NCHRP
National Cooperative Highway Research Program

RESEARCH RESULTS DIGEST

December 1990 Number 177

These **Digests** are issued in the interest of providing an early awareness of the research results emanating from projects in the NCHRP. By making these results known as they are developed, it is hoped that the potential users of the research findings will be encouraged toward their early implementation in operating practices. Persons wanting to pursue the project subject matter in greater depth may do so through contact with the Cooperative Research Programs Staff, Transportation Research Board, 2101 Constitution Ave., N.W., Washington, D.C. 20418.

Area of Interest: 40 maintenance (01 highway transportation) **Responsible Staff Engineer: Crawford F. Jencks**

NCHRP Research on Maintenance Engineering

An NCHRP digest of the progress and status of maintenance engineering research under the National Cooperative Highway Research Program. Prepared by Lloyd R. Crowther, Consultant.

Since its inception in 1962, the National Cooperative Highway Research Program (NCHRP) has included numerous studies of interest to maintenance engineers. As an easy reference, this Digest outlines the status of all NCHRP research related to highway maintenance (see Tables 1 through 5). These research projects are primarily applied research -- research aimed at producing results applicable by the practitioner.

Although the NCHRP is administered by the Transportation Research Board (TRB), it is sponsored by the member departments, i.e., the individual state departments of transportation (DOTs), of the American Association of State Highway and Transportation Officials (AASHTO) in cooperation with the Federal Highway Administration (FHWA), U.S. Department of Transportation. The state DOTs are the sole financial sponsors of the NCHRP. Such support is voluntary and uses funds from the states' Federal-aid apportionment of Highway Planning and Research (HPR) funds. The NCHRP is carried out under a three-way agreement between AASHTO, FHWA, and the National Academy of Sciences, TRB's parent organization.

Subject to an eventual two-thirds endorsement by the state DOTs, the AASHTO Standing Committee on Research (SCOR) is responsible for formulating the annual program for the NCHRP. SCOR selects projects from the numerous recommendations submitted annually in response to a solicitation from four authorized sources:

- chief administrative officers of the state DOTs,
- chairmen of subcommittees under AASHTO's Standing Committees on Highway and Administration,
- AASHTO Executive Committee, and
- the Federal Highway Administration.

These are the only sources from which problems can be submitted. Therefore, anyone interested in suggesting a research project that would result in a practical application to an immediate transportation problem shared nationwide, should seek consideration for a submittal through one of the sources listed above.

For each project assigned to the NCHRP, an expert panel, comprised of persons knowledgeable in the subject of interest, is formed to refine the scope of work, which is then used as part of a

request for proposals. The expert panel evaluates the proposals received, selects a qualified research agency (from academia, private industry, or government), and then provides the technical oversight until the project is complete.

TYPES OF NCHRP PUBLICATIONS

NCHRP's primary delivery mechanism is the *NCHRP Report*. Most of the projects listed in Table 1, Research in Progress, and Table 2, Pending Research, will result in a published NCHRP final report. Section (a) of Table 3, Available NCHRP Series Publications, lists NCHRP reports from already completed research projects.

A second type of publication, the *Synthesis of Highway Practice*, is addressed in section (b) of Table 3, and in Tables 1 and 2 under Project 20-5, "Synthesis of Information Related to Highway Problems." Synthesis publications are less rigidly formatted since they represent a compilation of existing practices or information rather than new applied research.

The third publication format included herein is the *Research Results Digest*. RRDs are issued in the interest of providing an early awareness of the research results emanating from some NCHRP projects. Occasionally, an RRD will be published to disseminate specific information to the organizations that support NCHRP. This Research Results Digest is an example of the latter practice. Pertinent RRDs are listed in section (c), Table 3.

The fourth publication format used by NCHRP is the *Legal Research Digest (LRD)*, listed in Table 3, section (d). These digests are produced under NCHRP Project 20-6, "Legal Problems Arising Out of Highway Programs." These digests are a mechanism for addressing State Highway Departments' continuing need for the assembly, analysis, and evaluation of operating practices and legal elements of special problems involving highway law. LRDs are published as a means of early awareness to affected individuals. Periodically LRDs are compiled and published as an addendum to the treatise Selected Studies in Highway Law.

Table 4, Uncorrected Agency Final Reports, lists unedited manuscripts submitted by research agencies in compliance with project contractual requirements. These reports are also available for loan or purchase on written request to the NCHRP.

Table 5, Agency Final Reports Receiving Special Treatment, lists relevant reports that were produced for Project 20-7, Research for AASHTO Standing Committee on Highways (SCOH). This ongoing project consists of a series of tasks specified by that committee to obtain the data required by the SCOH to fulfill its mandate to continually rule on engineering and operations policies as a guide for State DOTs to follow. Project 20-7 research sometimes results in a NCHRP Research Report, but more frequently, the findings are used to develop an AASHTO policy or guideline.

THE NCHRP STAFF

After the title of each ongoing and pending research project listed in Tables 1 and 2, the responsible staff person's name appears in parentheses. The NCHRP staff will be able to answer many of the questions you may have concerning ongoing research. They are also the liaison with the researchers involved, the appropriate NCHRP panels, and highway department personnel at both the state and federal level.

The following is a listing of the NCHRP professional staff, who can be reached at 202/334-3224:

DIRECTOR
Robert J. Reilly

SENIOR PROGRAM OFFICERS
D.W. (Bill) Dearasaugh
Ian M. Friedland
Crawford F. Jencks
Kenneth S. Opiela
Dan A. Rosen

PROGRAM OFFICER
Louis M. MacGregor

EDITOR
Helen Mack

OBTAINING PUBLICATIONS

Copies of the publications in Table 3 and Table 4 can be obtained from the Business Office, Transportation Research Board, 2101 Constitution Avenue, NW, Washington, DC 20418. A check or money order payable to the *Transportation Research Board* must accompany orders totaling $20.00 or less.

TABLE 1 - RESEARCH IN PROGRESS

Project Number	Title	Research Agency	Completion Date
10-30(3)	Nondestructive Methods for Field Inspection of Embedded or Encased High Strength Steel Rods and Cables (*Jencks*)	University of Manchester Institute of Science and Technology (UK)	2/91
12-23	Recommended Revisions to the AASHTO Manual for Maintenance Inspection of Bridges (*Friedland*)	A.G. Lichtenstein & Associates, Inc.	1/91
14-7	Interactive Microcomputer Network for Innovative Maintenance Operations (*Opiela*)	Woodward-Clyde Consultants, Inc.	2/91
14-8	Chip Seal Coats for High-Traffic-Volume Asphalt Concrete Pavements (*Dearasaugh*)	Intermountain Research Foundation (U. of N.M.)	10/91
14-9(1)	Effective Maintenance Budget Strategies (*Opiela*)	The Urban Institute	11/91
14-9(2)	Incorporation of Maintenance Considerations in Highway Design (*Jencks*)	Daniel, Mann, Johnson, & Mendenhall	2/92
14-9(3)	Maintenance Contracting (*Jencks*)	Bergstralh-Shaw-Newman, Inc.	9/91
14-11	Effective Motoivation of Highway Maintenance Personnel (*Opiela*)	The Pennsylvania State University	8/91
17-6A	Service Vehicle Lighting and Traffic Control Systems for Short-Term and Moving Work Zones (Phase II) (*Opiela*)	Transportation Research Corporation	*
17-8	Traffic Barrier and Control Treatments for Restricted Work Zones (*Opiela*)	Texas A&M Research Foundation	5/91
20-5	Synthesis of Information Related to Highway Problems (*Jencks*)	Transportation Research Board	Varies
	Topic 20-04 - Work Zone Traffic Control and Safety on Urban and Suburban Streets		
	Topic 20-05 - Short-Term Responsive Maintenance Systems		
	Topic 20-09 - Bridge Paint: Removal, Containment, and Disposal		
	Topic 21-06 - Development of Professional Highway Maintenance Engineers		
	Topic 21-08 - Development and Implementation of Traffic Control Plans for Highway Work Zones		
	Topic 21-10 - In-Place Recycling of Asphalt Concrete		
	Topic 21-11 - Highway Maintenance Procedures Dealing with Hazardous Materials Incidents		
	Topic 21-12 - Truck Escape Ramps: Location, Design, Operation, and Maintenance		
	Topic 22-01 - Performance and Operational Experience of Truck-Mounted Attenuators		
	Topic 22-04 - Underwater Bridge Repair Techniques		
	Topic 22-07 - Current Practices in Determining Pavement Condition		
	Topic 22-08 - Disposal of Roadside Litter Mixtures		Varies
20-7	Research for AASHTO Standing Committee on Highways (*Dearasaugh*)		9/91
	Task 34 - AWS/AASHTO Bridge Welding Code Commentary and Draft Fracture Control Plan (*Freidland*)	Warren G. Alexander, P.E.	*a
	Task 37 - Development of an Asphalt Paving Handbook (*Dearasaugh*)	TRB Division B	3/92
21-3	Instruments for Measuring Scour at Bridge Piers and Abutments (*Friedland*)	Resource Consultants, Inc.	

(Name of Responsible TRB Staff Engineer is italicized in parentheses. See text.)
* Report is in the publication process
[a] Handbook will be distributed by AASHTO after publication.
[b] Submitted to AASHTO for publication consideration.

TABLE 2 - PENDING RESEARCH

Project Number	Title	Funds Available	Expected Start
6-12	Improved Visibility for Snow Plowing Operations (*Opiela*)	300,000	Early 1991
14-9(4)	Role of Highway Maintenance in Integrated Management Systems (*Dearasaugh*)	225,000	Early 1991
14-9(5)	Impacts of Environmental, Health, and Safety Regulations on Highway Maintenance (*Friedland*)	150,000	Early 1991
14-9(6)	Professional Development of Maintenance Engineers and Managers (*Jencks*)	175,000	Early 1991
20-5	Synthesis of Information Related to Highway Problems *(Jencks)*		
	Task 23-02 - Rapid Test Methods		Early 1991
	Task 23-03 - Managing Snow and Ice Control Operations		Early 1991
	Task 23-07 - Guaranty of Road Construction by the Contractor		Mid 1991
	Task 23-08 - Minimization of Costs for Dealing with Hazardous or Toxic Materials		Mid 1991
	Task 23-09 - Severity Indices for Roadside Hazards		Mid 1991

TABLE 2 - Continued

Project Number	Title	Funds Available	Expected Start
	Task 23-10 - Portland Cement Concrete Resurfacing		Mid 1991
	Task 23-11 - Changeable Message Signs		Late 1991
	Task 23-12 - Reduced Visibility on the Highway		Late 1991
	Task 23-13 - Park and Ride: Operation, Maintenance, and Funding		Late 1991
	Task 23-14 - Crash Test Performance of Permanent and Temporary Crash Cushions		Late 1991
	Task 23-15 - Subbases Under PCC Pavement		Early 1992 (tentative)
	Task 23-16 - Public/Private Donations for Highway Maintenance and/or Operations		Early 1992 (tentative)
20-7	Research for AASHTO Standing Committee on Highways (*Dearasaugh*)		
	Task 46 - AASHTO Guidelines for Bridge Management Systems (*Freidland*)	75,000	Early 1991

(Name of Responsible TRB Staff Engineer is italicized in parentheses. See text.)

TABLE 3 - AVAILABLE NCHRP SERIES PUBLICATIONS

No.	Title	Research Agency	Pages	Cost ($)	Year
	(a) NCHRP Reports				
1	Evaluation of Methods of Replacement of Deteriorated Concrete in Structures	The Pennsylvania State University	56	*	1965
4	Non-Chemical Methods of Snow and Ice Control on Highway Strutures	Roy Jorgensen and Associates	74	*	1964
5	Effects of Different Methods of Stockpiling Aggregates - Interim Report	Miller-Warden Associates	48	*	1964
8	Synthetic Aggregates for Highway Construction	Battelle Memorial Institute	13	*	1964
16	Protective Coatings to Prevent Deterioration of Concrete by Deicing Chemicals	Battelle Memorial Institute	21	*	1965
19	Economical and Effective Deicing Agents for Use on Highway Structures	ITT Research Institute	19	*	1964
23	Methods for Reducing Corrosion of Reinforcing Steel	Battelle Memorial Institute	22	*	1965
26	Development of Uniform Procedures for Establishing Construction Equipment Rental Rates	Ernst & Ernst	33	*	1966
27	Physical Factors Influencing Resistance of Concrete to Deicing Agents	University of Illinois	41	*	1965
38	Evaluation of Pavement Joint and Crack Sealing Materials and Practices	Rensselaer Polytechnic Institute	40	*	1966
42	Interstate Highway Maintenance Requirements and Unit Maintenance Expenditure Index	Bertram D. Tallamy Associates	144	*	1967
46	Effects of different Methods of Stockpiling and Handling Aggregates	Miller-Warden Associates	102	*	1965
54	Location, Selection, and Maintenance of Highway Guardrails and Median Barriers (See No. 118)	Southwest Research Institute	96	*	1970
66	Identification of Frost-Susceptible Particles in Concrete Aggregates	The Pennsylvania State University	62	*	1967
69	Evaluation of Construction Control Procedures - Aggregate Gradation Variations and Effects	Materials Research and Development	58	*	1967
74	Protective Coatings for Highway Structural Steel	Steel Structures Painting Council	64	*	1966
74B	Protective Coatings for Highway Structural Steel - Current Highway Practices	Steel Structures Painting Council	102	*	1966
91	Effects of Deicing Salts on Water Quality and Biota - Liturature Review and Recommended Research (See No. 170)	Virginia Polytechnic Institute	70	*	1972
95	Highway Fog (See No. 171)	Cornell Aeronautical Labortory	48	*	1969
118	Location, Selection, and Maintenance of Highway Traffic Barriers (See No. 54)	Southwest Research Institute	96	*	1971
127	Snow Removal and Ice Control Techniques at Interchanges	Bertram D. Tallamy Associates	90	*	1970
131	Performance Budgeting System for Highway Maintenance Management	Roy Jorgensen & Associates	213	*	1971

TABLE 3 - Continued

No.	Title	Research Agency	Pages	Cost ($)	Year
(a) NCHRP Reports, continued					
161	Techniques for Reducing Roadway Occupancy During Routine Maintenance Activities	Byrd, Tallamy, MacDonald	55	*	1973
170	Effects of Deicing Salts on Plant Biota and Soils (See No. 91)	Virginia Polytechnic Institute	88	*	1972
171	Highway Fog - Visibility Measures and Guidance Systems (See No. 95)	Sperry Rand Corporation	40	4.00	1973
191	Effect of Air Pollution Regulations on Highway Construction and Maintenance	Howard, Needles, Tammen, & Bergendoff	81	*	1975
203	Safety at Narrow Bridge Sites	Texas A & M	63	*	1975
215	Pavement Management System Development	ARE, Inc.	32	*	1981
221	Erosion Control During Highway Construction - Manual on Principles and Practices	Utah State University	108	14.40	1979
222	Bridges on Secondary Highways and Local Roads - Rehabilitation and Replacement (See No. 243)	University of Virginia	132	9.20	1980
223	Maintenance Levels-of-Service Guidelines (See No. 273)	Woodward-Clyde Consultants, Inc.	118	*	1980
224	Guidelines for Recycling Pavement Materials	Texas A&M University	137	9.20	1979
226	Damage Evaluation and Repair Methods for Prestressed Concrete Bridge Members (See No. 280)	George O. Shanafelt & Willis B. Horn	66	7.20	1980
236	Evaluation of Traffic Controls for Highway Work Zones	BioTechnology, Inc.	189	12.00	1981
237	Locating Voids Beneath Pavement Using Pulsed Electromagnetic Wave Techniques	Georgia Tech Research Corporation	40	*	1981
243	Rehabilitation and Replacement of Bridges on Secondary Highways and Local Roads (See No 222)	University of Virginia	46	6.80	1981
251	Assessment of Deficiencies and Preservation of Bridge Substructures Below the Waterline	Byrd, Tallamy, MacDonald & Lewis	80	8.40	1982
257	Long-Term Rehabilitation of Salt-Contaminated Bridge Decks	Lehigh University	32	6.40	1983
264	Guidelines for the Management of Highway Runoff on Wetlands	Rexnord, Inc.	166	10.80	1984
265	Removal of Lead-Based Bridge Paints	Midwest Research Institute	72	8.00	1983
271	Guidelines for Evaluation and Repair of Damaged Steel Bridge Members	George O. Shanafelt & Willis B. Horn	64	7.60	1984
272	Performance of Weathering Steel in Bridges (See No 314)	Sheladia Associates, Inc.	164	12.00	1984
273	Manual for the Selection of Optimal Maintenance Levels of Service (See No. 223)	Woodward-Clyde Consultants	81	9.20	1984
280	Guidelines for Evaluation and Repair of Damaged Prestressed Concrete Bridge Members (See No. 226)	George O. Shanafelt & Willis B. Horn	84	9.20	1985
281	Joint Repair Methods for Portland Cement Concrete Pavements - Design and Construction Guidelines	University of Illinois	83	9.20	1985
285	Evaluating Alternative Maintenance Strategies	ARE Inc.	86	10.40	1985
293	Methods of Strengthening Existing Highway Bridges	Iowa State University	114	12.00	1987
297	Evaluation of Bridge Deck Protective Strategies	University of Washington	80	12.00	1987
304	Determining Deteriorated Areas in Portland Cement Concrete Pavements Using Radar and Video Imaging	Gulf Applied Research	107	14.00	1987
305	Environmental Monitoring and Evaluation of Calcium Magnesium Acetate (CMA)	University of Washington	160	13.60	1987
310	Dealing with Hazardous Waste Sites - A Compendium for Highway Agencies	HMM Associates	107	12.00	1988
312	Condition Surveys of Concrete Bridge Components - User's Manual	New Mexico State University	84	11.00	1987
314	Performance of Weathering Steel in Bridges (See No. 272)	Sheladia Associates, Inc.	98	16.00	1988
321	Welded Repair of Cracks in Steel Bridge Members	The Welding Institute	46	8.00	1989
334	Improvement in Data Acquisition Technology for Maintenance	The Urban Institute	**	**	1990
(b) NCHRP Synthesis of Highway Practice (Project 20-5)		Transportation Research Board			
1	Traffic Control for Freeway Maintenamce		47	2.20	1969
9	Pavement Rehabilitation - Materials and Techniques		41	*	1972
10	Recruiting, Training, and Retaining Maintenance and Equipment Personnel		35	*	1972
11	Development of Management Capability		50	*	1972

TABLE 3 - Continued

No.	Title	Research Agency	Pages	Cost ($)	Year
(b) NCHRP Synthesis of Highway Practice (Project 20-5), continued					
12	Telecommuntcations Systems for Highway Administration and Operations		39	2.80	1972
19	Design, Construction, and Maintenance of PCC Pavement Joints		40	*	1973
20	Rest Areas		38	3.60	1973
24	Minimizing Deicing Chemical Use		58	*	1974
25	Reconditioning High-Volume Freeways in Urban Areas		56	4.00	1974
30	Bituminous Emulsions for Highway Pavements		76	*	1975
31	Highway Tunnel Operations		29	3.20	1975
36	Instrumentation and Equipment for Testing Highway Materials, Products, and Performance		70	4.80	1976
45	Rapid-Setting Materials for Patching of Concrete		13	*	1977
46	Recording and Reporting Methods for Highway Maintenance Expenditures		35	3.60	1977
52	Management and Selection Systems for Highway Maintenance Equipment		17	4.40	1978
54	Recycling Materials for Highways		53	*	1978
56	Joint-Related Distress in PCC Pavement - Cause, Prevention, and Rehabilitation		36	5.20	1979
58	Consequences of Deferred Maintenance		24	4.40	1979
60	Failure and Repair of Continuously Reinforced Concrete Pavement		42	5.60	1979
64	Bituminous Patching Mixtures		26	4.80	1979
76	Collection and Use of Pavement Condition Data		74	8.00	1981
77	Evaluation of Pavement Maintenance Strategies		56	7.40	1981
80	Formulating and Justifying Highway Maintenance Budgets		49	7.20	1981
86	Effects of Traffic-Induced Vibrations on Bridge Deck Repairs		40	6.80	1981
88	Underwater Inspection and Repair of Bridge Substructures		77	7.60	1981
92	Minimizing Reflection Cracking of Pavement Overlays		38	6.80	1982
94	Photologging		38	6.80	1982
98	Resealing Joint and Cracks in Rigid and Flexible Pavements		62	7.20	1982
99	Resurfacing with Portland Cement Concrete		90	*	1982
106	Practical Guidelines for Minimizing Tort Liability		40	6.80	1983
110	Maintenance Management Systems		48	8.00	1984
114	Management of Traffic Signal Maintenance		134	10.80	1984
118	Detecting Defects and Deterioration in Highway Structures		52	8.00	1985
123	Bridge Design to Reduce and Facilitate Maintenance and Repair		65	8.40	1985
125	Maintenance Activities Accomplished by Contract		42	8.00	1986
126	Equipment for Obtaining Pavement Condition and Traffic Loading Data		118	11.20	1986
134	D-Cracking of Concrete Pavements		34	7.60	1987
138	Pavement Markings: Materials and Application for Extended Life		45	8.00	1988
148	Indicators of Quality in Maintenance		114	11.00	1989
153	Evolution and Benefits of Preventative Maintenance Strategies		69	9.00	1989
157	Maintenance Management of Street and Highway Signs		134	12.00	1990
162	Signing Polices, Procedures, Practices, and Fees for Logo and Tourist-Oriented Directional Signing		41	8.00	1990
163	Innovative Strategies for Upgrading of Personnel in State Transportation Departments		35	7.00	1990
170	Managing Urban Freeway Maintenance		**	**	1990
(c) NCHRP Research Results Digest					
48	Surface Condition Rating System for Bituminious Pavement	University of Minnesota	24	1.50	1974
85	Bridge Deck Repairs	Battelle Columbus Laboratories	22	1.00	1977
100	Safe Conduct of Traffic Through Highway Construction and Maintenance Zones	Transportation Research Board	5	1.00	1978
106	Use of Waste Materials in Highway Construction and Maintenance	Transportation Research Board	2	1.00	1979
169	Rapid Replacement of Portland Cement Concrete Pavement Segments	ARE Inc.	11	4.00	1988

TABLE 3 - Continued

No.	Title	Research Agency	Pages	Cost ($)	Year
(d) NCHRP Legal Research Digests[a] (Project 20-6)		Transportation Research Board			
2	Supplement to Liability of State Highway Departments for Design, Construction, and Maintenance Defects		20	6.00	1988
3	Supplement to Liability of State and Local Governments for Negligence Arising Out of the Installation and Maintenance of Warning Signs, Traffic Lights, and Pavement Markings		10	3.00	1988
4	Supplement to Personal Liability of State Highway Department Officers and Employees		9	3.00	1988
6	Impact of the Discretionary Function Exception on Tort Liability of State Highway Departments		25	6.00	1989
9	Supplement to Liability of State and Local Governments for Snow and Ice Control		11	6.00	1990
10	Supplement to Liability of the State for Injury-Producing Defects in Highway Surface		10	6.00	1990
14	Supplement to Liability of State Highway Departments for Defects in Design, Construction, and Maintenance of Bridges		12	6.00	1990

Copies of the publications listed in Table 3 can be obtained from the Business Office, Transportation Research Board, 2101 Constitution Avenue, NW, Washington, DC 20418. A check or money order payable to the Transportation Research Board must accompany orders totaling $20.00 or less.

* Out of print -- Available in microfiche from the Transportation Research Board. The cost is $8.00 per publication.
** In Publication -- Available in 1990
[a] Supplements and new papers will be published in an Addendum to the 4-volume *Selected Studies in Highway Law*.

TABLE 4 - UNCORRECTED AGENCY FINAL REPORTS

Proj. No.	Title	Year	Research Agency	Availability*
4-14	Coating Systems for Painting Old and New Structural Steel	1981	Georgia Tech Research Corporation	A & B
10-9	Criteria for Need of Seal Coats for Bituminous Pavements	1974	University of Minnesota	B
10-24	Rapid Replacement of PCC Pavement Segments	1988	ARE Inc.	A & B
12-16	Influence of Bridge Deck Repairs on Corrosion of Reinforcing Steel	1977	Battelle Columbus Laboratories	A & B
20-7	Task 8 - Energy and Transportation Systems	1979	California Department of Transportation	B

* A--A copy of the uncorrected draft of the agency's report may be obtained on a loan basis by request to the Director, Cooperative Research Programs, Transportation Researcg Board.
B--Available in microfiche from the Transportation Research Board. The cost is $8.00 per report.

TABLE 5 - AGENCY FINAL REPORTS RECEIVING SPECIAL TREATMENT

Proj. No.	Title	Year	Research Agency	Available From
20-7	Task 18 - Standard Specifications for Highway Bridges	1983	Howard, Needles, Tammen & Bergendoff	AASHTO
20-7	Task 23 - Contracting Policies and Payment Procedures	1984	Bergstralh-Shaw-Newman, Inc.	Sent to Sponsors
20-7	Task 32 - Design and Construction Specifications for Segmental Concrete Bridges	1989	Post-Tensioning Institute	AASHTO
20-7	Task 38 - AASHTO Guidelines for Pavement Management Systems	1990	ARE Inc.	AASHTO
	Task 41 - AASHTO Guide for Recruitment and Retention of Transportation Professionals	1990	Dr. Herb Golden	AASHTO

MATERIALS	ACT	INF
Mtls Supv		✓
Research Supv		copy sent
QC Supv		Copy sent
Geotech		
Prob Dev		Copy sent
Proj Dev		
Pavement		
QC Coord		
Agg & Struc		
Chem & Asph		
Soils & Aspli Mix		
PPMTS		
EIT		
File		

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