Porous Pavements & ASCRL

Charles E. Mills, P.E.

Director of Engineering

Asphalt Pavement Association of Michigan

www.apa-mi.org

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Presentation Outline

- **Porous Asphalt Pavements**
  - **What is a Porous Pavement**
  - **Design and Construction**
  - **Example Projects**
- **ASCRL**
  - **What is ASCRL**
  - **Design and Construction**
  - **Example Projects**

What are Porous Pavements?

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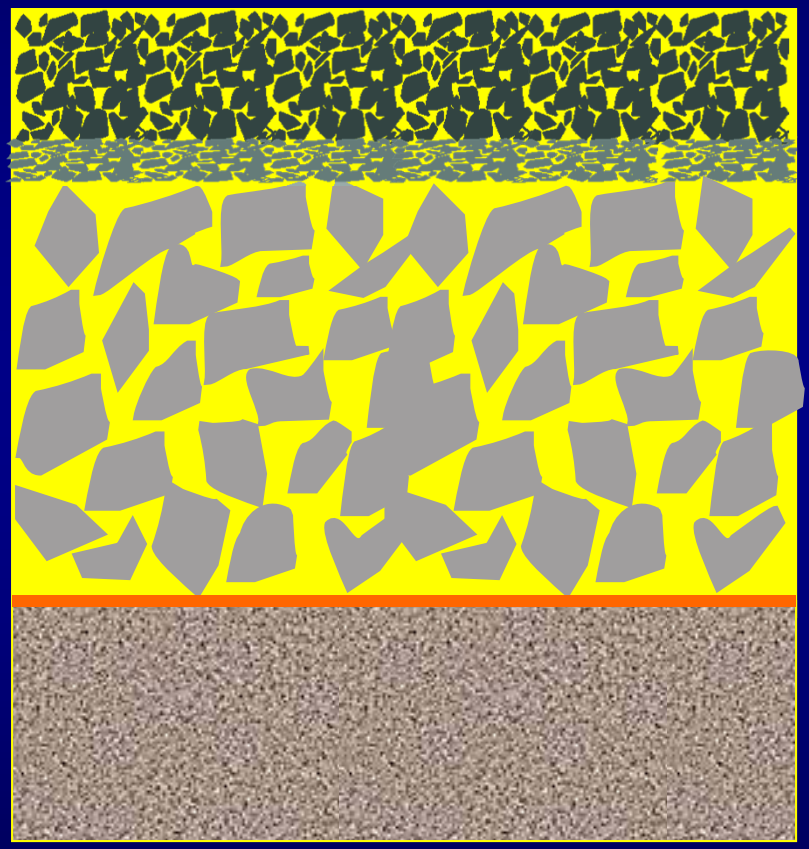
Open-Graded HMA ~ 2 ½ - 4”

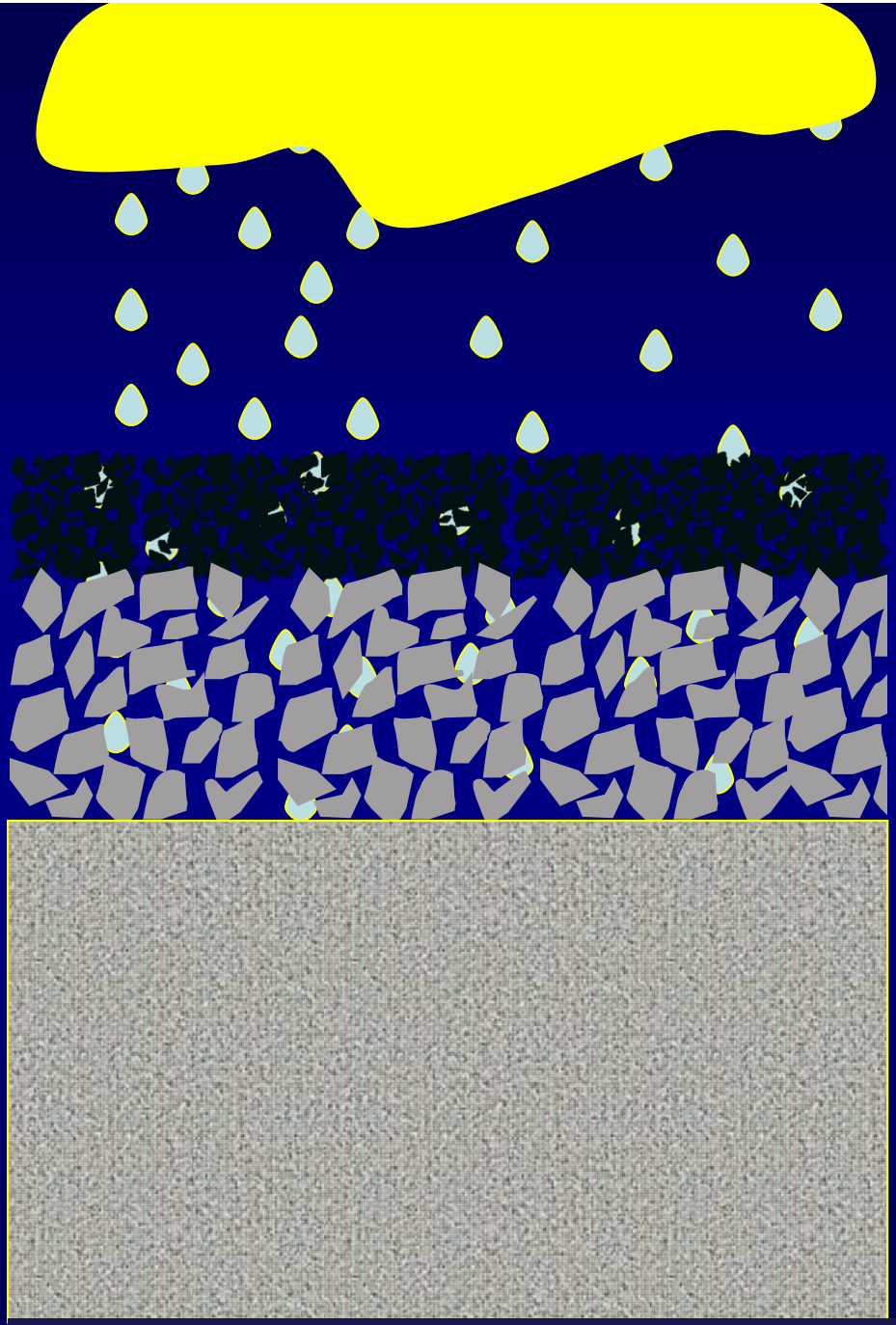
½” Agg. (#57) ~ 1 – 2” Thick

Clean Uniformly Graded 2”-3”
Crushed Agg. (#2) – 40% Voids

Non-Woven Geotextile

Uncompacted Subgrade





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Porous Applications

- Parking Lots
- Roads
  - on a limited basis
- Recreational Facilities
  - playgrounds, tennis courts, paths, etc.

Typical Porous Pavement

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Keys to Success – Site Conditions

- Soil permeability/infiltration rate
  - EPA recommends 0.5”/hour
  - 0.1”/hour still OK
- Depth to bedrock > 2’
- Depth to high water > 3’
- Fill – not recommended
- Frost
  - Pavement section should exceed frost depth

Soils Investigation

- Borings and/or test pits
  - Test permeability
  - Determine depth to high water table
  - Determine depth to bedrock

Keys to Success - Design

- Slope – limit surface slope to 5%
  - Terrace when necessary
  - Use conventional HMA for steeper slopes
- Avoid piping water long distances
- Spread infiltration over largest area possible
  - 5:1 Impervious: Infiltration

Keys to Success – HMA Design

- Materials Selection
- Aggregates
  - Fine Aggregate Angularity
  - Fractured Faces
  - L.A. Abrasion
- Binder
  - Stiffness
  - Polymer Modified
  - Fibers

Keys to Success – HMA Design

Gradation (APAM Guide)

Aggregate Gradation:	**Total Passing**
Sieve Size	**(% by weight)**
(3/4”) 19 mm	**100**
(1/2”) 12.5 mm	**85-100**
(3/8”) 9.5 mm	**55-75**
(#4) 4.75 mm	**10-25**
(#8) 2.36 mm	**5-10**
(#200) 75 µm	**2-4**

Keys to Success – HMA Design

- Binder Content 5.0 - 6.5%
- Air Voids ≥ 18%
- Drain down ≤ 0.3%
- Evaluate for Moisture Susceptibility
- Mix Design is required!!!

Keys to Success – Construction

- Build porous pavement last
  - Protect from construction debris
  - Protect from soil laden runoff
- Protect site from heavy equipment
  - Don't compact subgrade
- Excavate to subgrade (soft footprint)
- Place filter fabric

Keys to Success – Construction

- Place reservoir course 1.5 to 3 in. stone
- Place 1-2 in layer of ½ in stone to stabilize the surface of the reservoir course
- Place porous asphalt course (2 to 4 in.) usually compacted with 2-3 passes with 10 ton roller

Construction Guidelines

- Restrict traffic for 24 hrs.
- Protect porous pavement from contamination.
  - Runoff sediment
  - Construction debris
- Check Permeability

Construction Guidelines

Post Construction

- Inspect for design compliance during storm event.
- Confirm vegetation is established before removing temporary storm water measures
- Do not sand for snow or ice, liquid de-icing compounds may be used.
- Sign for maintenance.

Educational Sign

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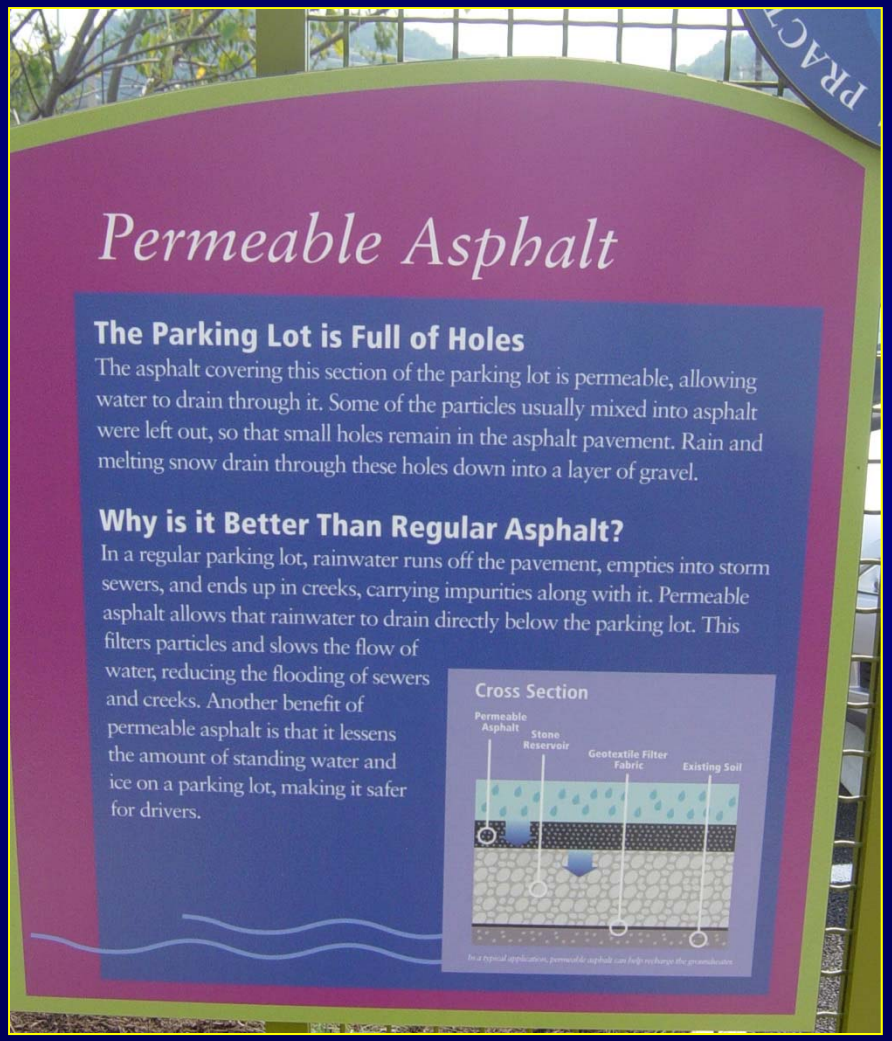

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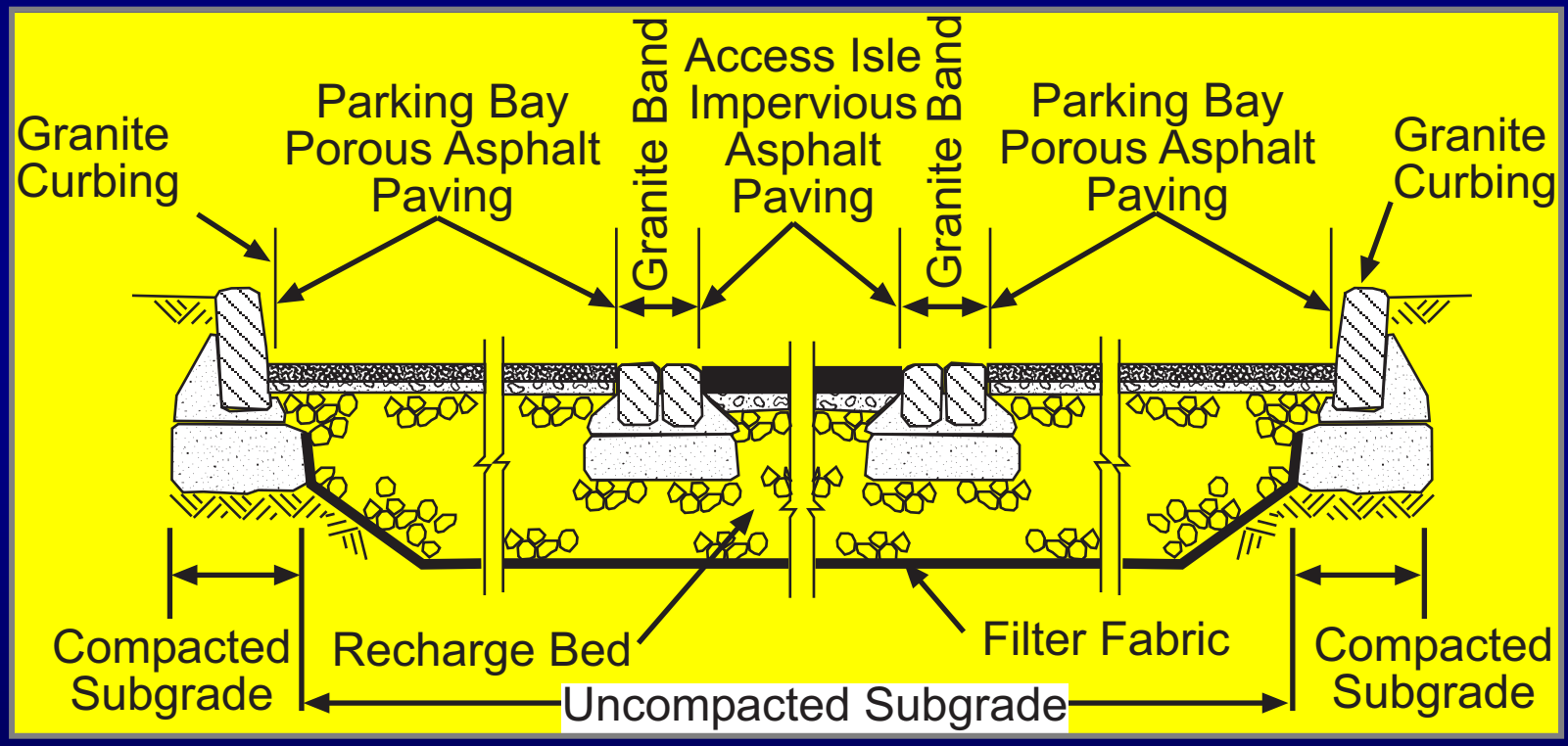
Maintenance

- Inspect several times first few months & during storm events.
- Inspect annually thereafter.
- Pavement surface may be flushed or vacuumed.
- Damaged pavement can be repaired using dense hot mix (provided <10% area).

Morris Arboretum
Philadelphia, PA
1983

Diagram of infiltration bed at Morris Arboretum



Morris Arboretum

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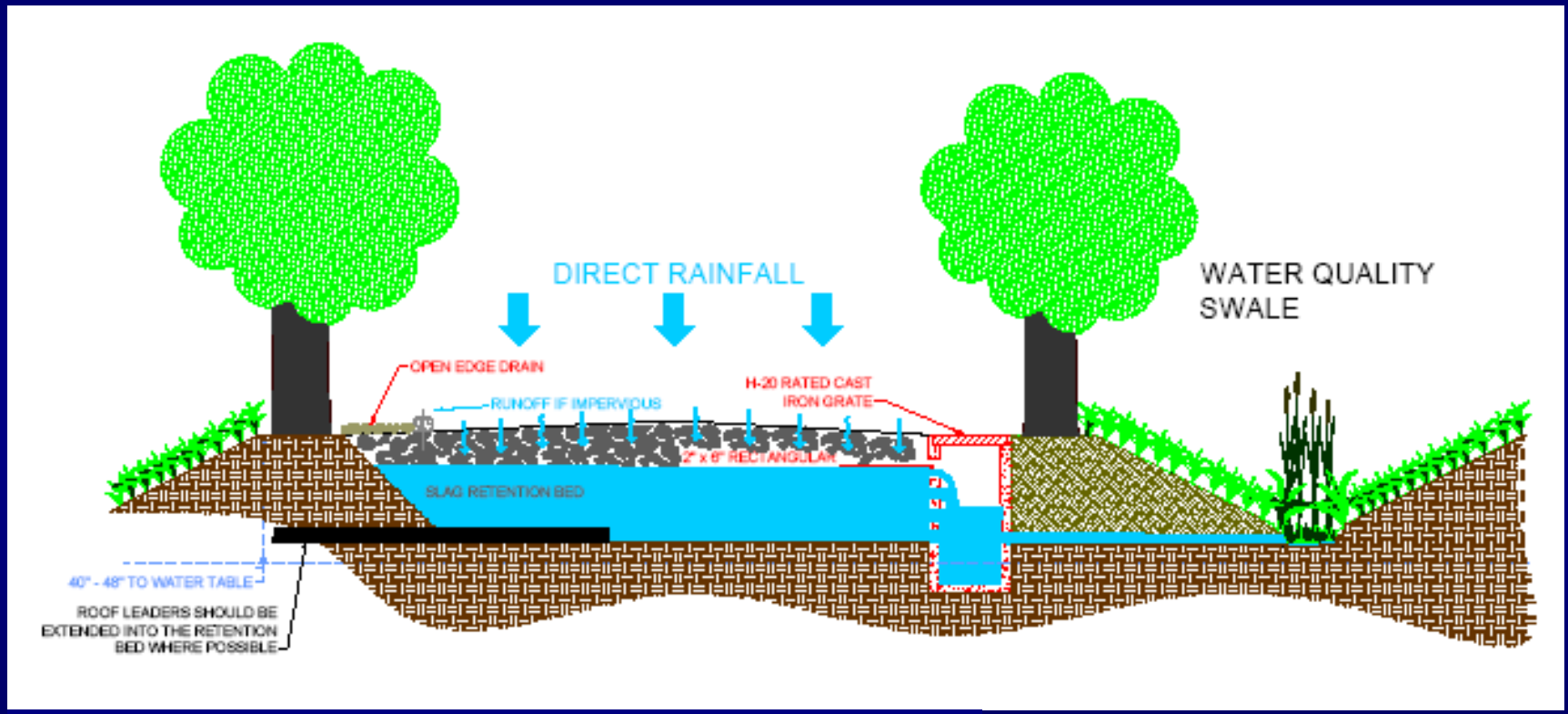
Morris Arboretum

Ford Rouge Center
Dearborn, MI
2002

Strategy for Water Quality at Ford Rouge Center



Ford Motor Company

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Ford Rouge Center

Longacre House
Farmington Hills, MI
2007

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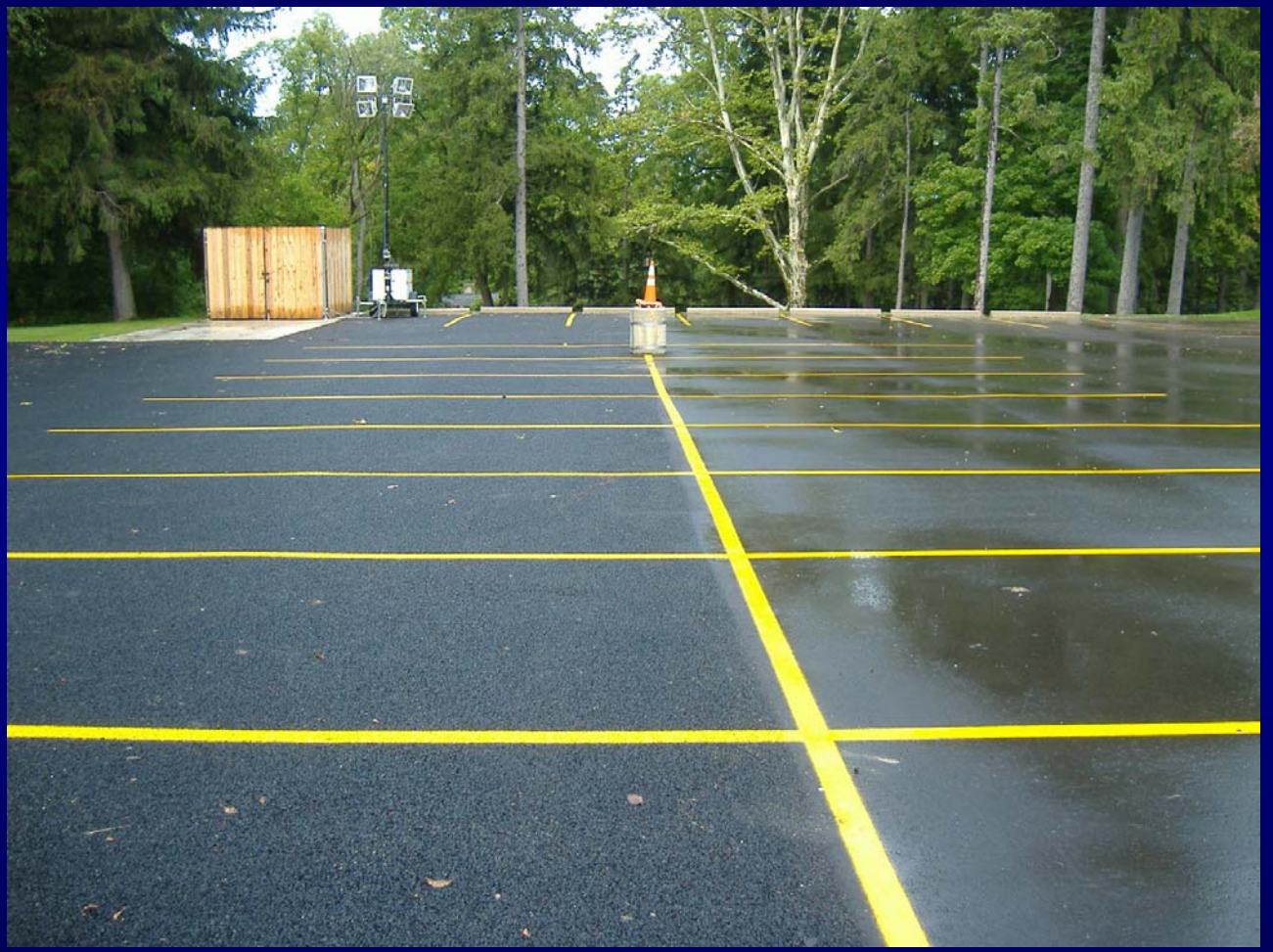
Farmington Hills



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Farmington Hills

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Farmington Hills

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Washtenaw Community College
Ypsilanti, MI
2007

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Washtenaw Community College

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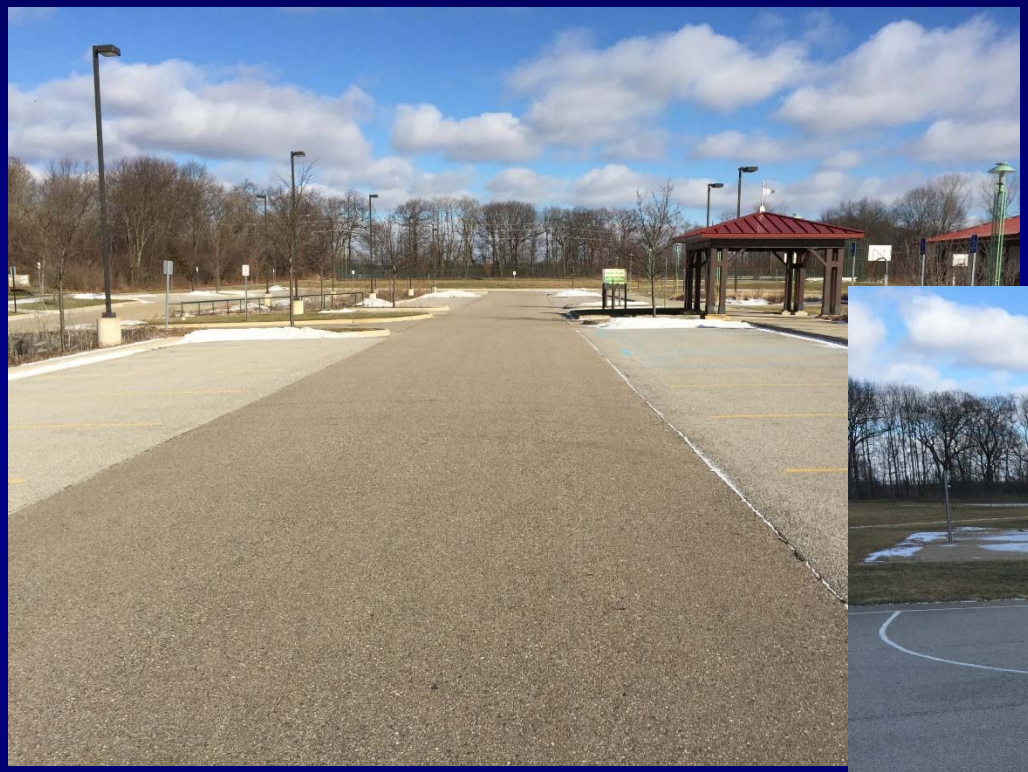

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Michigan State University
East Lansing, MI
2009

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Michigan State University

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Michigan State University

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Meijer Store
Manistee, MI
2014

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Manistee Meijer

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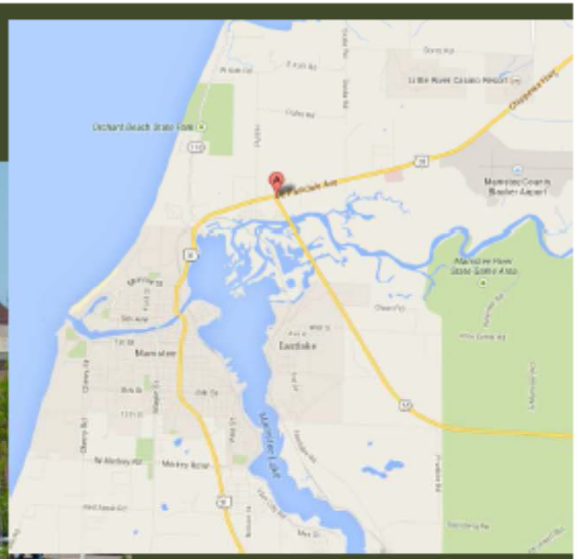
Project Location – Manistee



fitch

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Manistee Meijer

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Manistee Meijer

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Design Focus: Stormwater Quality

- Porous paving
- Catch basin sediment sumps
- Mechanical sediment removal
- Infiltration basins
- Low-velocity discharge
- Maintenance plan

fTC&h

Sylvan Avenue – Ann Arbor

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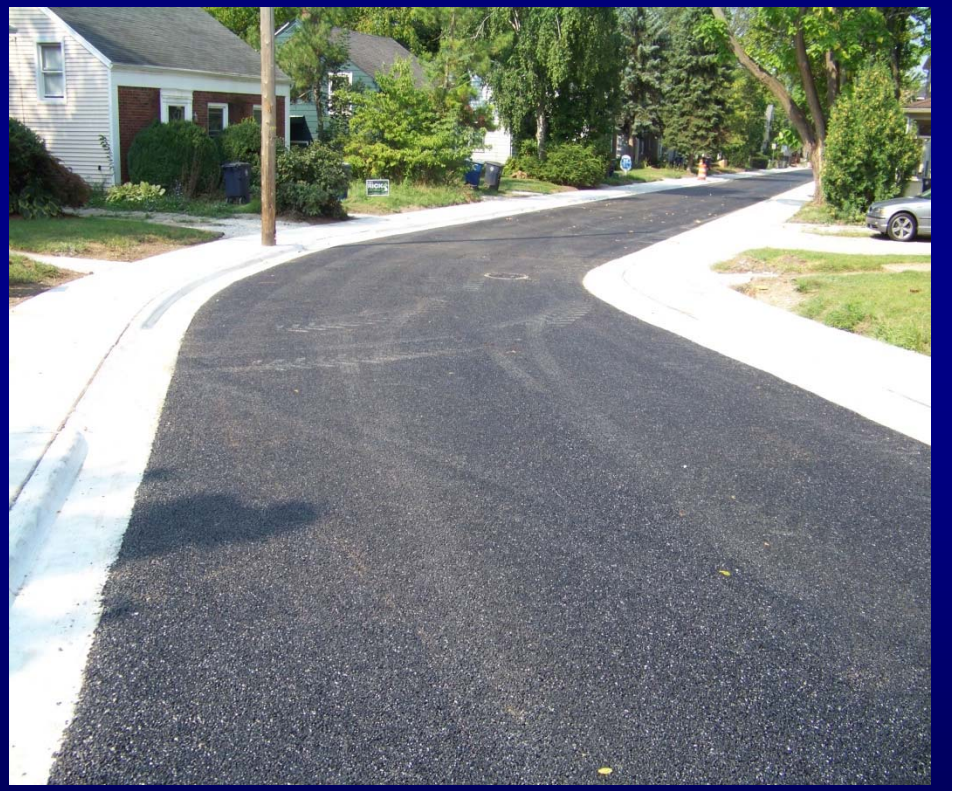

porous streets !!

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Sylvan Avenue – Ann Arbor

Maintenance is Important!

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Willard Street – Ann Arbor

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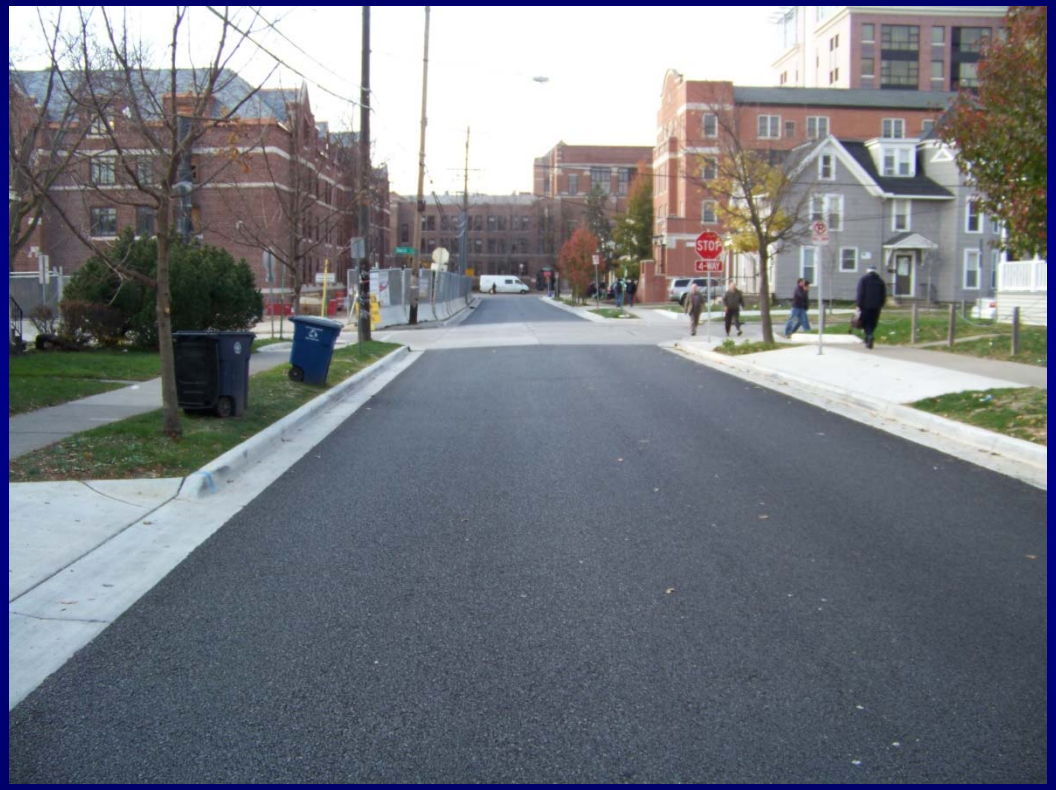

porous streets !!

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Willard Street – Ann Arbor

2016 – 6 years old

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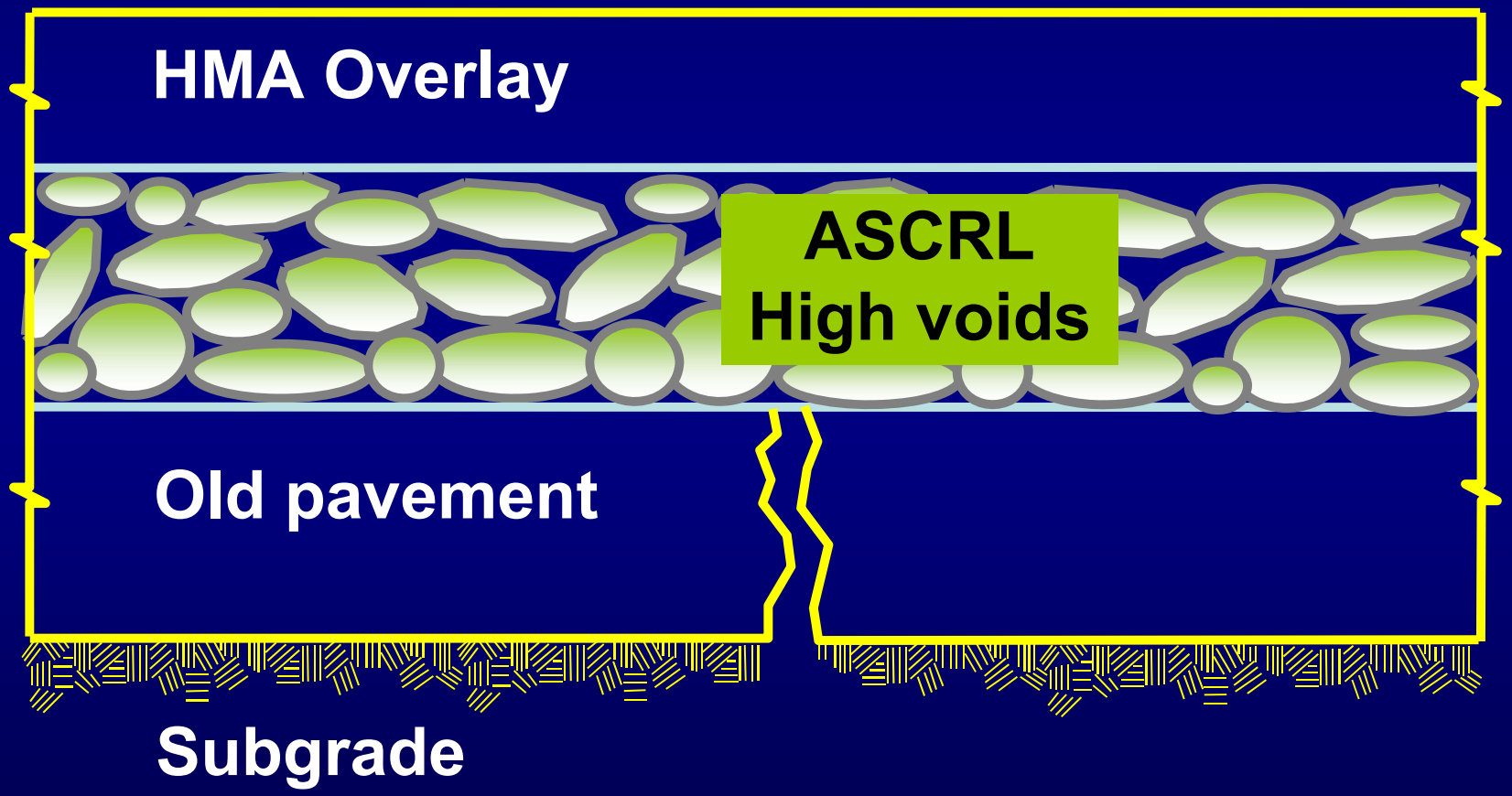
Conclusions

- Porous pavements offer good alternative to conventional storm water mitigation
- Site Conditions must be right
- Need to protect pavement from contamination during and after construction
- Properly designed constructed and maintained, will last more than 20 years

Presentation Outline

- Porous Asphalt Pavements
  - What is a Porous Pavement
  - Design and Construction
  - Example Projects
- ASCRL
  - What is ASCRL
  - Design and Construction
  - Example Projects

Asphalt Stabilized Crack-Relief Layer (ASCRL)



Asphalt Stabilized Crack-Relief Layer (ASCRL)

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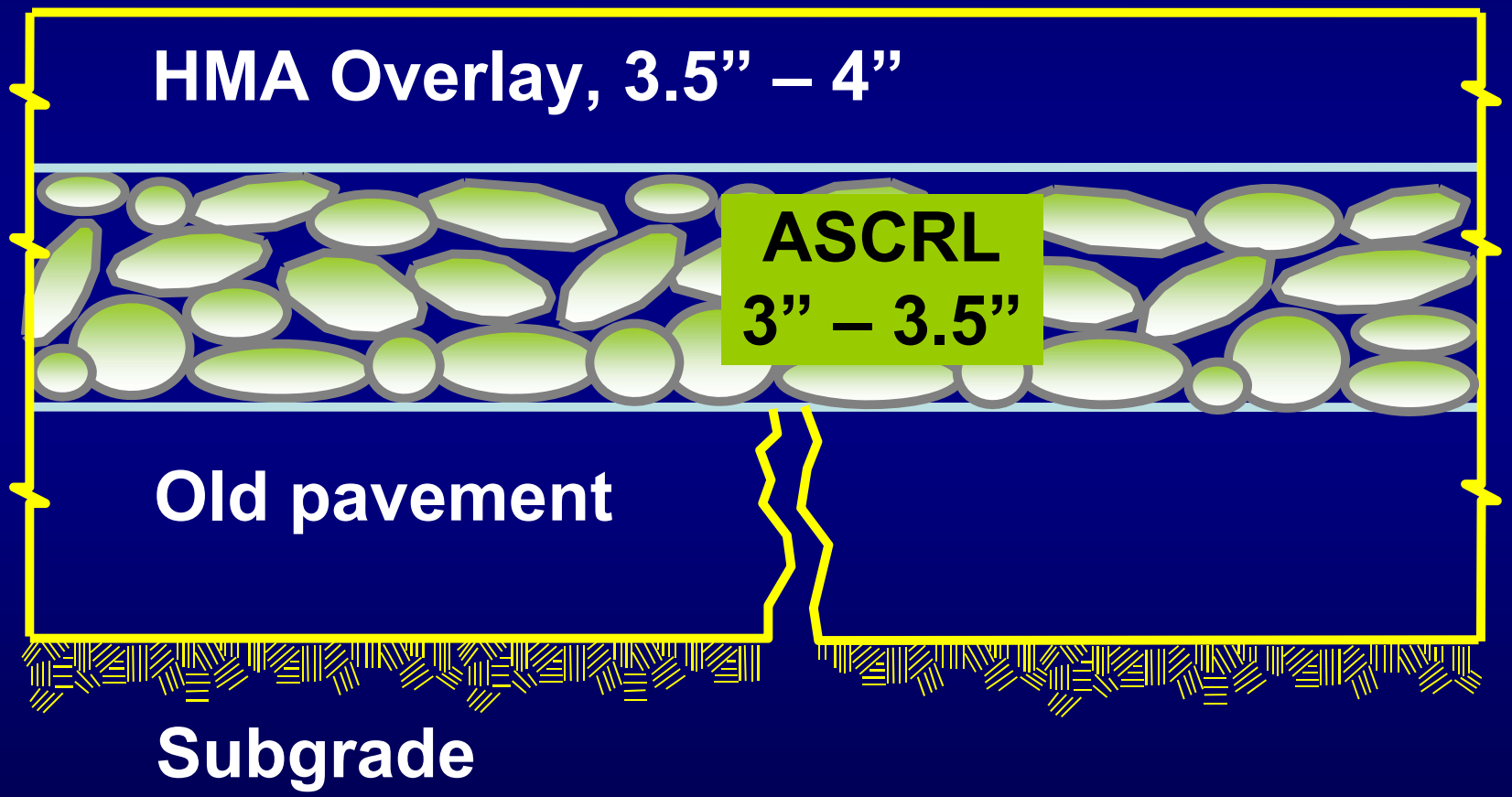
Asphalt Stabilized Crack-Relief Layer (ASCRL)



Asphalt Stabilized Crack-Relief Layer (ASCRL)

MICHIGAN
DEPARTMENT OF TRANSPORTATION

SPECIAL PROVISION
FOR
ASPHALT STABILIZED CRACK RELIEF LAYER

C&T:GMM 1 of 4 C&T:APPR:JB:CJB:04-03-04

a. Description. Furnish, place and compact an asphalt stabilized crack relief layer (ASCRL) on a prepared pavement base according to the details shown on the plans or as directed by the Engineer. The HMA mixture will be provided according to the requirements of the 2003 Standard Specifications for Construction, except where modified herein.

b. Materials. The aggregate materials used to prepare the ASCRL shall meet the following requirements.

The coarse aggregate shall originate geologically only from natural sources. Crushed concrete or reclaimed asphalt pavement cannot be used in the ASCRL mixture.

Table 1 Aggregate Specifications

Gradation Requirements						
Sieve Size (inch)	1 1/2	1	1/2	No. 4	No. 30	No. 200 (LBW) (a)
Percent Passing	100	90-100	30-60	10-25	5-15	3-5
Physical Requirements						
Crushed Material, Min. (MTM 117) % (b)	95					
Loss, max., Los Angeles Abrasion (AASHTO T96) %	35					
Soft Particle (max) % (c)	5.0					

a. Loss by Washing shall be by MTM 108. Mineral filler may used to meet the required percentage.
b. The percentage of crushed material will be determined on that portion of the sample retained on all sieves down to and including the No. 4 sieve.
c. The sum of aggregate particles retain on the No. 4 sieve identified as shale, siltstone, clay ironstone and particles which are structurally weak or are found to non-durable in service.

c. Mix Design. The Contractor shall provide a mix design in accordance with the criteria herein. The following are the requirements for the testing, documentation, and material samples for a mix design verification. Submittal of the Mix Design and samples shall be made to MDOT,

Asphalt Stabilized Crack-Relief Layer (ASCRL)

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Asphalt Stabilized Crack-Relief Layer (ASCRL)

Mix Design

- Asphalt Binder – PG 64-28 with 0.5% liquid antistrip additive
- Asphalt content – 3 to 4 %
- Surface Coating – 100 % without excessive draindown (max 0.30 %)
- Minimum Asphalt film thickness - 9.0 microns
- Moisture sensitivity (AASHTO T283)

Asphalt Stabilized Crack-Relief Layer (ASCRL)

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Construction

- Placed in a single layer
- Compaction – steel – wheeled tandem roller (1.0 ton per foot of drum length)
  - Static mode only
  - Minimum of three passes (down and back)
  - Compaction test strip may be required (minimize breakage of Agg.)

Asphalt Stabilized Crack-Relief Layer (ASCRL)

MDOT Projects to Date

Project	# of Jobs	Length (miles)
ASCRL	30	148

Started in 1999

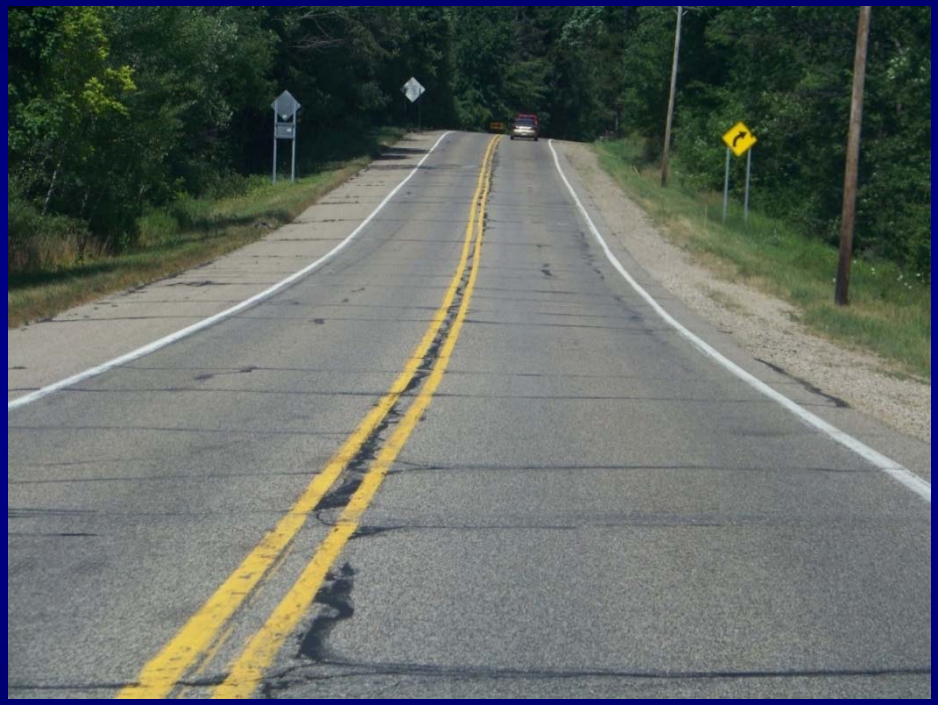
- All are performing very well

Asphalt Stabilized Crack-Relief Layer (ASCRL)

MDOT Projects to Date

Region	# of Jobs	Length (miles)
Superior	1	10
North	10	31
Grand	8	27
Bay	4	19
University	4	38
Metro	3	23

Asphalt Stabilized Crack-Relief Layer (ASCRL)



M-21, Before Construction

Asphalt Stabilized Crack-Relief Layer (ASCRL)

M-21, 5 years old

Asphalt Stabilized Crack-Relief Layer (ASCRL)

I-69, 4 years old

Asphalt Stabilized Crack-Relief Layer (ASCRL)

I-69, 10 years old

Asphalt Stabilized Crack-Relief Layer (ASCRL)

I-69BL, 5 years old

Asphalt Stabilized Crack-Relief Layer (ASCRL)

I-69BL, 11 years old

Asphalt Stabilized Crack-Relief Layer (ASCRL)

M-43, 13 years old

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Asphalt Stabilized Crack-Relief Layer (ASCRL)

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M-43, 13 years old

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Questions?

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