

159 **HIGHWAY RESEARCH**
CIRCULAR

Number 159

Subject Classification
Bituminous Materials and Mixes
Construction, General Materials

July 1974

COMMITTEE ACTIVITY
in the
Evaluations, Systems & Procedures
Section of the
Design and Construction of Transportation Facilities Group
Transportation Research Board



Results of the 1973 Questionnaire
on
HIGHWAY APPLICATIONS
OF
NUCLEAR TECHNIQUES

HIGHWAY RESEARCH BOARD

NATIONAL RESEARCH COUNCIL NATIONAL ACADEMY OF SCIENCES - NATIONAL ACADEMY OF ENGINEERING
2101 CONSTITUTION AVENUE, N.W. WASHINGTON, D.C. 20418

GROUP 2
Design and Construction of Transportation Facilities

W. B. Drake, Chairman
Transportation Planning Coordinator
Kentucky Executive Department for
Finance and Administration
Frankfort, Kentucky

Transportation Research Board Staff

W. G. Gunderman, Engineer of Materials and Construction

SECTION H - EVALUATIONS, SYSTEMS & PROCEDURES

Dr. Donald R. Lamb
Professor, Civil and Architectural Engineering
University of Wyoming
Laramie, Wyoming

Committee A2H01 - Nuclear Principles and Applications
C. S. Hughes III, Chairman

Members:

Donald W. Anderson
Philip S. Baker
Percy L. Blackwell
Wayne R. Brown
John C. Cook
Wilbur J. Dunphy, Jr.
C. Page Fisher

Robin P. Gardner, Secretary
Richard L. Grey
Terry M. Mitchell
Harry D. Richardson
Charles H. Shepard
Earl C. Shirley
John Toman

RESULTS OF THE 1973 QUESTIONNAIRE ON HIGHWAY APPLICATIONS OF NUCLEAR TECHNIQUES

Transportation Research Board
Committee A2-H01
Nuclear Principles and Applications
January 1974

INTRODUCTION

The TRB Committee on Nuclear Principles and Applications has endeavored to keep abreast of the progress being made in the development and use of nuclear gauges in the field of highway research and operations. At approximately three-year intervals questionnaires have been sent to the highway or transportation agencies of the 50 states, the Canadian Provinces and of various cities and counties, and to several toll authorities.

This summary reports the response of the 50 state agencies, 7 Canadian Provinces and 19 cities, counties or other authorities. The states reported possession of a total of 1,473 portable surface testing systems. (The word "systems" means a combination of scaler and gauge for a particular testing purpose.) Thirty-one systems were reported from the Canadian agencies and 47 from the other areas surveyed. Four state agencies own more than 100 gauges, with California owning the most systems — 165.

The results of the survey are presented in two parts. Part I is a summary of the replies from the 50 state agencies and Part II concerns the information received from the Canadian Provinces, cities, counties, and miscellaneous authorities.

PART I

RESULTS FROM STATE AGENCIES

Thirty-nine states are using nuclear systems for specification control of the moisture and density of soils and aggregates. Twenty-nine states are using nuclear systems for specification control of the density of bituminous concrete and an additional ten are using the systems for non-specification uniformity checks. The survey indicates that research is still ongoing in both of the above mentioned materials areas.

Additionally, there are 15 states involved in some aspect of measuring asphalt content by nuclear systems.

The data are summarized in Table 1. Figure 1 shows the distribution of the 1,473 portable surface M/D systems.

1962-1964-1967-1970-1973 Comparison

The following data compare the TRB nuclear questionnaire results over the past eleven years.

USA STATE AGENCIES ENGAGED IN NUCLEAR TESTING

<u>1962</u>	<u>1964</u>	<u>1967</u>	<u>1970</u>	<u>1973</u>
56%	74%	94%	100%	100%

NUCLEAR TESTING USED FOR SPECIFICATION MATERIALS CONTROL

<u>1962</u>	<u>1964</u>	<u>1967</u>	<u>1970</u>	<u>1973</u>
14%	24%	56%	70%	88%

Table 1

Tabulation of State Agencies

STATE	Portable	Asphalt Content	Specification Control	
	Surface M/D Systems	Devices	Moist. Den.	Bit.
Alabama	37	0	X	X
Alaska	13	2	X	R
Arizona	22	0	R	X
Arkansas	1	0	N	N
California	165	1	X	R
Colorado	44	1	X	X
Connecticut	20	0	X	X
Delaware	10	0	X	X
Florida	116	1	X	X
Georgia	50	0	X	X
Hawaii	2	0	-	X
Idaho	10	0	X	X
Illinois	38	0	X	R
Indiana	35	*	X	X
Iowa	12	0	X	X
Kansas	5	0	-	X
Kentucky	24	*	X	N
Louisiana	51	0	X	N
Maine	2	0	X	N
Maryland	6	1	-	-
Massachusetts	1	0	X	N
Michigan	15	*	X	N
Minnesota	10	0	-	X
Mississippi	17	0	X	R
Missouri	1	0	R	-
Montana	60	0	X	X
Nebraska	5	1	N	N
Nevada	7	0	X	R
New Hampshire	3	0	X	N
New Jersey	9	0	X	R
New Mexico	9	0	X	X
New York	2	0	R	N
North Carolina	30	1	X	-
North Dakota	18	0	X	X
Ohio	40	0	X	N
Oklahoma	4	0	X	-
Oregon	12	0	X	X
Pennsylvania	141	2	X	X
Rhode Island	5	0	X	X
South Carolina	9	0	X	X
South Dakota	18	*	R	X
Tennessee	65	0	X	X
Texas	21	2	X	X
Utah	55	0	X	X
Vermont	4	0	X	X
Virginia	125	1	X	X
Washington	4	0	N	-
West Virginia	77	1	X	X
Wisconsin	24	0	X	X
Wyoming	19	0	X	X
Total	1473	14		

*Surface moisture gauge used for A. C. determination.

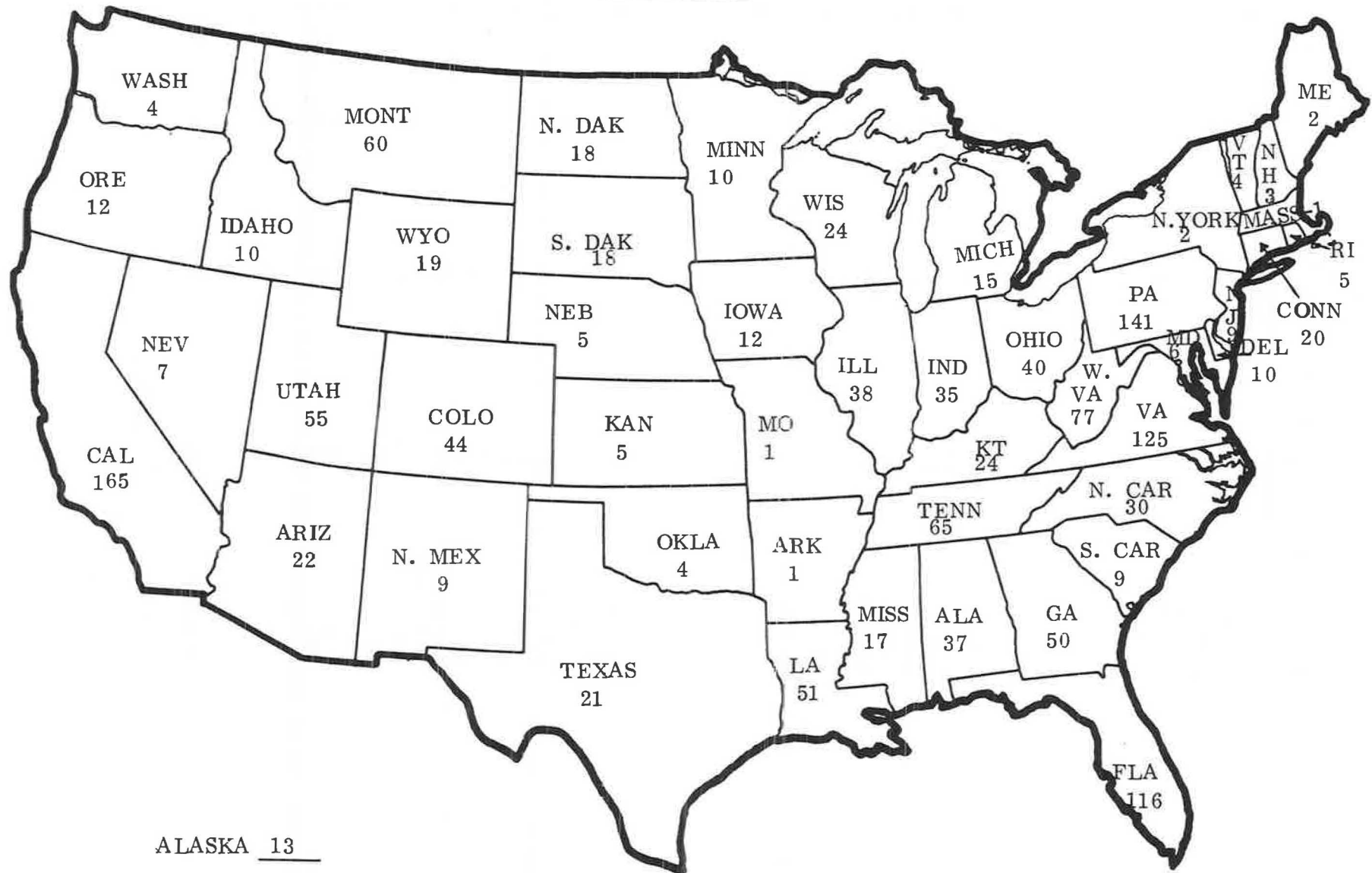
N - non specification usage.

R - research.

FIGURE 1. USA STATE HIGHWAY DEPARTMENTS

NUCLEAR SURFACE M/D SYSTEMS IN USE — 1973

TOTAL 1473



ALASKA 13

HAWAII 2

PART II

RESULTS FROM CANADIAN PROVINCES, CITIES, COUNTIES, ETC.

Five of the seven Canadian Provinces replying indicated they are using nuclear systems for specification control of the moisture and density of soils and aggregates and three are using them for specification control of bituminous concrete.

Of the 19 cities, counties and miscellaneous authorities reporting nuclear systems 16 are using them for specification control of soils and aggregates and 11 for bituminous concrete.

The results of this part of the survey are tabulated in Table 2.

Table 2

Tabulation of Canadian Provinces, Cities, Counties, Etc.				
Canadian Provinces	Portable	Asphalt	Specification Control	
	Surface M/D Systems	Content Devices	M/D	Bit.
Alberta	5	1	X	-
British Columbia	1	0	N	-
Manitoba	1	0	R	R
New Brunswick	1	0	X	-
Newfoundland	2	0	X	X
Ontario	17	1	X	X
Saskatchewan	4	1	X	X
Totals	31	3		
Cities, Counties, Misc. Authorities				
Baltimore, Md.	3	0	-	-
Cook Co., Ill.	5	0	X	N
Detroit, Mich.	1	0	R	R
Columbus, Ohio	1	0	X	X
King Co., Wash.	3	0	X	-
Los Angeles Co., Cal.	3	0	X	-
Milwaukee Co., Wisc.	1	0	X	X
Multnomah Co., Ore.	2	0	X	X
New Jersey Turnpike Auth.	4	0	X	X
Ottawa, Ontario	1	0	N	N
Port Auth. of N. Y. & N. J.	4	0	X	X
Ramsey Co., Minn.	1	0	X	X
Sacramento Co., Cal.	2	0	X	-
San Antonio, Texas	4	0	X	X
San Diego, Cal.	2	*	X	X
San Diego Co., Cal.	3	0	X	X
Seattle, Wash.	1	0	X	R
Suffolk Co., N. Y.	2	0	X	X
Wayne Co., Mich.	4	0	X	X
Total	47	0		

*Surface moisture gauge used for A. C. determination.

N - non specification usage.

R - research.