

Rubblizing in an Urban Environment



Presented by Antigo Construction, Inc.

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Presentation Outline

- ⇒ What is rubblizing?
- What is rubblizing in an urban environment?
- ⇒ Example project STH 20 (Washington Ave.), Racine
- Pavement performance





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Rubblizing defined

"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



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Rubblizing concrete







Pneumatic & smooth drum vibratory rollers





Obliterating existing pavement distresses & joints

Rubblized pavement behavior

"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 possess 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

Typical roadway specification

"Break concrete uniformly across the pavement width into particles that have a maximum dimension less than or equal to 12 inches. Also, 75 percent of the particles, as the engineer determines visually, must have a maximum dimension less than or equal to the following:

- In the bottom half of the slab; 9 inches.
- In the top half of the slab; 3 inches.
- At the surface of the slab; 2 inches.

The engineer may direct or allow larger maximum particle dimensions."

From Wisconsin DOT Specification "Section 335 Rubblized Pavement"

High performance, long lasting HMA over rubblized concrete

What is rubblizing in an urban environment?







Rubblizing near homes.



Rubblizing near commercial buildings.



Rubblizing adjacent to heavy traffic.



Rubblizing over and near utilities.



Rubblizing over a weak subgrade.



Rubblizing while maintaining existing curb and gutter.

Square Yards of Rubblization by Project Type



STH 20 (Washington Ave.), Racine

West Blvd. to Marquette Street State Project # 2440-03-70

Constructed during summer of 2002

Owners: City of Racine John Rooney, Assistant City Engineer

> Wisconsin Department of Transportation Frank D' Amato (Daar Engineering), Project Engineer

Contractor: Payne and Dolan, Inc. Donald Oakes, Project Manager

STH 20 (Washington Ave.), Racine Principal Planned Quantities

- Sawing Pavement, Full Depth 32,671 linear feet
- Removing Concrete Surface, Partial Depth (2") 53,583 square yards
- Rubblizing Concrete Pavement 50,741 square yards
- Asphaltic Concrete Pavement, Type E-10 12,639 tons
- Crack and Damage Survey Lump Sum 35,000 dollars (114 buildings)

Typical Existing Section



Proposed Typical Section



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Curb & Gutter Detail



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Staging

• Stage 1 – 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 challenges



Rubblizing near homes and commercial buildings.

Meeting the challenges

"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.

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Meeting the challenges



Rubblizing adjacent to heavy traffic.

Meeting the challenges



Rubblizing over and near utilities.

Meeting the challenges Depth of water mains

Valve #	Location	Depth	Valve #	Location	Depth
2854	938 Washington Ave.	4'	566	n/line Washington & 14th	2'-9"
222	hyd. @ 10th &. Washington Ave.	4'-3"	567	w/line Washington & 14th	3'-9"
502	w/line 10th & Washington Ave.	31"	568	e/line Washington & 14th	2'-2"
725	w/line 10th & Washington hyd. Valve	4'-3"	569	s/line Washington & 14th	3'-6"
2859	1028 Washington hyd. Valve	3'-11"	Hyd. Valve	1327 Washington	4'-9"
521	n/line Washington & 11th	2'-4"	2301	s/line Washington & Ann	3'-8"
523	e/line Washington & 11th	2'-1"	2842	hyd. Valve @ Washington & Ann	3'-11"
524	s/line Washington & 11th	2'-7"	586	s/line Washington & Owen	4'-8"
1407	w/line Washington & 11th	2'-1"	2845	Hyd. Valve @ Washington & Owen	4'-11"
2857	Hyd. Valve @ 1124 Washington	4'	4589	S. Memorial 30" valve	3'-9"
557	w/line Washington & 12th	4'-2"	583	s/line S, Memorial & Washington	3'-6"
556	e/line Washington & 12th	4'-2"	3651	24" valve @ Washington & S. Memorial	4'-2"
2843	Hyd. @ Washington & 12th	3'-9"	2468	w/line Washington & S. Memorial	3'
2852	s/line Washington & 12th	2'-6"	592	e/line Washington & Packard	3'-4"
8821	1228 Washington 4" service	4'-6"	593	s/line Washington & Packard	1'-10"
2833	hyd. @ 1228 Washington	4'	2573	hyd. @ Valley & Washington	4'-1"
2848	main line valve @ 1228 Wash.	2'-7"	600	s/line Phillips & Washington	4'-2"
4" service	1236 Washington Ave.	4'	2253	e/line Valley & Washington	4'-1"
6766	hyd. @ 13th & Washington Ave.	3'-9"	1289	n/line Valley & Washington	4'-1"
1302	w/line Washington & 13th	4'-10"	2000	Washington 6" service	3'-9"
558	e/line Washington & 13th	4'-8"	2856	2002 Washington hyd. Valve	3'-9"

Meeting the challenges Depth of water mains

Valve #	Location	Depth	Valve #	Location	Depth
2016	Washington 4" service	3'-7"		e/1ine Washington & Flett	4'-3"
2233	hyd. @ washington & Taylor	4'	623	s/line Washington & Flett	3'-10"
607	e/line Washington & Taylor	3'-2"	598	e/line Washington & Wright	3'
609	s/line Washington & Taylor	2'-6"	626	s/line Washington & Wright	4'-6"
3654	w/line Washington & Taylor	3'-6"	2130	hyd. Valve @ Washington & Wright	4'-5"
3653	24" valve @ Washington & Tavlor	4'-10"	632	e/line Washington & Thurston	4'-4"
service	2200 Blk Washington	3'-7"	633	s/line Washington & Thurston	4'-5"
3" service	2218 Washington	۵'	639	s/line Washington & Quincy	4'-2"
615	alling Washington & Kaarnay		2283	e/line Washington & Deane	4'-6"
015	shine washington & Reamey	5-5	643	s/line Washington & Deane	4'-5"
2968	hyd. Valve @ Washington & Kearney	4'-4"	6343	hyd. Valve Washington & 12th(w. side)	3'-10"
6300	Washington & Boyd hyd. Valve	4'-1"	3029	Washington 3" service	4'-4"
618	e/line Washington & Boyd	2'-9"	647	Washington & West Blvd.	3'-7"
619	s/line Washington & Boyd	3'	1404	Washington & West Blvd.	3'-6"
621	s/line Washington & holmes	4'-3"	705	s/line Washington & West Blvd.	4'-10"
1960	hyd. Valve @ Washington &Flett	3'-9"	1405	s/line Washington & West Blvd.	2'-9"

Meeting the challenges



Rubblizing over a weak subgrade.

Meeting the challenges

"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 while maintaining existing curb and gutter.



Meeting the challenges



Rubblizing while maintaining existing curb and gutter.

Pavement performance



Research finds that rubblizing & HMA overlay performing well

3 recent studies of the pavement performance of rubblizing and asphalt overlay projects found good performance and no evidence of reflective cracking:

-"Evaluation of Rubblized Pavement Sections in Michigan Constructed between 1988 and 2002", December 2006, prepared for Antigo Construction, Inc. by Applied Pavement Technology, Inc.

-"Guidance, Parameters, and Recommendations for Rubblized Pavements", January 2007, Harold L. Von Quintus, P.E., et al, Applied Research Associates, Inc., sponsored by Wisconsin DOT's Wisconsin Highway Research Program

-"Rehabilitation of Concrete Pavements Utilizing Rubblization and Crackand-Seat Methods: Phase II – Performance Evaluation of Rubblized Pavements in Iowa", April 2008, Halil Cheylan, Ph. D., et al, sponsored by Iowa DOT's Iowa Highway Research Board

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Washington Street, Burlington Constructed by B.R. Amon & Sons, Inc. in 1997



2002 survey: no longitudinal or transverse cracking, PDI=0.

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Taylor Drive, SheboyganConstructed by Northeast Asphalt, Inc. in 1998



2002 survey: no longitudinal or transverse cracking, PDI=0.

STH 67, Williams Bay Constructed by B.R. Amon & Sons, Inc. in 1999



2002 survey: no longitudinal or transverse cracking, PDI=0.



Questions & Answers



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