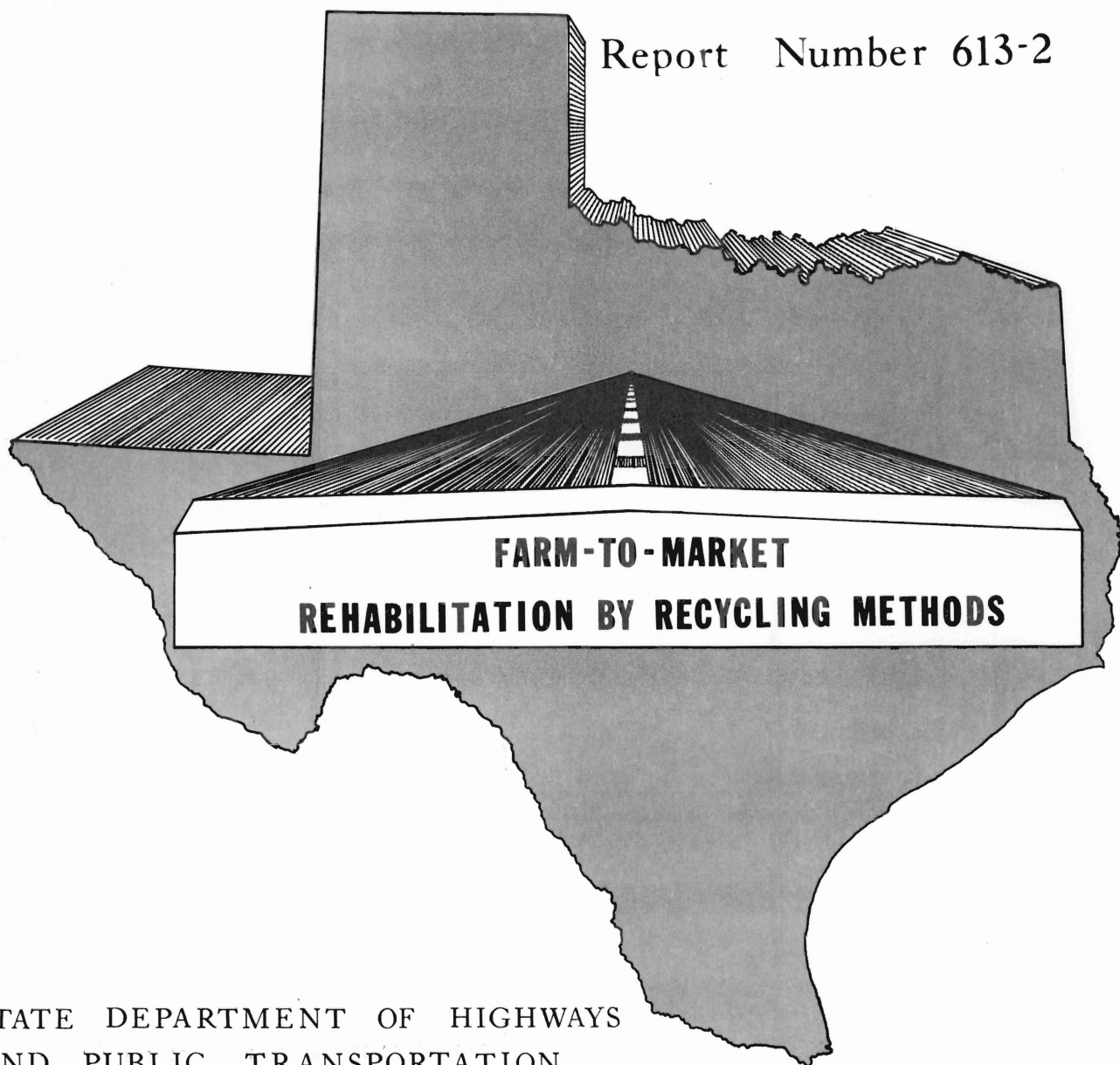


EXPERIMENTAL PROJECTS

Report Number 613-2



STATE DEPARTMENT OF HIGHWAYS
AND PUBLIC TRANSPORTATION

STATE DEPARTMENT OF HIGHWAYS
AND
PUBLIC TRANSPORTATION

FARM-TO-MARKET HIGHWAY REHABILITATION
BY RECYCLING METHODS

Experimental Projects Report
613-2

By

Bobby R. Lindley
Assistant District Engineer
District 8 Abilene, Texas

June, 1980

DISCLAIMER

The opinions and conclusions expressed within this report do not necessarily reflect the views of the Texas State Department of Highways and Public Transportation.

ACKNOWLEDGMENT

A special acknowledgment is given to the employees in Shackelford County who tirelessly put forth extra effort and time to perform duties above their routine schedules. Under the leadership of Mr. Paul E. Wheeler, Jr., these men did an excellent job, under unusual circumstances.

A special thanks to the Pettibone Corporation for furnishing equipment required, and offering their assistance in the manipulation of this project. Their past experience was a definite aid to the end product.

Special thanks are also expressed to our district laboratory personnel who added the technical knowledge necessary on a research type project.

My appreciation is also given to the personnel involved in the preparation of this report.

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INTRODUCTION

The majority of low volume State Highways and Farm-to-Market Highways in this state are twenty to twenty-five years old and are in need of complete rehabilitation. The increase in load limit and traffic, plus fatigue caused by age, have completely deteriorated this system. Priority dictates that reconstruction of these low volume roads has been delayed for years. This added to the problem.



Typical Aged FM Highway

Several miles of the FM system in this district has been reconstructed in the past five years. The design for this type of work is to scarify the existing surface, add a nominal amount of new base, and place a penetration seal for the surface. Any structure work necessary is also done at the same time. This type of construction has averaged approximately \$75,000 per mile and requires approximately 20 working days per mile of construction. In other words, a

4-mile FM highway would be under construction 80 working days (120⁺ calendar days) and would cost approximately \$300,000.

We have had an enormous amount of difficulty carrying traffic through these projects because all of the roadway is torn up and the narrow (80') right of way is not conducive to managing traffic. This is a greater problem in small cities where the school systems are the total center of community activities. This type of rehabilitation work is delayed many times because of weather conditions and creates public relation problems.

The end result of the above described design is a highway that closely resembles the original highway but the disadvantages are many. These disadvantages are listed as follows:

1. Local citizens are often denied safe and reasonable passage.
2. The cost per mile is increased because the Contractor bids in extra pay for handling traffic and prolonged construction practices.
3. Engineering cost is increased because of the extended time period of engineering required for this type of work.
4. The strength of the highway is not always increased relative to the incurred cost.

The conclusion based on past experiences is that this type of rehabilitation is not desirable for the times.

DESIGN OBJECTIVE

To develop a rehabilitation design technique to satisfy the requirements of a farm-to-market system. These requirements will include an increase in structural strength, rideability, lasting performance, and safety improvements. The design should also substantially reduce the cost per mile and construction time. This, in turn, should reduce the number of engineering personnel and the total engineering cost.

The objective is to get more miles for the money with less personnel.

EXISTING CONDITION AND DESIGN PROPOSAL

The project selected for this experiment is a programmed two-mile section of FM 576 in Shackelford County. It begins in the small city of Moran at the intersection of SH 6, and extends two miles northeast. There are several rural-type dwellings along this route and it is also an established mail and school bus route. Approximately 20% of traffic is oil field related, which includes heavy loads. The soil is a sandy loam with approximately one mile of subirrigated subsoil. There is evidence of seepage and the shoving of the existing pavement indicates excessive moisture. The average rainfall for this area is approximately 25 inches annually.

The existing base is 6" of pit run siliceous material. The history of this type of base has proven to be satisfactory for the type traffic involved (300 vehicles per day.) The surface consists of approximately 1" of accumulated penetration seals with spots of asphaltic concrete cold-laid material.

Our proposal for this project was to utilize programmed funds in the amount of \$200,000 and increase the length of the project as far as possible and complete it in a minimum amount of time. This is in accordance with our Design Objective.

TEXAS HIGHWAY DEPARTMENT

STATE PROJECT NO. M-1031-4

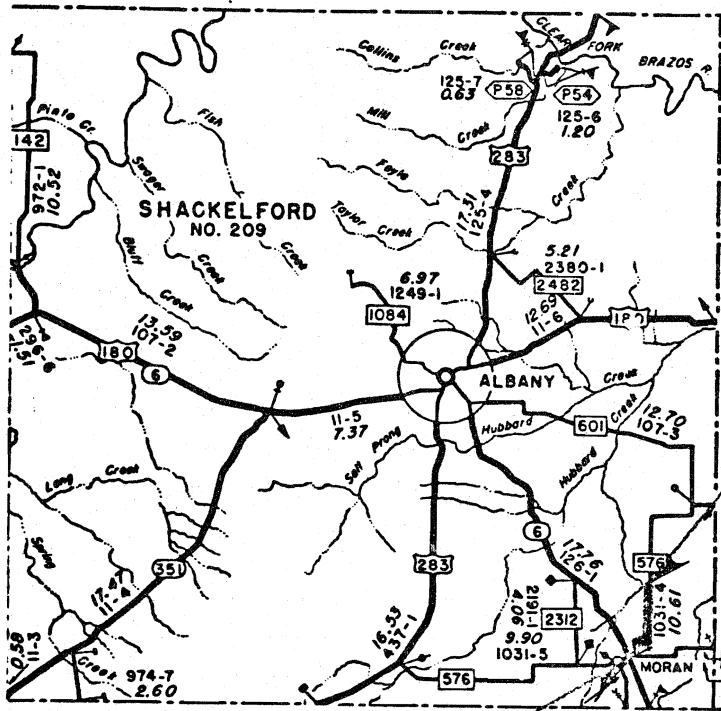
FM 576

SHACKELFORD COUNTY

PROPOSED CONSTRUCTION

FROM SH. 6 IN MORAN TO 4.25 MILES NORTHWEST
RECYCLING AND STABILIZING THE EXISTING BASE AND SURFACING

NET LENGTH 22,440 FT. = 4.25 MILES



End Project
M-1031-4

Begin Project
M-1031-4

RECOMMENDED
FOR APPROVAL:

8-22-79

James D. Wilk

DISTRICT ENGINEER

SCALE:

5.

DIST. NO.	COUNTY	CONT.	SECT.	JOB	HWY. NO.
08	SHACKELFORD	1031	4		FM 576

DESIGN PROCEDURES

Random sampling was taken from the roadway to obtain a representative sample for laboratory use. These samples were obtained by stripping the base and surface from the highway with a 6' wide front-end loader. These samples were split to obtain adequate material for testing.

From these samples tests were performed to determine what cementing material should be utilized in the base. The exact moisture had to be used in testing to duplicate proposed construction conditions. Test results indicated that a cut-back asphalt should be tried.

An asphalt stabilized base sample was prepared using varied percentages of MC type asphalt. Samples were tested for strength and visually observed for quality. The results were not to our satisfaction so these samples were set aside.

Next, a sample was prepared using emulsion (CRS-2.) Again, varied percentages of CRS-2 were used and tests were run for quality. It was apparent from these tests that 5.5% of emulsion would be adequate to stabilize the combination of existing base and surface. The appearance of the sample was extremely dry and dull in color but the density and strength bore out this design.

Tests were also conducted to identify the moisture resistance qualities of this stabilized base. The tests indicated that the surface would have to be sealed to prevent infiltration of moisture from the surface.

Due to unstable base in the existing roadway, plans were made to lime stabilize those areas where the subgrade was super-saturated with moisture. During construction we learned that only a very small amount of area had to be stabilized. The majority of the subgrade was in good condition and the moisture was trapped in the base structure.

Attached are all test reports showing results for design procedures.

SOILS AND BASE MATERIALS TEST REPORT

Base
CDR MJSI

Laboratory No. LPO 16,327
 Date Rec'd 2/12/79 Reported 2/22/79
 Engineer Riley Walker
 Address Abilene
 Contractor _____
 Sampler Billy W. Davis
 Sampler's Title Engineering Technician
 Sampled From Roadway
 Producer _____
 Quantity Represented by Sample _____
 Has been Used on _____

1031 4
 Control Number Section Number Job Number
Shackelford FM576
 County Federal Project No. Highway No.
08 3-226 2/12/79
 District No. I.P.E. No. Req. No. Date Sampled
 Specification Item No. _____
 Material from Property of Base-DHT
 Proposed for Use as Base

Lab. No.	LL	PI	SL	LS	SR	Class	Soil Binder	WBM % Loss	% Moist.
LFR-790035-R	26.6	14.9	11.1	9	1.96				6.5%
LFR-790037-R	23.4	11.8	12.3	7.1	1.95				3.0%
LFR-790039-R	20.4	6.7	14.9	3.5	1.90				3.5%
LFR-790041-R	22.7	10.7	12.3	6.5	1.98				3.7%

PERCENT RETAINED ON

Lab. No.	Square Mesh Sieve														Grain Diam.			Specific Gravity	
	Opening in Inches							Sieve Numbers							in Millimeters				
	3	2 1/2	2	1 1/2	1	3/4	1/2	4	10	20	40	60	100	200	.05	.005	.001		
LFR-790035-R					9	11	16	19	25	32			41						
LFR-790037-R					10	14	25	30	41	52			64						
LFR-790039-R					19	24	37	41	53	65			77						
LFR-790041-R					10	10	27	33	45	55			67						

SAMPLE IDENTIFICATION

Lab. No.	Identification Marks	Location—Properties—Station Numbers	Type of Materials
LFR-790035-R		Sta. 90+00	Base
LFR-790037-R		Sta. 142+80	Base
LFR-790039-R		Sta. 231+00	Base
LF 790041-R		Sta. 255+00	Base

These test results are for your Job Information and are tested in accordance with DHT "Manual of Testing Procedures".

Walter L. Plumlee
 Walter L. Plumlee
 Geologist I

INTEROFFICE MEMORANDUM

TO: Riley Walker

Date 2/22/79

FROM: Walter L. Plumlee

Responsible.

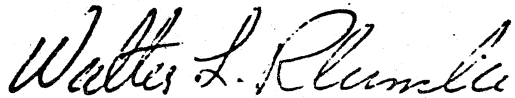
SUBJECT: FM 576, Shackelford Co., from SH 6 in Moran to
4.5 miles North. IPE 226
Control 1031-4

Desk WLP/gg

Attached is a copy of our Test Report on Soils Constants.

We would recommend stabilizing with approximately 2.5% lime or 7.0% cement by dry weight. The unit weight of existing base is estimated at 116.0 #/ft³.

The depth test will be taken in about 10 days.



Walter L. Plumlee
Geologist I

SOILS AND BASE MATERIALS TEST REPORT CDR MJSB

Laboratory No. LPO 16,327 1031 4
 Date Rec'd 2/12/79 Reported 2/22/79 Control Number Section Number Job Number
 Engineer Riley Walker Shackelford FM 576
 Address Abilene County Federal Project No. Highway No.
 Contractor _____ 08 3-226 2/12/79
 Sampler Billy W. Davis District No. I.P.E. No. Req. No. Date Sampled
 Sampler's Title Engineering Technician Specification Item No. _____
 Sampled From Roadway Material from Property of DHT
 Producer _____
 Quantity Represented by Sample _____
 Has been Used on _____ Proposed for Use as Subgrade

Lab. No.	LL	PI	SL	LS	SR	EST. Class	Soil Binder	WBM % Loss	% Moist.
LDR-790036-R	31.3	17.7	11.8	10	1.94	4.4*			9.5%
LDR-790038-R	37.1	20.6	15.4	11.5	1.85	4.7*			9.4%
LDR-790040-R	35.5	20.0	13.4	11.8	1.93	4.6*			10.8%
LDR-790042-R	28.1	13.9	15.0	7.7	1.88	4.0*			9.2%
	*Estimated Class								

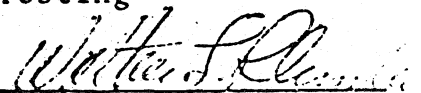
PERCENT RETAINED ON

Lab. No.	Square Mesh Sieve														Grain Diam.			Specific Gravity		
	Opening in Inches							Sieve Numbers							in Millimeters					
	3	2 1/2	2	1 1/2	1 1/8	3/4	1/2	4	10	20	40	60	100	200	.05	.005	.001			
LDR-790036-R					0	0	0	1	2	3				7						
LDR-790038-R					2	2	3	4	6	9				14						
LDR-790040-R					0	0	1	2	5	8				12						
LDR-790042-R					0	0	0	0.4	1	3				4						

SAMPLE IDENTIFICATION

Lab. No.	Identification Marks	Location—Properties—Station Numbers	Type of Materials
LDR-790036-R		Sta. 90+00	Subgrade
LDR-790038-R		Sta. 142+00	Subgrade
LDR-790040-R		Sta. 231+00	Subgrade
LDR-790042-R		Sta. 255+00	Subgrade

These test results are for your Job Information and are tested in accordance with DHT "Manual of Testing Procedures".


 Walter L. Plumlee
 Geologist I

GENERAL TEST REPORT

Laboratory No. LPO 16,630
 Date Received 7-3-79 Date Reported 7-9-79
 Dist. or Res. Engr. Bob Lindley
 Address Abilene
 Sampler W. O. Gayle
 Sampler's Title Engr. Tech. III
 Contractor _____
 Sampled from Roadway
 (pit, quarry, car or stockpile)
 Producer _____
 Quantity represented by sample _____
 Has been used on _____
 Proposed for use as _____

Material **BASE & SUBGRADE**

¹⁰³¹
~~1034~~ _____ 1 _____
 Control No. Sect. No. Job. No.
Shackelford. _____ FM 576
 County Federal Project No. Hwy. No.
8 _____ 7-3-79
 District No. Req. No. Date Sampled
 Identification marks _____
 Specification Item No. _____
 Material from property of Roadway

DETERMINATIONS

	% Moisture
BASE	3.5
SUBGRADE	10.9

These test results are for your Job Information and are tested in accordance with SDH & PT "Manual of Testing Procedures".

Walter L. Plumlee
 Walter L. Plumlee
 Geologist I
Bill Davis

SOILS AND BASE MATERIALS TEST REPORT

Laboratory No. LPO 16,639
 Date Rec'd 7-9-79 Reported 7-16-79
 Engineer Rob Lindley
 Address Abilene
 Contractor _____
 Sampler W. O. Gayle
 Sampler's Title Engr. Tech. III
 Sampled From Roadway
 Producer _____
 Quantity Represented by Sample _____
 Has been Used on _____

1031 4
 Control Number Section Number Job Number
Shackelford FM 576
 County Federal Project No. Highway No.
8 3-226 7-9-79
 District No. I.P.E. No. Req. No. Date Sampled
 Specification Item No. _____
 Material from Property of Roadway

 Proposed for Use as _____

Lab. No.	LL	PI	SL	LS	SR	Class	Soil Binder	WBM % Loss	% Moist.
LFR 790430 R	20	8	13.3	4.5	1.91				

PERCENT RETAINED ON

Lab No.	Square Mesh Sieve														Grain Diam.			Specific Gravity			
	Opening in Inches							Sieve Numbers							in Millimeters						
	3/8	1/2	3/4	1	1 1/4	1 1/2	1 3/4	2	2 1/2	3	4	10	20	40	60	100	200		.05	.005	.001
430 R				10	15	25	30	40	50				58								

SAMPLE IDENTIFICATION

Lab. No.	Identification Marks	Location—Properties—Station Numbers	Type of Materials
430 R			Caliche Gravel

These test results are for your Job Information and are tested in accordance with SDH & PT "Manual of Testing Procedures".

Walter L. Plumlee

Walter L. Plumlee
Geologist I

GENERAL TEST REPORT

Laboratory No. LPO 16,639
 Date Received 7-9-79 Date Reported 7-16-79
 Dist. or Res. Engr. Bob Lindley
 Address Abilene
 Sampler W. O. Gayle
 Sampler's Title Engr. Tech. III
 Contractor _____
 Sampled from Roadway
 (pit, quarry, car or stockpile)
 Producer _____
 Quantity represented by sample _____
 Has been used on _____
 Proposed for use as _____

Material

1031 4
 Control No. Sect. No. Job. No.
Shackelford. FM 576
 County Federal Project No. Hwy. No.
8 3-226 7-9-79
 District No. Req. No. Date Sampled
 Identification marks _____
 Specification Item No. _____
 Material from property of Roadway

DETERMINATIONS

GYRATORY PRESS

SPEC. NO.	% WATER	% CRS-2	DENSITY	COMP. STRENGTH
2	5.0	5.0	143.95	62.27
3	3.75	4.0	147.17	89.93
4	3.75	5.0	145.59	54.54
5	3.75	3.0	146.54	107.27
6	2.58	5.17	145.17	31.75

RAINHART COMPACTOR

1	2.0	2.0	130.65	41.63
2	2.0	4.0	131.07	46.20
3	2.0	5.0	133.16	35.22
4	2.0	6.0	132.93	25.85
5	2.58	5.17	139.00	19.75

Walter L. Plumlee

 Walter L. Plumlee
 Geologist I

GENERAL TEST REPORT

Laboratory No. LPO 16,673
 Date Received 7-24-79 Date Reported 7-30-79
 Dist. or Res. Engr. B. R. Lindley
 Address Abilene
 Sampler B. C. Satterwhite
 Sampler's Title Engr. Tech. III
 Contractor _____
 Sampled from Roadway
 (pit, quarry, car or stockpile)
 Producer _____
 Quantity represented by sample _____
 Has been used on _____
 Proposed for use as _____

Material RECYCLE BASE

1031 4
 Control No. Sect. No. Job. No.
Shackelford FM 576
 County Federal Project No. Hwy. No.
8 3-226 7-24-79
 District No. Req. No. Date Sampled
 Identification marks LF 790430 R
 Specification Item No. _____
 Material from property of Roadway

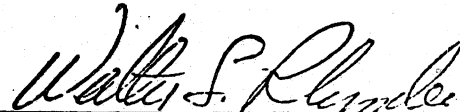
DETERMINATIONS

GYRATORY PRESS

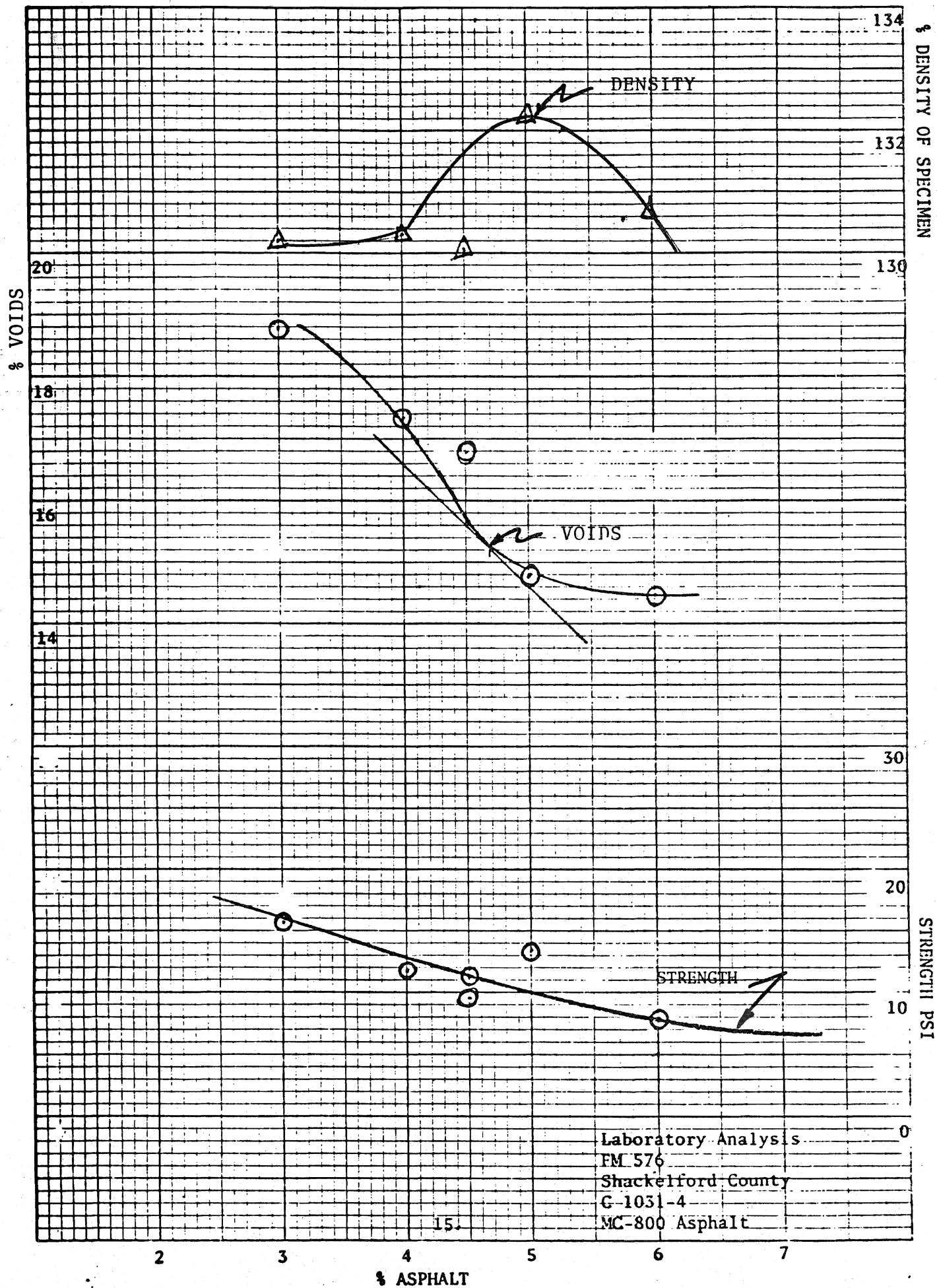
SPECIMEN NO.	% MC-800	LBS/Cu.Ft. DENSITY	PSI COMPRESSIVE STRENGT
2	5.0%	146.60	12.44
3	6.0%	144.98	-----
4	4.5%	146.98	17.18
5	4.3%	147.58	21.27
6	3.5%	146.74	58.00
7	3.0%	146.76	63.19

RAINHART COMPACTOR

1	3.0%	130.18	15.68
2	4.0%	130.31	11.75
3	5.0%	132.26	13.37
4	6.0%	130.67	7.84
5	4.5%	128.71	9.69
6	4.5%	130.06	11.30



Walter L. Plumlee
Geologist I

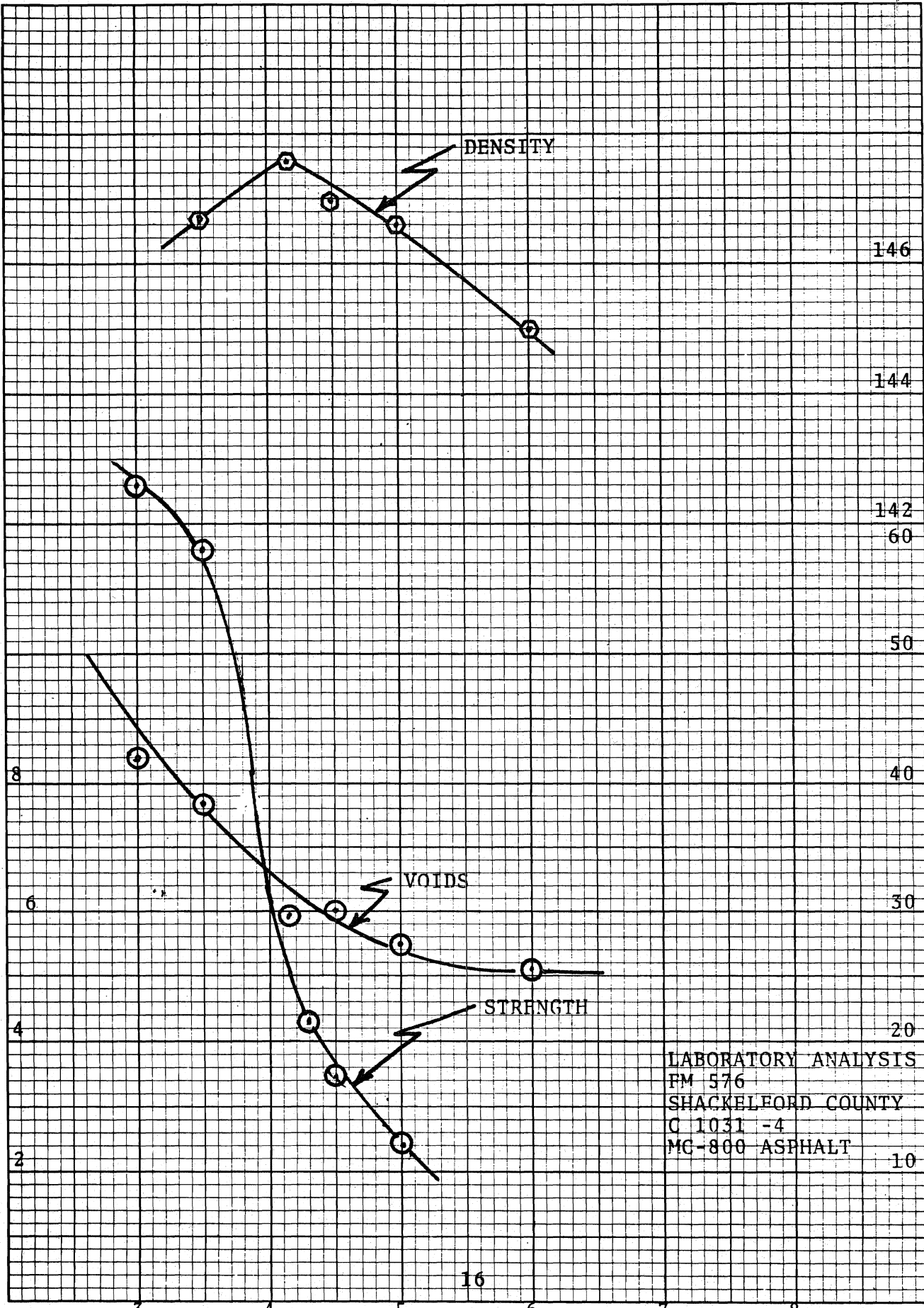


GYRATORY

% VOIDS

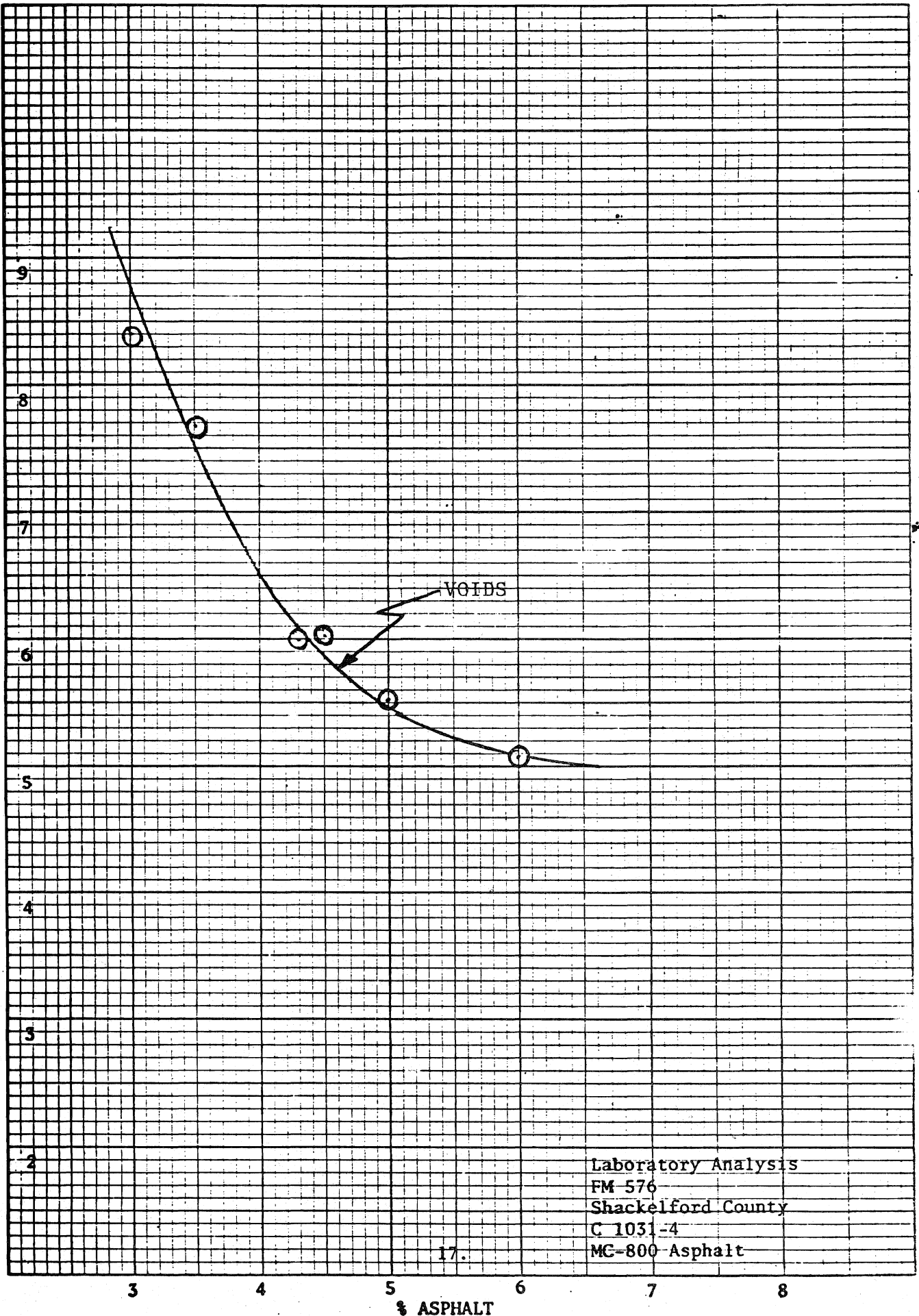
DENSITY OF SPECIMEN

STRENGTH PSI



LABORATORY ANALYSIS
FM 576
SHACKELFORD COUNTY
C 1031 -4
MC-800 ASPHALT

% VOIDS



% ASPHALT

GENERAL TEST REPORT

Laboratory No. LPO 16,673
 Date Received 7-24-79 Date Reported 8-21-79
 Dist. or Res. Engr. Bob Lindley
 Address Abilene
 Sampler W. O. Gayle
 Sampler's Title Engr. Tech. III
 Contractor _____
 Sampled from Roadway
 (pit, quarry, car or stockpile)
 Producer _____
 Quantity represented by sample _____
 Has been used on _____
 Proposed for use as _____

Material

1031 4
 Control No. Sect. No. Job. No.
Shackelford FM 576
 County Federal Project No. Hwy. No.
8 3-226 7-24-79
 District No. Req. No. Date Sampled
 Identification marks _____
 Specification Item No. _____
 Material from property of Roadway

DETERMINATIONS

GYRATORY PRESS

SPECIMEN NO.	% H2O	% CRS-2	LBS./CU.FT. DENSITY	PSI COMPRESSIVE STRENGTH
2	5.0	5.0	143.95	62.27
3	3.75	4.0	147.17	89.93
4	3.75	5.0	145.59	54.54
5	3.75	3.0	146.54	107.27
6	2.58	5.17	145.17	31.75

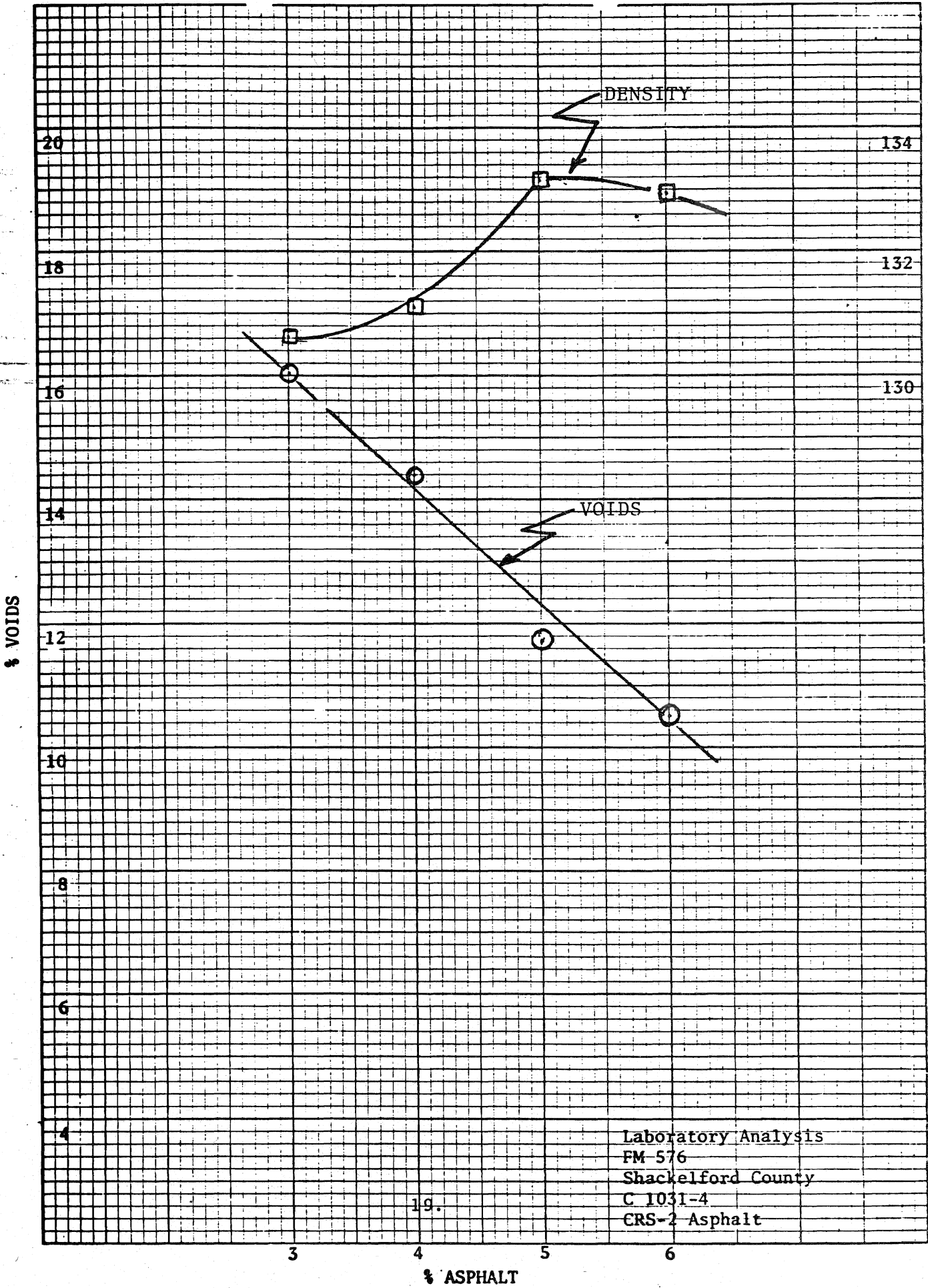
RAINHART COMPACTOR

1	2.0	2.0	130.65	41.63
2	2.0	4.0	131.07	46.20
3	2.0	5.0	133.16	35.22
4	2.0	6.0	132.93	25.85
5	2.58	5.17	139.00	19.75

Walter L. Plumlee

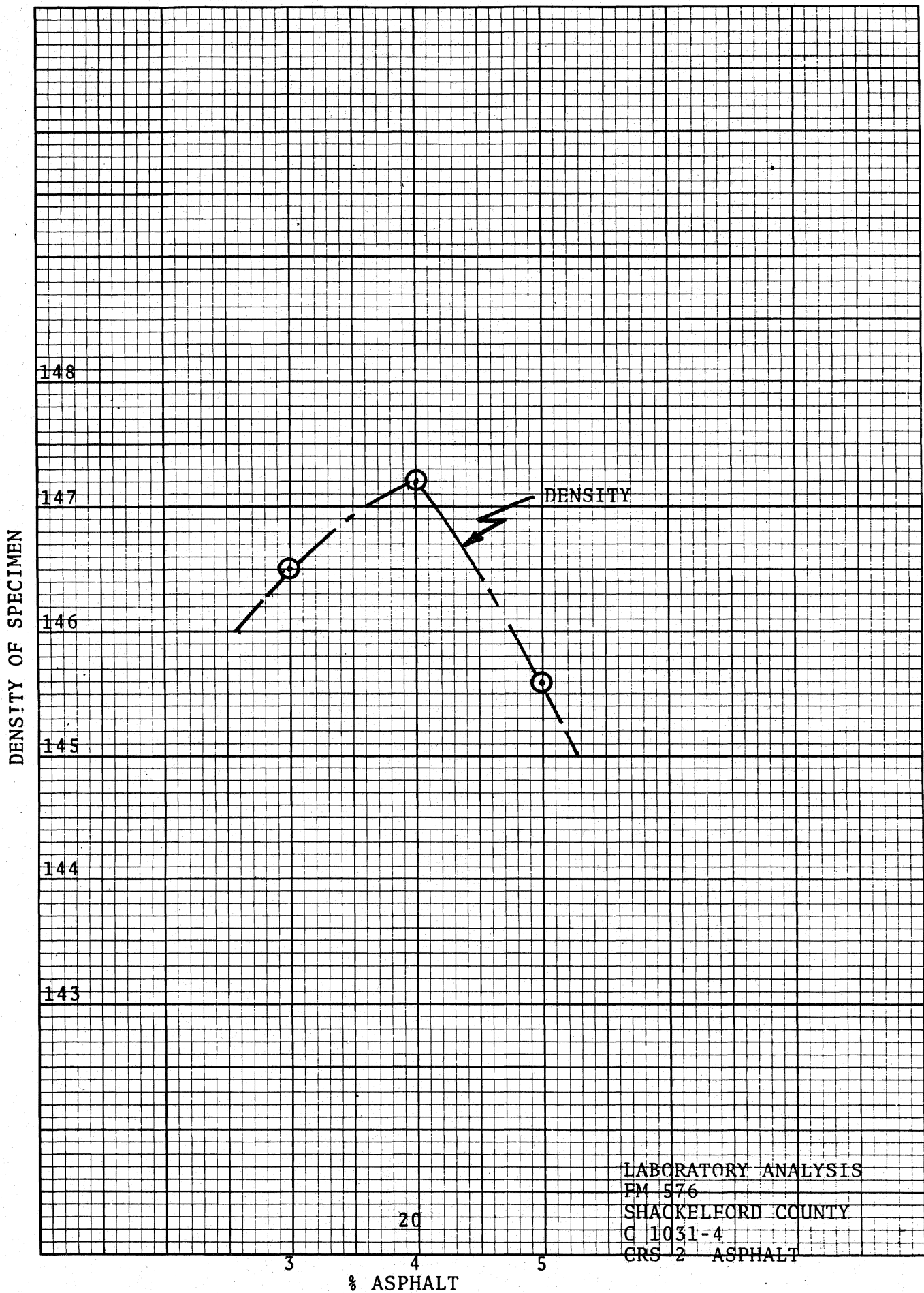
18. Walter L. Plumlee
Geologist I

MOLDED IN RAINHART COMPACTOR

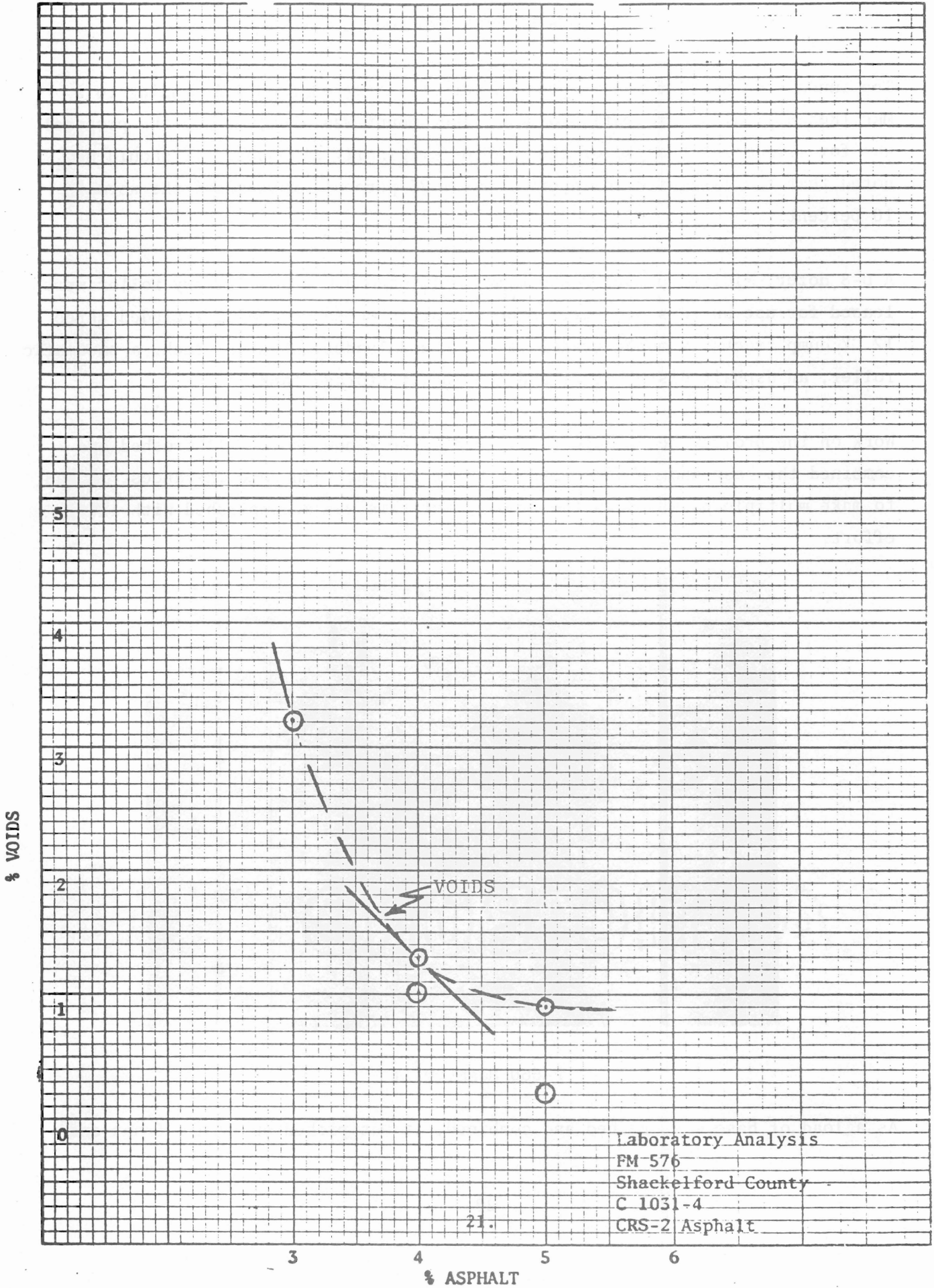


% DENSITY OF SPECIMEN

GYRATORY



GYRATORY



CONSTRUCTION PROCEDURES

The funds programmed for this project were transferred from D-8 funding to a MRP (Rehabilitation Program) project. The amount was \$260,000 and the proposal was for 4.25 miles instead of the 2 miles originally proposed. It should be noted that the estimated engineering was 1.25 percent, instead of the normal 10 percent.

A D-8 dozer, Midland paver, P-660 hammermill, and a C-205 vibratory roller were leased for use on this project. Proposed state owned equipment included three 12 CY dump trucks, a motor grader, a front-end loader, a water truck, a pneumatic roller, an asphalt distributor, and an asphalt storage tank.

Work on the project began August 20, 1979. The P-660 hammermill crushed and combined the base and surface without prior ripping. In some instances, it had to make multiple passes down the roadway but this was accomplished with little effort.



P-660 Hammermill

As a load of base was crushed and combined, it was picked up with a front-end

loader and removed from the subgrade. The base was stockpiled at random locations near the working area.



Front-End Loader



Motor Grader

The subgrade was reshaped and compacted with the vibratory roller. Any failures were repaired immediately. This was done by use of lime or just recompaction. This described procedure created a very minimum interruption and allowed traffic to be carried through the working area at all times.



Vibratory Roller

As soon as the subgrade was prepared the Midland paver moved in and the stock-piled material was hauled to the paver and replaced as a stabilized base.



Midland Paver
24.

This procedure was repeated until completion of the project. Total working time for this project was 20 working days or approximately 35 calendar days.

The only staking required was to offset the centerline so that it could be reset at a correct location. This procedure proved to be satisfactory in that the profile and slope of the finished product has been improved by reconstruction.

The stabilized base was skheeted with a 40 percent solution of CRS-2 and water at the end of each day. This fog seal was a safety measure taken to prevent night showers from infiltrating the base and also to help seal off the base.



The Finished Product

District No. 08

PROJECT ESTIMATE
For Maintenance Special Jobs or Day Labor Construction

County Shackelford Co. No. 209 Hwy. FM No. 576 Kind of Project M Control No. 1031 Sec. No. 4 Job No. _____ Struct. No. --

Limits: From: State Highway 6 in Moran Length 22,440 Ft.
To: 4.25 Miles Northwest Length 4.25 Miles

Present Condition: Severely Cracked and Out of Section

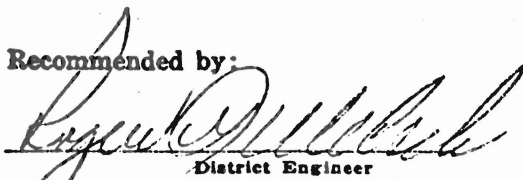
Proposed Work: Recycling and Stabilizing the Existing Base and Surface.

Prepared By: Roger G. Welsch, District Engineer August 16, 19 79

ITEM NO.	DESCRIPTION	UNIT OF MEASURE	QUANTITY	PRICE	AMOUNT
		DESCRIPTION			
	LEASE EQUIPMENT	LS	1	65,780.00	65,780.00
	STATE EQUIPMENT RENTAL	LS	1	37,230.00	37,230.00
	ASPHALT (EA-CRS-2, EA-CMS-2 OR MC-800)	GAL	233,545	.60	134,124.90
	AGGREGATE (CL-B TY-PB GR-3)	CY	476	18.00	8,568.00
	ASPHALT (AC-5 OR EA-CRS-2)	GAL	18,326	.60	10,995.60

Traffic Count _____ Total \$ 256,698.50
 Plus ^{1.25%} Engineering and Contingencies \$ 3,301.50
 Fatal + Injury Accidents in 19 _____ TOTAL ESTIMATE \$ 260,000.00

Fatal + Injury Accident Rate Per 100 Million Vehicle Miles in 19 _____

Recommended by:

 District Engineer

GENERAL TEST REPORT

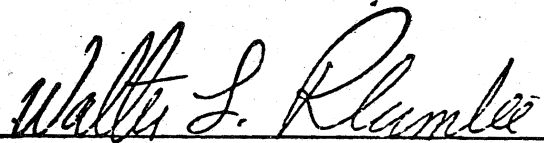
Laboratory No. LPO 16,673
 Date Received 7-24-79 Date Reported 8-21-79
 Dist. or Res. Engr. Bob Lindley
 Address Abilene
 Sampler W. O. Gayle
 Sampler's Title Engr. Tech. III
 Contractor _____
 Sampled from Roadway
 (pit, quarry, car or stockpile)
 Producer _____
 Quantity represented by sample _____
 Has been used on _____
 Proposed for use as _____

Material

1031 4
 Control No. Sect. No. Job. No.
Shackelford EM 576
 County Federal Project No. Hwy. No.
8 3-226 7-24-79
 District No. Req. No. Date Sampled
 Identification marks _____
 Specification Item No. _____
 Material from property of Roadway

DETERMINATIONS

Lab. No. LFR-790430 R
 2.58% Water Added
 5.17% = CRS-2 Emulsion
 7.75% Total Liquid
 145.17 Density of Soil
 Asphalt Content Used Was By Visual Observation



Walter L. Plumlee
 Geologist I

CDR MJS

Texas Highway Department
Form 231

60494-1066-30m

GENERAL TEST REPORT

Laboratory No. LPO 16,736 & L6,737
 Date Received 8-29-79 Date Reported 8-30-79
 Dist. or Res. Engr. Bob Lindley
 Address Abilene
 Sampler Billy Davis
 Sampler's Title Engr. Tech. V
 Contractor _____
 Sampled from Roadway
 (pit, quarry, car or stockpile)
 Producer _____
 Quantity represented by sample _____
 Has been used on _____
 Proposed for use as _____

Material

<u>1031</u>	<u>4</u>	
Control No.	Sect. No.	Job. No.
<u>Shackelford</u>		<u>FM 576</u>
County	Federal Project No.	Hwy. No.
<u>8</u>		<u>8-28-79</u>
District No.	Req. No.	Date Sampled
Identification marks _____		
Specification Item No. _____		
Material from property of <u>Roadway</u>		

DETERMINATIONS

LIR 790522 R
 5.2% CRS-2 Added to Base
 148.0 Density of Specimen

These test results are for your Job Information and are tested in accordance with SDH & PT "Manual of Testing Procedures".

Walter L. Plumlee
 Walter L. Plumlee
 Geologist I
Billy Davis

GENERAL TEST REPORT

Laboratory No. LPO 16,751
 Date Received 9-12-79 - Date Reported 9-14-79
 Dist. or Res. Engr. Bob Lindley
 Address Abilene
 Sampler Billy Davis
 Sampler's Title Engr. Tech. V
 Contractor _____
 Sampled from Roadway
 (pit, quarry, car or stockpile)
 Producer _____
 Quantity represented by sample _____
 Has been used on _____
 Proposed for use as _____

Material	Base
----------	------

1031	4	
Control No.	Sect. No.	Job. No.
Shackelford		FM 576
County	Federal Project No.	Hwy. No.
8		9-12-79
District No.	Req. No.	Date Sampled
Identification marks _____		
Specification Item No. _____		
Material from property of <u>Roadway</u>		

DETERMINATIONS

LFR 790541 R

2.3 % Moisture in Base

3.1 % Moisture in Base w/CRS-2 added

These test results are for your Job Information and are tested in accordance with SDH & PT "Manual of Testing Procedures".

Walter L. Plumlee
 Walter L. Plumlee
 Geologist I
Billy W. Davis

GENERAL TEST REPORT

Laboratory No. LPO 16,766
 Date Received 9-4-79 Date Reported 9-21-79
 Dist. or Res. Engr. B. R. Lindley
 Address Abilene
 Sampler B. W. Davis
 Sampler's Title Engr. Tech. V
 Contractor _____
 Sampled from Roadway
 (pit, quarry, car or stockpile)
 Producer _____
 Quantity represented by sample _____
 Has been used on _____
 Proposed for use as _____

Material _____

1031 4
 Control No. Sect. No. Job. No.
Shackelford FM 576
 County Federal Project No. Hwy. No.
8 IPE 3-226 9-4-79
 District No. Req. No. Date Sampled

Identification marks _____
 Specification Item No. _____
 Material from property of Roadway

DETERMINATIONS

LANE	TEST NO.	% DENSITY	LOCATION APPROX. FROM ST. 6
Rt.	1	99.4	1.7 Miles
Lt.	2	99.4	1.9 Miles
Lt.	3	97.6	1.6 Miles
Lt.	4	97.3	1.5 Miles
Lt.	5	97.3	1.3 Miles
Rt.	6	92.5	1.3 Miles
Rt.	7	96.6	0.1 Miles
Lt.	8	90.8	0.1 Miles
Rt.	9	95.6	0.2 Miles
Lt.	10	90.1	0.2 Miles
Rt.	11	95.9	0.5 Miles
Lt.	12	96.9	0.5 Miles
Rt.	13	92.9	0.6 Miles
Lt.	14	97.7	0.6 Miles
Lt.	15	96.3	2.1 Miles
Lt.	16	97.0	2.3 Miles
Lt.	17	93.9	2.4 Miles
Rt.	18	95.6	2.4 Miles
Lt.	19	98.7	2.5 Miles

These test results are for your Job Information and are tested in accordance with SDH & PT "Manual of Testing Procedures".

Walter L. Plumlee
 Walter L. Plumlee
 30. Geologist I

GENERAL TEST REPORT

Laboratory No. LPO 16,778
 Date Received 9-4-79 Date Reported 9-28-79
 Dist. or Res. Engr. Bob Lindley
 Address Abilene
 Sampler B. W. Davis
 Sampler's Title Engr. Tech. V
 Contractor _____
 Sampled from Roadway
 (pit, quarry, car or stockpile)

Material **BASE W/CRS 2 ADDED**

1031	4	
Control No.	Sect. No.	Job. No.
Shackelford		FM 576
County	Federal Project No.	Hwy. No.
8	IPE 3-226	9-28-79
District No.	Req. No.	Date Sampled

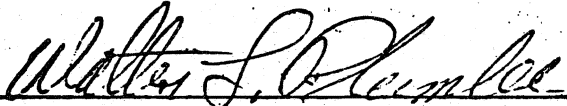
Producer _____
 Quantity represented by sample _____
 Has been used on _____
 Proposed for use as _____

Identification marks _____
 Specification Item No. _____
 Material from property of Roadway

DETERMINATIONS

LANE	TEST NO.	% DENSITY	LOCATION APPROX. FROM ST. 6
Rt.	20	100.0	3.0 Miles
Lt.	21	96.9	3.0 Miles
Rt.	22	100.7	3.4 Miles
Lt.	23	99.0	3.4 Miles
Rt.	24	98.0	3.8 Miles
Lt.	25	98.7	3.8 Miles

These test results are for your Job Information and are tested in accordance with SDH & PT "Manual of Testing Procedures".



 Walter L. Plumlee
 Geologist I

PROBLEM AREAS

The success of this type of construction depends on the weather conditions and temperature. It is definitely more successful during warmer months. Any moisture that falls will have to be dried back to the design percentage before the addition of asphalt material. Due to this fact, this procedure is recommended for dry, low rainfall areas of the country.

It is difficult, if not impossible, to regulate the mixing time in the Midland Paver. Other road construction machinery can be used if additional mixing is deemed necessary. This stabilized base may have been more homogeneous if additional mixing had been used.

The riding surface is not as smooth as it should be. This was caused in part by workmanship and by a non-homogeneous base material. It was difficult to obtain uniform existing moisture. We believe that prior knowledge of this problem would have been beneficial in the end product. In other words, experience gained in this project will aid in control of future projects.

CONCLUSIONS

On this project more than twice the length of highway was rehabilitated, in one-fourth of the normal time, with an enormous savings in engineering. This alone seems to be an answer to the Department's manpower management problems. By proper management a system was developed to fit our times; more highways repaired in less time, utilizing fewer personnel. We believe our original objective was successfully accomplished.

Although specialized equipment was used on this project we do not believe that this is absolutely necessary. Heavy duty mixers, in most instances, could be used to mix and incorporate the existing surface into the base. A normal hot-mix laydown machine, or a motor grader, could be utilized for the placement of the stabilized base. Most contractors are equipped to perform this type of work without specialized equipment; however, the performance of the listed equipment was excellent.

We believe that engineering concepts utilized in this project bears fruit of good management and value engineering. Our main objective became reality and the ultimate product was produced from the money invested. Like all new innovations, time will tell if this system will last.

Due to the experience gained on this experimental project this district will consider this design on all future Farm-to-Market rehabilitation projects.