

Airfield Pavement Markings— Removal and Temporary Applications

June 5, 2023



Today's Learning Objectives

- (1) Identify the best practices and techniques for the removal of old airfield markings**
- (2) Gain insight on the importance of minimizing long-lasting effects on the airfield surface**
- (3) Use best practices and application methods for the application and removal process**

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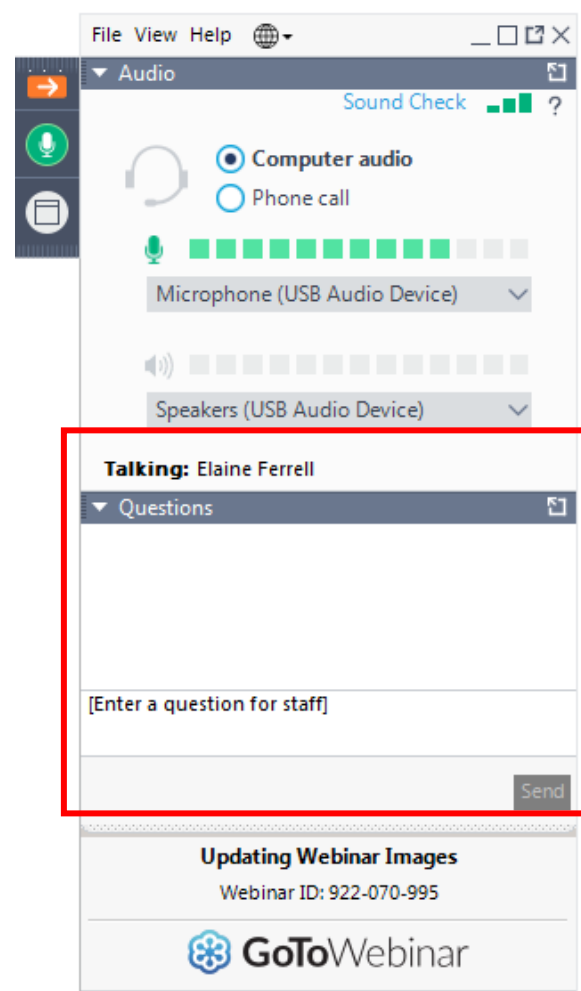
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Questions and Answers

Please type your questions into your webinar control panel

We will read your questions out loud, and answer as many as time allows

#TRBwebinar



Jeff Stempihar

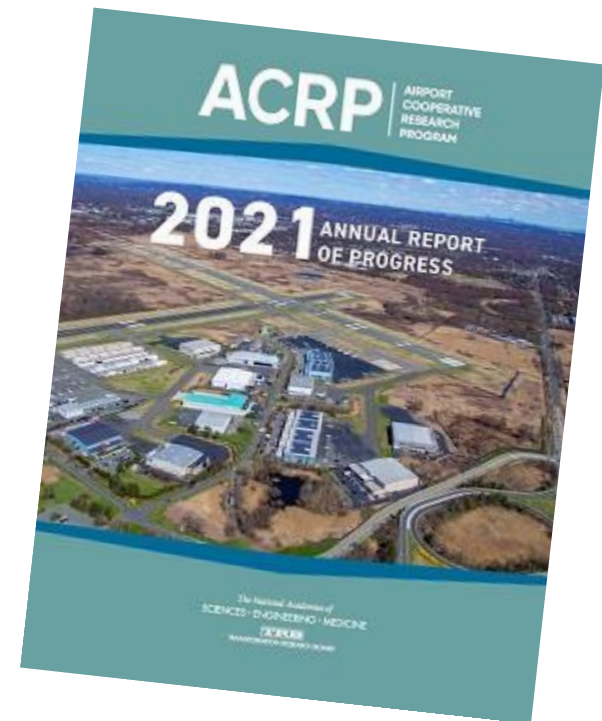
NCE

- Associate at NCE
- 18 years+ of engineering and applied research experience in airfield and highway pavements
- Registered professional engineer
- Engaged with local industry groups to support technology transfer and training efforts for practicing engineers.



ACRP is an Industry-Driven Program

- Managed by TRB and sponsored by the Federal Aviation Administration (FAA).
- Seeks out the latest issues facing the airport industry.
- Conducts research to find solutions.
- Publishes and disseminates research results through free publications and webinars.



Today's Speakers



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TRB Webinar: June 5, 2023



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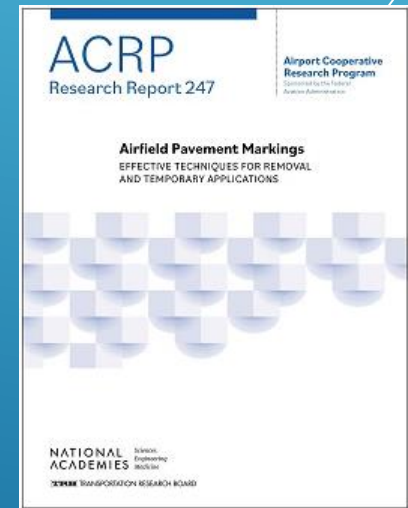
Higher Standards.

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AIRPORT COOPERATIVE RESEARCH PROGRAM PROJECT 09-19

AIRFIELD PAVEMENT MARKINGS – EFFECTIVE TECHNIQUES FOR REMOVAL AND TEMPORARY APPLICATIONS

- Research developed a Guidebook and full report
- Guidebook: ACRP 247
 - Chapter 1: Airfield Guide for Engineers
 - Chapter 2: Field Inspection Guide
- <https://www.trb.org/Main/Blurbs/182860.aspx>



Webinar Overview

- Brief overview of FAA guidance and evolution of surface preparation
- Airfield Marking Handbook best practices on paint removal
- ACRP 247 findings on Removal of Airfield Pavement Markings
- ACRP 247 findings on Temporary Marking Applications



AC 150/5370-10H - P620

Runway and Taxiway Markings

620-3.3 – Surface Preparation

- a. Preparation of new pavement surfaces
- b. Preparation of pavement to remove existing markings.
- c. Preparation of pavement markings to clean markings prior to remarking.

AC 150/5370-10H - P620

Runway and Taxiway Markings

620-3.7 – Control Strip

Prior to the full application of airfield markings, the Contractor shall prepare a control strip in the presence of the RPR. The Contractor shall **demonstrate the surface preparation method** and all striping equipment to be used on the project. The marking equipment must achieve the prescribed application rate of paint and population of glass beads (per Table 1) that are properly embedded and evenly distributed across the full width of the marking. Prior to acceptance of the control strip, markings must be evaluated during darkness to ensure a uniform appearance.

Surface Preparation – Type B (Paint Removal)

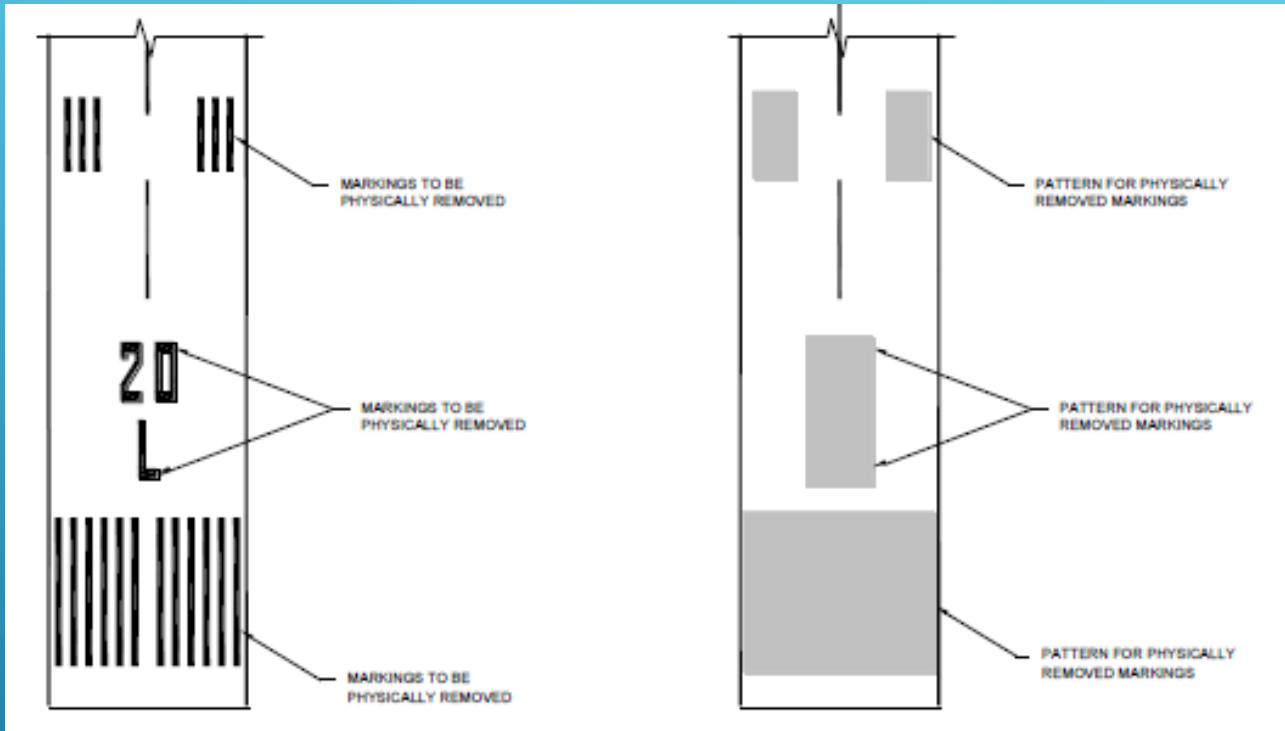
Advisory Circular 150/5340-1J

“Pavement markings *that are no longer needed* should be physically removed by sand blasting, chemical removal or other means, **not** painted over. Painting over the old markings merely preserves the old marking, will require additional maintenance, and in certain conditions, can be misleading to pilots.”

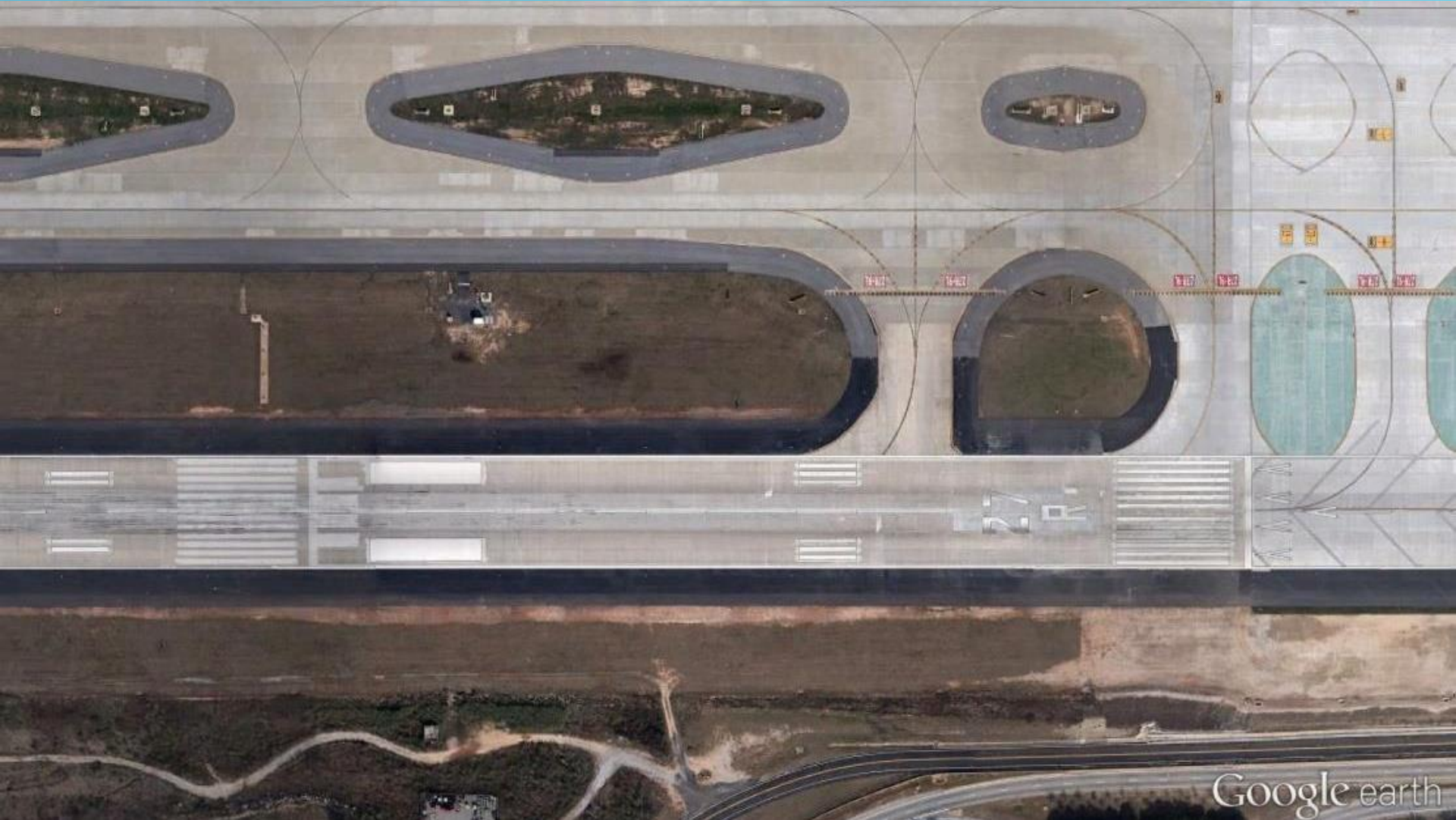
Surface Preparation – Type B (Paint Removal)

Advisory Circular 150/5340-1L, 1.3.f

The physical removal of any old marking(s) must include a pre-determined larger size and shape of a removal area that encompasses the old marking(s) and by grouping adjacent markings together into a larger rectangular removal area. [Blocking out]

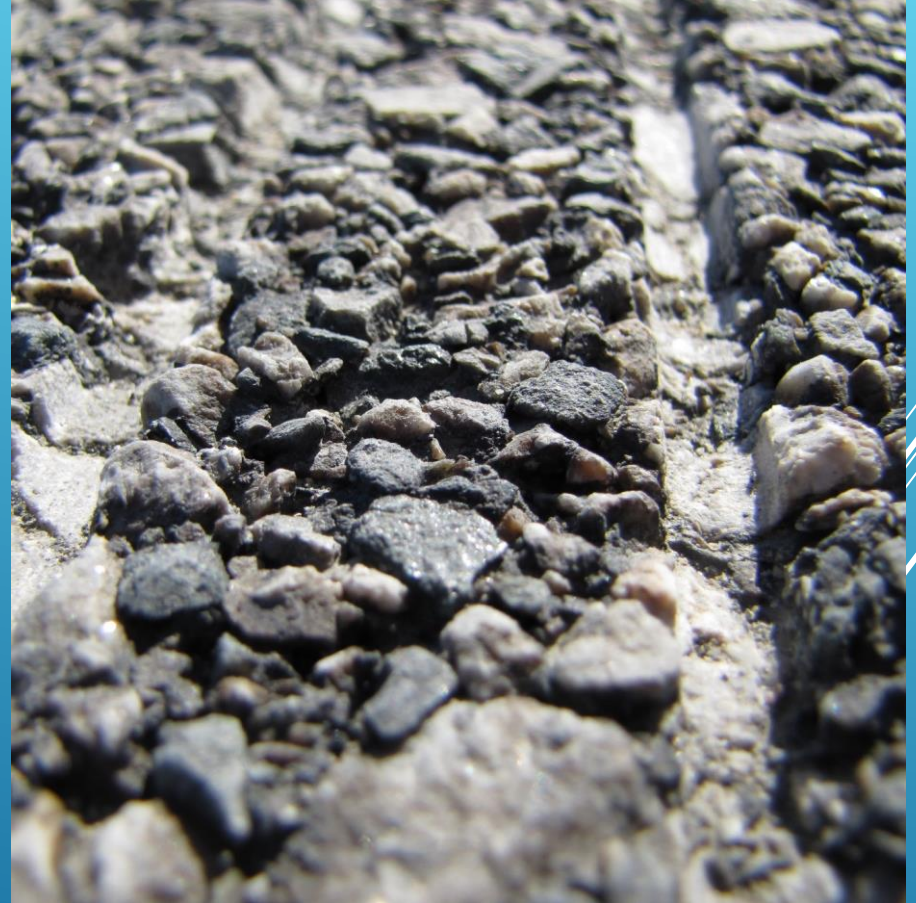


Para 1.3(f) The physical removal of any old marking(s) must include a pre-determined larger size and shape of a removal area that encompasses the old marking(s).



Google earth







AC 150/5370-10H - P620

Runway and Taxiway Markings

620-3.3 – Surface Preparation

b. Preparation of pavement to remove existing markings. Existing pavement markings shall be removed by rotary grinding, water blasting, or by other methods approved by the RPR minimizing damage to the pavement surface.

The removal area *may need* to be larger than the area of the markings to eliminate ghost markings. After removal of markings on asphalt pavements, apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings.

Airfield Marking Handbook

- ✓ Sightline researched in 2006-08
- ✓ Published in 2008
- ✓ Revised in 2019
- ✓ How-to manual for marking design, surface preparation, maintenance, and inspection.
- ✓ Chapter 5 – Paint Removal



**REVISED
JAN 2019**

Download for free at sightline.us

Surface Preparation – Type B

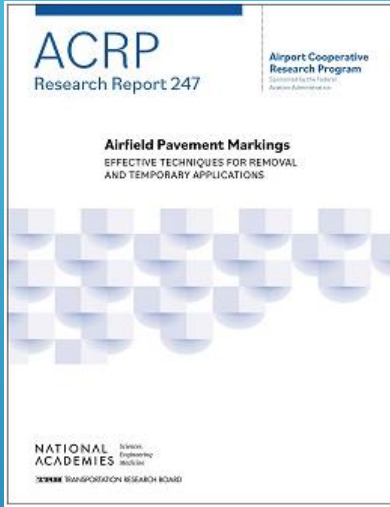
Definition:

- ➔ Pavement marking removal is the mechanical eradication of markings from the pavement to a specified degree.

There are several reasons airports remove markings, and each situation requires different degrees (or percentages) of eradication.

Types and Degrees of Marking Removal

Types of Marking Removal	Degrees of Removal
Obsolete markings and changing marking patterns	95 - 100%
Seal coats or other surface treatment	80 - 85%
Marking build-up and/or excessive layers	85 - 90%
Changing paint colors	90 - 95%
Incompatible materials	85 - 100%



ACRP 247 FINDINGS ON REMOVAL OF AIRFIELD PAVEMENT MARKINGS

Challenges:

- Type and condition of pavement
- Type and thickness of coatings
- Availability of equipment and experienced operators

Challenges:

→ Type and condition of pavement

Rigid Pavement

- Portland Cement Concrete
 - Grooved



Challenges:

→ Type and condition of pavement

Rigid Pavement

- Portland Cement Concrete
 - Ungrooved

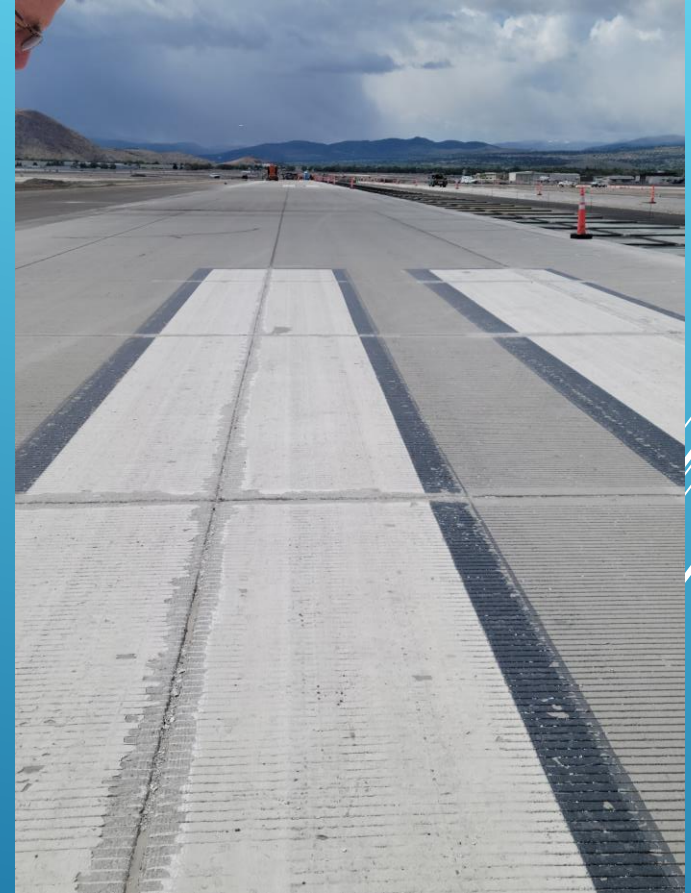


Challenges:

→ Type and condition of pavement

Rigid Pavement

- Portland Cement Concrete
 - Protect joints from damage



Challenges:

→ Type and condition of pavement

Flexible Pavement

- Asphalt Cement Concrete
 - Ungrooved



Challenges:

→ Type and condition of pavement

Flexible Pavement

- Asphalt Cement Concrete
 - Grooved



Challenges: Pavement Scarring

→ All marking removal methods will leave a scar.

Airfield Marking Handbook definition:

Scarring is removal of the texture with some exposed aggregate.

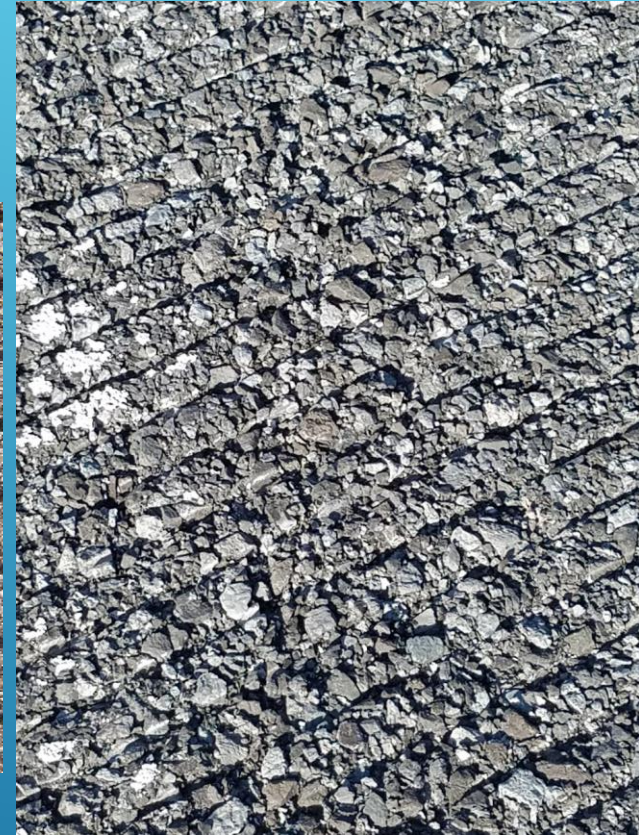


Challenges: Pavement Damage

Airfield Marking Handbook definition:

Damage occurs when more than 25 percent of the depth of the nominal-size aggregate diameter is uniformly exposed across the pavement, and aggregate could loosen.

Challenges: Pavement Damage



Challenges: Pavement Damage

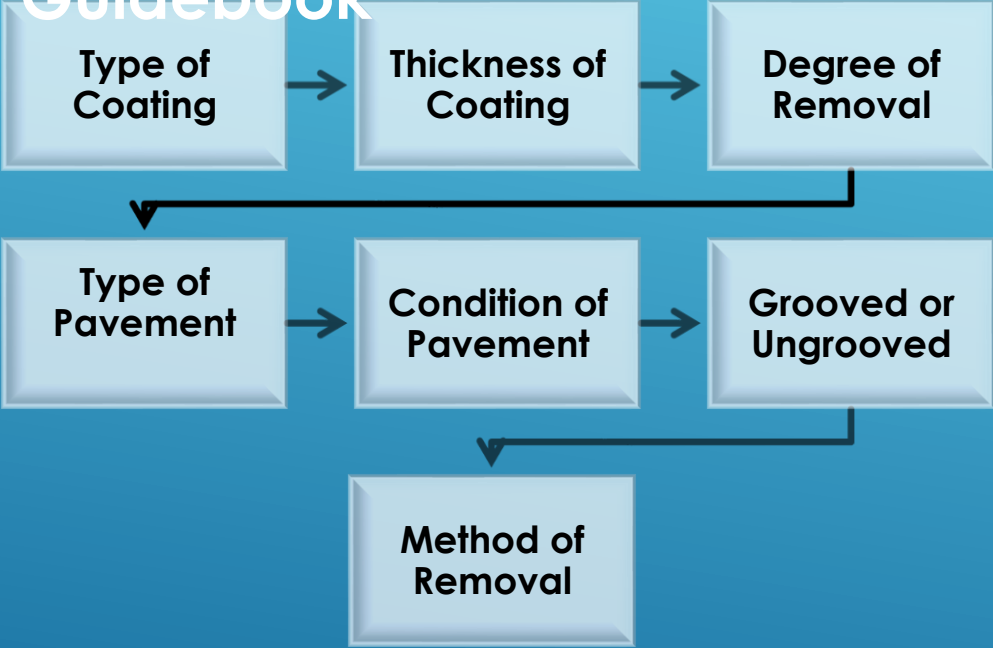


Challenges: Incomplete Removal



Considerations for Determining Type of Airfield Marking Removal

ACRP 09-19 Airfield Guidebook



Surface Preparation and Pavement Marking Removal Methods

Equipment Type	Concrete		Asphalt		Poor Asphalt		Sealcoat
	G	U	G	U	G	U	
G=grooved U=ungrooved	G	U	G	U	G	U	
Grinder	✘	✓	✘	✓	✘	✓	✓
Shotblaster	✘	✓	✘	✓	✘	✓*	✘
Sandblaster	✓	✓	✓	✓	✓	✓	✓
Waterblasters:							
Low Pressure, up to 10K psi	✓	✓	✓	✓	✓*	✓*	✓*
High Pressure, up to 20K psi	✓	✓	✓	✓	✓*	✓*	✓*
Ultra High, up to 40K psi	✓	✓	✓	✓	✓*	✓*	✓*

✓* - Use in combination with grinding or other methods to minimize potential damage to poor pavements.

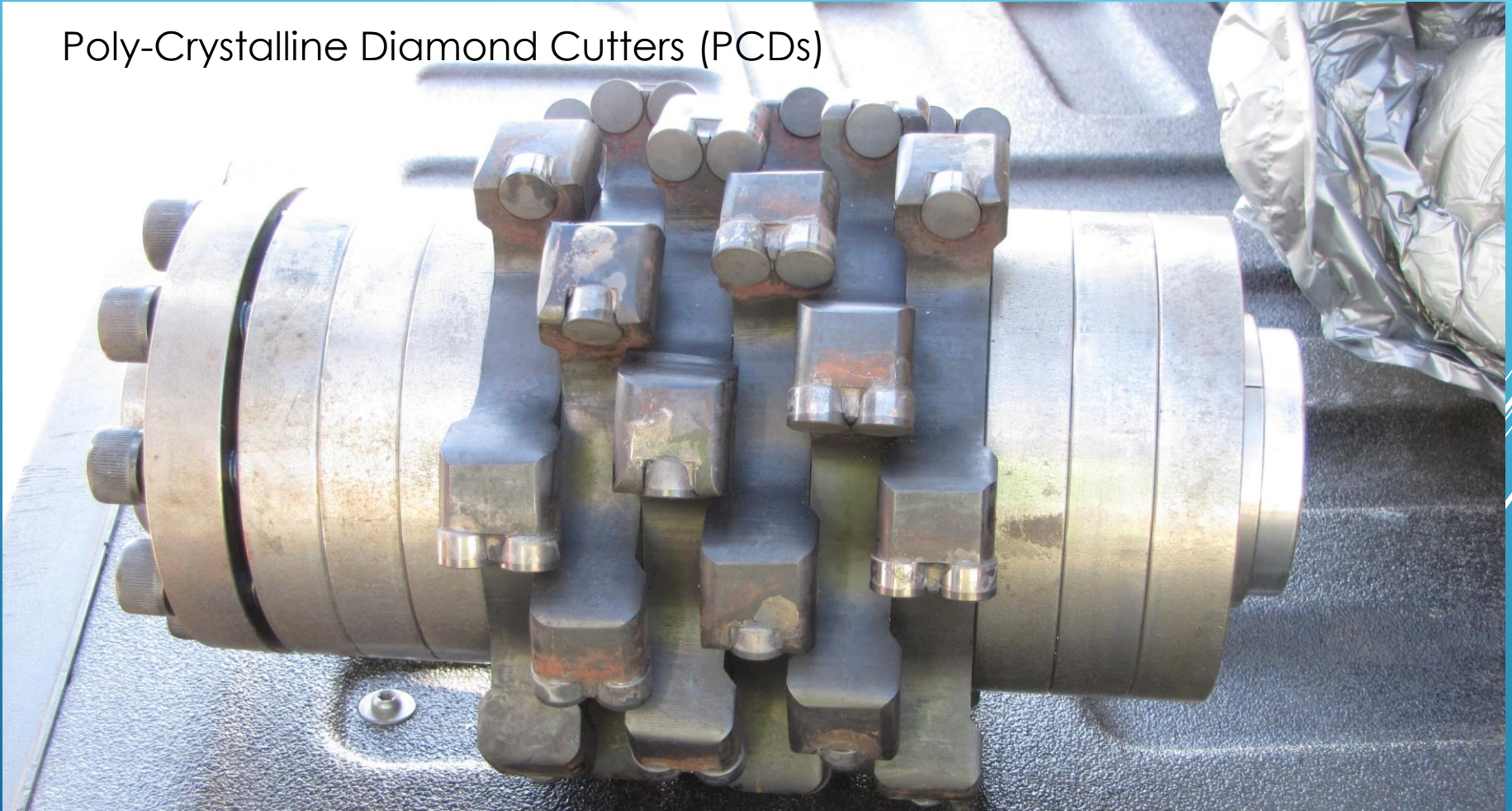








Poly-Crystalline Diamond Cutters (PCDs)





Removal of existing markings prior to displacing threshold





After removal, and before
Displaced Threshold
installed.

Polyurea markings with pavement damage



Diamond Grind

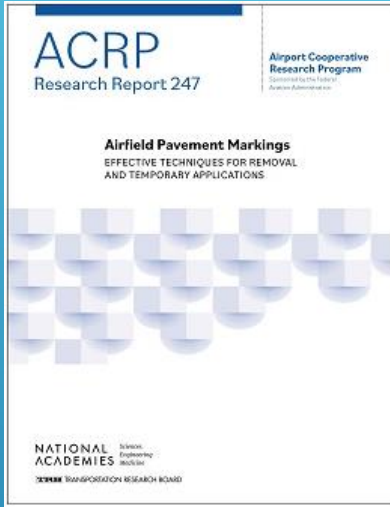


Selection of Removal Method(s):

- Match the method with the condition of pavement under the marking to be removed
- Consider the thickness of coatings to be removed
- What type of coating, i.e., paint, preformed thermoplastic, etc.
- Availability of equipment and experienced operators
- Allow adequate time to do the job well
- Conduct test area prior to full removal

Additional Considerations:

- Combination of methods (grinding and waterblasting)
- Use grooving blades to remove paint in grooves
- Diamond grinding to remove severely damaged areas
- Apply a fog seal or seal coat to 'block out' the removal area to eliminate 'ghost' markings
- Inspect removal day/night and different sun angles

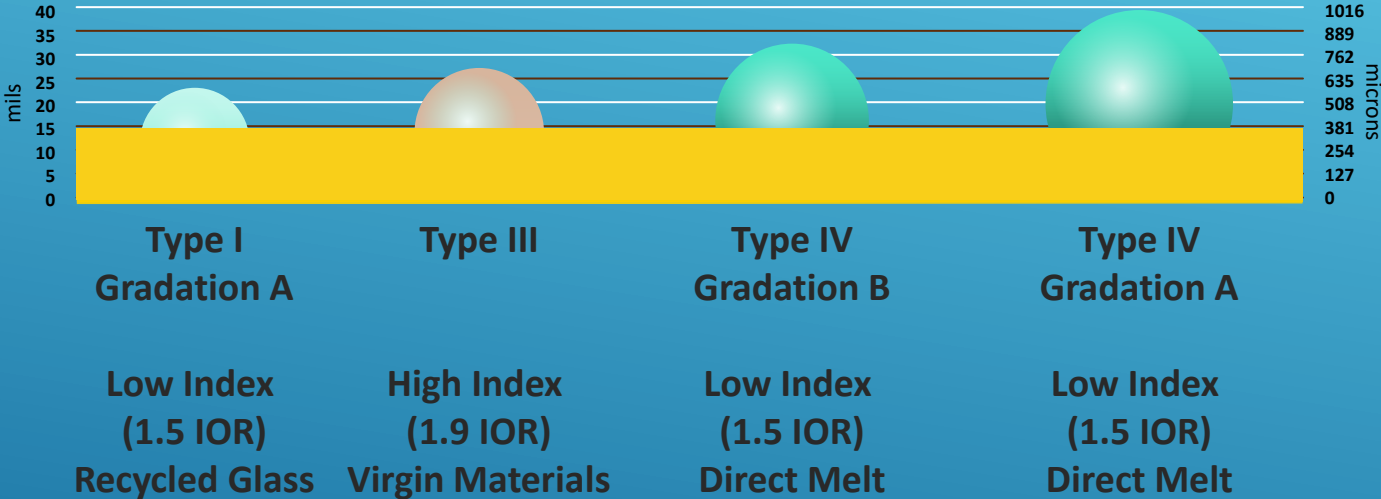


ACRP 247 FINDINGS ON TEMPORARY MARKING APPLICATIONS

AIRFIELD MARKING REQUIREMENTS

- Marking requirements for Part 139 airports (and military installations) are outlined in AC 150/5340-1 (UFC 3-260-04)
- Most markings are required to have glass beads
- If markings are needed to temporarily displace a threshold or divert traffic, temporary markings are installed
- Temporary markings are usually installed thinner than the standard 15 wet mil thickness and without glass beads

GLASS BEAD FILM THICKNESS REQUIREMENT



TEMPORARY MARKINGS AC 150/5370-10, Item P620

- ➔ A 24- to 30-day waiting period is recommended for all types of paint used for pavement marking on either new concrete or asphalt
- ➔ Markings may be required before paving operations are complete or prior to the end of the waiting period
- ➔ The Engineer may wish to specify waterborne or solvent-based materials for temporary markings at 30% to 50% of the specified application rates. Glass beads will not adhere well at the low(thin) application rates for temporary markings

7 wet mils was applied with a temporary marking paint



REMOVAL OF TEMPORARY MARKINGS

Even at a thin rate using a “temporary” paint, the markings on asphalt surfaces left a scar when they were removed.



Paint bonds to the microtexture of the pavement. When even a thin coating is removed, aggregate is exposed as the microtexture is removed with the paint.

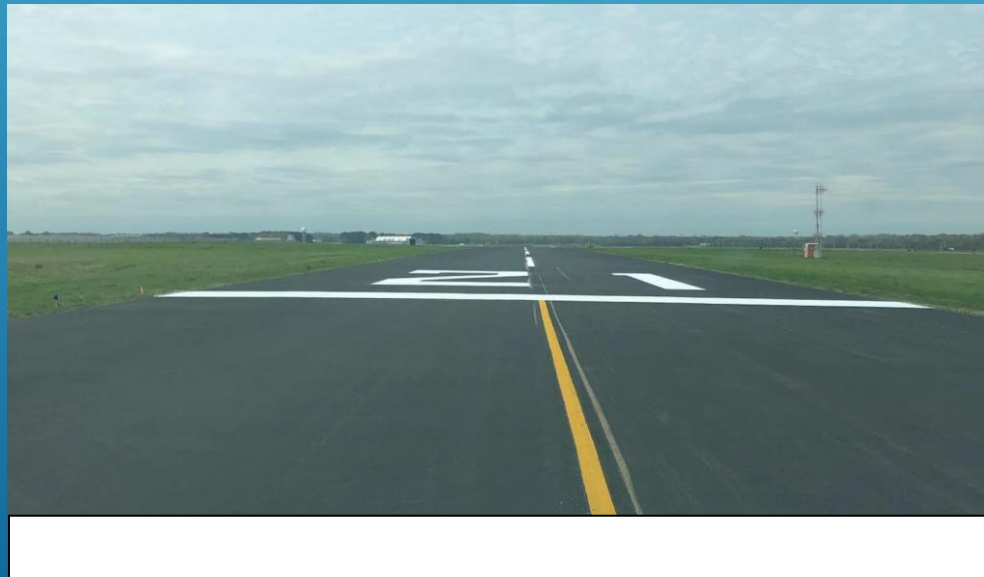


CURING COMPOUND

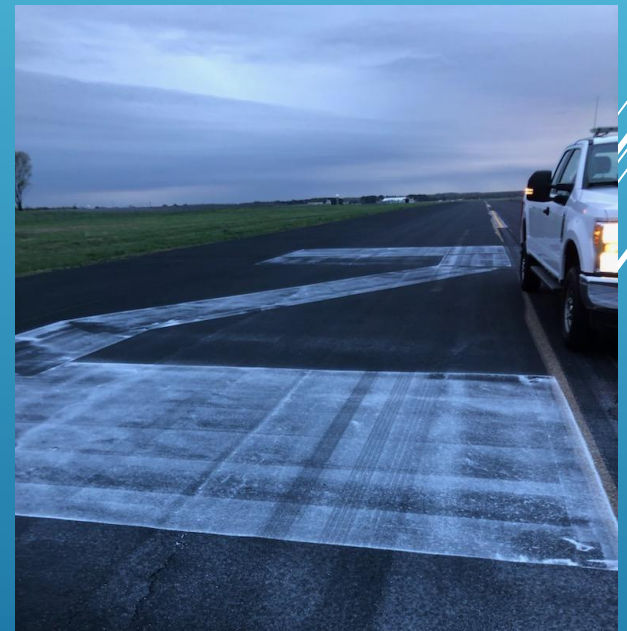
- ➔ Temporary markings painted over curing compound on new concrete pavements must be removed prior to the application of permanent markings
- ➔ Removal of the temporary markings on concrete pavement is less likely to damage the pavement due to its resiliency
- ➔ Curing compound sprayed on asphalt pavements prior to the application of temporary markings to facilitate removal has not prevented scarring during removal operations

TEMPORARY MARKINGS

- ➔ A waterborne formulation was created by Safety Coatings of Foley, AL with a weak resin
- ➔ Millington Airport, Millington, TN converted a taxiway to a runway for 6 months to rehabilitate the runway. The waterborne formulation was used to apply the temporary runway markings



The work was finished overnight, humidity was high, and then it rained. The paint had not dried sufficiently to survive the rain.



TEMPORARY MARKINGS

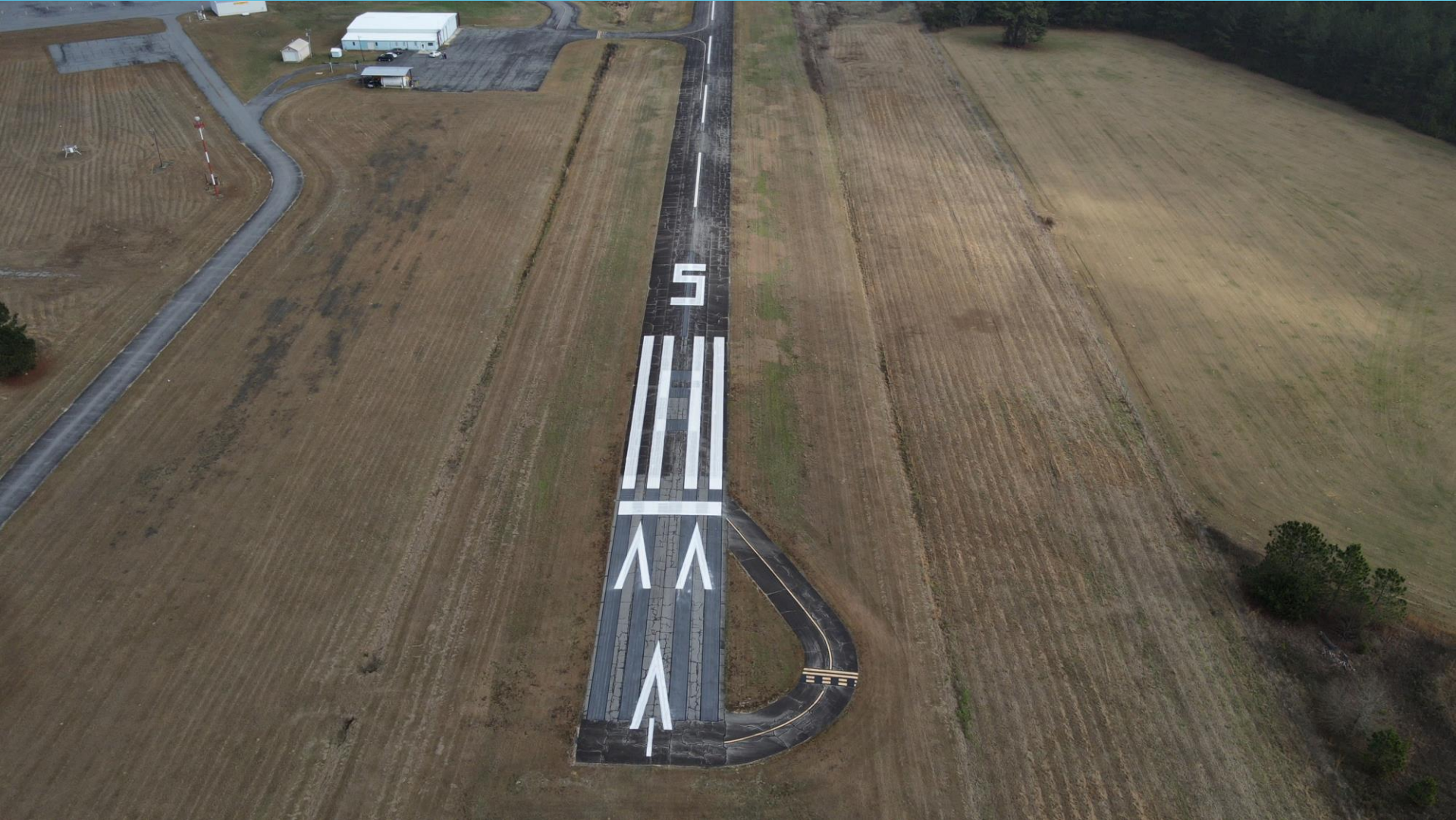
Georgia DOT accommodated the research project by allowing a temporary displaced threshold on Runway 5 at Cochran Airport using the removable paint with the weak resin.

Existing markings were in poor condition with little reflectivity



Black and white removable paint was applied to displace Runway 5









No scarring
No damage to crack seal
Minimal damage to
existing markings



Before and After



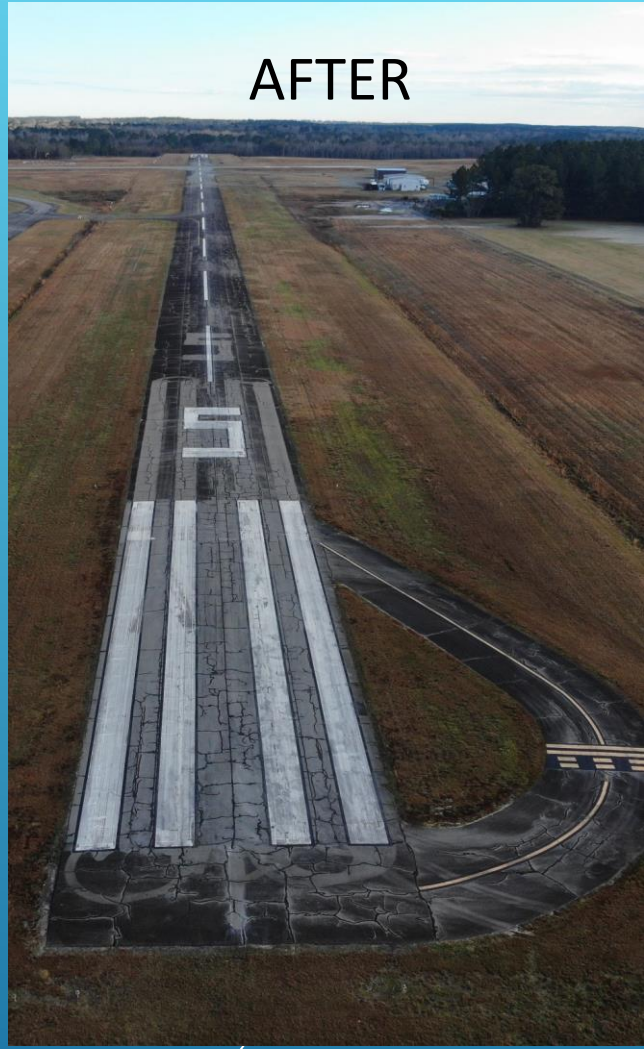
BEFORE



DISPLACED



AFTER



Summary:

- Airfield markings must be removed periodically
- Reason(s) for removal dictate degrees of removal
- Careful evaluation of pavements and materials is crucial
- Specifications must be tailored to the project
 - ✓ Degree(s) of removal is/are specified
 - ✓ Recommended equipment based on conditions
 - ✓ Include pictures if no mandatory pre-bid
- Removable Temporary paint should be studied by FAA and DoD to preserve asphalt pavements from scarring

Thank you!



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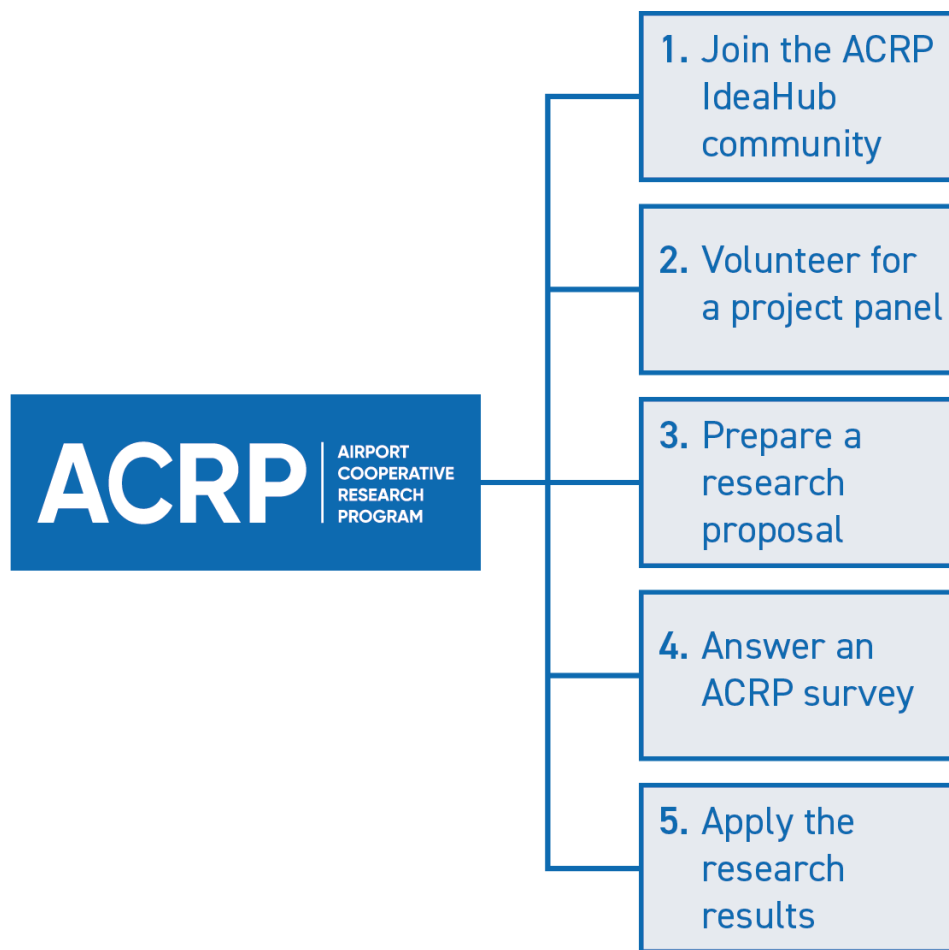
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