173

TRANSPORTATION RESEARCH

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FIXED HIGHWAY LIGHTING QUESTIONNAIRE NO. II SUMMARY

subject areas
22 highway design
40 general maintenance
51 highway safety
53 traffic control and operations

Highway Research Circular 149, published in October 1973, contained extensive information about current and proposed design and operational practice in fixed highway lighting. The information was obtained from 49 responses to Questionnaire No. I, sent to the 50 states, the District of Columbia, and Puerto Rico.

With a view toward assessing the usefulness of the data in Circular 149, and in gauging effects of the energy shortage, Questionnaire No. II was prepared by the same Visibility Committee Subcommittee chaired by Ralph R. Lau. The results are presented herein, and should be of interest to researchers and practitioners concerned with street lighting and energy conservation. Again, the response summaries are presented without critical comment, except to observe here that the very limited responses to questions 9 through 14 may suggest the need for extensive study of the effects of some responses to energy shortages. It is hoped that the limited studies reported here simply reflect the timing of the questionnaire, perhaps too early for definitive study to have been started. Individual State responses to Questions 1-8 and 15-16 appear in the Appendix.

The efforts of those in the 48 states and the District of Columbia who responded are also gratefully acknowledged by us and by Visibility Committee Chairman Albert Burg.

FIXED HIGHWAY LIGHTING QUESTIONNAIRE NO. II SUMMARY (49 RETURNS)

Question 1. Are you familiar with the first questionnaire and the results which were published in Circular 149? What is your opinion of the overall information that was made available to you?

Response. Useful, 34 percent; interesting, 46 percent; no value, 2 percent; and not familiar, 18 percent.

Question 2. What changes, if any, have been made in your highway lighting practices since December 1972?

Response. Eighty percent of the states made changes since December 1972.

Question 3. If you have made changes in your highway lighting practices since December 1972, to what were they attributable?

Response. Highway lighting questionnaire results, 2 percent; energy shortage 54 percent; new research findings, 12 percent; and other, 32 percent.

Question 4. If no changes have been made in your highway lighting practices since December 1972, what changes, if any, do you plan to make in the near future?

Response. Of the 20 percent who made no changes, half plan to make changes in the near future and half do not plan to make any changes.

Question 5. To what are these proposed practice changes attributable?
Response. Of the 10 percent who plan to make changes in the near future, changes are due to: energy shortage, 43 percent; new research findings, 29 percent; and other, 28 percent.

Question 6. Do your future highway lighting plans include:
Response. High Mast Lighting: more, 63 percent; less, 12 percent; none, 17 percent; same, 6 percent; and no indication, 2 percent. Lamps: mercury vapor, 18 percent; metal halide, 14 percent; HPS, 61 percent; and LPS, 7 percent.

Question 7. Did you turn out any existing highway lighting due to the energy shortage?
Response. Yes, 51 percent; No, 49 percent.

Question 8. Have you since re-energized any or all of the lights that were turned out?
Response. Yes, 73 percent; No, 27 percent.

Question 9. Have you made an evaluation to show what changes resulted from turning out the lights?
Response. Georgia - yes;
Maine - yes;
Tennessee - no (While no data were compiled, observation indicated a decrease in accidents); and
Virginia - yes.

Question 10. If "yes", please describe the results of your evaluation.
Response. Georgia - An in-house evaluation, covering a period of one month with the lights on and one month with the lights off, was conducted on a two-mile section of interstate highway. There was very little difference in the percentage of night accidents during the period. The results of this evaluation were inconclusive due to the short period of evaluation.
Maine - Accident statistics were reviewed and relatively no change was noted.
Virginia - Darkness/daylight accident ratios for the same sections of roadway for three months were as follows: before lighting turned off, 1:1; after lighting turned off, 2:1.

Question 11. If an accident study was made, do you have data showing a change in the night time accident rate after the lights were turned out?
Response. Georgia - See Question 10 above;
Maine - no; and
Virginia - yes, 9.0 percent increase.

Question 12. What method of controlling for concurrent changes in traffic volume and speed were employed?
Response. Georgia - By using control sections without lighting;
Maine - by using control sections without lighting; and
Virginia - by using the daytime accident data from the same roadway sections.

Question 13. If you can estimate what proportion of the change in the night time accident rate was attributable to the reduction in lighting, as opposed to the reduced speeds and/or traffic volumes, please specify.

Response. Georgia - No answer;
Maine - 0; and
Virginia - see Questions 10 and 11 above.

Question 14. Could we obtain copies of your test data and reports if desired?
Response. Georgia - No;
Maine - none prepared; and
Virginia - yes: Mr. Marvin Hilton, Research Analyst, Box 3817, University Station, Charlottesville, Virginia 22903.

Question 15. Were any other practices of energy reduction, such as turning out building lights, lowering thermostat settings, etc., instituted in your state's facilities since December 1972?
Response. Yes, 98 percent; No, 2 percent.

Question 16. If "yes", are any of these measures still in effect?
Response. Yes, 94 percent; No, 6 percent.

APPENDIX

Question 1 Response: Opinion of Circular 149?

State	Useful	Interesting	No Value	Not familiar with Circular 149
Alabama	X			
Alaska				X
Arizona		X		
Arkansas				X
California		X		
Colorado	X			
Connecticut	X			
Delaware		X		
Florida	X			
Georgia				X
Hawaii		X		
Idaho		X		
Illinois		X		
Indiana		X		
Iowa	X			
Kansas	X			
Kentucky		X		
Louisiana		X		
Maine				X
Massachusetts		X		
Michigan				X
Minnesota	X	X		
Mississippi	X			
Missouri		X		
Montana		X		
Nebraska		X		
Nevada				X
New Hampshire		X		
New Jersey		X		
New Mexico		X		
New York		X		
N. Carolina		X		
N. Dakota		X		
Ohio		X		

Question 1 Response (continued)

State	Useful	Interesting	No Value	Not familiar with Circular 149
Oklahoma	X			
Oregon				X
Pennsylvania	X			
S. Carolina				X
S. Dakota	X			
Tennessee			X	
Texas	X			
Utah	X			
Vermont		X		
Virginia	X			
Washington	X			
W. Virginia	X			
Wisconsin				X
Wyoming	X			
Dist. of Columbia		X		

Question 2 Response: Changes in Lighting Practice since December 1972?

State	Comments
Alabama	None
Alaska	Lighting urban intersections on FAP and FAS system approved with safety justification
Arizona	Using HPS on new systems; revised rural area lighting policy to provide lighting more in line with need (volumes)
Arkansas	Using HPS, "Interstate" luminaire; possibly lower illumination levels in accordance with AASHTO criteria
California	Reduced lighting on new projects; using 400 ^{W}MV in lieu of 700^{W}
Colorado	None
Connecticut	Introduction of HPS
Delaware	Increase from 30' MH to 40' MH and above
Florida	Increased use of HPS at 40' - 50' MH
Georgia	Using more HPS luminaires and lower wattage lamps; plan to use "Interstate" luminaire with 35' setback from edge of pavement
Hawaii	Using more HPS; converting incandescent to MV or HPS; designing to lower illumination level (1.0 fc initial)
Idaho	250^{W} HPS at 40' MH installed on urban sections
Illinois	None
Indiana	Design to 0.6 fc where UR permits
Iowa	Using HPS almost exclusively on conventional and HM lighting; tendency toward 50' MH for conventional lighting
Kansas	Just started using HPS
Kentucky	Changed type of light source
Louisiana	Trend toward higher mounting heights and use of HPS lamps
Maine	Approximately 50 percent of lighting has been removed
Massachusetts	Exclusive use of HPS lamps
Michigan	Using HPS; 1000^{W} and 400^{W} MV replaced with 400^{W} and 250^{W} HPS; designing to 0.6 maint. fc and max. UR of 4:1
Minnesota	Using HPS lights on many projects; designing to 0.6 fc maintained with UR of 3:1 to 4:1
Mississippi	More use of HPS
Missouri	Generally turn out lights at midnight and turn on at 6 AM on limited access highways; exceptions are high crime areas, etc.
Montana	Using almost all HPS on new lighting

Question 2 Response (continued)

State	Comments
Nebraska	All conventional lighting using HPS; a few installations under design using LPS
Nevada	Turned out 20 percent of each high mast assembly
New Hampshire	Reduced lighting levels considered when due to reduced traffic volume and speed; 250W lamps substituted for 400W lamps
New Jersey	Plan more HM lighting; converting incandescent to new HID lamps reduced new lighting on land service roadways
New Mexico	None
New York	None
N. Carolina	Designing more HM lighting and lower mounting heights w/HPS
N. Dakota	Installing sodium vapor luminaires
Ohio	Asymmetric distribution f/continuous HM lighting; HM lighting in rest areas; lighting berms to 1/2 intensity of mainline roadway
Oklahoma	No major changes
Oregon	Reduced lighting to 0.6 fc maintained w/4:1 Avg/Min UR
Pennsylvania	HM lighting; exclusive use of HPS; up to and including 50' MH for conventional lighting; use of "Interstate" luminaire
S. Carolina	None
S. Dakota	Using more HPS luminaires
Tennessee	None
Texas	Changed lighting standards to use more efficient HPS
Utah	None, more conservative in number and projects
Vermont	Avoid street lighting if possible
Virginia	HM lighting under contract
Washington	Specify HPS, Halide and some LPS instead of MV; as "time of night" function, reduce from complete to partial interchange lighting
W. Virginia	Using more HPS
Wisconsin	10 percent of lighting turned off to conform to energy conservation practices
Wyoming	New type pole breakaway facilities to be incorporated sometime during 1975
Dist. of Columbia	None

Question 3 Response: Reason for changed practice?

State	Highway Lighting Question-naire Results	Energy Shortage	New Research Findings	Other	N/A	Comments
Alabama					X	
Alaska		X		X		Interest in improved lighting to reduce accidents
Arizona		X	X			Research and development on new light sources
Arkansas		X	X			No comments
California		X				Reduced funding by gas tax because of reduced travel
Colorado					X	
Connecticut		X				Increase in lumen output w/approx 1/w the electrical energy

Question 3 Response (continued)

State	Highway Lighting Question-naire Results	Energy Shortage	New Research Findings	Other	N/A	Comments
Delaware	X	X				No comments
Florida		X		X		Improved economics of HPS system
Georgia		X		X		Improved economics and reliability of HPS luminaires
Hawaii		X				No comments
Idaho				X		Cost factors plus energy savings
Illinois				X		
Indiana					X	
Iowa		X		X		Improvements in HPS lamps and increased costs
Kansas				X		Can get FHWA participation only on HPS lamps
Kentucky				X		Efficiency of light source
Louisiana		X		X		Material shortages
Maine		X		X		Reduction in operating funds
Massachusetts		X				No comments
Michigan		X		X		Trends in recommended practice
Minnesota		X	X	X		Conform to FHWA notice; time clock controls in rest areas
Mississippi		X				No comments
Missouri		X				No comments
Montana		X				No comments
Nebraska			X	X		New LPS sources; FEO guidelines; own research
Nevada		X				No comments
New Hampshire		X				No comments
New Jersey		X		X		Budget restrictions; maintenance considerations prompted HM
New Mexico					X	
New York					X	
N. Carolina		X				No comments
N. Dakota		X				No comments
Ohio		X		X		HM lighting used for continuous and rest area lighting
Oklahoma					X	
Oregon		X				Some HM lighting reduced by turning off 1 in 6
Pennsylvania		X		X		Improved lumen output, life and economics of HPS lamp; new luminaires

Question 3 Response (continued)

State	Highway Lighting Question-naire Results	Energy Shortage	New Research Findings	Other	N/A	Comments
S. Carolina					X	
S. Dakota				X		Development of better lamps and luminaires by the industry
Tennessee					X	
Texas		X				HPS was being studied prior to the energy shortage
Utah		X	X	X		Economy and research findings showing no. of lights can be excessive
Vermont				X		Energy costs - paid from road maintenance money
Virginia		X	X			HPS efficiency; good UR w/HM lighting; new type luminaires
Washington		X				No comments
W. Virginia		X	X			No comments
Wisconsin		X				No comments
Wyoming				X		Results from other states
Dist. of Columbia					X	

Question 4 Response: Changes planned?

State	None	N/A	Comments
Alabama	X		
Alaska		X	
Arizona		X	
Arkansas		X	
California		X	
Colorado	X		
Connecticut		X	
Delaware		X	
Florida		X	
Georgia		X	
Hawaii		X	
Idaho		X	
Illinois	X		
Indiana	X		
Iowa		X	
Kansas		X	
Kentucky		X	
Louisiana		X	
Maine		X	
Massachusetts		X	
Michigan		X	

Question 4 Response (continued)

State	None	N/A	Comments
Minnesota			Considering warrant changes for partial interchange lighting and for continuous lighting
Mississippi		X	
Missouri		X	
Montana		X	
Nebraska		X	
Nevada	X		
New Hampshire		X	
New Jersey		X	
New Mexico	X		
New York			Plan to evaluate NCHRP Report 152 and analyze effects of lighting reduction program; may lead to change
N. Carolina		X	
N. Dakota		X	
Ohio		X	
Oklahoma			Use of more MV sign lights; possibly use new "Interstate" luminaire
Oregon			Plan to continue to down grade the amount of lighting
Pennsylvania		X	
S. Carolina			Plan to try the "Interstate" luminaire
S. Dakota		X	
Tennessee			Make more use of HPS light sources
Texas		X	
Utah	X		
Vermont		X	
Virginia		X	
Washington		X	
W. Virginia		X	
Wisconsin		X	
Wyoming		X	
Dist. of Columbia			Plan to use higher efficiency lamps, such as HPS, and higher mounting heights for increased pole spacing

Question 5 Response: Reason for planned changes?

State	Highway Lighting Questionnaire Results	Energy Shortage	New Research Findings	Other	N/A	Comments
Alabama					X	
Alaska					X	
Arizona					X	
Arkansas					X	
California					X	
Colorado					X	
Connecticut					X	
Delaware					X	
Florida					X	
Georgia					X	
Hawaii					X	

Question 5 Response (continued)

State	Highway Lighting Question-naire Results	Energy Shortage	New Research Findings	Other	N/A	Comments
Idaho					X	
Illinois					X	
Indiana					X	
Iowa					X	
Kansas					X	
Kentucky					X	
Louisiana					X	
Maine					X	
Massachusetts					X	
Michigan					X	
Minnesota		X				
Mississippi					X	
Missouri					X	
Montana					X	
Nebraska					X	
Nevada					X	
New Hampshire					X	
New Jersey					X	
New Mexico					X	
New York		X	X			NCHRP Report 152
N. Carolina					X	
N. Dakota					X	
Ohio					X	
Oklahoma				X		New products
Oregon		X				
Pennsylvania					X	
S. Carolina			X			New products
S. Dakota						
Tennessee		X				
Texas					X	
Utah					X	
Vermont					X	
Virginia					X	
Washington					X	
W. Virginia					X	
Wisconsin					X	
Wyoming					X	
Dist. of Columbia		X		X		Reduce energy and maintenance costs

Question 6 Response: Future plans include high mast, etc.?

State	High Mast Lighting			Lamps				Comments
	More	Less	None	MV	MH	HPS	LPS	
Alabama	X					X		
Alaska	X					X	X	
Arizona	X					X		
Arkansas	X					X		
California		X				X		
Colorado		X		X	X	X		
Connecticut	X					X		
Delaware	X					X		
Florida	X					X		
Georgia	X			X	X	X		
Hawaii			X	X		X		
Idaho			X			X		
Illinois	X					X		
Indiana	X					X		
Iowa		X				X	X	LPS on a very limited basis
Kansas	X					X		
Kentucky			X			X	X	
Louisiana	X					X		
Maine		X			X			
Massachusetts	X					X		
Michigan	X				X	X		
Minnesota		X		X		X		
Mississippi	X					X		
Missouri	X					X		
Montana			X			X		
Nebraska	X				X	X	X	
Nevada			X	X				
New Hampshire	X			X	X	X	X	
New Jersey	X			X		X		
New Mexico	X			X		X		
New York	X					X		
N. Carolina	X					X		
N. Dakota				X		X		Same amount of HM lighting
Ohio	X			X	X	X		
Oklahoma					X	X		Future use of HM same as present
Oregon		X				X		
Pennsylvania	X					X		
S. Carolina			X			X		
S. Dakota	X					X		
Tennessee	X					X		
Texas								No change in HM lighting or lamps
Utah			X			X		
Vermont			X	X		X		
Virginia	X			X		X		
Washington	X			X	X	X		
W. Virginia	X					X		
Wisconsin	X					X		
Wyoming	X				X			
Dist. of Columbia						X		No indication for HM lighting

Question 7 Response: Lighting turned out?

State	Yes	No	Percent	Date	Comments
Alabama		X			
Alaska	X		75	11/73	Most continuous lighting deleted; some intersection lighting retained
Arizona	X		20	5/74	
Arkansas		X			
California	X		17	5/75	
Colorado		X			
Connecticut	X		33	3/74	Some on mainline and every other light on ramps
Delaware	X		10	11/73	
Florida	X		30		Date unknown
Georgia	X		9	12/73	
Hawaii		X			Plans made to turn out lights if situation becomes critical again
Idaho		X			Safety was considered more important; city lighting not turned off either
Illinois	X		<1		Date unknown
Indiana		X			
Iowa	X		50+	11/73	
Kansas		X			
Kentucky		X			
Louisiana		X			
Maine	X		50	12/73	
Massachusetts		X			
Michigan		X			Lighting retained in interest of safety
Minnesota	X		43	1/74	Number of lights used in partial lighting reduced from 16-18 to 6-8; rural areas
Mississippi	X		10	9/73	
Missouri	X		11	1/74	
Montana		X			Plans were made but not implemented to turn out 1/2 of interstate lighting
Nebraska		X			
Nevada	X		20	Mid'74	Turned out one of five 1000^{W} lamps on each of (25) 100' towers
New Hampshire	X		50		Fourth quarter 1973
New Jersey		X			Only minimum number of lights installed, therefore none extinguished
New Mexico		X			
New York	X		1	12/73	
N. Carolina		X			All lighting designed to .6 - .8 fc as warranted by FHWA
N. Dakota		X			
Ohio		X			
Oklahoma		X			Utility companies not adversely affected and did not recommend turning out lights
Oregon	X		50	12/73	Regional engineer controlled this aspect
Pennsylvania	X		50	11/73	Included limited access highways and rest areas
S. Carolina		X			

Question 7 Response (continued)

State	Yes	No	Percent	Date	Comments
S. Dakota		X			Safety considerations prevailed over energy savings
Tennessee	X		50-100	11/74	Only interstate lighting was reduced at request of the State
Texas		X			Two cities responsible for highway lighting turned off some lights
Utah	X		30	10/73	Turned out 1500 lamps
Vermont	X		70	11/73	At interstate rest areas
Virginia	X		50	12/73	Some lighting turned out was designed for future TV surveillance
Washington	X		40	12/74	
W. Virginia		X			Few locations w/lighting; saw no need to turn them off
Wisconsin	X		10	11/73	
Wyoming	X		50	1174	
Dist. of Columbia		X			Safety and security outweigh small energy savings resulting from turning out lights

Question 8 Response: Lighting restored?

State	Yes	No	Percent	Date	N/A	Comments
Alabama					X	
Alaska	X		75			Date varies
Arizona		X				
Arkansas					X	
California		X				
Colorado					X	
Connecticut	X		11	3/75		Turned some lights on at request of State Police
Delaware	X		5	3/75		
Florida	X		80			Date unknown
Georgia	X		100	2/74		
Hawaii					X	
Idaho					X	
Illinois	X					No percentage or date indicated
Indiana					X	
Iowa	X					17 installations remain with reduced lighting
Kansas					X	
Kentucky					X	
Louisiana					X	
Maine	X		5	4/75		Only lights in rest areas were re-energized
Massachusetts					X	
Michigan					X	
Minnesota	X					Less than 170 re-energized at critical locations at different times
Mississippi	X		5	1/75		
Missouri		X				
Montana					X	

Question 8 Response (continued)

State	Yes	No	Percent	Date	N/A	Comments
Nebraska					X	
Nevada		X				
New Hampshire	X		5-10			Spring 1975; public sentiment, off-road accidents, traffic volume increased
New Jersey					X	
New Mexico					X	
New York		X				
N. Carolina					X	
N. Dakota					X	
Ohio					X	
Oklahoma					X	
Oregon	X		40			Fall 1974
Pennsylvania	X		100	6/74		
S. Carolina					X	
S. Dakota					X	
Tennessee	X		100	2/75		
Texas		X				
Utah	X		66	5/75		Turned on 1000 lamps; 500 lamps will be energized in Nov. 1975
Vermont		X				Public has not requested re-energizing except on residential city streets
Virginia	X		40	1/75		
Washington	X					No percentage or date given; operate at 15 percent power reduction
W. Virginia					X	
Wisconsin	X		2	6/74		
Wyoming	X		50	1/75		
Dist. of Columbia					X	

Question 15 Response: Energy use reductions other than lighting ?

State	Yes	No	Comments
Alabama	X		
Alaska	X		
Arizona	X		
Arkansas	X		
California	X		
Colorado	X		
Connecticut	X		
Delaware	X		
Florida	X		
Georgia	X		
Hawaii	X		
Idaho		X	
Illinois	X		
Indiana	X		
Iowa	X		
Kansas	X		
Kentucky	X		
Louisiana	X		

Question 15 Response (continued)

State	Yes	No	Comments
Maine	X		
Massachusetts	X		
Michigan	X		
Minnesota	X		
Mississippi	X		
Missouri	X		
Montana			No indication
Nebraska	X		
Nevada	X		
New Hampshire	X		
New Jersey	X		
New Mexico	X		
New York	X		
N. Carolina	X		
N. Dakota	X		
Ohio	X		
Oklahoma	X		
Oregon	X		
Pennsylvania	X		
S. Carolina	X		
S. Dakota	X		
Tennessee	X		
Texas	X		
Utah	X		
Vermont	X		
Virginia	X		
Washington	X		
W. Virginia	X		
Wisconsin	X		
Wyoming	X		
Dist. of Columbia	X		

Question 16 Response: Reductions still in effect?

State	Yes	No	Comments
Alabama	X		Lights turned off between work hours and clean up time; thermostats adjusted to save fuel
Alaska	X		Many building lights turned out; maintenance relaxed; bldg. temps reduced; state travel reduced; small engines
Arizona	X		
Arkansas	X		
California	X		
Colorado	X		Turned out building lights; lowered thermostat settings
Connecticut	X		
Delaware	X		
Florida	X		Reduced hallway lighting; complete shutdown
Georgia	X		Corridor lighting reduced by turning off several lights in each corridor
Hawaii	X		Unnecessary lights turned off; higher thermostat settings for air conditioning systems
Idaho		X	

Question 16 Response (continued)

State	Yes	No	Comments
Illinois	X		
Indiana	X		Lower thermostat settings for heating and higher for cooling; reduced hallway lighting
Iowa		X	
Kansas	X		Lower thermostat settings
Kentucky	X		Lowered thermostats; turned off some interior lights
Louisiana	X		Some building lighting turned off; thermostat settings lowered in winter and raised in summer
Maine	X		Lower heating; less lighting intensity
Massachusetts	X		Reduced elevator usage
Michigan	X		Reduced building lighting; lower thermostat settings in winter, higher during summer
Minnesota	X		1/3 of building lights turned off; facade lights turned off; lower thermostat settings; janitorial work in daytime
Mississippi	X		Office building lights turned off; thermostat settings adjusted to national recommendations; speeds reduced
Missouri	X		Thermostat setting lowered in winter, raised in summer; building lights out after cleaning
Montana			No indication
Nebraska	X		Lowered thermostat settings; speeds reduced; reduced lighting in hallways and non-critical areas
Nevada	X		Building lights were turned off; thermostat settings were lowered
New Hampshire	X		Lower thermostat settings for heating and higher for air conditioning
New Jersey	X		Reduced indoor lighting; lowered building temperatures, reduced use of vehicular equipment
New Mexico		X	
New York	X		
N. Carolina	X		
N. Dakota	X		
Ohio	X		
Oklahoma	X		
Oregon	X		Lower temperature settings; reduced lighting in non-work areas
Pennsylvania	X		Reduced corridor and office lighting; lower thermostat settings in winter, higher in summer
S. Carolina	X		
S. Dakota	X		Thermostats set at 65-68 degrees; every other hall light turned out
Tennessee	X		
Texas	X		
Utah	X		Limited some vehicle usage; encouraged car pooling among employees
Vermont	X		
Virginia	X		Approx. 50 percent building lights turned out; thermostats 68 degrees in winter, 75 degrees in summer; insulating doors, windows
Washington	X		All energy usage reduced including vehicles
W. Virginia	X		
Wisconsin	X		
Wyoming	X		Some bldg. lights still turned off; thermostat settings lower than before energy shortage
Dist. of Columbia	X		Some bldg. lights turned off; thermostats set to conform to Federal requirements

GROUP 3 - OPERATION AND MAINTENANCE OF TRANSPORTATION FACILITIES
Lloyd G. Byrd, Byrd, Tallamy, MacDonald, and Lewis, chairman

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Questionnaire Subcommittee
Ralph R. Lau, Chairman
Neilon J. Rowan
Richard N. Schwab
Richard E. Stark

K. B. Johns, Transportation Research Board staff

The organizational units and the chairmen and members are as of December 31, 1974.

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NATIONAL RESEARCH COUNCIL
2101 Constitution Avenue, N.W. Washington, D.C. 20418

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