

## Recent Developments in Concrete Rubblization and Asphalt Overlay for Airfield Pavements



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## Presentation Outline

- 1. Airfield concrete rubblization overview**
- 2. FAA design guidance includes rubblization**
- 3. Partial-depth milling of rubblized concrete surface**
- 4. Intermediate base layers**
- 5. Sustainability: rubblization & asphalt overlay**
- 6. Questions & answers**



## Reflective Cracking of Asphalt Overlay





## Distressed concrete





**Rubblize it!**



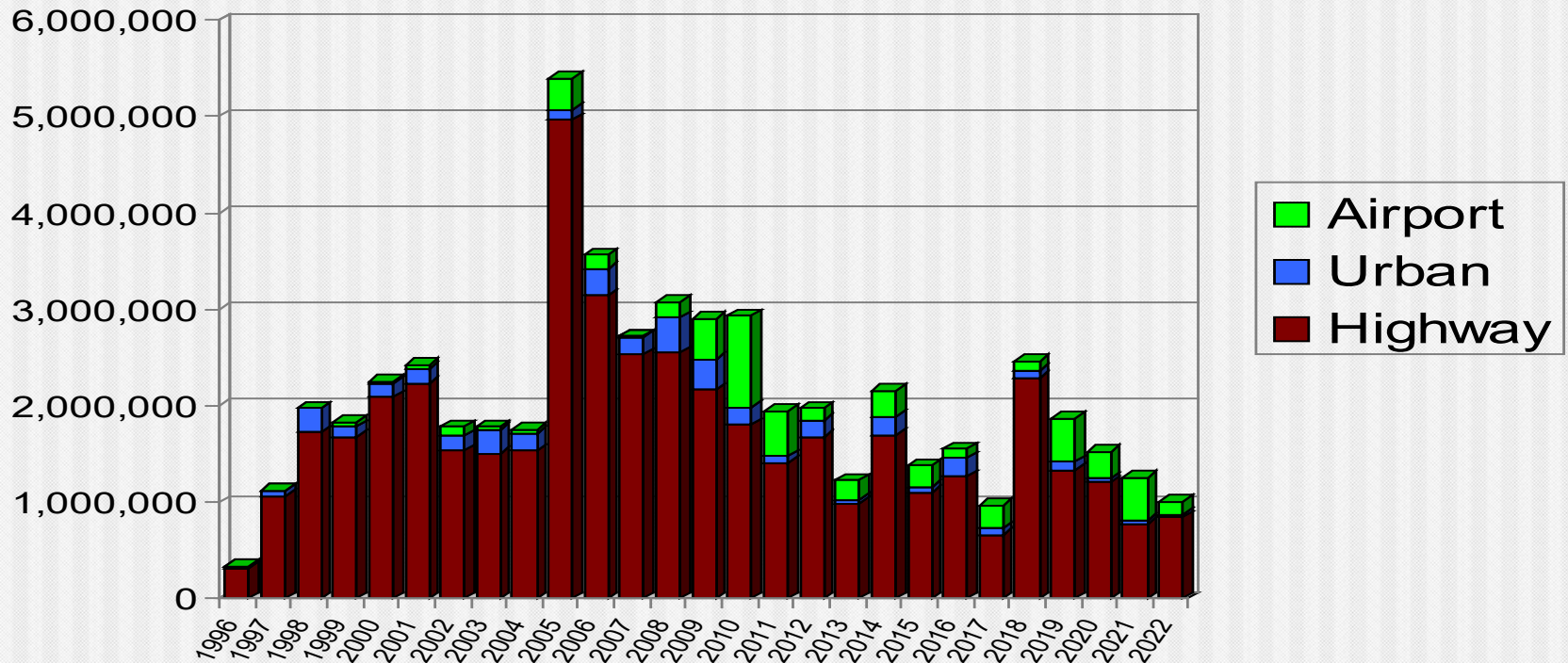


## After rubblization





## Square Yards of Rubblization by Project Type Performed by Antigo



**Antigo**

# 8600 Badger Breaker<sup>®</sup>





# Antigo

## MHB Badger Breaker<sup>®</sup>





## Grid Roller





## **FAA Design Guidance Includes Rubblization**

**FAA Advisory Circular 150/5320-6G, Airport Pavement Design and Evaluation, issued June 7, 2021**

**[https://www.faa.gov/documentLibrary/media/Advisory\\_Circular/150-5320-6G-Pavement-Design.pdf](https://www.faa.gov/documentLibrary/media/Advisory_Circular/150-5320-6G-Pavement-Design.pdf)**

### ***1. Purpose.***

***This advisory circular (AC) provides guidance to the public on the design and evaluation of pavements used by aircraft at civil airports.***



## FAA Design Guidance Includes Rubblization

*4.1.5 When considering pavement reconstruction, in-place recycling methods such as full depth reclamation of flexible pavement and rubblization of rigid pavements may be cost-effective alternatives to removal of the existing pavement section.*



## FAA Design Guidance Includes Rubblization

***4.7.5.2 Rigid pavements that have significant structural distress generally are not candidates for an overlay. Generally, pavements with an SCI less than 80 are not acceptable candidates for a standard overlay because they would require extensive repairs prior to the overlay. For pavements with significant distress, concrete rubblization or similar methods of destroying panel action prior to overlay may be a better alternative (see paragraph 4.8).***



## FAA Design Guidance Includes Rubblization

***4.9.3.2 The thickness design procedure for an overlay over a rubblized concrete base is similar to a new flexible or new rigid pavement design. In FAARFIELD, model the rubblized concrete pavement layer as a user defined layer with recommended modulus values ranging from 100,000 to 400,000 psi.***



## FAA Design Guidance Includes Rubblization

***4.9.3.3 Use engineering judgment when selecting the appropriate modulus value to characterize the rubblized concrete pavement layer. Many factors influence the modulus of the rubblized layer including: the thickness, strength and particle size of the rubblized layer, the condition and type of base, subbase and subgrade materials. Refer to AAPT Report 04-01, Development of Guidelines for Rubblization, and Engineering Brief 66, Rubblized Portland Cement Concrete Base Course, for further information.***



## FAA Design Guidance Includes Rubblization

**4.9.3.3 continued: The following are suggested ranges for the design modulus value of rubblized concrete on airfields:**

- Panels 6 to 8 inches thick:  $E = 100,000$  to  $135,000$  psi**
- Panels 8 to 14 inches thick:  $E = 135,000$  to  $235,000$  psi**
- Panels greater than 14 inches thick:  $E = 235,000$  to  $400,000$  psi**



## FAA Design Guidance Includes Rubblization

***4.9.3.4 Install subsurface drainage for rubblized layers prior to rubbilization. See AAPT Report 04-01.***



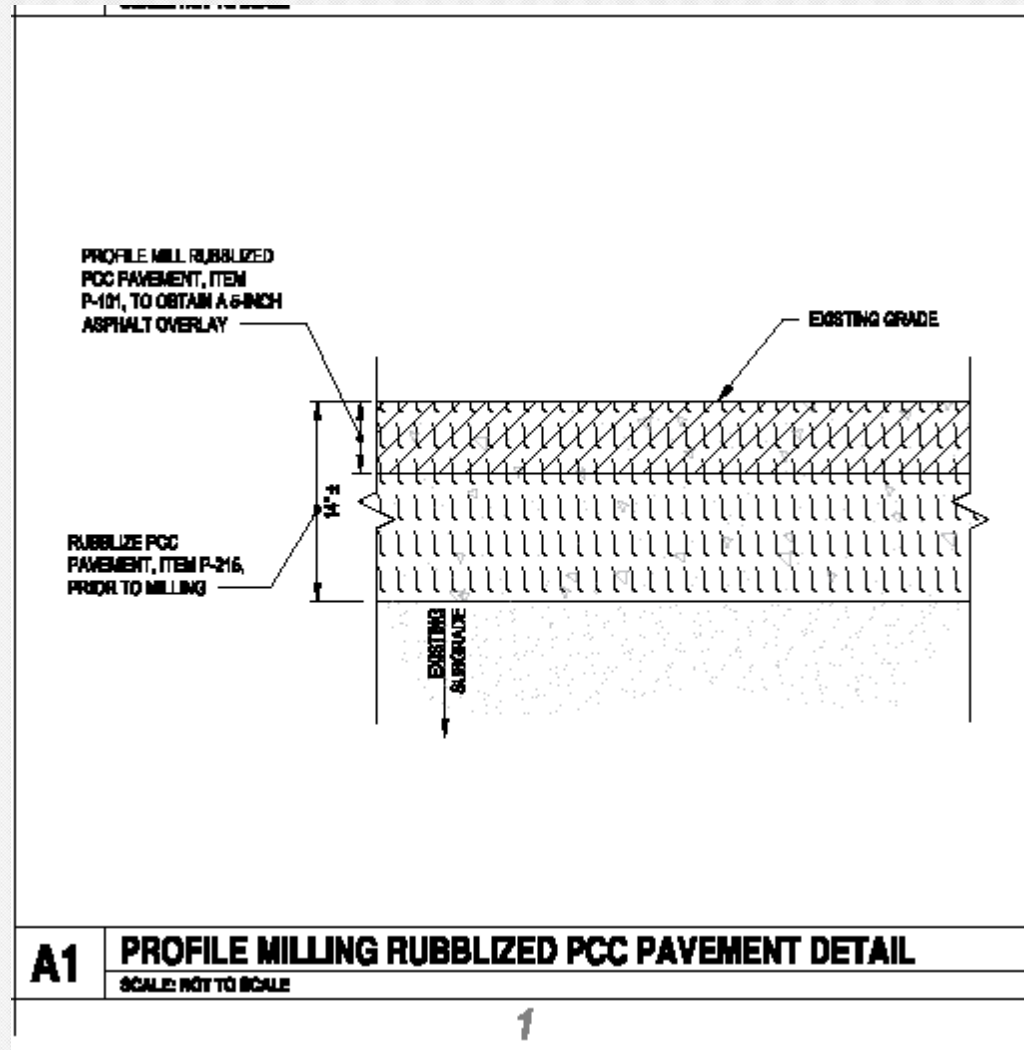
## Partial-Depth Milling

**Question: When designing an airfield concrete rubblization and asphalt overlay project, how do you account for the increased elevation of the overlay and the transitions to adjoining pavements that are not overlaid?**

**One potential answer: Partial-depth milling of the rubblized concrete surface.**



## Partial-Depth Milling





## Milling 5"-6" of rubblized concrete surface





# Partial-Depth Milling

## Antigo's Airfield Rubblization Projects w/ Partial-Depth Milling

Antigo	Location	Year	Concrete Rubblized (SY)	Thickness of Existing Concrete (inches)	HMA Overlay Thickness (inches)	Comments
4817	Griffiss Intl Airport, Rome, NY, Rehab Taxiways	2013	52,610	16-24	5	Concrete milled (5"-6") after rubblization to lower grade to accommodate overlay. Crushed aggregate (3") placed prior to asphalt overlay.
5823	Rickenbacker Airport, Columbus, OH, T/W A, T/W B	2017	48,046	19-27	9	Concrete milled (8") prior to rubblization to lower grade to accommodate overlay. Crushed aggregate (2") placed prior to asphalt overlay.
6209	Rickenbacker Airport, Columbus, OH, T/W A, T/W G	2018	34,733	19-21	9	Concrete milled (8") prior to rubblization to lower grade to accommodate overlay. Crushed aggregate (2") placed prior to asphalt overlay.
6445	Plattsburgh Intl Airport, NY, R/W 17-35, T/W C	2018	17,290	10-14	5	Concrete milled partial depth after rubblization to lower grade to accommodate overlay.
6444	Griffiss Intl Airport, Rome, NY, R/W 15-33	2019	157,698	14	7	Concrete milled (5") after rubblization to lower grade to accommodate overlay.
6462	Rickenbacker Airport, Columbus, OH, T/W 1C	2019	10,791	13	7	Concrete milled (3") prior to rubblization to lower grade to accommodate overlay.
6463	Coles County Memorial Airport, Mattoon, IL, T/W B	2019	27,900	16	4	Concrete milled partial depth after rubblization to lower grade to accommodate overlay.
6794	Griffiss Intl Airport, Rome, NY, R/W 15/33	2020	159,462	14-17	5	Concrete milled ~2" after rubblization to lower grade to accommodate overlay.
6865	Norfolk Int'l Airport, VA, T/W C	2020	17,700	16-17	6	Concrete milled partial depth prior to rubblization to lower grade to accommodate overlay.

# Partial-Depth Milling

## Antigo's Airfield Rubblization Projects w/ Partial-Depth Milling

Antigo	Job #	Location	Year	Concrete Rubblized (SY)	Thickness of Existing Concrete (inches)	HMA Overlay Thickness (inches)	Comments
	6865	Norfolk Int'l Airport, VA, T/W C	2020	17,700	16-17	6	Concrete milled partial depth prior to rubblization to lower grade to accommodate overlay.
	6935	Griffiss Intl Airport, Rome, NY, R/W 15/33	2020	71,669	14	7	Concrete milled ~1.5" after rubblization to accommodate asphalt overlay.
	6991	Willard Airport, s/o Champaign, IL, R/W 4-22	2021	98,728	16-21	9	Concrete milled 2"-3" after rubblization to provide a rubblized surface that is 9" below final grade.
	6992	Coles County Memorial Airport, Mattoon, IL, T/W B	2021	31,935	14	4	Concrete milled partial depth after rubblization to lower grade to accommodate overlay.
	7055	Plattsburgh Intl Airport, NY, R/W 17-35	2021	228,762	14	5	Concrete milled 1" after rubblization. Some areas additional profile milled to obtain 5" asphalt at proposed grade.
	7272	Norfolk Int'l Airport, VA, T/W C North	2021	15,420	16	6	Concrete milled 6" after rubblization to provide a rubblized surface that is 6" below final grade.
	7339	Plattsburgh Intl Airport, NY, T/W A	2022	49,350	14	5	Concrete milled 5" after rubblization to provide a rubblized surface that is 5" below final grade.
	7429	Plattsburgh Intl Airport, NY, T/W A, T/W B	2023	28,684	14	5	Rubblized concrete milled 5" to accommodate 5" asphalt overlay.
	7657	Norfolk Int'l Airport, VA, R/W 23, T/W H, T/W C	2023	38,751	16	6-7	Concrete milled variable depth after rubblization to lower profile to allow for uniform thickness asphalt overlay.
	7730	Plattsburgh Int'l Airport, NY, T/W A, T/W B	2023	109,400	14	5	Rubblized concrete milled 5" to accommodate 5" asphalt overlay.



## Intermediate Base Layers

- Often used for crown correction on airfield runway projects
- May be used to improve base support in weak subgrade areas
- May be used to minimize any difficulties with a rubblized surface being rough or uneven (weaker subgrade situation)
- Crushed aggregate base course most common material, asphalt millings used a few times
- May affect structural design

## FAA Design Guidance Includes Rubblization

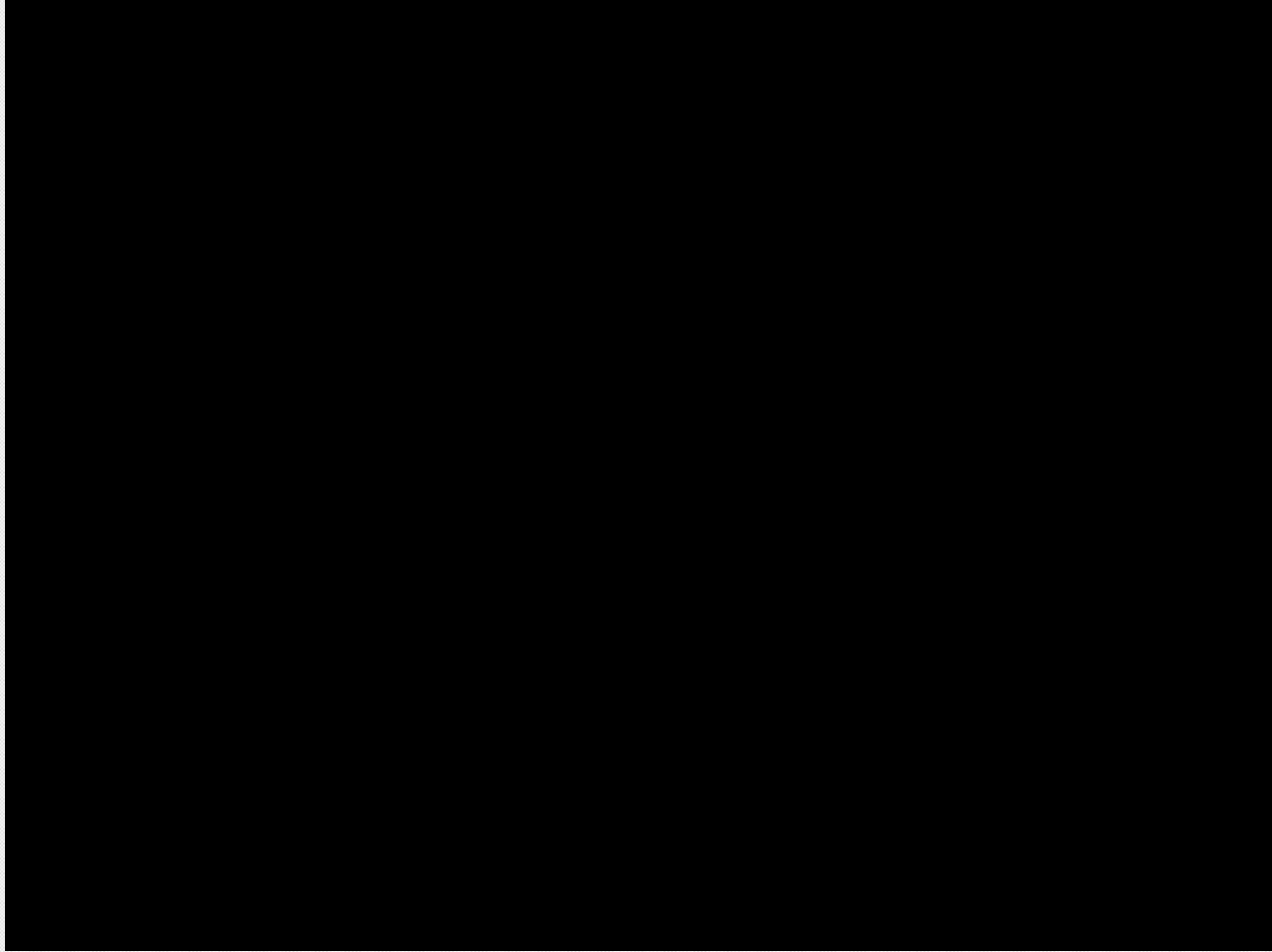
***4.9.3.5 An aggregate leveling course of P-209 will minimize any difficulties with a rubblized surface being rough or uneven. Whether or not a leveling course will be required depends upon the thickness of concrete being rubblized and the amount and stiffness of base material beneath the pavement being rubblized. It is a best practice to include an allowance for a leveling course as well as an allowance for localized full depth patching. See AAPT Report 04-01.***



## Placing crushed aggregate layer



## Pictures & Video: Griffiss Int'l Airport





## Sustainability: Concrete Rubblization & Asphalt Overlay vs Full-Depth Reconstruction

- Existing concrete pavement and base recycled in-place reduces need for new materials
- Reduction in truck movements and equipment usage
- Good long-term performance of asphalt overlay
- Asphalt surface can be replaced as needed over time leaving rubblized layer as is
- Accelerated construction reduces impact on airport operations

## Questions & Answers





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