

NEW MEXICO'S EXPERIENCES WITH ASPHALT ADHESION/COHESION



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NEW MEXICO HAS TWO WAYS OF DEALING WITH ASPHALT ADHESION/COHESION

- APPLICATION OF HISTORICAL DATA.
- RUN TESTING AT MIX DESIGN AND DURING CONSTRUCTION.



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HISTORICAL DATA IS APPLIED IN TWO WAYS

1. WE HAVE CERTAIN AGGREGATE SOURCES (FORMATIONS) THAT WE KNOW ASPHALT CEMENTS HAVE TROUBLE ADHERING.
2. WE KNOW IN THE PAST THAT CERTAIN ASPHALT CEMENTS HAVE NEEDED ADDITIVES TO INCREASE ADHESION.



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AN EXAMPLE OF AN
AGGREGATE SOURCE IN NEW
MEXICO THAT CONSISTENTLY
HAS PROBLEMS WITH BINDER
ADHESION COMES FROM THE
TODILTO FORMATION NEAR
GALLUP



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PAST PROBLEMS OBSERVED WITH THE TODILTO AGGREGATES ARE:

- STRIPPING/RAVELING
- LOW IMMERSION COMPRESSION TESTS
- EARLY PAVEMENT FAILURES



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THE SOLUTION IS TO AVOID
USING THIS FORMATION AND
OTHER FORMATIONS THAT
CONTAIN AGGREGATES DERIVED
FROM THIS FORMATION FOR
NMDOT ASPHALT
CONSTRUCTION OPERATIONS



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EXPERIENCE ALSO IS APPLIED TO VARIOUS ASPHALT CEMENTS

USUALLY IT'S A MATTER OF KNOWING HOW TO
CORRECT FOR THE POTENTIAL ADHESION
FAILURE FOR A PARTICULAR TYPE OR BRAND
OF ASPHALT CEMENT!



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AS AN EXAMPLE:

WE KNOW THAT HISTORICALLY, WHEN PRODUCING OPEN GRADED FRICTION COURSE ANYWHERE IN THE RIO GRANDE VALLEY, THAT LIQUID ANTI-STRIP WILL BE NEEDED FOR STRAIGHT PG 64-22 TO PG 58-28 (OLD 85/100 AND 60/70) ASPHALT CEMENTS.



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HISTORIES ARE NEVER
RELIED UPON EXCLUSIVELY!
THE NEW MEXICO
DEPARTMENT OF
TRANSPORTATION ALSO
TESTS EACH MIX DESIGN FOR
COHESION/ADHESION.



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NEW MEXICO USES THREE TESTS

- FOR OPEN GRADED FRICTION COURSES
 - STATIC IMMERSION TEST (NMDOT TEST) [THIS TEST IS SIMILAR TO AASHTO T-182 BUT NOT QUITE THE SAME!]
- FOR DENSE GRADED PLANT MIX BITUMINOUS PAVEMENTS
 - EFFECT OF WATER ON COHESION OF COMPACTED BITUMINOUS MIXTURES (AASHTO T-165)
 - RESISTANCE OF COMPACTED ASPHALT MIXTURES TO MOISTURE-INDUCED DAMAGE (AASHTO T-283)



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THE NMDOT STATIC IMMERSION TEST

- THIS TEST IS USED FOR FRICTION COURSE ONLY!
- TESTS ARE RUN ON BOTH PRODUCTION AND DESIGN MIXES.
- NMDOT HAS BEEN RUNNING THIS TEST FOR ABOUT TWENTY YEARS.
- THIS TEST HAS BEEN FAIRLY EFFECTIVE IN PREDICTING RESULTS.



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DESIGN PROCEDURE (STATIC IMMERSION TEST)

OBTAIN REPRESENTATIVE MATERIALS

- AGGREGATES FROM STOCKPILE OR STOCKPILES.
- ASPHALT CEMENT FROM SOURCE PLANT.
- LIME FROM SOURCE PLANT OR SOURCE SILO.
- PROPOSED LIQUID ANTI-STRIP.
- MATERIALS ARE USUALLY WITNESSED DURING SAMPLING.



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DESIGN PROCEDURE CONTINUED (STATIC IMMERSION TEST)

PREPARE SPECIMENS

- DETERMINE NUMBER OF VARIATIONS TO TEST AND PREPARE THREE SPECIMENS PER VARIATION.
- DRY AGGREGATES AND HEAT OIL TO DESIGN TEMPERATURE.
- WEIGH OUT 100 GRAMS OF AGGREGATE PER SPECIMEN.
- ADD LIME TO SPECIMENS REQUIRING LIME.
- HEAT AGGREGATE AND LIME TO MIXING TEMPERATURE.



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DESIGN PROCEDURE CONTINUED (STATIC IMMERSION TEST)

PREPARE SPECIMENS

- STIR LIQUID ASPHALT AND ADD CORRECT PERCENTAGE TO SPECIMEN.
- STIR AGGREGATE AND ASPHALT CEMENT UNTIL THOROUGHLY MIXED.
- DUMP AN MINIMUM OF 100 GRAMS OF THE MATERIAL INTO A TALL 600 MM BEAKER.
- COOL SPECIMEN TO 25°C (ROOM TEMPERATURE.)



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DESIGN PROCEDURE CONTINUED (STATIC IMMERSION TEST)

TESTING OF SPECIMENS

- FILL BEAKERS WITH 400 ML OF 25°C (ROOM TEMPERATURE) DISTILLED WATER.
- PLACE THE SPECIMEN IN A 60°C OVEN FOR TWENTY-FOUR HOURS, THEN REMOVE FROM OVEN AND ALLOW TO COOL.
- SPECIMENS ARE JUDGED ON A PASS/FALL BASIS AT 95% OF THE OVERALL AGGREGATE SURFACE COATED.



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DESIGN PROCEDURE

THE BEST OVERALL COMBINATION IS
THEN APPROVED FOR PRODUCTION!



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PRODUCTION PROCEDURE (STATIC IMMERSION TEST)

PREPARE SPECIMENS

- COLLECT A REPRESENTATIVE SAMPLE OF THE OPEN GRADED FRICTION COURSE FROM OUT OF THE AUGERS ON THE LAY- DOWN MACHINE.
- DUMP A MINIMUM OF 100 GRAMS OF THE MATERIAL INTO A TALL 600 MM BEAKER.
- COOL SPECIMEN TO 25°C (ROOM TEMPERATURE).



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PRODUCTION PROCEDURE CONTINUED (STATIC IMMERSION TEST)

TESTING OF SPECIMENS

- FILL BEAKERS WITH 400 ML OF 25°C (ROOM TEMPERATURE) DISTILLED WATER.
- PLACE THE SPECIMEN IN A 60°C OVEN FOR TWENTY-FOUR HOURS THEN REMOVE FROM OVEN AND ALLOW TO COOL.
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PRODUCTION STATIC IMMERSION TESTING

IN THE EVENT THAT SAMPLES FAIL!

- THE CONTRACTOR IS NOTIFIED OF THE PROBLEM
 - THE MIX DESIGN IS ADJUSTED.
 - THE MATERIAL MAY BE REMOVED AND REPLACED.
 - THE MATERIAL MAY BE LEFT IN PLACE AND MONITORED.
 - MATERIAL WILL BE FOG SEALED.



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EFFECTIVENESS

FAILURES HAVE DROPPED TO ZERO
AS A RESULT OF THIS TESTING AND
WORKING WITH BETTER ASPHALT
CEMENTS!



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TESTING DENSE GRADED PLANT MIX BITUMINOUS PAVEMENTS



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NMDOT TESTS FOR DENSER MIXES ARE:

**AASHTO T-165 THE EFFECT OF WATER ON
COHESION OF COMPACTED BITUMINOUS
MIXTURES**

**AASHTO T-283 RESISTANCE OF
COMPACTED ASPHALT MIXTURES TO
MOISTURE-INDUCED DAMAGE**



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AASHTO T-283

- THIS TEST WAS USED ONLY ON A VERY LIMITED BASIS.
 - IT WAS NEVER DEPLOYED ON A PROJECT BY PROJECT BASIS.
 - IT WAS RUN ONLY AT THE DISTRICT AND CENTRAL LAB.
 - THEREFORE NO REAL HISTORY WAS DEVELOPED.
- THIS TEST WAS NEVER PHASED INTO FULL PRODUCTION WITH THE ADVENT OF SHRP.



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AASHTO T-165

- THIS TEST HAS BEEN RUN FOR THE LAST TWENTY TO TWENTY-FIVE YEARS ON NMDOT PROJECTS.
- IT IS RUN PRIMARILY DURING THE DESIGN PROCESS.
- OCCASIONALLY WHEN A KNOWN PROBLEM AGGREGATE EXISTS, THIS TEST WILL BE ADDED TO THE SPECIFICATIONS AS A PRODUCTION TESTING REQUIREMENT.
- THIS IS NOT THE MOST ACCURATE TEST FOR PREDICTION.



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AASHTO T-165

- THIS TEST ALLOWS FOR A SINGLE-OPERATOR TO VARY BY 18% ON TWO SAMPLES OF THE SAME MATERIAL.
- THIS TEST ALLOWS FOR TWO LABORATORIES TO VARY BY 50% ON IDENTICAL SAMPLES.
- WITH THESE LEVELS OF PRECISION, NMDOT FEELS THAT WE NEED A LARGE RETAINED STABILITY FOR ASSURANCE THE MIX WILL MAINTAIN COHESION.
- THE NEW MEXICO DEPARTMENT OF TRANSPORTATION REQUIRES AN 85% RETAINED STABILITY AT 7% AIR VOIDS.



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IN CONCLUSION

NEW MEXICO HAS A FAIRLY
EFFECTIVE PROGRAM FOR OPEN
GRADED FRICTION COURSE BUT NOT
FOR DENSE GRADED MIXES.



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ARE BETTER TESTS NEEDED?

**ABSOLUTELY! WITH THE SHRINKING
FUNDING LEVELS AND INCREASED
DEMANDS ON OUR SYSTEM, WE CANT
AFFORD FOR A MIX TO LOSE
ADHESION/COHESION AND FALL APART!**



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