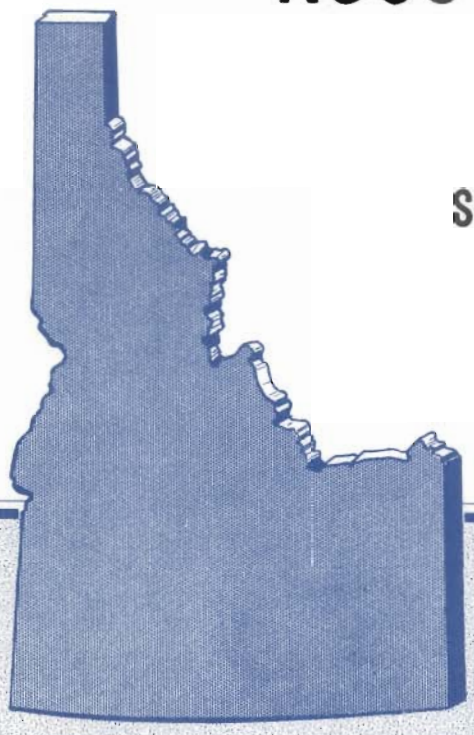
MIXING TIME STUDIES USING ROSS COUNT METHOD



SEPTEMBER 1968

RESEARCH PROJECT NO. 24

STATE OF IDAHO DEPARTMENT OF HIGHWAYS

Report on Mixing Time Studies Using the Ross Count Test Method

by

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Engineering Technician VI

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Idaho Department of Highways

Research Project No. 24

REPORT ON MIXING TIME STUDIES USING THE ROSS COUNT TEST METHOD

INTRODUCTION

The Idaho Department of Highways Standard Specifications for Highway Construction, 1967 Edition, gives the Engineer the responsibility of determining mixing time for plantmix paving. Prior to 1967, the specifications required a minimum finish wet mixing time of 30 seconds for batch plants. Continuous plantmixing time was controlled by the output in lbs./sec. This output was not to be greater than the dead weight capacity of the pugmill in pounds, divided by 30.

In May 1968, mixing time studies were undertaken using the Ross Count Test Method. The purpose of these studies was to determine the mixing times being used by the plants throughout Idaho, to determine the effectiveness of the mixing using the Ross Count criteria and to determine a minimum allowable mixing time using the same criteria.

PROCEDURE

A proposed testing procedure (included in the appendix) was established through a review of existing literature and reports of mixing time studies. Reports of The Kansas State Highway Commission and The Bureau of Physical Research of The New York Department of Transportation were of particular assistance. The method of determining when a mix is "mixed" seem to vary from state to state. The Kansas Highway Commission has recommended the use of the Marshall Stability Test to control mixing time. The New York Department of Transportation has found the use of the Ross Count Test satisfactory for establishing specifications for mixing time. It should be noted that both states feel that mixing time should be established on an individual basis for each hot plant.

Arrangements were made with the Districts for personnel from the Materials and Research Division to perform the tests at the various hot plant locations throughout the State. (trip reports included in appendix)

Mix Cycle Timing

Batch plant mix cycles were timed by observing both the timing lights on the control panel and the physical operations of the plant, including scale dial movements, pugmill discharge gate opening and closing, and weigh box and asphalt bucket discharge. Samples for Ross Counts and Asphalt Extraction Tests were obtained after establishing the mixing cycle time elements for the plant's regular production mixing time. Additional tests were made at increased or decreased wet mixing times, depending on the Ross Count Test Results of the plant's regular production mixing time.

Continuous plantmixing times were obtained at the plant's regular production output by using the dead weight capacity of the pug-mill. The following formula was used to obtain the mixing time:

$$\text{Mixing Time} = \frac{\text{Pugmill dead weight capacity in lbs.}}{\text{Plant output in lbs./sec.}}$$

Due to the difficulty and delay involved, no attempt was made to vary the mixing time of continuous plants.

SAMPLING PROCEDURE

Samples for Ross Counts and Asphalt Extractions were obtained from the truck whenever possible. At batch plants utilizing surge hoppers for storage of the asphalt mix, some of the samples were obtained from the conveyor belt leading from the holding hopper under the pugmill. Material from opposite sides of a batch were obtained to make a total of two Ross Counts and two Extraction Tests for each mixing cycle time. The results of the two Ross Counts were averaged to obtain the percent asphalt coating for each cycle time.

ROSS COUNT PROCEDURE

The Ross Counts were conducted in accordance with the proposed Ross Count Test Method included in the appendix.

RESULTS

A tabulation of Ross Count test results from hot plants that have been tested to date, is included in the appendix.

For this study minimum specifications for asphalt retention was 90% for Asphalt Treated Bases and 95% for plant mixes.

The mixing times established in Table I and II for continuous plants are probably in error because the exact volume of the pugmill was not calculated.

DISCUSSION OF PROCEDURES AND RESULTS

No problems were encountered in timing the mix cycles of batch plans.

Difficulties in obtaining the volume of the pugmill and the production rate in tons per hour were encountered in continuous mix plants. Most of the difficulties occurred because of modifications to the plant, non-continuous flow of material, and lack of proper equipment and plant information to accurately measure the volume of the pugmill. Mixing time tests conducted in the future should concur with the following procedure when sampling continuous mix plants:

1. The depth of the material in the pugmill must be measured, usually from the surface to the bottom longitudinal center line of the pugmill. A pointed 3/8" diameter rod, 4 feet long is recommended for measuring purposes. This measurement must be made with the plant shut down and at the production rate being timed. A volume can be determined from the manufacturer's plant manual when the depth has been obtained.

2. A loose unit weight is obtained to compute the weight of material in the pugmill. The sample of material for the unit weight test should be taken from the pugmill whenever possible.

3. The production rate must be determined by weighing a number of truck loads of material over a known period of time. Any shutdown time during the timing period must be subtracted from the total time.

4. The use of a surge hopper will make the determination of the production rate more difficult. If a surge hopper is encountered the timing cycle may be determined either by beginning and ending with an empty hopper, or by beginning and ending with the material at a given depth.

Sampling of the plantmix material for Ross Counts and Extractions appears to be a problem when a surge hopper is used in conjunction with a batch plant. Samples were taken from the conveyor belt under the pugmill in order to keep track of a single batch. It was noted at one plant that the sample material was not completely coated when removed from the conveyor belt. However, completely coated material was obtained from the

truck after going through the surge hopper. For this reason the sample should be taken from the truck.

A 3/8" screen was used to obtain the coarse particles for the Ross Counts. A #4 screen, used on several 1/2" minus samples, was quickly plugged with asphalt. Possibly a 1/4" screen could be used on very fine mixes to some advantage, although a 3/8" screen is adequate in most cases.

Care must be taken to conduct the Ross Count in a location that is protected from wind and dust. Dust specks on the aggregate are very difficult to discern from uncoated "pin prick" spots.

One-half gallon paint cans with attached wire bail handle, and the sealing rim cut out were found to be adequate for sampling material from the truck.

Asbestos gloves, wire screen brushes, spatulas, and a quantity of solvent (socal) are necessary items in conducting a successful test.

CONCLUSIONS

The following factors are felt to influence the coating of aggregate in an asphalt hot plant:

1. Asphalt and aggregate temperature.
2. Percent of asphalt used.
3. Residual moisture content of the aggregate after drying.
4. Aggregate characteristics (soundness, angularity, absorption, etc.)
5. Condition of the pugmill (paddle wear, paddle clearance, etc.)
6. Mixing time.

All of the above factors vary from project to project. Some plants will produce "mixed" mixes in less than 30 seconds wet mixing time; others will require wet mixing time in excess of 50 seconds. The following example illustrates the variance of mixing time and the subsequent Ross Count results:

> One batch plant checked had a production finish wet mixing time of 30 seconds. Samples showed a Ross Count of 91% retention. A second batch plant, with an exceptionally long asphalt application had 99% coverage even though the finish wet mixing time was reduced from 30 seconds to 15 seconds.

From this brief study it would appear that each plant has an optimum mixing time for the most efficient and economical production of asphaltic mixes.

Extra extraction samples were taken from projects using lime filler. These samples are being used to develop a test for the recovery of lime from plantmix samples (see "A Report of Preliminary Findings on Studies of Lime Content of Plantmix Asphalts"). In relation to lime content and mixing cycles; it has been observed that most of the lime is being added without the benefit of a dry mix cycle. The question arises as to whether the addition of lime directly into a pugmill where the asphalt application has already started will produce a uniform distribution of lime throughout the mix. While it is felt a dry mix cycle is not necessary to produce a well coated aggregate; it may be very beneficial in distributing the lime before the addition of asphalt.

RECOMMENDATIONS

Data gathered in this study indicates that the Engineer should be responsible for determining the optimum mixing time for each asphalt plant.

The Ross Count Test appears to be an important guide in helping to establish a minimum mixing time.

A P P E N D I X

MIXING TIME FOR PLANTMIX PAVING MIXES

PURPOSE - The purpose of this investigation is to determine the effects of mixing time upon the coating of the aggregate and to determine the variations in asphalt content and gradation in a single batch of plantmix at the various mixing times.

SCOPE - A minimum of six different plantmix plants will be investigated; hopefully, 3 batch plants and 3 continuous plants. At each batch plant, mixing times will be varied on ± 5 second intervals from the production mixing time.

At each time cycle 2 samples will be obtained for a Ross Count to determine degree of coating. There will also be 2 samples obtained for extraction of asphalt and gradations.

At each continuous plant, two Ross Count samples and 2 gradation and extraction samples will be taken at the production mixing time.

PROCEDURE

1. Prior to sampling, all cycle time elements shall be determined by observing the mixing operation. Cycle time elements to observe and "Time" are defined as follows:

    a. Cycle Time - The interval of time between successive openings of the pugmill discharge gate for succeeding batches.

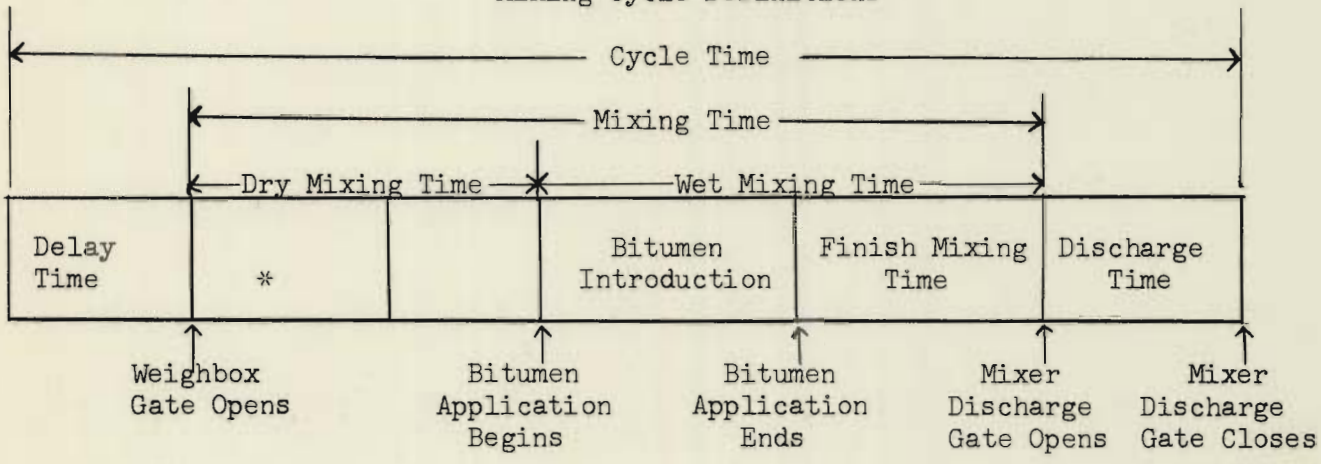
    b. Mixing Time - The interval of time between the opening of the aggregate weighbox gate and the opening of the pugmill discharge gate.

    c. Dry Mixing Time - The interval of time between the opening of the aggregate weighbox gate and the beginning of application of bituminous material.

d. Wet Mixing Time - The interval of time between the beginning of application of bituminous material and the opening of the pugmill discharge gate.

e. Finish Mixing Time - The interval of time between the termination of application of bituminous material and the opening of the pugmill discharge gate.

Mixing Cycle Definitions



*Weigh Hopper Discharge Time

Delay Time occurs when the cycle time is so short that it results in a production rate exceeding the operating capacity of the plant. This may occur during some of the short test periods but since it is not economical these periods should not be prolonged.

2. The Cycle Time of the plant should be observed and timed several times during the sampling period. This is only for checking the uniformity of the plant operation.

3. Project personnel should check the cycle time of the plant several times daily (5 minimum) for at least 10 days (if project continues that long).

4. From each batch being sampled, samples should be taken for 2 Ross Count determinations and for 2 extractions and gradations. These will

determine the degree of coating of the mix, the variation in asphalt content in the mix, and the variation in the gradation of the mix. The samples for extraction and gradation will be sent to the Central Lab.

BATCH PLANTS

Cycle Time on batch plants will be varied from the production mixing time at ± 5 second intervals. Ross Count samples and extraction and gradation samples will be taken from each batch at each cycle time as specified under Paragraph 4 in the Procedure. For surface paving courses the Ross Count must indicate at least 95% coating. Base courses must have a coating of at least 90%.

CONTINUOUS PLANT

Since it is a major operation to adjust the time cycle on a continuous plant only the production cycle time will be sampled. The same testing will be done on these plants as on the batch plants.

As a result of these tests it may be possible to adjust the Cycle Time on these plants to provide the most effective and efficient operation for the contractor. This will be the point where there is no Delay Time in the cycle unless the operating capacity of the plant is such that the optimum mixing Cycle Time is shorter than required. Should this occur, the mixing Cycle Time will be lengthened to eliminate the Delay Time.

ROSS COUNT TEST METHOD

This test is for determining the degree of coating of a hot asphaltic concrete mixture in relation to mixing time.

This method is based on the premise that when mixing, the coarse aggregate is the most difficult and last to coat with asphalt.

SAMPLING

The problem in this test is to obtain a representative sample and separate the coarse fraction for counting. It is desirable to obtain a sample with a coarse fraction count of from 200 to 400 coarse particles.

The screens to be used shall be as follows:

For 1/2" max. size aggregate, a 1/4" screen may be used.
For 1/2" to 1" max. size aggregate, a 3/8" screen may be used.
For plus 1" max. size aggregate, a 1/2" screen may be used.

Samples may be taken from the truck by pushing the top surface of the load back and filling the container with a shovel or small scoop. Two samples should be taken from each batch being tested. These should be taken from opposite sides of the load from an area where no segregation is evident, and each sample processed separately.

Whenever it is felt that the short mixing time will produce an unacceptable batch, that batch should be the first discharged into the truck and immediately counted so that it can be disposed of, if necessary, without also having to waste other batches.

SCREENING

As soon as the sample is taken it should immediately be screened over the screen selected. The mix should have a temperature of between 250°F. and 350°F. Immediately after screen, brush the screen with a wire brush to remove excessive asphalt mix.

COUNTING

A flat work table is necessary. Spread sheet of manila paper on the table and dump the coarse sample. In counting, any particle that shows a spot, even pin point size, is counted as uncoated. Group the counted particles, placing the uncoated ones on one side and the coated ones on the other. The percentage coated and uncoated is obtained by dividing the total number of each by the total number of coarse particles.

Counting in normal daylight is the best but a flood light may be used if necessary.

After the particles have been separated and piled, it is advisable to roll the particles in each coated pile slightly to see if any uncoated particles have been missed.

REPORTING

The report should contain the following information as a minimum:

Mix - 1. Date
2. Size and Class of Aggregate
3. Type and % Filler (if any)
4. Job Mix Formula
5. Grade of Asphalt, Source
6. % Asphalt
7. Mixing Time

Plant - 1. Location
2. Make
3. Type
4. Batch Size
5. Dry Mixing Time
6. Wet Mixing Time
7. Condition of Pugmill
8. Temperature of Mix

Any other information which might be helpful or pertinent should be given.

APPARATUS

1. Container with bail, 1/2 to 1 gallon capacity.
2. Square nosed shovel, preferably short handle, or hand scoops.
3. Heavy gloves. (asbestos)
4. Asphalt mix thermometers.
5. Sample containers. (sacks, for extraction tests)
6. One or more box type screens of the size required for the mix.
7. Several sheets of manila paper, approximate 24" x 36".
8. Flat work table.
9. A vertically adjustable flood light, if required.

10. Stiff wire brush.
11. Small round blade spatula.
12. Solvent (socal) & cleaning rags.

Following is a sample form for recording information in the Ross Count Test.

PLANTMIX PAVING MIXING TIMES

District _____ Mix Type _____ Date _____

Plant _____ Location _____

CYCLE TIME ELEMENTS

Delay	Weigh-Box Discharge	Additional Dry Mixing	Asphalt Application	Finish Mixing	Pugmill Discharge
	Total Dry Mix Time		Total Wet Mix Time		

Sample Identification	Particles Coated	Particles Not Coated	Total Particles Counted	Percent Coated

PLANTMIX PAVING MIXING TIMES - CONTINUOUS MIX PLANT

District _____ Mix Type _____ Date _____

Plant _____ Location _____

Pugmill Capacity (Cu.Ft.) _____

MIXING TIME DATA

Volume in Pugmill Cu. Ft.	Weight of Material in Pugmill, lbs/Cu.Ft.	Output * Tons/Hr.	Mixing Time

* To convert to lbs./sec. divide T/Hr. by 1.8 or multiply by 0.556

Formulae:

$$T = \frac{P}{C}$$

P = Pugmill dead capacity in pounds *
C = Output, lbs./sec.

* Volume in Pugmill (Cu.Ft. x Weight of Material)(lbs./Cu.Ft.)

$$T = \frac{KWV}{C_1}$$

K = Constant, 1.8
W = Loose Weight of Material in Pugmill
V = Volume of Material in Pugmill
C_1 = Output, T/Hr.

ROSS COUNT DATA

Sample Identification	Particles Coated	Particles Not Coated	Total Particles Counted	Per Cent Coated

TABLE NUMBER I

Project: F-2351(7)

Location: Gooding - Shoshone

Contractor: Holmes Construction Co.

Plant Type: Pioneer Continuous

Capacity:

Type of Mix: Class G Plantmix

Type of Asphalt: 85-100 Pen, American Oil Company

Percent Asphalt Intended: 6.0

Pit No.: LN-67

Filler: 1% Lime

MIXING TIME

Sample Identification	Volume in Pugmill Cu.Ft.	Weight of Material in Pugmill, lbs/Cu.Ft.	Output * Tons/Hr.	Mixing Time
601 & 602	50.6	100.4	285	32

ROSS COUNT

Sample Ident.	Particles Coated	Particles Not Coated	Percent Coated	Average % Coated
601	250	5	98.0	
602	200	9	96.0	97.0

TABLE NUMBER II

Project: I-IG-15W-4(11)76 "A"

Location: Pocatello Airport

Contractor: Burggraf

Plant Type: Barber Green Continuous

Capacity:

Type of Mix: Class "D" Plantmix

Type of Asphalt: 60-70 Pen, American Oil Company

Percent Asphalt Intended: 5.5

Pit No.: Bk-114s

Filler: 1% Lime

MIXING TIME

Sample Identification	Volume in Pugmill Cu.Ft.	Weight of Material in Pugmill, lbs/Cu.Ft.	Output * Tons/Hr.	Mixing Time
601 & 602	89.2	106.2	410	41.6

ROSS COUNT

Sample Ident.	Particles Coated	Particles Not Coated	Percent Coated	Average % Coated
601	160	3	98	
602	200	6	97	97.5

TABLE NUMBER III

Project: S-1721(11)

Location: Aberdeen Streets

Contractor: Burggraf - Nelson

Plant Type: Pioneer Continuous

Capacity:

Type of Mix: Class "G" Plantmix

Type of Asphalt: 85-100 Pen., Farmers Union

Percent Asphalt Intended: 5.8

Pit No.: Bg-87

Filler: None

MIXING TIME

Sample Identification	Volume in Pugmill Cu.Ft.	Weight of Material in Pugmill, lbs/Cu.Ft.	Output * Tons/Hr.	Mixing Time
601A & B	43.8	106.18	135.5	61.8
603A & B	43.8	106.18	131.7	63.6

ROSS COUNT

Sample Ident.	Particles Coated	Particles Not Coated	Percent Coated	Average % Coated
601A	214	1	99.5	
601B	225	0	100.0	
602A	187	0	100.0	
602B	230	0	100.0	
603A	170	1	99.4	
603B	191	2	99.0	99.7

TABLE NUMBER IV

Project: I-15-1(16)37

Location: Virginia - Arimo

Contractor: Western; Paving Contractor: Allied Paving

Plant Type: Hetherington - Berner Batch Plant

Capacity: 7000 # Batch (producting 6000# batches)

Type of Mix: Plantmix - Job mix formula

Type of Asphalt: 85-100 Pen, American Oil Company

Percent Asphalt Intended: 5.2

Pit No.: Bk-112

Filler: 1% Lime, Fk-58 (approx. 6%)

MIXING TIME

	Total Dry Mix Time		Total Wet Mix Time		
Ident. No.	Weighbox Discharge	Add'l. Dry Mix	Asph. Appl. *	Finish Mixing	Pugmill Discharge
601A & B	3.0		5.0	30.0	6.0
602A & B	3.0		5.0	25.0	6.0
603A & B	3.0		5.0	25.0	6.0
604A & B	3.0		5.0	30.0	6.0

* No actual dry mix time - weigh box discharge and asphalt application began at same time.

ROSS COUNT

Sample Ident.	Particles Coated	Particles Not Coated	Percent Coated	Average % Coated
601A	253	3	98.9	
601B	206	4	98.0	98.5
602A	283	69	80.5	
602B	228	61	78.9	79.7
603A	252	43	84.1	
603B	220	73	75.2	79.7
604A	212	0	100.0	
605B	224	0	100.0	100.0

TABLE NUMBER V

Project: I-IG-15W-4(11)76 "A"

Location: Pocatello West

Contractor: Peter Kiewit

Plant Type: Cedar Rapids Batch

Capacity: Producing 9500# Batches

Type of Mix: 3/4" ATB

Type of Asphalt: 60-70 Pen, American Oil Company

Percent Asphalt Intended: 5.0

Pit No.: Pw-69s

Filler: 1% Lime

MIXING TIME

	Total Dry Mix Time		Total Wet Mix Time		
Ident. No.	Weighbox Discharge	Add'l. Dry Mix	Asph. Appl. *	Finish Mixing	Pugmill Discharge
601A & B	3.5		7.0	27.0	8.0
602A & B	3.5		7.0	22.0	8.0
603A & B	3.5		7.0	17.0	8.0

* No actual dry mix time - weighbox discharge and asphalt application began at same time.

ROSS COUNT

Sample Ident.	Particles Coated	Particles Not Coated	Percent Coated	Average % Coated
601A	191	0	100.0	
601B	200	0	100.0	100.0
602A	216	1	99.5	
602B	231	3	98.7	99.1
603A	288	33	89.7	
603B	195	18	91.5	90.6

TABLE NUMBER VI

Project: F-1031(17)

Location: 4th Avenue, Pocatello

Contractor: Bannock Paving

Plant Type: Cedar Rapids Batch

Capacity: 3000# (producing 3000# batches)

Type of Mix: 3/4" ATB

Type of Asphalt: 60-70 Pen Phillips Petroleum Company

Percent Asphalt Intended: 5.0

Pit No.: Bk-100

Filler: 1% Lime

MIXING TIME

	Total Dry Mix Time		Total Wet Mix Time		
Ident. No.	Weighbox Discharge	Add'l. Dry Mix	Asph. Appl. *	Finish Mixing	Pugmill Discharge
601A & B	2.0		9.0	30.0	18.0
602A & B	2.0		9.0	30.0	18.0
603A & B	2.0		9.0	35.0	18.0
604A & B	2.0		9.0	39.0	18.0

*No actual dry mix time - weighbox discharge and asphalt application began at same time.

ROSS COUNT

Sample Ident.	Particles Coated	Particles Not Coated	Percent Coated	Average % Coated
601A	195	17	92.0	
601B	185	21	89.8	90.9
602A	237	16	93.7	
602B	213	17	92.7	93.2
603A	277	11	96.3	
603B	237	13	94.8	95.6
604A	301	6	98.0	
604B	234	3	98.7	98.4

TABLE NUMBER VII

Project: S-4769(5) & F-4201(21)

Location: Spaulding - Arrow Jct.

Contractor: Degerstrom; Paving Contractor: L. W. Vail

Plant Type: Standard Batch

Capacity: 5000# (Producing 5000# Batches)

Type of Mix: Class "D" Plantmix

Type of Asphalt: 85-100 Pen, Shell Oil Company

Percent Asphalt Intended: 6.1

Pit No.: NP-115

Filler: None

MIXING TIME

	Total Dry Mix Time		Total Wet Mix Time		
Ident. No.	Weighbox Discharge	Add'l. Dry Mix	Asph. Appl. *	Finish Mixing	Pugmill Discharge
601A & B	6.0		16.0	30.0	4.0
602A & B	6.0		16.0	25.0	4.0
603A & B	6.0		16.0	20.0	4.0
604A & B	6.0		16.0	15.0	4.0

ROSS COUNT

Sample Ident.	Particles Coated	Particles Not Coated	Percent Coated	Average % Coated
601A	257	0	100.0	
601B	265	1	99.7	99.9
602A	301	3	99.2	
602B	252	0	100.0	99.6
603A	233	1	99.6	
603B	219	1	99.7	99.7
604A	206	2	99.2	
604B	209	1	99.6	99.4

TABLE NUMBER VIII

Project: I-IG-80N-1(22)50 "A"

Location: Boise, West

Contractor: Boise Asphalt Paving

Plant Type: Madsen Batch Plant

Capacity: 3000# (Producing 3,030# Batches)

Type of Mix: Class "D" Plantmix

Type of Asphalt: 85-100 Pen., Husky

Percent Asphalt Intended: 6.2

Pit No.: Ad-86

Filler: 1% Lime

MIXING TIME

	Total Dry Mix Time		Total Wet Mix Time		
Ident. No.	Weighbox Discharge	Add'l. Dry Mix	Asph. Appl. *	Finish Mixing	Pugmill Discharge
601A & B	3.0		7.0	32.0	4.5
602A & B	3.0		7.0	25.0	4.5
603A & B	3.0		7.0	20.0	4.5
604A & B	3.0		7.0	15.0	4.5

ROSS COUNT

Sample Ident.	Particles Coated	Particles Not Coated	Percent Coated	Average % Coated
601A	217	3	98.7	
601B	209	4	98.3	98.5
602A	240	4	98.4	
602B	249	2	99.3	98.9
603A	250	6	97.7	
603B	246	2	99.2	98.5
604A	248	31	88.9	
604B	221	20	91.8	90.4

DH-500 4-'65

STATE OF IDAHO
DEPARTMENT OF HIGHWAYS

Intra-Department
Correspondence

To: MATERIALS & RESEARCH ENGINEER

Date: AUGUST 6, 1968

From: MATERIALS SECTION

By: Larry A. Hippler
LARRY A. HIPPLER
ENGINEERING TECH. VI

Subject: TRIP REPORT, JULY 31 THROUGH AUGUST 2, 1968

Project: RESEARCH NO. 24
(HOT PLANT MIXING TIME STUDIES IN DISTRICT FOUR)

ON JULY 31, BARRY TYLER, ENGINEERING TECH. V, AND I TRAVELED TO DISTRICT FOUR FOR THE PURPOSE OF OBTAINING HOT PLANT MIXING TIME AND ROSS COUNT TEST ON PROJECT S-4769(5), F-4201(21); SPAULDING TO ARROW JCT.

THIS WAS A "STANDARD" BATCH PLANT, 5000 POUND BATCH CAPACITY. THE CONTRACTOR WAS DEGERSTROM, WITH L. W. VAIL SUBCONTRACTOR FOR THE PAVING OPERATION. THIS PLANT WAS PRODUCING CLASS "D" PLANT MIX WITH 6.1% 85-100 PEN ASPHALT. BATCH WEIGHT WAS 5000 POUNDS.

AT REGULAR PRODUCTION TIME THE BATCH RECEIVED A 4.5 SECOND DRY MIX CYCLE, 16.0 SECOND ASPHALT APPLICATION (BY SPRAY) AND A FINISH WET MIX TIME OF 30 SECONDS. THE BATCHES WERE DROPPED DIRECTLY INTO THE TRUCKS FROM THE PUGMILL. THE FOLLOWING ROSS COUNT TESTS AT THE INDICATED TOTAL WET MIX TIMES WERE OBTAINED:

46 SECONDS (REGULAR PRODUCTION MIXING TIME)	100% COATING
41 SECONDS	100% COATING
36 SECONDS	100% COATING
31 SECONDS	99% COATING

THE LAST TWO TESTS (AT 36 AND 31 SECOND MIXING TIME) HAD THE APPEARANCE OF EXCESSIVE FREE ASPHALT IN THE MIX. THE AGGREGATE, A RIVER RUN BASALT FROM NP-115 WAS FAIRLY SMOOTH WITH VERY FEW PIECES OF EXTREMELY ANGULAR AGGREGATE OR AGGREGATE WITH CAVITIES APPARENT.

GB

cc: ASHE(E)
ASHE(O)
CONSTRUCTION ENGINEER
DISTRICT FOUR ENGINEER
RESIDENT ENGINEER

DH-500 4-'65

STATE OF IDAHO
DEPARTMENT OF HIGHWAYS

Intra-Department
Correspondence

To: MATERIALS & RESEARCH ENGINEER **Date:** JULY 31, 1968

From: MATERIALS SECTION **By:** Larry Hippler
LARRY HIPPLER
ENGINEERING TECH. VI

Subject: TRIP REPORT, JULY 23 THROUGH JULY 26, 1968 **Project:** RESEARCH NO. 24 (HOT PLANT MIXING TIME STUDIES IN DISTRICT ONE)

ON JULY 23, BARRY TYLER, ENGINEERING TECHNICIAN V, AND I TRAVELED TO DISTRICT ONE FOR THE PURPOSE OF OBTAINING HOT PLANT MIXING TIMES AND ROSS COUNTS ON VARIOUS SURFACING PROJECTS IN THE DISTRICT. FOLLOWING IS A SUMMARY OF HOT PLANT OPERATIONS AND TEST RESULTS ON EACH PROJECT VISITED.

I-IG-15W-4(11)76 SEC A POCATELLO WEST
CONTRACTOR: PETER KIEWIT
PLANT: CEDAR RAPIDS BATCH

THIS PLANT WAS PRODUCING 3/4" ATB WITH 5% 60-70 PEN ASPHALT AND 1% LIME FILLER. THE BATCH WEIGHT WAS 9,500 POUNDS. THE BATCHES WERE DROPPED FROM THE PUGMILL INTO A LARGE BIN. THE MATERIAL WAS CARRIED FROM THE BIN BY A SMALL CONVEYOR BELT TO A LARGE PRIMARY CONVEYOR BELT WHICH LED TO A LARGE CAPACITY SURGE HOPPER. THE TRUCKS THEN LOADED FROM THE SURGE HOPPER. THE FOLLOWING ROSS COUNTS AT THE INDICATED TOTAL WET MIX TIMES WERE OBTAINED:

34 SECONDS (REGULAR PRODUCTION TIME)	100% COATING
29 SECONDS	99% COATING
24 SECONDS	91% COATING

NOTE THAT THE FIRST FIVE SECOND CUT IN MIXING TIME STILL PRODUCED ALMOST COMPLETE COATING:

F-1031(17) 4TH AVE. POCATELLO
CONTRACTOR: BANNOCK PAVING
PLANT: CEDAR RAPIDS BATCH - 3000 POUND CAPACITY

THIS PLANT WAS ALSO PRODUCING 3/4" ATB WITH 5% 60-70 PEN ASPHALT AND 1% LIME FILLER. THE BATCH WEIGHT WAS 3000 POUNDS. THIS PLANT WAS OPERATED BY MANUALLY CONTROLLED LEVERS, AND MIXING TIME SEEMED TO BE CONTROLLED ONLY BY THE LENGTH OF TIME IT TOOK THE OPERATOR TO COMPLETE FILLING THE AGGREGATE AND ASPHALT WEIGH BOXES FOR THE NEXT BATCH. THE MATERIAL WAS DROPPED FROM THE PUGMILL INTO A HOPPER WHERE A SHORT CONVEYOR BELT UNLOADED DIRECTLY INTO THE TRUCKS. THE PRODUCTION TOTAL WET MIX TIME AVERAGED ABOUT 41 SECONDS ALTHOUGH MIX TIME AS LOW AS 37 SECONDS AND AS HIGH AS 49 SECONDS WERE OBSERVED. AS NOTED BY THE ROSS COUNTS BE-

TIME FORMULA. OBSERVATION OF THE MIX IN THE TRUCK INDICATED ADEQUATE ASPHALT COVERAGE. APPARENTLY THE CONTRACTOR AND THE DEPARTMENT PROJECT PERSONNEL HAD NEVER ATTEMPTED TO OBTAIN MIXING TIMES ON THIS PLANT OR THE CONTINUOUS PLANT AT ABERDEEN.

WE ALSO OBTAINED EXTRA PLANT MIX SAMPLES, AND AGGREGATE SAMPLES FROM THE STOCKPILES FROM THE THREE PROJECTS USING 1% LIME FILLER. THESE SAMPLES WERE REQUESTED BY CHUCK HUMPHREY, MATERIALS ENGINEER, FOR LIME RECOVERY STUDIES.

GB

CC: ASHE(O)
MATERIALS & RESEARCH ENGINEER
CONSTRUCTION ENGINEER
DISTRICT ONE ENGINEER
DISTRICT ONE MATERIALS ENGINEER