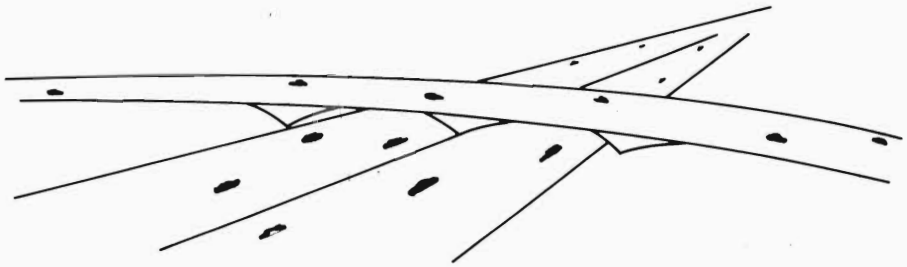


DEPARTMENTAL RESEARCH

Report Number: **S S-15.5**

EXPERIENCE OF DISTRICT 11 IN THE USE OF PLANT MIX SEAL COURSES

TEXAS HIGHWAY DEPARTMENT

EXPERIENCE OF DISTRICT 11 IN THE USE OF PLANT MIX SEAL COURSES

by

J. L. Beaird
District Construction Engineer

Special Study 15.5

District 11
Texas Highway Department

February 1972

EXPERIENCE OF DISTRICT 11 IN THE USE OF PLANT MIX SEAL COURSES

Introduction.

In an effort to improve the skid resistance characteristics of pavement surfaces, personnel of District 11 initiated a search of available literature to learn of possible construction procedures and various materials that would assist in alleviating the problem of "slick pavements".

A construction procedure that appeared to offer a solution to the problem was the plant mix seal, which might also be referred to as an open-graded asphaltic concrete surface. It was learned that a number of western states have utilized this procedure on various sections requiring remedial surfacing. The study indicated that the plant mix seal served to provide the pavement structure with a durable, uniform, skid resistant surface that was open-textured which lowered the potential to hydroplaning.

Test Section.

Following the literature research, a decision was reached to construct a test section in order to learn more of the construction operations and observe the performance of the plant mix seal. Location of the test section was on U.S. 59 approximately 3 miles north of Lufkin. This site was selected due to its proximity to the District Office for observation and volume of traffic (11,500 ADT).

In considering various materials for the aggregates of the test section, it was desirable to have durable and skid resistant characteristics; and yet, be readily available economically to this area. Due to the limited funds available for the test section, only three aggregates were selected for consideration. In order to evaluate the performance of each aggregate, it was decided that a separate test section of approximately 3,000 feet be constructed for each material source represented in the test. To study the effects of the lateral distribution of the traffic volume, it was decided that the 3,000 foot test section should encompass both of the southbound traffic lanes of U.S. 59.

Funds to finance the proposed project were obtained from District Maintenance Budget.

Bids were received November 1, 1971, from local producers and contractors to furnish asphalt aggregate mixtures conforming to specified requirements. Bids were also received this date to furnish various pieces of equipment that were considered necessary to complete the work. Copies of the Invitation for Bids are found on Pages 1 and 4 of the Appendix.

The work to construct the test section was awarded to Moore Brothers Construction Company, Lufkin, Texas, since their bid was the lowest of three submitted.

Materials.

Available funds limited the number of aggregates to three types of materials; namely, trap rock, sandstone, and lightweight

aggregate. Basalt

Trap rock is a crushed stone material from White's Mines, Inc. The material is produced from their plant at Knippa, Texas. Table 1 illustrates the gradation of the material used in the project. Test data for the trap rock is found on Pages 5 and 6 of the Appendix. Located also in the Appendix on Page 7 is a copy of data which was furnished by the materials supplier for this material. Selection of this material was based on previous performance of the aggregate in limestone rock asphalt mixtures as being characterized as hard, durable and skid resistant.

In addition to the trap rock, crushed stone from the Blue Mountain Pit of East Texas Stone Company was included for evaluation in the test section. Gradation of this material is also depicted in Table 1. It is noted from the gradation that the East Texas Stone material is larger in size than the trap rock. The size of the aggregates was a characteristic which was considered to merit evaluation. Pages 8 and 9 of the Appendix are test data which describe the physical characteristics of this aggregate. Past performance as a skid resistant aggregate plus availability was the basis for its selection.

The third material to be used in the study was a lightweight aggregate. Source of this material was Texas Industries, Inc. of Dallas, Texas. Gradation of the material is also found in Table 1. Characteristics of the material are shown on Pages 10 and 11 of the Appendix. The use of the lightweight material source was

PHYSICAL CHARACTERISTICS OF AGGREGATES FOR PLANT MIX SEAL

	TRAP ROCK	CRUSHED STONE	LIGHTWEIGHT AGGREGATE
SOURCE:	White's Mines	East Texas Stone	Texas Industries
GRADATION:			
Percent Retained, % by Weight			
1/2" Sieve	0	0	0
3/8" Sieve	0.5	17.7	0
#4 Sieve	65.0	87.0	59
#10 Sieve	98.6	99.2	97.3
#20 Sieve	99.5	99.4	97.5
#200 Sieve	99.9	99.9	98.9
Los Angeles Abrasion Wear,%	10.0 (c)	29.2 (c)	20.6 (c)
Pressure Slaking Value,%	--	--	2.8
Unit Weight (Dry Loose Wt., lbs/cu ft)	98.4	89.1	40.1
Sp. Gr. (Bulk)	3.054	2.632	1.175
Absorption,%	0.8	0.6	20.6

TABLE 1

prompted by the performance of the aggregate in asphaltic concrete which exhibited good skid resistant qualities. Availibility was also a factor in dictating the use of this source in the study.

The asphaltic material used in the project was Type AC-20 Asphalt Cement and furnished by Texaco from their facility at Port Neches, Texas. Pages 12 and 13 of the Appendix are copies of data for the asphaltic material for its compliance with specification requirements.

Asphalt Aggregate Mixtures.

In determining the amount of asphalt for the three materials, two procedures were used.

One procedure was based on data developed in the District Laboratory. Various percentages of asphalt were added to the aggregates from the East Texas Stone Company and Texas Industries, Inc. to determine visually which amount of asphalt tended to cover the aggregate adequately; and yet, not be excessive to the point that the mixture appeared "soupy", with asphalt draining to the bottom of the mixing pan.

The asphalt-aggregate mixtures were premixed and heated to a temperature of 250° F before final mixing. Following final mixing, the material was spread on prepared kraft paper test panels and rolled by hand with a steel cylinder. The rolled test specimen indicated to a certain degree the texture of the mixture that could be anticipated when constructed.

Trap rock was not used in this particular phase of the study; however, the physical nature (hardness and absorption) of the East Texas Stone was considered to be comparable and would provide sufficient data to determine the amount of asphalt for this source.

The procedure, which exhibited the greatest influence in determining the amount of asphalt required was the literature research. It was noted the similarity of the physical properties of the aggregates being used and that employed in a research study by the Louisiana State Highway Department. The work by the Louisiana State Highway Department is referenced as Items 1, 2 and 14 in the Bibliography.

From the two sources of information, asphalt contents were established at 6.5 percent by weight for the crushed stone aggregates and 13.0 percent by weight for the lightweight material. The asphalt content is approximately the same when the percentage is based on volume of material.

Referring to Page 2 of the Appendix, it can be observed that the low bid reflected the following prices for the various asphalt aggregate mixtures:

Description	Cost/Ton
93.5% Trap rock + 6.5% Asphalt	$ 12.10
93.5% East Texas Stone + 6.5% Asphalt	10.87
87.0% Texas Industries + 13.0% Asphalt	23.14

In determining the quantity of material required for each test section, the thickness of the mat was based on the maximum size of aggregate being used. For the trap rock and lightweight aggregate, 3/8-inch aggregate was the maximum size, thus a 5/8-inch mat was desired. A 3/4-inch mat was established for the East Texas Stone material as the maximum size aggregate was 1/2-inch in size.

Construction of Test Section.

As stated earlier, bids were received on November 1, 1971, to construct the test section; however, actual work began on the morning of November 10th. Construction of the test facility will be described in two sections; namely, plant and roadway operations. Each area received separate attention in order to reap maximum benefits from this study.

Plant Operations.

A conventional asphaltic concrete batch plant was used to heat and mix the asphalt-aggregate mixture. The type used by the contractor was a 5,000 lb. Standard Asphalt Plant, Model R-M.

The aggregate was fed from the stockpile to the cold bins with Cat. No. 933 End Loader. From the cold bins, the aggregate was conveyed and heated in the drier in such a manner as to produce an asphalt-aggregate mixture at a temperature not to exceed 250° F. From the drier the aggregates were conveyed to the screens and separated into the hot bins. This operation was not considered

necessary to the benefit of the project, however. Separating the material into the hot bins was at the Contractor's option. Since the asphaltic plant is considered a semi-permanent installation, it would necessitate removing and replacing the screens which was felt to be immaterial for such a small quantity of plant-mix seal material.

In batching and mixing the asphalt and aggregate, several variations were used. One method was to add the aggregate plus half of the asphalt and mix, followed by the remaining portion of the asphaltic material and mixing the mixture for a total of 35 seconds. A second procedure was to introduce all of the aggregate to the pug mill plus all the asphalt and mix for a total time of 35 seconds. Visual inspection of several loads of the asphalt aggregates mixture indicated no discernable variation, therefore the second procedure was utilized the greater portion of the project.

Checks for gradation were made on samples of the aggregate from the cold bins and hot bins. Test data indicated that the plant was producing a uniform distribution of aggregate with no segregation being evident. Pages 14 thru 18 of the Appendix are copies of sieve analysis conducted during construction operations.

Moisture tests were also conducted on the aggregate and the total mixture. Aggregate samples were obtained from the hot bins for moisture determinations. Samples of the asphalt-aggregate mixture were obtained from the vehicles prior to leaving the plant

for the test site. Results of the moisture checks may be found on Page 19 of the Appendix.

In order to check the asphalt content of the mixture, samples were secured and testedin accordance to Test Method Tex-210-F. Results of the extraction test may also be found on Pages 14 thru 18 of the Appendix. It may be noted that the test data appears to be erratic. Examination of sampling procedures indicated one factor for the variation. In sampling the asphaltic mixture, the sample was placed in a sealed gallon bucket for testing at a more convenient time at the District Laboratory. In delaying the time of testing, the asphalt drained to the bottom portion of the container. It was later observed that asphalt was present on the walls of the container, after the sample was removed for testing. A second factor which attributed to the erratic results; particularly, for the lightweight material, was the absorbed moisture in the aggregates. Any moisture within the mixture would be reported as asphalt unless the asphaltic mixture was dried prior to testing.

One of the primary functions of inspection personnel at the plant was to check the temperature of the mixture after being discharged from the mixer. From the literature research, much emphasis was placed on keeping the mixture below 260° F, in order to prevent the asphalt from draining to the bottom of the asphaltic mixture. In regulating the temperature of the mixture, the asphalt

cement was permitted to be introduced into the mixer at 300° F. A temperature of 300° F is maintained at all times for the asphalt cement by the plant producer. It was felt that the temperature of the asphalt would be dissipated sufficiently that the mixture would be below the maximum temperature specified. This reasoning proved valid, as the temperature of the mixture was influenced more by the aggregates than the asphalt cement.

Included also to the duties of the inspection personnel was controlling the type and amount of material used by the Contractor's personnel in coating the vehicles to prevent the asphaltic mixture from adherring to the sides of truck bed. Initially, a soapy-water solution was used to coat the bed of the trucks. This material was recommended from several sources of the literature review. This procedure did not work too well, as several truck beds were observed to have the plant-mix seal mixture adhering to the sides. The next procedure employed was a thin coating of diesel fuel followed by a coating of soapy water. This procedure proved to be better than the single application of soapy-water solution. Towards the end of the project, a single application of diesel fuel was being used to coat the truck bed, and was serving adequately with no apparent ill effects to the asphaltic mixture.

The asphaltic concrete plant was located approximately seven miles from the test site. Initially, the Contractor used only four dump trucks to haul the material to the test site, but later increased this number to six.

Roadway Operations.

Prior to placing the plant mix seal on the roadway, an application of RC-2 cut-back asphalt was used to tack the surface. Various rates of application were used to observe the effects that tack coat would have on the performance of the asphaltic mixture. Application rates of RC-2 for the various materials were as follows:

Material	Surface Area S. Y.	Application Rate Gallons/Sq.Yd.
Trap Rock	4,000	0.0325
	2,000	0.0425
	2,000	0.050
Lightweight Aggregate	7,640	0.0525
East Texas Stone	8,580	0.0525
	320	none

It is not possible to fully evaluate the effects of the tack coat at this time; however, there appeared to be no significant difference in placing the asphaltic mixture with or without tack. It is the opinion of the author that tack should be used in the cooler months of the year, but may be eliminated during the summer months. Time will enable a more thorough evaluation of the tack coat on the performance of the plant mix seal.

In the paving train of the plant mix seal operations, the Contractor used a crawler type Model SA-41E Barber Green Laydown Machine equipped with a vibratory screed to spread and place the

mixture. Immediately behind the laydown machine was a 6-ton Ingram Tandem Roller that was used for initial rolling. A twenty-five ton pneumatic roller followed the tandem and completed the paving train. A solution of soapy water was used to moisten the wheels to prevent the asphaltic mixture from adhering to the rollers.

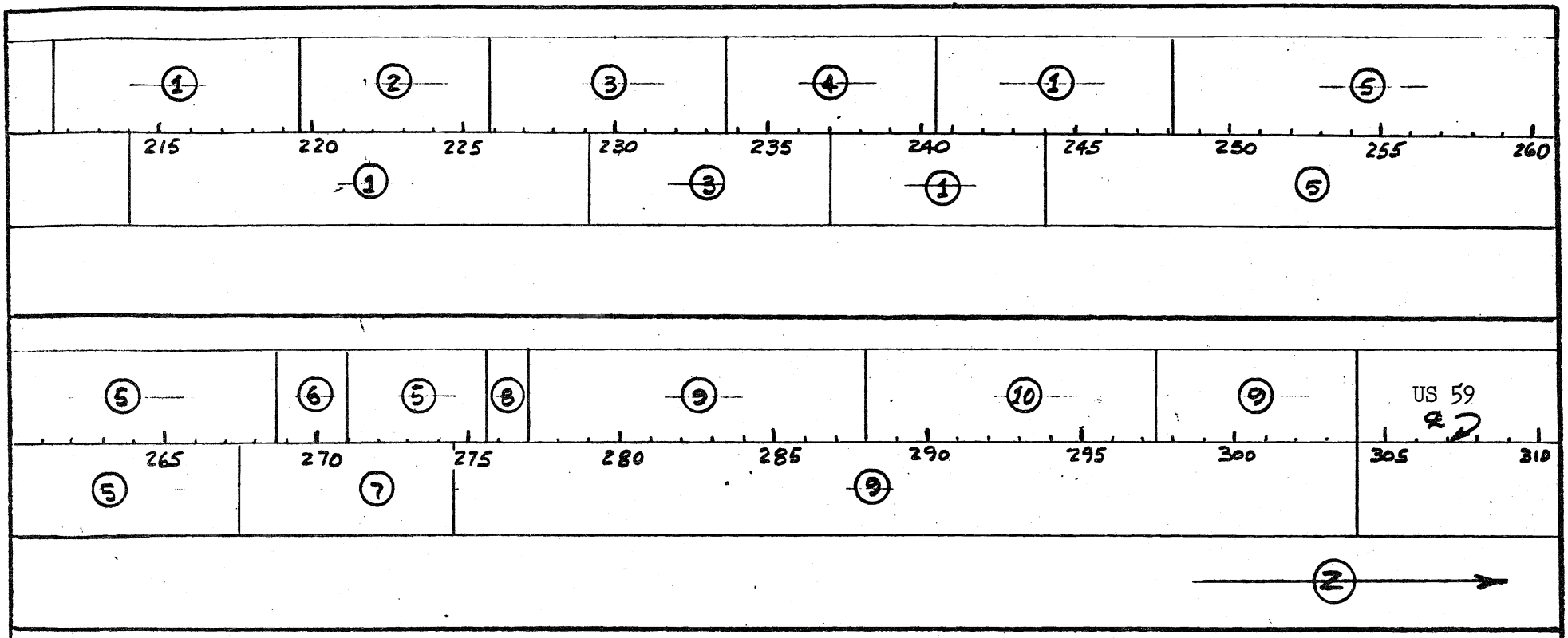
Roadway Operations.

Figure 1 is a plan view of the test section which serves to describe the limits of the materials placed.

Paving operations began at the north end of the test section with placing the trap rock mixture. As noted in Figure 1, the lightweight material was placed next followed by the East Texas Stone to complete the test section. Pages 14 thru 18 of the Appendix are copies of the Daily Construction Report and reflect daily production rates and test data.

In placing the trap rock mixture the Contractor varied the speed of the laydown of the machine from 26 feet per minute to 43 feet per minute. The mat appeared to tear at the higher rate of speed, therefore the laydown machine was reduced to 34 feet per minute with no detrimental effects. Approximately 80% of the trap rock mixture was placed at this speed.

Table 11 reflects the temperature of the different mixtures at various stages in the research study. It is noted that the upper limit of 260° F was approached with the lightweight and



Work began at Station 304 and proceeded south.

LEGEND

1. Crushed Stone + 6.5% Asphalt
2. Crushed Stone + 6.0% Asphalt
3. Crushed Stone + 6.3% Asphalt
4. Crushed Stone + Local Sand (9:1) + 6.5% Asphalt
5. Lightweight Aggregate + 12.5% Asphalt
6. Lightweight Aggregate + 12.0% Asphalt
7. Lightweight Aggregate + 13.0% Asphalt
8. Trap Rock + 6.8% Asphalt
9. Trap Rock + 6.5% Asphalt
10. Trap Rock + 6.0% Asphalt

PLAN VIEW
PLANT MIX SEAL
TEST SECTION
PROJECT 176-2-30
DATE: NOVEMBER, 1971

FIGURE 1

East Texas Stone mixtures. In both instances, the asphalt tended to drain to the body of the truck bed and caused some difficulty in cleaning the truck prior to hauling the next load.

	TEMPERATURE, ^{o} F			
	Plant		Roadway	
	Avg.	Range	Avg.	Range
Materials				
Trap Rock	220	200-245	210	195-235
Lightweight Aggregate	225	200-255	210	190-255
East Texas Stone	235	200-255	225	190-250

TABLE 11

In placing the asphaltic mixtures, no difficulties were encountered as to hot materials. The cooler mixtures tended to segregate and tear; however, those sections could readily be repaired with additional hot material and hand rakes. To alleviate the problems encountered with cool materials (below 195^{o} F), the Contractor improved the appearance of the mat by reducing the speed of the laydown machine and increasing the frequency of the vibratory screed. Corrections for cool material were an exception; as the bulk of the paving mixtures were placed hot.

Effect of temperature on the asphaltic mixture was also observed on a load of trap rock mixture. The truck had to stand-by for approximately an hour while the laydown machine was walked from

the end of one paving lane to the beginning of the next lane to be paved. During this waiting period, the upper two inches of the mixture appeared to be "crusty"; however, immediately below this layer a temperature of 215° F was recorded. This particular load of material was sandwiched between two warmer loads of material and placed without any noticeable effects to the surface mat.

In placing the lightweight paving mixture, the initial four loads of material were too hot (245° F) and caused some difficulty in rolling operations. At this temperature, the asphalt tended to drain towards the bottom, resulting in a thinner film of asphalt on the aggregate at the top of the load. The thin asphalt film increased the possibility of stacking the aggregate (by point to point contact) which is detrimental to lightweight aggregate. Rolling of these four loads was delayed until the mat cooled with no harmful effects. The temperature of the mixture and asphalt content was lowered and the resulting mixtures were placed with no difficulty.

In placing the lightweight mixture, the paving machine was operated at speeds from 26 feet per minute to 43 feet per minute. Of the 81 tons of material placed, 55% was placed at the slower speed. The remaining portion was placed at speeds from 34 and 43 feet per minute with no apparent change in the pavement texture.

Rolling the lightweight mixture with the pneumatic roller, it was observed that the aggregate appeared to be "breaking down",

which resulted in the removal of the pneumatic roller from the paving train. It may have been possible to correct this problem by lowering the tire pressure; thereby reducing the ground contact pressure of the roller and continue its use. For the limited amount of material to be placed, it was not considered necessary to roll with the pneumatic. The tandem was providing adequate compaction to the pavement surface.

The asphaltic mixtures of trap rock and lightweight material were placed at approximately the same depth of 5/8 inches. As indicated in Table 1, the maximum size of these aggregates was 3/8 inch. The East Texas Stone material was placed at approximately 3/4 inch mat thickness due to the aggregate size of 1/2 inch.

Paver speeds in placing the East Texas Stone material ranged from 26 feet per minute up to 58 feet per minute. Fifty-five percent of 240 tons of material placed was at the speed of 26 feet per minute. No difficulties were encountered in placing the material at the various rates of speed.

The asphalt content for each of the materials was varied as shown in Table 111. The asphalt was varied in order to observe the mixtures under traffic and the effects thereof.

It is also noted in Table 111 that the East Texas Stone material was mixed with a local field sand in a 9 to 1 ratio by weight. Physical characteristics of the sand are shown on Page 20 of the Appendix. The sand-aggregate mixture was placed in order to

PLANT MIX SEAL MIXTURES

	Asphalt Content % by Weight	Material Placed Tons
Trap Rock	6.0	32
	6.5	166
	6.8	8
Lightweight Aggregate	12.0	3
	12.5	66
	13.0	12
Crushed Stone		
Aggregate, 100%	6.0	6
	6.3	48
	6.5	128
Aggregate, 90% Local Sand, 10%	6.5	24

TABLE 111

observe the effects of traffic on the voids of the East Texas Stone with and without the sand additive. The addition of the sand was also thought to increase the skid resistance by providing a "gritty" texture to the mixture. Addition of the sand resulted in a stiffer mix, which caused some difficulty in placing. The mat appeared to pull somewhat and required additional material and hand work. Reducing the paving speed from 34 to 26 feet per minute and increasing the frequency of the vibrating screed eliminated the need for any hand work.

In constructing the test section, traffic was diverted to the adjacent driving lane with traffic cones. There was some concern at the beginning as to what would happen once traffic was channeled on to the newly surfaced pavement. The aggregate was coated with a thick film of asphalt and it was thought that traffic would track or pick-up the asphaltic mixture. As a preventative measure, a truck loaded with sand, was placed near the paving site, but was for naught. Once rolling was complete, the lane being surfaced was immediately opened to traffic without any problems, other than that some motorists were somewhat reluctant to travel initially on the surface as the surface appeared to be fresh asphalt. After several automobiles passed through the test section, traffic progressed through the test section without any hesitancy.

In that a film of asphalt was present on the aggregate when

the section was complete, it was desirable to determine the skid resistance of the completed surface. Skid values were determined on the trap rock and lightweight sections immediately following completion. Results of the skidtesting is found on Page 21 of the Appendix. The values were somewhat higher than anticipated.

On November 23, 1971, additional skid values were determined and may be found on Page 22 of the Appendix. At this time, values were obtained from all the materials represented in the research study. Table IV is a summary of the data obtained from this test.

Cost per square yard for each of the materials was as follows:

	Surface Area Sq. Yd.	Tons	Cost Sq. Yd.
Trap Rock	7,920	206	$0.395
Lightweight	7,640	81	0.285
East Texas Stone	8,900	240	0.374

This cost does not include charges for engineering and handling of traffic.

The plant mix seal provided a smooth riding surface without any noticeable changes in noise levels for the various aggregate sizes. No ravelling or flushing has occurred as of this date.

Observing the test section during periods of inclement (rainy) weather, indicates that the plant mix seal provides an adequate void system that permits the water to travel through the mix rather than sheet across the surface. This feature enables the surface to

SKID RESISTANCE RESULTS FOR

PLANT MIX SEAL

PROJECT NO. 176-2-30

Material	Asphalt Content, %	Skid Values* Range	Average
Crushed Stone			
100% Aggregate	6.0	0.33	0.33
	6.3	0.36	0.36
	6.5	0.37-0.39	0.38
90% Aggregate 10% Local Sand	6.5	0.35	0.35
Lightweight Aggregate	12.5	0.30-0.37	0.33
Trap Rock	6.0	0.28-0.33	0.30
	6.5	0.28-0.34	0.31

*Skid values obtained 11-23-71; 13 days following placement of seal.

TABLE IV

alleviate the problem of hydroplaning.

Conclusion:

The test section has provided a number of favorable results for the plant mix seal. It was found that this construction procedure was easy to construct, economical, smooth riding and presented a solution to the hydroplaning portion of the "slick pavement" problem.

From information and knowledge gained as the test section was being developed, a specification for the plant mix seal was prepared and is included in the Appendix. It is noted that the aggregate is paid for by the cubic yard and asphalt by the ton. Payment for tack coat is also included, with payment by the gallon.

Only time will enable a true evaluation of this construction practice; however, at the present time the plant mix seal appears to be performing satisfactorily and should merit further consideration as a surfacing media for the pavement structure.

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APPENDIX

TEXAS HIGHWAY DEPARTMENT
FORM 213 Rev. 7-1-69

188879-000-1914

LOCAL BID INVITATION

SEALED BIDS WILL BE RECEIVED BY **TEXAS HIGHWAY DEPARTMENT** UNTIL 2:00 p.m. OF DATE SHOWN BELOW

Lufkin, Texas

Bidder Must Fill in & Sign

October 26, 1971
DATE

QUOTE F.O.B.
4 Miles North of Lufkin on U.S. Highway 59
City or Town

FOR TEXAS HIGHWAY DEPARTMENT
M. G. Goode, District Engineer
P.O. Box 280 - Lufkin, Texas 75901
Address

In this proposal bidder agrees to comply with all conditions on reverse side of this bid

BIDS MUST Be SEALED and IDENTIFIED with RETURN ADDRESS of BIDDER

SHOW REQUISITION NUMBER and BID OPENING DATE In Lower Left Hand Corner of Envelope

Date of Bid November 1, 1971

Name of Bidder Moore Bros. Constr. Co.

Street Address P.O. Box 35 City Lufkin

Authorized Signature [signature]

Requisition Number 11-2-330

Bid Opening Date November 1, 2 PM 1971

Failure to manually sign will disqualify bid

Item No.	Item and Description	Quantity	Unit	Unit Price	Extension
	OUR ACCOUNTING SYSTEM REQUIRES UNIT PRICES AND EXTENSIONS. IF A TRADE DISCOUNT IS SHOWN ON BID IT SHOULD BE DEDUCTED AND NET LINE EXTENSIONS SHOWN.				
	RETURN ORIGINAL AND TWO COPIES OF BID TO THE TEXAS HIGHWAY DEPARTMENT				
	Furnish a heated asphalt - aggregate mixture. Asphalt shall comply with requirements for AC-20, Asphalt Cement, as specified by Item 300, Asphalt, Oil, and Emulsion and Special Provision, Item 300, Stencil Number 300-018 dated 4-71. Aggregate shall comply to the following requirements:				
	Item 1. Aggregate shall be sandstone and shall meet the requirements of Grade 4, Item 302, "Aggregate for Surface Treatments" Source of material shall be East Texas Stone.	[illegible]	Ton		
	Item 2. Aggregate shall be trap rock and meet the requirement of Grade 5, Item 302, "Aggregate for Surface Treatments. "Source of material shall be White's Uvalde Mine.	[illegible]			
	Item 3. Aggregate shall be lightweight aggregate and meet the requirements of Grade 5, Item 1989, "Aggregate for Surface Treatments" (Lightweight). Source of material to be Texas Industries, Dallas, Texas.				
	"Purchases made for State use are exempt from the State Sales Tax—Art. 20.04 (F) 3, Chapter 20, Title 122A—Taxation, General, R.C.S. 1925, as amended by the 57th Legislature First Called Session, 1961. **DO NOT INCLUDE TAX IN YOUR BID."**				

Supplies will be placed in transit in _____ **days from receipt of order**

Prices Quoted Are F.O.B. Destination ***Cash Discount** _____ % 90 Da.

*Normal payment of **CASH DISCOUNT INVOICES** is approximately 90 calendar days, after the correct supplies and invoices are received by the proper agency. Bidder must state the **MAXIMUM** discount period he will allow. **In the event his bid is low ONLY** because of cash discount, he must have allowed at least 90 calendar days OR award will be made to next low bidder.

FORM 213 Rev. 7-1-69

LOCAL BID INVITATION

SEALED BIDS WILL BE RECEIVED BY **TEXAS HIGHWAY DEPARTMENT** UNTIL 2:00 p.m. OF DATE SHOWN BELOW

Lufkin, **Texas**

Bidder Must Fill in & Sign

October 26, 1971
DATE

QUOTE F.O.B.
4 Miles North of Lufkin on U.S. Highway 59
City or Town

FOR **TEXAS HIGHWAY DEPARTMENT**

M. C. Goode, District Engineer
P.O. Box 200 - Lufkin, Texas 75901
Address

In this proposal bidder agrees to comply with all conditions on reverse side of this bid

BIDS MUST Be SEALED and IDENTIFIED with RETURN ADDRESS of BIDDER

SHOW REQUISITION NUMBER and BID OPENING DATE In Lower Left Hand Corner of Envelope

Date of Bid November 1, 1971

Name of Bidder Moore Bros. Constr. Co.

Street Address P.O. Box 35 City Lufkin

Authorized Signature [signature]

Requisition Number 11-2-330

Bid Opening Date November 1, 2 PM 1971

Failure to manually sign will disqualify bid

Item No.	Item and Description	Quantity	Unit	Unit Price	Extension
	OUR ACCOUNTING SYSTEM REQUIRES UNIT PRICES AND EXTENSIONS. IF A TRADE DISCOUNT IS SHOWN ON BID IT SHOULD BE DEDUCTED AND NET LINE EXTENSIONS SHOWN. RETURN ORIGINAL AND TWO COPIES OF BID TO THE TEXAS HIGHWAY DEPARTMENT				
	Asphalt - Aggregate Mixtures shall be combined by weight in the following proportions:				
Item 1.	Aggregate - 93.5% Asphalt - 6.5%	300	Tons	10.67	3,261.00
Item 2.	Aggregate - 93.5% Asphalt - 6.5%	300	Tons	12.10	3,630.00
Item 3.	Aggregate 87. % Asphalt 13 %	150	Tons	23.14	3,471.00
	Mixture shall be heated and processed in asphaltic concrete plant. F.O.B. to Project located approximately four miles North of Lufkin, U.S. Hwy. 59.				

"Purchases made for State use are exempt from the State Sales Tax—Art. 20.04 (F) 3, Chapter 20, Title 122A—Taxation, General, R.C.S. 1925, as amended by the 57th Legislature First Called Session, 1961.
DO NOT INCLUDE TAX IN YOUR BID."

Supplies will be placed in transit in As needed days from receipt of order

Prices Quoted Are F.O.B. Destination

***Cash Discount** 0 %

*Normal payment of **CASH DISCOUNT INVOICES** is approximately 90 calendar days, after the correct supplies and invoices are received by the proper agen... must state the **MAXIMUM** discount period he will allow. **In the event his bid is low ONLY** because of cash discount, he must have allowed at least 90 calendar... award will be made to next low bidder.

TEXAS HIGHWAY DEPARTMENT
FORM 213 Rev. 7-1-69

LOCAL BID INVITATION

SEALED BIDS WILL BE RECEIVED BY **TEXAS HIGHWAY DEPARTMENT** UNTIL 2:00 p.m. OF DATE SHOWN BELOW

Lufkin, Texas

Bidder Must Fill in & Sign

October 26, 1971
DATE

QUOTE F.O.B.
Jobsite, 4 Miles North of Lufkin on U.S. Highway 59
City or Town

FOR TEXAS HIGHWAY DEPARTMENT
M. G. Goode, District Engineer
P.O. Box 280 - Lufkin, Texas 75901
Address

In this proposal bidder agrees to comply with all conditions on reverse side of this bid

BIDS MUST Be SEALED and IDENTIFIED with RETURN ADDRESS of BIDDER

SHOW REQUISITION NUMBER and BID OPENING DATE In Lower Left Hand Corner of Envelope

Date of Bid November 1, 1971

Name of Bidder Moore Bros. Constr. Co.

Street Address P.O. Box 35 City Lufkin

Authorized Signature [signature]

Requisition Number 11-34

Bid Opening Date November 1 2 PM 19 71

Failure to manually sign will disqualify bid

Item No.	Item and Description	Quantity	Unit	Unit Price	Extension
	OUR ACCOUNTING SYSTEM REQUIRES UNIT PRICES AND EXTENSIONS. IF A TRADE DISCOUNT IS SHOWN ON BID IT SHOULD BE DEDUCTED AND NET LINE EXTENSIONS SHOWN.				
	RETURN ORIGINAL AND TWO COPIES OF BID TO THE TEXAS HIGHWAY DEPARTMENT				
	We propose to furnish the following laydown equipment for the purpose of laying Asphaltic Concrete Pavement:				
	1. ea. LAYDOWN MACHINE capable to laying 12' width with automatic screed control for spreading & finishing.				
	1. ea. ASPHALTIC DISTRIBUTOR				
	1. ea. STEEL WHEEL ROLLER 8 to 10 ton				
	1. ea. RUBBER TIRED ROLLER 5 to 10 ton	750	Per/Ton	3.00	2,250.00
	1. Price quotation should be on a tonnage basis covering the usage of the above listed equipment.				
	2. Agreement to include all maintenance upkeep, operation cost, transportation expense to and from the project, and necessary operators satisfactory to the District Engineer & also includes Workmen's Compensation Insurance if legally required, & liability insurance				

"Purchases made for State use are exempt from the State Sales Tax—Art. 20.04 (F) 3, Chapter 20, Title 122A—Taxation, General, R.C.S. 1925, as amended by the 57th Legislature First Called Session, 1961.
DO NOT INCLUDE TAX IN YOUR BID."

Supplies will be placed in transit in As Needed **days from receipt of order**

Prices Quoted Are F.O.B. Destination

***Cash Discount** 0 % 90 Da.

*Normal payment of **CASH DISCOUNT INVOICES** is approximately 90 calendar days, after the correct supplies and invoices are received by the proper agency. Bidder must state the **MAXIMUM** discount period he will allow. In the event his bid is low **ONLY** because of cash discount, he must have allowed at least 90 calendar days OR award will be made to next low bidder.

TEXAS HIGHWAY DEPARTMENT
FORM 213 Rev. 7-1-69

188879-869-19M

LOCAL BID INVITATION

SEALED BIDS WILL BE RECEIVED BY **TEXAS HIGHWAY DEPARTMENT** UNTIL 2:00 p.m. OF DATE SHOWN BELOW

Lufkin, **Texas**

Bidder Must Fill in & Sign

October 25, 1971
DATE

QUOTE F.O.B.
Jobsite, 4 Miles North of Lufkin on U.S. Highway 59
City or Town

FOR **TEXAS HIGHWAY DEPARTMENT**

H. C. Goode, District Engineer
P.O. Box 200 - Lufkin, Texas 75901
Address

In this proposal bidder agrees to comply with all conditions on reverse side of this bid

BIDS MUST Be SEALED and IDENTIFIED with RETURN ADDRESS of BIDDER

SHOW REQUISITION NUMBER and BID OPENING DATE In Lower Left Hand Corner of Envelope

Date of Bid November 1, 1971

Name of Bidder Moore Bros. Constr. Co.

Street Address P.O. Box 35 City Lufkin

Authorized Signature [signature]

Requisition Number 11-34

Bid Opening Date November 1, 2 PM 1971

Failure to manually sign will disqualify bid

Item No.	Item and Description	Quantity	Unit	Unit Price	Extension
	OUR ACCOUNTING SYSTEM REQUIRES UNIT PRICES AND EXTENSIONS. IF A TRADE DISCOUNT IS SHOWN ON BID IT SHOULD BE DEDUCTED AND NET LINE EXTENSIONS SHOWN.				
	RETURN ORIGINAL AND TWO COPIES OF BID TO THE TEXAS HIGHWAY DEPARTMENT				
	in at least minimum legally required amounts.				
	3. Equipment to be used on Regular Maintenance 176-2-30				
	4. Agreement Date to extend from November 8, 1971 through December 15, 1971, a period of 37 days.				
	5. It is anticipated that approximately 750 tons will be involved.				

"Purchases made for State use are exempt from the State Sales Tax—Art. 20.04 (F) 3, Chapter 20, Title 122A—Taxation, General, R.C.S. 1925, as amended by the 57th Legislature First Called Session, 1961.
DO NOT INCLUDE TAX IN YOUR BID."

Supplies will be placed in transit

in _____ **days from receipt of order**

Prices Quoted Are F.O.B. Destination

***Cash Discount** _____% 90 Da.

*Normal payment of **CASH DISCOUNT INVOICES** is approximately 90 calendar days, after the correct supplies and invoices are received by the proper agency. Bidder must state the **MAXIMUM** discount period he will allow. In the event his bid is low **ONLY** because of cash discount, he must have allowed at least 90 calendar days OR award will be made to next low bidder.

Texas Highway Department
Form 272

65617-261-15m

AGGREGATE TEST REPORT

Material: Trap Rock

Laboratory No. _____
Date Received 11-10-71 Date Reported 11-18-71
Dist. ~~or Div.~~ Engr. M. G. Goode
Address Lufkin, Texas
Contractor _____
Sampler Robert W. Walker
Sampler's Title Engr. Tech. III
Sampled from Stockpile
(Pit, quarry, car or stockpile)
Producer White's Mines, Knippa, Texas
Quantity represented by sample _____
Has been used on _____
Proposed for use as _____

B/C 09822
Control No. | Sect. No. | Job No.

County 11-306 | Federal Project No. 2-330(2) | Hwy. No.

Dist. No. | I.P.E. No. | Req. No. | Date Sampled

Identification Marks TR-1
Specification Item No. 302
Material from property of East Texas Asph. Co., Angelina County, 1 Mile W. Lufkin on SH 94

SIZES	Grams	Per Cent
Ret'd. on 3½" sieve		
Ret'd. on 3" sieve		
Ret'd. on 2½" sieve		
Ret'd. on 2" sieve		
Ret'd. on 1¾" sieve		
Ret'd. on 1½" sieve		
Ret'd. on 1¼" sieve		
Ret'd. on 1" sieve		
Ret'd. on ⅞" sieve		
Ret'd. on ¾" sieve		
Ret'd. on ⅝" sieve		
Ret'd. on ½" sieve		0
Ret'd. on ⅜" sieve		0.5
Ret'd. on ¼" sieve		
Ret'd. on #4 sieve		65.0
Ret'd. on #8 sieve		
Ret'd. on #10 sieve		98.6
Ret'd. on #16 sieve		
Ret'd. on #20 sieve		99.5
Ret'd. on #30 sieve		
Ret'd. on #40 sieve		
Ret'd. on #50 sieve		
Ret'd. on #60 sieve		
Ret'd. on #80 sieve		
Ret'd. on #100 sieve		
Ret'd. on #200 sieve		
Loss by elutriation		
Total		100.0
Fineness Modulus		

GRADING OF FINE-AGGREGATE

Grams	Per Cent

TENSILE STRENGTH
1:3 Mortar at 3 days H.E.S.
This Sand | Ottawa

L.A. Abrasion _____
Type _____
Organic Color _____
Type of Soundness _____
% Unsound _____

Loss By Decantation _____
Wt. Per C.F. ~~S/D~~ 98.4
Bulk Specific Gravity 3.054
Absorption 0.8

Weight Solids _____
% Solids _____
% Voids _____

Remarks:

Texas Highway Department
Form 272 (Revised)

AGGREGATE TEST REPORT

Charge $9.00

Laboratory No. 71-5330-A
Date Received 12-20-71 Date Reported 1-4-72
Dist. or Res. Engr. M. G. Goode
Address Lufkin, Texas
Contractor
Sampler Robert W. Walker
Sampler's Title Engr. Tech. III
Sampled from Stockpile
(Pit, quarry, car or stockpile)
Producer White's Mines, Knippa, Texas
Quantity represented by sample
Has been used on
Proposed for use as

Material: Trap Rock

B/C 09822
Control No. Sect. No. Job No.

County 11-306 Federal Project No. 2-330(2) Hwy. No. 12-16-71
Dist. No. I.P.E. No. Req. No. Date Shipped

Identification Marks TR-1
Specification Item No. 302
Material from property of East Texas Asph. Co., Angelina County, 1 mile W. Lufkin on State 94.

SIZES	Grams	Per Cent
Ret'd. on 3½" sieve		
Ret'd. on 3" sieve		
Ret'd. on 2½" sieve		
Ret'd. on 2" sieve		
Ret'd. on 1¾" sieve		
Ret'd. on 1½" sieve		
Ret'd. on 1¼" sieve		
Ret'd. on 1" sieve		
Ret'd. on ⅞" sieve		
Ret'd. on ¾" sieve		
Ret'd. on ⅝" sieve		
Ret'd. on ½" sieve		
Ret'd. on ⅜" sieve		
Ret'd. on ¼" sieve		
Ret'd. on #4 sieve		
Ret'd. on #8 sieve		
Ret'd. on #10 sieve		
Ret'd. on #16 sieve		
Ret'd. on #20 sieve		
Ret'd. on #30 sieve		
Ret'd. on #40 sieve		
Ret'd. on #50 sieve		
Ret'd. on #60 sieve		
Ret'd. on #80 sieve		
Ret'd. on #100 sieve		
Ret'd. on #200 sieve		
Loss by elutriation		
Total		100.0
Fineness Modulus		

GRADING OF FINE-AGGREGATE

Grams	Per Cent

	100.0

TENSILE STRENGTH
1:3 Mortar at 3 days H.E.S.
This Sand Ottawa

L.A. Abrasion 10.0
Type C
Organic Color
Type of Soundness
% Unsound
Loss By Decantation
Wt. Per C.F. S.S.D.
Specific Gravity
Absorption
Weight Solids
% Solids
% Voids

Division of Materials and Tests
MEETS QUALITY
✓ SPECIFICATIONS

Remarks: This sample of material consists of crushed trap rock.
ed

403790-471-30M

WHITE'S MINES TRAP ROCK

Plant Located in Knippa, Texas

PHYSICAL ANALYSIS

Specific Gravity	3.18
Absorption	.12%
Los Angeles Abrasion Loss	7-10%
Fusion Point	2300°-2400°F
Magnesium Sulphate Soundness Loss (5 Cycle)	.97%
Sodium Sulphate Soundness Loss (20 Cycle)	1.3%
Barrett Hardness	86.8%

CHEMICAL ANALYSIS

Silica Dioxide	35.8%
Iron Oxide	12.6%
Alumina	16.7%
Titania	4.3%
Calcium Oxide	12.4%
Magnesium Oxide	12.5%
Ignition Loss	4.9%

WHITE'S MINES TRAP ROCK IS THE HEAVIEST, HARDEST AND DARKEST COLORED AGGREGATE READILY AVAILABLE IN TEXAS. WHEN YOU NEED AN AGGREGATE THAT IS HARD, DURABLE AND PRACTICALLY IMPERVIOUS TO ACIDS, ALKALINES, AND "FREEZE-THAW" CYCLES, YOU NEED WHITE'S MINES TRAP ROCK.

WHITE'S MINES TRAP ROCK

APPLICATIONS INCLUDE:

- SKID RESISTANT PAVING MATERIALS
- INDUSTRIAL FLOORING
- TRICKLING SEWERAGE FILTER MEDIA
- ROOFING MATERIAL
- HEAVY DUTY CONCRETE
- ARCHITECTURAL CONCRETE
- GARDEN MULCH
- DECORATIVE LANDSCAPE STONE
- STACK LININGS
- CINDER PITS

We will be happy to provide samples for your inspection upon request.

Texas Highway Department
Form 272

65617-261-15m

AGGREGATE TEST REPORT

Material: Sandstone

Laboratory No. 71-2912
Date Received 11-8-71 Date Reported Nov. 1971
Dist. ~~by Res.~~ Engr. M. G. Goode
Address Lufkin, Texas
Contractor Moore Bros. Const. Co.
Sampler District 11 Testing Laboratory
Sampler's Title
Sampled from Stockpile
(Pit, quarry, car or stockpile)
Producer East Texas Stone, Blue Mountain Plant
Quantity represented by sample
Has been used on
Proposed for use as Aggregate for Plant Mix Seal

176-2
Control No. | Sect. No. | Job No. U.S. 59
County 11 | Federal Project No. | Hwy. No. 11-8-71
Dist. No. | I.P.E. No. | Req. No. | Date Sampled

Identification Marks
~~Specification~~ Item No. 11-33-1
Material from property of

SIZES	Grams	Per Cent
Ret'd. on 3½" sieve		
Ret'd. on 3" sieve		
Ret'd. on 2½" sieve		
Ret'd. on 2" sieve		
Ret'd. on 1¾" sieve		
Ret'd. on 1½" sieve		
Ret'd. on 1¼" sieve		
Ret'd. on 1" sieve		
Ret'd. on ⅞" sieve		
Ret'd. on ¾" sieve		
Ret'd. on ⅝" sieve		0
Ret'd. on ½" sieve		0
Ret'd. on ⅜" sieve		17.7
Ret'd. on ¼" sieve		
Ret'd. on #4 sieve		87.0
Ret'd. on #8 sieve		
Ret'd. on #10 sieve		99.2
Ret'd. on #16 sieve		
Ret'd. on #20 sieve		99.4
Ret'd. on #30 sieve		
Ret'd. on #40 sieve		
Ret'd. on #50 sieve		
Ret'd. on #60 sieve		
Ret'd. on #80 sieve		
Ret'd. on #100 sieve		
Ret'd. on #200 sieve		
Loss by elutriation		
Total		100.0
Fineness Modulus		

GRADING OF FINE-AGGREGATE

Grams	Per Cent
	100.0

TENSILE STRENGTH
1:3 Mortar at 3 days H.E.S.
This Sand Ottawa

L.A. Abrasion
Type
Organic Color

Type of Soundness
% Unsound

Loss By Decantation
Wt. Per C.F. ~~S.S.D.~~ Dry 89.1
Bulk
Specific Gravity 2.632
Absorption 0.6

Weight Solids
% Solids
% Voids

Remarks:

Texas Highway Department
Form 252 (Revised)

AGGREGATE TEST REPORT

Charge $9.00

Laboratory No. 71-5339-A
Date Received 12-16-71 Date Reported 1-4-72
Dist. or Res. Engr. M. C. Coode
Address Lufkin, Texas
Contractor —
Sampler Robert W. Walker
Sampler's Title Engr. Tech. III
Sampled from Stockpile
(Pit, quarry, car or stockpile)
Producer East Texas Stone Co., Blue Mtn. Plant
Quantity represented by sample
Has been used on
Proposed for use as

Material: Sandstone

B/C 09822
Control No. Sect. No. Job No.

County 11-306 Federal Project No. 2-330(1) Hwy. No. 12-16-71
Dist. No. I.P.E. No. Req. No. Date Shipped

Identification Marks E.T.S.-1
Specification Item No. 302
Material from property of East Texas Asph. Co., Angelina County, 1 mile W Lufkin on State 94.

SIZES	Grams	Per Cent
Ret'd. on 3½" sieve		
Ret'd. on 3" sieve		
Ret'd. on 2½" sieve		
Ret'd. on 2" sieve		
Ret'd. on 1¾" sieve		
Ret'd. on 1½" sieve		
Ret'd. on 1¼" sieve		
Ret'd. on 1" sieve		
Ret'd. on ⅞" sieve		
Ret'd. on ¾" sieve		
Ret'd. on ⅝" sieve		
Ret'd. on ½" sieve		
Ret'd. on ⅜" sieve		
Ret'd. on ¼" sieve		
Ret'd. on #4 sieve		
Ret'd. on #8 sieve		
Ret'd. on #10 sieve		
Ret'd. on #16 sieve		
Ret'd. on #20 sieve		
Ret'd. on #30 sieve		
Ret'd. on #40 sieve		
Ret'd. on #50 sieve		
Ret'd. on #60 sieve		
Ret'd. on #80 sieve		
Ret'd. on #100 sieve		
Ret'd. on #200 sieve		
Loss by elutriation		
Total		100.0
Fineness Modulus		

GRADING OF FINE-AGGREGATE

Grams	Per Cent

TENSILE STRENGTH
1:3 Mortar at 3 days H.E.S.
This Sand Ottawa

L.A. Abrasion 29.2
Type C
Organic Color
Type of Soundness
% Unsound
Loss By Decantation
Wt. Per C.F. S.S.D.
Specific Gravity
Absorption
Weight Solids
% Solids
% Voids

Division of Materials and Tests
MEETS QUALITY
SPECIFICATIONS

Remarks: This sample of material consists of crushed calcareous sandstone.

ed

403790-471-30M

Texas Highway Department
Form 272

65617-261-15m

AGGREGATE TEST REPORT

Material Lt. Wt. Aggr.

Laboratory No. 71-2741, etc.
Date Received ____ Date Reported 10-21-71
Dist. or Res. Engr. ____
Address ____
Contractor ____
Sampler ____
Sampler's Title ____
Sampled from ____ (Pit, quarry, car or stockpile)

Control No. ____ Sect. No. ____ Job No. ____
County ____ Federal Project No. ____ Hwy. No. ____
Dist. No. 11 I.P.E. No. ____ Req. No. ____ Date Sampled ____

Producer Texas Industrion(Haydite), Dallas Plant
Quantity represented by sample ____
Has been used on ____
Proposed for use as Crse. Aggr. for Plant Mix Seal (Preliminary Research)

Identification Marks ____
Specification Item No. ____
Material from property of ____

Item 302, Gr 5

SIZES	Grams ////	Per Cent
Ret'd. on 3½" sieve	Spec:	
Ret'd. on 3" sieve		
Ret'd. on 2½" sieve		
Ret'd. on 2" sieve		
Ret'd. on 1¾" sieve		
Ret'd. on 1½" sieve		
Ret'd. on 1¼" sieve		
Ret'd. on 1" sieve		
Ret'd. on ⅞" sieve		
Ret'd. on ¾" sieve		
Ret'd. on ⅝" sieve		
Ret'd. on ½" sieve	0	0
Ret'd. on ⅜" sieve	0-2	0
Ret'd. on ¼" sieve		
Ret'd. on #4 sieve	40-85	58.5
Ret'd. on #8 sieve		
Ret'd. on #10 sieve	98-100	97.3
Ret'd. on #16 sieve		
Ret'd. on #20 sieve		
Ret'd. on #30 sieve		
Ret'd. on #40 sieve	- -	97.8
Ret'd. on #50 sieve		
Ret'd. on #60 sieve		
Ret'd. on #80 sieve		
Ret'd. on #100 sieve		
Ret'd. on #200 sieve	- -	98.9
Loss by elutriation		
Total		100.0
Fineness Modulus		

GRADING OF FINE-AGGREGATE

Grams	Per Cent
	100.0

TENSILE STRENGTH
1:3 Mortar at 3 days H.E.S.
This Sand ____ Ottawa

L.A. Abrasion ____
Type ____
Organic Color ____
Type of Soundness ____
% Unsound ____

Loss By Decantation ____
Wt. Per C.F. S.S.D. 40.1
Dry
Bulk Specific Gravity 1.175
Absorption ____

Weight Solids ____
% Solids ____
% Voids ____

Remarks:

Sieve Size	Bulk Sp.Gr.	Absorption(%)
(+4)	1.166	20.4
(-4)	1.183	21.0

Texas Highway Department
Form 231

GENERAL TEST REPORT

* CHARGE $45.00

Laboratory No. 71-201-F
Date Received 2-8-71 Date Reported 2-19-71
Dist. or Res. Engr. Thomas D. Quinn
Address Center
Sampler J. K. Denum
Sampler's Title E.T. III
Contractor W. R. Boyd, Inc., etc.
Sampled from Stockpile
(pit, quarry, car or stockpile)

Material Lt. Wt. Aggr.

C-175-2-40, FD 0062, etc.
Control No. Sect. No. Job No.
Shelby US 59, etc.
County Federal Project No. Hwy. No.
11 2-3-71
District No. Req. No. Date Sampled

Producer Tex. Ind.-Arlington-Dallas Plant Identification marks --
Quantity represented by sample
Has been used on
Proposed for use as
Specification Item No. Spl. Spec. Field Change #2
Material from property of East Texas Asph. Lufkin

DETERMINATIONS

		Lab. No. 71-201-F
Tex-404-A	Unit Wt. of Aggr. ..... (Dry Loose Wt., lbs./cu.ft.)	40.64
Tex-410-A	Los Angeles Abrasion (Loss, % By Wt.)	20.6(c)
Tex-431-A	Pressure Slaking Value (%)	2.8
Tex-217-F, Part 1	Deleterious Material (Loss, % by Wt.)	0
Tex-217-F, Part 2	Decantation (Loss, % By Wt.)	0.7

Division of Materials and Tests
MEETS
SPECIFICATIONS

cc Lab
Quinn

251264-370-30M

Texas' Highway Department
Form No. 320-A

ASPHALT CEMENTS TEST REPORT No Charge

Laboratory No. 71-3061-C
Date Received 11-10-71 Date Reported 11-16-71
Dist. or Res. Engr. _____
Address _____
Sampler John Casto
Sampler's Title _____
Contractor _____
Sampled from _____ (pit, quarry, car or stockpile)
Producer Texaco, Inc., Pt. Neches, TX
Quantity represented by sample 67,746 gals.
Has been used on _____
Proposed for use as _____

MATERIAL AC-20

INFORMATIONAL
Control No. Sect. No. Job No.

County Federal Project No. Hwy. No.

District No. Req. No. 11-8-71 Date sampled

Identification marks _____
Specification Item No. _____
Material from property of _____
Tank 248, Seals 1923-1924
Samples 3

Water, %	Nil
Viscosity at 275°F., Stokes	4.2
Viscosity at 140°F., Stokes	2405
Solubility in CCl_4, %	99.9+
Flash Point C.O.C., °F.	595
Ductility, 77°F., 5 cm/min., cm.	141+
Relative Viscosity (after oxidation, 15 u films for 2 hours at 225°F., viscosities determined at 77°F.)	5.0
Penetration at 77°F., 100 g., 5 Sec.	77
Specific Gravity at 77°F.	1.005

D-9 Remarks: **Meets Item 300-009 & satisfactory for use under Item 300-017.**

df

Division of Materials and Tests
MEETS
SPECIFICATIONS

D4 P-1386 F-266 12-68 20M

Texas Highway Department
Form No. 326-A

ASPHALT CEMENTS TEST REPORT No Charge

MATERIAL AC-20

Laboratory No. 71-3044-C
Date Received 11-8-71 Date Reported 11-16-71
Dist. or Res. Engr.
Address
Sampler John Casto
Sampler's Title
Contractor
Sampled from
(pit, quarry, car or stockpile)

INFORMATIONAL
Control No. Sect. No. Job No.
County Federal Project No. Hwy. No.
District No. Req. No. 11-5-71 Date sampled

Producer Texaco, Inc., Pt. Neches, Texas
Quantity represented by sample 40,446 gals.
Has been used on
Proposed for use as

Identification marks
Specification Item No.
Material from property of
Tank 8202, Seals 1908 - Samples 2

Water, %	Nil
Viscosity at 275°F., Stokes	4.4
Viscosity at 140°F., Stokes	2396
Solubility in CCl_4, %	99.9+
Flash Point C.O.C., °F.	595
Ductility, 77°F., 5 cm/min., cm.	141+
Relative Viscosity (after oxidation, 15 u films for 2 hours at 225°F., viscosities determined at 77°F.)	5.0
Penetration at 77°F., 100 g., 5 Sec.	73
Specific Gravity at 77°F.	1.008

D-9 Remarks:

Meets Item 300-009 & satisfactory for use under Item 300-017.

df

Division of Materials and Tests
MEETS
SPECIFICATIONS

Texas Highway Department
Construction Form No. 404 Rev. (2)

TEXAS HIGHWAY DEPARTMENT
DAILY CONSTRUCTION REPORT—ASPHALTIC CONCRETE PAVEMENT

County Angelina | Highway U.S. 59 | Project | Control 176-2
Location of Plant Lufkin | Type of Plant Weight Batch | Contractor Moore Bros. Const. Co.
Date 11-10-71 | Specification Item 11-33-2 Type | Plant Started 9:00 A.M. | Plant Stopped 4:00 P.M.

Location No.								
	1	Main Lane	3	Decel. Lane	5	Entr. Ramp	7	Lt.Lane,So.Bnd.
	2	Fr. Rd. Lane	4	Accel. Lane	6	Exit Ramp	8	Rt.Lane,So.Bnd.

Sieve Size	Design No.	Combined Bin Analysis 1	2	3	4	5	6	7	8	Extractions 1	2	3
			(Hot Bins)					(Cold Bins)				
1¾" - ⅞"												
⅞" - ⅝"												
⅝" - ⅜"												
½" - ⅜"		0	0	0	0.5		0	0	0.8	0	0	
⅜" - 4		72.4	51.4	55.4	72.6		56.0	60.9	63.3	57.9	64.4	
¼" - 10												
4 - 10		16.7	37.7	34.2	18.8		32.8	28.5	27.6	34.0	28.0	
+ 10		89.1	89.1	89.6	91.9		88.8	89.4	91.7	91.9	92.4	
10 - 40		3.4	3.6	3.0	1.1		3.4	2.4	0.8	3.2	2.2	
40 - 80		0.4	0.1	0.3	0.2		0.3	0.4	0.1	0.3	0.2	
80 - 200		0.4	0.3	0.4	0.1		0.3	0.6	0.3	0.3	0.3	
Pass 200		0.2	0.4	0.2	0.2		0.7	0.7	0.6	0.5	0.8	
Asphalt		6.5	6.5	6.5	6.5		6.5	6.5	6.5	3.8	4.1	
Total		100.0	100.0	100.0	100.0		100.0	100.0	100.0	100.0	100.0	

Bin Analy. No.	Extr. No.	Time	Location No.	Course of	Courses	Station No.	Mix Temp. °F. Plant	Road	Specimen Nos.	Lab Dens.	% Stab.
1		10:15	7	1	1	300+90	245°	220°			
	1	11:00	7	1	1	298+30	210°	210°			
2		11:15	7	1	1	290+00	210°	205°			
3		12:10	7	1	1	277+50	225°	200°			
4		2:45	8	1	1	288+00	200°	195°			

Materials Used

	Asphalt (Tons)	Aggregate (Tons)
Previous Report		
This Report		
Total To Date		

Percent Complete-Asphaltic Concrete Pavement

Percent Complete—This Type	%
Percent Complete—All Types	%

Days Run

Location No.	Course of	Courses	Station	to	Station	Width (Feet)	Rate of Application: Inches ____ Lbs/Sq. Yd. Sq. Yds.	Tons	Inches ____ Lbs/Sq. Yd. Sq. Yds.	Tons	Inches ____ Lbs/Sq. Yd. Sq. Yds.	Tons
7	1	1				12						
8	1	1				12						
Total Today												
Previous Report												
Total To Date												
Avg. Rate To Date							Lbs/Sq. Yd.		Lbs/Sq. Yd.		Lbs/Sq. Yd.	

Weather Clear
Min. Temp. 55 °F.
Max. Temp. 71 °F.

Remarks Aggr: Trap Rock(Gr. 5) White Mines, Knippa, Texas
Asph: AC-20, Texaco, Inc., Pt.Neches, Lab. #71-3044-C & #71-3061-C

Morgan Prince
Inspector

Type | Date November 10, 1971 | Report No. 1

Texas Highway Department
Construction Form No. 404 Rev. (2)

TEXAS HIGHWAY DEPARTMENT
DAILY CONSTRUCTION REPORT—ASPHALTIC CONCRETE PAVEMENT

County Angelina | Highway U.S. 59 | Project | Control 176-2
Location of Plant Lufkin | Type of Plant Weight Batch | Contractor Moore Bros. Const. Co.
Date 11-11-71 | Specification Item 11-33-3 Type | Plant Started 9:00 A.M. | Plant Stopped 2:00 P.M.

Location No.							
1	Main Lane	3	Decel. Lane	5	Entr. Ramp	7	Lt.Lane,So.Bnd.
2	Fr. Rd. Lane	4	Accel. Lane	6	Exit Ramp	8	Rt.Lane,So.Bnd.

Combined Bin Analysis										Extractions		
Sieve Size	Design No.	1	2	3	4	5	6	7	8	1	2	3
											Sampled from	
											Truck on Road	
			(Hot	Bins)				(Cold	Bins)			
1¾" - ⅞"											Tp.¼Pt.	Bot.¼ Pt.
⅞" - ⅝"												
⅝" - ⅜"												
½" - ⅜"		0	0	0			0	0	0	0	0	0
⅜" - 4		55.7	34.7	41.6			42.5	45.2	48.1	37.7	46.2	46.3
¼" - 10												
4 - 10		28.2	48.7	42.7			37.4	38.2	35.7	40.7	47.0	35.6
+ 10		83.9	83.4	84.3			79.9	83.4	83.8	78.4	83.2	81.9
10 - 40		2.5	3.4	1.7			3.8	2.3	1.8	2.7	1.8	2.2
40 - 80		0.2	0.3	0.5			1.2	0.4	0.5	0.7	0.4	0.7
80 - 200		0.2	0.1	0.3			0.9	0.7	0.7	0.5	0.3	0.4
Pass 200		0.2	0.1	0.3			0.9	0.7	0.7	0.6	0.8	0.5
Asphalt		13.0	12.5	12.5			13.0	12.5	12.5	17.1	13.5	14.3
Total		100.0	100.0	100.0			100.0	100.0	100.0	100.0	100.0	100.0

Bin Analy. No.	Extr. No.	Time	Location No.	Course of	Courses	Station No.	Mix Temp. °F. Plant	Mix Temp. °F. Road	Specimen Nos.	Lab Dens.	% Stab.
1	-	9:20	7	1	1	271+50	255°	285°			
-	1	11:15	7	1	1	253+00	215°	185°			
-	2&3	-	7	1	1	248+60	215°	200°			
2	-	12:55	8	1	1	268+70	225°	195°			
3	-	1:57	8	1	1	250+60	200°	190°			

Materials Used	Asphalt (Tons)	Aggregate (Tons)
Previous Report		
This Report		
Total To Date		

Percent Complete-Asphaltic Concrete Pavement	
Percent Complete—This Type	%
Percent Complete—All Types	%

Days Run						Rate of Application					
Location No.	Course of	Courses	Station	to Station	Width (Feet)	____ Inches Lbs/Sq. Yd. Sq. Yds.	Tons	____ Inches Lbs/Sq. Yd. Sq. Yds.	Tons	____ Inches Lbs/Sq. Yd. Sq. Yds.	Tons
7	1	1			12						
8	1	1			12						
Total Today											
Previous Report											
Total To Date											
Avg. Rate To Date						Lbs/Sq. Yd.		Lbs/Sq. Yd.		Lbs/Sq. Yd.	

Weather Clear
Min. Temp. 55 °F.
Max. Temp. 75 °F.

Remarks Aggr: Lt. Wt. (Gr.5) Texas Industries, Dallas Plant
Asph: AC-20, Texaco, Inc., Pt. Neches, Lab. #71-3044-C & 71-3061-C

Morgan Prince
Inspector

Type | Date November 11, 1971 | Report No. 1

Texas Highway Department
Construction Form No. 404 Rev. (2)

TEXAS HIGHWAY DEPARTMENT
DAILY CONSTRUCTION REPORT—ASPHALTIC CONCRETE PAVEMENT

County Angelina | Highway U.S. 59 | Project | Control 176-2
Location of Plant Lufkin | Type of Plant Weight Batch | Contractor Moore Bros. Const. Co.
Date 11-11-71 | Specification Item 11-33-1 Type | Plant Started 2:30 P M. | Plant Stopped 4:30 P M.

Location No.								
1	Main Lane	3	Decel. Lane	5	Entr. Ramp	7	Lt.Lane, So.Bnd.
2	Fr. Rd. Lane	4	Accel. Lane	6	Exit Ramp	8	

Combined Bin Analysis

Sieve Size	Design No.	1	2	3	4	5	6	7	8
1¾" - ⅞"									
⅞" - ⅝"									
+½" - ½" - ⅜"		0	0						
½" - ⅜"		38.4	15.4						
⅜" - 4		42.1	58.5						
¼" - 10									
4 - 10		10.4	16.8						
+ 10		90.9	90.7						
10 - 40		0.9	1.1						
40 - 80		0.8	0.6						
80 - 200		0.8	0.6						
Pass 200		0.3	0.5						
Asphalt		6.3	6.5						
Total		100.0	100.0						

Extractions

1	2	3
0		
18.4		
61.5		
13.7		
93.6		
0.7		
0.5		
0.7		
0.8		
3.7		
100.0		

Bin Analy. No.	Extr. No.	Time	Location No.	Course of	Courses	Station No.	Mix Temp. °F. Plant	Mix Temp. °F. Road	Specimen Nos.	Lab Dens.	% Stab.
1	1	3:10	7	1	1	237+00	240°	230°			
2		3:55	7	1	1	225+50	250°	240°			

Materials Used

	Asphalt (Tons)	Aggregate (Tons)
Previous Report		
This Report		
Total To Date		

Percent Complete-Asphaltic Concrete Pavement

Percent Complete—This Type	%
Percent Complete—All Types	%

Days Run

Location No.	Course of	Courses	Station	to Station	Width (Feet)	Rate of Application: Inches Lbs/Sq. Yd. Sq. Yds.	Tons	Inches Lbs/Sq. Yd. Sq. Yds.	Tons	Inches Lbs/Sq. Yd. Sq. Yds.	Tons
7	1	1			12						
Total Today											
Previous Report											
Total To Date											
Avg. Rate To Date							Lbs/Sq. Yd.		Lbs/Sq. Yd.		Lbs/Sq. Yd.

Weather Clear
Min. Temp. 71 °F.
Max. Temp. 76 °F.

Remarks Aggr: Crushed Sandstone(Gr.4) East Texas Stone Co.,Blue Mt. Plant
Asph: AC-20, Texaco, Inc., Pt. Neches, Lab. #71-3044-C & #71-3061-C

Morgan Prince
Inspector

Type | Date November 11, 1971 | Report No. 1

Texas Highway Department
Construction Form No. 404 Rev. (2)

TEXAS HIGHWAY DEPARTMENT
DAILY CONSTRUCTION REPORT—ASPHALTIC CONCRETE PAVEMENT

County Angelina Highway U.S. 59 Project Control 176-2
Location of Plant Lufkin Type of Plant Weight Batch Contractor Moore Bros. Const. Co.
Date 11-12-71 Specification Item 11-33-1 Type Plant Started 9:00 A.M. Plant Stopped 11:15 A.M.

Location No.	1 Main Lane	3 Decel. Lane	5 Entr. Ramp	7
	2 Fr. Rd. Lane	4 Accel. Lane	6 Exit Ramp	8 Rt. Lane, So. Bnd.

Combined Bin Analysis

Sieve Size	Design No.	1	2	3	4	5	6	7	8	Extractions * 1 Sampl. @ Pl.	2 Sampled from Tk. on Road	3
			(Hot Bins)				(Cold Bins)				Tp. ¼ Pt.	Btm. ¼ Pt.
1¾" - ⅞"								Local				
⅞" - ⅝"								Sand				
+½" ⅝" - ⅜"		0	0	0	0		0	Only	0	0	0	0
½" - ⅜"		31.6	28.4	27.8	36.1		21.1		12.8	18.7	19.2	17.2
⅜" - 4		44.0	39.6	47.4	41.1		58.9		60.6	63.9	61.8	60.6
¼" - 10												
4 - 10		14.7	13.5	16.0	13.3		12.4	1.7	18.1	11.2	12.5	12.7
+ 10		90.3	81.5	91.2	90.5		92.4		91.5	93.8	93.5	90.5
10 - 40		0.7	4.6	1.2	0.8		0.4	36.8	1.0	0.6	0.6	0.7
40 - 80		0.7	5.1	1.3	0.7		0.1	43.7	0.3	0.4	0.3	0.5
80 - 200		1.1	1.6	0.2	1.0		0.2	13.0	0.6	0.9	0.8	1.1
Pass 200		0.7	0.7	0.1	0.5		0.4	4.8	0.6	0.8	0.7	3.4
Asphalt		6.5	6.5	6.0	6.5		6.5	-	6.0	3.5	4.1	3.8
Total		100.0	100.0	100.0	100.0		100.0	1	100.0	100.0	100.0	100.0

Bin Analy. No.	Extr. No.	Time	Location No.	Course of	Courses	Station No.	Mix Temp. °F. Plant	Road	Specimen Nos.	Lab Dens.	% Stab.
1	1,2&3	9:15	8	1	1	244+00	225°	220°			
2	4		8	1	1	238+00	235°	225°			
3	5		8	1	1	225+80	240°	220°			
4	-		8	1	1	217+60	235°	225°			

Materials Used

	Asphalt (Tons)	Aggregate (Tons)
Previous Report		
This Report		
Total To Date		

Percent Complete-Asphaltic Concrete Pavement	
Percent Complete—This Type	%
Percent Complete—All Types	%

Days Run

Location No.	Course of	Courses	Station to Station	Width (Feet)	Rate of Application: Inches ____ Lbs/Sq. Yd. Sq. Yds.	Tons	Inches ____ Lbs/Sq. Yd. Sq. Yds.	Tons	Inches ____ Lbs/Sq. Yd. Sq. Yds.	Tons
8	1	1		12						
Total Today										
Previous Report										
Total To Date										
Avg. Rate To Date						Lbs/Sq. Yd.		Lbs/Sq. Yd.		Lbs/Sq. Yd.

Weather Clear
Min. Temp. °F.
Max. Temp. °F.

Remarks Aggr: Crushed Sandstone(Gr.4) East Texas Stone Co., Blue Mt. Plant
Asph: AC-20, Texaco, Inc. Pt. Neches, Lab. #71-3044-C & 71-3061-C
Aggr: Sand, Local

* See Sheet 2A

Morgan Prince
Inspector

Type Date November 12, 1971 Report No. 2

Texas Highway Department
Construction Form No. 404 Rev. (2)

TEXAS HIGHWAY DEPARTMENT
DAILY CONSTRUCTION REPORT—ASPHALTIC CONCRETE PAVEMENT

County Angelina | Highway U.S. 59 | Project | Control 176-2
Location of Plant Lufkin | Type of Plant Weight Batch | Contractor Moore Bros. Const. Co.
Date 11-12-71 | Specification Item 11-33-1 Type | Plant Started 9:00 A.M. | Plant Stopped 11:15 A.M.

Location No.								
1	Main Lane	3	Decel. Lane	5	Entr. Ramp	7		
2	Fr. Rd. Lane	4	Accel. Lane	6	Exit Ramp	8		

Combined Bin Analysis										Extractions		
Sieve Size	Design No.	1	2	3	4	5	6	7	8	1	2	3
											(90%) (ETS)	(10%) (Sand)
1¾" - ⅞"												
⅞" - ⅝"												
⅝" - ⅜"											0	0
½" - ⅜"											17.0	17.5
⅜" - 4											53.6	60.1
¼" - 10												
4 - 10											11.4	15.5
+ 10											82.0	93.1
10 - 40											2.7	0.1
40 - 80											5.5	0.5
80 - 200											2.6	1.3
Pass 200											1.8	0.9
Asphalt											5.4	4.1
Total											100.0	100.0

Bin Analy. No.	Extr. No.	Time	Location No.	Course of Courses	Station No.	Mix Temp. °F. Plant	Mix Temp. °F. Road	Specimen Nos.	Lab Dens.	% Stab.

Materials Used

	Asphalt (Tons)	Aggregate (Tons)
Previous Report		
This Report		
Total To Date		

Percent Complete-Asphaltic Concrete Pavement	
Percent Complete—This Type	%
Percent Complete—All Types	%

Days Run

Location No.	Course of Courses	Station	to	Station	Width (Feet)	Rate of Application: Inches Lbs/Sq. Yd. — Sq. Yds.	Tons	Inches Lbs/Sq. Yd. — Sq. Yds.	Tons	Inches Lbs/Sq. Yd. — Sq. Yds.	Tons
					Total Today						
					Previous Report						
					Total To Date						
					Avg. Rate To Date		Lbs/Sq. Yd.		Lbs/Sq. Yd.		Lbs/Sq. Yd.

Weather Clear
Min. Temp. °F.
Max. Temp. °F.

Remarks Aggr: Crushed Sandstone(Gr.4) East Texas Stone Co., Blue Mt. Plant
Asph: AC-20, Texaco, Inc., Pt. Neches, Lab. #71-3044-C & #71-3061-C
Aggr: Sand, Local

Morgan Prince
Inspector

Type | Date November 12, 1971 | Report No. 2A

Texas Highway Department
Form 231

GENERAL TEST REPORT

Laboratory No. 71-11-33-1,etc.
Date Received Nov. 1971 **Date Reported** Nov. 1971
Dist. ~~07~~ **Engr.** M. G. Goode
Address Lufkin, Texas
Sampler Dist. 11 Testing Laboratory
Sampler's Title
Contractor Moore Bros. Const. Co.
Sampled from
(pit, quarry, car or stockpile)

Material Plant Mix Seal

Control No.	Sect. No.	Job. No.
176	2	
County	**Federal Project No.**	**Hwy. No.**
Angelina		U.S. 59
District No.	**Req. No.**	**Date Sampled**
11		Nov. 1971

Producer
Quantity represented by sample
Has been used ~~or~~ as Aggregate for Plant Mix
Proposed for use as Seal

Identification marks
Specification Item No. 11-33-1,etc.
Material from property of
Trap Rock, White's Mines, Knippa, Texas
Lt.Wt., Texas Industries, Dallas Plant
Crushed Sandstone, East Texas Stone, Blue Mt. Plant

DETERMINATIONS

The following is a comparison of the moisture in the aggregate at the cold bin and of the same aggregate as it reached the hot bin and of the moisture in the truck.

Material	Moisture @ Cold Bin % by Wt.	Moisture @ Hot Bin % by Wt.	Mixture-Moisture in Truck % by Wt.
Trap Rock	1.9	0.7	
Trap Rock	1.8	0.5	
Trap Rock	- -	- -	0.0
Lightweight	35.7	1.5	
Lightweight	29.9	4.3	
Lightweight	27.2	0.4	
Lightweight	23.8	5.8	
Lightweight	- -	- -	1.2
Crushed Sandstone	0.6	0.1	
Crushed Sandstone	0.3	0.0	
Crushed Sandstone	- -	- -	0.0

Note: It was intended not to heat the aggregate to the extent that the asphaltic mixture exceeded 250°F.

Texas Highway Department
Form 272 (Revised)

AGGREGATE TEST REPORT

Laboratory No. 71-2933
Date Received 11-12-1971 Date Reported Nov. 1971
Dist. ~~Res.~~ Engr. M. G. Goode
Address Lufkin, Texas
Contractor Moore Bros. Constr. Co.
Sampler District 11 Testing Laboratory
Sampler's Title
Sampled from Stockpile
(Pit, quarry, car or stockpile)

Material: Sand

176-2
Control No. | Sect. No. | Job No.
11 | | U.S. 59
County | Federal Project No. | Hwy. No.
11 | | 11-12-71
Dist. No. | I.P.E. No. | Req. No. | Date Shipped

Producer East Texas Asph. Co., Lufkin
Quantity represented by sample
Has been used on
Proposed for use as Fine Aggregate Filler for Plant Mix Seal

Identification Marks
~~Specification~~ Item No. 11-33-1(Suppl.)
Material from property of Daniel Pit, Angelina, Co.

SIZES	Grams	Per Cent	GRADING OF FINE-AGGREGATE Grams	Per Cent
Ret'd. on 3½" sieve				
Ret'd. on 3" sieve				
Ret'd. on 2½" sieve				
Ret'd. on 2" sieve				
Ret'd. on 1¾" sieve				
Ret'd. on 1½" sieve				
Ret'd. on 1¼" sieve				
Ret'd. on 1" sieve				
Ret'd. on ⅞" sieve				
Ret'd. on ¾" sieve				
Ret'd. on ⅝" sieve				
Ret'd. on ½" sieve				
Ret'd. on ⅜" sieve				
Ret'd. on ¼" sieve				
Ret'd. on #4 sieve				
Ret'd. on #8 sieve				
Ret'd. on #10 sieve				1.7
Ret'd. on #16 sieve				
Ret'd. on #20 sieve				
Ret'd. on #30 sieve				
Ret'd. on #40 sieve				38.5
Ret'd. on #50 sieve				
Ret'd. on #60 sieve				
Ret'd. on #80 sieve				82.2
Ret'd. on #100 sieve				
Ret'd. on #200 sieve				95.2
Loss by elutriation				4.8
Total		100.0		100.0
Fineness Modulus				

TENSILE STRENGTH
1:3 Mortar at 3 days H.E.S.
This Sand | Ottawa

L.A. Abrasion
Type
Organic Color

Type of Soundness
% Unsound

Loss By Decantation
Wt. Per C.F. ~~S.S.D.~~ 83.4
Bulk Dry
Specific Gravity 2.606
Absorption 0.2

Weight Solids
% Solids
% Voids

Remarks:

403790-471-30M

TEXAS HIGHWAY DEPARTMENT

SKID RESISTANCE RESULTS

FOR SECTION NUMBER 1

DISTRICT	COUNTY	DATE	HIGHWAY	SPEED	TRUCK NO.
11	ANGELINA	11-11-71	US 59	40	42

DATE EXISTING SURFACE WAS PLACED - 11-10-71
AVERAGE DAILY TRAFFIC - 0
PAVEMENT TYPE - NOT GIVEN
COARSE AGGREGATE TYPE - NOT GIVEN
ACP TYPE OR AGGREGATE GRADING - NOT GIVEN
ASPHALT OR CEMENT CONTENT - NOT GIVEN

LOCATION FROM STATION 304
TO STATION 261

ZERO MI.= 8.2 US 59 SB INSIDE LANE

TEST	COEF.	COMMENTS	ACC. MILES
1	0.31	STA 304	0.0
2	0.31	STA 300	0.1
3	0.27	STA 296	0.2
4	0.31	STA 292	0.3
5	0.38	STA 287	0.4
6	0.38	STA 283	0.5
7	0.36	STA 279	0.6
8	0.39	STA 275	0.7
9	0.38	STA 271	0.8
10	0.39	STA 266	0.9
11	0.42	STA 261 END	1.0

AVERAGE COEF. FOR ABOVE SECTION = 0.35

STANDARD DEVIATION = 0.04

COEF. VALUES RANGE FROM 0.27 TO 0.42

TEXAS HIGHWAY DEPARTMENT

SKID RESISTANCE RESULTS

SECTION NUMBER 8

DISTRICT	COUNTY	DATE	HIGHWAY	SPEED	TRUCK NO.
11	ANGELINA	11-23-71	US 59	40	42

DATE EXISTING SURFACE WAS PLACED - 11-10-71
AVERAGE DAILY TRAFFIC - 0
PAVEMENT TYPE - HOT MIX ASPHALTIC CONCRETE
COARSE AGGREGATE TYPE -LIMESTONE-LIGHTWEIGHT
ACP TYPE OR AGGREGATE GRADING - NOT GIVEN
ASPHALT OR CEMENT CONTENT - 0.0 PERCENT

LOCATION FROM JCT FM 2021 AT REDLAND
TO JCT FM 2021 AT LUFKIN

ZERO MI.= 92.3 US 59 SBL

TEST	COEF.		COMMENTS		ACC. MILES
			MATERIAL -	ASPHALT, %	
1A	0.28	AT PVT CHANGE STA 304	TRAPROCK -	6.5	0.7
2B	0.32	299	TRAPROCK -	6.5	0.8
3A	0.28	294	TRAPROCK -	6.0	0.9
4B	0.33	289	TRAPROCK -	6.0	1.0
5A	0.31	284	TRAPROCK -	6.5	1.1
6B	0.34	278	TRAPROCK -	6.5	1.2
7A	0.33	273	LTWT AGG'R	12.5	1.3
8A	0.30	268	LTWT AGG'R	12.5	1.4
9B	0.33	262	LTWT AGG'R	12.5	1.5
10A	0.33	257	LTWT AGG'R	12.5	1.6
11B	0.37	251	LTWT AGG'R	12.5	1.7
12A	0.39	246	CR. STN	6.5	1.8
13B	0.35	240	CR.STN&SAND	6.5	1.9
14A	0.37	234	CR.STN&SAND	6.5	2.0
15B	0.36	229	CR. STN	6.3	2.1
16A	0.33	224	CR. STN	6.0	2.2
17B	0.37	218	CR. STN	6.5	2.3
18A	0.28	RR UNDER PASS 0.2 MI SOUTH OF TEST NO 18A			2.4
	0.0	END MILEAGE AT JCT FM 2021			-92.3

AVERAGE COEF. FOR ABOVE SECTION = 0.33

STANDARD DEVIATION = 0.03

C VALUES RANGE FROM 0.28 TO 0.39

TEXAS HIGHWAY DEPARTMENT

SPECIAL SPECIFICATION

ITEM ____

PLANT MIX SEAL

1. DESCRIPTION:

This item shall consist of a wearing surface composed of a compacted mixture of mineral aggregate and asphaltic material, constructed on prepared base or surface in accordance with these specifications and to the dimensions as shown on the plans.

2. MATERIALS:

(1) Asphaltic Materials.

(a) Plant Mix Seal Material shall be of the types of asphalt cement as indicated on the plans and shall meet the requirements of the Item, "Asphalt, Oils and Emulsions". The Contractor shall notify the Engineer the source of asphaltic material prior to production of the surfacing mixture and this source shall not be changed during the course of the project except on written permission of the Engineer.

(b) Tack Coat. The asphaltic material for tack coat shall meet the requirements for emulsified asphalt EA-11M, cut-back asphalt RC-2, or shall be a cut-back asphalt made by combining 50 to 70 percent by volume of the asphaltic material as specified for the asphalt-aggregate mixture with 30 to 50 percent by volume of gasoline and/or kerosene. If RC-2 cut-back asphalt is used, it may, upon instructions from the Engineer, be diluted by the addition of an approved grade of gasoline and/or kerosene, not to exceed 15 percent by volume. Asphaltic materials shall meet the requirements of the Item, "Asphalts, Oils and Emulsions".

(2) Mineral Aggregate.

(a) Description. The mineral aggregate used shall be either crushed stone conforming to the requirements of Item 302, "Aggregate for Surface Treatments", lightweight aggregate conforming to the requirements of Item 303, "Aggregate for Surface Treatments(Lightweight) or that material as shown on the plans.

In addition to the above requirements, the mineral aggregate shall have a "Polish Value" of not less than 34, unless otherwise shown on the plans, when tested in accordance with Test Method Tex-224-F Tentative. The "Polish Value" test is a quality test for approval of the source and not a job-control test.

(b) Grades. When tested by Test Method Tex-200-F, the mineral aggregate shall conform to the following gradation limits or that shown on the plans:

	Percent by weight
Retained on 5/8" sieve	0
Retained on 1/2" sieve	0-2
Retained on 3/8" sieve	5-25
Retained on No. 4 sieve	80-100
Retained on No. 10 sieve	95-100

3. SURFACING MIXTURE:

(1) General. The mixture shall be uniform and consist of mineral aggregate and asphaltic material. For mixtures composed of crushed stone, the asphaltic material shall form from 5.0 to 7.5 percent of the mixture by weight unless otherwise shown on the plans. For mixtures composed of lightweight aggregate, the asphaltic material shall form from 10.5 to 14.0 percent of the mixture by weight unless otherwise shown on the plans.

(2) Tolerances. The Engineer will designate the asphalt content to be used in the

mixture after tests have been made with the aggregate to be used in the project. When tested, as determined by the Engineer, samples of the mixture shall not vary from the asphalt content designated by the Engineer by more than 0.5 percent dry weight(based on total mixture).

4. EQUIPMENT:

(1) Mixing Plants. Mixing plants that will not continuously meet all the requirements of this specification shall be condemned.

Mixing plants may be either the weight-batching type or the continuous mixing type. Both types of plants shall be equipped with satisfactory conveyors, power units, aggregate handling equipment, aggregate screens and bins and shall consist of the following essential pieces of equipment:

(a) Weight-batching Type.

Cold Aggregate Bin and Proportioning Device. The cold aggregate bins or aggregate stockpiles shall be of sufficient number and size to supply the amount of aggregate required to keep the plant in continuous operation. The proportioning device shall be such as will provide a uniform and continuous flow of aggregate in the desired proportion to the plant.

Dryer. The dryer shall be of the type that continually agitates the aggregate during heating and in which the temperature can be so controlled that aggregate will not be injured in the necessary drying and heating operations required to obtain a mixture of the specified temperature.

The burner, or combination of burners, and type of fuel used shall be such that in the process of heating the aggregate to the desired or specified temperatures, no residue from the fuel shall adhere to the heated aggregate. A recording thermometer

shall be provided which will record the temperature of the aggregate when it leaves the dryer. The dryer shall be of sufficient size to keep the plant in continuous operation.

Screening and Proportioning. The screening capacity and size of the bins shall be sufficient to screen and store the amount of aggregate required to properly operate the plant and keep the plant in continuous operation at full capacity. Proper provisions shall be made to enable inspection forces to have easy and safe access to the proper location on the mixing plant where accurate representative samples of aggregate may be taken from the bins for testing. Separation of hot bin into compartments will not be required providing uniform grading and asphalt content are consistently produced in the completed mix.

Aggregate Weigh Box and Batching Scales. The aggregate weigh box and batching scales shall be of sufficient capacity to hold and weigh a complete batch of aggregate. The weigh box and scales shall conform to the requirements of the Item, "Weighing and Measuring Equipment".

Asphaltic Material Bucket and Scales. The asphaltic material bucket and scales shall be of sufficient capacity to hold and weigh the necessary asphaltic material for one batch. If the material is measured by weight, the bucket and scales shall conform to the requirements of the Item, "Weighing and Measuring Equipment".

If a pressure type flow meter is used to measure the asphaltic material, the requirements of the Item, "Weighing and Measuring Equipment" shall apply.

Mixer. The mixer shall be of the pug mill type and shall have a capacity of not less than 20 cubic feet unless otherwise shown on the plans. The number of blades and the position of same shall be such as to give a uniform and complete circulation of the batch in the mixer. The mixer shall be equipped with an

approved spray bar that will distribute the asphaltic material quickly and uniformly throughout the mixer. Any mixer that has a tendency to segregate the mineral aggregate or fails to secure a thorough and uniform mixing with the asphaltic material shall not be used. This shall be determined by mixing the standard batch for the required time, then dumping the mixture and taking samples from its different parts. This will be tested by the extraction test and must show that the batch is uniform throughout. All mixers shall be provided with an automatic time lock that will lock the discharge doors of the mixer for the required mixing period. The dump door or doors and the shaft seals of the mixer shall be tight enough to prevent spilling of aggregate or mixture from the pug mill.

(b) Continuous Mixing Type.

Cold Aggregate Bin and Proportioning Device. Same as for weight-batching type of plant.

Dryer. Same as for weight-batching type of plant.

Screening and Proportioning. Same as for weight-batching type of plant.

Aggregate Proportioning Device. The hot aggregate proportioning device shall be so designed that when properly operated a uniform and continuous flow of aggregate into the mixer will be maintained.

Asphaltic Material Spray Bar. The asphaltic material spray bar shall be so designed that the asphalt will spray uniformly and continuously into the mixer.

Asphaltic Material Meter. An accurate asphaltic material recording meter shall be placed in the asphalt line leading to the spray bar so that the cumulative amount

of asphalt used can be accurately determined. Provisions of a permanent nature shall be made for checking the accuracy of the meter output. The asphalt meter and line to the meter shall be protected with a jacket of hot oil or other approved means to maintain the temperature of the line and meter at near the temperature specified for the asphaltic material.

If a pressure type flow meter is used to measure the asphaltic material, the requirements of the Item "Weighing and Measuring Equipment" shall apply.

Mixer. The mixer shall be of the pug mill continuous type and shall have a capacity of not less than 40 tons of mixture per hour. Any mixer that has a tendency to segregate the aggregate or fails to secure a thorough and uniform mixing of the aggregate with the asphaltic material shall not be used. The dam gate at the discharge end of the pug mixer and/or pitch of the mixing paddles shall be so adjusted to maintain a level of mixture in the pug mixer between the paddle shaft and the paddle tips (except at the discharge end).

Truck Scales. A set of standard platform truck scales, conforming to the Item, "Weighing and Measuring Equipment", shall be placed at a location approved by the Engineer.

(2) Asphaltic Material Heating Equipment. Asphaltic material heating equipment shall be adequate to heat the amount of asphaltic material required to the desired temperature. Asphaltic material may be heated by steam coils which shall be absolutely tight. Direct fire heating of asphaltic materials will be permitted, provided the heater used is manufactured by a reputable concern and there is positive circulation of

the asphalt throughout the heater. Agitation with steam or air will not be permitted. The heating apparatus shall be equipped with a recording thermometer with a 24-hour chart that will record the temperature of the asphaltic material at the highest temperature.

(3) Spreading and Finishing Machine. The spreading and finishing machine shall be of a type approved by the Engineer, shall be capable of producing a surface that will meet the requirements of the typical cross section and the surface test, when required, and when the mixture is dumped directly into the finishing machine shall have adequate power to propel the delivery vehicles in a satisfactory manner. The finishing machine shall be equipped with a flexible spring and/or hydraulic type hitch sufficient in design and capacity to maintain contact between the rear wheels of the hauling equipment and the pusher rollers of the finishing machine while the mixture is being unloaded.

The use of any vehicle which requires dumping directly into the finishing machine and which the finishing machine cannot push or propel in such a manner as to obtain the desired lines and grades without resorting to hand finishing will not be allowed.

Automatic screed controls, if required, shall meet the requirements of the Item, "Automatic Screed Controls for Asphaltic Concrete Spreading and Finishing Machines".

(4) Pneumatic Tire Rollers. The rollers shall be acceptable medium pneumatic tire rollers conforming to the requirements of the Item "Rolling (Pneumatic Tire)", Type B unless otherwise specified on plans.

The tire pressure of each tire shall be adjusted as directed by the Engineer and

this pressure shall not vary by more than 5 pounds per square inch.

(5) Two Axle Tandem Roller. This roller shall be an acceptable power driven tandem roller weighing not less than 8 tons.

(6) Three Wheel Roller. This roller shall be an acceptable power driven three wheel roller weighing not less than 10 tons.

(7) All equipment shall be maintained in good repair and operating condition and shall be approved by the Engineer.

(8) Alternate Equipment. When permitted by the Engineer in writing, equipment other than that specified which will consistently produce satisfactory results may be used.

5. STOCKPILING, STORAGE, PROPORTIONING AND MIXING:

(1) Aggregate Storage. If the mineral aggregates are stored or stockpiled, they shall be handled in such a manner as to prevent segregation, the mixing of the various materials or sizes, and the contamination with foreign materials. The grading of aggregates proposed for use and as supplied to the mixing plant shall be uniform. Suitable equipment of acceptable size shall be furnished by the Contractor to work the stockpiles and prevent segregation of the aggregates.

(2) Storage and Heating of Asphaltic Materials. The asphaltic material storage shall be ample to meet the requirements of the plant. Asphalt shall not be heated to a temperature in excess of that specified in the Item, "Asphalts, Oils and Emulsions". All equipment used in the storage and handling of asphaltic material shall be kept in a clean condition at all times and shall be operated in such manner that there will be no contamination with foreign matter.

(3) Feeding and Drying of Aggregate. The feeding of various sizes of aggregate to the dryer shall be done through the cold aggregate bin and proportioning device in such a manner that a uniform and constant flow of materials in the required proportions will be maintained. When specified on the plans, the cold aggregate bins shall be charged by use of a clamshell, dragline, shovel or front end loader. The aggregate shall be dried and heated to the temperature necessary to produce a mixture having the specified temperature.

(4) Proportioning. The proportioning of the various materials entering into the asphaltic mixture shall be as directed by the Engineer and in accordance with these specifications. Aggregate shall be proportioned by weight using the weigh box and batching scales herein specified when the weight-batch type of plant is used and by volume using the hot aggregate proportioning device when the continuous mixer type of plant is used. The asphaltic material shall be proportioned by weight or by volume based on weight using the specified equipment.

(5) Mixing.

(a) Batch Type Mixer. In the charging of the weight box and in the charging of the mixer from the weigh box, such methods or devices shall be used as are necessary to secure a uniform asphaltic mixture. In introducing the batch into the mixer, the mineral aggregate shall be introduced first; shall be mixed thoroughly for a period of 5 to 20 seconds, as directed, to uniformly distribute the various sizes throughout the batch before the asphaltic material is added; the asphaltic material shall then be added and the mixing continued for a total mixing period of not less than 30 seconds. This mixing period may be increased, if, in the opinion of the Engineer, the mixture is not uniform.

(b) Continuous Type Mixer. The amount of aggregate and asphaltic material entering the mixer and the rate of travel through the mixer shall be so coordinated that a uniform mixture of the specified grading and asphalt content will be produced. Checks on asphalt used shall be made at least twice daily by comparing the asphalt used in ten loads of completed mix as shown on the asphalt recording meter and the design amount for these ten loads. The acceptable percent of variation between the asphalt used and the design amount will be as shown on the plans or as determined by the Engineer.

(c) The mixture produced from each type of mixer shall not vary from the specified mixture by more than the tolerances herein specified.

(d) The Surfacing Mixture from each type of mixer will not exceed a temperature of 260° F and shall be specified by the Engineer. The temperature of the mixture will not be lower than 180° F when placed on the road.

6. CONSTRUCTION METHODS:

The tack coat or surfacing mixture shall not be placed when the air temperature is below 50° F and is falling, but it may be placed when the air temperature is above 40° F and is rising. The air temperature shall be taken in the shade away from artificial heat. It is further provided that the tack coat or surfacing mixture shall be placed only when the humidity, general weather conditions and temperature and moisture condition of the pavement surface, in the opinion of the Engineer, are suitable.

(1) Tack Coat. Before the surfacing mixture is laid, the surface upon which the tack coat is to be placed shall be cleaned thoroughly to the satisfaction of the Engineer.

The surface shall be given a uniform application of tack coat using asphaltic materials of this specification. This tack coat shall be applied, as directed by the Engineer, with an approved sprayer at a rate not to exceed 0.07 gallon per square yard of surface. Where the mixture will adhere to the surface on which it is to be placed without the use of a tack coat, the tack coat may be eliminated by the Engineer. The tack coat shall be rolled with a pneumatic tire roller when directed by the Engineer.

(2) Transporting the Surfacing Mixture. The mixture, prepared as specified above, shall be hauled to the work in tight vehicles previously cleaned of all foreign material. The dispatching of vehicles shall be arranged so that all material delivered may be placed, and all rolling shall be completed during daylight hours. In cool weather or for long hauls, canvas covers and insulating of the truck bodies may be required. The inside of the truck body may be given a light coating of oil, lime slurry or other material satisfactory of the Engineer, if necessary, to prevent the mixture from adhering to the body.

(3) Placing. The asphaltic mixture shall be spread on the approved prepared surface with the specified spreading and finishing machine, in such a manner, that when properly compacted, the finished surface will be smooth and of uniform texture and density. During application of asphaltic material, care shall be taken to prevent splattering of adjacent pavement, curb and gutter and structures.

(4) Compacting

(a) As directed by the Engineer, the surface mixture shall be compressed thoroughly and uniformly with the specified rollers and/or other approved rollers.

(b) Immediately, following placement of the asphaltic mixture, the surface shall be given complete rolling with a tandem or three wheel roller of such weight as to accomplish good density without excessive breakage of the mineral aggregate. Immediately following initial rolling, the entire surface will be rolled with the pneumatic roller as directed by the Engineer. The motion of the rollers shall be slow enough at all times to avoid displacement of the mixture. If any displacement occurs, it shall be corrected at once by the use of rakes and of fresh mixture where required. To prevent adhesion of the surfacing mixture to the roller, the wheels shall be kept thoroughly moistened with a soap-water solution. Necessary precautions shall be taken to prevent the dropping of gasoline, oil, grease or other foreign matter on the pavement, either when the rollers are in operation or when standing.

7. MEASUREMENT:

(1) The surfacing mixture will be measured separately by the ton of 2,000 pounds of "Asphalt" and by the cubic yard of "Aggregate" of the type actually used in the completed and accepted work in accordance with the plans and specifications for the project. The volume of aggregate in the compacted mix shall be calculated from the measured weights of the surfacing mixture by use of the following formula:

$$V = \frac{(W - A)}{(27)K}$$

V = Cubic Yards of truck measured aggregates

W = Total weight of surfacing mixture in pounds

A = Weight of Asphalt in pounds

K = Unit Weight of Aggregate in pounds per cubic feet

The value "K" shall be the average of two or more tests determined by the Engineer in the following manner:

At the beginning of plant operations, a specified weight of dried mineral aggregate shall be placed in an acceptable container that will contain a minimum volume of three cubic yards. The aggregate shall be leveled or "struck-off" and measured, to determine the volume of the mineral aggregate, in cubic feet. The unit weight of the mineral aggregate shall be obtained by dividing the specified weight of dried aggregate in pounds by the measured volume in cubic feet. The value "K" is an average of two or more of the above described tests.

The value "K" shall be checked a minimum of one time for each 3,000 cubic yards of mineral aggregate. If in the opinion of the Engineer or the Contractor's representative, the value of "K" has changed, a check test shall be made. A new value for "K" shall be determined if the checked value of "K" varies more than two percent (plus or minus) from the value being used.

Measurement, if mixing is done by a continuous mixer, will be made on truck scales. Measurement, if batched by weight, may be made on the batch scales and records of the number of batches, batch designs and weight of "Asphalt" and "Aggregate" shall be kept.

(2) Tack coat will be measured at the point of application on the road in gallons at the applied temperature. When gasoline and/or kerosene is added to the cut-back asphalt for tack coat, as ordered, measurement will be made after mixing.

8. PAYMENT:

(1) The work performed and materials furnished as prescribed by this item and measured as provided under "Measurement", will be paid for at the unit prices bid for "Asphalt" and "Aggregate", of the types specified, which prices shall each be full compensation for quarrying, furnishing all materials, freight involved for

all heating, mixing, hauling, cleaning the existing pavement, placing asphalt-aggregate surfacing mixture, rolling and finishing; and for all manipulations, labor, tools, equipment and incidentals necessary to complete the work except tack coat.

(2) The tack coat, measured as provided under "Measurement" will be paid for at the unit price bid for "Tack Coat", which price shall be full compensation for furnishing, preparing, hauling and placing the asphaltic materials of the grade used; and for all manipulations, labor, tools, equipment and incidentals necessary to complete the work.

(3) All templates, straightedges, scales and other weighing and measuring devices necessary for the proper construction, measuring and checking of the work shall be furnished, operated and maintained by the Contractor at his expense.