GMC AVIATION

Airfield Marking Best Practices and Industry Standards

Association of Georgia General Aviation Airports

Inaugural Conference

May 2022

Matt Thomason, AICP, CM, PE (AL)

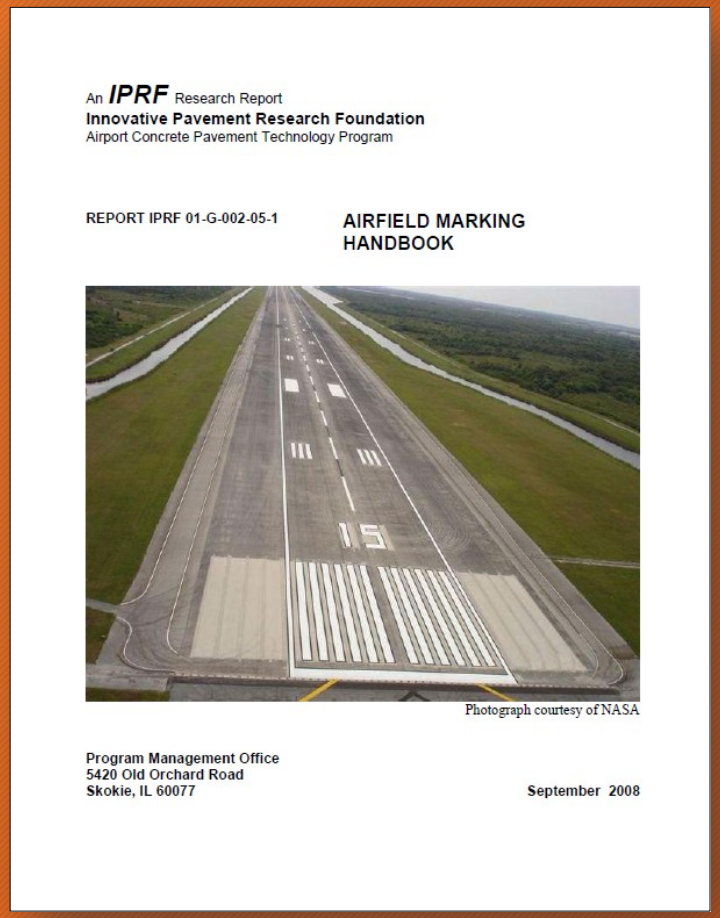
Airfield Markings

- Safety enhancement
- Increase situational awareness
- Common Perception: Markings are easy with little to go wrong
- Good materials and application practices result in less maintenance and have an extended life

GMC

Happy little airfield markings…

Airfield Marking Handbook


An *IPRF* Research Report
Innovative Pavement Research Foundation
Airport Concrete Pavement Technology Program

REPORT IPRF 01-G-002-05-1

AIRFIELD MARKING HANDBOOK

Photograph courtesy of NASA

Program Management Office
5420 Old Orchard Road
Skokie, IL 60077

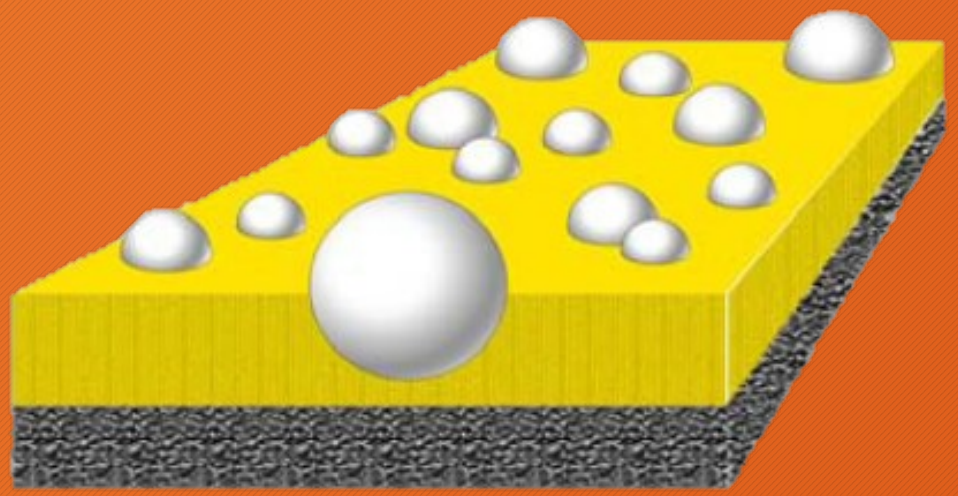
September 2008

- Curated Presentation of Selected Sections with Field Experience
- Excellent reference for the compendium of best practices
- “If you’ve seen one marking project, you’ve seen one marking project.”

FAA Design and Paint Specs

- Most domestic airport marking work in the United States is performed in accordance with the provisions of FAA Advisory Circular 150/5340-1: *Standards for Airfield Markings*.
  - ❖This advisory circular describes the different marking elements, their placement, color, and visibility
- Advisory Circular, AC 150/5370-10, Standards for Specifying Construction of Airports, Item P-620, describes methods for the preparation of existing surfaces, and the installation of the markings.

Markings Materials



- At simplest level: Binder and Bead
- Binder: water-borne,solvent-borne, epoxy, methyl methacrylate (MMA), thermoplastic
- Beads: Reclaimed or Virgin glass
- Match Material to Airport Environment
  - Humid = Algae
  - High Iron = Rust
  - Compatibility with Old Coatings

Compatibility of Materials

Existing Material (Old Coating)	Restripe (New) Material				
	Waterborne Paint	Solvent Paint	Epoxy	MMA	Thermoplastic
Waterborne Paint	✓	✗	✗	✗	✓
Solvent Paint	✓	✓	✗	✗	✓
Epoxy	✓	✓	✓	✗	✗
MMA	✓	✓	✗	✓	✗
Thermoplastic	✓	✓	✗	✗	✓

Water-borne Paints

- Water-borne paint and glass beads are used in 95 percent of airport applications
- Benefits of using water-borne paints include ease of use, clean up and no toxic chemicals
- Fast-dry water-borne paints can be installed quickly and new markings can be driven over soon after installation
- Limitations of using water-borne paints are weather related
  - ❖Type I dries slowly when the humidity is high; it may take up to 30 to 45 minutes to dry.
  - ❖Type II is a faster drying material, and under humid conditions, drying can take up to 20-30 minutes.
  - ❖Type III is a high-build acrylic and a more durable product; it contains special fast-dry polymer binders that hasten the drying process.

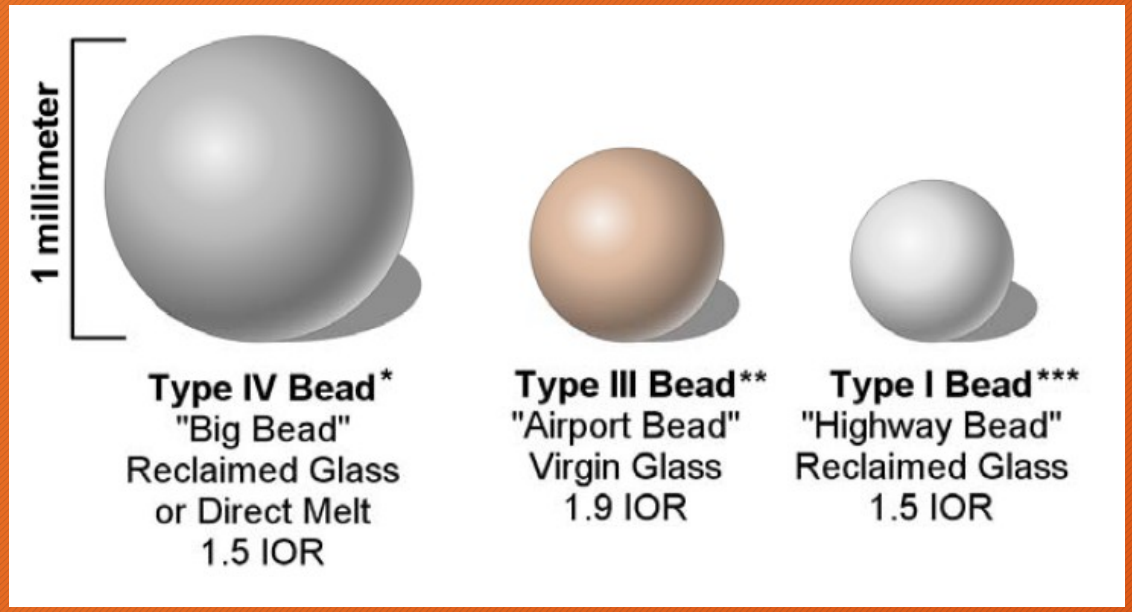
Water-borne Paints

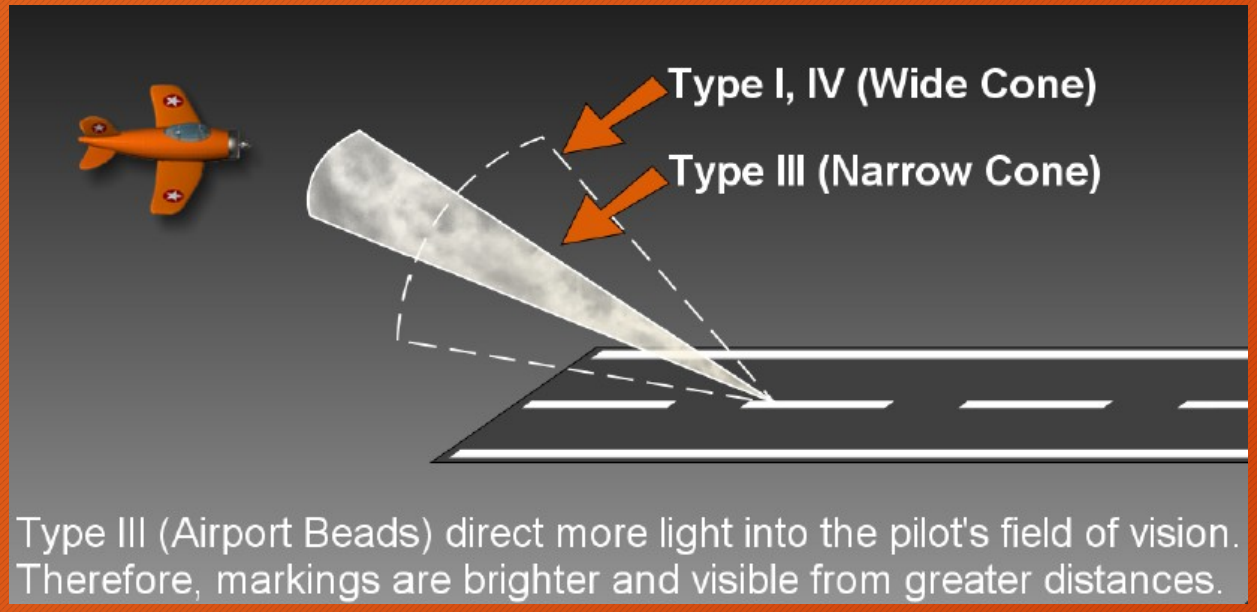
Because waterborne paint cures through a combination of evaporation and coalescence, the curing time depends on the following:

- Paint temperature : The higher the temperature, the faster the paint will cure
- Pavement temperature : The higher the temperature, the faster the paint will cure
- Humidity : The more humidity, the slower the paint will cure
- Wind speed : The higher the wind speed, the faster the paint will cure
- Paint thickness : The thicker the paint, the slower it will cure

Glass Beads

- The ability to see a pavement marking at night is based on the retro-reflective characteristics of the marking.
- “Retro-reflectivity” is the technical term that defines how much light is reflected from a light source back to a specific measurement or vantage point.





Evaluation of Existing Markings

Airfield markings deteriorate over time from traffic wear, ultraviolet light, wind, rain, sweeping, etc.

1. Faded colors or appearance.
2. Poor nighttime visibility or retro-reflectivity.
3. Existing markings are worn 50 percent or more.
4. Existing markings are covered with contaminants.
5. Layers of paint
6. Rust discoloration
7. Algae Growth
8. UV damage
9. Standards compliance

Size and Alignment

- The edges of the markings shall not vary from a straight line more than 1/2 inch in 50 feet
- Dimensions and spacing tolerance ranges between +/- 0.5 inch to +/- 3 inches depending on length

Multiple Paint Layers

- Delamination of paint layers creates FOD issue
- Paint bonds better to the asphalt than the asphalt does to itself
- Fresh coating will cause the old layers to crack and pull apart

Algae and Fungal Growth

- Moist, warm, humid environments promote the growth of algae, which often covers and obscures airfield markings on non-trafficked areas.
- GDOT requires microbicide in paint specifications
- Two methods that can be used to distinguish microbial (fungal and algal) growth from dirt on airport markings:
    1. Bleach test
    2. “Bloom” Algae

Pavement Condition Under Markings

- If the stressed and damaged material is not removed through preparation of the surface, repeated coatings cause ***asphalt*** pavement to deteriorate prematurely.
- Most markings (coatings) absorb moisture and expand/contract differently than the pavement, contributing to the cracking.

Rust Discoloration

- Some environments have high iron content in soils, ground water, or even in the pavement aggregate.
- The iron contaminants on the pavement surface are transported by rainwater across the runway
- Affects compliance with color standards
- Modifications to standard materials can be made to resist the staining of the markings caused by the iron contaminant.

GMC

Other Contaminants

Fuel/Oil Residue

Fuel/Oil Residue

Concrete Curing Compound

Surface Prep and Paint Removal

- Surface preparation and paint removal are two separate procedures
- Surface preparation is the cleaning and removal of *anything* that would reduce the bond
- Removal is the mechanical obliteration to a specified degree
- To perform as expected, pavement markings must adhere to the pavement surface

FUN FACT
75% of all coating failures are due to poor surface preparation

Prep/Removal Equipment and Methods

Waterblasters

Shotblasters

Grinders

Surface Preparation – Best Practices

Equipment Type	Concrete		Asphalt		Poor Asphalt		Sealcoat
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.

Defining Damage to Pavement

- Scarring will occur when paint is removed
- Scarring – some of textures is removed and portions of aggregate exposed
- Damage – more than 25% of the aggregate diameter is exposed in vertical direction

Best Practice –Test Strip

A test strip is **a best practice,** and should always be performed on the area(s) to be removed in order to determine:

- The degree of paint removal that will be satisfactory
- The ability of the equipment to do the work
- The ability of the operator to run the equipment
- The extent of scarring that will occur

Application

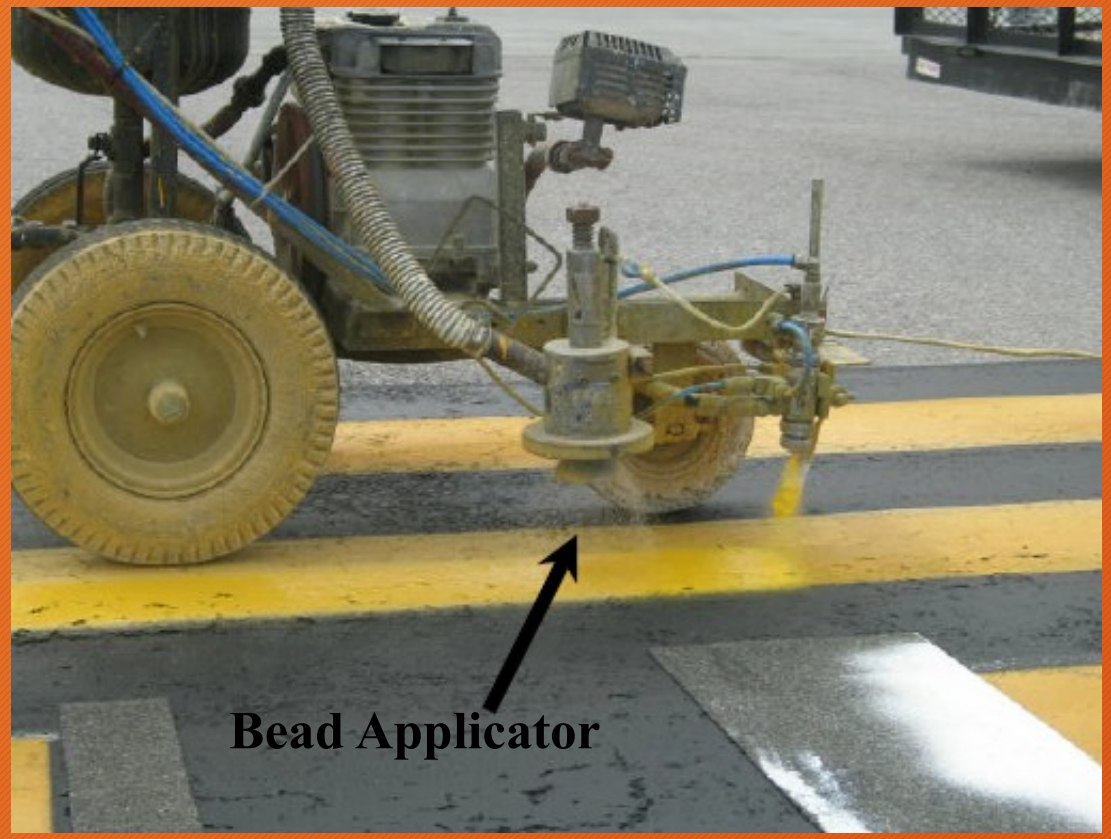
- Requires knowledge and experience in a wide range of areas, including standards, specifications, equipment, materials, procedures, and quality control
- Of all of the techniques used to prepare and apply markings, the best are those:
  - Where close attention is paid to details
  - Where data is recorded and documented
  - Where quality materials are used

Application – Layout of Markings

Application – Equipment

- Airless systems
- Pneumatic or air-atomized systems

Application – Equipment



- Pressurized Glass Bead System
- Gravity Drop Glass Bead System
- Hand Applied
  - Not “thrown” evenly
  - Applied after paint has “filmed over”
  - Increases cleanup necessary

GMC

Example - Poor Bead Application

Application – Best Practices

- Perform layout to maintain dimension and straightness
- “Primer” (temporary) coat applied
- Adequate surface preparation performed [Waterblasting best]
- Ensure proper coverage rates
- Use automatic or pressurized bead dispensers
- Uniform film thickness across marking width
- Paint is not thinned
- Applied from 6-36 inches in single pass
- Documentation a daily function

Your airfield marking project – Best Practices

- Design specific to your airports needs and conditions
- Specify appropriate and compatible materials
- Evaluate pavement under markings
- Evaluate actual site conditions and quantify remediation
- Prescribe surface preparation methods and quantity
- Determine amount, type, degree of markings removal
- Test strips may be beneficial
- Schedule phasing of markings for a time of year when weather is conducive to application of marking materials.

GMC

Wishing you and your airport happy little airfield markings…