COMPTE-RENDU DE LA 66IEME REUNION

ANNUELLE DU T R B, JANVIER 1987

Préparé par: Richard Langlois, ing.
Chef - Division Matériaux
Ministère des Transports
2700, rue Einstein
Sainte-Foy (Québec)
G1P 3W8

C.C. Service des Relations Ministérielles
MM. Claude Lortie, s.m.a.
Yvan Demers, s.m.a.
Jean-Réal Lahaye, ing.
Pierre Lafontaine, ing.
Paul Brochu, ing.
Robert Doucet, ing.
Alain Vallières, ing.
Gérard Tessier, ing.
Richard Pagé

Sainte-Foy, le 3 février 1987

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COMPTE-RENDU DE LA 66IEME REUNION ANNUELLE DU T R B, JANVIER 1987

1.0 IDENTIFICATION DU PARTICIPANT

1.1 Nom : Richard Langlois
1.2 Fonction : Ingénieur, chef de la div. Matériaux
1.3 Service : Laboratoire Central

2.0 DESCRIPTION DES VOYAGES

2.1 Endroit : Washington

2.2 Durée : du 10 au 16 janvier 1987

2.3 Autorisation: CT 86-C-292

2.4 Raison du voyage : Participer au TRB et à la réunion du SHRP à titre de coordonnateur Québecois du SHRP et membre du groupe de coordination de la recherche en infrastructure des transports.

3.0 CARACTERISTIQUES DES REUNIONS

3.1 Type de réunion: Nationale à caractère international

3.2 Nom de l'organisme responsable : Transportation Research Board

3.3 Contenu de la réunion

3.3.1 Liste des thèmes abordés: Elle est présentée en annexe A.

3.3.2 Résumé des conférences et des discussions.

Les sessions techniques ont été des plus intéressantes et très diversifiées: Les auteurs venaient de différents milieux, de gouvernements, de municipalités, d'universités et de diverses entreprises privées.

Les principaux faits techniques découlant des diverses rencontres, discussions et présentations techniques se résument ainsi:

1- Les appareils nucléaires ordinaires de mesure de densité mesurent la densité d'une couche de 75 à 100 mm de profondeur. Avec un appareil spécial muni de 2 détecteurs, il est possible de mesurer avec précision la densité d'une couche mince de 25 mm.

2- La densité des carottes est toujours supérieure à celle mesurée avec des nucléodensimètres (Troxler, CPN, Seaman), sur un joint ou ailleurs. La densité des joints est en moyenne 96 Kg/m^3 inférieure. L'écart type des mesures de densités par carottes, est inférieure à celui des nucléodensimètres. La compacité des joints est de 4% inférieure si elle est mesurée par des carottes et de 7% inférieure par les nucléodensimètres.

3- Les normes de compacité du Texas sont de 92 à 97% de la densité maximale Rice. En 83-84, alors que les normes de compacité n'étaient pas en vigueur, la compacité moyenne des revêtements était de 92,7% avec un écart type de 2,3, alors qu'en 86, avec la mise en force de la norme, la compacité moyenne est passée à 95,2% avec un écart type de 1,13.

4- L'état du Nouveau-Mexique a recyclé à froid une couche de 75 mm de BB en utilisant un train de recyclage composé de: une fraiseuse Rota Mill-1000 tirant un concasseur derrière lequel est attaché une usine d'enrobage à froid (Pug mill) qui met le mélange en andain lequel est ramassé par un élévateur spécial installé devant une finisseuse (paver). La production horaire de ce train est de 350 T/h. Une émulsion HF 150 est utilisée au tout, de 1 à 1,25% de bitume résiduel. Le compactage se fait à 300 m derrière la finisseuse pour laisser évaporer l'eau suffisamment. Cette procédure permet d'économiser environ \$4.00/v2 (\$7,12/v^2 comparativement à \$11,00/v^2 par la méthode usuelle de SAMI pour réduire les fissures de réflexions). Le mélange recyclé a une stabilité Marshall à 22°C qui varie de 8,9 KN à 33,4 KN après 7 jours de curage à 22°C.

5- L'institut de recherche en ingénérie de l'université du Nouveau-Mexique a fabriqué deux vidéo: un sur le procédé de recyclage à froid décrit en 4 et une sur la fracturation et l'assise des dalles de béton avant recouvrement. M. Dale Decker, de cet institut, a promis de m'envoyer ces deux vidéo et les frais ne seront que le coût d'une vidéo-cassette.

6- Une extraction par stage a montré que le bitume sur le granulat a une distribution variable de sa consistance: la microcouche de surface est sévèrement durcie, alors que la seconde couche l'est moins et que la couche en contact avec le granulat retient la même consistance qu'au moment de la construction du revêtement bitumineux. Les agents de rajeunissement AC-25, AE-150 et Mobisol-30 sont plus effectifs pour ramollir le bitume durci des deux microcouches extérieures.

7- Le coulis de chaux hydraté est le meilleur agent pour réduire le désenrobage dans les mélanges bitumineux. Le ciment et la chaux hydrate sèche n'améliore pas beaucoup la résistance au désenrobage.

8- L'addition de Ethylène - Vinyle - Acétate au bitume produit des mélanges avec une résistance à la fatigue accrue. L'ajout de 50% de soufre est deuxième pour l'augmentation de cette résistance suivi de l'addition de caoutchouc au bitume, et en dernier lieu, les fibres de polypropylène.

9- Un mélange bitumineux satisfaisant peut-être produit avec une teneur de 20% de rebut de toiture, si le choix du bitume et de la granulométrie des granulats est fait judicieusement.

10- La profondeur d'ornière augmente avec l'épaisseur de la couche de béton bitumineux posé sur le béton de ciment. Le taux d'orniérage est fort durant la première année de service puis il décroit avant d'augmenter de nouveau après que le trafic a complètement compacté le milieu de l'ornière.

11- L'appareil nucléaire Troxler 3241 permet de déterminer la teneur en bitume sur deux briquettes Marshall avec une erreur maximale de $\pm$ 0,1%.

12- Selon le Texas, une couche d'usure antidérapante à granulométrie ouverte (Open-Graded Friction Course) doit avoir 8 à 10% passant le 2 mm, 2 à 3% passant le 80 µm et un vide d'environ 15%. Pour évaluer les caractéristiques de surface de l'OFC l'essai au sable n'est pas valable, c'est l'essai du mastic (putty) qui est le meilleur. L'OFC est très antidérapant à toute vitesse à condition qu'il ne soit pas recouvert d'eau car alors il devient glissant s'il est recouvert de 1.8 mm d'eau et plus. L'ajout de silicone aide à placer ce genre de mélange. La vie normale d'un OFC est de 6 à 12 ans selon le trafic (100 à 200 millions de passages).

13- La Californie utilise les OFC depuis 40 ans. On ne peut poser un OFC sur un vieil OFC, il faut l'enlever par fraisage à froid avant. C'est un grade plus dur de bitume qui est utilisé pour les OFC par rapport aux mélanges denses. La grosseur maximale de la pierre est de 12.5 mm, le maximum passant le 80 µm est le 3% et ce revêtement ne se pose jamais à des températures inférieures à 21°C. Quant à la Georgie, elle a posé plus de 3000 Km de OFC depuis 1970. En 1982, elle a débuté l'ajout de chaux hydratée pour empêcher le désenrobage. Le taux de pose utilisé est de 33 Kg/m^2. Le Nouveau-Mexique utilise les OFC depuis la fin des années 50. La granulométrie est de 90 à 100% passant le 10 mm, 0 à 10% passant le 2 mm. La température du mélange est en moyenne 115°C et se pose jamais à une température ambiante inférieure à 15°C. Pour empêcher l'arrachement, il est préférable d'utiliser un bitume polymère comme le Styrelf. Le Michigan pose des OFC depuis 1973 au taux de 55 Kg/m^2. Le Montana en pose depuis 1975 (encore en service) avec la granulométrie suivante: 10 µm - 100%, 5 µm - 30 à 40%, 2.25 µm -5 à 15%, 80 µm - 2 à 5% passant. La chaux hydratée est incorporée et un liant d'accrochage est utilisé. L'Ontario en pose depuis 1976 et a remarqué une diminution des accidents sous la pluie de 40%.

14- En Illinois on a trouvé une bonne corrélation (R^2=0,82) entre l'orniérage et le pourcentage passant le 400 µm et retenu le 175 µm ainsi que la déviation du passant le 400 µm par rapport à la courbe de la puissance 0,45.

15- En Californie un béton polymère de 19 mm d'épaisseur avec une pierre 9.5 mm de grosseur maximale a été posé sur des surfaces usées par les chaînes. Ce revêtement est ouvert au trafic après 12 heures de mûrissement.

16- Dans les mélanges au bitume - caoutchouc la granulométrie doit être modifiée pour allouer de l'espace aux particules de caoutchouc. Le design du mélange peut se faire par la méthode Marshall à condition que le compactage de briquettes se fasse à 190 °C. La teneur en caoutcjouc par rapport au bitume est de 15 à 18%.

17- Le mélange au bitume moussé avec sable contenant plus de 5% passant le 80 µm est plus résistant à l'orniérage en couche de base que les stabilisations à chaud de sable.

19- La bombe d'oxydation sous pression est très valable pour simuler l'oxydation du bitume et des mélanges bitumineux. Le point de fragilité Fraas est un bon indicateur de la mesure du taux de vieillissement du bitume.

20- Au Texas, une usine expérimentale de recyclage du béton bitumineux, à chaud par micro ondes est en fonction. Cette usine permet de recycler à 100% et d'éliminer l'excès de fines du vieux béton bitumineux concassé. Le coût d'usinage est présentement de $13 US la tonne.

21- Majidzadeh a développé un nouveau modèle de prédiction des fissures de réflexions induites par la variation de température.

22- Le bitume AR-2000 (≃ 85-200) additionné de Carbon Black (environ 20%) se comporte à basse température comme un AR-2000 mais à haute température comme un AR-8000 (≃ 60-70). Un tel bitume modifié peut servir à améliorer les mélanges faits avec des granulats de moins bonne qualité.

22- Le latex SBR est l'additif qui augmente le plus le PVN du bitume, donc qui réduit le plus sa susceptibilité à la température: les autres additifs étudiés sont le SBS Kraton de Shell, l'Ethylène Vinyle Acétate, le Polyéthylène de Novophalt et le Carbon Black. De plus le SBR réduit l'oxydation du bitume alors que les SBS, le Polyéthylène et le Carbon Black durcissent le bitume encore plus lorsqu'entreposé à 175°C pendant 48 heures.

23- Le gauchissement du béton sous l'effet des différentiels de température provoquent la réflexion des fissures dans les revêtements bitumineux qui recouvrent les dalles de béton.

24- L'Orégon a construit, en 1985, 10 sections expérimentales de route pour évaluer 7 additifs différents et deux combinaisons de deux additifs dans le mélange bitumineux (Plus Ride 12, Arm-R-Shield, Fiber Pave, BoniFibers, Pave Bond, Lime, Polymer, Pave Bond + Lime, Polymer + Lime).

3.3.3. Documentation recueillie

L'annexe B fournit les titres des exposés, des conférences et des documents techniques recueillis en plus de ceux marqués d'un astérique * en annexe A avec la liste des thèmes abordés.

3.4 Liste des personnes assistant aux réunions

Plus de 1500 personnes assistaient aux différentes réunions et aucune liste n'était disponible. Seule la liste des conférenciers était disponible et elle est présentée en annexe C.

4.0 NATURE DE MA PARTICIPATION

1. Sessions techniques et comités

J'ai posé des questions ou fait des commentaires sur la plupart des conférences et ateliers des différents comités où j'ai assisté (A 2 F 0 6, A 2 F 0 2, A 2 D 01, A 2 D 04, A 2 D 01).
J'ai proposé que la compacité de revêtements bitumineux soit déterminée de la même façon par tout le monde; soit par rapport à la densité maximale Rice. J'ai été appuyé par Tom Kennedy du Texas et E.R. Brown du US corps of Engineers.

2. Réunion des coordonnateurs SHRP.

Dimanche, de 8h.30 à 17h00, à titre de coordonnateur québecois du SHRP, j'ai participé à cette réunion. J'y ai posé plusieurs questions afin d'obtenir des éclaircissements entre autres sur les sections SPS. J'ai de plus proposé l'organisation, par chaque coordonnateur, de colloques d'information sur le programme SHRP dans chaque état ou province, en mentionnant que j'avais déjà debuté cela au Québec et que c'était très bien accueilli. L'agenda de la réunion est présenté en annexe D.

3. Souper de la francophonie

J'ai organisé un souper le jeudi soir pour permettre aux francophones assistants au TRB de se rencontrer et d'échanger: 5 francais et 4 québecois y ont participé. De plus en demandant à M. Harry Smith du TRB une recommandation pour un restaurant, celui-ci nous a invité à une dégustation de vin à sa suite, et nous a accompagné avec deux de ses employés au restaurant. Cela a permis des échanges fructueuses et la création de liens amicaux avec mon collègue de France.

5.0 POINTS D'INTERET POUR LE MTQ

Tous les faits techniqu s énumérés dans le résumé des conférences et des discussions sont d'un intérêt pour le MTQ. Les points suivants sont d'un intérêt peut-être plus marqué.

1- Le MTQ devrait avoir une exigence spéciale sur la densité des joints.

2- La chaux hydratée devrait être utilisée dans les mélanges bitumineux en Abitibi car du désenrobage y a été décelé.

3- Le MTQ devrait se procurer de nouveaux appareils nucléaires Troxler pour déterminer la densité des couches minces.

4- Le MTQ devrait utiliser plus les OFC pour des couches d'usure sur autoroutes (Voir 12 et 13 de l'article 3.3.2).

5- Un essai du mélange mince au béton polymère devrait être fait par le MTQ sur une section expérimentale de route en béton.

6.0 AUTRES INFORMATIONS

En résumé, cette réunion a été l'objet d'échanges très fructueux pour tous les participants grâce aux très bonnes dispositions matérielles mises à leur service. La prochaine réunion annuelle se tiendra à Washington en janvier 1988, et elle méritera elle aussi que le Québec y délègue des représentants, non seulement pour acquérir de nouvelles connaissances, mais aussi pour faire profiter aux autres ses propres connaissances. De plus, les personnes déléguées devraient avoir une bonne connaissance de l'anglais, des connaissances techniques importantes et une aisance à parler en public afin d'y faire valoir le point de vue du Québec et de faire bénéficier les autres des techniques développées au Québec. Le TRB est le congrès où les principales recherches en Amérique dans le domaine des transports et des infrastructures du transport sont présentés. Il serait donc très important que les différents secteurs soient couverts par un spécialiste dans le domaine. Pour ce faire, le MTQ devrait déléguer à chaque année au TRB les spécialistes suivants:

Domaine	Service concerné
1- Béton Bitumineux :	Laboratoire Central
2- Béton de Ciment :	Laboratoire Central
3- Mécanique des chaussées;	Sols et Chaussée
4- Collectes de données :	Relevés Techniques
5- Transport	
6- Recherches en général :	Direction de la Recherche et Coordonnateur SHRP
7- Equipement et Opération:	Direction des Opérations

ANNEXE A

LISTE DES THEMES ABORDES

No. SESSION

Nom de celui qui a

le texte de la conférence.

2 Monday, 9:00 a.m., Rockville Room, Sheraton
CONCRETE AND CONCRETE CONSTRUCTION
Charles F. Scholer, Purdue University, presiding
(Sponsored by Committees on Performance of Concrete, on Chemical Additions and Admixtures for Concrete, and on Rigid Pavement Construction and Rehabilitation)

Paper:

1 * THE RELATIONSHIP OF FERROAN DOLOMITE AGGREGATE TO RAPID CONCRETE DETERIORATION, Wendell Dubberke and Vernon J. Marks, Iowa Department of Transportation
SULFATE IMPURITIES FROM DEICING SALT AND DURABILITY OF PORTLAND CEMENT MORTAR, Myron C. Schulter, John M. Pitt, and Dah-Yinn Lee, Iowa State University
2 * MOISTURE RETENTION TESTS AND AGITATION FOR MEMBRANE-FORMING CURING COMPOUNDS FOR PORTLAND CEMENT CONCRETE, A.E. Meyer, Matthew D. Loeffler, Chryssis G. Papaleontiou, and D.W. Fowler, University of Texas at Austin
FIELD EVALUATION OF CONCRETE PAVEMENT CONSOLIDATION, Shiraz D. Tayabji and David A. Whiting, Construction Technology Laboratories
FIELD EVALUATION OF DOWEL PLACEMENT IN CONCRETE PAVEMENTS, Shiraz D. Tayabji and Paul A. Okamoto, Construction Technology Laboratories

Daniel Vézina (1 - 2)

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71 Tuesday, 9:00 a.m., South Cotillion Room, Sheraton
[redacted] RECYCLING
Robert McGennis, Asphalt Institute, presiding
(Sponsored by Committee on Flexible Pavement Construction and Rehabilitation)

Paper:

3 * CORRELATION OF NUCLEAR DENSITY RESULTS WITH CORE DENSITIES, James L. Burati, Jr., Clemson University and George B. Elzoghbi, Crawford and Russell, Inc.
4 * A NUCLEAR DENSITY GAUGE FOR THIN OVERLAYS OF ASPHALT CONCRETE AND PORTLAND CEMENT, Ali Regimand, Troxler Electronic Laboratories, Inc.
5 * STUDY OF JOINT DENSITIES IN BITUMINOUS AIRPORT PAVEMENTS, James L. Burati, Jr., and George B. Elzoghbi

Presentation:
FIELD EVALUATION OF ASPHALT MIXTURE DENSITIES IN TEXAS, Thomas W. Kennedy, University of Texas at Austin

Paper:
IN SITU COLD RECYCLING, Douglas L. Hanson, New Mexico State Highway Department, and Robert Williams, Santa Fe, New Mexico

Richard Langlois (3, 4, 5)

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Richard Langlois, Ing. M.Sc.
Chef de la Division Matériaux

* Texte recueilli

No. SESSION

[redacted] Monday, 8:00 p.m., Wilmington Room, Sheraton

Vytautas P. Puzinauskas, Asphalt Institute, presiding
(Sponsored by Committees on Characteristics of Bituminous Materials and on Characteristics of Nonbituminous Components of Bituminous Paving Mixtures)

Papers:

EVALUATION OF ASPHALT CEMENTS FOR LOW-TEMPERATURE PERFORMANCE, S.C. Leung and R.O. Anderson, University of Alberta, Canada

6 * REJUVENATOR DIFFUSION IN BINDER FILM FOR HOT-MIX RECYCLED ASPHALT PAVEMENT, A. Samy Noureldin and Leonard E. Wood, Purdue University

7 * ANTISTRIP ADDITIVES: A FIELD PERFORMANCE STUDY, John S. Copeland and Jon A. Epps, University of Nevada, and Lee Quilici, Nevada Department of Transportation

8 * FOUR VARIABLES AFFECTING THE PERFORMANCE OF LIME IN ASPHALT-AGGREGATE MIXTURES, Mary Stroup-Gardiner, Herb Waite, and Jon A. Epps, University of Nevada

9 * THE EFFECT OF ADDITIVES ON BITUMINOUS HIGHWAY PAVEMENT MATERIALS EVALUATED BY THE INDIRECT TENSILE TEST, F. Kaiati-Afshar and R.J. Salter, University of Bradford, England

10 * ROOFING WASTE IN ASPHALT PAVING MIXTURES, Greg L. Paulsen, Mary Stroup-Gardiner, and Jon A. Epps, University of Nevada

53 Monday, 8:00 p.m., South Cotillion Room, Sheraton

PAVEMENT REHABILITATION USING CONCRETE
Theodore L. Neff, Concrete Reinforcing Steel Institute, presiding
(Sponsored by Committees on Rigid Pavement Construction and Rehabilitation and on Pavement Rehabilitation)

Papers:

MONTANA'S EXPERIENCE WITH AND STRATEGIES FOR CONCRETE PAVEMENT REHABILITATION, John C. Ulberg, Montana Department of Highways

11 * DRAINCRETE IN PAVEMENT REHABILITATION, Torbjorn J. Larsen and Jamshid M. Armaghani, Florida Department of Transportation

12 * FIELD PERFORMANCE OF BONDED CONCRETE OVERLAYS, Gerald F. Voigt, Michael I. Darter, and Samuel H. Carpenter, University of Illinois at Urbana-Champaign

13 CONSTRUCTION OF A THIN-BONDED PORTLAND CEMENT CONCRETE OVERLAY IN SOUTH DAKOTA, Daniel P. Johnston, South Dakota Department of Transportation

Presentation:

COMPARISON OF CONCRETE PAVEMENT REHABILITATION TECHNIQUES IN OHIO DEMONSTRATION PROGRAM, Kamran Majidzadeh, A. Abdulshafi, and K. Kaloush, Resource International, Inc., and Kenneth M. Miller, Ohio Department of Transportation

UTAH'S EXPERIENCE WITH WHITETOPPING, Douglas I. Anderson, Utah Department of Transportation

54 Monday, 8:00 p.m., Colorado Room, Sheraton

GEOTECHNICAL ENGINEERING
J. Allan Tice, Law Engineering Testing Company, presiding
(Sponsored by Committees on Mineral Aggregates, on Transportation Earthworks, on Foundations and Bridges and Other Structures, and on Exploration and Classification of Earth Materials)

Papers:

14 * RELIABILITY OF THE DIMETHYLSULFOXIDE (DMSO) ACCELERATED WEATHERING TEST TO PREDICT DEGRADATION OF AGGREGATES, Tom Szymoniak, Pavement Services, Inc.; Ted S. Vinson, Oregon State University; and James E. Wilson, Oregon Department of Transportation

15 * AN IMPROVED CALIFORNIA BEARING RATIO TEST PROCEDURE, Colin A. Franco, Rhode Island Department of Transportation, and Kang-Mon Wayne Lee, University of Rhode Island

COHESIONLESS SOIL PARAMETERS IN LATERAL DIRECTION RELATED TO FLAT-DILATOMETER DATA, E. Sabri Motan, Bradley University, and Brian J. Jacot, Fred C. Hart Associates, Inc.

* Texte recueilli

Nom de celui qui a le texte de la conférence.

Richard Langlois (6 & 12)

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Guy Dallaire (14 & 15)

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Tél.: (418) 643-3178

Guy Dallaire, Ing.
Chef, division des sols et granulats

No. SESSION

Nom de celui qui a le texte de la conférence.

94 Tuesday, 2:00 p.m., Alexandria Room, Sheraton
A RESEARCH POTPOURRI
Kenneth A. Brewer, Iowa State University, presiding
(Sponsored by Committees on Conduct of Research; on Structures Maintenance; on Pavement Maintenance; and on Adhesives, Bonding Agents and Their Use)

Papers:
POSTERING INNOVATION IN THE STRATEGIC HIGHWAY RESEARCH PROGRAM, William A. Hyman, ARE, Inc.
COST-EFFECTIVENESS ANALYSIS FOR STRENGTHENING EXISTING BRIDGES, Terry J. Wipf, Donald L. Erickson, and F. Wayne Klaiber, Iowa State University
16 * RUTTING OF ACP OVERLAYS ON CRCP IN THE STATE OF TEXAS, C.L. Saraf, B. Frank McCullough, and M.F. Asian, University of Texas at Austin
STATIC AND REPEATED LOAD TESTING OF POLYMER MORTAR MATERIALS, George Kelsey and Mrinmay Biswas, Duke University

Richard Langlois (16)

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Richard Langlois, Ing. M.Sc.
Chef de la Division Matériaux

98 Tuesday, 2:00 p.m., Washington Ballroom, Sheraton
PAVEMENT MARKING
Blaine Himmelman, Minnesota Department of Transportation, presiding
(Sponsored by Committee on Coatings, Signing and Marking Materials)

Presentations:
PAVEMENT MARKINGS: PERFORMANCE AND QUALITY CONTROL, Philip O. Russell, Federal Highway Administration

A NEW LOW-COST PORTABLE RETROREFLECTOMETER, James Kalchbrenner, Potters Industries Inc.
A NEW LASER RETROREFLECTOMETER, Justin J. Reinnilson, Retro-Tech

Papers:
17 * THE DETERMINATION OF LIFE-CYCLE COSTS OF PAVEMENT MARKING MATERIALS, John Jewett Henry, Charles E. Antle, and Joseph L. Carroll, Pennsylvania State University
18 * TRAFFIC PAINT PERFORMANCE IN ACCELERATED WEAR TESTS, James E. Bryden and Ronald A. Lorini, New York State Department of Transportation
MEASURES OF SNOWPLOWABLE RAISED PAVEMENT MARKER REFLECTOR WEAR, Sanat N. Bhavsar, New Jersey Department of Transportation

Presentation:
WET NIGHT THERMOPLASTIC STUDY IN GEORGIA, Charles W. Niessner, Federal Highway Administration

Jean-Claude Hébert (17 - 18)

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JEAN-CLAUDE HÉBERT, CHIM. P.
CHEF DE LA DIVISION
CHIMIE

* Texte recueilli

No. SESSION

115

[redacted] Annapolis Room, Sheraton [redacted] CONTRC.

James S. Moultrop, Exxon Chemical Company, presiding

(Sponsored by Committee on Quality Assurance and Acceptance Procedures

Papers

SPECIFICATIONS FOR QUALITY CONTROL: A CASE STUDY, Claude Gentry, Byrd, Tallamy, MacDonald and Lewis, and William A. Yrjanson, American Concrete Pavement Association

19 * GARBAGE IN: GARBAGE OUT! Richard L. Davis, Koppers Company, Inc.

ELEMENTS OF A FRAMEWORK FOR THE DEVELOPMENT OF PERFORMANCE-RELATED MATERIALS AND CONSTRUCTION SPECIFICATIONS, Paul E. Irick, Hampton, Virginia

20 * USE OF MARSHALL SPECIMENS IN A NUCLEAR ASPHALT CONTENT GAUGE, James L. Burati, Jr., and Boke S. Hill, Jr., Clemson University, and Thomas E. Freeman, William F. Freeman Associates

Presentation:

PRECISION AND REPEATABILITY OF THE LOTTMAN AND MODIFIED LOTTMAN PROCEDURES, Erwin L. Dukatz, Jr., Vulcan Materials Company

STATISTICAL EVALUATION OF THE SELECTION OF SAMPLING LOCATIONS FOR UNBOUND AGGREGATE, David A. Anderson and Charles E. Antle, Pennsylvania State University, and K. Gill Shaw, John Portman and Associates

Nom de celui qui a le texte de la conférence

Richard Langlois (19 - 20)

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Richard Langlois, Ing. M.Sc.
Chef de la Division Materiaux

119

TAPE

[redacted] Tuesday, 8:00 p.m., Wilmington Room, Sheraton [redacted]

James A. Scherocman, Scherocman Associates, presiding

(Sponsored by Committee on Characteristics of Bituminous-Aggregate Combinations to Meet Surface Requirements

Papers

21 * USE OF FRICTION COURSE MIXES IN ONTARIO, Kai K. Tam and Daniel F. Lynch, Ontario Ministry of Transportation and Communications, Canada

22 * THE DEVELOPMENT OF SPRAY-REDUCING MACADAM ROAD SURFACINGS IN UNITED KINGDOM, 1967-1987, D.M. Colwill and M.E. Daines, Transport and Road Research Laboratory, England

✓ OPEN GRADED FRICTION COURSES IN TEXAS: SPECIFICATIONS, DESIGN, CONSTRUCTION, AND MAINTENANCE, Bob M. Gallaway, David A. Bass, Kenneth W. Faults, and Charles H. Little, Texas A&M University System

Presentations--STATE VIEWS

CALIFORNIA, Raymond A. Forsyth, California Department of Transportation

GEORGIA, William T. Stapler, Georgia Department of Transportation

NEW MEXICO, Douglas I. Hanson, New Mexico Highway Department

MICHIGAN, Fred Copple, Michigan Department of Transportation

MONTANA, Don M. Harriott, Montana Department of Highways

OREGON, Robert Blensly, Oregon Department of Transportation

Richard Langlois (21 - 22)

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* Texte recueilli

No. SESSION

Nom de celui qui a le texte de la conférence

129 Wednesday, 9:00 a.m., Rockville Room, Sheraton
RIGID PAVEMENT
John P. Zaniewski, Arizona State University, Presiding

(Sponsored by Committees on Rigid Pavement Design, on Rigid Pavement Construction and Rehabilitation, and on Pavement Rehabilitation)

Papers:

NINE-YEAR PERFORMANCE EVALUATION OF ARIZONA'S PRESTRESSED CONCRETE PAVEMENT, Richard L. Powers and John P. Zaniewski, Arizona State University

FEACONS III COMPUTER PROGRAM FOR AN ANALYSIS OF JOINTED CONCRETE PAVEMENTS, Hans Tia, Chung-Lung Wu, Shao-Lei, and Kevin L. Doyt, University of Florida, and Jamshid M. Armaghani, Florida Department of Transportation

23 * THICKNESS DESIGN OF ROLLER-COMPACTED CONCRETE PAVEMENTS, Shiraz D. Tayabji, Construction Technology Laboratories, and David J. Halpenny, Portland Cement Association

ENGINEERING PROPERTIES OF ROLLER-COMPACTED CONCRETE, Shiraz D. Tayabji and Paul A. Okamoto, Construction Technology Laboratories

EFFECT OF CONCRETE OVERLAY DEBONDING ON PAVEMENT PERFORMANCE, Thomas Van Dam, M.Y. Shahin, and Eleanor Blackmon, U.S. Army Construction Engineering Research Laboratories

Daniel Vézina (23)

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Daniel Vézina, ing.
Division Matériaux

135

[redacted]nesday, 9:00 a.m., South Cotillion Room, [redacted]PERFORMANCE

Herbert F. Southgate, University of Kentucky, Presiding
(Sponsored by Committee on Flexible Pavement Design)

Papers:

24 * FIELD ANALYSIS OF RUTTING IN OVERLAYS OF CONCRETE INTERSTATE PAVEMENTS IN ILLINOIS, Samuel H. Carpenter and Lynn Knoxson, University of Illinois at Urbana-Champaign

DELINEATING ZONES OF DETERIORATION AND SEASONAL CHANGES IN MODULUS PROFILES OF SECONDARY ROADS WITH THE SASW METHOD, Soheil Nazarian and Kenneth H. Stokoe II, University of Texas at Austin, and Robert C. Briggs, Texas State Department of Highways and Public Transportation

ANALYSIS OF AXLE LOADS AND AXLE TYPES FOR THE EVALUATION OF LOAD LIMITS ON FLEXIBLE PAVEMENTS, Emmanuel G. Fernando and David R. Luhr, Pennsylvania State University, and Hari N. Saxena, Jaipur Department of Public Works, India

RELIABILITY OF THE FLEXIBLE PAVEMENT DESIGN MODEL, John C. Potter, U.S. Army Engineer Waterways Experiment Station

DYNAMIC RESPONSE OF PAVING MATERIALS, Jorge B. Sousa and Carl L. Monismith, University of California, Berkeley

ANALYTICAL EVALUATION OF VARIABLES AFFECTING SURFACE WAVE TESTING OF PAVEMENTS, Ignacio Sanchez-Salinero, Jose M. Roesset, Glenn J. Rix, and Kenneth H. Stokoe II, University of Texas at Austin, and Ro-Young Shao, Harza Engineering Company

Richard Langlois (24)

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Richard Langlois, Ing. M.Sc.
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* Texte recueilli

181 No. SESSION

[redacted] Wednesday, 8:00 p.m., Baltimore/Annapolis Room, Sheraton

N. Paul Khosla, North Carolina State University, presiding

(Sponsored by Committees on Characteristics of Bituminous Materials and on Bituminous Paving Mixtures To Meet Structural Requirements)

Papers

25 * FAA MIXTURE DESIGN PROCEDURE FOR ASPHALT-RUBBER CONCRETE, Fredov L. Roberts, Auburn University, and Robert L. Lytton, Texas A&M University System

26 * STRUCTURAL RESPONSE OF FOAMED ASPHALT SAND MIXTURES IN HOT ENVIRONMENTS, Amir F. Bissada, Kuwait University

USE OF CLIMATIC DATA FOR THE ASSESSMENT OF RUTTING POTENTIAL, Mikael P.J. Olsen, Jun Li, and Dallas N. Little, Texas A&M University System

EVALUATION OF INDIRECT TENSILE TESTS FOR ASSESSING STRIPPING OF ALABAMA ASPHALT CONCRETE MIXES, Frazier Parker and Fouad A. Ghavabeh, Auburn University

27 * DEVELOPMENT OF LABORATORY OXIDATIVE AGING PROCEDURES FOR ASPHALT CEMENTS AND ASPHALT MIXTURES, Ok-Kee Kim and Chris A. Bell, Oregon State University, and James E. Wilson and Glenn Boyle, Oregon Department of Transportation

28 * HOT-MIX RECYCLING WITH MICROWAVE HEATING, James A. Scherocman, Scherocman Associates, and Robert B. Nath, C D High Technology, Inc.

Nom de celui qui a le texte de la conférence.

Richard Langlois (25 & 28)

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Richard Langlois, Ing. M.Sc.
Chef de la Division Materiaux

195

[redacted] Thursday, 9:00 A[redacted]olis Room, Sheraton

Gordon W. Beecroft, Oregon Department of Transportation, presiding

(Sponsored by Committee on Pavement Rehabilitation)

Papers

SUBSEALING AND LOAD TRANSFER RESTORATION, Ronald J. Koman and Mohamed Y. Shahin, ERES Consultants, Inc.

DEVELOPMENT OF A DEMONSTRATION PROTOTYPE EXPERT SYSTEM FOR CONCRETE PAVEMENT EVALUATION, Kathleen T. Hall, Michael I. Darter, Samuel H. Carpenter, and James M. Connor, University of Illinois at Urbana-Champaign

NUMERICAL ASSESSMENT OF PAVEMENT TEST SECTIONS, T. Krauthammer and H. Khanlarzadeh, University of Minnesota

DEVELOPMENT OF A DISTRESS INDEX AND REHABILITATION CRITERIA FOR CONTINUOUSLY REINFORCED CONCRETE PAVEMENTS USING DISCRIMINANT ANALYSIS, B. Frank McCullough and Chia-Pei Chou, University of Texas at Austin

29 * A MECHANISTIC MODEL FOR THERMALLY INDUCED REFLECTION CRACKING OF PORTLAND CEMENT CONCRETE PAVEMENT WITH REINFORCED ASPHALT-CONCRETE OVERLAY, Kamran Majidzadeh and A. Abdulshafi, Research International, Inc., and Aston McLaughlin, Federal Aviation Administration

NEW MEXICO STUDY OF INTERLAYERS USED IN REFLECTIVE CRACK CONTROL, Virginia M. Lorenz, New Mexico State Highway Department

Richard Langlois

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* Texte recueilli

No. SESSION

200 Thursday, 9:00 a.m., Wilmington Room, Sheraton
ENVIRONMENTAL EFFECTS ON PAVEMENTS, PART 1: TEMPERATURE
Byron E. Ruth, University of Florida, presiding
(Sponsored by Committee on Strength and Deformation Characteristics of Pavement Sections)

Papers:
PROCEDURES FOR ESTIMATION OF ASPHALT-CONCRETE PAVEMENT MODULI AT IN SITU TEMPERATURES, Kwasi Badu-Tweneboah, Hang Tia, and Byron E. Ruth, University of Florida
STRESS CAUSED BY TEMPERATURE GRADIENTS IN PORTLAND CEMENT CONCRETE PAVEMENTS, Joseph M. Richardson, McNeese State University, and Jamshid M. Armaghani, Florida Department of Transportation
CHARACTERIZING TEMPERATURE EFFECTS FOR PAVEMENT ANALYSIS AND DESIGN, Marshall R. Thompson, Barry J. Dempsey, and H. Hill, University of Illinois at Urbana-Champaign, and J. Vogel, Illinois State Water Survey
30 ✱ TEMPERATURE RESPONSE OF CONCRETE PAVEMENTS, Jamshid M. Armaghani, Torbjorn J. Larsen, and Lawrence L. Smith, Florida Department of Transportation
AN EXAMINATION OF ENVIRONMENTAL VERSUS LOAD EFFECTS ON PAVEMENTS, W. R. Hudson, University of Texas at Austin, and Patrick R. Flanagan, ARI, Inc.

TAPE 201

Thursday, 9:00 a.m., North Cotillion Room, Sheraton
SYMPOSIUM ON [redacted] PAVING
[redacted] MODIFIED
SYM[redacted]
B.A. Vallerga, B.A. Vallerga, Inc., presiding
(Sponsored by Committee on Characteristics of Bituminous Paving Mixtures To Meet Structural Requirements)

Presentations:
PHYSICAL PROPERTIES OF ASPHALT MIXTURES CONTAINING MODIFIED BINDERS, Carl L. Monismith, University of California, Berkeley
EFFECT OF POLYMER MODIFIERS ON MIXTURE PROPERTIES, R.D. Pavlovich, T.S. Shuler, J.H. Collins, and M. O'Leary, University of New Mexico
EFFECTS OF POLYMERIC ADDITIVES ON ASPHALT MIXTURE PROPERTIES, Dallas N. Little and Joseph W. Button, Texas A&M University System
EFFECTS OF SELECTED ASPHALT ADDITIVES ON ASPHALT-CONCRETE STRUCTURAL RESPONSES, Dallas N. Little, Jamil Ahmed, and Joseph W. Button, Texas A&M University System

Paper:
31 ✱ PERFORMANCE COMPARISONS OF POLYMER MODIFIED AND UNMODIFIED ASPHALT-CONCRETE MIXTURES, Samuel H. Carpenter and Thomas Van Dam, University of Illinois at Urbana-Champaign

213

Thursday, 2:00 p.m., Rockville Room, Sheraton
[redacted]
Freddie L. Roberts, Auburn University, presiding
(Sponsored by Committee on Monitoring, Evaluation and Data Storage)

Papers:
FACTOR ANALYSIS OF PAVEMENT DISTRESSES FOR SURFACE CONDITION PREDICTIONS, J.J. Bajek, Ontario Ministry of Transportation and Communications, and Ralph C.G. Haas, University of Waterloo, Canada
PRESENT SERVICEABILITY-ROUGHNESS CORRELATIONS USING RATING PANEL DATA, Raymond H. Moore, University of Kansas, and G. Norman Clark and Gary N. Plumb, Kansas Department of Transportation
ESTIMATING THE LIFE OF ASPHALT OVERLAYS USING LONG-TERM PAVEMENT PERFORMANCE DATA, J.J. Bajek, William A. Phang, and A. Prakash, Ontario Ministry of Transportation and Communications, Canada
32 ✱ DEVELOPMENT OF A UTILITY EVALUATION FOR NONDESTRUCTIVE TESTING EQUIPMENT USED ON ASPHALT-CONCRETE PAVEMENTS, Shelly M. Stoffels, ERES Consultants, Inc., and Robert L. Lytton, Texas A&M University System
VIDEO IMAGE DISTRESS ANALYSIS TECHNIQUE FOR THE IDAHO TRANSPORTATION DEPARTMENT PAVEMENT MANAGEMENT SYSTEM, Jim Baker and Basil Dahlstrom, VideoComp, and Keith Longenecker and Tri Buu, Idaho Transportation Department

Nom de celui qui a le texte de la conférence.

Daniel Vézina (30)

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Chef de la Division Matériaux

No. SESSION

Nom de celui qui a le texte de la conférence.

215 Thursday, 2:00 p.m., Wilmington Room, Sheraton
ENVIRONMENTAL EFFECTS ON PAVEMENTS, PART 2: WATER
Robert L. Lytton, Texas A&M University System, presiding
(Sponsored by Committees on Strength and Deformation Characteristics of Pavement Sections, on Subsurface Drainage, and on Environmental Factors Except Frost)

Papers:

33 * MOISTURE IN PORTLAND CEMENT CONCRETE, Donald J. Janssen, University of Washington

Daniel Vézina (33)

THE EFFECT OF RAINFALL ON THE PERFORMANCE OF RIGID PAVEMENTS IN TEXAS, C.L. Saraf, Chia-Pei Chou, and B. Frank McCullough, University of Texas at Austin
THE EFFECT OF MOISTURE ON THE STRUCTURAL PERFORMANCE OF GRANULAR ROAD BASES, N.B. Thom and Stephen F. Brown, University of Nottingham, England
WATER-INDUCED FLEXIBLE PAVEMENT DISTRESSES IN A WET TROPICAL CLIMATE, Tien-Fang Fwa, National University of Singapore
EVALUATION OF DESIGN HIGH-WATER CLEARANCES FOR PAVEMENTS, M.R. Elfino, Virginia Department of Highways and Transportation, and J.L. Davidson, University of Florida
THE ECONOMIC IMPACT OF PAVEMENT SUBSURFACE DRAINAGE, Raymond A. Forsyth, Gordon B. Wells, and James E. Woodstrom, California Department of Transportation

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Daniel Vézina, ing.
Division Matériaux

216

TAPI

216 Thursday, 2:00 p.m., North Cotillion Room, Sheraton

[redacted] ASPHALT PAVING [redacted] IELD EXPERIENCE

Ronald L. Terrel, Edmonds, Washington, presiding
(Sponsored by Committee on Characteristics of Bituminous Paving Mixtures To Meet Structural Requirements)

Presentations:

FIELD EXPERIENCE IN MINNESOTA WITH MODIFIED ASPHALTS, Roger C. Olson, Minnesota Department of Transportation
EFFECTS OF CARBON-BLACK MODIFIED ASPHALTS ON FIELD PERFORMANCE OF ASPHALT CONCRETE, B.A. Vallerga, B.A. Vallerga Inc., and Larry T. Newman and R. W. Anderson, Cabot Corporation

34 * CHEMICAL MODIFIERS TO IMPROVE THE STRENGTH AND DURABILITY OF ASPHALT CONCRETE, William A. Biggins, Lubrizol Corporation

Richard Langlois (33-35)

35 * Papers: [redacted] ROAD, [redacted] R.G. Hicks, Oregon State University, and Keith Martin, James E. Wilson and Dale Allen, Oregon Department of Transportation

Panel discussion:
This session will conclude with a discussion among the authors of both sessions and the audience on asphalt mixtures with modified binders.

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Richard Langlois, Ing. M.Sc.
Chef de la Division Matériaux

* Texte recueilli

ANNEXE B

DOCUMENTATION RECUEILLIE

Noms et adresses des personnes auprès

de qui on peut se procurer les documents:

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Nos. 1, 2, 11, 12, 13, 23, 30 et 33.

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Nos. 3, 4, 5, 6, 7, 8, 9, 10, 16, 19, 20, 21, 22, 24, 25, 26, 27, 28, 29, 31, 32, 34 et 35.

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Guy Dallaire, Ing.
Chef, division des sols et granulats

Nos. 14, 15

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DES TRANSPORTS

**LABORATOIRE
CENTRAL**

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JEAN-CLAUDE HÉBERT, CHIM. P.
CHEF DE LA DIVISION
CHIMIE

Nos. 17, 18

PROBLEM STATEMENT

I. TITLE: Methods to Minimize Rutting in Asphalt Concrete Pavements.

II. THE PROBLEM:

Rutting is one of the leading causes of early failure in asphalt concrete pavements. Asphalts that are too soft, slow setting or highly temperature susceptible can contribute to rutting. Aggregates that are predominantly rounded and smooth textured, contain excessive sand-sized particles or insufficient filler or consist of small top-size particles have been associated with rutting. Chemical reactions between asphalt and aggregate fines in the presence of heat can change the rheological properties of asphalt cement. Paving mixtures containing excessive air voids, voids in the mineral aggregate or foreign materials (such as unburned liquid fuels or liquid antistripping additives) or mixtures that are water susceptible are candidates for rutting. Other considerations include mixing plant types, traffic, environmental and geographical factors.

III. OBJECTIVES:

Assemble and analyze significant publications and data regarding rutting in asphalt pavements and prepare a concise document for implementation by Highway Departments. Rutted and non-rutted pavements across the U.S. should be critically analyzed to accurately determine the source of rutting (subgrade, base or surface). If rutting is in the flexible pavement courses, further investigation should be conducted. Collect samples and data from rutted and non-rutted pavements and conduct carefully coordinated laboratory and field experiments to isolate the cause(s) of rutting. Seek new approaches (tests, standards, techniques and specifications) to identify and control rut-prone mixes. For example, develop stress-strain relationships to be considered in mix design which reflect pavements strengths and demands by traffic and the environment. Develop realistic mathematical models to predict rutting.

IV. CURRENT ACTIVITIES:

A. Key Words: Asphalt Concrete Pavement, Rutting, Permanent Deformation, Plastic Deformation

B. Related Activities:

Concerns of WASHTO have precipitated two NCHRP studies which indirectly address rutting: (1) Development of Asphalt-Aggregate Mixture Analysis System and (2) Mechanistic-Empirical Pavement Design Methods. These studies will begin in 1986. The University of Kentucky developed PAVRUT in 1985. PAVRUT is a model (based upon one mixture) designed to predict pavement rut depth. Based upon preliminary results from the Texas A&M University, certain additives may provide important contributions toward methods to control rutting.

V. URGENCY:

In 1984, WASHTO stated that in some states rutting in asphalt concrete pavements "is the most pressing issue presently facing the highway agencies". Findings of this research should be used to develop a concise document for use by highway agencies as a guideline to reduce the probability of rutting in asphalt concrete pavements.

Statement Prepared by: Joe W. Button Date: February 25, 1986

TRB Committee: A2D01 Committee Chairman: Vyt Puzinauskas

Endorsed by Section _____, with the following comments re:

Urgency, Relevancy, and Implementability: _____

_____

_____

_____

Section Chairman

COURSE NUMBER: 13123

COURSE TITLE: HIGHWAY MATERIALS ENGINEERING

COURSE ANNOUNCEMENT : To be issued February 1987 for presentation in fall of 1987 and spring 1988.

COURSE FEE: Estimated $3,000

LENGTH: 6 weeks

MAXIMUM CLASS SIZE: 30

DESCRIPTION: The course provides a mix of theory and state-of-the-art knowledge in highway engineering materials and quality control. Coverage includes one week in eac of (1) soils and soil aggregate mixtures, (2) portland cement concrete (3) miscellaneous materials such as aluminum, wood and polymers and (4) materials control methods. Two weeks will be devoted to bituminous materials and one week to a specialty option (in lieu of one week of designated study) to be identified by the participants in cooperation with the faculty advisor.

OBJECTIVES: Upon completion of the course, participants should be able to:

1. Identify and describe the characteristics and engineering properties of the materials utilized in highways, and demonstrate a conceptual understanding of the load carrying capabilities, stress strain relationships, particle and ingredient interactions, etc.

2. Identify and describe the selection and design criteria for highway materials, and demonstrate understanding of strength of materials versus load demands in terms of selecting the proper natural materials or setting the requirements of designed materials.

3. Describe the important steps and considerations in the mix design procedures for designed materials, and demonstrate a conceptual understanding of how and why of combining of soils and aggregates, stabilization of soils, and asphaltic and portland cement concretes.

4. Describe the current, most effective field testing and materials control procedures, and show the relationship of field testing methods to laboratory designs as well as materials quality control during construction.

5. Identify and descibe the key principles and functions of the field production equipment, and demonstrate understanding of the suitability and proper operation of equipment in terms of obtaining quality in-place materials.

6. Develop an effective materials control program to provide for proper and adequate materials selection, design, and control. Demonstrate and understanding of the traditional "methods and materials" approach and the "quality assurance" approach.

FOR WHOM DESIGNED: Design, construction, and materials engineers and technologists in highway transportation agencies, who have sufficient engineering, math and science background to qualify for admission for graduate study.

PREREQUISITES: Bachelor of Science in engineering or engineering technology or academic and professional backgrounds sufficient to qualify for admission to university graduate level study.

PRESENTED BY: Purdue University

COURSE COORDINATOR: Roger L. Dean
Federal Highway Administration
6300 Georgetown Pike
McLean, Virginia 22101
(703) 285-2782

KENTUCKY TRANSPORTATION CABINET
DEPARTMENT OF HIGHWAYS
SPECIFICATIONS FOR
POLYMER-ASPHALT EMULSIONS
FOR
SEAL COAT APPLICATIONS

I. Description -

These products are designed for surface treatment by the technique specified in Section 406 of the Kentucky Standard Specifications for Road and Bridge Construction.

II. Test Requirements -

	CRS-2 or RS-2S		AE-90S	
Test	Min.	Max.	Min.	Max.
1. Viscosity, SSF, @ 122°F. (AASHTO-T-59)	175	450	50+	
2. Storage Stability Test, 24 hrs., % (AASHTO-T-59)	---	1		1
3. Sieve Test, 20 mesh, % (AASHTO-T-59)		0.1		0.1
4. Distillation: (AASHTO-T-59)				
Oil Distillate by Vol. of Emulsion, %:		3		3.0
Residue from Distillation, %:	65		65	
Test on Residue from Evaporation or Distillation: (AASHTO-T-59)				
5. Penetration, 77°F., 100, 5 sec. (AASHTO-T-49)	90	150	90	150
6. Ductility, 77°F., cm (AASHTO-T-51)	50+		50+	
7. Ductility, 34± 1°F. (AASHTO-T-51)	15+		15+	
*8. Ductility, 34± 1°F. (AASHTO-T-51)	55+		55+	
9. Solubility in Trichloroethylene, % (AASHTO-T-44)	97.5			
10. Demulsibility, 0.02N $CaCl_2$, % (AASHTO-T-59) Anionic Emulsion	40+		40+	
11. Demulsibility, 35 ml., 0.8% Sodium Dioctyl Sulfosuccinate, % (AASHTO-T-59) Cationic Emulsion	20+			
12. Float Test @ 140°F. sec. (AASHTO-T-59)			1200+	

Suppliers of the specified CRS-2S, RS-2S, or AE-90S may be required to perform and certify conformance to the above test requirements prior to shipment of the material.

*This test is an extension of the routine ductility test. When the specimen is extended 10 cm. the distressed area is severed in the middle by a pair of shears. After 1 hour at the test temperature the severed distressed ends are returned to contact and the ductilometer reading is read again. The sample must recover at least 55% of the 10 cm. distance or to a reading of 4.5 or less.

III APPLICATION -

CRS-2S is intended to be used in chip-seal applications where the stone is silicious, minus no. 200 sieve fines are less than 3%, high skid resistance is desired, and early retention of aggregate is required. In many cases CRS-2S has been found to work well with limestone aggregate. RS-2S is intended to be used like CRS-2S except it is to be used with limestone aggregate. AE-90S is to be used with limestone but due to its slower setting speed is more tolerant of fines than the other products. (This statement is not intended to increase the maximum of 3% minus No. 200 sieve materials but rather to identify a property that may occasionally improve performance with a borderline aggregate.)Aggregates that are not clearly defined as limestone or silicious should be evaluated for compatibility with the intended emulsion to assure the

best retention of aggregate. Non-compatibility is judged to be failure of an aggregate to adhere to a particular emulsion.

Generally the quality of the finished product improves as aggregate fines are decreased. Increased fine material less than a no. 200 sieve always decreases the quality of a seal-coal application.

P.E.M.B. = POLYETHYLENE-MODIFIED BITUMEN
A SUCCESSFUL BINDER ON ITALIAN TOLLROADS

G. Legnani

The use of P.E.M.B. or Polyethylene-Modified bitumen, for road construction purposes, started late in Italy in 1982, when Autostrade S.p.A., the State owned Corporation responsible for construction, operations and maintenance on two thirds of the Italian toll-road system (2,700 Km), decided to start some full-scale trials on a number of bridges located on a very critical section of their network; the Bologna-Florence section crossing the Appennine Mountains.

These full-scale applications were the result of a rather extensive laboratory work aiming at a better understanding of the rheology of the new binder and the design of mixtures exhibiting:

= high mechanical strength, even with high binder content,

= and complete impermeability (low Voids content),

both for wearing and binder courses.

The Novophalt technology was adopted, and the addition of the Polyethylene (P.E.) to standard 80/100 pen. bitumen effected by means of a specially designed high-shear mixing equipment.

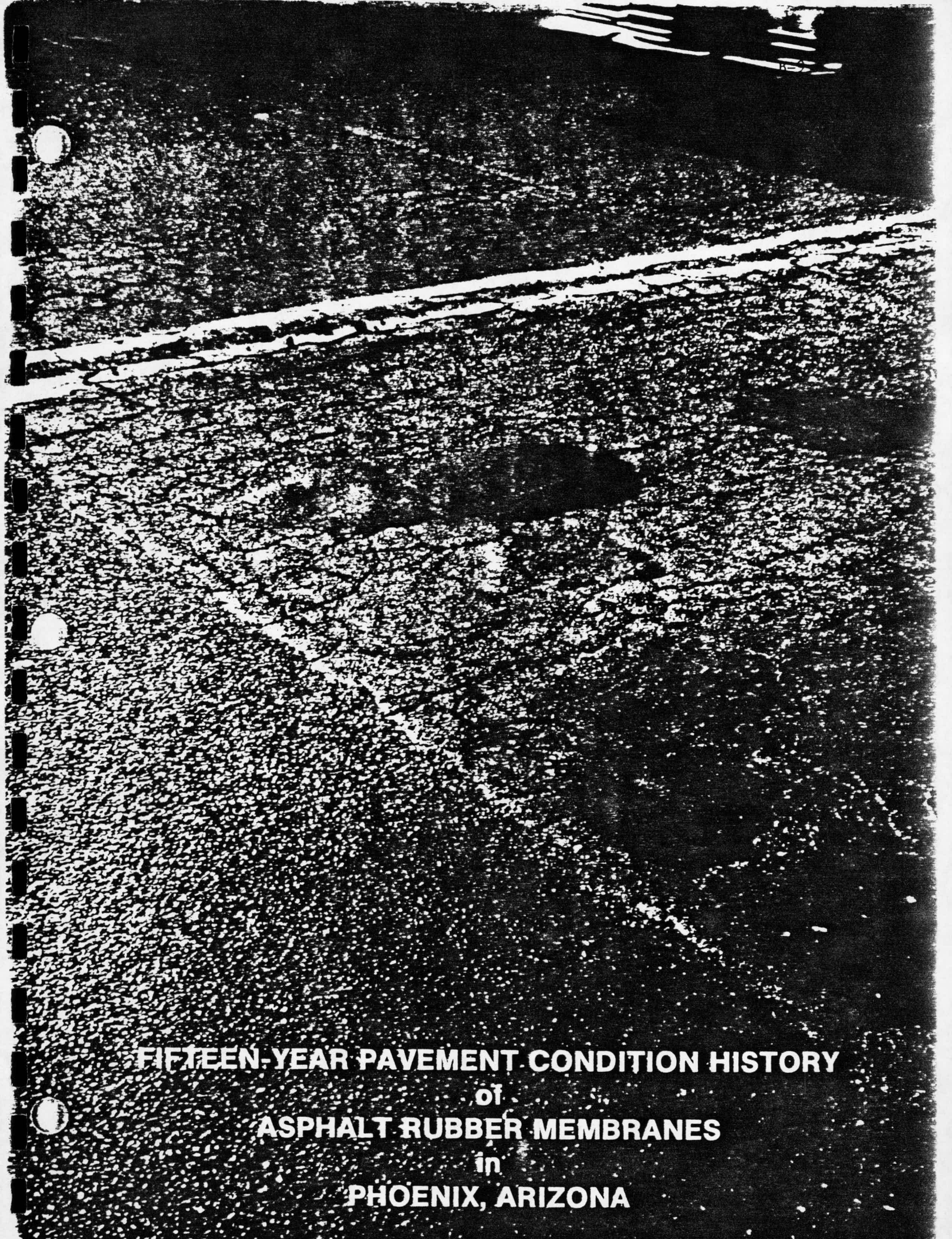
Two "degrees" of "modification" were initially considered in the preparation of the binder; 4% and 7% for the wearing course and 4% for the binder course.

Total thickness of the two courses, wearing and binder, on bridge decks is normally 9 to 10 cm. (4 inches), and the average characteristics of the mixtures laid on the first 4 viaducts (Gambellato, Pattano, Merizzano e Gamberi) resulted as follows:

Wearing course

a) = P.E.M.B.	80/100 + 4% P.E.	80/100 + 7% P.E.
b) = Binder content (°)	6.20%	6.50%
c) = Marshall stability	1,260 Kg.	1,350 Kg.
d) = Marshall flow	4 mm.	3.6 mm.
e) = Stiffness c)/d)	315 Kg/mm	375 Kg/mm
f) = Voids (Marshall)	2.2 %	1.8 %

(°) referred to the aggregate



FIFTEEN-YEAR PAVEMENT CONDITION HISTORY of ASPHALT RUBBER MEMBRANES in PHOENIX, ARIZONA

US Department of Transportation
Federal Highway Administration

Research, Development and Technology

Course Announcement 86-10

SUBJECT: 13036 - Inspection of Fracture Critical Bridge Members

The Federal Highway Administration (FHWA), through the National Highway Institute and in cooperation with the Office of Implementation and the Bridge Division, is sponsoring up to 36 presentations of this 2-day course. The curriculum material was developed for FHWA by Byrd, Tallamy, MacDonald and Lewis and the course will be taught by staff from this firm.

FOR WHOM DESIGNED: This course is intended primarily for FHWA, State and local bridge inspectors who have responsibility for on-site inspection of highway bridges. Supervisors, project engineers, bridge maintenance engineers, and designers will also benefit from the course.

PREREQUISITES: None, although previous hands-on inspection experience of bridges is desirable.

COURSE DESCRIPTION: Bridges that have fracture critical members (FCMs) are susceptible to catastrophic collapse as was most recently demonstrated by the Mianus River Bridge failure. It is imperative that bridge inspectors be trained to recognize and inspect FCMs in order to guarantee public safety and protect the investment in our Nation's bridges.

Participants of this course will learn what "fracture critical" means, and then review stresses, redundancy, basic fracture mechanics, and fatigue prone details. The techniques for inspection will be examined, and proper preparation of fracture critical inspection reports will be explained. While this course will acquaint inspectors with procedures to be used in making detailed visual bridge inspections, nondestructive testing methods are discussed only briefly. Nondestructive testing methods are the topic of another National Highway Institute course, 13023 - Nondestructive Testing Methods for Steel Bridges.

In addition to a participant notebook, attendees will receive a comprehensive, well-illustrated manual that has been developed to be used by bridge inspectors as a guideline for identifying and inspecting FCMs within existing bridges. This manual will supplement FHWA's "Bridge Inspector's Training Manual 70."

COURSE OBJECTIVES: Upon completion of the course the participants should be able to:

1. Recognize whether a bridge is redundant or non-redundant.

2. Identify the FCMs within a non-redundant bridge.

3. Identify common modes of failure of FCMs.

4. Be familiar with the various nondestructive testing methods commonly used for inspecting steel highway bridges.

5. Write a bridge inspection report emphasizing the condition of FCMs from visual inspection.

6. Evaluate the condition of the FCMs from the inspection and relate the results to the rating of the bridge.

NUMBER OF PARTICIPANTS: Class size is limited to a maximum of 40 participants.

COST: The cost for sponsoring this course is $2,000. The sponsoring agency is also responsible for furnishing a meeting room, inviting participants, providing visual-aid equipment, and taking care of other housekeeping duties. Travel and per diem for participants must be funded by their own agencies.

COURSE REQUESTS: Pilot courses have been conducted in Washington, D.C. and in St. Paul, Minnesota. The course is now available for scheduling in response to requests from State highway agencies and others. First preference will be given to conducting one presentation in each FHWA region. Other presentations will be scheduled on a first-come-first-served basis. State highway agencies desiring to host presentations should submit requests to the National Highway Institute through the local FHWA division office. Local agencies are requested to submit requests through the State highway agency.

CONTACT: For information on scheduling, course material, etc., please contact:

Mr. Larry E. Jones
National Highway Institute (HHI-22)
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101
Telephone: (703) 285-2779

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US Department
of Transportation

Federal Highway Administration

Research, Development
and Technology

Course Announcement 86-3

SUBJECT: 13108 - Techniques for Pavement Rehabilitation

This announcement supersedes Course Announcement 84-3. It has been revised to reflect a policy decision to charge a fee for this course.

The Federal Highway Administration (FHWA), through the National Highway Institute, and in cooperation with the Office of Engineering, is offering presentations of the subject course to be sponsored by public highway agencies. This course was developed under a contract with ERES Consultants, Inc. and is presented under a continuing contract with the same firm.

FOR WHOM DESIGNED: The course is directed to State and local highway agency design, construction and maintenance engineers involved in the development of pavement resurfacing, restoration and recycling techniques. The course serves as an excellent introduction of the subject for the young, inexperienced engineer and also provides the depth of coverage needed by more experienced engineers.

PREREQUISITES: None

COURSE DESCRIPTION: This 28-hour course is presented over a 4-day period, normally starting at 8 a.m. on the first day and concluding at noon on the fourth day. A variety of instructional techniques is employed, including lecture and discussion with visual aids, case studies and workshops. Each participant will receive a copy of the notebook, "Techniques for Pavement Rehabilitation" which should serve as a valuable future reference on the subject. The following sessions are included in the course:

Project Survey and Evaluation
Restoration
Recycling
Resurfacing
Selection of Design Alternatives
Workshop on Rehabilitation Design

COURSE OBJECTIVES: Upon completion of this course, participants should be able to:

1. Identify common pavement distress types, determine their causes, and be familiar with the procedures for project field surveys and overall project evaluation.

2. Recognize the principles and the importance of proper preparation of the existing pavement prior to resurfacing or restoration.

3. Recognize the basic principles and state-of-the-art technology of pavement rehabilitation.

4. Understand the design procedures and their applicability to various types of overlays.

5. Select the most cost-effective pavement rehabilitation alternative for a given project.

NUMBER OF PARTICIPANTS: Maximum of 40 participants.

COST: Cost for sponsoring this course is $3,000. Travel and per diem for participants must be funded by their own agencies. The sponsoring agency also is responsible for furnishing a meeting room, providing visual-aid equipment, inviting participants, and other housekeeping duties.

COURSE REQUESTS: Federal, State or local agencies may sponsor the course. Presentations will be scheduled on a first-come-first-serve basis. All course requests should be made through the local FHWA division office.

CONTACT: For information on scheduling, availability, course materials, etc., contact:

Mr. William Y. Bellinger
National Highway Institute
Federal Highway Administration
6300 Georgetown Pike
McLean, Virginia 22101-2296
Telephone: (703) 285-2776

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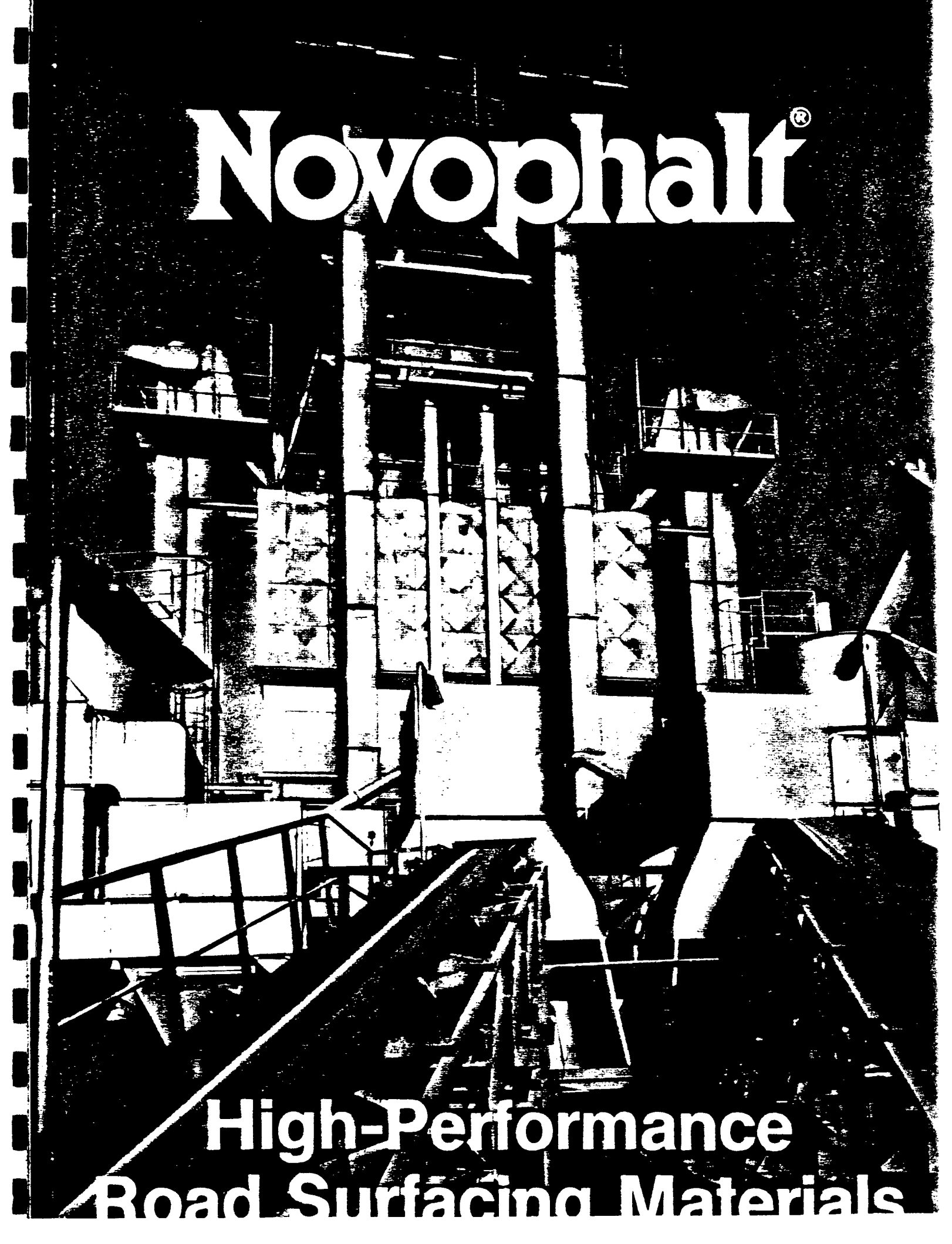
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U.S Department
of Transportation

Federal Highway Administration

TECHNICAL SUMMARY

PAVEMENT SURFACE TEXTURE: SIGNIFICANCE AND MEASUREMENT

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

REPORT NO. FHWA/RD-84/092
SEPTEMBER 1986

HNR-1

HNR-1

U.S Department
of Transportation

Federal Highway Administration

TECHNICAL SUMMARY

DATA COLLECTION PROCEDURES FOR USE WITH SKID RESISTANCE MEASUREMENTS

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

REPORT NO. FHWA/RD-84/109
SEPTEMBER 1986

U.S Department
of Transportation

Federal Highway Administration

TECHNICAL SUMMARY

IMPROVED METHODS TO ELIMINATE REFLECTION CRACKING

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

REPORT NO. FHWA/RD-86/075
OCTOBER 1986

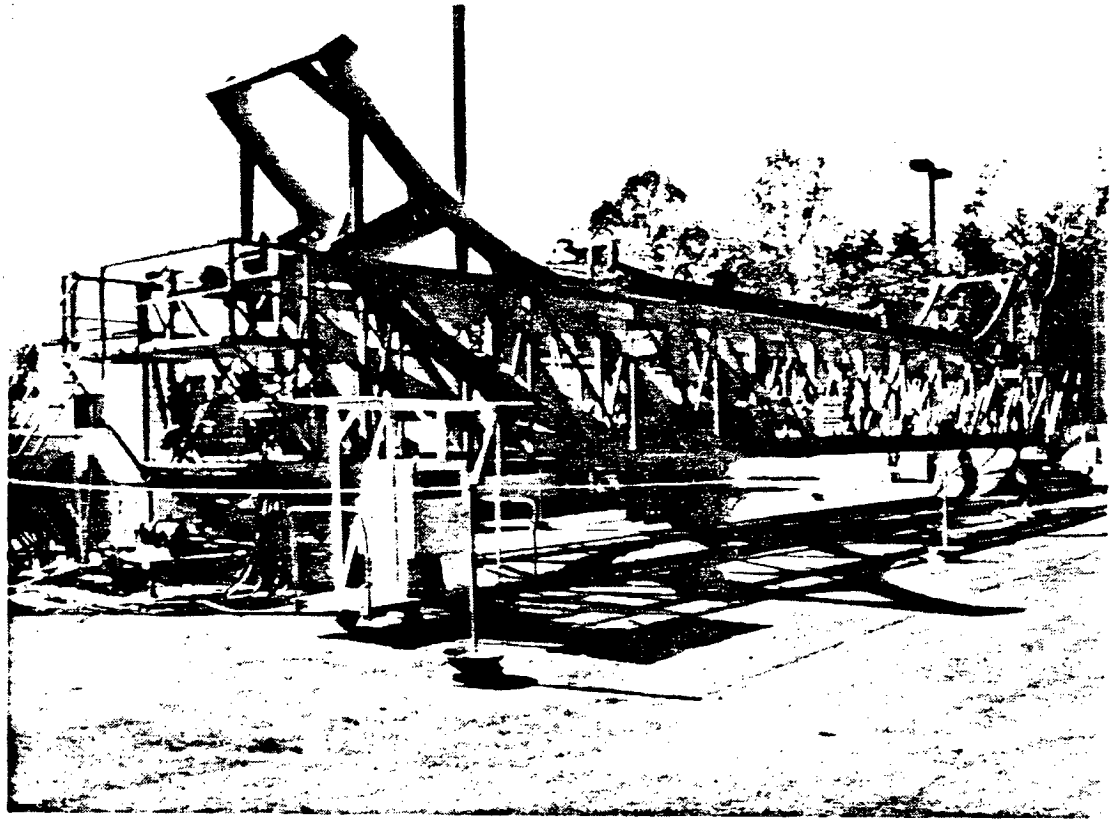
HNR-1

U.S. Department of Transportation
Federal Highway Administration

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101

January, 1987

PAVEMENT TESTING FACILITY



The Accelerated Loading Facility Pavement Testing Machine

The Pavement Testing Facility is an outdoor, full-scale accelerated pavement testing laboratory located at Federal Highway Administration's Turner-Fairbank Highway Research Center in McLean, Virginia. The facility consists of two bituminous concrete pavement test sections, each 200 feet long, and the Accelerated Loading Facility (ALF) machine. Put into operation on October 20, 1986, ALF has completed loading of a portion of test lane 1. Preliminary analysis of the data indicates good agreement with the predicted performance based upon the American Association of State Highway and Transportation Officials pavement design procedure. Additionally, the Pavement Testing Facility has proven its potential as an accelerated pavement testing tool.

Office of Engineering and Highway Operations R & D
Pavements Division

B-16
HNR-1

TECHNICAL SUMMARY

U.S Department
of Transportation
Federal Highway Administration

DATA COLLECTION PROCEDURES FOR USE WITH SKID RESISTANCE MEASUREMENTS

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

REPORT NO. FHWA/RD-84/109
SEPTEMBER 1986

HES-1

TECHNICAL SUMMARY

U.S. Department
of Transportation
Federal Highway Administration

IMPROVED METHODS FOR PATCHING ON HIGH-VOLUME ROADS

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

REPORT NO. FHWA/RD-86/076

JANUARY 1986

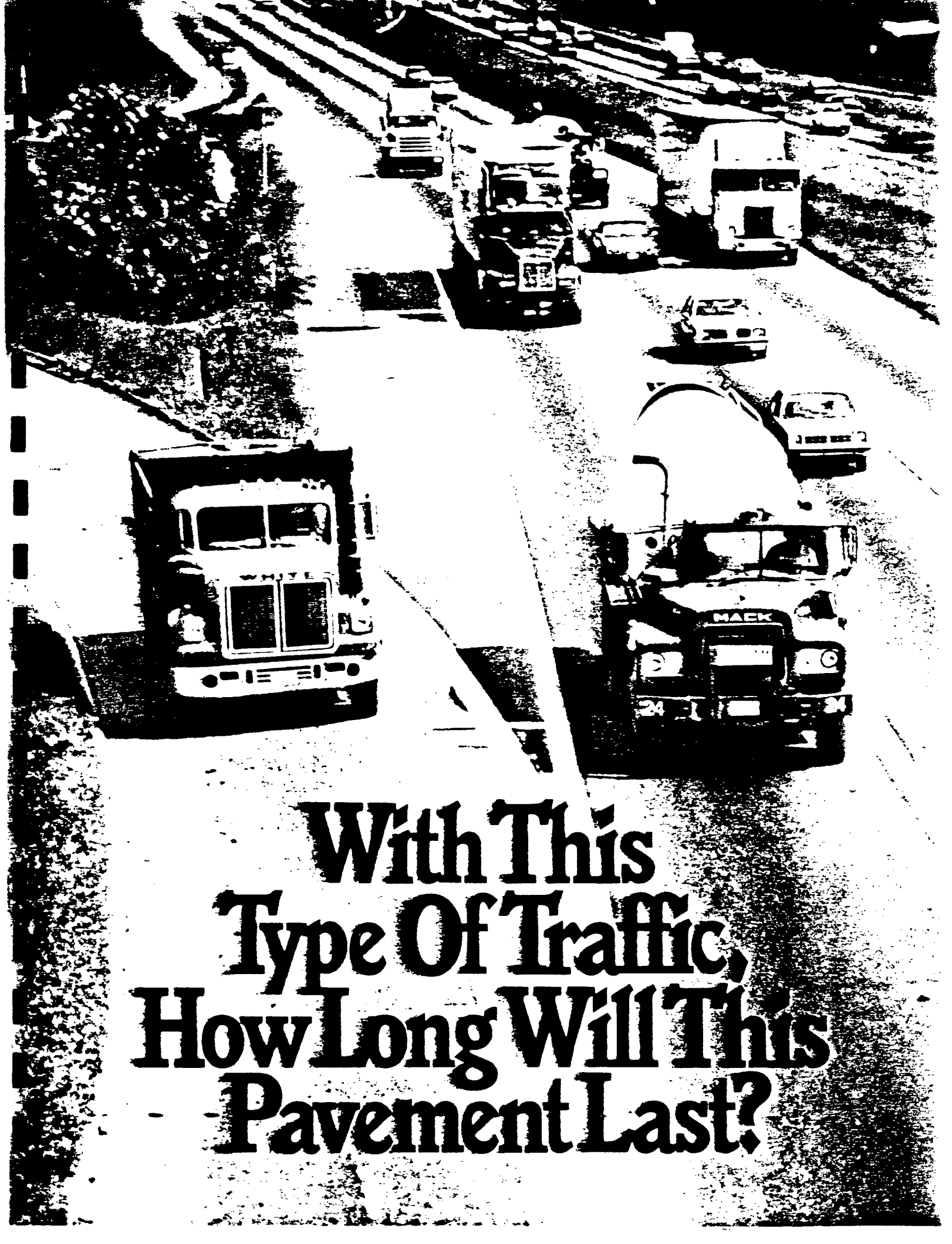
TECHNICAL SUMMARY

U.S. Department
of Transportation
Federal Highway Administration

FINAL DESIGN OF AUTOMATED PAVEMENT CRACK MEASUREMENT INSTRUMENTATION FROM A SURVEY VEHICLE

Research, Development, and Technology
Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101-2296

REPORT NO. FHWA/RD-85/077
MAY 1986



With This Type Of Traffic, How Long Will This Pavement Last?

Planning and Scheduling Work Zone Traffic Control

Implementation Package
FHWA-IP-81-6
User Guide

October 1981

U.S. Department
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Federal Highway
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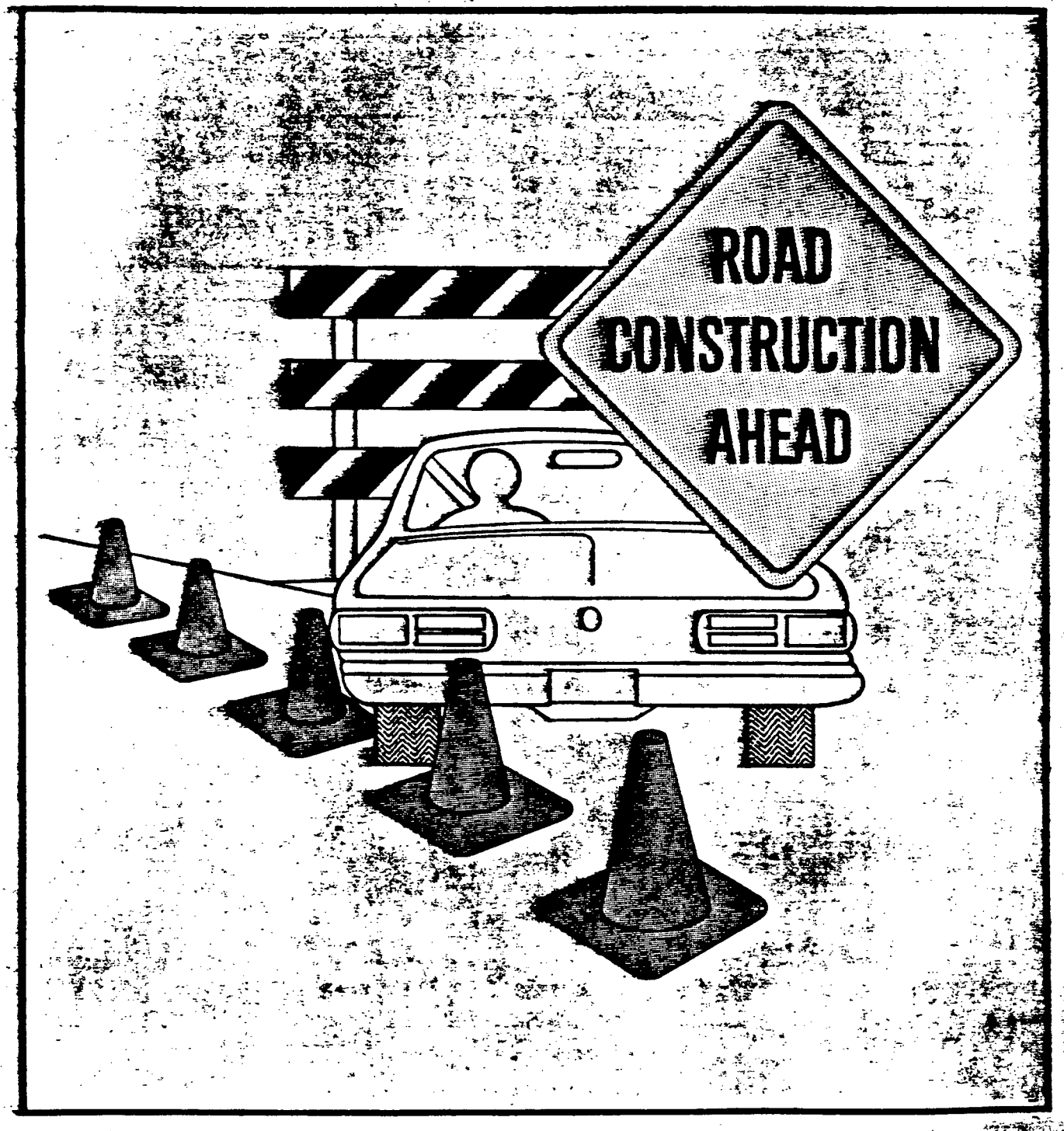


FHWA DATA BANK FOR RECYCLED BITUMINOUS CONCRETE PAVEMENTS

by
James F. Shook*
Rosemary Allender**

ABSTRACT

The FHWA Data Bank for Recycled Bituminous Concrete Pavements was assembled in 1981 from data collected from a variety of sources. The Data Bank includes general project information, design information, construction details, recycled pavement performance evaluations, maintenance and rehabilitation records, and detailed physical properties of mixes from 32 special projects. In its present form the Data Bank consists of data from 204 recycled projects, and 4 control projects.

Most project entries include basic location data, information on the recycling method used, and some data on binder and mixture characteristics. In addition, about one-third of the projects reported results of measurements made on the recycled pavement from one to six years after recycling, including pavement distress, ride quality, and deflection measurements.

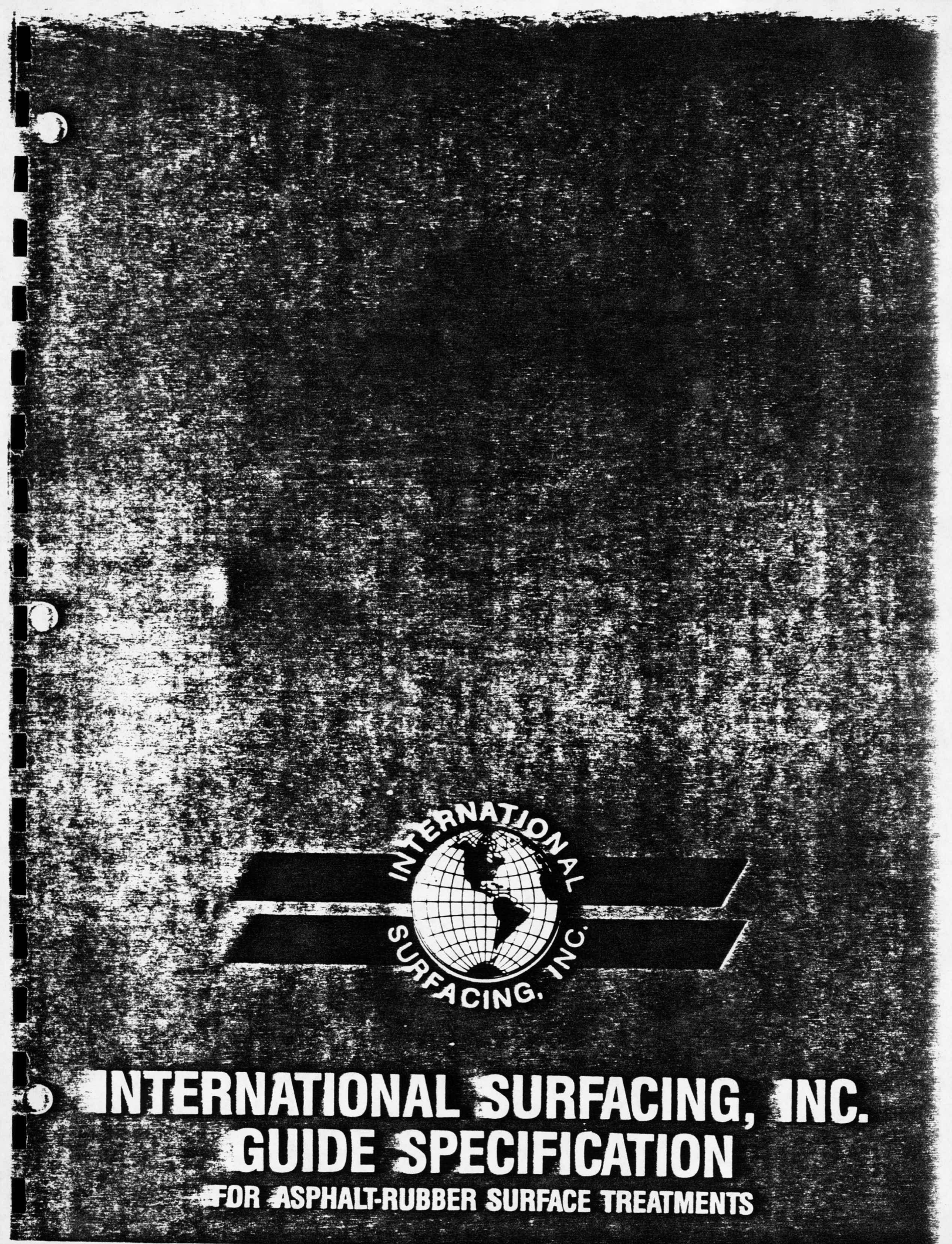
The Data Bank includes data from projects in 42 states. Most states reported the use of more than one recycling method. The hot recycling process was used in 30 (81%) of the 42 states, the cold recycling process in 11 states (30%), and surface recycling in 8 states (22%).

The Data Bank also includes information on recycling construction operations. In general, mixing and lay-down practices appeared to be standard with no substantial deviations from normal practice.

Analyses were made of recycled mix design and mixture component proportioning methods, changes in binder properties, and other effects of recycling on binder and mix properties. The findings from these analyses indicate that reclaimed asphalt pavements can be used to produce mixes having properties similar to conventional mixes.

---

* Sr. Vice President, ARE Inc., Riverdale, Maryland (Formerly with The Asphalt Institute)
**Formerly Analyst with The Asphalt Institute.



INTERNATIONAL SURFACING, INC.
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FOR ASPHALT-RUBBER SURFACE TREATMENTS

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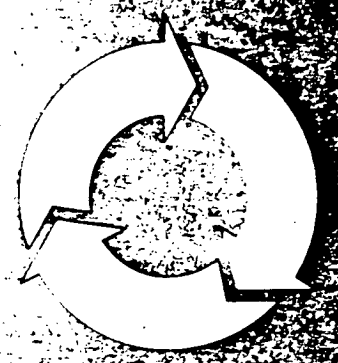
Master of Science
LABORATOIRE CENTRAL DES PONTS ET CHAUSSEES

J.P. AUGOYARD
L. PONSART
GTM-ENTREPOSE

A NEW PROCESS FOR THE LAYING OF MONOLITHIC COMPOSIT C.R.C. PAVEMENTS

Nanterre, November 28th, 1986

68a



RECYCLING PORTLAND CEMENT CONCRETE

U.S. Department
of Transportation
**Federal Highway
Administration**

DP
Demonstration
Projects Program
FHWA-DP-87-05

REDESIGN AND FIELD OPERATION OF A SELF-PROPELLED CAVITATING CONCRETE REMOVAL SYSTEM

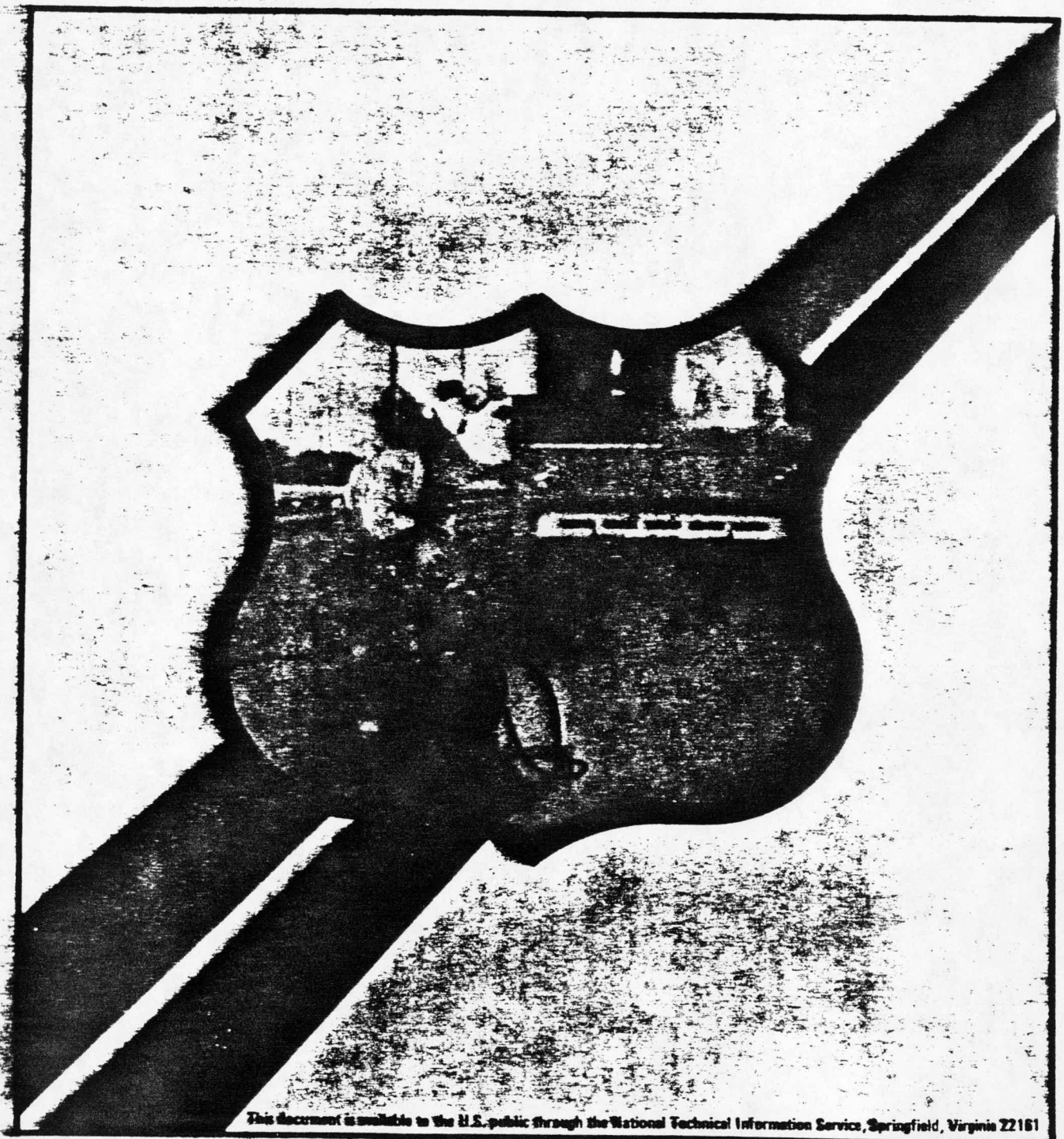
Research, Development, and Technology

Turner-Fairbank Highway Research Center
6300 Georgetown Pike
McLean, Virginia 22101

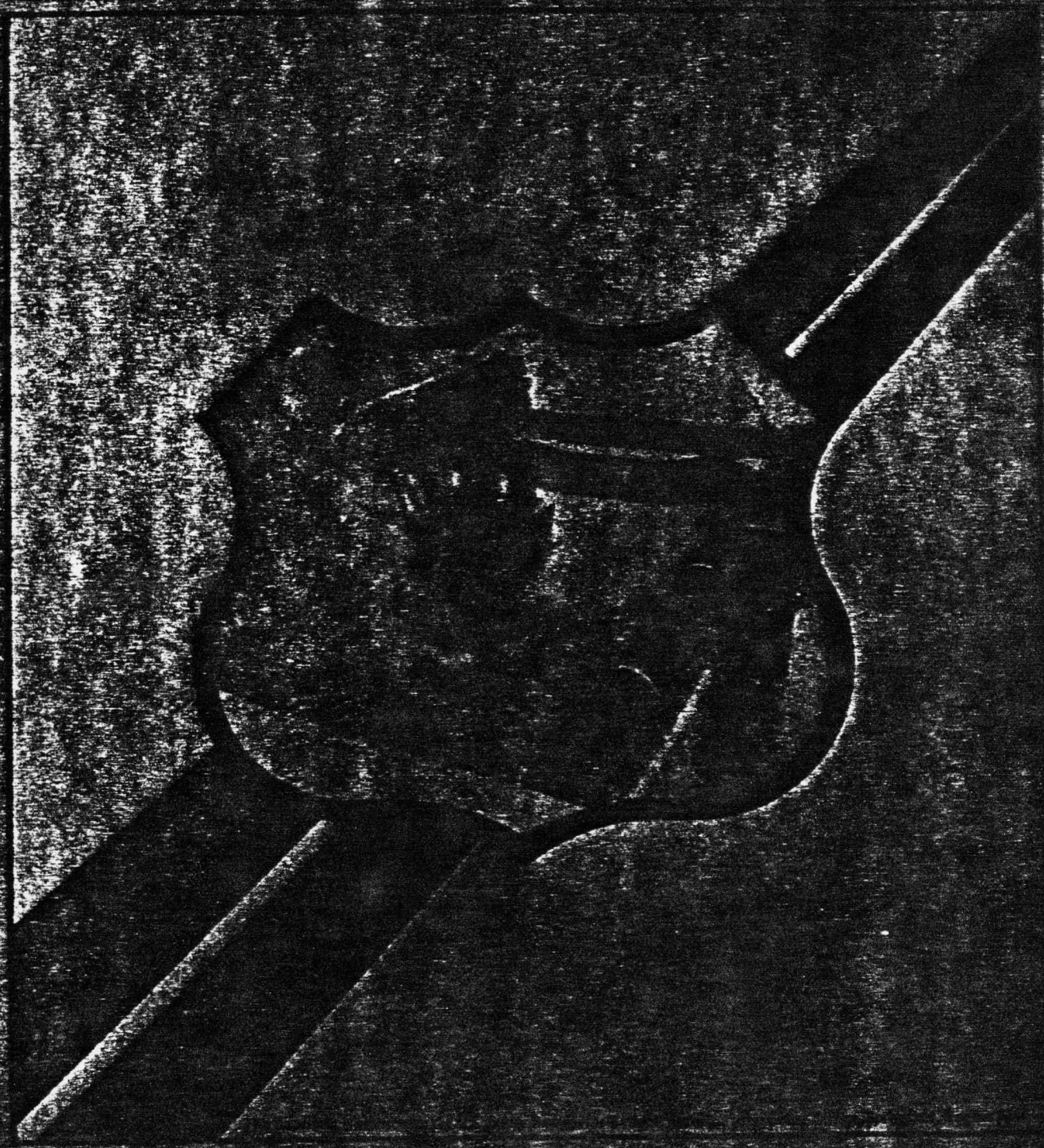
U.S. Department of Transportation
Federal Highway Administration

Report No.
FHWA-TS-84-207

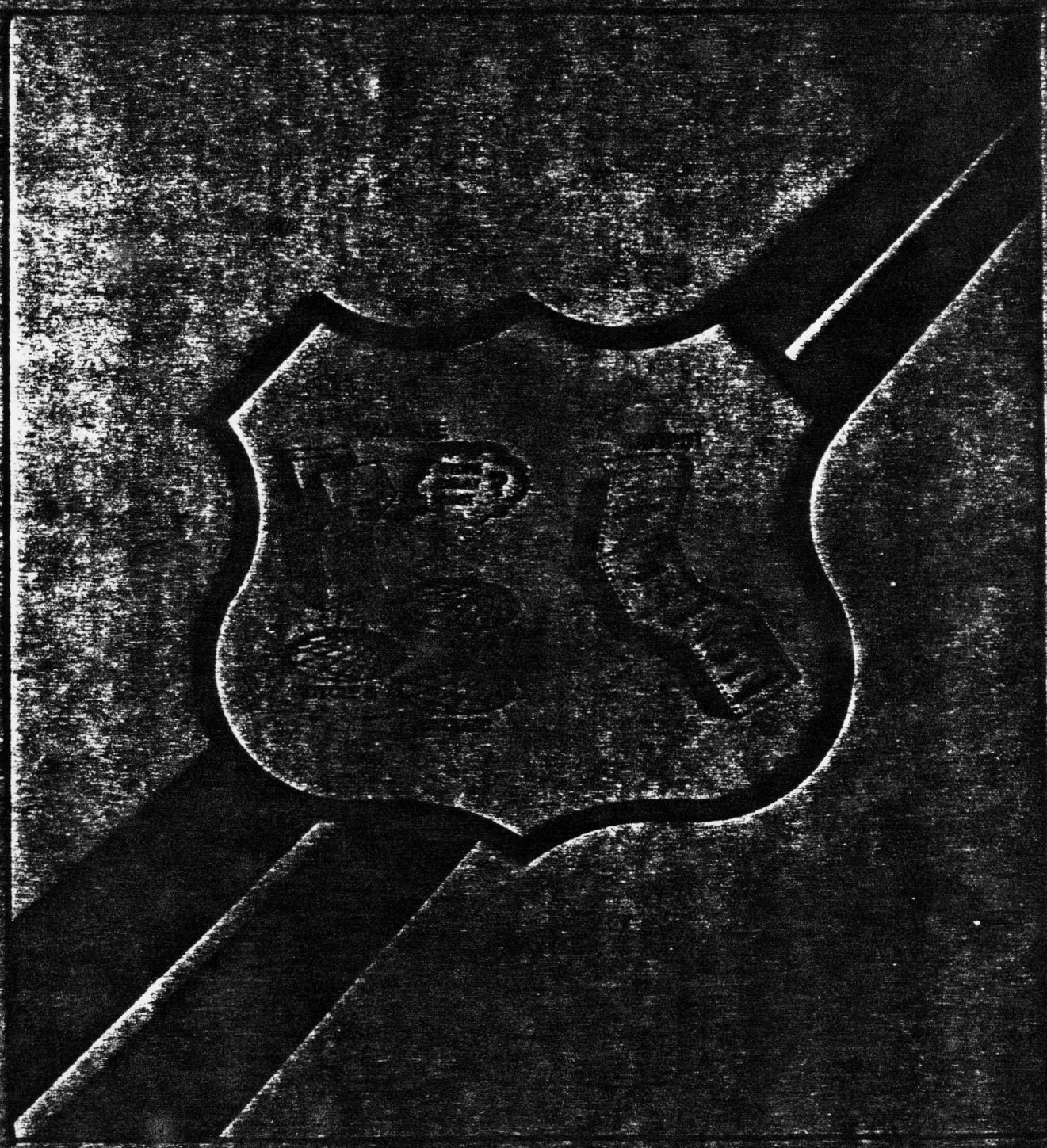
Final Report
May 1984



DEVELOPMENT OF A WATER JET FOR THE RAPID REMOVAL OF CONCRETE



SIGOP-II
User's Manual



INTERNATIONAL SURFACING GUIDE
SPECIFICATION FOR ASPHALT-RUBBER USED AS HOT-MIX ASPHALT CONCRETE BINDER

1.0 GENERAL

1.1 Scope

This specification covers requirements for materials and manufacturing asphalt-rubber mixtures for use as a binder in hot-mix asphalt concrete. The asphalt rubber may be used as binder for most types of asphalt concrete paving including open graded friction courses, dense surface mixtures, and base courses for highway pavement applications.

1.2 Types

This specification covers two types of asphalt-rubber binders, Type I and Type II. Type I asphalt rubber is a lower stiffness material suited for use in cooler climates, while Type II is a higher stiffness material suited for use in warmer climates.

2.0 MATERIALS

2.1 Description

The asphalt rubber binders shall be a uniform and reacted mixture of compatible paving grade asphalt cement, granulated reclaimed vulcanized rubber, and, if required, liquid anti-stripping agent.

2.2 Asphalt Cement

The asphalt cement shall be an appropriate grade as determined by the asphalt-rubber supplier and shall meet requirements of ASTM D946 or ASTM D3381 for the specific grade used. As an alternative, state or local specifications may be used. The asphalt cement shall be tested by the asphalt-rubber supplier to determine and assure that appropriate characteristics are achieved when blended with the granulated rubber.

2.2.1 Asphalt Grade Selection

Generally, the following grades of asphalt cement are used for the manufacture of Types I and II asphalt-rubber binder.

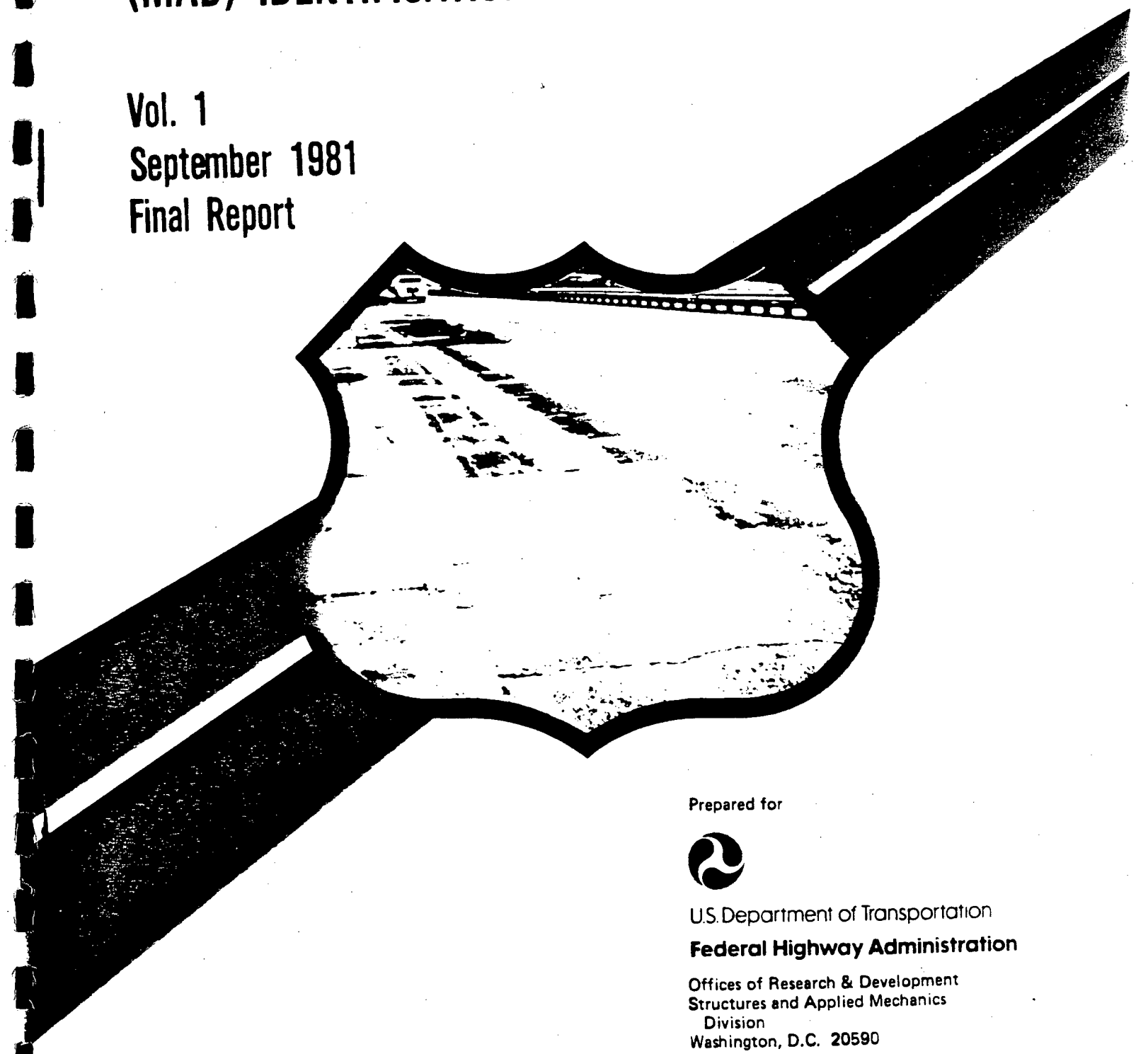
2.2.1.1 Type I Asphalt-Rubber

ASTM D3381 - AC-2.5, AC-5, AR-1000
ASTM D946 - 120-150, 200-300

Report No. FHWA/RD-81/079

A PAVEMENT MOISTURE ACCELERATED DISTRESS (MAD) IDENTIFICATION SYSTEM

Vol. 1
September 1981
Final Report



Prepared for

U.S. Department of Transportation
Federal Highway Administration

Offices of Research & Development
Structures and Applied Mechanics
Division
Washington, D.C. 20590

Document is available to the public through
the National Technical Information Service,
Springfield, Virginia 22161

ANNEXE C

LISTE DES CONFERENCIERS

Participants

ANNEXE D

AGENDA DE LA REUNION DU SHRP

TENTATIVE AGENDA
STRATEGIC HIGHWAY RESEARCH PROGRAM STATE COORDINATORS MEETING
SUNDAY, 11 JANUARY 1987
SHERATON WASHINGTON HOTEL
WASHINGTON BALLROOM

OBJECTIVES:

The three major objectives of this meeting are:

- To inform you on progress being made to implement SHRP and future activities planned.
- To get your advice on how to ensure that SHRP is useful, timely, innovative, and efficient.
- To discuss future LTPP plans, including pricrities for recruitment of additional candidate sites.

TIME	TOPIC	SPEAKER
8:30 AM	Continental Breakfast	
9:00	Welcome and Objectives of Meeting	Thomas Larson
	SHRP: Status of Current Activities and Future Outlook	Damian Kulash
	Overview of the Development of LTPP	Pav. Perf. Committee Rep.
	Site Selection: Status and Discussion of Problems and Next Steps	Pav. Perf. Committee Rep.
	Discussion of Plan to Obtain Additional Sites	Pav. Perf. Committee Rep.
	Data Collection Plans	Pav. Perf. Committee Rep.
Noon	Buffet Lunch	
1:00 PM	Equipment and Instrumentation: Coordination with Other State Needs	Pav. Perf. Committee Rep.
	Questions and Concerns from a State Perspective	Francis Francois
	Key Issues from Federal Perspective	David Phillips
	Need for Sustained State Cooperation	John Tabb
	Potential for Payoff in SHRP	Thomas Larson
	Discussion of Key Issues	State SHRP Coordinators
5:00	Adjourn	

ANNEXE E

LISTE DES PRINCIPALES PERSONNES RENCONTREES

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Division Matériaux

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Materials and Research Engineer

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Agency of Transportation
Materials & Research Division
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Montpelier, VT 05602

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ARPG
ASPHALT RUBBER PRODUCERS GROUP

Asphalt Rubber Producers Group

Russell H. Schnormeier
Technical Director

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Res. (602) 943-0024

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ROADS AND HIGWAYS
ENGINEERING DEPARTEMENT

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Head of the Pavement Division

North Dakota State Highway Department

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STEVEN S. SMITH, P.E.

Geotechnical and Research Supervisor

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President

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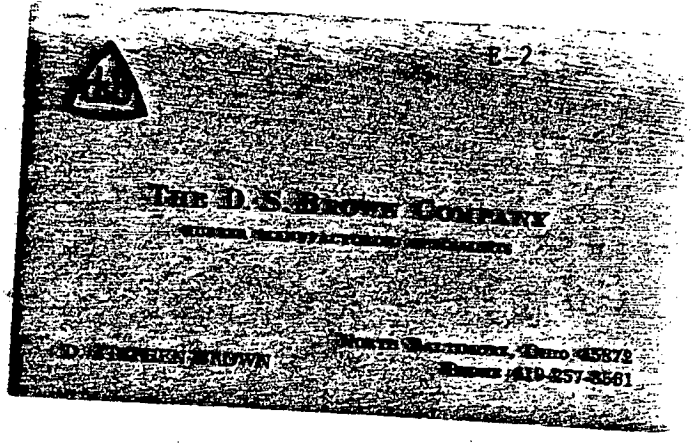

DEPARTMENT OF TRANSPORT

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Head of Highways Group
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TELEX 79800 KUNZE A

Autoroute
du Sud
de la France

Jean Pierre MARCHANT
Chargé de mission

LABORATOIRE CENTRAL
DES PONTS ET CHAUSSÉES

Département des Chaussées

J. BONNOT
Ingénieur en Chef des Ponts et Chaussées
Chef du Département

Tél. (1) 853.12.34 - Poste 52.46
Télex : LCORLY 200358 F

ORLY SUD n° 155
94396 ORLY AÉROGARE CEDEX

Division des matériaux
de chaussées

Jean-Marie MACHET

Docteur-Ingenieur
Chef de la Section des propriétés des matériaux de chaussées

LABORATOIRE CENTRAL DES PONTS ET CHAUSSÉES
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Asphalt Rubber Producers Group

Jane L. Hyler
Administrative Director

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Jon A. Epps
Professor and Chairman

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University of Nevada Reno
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(702) 323-5815 (Residence

EXXON

J. G. BARDET

PRODUCTS RESEARCH DIVISION
EXXON RESEARCH AND ENGINEERING COMPANY
P.O. Box 51, Linden, N.J. 07036
(201) 474-2037

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Res. (602) 943-0024

P.O. Box 1358
Tempe, Arizona 85281

ROGER C. OLSON, P.E.
research operations engineer

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612-296-[illegible]

TESTING & RESEARCH LABORATORY
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LANSING, MICHIGAN 48909

322-5710
AC-517

FRED COPPLE, P.E.
SUPERVISING ENGINEER
BITUMINOUS TECHNICAL SERVICES UNIT

MICHIGAN DEPARTMENT OF TRANSPORTATION

TESTING LABORATORY
P.O. BOX 30049
LANSING, MICHIGAN 48909

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