

#### Rubblization – Urban/Rural/Interstate



Presented by Matt Shinners, Antigo Construction, Inc.

Illinois Asphalt Pavement Association Annual Meeting (March 16, 2021)



#### **Presentation Outline**

- ⇒What is rubblization?
- ⇒Illinois Interstate rubblization
- ⇒Illinois rural 2-lane rubblization
- ⇒What is rubblizing in an urban environment?



#### Rubblized pavement behavior

#### Professor Marshall Thompson's TRB Paper 99-0922

TRANSPORTATION NESEARCH RECORD SOLA

Paper No. 99-0922

147

#### Hot-Mix Asphalt Overlay Design Concepts for Rubblized Portland Cement Concrete Pavements

MARSHALL R. THOMPSON

The Illimais Department of Tempportation's (100/1"s) first interstate anti-Sizzation project was constructed in 1990 on 1.57 cent Poststant as part of a jointhilliation study. That inix asphalt overlays (HMA (ii.) were curstructed over a rubblized jointed reinforced concrete pavement (JRCP) with a granular subbase. Exertlent performance was achieved on the projcet, which had accommedated 7.5 million equivalent single-axie hads though 1998. Periodically collected falling weight deflectameter (FWD) done indicate the sections have retained their structural capacity and integrity. BMA Jatigue distress has not developed. The auccess of the project prompted IDOT to consider portland consent concrete povement (PCCP) rubblication and HMA OL a viable and cost-effective rehabitization option. Rubblization is particularly appropriate for eliminating reflective gracking and for use when PCCP patching quantities are high or concrete deterioration is in an advanced stage. FIMA Of, fatigue considerations control the HMA OL thickness requirement for rubblisted PCCPs. HMA DLA for rebblized PCCPs, generally in the 15th-men to 250-root (6-to. In 10-in.) range, we thicker threathese used in the traditional PCCP rehabilitation and HMA OL projects. IDOT uses mechanisticempirical (M-E) Beatble pavement design procedures for full depth asphalt and conventional flexible pavements. M-E-based HMA OL design procedures for nubbilized PCCPs are being developed. In the M-D

#### PRACTURED SLAB TECHNIQUES

Thempson's 1989 NCHRP Synthesis of Highway Practice (I) summarized breaking/emcking/sesting (BrC/S) practices and lochhology. The stated princary good of BrC/S was to reduce (preferably eliminate) HMA OL reflective cracking, 900T constructed and manifered several BrC/S with HMA OL projects in the 1980s, but got on fatestate runter. Fullway up annihilaring statility (3) Inclinated that the BrC/S tochniques delayed, (a) did not eliminate, HMA OL reflective cracking. The delay period typically varied from 3 to 5 years, and langer delays were acticewed with the blocker HMA OLs. Smitze hearts were noted to the NCHRP Synthesis (I) and a congreberative rationwide National Asphall Priving Association (NAPA) study published in 1907 (C).

At the time of the NCHRP Synthesis, inhibitionless applications were not as widespread as BCCRs, but several states had used the procedure. The NAPA study (3) indicated rubblization was the most effective procedure for militerating reflective errording. Buildization destinate PCCP stab continuity and eliminates transverse initial and the

#### Rubblized pavement behavior

"Rubblization destroys PCCP slab continuity and eliminates transverse joints and the associated joint opening and closing that cause reflective cracking."

"A rubblized and compacted PCCP is an assemblage of PCC segments that form a tightly keyed, interlocked, high-density material layer. A rubblized PCCP layer is fractured, lacks continuity, and cannot sustain flexural stress. However, it possesses high shear strength and rutting resistance. It is not a typical granular material."

From "Hot-Mix Asphalt Overlay Design Concepts for Rubblized Portland Cement Concrete Pavements", Marshall R. Thompson, Transportation Research Record 1684, Paper No. 99-0922



#### **Rubblization intent**

"The intent of rubblizing concrete pavement prior to a pavement overlay is to produce a structurally sound base which prevents reflective cracking by obliterating the existing pavement distresses and joints. . . . It is not a typical granular material and it is not an engineered material like crushed aggregate base course."

From "Rubblizing Concrete Pavement" section of WisDOT Construction & Materials Manual

### Concrete pavement in need of rehabilitation



### Reflective cracking in asphalt overlay



#### A video is worth a million words

 $\underline{https://www.youtube.com/watch?v=Q\_bN3kx5fm4\&t=1s}$ 



#### I-70, Clark County, IL, 2003

Marshall to Martinsville

Antigo rubblized 263,000 square yards of 8" CRCP

Howell Asphalt and Champaign Asphalt JV: 550,000 tons,17.5-inch HMA, 30-year Extended Life Pavement













#### Monticello Road, Piatt County, IL, 2016

Monticello city limits to Champaign County line

Existing pavement: 5" JPCP whitetopping on 3" asphalt

1<sup>st</sup> rubblization of whitetopping (Oreo design?)

Antigo rubblized 62,204 square yards in 4 days

Open Road Paving: 5" asphalt overlay













#### Antigo Rubblization Projects in IL, 1996 to 2020

Interstate: 36 projects, 4.6 million square yards

Rural 2-Lane: 18 projects, 0.5 million square yards

Airport: 7 projects, 0.3 million square yards

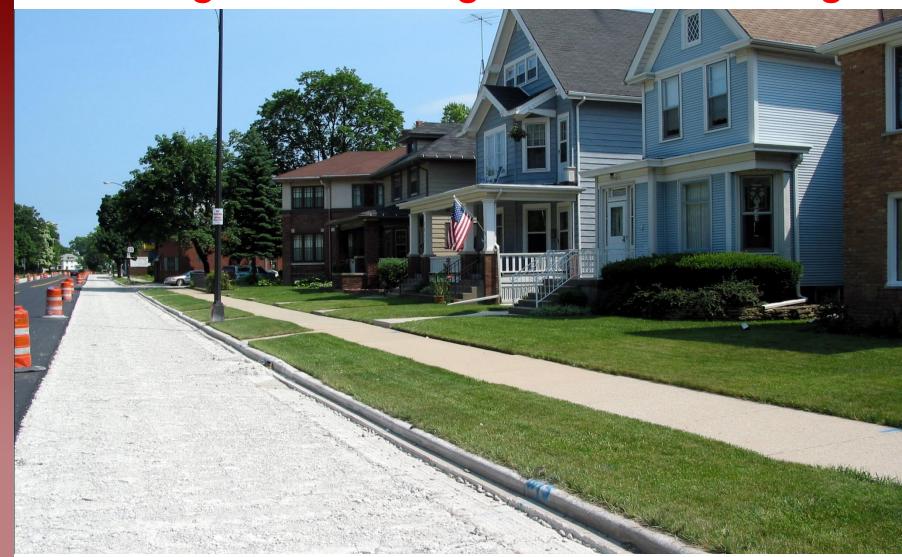
Urban Streets: 9 projects, 0.035 million square yards

Urban Streets – Everywhere: 3.7 million square yards

What is rubblizing in an urban environment?
Rubblizing while meeting additional challenges.



#### Rubblizing while meeting additional challenges



Rubblizing near homes & other buildings

#### Rubblizing while meeting additional challenges



Rubblizing over and near utilities

### Rubblizing while meeting additional challenges



Rubblizing over a weak subgrade

#### Rubblizing while meeting the challenges



Rubblizing while maintaining existing curb and gutter

# Washington Ave, City of Racine, 2002 West Blvd to Marquette St

Paving contractor: Payne & Dolan, Inc.

Sawing Pavement, Full Depth: 32,671 linear feet

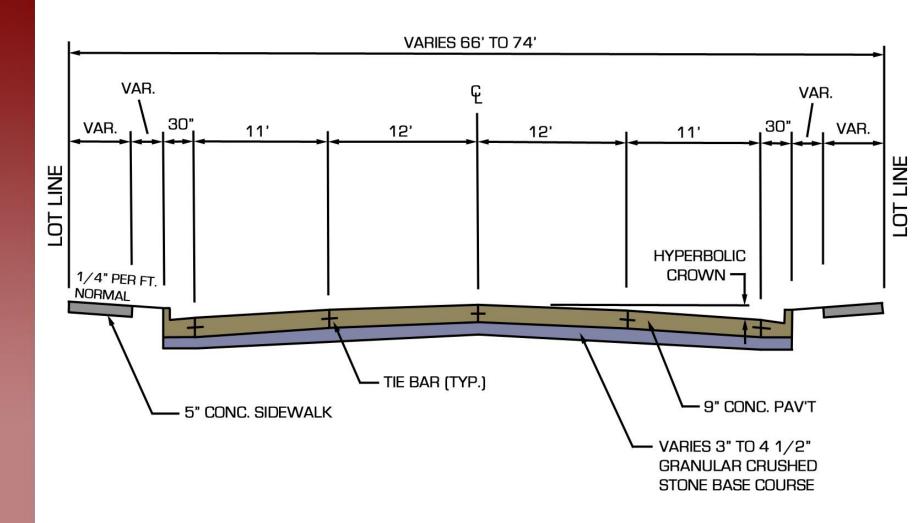
Removing Concrete Surface, Partial Depth (2"): 53,583 square yards

Rubblizing 7" JRCP: 50,741 square yards

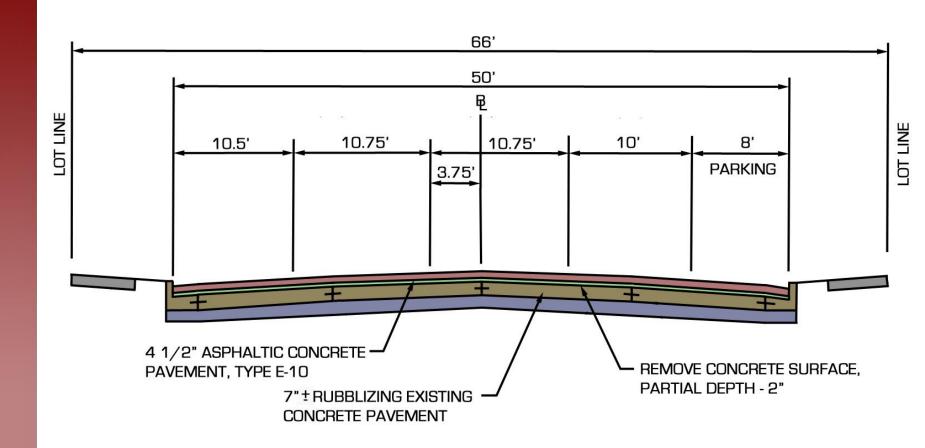
Asphaltic Concrete Pavement, Type E-10: 12,639 tons

Crack & Damage Survey: Lump Sum \$35,000 (114 buildings)

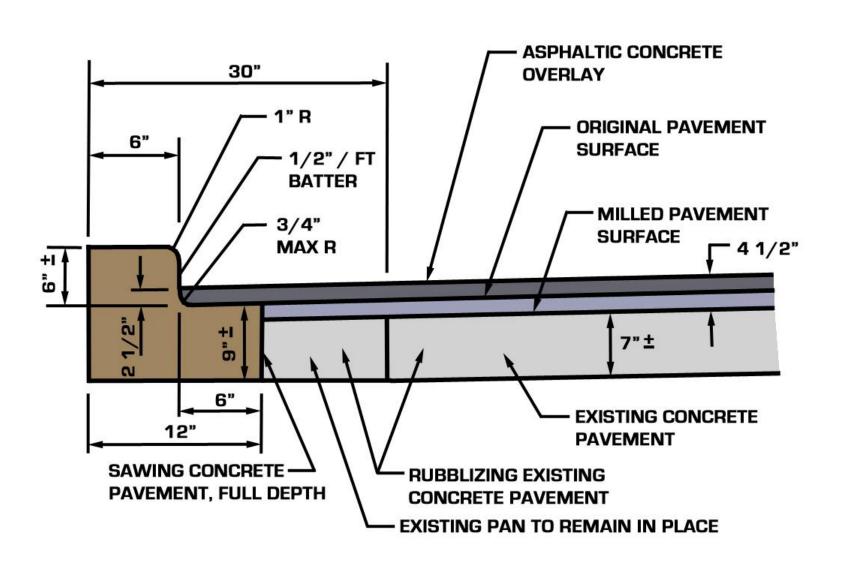
#### **Typical Existing Section**



#### **Proposed Typical Section**



#### **Curb & Gutter Detail**



#### **Construction Staging**

**Stage 1** – Complete saw cuts, mill off 2" of concrete surface

**Stage 2** – Rubblize 2 inner lanes and overlay with asphalt (1" leveling and 2-1/4" binder)

**Stage 3** – Rubblize 2 outer lanes and overlay with asphalt (2-1/4" base)

Stage 4 – Pave 2" asphalt surface

#### Meeting the challenge

"Crack and Damage Survey, Item 90004A
This survey shall consist of two parts. The first part,
performed prior to construction activities, shall include
a visual inspection, photographs, and a written report
describing the existing defects in the buildings being
inspected. The second part, performed after the
construction activities, shall also include a visual
inspection, photographs, and a written report
describing any change in the building's condition."

From Special Provisions for Project # 2440-03-70.

Rubblizing near homes & other buildings



# Meeting the challenge Depth of water mains

Valve #	Location	Depth	
2854	938 Washington Ave.	4'	
222	hyd. @ 10th &. Washington Ave.	4'-3"	Rubblizing over and near
502	w/line 10th & Washington Ave.	31"	
725	w/line 10th & Washington hyd. Valve	4'-3"	utilities
2859	1028 Washington hyd. Valve	3'-11"	
521	n/line Washington & 11th	2'-4"	
523	e/line Washington & 11th	2'-1"	
524	s/line Washington & 11th	2'-7"	
1407	w/line Washington & 11th	2'-1"	
2857	Hyd. Valve @ 1124 Washington	4'	
557	w/line Washington & 12th	4'-2"	
556	e/line Washington & 12th	4'-2"	
2843	Hyd. @ Washington & 12th	3'-9"	
2852	s/line Washington & 12th	2'-6"	
8821	1228 Washington 4" service	4'-6"	
2833	hyd. @ 1228 Washington	4'	
2848	main line valve @ 1228 Wash.	2'-7"	
4" service	1236 Washington Ave.	4'	
6766	hyd. @ 13th & Washington Ave.	3'-9"	
1302	w/line Washington & 13th	4'-10"	

#### Meeting the challenge

"Another way to compensate for a weak subgrade is to modify the rubblizing pattern to produce larger particle sizes which maintain more of the existing concrete pavement's structural support. Experience has shown that segments of twelve to eighteen inches in the lower half of the slab are still effective for eliminating reflective cracking."

From draft "Rubblizing Concrete Pavement" section of WisDOT Construction & Materials Manual

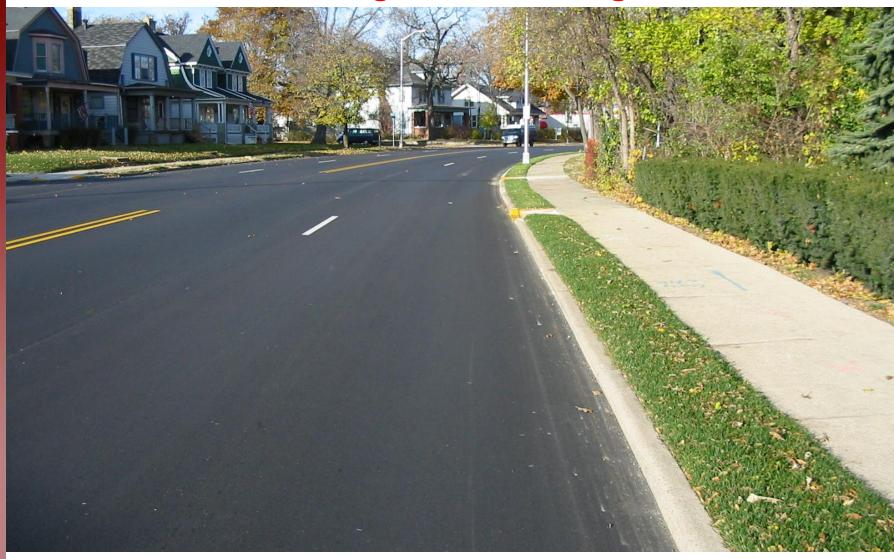
Rubblizing over a weak subgrade

#### Meeting the challenge



Rubblizing while maintaining existing curb and gutter

#### Meeting the challenge



Rubblizing while maintaining existing curb and gutter

#### **Washington Ave Today**



2018: 2.25" mill & fill – urban perpetual?

#### **Questions & Answers**





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