



5TH ANNUAL ASPHALT SHINGLE RECYCLING FORUM

DALLAS, TX
OCT 28, 2011





TILLER
CORPORATION

CA COMMERCIAL
ASPHALT CO.



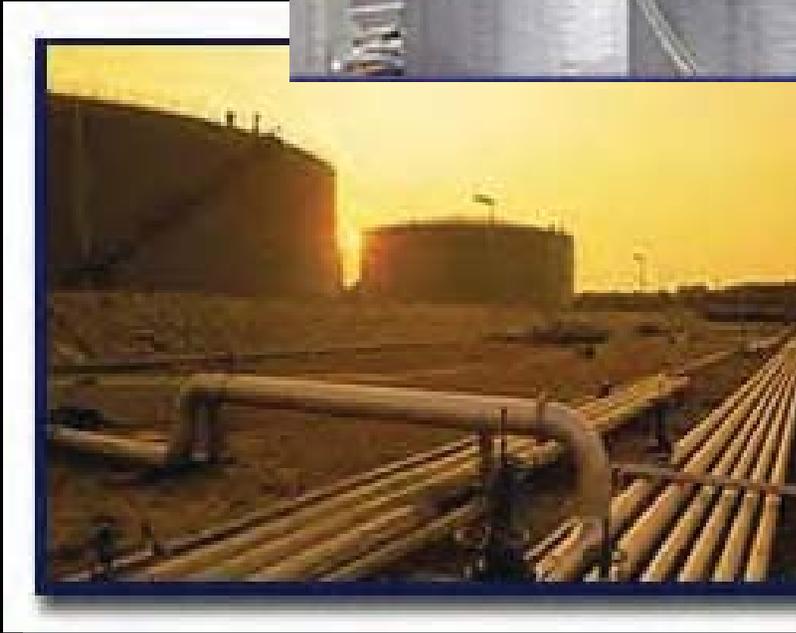
TILLER
CORPORATION

Barton
Sand &
Gravel Co.





BARTON
ENTERPRISES, INC.





HMA Recycling in Minnesota - RAP

- Minnesota was one of the first states to experiment with RAP
- 1976 - First Research project
- 1983 - Permissive Specification (60% Non-Wear / 30% Wear)
- Last Decade – Virtually all state projects use RAP



RAS – Recycled Asphalt Shingles

- MWSS (Manufactured Waste Scrap Shingles) – First used in Minnesota in the early 1990's (Experimental Projects)
- 1996 – First Spec “When approved by the Project Engineer”
- 2003 – Permissive Spec – 5% max can be used at Contractor's Discretion



RAS – Recycled Asphalt Shingles

- TOSS (Tear Off Scrap Shingles) – First used in Minnesota in mid 1990's (Experimental Projects)
- 2007 – First Spec “When approved by project engineer”
- 2010 – Permissive Spec – 5% max can be used at Contractor's discretion *except in final lift of high volume mix types
- Certification of supply required
- Only single layer from single family homes - up to 4-plex buildings allowed



Why Mn/dot More Conservative with TOSS?

- Debris and other contaminants
- Hazardous Material (i.e. Asbestos)
- Possible performance / durability issues (stiff AC used in shingles aged more when on a roof for 10 - 30 years)
- Certification of supply required



Final Specification

MWSS / TOSS Processing	
Raw Product	
Gradation (% Passing)	
Sieve Size	% Passing
1/2" (12.5mm)	100
#4 (4.75mm)	90

Extracted Gradation	
Used for mix design composite	
Sieve Size	% Passing
3/8" (9.5mm)	100
#4 (4.75mm)	97
#8 (2.36mm)	95
#16 (1.16mm)	80
#30 (0.6mm)	60
#50 (0.30mm)	50
#100 (0.15mm)	40
#200 (0.075mm)	30



Final Specification (cont.)

The ratio of added new asphalt binder to total asphalt binder shall be 70% or greater (added binder / total binder).

Example:

Millings (RAP): 5% AC

RAS: 20% AC

10% Millings (RAP) used = .5% contribution

5% RAS used = 1.0% contribution

Contribution from recycled products = 1.5% AC

Total AC required in Mix = 5.5%

Add AC = 4.0%

ratio = 73% → OK



Final Specification (cont.)

Mn/Dot 3139-3

Traffic Level	2	3	4	5
20 year Design ESAL's	<1 mil	1 - 3 mil	3 - 10 mil	10 - 30 mil
Max allowable scrap shingles - MWSS Final Lift / All other Lifts	5/5	5/5	5/5	5/5
Max allowable scrap shingles - TOSS Final Lift / All other Lifts	5/5	5/5	0/5	0/0



BITUMINOUS PLANT MIX DESIGN REPORT
 Minnesota Department of Transportation
 Office of Materials and Road Research
 1400 Gervais Avenue
 Maplewood, MN 55109
 Phone: 651-386-6459
 Fax: 651-386-5580

0-2009-193

Date: 8/19/2009

THIS MIX DESIGN REPORT IS NOT VALID UNTIL PLANT NO. INDICATED BELOW IS CERTIFIED.

ENGINEER	FOR RAMSEY COUNTY
PROJECT NUMBER	MCKNIGHT ROAD (P-3074)
CONTRACTOR SIGN.	
FOR ALL STATE, COUNTY AND CITY PROJECTS, CONTRACTORS MUST FAX A COPY TO MNDOT TWO WORKING DAYS PRIOR TO PRODUCTION AT 651-366-6583	

SPEC	2360
SPEC YEAR	2009
MIX TYPE	SPWE8440(RS)
AC GRADE	PER PROPOSAL

THIS MIXTURE HAS BEEN REVIEWED FOR VOLUMETRIC PROPERTIES ONLY, IT DOES NOT ASSURE THAT FIELD PLACEMENT AND COMPACTION REQUIREMENTS HAVE BEEN MET.

PLANT NO. **901209** - JOB MIX FORMULA

Begin With Test Number	Slave Size (mm) (in.)	Composite Formula	JMF LIMITS	For Information Only Vkgth Formula
SP WE 401	37.5 (1 1/2)			
	25.0 (1)			
	19.0 (3/4)	100	100 - 100	
	12.5 (1/2)	97	90 - 100	
	9.5 (3/8)	85	78 - 90	
	4.75 (#4)	61	54 - 68	
	2.36 (#8)	52	46 - 68	
	0.075 (#200)	3.2	2.0 - 5.2	
	Spec. Voids	4.0	3.0 - 5.0	
	Spec. VMA	14.0	13.7	
	% AC	5.2	4.8	
	(TOTAL)			

TM # 2009-089 Indicates a Gyration Density of 146.6 (lbs/ft³) at 90 Design Gyration.
 Use of anti-strip required: No

Proportions	Pit	Source of Material	Sp. G
20 %	1910E	KRAEMER BURNSVILLE 9/16" CLEAR (LIMESTONE)	2.636
8 %	7800E	MARTIN MARIETTA ST. CLOUD GA-50 (GRANITE)	2.713
5 %		SHINGLES (T.O.S.S.)	2.650
8 %		PLANT MILLINGS	2.720
13 %	7300E	MARTIN MARIETTA ST. CLOUD 1/2" CLEAR (GRANITE)	2.709
41 %	71241	AGG IND ELK RIVER CLASS D MAN. SAND	2.657
8 %	13334	AGG IND ST. CROIX WASHED SAND	2.654
0 %	06354	BARTON GLENDORADO 1/2" CLEAR	2.756

Mix Aggregate Specific Gravity at the Listed Percentages = 2.578

This Mix Design Report supersedes MDR # 0-2009-158 Date: 7/20/2009

Remarks: MINUS #4 AGG SPG AT THE LISTED PROPORTIONS=2.066. THE RATIO OF NEW AC TO TOTAL AC MUST BE MAINTAINED AT 70% OR GREATER. DAILY SPOT-CHECKS ARE REQUIRED. NO LIMESTONE PROPORTION MUST NOT EXCEED 20% FOR FINAL MIX. (Submit TOSS sample for gradation)

Mix Design Reviewed by:

[Signature]

Contractor - COMMERCIAL ASPHALT #9
 METRO INSPECTION

Mix Design Specialist
 0-2009-193 Ver. 1





BITUMINOUS PLANT MIX DESIGN REPORT

Minnesota Department of Transportation
Office of Materials and Road Research
1400 Gervais Avenue
Maplewood, MN 55109
Phone: 651-366-5459
Fax: 651-366-5580

0-2010-128

Date: 5/28/2010

THIS MIX DESIGN REPORT IS NOT VALID UNTIL PLANT NO. INDICATED BELOW IS CERTIFIED.

ENGINEER	FOR
PROJECT NUMBER	
CONTRACTOR SIGN.	
FOR ALL STATE, COUNTY AND CITY PROJECTS, CONTRACTORS MUST FAX A COPY TO WACOT TWO WORKING DAYS PRIOR TO PRODUCTION AT 651-366-5580	

SPEC	2360
SPEC YEAR	2009
MIX TYPE	LVNW45J3C(RS)
	LVWE45030(RS)
AC GRADE	PER PROPOSAL

THIS MIXTURE HAS BEEN REVIEWED FOR VOLUMETRIC PROPERTIES ONLY, IT DOES NOT ASSURE THAT FIELD PLACEMENT AND COMPACTION REQUIREMENTS HAVE BEEN MET.

PLANT NO. **901204** - JOB MIX FORMULA

Depth With Test Number	Sieve Size (mm) (in.)	Composite Formula	JMF LIMITS	For Information Only Virgin Formula
LV NW 401	37.5 (1 1/2)			
	25.0 (1)			
LV WE 401	19.0 (3/4)			
	12.5 (1/2)	100	100	100
	9.5 (3/8)	98	91	100
	4.75 (#4)	70	63	77
	2.36 (#8)	56	50	62
	0.075 (#200)	5.2	3.2	7.0
	Spec. Voids	3.0	2.0	4.0
	Spec. VMA	14.5	14.2	
	% AC	8.1	5.7	
	(TOTAL)			

TM # 2010-066 Indicates a Marshall Density of 147.7 (lbs/ft³) at 50 Blows per side.
Use of anti-strip required: No

Proportions	Pit	Source of Material	Sp. G
20 %	10138	KRAEMER BURNVILLE 3/8" CLEAR LIMESTONE	2.873
48 %	71059	BARTON ELK RIVER #2 BA 1/2"	2.844
5 %		DEMCON SHINGLES (MWSS)	2.650
10 %		PLANT 1/2" RAP	2.633
17 %	71059	BARTON ELK RIVER #2 SCREENED SAND	2.641
%			
%			
%			

Mix Aggregate Specific Gravity at the Listed Percentages = 2.648

Remarks: **NRW ADDED AC MUST BE 3.5% OR GREATER. DAILY SPOT CHECKS ARE REQUIRED.**

Mix Design Reviewed by:

I. R. W.

Mix Design Specialist
0-2010-128 v01

cc

Contractor - COMMERCIAL ASPHALT #4
METRO INSPECTION





Final Specification (cont.)

- Deleterious materials equal or greater than .5% by weight of material retained on #4 sieve (500 – 700g sample picked)
- Asbestos Fibers:
Testing frequency of 1 per 250 ton of TOSS
- MWSS / TOSS shall be stockpiled separately from one another and separately from other materials



Before Recession

- Economy booming in all construction facets
- HMA Producers:
 - High Volumes
 - Abundance of New construction
 - Shortage of RAP/RAS supply
 - High demand for recycle material (RAP/RAS) drives up value



Economic Conditions Change

- 2007 – Economy Worsens
- Lower volumes of HMA production overall
- Significantly less new construction, everything re-hab and maintenance
- Significant amounts of RAP / MILLINGS produced from projects...Inventories BUILD
- Contractors bid projects with RAP inventories they own
- Value of RAS decreases
- Market will assess value and price



Commercial Asphalt RAS USE

- Work with our supplier Dem-Con to establish RAS gradation - #4 is critical to be 90% or more passing - otherwise potential to see in mat
- Store small inventory “hand to mouth” - otherwise particle conglomeration
- Keep RAS covered - sun/rain exacerbate sticking problem



Commercial Asphalt RAS USE – (cont.)

- Anticipate less effective AC than chemical extraction results – program plant to assume 17% AC rather than 20%
- Typically run RAS in conjunction with RAP.
- Sandwich RAS between belt and RAP to prevent airborne lighter particles











Manufacture
WASTE SHINGLE
SCRAP





















































ShopNBC
MAIN LOBBY

391 DUT
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LEXUS

LS 350







Thank You!

