Appendix E

Hot Plant Inspection Manual

MONTANA
DEPARTMENT
OF TRANSPORTATION

Updated June 2022

Montana Department of Transportation

Hot Plant Inspection Manual

Mark Beckedahl

Engineering Project Manager

Great Falls District

Updated

by

Construction Engineering Services Bureau

June 2022

FIELD SUPPLIES

FIELD DOCUMENTS:

Copy of approved Plant Mix Design
Form CB 31 - Daily Plant Mix Form
Form SHRP 57 - Asphalt Material Report (for PG Binder samples)
Form 101-C - Asphalt Material Report (for SS-1 tack samples)
Form MBA 123 - Aggregate Test Work Sheet

MISCELLANEOUS SUPPLIES:

Pens, Pencils, Permanent Markers, Calculator
Laptop Computer, Thumb Drive
Asphalt Temperature-Volume & Specific Gravity Conversion Charts (lbs/gal)
Asphalt Institute "Pocket Book of Useful Information"
Personal Protective Equipment (PPE) - Hard Hat, Vest, Heavy Gloves, Eye & Ear Protection, Proper Footwear & Clothing

TEST TRAILER SET UP

TESTING EQUIPMENT:

+4 Mesh Screens - Check condition and order in nest of sieves
-4 Mesh Screens - Check condition and order in nest of sieves
Scales - Check condition & balance
Splitters - Set to proper spacing (spacing set to twice tested aggregate)

TRAILER SUPPLIES:

-metal sample cans
-plastic sample cans sample
-tags/labels canvas sample
-bags
-brown paper sacks (for hydrated lime)
-propane bottles filled
-water tank filled

TRAILER SETUP:

proper power supply hooked up (60 Hz)*
trailer set up level and 200 feet from the plant*

*standard specification 210.03.7 or special provision

TEMPERATURE-VOLUME CORRECTION TABLE

Inspectors must select proper asphalt material tables from national publications such as:

The Asphalt Institute Pocket Book of Useful Information,
Manual Series No. 6 (MS-6)

HOT PLANT COMPONENTS and OPERATION

Due to evolving technologies, numerous hot mix asphalt (HMA) plant types, and varying construction equipment, inspectors are encouraged to obtain a copy of and become familiar with publications such as: "The Asphalt Institute, MS-22, Construction of Hot Mix Asphalt Pavements"

EXAMPLE: Hot Plant Control House Setup

Standard Specification 401.03.2.A.10. (automatic weighing)

PMS load tickets should have the following information printed on each ticket:

PROJECT NO. (shown on plans)
ITEM NAME (e.g. "Grade S mix")
DATE
TIME
TICKET NO. (two copies numbered consecutively)
HAUL UNIT NO.
LOAD (net tons)
SUBTOTAL of ACCUMULATED TONS / EACH HAUL UNIT / SHIFT
ACCUMULATED TOTAL TONS for SHIFT

Standard Specification 401.03.2.A.6 - Thermometric Equipment

The Contractor should have a temperature probe installed in the Asphalt Cement (AC) feed line with a direct readout in the control house. This information should also be recorded (printed) on the hot plant production monitor.

Standard Specification 401.03.2.D.8 - Production Monitor-Recorder

Record the following shown on the production monitor:

AGGREGATE WEIGHT (tons/hr)
HYDRATED LIME (tons/hr / ton asphalt)
FEED RATE (tons/hr)

INFORMATION NEEDED for production start up:

% ASPHALT CEMENT (AC)

% HYDRATED LIME

TYPE AC

UNIT WEIGHT of AC (lbs/gal) SPECIFIC GRAVITY of AC

MIXING TEMPERATURE RANGE

% MOISTURE in VIRGIN AGGREGATE

ASPHALT CEMENT METER CALIBRATION

Standard Specification 401.03.2.D.7

Dryer Drum Mixing Plant

TOLERANCE: ± 0.20% of measured quantity/ 3,000 gpm calibration quantity to be pumped

CALIBRATION PROCEDURE:

1. Determine asphalt cement (AC) unit weight (example: 8.5 lbs/gal)
2. Tare weigh receiving tanker*
3. Hook up supply line between AC pump and tanker; purge line*
4. "Zero" up AC meter in control shack/house*
5. Begin pumping 3,000+ gallons*
6. Stop pumping; close valve at tanker; reverse pump supply line to main storage tank*
7. Weigh filled tank*

*Performed by Contractor only. Inspector observes and documents.

WEIGHING PROCEDURE:

Given 3,100 gallons are pumped and displayed on control readout at control house; Unit weight AC = 8.5 lbs/gal

3,100 gal x 8.5 lb/gal = 26,350 lb (theoretical weight)

Tanker plus Tare	36,341 lb (per certified scale)
Weight: Tanker	-10,000 lb (per certified scale)
Tare Weight:	26,341 lb (actual weight of AC pumped)
Net Scale Weight:	

26,341 x 0.20% = ± 52.68 lb (tolerance range)

26,350 - 26,341 = 9 lb (0.034%)

-Calibration is OK-

Obtain a Materials Safety Data Sheet (MSDS) copy from the contractor, as well as a copy of procedures for "Removing Tar/Asphalt from a Burn". Become familiar with precautions prior to material exposure and handling.

ASPHALT CEMENT METER CALIBRATION

(Use this procedure when platform scale is located a long distance from hot plant.)

EXAMPLE:

Haul truck fuel consumption is 6 mpg (if possible ask driver for fuel consumption).

The certified platform scale is 15 miles from the hot plant, or 30 miles round trip at 6 mpg, equaling 5 gal fuel used per round trip. At 7 lb/gal, 35 lbs less tare weight is measured during weighing.

EXAMPLE:	3,100 gal AC pumped at 8.5 lbs/gal	= 26,350
	original tare weight at certified scale:	10,000 lbs
	fuel weight loss:	- 35 lbs
		9,965 lbs
	tare plus gross weight of AC:	36,306 lbs
	adjusted tare weight:	- 9,965 lbs
	net scale weight:	26,341 lbs actual weight pumped

See previous "Asphalt Cement Meter Calibration" sheet for weight comparison.

HYDRATED LIME OR MINERAL FILLER SCALE CALIBRATION

Standard Specification 401.03.2.D.6; hydrated lime or mineral filler feed system

Tolerance is ± 20.00% of desired target when hot mix is within ± 0.50% of plant scale tolerance.

CALIBRATION and WEIGHING PROCEDURE: (Same as plant mix silo scale calibration.)

Hydrated lime specific gravity equals 2.34 x 62.4 lbs/ft^3 = 146.016 lbs/ft^3

Conversion for metric or Canadian products: 1 kg = 2.205 lbs/kg

Sample frequency = 1 sample/100 tons hydrated lime used

Sample size = approximately 5 lb per doubled brown paper sack

Contractor personnel only secure sample. Inspector witnesses sampling procedure and takes immediate possession of sample from Contractor.

Record on sample bag:

-project number
-project designation product information
-target hot plant % lime when sample taken
-date and witness
-project manager
-tons lime used

Obtain a Materials Safety Data Sheet (MSDS) copy for this product from contractor. Become familiar with material exposure and handling hazards.

AGGREGATE MOISTURE CALIBRATION

Standard Specification 401.03.2.D.4 - aggregate and bituminous material feed synchronization

The weighing system mounted on the belt scale from the virgin aggregate cold feed bins weighs the aggregate with natural moisture included. In order for hot plant synchronized feed systems to dispense proper individual product quantities, virgin aggregate natural moisture must be determined and accounted for by entering a value into the computerized hot plant control system.

Example:

1,000 tons plant mix with 5.5% asphalt cement (AC) binder, 1.4% hydrated lime, and 2.3% virgin aggregate moisture would equal 55 tons AC, 14 tons hydrated lime, 931 tons dry aggregate (or 952 tons wet aggregate).

To compute proper blend ratios, aggregate moisture must be determined. Percent moisture is determined using MT-202, described within the "MDT Materials Manual". This data is entered into the hot plant blending computer, by Contractor personnel to account for natural moisture and enable individual product flowrate meters to adjust to virgin aggregate weights.

The following examples show typical blend ratio errors if moisture is unaccounted for, but entered into the blending computer.

EXAMPLE:

1,000 tons Plant Mix, 5.5% AC, 1.4% hydrated lime, and 2.3% moisture

1,000 tons Plant Mix@ 5.5% AC = 55 tons AC
1,000 tons Plant Mix@ 1.4% hydrated lime + 14 tons hydrated lime
= 69 tons of additives

****

1,000 tons plant mix - 69 tons additive = 931 tons dry aggregate
931 tons dry agg. @ 2.3% moisture = 952 tons wet aggregate
55 tons AC+ 931 tons dry agg. = 5.9076 % AC by dry weight of agg.
952.41 tons wet agg. @ 5.9076% AC = 56.26 tons AC fed by flowrate meter
56.26 tons AC + 1,000 plant mix desired = 5.63% AC content

= 0.13% over feed AC error

14 tons hydrated lime + 931 tons dry agg. = 1.5038% lime by dry agg.

952.41 tons wet agg. @ 1.504% lime = 14.3 tons lime recorded by flow rate meter

14.3 tons lime + 1,000 tons plant mix desired = 1.43 % lime content (0.03 % lime excess)

PLANT MIX SILO SCALE CALIBRATION

Standard Specification 401.03.2.A.9; plant scale tolerance = ± 0.50% of actual weight weighed

CALIBRATION PROCEDURE:

1. Zero set empty the silo scale readout in the control house after weight hardware is attached to the silo (chains, cable ratchet, etc.)*
2. Hang 1,000 lbs (min) under Silo*. Visually check that scale reads equal to weight hung
3. Remove weights while leaving hanging hardware in place.* Readout should read zero.
4. This procedure may take several attempts to "fine tune" to zero set point.

***** Performed by Contractor. Inspector observes and documents.

WEIGHING PROCEDURE:

Scale Reading: Hanging	0 lbs
Test Weights:	4,000 lbs
Scale Reading:	3,980 lbs
Difference:	20 lbs.

Actual weight hung: 4,000 lbs x 0.005 = ± 20.0 lbs (within tolerance range)

-calibration check is acceptable-

Most scales read in 20 lb increments and are reset to zero after hanging hardware is removed.

PLANT MIX SCALE VERIFICATION

Standard Specification 401.03.2.A.10.a.9; Automatic weighing, or by special provision

Tolerance = ± 1.5% weight per certified platform scale

Specification requires that plant mix scale weight checks be performed at least three times per project. Checks should be done without warning to Contractor and minimize operational delay.

For each hot plant scale ticket, record date, load number, tons, and time.

WEIGHING PROCEDURE:

hot plant ticket (net weight) =	51,000 lbs (25.5 tons)
certified platform scale gross weight =	86,000 lbs
certified platform scale weight * =	35,150 lbs
actual net weight:	50,850 lbs

Difference: 51,000 lbs - 50,850 lbs = 150 lbs.

tolerance range = 50,850 lbs. x 0.015 = ± 762.75 lbs.

-scale check meets specification-

*Adjust by fuel consumption weight if certified scale is distant from hot plant.

ASPHALT CEMENT AND HYDRATEDLIME VERIFICATION

Asphalt Cement Spot Check Procedure:

Gallons asphalt cement (AC) x unit wt AC (lbs/gal.) divided by 2,000 lbs/ton = tons AC used

EXAMPLE:

tons plant mix = 1,791 (from production monitor)

tons AC = 98.51 (production monitor)

ac target value = 5.50%

tolerance range = ± 0.20% of target (Std Spec 401.03.2.D.7) = 5.30 - 5.70%

spot check: (98.40 divided by 1,791.09) X 100 = 5.49% (ok)

Hydrated Lime Spot Check Procedure:

EXAMPLE:

Tons Plant Mix = 1,791.09 (per production monitor)
Tons Hydrated Lime = 26.22 (production monitor)
Hydrated Lime Target Value= 1.40%

Tolerance = ± 20.0% of target (Std Spec 401.03.2.D.6) = 1.12% - 1.68%

Spot check:

(26.22 -c- 1,791.09) X 100 = 1.46% (therefore OK)

Example:

Contractor
Furnished Mix Design

19 Km NW OF GLACIER COUNTY LINE NW FEDERAL AID NO. ARRA 3-4(13)101
19.0mm GRADE "S"
Plant Mix Design

September 29, 2009
Project No. 03-150-03

Prepared for: Dwayne Rehbein
Riverside Contracting, Inc.
5571 Alloy South
Missoula, MT 59808

Prepared by: Rimrock Engineering, Inc.
5440 Holiday Avenue
Billings, MT 59101

RIMROCK
ENGINEERING, INC.

5440 Holiday Avenue • Billings. MT 59101

Phone 406.294.8400
Fax 406.294.8405

September 29, 2009

Riverside Contracting, Inc.
5571 Alloy South
Missoula, MT 59808-8413

Attn: Mr. Dwayne Rehbein

Re: 19 Km NW of Glacier County Line-NW- Federal Aid No. ARRA 3-4(13)101
19.0mm Grade "S" Plant Mix Design
Rimrock Engineering Inc. Project No. 03-150-03

Per the request of Riverside Contracting Inc., Rimrock Engineering has performed a 19.0mm Grade "S" asphalt concrete mix design for the above project. Mix design was performed in accordance with Montana Department of Transportation (MDT) Standard and Special Provisions and associated AASHTO and ASTM Test Methods. This report contains data and results to verify a representative Grade "S" mix design is viable for the project using materials and aggregate blend noted here.

Mix design asphalt binder is PG 64-28 supplied by Cenex Harvest States of Polson, Montana. Hydrated lime is supplied by Graymont and added at 1.4% by total mix weight.

Riverside Contracting Inc. has three mix stockpiles located near the project. Following are suggested blend percentages:

Coarse; 19.0mm nominal max size	38.0%
Intermediate	25.0%
Crushed Fines	35.6%
Hydrated Lime	1.4%

See Table 1 for stockpile average gradations.

Riverside Contracting Inc.
19 Km NW of Glacier County Line-NW- Federal Aid No. ARRA 3-4(13)101
Project No. 03-150-03
September 29, 2009

The following traffic design requirements apply:

SUPERPAVE DESIGN REQUIREMENTS						
20 Year Design ESALs		Gyratory Compactive Effort			Coarse Agg Angularity	VFA
Totals (Million)	Daily	Nini	Ndes	Nmax	% 1 face / 2 face	%
0.3 to <3	41-410	7	75	115	85/80	65-78

Design mixing and compaction temperatures were 308°F to 323°F for mixing and 266°F to 272°F for compaction, as provided by the asphalt supplier.

The following table summarizes pertinent mix design data:

Gradation (% passing) 19.0mm nominal maximum size gradation	Job Mix Target
25mm	100
19mm	100
12.5mm	85
9.5mm	65
4.75mm	38
2.36mm	25
1.18mm	19
0.600mm	14
0.300mm	11
0.150mm	8
0.075mm	4.7
Asphalt Content % @ 3.4% Ndes air voids	5.1
Voids in Mineral Aqqreqate (VMA) % @ 3.4% Nd., air voids	13.2
Voids Filled with Asphalt (VFA) % @ 3.4% Ndes air voids	74.2
Dust-to-Effective Binder Ratio ($P_{0.075}$/Pbe)	1.1
Dust-to-Binder Proportion	0.9
Maximum Theoretical Specific Gravity (Gmm -t>Rice)	2.480
% Gmm@ Nini	85.5
% Gmm@ Ndes	96.6
% Hydrated Lime	1.4
Tensile Strenqth Ratio %	0.81

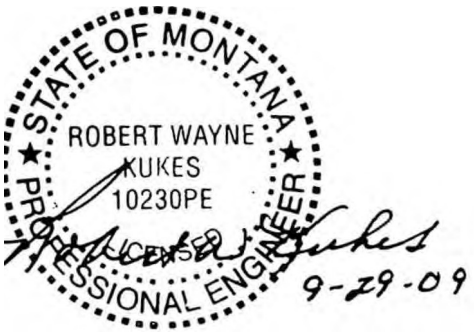
Grade "S" mix design presented here is based upon laboratory results using specified material, gradation, and design procedure to provide a mix design closely representing field production characteristics. Rimrock Engineering cannot predict limitations imposed by laboratory environments.

production mix may perform during field production, lay down, and future use. Hot plant mix properties should be retested and evaluated with design adjustments made accordingly. Minor variation between laboratory prepared mix and hot plant produced mix test results are normal. If notable changes occur to mix characteristics, a new or revised mix design should be developed.

Information presented in this design is specific to the above project only. Reuse of information contained here is prohibited without written consent of Rimrock Engineering Inc.

Sincerely,
RIMROCK ENGINEERING, INC.

Wayne L Couture, SET
Senior Engineering Technician



Robert W. Kukes PE
Principal

Stockpile Averages and Gradation Specifications

Table 1

Sieve Size (mm)	Coarse Aggregate	3/8" Chips	Crushed Fines	Hydrated Lime	Specifications	
					Combined Gradation	Target Range
			% Passing			
25	100	100	100	100	100	100
19	100	100	100	100	100	90-100
12.5	61	100	100	100	85	90 Max
9.5	13	94	100	100	65	-
4.75	2	9	95	100	38	-
2.36	2	2	62	100	25	23-49
1.18	2	2	46	100	19	-
0.600	2	2	33	100	14	-
0.300	1	2	24	100	11	-
0.150	1	1	16	100	8	-
0.075	1.1	1.2	7.6	87	47	2.0-8.0
% Used	38	25	35.6	1.4		

Aggregate

Properties

Table 2

Test	Coarse Aggregate					Test Method
Bulk Dry Sp. Gravity (G,b)	2.665					AASHTO T-84 & T-85
Absorption % Water	1.2					AASHTO T-84 & T-85
					Specification	
angularity %		1 Face		91	85	ASTM 0-5821
		2 Face		84	80	
wear, L.A. abrasion % loss				20	40 Max.	AASHTO T-96
Flat and Elongated Particles, 3:1 by mass %				12	20 Max.	ASTM 0-4791
fine aggregate angularity,%				49	45 Min.	AASHTO T-304 Method A
sand equivalent value				66	45 Min.	AASHTO T-176
plasticity index of mix design blend				GNP	Non-Plastic	AASHTO T-89 & T-90
specific gravity hydrated lime				2.240	---	Supplier Provided

Asphalt Binder Properties

Table 3

Cenex Harvest States, PG64-28	Mixinq Temperature °C	153-162
	Compaction Temperature °c	130-133
	Specific Gravity, 15 °c	1.026

Laboratory
Mixture Properties

Table 4

Property	Laboratory Values				Interpolated	Specifications
Asphalt Binder%	4.5	5.0	5.5	6.0	5.1	---
Bulk Specific Gravity (Gmb)	2.367	2.371	2.417	2.415	2.396	---
Max Theoretical Sp. Gravity (Gmm -<> Rice)	2.502	2.484	2.465	2.477	2.480	---
Air Voids (Va)%, @ No.,	5.4	3.8	1.9	1.3	3.4	3.4-4.0
VMA %, @ *No.*.	13.7	13.3	12.8	13.4	13.2	13.0 Min.
VFA %, @ No.,	60.7	71.7	84.8	90.1	74.2	65-78
% Gmm @ N,n,	84.1	85.2	86.5	87.4	85.5	90.5 Max
% Gmm @ No.,	94.6	96.2	98.1	98.7	96.6	96.0-96.6
Effective Asphalt % (Poe)	3.6	4.1	4.6	5.1	4.2	---
Dust Proportion (Poe,JPoe)	1.3	1.1	1.0	0.9	1.1	0.6-1.6

Table 5

Values @ Nm
(5.1% Asphalt)

Property	Laboratory Values.	Specification
% Gmm @ Nmax	98.0	98 max.
Bulk Specific Gravity (Gmb)	2.430	---
Max Theoretical Sp. Gravity (Gmm Rice)	2.480	---
Determined from back calculation method based on gyratory height		
Air Voids (Va)%	3.8	
VMA %, (a) Noes	13.5	
VFA %, @ Noes	72.3	

Modified Lottman Results

(resistance of compacted bituminous mixture to moisture damage)

MT-330, 150mm specimens at approximately 95mm height 1.4% hydrated lime)

Table 6

Property	Dry	Condition (wet/freez)	Specification
Average Tensile Strength (S_1), psi	138	112	---
Average Air Voids, %	7.0	6.9	7±0.5
Degree of Saturation, %	------	74.8	70 to 80
Tensile Strength Ratio (TSR)	0.81		0.70 min.

ASPHALT CEMENT (AC) SAMPLING DURING

GRADE or BRAND CHANGES

If asphalt cement brand changes during production, lot numbers are assigned consecutively. Sample numbers shall start with the number "1" for each asphalt cement brand.
If previous asphalt brands and grades are used, continue with the next consecutive sample number for the same asphalt cement brand. If asphalt cement grade changes, start lot and sample numbering at "1"

EXAMPLE:

AC Brand	Grade	Sample #	Lot #
MRC	PG 70-28	1-24	1-4
Exxon	PG 70-28	1-12	5-6
MRC	PG 70-28	25-37	7-8
MRC	PG 64-28	1-18	1-3

ASPHALT CEMENT SAMPLING

SAMPLING INTERVAL:

Sample numbers within a lot may vary from 3 to 7 (Standard Specification 105.03.2}, depending on plant mix tons in the lot. Standard size lots consist of 3,000 tons plant mix. Each sample is referred to as a "sub-lot".

EXAMPLE: 3 to 7 sublot samples = 1 lot

One sample represents 500 plant mix tons, except within the final project lot. For example, if the final project lot equals 1,800 tons, this requires 4 samples (1,800 / 500 = 3.6; round to 4). Sampling frequency can easily be calculated using a Stratified Random (QA) Samples Report within the MDT Engineering Applications program. See following sheet.

PAPER WORK:

Each lot is to be accompanied by Form SHRP57 prior to shipment (see the random samples report example below). Each asphalt cannister and attached tag must display:

-project no.
-project designation refinery
-ac type
-lot no.
-sample no.
-date sampled

Random Samples Report

STRATIFIED RANDOM (QA)

Minimum random number value: 0
Sample interval size per random number: 500
Random numbers to be generated: 18

RANDOM	SAMPLE	SAMPLE INTERVAL
1	384	0-499
2	907	500-999
3	1498	1000-1499
4	1887	1500-1999
5	2167	2000-2499
6	2860	2500-2999
7	3214	3000-3499
8	3860	3500-3999
9	4001	4000-4499
10	4762	4500-4999
11	5103	5000-5499
12	5904	5500-5999
13	6048	6000-6499
14	6931	6500-6999
15	7479	7000-7499
16	7832	7500-7999
17	8167	8000-8499
18	8597	8500-8999

LOT 1

LOT 2

LOT 3

LOT 4 & SUBSEQUENT LOTS

Form SHRP57/Q:\MT-STD\F-SHRP57.doc
Revised 06/15/01
stk #3255-2958

Montana Department of Transportation

Sampling Procedure MT302
Testing Methods
(1) TP5
(2) TP1,TP3
PP1,T48
T240,D4402

Red - mandatory information by field inspector
Blue - information provided by District/area lab
Black - information provided by Helena Materials lab

QUALITY ASSURANCE EVALUATION OF PERFORMANCE GRADED BINDER

Project Number (3)
Project Name (5)
Contractor (7J
Refinery (10)
Witnessed By (13)
Submitted By (15)
District/area (17J
Date Submitted (19J

Mix Type (4) _____
PG Binder (6J _____
Lot Number (8) Tons Mix (9) _____
Target AC% (11) Tons AC (12) _____
AC Price (14) _____
Sp. Gr. (16) _____
Additive (18) _____
Date Rec'd (Helena) (20J _____

Helena Laboratory Number	Field Number	Date Sampled	DSR	RTFO DSR	BBR	PG Value
(21)	(22)	(23)	(24)	(25)	(26)	(27)

A PGAB grade reduction is any change for which the high number is lower or the low number is higher by one grade.

A percent price reduction (P) is applied to lots having one or more samples with a grade reduction.

Use MDT Standard Specification Section 105.03.2 and the following formulas to determine 'P' value. For high temperature grading components P = (TL+ aR - Xn) X F, use an 'F' factor of 4. For low temperature grading components P = (Xn + aR - Tu) X F, use an 'F' factor of 4. Positive 'P' value will be added to determine total lot price reduction.

Helena Distribution: (28)
_ Dist. Eng._____
___ Dist. Mat'ls Supr.____ _
Area Lab_____ ___
__ Mgr.Fld.Proj._____
Maint. Div._____ __
Const. Bureau__ _
Pre.Constr.Bur.____ _
_ County File_____
_____ Helena
_____
Lab File

Dist./Area Distribution: (29)
Materials Bureau
Constr.Bur.
Area Lab____ _
Area Lab____ _
__ Mgr.Fld.Proj.
__ Sample

Checked and Approved (30)

Date	Name

Materials Bureau

Dated _____

Reel - information by field inspector
Blue - information by District/area tab
Black - information by Heleru1 Materials Lab

Materials Form: SHRP 57 ASPHALT MATERIALS FORM

1) TESTING METHODS Information provided by Helena Materials lab.

2) **TESTING METHODS** Information provided by Helena Materials lab.

3) **PROJECT NUMBER** as appearing on contract or bid package.

4) MIX TYPE Information found on Mix Design Transfer Memo, generated by the District/area lab. Ask project manager for this form or information.

5) **PROJECT NAME** as it appears on the contract or bid package.

6) PG BINDER (performance graded asphalt) This information is found on the truck delivery certificate.

7) **CONTRACTOR** Company awarded the contract

8) LOT NUMBER MT 601 lists samples required per product ton, and also sample size. MT 601 also tells determines how many samples are in a single lot. Lot numbers are consecutive numbers for a specific job product. If a product changes, lot numbers start over at 1.

9) **TONS MIX** MT 601 lists the number of samples submitted per mix ton. This number is not a cumulative number of tons, but the number of tons represented by a lot.

10) REFINERY Recorded on the truck delivery certificate.

11) TARGET AC% From daily plant report. Ask the project manager for this information.

12) TONS AC Calculated by multiplying mix tons (#9) by %AC (#11).

13) WITNESSED BY MDT employee witnessing sample collection.

14) AC PRICE Indicated on contract or bid package. AC bid price must recorded on each form.

15) SUBSTITUTED BY Name and work address for MDT employee submitting the sample. This person should be an Engineering Project Manager, Tech IV, III, etc.

16) Specific Gravity Found on truck delivery certificate or the supplier sheet, and critical for Helena lab calculations.

17) DISTRICT/AREA Work address for individual submitting the sample, and is the district or area project location.

18) ADDITIVE This information is found on the mix design memo, and most commonly hydrated lime. No additive may be used.

19) DATE SUBMITTED Date the field sends a sample to the district or area lab.

20) DATE RECORDED Date sample was received in Helena.

21) HELENA LABORATORY NUMBER Helena lab assigns a laboratory number to each sample.

22) FIELD NUMBER Inspector assigns a consecutive sample number to each product sample. If suppliers change during a job (product remains the same), start a new field number but continue numbering lots according to established numerical sequence.

23) DATE SAMPLED Field sample collection date

24- 27) Helena Materials lab enters sample test values into these fields.

28) HELENA DISTRIBUTION Helena materials lab completes this form segment.

29) DISTRICT LAB DISTRIBUTION District or area lab completes this form segment.

30) CHECKED AND APPROVED Helena materials lab completes this form segment after test information has been reviewed and approved.

GRADE "S" VOLUMETRIC SPECIFICATION PROPERTIES

EXAMPLE CALCULATIONS:

VMA = Voids in Mineral Aggregate

$$VMA = 100 - \frac{(100 - \%\,AC) \times \text{Bulk Specific Gravity of Compacted Mix (not Rice)}}{\text{Bulk Specific Gravity of Combined Aggregates (per bin splits)}}$$

EXAMPLE: $VMA = 100 - \frac{(100 - 5.2) \times 2.368}{2.589} = 13.3\%$ (nearest 0.1%)

VTM = Voids in Total Mix

$$VTM = 100 \times \frac{\text{Rice Gravity} - \text{Bulk Specific Gravity}}{\text{Rice Gravity}}$$

EXAMPLE: $VTM = 100 \times \frac{2.442 - 2.347}{2.442} = 100 \times \frac{0.095}{2.442} = 3.8\%$ (nearest 0.1%)

VFA = Voids Filled with Asphalt

$$VFA = 100 \times \frac{VMA - VTM}{VMA}$$

EXAMPLE: $VFA = 100 \times \frac{13.3 - 3.8}{13.3} = 71.4\%$ (nearest 1.0%)

D/A = Dust/Asphalt Ratio

$$D/A = \frac{\text{-200 Mesh (\% passing) (per MT-320)}}{\text{Corrected Asphalt Content (per MT-319)}} = \_\_\_\ \%$$ (nearest 0.1%)

Form CB 31 6/08 DGH

Montana Department of Transportation

Plant Mix Report Form

Contract ID: 04808 Mtl Item & Vers.: 401080000 - 1 Spec Effective Date: 2/15/2005 Metric

Project No: NH 5-1(31)13 [1744031000] Report No: 11 Date: 6/18/2009

Designation: McCLURE RD - N OF ARLEE COUPLET Weather Condition: Partly Cloudy/Intermittent Showers

Type of Mix: Grade S Vol Contract Tons: 52938 t Temperatures: AM: -1 PM: -1

Plan Thickness: 120 mm No. of Lifts: 2 Mix Design No. & Date: 1 - 3/23/2009

Contractor: SCHELLINGER CONST CO INC Type of Plant: Counter Flow

Plant Data

Time Start: 6:47 Time stop : 10:54 Gross Time: 4:07 Delay: 0:30

Net Time: 3:37 Average Hourly Production: 394 Vhr Tons per hour: 116 t/hr

Spot Checks	Time	9:45						
	Asphalt%	5.39						
	Burns							
	Hyd. Lime%	1.35						
Mix Discharge Temp		315						
Avg Mix Discharge Temp								

Viscosity Temperature Range: From: 154 To: 166

Placement Summary
(tons to nearest .001)

Course or Lift	Gross Tons Today	Waste Tons Today	Net Tons Placed Today	Net Tons Placed Previous	Net Tons Placed To Date
Roadbed-1	1,424.410	791.340	633.070	20,703.270	21,336.340
Totals:	1,424.410	791.340	633.070	20,703.270	21,336.340

Gyratory Comparisons
(Field averages at current job mix)

	Rice Density	VFA	% Voids	Density
Design	2.493	71	3.8	2.399
Field	2.445	78	3.4	2.363

Date of last field testing averages 6/19/2009

Bin Split Percentages

	Coarse	Int.	C. Fines	Hydrated Lime
Design	39.45	19.72	39.45	1.38
Current	40	14	46	1.65

Hydrated Lime Pay Tons	Today	Previous	To Date
	9.933	321.776	331.709

Asphalt & Additive Summary

Tons Used (Report to the nearest thousandth}

	Gross Today	Waste Today	Net Placed Today	Net Placed Previous	Net Placed To Date	Percent of Mix Today	Percent of Mix Job Mix	Percent of Mix Design
Asphalt	74.114	41.175	32.939	1,057.975	1,090.914	5.2	5.39	4.7
Hydrated Lime	22.350	12.417	9.933	328.932	338.865	1.57	1.35	1.4
2nd Additive								

Asphalt Type:	64-28	Supplier: MRC and Cenex
Hydrated Lime Type:	hydrated Lime	Supplier: Graymont
2nd Additive Type:		Supplier:

Placement Summary Remarks: Paved remaining side streets and couplet except Finley west and east, paved bulb-outs 284+00 to 295+00 NB.

Inspector: KNUDSON, SOPHIA

Montana Department of Transportation

Plant Mix Report Form

Project No: _____ Report No: _____ Date: _____

Designation: _____ Weather Condition: _____

Mix Type: _____ Contract Tons: _____ Temperatures: AM: ____ PM: _____

Plan Thickness: _____ No. of Lifts: ___

Mix Design No. & Date: _____

ASPHALT CEMENT "IN STORAGE" DETERMINATION

1. Determine tank volume. Obtain "Tank Gauge Chart" for tank being measured. (See chart on following sheet).

   EXAMPLE: Measure down 58" (AC top surface)* 120" -

   58" = 62" AC in tank

   62" = 15,617.3 hot gallons@ 315° F

2. Convert hot gallons to cold gallons @ 60° F;
   Refer to temperature-volume correction table for asphalt cement (AC) specific gravity.

   EXAMPLE: AC in tank@ 315° F = 0.9138 multiplier

   15,617.3 x 0.9138 = 14,271.09 gallons @ 60° F

   14,271.09 x 8.552 lbs/gal. = 122,046.36 lbs.

   122,046.36 lbs / 2,000 lbs/gal = 61.02 tons AC in storage

"In storage" tank measurement quantity should agree with the control house meter measurements for "in storage" on a daily basis.

*Performed by Contractor personnel. Inspector observes and documents.

TACK (SS-1) SAMPLING PROCEDURE

Collect a tack sample from each shipment.

Collect two single quart raw asphalt samples (use plastic bottles) before water is blended with raw asphalt.

Number samples consecutively (1, 1A, 2, 2A, etc.) throughout project duration.

Each sample bottle and attached tag shall display:

-Project Number Project Designation
-Type of Asphalt Emulsion Quantity in Shipment (gal)
-Specific Gravity
-Sample Number
-Date Sampled

Form 101-C should be included with samples shipped from the project. If old NCR forms are used, white and yellow copies should accompany each sample or sample box.

Form to Accompany Sample or Samples Other Than PG Binders

Reel-· manda1ory infonna1ion by field inspectors
Blue - information by Districtiarea lab
Black - information by Helena Materials lab

Form 101-C/Q:\MT-STD\FIOI-C.DOC
Rev. 07-98

.MATERIALS BUREAU
MDT
2701 Prospect Ave.
Helena, MT 59620

Sampling Procedure MT302
Testing Methods
(1) T49 T72
(2) T59 T201

Asphaltic Materials Report

Project No. (3) _____ Designation (4) _____

Name of contractor (5) _____

Address of contractor (6) _____

Type of asphalt materials (7) _____

Asphalt material manufacturer (8) _____

Adhesive agent type (9) _____

Witnessed by (10) _____ Title (11) _____ District/area (12) _____

Submitted by (13) _____ Title (14) _____ District/area (15) _____

Date submitted (16) _____ Date received (17) _____ Spec Grav (18) _____

Identification Test Results

Lab. No.	Field No.	Date Sampled	Invoice No.	Quantity	Viscosity	Penetration	Flash
(19)	(20)	(21)	(22)	(23)	(24)	(25)	(26)

/27) Dist. Eng. _____
Dist. Mat'! Supr _____
Area Lab _____
Mgr. Field Proj. _____
Main!. Div.
Constr. Bur. _____
Helena
Lab File

Dist. Distribution
Mtrls. Bur.
Office File
Project File
lab File

Checked and Approved	Date	Name

Red - mandatory information by field inspector
Blue - information by District/area lab
Black - information by Helena Materials Lab

MATERIALS FORM: 101- C ASPHALT MATERIALS REPORT FORM

Instructions:
Each sample must have a tag or printed label attached. Make a copy of this completed form for field office files, and submit the original to the district lab. Apply hot asphalt glued labels after cooling.

1) TESTING METHODS - Information provided by the Helena Materials Lab.
2) **TESTING METHODS** - Information provided by the Helena Materials Lab.
3) **PROJECT NUMBER** – Identified on the contract. (Maintenance uses PO number.)
4) **PROJECT NAME** – Identified on the contract (Maintenance uses PO number.)
5) **NAME OF CONTRACTOR** – Identified on contract/bid package.
6) **ADDRESS OF CONTRACTOR** - city and state. This information is found on the contract/bid package.
7) **TYPE OF ASPHALT MATERIAL-** Indicated on bill of lading, and must match project specifications.
8) MANUFACTURER OF ASPHALT MATERIAL - Indicated by bill of lading or contract.
9) **TYPE OF ADHESIVE AGENT** - Indicated on bill of lading or contract.
10) WITNESSED BY - MDT employee witnessing sample collection.
11) TITLE - Job title MDT witness.
12) DISTRICT/AREA – MDT witness work address (Section address for maintenance projects)
13) SUBMITTED BY - MDT employee submitting sample - Engineering Project Manager, Tech IV, III, or Section Supervisor for maintenance projects.
14) TITLE - Job title of MDT employee submitting form or sample
15) DISTRICT/AREA - Work address of person submitting sample - MDT District or Area
16) DATE SUBMITTED - Sample submission date
17) DATE RECEIVED - Date Helena lab receives sample.
18) SPECIFIC GRAVITY - (of sampled material) This information must be listed on bill of lading. Do not attach bill of lading to this form.
19) LAB NUMBER - Helena lab assigns sample lab number upon arrival in Helena.
20) SAMPLE NUMBER - Sample number assigned in the field.
21) DATE SAMPLED – Sample collection date.
22) INVOICE NUMBER - Sample invoice number shown by bill of lading
23) QUANTITY - Sample quantity in gallons or liters listed on bill of lading.
24), 25), and 26) - Helena lab lists product test results.
2.1) DISTRIBUTION - Helena lab distributes copies.

Sample Tag Information
PROJECT NUMBER - As appearing on bid package (line 3 above)
SPECIFIC GRAVITY - Information from truck deliverv ticket.
SAMPLE NO. - Sample numbers assigned consecutively for each job product on the job.
OIL TYPE – See truck delivery ticket
GALLONS - Total product amount per load.
MANUFACTURER - Information shown by truck delivery ticket
LOT NUMBER - Refer to MT601 for sampling frequency. Consecutive lot numbers assigned for each job product.
INVOICE NUMBER – See truck delivery ticket.
PROJECT MANAGER NAME
DATE - Product collection date

Form 101-C/Q:\MT-STD\F101-C.DOC
Rev. 2/8/10

MATERIALS BUREAU

Montana Department of Transportation
2701 Prospect Ave.
Helena, MT 59620

Sampling Procedure MT302
Testing Methods
T49 T72
T59 T201

Asphalt Material Report

Project No. _____ Designation _____

Contract No. _____ UPN _____

Contract Item # _____ Material Number _____

Contractor _____

Contractor address _____

Asphalt material type _____

Asphalt material manufacturer _____

Adhesive agent used _____

Witnessed by _____ Title _____ District/area _____

Submitted by _____ Title _____ District/area _____

Date submitted _____ Helena date recorded _____ Sp. Gr. _____

Identification Test Results

Lab. No.	Field No.	Date Sampled	Invoice No.	Quantity	Viscosity	Penetration	Flash

Miscellaneous Sample - tag information

PROJECT NO. **SP.GR.**

SAMPLE NO. **GAL.** _____

OIL TYPE _____ **MFG.** _____

LOT NO. _____

INVOICE NO. _____

PROJECT MGR. **DATE**

_____ Dist. Eng. _____
_____ Dist. Mat'l Supr _____
_____ Area Lab _____
_____ Mgr. Field Proj. _____
_____ Maint. Div. _____
_____ Constr. Bur. _____
_____
_____ Helena
_____
_____ Lab File

Dist. Distribution
Mtrls Bur.
Office File
__ Project File
_____
Lab File

	Date	Name
Checked and Approved		

Lot No _

0il Type. --------MFG._____

Invoice No._____

Proj. Mgr._____Date_____

Form91
State of Montana, Dept. of Transportation, PO Box 1359, Great Falls, MT 594-03

Lot No _____

Oil Type.----------MFG._____

Invoice No._____

Proj. Mgr._____Date_____

Form 91
State of Montana, Dept. of Transportation, PO Box 1359, Great Falls, MT 59403

Project No. Sp. Gr.

Sample No. M. Tons

Lot No

Oil Type. MFG.

Invoice No.

Proj. Mgr. Date

Form 91
State of Montana, Dept. of Transportation, PO Box 1359, Great Falls, MT 594-03

Project No. Sp. Gr.

Sample No. M. Tons

Lot No

Oil Type. MFG.

Invoice No.

Proj. Mgr. Date

Form91
State of Montana, Dept. of Transportation, PO Box 1359, Great Falls, MT 59403

Project No. Sp. Gr.

Sample No. M. Tons

Lot No

Oil Type. MFG.

Invoice No.

Proj. Mgr. Date

Form 91
State of Montana, Dept. of Transportation, PO Box 1359, Great Falls, MT 59403

Project No. Sp. Gr._____

Sample No. M. Tons_____

Lot No _____

Oil Type. MFG._____

Invoice No._____

Proj. Mgr. Date_____

Form91
State of Montana, Dept. of Transportation, PO Box 1359, Great Falls, MT 59403

Project No. Sp. Gr.

Sample No. M. Tons

Lot No

Oil Type. MFG.

Invoice No.

Proj. Mgr. Date

Form 91
State of Montana, Dept. of Transportation, PO Box 1359, Great Falls, MT 59403

Project No. Sp. Gr._____

Sample No. M. Tons_____

Lot No _____

Oil Type. MFG._____

Invoice No._____

Proj. Mgr. Date_____

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Sample No. M. Tons_____

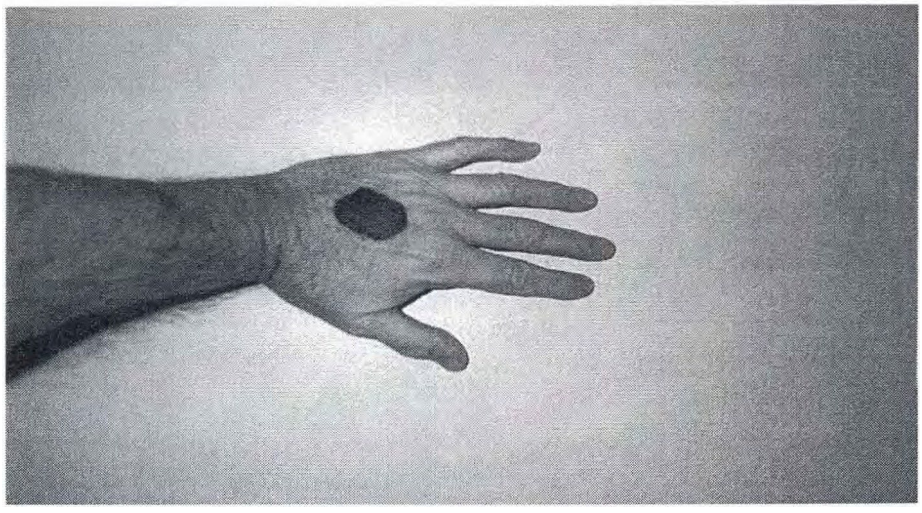
Lot No _____

Oil Type. MFG._____

Invoice No._____

Proj. Mgr. Date_____

Form91
State of Montana, Dept. of Transportation, PO Box 1359, Great Falls, MT 59403



Removing Tar/Asphalt from a Burn*

Tar must be removed safely to treat the underlying burn. Partial removal increases infection risk.

"The biggest mistake people make is trying to remove the tar at the scene of the accident," says Dr. Glenn D. Warden, associate professor of surgery at the University of Utah School of Medicine and director of the Salt Lake City Intermountain Burn Center. Tar or asphalt must first be cooled rapidly to room temperature, which takes only a minutes. Immerse affected areas in cold water to dissipate heat and speed up the hardening process. Prolonged cooling has no benefits, so cool injuries judiciously. Cooling should be done as soon as possible at the accident scene, or can be done at an ER shortly after the accident.

Once cooled, tar must be removed, but not by manual or mechanical debridement. Mechanical removal can cause considerable damage, not to mention incredible pain. Many tar burns are deep second- degree burns with only the hair follicles left to grow new skin. If you pull the tar off, hair comes off with it.

The best approach is to dissolve the tar. Largely ineffective and occasionally harmful agents such as gasoline and acetone were once used as solvents, but tar is best dissolved by an agent of similar chemical structure, such as petroleum. A topical antibiotic in a petroleum or petroleum base, such as Neosporin ointment, effectively removes tar and asphalt, and fights infection.

Dr. Warden has come to prefer De-Solvit, a citrus and petroleum distillate currently in use as an industrial cleaner. "De-Solvit is the best solvent we've used," said the Utah expert. "It removes tar and asphalt from skin and mucous membranes safely in half the time other surface agents do. It's nontoxic, nonirritating, odorless and costs less than other agents." Liberal application and gentle wiping removes tar and asphalt from skin.
Eye injuries can be treated by copiously irrigating the eye with De-Solvit and saline solution.

Once the tar is removed, assess and treat burns as any other.