Midwest Pavement Preservation Partnership Annual Meeting

September 8 - 11, 2008
Minneapolis, Minnesota

Rumble Strip Preservation

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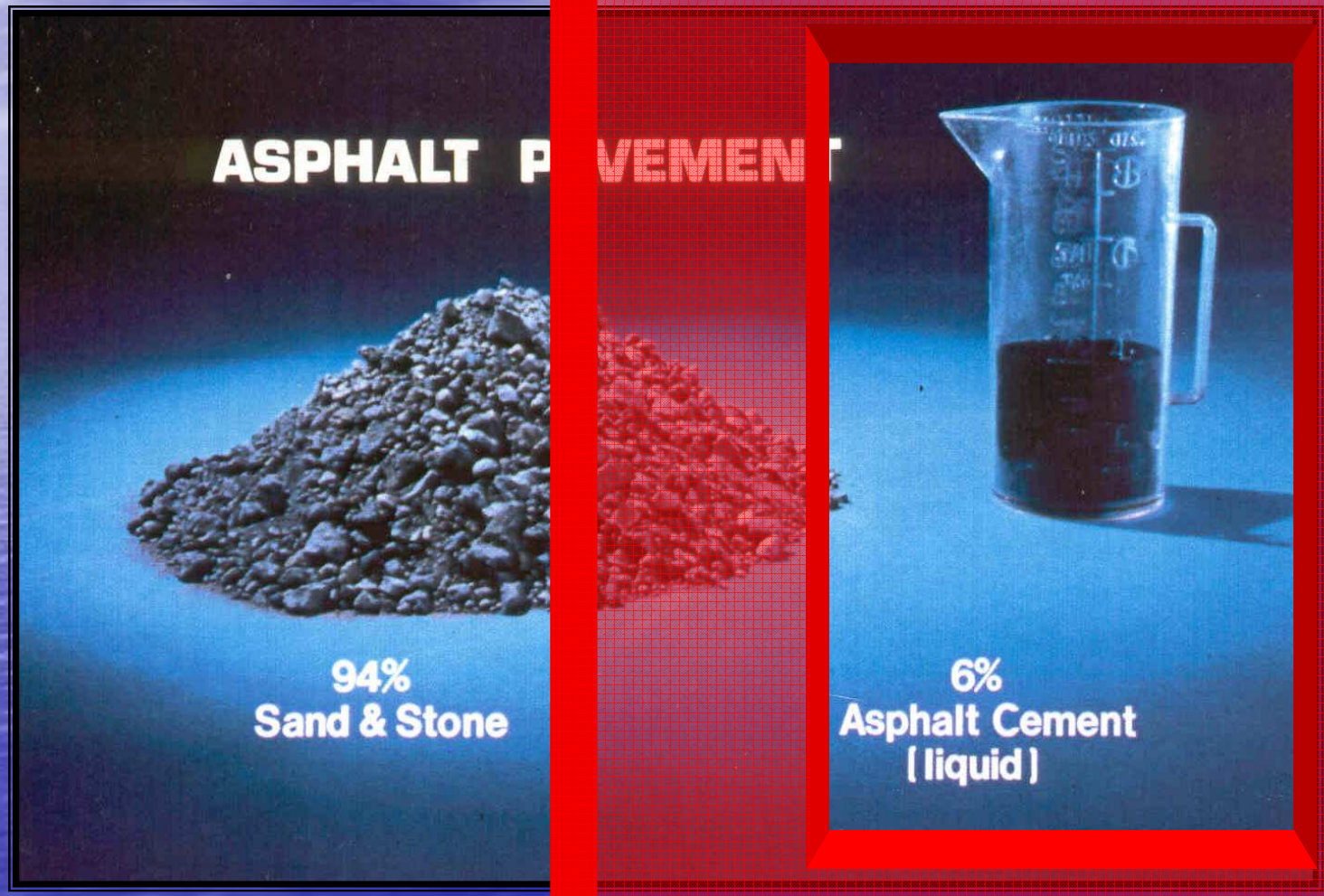
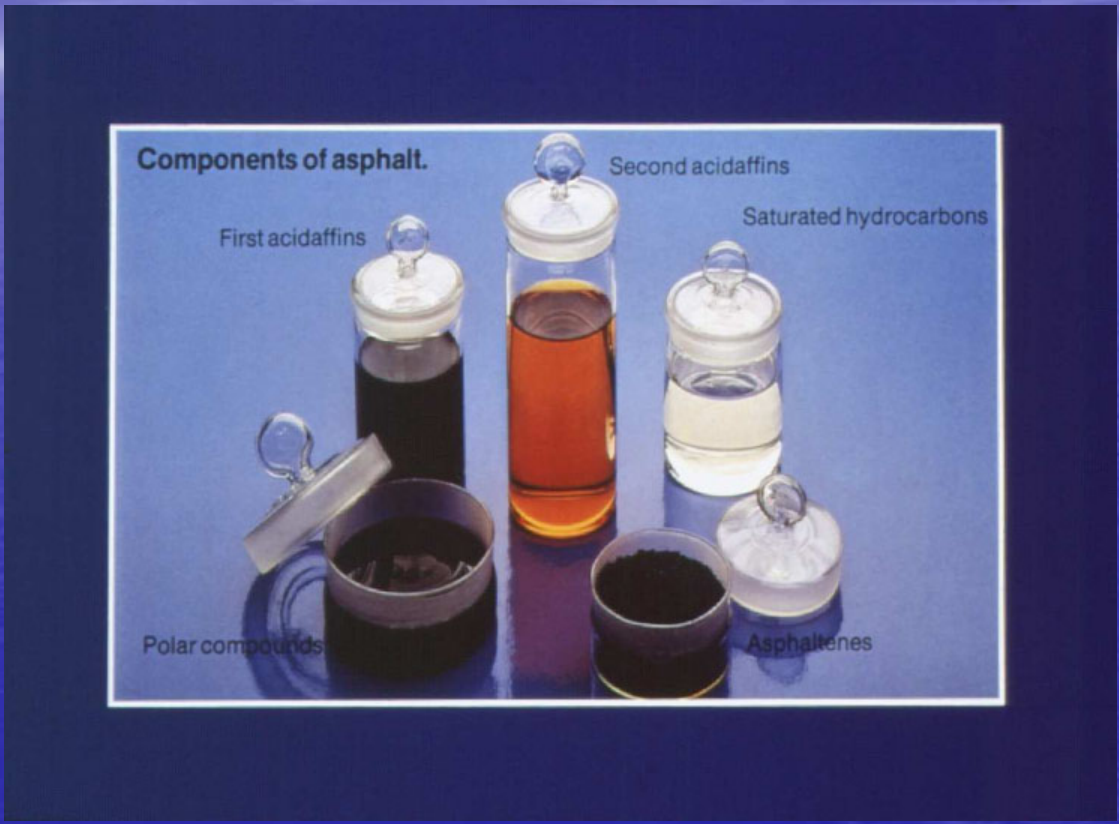
BUMPY ROAD
SLOW
CONOMY CARS ONLY
BUMP
ROAD WORK
SPEED LIMIT
01
ROAD CLOS
TO HEAVY
VEHICLES
DETOU
Structurally Adequate Pavement
© 2002 URETEK USA

Which component changed?



Asphalt Cement

- Stable component:
  - Asphaltenes
- Reactive components:
  - Saturated hydrocarbons (paraffins)
  - First acidaffins
  - Second acidaffins
  - Polar compounds



Chemical Composition of Asphalt Cement

Asphalt cement consists of five component groups:

Asphaltenes(A), the bodying agent gives asphalt its black color, is hard and brittle like pencil lead.

Maltenes, which provide the *cohesive* and *flexible* qualities of the asphalt cement. They are categorized as:

- **Polar compounds** or Nitrogen bases (N)- components of highly reactive resins, which act as a peptizer for the asphaltenes.
- **First acidiffins** (A_1)- components of resinous hydrocarbons which function as a solvent for the peptized asphaltenes.
- **Second acidiffins** (A_2)- components of slightly unsaturated hydrocarbons that also serve as a solvent for the peptized asphaltenes.
- **Paraffins** (P) – saturated hydrocarbons, which function as a gelling agent for the asphalt components

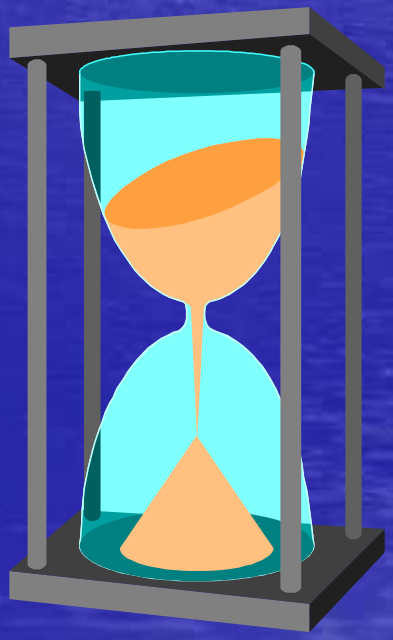
From the moment an asphalt pavement is created at a central mixing plant -- deterioration of the “GLUE” begins.

This is due to the high heat environment necessary to blend asphalt cement with stone and get it to the job site in a pliable state.

Deterioration

Substantial chemical changes such as a decrease in penetration number and an increase in viscosity (**embrittlement**) of the asphalt cement take place during this short mixing period primarily due to the high heat environment.

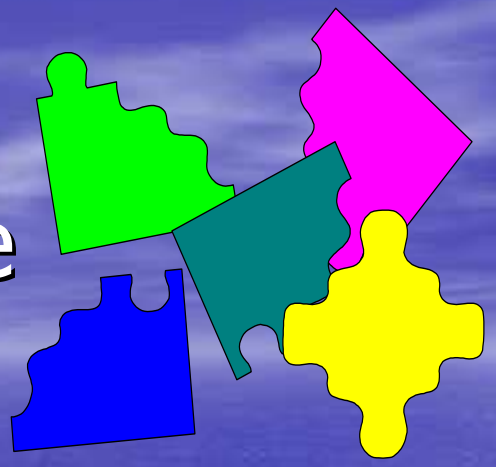
The penetration number (**softness**) of the asphalt cement after the mixing cycle is only 60% to 75% of its original value.



Deterioration continues once the asphalt mixture is placed on a roadway from:

- Environmental temperature
- Oxidation
- Stripping action of storm water and melting snow
- Traffic wear

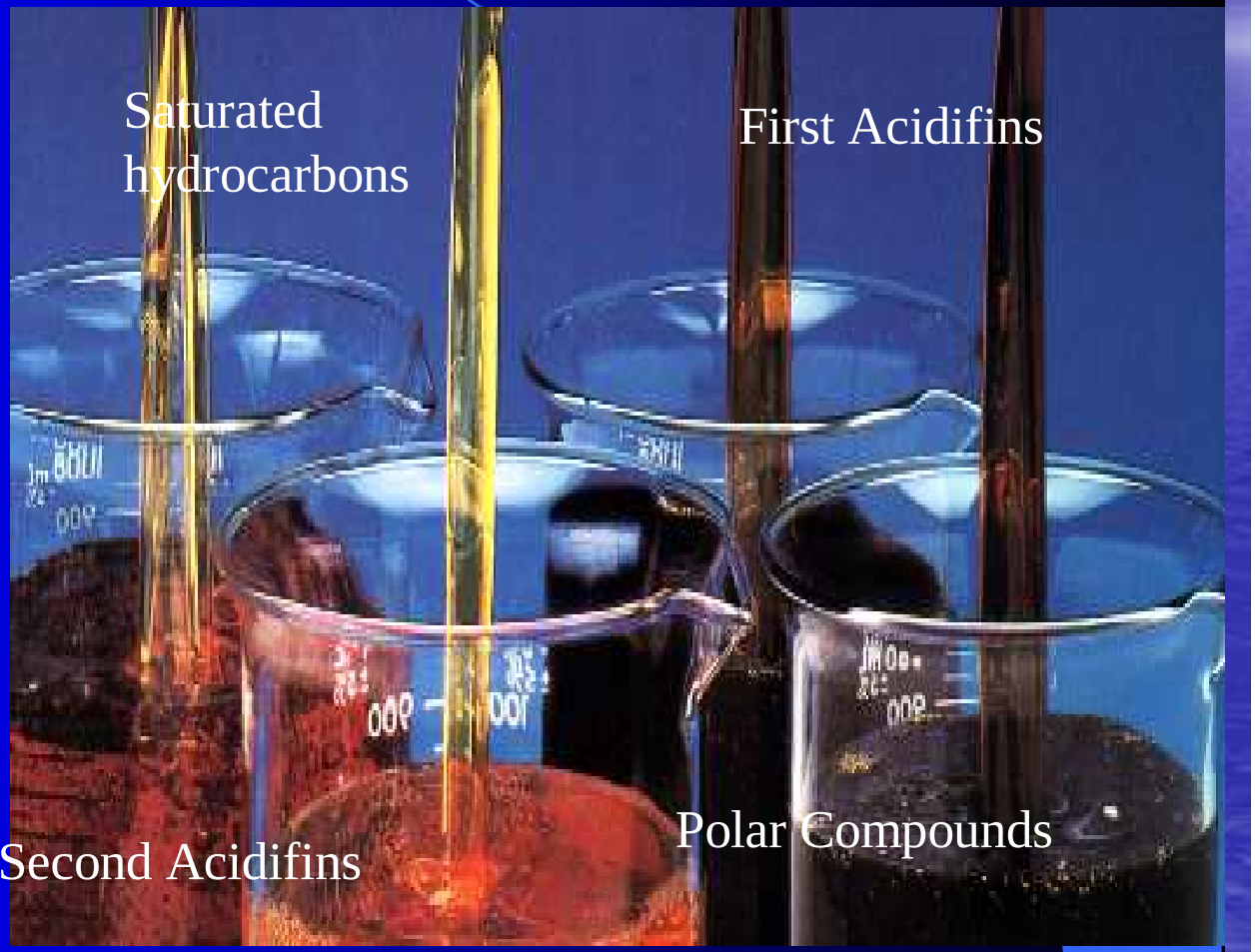
Reactive components deteriorate causing an imbalance with the asphaltenes.



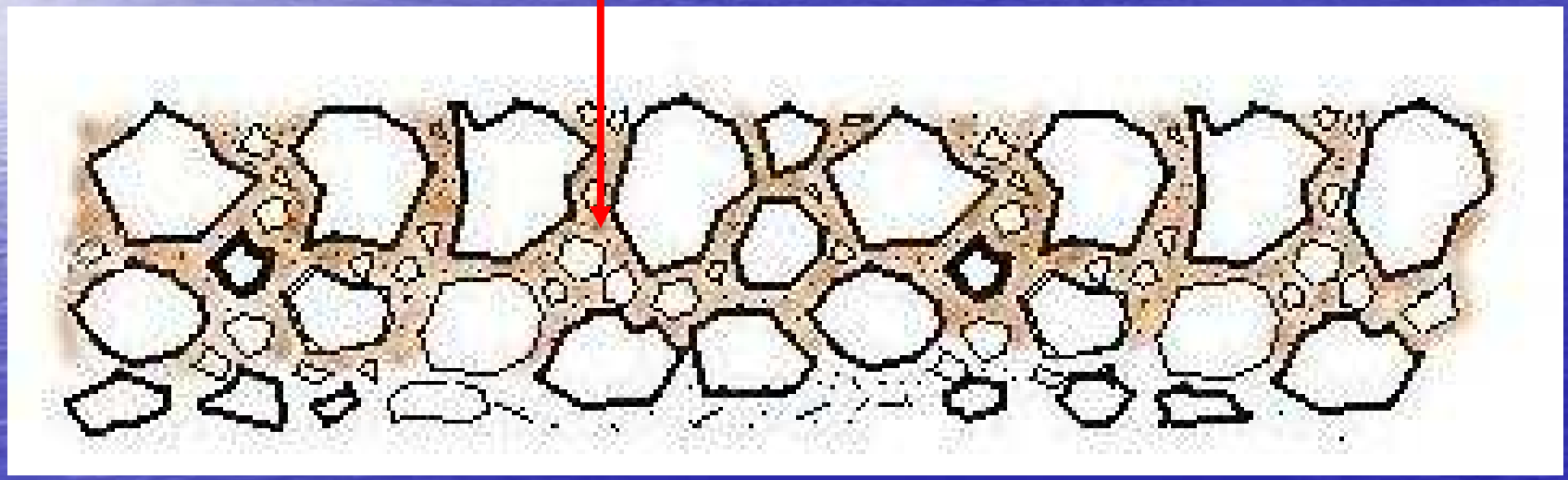
The Result:
"A Failed Glue!"

KEYS TO A QUALITY REJUVENATOR

An asphalt rejuvenator is a manufactured product which has the ability to absorb or penetrate into the pavement and restore those reactive components that have been lost due to oxidation



- **Maltenes** must penetrate into the pavement




SR 155 2003


SR155 - 9/30/05
Two years later the results are clear!

Two years later the results are clear!


The weakest part of a new asphalt pavement is the longitudinal construction joint between paving machine passes.

NCHRP
SYNTHESIS 339

NATIONAL COOPERATIVE HIGHWAY RESEARCH PROGRAM

Centerline Rumble Strips

A Synthesis of Highway Practice

TRANSPORTATION RESEARCH BOARD

CHAPTER FIVE

KEY ISSUES AND ANALYSIS

CENTERLINE RUMBLE STRIP EFFECTIVENESS

Most information on CLRS obtained from published and unpublished literature, a nationwide survey, and personal contacts was positive, and the available body of evidence suggests they reduce cross-over crashes on two-lane roadways and save lives. Although there are some negative aspects to their installation, the positive aspects appear to far outweigh the negative ones. Analysis should continue and more studies should be conducted to address the negative points, such as centerline marking visibility; pavement deterioration; effects on motorcycles; risk to bicyclists, particularly on roadways with narrow or no shoulder; and the effects of noise on residences.

EXTENT OF CENTERLINE RUMBLE STRIP USE

In the interval between the two surveys, in 2000 and 2003, the number of states with CLRS only increased from 20 to 22 and the number of Canadian provinces from 1 to 2; however, the number of miles of CLRS increased considerably. In 2000, the maximum number of miles in any state was 15. In 2003, there was one state with 300 mi, and the total miles of all states using CLRS increased significantly to more than 2,000. Several states reported having only a few miles of CLRS in 2003, indicating the tendency to still be experimental. Six states indicated they had no interest in CLRS. Most states that have not installed or have not considered using them appear to be waiting for more "evidence."

COMPILATION OF POSITIVE FINDINGS

- Several states using CLRS reported a reduction in overall, targeted (cross-over), injury, and/or fatal crashes.
- A report setting forth guidance for implementation of the AASHTO strategic safety plan cited positive reviews of CLRS for reducing crashes in three states and found no significant negative effects.
- A Pennsylvania study reported that PennDOT believed that the safety effectiveness of CLRS was well documented.
- A Delaware study on 2.9 mi of CLRS reported a cost
- Although the quality of the statistical analysis used in the studies that report crash reductions is, in most cases, unknown, a comprehensive study using reliable data available from seven states and state-of-the-art statistical methodology found that overall vehicle crashes were reduced by an estimated 15%, injury crashes by an estimated 15%, head-on and opposing-direction crashes by an estimated 21%, and head-on and opposing-direction sideswipe crashes involving injury by an estimated 25%. Available data were insufficient to make any conclusions about reductions in fatal crashes.
- In a Kansas study, 96% of the respondents felt that installation of CLRS would reduce crashes. Minnesota also reported driver satisfaction with CLRS.
- Benefits beyond safety were also reported by some states.

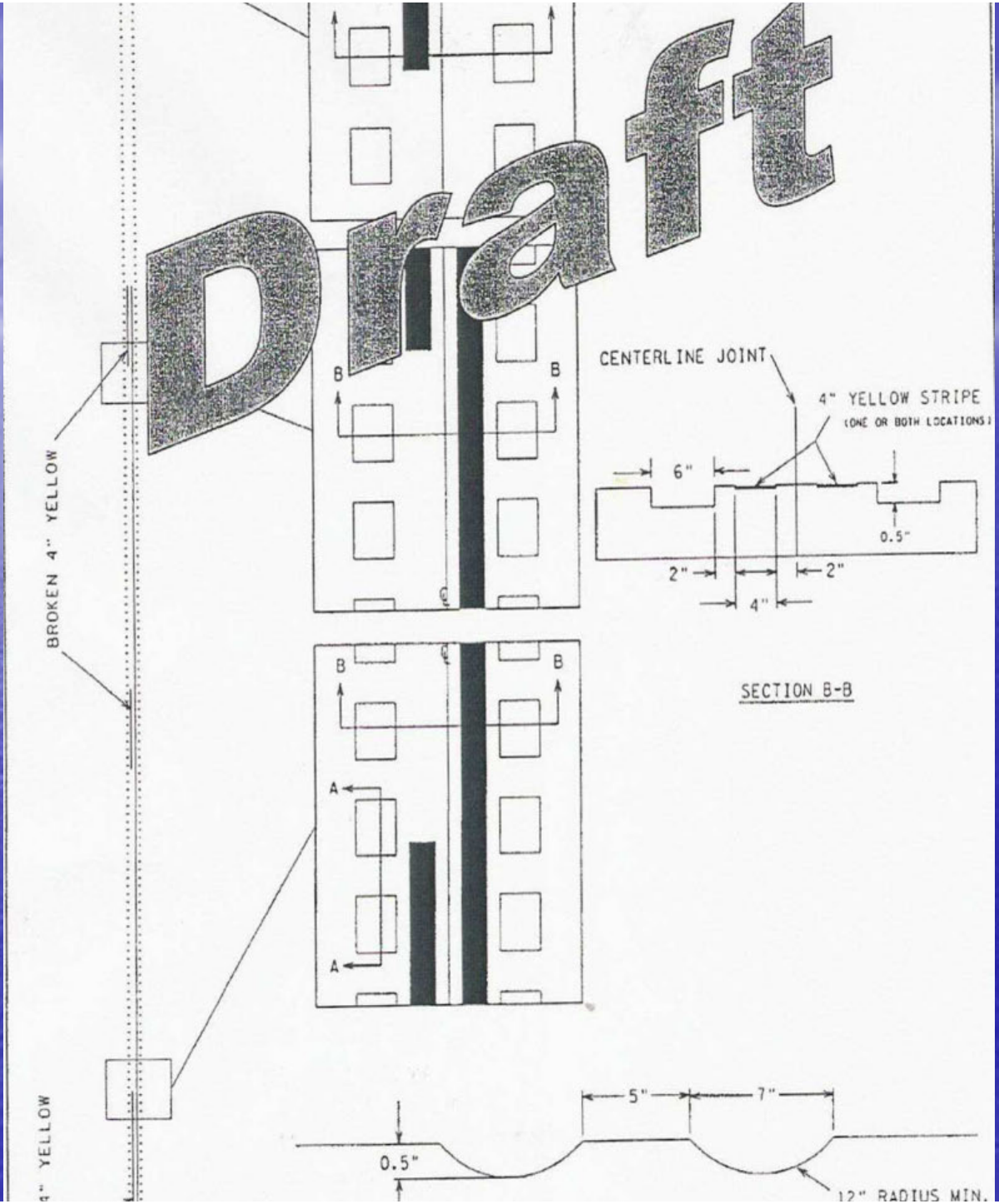
COMPILATION OF NEGATIVE FINDINGS

No reliable evidence of negative effects was uncovered; however, there are several concerns that have not yet been proven, disproved, or, in some cases, adequately studied:

- Danger to bicyclists,
- Effect on motorcycles,
- Roadside noise complaints,
- Drivers reacting to the left,
- Pavement deterioration,
- Effect(s) on different types of pavement material,
- Striping visibility,
- Increased snowplow wear,
- Limited after data,
- Effect(s) on emergency vehicles,
- Lack of widely accepted guidelines, and
- Water, snow, and ice accumulation.

RELATIONSHIP OF KEY ISSUES TO SYNTHESIS SCOPE

The following summarizes the consultants' findings categorized by specific topics listed in the synthesis final scope.


Draft
CENTERLINE JOINT
4" YELLOW STRIPE
(ONE OR BOTH LOCATIONS)
6"
0.5"
2"
2"
4"
BROKEN 4" YELLOW
B
B
B
B
A
A
SECTION B-B
5"
7"
0.5"
12" RADIUS MIN.

PENETRATING MALTENE EMULSION Being Applied To The Longitudinal Joints

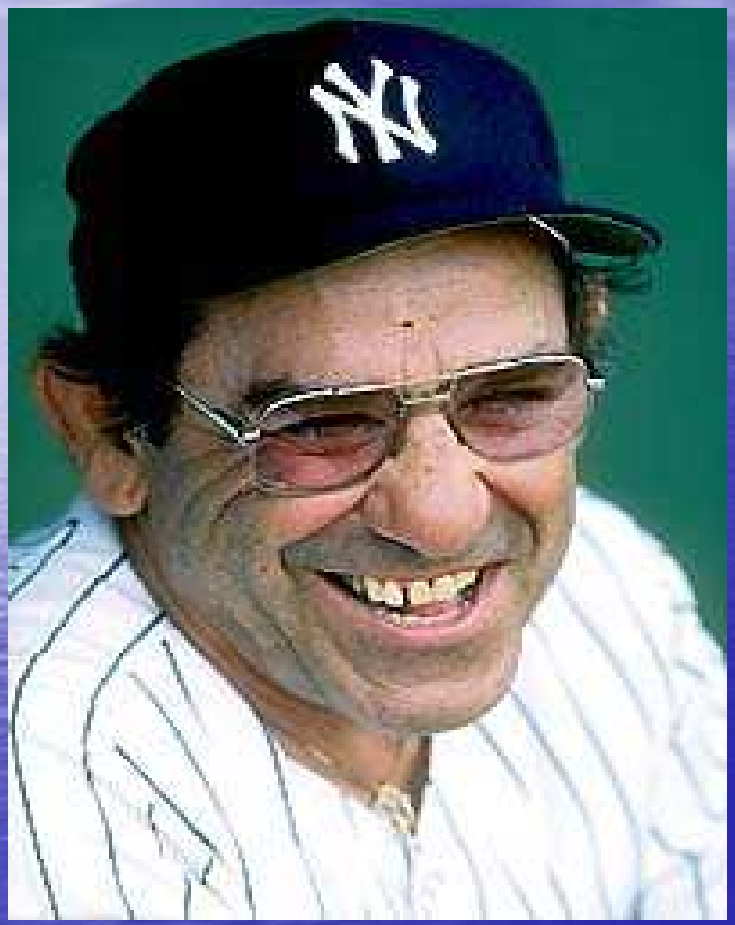
With Penetrating Emulsion , Striping is Not Obliterated!


Treated Areas
after
three years
in
TDOT trial.


“Untreated joints are beginning to crack and separate after three years”
TDOT
NOT
TREATED


"Untreated V's Treated"
Not Treated
Treated with Polymer Enhanced Maltenes
After Three Years
TDOT

Future



“Prediction is very hard, especially when it’s about the future”
-Yogi Berra.

Treatments

Common Preventive Maintenance Treatments

- Minnesota Treatments:
  1. Fog Seals: CSS-1h, CSS-1h (1:1), CRS-2pd
  2. Crack Treatments (longitudinal cold joint)
  3. Rejuvenators (Many Proprietary Products)


MNDOT SR 95


CHEVROLET

Questions or Comments?