

**Tilcon New York Inc**

**HI-RAP PROJECT 2014 – 2015**  
**MT HOPE ASPHALT PLANT**  
**WHARTON NJ**

# I Love Chocolate Cake!

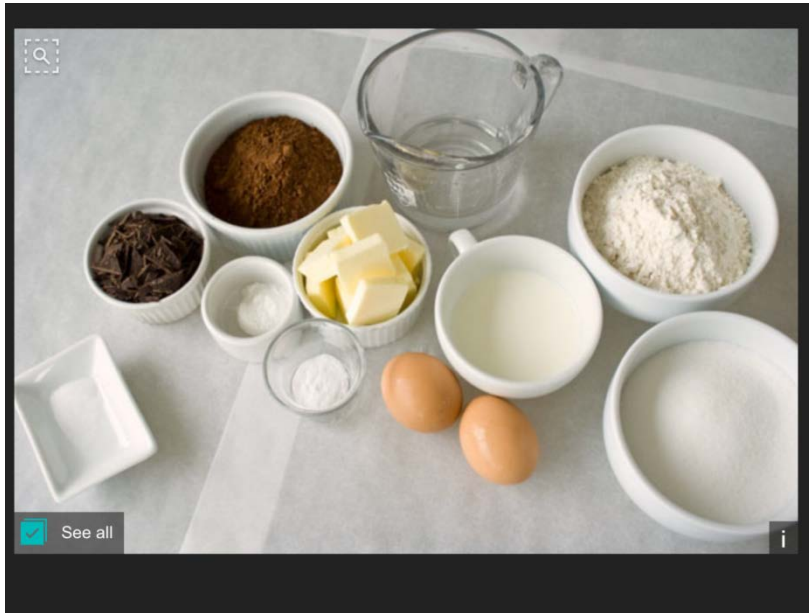


# I Love Asphalt!



# Ingredients

**Know your ingredients!**



# 12.5M64 30% RAP

- In 2014 Design a 12.5m64 with 30% RAP meeting new VMA and Performance Requirements
- Raise Minimum VMA from 14% to 15%
- APA (Rutting) less than 7mm
- NJDOT B-10 Overlay (Cracking) greater than 150 Cycles

# Design Time Line

- **January-February 2014-** started design 12.5m64 30% RAP, Gradation, volumetric and Specific Gravities completed.
- Current 12.5m64 15% RAP mix AC target 5.1%, as per Tom Bennert typically need 3-4 tenths more AC to meet overlay requirements. Design at 5.4% AC- (RAP residue 5.0, 3.9 virgin +1.5 total 5.4%).
- **March**
- Tom Bennert asked for two sets of Performance plugs, produced one set using PG-64-22 (reference set) and second set using modified binder supplied by Axeon PG64.6-26.6.
- Source of PG 64-22 is stock oil we had on hand, unsure of supplier Axeon and/or PBF holding company.
- First set for testing: PG64-22 (Combination of Axeon and/or PBF)- overlay passed.
- Second set for testing Axeon PG64.6-26.6- overlay failed.
- **April**
- Produced Performance plugs for NJDOT using Axeon PG64-22- overlay failed.
- **April-May**
- Axeon suggested PG64.5-28.1, produced performance plugs for NJDOT-overlay failed.
- Axeon and Rutgers suggested adding 0.2 tenths of oil (RAP sample tested, lower residue 4.5%)
- Re-design to incorporate increased oil content.
- Produced performance plugs with 5.6% total oil content for NJDOT using Axeon PG64.5-28.1- overlay failed.

# Design Time Line

- *May-June*
- Axeon suggested PG61.2-30.29 produced performance plugs, overlay failed.
- *June-July*
- Discussion with Tom Bennert, perhaps laboratory samples may not be representative of plant produced material.
- Ran material through plant, produced performance plugs.
- Two sets using PBF PG64-22 to be tested by Rutgers and Rowan, Rutgers Passed/Rowan Passed
- Two sets using Axeon PG76-22 to be tested by Rutgers and Rowan,
- Rutgers failed/Rowan Passed
- *July*
- Produced performance plugs for NJDOT using PBF PG64-22, Plant produced- overlay failed.
- *August*
- Contacted Engineered Additives- Tote of Bitutech Rejuvenator ordered.



# Design Time Line

- *September -October*
- Bitutech Rejuvenator using existing Anti-strip pump (half recommended dosage)
- 1<sup>st</sup> test w/Rejuvenator w/PG64-22 all tests passed.
- 2nd test w/Rejuvenator all tests passed.
- 3<sup>rd</sup> test w/Rejuvenator, NJDOT present-all tests passed.
- Mix Design Approved!
- Pave April 2015





# Designs

## 12.5M64 15% RAP

	<b>New Jersey Department of Transportation</b>		04/14/2016
	<b>HMA Mix Design</b>		
Region: North			

Mix ID#	N01DN0049R15	Effective Date	9/20/2011
Mix Type	HOT MIX ASPHALT 12.5 M 64	Expiration Date	5/1/2027
Producer	TILCON - MOUNT HOPE, NJ (HMA PLANT)	Verification Type	Lab Verification
Mix Temp. (F)	316.5	Designer	12.5M64
Compaction Temp. (F)	293.5		

SIEVE SIZE Inch	SIEVE SIZE mm	Job Mix Formula	Broadband		Production Tolerances		Tests Performed	Test Results		Test Criteria	
			min.	max.	min.	max.		min.	max.	min.	max.
2	50		100	100			%Air Voids (Va)	3.99			
1 1/2	37.5		100	100			%VMA	14.6	14		
1	25		100	100			%VFA	73			
3/4	19	100	100	100			Dust/Asphalt Ratio	0.8	0.6	1.3	
1/2	12.5	99	90	100			Drain Down				
3/8	9.5	97	0	90			VCA - Mix			<VCA dry	
No.4	4.75	0	0	100			VCA - dry				
No.8	2.36	34	28	58			Max. Sp.Grav. (Gmm)	2.530			
No.16	1.18	0	0	100			Bulk Sp.Grav. (Gmb)	2.429			
No.30	0.6	0	0	100			% Gmm @ N Max			98	
No.50	0.3	0	0	100			Sp. Grav. of Binder (GB)	1.030			
No.100	0.15	0	0	100			Sp. Grav. of Agg. Blend (Gsb)	2.699			
No.200	0.075	3.5	2	10			Moist Sensitivity TSR	83.0			
Virgin Binder Content								4.3			
Binder Content of RAP								0.8			
								% Gmm @ N Design	95.0	97.0	
								Ignition Oven Agg. Correction Factor CFI	0.13 @ 538 Degrees C		
								% Absorbed AC	0.61		

COMPONENT MATERIALS	TOTAL MIX %	COMPONENTS - PRODUCER &
AGGREGATES, COARSE #8, BROKEN STONE	17.7	TILCON NEW JERSEY - MOUNT HOPE, NJ (AGGREGATE)
AGGREGATES, STONE SAND, WASHED	17.2	TILCON NEW JERSEY - MOUNT HOPE, NJ (AGGREGATE)
AGGREGATES, STONE SAND, UNWASHED	8.2	TILCON NEW JERSEY - MOUNT HOPE, NJ (AGGREGATE)
AGGREGATES, COARSE, #9, BROKEN STONE	23.2	TILCON NEW JERSEY - MOUNT HOPE, NJ (AGGREGATE)
AGGREGATES, COARSE, #67, BROKEN STONE	14.4	TILCON NEW JERSEY - MOUNT HOPE, NJ (AGGREGATE)
AGG FOR HMA, RAP	15.0	TILCON NEW JERSEY - MOUNT HOPE, NJ (AGGREGATE)
ASPHALT, BINDER, GRADE 64-22	4.3	NJDOT APPROVED BINDER

Remarks:

## 12.5M64 30% RAP

	<b>New Jersey Department of Transportation</b>		02/18/2015
	<b>HMA Mix Design</b>		
Region: North			

Mix ID#	N01DN0464R30	Effective Date	2/17/2015
Mix Type	HOT MIX ASPHALT 12.5 M 64	Expiration Date	5/1/2015
Producer	TILCON - MOUNT HOPE, NJ (HMA PLANT)	Verification Type	Plant Verification
Mix Temp. (F)	316.5	Designer	12.5M64 30%RAP
Compaction Temp. (F)	293.5		

SIEVE SIZE Inch	SIEVE SIZE mm	Job Mix Formula	Broadband		Production Tolerances		Tests Performed	Test Results		Test Criteria	
			min.	max.	min.	max.		min.	max.	min.	max.
2	50		100	100			%Air Voids (Va)	4.03			
1 1/2	37.5		100	100			%VMA	15.5	14		
1	25		100	100			%VFA	74			
3/4	19	100	100	100			Dust/Asphalt Ratio	0.7	0.6	1.3	
1/2	12.5	99	90	100			Drain Down				
3/8	9.5	94	0	90			VCA - Mix			<VCA dry	
No.4	4.75	86	0	100			VCA - dry				
No.8	2.36	35	28	58			Max. Sp.Grav. (Gmm)	2.483			
No.16	1.18	0	0	100			Bulk Sp.Grav. (Gmb)	2.383			
No.30	0.6	0	0	100			% Gmm @ N Max			98	
No.50	0.3	0	0	100			Sp. Grav. of Binder (GB)	1.049			
No.100	0.15	0	0	100			Sp. Grav. of Agg. Blend (Gsb)	2.665			
No.200	0.075	3.5	2	10			Moist Sensitivity TSR	87			
Virgin Binder Content								4.0			
Binder Content of RAP								1.5			
								% Gmm @ N Design	95.0	97.0	
								Ignition Oven Agg. Correction Factor CFI	0.14 @ 538 Degrees C		
								% Absorbed AC	0.44		

COMPONENT MATERIALS	TOTAL MIX %	COMPONENTS - PRODUCER &
AGGREGATES, STONE SAND, WASHED	15.0	TILCON NEW JERSEY - MOUNT HOPE, NJ (AGGREGATE)
AGGREGATES, COARSE, #9, BROKEN STONE	33.0	TILCON NEW JERSEY - MOUNT HOPE, NJ (AGGREGATE)
AGGREGATES, COARSE, #67, BROKEN STONE	18.0	TILCON NEW JERSEY - MOUNT HOPE, NJ (AGGREGATE)
AGG FOR HMA, RAP	30.0	TILCON NEW JERSEY - MOUNT HOPE, NJ (AGGREGATE)
ASPHALT, BINDER, GRADE 64-22	4.0	NJDOT APPROVED BINDER

Remarks: RESEARCH - MTRC N104 SCHIFANO CONSTRUCTION  
0.125% BituTech (4.5% of ACV08) ASPHALT REGENERATOR  
VMA 14.4<15% WILL BE ALLOWED SINCE THIS IS RESEARCH  
APA 5.14-7MM OVERLAY 203>150CYCLES



# HMA Plant

- 600 TPH Gencor “Ultra Drum”, Warm Mix and RAP Compatible
- 10 – 100 Ton Cold Feed Bins
- 3 – 90 Ton RAP Bins
- **4 – 35,000 Gallon Vertical Asphalt Binder Tanks**
- 9 – 300 Ton Storage Silos
- Automatic Ticket Tube and Intercom System
- Central Testing Laboratory
- Easy and Safe Entrance and Exiting

# HMA Plant



# Production



# Production





# Drum, Filler System, AC Tanks



# Incorporating Bitutech Rejuvenator

- Anti-Strip pump is not capable of delivering required dosage rate!
- Required dosage is 4.5lbs. per ton of final HMA mix
- Add rejuvenator to the Asphalt Tank
- 1.46 tons (2920lbs.) of Rejuvenator to 25 tons of Asphalt Cement
- Each Tank can produce approximately 1500 tons of HMA
- Issues!
- Dosing the Tank is not the ideal way to introduce an additive





# New Jersey High RAP Production and Paving

April 2015

PROJECT ROADWAY: SR 22 Mountainside

MIX TYPE: 12.5m64 30% test strip

Comments from plant, construction, NJDOT(field) and testing lab:

- “Beautiful mix”
- “Lays down very nice”
- “Easy to work with”
- “Very surprised, not what I expected”
- “Wow.....”

# Test Strip Performance Results

## NJDOT HRAP Test Information

Supplier Name: Ticon Mt. Hope      Date Material Submitted: 4/8/2015  
 Mix Type: 12.5M64, 30% RAP      Additive/Modifier: Rejuvenator  
 Binder Supplier: Unknown      PG Grade: N.A.

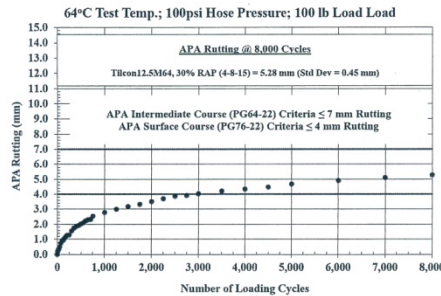
Test	Requirement			
	Surface Course		Intermediate Course	
	PG 64-22	PG 76-22	PG 64-22	PG 76-22
APA @ 8,000 loading cycles (AASHTO T 340)	< 7 mm	< 4 mm	< 7 mm	< 4 mm
Overlay Tester (NJDOT B-10)	> 150 cycles	> 175 cycles	> 100 cycles	> 125 cycles

### Test Results

#### NJDOT HRAP Criteria (PASS/FAIL)

APA Rutting (mm): 5.28  
 Overlay Tester (cycles): 473

	Rutting	Fatigue
PG76-22, Surface:	FAIL	PASS
PG64-22, Surface:	PASS	PASS
PG76-22, Intermediate:	FAIL	PASS
PG64-22, Intermediate:	PASS	PASS



Overlay Tester Results (NJDOT B-10)			
Sample ID	Width (mm)	Height (mm)	Cycles
#1	76.14	39.11	495
#2	75.86	39.47	372
#4	76.01	40.73	553
<b>Ave =</b>	<b>76.0</b>	<b>39.8</b>	<b>473</b>

# New Jersey High RAP Production and Paving

## April 2015



# New Jersey High RAP Production and Paving

April 2015

PROJECT ROADWAY:	SR 15	SR 94	SR 23
MIX TYPE:	12.5m64	12.5m64	12.5m64
RAP CONTENT, %:	30.0	30.0	30.0
RAS CONTENT, %:	0.0	0.0	0.0
DOSAGE, % of RAP	0.75*	0.75*	0.75*
MIX TEMP., °F	300	300	300
COMPACTION TEMP., °F	285	285	285

- \*replacing a portion of the virgin binder

# New Jersey High RAP Production and Paving

April 2015

PROJECT ROADWAY: SR 15 SR 94 SR23

MIX TYPE: 12.5m64 30%

Comments from construction contractor and crew and testing lab:

- “Nice mix to handle”
- “Lays down very nice”
- “Easy mix to compact”
- “We like working with this mix”



# Rt. 15 Sussex County



# Pavement Close-Up

15% RAP Pavement



30% RAP Pavement





# 12.5M64 30% RAP



Rt. 15 NB

# Lessons Learned

- Know your raw ingredients
- Install a dedicated Additive Pump
- Adding Rejuvenator to AC tanks is not practical
- QC Performance Testing can be done in-house
- Explore different Rejuvenators
- Design new mix's with 40% and 50% RAP
- Is it Possible to add Rejuvenators to existing mix's?
- Think outside of the Box!

# Chocolate Cake

## No Dairy Products!

### Ingredients

- 6 TBSP Cocoa
- 3 Cups Flour
- 2 Cups Sugar
- 2 tsp Baking Soda
- 1 tsp Salt
- 1 tsp Vanilla
- $\frac{3}{4}$  Cup Oil
- 2 TBSP Vinegar
- 2 Cups Cold Water

- Mix all dry ingredients together. Make three holes; in one put the vanilla; in second put the oil; in the third put the vinegar. Pour the water over it all and mix until all ingredients are well mixed. Pour into lightly oiled 9x13 pan. Bake 30 minutes (or until toothpick comes out clean) in 350 degree oven; leave in pan to serve. Frost



# Acknowledgements

- Tilcon QC Team
- Thomas Bennert, Ph.D.
- Rutgers University (CAIT Lab)
- Engineered Additives (Rejuvenator)
- Schifano Construction Corp. (Paving Contractor)
- NJDOT

# THANK YOU!



## Questions?

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