Paint and Bead Specifications, Fencing Specification, Non-Destructive Testing, and PASER

2006 March FAA Southwest Region Partnership Conference

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Federal Aviation Administration

Presentation Objectives

- Provide information on newly issued guidance for marking, fencing, and evaluation of pavements
- Guidance available on the Airports internet web site.

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FAA Guidance

- <u>AC 150/5340-1</u> Standards For Airport Markings

- <u>AC 150/5370-10</u> Standards For Specifying Construction of Airports
  - Item P-620

- Overview of Air Force Engineering Technical Letter Guidance—Perhaps the best available guidance on removal of paint and rubber

Standards For Airport Markings

- In 8/99, the marking AC requires obliteration of markings no longer needed.

Subject:	STANDARDS FOR AIRPORT MARKINGS	Date: 8/31/99	AC No: 150/5340-1H
		Initiated by: AAS-300	Change:

d. Removal of Markings. 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.

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Standards For Airport Markings

- In 12/00, the marking AC clearly requires obliteration of markings no longer needed.

| Subject: Change 1 to Advisory Circular (AC) 150/5340-1H, STANDARDS FOR AIRPORT MARKINGS	Date: 12/100	AC No: 150/5340-1H
	Initiated by: AAS-310	Change: 1

d. Removal of Markings. Physically remove pavement markings that are no longer needed by sand blasting, chemical removal or other means, <u>not</u> by painting over them. Painting over the old markings merely preserves the old marking, will require additional maintenance, and in certain conditions, can be misleading to pilots.
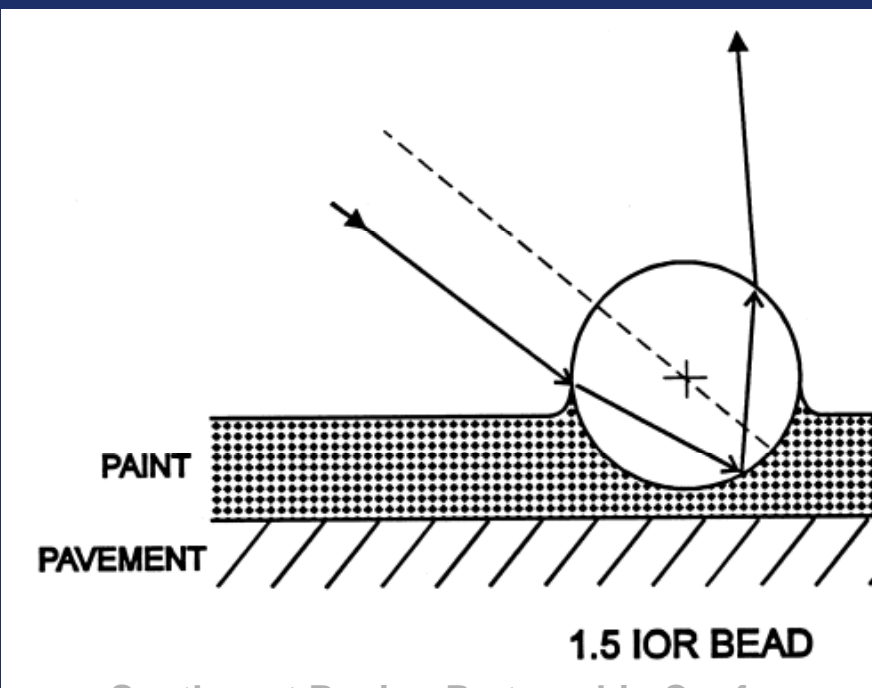
Item P-620 Marking Specifications

- Requires reflective glass beads in markings.

Glass Bead Retroreflection
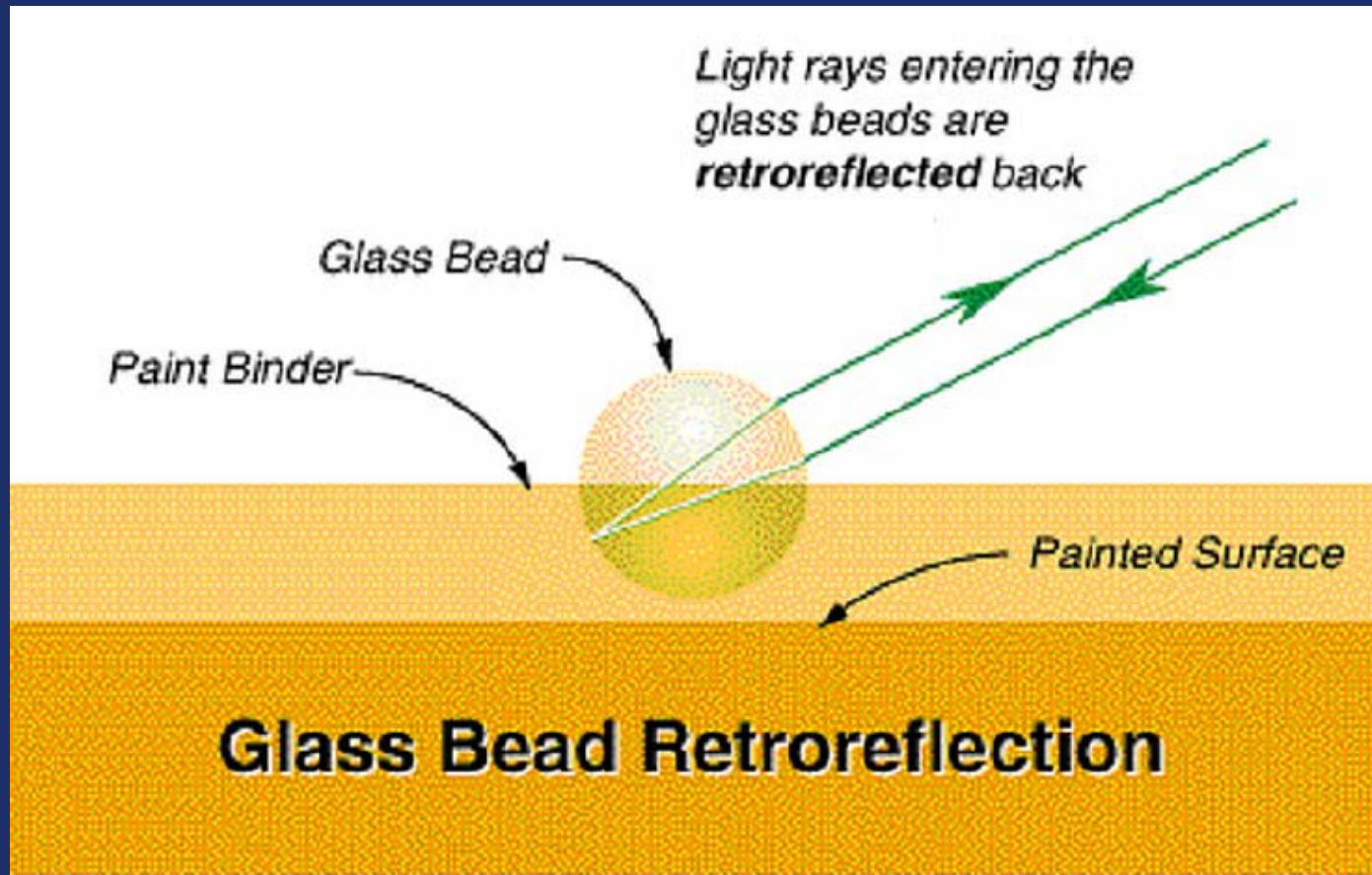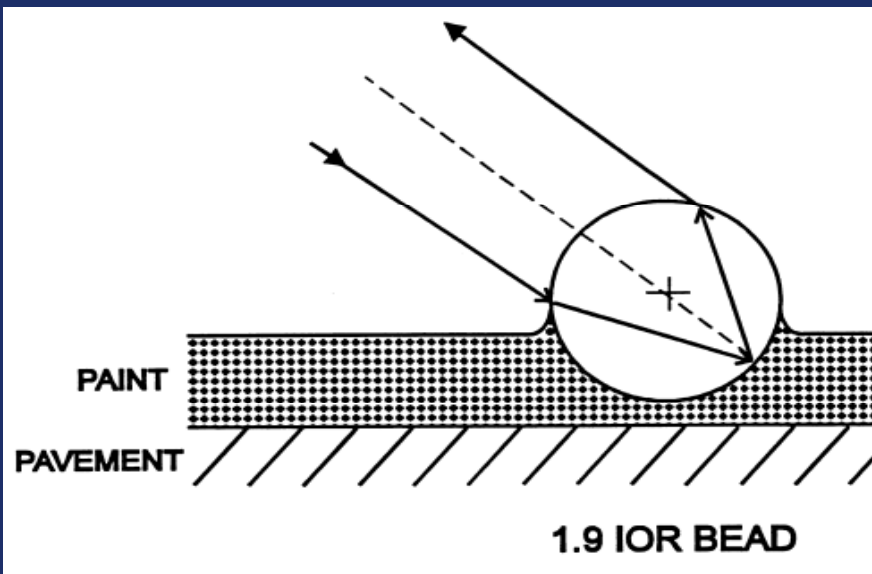
High IOR Bead

- Type III, "High Index Bead" made from high density glass.

Low IOR bead

- Type I, "Low Index Bead" made from reclaimed scrap glass.
- Type IV, "Low Index Bead" made from glass with fewer air bubbles.

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Material Types

- Waterborne Paint
  - Meet TT-P-1952D
- Solvent-Based Paint (Local Environmental Rules apply)
- Methacrylate
- Epoxy

(Item P-620) Paint Glass Bead Issues

- 620 2.3 REFLECTIVE MEDIA. … Glass beads shall be treated with all compatible coupling agents recommended by the the manufacturers of the paint and reflective media to ensure adhesion and embedment

- NOTE TO ENGINEER--The Engineer should consult with the paint and bead manufacturer on the use of adhesion, flow promoting, and/or flotation additives

Item P-620 Reflective Media

- The Engineer inserts all that will be used in the project. When more than one bead type is specified, the plans should indicate the bead type for each marking.

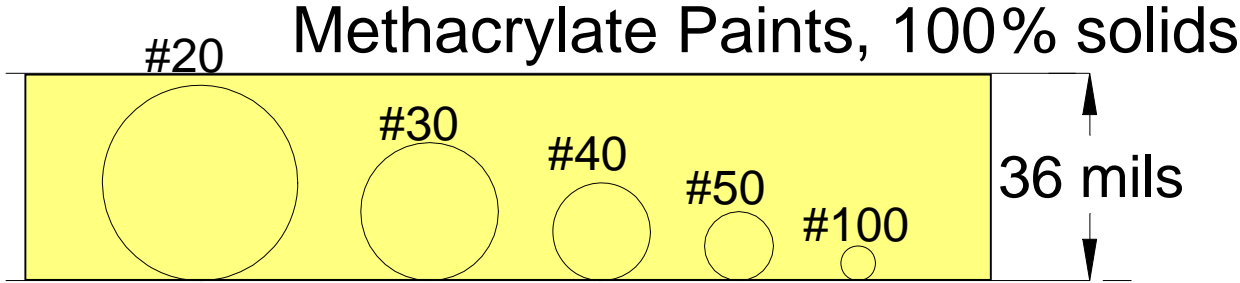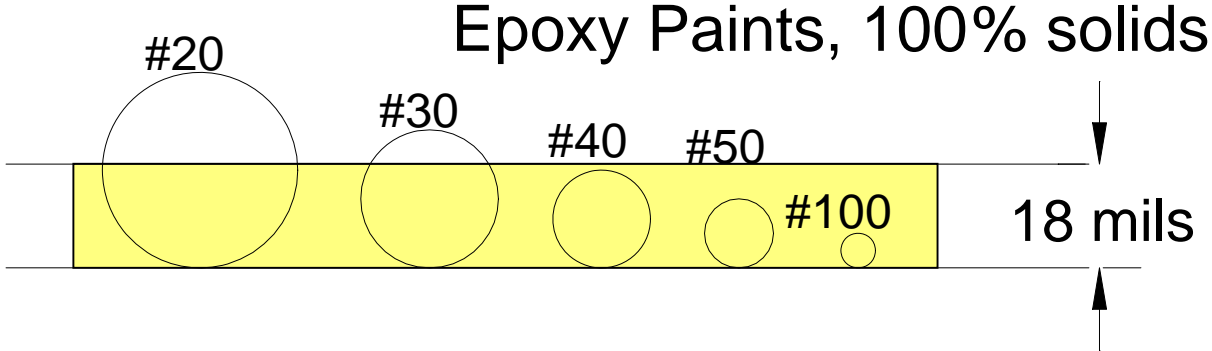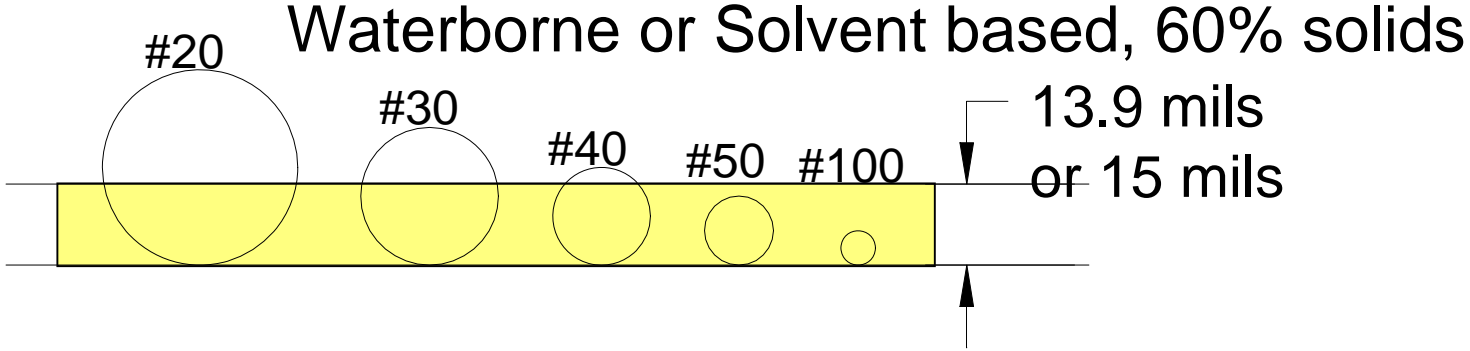TT-B-1325C, Type I, gradation A smallest bead

TT-B-1325C, Type III larger bead

TYPE IV largest bead-more paint per square foot

Item P-620 Reflective Media

Gradation					
		Type I	Type III	Type IV-A	Type IV-B
U.S. Sieve No.	Microns (mils)	Min. % pass	Min. % pass	Min. % pass	Min . % pass
12	1700 (67)	--	--	100	100
14	1400 (55)	--	--	95	--
16	1180 (46)	--	100	80	95
18	1000 (39)	--	--	10	--
20	850 (33)	100	95	0	35
30	600 (24)	80	55	--	0
40	425 (17)	--	15	--	--
50	300 (12)	18	0	--	--
100	150 (6)	0	--	--	--
200	75 (3)	0	--	--	--
Pan					

Wet Film Thickness   (Dry Film = Wet film × %Solids)

Waterborne or Solvent based, 60% solids

#20

#30

#40   #50   #100

13.9 mils
or 15 mils

Epoxy Paints, 100% solids

#20

#30

#40   #50

#100

18 mils

Methacrylate Paints, 100% solids

#20

#30

#40

#50

#100

36 mils

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Hand-Held Retroreflectometer

- These devices can spot check the condition of selected retroreflective pavement markings.
- Not Required in specification—FAA researchers use to evaluate marking materials.

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Item P-620 Marking Specifications

- WEATHER LIMITATIONS. The painting shall be performed only when the surface is dry and when the surface temperature is at least 45 degrees F (7 degrees C) and rising and the pavement surface temperature is at least 5 degrees F (2.7 degrees C) above the dew point. [Painting operations shall be discontinued when the surface temperature exceeds [   ] degrees F ([   ] degrees C.]

Item P-620 Marking Specifications

- PREPARATION OF SURFACE. Dry and free material that would reduce the bond between the paint and the pavement. Cleaned by sweeping and blowing or by other methods as required to remove all dirt, laitance, and loose materials. Sandblasting or high-pressure water used to remove curing materials.

- The Engineer should specify any additional surface preparation required and should specify the type of surface preparation to be used when existing markings interfere with or would cause adhesion problems with new markings.

(Item P-620) Paint Glass Bead Issues

- 620-3.6 PROTECTION AND CLEANUP. … The Contractor shall remove from the site all debris, waste, loose or unadhered reflective media, and by-products generated by the surface preparation and application operations to the satisfaction of the Engineer. The Contractor shall dispose of these wastes in strict compliance with all applicable state, local, and Federal environmental statutes and regulations,

Air Force Guidance—Best Available

- Engineering Technical Letter (ETL) 97-17: Guide Specification – Paint and Rubber Removal from Roadway and Airfield Pavements

- Point Of Contact. Mr. Michael D. Ates, HQ AFCESA/CESC, DSN 523-6351, commercial (850) 283-6351, Internet atesm@afcesa.af.mil.

Air Force Guidance—Best Available

- <u>Description of Work</u>. Required to remove 85 percent of the paint buildup from 100 percent of the painted area within a designated area of (runway, taxiway, apron, (and) roadway) pavement. The removal is to be completed without damage to the pavement surface, joints, and joint and crack seals, or any other property. The term "paint" used herein may include obsolete paint markings and/or loose and poorly bonded paint

Air Force Guidance—Best Available

- <u>Pavement Damage Survey</u>. The Engineer and the Contractor shall jointly inspect the work area before work commences. Any existing damage to the pavement systems shall be documented at that time. The Contractor shall repair damage incurred during the contracted operations.

Air Force Guidance—Best Available

- <u>Test Strip Demonstration</u>. The Contractor shall test all equipment and demonstrate on the designated pavement work areas the proposed method to be used to remove paint.

Fencing Specifications

- F- specifications in AC 150/5370-10.
- Wildlife Deterrent Option added.

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Added at bottom of Fence
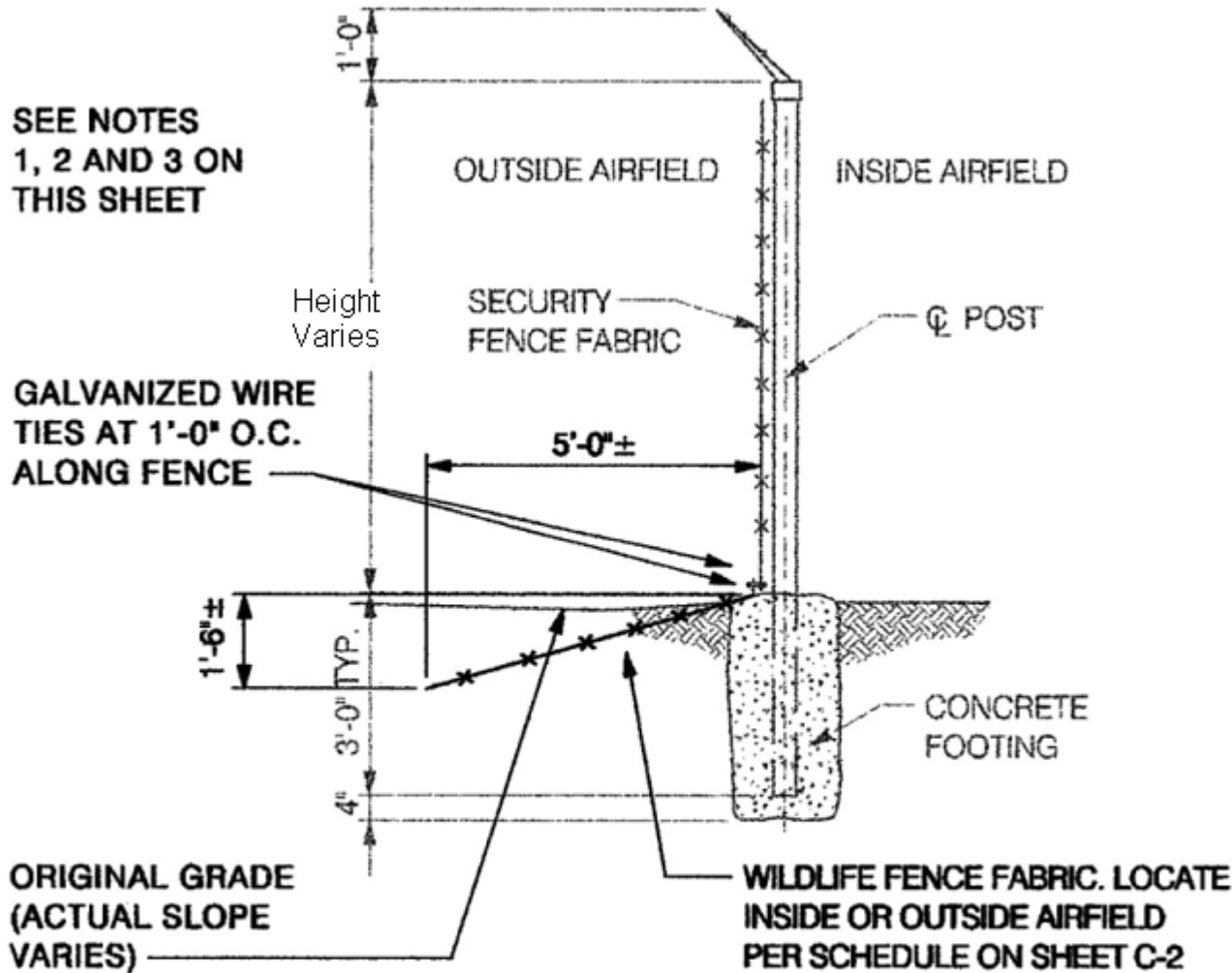
EXISTING SECURITY FENCE
WITH WILDLIFE DETERRENT FENCE

AC 150/5370-11A
Use of Nondestructive Testing Devices in the Evaluation of Airport Pavements (12-29-04)

FWD Sensors

P

Displacement Sensors

d2 d3 d4 d5 d6 d7

Load Cell

Pavement

Subgrade
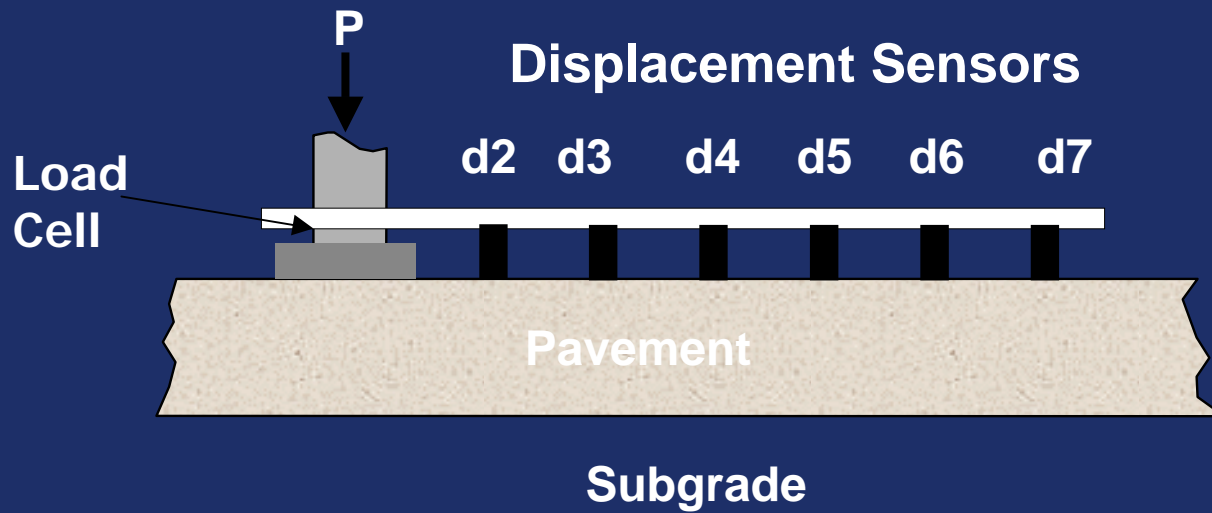
Deflection Basin
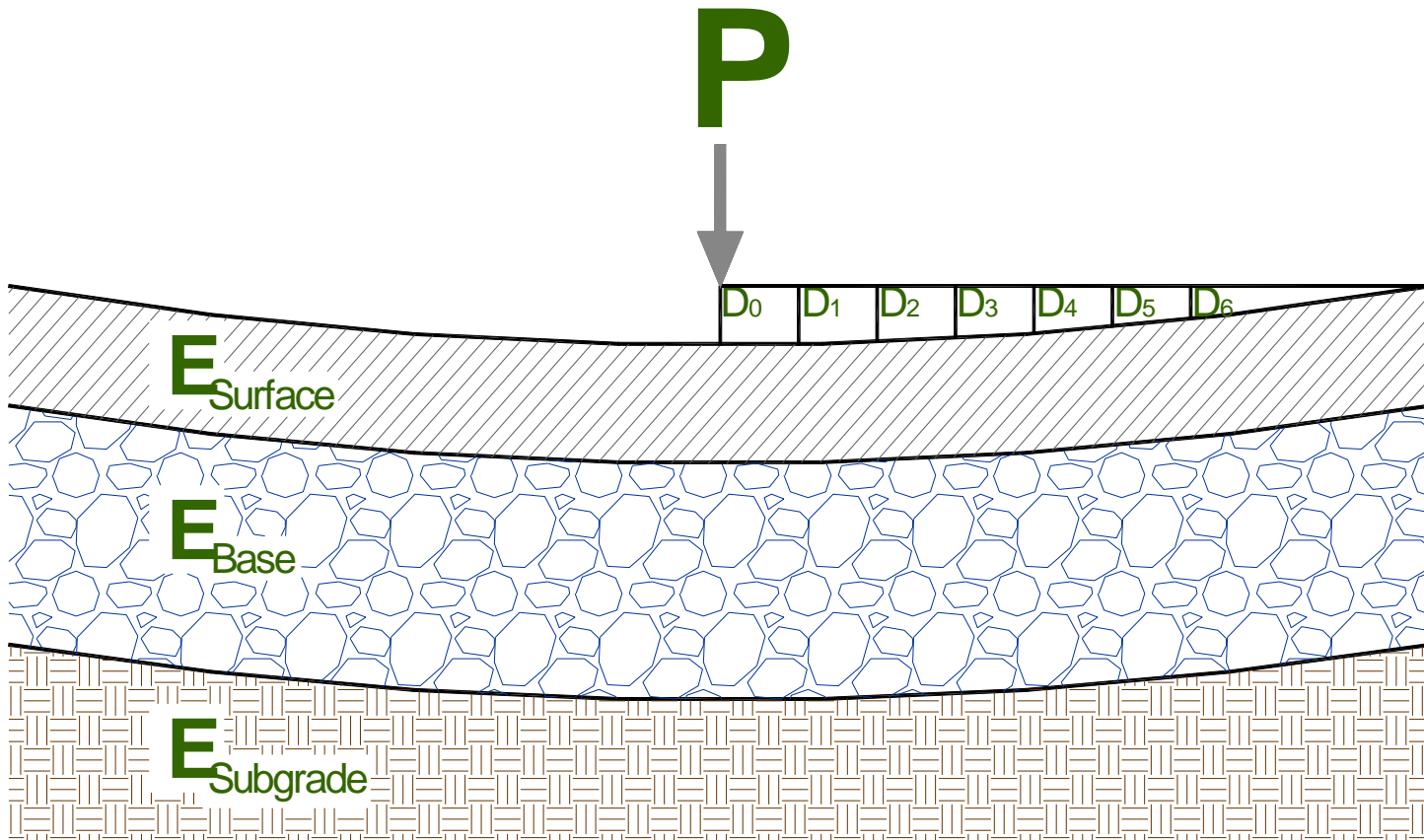
ASTM Deflection-Measuring Equipment Standards

| ASTM	NDT Equipment Type		
	Static	**Vibratory**	**Impulse**
<u>**D4695-96**</u>, **"Standard Guide for General Pavement Deflection Measurements"**	•	•	•
<u>**D4602-93**</u> **(2002), "Standard Guide for Nondestructive Testing of Pavements Using Cyclic-Loading Dynamic Deflection Equipment"**		•	
<u>**D4694-96**</u>, **"Standard Test Method for Deflections with A Falling-Weight-Type Impulse Load Device"**			•

Data Analysis

- Qualitative – patterns of variability in support conditions

- Quantitative – design input

- Other –
  - PCC Voids Analysis
  - PCC Joint Load Transfer

Stiffness Modulus
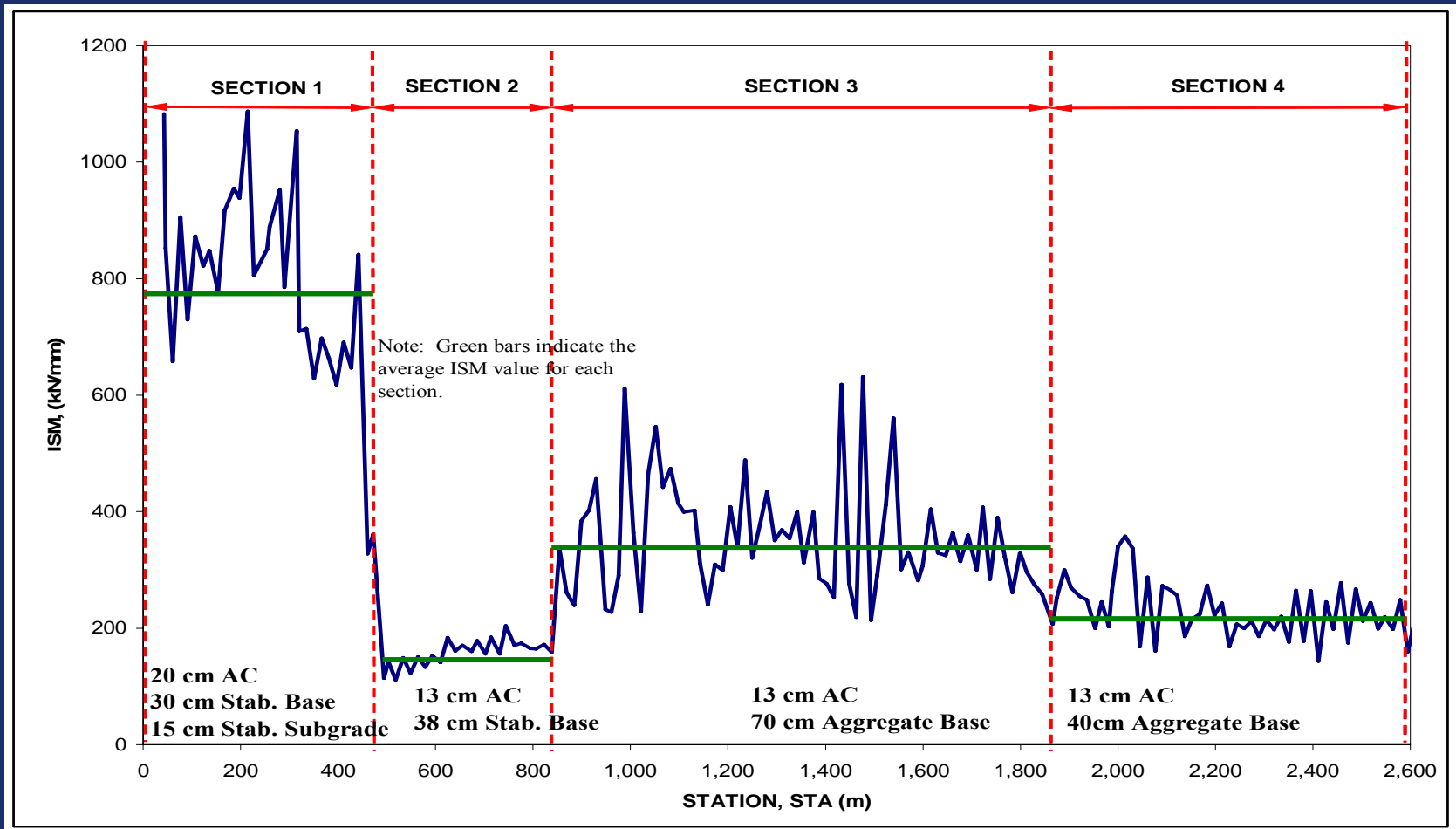
Describes Overall System Behavior
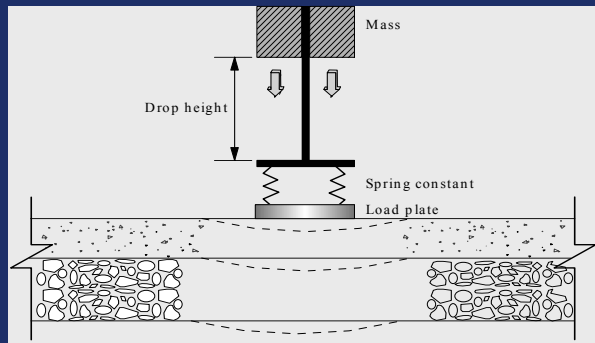
$$I(D)SM = L / do$$

I(D)SM = Impulse or Dynamic Stiffness Modulus

L = Applied Load

do =   Maximum Deflection

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Typical ISM Profile

Backcalculation

- Compute Layer Properties
  - Layered Elastic Backcalculation
  - Closed Form Solutions

- Backcalculation method should be consistent with structural model
  - Layered Elastic: LEDFAA (Flexible & Rigid)
  - Closed Form: Conventional Rigid
  - Correlation E to CBR: Conventional Flexible

Layered Elastic Backcalculation
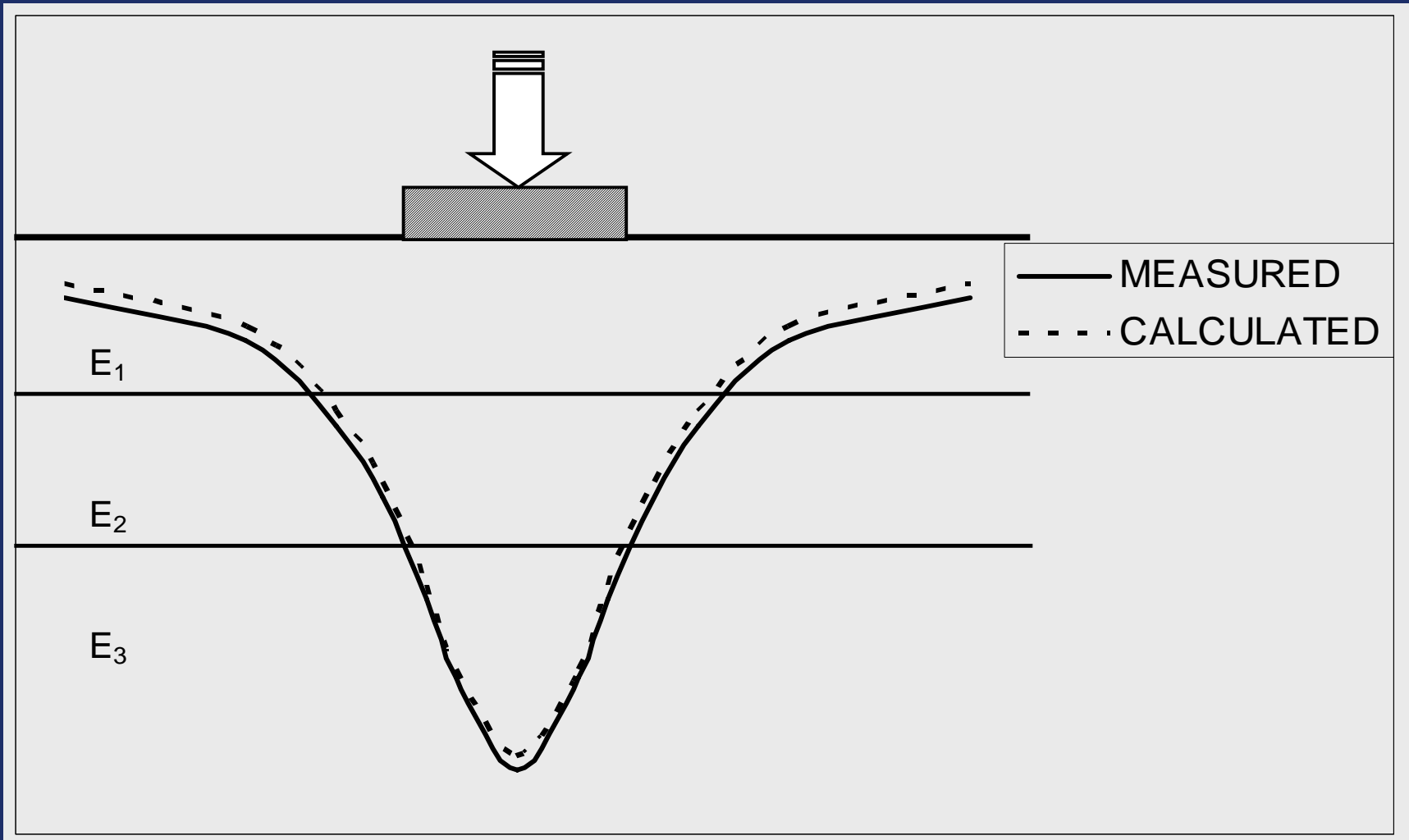
Commonly Used Layered Elastic Backcalculation Programs

Program Name	Developed By	Calculation Subroutine	Rigid Layer Analysis	Layer Interface Analysis		
BAKFAA	FAA	LEAF	Yes	Variable		
BISDEF	U.S. Army Corps of Engineers - WES	BISAR Proprietary	Yes	Variable		
CHEVDEF	U.S. Army Corps of Engineers - WES	CHEVRON	Yes	Fixed (Rough)		
ELSDEF	Texas A&M Univ.; U.S.Army C.O.E.WES	ELSYM5	Yes	Fixed (Rough)		
MODULUS	Texas Trans Institute	WESLEA	Yes Variable	Fixed?		
WESDEF	U.S. Army C.O.E. WES	WESLEA	Yes	Variable		
MICHBAK	Michigan State	CHEVRON	Yes	Fixed		

BAKFAA Program

Locations Within PCC Slab

Center of Slab   Transverse Joint   Slab Corner   Longitudinal Joint

Direction of Testing
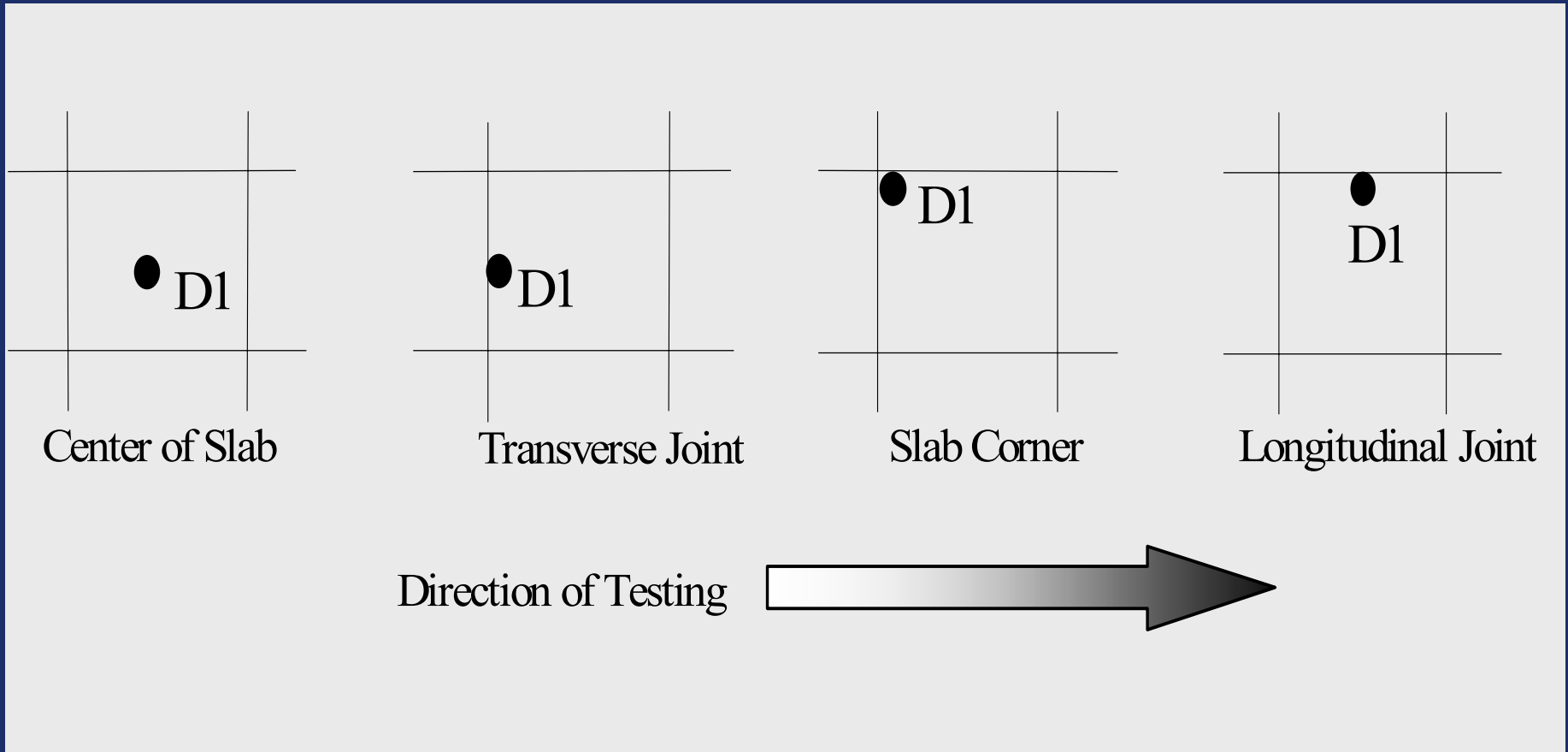
PCC Load Transfer Plot

LTE = d*u*/d*l*
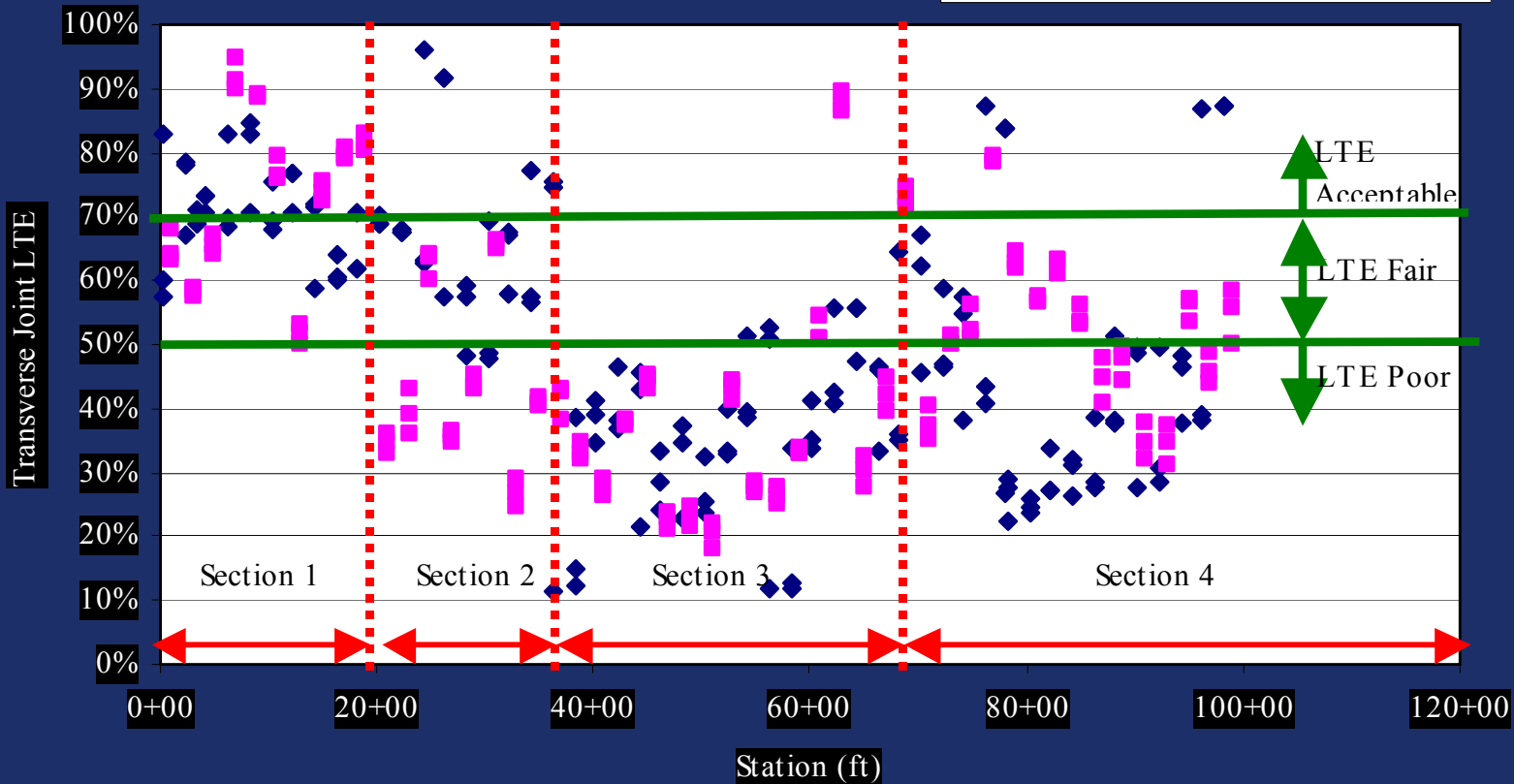
Advisory Circular 150/5320-17 Airfield Pavement Surface Evaluation and Rating Manuals

WHY PASER MANUALS

1998 – GAO/RCED 98-226 Report *Keeping Nation's Runways in Good Conditions Could Require Substantially Higher Spending*

Discussed maintenance needs and called for action by the FAA

FAA responded to GAO

Congress responded in AIR-21

PASER

- PASER chosen as most appropriate "primitive" rating method originally evaluated by the Federal Highway Administration

- Developed by the College of Engineering – Univ. of Wisconsin-Madison

- Simplified visual rating system adapted for airfield pavements by Dr. Donald Walker

PAvement Surface Evaluation and Rating "PASER"

Two manuals

Flexible pavement

Rigid pavement

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Pavement Surface Evaluation and Rating

PASER Manual
Asphalt Airfield Pavements

RATING 5

RATING 3

RATING 1

Advisory Circular 150/5320-17, Appendix 1

PASER Rating System (Flexible)

Rating system

Surface rating	Visible distress*	General condition/ treatment measures
5 Excellent	None, or initial thermal cracks, all narrow (less than ⅛")	New pavement less than 5 years old. No maintenance or isolated crack sealing required.
4 Good	Additional thermal cracking. Cracks generally spaced more than 50' apart. Less than 10% of cracks and joints need sealing. Minimal or slight raveling. No distortion. Patches in good condition.	Recent sealcoat or pavement over 5 years old. Seal open cracks or joints and replace sealant where needed.
3 Fair	Moderate raveling. Thermal cracks and joints generally spaced less than 50' apart. Crack sealing or repair of sealant needed on 10%-25% of cracks or joints. Edge cracks along 10% or less of pavement edges. Block crack pattern with cracks 6'-10' apart. Isolated alligator cracking and poor patches. Minor distortion or crack settlement less than 1".	Seal open cracks and joints. Replace failed sealant. Apply new surface treatment or thin overlay. Minor patching and joint repair.
2 Poor	Frequent thermal cracks. Wide cracks and joints with raveling in cracks. Deterioration along more than 25% of cracks. Edge cracks on up to 25% of pavement edges. Block cracks spaced 5' apart or less. Alligator cracking or poor patches cover up to 20% of surface area. Distortion or settlement 1"-2".	Needs significant crack sealing plus patching and repair on up to 25% of pavement surface. Overlay entire area with structural overlay.
1 Failed	Widespread, severe cracking with raveling and deterioration. Alligator cracking and potholes over 20% of the area. Distortion over 2".	Condition may be limiting service. Needs reconstruction.

A given pavement segment may only have one or two types of distess rather than all of the types listed for a particular rating.

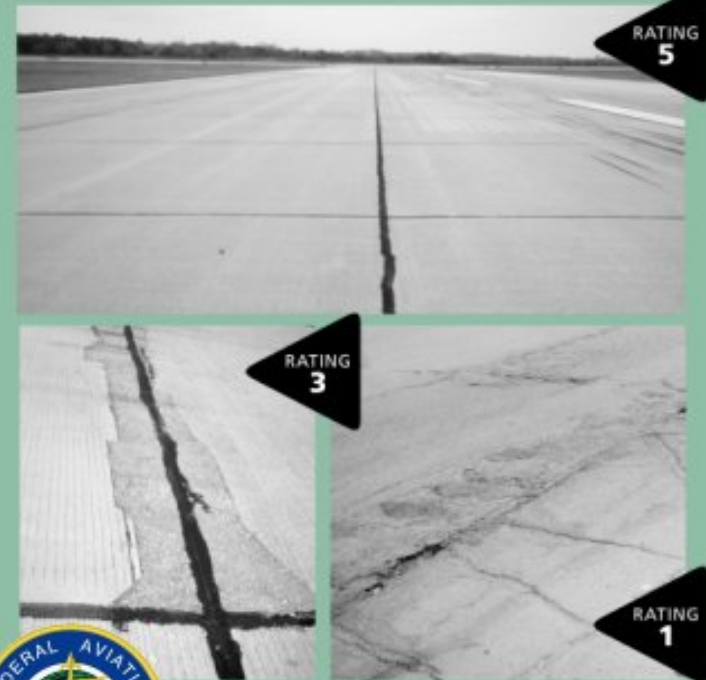# PAvement Surface Evaluation and Rating "PASER"

Two manuals

Flexible pavement

Rigid pavement

**Southwest Region
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Pavement Surface Evaluation and Rating

PASER Manual
Concrete Airfield Pavements

RATING 5

RATING 3

RATING 1

Advisory Circular 150/5320-17, Appendix 2

PASER Rating System (Rigid)

Rating system

Surface rating	Visible distress*	General condition/ treatment measures
5 Excellent	None.	New pavement or recent major concrete rehabilitation. Like-new condition. Less than 5 years old. No maintenance required.
4 Good	Hairline or sealed cracks 1/8" wide or less. Map cracking. Pop-outs.	Concrete over 5 years old. Signs of wear. Minor spot repair of cracks or joint sealant.
3 Fair	Several slabs broken into two pieces by slab cracks. Corner cracking on several slabs, 1/4" wide with no spalling. Joint sealant mostly in good condition, less than 10% needing replacement. Several patches in fair to good condition. Map cracking or scaling on 10% or less of the surface area. Slight faulting, less than 1/4", in several locations.	First sign of significant slab cracking, corner cracking, scaling, or faulting. Several patches. Joint sealant repair required. Isolated repair of joint or patch.
2 Poor	Many slab cracks, some breaking the slab into three or more pieces. Cracks open 1/8" or cracks with spalling. D-cracks at several joints. Sealant failure over 10% of joints. Several patches in fair to poor condition with cracks in patch and uneven surface. Faulting 1/4" to 1/2" in several locations. Severe or extensive scaling.	Needs sealant replacement on more than 10% of cracks or joints. Partial depth or full depth joint repairs or patch replacement. Repair faulted joints. Replace or overlay slabs with severe scaling. Bonded or unbonded concrete overlay.
1 Failed	Many wide cracks with failed sealant and grass. Extensive crack and joint spalling. Slabs extensively cracked or shattered. Many corner breaks with spalling. D-cracks with spalling. Patches in poor condition with spalling. Numerous faults over 1/2".	Extensive full depth joint repairs or slab replacements. Extensive patching and complete overlay. Complete reconstruction.

* A given pavement segment will not have all of the types of distress listed for a particular rating. It may have only one or two types.

Each PASER Manual is an Appendix to AC 150/5320-17

- Discusses common pavement distresses.

- Provides multiple examples for each rating.

- Includes a 2-page summary of practical advice on evaluating airfield pavements.

- Contains a simplified form to document rating.

  - Comments for drainage, maintenance, and rehabilitation.

- Is accompanied by an instructional video.

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Thank You
Questions / Discussion

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