remarks: Sample meets Specification Requirements.

TABLE 7 AGGREGATE FOR BMP

Materials : Crushed Stone 1-1/2"
Source : Angono, Rizal

Test Items		Test Results	Specification Item 305
Sieve Analysis (% Passing)			
Sieve Size			
63.0 mm	%	100	100
50.0 mm	%	100	100
37.5 mm	%	73	35 - 75
25.0 mm	%	12	0 - 15
19.0 mm	%	8	-
12.5 mm	%	3	0 - 5
9.5 mm	%	-	-
4.75 mm	%	-	-
Bulk Specific Gravity (SSD)	%	2.80	
Absorption	%	0.80	
Abrasion Loss	%	13	<40

Remarks: Sample meets Specification Requirements.

TABLE 8 AGGREGATE FOR BST AND BMP

Materials : Crushed Stone 3/4"
Source : Angono, Rizal

Test Items		Test Results	Specification BST Item 304	Specification BMP 305
Sieve Analysis (% Passing)			Grading A	C
Sieve Size				
25.0 mm	%	100	100	
19.0 mm	%	97	90 - 100	
12.5 mm	%	54	20 - 55	
9.5 mm	%	12	0 - 15	
4.75 mm	%	4	0 - 5	
2.36 mm	%	-		
Bulk Specific Gravity (SSD)		2.80		
Absorption	%	0.8		
Abrasion Loss	%	20	<40	

Remarks: Sample meets Specification Requirements.

TABLE 9 AGGREGATE FOR BST AND DBST

Materials : Crushed Stone 3/8"
Source : Angono, Rizal

Test Items		Test Results	Specification BST Item 304	Specification BMP 305
Sieve Analysis (% Passing)			Grading B	D
Sieve Size				
12.5	mm	% 100	100	
9.5	mm	% 99	85 - 100	
4.75	mm	% 19	10 - 30	
2.36	mm	% 3	0 - 10	
1.18	mm	% 2	0 - 5	
0.30	mm	% -		
Bulk Specific Gravity (SSD)		2.75		
Absorption		% 1.40		
Abrasion Loss		% 22		<40

Remarks: Sample meets Specification Requirements.

TABLE 10 AGGREGATE FOR BITUMINOUS SEAL COAT

Materials : Crushed Sand
Source : Angono, Rizal

Test Items		Test Results	Specification Item 303
Sieve Analysis (% Passing)			Type 2
Sieve Size			
9.5	mm	% 100	100
4.75	mm	% 97	85 - 100
2.36	mm	% 70	60 - 100
1.18	mm	% 43	-
0.300	mm	% 8	-
0.150	mm	% 3	0 - 10
Bulk Specific Gravity (SSD)		2.75	
Absorption		% 1.48	

Remarks: Sample meets Specification Requirements.

TABLE 11 EMULSIFIED ASPHALT

Materials : Cationic Emulsified Asphalt CSS-1h
Source : Rigid Sales Corporation
Proposed Use : Prime Coat, Seal Coat, BST and BMP

Test Items		Test Results	Specification AASHTO M-208
Viscosity (Saybolt furol) 25°C	s	27	20 - 100
Stability	%	0.1	1.0 max
Cement mixing	%	2.0	2.0 max
Sieve test	%	0.1	0.1 max
Residue by distillation	%		57 min
Residue			
Penetration, 25°C, 100g, 5 sec		60	40 - 90
Ductility 25°C	cm	100	40 min
Solubility in tricloethlene	%	98.7	97.5 min
Specific Gravity 25°C/25°C		1.01	

Remarks: Sample meets Specification Requirements.

TABLE 12 ASPHALT CEMENT

Materials : Straight Asphalt 60 - 70
Source : Petrophil Corporation
Proposed Use : Asphalt Concrete Mixture

Test Items		Test Results	Specification AASHTO M226
Penetration at 25°C, 100 g 5 sec		65	60 - 70
Flush Point COP	°C	333	232 min
Ductility 25°C	cm	118	100 min
Loss of heating	%	0.3	0.5 max
Solubility in trichloethylene	%	99.5	99.0 min
Residue			
Penetration % of original	%	61	54 min
Ductility 25 cm/min	cm	100	50 min
Spot Test		Negative	Negative
Specific Gravity 25°C/25°C		1.01	

Remarks: Sample meets Specification Requirements.

TABLE 13 ASPHALT CONCRETE MIXTURE DESIGN

Aggregate Blending Proportion

Materials	Material Source	Production by Wt. Percent	Specific Gravity
3/4" Crushed Stone	Golden Hills Taytay, Rizal	10%	2.80
3/8" Crushed Stone	"	35%	2.83
Crushed Sand	"	40%	2.58
Natural Sand	Bulcan	15%	2.31
		100%	2.657

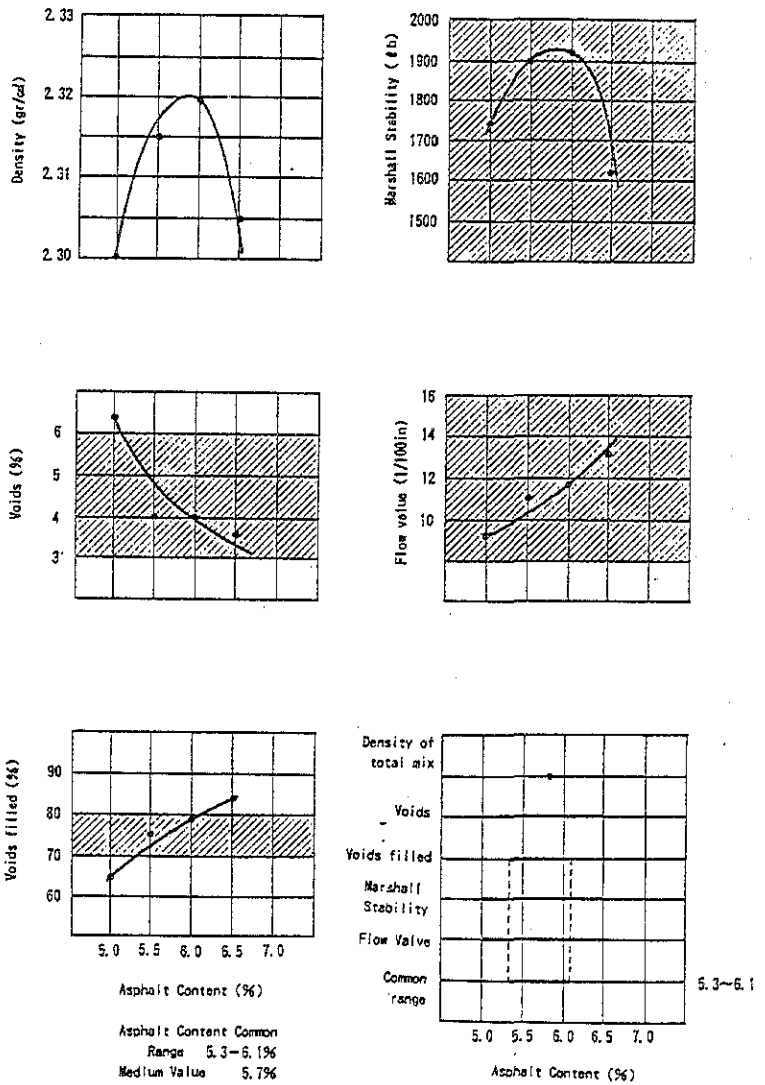
Blended Aggregate Gradation (Passing Sieve by Wt. Percent)

Sieve Size	Grading %	Specification Item 310, Type F
19 mm	100	100
12.5 mm	94	-
9.5 mm	91	-
4.75 mm	63	45 - 65
2.36 mm	48	33 - 53
1.18 mm	33	-
0.300 mm	11	10 - 20
0.075 mm	5	3 - 8

Marshall Test Properties of Mixture at Optimum Asphalt Content of 5.7% by Wt. of Total Mix

Test Items		Test Results	Specification Min	Max
Density	gr/cm^3	2.32		
Stability	lb	1,920	1,200	-
Flow	0.01 in	11.8	8	16
Void	%	4.2	3	6
Void Filled	%	73	70	80

Remarks: Test Results meet Specification Requirements.



Ashalt Content : Medium Percentage by Wt. of Total Aggregates

Graphics for Determination of Design Asphalt Content

Table No. 14 to Table No. 27
Test Results of Materials used in Section No. 5

TABLE 14 AGGREGATE FOR SUBBASE COURSE

Materials : Blended Aggregates of Crushed Stone/Sand/Soil
Source : Angono, Quarry and Trece Martrez Quarry

Test Items		Test Results	Specification Item 200
Sieve Analysis (% Passing)			
Sieve Size			
50.0 mm	%	100	100
25.0 mm	%	85	55 - 85
9.5 mm	%	46	40 - 75
0.075 mm	%	9	0 - 12
Liquid Limit		32	<35
Plasticity Index		12	<12
Abrasion Loss	%	42	50
Moisture Density Relation (AASHTO T-180 C)			
Maximum Dry Density	Kg/m^3	1,980	
Optimum Moisture Content	%	8.9	
California Bearing Ratio (At MDD)	%	27	>25

Remarks: Sample meets Specification Requirements.

TABLE 15 AGGREGATE FOR SUBBASE COURSE

Materials : Blended Crushed Aggregate
Source : Unirock Quarry, Antipolo, Rizal

Test Items		Test Results	Specification Item 200
Sieve Analysis (% Passing)			Grading A
Sieve Size			
37.5 mm	%	100	100
25.0 mm	%	86	-
19.0 mm	%	81	60 - 85
9.5 mm	%	59	-
4.75 mm	%	47	30 - 55
0.425 mm	%	18	8 - 25
0.075 mm	%	11	2 - 14
Liquid Limit		25	<25
Plasticity Index		6	< 6
Abrasion Loss	%	28	<45
Moisture Density Relation (AASHTO T-180 C)			
Maximum Dry Density	Kg/m^3	2,110	
Optimum Moisture Content	%	8.4	
California Bearing Ratio (At MDD)	%	46	>80
Swell	%	-	

TABLE 16 EMULSIFIED ASPHALT

Materials : Emulsified Asphalt SS-1
Source : Petrophil Corporation
Proposed Use : Prime Coat

Test Items		Test Results	Specification AASHTO M-140
Viscosity (Saybolt furol) 25°C	s	25	20 - 100
Stability	%	0.6	1.0 max
Cement mixing	%	1.7	2.0 max
Sieve test	%	0.05	0.1 max
Residue by distillation	%	60.5	57 min
Residue			
Penetration, 25°C, 100g, 5 sec		110	100 - 200
Ductility 25°C	cm	115	40 min
Solubility in tricloethlene	%	99.2	97.5 min
Specific Gravity 25°C/25°C		1.02	

Remarks: Sample meets Specification Requirements.

TABLE 17 ASPHALT CEMENT

Materials : Straight Asphalt 60 - 70
Source : Petrophil Corporation
Proposed Use : Asphalt Concrete Mixture

Test Items		Test Results	Specification AASHTO M226
Penetration at 25°C, 100 g 5 sec		64	60 - 70
Flush Point COP	°C	338	232 min
Ductility 25°C	cm	>120	100 min
Loss of heating	%	0.02	0.5 max
Solubility in trichloethylene	%	99.9	99.0 min
Residue			
Penetration % of original	%	66	54 min
Ductility 25 cm/min	cm	>100	50 min
Spot Test		Negative	Negative
Specific Gravity 25°C/25°C			

Remarks: Sample meets Specification Requirements.

TABLE 18 COARSE AGGREGATE FOR ASPHALT CONCRETE

Materials : 3/4" Crushed Aggregate
Source : Monterock, San Mateo, Rizal

Test Items		Test Results
Sieve Analysis (% Passing)		
Sieve Size		
19.0 mm	%	100
12.5 mm	%	64
9.5 mm	%	35
4.75 mm	%	2
0.075 mm	%	0
Bulk Specific Gravity (SSD)		2.81
Absorption	%	1.13
Abrasion Loss	%	25
Dry Unit Weight		
Loose	kg/m^3	1.32
Roded	kg/m^3	1.44

TABLE 19 COARSE AGGREGATE FOR ASPHALT CONCRETE

Materials : 3/8" Crushed Aggregate
Source : Monterock, San Mateo, Rizal

Test Items		Test Results
Sieve Analysis (% Passing)		
Sieve Size		
12.5 mm	%	100
9.5 mm	%	93
4.75 mm	%	18
2.36 mm	%	3
0.075 mm	%	0
Bulk Specific Gravity (SSD)		2.81
Absorption	%	1.13
Abrasion Loss	%	25.8
Dry Unit Weight		
Loose	kg/m^3	1.32
Roded	kg/m^3	1.46

TABLE 20 FINE AGGREGATE FOR ASPHALT CONCRETE

Materials : Manufactured Sand
Source : Monterock, San Mateo, Rizal

Test Items		Test Results
Sieve Analysis (% Passing)		
Sieve Size		
9.5 mm	%	100
4.75 mm	%	99
1.18 mm	%	55
0.300 mm	%	13
0.075 mm	%	2
Bulk Specific Gravity (SSD)		2.86
Absorption	%	3.63
Dry Unit Weight		
Loose	kg/m^3	1.53
Roded	kg/m^3	1.63

TABLE 21 MINERAL FILLER FOR ASPHALT CONCRETE

Materials : Hydrated Lime
Source : Guanzon Lime, Lucena City, Quezon

Test Items		Test Results	Specification Item 703 A
Sieve Analysis (% Passing)			
Sieve Size			
0.600 mm	%	100	100
0.300 mm	%	98	95 - 85
0.075 mm	%	85	70 - 100
Calcium Oxide & Magnesium Oxide (Non-Volatile Basis)	%	66	60 min

Remarks: Sample meets Grading Requirements of Specification.

TABLE 22 ASPHALT CONCRETE MIXTURE DESIGN

Aggregate Blending Proportion

Materials	Material Source	Blending Proportion by Wt. Percent
3/4" Crushed Stone	Monterock, San Mateo, Rizal	14 %
1/2" Crushed Stone	"	20 %
3/8" Crushed Stone	"	21 %
Manufactured Sand	"	44 %
Hydrated Lime	Guanzon Lime, Lucena, Quezon	1 %
Total		100 %

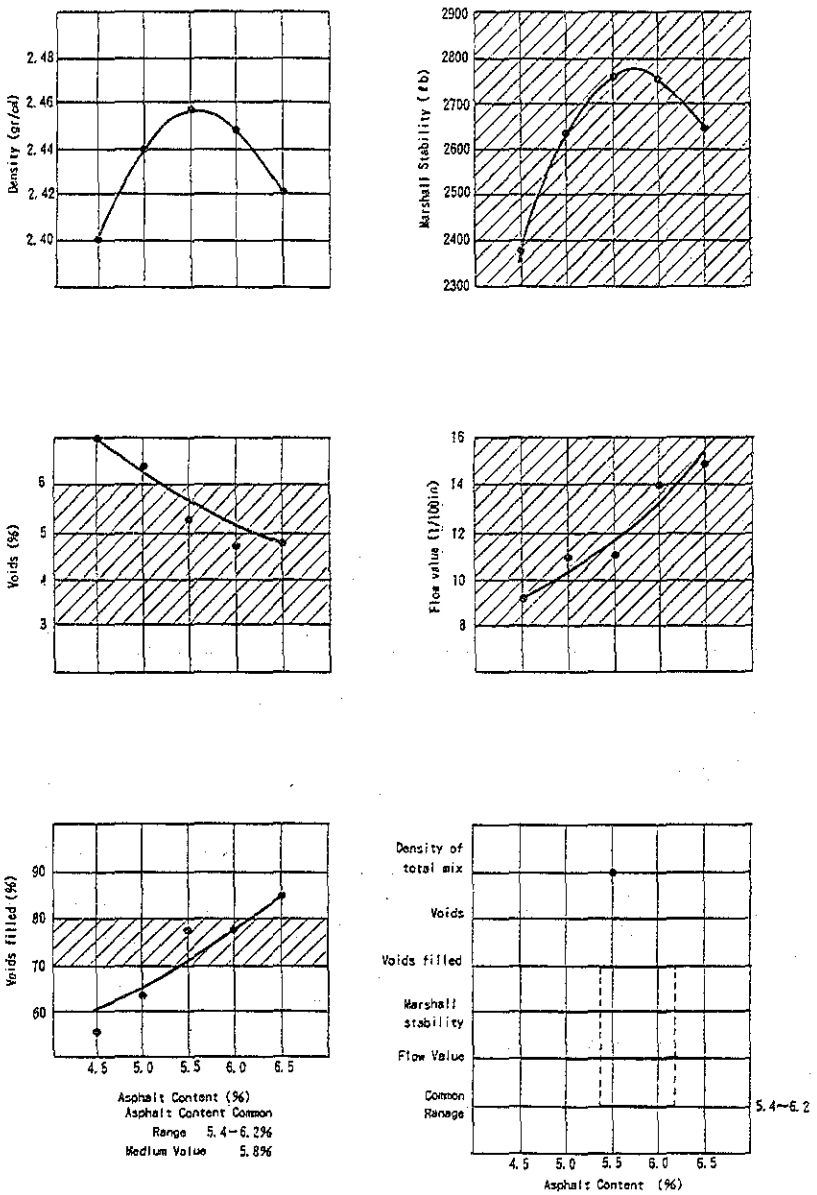
Blended Aggregate Gradation (Passing Sieve by Wt. Percent)

Sieve Size		Grading %	Specification Item 310, Type F
19	mm	100	100
12.5	mm	96	-
9.5	mm	84	-
4.75	mm	55	45 - 65
2.36	mm	43	33 - 53
1.18	mm	35	-
0.300	mm	15	10 - 20
0.075	mm	5	3 - 8

Marshall Test Properties of Mixture at Optimum Asphalt Content of 5.8% by Wt. of Total Aggregates

Test Items		Test Results	Specification Min	Max
Density	gr/cm^3	2.45		
Stability	lb	2,756	1,200	-
Flow	0.01 in	13	8	16
Void	%	5.3	3	6
Void Filled	%	71	70	80

Remarks: Test Results meet Specification Requirements.



Ashalt Content : Medium Percentage by Wt. of Total Aggregates

Graphics for Determination of Design Content

TABLE 23 JOB-MIX FORMULA

Mix Proportion

Materials	By Wt. of Aggregate	by Wt. of Total Mix
3/4" Crushed Stone	14 %	13.23 %
1/2" Crushed Stone	20 %	18.90 %
3/8" Crushed Stone	21 %	19.85 %
Manufactured Sand	44 %	41.59 %
Hydrated Lime	1 %	0.95 %
Asphalt Cement 60/70	5.80 %	5.48 %
Total	100	%

Job-mix Formula

1. Aggregate Grading:

Sieve Size	Design Grading % Passing	Tolerance %	Job-mix Tolerance %	Spec. %
19 mm	100	0	100	100
12.5 mm	96	-	-	-
9.5 mm	84	-	-	-
4.75 mm	55	±4	48 - 62	45 - 65
2.36 mm	43	±4	39 - 47	33 - 53
1.18 mm	35	-	-	-
0.300 mm	15	±4	11 - 19	10 - 20
0.075 mm	5	±2	3 - 7	3 - 8

2. Asphalt Content:

Asphalt Content	Design Asphalt Content %	Tolerance %	Job-mix Tolerance %
% by Wt. of Aggregate	5.8	±0.4	5.4 - 6.2
% by Wt. of Total Mix	5.5	±0.4	5.1 - 5.9

3. Mixing Temperature:

Temperature at Mix Design Test	Tolerance	Job-mix Tolerance
139°C	±10°C	129 - 149°C

TABLE 24 PORTLAND CEMENT

Materials : Portland Cement (Type-1)
Source : Island Cement Corporation, Antipolo, Rizal
Proposed Use : Portland Cement Concrete

Test Items		Test Results	Specification AASHTO: M85
Finesse:			
Residue on No. 200, sieve	%	89	
Blain specific surface	m^2/kg	280	
Specific Gravity 3.15			
Normal consistency	%	25.8	
Soundness:			
Autoclave expansion	%	-	0.8 max
Boil Test		Satisfactory	
Time of setting:			
Initial set, minutes		132	60 min
Final set, hours		4.0	10 max
Compressive strength			
1 day	psi	-	
3 days	psi	1,920	1,800 min
7 days	psi	2,880	2,800 min
28 days	psi	4,020	4,000 min
Chemical analysis			
Loss on ignition	%	2.6	3.0 max
Insoluble residue	%	0.59	0.75 max
Sulfur trioxide (SO_3)	%	2.1	3.0 max
Magnesium oxide (MgO)	%	3.5	5.0 max

Remarks: Sample meets Specification Requirements.

TABLE 25 FINE AGGREGATE FOR PCC

Materials : Sand
Source : Porac, Pampanga

Test Items		Test Results	Specification Item 311
Sieve Analysis (% Passing)			
Sieve Size			
9.5 mm	%	100	100
4.75 mm	%	97	95 - 100
2.36 mm	%	80	-
1.18 mm	%	58	45 - 80
0.600 mm	%	35	-
0.300 mm	%	13	5 - 30
0.150 mm	%	4	0 - 10
0.075 mm	%	2	-
Fines Modules		3.13	
Bulk Specific Gravity (SSD)		2.58	
Absorption	%	1.30	
Dry Unit Weight			
Lose	kg/m^3	1,513	
Roded	kg/m^3	1,600	

Remarks: Sample meets Specification Requirements.

TABLE 26 COARSE AGGREGATE FOR PCC

Materials : Blended Crushed Aggregates
Source : Marocco, Antipolo, Rizal

Test Items		Test Results	Specification Item 311
Sieve Analysis (% Passing)			Grading C
Sieve Size			
50.0 mm	%	100	95 - 100
37.5 mm	%	100	-
25.0 mm	%	70	35 - 70
19.0 mm	%	51	-
12.5 mm	%	27	10 - 30
9.5 mm	%	18	-
4.75 mm	%	4	0 - 5
0.075 mm	%	0.3	-
Bulk Specific Gravity (SSD)		2.77	
Absorption	%		
Abrasion Loss	%	26	
Dry Unit Weight		0.4	
Lose	kg/m^3	1,585	
Roded	kg/m^3	1,786	

Remarks: Sample meets Specification Requirements.

TABLE 27 PCC MIXTURES PROPERTIES

A. Mixing Proportion per Bag of Cement

Cement	40.0 kg
Coarse Aggregate	125.7 kg
Fine Aggregate	74.0 kg
Water	18.6 kg

B. Properties of Mixture

1. Cement Factor	9.5 $bags/m^3$
2. Water Cement Ratio	0.64
3. Slump	2.5 - 3 in.
4. Flexural Strength at 28 days	

Test No.	Strength (psi)
1	600
2	600
3	624
4	654
5	558
6	558
7	535
8	582
Average	582

Remarks: Sample were taken from manufactured PCC mix.
Flexural strength of each test No. were the mean value of 3 specimens, and tested by the third-point loading method.

Appendix 8--11

QUALITY CONTROL TEST RESULTS OF EXPERIMENTAL PAVEMENT CONSTRUCTION

TABLE 1 MODEL NO. 1 GR: SUBBASE COURSE, h = 5 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	90	85	87	87	55 - 85
a Sieve	9.5	mm %	79	71	78	76	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	11	8	10	10	0 - 12
Moisture Content		%	12.1	11.0	11.8	11.7	
Field Density		gr/cm³	1.86	1.88	1.90	1.88	
Compaction Degree		%	96	97	98	97	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	82	85	89	85	55 - 85
a Sieve	9.5	mm %	74	74	75	74	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	12	11	12	12	0 - 12
Moisture Content		%	12.6	13.2	9.5	11.8	
Field Density		gr/cm³	1.90	1.92	1.96	1.93	
Compaction Degree		%	98	99	101	98	>95

TABLE 2 MODEL NO. 2 SBST: SUBBASE COURSE, h = 8 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	85	82	92	86	55 - 85
a Sieve	9.5	mm %	74	74	81	76	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	7	11	11	10	0 - 12
Moisture Content		%	15.3	13.6	12.9	13.9	
Field Density		gr/cm³	1.98	1.92	1.90	1.93	
Compaction Degree		%	102	99	98	100	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	98	94	83	92	55 - 85
a Sieve	9.5	mm %	90	83	71	81	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	14	7	8	10	0 - 12
Moisture Content		%	11.4	11.7	14.3	12.5	
Field Density		gr/cm³	1.94	1.98	1.90	1.94	
Compaction Degree		%	100	102	98	100	>95

TABLE 3 MODEL NO. 3 DBST: SUBBASE COURSE, h = 9 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	74	84	86	78	55 - 85
a Sieve	9.5	mm %	74	71	72	72	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	10	8	7	10	0 - 12
Moisture Content		%	15.5	14.3	15.0	14.9	
Field Density		gr/cm³	1.98	1.96	2.03	1.99	
Compaction Degree		%	102	101	105	103	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	85	95	91	90	55 - 85
a Sieve	9.5	mm %	73	76	84	78	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	9	11	13	11	0 - 12
Moisture Content		%	14.2	14.6	15.1	14.4	
Field Density		gr/cm³	1.86	1.90	2.07	1.94	
Compaction Degree		%	96	98	107	100	>95

TABLE 4 MODEL NO. 4 BMP: SUBBASE COURSE, h = 5 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	88	82	83	84	55 - 85
a Sieve	9.5	mm %	77	73	71	74	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	9	11	12	11	0 - 12
Moisture Content		%	16.5	10.2	13.8	13.5	
Field Density		gr/cm³	1.90	1.88	2.02	1.93	
Compaction Degree		%	98	97	104	100	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	85	84	89	86	55 - 85
a Sieve	9.5	mm %	74	72	78	75	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	11	8	12	10	0 - 12
Moisture Content		%	14.0	10.0	14.0	12.7	
Field Density		gr/cm³	1.86	1.92	1.92	1.90	
Compaction Degree		%	96	99	99	98	>95

TABLE 5 MODEL NO. 5 GR: SUBBASE COURSE, h = 8 cm

Left Lane — 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	91	84	90	88	55 - 85
a Sieve	9.5	mm %	79	72	74	75	40 - 75
	0.425	mm %	19	18	33	23	-
	0.075	mm %	8	6	10	8	0 - 12
Moisture Content		%	13.7	11.0	10.3	11.7	
Field Density		gr/cm³	1.96	1.94	1.94	1.95	
Compaction Degree		%	101	100	100	100	>95

Right Lane — 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	98	100	95	98	55 - 85
a Sieve	9.5	mm %	88	90	82	87	40 - 75
	0.425	mm %	23	18	14	18	-
	0.075	mm %	10	7	6	8	0 - 12
Moisture Content		%	12.1	13.5	11.0	12.2	
Field Density		gr/cm³	1.92	1.92	1.96	1.93	
Compaction Degree		%	99	99	101	99	>95

TABLE 6 MODEL NO. 6 SBST: SUBBASE COURSE, h = 12 cm

Left Lane — 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	81	93	88	87	55 - 85
a Sieve	9.5	mm %	73	84	77	78	40 - 75
	0.425	mm %	32	23	26	27	-
	0.075	mm %	10	11	11	11	0 - 12
Moisture Content		%	16.1	15.1	16.0	15.7	
Field Density		gr/cm³	1.98	1.97	2.02	1.99	
Compaction Degree		%	102	101	104	102	>95

Right Lane — 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	84	85	81	83	55 - 85
a Sieve	9.5	mm %	74	75	75	75	40 - 75
	0.425	mm %	33	19	17	23	-
	0.075	mm %	10	9	6	8	0 - 12
Moisture Content		%	16.0	16.3	16.2	16.2	
Field Density		gr/cm³	1.96	1.92	2.04	1.97	
Compaction Degree		%	101	99	105	102	>95

TABLE 7 MODEL NO. 7 DBST: SUBBASE COURSE, h = 14 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	62	65	80	69	55 - 85
a Sieve	9.5	mm %	55	60	72	62	40 - 75
	0.425	mm %	25	37	11	24	-
	0.075	mm %	5	5	7	6	0 - 12
Moisture Content		%	12.6	11.2	10.3	11.4	
Field Density		gr/cm³	2.03	1.95	1.96	1.98	
Compaction Degree		%	105	101	101	102	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	82	83	92	85	55 - 85
a Sieve	9.5	mm %	73	70	86	76	40 - 75
	0.425	mm %	32	30	38	33	-
	0.075	mm %	8	6	8	7	0 - 12
Moisture Content		%	9.2	12.8	15.2	12.7	
Field Density		gr/cm³	1.92	1.70	1.64	1.75	
Compaction Degree		%	99	87	84	90	>95

TABLE 8 MODEL NO. 8 BMP: SUBBASE COURSE, h = 10 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	77	78	90	82	55 - 85
a Sieve	9.5	mm %	67	68	76	70	40 - 75
	0.425	mm %	30	34	34	33	-
	0.075	mm %	0	13	7	7	0 - 12
Moisture Content		%	11.2	12.1	12.6	12.0	
Field Density		gr/cm³	1.92	2.05	1.95	1.97	
Compaction Degree		%	99	106	101	102	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	93	91	76	87	55 - 85
a Sieve	9.5	mm %	83	81	66	77	40 - 75
	0.425	mm %	38	36	30	35	-
	0.075	mm %	9	8	8	8	0 - 12
Moisture Content		%	12.6	11.6	10.1	11.4	
Field Density		gr/cm³	1.86	1.88	1.94	1.89	
Compaction Degree		%	96	97	100	98	>95

TABLE 9 MODEL NO. 9 DBST: SUBBASE COURSE, h = 30 cm
1st Layer, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	91	82	79	83	55 - 85
a Sieve	9.5	mm %	82	74	72	76	40 - 75
	0.425	mm %	42	34	33	36	-
	0.075	mm %	18	11	11	13	0 - 12
Moisture Content		%	11.4	10.1	10.7	10.8	
Field Density		gr/cm³	2.10	2.04	1.93	2.02	
Compaction Degree		%	108	105	100	104	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	94	82	78	85	55 - 85
a Sieve	9.5	mm %	75	74	70	73	40 - 75
	0.425	mm %	36	33	32	34	-
	0.075	mm %	11	9	8	9	0 - 12
Moisture Content		%	16.3	11.9	9.0	12.4	
Field Density		gr/cm³	1.94	2.04	2.14	2.04	
Compaction Degree		%	100	105	110	105	>95

TABLE 10 MODEL NO. 9 DBST: SUBBASE COURSE, h = 30 cm
2nd Layer, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	82	78	70	77	55 - 85
a Sieve	9.5	mm %	69	69	62	67	40 - 75
	0.425	mm %	30	29	28	29	-
	0.075	mm %	6	4	5	5	0 - 12
Moisture Content		%	7.0	12.0	12.3	10.4	
Field Density		gr/cm³	2.08	2.00	1.98	2.02	
Compaction Degree		%	107	103	102	104	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	85	69	79	78	55 - 85
a Sieve	9.5	mm %	73	62	72	69	40 - 75
	0.425	mm %	32	26	30	29	-
	0.075	mm %	8	4	4	5	0 - 12
Moisture Content		%	6.5	13.5	9.8	9.9	
Field Density		gr/cm³	2.39	1.96	2.11	2.15	
Compaction Degree		%	123	101	109	111	>95

TABLE 11 MODEL NO. 10 BMP: SUBBASE COURSE, h = 26 cm
1st Layer, h = 15 cm

Left Lane 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	87	81	78	82	55 - 85
a Sieve	9.5	mm %	79	75	72	75	40 - 75
	0.425	mm %	38	36	33	36	-
	0.075	mm %	12	12	10	11	0 - 12
Moisture Content		%	16.4	13.8	12.9	14.4	
Field Density		gr/cm³	1.81	1.92	1.91	1.88	
Compaction Degree		%	93	99	98	97	>95

Right Lane 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	77	83	85	82	55 - 85
a Sieve	9.5	mm %	70	76	77	74	40 - 75
	0.425	mm %	33	35	35	34	-
	0.075	mm %	11	10	10	10	0 - 12
Moisture Content		%	12.6	12.5	12.6	12.6	
Field Density		gr/cm³	2.06	1.97	1.87	1.97	
Compaction Degree		%	106	102	96	101	>95

TABLE 12 MODEL NO. 10 BMP: SUBBASE COURSE, h = 26 cm
2nd Layer, h = 11 cm

Left Lane 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	85	75	87	82	55 - 85
a Sieve	9.5	mm %	71	64	81	72	40 - 75
	0.425	mm %	32	29	36	32	-
	0.075	mm %	8	6	7	7	0 - 12
Moisture Content		%	15.1	16.4	14.4	15.3	
Field Density		gr/cm³	1.82	1.86	1.83	1.84	
Compaction Degree		%	94	96	94	95	>95

Right Lane 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	75	66	77	73	55 - 85
a Sieve	9.5	mm %	65	62	69	65	40 - 75
	0.425	mm %	28	28	29	28	-
	0.075	mm %	5	6	5	5	0 - 12
Moisture Content		%	12.6	9.1	15.1	12.3	
Field Density		gr/cm³	1.82	1.99	1.82	1.88	
Compaction Degree		%	94	103	94	97	>95

TABLE 13 MODEL NO. 11 AC 4 cm: SUBBASE COURSE, h = 8 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading: % Passing a Sieve	50	mm %	100	100	100	100	100
	25	mm %	80	77	70	76	55 - 85
	9.5	mm %	74	73	60	69	40 - 75
	0.425	mm %	35	35	30	33	-
	0.075	mm %	3	3	2	3	0 - 12
Moisture Content		%	13.6	15.1	11.4	13.4	
Field Density		gr/cm³	1.85	2.05	1.91	1.94	
Compaction Degree		%	95	106	98	100	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading: % Passing a Sieve	50	mm %	100	100	100	100	100
	25	mm %	78	55	80	71	55 - 85
	9.5	mm %	68	38	71	59	40 - 75
	0.425	mm %	32	35	33	33	-
	0.075	mm %	2	8	2	4	0 - 12
Moisture Content		%	11.7	10.3	16.4	12.8	
Field Density		gr/cm³	1.81	1.92	1.90	1.88	
Compaction Degree		%	93	99	99	97	>95

TABLE 14 MODEL NO. 12 AC 5 cm: SUBBASE COURSE, h = 6 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading: % Passing a Sieve	50	mm %	100	100	100	100	100
	25	mm %	70	76	77	74	55 - 85
	9.5	mm %	66	67	68	67	40 - 75
	0.425	mm %	32	32	32	32	-
	0.075	mm %	3	2	2	2	0 - 12
Moisture Content		%	13.8	11.0	8.5	11.1	
Field Density		gr/cm³	2.04	1.90	2.40	2.11	
Compaction Degree		%	105	98	124	109	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading: % Passing a Sieve	50	mm %	100	100	100	100	100
	25	mm %	81	62	85	76	55 - 85
	9.5	mm %	72	56	73	67	40 - 75
	0.425	mm %	33	27	33	31	-
	0.075	mm %	2	1	10	4	0 - 12
Moisture Content		%	12.2	14.4	11.1	12.6	
Field Density		gr/cm³	1.86	1.98	2.01	1.95	
Compaction Degree		%	96	102	104	100	>95

TABLE 15 MODEL NO. 13 DBST: SUBBASE COURSE, h = 13 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	79	73	86	79	55 - 85
a Sieve	9.5	mm %	70	64	78	71	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	7	9	12	9	0 - 12
Moisture Content		%	13.6	11.8	10.4	11.9	
Field Density		gr/cm³	2.08	2.19	2.13	2.13	
Compaction Degree		%	107	113	110	110	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	88	82	80	83	55 - 85
a Sieve	9.5	mm %	80	72	73	75	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	10	10	10	10	0 - 12
Moisture Content		%	12.2	12.4	9.6	11.4	
Field Density		gr/cm³	1.94	2.00	2.10	2.01	
Compaction Degree		%	100	103	108	104	>95

TABLE 16 MODEL NO. 14 BMP: SUBBASE COURSE, h = 16 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	93	84	81	86	55 - 85
a Sieve	9.5	mm %	88	76	73	79	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	9	6	7	7	0 - 12
Moisture Content		%	16.5	13.0	14.2	14.6	
Field Density		gr/cm³	1.77	2.02	1.96	1.91	
Compaction Degree		%	91	104	101	99	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	85	83	83	84	55 - 85
a Sieve	9.5	mm %	75	74	74	74	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	9	6	7	7	0 - 12
Moisture Content		%	12.8	11.7	11.2	11.7	
Field Density		gr/cm³	1.75	2.11	2.00	1.95	
Compaction Degree		%	90	109	103	101	>95

TABLE 17 MODEL NO. 15 AC 4 cm: SUBBASE COURSE, h = 23 cm
1st Layer, h = 8 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading: % Passing a Sieve	50	mm %	100	100	100	100	100
	25	mm %	80	68	79	76	55 - 85
	9.5	mm %	67	65	78	70	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	8	12	8	9	0 - 12
Moisture Content		%	11.5	14.4	12.8	12.9	
Field Density		gr/cm³	2.00	1.82	1.77	1.86	
Compaction Degree		%	103	94	91	96	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading: % Passing a Sieve	50	mm %	100	100	100	100	100
	25	mm %	76	78	85	80	55 - 85
	9.5	mm %	71	74	82	75	40 - 75
	0.425	mm %	-	-	-	-	-
	0.075	mm %	8	11	10	10	0 - 12
Moisture Content		%	12.3	15.3	13.1	13.6	
Field Density		gr/cm³	2.02	1.81	1.90	1.91	
Compaction Degree		%	104	98	98	99	>95

TABLE 18 MODEL NO. 15 AC 4 cm: SUBBASE COURSE, h = 23 cm
2nd Layer, h = 15cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading: % Passing a Sieve	50	mm %	100	100	100	100	100
	25	mm %	92	90	91	91	55 - 85
	9.5	mm %	78	77	72	76	40 - 75
	0.425	mm %	37	34	20	30	-
	0.075	mm %	12	8	9	10	0 - 12
Moisture Content		%	4.5	5.8	4.5	4.9	
Field Density		gr/cm³	2.05	2.06	2.13	2.08	
Compaction Degree		%	106	106	110	107	>95

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading: % Passing a Sieve	50	mm %	100	100	100	100	100
	25	mm %	85	83	71	86	55 - 85
	9.5	mm %	71	69	80	73	40 - 75
	0.425	mm %	33	31	38	34	-
	0.075	mm %	11	9	12	11	0 - 12
Moisture Content		%	5.9	5.8	5.8	5.8	
Field Density		gr/cm³	2.07	2.27	2.17	2.17	
Compaction Degree		%	107	117	112	112	>95

TABLE 19 MODEL NO. 16 AC 5 cm: SUBBASE COURSE, h = 21 cm
1st Layer, h = 6 cm

Left Lane 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	94	90	87	91	55 - 85
a Sieve	9.5	mm %	75	88	81	81	40 - 75
	0.425	mm %	32	38	36	35	-
	0.075	mm %	5	9	9	8	0 - 12
Moisture Content		%	14.1	14.3	16.5	15.6	
Field Density		gr/cm³	1.77	1.70	1.65	1.71	
Compaction Degree		%	91	88	85	88	>95

Right Lane 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	87	76	70	78	55 - 85
a Sieve	9.5	mm %	83	68	62	71	40 - 75
	0.425	mm %	36	29	27	31	-
	0.075	mm %	7	5	5	6	0 - 12
Moisture Content		%	13.9	8.8	9.8	10.8	
Field Density		gr/cm³	1.84	1.84	1.73	1.80	
Compaction Degree		%	95	95	89	93	>95

TABLE 20 MODEL NO. 16 AC 5 cm: SUBBASE COURSE, h = 21 cm
2nd Layer, h = 15cm

Left Lane 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	87	83	80	83	55 - 85
a Sieve	9.5	mm %	72	72	63	69	40 - 75
	0.425	mm %	17	21	16	18	-
	0.075	mm %	6	11	7	8	0 - 12
Moisture Content		%	5.1	4.6	5.7	5.5	
Field Density		gr/cm³	2.15	2.11	2.10	2.12	
Compaction Degree		%	111	109	108	107	>95

Right Lane 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	50	mm %	100	100	100	100	100
% Passing	25	mm %	87	85	89	87	55 - 85
a Sieve	9.5	mm %	70	58	71	66	40 - 75
	0.425	mm %	15	20	32	22	-
	0.075	mm %	4	6	9	7	0 - 12
Moisture Content		%	5.0	2.8	3.8	3.9	
Field Density		gr/cm³	2.25	2.27	2.20	2.24	
Compaction Degree		%	116	117	113	115	>95

TABLE 21 MODEL NO. 17 AC 5 cm: SUBBASE COURSE, h = 19 cm

Left Lane			1.5 m from Center Line					
Station / Test Items			0 + 025	0 + 075	0 + 125	0 + 175	Average	Spec.
Grading:	50	mm %	100	100	100	100	100	100
% Passing	25	mm %	81	78	89	81	82	55 - 85
a Sieve	9.5	mm %	65	61	62	64	63	40 - 75
	0.425	mm %	22	20	20	24	22	-
	0.075	mm %	11	11	14	12	12	0 - 12
Moisture Content		%	8.8	8.7	8.5	9.0	8.8	
Field Density		gr/cm³	2.000	2.075	2.018	2.059	2.039	
Compaction Degree		%	101	105	102	104	103	>95

Right Lane			1.5 m from Center Line					
Station / Test Items			0 + 025	0 + 075	0 + 125	0 + 175	Average	Spec.
Gading:	50	mm %	100	100	100	100	100	100
% Passing	25	mm %	87	75	88	84	84	55 - 85
a Sieve	9.5	mm %	60	62	72	66	65	40 - 75
	0.425	mm %	20	26	22	23	23	-
	0.075	mm %	13	12	14	12	13	0 - 12
Moisture Content		%	10.2	9.2	9.0	10.3	9.7	
Field Density		gr/cm³	1.927	2.000	2.040	2.074	2.010	
Compaction Degree		%	97	101	103	105	102	>95

TABLE 22 MODEL NO. 18 PPC 18cm: SUBBASE COURSE, h = 20 cm

Left Lane			1.5 m from Center Line					
Station / Test Items			0 + 025	0 + 075	0 + 125	0 +175	Average	Spec.
Grading:	50	mm %	100	100	100	100	100	100
% Passing	25	mm %	81	85	82	80	82	55 - 85
a Sieve	9.5	mm %	60	60	64	61	61	40 - 75
	0.425	mm %	24	22	20	22	22	-
	0.075	mm %	12	15	11	11	12	0 - 12
Moisture Content		%	8.7	8.4	9.3	8.6	8.8	
Field Density		gr/cm³	2.039	2.096	2.020	2.039	2.049	
Compaction Degree		%	103	106	102	103	104	>95

Right Lane			1.5 m from Center Line					
Station / Test Items			0 + 025	0 + 075	0 + 125	0 + 175	Average	Spec.
Grading:	50	mm %	100	100	100	100	100	100
% Passing	25	mm %	80	80	92	81	83	55 - 85
a Sieve	9.5	mm %	59	65	56	59	62	40 - 75
	0.425	mm %	19	22	20	29	23	-
	0.075	mm %	12	11	13	12	12	0 - 12
Moisture Content		%	5.8	10.4	6.8	6.5	9.8	
Field Density		gr/cm³	2.165	2.044	2.190	2.019	2.105	
Compaction Degree		%	109	103	111	102	106	>95

TABLE 23 MODEL NO. 2 SBST : BASE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	69	79	71	73	60 - 85
a Sieve	4.75	mm %	46	51	44	47	30 - 55
	0.425	mm %	13	22	15	17	8 - 25
	0.075	mm %	6	13	8	9	2 - 14
Moisture Content		%	12.9	10.5	7.1	10.2	
Field Density		gr/cm³	1.92	1.92	1.94	1.93	
Compaction Degree		%	99	99	100	99	>100
Prime Coat		lit/m²	1.11	1.08	1.12	1.10	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	76	74	53	68	60 - 85
a Sieve	4.75	mm %	53	52	37	47	30 - 55
	0.425	mm %	18	19	12	16	8 - 25
	0.075	mm %	9	10	7	9	2 - 14
Moisture Content		%	10.7	11.6	10.9	11.1	
Field Density		gr/cm³	1.98	2.00	1.96	1.98	
Compaction Degree		%	102	103	101	102	>100
Prime Coat		lit/m²	1.08	1.23	1.11	1.15	1.20

TABLE 24 MODEL NO. 3 DBST : BASE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	71	74	67	71	60 - 85
a Sieve	4.75	mm %	55	58	49	54	30 - 55
	0.425	mm %	21	21	19	20	8 - 25
	0.075	mm %	10	12	11	11	2 - 14
Moisture Content		%	10.5	12.5	12.5	11.9	
Field Density		gr/cm³	1.94	1.95	1.94	1.94	
Compaction Degree		%	100	101	100	100	>100
Prime Coat		lit/m²	0.92	0.98	0.85	0.92	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	87	67	93	82	60 - 85
a Sieve	4.75	mm %	66	50	73	63	30 - 55
	0.425	mm %	26	16	31	24	8 - 25
	0.075	mm %	10	9	12	10	2 - 14
Moisture Content		%	11.7	13.1	13.0	12.6	
Field Density		gr/cm³	1.98	2.00	1.94	1.97	
Compaction Degree		%	102	103	100	102	>100
Prime Coat		lit/m²	1.19	1.26	1.16	1.20	1.20

TABLE 25 MODEL NO. 4 BMP : BASE COURSE, h = 15 cm

Left Lane — 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	83	65	71	73	60 - 85
a Sieve	4.75	mm %	49	49	51	47	30 - 55
	0.425	mm %	18	17	24	20	8 - 25
	0.075	mm %	9	12	7	9	2 - 14
Moisture Content		%	12.8	14.6	12.4	13.3	
Field Density		gr/cm³	1.96	1.98	1.96	1.97	
Compaction Degree		%	101	102	101	101	>100
Prime Coat		lit/m²	1.24	1.22	1.26	1.24	1.20

Right Lane — 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	68	90	73	77	60 - 85
a Sieve	4.75	mm %	53	47	51	50	30 - 55
	0.425	mm %	23	21	19	21	8 - 25
	0.075	mm %	6	19	12	9	2 - 14
Moisture Content		%	13.8	13.4	13.4	12.6	
Field Density		gr/cm³	1.94	2.02	1.96	1.97	
Compaction Degree		%	100	104	101	102	>100
Prime Coat		lit/m²	1.24	0.99	0.88	1.04	1.20

TABLE 26 MODEL NO. 6 SBST: BASE COURSE, h = 15 cm

Left Lane — 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	85	84	84	84	60 - 85
a Sieve	4.75	mm %	58	52	52	54	30 - 55
	0.425	mm %	20	20	22	11	8 - 25
	0.075	mm %	11	10	12	11	2 - 14
Moisture Content		%	2.8	3.9	3.6	3.5	
Field Density		gr/cm³	2.29	2.30	2.30	2.30	
Compaction Degree		%	100	101	101	101	>100
Prime Coat		lit/m²	1.15	1.21	1.19	1.18	1.20

Right Lane — 1.5 m from Center Line

Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	76	81	83	80	60 - 85
a Sieve	4.75	mm %	51	53	51	52	30 - 55
	0.425	mm %	18	20	20	19	8 - 25
	0.075	mm %	7	12	11	10	2 - 14
Moisture Content		%	3.8	4.1	3.6	3.8	
Field Density		gr/cm³	2.21	2.28	2.26	2.22	
Compaction Degree		%	93	100	99	99	>100
Prime Coat		lit/m²	1.20	1.10	1.25	1.18	1.20

TABLE 27 MODEL NO. 7 DEST : BASE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	86	76	88	83	60 - 85
a Sieve	4.75	mm %	51	34	59	46	30 - 55
	0.425	mm %	17	8	19	15	8 - 25
	0.075	mm %	17	8	19	15	2 - 14
Moisture Content		%	2.4	3.7	5.4	3.8	
Field Density		gr/cm³	2.28	2.47	2.19	2.51	
Compaction Degree		%	126	108	96	110	>100
Prime Coat		lit/m²	1.29	1.18	1.20	1.22	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	87	74	80	80	60 - 85
a Sieve	4.75	mm %	51	42	48	47	30 - 55
	0.425	mm %	11	13	16	13	8 - 25
	0.075	mm %	2	7	7	6	2 - 14
Moisture Content		%	2.4	4.2	5.1	3.9	
Field Density		gr/cm³	2.33	2.37	2.23	2.31	
Compaction Degree		%	102	104	98	101	>100
Prime Coat		lit/m²	1.14	1.20	1.27	1.20	1.20

TABLE 28 MODEL NO. 8 BMP : BASE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	84	84	81	83	60 - 85
a Sieve	4.75	mm %	51	53	46	50	30 - 55
	0.425	mm %	17	22	16	18	8 - 25
	0.075	mm %	8	11	8	8	2 - 14
Moisture Content		%	3.6	4.5	3.8	4.0	
Field Density		gr/cm³	2.43	2.42	2.46	2.44	
Compaction Degree		%	107	106	106	110	>100
Prime Coat		lit/m²	1.14	1.21	1.23	1.19	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	82	82	84	83	60 - 85
a Sieve	4.75	mm %	47	49	54	50	30 - 55
	0.425	mm %	18	17	23	19	8 - 25
	0.075	mm %	9	9	12	10	2 - 14
Moisture Content		%	4.1	3.6	5.0	4.0	
Field Density		gr/cm³	2.46	2.47	2.43	2.45	
Compaction Degree		%	108	108	107	107	>100
Prime Coat		lit/m²	1.15	1.21	1.26	1.22	1.20

TABLE 29 MODEL NO. 9 DBST : BASE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	90	91	91	91	60 - 85
a Sieve	4.75	mm %	65	61	68	65	30 - 55
	0.425	mm %	24	21	22	23	8 - 25
	0.075	mm %	11	9	7	9	2 - 14
Moisture Content		%	2.9	5.4	3.2	3.8	
Field Density		gr/cm³	2.08	2.18	2.09	2.12	
Compaction Degree		%	91	96	92	93	>100
Prime Coat		lit/m²	1.18	1.28	1.03	1.16	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Arading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	93	93	94	93	60 - 85
a Sieve	4.75	mm %	61	63	65	63	30 - 55
	0.425	mm %	21	22	23	22	8 - 25
	0.075	mm %	9	11	10	10	2 - 14
Moisture Content		%	4.1	3.6	5.0	4.0	
Field Density		gr/cm³	2.22	2.26	2.24	2.24	
Compaction Degree		%	97	99	99	98	>100
Prime Coat		lit/m²	1.11	1.18	1.11	1.13	1.20

TABLE 30 MODEL NO.10 BMP BASE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	90	89	89	89	60 - 85
a Sieve	4.75	mm %	55	61	55	57	30 - 55
	0.425	mm %	19	20	18	19	8 - 25
	0.075	mm %	9	9	8	9	2 - 14
Moisture Content		%	8.0	3.9	3.2	5.1	
Field Density		gr/cm³	2.47	2.39	2.35	2.49	
Compaction Degree		%	108	105	103	105	>100
Prime Coat		lit/m²	1.27	1.19	1.23	1.23	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	90	95	88	91	60 - 85
a Sieve	4.75	mm %	52	62	55	56	30 - 55
	0.425	mm %	17	21	18	19	8 - 25
	0.075	mm %	7	9	7	8	2 - 14
Moisture Content		%	7.7	3.7	7.2	6.2	
Field Density		gr/cm³	2.28	2.45	2.33	2.35	
Compaction Degree		%	100	108	102	103	>100
Prime Coat		lit/m²	1.27	1.17	1.14	1.19	1.20

TABLE 31 MODEL NO.11 AC 4cm BASE COURSE, h = 12 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	98	88	88	89	60 - 85
a Sieve	4.75	mm %	61	53	53	56	30 - 55
	0.425	mm %	21	18	19	19	8 - 25
	0.075	mm %	9	8	9	9	2 - 14
Moisture Content		%	4.5	3.6	3.7	3.9	
Field Density		gr/cm³	2.09	2.23	2.24	2.19	
Compaction Degree		%	92	98	98	96	>100
Prime Coat		lit/m²	1.23	1.19	1.23	1.22	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	91	89	90	90	60 - 85
a Sieve	4.75	mm %	57	50	59	55	30 - 55
	0.425	mm %	17	16	18	18	8 - 25
	0.075	mm %	11	8	8	9	2 - 14
Moisture Content		%	4.5	4.1	6.3	5.0	
Field Density		gr/cm³	2.13	2.14	2.03	2.10	
Compaction Degree		%	94	94	89	92	>100
Prime Coat		lit/m²	1.16	1.18	1.14	1.16	1.20

TABLE 32 MODEL NO.12 AC 5cm : BASE COURSE, h = 12 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	91	89	87	89	60 - 85
a Sieve	4.75	mm %	59	54	57	57	30 - 55
	0.425	mm %	20	20	19	20	8 - 25
	0.075	mm %	10	9	10	10	2 - 14
Moisture Content		%	4.5	3.3	4.4	4.1	
Field Density		gr/cm³	2.25	2.28	2.39	2.31	
Compaction Degree		%	99	100	105	105	>100
Prime Coat		lit/m²	1.17	1.19	1.18	1.18	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	91	89	97	89	60 - 85
a Sieve	4.75	mm %	59	54	57	57	30 - 55
	0.425	mm %	20	20	19	20	8 - 25
	0.075	mm %	10	9	10	10	2 - 14
Moisture Content		%	4.5	3.3	4.4	4.1	
Field Density		gr/cm³	2.25	2.28	2.39	2.31	
Compaction Degree		%	99	100	105	101	>100
Prime Coat		lit/m²	0.96	1.29	1.34	1.20	1.20

TABLE 33 MODEL NO.13 DBST : BASE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	90	86	82	86	60 - 85
a Sieve	4.75	mm %	57	55	51	54	30 - 55
	0.425	mm %	20	20	17	19	8 - 25
	0.075	mm %	7	7	7	8	2 - 14
Moisture Content		%	6.8	6.4	5.1	6.1	
Field Density		gr/cm³	2.28	2.32	2.32	2.31	
Compaction Degree		%	100	102	102	101	>100
Prime Coat		lit/m²	1.13	1.18	1.24	1.18	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	97	88	90	88	60 - 85
a Sieve	4.75	mm %	53	53	56	54	30 - 55
	0.425	mm %	17	18	19	18	8 - 25
	0.075	mm %	6	10	10	9	2 - 14
Moisture Content		%	4.4	5.1	5.3	4.9	
Field Density		gr/cm³	2.29	2.40	2.30	2.33	
Compaction Degree		%	100	105	101	102	>100
Prime Coat		lit/m²	1.10	0.87	1.17	1.05	1.20

TABLE 34 MODEL NO.14 BMP : BASE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	84	92	84	87	60 - 85
a Sieve	4.75	mm %	48	57	54	53	30 - 55
	0.425	mm %	15	21	19	18	8 - 25
	0.075	mm %	8	11	10	10	2 - 14
Moisture Content		%	3.2	4.2	3.7	3.6	
Field Density		gr/cm³	2.39	2.51	2.56	2.49	
Compaction Degree		%	105	110	112	109	>100
Prime Coat		lit/m²	1.30	1.26	0.95	1.18	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	89	91	90	90	60 - 85
a Sieve	4.75	mm %	56	59	58	58	30 - 55
	0.425	mm %	18	20	20	19	8 - 25
	0.075	mm %	8	11	10	10	2 - 14
Moisture Content		%	4.2	3.7	3.6	3.8	
Field Density		gr/cm³	2.23	2.57	2.54	2.48	
Compaction Degree		%	102	113	111	109	>100
Prime Coat		lit/m²	1.24	1.30	1.08	1.21	1.20

TABLE 35 MODEL NO.15 AC 4cm : BASE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	85	85	84	85	60 - 85
a Sieve	4.75	mm %	51	50	48	50	30 - 55
	0.425	mm %	18	17	17	17	8 - 25
	0.075	mm %	9	8	8	8	2 - 14
Moisture Content		%	4.5	3.8	3.9	4.1	
Field Density		gr/cm³	2.50	2.52	2.39	2.47	
Compaction Degree		%	110	111	105	109	>100
Prime Coat		lit/m²	1.06	1.38	1.19	1.21	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	85	92	70	82	60 - 85
a Sieve	4.75	mm %	53	56	40	50	30 - 55
	0.425	mm %	18	21	13	17	8 - 25
	0.075	mm %	8	11	5	8	2 - 14
Moisture Content		%	3.8	3.1	3.9	3.6	
Field Density		gr/cm³	2.46	2.33	2.31	2.37	
Compaction Degree		%	108	102	101	104	>100
Prime Coat		lit/m²	1.29	1.33	1.05	1.22	1.20

TABLE 36 MODEL NO.16 AC 5cm : BASE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	91	90	81	87	60 - 85
a Sieve	4.75	mm %	70	66	58	65	30 - 55
	0.425	mm %	24	24	20	23	8 - 25
	0.075	mm %	8	12	8	9	2 - 14
Moisture Content		%	11.4	8.5	10.3	10.1	
Field Density		gr/cm³	2.30	2.30	2.19	2.24	
Compaction Degree		%	101	101	99	99	>100
Prime Coat		lit/m²	1.31	1.11	0.99	1.14	1.20

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100
% Passing	19	mm %	92	89	83	88	60 - 85
a Sieve	4.75	mm %	55	58	55	56	30 - 55
	0.425	mm %	20	18	20	19	8 - 25
	0.075	mm %	10	9	9	9	2 - 14
Moisture Content		%	4.1	5.6	7.7	5.8	
Field Density		gr/cm³	2.32	2.28	2.17	2.26	
Compaction Degree		%	101	101	96	104	>100
Prime Coat		lit/m²	1.30	1.24	1.22	1.22	1.20

TABLE 37 MODEL NO.17 AC 5cm :BASE COURSE, h = 15 cm

Left Lane 1.5 m from Center Line

Station / Test Items			0 + 025	0 + 075	0 + 125	0 + 175	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100	100
% Passing	19	mm %	70	73	87	70	75	60 - 85
a Sieve	4.75	mm %	38	37	42	36	38	30 - 55
	0.425	mm %	23	21	27	22	23	8 - 25
	0.075	mm %	13	14	15	13	14	2 - 14
Moisture Content		%	8.7	8.6	8.9	8.4	8.7	
Field Density		gr/cm³	2.308	2.203	2.266	2.203	2.245	
Compaction Degree		%	102	104	107	104	106	>100

Right Lane 1.5 m from Center Line

Station / Test Items			0 + 025	0 + 075	0 + 125	0 + 175	Average	Spec.
Grading:	37.5	mm %	100	100	100	100	100	100
% Passing	19	mm %	71	74	72	85	76	60 - 85
a Sieve	4.75	mm %	43	40	41	57	45	30 - 55
	0.425	mm %	21	20	23	24	22	8 - 25
	0.075	mm %	12	14	13	14	13	2 - 14
Moisture Content		%	9.3	9.0	9.6	9.5	9.4	
Field Density		gr/cm³	2.331	2.220	2.181	2.287	2.255	
Compaction Degree		%	110	105	103	108	107	>100

TABLE 38 MODEL NO. 1 GR : AGGREGATE SURFACE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	25	mm %	100	100	100	100	100
% Passing	9.5	mm %	65	64	69	66	50 - 85
a Sieve	4.75	mm %	57	55	57	56	35 - 65
	0.425	mm %	23	25	22	23	15 - 30
	0.075	mm %	14	13	7	11	5 - 20
Moisture Content		%	13.8	13.0	14.8	13.8	
Field Density		gr/cm³	1.92	1.96	1.92	1.93	
Compaction Degree		%	100	102	100	101	>100

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	25	mm %	100	100	100	100	100
% Passing	9.5	mm %	71	70	56	66	50 - 85
a Sieve	4.75	mm %	58	57	47	54	35 - 65
	0.425	mm %	24	21	19	22	15 - 30
	0.075	mm %	11	10	9	10	5 - 20
Moisture Content		%	13.9	13.9	14.9	14.2	
Field Density		gr/cm³	1.98	2.04	1.94	1.99	
Compaction Degree		%	103	106	101	103	>100

TABLE 39 MODEL NO. 5 GR : AGGREGATE SURFACE COURSE, h = 15 cm

Left Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	25	mm %	100	100	100	100	100
% Passing	9.5	mm %	62	62	66	63	50 - 85
a Sieve	4.75	mm %	53	52	52	54	35 - 65
	0.425	mm %	21	21	20	21	15 - 30
	0.075	mm %	13	12	6	10	5 - 20
Moisture Content		%	5.5	4.5	3.8	4.6	
Field Density		gr/cm³	2.53	2.60	2.41	2.51	
Compaction Degree		%	107	110	102	106	>100

Right Lane			1.5 m from Center Line				
Chainage / Test Items			0 + 50	0 + 100	0 + 150	Average	Spec.
Grading:	25	mm %	100	100	100	100	100
% Passing	9.5	mm %	70	59	55	65	50 - 85
a Sieve	4.75	mm %	57	55	45	52	35 - 65
	0.425	mm %	24	19	17	20	15 - 30
	0.075	mm %	11	8	7	9	5 - 20
Moisture Content		%	4.2	4.3	3.8	4.1	
Field Density		gr/cm³	2.62	2.48	2.45	2.52	
Compaction Degree		%	111	105	104	107	>100

TABLE 40 MODEL NO. 2, No. 6: SBST (5 mm) SURFACE COURSE

(Test results are mean value of 6 tests for each model)

Test Items		Design	Model No. 2	Model No. 6
Binder Spraying Rate				
1st Layer	kg/m²	1.4	1.38	1.43
Seal Coat	kg/m²	1.0	1.14	1.16
Binder Total	kg/m²	2.4	2.52	2.59
Aggregate Spreading Rate				
Chip (10-5 mm)	kg/m²	14	14.48	14.09
Seal Coat Sand	kg/m²	8	8.08	6.22
Aggregate Total	kg/m²	22	22.56	20.31

TABLE 41 MODEL NO. 3, No. 7, No. 9, No. 11: DBST (15 mm) SURFACE COURSE

(Test results are mean value of 6 tests for each model)

Test Items		Design	Model No. 3	Model No. 7	Model No. 9	Model No. 13
Binder Spraying Rate						
1st Layer	kg/m²	1.4	1.64	1.48	1.87	1.51
2nd Layer	kg/m²	1.2	1.34	1.24	1.26	1.31
Seal Coat	kg/m²	1.5	1.29	1.41	1.38	1.46
Binder Total	kg/m²	2.4	4.27	4.13	4.51	4.28
Aggregate Spreading Rate						
1st Chip (20-10 mm)	kg/m²	22	22.9	23.5	22.2	24.6
2nd Chip (10- 5 mm)	kg/m²	12	11.8	11.6	10.5	10.6
Seal Coat Sand	kg/m²	6	5.6	5.6	6.7	4.8
Aggregate Total	kg/m²	40	40.3	40.7	39.4	40.4

TABLE 42 MODEL NO. 4, No. 8, No. 10, No. 14: BMP (50 mm) SURFACE COURSE

(Test results are mean value of 6 tests for each model)

Test Items		Design	Model No. 4	Model No. 8	Model No. 10	Model No. 14
Aggregate Spraying Rate						
Base Layer (40-20 mm)	kg/m²	80	81.3	84.4	85.3	82.9
2nd Layer (20-10 mm)	kg/m²	13	13.4	14.8	13.0	15.6
3rd Layer (10- 5 mm)	kg/m²	11	10.1	10.2	11.1	10.9
4th Layer (Sand)	kg/m²	6	8.1	6.0	6.5	5.0
Agregate Total	kg/m²	110	112.9	115.4	115.9	114.4
Binder Spraying Rate						
Base Layer	kg/m²	2.7	2.73	2.76	2.44	2.61
2nd Layer	kg/m²	1.8	1.81	1.77	1.87	1.78
3rd Layer	kg/m²	1.5	1.42	1.48	1.52	1.29
Binder Total	kg/m²	6.0	5.96	6.01	5.83	5.63

TABLE 43 MODEL NO. 11, No. 15: AC 4 cm SURFACE COURSE

(Test results are mean value of 6 tests for each model)
Test Results No. AC-1 h = 4 cm Asphalt Concrete

Test Items			Spec.	Model No. 11	Model No. 15
Mixing Laying Temperature °C			-	156	149
Layer Thickness from Core Sample		cm	-	4.3	4.5
Core Density		gr/m³	-	2.264	2.200
Compaction Degree		%	>97	97.6	95.1
Grading:	19 mm	%	100	100	100
% Passing	4.75 mm	%	45 - 65	61	63
a Sieve	2.36 mm	%	33 - 53	46	46
	0.300 mm	%	10 - 20	12	12
	0.075 mm	%	3 - 8	4	4
Asphalt Content		%	5.7	5.69	5.66

TABLE 44 MODEL NO. 12, No. 16: AC 5 cm SURFACE COURSE

(Test results are mean value of 6 tests for each model)
Test Results No. AC-2 h = 5 cm Asphalt Concrete

Test Items			Spec.	Model No. 11	Model No. 15
Mixing Laying Temperature °C			-	158	153
Layer Thickness from Core Sample		cm	-	5.0	5.5
Core Density		gr/m³	-	2.275	2.263
Compaction Degree		%	>97	98.6	97.7
Grading:	19 mm	%	100	100	100
% Passing	4.75 mm	%	45 - 65	61	62
a Sieve	2.36 mm	%	33 - 53	46	45
	0.300 mm	%	10 - 20	13	12
	0.075 mm	%	3 - 8	4	5
Asphalt Content		%	5.7	5.69	5.67

TABLE 45-1 MODEL NO. 17: AC 5 cm SURFACE COURSE

(Marshall test results are mean value of 3 specimens for each sample)

Test Items			Job-mix Tolerance	Sample No. 1	Sample No. 2	Sample No. 3
Mixing Temperature °C			129 - 149	149	149	149
Marshal Test						
Density		gr/cm³		2.457	2.451	2.452
Stability		lb	>1,200	2,864	2,560	2,732
Flow		0.01 in	8 - 16	12	10	12
Air Voids		%	3 - 6	5.2	5.3	5.4
Void Filled		%	70 - 80	71	71	71
Asphalt Content *			5.4 - 6.2	5.82	5.90	5.70
Grading:	19	mm %	100	100	100	100
% Passing	4.75	mm %	48 - 62	61	57	61
a Sieve	2.36	mm %	39 - 47	46	44	45
	0.300	mm %	11 - 19	13	14	17
	0.075	mm %	3 - 7	4	5	4

Remarks :

Sample No. 1, 2, 3: Date of Placing: Sept. 25, 1990
Location: L / Lane, Sta. 0 + 264 to 0 + 400

* Percente by Weight of Total Aggregates

Sample meets Job-mix requirements.

TABLE 45-2 MODEL NO. 17: AC 5 cm SURFACE COURSE

(Marshall test results are mean value of 4 specimens for each sample)

Test Items			Job-mix Tolerance	Sample No. 4	Sample No. 5	Sample No. 6
Mixing Temperature °C			129 - 149	149	149	149
Marshal Test						
Density		gr/cm³		2.451	2.445	2.451
Stability		lb	>1,200	2,797	2,427	2,758
Flow		0.01 in	8 - 16	14	11	11
Air Voids		%	3 - 6	5.4	5.4	5.3
Void Filled		%	70 - 80	71	71	71
Asphalt Content *			5.4 - 6.2	5.87	6.00	5.94
Grading:	19	mm %	100	100	100	100
% Passing	4.75	mm %	48 - 62	61	60	61
a Sieve	2.36	mm %	39 - 47	43	45	42
	0.300	mm %	11 - 19	19	12	19
	0.075	mm %	3 - 7	5	5	6

Remarks :

Sample No. 4, 5: Date of Placing: Oct. 4, 1990
Location: L / Lane, Sta. 0 + 200 to 0 + 264
R / Lane, Sta. 0 + 290 to 0 + 400

Sample No. 6 : Date of Placing: Oct. 5, 1990
Location: R / Lane, Sta. 0 + 200 to 0 + 290

* Percente by Weight of Total Aggregates

Sample meets Job-mix requirements.

TABLE 46-1 MODEL NO. 18: PCC 18 cm FLEXURAL STRENGTH OF PCC

Date of Placement Location	Test No.	Slump	Flexural Strength 28 days, MPa (psi)
Aug. 2, 1990	No. 1	2.5 in	4.75 (690)
Right Lane		3 in	3.89 (564)
Sta. 0 + 000		3 in	3.77 (546)
to		Average	4.14 (600)
Sta. 0 + 094.5			
	No. 2	2.5 in	4.01 (582)
		2.5 in	4.26 (618)
		2.5 in	4.14 (600)
		Average	4.14 (600)
Aug. 15, 1990	No. 3	2.5 in	4.26 (618)
Right Lane		3 in	4.51 (654)
Sta. 0 + 094.5		2.75 in	4.51 (654)
to		Average	4.43 (642)
Sta. 0 + 200			
	No. 4	3 in	4.87 (707)
		3 in	4.26 (618)
		3 in	4.39 (636)
		Average	4.51 (654)

Remarks: Flexural Strength were tested by the third-point loading method.

TABLE 46-2 MODEL NO. 18: PCC 28 cm FLEXURAL STRENGTH OF PCC

Date of Placement Location	Test No.	Slump	Flexural Strength 28 days, MPa (psi)
Sept. 5, 1990	No. 5	3 in	3.77 (546)
Left Lane		3 in	3.89 (564)
Sta. 0 + 000		3 in	3.89 (564)
to		Average	3.85 (585)
Sta. 0 + 150			
	No. 6	3 in	3.89 (564)
		3 in	3.64 (529)
		3 in	4.01 (582)
		Average	3.85 (558)
	No. 7	3 in	3.64 (529)
		3 in	3.64 (529)
		3 in	3.77 (546)
		Average	3.68 (535)
Sept. 6, 1990	No. 8	3 in	3.39 (492)
Left Lane		3 in	3.89 (654)
Sta. 0 + 150		3 in	3.64 (529)
to		Average	3.64 (529)
Sta. 0 + 200			

Remarks: Flexural Strength were tested by the third-point loading method.

TABLE 47 MODEL NO. 17: AC 5 cm SURFACE COURSE

Core Sample Test

Test Items		Spec.	Left Lane		Right Lane	
			0 + 210	0 + 380	0 + 210	0 + 390
Layer Thickness from Core Sample	cm	5.0	6.2	6.2	5.3	4.8
Core Density	gr/cm^3		2.384	2.349	2.463	2.344
Laboratory Density	gr/cm^3		2.466	2.458	2.589	2.452
Compaction Degree	%	>97	97.46	95.56	95.13	95.60

TABLE 48 MODEL NO. 18: PCC 18 cm SURFACE COURSE

Core Sample Test

Test Items		Spec.	Left Lane		Right Lane	
			0 + 010	0 + 190	0 + 010	0 + 190
Layer Thickness from Core Sample	cm	18.0	19.2	18.6	20.6	19.0