AN INTRODUCTION TO ELEMENTS AND USES OF SLURRY SEAL SYSTEMS

by

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AN INTRODUCTION TO ELEMENTS AND USES OF SLURRY SEAL SYSTEMS — 1978 edition

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Engineers concerned with pavement surface construction and maintenance or who are contemplating a slurry seal project are encouraged and invited to use the services, facilities and technical publications of ISSA. Please call or write to:

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The author also invites inquiry and discussion of the contents of this presentation and oral comments.

AN INTRODUCTION TO ELEMENTS AND USES OF SLURRY SEAL SYSTEMS

I. INTRODUCTION

A. Remarks
   1. The International Slurry Seal Association
   2. Text only partly written; must write your own
   3. Bibliography - USCE WES "Instruction Report S-75-1 Slurry Seal Surface Treatments" and Robins AFB Slurry Seal Evaluation
   4. Subject matter to be covered
   5. Audience slurry experience survey

B. Basics of Pavement Systems and Components
   1. Structure supports the load. Consists of:
      a. Drainage
      b. Sub-base
      c. Base
      d. Pavement
   2. Surface
      a. Protects the underlying structure from deterioration by
         1. Chemical agents (air, water, environmental chemicals)
         2. Mechanical agents (water, ice, temperatures, abrasion)
      b. Gives special surface properties such as skid resistance and hydroplaning resistance.

C. Pavement Distress, two kinds
   1. Structural (Load/Base) associated (fatigue, consolidation, drainage, reflection, base shrinkage, rutting differential sub-structure)
   2. Surface associated (oxidation, loss of matrix, raveiling, surface shrinkage, slipperiness, water and air permeability)

D. Concepts of Pavement Maintenance
   1. "Do Nothing" policy results in "panic maintenance" and expensive reconstruction
   2. Planned period or preventive maintenance raises and maintains the serviceability level and life of the pavement and usually will be more economical.
      e.g., An overlay @ $1.50/SY, 15 year life = 10¢/SY
      2 Sealcoats @ $.75/SY, 15 year life = 5¢/SY

E. New Construction Design should plan for inevitable maintenance procedures

PAVEMENT SYSTEM COMPONENTS:

1. STRUCTURE - Supports the load
2. SURFACE - Protects the structure

TYPES OF PAVEMENT DISTRESS

1. STRUCTURAL - Load/Base associated
2. SURFACE - Surface Associated

Figure 1

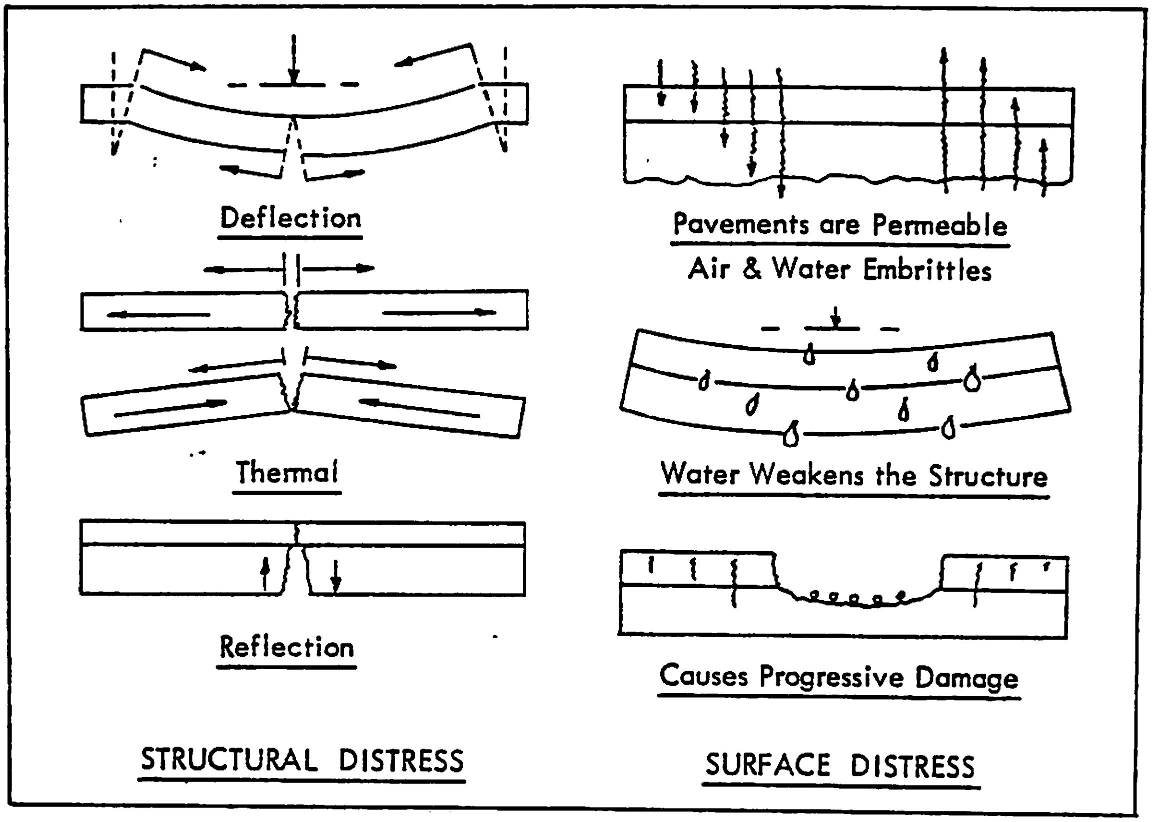


Figure 2. Examples of Pavement Distress.

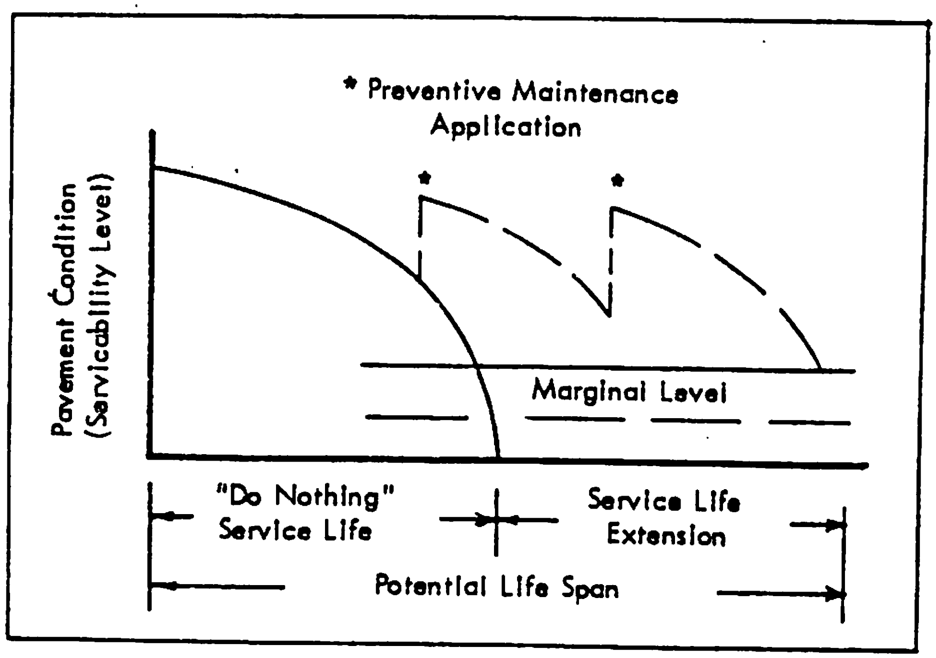


Figure 3. Theoretical Histogram Showing Consequences of Maintenance Policy.

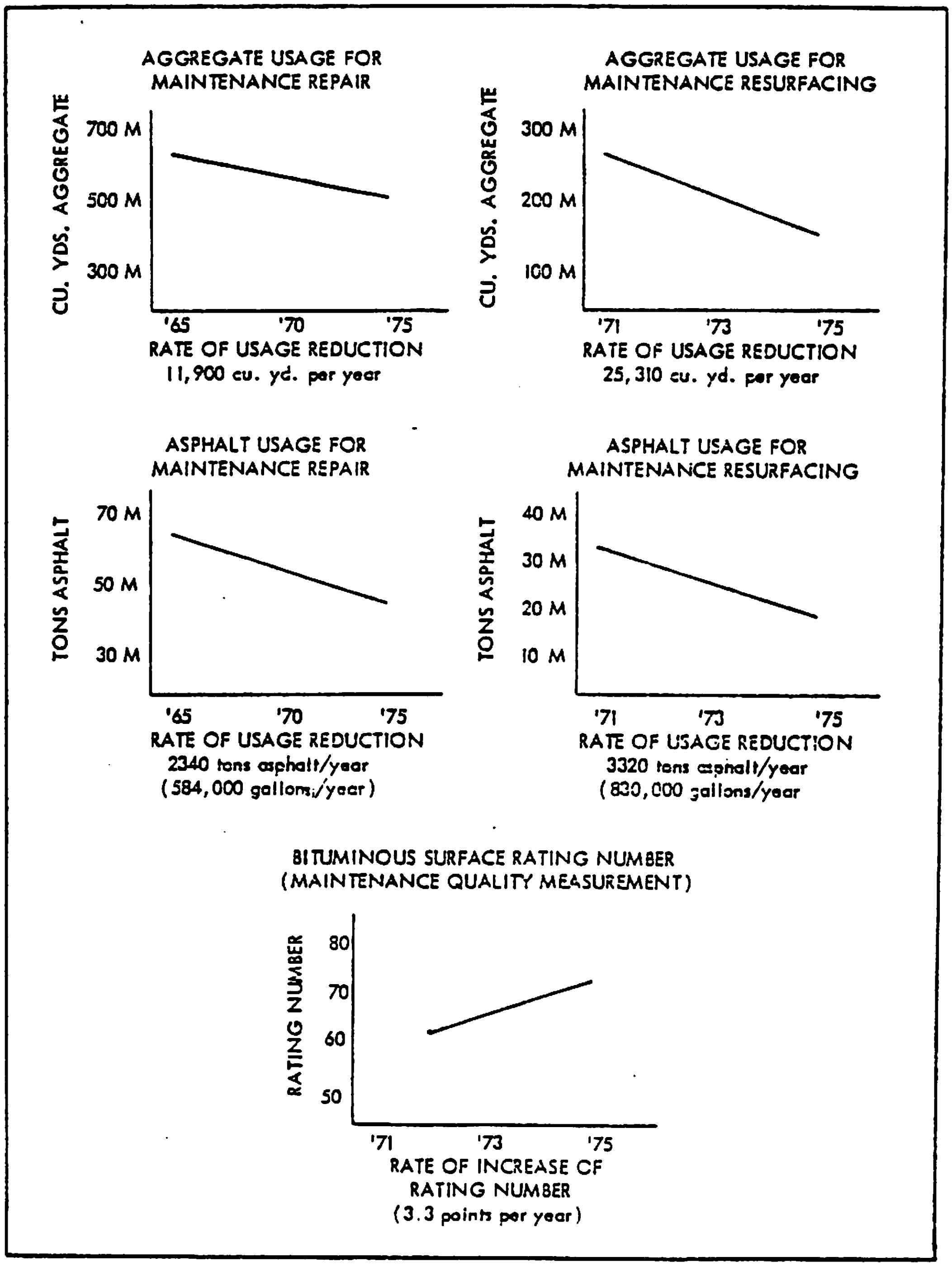


Figure 4. Kansas Highway Department. Results of Effective Preventive Maintenance Policy. ("Economics of Preventive Maintenance," LaRue Delp - TRB - 1976)

II. KINDS OF SURFACE TREATMENTS

How shall we preserve and protect our pavements?

Liquid only treatments (A–B):

A. Non-Penetrating Liquids
   1. Fog Seal - dilute emulsion
   2. Natural asphalt cut-back
   3. Coal tar pitch - clay emulsion

B. Penetrating Liquids
   1. Cut-back asphalt primers
   2. Cut-back asphalt emulsions
   3. Tar primers
   4. Cut-back tar
   5. Rejuvenators:
      a. Resin-oil plasticizers
      b. Emulsion plasticizers
      c. Solvent plasticizers

Liquid and aggregate treatments (C–D):

C. Aggregate Seals
   1. Spray bar and box seals
      a. Sand cover seals
      b. Chip cover seals
   2. Mix seals
      a. Tar emulsion - sand mixes (bar)
      b. Asphalt emulsion slurry seals (travel plant)
      c. Asphalt emulsion mix seals (travel plant)
      d. Asphalt cold mix (central plant)
      e. Asphalt/tar hot mix (central plant)

D. Surface Reworking
   1. Heater Planer and slurry seal
   2. Heater Scarify - rejuvenate - slurry seal
   3. Recycle (remove, remix, relay, seal)

E. Special Membranes

Fiber (woven and meshed), rubber mat, wire, rubber chip seals, latex slurries, combination tread rubber-aggregate slurries, epoxy-calcined bauxite chip seals.

KINDS OF SURFACE TREATMENTS
1. Non-Penetrating Liquids
2. Penetrating Liquids
3. Aggregate Seals - Bar or Mix
4. Surface Reworking/Reclaiming
5. Special Membrane Treatments

Figure 5

III. THE SLURRY SEAL SYSTEM

A. Introduction

Throughout written history, fine aggregate bituminous mixtures have made their special contribution to the construction arts. Examples are the sand filled mortars used to cement the bricks of the ancient Syrian ziggurats, caulking of papyrus rafts and Phoenician galleys, lake asphalts for floors, roofs and paving down through time to the current hot-mixed sheet asphalts, molten bituminous slurries . . . the German "gussasphalt" . . . the very thin sand-emulsion German "schlämme" and the early grout-like California slurries of the 1930's, 40's and 50's.

With the commercialization of the continuous-proportion, continuous-mix and lay slurry machines in 1960, the horizons of fine aggregate mixes expanded to include the more durable, coarser aggregate blends. The slurry seal industry was restricted to the use of slow setting conventional dense mixing grade (ss-1h) emulsions until 1966 when the first quick-set systems were introduced. All these materials have been classified as "Fine Aggregate Bituminous Mixes."

B. Definition

We have come to understand the material called "slurry seal" as a fluid, homogeneous mixture of asphalt emulsion, water, mineral filler and continuously graded fine aggregate which is applied to a pavement surface by means of a bottomless, runner-supported, squeegee-sealed spreader box.

C. The Continuous Slurry Seal Process

The continuous slurry seal process precisely proportions the materials, mixes and spreads the mixture.

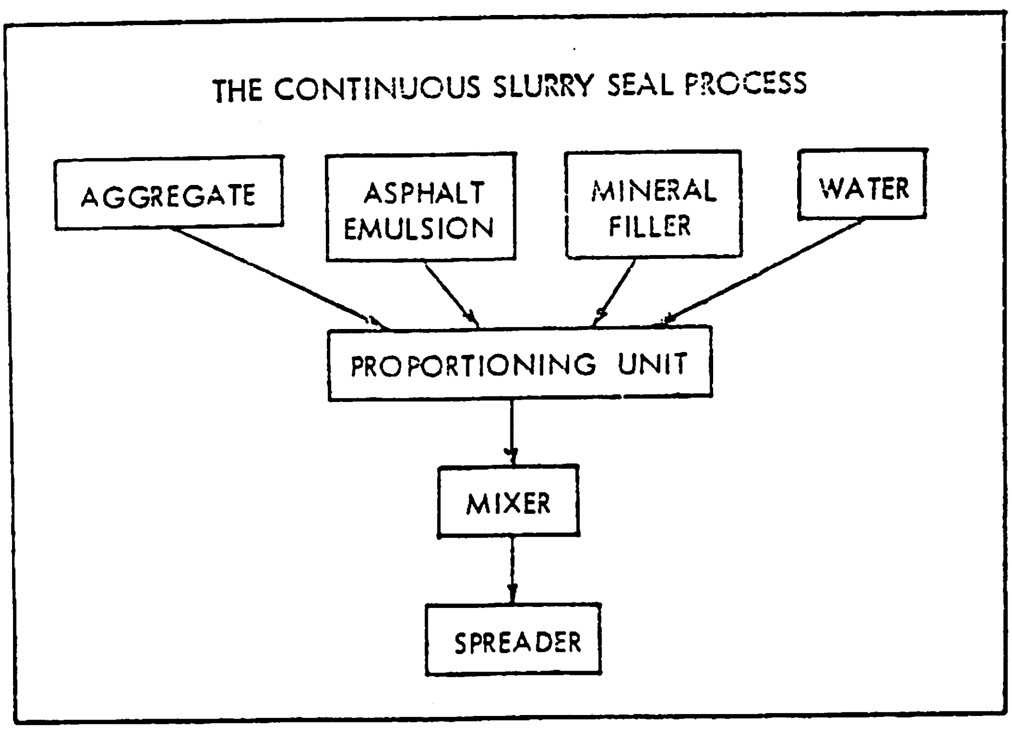


Figure 6

D. Materials for Slurry Seal

The principle materials of slurry seal are (1) aggregate and (2) asphalt emulsion. The aggregate must be clean, crushed, durable, properly graded and uniform. The emulsion is a three-part system consisting of asphalt cement, water and emulsifier. The asphalt emulsions generally conform to the AASHTO "SS" dense mixing types and are made from paving grade asphalts and may be hard or soft. The emulsions may be slow-set or quick-set types made from anionic, cationic, or non-ionic emulsifiers. Sometimes, liquid modifiers are used.

(3) Fillers such as portland cement or hydrated lime are often used in small quantities to stabilize incompatible mixtures or as chemical modifiers of the system. (4) Mix water should be potable and free from harmful salts.

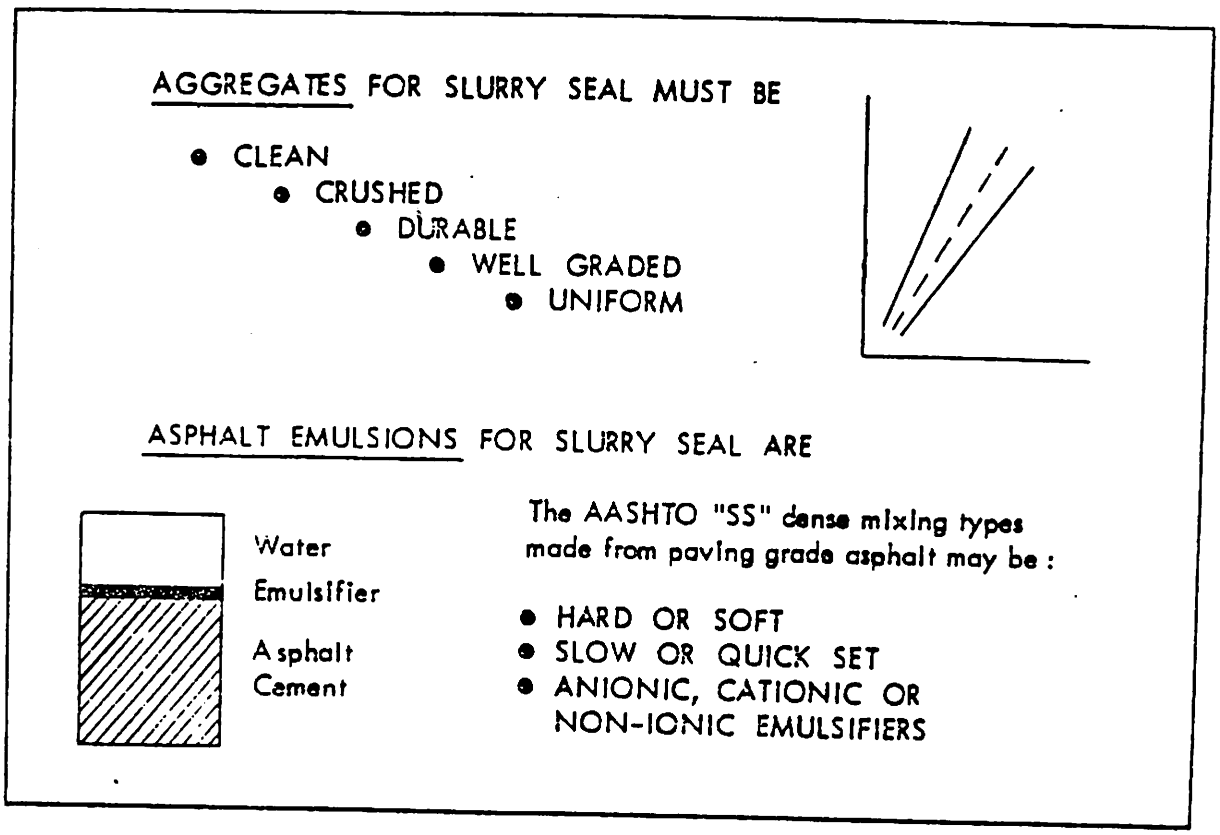


Figure 7

The International Slurry Seal Association's A-105 guide specification recognizes three basic aggregate gradations:

Fine Type I	(1/8")	3 mm.
General Type II	(1/4")	6 mm.
Coarse Type III	(3/8")	9 mm.

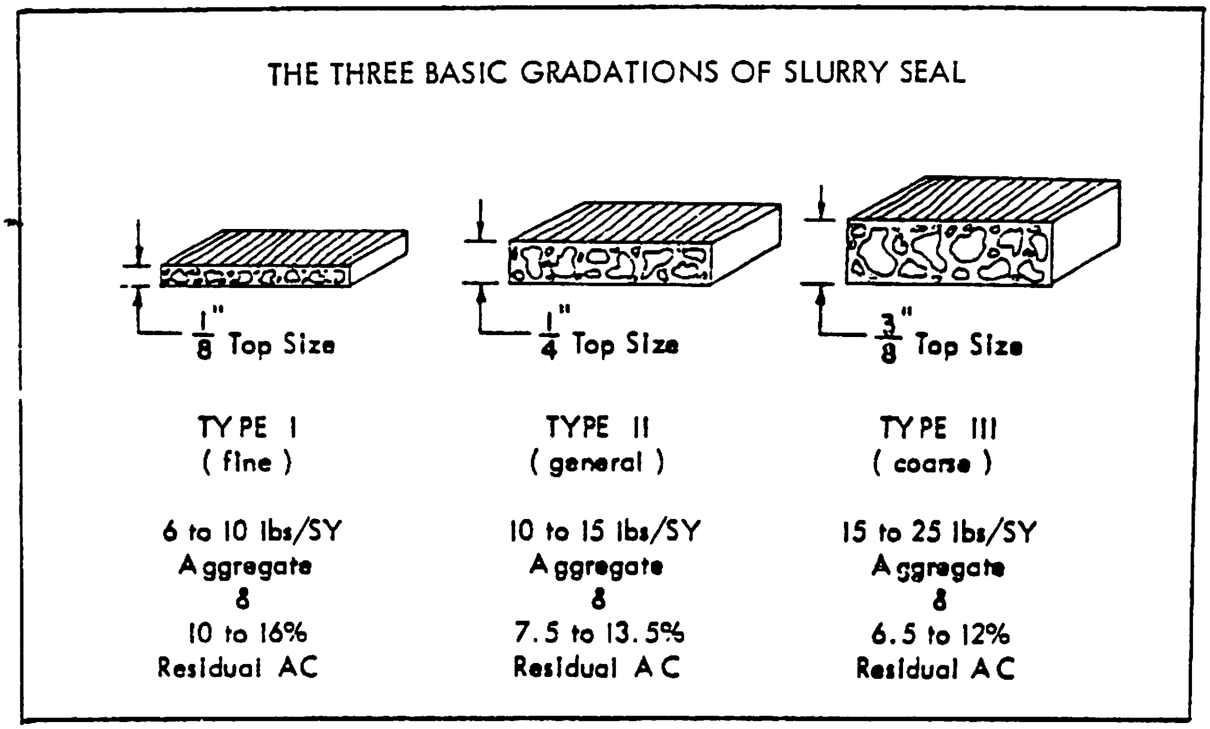


Figure 8

E. The aggregate gradation selected for use depends upon the objective of a particular treatment:

Type I is used for maximum crack penetration and as an excellent preparation for hot mix overlay or chip seal. It is usually used in low density or low wear traffic areas such as light aircraft airfields, parking areas or shoulders where the primary objective is sealing.

Type II is the most widely used gradation and is used to seal, to correct moderate to severe ravelling, oxidation and loss of matrix, and to improve skid resistance. It is used for moderate to heavy traffic depending upon the quality of aggregates available and the design.

Type III is used to correct severe surface conditions, as the first course in multicourse applications, to impart skid resistance and to prevent hydroplaning under very heavy traffic loadings for extended life under these conditions.

F. The primary uses for slurry seal surface treatments are:

1. Preventive . . . to prevent surface distresses from occuring in newly laid pavements such as the effects of weathering (oxidation, loss of oils, loss of matrix and embrittlement of the structural mix) and to provide special durability and texture not available in the underlying mix.

2. Corrective . . . to correct surface distresses that have already occurred in older pavements such as surface cracking, ravelling, loss of matrix, increased air and water permeability and slipperiness from flushing or aggregate polishing.

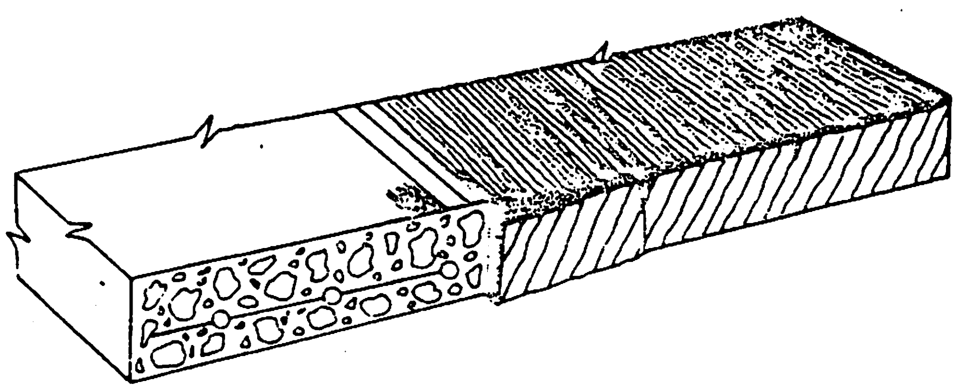
G. Properties of Slurry Seal

Slurry Seal is the most versatile of all pavement surface treatment systems. Because slurry seal is a relatively thin surface treatment, energy requirements are low and it becomes economically feasible to use special imported materials or even exotic materials to provide the desired surface characteristics.

Slurry Seal is distinguished from other surface treating systems by its single unique property: its inherent ability to deposit a thin bituminous mixture to pavement surfaces in accordance with the demands of a variably textured surface.

An example is this cross section of an interstate shoulder where slurry will fill the interface crack, deposit a modest wedge, fill ravelled surface voids and transverse cracks, place a skid-resistant, weather-tight seal and provide color delineation . . . all in a single pass.

VERSATILE SLURRY SEAL



SLURRY SEAL CAN, IN ONE PASS:

1. Deposit a bituminous seal according to the surface demand
2. Fill the interface crack
3. Place a modest wedge
4. Place a weather tight seal
5. Fill the surface voids
6. Provide color/texture delineation
7. Give good skid resistance

Figure 9

Consider another example of a pavement cross section where the wheel tracks are compacted by traffic to the point of flushing. The un-travelled areas are oxidized and there is a badly ravelled center joint, non-fluid coarse mixes will bridge the cracked and ravelled areas; chip seals will be either too rich or too lean. Many times these treatments merely compound the original problem. Slurry will perform all functions of filling the ravelled joint and oxidized areas and coating the entire areas as required by the demands of the surface . . . in a single pass.

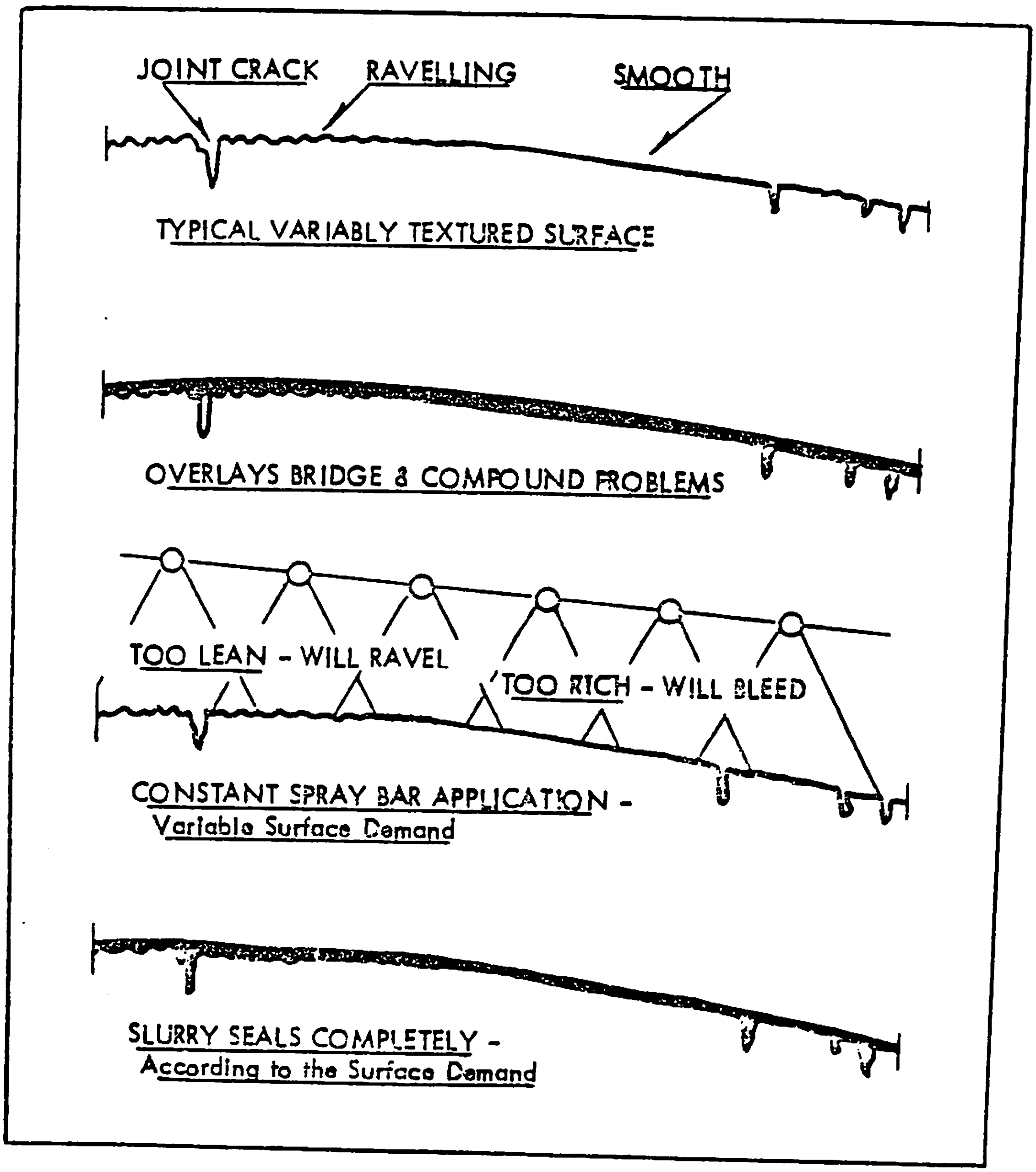
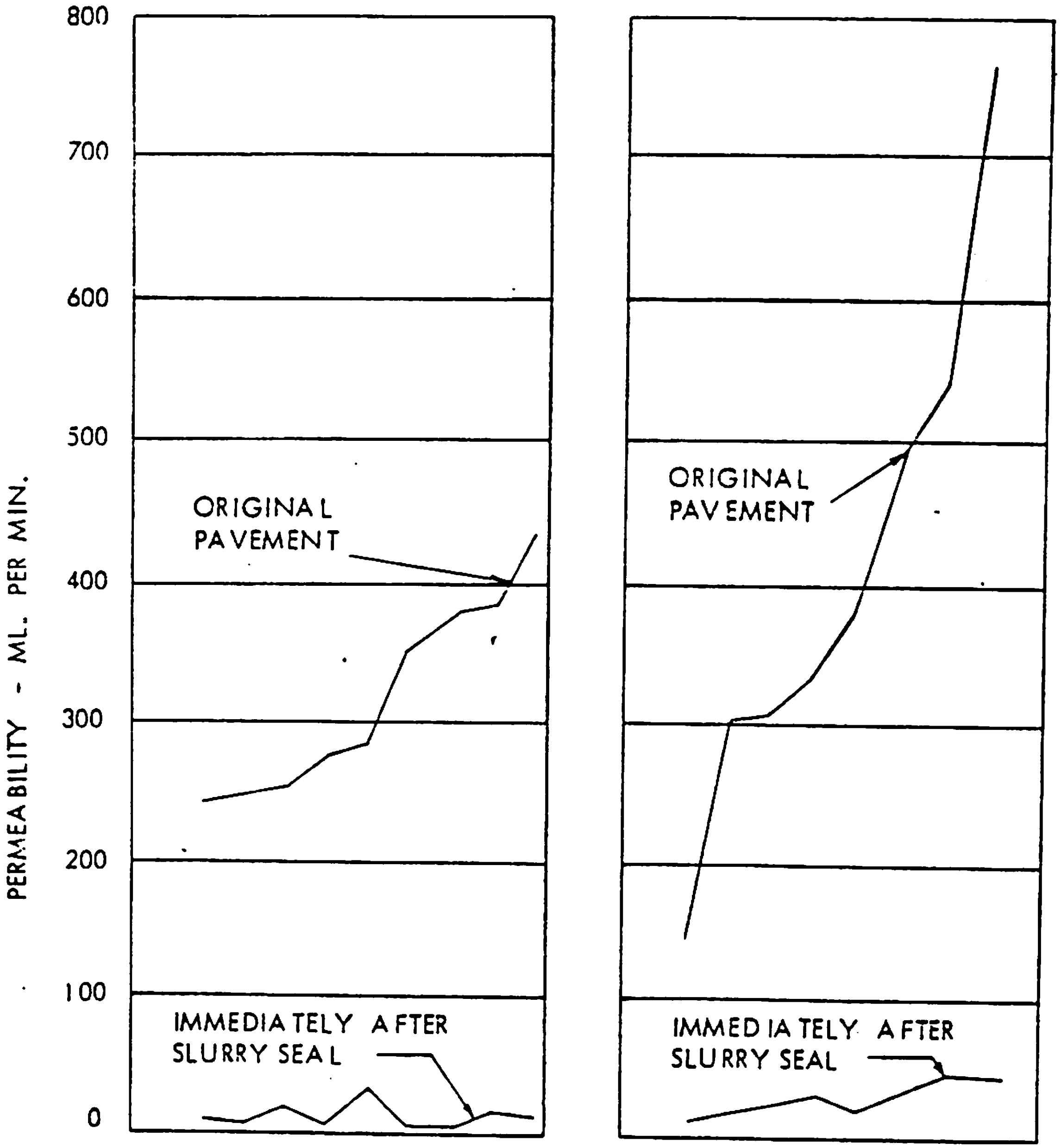


Figure 10. Effectiveness of Surface Treatments Applied to a Variable Cross Sectional Surface Texture.

The properties of a completed slurry seal vary with the properties of the materials incorporated into the mix and with the design and construction of the material combinations selected. Slurry Seal is usually considered as having very low permeability (an excellent seal), low tensile strength, high compressive strength, high skid resistance, good macrotexture and high hydroplaning resistance, good stability, excellent bond and appearance.

These properties may be altered by selection of materials such as special aggregates to impart special durability and skid resistance or the use of elastomers to impart flexibility and resistance to thermal cracking.

REDUCTION PERMEABILITY VALUES
FOLLOWING APPLICATION OF A SLURRY SEAL COAT



Reference: Ernest Zube, "Studies on Water Permeability of Asphalt Concrete Pavements", Proceedings of the 4th Annual Highway Conference, Univ. of the Pacific, March, 1961.

Figure 11

IV. APPLICATIONS AND USES FOR SLURRY SEAL

SLIDE NO.	
16-17	Wheat drilled pavement, five years after Slurry.
18-19	Wet shode erosion, three years after Slurry.
20-21	Crack filling (not fixing).
22	Surface crack and reflective crack.
23	Strain relieving inter layer. Tred rubber Slurry.
24	Soft asphalt Slurry compared with hard asphalt Slurry.
25-29	Bridge deck, re-bar cracks, wipe tack coat. Two-course latex Slurry.
30-31	Two-course airport run-off with roller on second course (Spain).
32-33	Ohio State University, black base over fill with Slurry.
34-35	Cape seal to choke chip seal, Richmond, Indiana, five years later.
36-37	Wright State University, old chip seal, cleaned, rolled, tacked and Slurried.
38	To sell a township bond issue.
39	Low density traffic: Wright Brothers grave at Woodland Cemetery, Dayton, Ohio.
40	High density traffic: The A-B test road.
41-45	Slippery pavement problems and their solutions: Polishing and flushing.
46-48	Dallas, Texas. Boiler slag Slurry--85% reduction in wet pavement rear-end collisions.
49-51	Hydroplaning prevention. Oakwood, Ohio, 5/8" latex Slurry.
52-54	Stripe delineation, Columbus, Ohio. Shoulder delineation, I-75, central Spain.
55-56	Slurry as a seal for motor-paver mixes. Miami County, Ohio.
57-60	Slurry Seal for heater planer, Wright-Patterson Air Force Base, Fairborn, Ohio.
61	Light Slurry Seal on I-75 near Lexington, Kentucky. Load-on-the-run machine.
62-65	Total tack coat preparation for hot mix overlay. Type "O" Slurry.
66-70	Slurry Seal for heater scarifier. Oehawa Airport, Ontario, Canada.
71-72	Open graded Slurry overlay.
-- --	CMI roto mill seal.

V. LABORATORY DESIGN OF SLURRY SEAL MIXES

The development of slurry seal design procedures parallels the history of the development of all other paving materials; i.e., trial and error, relating field performance with laboratory experience. In the search for understanding of increased serviceability, all paving arts undergo annual changes of direction and philosophy. For example, the arguments of the proper void contents or penetration of asphalt to be used in a given situation rages unresolved after 25 years of my experience. Each year, the paving industry re-invents ancient knowledge and sometimes repeats errors of the past. The industry understands that all is not known and fully expects to change current notions about design as new insights are gained.

I rely mainly on the design procedures listed in the ISSA A-105 Guide Specification, The Bituminous Surfaces Handbook, Slurry Seal, Inc., Instruction Report S-75-1, U.S. Army Waterways Experiment Station, ASTM publications and the newly published ISSA "Design Technical Bulletins - 1978."

The State of the Art does not establish universal values for all tests suggested in the outline procedure. The engineer may wish to establish his own values based on his experience. The principles used will be identified in one way or another by the performance of the Mix.

To meet the objectives of a successful slurry seal construction, these requisites should be followed:

REQUISITES FOR SUCCESSFUL SLURRY SEAL

1. ISSA A-105 Guide Specifications, also FAA or USCE specs.
2. Laboratory evaluation of materials
3. Laboratory design with job materials
4. Qualified contractors and suppliers
5. Knowledgeable inspectors
6. Field control by contractors and buyer

Figure 12

There are three parts to this outline procedure in ISSA Technical Bulletin #111, "Outline Guide for the Design of Slurry Seal."

Part 1. Preliminary Considerations . . . pavement condition, statement of objectives, materials evaluation and selection to meet objectives.
Part 2. Job Mix Formula determined by physical field-simulation tests to laboratory specimens.
Part 3. Translation of Job Mix Formula to Field Control Data.

The philosophy behind this design approach is pragmatic; that is, the designer should, during his bench work, continually ask these questions;

1. Will this slurry mix well?
2. Will this slurry wear well?
3. Will this slurry be safe?

SLURRY SEAL DESIGN PROCEDURES - ISSA Technical Bulletin #111

1. Pavement Description, Condition, ADT, Climate
2. Objectives - Life Expectancy, Texture Requirements
3. Selection of Materials
   a. Select Aggregate
   b. Select Asphalt Emulsion
   c. Select Filler
4. Laboratory Design
   a. Determine Theoretical AC Requirements
   b. Determine Water and Filler Requirements (Consistency)
   c. Run Compatibility Cup Test and Adhesion Test
   d. Subject Trial Mixes to Physical Tests
5. Translate Optimum Design to Field Control Quantities

Figure 13

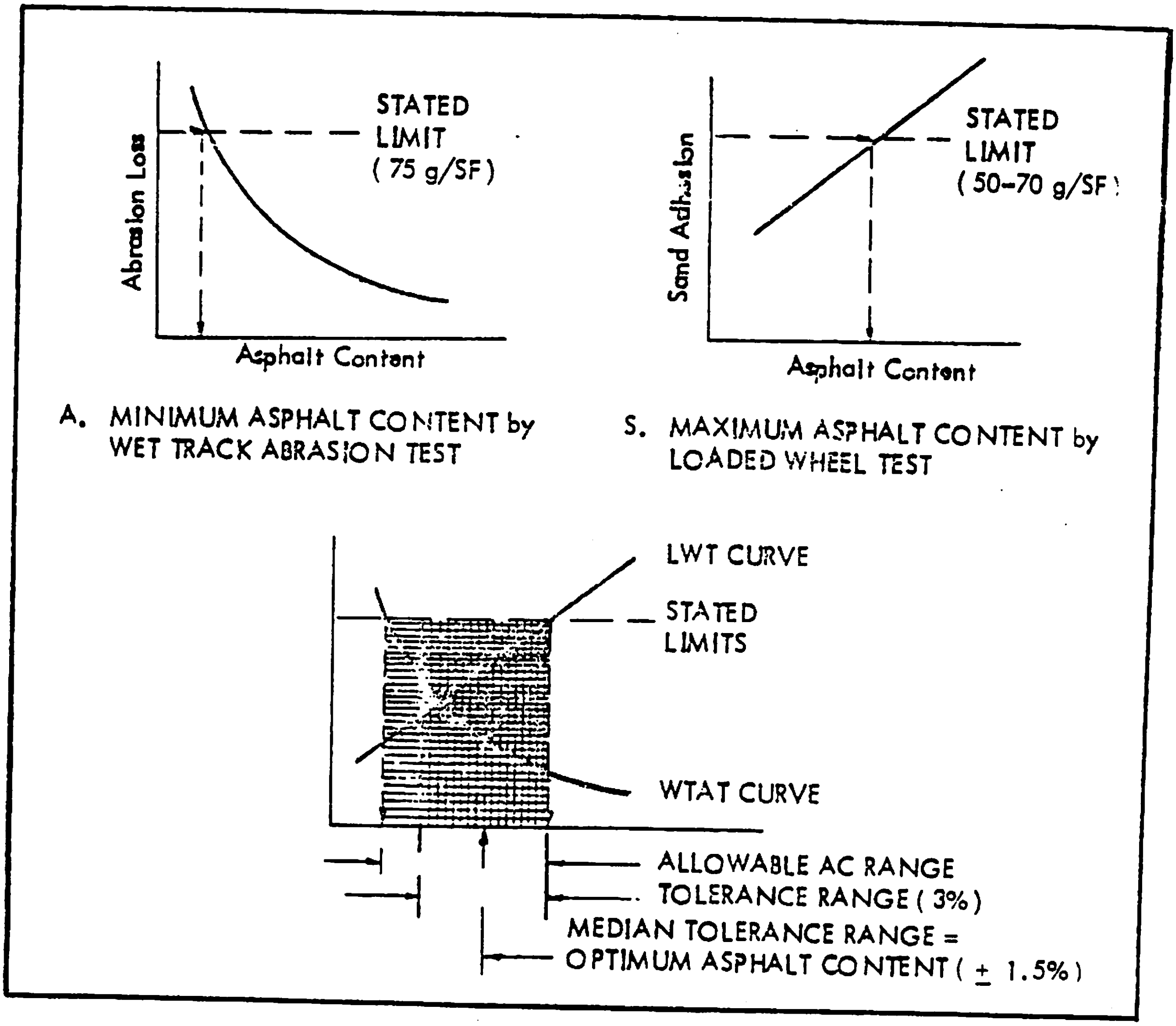


Figure 14. Graphical Determination of Optimum Asphalt Content

VI. CONTROL OF SLURRY SEAL CONSTRUCTION

Comment:

We stress the importance of thorough surface preparation and cleanliness. Surface preparation and cleaning is the most neglected area of all surface treatment construction and will, if improperly executed, result in the eventual failure of the pavement surface regardless of the kind of surface application.

After the optimum design suggested is established, it is necessary to translate this design into field control quantities. One suggested method is described in ISSA Technical Bulletin #107, "A Method for Unit Field Control of Slurry Seal Quantities." The objective of this method is to aid operators and inspectors to control the field material quantities and application rates so that design results are obtained. The method is essentially to translate laboratory design into field units of gallons, tons and bags and to measure these during application.

The following is an example of the laboratory design translation into the essential field control quantities:

LABORATORY DESIGN FOR FIELD CONTROL

— EXAMPLE —

	Optimum Lab Design	Control Quantities	Tolerances
a) Aggregate	100.0%		
b) Filler* Type PC-II	1.0%	2-bags/10 tons	± 1/2 bag
c) Mix Water*	12.0%	29 gals./ton	± 2.3 g/t
d) Cone Flow Consistency	2.5 cm.		± .75 cm.
e) AC Target Extraction	10.5%		± 1.5%
f) Emulsion* @ 61.0% Res. AC	17.2%*	41.0 gals/ton	± 4.0 g/t
g) Design Width	20.0 Ft.	2 lanes x 10 ft.	± .5' OA
h) Spread Rate	15.0 lbs/SY		± 2.0 Lb/SY
	133 SY/ton	118 to 154 SY/ton	
i) Lineal Ft./ton @ Lane Width	120 LF/ton	106 to 138 LF/ton	

j) Aggregate Specific Weight vs. Moisture Content:

Moisture Content	Moist Lbs/ CF Loose	Dry Lbs/CF of Moist Ag.	% Dry/Wet	Machine Setting At Design
0%	96.4	96.4	100.0	
1	95.4	94.5	98.0	—
2	83.6	81.9	84.9	—
3	79.7	77.3	80.1	—
4	79.0	75.8	78.6	—
5	78.0	74.1	76.8	—
6	77.9	73.2	75.9	—
				—

* Per Cent added to the dry weight of the aggregate

Figure 15. Example of Laboratory Design for Field Control

Spread rates shown Figure 15 are estimated from the charts in ISSA Technical Bulletin #112.

Reduction in loose unit weights due to increase in moisture contents of the aggregate is determined by using ASTM C-29 "Test for Unit Weight of Aggregate" at various moisture levels likely to be encountered in the field, such as 0% to 6%. Some contractors relate the various wet weights directly to machine calibrations and settings.

Inspectors and engineers should be well schooled in the particular control techniques selected for use. The presence of the inspector in the laboratory during the design process, particularly the consistency testing, is helpful to develop understanding of the process.

There are at least five (5) methods of field proportion control which have been suggested. They are:

*1. Calibration according to manufacturer's instructions (counter for head pulley or belt revs.)
*2. Batch Unit Control by measurement of batch weights and net liquid usage as described in TB #107.
3. Field consistency tests vs. gross RPM and water flow meter.
4. RPM, emulsion flow meter and water flow meter ratios versus field consistency measurements.
5. Continuous measurement by emulsion flow meter and aggregate weigh meter ratios versus field consistency measurements.

Calibration of each machine to be used on the job is essential, and is normally done by the contractor in accordance with the manufacturer's instructions. The procedure involves weighing each material as it is discharged at either a unit time per RPM and setting, or unit number of revolutions of the drive at various settings. The results are then plotted on a reference chart. Calibrations for aggregate delivery should be related in some way to moisture content/unit weight of the aggregate.

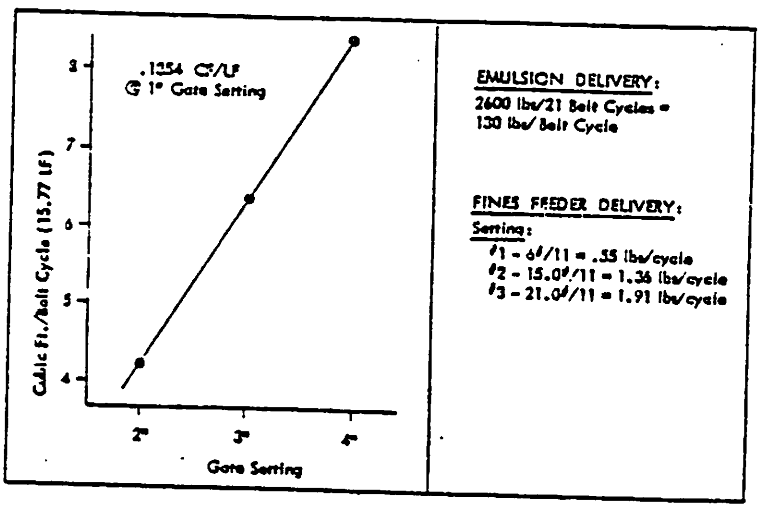


Figure 16. Calibration data for "Big Bob" Slurry Machine.

CALIBRATION CHART FOR "BIG RED"

AGG. MOISTURE CONTENT %	CAN WEIGHT + LOOSE AGG.	GATE SETTING (Aggregate Deam on Belt) FOR % EMULSION ADDED TO MIX			
		15%	16%	17%	18%
			(inches)		
7	18#				
6	18.5				
6	19.0				
5	19.5	3.7	3.5	3.3	3.1
5	20.0	3.6	3.4	3.1	3.0
5	20.5	3.5	3.3	3.1	2.9
5	21.0	3.4	3.2	[illegible]	[illegible]
4	21.5	3.3	3.1	[illegible]	2.3
4	22.0	3.2	3.0	2.8	2.7
4	22.5	3.1	2.9	2.7	2.6
4	23.0	3.0	2.3	2.6	2.5
4	23.5		2.7	2.5	2.4
3	24.0		2.6	2.4	2.3
3	24.5		2.5	2.3	2.2
3	25.0		2.4	2.2	2.1

Figure 17. Calibration Chart for "Big Red" Slurry Machine.

There are four (4) important factors involved in the construction of the optimum laboratory design that should be emphasized here.

1. Field changes in the aggregate specific weight (pounds per cubic foot) due to the bulking effect of moisture in the aggregate are critical. Operators must be made aware of this critical variation and trained how to recognize changes and to compensate for them by adjustment of machine settings. Four methods are suggested to recognize these changes and to relate them to machine settings:
   - a. Direct percentage moisture analysis of the job with the soil test carbide-acetylene bomb versus a machine setting chart
   - *b. Unit weight of specific container filled with the job aggregate versus a machine setting chart
   - c. Continuous moisture content by electronic probe versus a machine setting chart
   - *d. Aggregate color-moisture content comparison specimen versus a machine setting chart

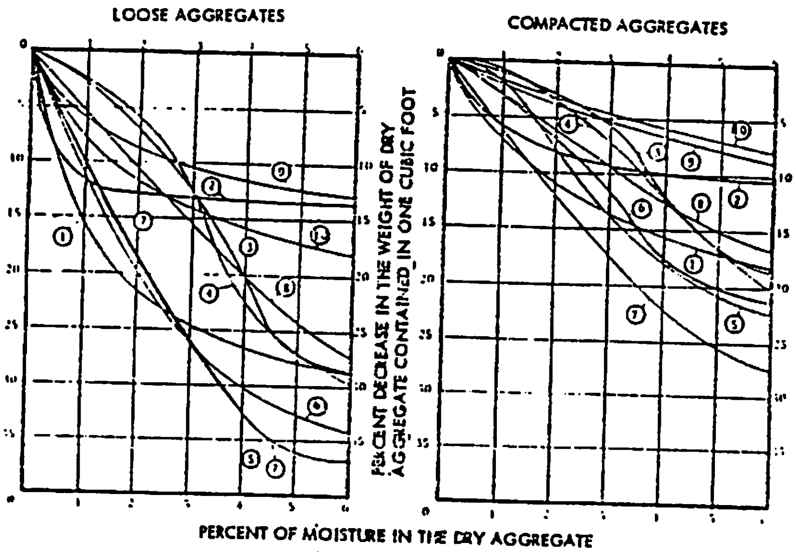


Figure 18. Effects of Moisture Content on the Specific Weights of Various Aggregates

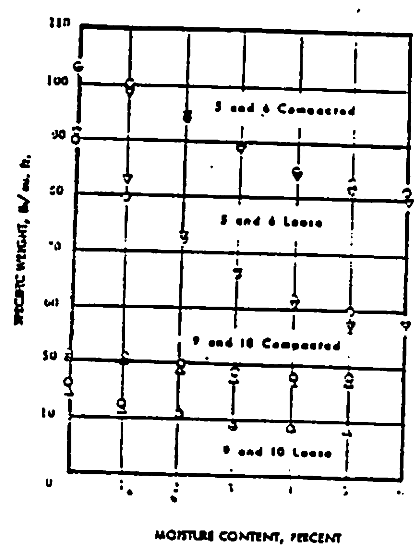


Figure 19. Minimal Effect of Fines on Bulking Due to Moisture Content

2. Control of materials at the source can alleviate many problems in the achievement of the optimum design. Aggregate gradation changes such as over-size or under-size contamination can radically alter the asphalt requirements. These changes are most economically controlled at the source. Subtle changes in emulsion formulation and manufacture can play havoc with mixing and setting characteristics.

   Measures should be taken at the source to assure delivery of emulsion as specified such as the mixing profile with the job aggregate. Changes in the residual asphalt content should be noted on the delivery tickets so that field adjustments can be made to insure application of optimum design.

3. Operating crews must be trained to understand acceptable operating procedures. Each contractor must develop his own operator training program to best suit his local situation. Film and manuals may be most helpful. We find that actual laboratory bench experience in making proper and improper mixes, learning the "feel" of the mix and the hand-eye association to be the most expedient training technique.

4. The achievement of steady state operations: i.e., uniformity equals the best chance of success. Operators should seek the steady state.
   a. Maintain constant mix consistency
   b. Maintain constant mixer speed, output, slurry mixer depth
   c. Maintain constant forward speed
   d. Maintain uniform, constant depth of slurry in the spreader

The control or elimination of the following list of pernicious problems and variables is essential to the achievement of successful slurry construction:

1. Aggregate moisture content
2. Varied aggregate compaction on the metering belt
3. Fine aggregate build-up on metering gates or screws
4. Erratic loading of the mixer
5. Temperature-viscosity variations of emulsions
6. Pump slippage, clutch slippage, belt slippage
7. Air leaks from worn packings, grease fittings, seals, hoses and pipe threads
8. Positive and negative pump heads
9. Surging or rough running drive engines
10. Sudden changes in drive engine speeds
11. Partially plugged nozzles, valves and screens, lines
12. Variable mix consistency due to indiscriminate use of water
13. Variable depth and quantity of slurry in the spreader
14. Spreader box improperly adjusted, dirty or worn squeegees and drags
15. Improper mix sampling and laboratory extraction technique

Generally, results of laboratory extractions of mixer samples have been erratic and unreliable. Variations thus obtained have not been observed in the field. ISSA Technical Bulletin #101, "Guide for Sampling of Slurry Mix for Extraction Tests" may prove helpful when this test is performed. Reflux extractions are generally more reliable than centrifuge extractions.

We invite your inquiries to:

Executive Secretary
International Slurry Seal Association
1730 Pennsylvania Avenue N.W.
Washington, D.C. 20006
(202-785-0500)

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VIII. Report of Field Evaluation of Slurry Seal, MEP Project A P 69-19C, A F Contract F09603-70-A-0010

1. Slurry seal was applied to street and evaluated at Robins A FB Ga. Part of the application was accomplished under adverse weather conditions which exceeded the specifications. Slurry was applied to heavily traveled streets. The evaluation was started 27 Aug., 1969 and completed 1 Feb., 1973.

2. The following comments are offered as a result of the evaluations:

   a. Slurry affords an excellent long-lasting seal for pavement - when applied over asphalt, concrete or brick.

   b. Properly applied, slurry's life expectancy will be five to eight years.

   c. Slurry's anti-skid qualities make it a perfect seal to prevent hydroplaning and skidding on accident-prone streets.

   d. Before starting a slurry job, emulsion and aggregate should be laboratory tested for compatibility and to determine the mix design to be used for the project.

   e. The key to good slurry is rigid specifications and strict quality control.

   f. Slurry can be applied with good success on airfields, runways, taxiways and parking ramps.

   g. A slurry seal preventive maintenance program will result in longer pavement life with less repairs. On streets which carry medium traffic at slow to medium speed, slurry will last from five to eight years and possibly ten to twelve years.

   h. Slurry does not rut or bleed back causing erratic steering or creating slippery spots when wet.

   i. Slurry should never be applied until the temperature is 40°F and rising and when rain is an immediate possibility.

   j Aggregate stock pile must be closely monitored to insure moisture content does not exceed 4%.

   k. Slurry should never be applied over a base failure without first removing and patching the area.

   l. All vegetation must be removed before the slurry application.

   m. Even though fine hairline cracks appear in newly applied slurry, the surface remains sealed preventing moisture penetration.

   n. Carbide snow plow blades and ice control chemicals have no effect on slurry.

   o. Preventive street maintenance utilizing a slurry program will extend the pavement surface life.

   p. Slurry can be applied on low traffic streets over a sand stabilized base, eliminating the requirements to overlay the street.

3. The performance of slurry seal throughout the evaluation period was excellent. Through use of slurry seal street maintenance, cost was reduced. From an overall standpoint, slurry seal performed as claimed by the manufacturer. This declaration of suitability does not, however, guarantee purchase of slurry seal by the Air Force.