ASPHALT

THE SMOOTH QUIET RIDE

ASPHALT 100% RECYCLABLE

# 2016 Local Roads Workshop

# Pavement Maintenance

Asphalt Pavement Association of Michigan

MICHIGAN RIDES ON US

Asphalt.

# Maintaining your roads with Asphalt

HMA – America's Most Versatile Product

SMOOTH | DURABLE | SAFE | QUIET

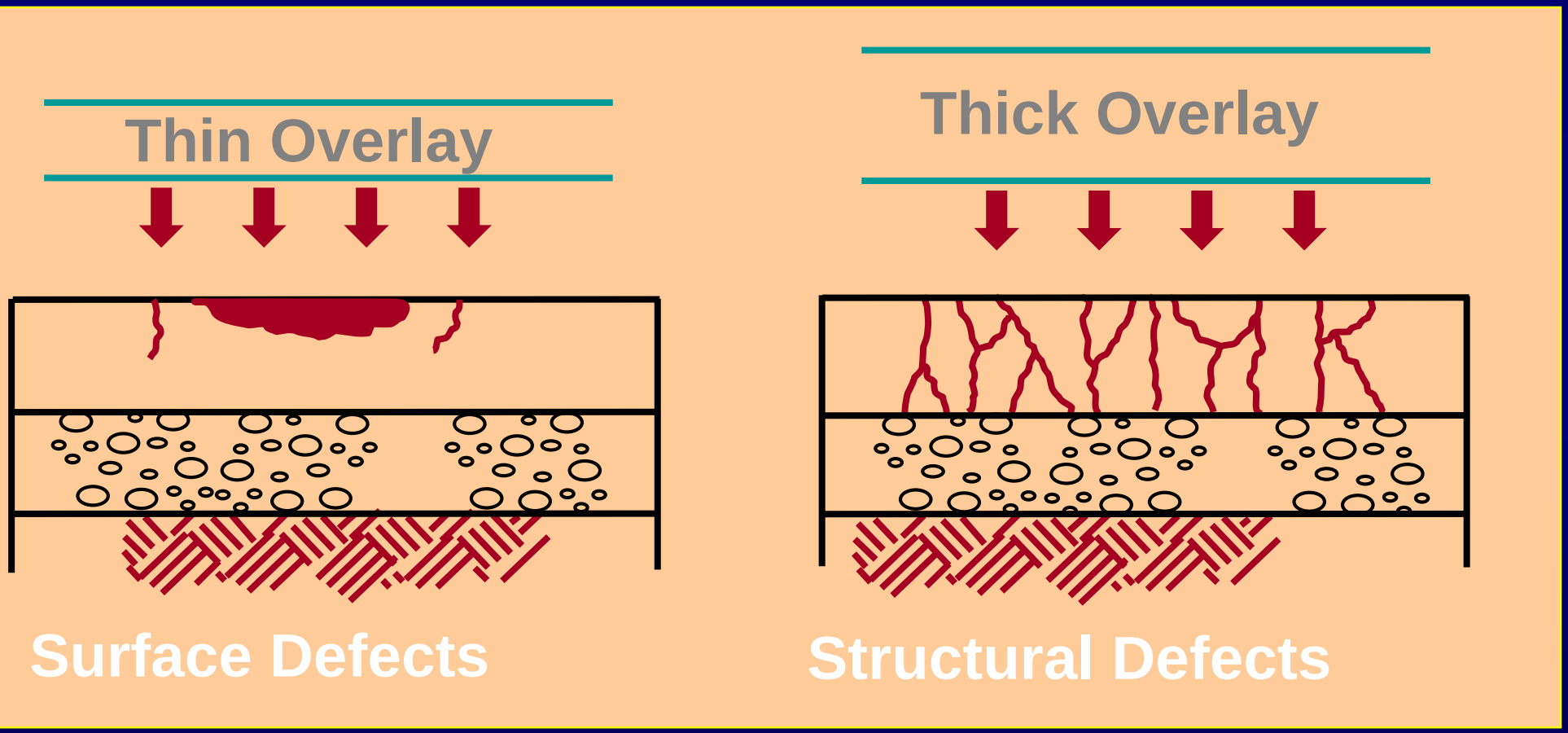
# Maintaining your roads with Asphalt

- **Asphalt Overlays**
- **Asphalt for Preventive Maintenance**

# Asphalt Overlays

- Functional overlays
  - Typically used to address surface distresses or improve ride quality
  - Generally not designed and rely on past experience
- Structural overlays
  - Correct structural deficiencies and are designed

# Asphalt Overlays



# Functional Overlays

- Remedy functional deficiencies
- Minimum constructible thickness
- May involve surface milling and repair with overlay

# Functional Deficiencies

- Adversely affect highway user
  - Poor surface friction
  - Hydro-planing
  - Surface distortion
    - Minor Rutting
    - Raveling
    - Surface Cracking
    - Surface Irregularities

# Surface Roughness

Irregularities in the pavement surface that adversely affect ride quality, safety, and vehicle maintenance costs

- HMA Pavements
  - Heaves, settlements
  - Deteriorated cracks
  - Deterioration
  - Raveling
- PCC Pavements
  - Heaves, settlements
  - Spalling
  - Faulting
  - Curling/warping
  - Texture application

# Options for Correcting Functional Deficiencies

- Thin overlay
- Milling plus thin overlay
- Full-depth or partial-depth repairs with thin overlay

# Structural Overlays

- Remedy structural deficiencies
- Minimum design thickness
- May involve surface milling and repair with overlay

# Structural Deficiencies

- Adversely affect the load-carrying capability of the pavement
- Indicators
  - Cracking
  - Distortion (rutting)
  - Disintegration

# Options for Correcting Structural Deficiencies

- Structural overlay
- Pre - overlay repair and structural overlay
- Rehabilitation and structural overlay
- Reconstruction

# Pre - overlay Repairs

- Amount and type depends on
  - Type of overlay
  - Structural adequacy
  - Distress types and severity
  - Future traffic loadings
  - Physical constraints
  - Overall project funding

# Pre - overlay Repairs

- Consider trade-offs between
  - Overlay type
  - Overlay thickness
  - Pre - overlay repair extent

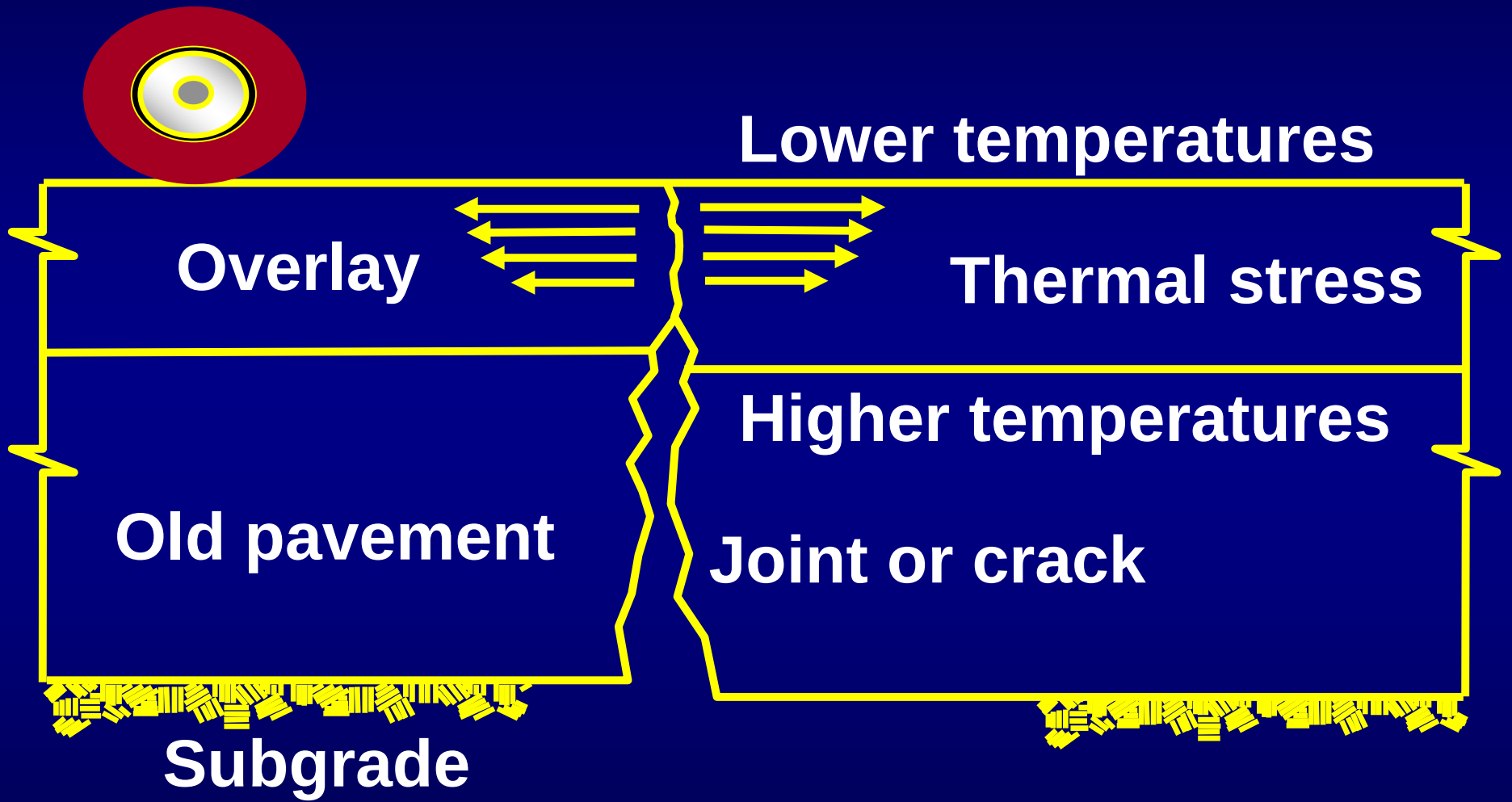
# Reflection Cracking

- Appear above joints or cracks in underlying pavement layer
  - AASHTO design equations do not consider directly
  - Additional steps must be taken to reduce the rate and severity

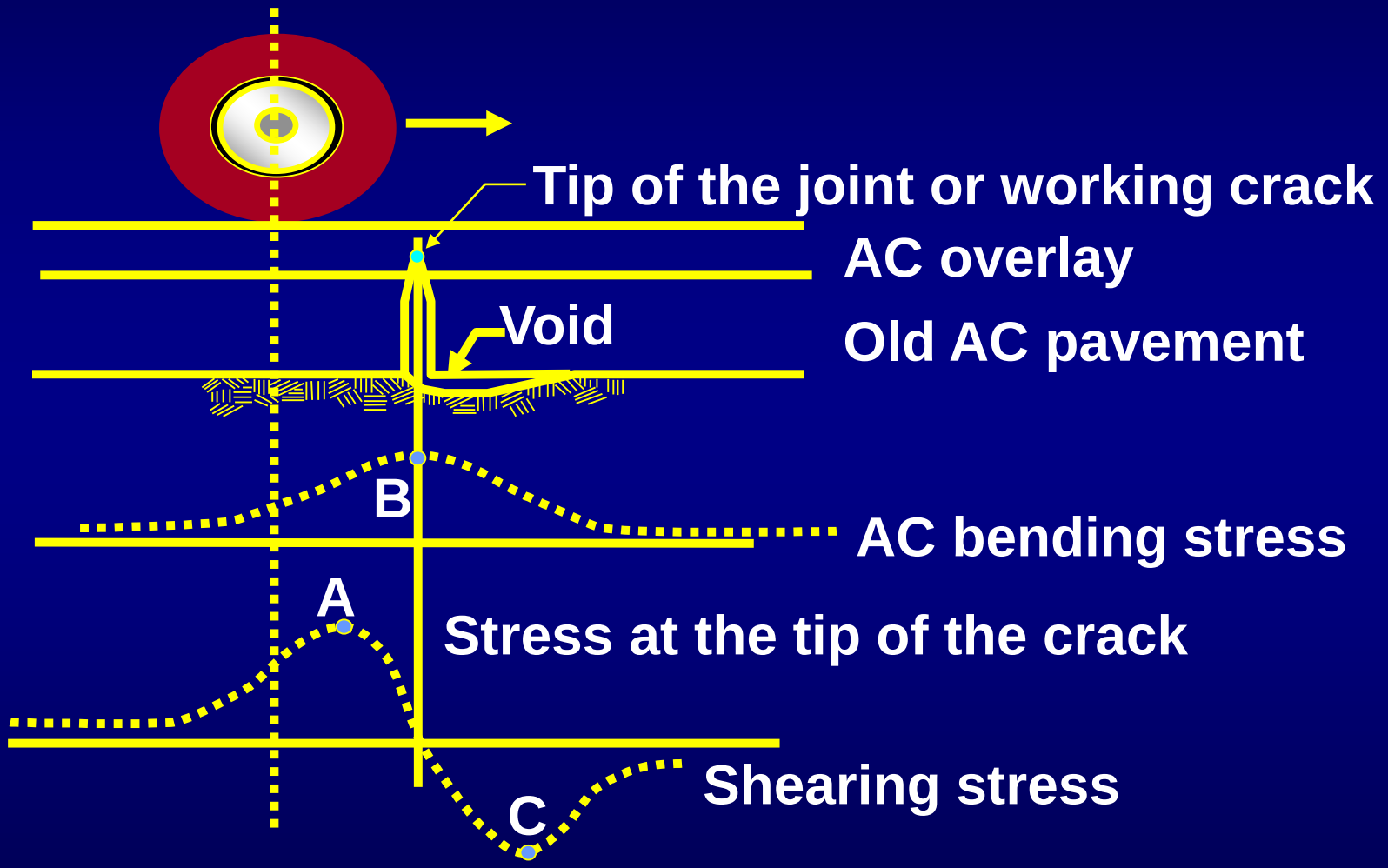
# Reflection Cracking

- Causes
  - Low temperature cycles
  - Traffic loads
- Excessive tensile stresses developed in overlay due to movement of existing pavement
- Initiates at bottom of overlay

# Stresses from Low Temperatures



# Stresses from Traffic Loads



# Reflection Cracking Control Measures

- Increased overlay thickness
- Fabrics
- Crack-arresting interlayers
- Pre - overlay treatments

# Increased Overlay Thickness

- Does not prevent the occurrence of reflection cracking
- Reduces the rate and severity of reflection cracking
- Cost-effectiveness must be considered relative to other techniques

# Fabrics

- Provide physical restraint (reinforcing layer) to resist formation of cracks
- Not as effective with substantial horizontal and vertical movements
- Most effective at longitudinal joints and in warm climates

# Crack-Arresting Interlayers

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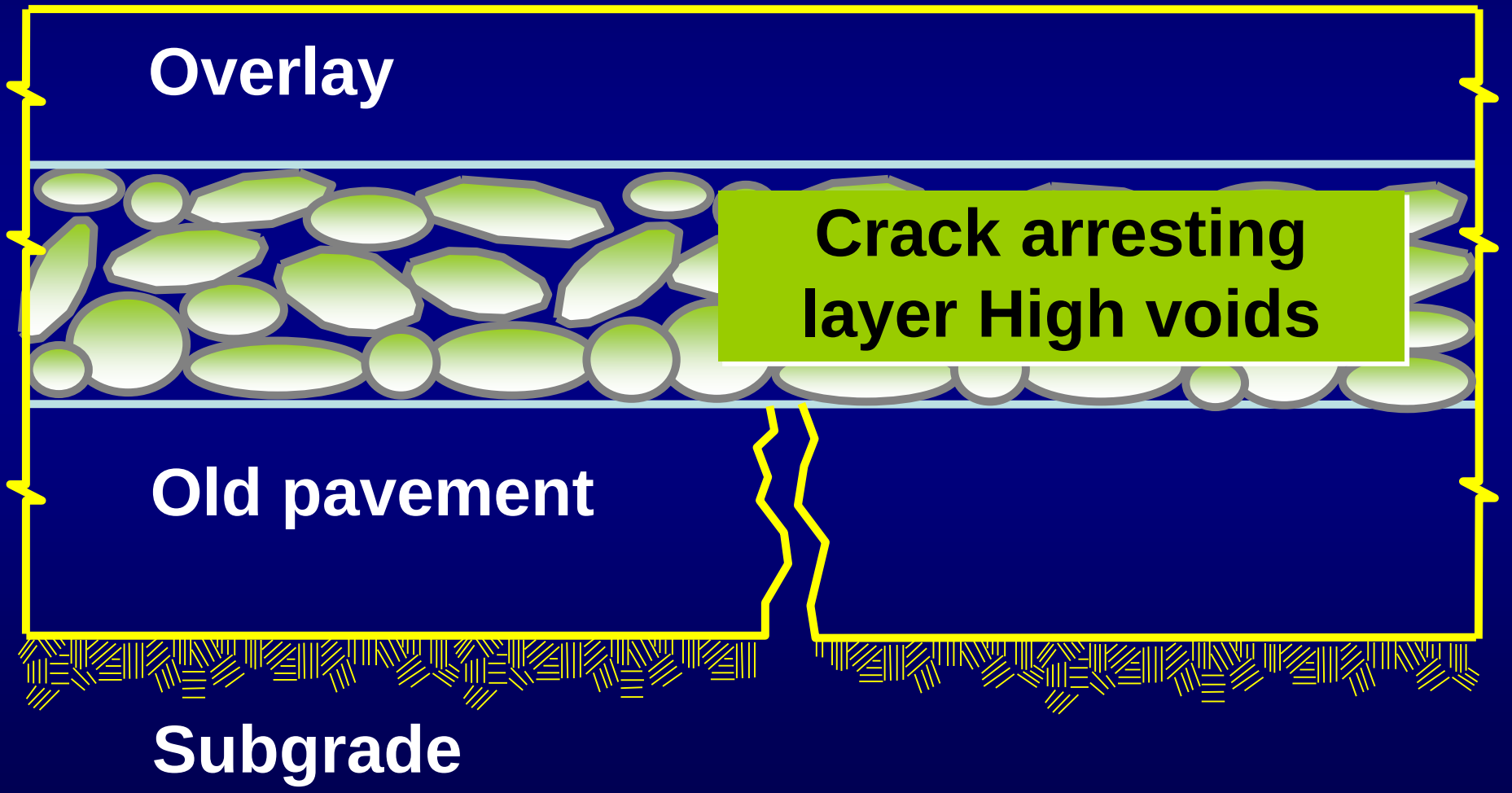
Aggregate lift or ASCRL (HMA)



# Pre-overlay Repair Treatments

- Any method that reduces movement at joints and cracks can potentially reduce reflection cracking
- Possible treatments
  - Surface milling
  - Crack Repair
  - Crush and Shape (rehab strategy)

# Summary

- Examine the feasibility of an overlay as most effective alternative vs. major rehab
- There is more to overlay design than just thickness design
  - Pre-overlay repairs
  - Sub-drainage
  - Reflection crack control
- Need to have reasonable performance expectations!

# Maintaining your roads with Asphalt

- Asphalt Overlays
- Asphalt for Preventive Maintenance

# Asphalt for Preventive Maintenance

## Thin Asphalt Overlays

- Shift from new construction to renewal and preservation
- Functional improvements for safety and smoothness needed more than structural improvements

# Benefits of Thin Asphalt Overlays


- Long service, low life-cycle cost
- Maintain grade and slope
- Handles heavy traffic
- Smooth surface
- Seal the surface
- No loose stones
- Minimize dust
- Minimize traffic delays
- No curing time
- Low noise generation
- No binder runoff
- Can be recycled
- Can use in stage construction
- Easy to maintain
- Restore skid resistance

# Preventive Maintenance

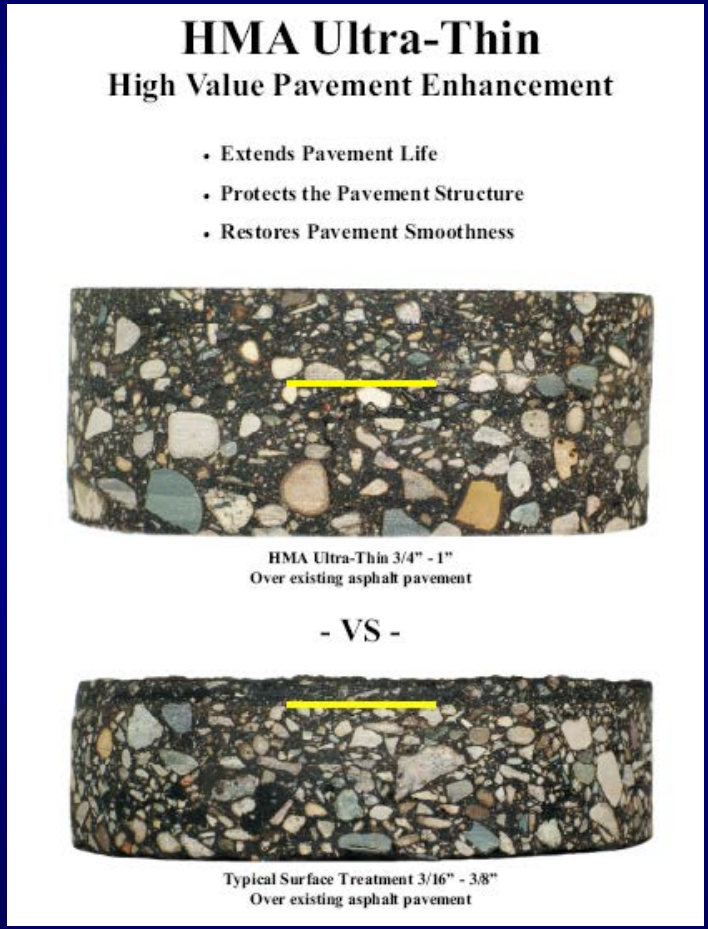
**WHAT EXACTLY *IS* YOUR PREVENTIVE MAINTENANCE PROGRAM PREVENTING?**

# Asphalt for Preventive Maintenance

Asphalt Pavement Association of Michigan

## HMA Ultra-Thin:

- Extends Pavement Service Life
- Protects the Pavement Structure
- Restores Pavement Smoothness



# HMA Ultra Thin

Asphalt Pavement Association of Michigan

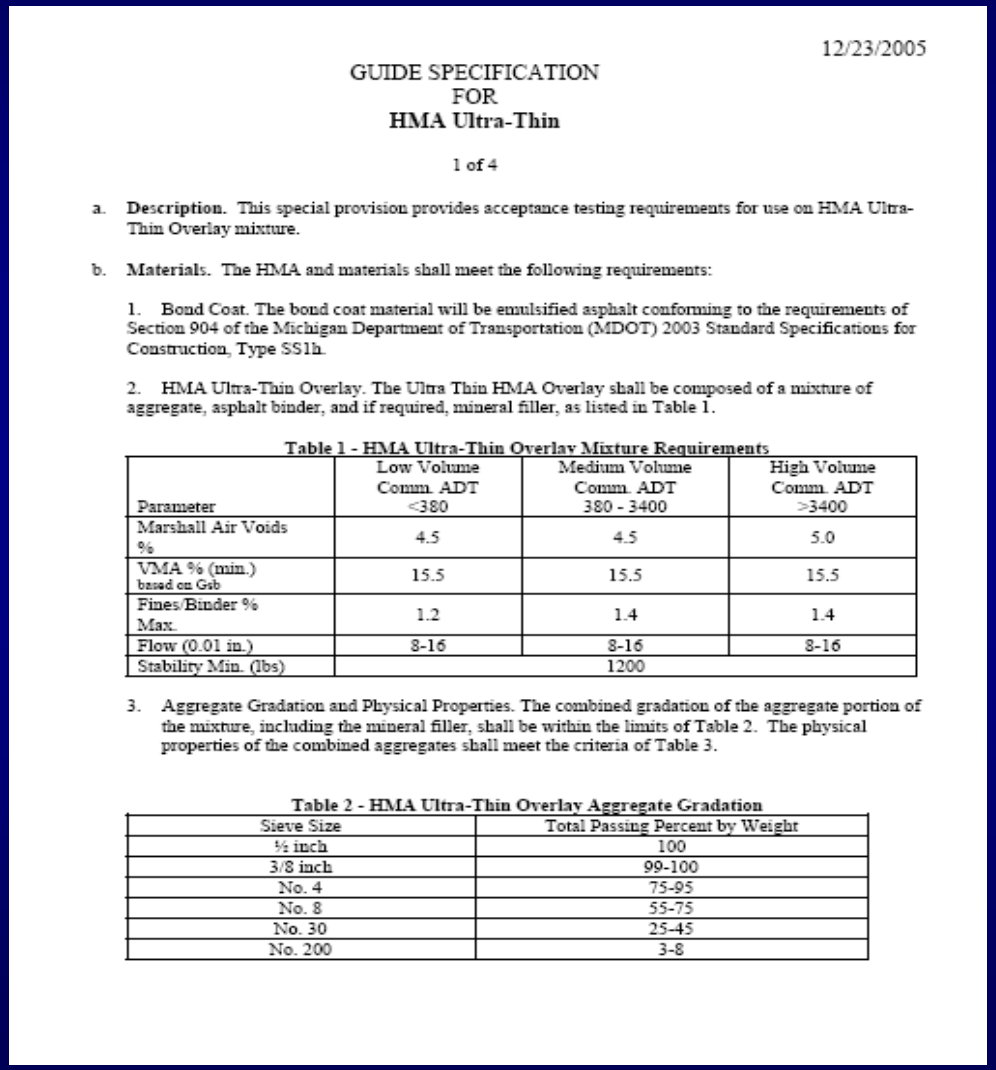
What does HMA Ultra-Thin do:

- Protects the pavement structure
- Adds structural value
- Corrects surface deficiencies
- Improves skid - resistance
- Improves ride quality (restores crown)

# HMA Ultra Thin

ASPHALT PAVEMENT ASSOCIATION OF MICHIGAN

## Guide Specification for HMA Ultra-Thin 2005: APAM



12/23/2005

GUIDE SPECIFICATION
FOR
**HMA Ultra-Thin**

1 of 4

a. **Description.** This special provision provides acceptance testing requirements for use on HMA Ultra-Thin Overlay mixture.

b. **Materials.** The HMA and materials shall meet the following requirements:

1. Bond Coat. The bond coat material will be emulsified asphalt conforming to the requirements of Section 904 of the Michigan Department of Transportation (MDOT) 2003 Standard Specifications for Construction, Type SS1h.

2. HMA Ultra-Thin Overlay. The Ultra Thin HMA Overlay shall be composed of a mixture of aggregate, asphalt binder, and if required, mineral filler, as listed in Table 1.

**Table 1 - HMA Ultra-Thin Overlay Mixture Requirements**

| Parameter | Low Volume Comm. ADT <380 | Medium Volume Comm. ADT 380 - 3400 | High Volume Comm. ADT >3400 |
|---|---|---|---|
| Marshall Air Voids % | 4.5 | 4.5 | 5.0 |
| VMA % (min.) based on Gsb | 15.5 | 15.5 | 15.5 |
| Fines/Binder % Max. | 1.2 | 1.4 | 1.4 |
| Flow (0.01 in.) | 8-16 | 8-16 | 8-16 |
| Stability Min. (lbs) | 1200 | | |

3. Aggregate Gradation and Physical Properties. The combined gradation of the aggregate portion of the mixture, including the mineral filler, shall be within the limits of Table 2. The physical properties of the combined aggregates shall meet the criteria of Table 3.

**Table 2 - HMA Ultra-Thin Overlay Aggregate Gradation**

| Sieve Size | Total Passing Percent by Weight |
|---|---|
| ½ inch | 100 |
| 3/8 inch | 99-100 |
| No. 4 | 75-95 |
| No. 8 | 55-75 |
| No. 30 | 25-45 |
| No. 200 | 3-8 |

# HMA Ultra Thin

## APAM Guide Specification

**Table 4 - Asphalt Binder Selection for HMA Ultra-Thin Overlay**

| Low Volume<br>Comm. ADT<br><380 | Medium Volume<br>Comm. ADT<br>380 - 3400 | High Volume<br>Comm. ADT<br>>3400 |
|---|---|---|
| PG 64 -22* | PG 64 -28P** | PG 70-22P* |
| * In areas North of M-46, May use PG 58-28 (Low) or PG 70-28P (High)<br>** May use another "readily available" polymer modified (P) grade. | | |

# HMA Ultra Thin

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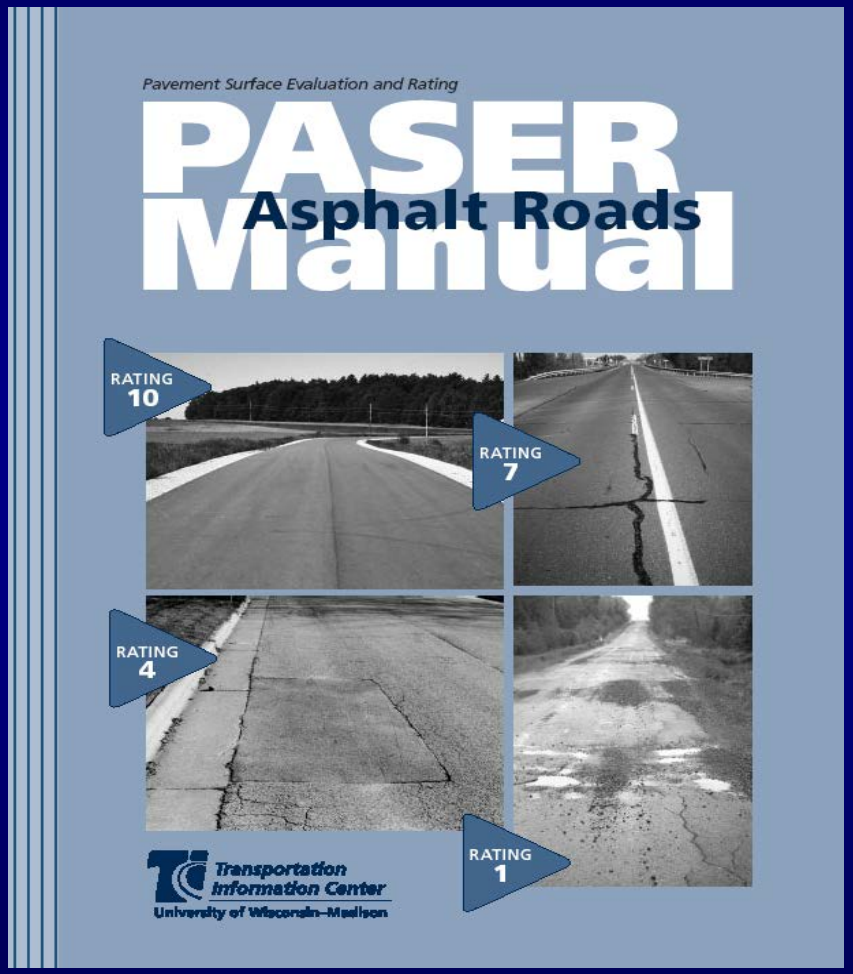
Existing Pavement Conditions:

- Good cross section
- Good base, structurally sound
- Visible surface distress may include:
  - Moderate cracking, ≤ 1/2” wide
  - Raveling and surface wear
  - Slight to moderate flushing or polishing
  - Occasional patch in good condition

# HMA Ultra Thin




4 – 6 Paser rating

# HMA Ultra Thin

| | HMA UT | Chip Seal | Microsurfacing |
|---|---|---|---|
| Increase skid resistance | ✓ | ✓ | ✓ |
| Minimizes curb loss | ✓ | ✓ | ✓ |
| Corrects surface distress | ✓ | ✓ | ✓ |
| Can be applied in one pass | ✓ | ✓ | |
| Increases structural strength | ✓ | | |
| Improves ride quality | ✓ | | |
| Improves pavement draining | ✓ | | |
| Corrects minor rutting | ✓ | | ✓ |
| Eliminates dust, loose aggregate | ✓ | | ✓ |
| Minimizes delamination | ✓ | | ✓ |

# HMA Ultra-Thin Performance

## MDOT Projects - Statewide

| UT Type | # of Jobs | Length (miles) | Avg. Age (end service) | Avg. Age (in service) | Avg. Age (overall) |
|---|---|---|---|---|---|
| Ultra-thin low | 52 | 483 | 6.6 (13) | 9.8 | 8.6 |
| Ultra-thin med | 41 | 339 | 5.5 (4) | 8.6 | 6.6 |
| Ultra-thin high | 16 | 89 | 5.3 (3) | 7.3 | 6.4 |

# HMA Ultra Thin

ASPHALT PAVEMENT ASSOCIATION OF MICHIGAN

## Prevention Maintenance Treatments Cost Comparison

| Treatment | $/syd | Cost/mile (24' wide) | MDOT Life extension range (years) | Life extension range average (years) | Cost/mile per year |
|---|---|---|---|---|---|
| Double chip seal | $3.18 | $44,773 | 3-5 | 4 | $11,193 |
| Micro-surface | $2.61 | $36,747 | 3-5 | 4 | $9,187 |
| Ultra-thin low | $2.51 | $35,339 | 5-9* | 9* | **$3,927** |
| Ultra-thin med | $2.87 | $40,408 | 5-9* | 8* | **$5,051** |
| Ultra-thin high | $3.29 | $46,321 | 5-9* | 7* | **$6,617** |

***Average Life Extension estimated by APAM**
**Unit Prices based on MDOT Information as of Jan. 2016**

# HMA Ultra Thin

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# Asphalt for Preventive Maintenance

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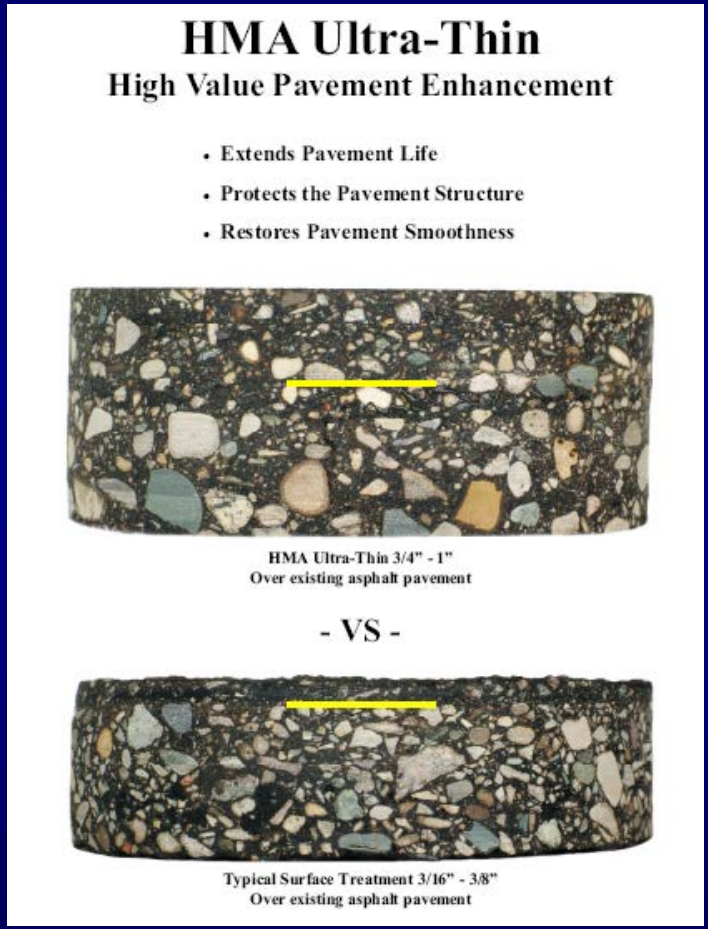

# Maintaining your roads with Asphalt

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Asphalt is the popular solution to pavement maintenance. Asphalt overlays are economical, long-lasting, and effective in treating a wide variety of surface distresses to restore ride quality, skid resistance, and overall performance.

# Maintaining your roads with Asphalt

**Thank You!**

**Questions??**

**www.apa-mi.org**

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