# FIRST ANNUAL REPORT

## SHRP C103 Task 4

## Rapid Repair Techniques

Michael M. Sprinkel, P.E.
Research Scientist

(The opinions, findings, and conclusions expressed in this report are those of the author and not necessarily those of the sponsoring agencies.)

Virginia Transportation Research Council
(A Cooperative Organization Sponsored Jointly by the
Virginia Department of Transportation and
the University of Virginia)

Charlottesville, Virginia

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## PREFACE

This report was prepared and distributed under the authority of Virginia Polytechnic Institute and State University (VPI & SU), the prime contractor for Strategic Highway Project C103 entitled Concrete Bridge Protection and Rehabilitation: Chemical and Physical Techniques. The report was prepared at the Virginia Transportation Research Council (VTRC) to partially satisfy the requirements of a subcontract between the VPI & SU and the VTRC. A VTRC title page was prepared to properly include the report in the Council's bound volumes.

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# SHRP C-103 TASK 4 FIRST YEAR ANNUAL REPORT

## INTRODUCTION

The objective of task four is to develop technically and economically feasible methods of concrete bridge deck protection, rehabilitation, and replacement. The objective of the task will be accomplished through a progression of six subtasks. The subtasks include:

- State-of-the-Art Review.
- Data reduction, analysis and comparison of alternatives.
- Refinement of details for selected installations.
- Selection of sites and development of special provisions.
- Evaluation of installations.
- Preparation of field guide manual.

The first year work plan included the initiation of the State-of-the-Art Review. Approximately 68% of the first year work plan was completed during the first year. Thus, the 54 month task is about 32% behind schedule which is a result of problems which occurred in the signing of the first year subcontract with VDOT. However, the proposed second year contract was revised and the project will be back on schedule at the end of the second contract year. It needs to be pointed out that Task 4 being behind schedule will not affect the progress of the other project tasks.

The results of the first year research work is primarily based on the response to questionnaires sent to State DOT's, Canadian Provinces, Thruway Authorities, $T^2$ Centers, material suppliers (See Appendix A). The results of the study are based on the outline on rapid repair techniques presented in Appendix B.

## RESPONSE TO and ANALYSIS OF QUESTIONNAIRES

The questionnaires were designed to identify techniques to obtain information on the time required for and the cost of traffic control, surface preparation and placing and curing materials and the service life of the techniques. The intent of the questionnaire sent to the material suppliers was to obtain detailed information that can be used to refine selected techniques.

The response sent to the state DOTs and the Canadian Provinces wa very good. The response by the other transportation agencies was not very good but provides some additional data.

The principal problem with some of the responses by the DOTs and Canadian Provinces was unreasonable and incomplete data. To make use of the available data the following procedure was used.

1. Examine the data for blank entries and unreasonable totals which are defined as total lane closure times, total costs or service life data that are greater than 3 standard deviations from the average of the other data in the category or total lane closure times that is greater than 21 hours.

2. Make telephone contacts with those that completed the questionnaire and try to fill in the blanks and to revise the unreasonable data.

3. Reexamine the data and delete the entries that have unreasonable totals.

4. Examine traffic control time data for time required to set up and remove traffic control. If space is blank or time for traffic control = total time, fill in the space with a traffic control time that equals the average traffic control time for the category and reduce the time required for surface preparation and placing and curing materials by one half of the traffic control time.

5. Examine traffic control cost data. If space is blank, compute the average cost of traffic control for the category, fill in the space with the average, and increase the total cost for the entry by the cost of traffic control except where the only data entry is total cost in which case it is assumed the total cost already includes the cost of traffic control. Compute a revised total cost for the category.

6. Examine the data for surface preparation cost and time and placing and curing cost and time and if blanks are found, compute a revised time or cost for both surface preparation and placing and curing materials such that the time or cost of surface preparation and the time or cost of placing and curing materials ae the same percent of the toal as the revised averages for the category.

Techniques Identified

Details of the analysis of the identification of techniques used is presented in Appendix C. As shown, the most used protective system is the bituminous concrete overlay (IA)(23 users). The second most used system is no system (IZ)(21 respon-

dents). Evidently most transportation agencies use the well-known bituminous overlay or no technique at all when the protection system must be installed with lane closures of less than 21 hours. A number of more progressive agencies use high-early strength portland cement concrete overlays (IC), rapid curing penetrating sealers (ID), and polymer overlays (IE). It is likely that use of these systems will increase as the technology is transferred and experience is gained.

The most used rehabilitation techniques are patching with high-early strength portland cement (IID)(27 users) and no technique (IIZ)(21 respondents). Patching with bituminous concrete (IID) was cited by 8 users, patching with other materials (IIF) by 9 users, patching with polymer concrete (IIE) by 3 users and application of a crack sealer (IIA) by 2 users. Patching with bituminous concrete may maintain a deck but it does not rehabilitate a deck. Generally speaking, rehabilitation requires proper surface preparation, patching and the installation of a protective system. However, to simplify the reporting of data, protective systems were not reported as part of rehabilitation.

Very few agencies use rapid replacement techniques as indicated by 33 respondents reporting no technique (IIIZ) and another 10 respondents leaving the space on the questionnaire blank (IIIY). The most used systems are site case portland cement concrete (IIID)(8 users), site cast other hydraulic cement concrete (IIIF)(3 users), precast concrete (IIIB)(2 users), and posttensioned concrete (IIIA)(1 user). Evidently most agencies use a permanent lane closure for replacement.

Technique Time Demands

The response to the questionnaire sent to the DOTs, Canadian Provinces and selected Thruway Authorities provided sufficient data to allow the construction of technique time demand graphs for 14 protection techniques, 13 rehabilitation techniques and 2 replacement techniques. The graphs show the time required to set up and remove traffic control, prepare the surface, and place and cure the material. Details of results are presented in Appendix C.

A bridge deck in need of a rapid repair will usually have one of three maximum lane closure time conditions as follows:

$\leq$ 21 hours - rapid.
$\leq$ 12 hours - very rapid, and
$\leq$ 8 hours - most rapid.

A rapid rapair condition exists when the lane must be opened for about 3 hours each day such as from 3:30 p.m. to 6:30 p.m. or 6:30 a.m. to 9:30 a.m. A very rapid repair condition exists when the lane must be opened during the day such as from 6:00 a.m. to 6:00 p.m. or the lane must be opened at night say from 6:00 p.m.

to 6:00 a.m. A most rapid repair condition exists when the lane must be opened for all but 8 hours each day, i.e., the work must be done between 8:30 a.m. and 4:30 p.m. or more typically from 9:00 p.m. to 5:00 a.m.

The responses to the questionnaire allowed for the construction of 8 technique time demand graphs that satisfy the requirement for a most rapid protection technique and 14 that satisfy the requirement for a very rapid protection technique. However, experience in Virginia has shown that an additional 3 of these 14, polymer concrete overlay (IE), multiple layer polymer concrete overlay (IE1) and premixed polymer concrete overlay (IE2) can satisfy the requirement for a most rapid technique. The response to the questionnaire indiated that of the techniques cited the bituminous concrete overlay on membrane (IA2) requires the most lane closure time (11.7 hours) and bituminous concrete overlay on chipseal (IA5) requires the least time (1.5 hours). Other most rapid protection techniques include application of coating (IB)(5.5 hours), application of penetrating sealer (ID)(6.1 hours), application of other hydraulic cement overlays (IF)(7.55 hours), and application of high-early strength portland cement concrete overlay (IC)(8.0 hours).

The responses to the questionnaire allowed for the construction of 6 technique time demand curves that satisfy the requirement for a most rapid rehabilitation technique, 11 that satisfy the requirement for a very rapid rehabilitation technique and 13 that satisfy the requirement for a rapid rehabilitation technique. However, experience in Virginia has shown that 4 additional techniques of the 11, patching with high-early strength cement (IID), patching with rapid hardening cementitious materials (IID4), patching with type III cement (IID5), and patching with polyester styrene concrete (IIE5) can satisfy the requirement of a most rapid technique. Also, it is likely that the time required to construct expansion joints and concrete headers (IIB) can be reduced to less than 21 hours. The most rapid techniques include patching with bituminous concrete (IIC)(2.03 hours) patching with polymer concrete (IIE)(6.50 hours), patching with other hydraulic cement concrete (IIF)(7.22 hours) and application of crack healer sealer (IIA)(7.25 hours).

The response to the questionnaire allowed for the construction of 2 technique time demand curves (IIIA and IIIF) that satisfy criteria for a very rapid replacement technique and one (IIID) that satisfies the criteria for a rapid replacement technique.

As more data is obtained, it is likely that some time demand curves will be refined and others will be added.

Cost Distribution Graphs

The response to the questionnaire provided sufficient data to allow the construction of cost distribution graphs for 18

protection techniques, 12 rehabilitation techniques, and 2 replacement techniques (See Appendic C for details). The total cost per $yd^2$ for the techniques ranged from a low $3.27 for the application of a penetrating sealer to a high of $870.50 for the replacement of a deck with site cast hydraulic cement concrete other than portland cement.

The lowest cost protection technique is the application of a penetrating sealer (ID), the lowest cost rehabilitation technique is the application of a crack healer sealer (2A) and the lowest cost replacement technique is site cast high early portland cement concrete (3D).

The costs will be refined as more data is obtained and life cycle costs will be determined once the service life of the technique can be identified.

Service Life Graphs

The response to the questionnaire provide sufficient information to allow the construction of service life graphs for the rapid repair techniques, also presented in Appendix C. The service life ranged from a low of 1.5 years for a bituminous concrete patch (IIC1) to a high of 42 years for precast concrete slabs (IIIB2). The time unit minor repairs (maintenance) are required is also shown and ranged from 0.5 years for an asphalt patch (IIC1) to a high of 24 years for the precast concrete.

## WORK PLANNED NEXT QUARTER

As required by the proposal, the State-of-the-Art review and tabulation of information are the activities to be performed for Task 4 during the first quarter of year two. It is anticipated that the following will be accomplished.

1. The outline on Rapid Methods of Deck Protection, Rehabilitation and Replacement will be updated.

2. The DBASE III software package will be used to store data obtained from questionnaires and literature review and to store summaries and revisions of the data.

3. The data base management system will be revised.

4. The files on properties of materials, material suppliers, consultants, and contractors will be refined.

5. Arrangements will be made to test rapid setting patching materials in the laboratory.

6. An effort will be made to find a bridge upon which to place selected rapid setting patching materials as an overlay.

# APPENDIX A

Questionnaire No. 1, Questionnaire No. 2, and Questionnaire No. 3

DATE: March 8, 1989

TO: SHRP State DOT Coordinators, CSHRP Provincial Coordinators, Selected Thruway Authorities, Cities, Consultants, Material Suppliers, and Contractors.

FROM: Michael M. Sprinkel
Principal Investigator

PROJECT: SHRP Project C-103 - Concrete Bridge Protection and Rehabilitation: Chemical and Physical Techniques

ACTIVITY: Task 4 Questionnaire

Dear Mr.

The objectives of Task 4 (Rapid Repair Techniques) are to identify and to develop technically and economically feasible methods of deck protection, rehabilitation, and replacement that can be used where construction must be rapid. The information obtained for Task 4 will be tabulated, reduced, analyzed, and eventually used to prepare a guide manual containing specifications, special provisions, descriptions, costs, and service life estimates for rapid repair techniques.

For this study, a rapid technique is tentatively defined as one that can be done with one or more lane closures of $\leq$24 hours. Also, techniques cited should be those that are used for the protection, rehabilitation, or replacement of a deck. An epoxy mortar overlay and an asphalt overlay placed on a membrane are examples of rapid protective systems. The removal of chloride contaminated and unsound concrete and the placement of a high early strength cement concrete patch is a rehabilitative system. Deck removal and the subsequent installation of a prestressed, precast concrete deck replacement panel is an example of a replacement system.

The purpose of the questionnaire is to solicit your help in obtaining information on rapid techniques for the protection, rehabilitation, and replacement of bridge decks. Please provide readily available information as requested on the attached four-page form for several of the techniques that are cost-effective or frequently used by your agency.

In addition, I would like to receive copies of specifications, special provisions, reports, literature, and other information that could be used to properly identify and describe a technique. Also, I would appreciate receiving any comments you may have that are not addressed by the questionnaire.

Several of the most cost-effective protective and rehabilitative techniques will be installed in trials for SHRP in the spring of 1992. You should answer "yes" to question 9 on the attached form if you would be interested in providing a site for an installation.

Please return all responses by April 30, 1989, to:

Michael M. Sprinkel
Virginia Transportation Research Council
P. O. Box 3817, University Station
Charlottesville, Virginia 22903
Telephone: (804) 293-1941

SHRP has approved the collection of this information

Thank you.

MMS:amf

cc: SHRP Regional Engineers
G. Williams, C-SHRP
R. Dindio, SHRP
J. Broomfield, SHRP
A. Horosko, SHRP
R. Weyers
H. Newlon, Jr.
H. Brown

Questionnaire No. 1

# QUESTIONNAIRE ON RAPID REPAIR TECHNIQUES FOR BRIDGE DECKS

SHRP C-103, TASK 4

Michael M. Sprinkel

Name: _____

Agency: _____

Phone No.: _____

Date: _____

1. For this questionnaire a rapid technique is tentatively defined as one that can be done with one or more lane closures of ≤24 hours. Do you consider this definition to be acceptable?

   Yes _____ No _____

   If your answer is "No," please provide the definition that you are using when completing this questionnaire.

   _____

   _____

   _____

   _____

2. List the three techniques you most frequently use for the rapid protection, rehabilitation, and replacement of bridge decks.

   A. Protection 1. _____

   2. _____

   3. _____

   B. Rehabilitation 1. _____

   2. _____

   3. _____

   C. Replacement 1. _____

   2. _____

   3. _____

3. Please estimate the time (hours) required for traffic control, surface preparation, and placing and curing materials using these techniques.

| | | Traffic Control | Surface Preparation | Placing and Curing Materials | Total Time | Yds$^2$* |
|---|---|---|---|---|---|---|
| A. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |
| B. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |
| C. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |

* Please indicate the yds$^2$ of deck surface for which the times are estimated.

4. Please estimate the approximate cost per yd$^2$ for traffic control, surface preparation, and placing and curing materials for these techniques.

| | | Traffic Control | Surface Preparation | Placing and Curing Materials | Other | Total* |
|---|---|---|---|---|---|---|
| A. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |
| B. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |
| C. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |

* Please attach copies of bid tabs or engineering estimates.

5. Please estimate the time (years) until some maintenance or major repair will be required using these techniques.

| | | Some Maintenance | Major Repair |
|---|---|---|---|
| A. | 1. | | |
| | 2. | | |
| | 3. | | |
| B. | 1. | | |
| | 2. | | |
| | 3. | | |
| C. | 1. | | |
| | 2. | | |
| | 3. | | |

6. Please cite the principal advantages of these techniques.

A. 1. _____

2. _____

3. _____

B. 1. _____

2. _____

3. _____

C. 1. _____

2. _____

3. _____

7. Please cite the principal disadvantages of these techniques.

   A. 1. _____

      2. _____

      3. _____

   B. 1. _____

      2. _____

      3. _____

   C. 1. _____

      2. _____

      3. _____

8. On a separate sheet of paper, please provide a brief description and additional information on the rapid techniques listed above. (Please attach specifications and reports).

9. Interested in experimental installation for SHRP?

   Yes _____ No _____

Please return all responses by April 30, 1989, to:

Michael M. Sprinkel
Virginia Transportation Research Council
P. O. Box 3817, University Station
Charlottesville, Virginia 22903
Telephone: (804) 293-1941

Thank you.

# COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
TRANSPORTATION RESEARCH COUNCIL
BOX 3817 UNIVERSITY STATION
CHARLOTTESVILLE, 22903

2349

11.8.5

IN REPLY PLEASE
REFER TO FILE NO _____

MEMORANDUM

TO: Directors of T2 Centers

FROM: Mehmet C. Anday

DATE: April 26, 1989

SUBJECT: Publication in Newsletter

Mr. Sprinkel, of our staff, would appreciate it if you could print as much of the attached as possible in your upcoming newsletter.

Should you have questions, please call Mr. Sprinkel at (804) 293-1941.

MCA/bat
Attachment

cc: Dr. Richard Weyers
Mr. Howard Newlon, Jr.
Mr. H. E. Brown
Mr. M. M. Sprinkel ✓

Questionnaire No. 2

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CAN YOU HELP?

The objectives of Task 4 (Rapid Repair Techniques) of SHRP Project C-103 -- Concrete Bridge Protection and Rehabilitation, are to identify and to develop technically and economically feasible methods of deck protection, rehabilitation, and replacement that can be used where construction must be rapid. The information obtained for Task 4 will be tabulated, reduced, analyzed, and eventually used to prepare a guide manual containing specifications, special provisions, descriptions, costs, and service life estimates for rapid repair techniques.

Your help is needed to obtain readily available information for several of the techniques that are cost-effective or frequently used by your agency.

Needed are copies of specifications, special provisions, reports, literature, and other information that could be used to properly identify and describe a technique. Also, it would be appreciated if you could provide answers to the nine questions on the reverse side.

Please return all responses by June 30, 1989, to Mike Sprinkel, whose address is shown on the back.

[PLEASE FOLD AND MAIL]

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QUESTIONS ON RAPID REPAIR TECHNIQUES FOR BRIDGE DECKS

1. A rapid technique is tentatively defined as one that can be done with one or more lane closures of ≤24 hours. Do you consider this definition to be acceptable? Yes _____ No _____

   If your answer is "No," please provide the definition that you are using when answering the following questions.

2. What techniques do you most frequently use for the rapid protection, rehabilitation, and replacement of bridge decks?

3. What is the time (hours) required for traffic control, surface preparation, and placing and curing materials using these techniques?

4. What is the approximate cost per $yd^2$ for traffic control, surface preparation, and placing and curing materials for these techniques?

5. What is the time (years) until some maintenance or major repair will be required using these techniques?

6. What are the principal advantages of these techniques?

7. What are the principal disadvantages of these techniques?

8. Do you have additional information on the rapid techniques listed above? (Please attach specifications and reports).

9. Interested in experimental installation for SHRP? Yes _____ No _____

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# COMMONWEALTH of VIRGINIA

DEPARTMENT OF TRANSPORTATION
TRANSPORTATION RESEARCH COUNCIL
BOX 3817 UNIVERSITY STATION
CHARLOTTESVILLE, 22903

IN REPLY PLEASE
REFER TO FILE NO. _____

11.8.5

MEMORANDUM

DATE: June 7, 1989

TO: Material Suppliers

FROM: Michael M. Sprinkel
Principal Investigator

PROJECT: SHRP Project C-103 - Concrete Bridge Protection and Rehabilitation: Chemical and Physical Techniques

ACTIVITY: Task 4 Questionnaire

Gentlemen:

The objectives of Task 4 (Rapid Repair Techniques) are to identify and to develop technically and economically feasible methods of deck protection, rehabilitation, and replacement that can be used where construction must be rapid. The information obtained for Task 4 will be tabulated, reduced, analyzed, and eventually used to prepare a guide manual containing specifications, special provisions, descriptions, costs, and service life estimates for rapid repair techniques.

For this study, a rapid technique is tentatively defined as one that can be done with one or more lane closures of $\leq$24 hours. Also, techniques cited should be those that are used for the protection, rehabilitation, or replacement of a deck. An epoxy mortar overlay and an asphalt overlay placed on a membrane are examples of rapid protective systems. The removal of chloride contaminated and unsound concrete and the placement of a high early strength cement concrete patch is a rehabilitative system. Deck removal and the subsequent installation of a prestressed, precast concrete deck replacement panel is an example of a replacement system.

The purpose of the questionnaire is to solicit your help in obtaining information on rapid materials for the protection, rehabilitation, and replacement of bridge decks. Please provide readily available information as requested on the attached fourteen-page form for several of the materials that are cost-effective or frequently distributed by your company.

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In addition, I would like to receive copies of specifications, special provisions, reports, literature, and other information that could be used to properly identify and describe a material or technique. Also, I would appreciate receiving any comments you may have that are not addressed by the questionnaire.

Several of the most cost-effective protective and rehabilitative techniques will be installed in trials for SHRP in the spring of 1992. You should answer "yes" to question 29 on the attached form if you would be interested in donating material for an installation.

Please return all responses by July 15, 1989, to:

Michael M. Sprinkel
Virginia Transportation Research Council
P. O. Box 3817, University Station
Charlottesville, Virginia 22903
Telephone: (804) 293-1941

SHRP has approved the collection of this information

Thank you.

MMS:amf

cc: SHRP Regional Engineers
G. Williams, C-SHRP
R. Dindio, SHRP
J. Broomfield, SHRP
A. Horosko, SHRP
R. Weyers
H. Newlon, Jr.
H. Brown

# QUESTIONNAIRE ON RAPID REPAIR TECHNIQUES FOR BRIDGE DECKS

SHRP C-103, TASK 4

Michael M. Sprinkel

Name: _____

Company: _____

Phone No.: _____

Date: _____

1. For this questionnaire a rapid technique is tentatively defined as one that can be done with one or more lane closures of ≤24 hours. Do you consider this definition to be acceptable?

   Yes _____ No _____

   If your answer is "No," please provide the definition that you are using when completing this questionnaire.

   _____

   _____

   _____

   _____

2. List the three materials you most frequently distribute for the rapid protection, rehabilitation, and replacement of bridge decks.

   A. Protection 1. _____

   2. _____

   3. _____

   B. Rehabilitation 1. _____

   2. _____

   3. _____

   C. Replacement 1. _____

   2. _____

   3. _____

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3. Please estimate the time (hours) required for traffic control, surface preparation, and placing and curing these materials (Assume 75°F).

| | | Traffic Control | Surface Preparation | Placing and Curing Materials | Total Time | Yds$^2$* |
|---|---|---|---|---|---|---|
| A. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |
| B. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |
| C. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |

* Please indicate the yds$^2$ of deck surface for which the times are estimated.

4. Please estimate the approximate cost per yd$^2$ for traffic control, surface preparation, and placing and curing these materials.

| | | Traffic Control | Surface Preparation | Placing and Curing Materials | Other | Total* |
|---|---|---|---|---|---|---|
| A. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |
| B. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |
| C. | 1. | | | | | |
| | 2. | | | | | |
| | 3. | | | | | |

* Please attach copies of bid tabs or engineering estimates.

5. Please estimate the time (years) until some maintenance or major repair will be required using these materials.

| | | Some Maintenance | Major Repair |
|---|---|---|---|
| A. | 1. | | |
| | 2. | | |
| | 3. | | |
| B. | 1. | | |
| | 2. | | |
| | 3. | | |
| C. | 1. | | |
| | 2. | | |
| | 3. | | |

6. Please cite the principal advantages of these materials and techniques.

A. 1. _____

2. _____

3. _____

B. 1. _____

2. _____

3. _____

C. 1. _____

2. _____

3. _____

7. Please cite the principal disadvantages of these materials and techniques.

A. 1. _____

2. _____

3. _____

B. 1. _____

2. _____

3. _____

C. 1. _____

2. _____

3. _____

8. Please describe the composition of these materials.

A. 1. _____

2. _____

3. _____

B. 1. _____

2. _____

3. _____

C. 1. _____

2. _____

3. _____

9. Please describe the surface preparation required for these materials.

A. 1. _____

2. _____

3. _____

B. 1. _____

2. _____

3. _____

C. 1. _____

2. _____

3. _____

10. Please indicate the required minimum strength of these materials for opening to traffic, psi

| | | Compressive (ASTM C 39) | Tensile ( )* | Flexural (ASTM C 78) | Bond (ASTM C882) |
|---|---|---|---|---|---|
| A. | 1. | | | | |
| | 2. | | | | |
| | 3. | | | | |
| B. | 1. | | | | |
| | 2. | | | | |
| | 3. | | | | |
| C. | 1. | | | | |
| | 2. | | | | |
| | 3. | | | | |

* Note test method.

11. Please estimate the time for placing and curing these materials prior to opening them to traffic at

| | | 40°F | 55°F | 90°F | °F* |
|---|---|---|---|---|---|
| A. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| B. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| C. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |

* Other temperature for which you have information _____.

12. Please indicate the compressive strength (ASTM C 39) of these materials at 24 hours, psi at

| | | 40°F | 55°F | 75°F | 90°F |
|---|---|---|---|---|---|
| A. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| B. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| C. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |

13. Please indicate the compressive strength (ASTM C 39) of these materials at 28 days, psi at

| | | 40°F | 55°F | 75°F | 90°F |
|---|---|---|---|---|---|
| A. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| B. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| C. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |

14. Please indicate the tensile strength of these materials at 24 hours, psi at

| | | 40°F | 55°F | 75°F | 90°F |
|---|---|---|---|---|---|
| A. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| B. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| C. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |

15. Please indicate the tensile strength of these materials at 28 days, psi at

| | | 40°F | 55°F | 75°F | 90°F |
|---|---|---|---|---|---|
| A. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| B. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| C. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |

16. Please indicate the flexural strength (ASTM C 78) of these materials at 24 hours, psi at

| | | 40°F | 55°F | 75°F | 90°F |
|---|---|---|---|---|---|
| A. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| B. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| C. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |

17. Please indicate the flexural strength (ASTM C 78) of these materials at 28 days, psi at

| | | 40°F | 55oF | 75°F | 90°F |
|---|---|---|---|---|---|
| A. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| B. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |
| C. | 1. | ____ | ____ | ____ | ____ |
| | 2. | ____ | ____ | ____ | ____ |
| | 3. | ____ | ____ | ____ | ____ |

18. Please indicate the slant shear bond strength (ASTM C 882) of these materials at the following ages (75°F).

| | | 24 Hours | 28 Days | Other Age* |
|---|---|---|---|---|
| A. | 1. | _____ | _____ | _____ |
| | 2. | _____ | _____ | _____ |
| | 3. | _____ | _____ | _____ |
| B. | 1. | _____ | _____ | _____ |
| | 2. | _____ | _____ | _____ |
| | 3. | _____ | _____ | _____ |
| C. | 1. | _____ | _____ | _____ |
| | 2. | _____ | _____ | _____ |
| | 3. | _____ | _____ | _____ |

* Note age _____.

19. Please indicate the quillotine shear bond strength of these materials at the following ages (75°F).

| | | Suitable for Traffic | 24 Hours | 28 Days |
|---|---|---|---|---|
| A. | 1. | | | |
| | 2. | | | |
| | 3. | | | |
| B. | 1. | | | |
| | 2. | | | |
| | 3. | | | |
| C. | 1. | | | |
| | 2 | | | |
| | 3. | | | |

20. Please indicate the tensile adhesion bond strength (ACI 503R) of these materials at the following ages (75°F).

| | | Suitable for Traffic | 24 Hours | 28 Days |
|---|---|---|---|---|
| A. | 1. | | | |
| | 2. | | | |
| | 3. | | | |
| B. | 1. | | | |
| | 2. | | | |
| | 3. | | | |
| C. | 1. | | | |
| | 2. | | | |
| | 3. | | | |

21. Please indicate the linear shrinkage (ASTM C 157) of these materials, %*

| | | 24 Hours | 28 Days | Other Age** |
|---|---|---|---|---|
| A. | 1. | | | |
| | 2. | | | |
| | 3. | | | |
| B. | 1. | | | |
| | 2. | | | |
| | 3. | | | |
| C. | 1. | | | |
| | 2. | | | |
| | 3. | | | |

* Note if use other test method _____.
** Note age _____.

22. Please indicate the modulus of elasticity of these materials, psi*

| | | Compression | Tension |
|---|---|---|---|
| A. | 1. | | |
| | 2. | | |
| | 3. | | |
| B. | 1. | | |
| | 2. | | |
| | 3. | | |
| C. | 1. | | |
| | 2. | | |
| | 3. | | |

* Note test methods and age of specimens _____.

23. Please indicate the tensile elongation (ASTM D 638) of these materials, %*.

A. 1. _____

2. _____

3. _____

B. 1. _____

2. _____

3. _____

C. 1. _____

2. _____

3. _____

* Note age of specimens _____.

24. Please indicate the permeability to chloride ion (AASHTO T277) of these materials, coulombs*.

A. 1. _____

2. _____

3. _____

B. 1. _____

2. _____

3. _____

C. 1. _____

2. _____

3. _____

* Note age of specimens _____.

25. Please indicate the skid number at 40 mph of these materials (ASTM E 524).*

A. 1. _____

2. _____

3. _____

B. 1. _____

2. _____

3. _____

C. 1. _____

2. _____

3. _____

* Note if use other test method _____.

26. Please list the State DOT's, Thruway Authorities, Cities, Towns, etc. that have successfully used these materials.

A. 1. _____

2. _____

3. _____

B. 1. _____

2. _____

3. _____

C. 1. _____

2. _____

3. _____

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27. Please provide names and addresses of contractors that have successfully used these materials.

A. 1. _____

2. _____

3. _____

B. 1. _____

2. _____

3. _____

C. 1. _____

2. _____

3. _____

28. On a separate sheet of paper, please provide a brief description and significant additional information on the rapid materials or techniques listed above. (Please attach specifications and reports).

29. Interested in donating material for an experimental installation for SHRP?

Yes _____ No _____

Please return all responses by July 15, 1989, to:

Michael M. Sprinkel
Virginia Transportation Research Council
P. O. Box 3817, University Station
Charlottesville, Virginia 22903
Telephone: (804) 293-1941

Thank you.

# APPENDIX B

## Outline on Rapid Methods of Deck Protection, Rehabilitation and Replacement

# I.RAPID PROTECTION SYSTEMS

- A.BITUMINOUS CONCRETE OVERLAY
  - 1.ON RESINOUS MEMBRANE (VA CLASS I)
    - a.ON RESINOUS MEMBRANE
  - 2.ON PREFABRICATED OR LIQUID MEMBRANE (VA CLASS II)
    - a.ON HOT POURED ELASTOMERIC MEMBRANE (SYS D)
    - b.ON PLASTICIZED COAL TAR & SYNTHETIC FIBERS (SYS A)
    - c.ON RUBBERIZED ASPHALT & PROTECTIVE COAT (SYS E)
    - d.ON RUBBERIZED ASPHALT & SYNTHETIC FIBERS (SYS B)
    - e.ON RUBBERIZED ASPHALT & SYNTHETIC MESH (SYS C)
  - 3.ON PENETRATING SEALER
    - a.ON PENETRATING SEALER
  - 4.ON TAC COAT
    - a.ON TAC COAT
  - 5.SURFACE TREATMENT
    - a.CHIP SEAL
  - 6.OTHER BITUMINOUS OVERLAYS
    - a.OTHER BITUMINOUS OVERLAYS
- B.COATINGS
  - 1.ACRYLIC
    - a.ACRYLIC
    - b.ACRYLIC COPOLYMER
    - c.HIGH MOLECULAR WEIGHT METHACRYLATE
    - d.METHACRYLATE
    - e.METHYL-METHACRYLATE
    - f.METHYL-METHACRYLATE / ETHYL-METHACRYLATE COPOLYMER
  - 2.CEMENTITIOUS
    - a.NON-POLYMERIC
    - b.POLYMERIC
  - 3.EPOXY
    - a.EPOXY
  - 4.GUM RESIN
    - a.GUM RESIN
    - b.MINERAL GUM
  - 5.RUBBER
    - a.CHLORINATED RUBBER
    - b.EPONIDE CHLORINATED RUBBER
    - c.ELASTOMERIC OVERLAY
  - 6.SILICON-BASED
    - a.SILANE
    - b.SILANE-SILICONE

c.SILICATE
d.SILICONE
e.SILOXANE
f.SODIUM-SILICATE

7.OTHER COATINGS
a.OTHER COATINGS

C.HIGH EARLY STRENGTH PORTLAND CEMENT OVERLAYS
1.BLENDED CEMENT
a.BLENDED CEMENT

2.CONCRETE CONTAINING ADMIXTURES
a.CORROSION INHIBITOR
b.HIGH-RANGE WATER REDUCERS
c.LATEX MODIFIED CONCRETE
d.SILICA FUME

3.LOW SLUMP CONCRETE
a.LOW SLUMP CONCRETE

4.RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)
a.RAPID HARDENING
b.VERY RAPID HARDENING

5.TYPE III CEMENT
a.CLASS "K" - AIR ENTRAINING & ACCELERATED
b.TYPE III

6.OTHER PORTLAND CEMENT OVERLAYS
a.SHOTCRETE

D.PENETRATING SEALERS (RAPID CURING)
1.ACRYLIC
a.ACRYLIC
b.ACRYLIC COPOLYMER

2.EPOXY
a.EPOXY

3.GUM RESIN
a.GUM RESIN
b.MINERAL GUM

4.RUBBER
a.CHLORINATED RUBBER
b.EPOXIDE CHLORINATED RUBBER
c.TRIPLENE ELASTOMER

5.SILICONE BASED
a.SILANE
b.SILANE-SILICONE
c.SILICATE
d.SILICONE

e.SILOXANE
f.SODIUM-SILICATE

6.OTHER PENETRATING SEALERS
a.ASPHALT EMULSION

E.POLYMER OVERLAY
1.MULTIPLE LAYER POLYMER OVERLAY
a.ACRYLIC / METHACRYLIC
b.EPOXY
c.EPOXY-URETHANE
d.POLYESTER STYRENE
e.POLYURETHANE

2.PREMIXED POLYMER OVERLAY
a.ACRYLIC / METHACRYLIC
b.EPOXY
c.EPOXY-URETHANE
d.FURFURYL ALCOHOL
e.POLYESTER STYRENE
f.POLYURETHANE

3.SLURRY POLYMER OVERLAY
a.ACRYLIC / METHACRYLIC
b.EPOXY
c.EPOXY-URETHANE
d.POLYESTER STYRENE
e.POLYURETHANE

4.SULPHUR
a.SULFUR

5.OTHER POLYMER OVERLAYS
a.OTHER POLYMER OVERLAYS

F.OTHER HYDRAULIC OVERLAYS
1.ALUMINA CEMENT
a.ALUMINA CEMENT
b.RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)
c.VERY RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)

2.MAGNESIUM PHOSPHATE CEMENT
a.MAGNESIUM PHOSPHATE CEMENT
b.RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)
c.VERY RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)

3.SHOT CRETE
a.SHOT CRETE

G.OTHER PROTECTION SYSTEMS
1.OTHER PROTECTION SYSTEMS
a.OTHER PROTECTION SYSTEMS

H.MISCELLANEOUS PROTECTION SUBSYSTEMS
    1.AGGREGATE
        a.AGGREGATE

    2.BONDING AGENTS
        a.BONDING AGENTS

    3.OTHER PROTECTION SUBSYSTEMS
        a.OTHER PROTECTION SUBSYSTEMS

Y.NO REPLY TO QUESTIONNAIRE

Z.NO RAPID PROTECTION SYSTEM

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## II.RAPID REHABILITATION SYSTEMS

A.CRACK HEALER SEALERS

1.GRAVITY FILL
- a.ACRYLIC
- b.ACRYLIC COPOLYMER
- c.HIGH MOLECULAR WEIGHT METHACRYLATE
- d.METHACRYLATE
- e.METHYL-METHACRYLATE
- f.METHYL-METHACRYLATE / ETHYL METHACRYLATE COPOLYMER

2.EPOXY INJECTION
- a.FINE CRACK
- b.DEEP CRACK

3.ROUT AND SEAL
- a.EPOXY

4.OTHER CRACK HEALER SEALERS
- a.OTHER CRACK HEALER SEALERS

B.EXPANSION JOINTS AND CONCRETE HEADERS

1.EXPANSION JOINTS AND CONCRETE HEADERS
- a.ACRYLIC/METHACRYLIC
- b.EPOXY/EPOXY-URETHANE
- c.ETHYLENE VINYL ACETATE
- d.POLYURETHANE

C.PATCHING WITH BITUMINOUS CONCRETE

1.PATCHING WITH ASPHALT
- a.COLD MIX PATCH
- b.HOT MIX PATCH

2.OTHER BITUMINOUS CONCRETE PATCHING
- a.OTHER BITUMINOUS CONCRETE PATCHING

D.PATCHING WITH HIGH EARLY STRENGTH PORTLAND CEMENT

1.BLENDED CEMENT
- a.BLENDED CEMENT

2.CONCRETE CONTAINING ADMIXTURES
- a.CORROSION INHIBITOR
- b.HIGH-RANGE WATER REDUCED
- c.LATEX MODIFIED CONCRETE WITH TYPE III CEMENT
- d.SILICA FUME

3.LOW SLUMP CONCRETE
- a.LOW SLUMP CONCRETE

4.RAPID-HARDENING CEMENTITIOUS MATERIALS (ASTM C928)
- a.RAPID HARDENING
- b.VERY RAPID HARDENING

5.TYPE III CEMENT
- a.CLASS "K" -- AIR ENTRAINING AND ACCELERATED

b.TYPE III

6.OTHER PORTLAND CEMENT PATCHING
a.OTHER PORTLAND CEMENT PATCHING

E.PATCHING WITH POLYMER CONCRETE
1.ACRYLIC
a.ACRYLIC
b.ACRYLIC COPOLYMER
c.HIGH MOLECULAR WEIGHT METHACRYLATE
d.METHYL-METHACRYLATE
e.METHYL-METHACRYLATE / ETHYL METHACRYLATE COPOLYMER

2.EPOXY
a.EPOXY

3.EPOXY-URETHANE
a.EPOXY-URETHANE

4.FURFURYL ALCOHOL
a.FURFURYL ALCOHOL

5.POLYESTER STYRENE
a.POLYESTER STYRENE

6.POLYURETHANE
a.POLYURETHANE

7.SULFUR
a.SULFUR

8.OTHER POLYMER CONCRETE PATCHING
a.OTHER POLYMER CONCRETE PATCHING

F.PATCHING WITH OTHER HYDRAULIC CEMENT
1.ALUMINA CEMENT
a.ALUMINA CEMENT
b.RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)
c.VERY RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)

2.MAGNESIUM PHOSPHATE CEMENT
a.MAGNESIUM PHOSPHATE CEMENT
b.RAPID HARDENING CEMENTITOUS MATERIAL (ASTM C928)
c.VERY RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)

G.OTHER REHABILITATION SYSTEMS
1.STEEL PLATE OVER CONVENTIONAL CONCRETE
a.STEEL PLATE OVER CONVENTIONAL CONCRETE

H.MISCELLANEOUS REHABILITATION SUBSYSTEMS
1.ADHESIVES BETWEEN OLD & NEW CONCRETE
a.EPOXY

2.OTHER REHABILITATION SUBSYSTEMS

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a.OTHER REHABILITATION SUBSYSTEMS

Y.NO REPLY TO QUESTIONNAIRE

Z.NO RAPID REHABILITATION SYSTEM

# III. RAPID REPLACEMENT SYSTEMS

- A. POST-TENSIONED CONCRETE
  - 1. PRECAST BOX BEAMS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY
  - 2. PRESTRESSED PRECAST BOX BEAMS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY
  - 3. SITE CAST BOX BEAMS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY
  - 4. PRECAST SLABS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY
  - 5. PRESTRESSED PRECAST SLABS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY
  - 6. SITE CAST SLABS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY
  - 7. PRECAST TEE BEAMS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY
  - 8. PRESTRESSED PRECAST TEE BEAMS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY
  - 9. SITE CAST TEE BEAMS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY
- B. PRECAST CONCRETE
  - 1. PARAPETS
    - a. PRECAST CONCRETE PARAPETS
  - 2. SLABS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY
- C. PRESTRESSED PRECAST CONCRETE
  - 1. BOX BEAMS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY
  - 2. SLABS
    - a. WITH OVERLAY
    - b. WITHOUT OVERLAY

3.SUBDECK PANELS WITH SITECAST CONCRETE
a.SUBDECK PANELS WITH SITECAST CONCRETE

4.TEE BEAMS
a.WITH OVERLAY
b.WITHOUT OVERLAY

D.SITE CAST HIGH EARLY STRENGTH PORTLAND CEMENT CONCRETE
1.BLENDED CEMENT
a.BLENDED CEMENT

2.CONCRETE CONTAINING ADMIXTURES
a.CORROSION INHIBITOR
b.HIGH-RANGE WATER REDUCED
c.LATEX MODIFIED CONCRETE WITH TYPE III CEMENT
d.SILICA FUME

3.RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)
a.RAPID HARDENING
b.VERY RAPID HARDENING

4.TYPE III CEMENT
a.CLASS "K" -- AIR ENTRAINING AND ACCELERATED
b.TYPE III

5.OTHER SITE CAST PORTLAND CEMENT
a.OTHER SITE CAST PORTLAND CEMENT

E.SITE CAST POLYMER CONCRETE
1.ACRYLIC
a.ACRYLIC
b.ACRYLIC COPOLYMER
c.HIGH MOLECULAR WEIGHT METHACRYLATE
d.METHYL-METHACRYLATE
e.METHYL-METHACRYLATE / ETHYL METHACRYLATE COPOLYMER

2.EPOXY
a.EPOXY

3.EPOXY-URETHANE
a.EPOXY-URETHANE

4.FURFURYL ALCOHOL
a.FURFURYL ALCOHOL

5.POLYESTER STYRENE
a.POLYESTER STYRENE

6.POLYURETHANE
a.POLYURETHANE

7.SULPHUR
a.SULPHUR

8.OTHER SITE CAST POLYMER CONCRETE
a.OTHER SITE CAST POLYMER CONCRETE

F.OTHER HYDRAULIC SITE CAST CEMENT
1.ALUMINA CEMENT
a.ALUMINA CEMENT
b.RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)
c.VERY RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)

2.MAGNESIUM PHOSPHATE CEMENT
a.MAGNESIUM PHOSPHATE CEMENT
b.RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)
c.VERY RAPID HARDENING CEMENTITIOUS MATERIAL (ASTM C928)

G.OTHER REPLACEMENT SYSTEMS
1.OTHER REPLACEMENT SYSTEMS
a.OTHER REPLACEMENT SYSTEMS

H.MISCELLANEOUS REPLACEMENT SUBSYSTEMS
1.JOINT FILLER SYSTEMS
a.EPOXY/EPOXY-URETHANE
b.ETHYLENE VINYL ACETATE

2.PRECAST SEGMENT ADHESIVE
a.PRECAST SEGMENT ADHESIVE

3.STEEL INSTALLATION ADHESIVES
a.ANCHOR BOLT INSTALLATION
b.RE-BAR INSTALLATION

4.OTHER REPLACEMENT SUBSYSTEMS
a.OTHER REPLACEMENT SUBSYSTEMS

Y.NO REPLY TO QUESTIONNAIRE

Z.NO REPLACEMENT SYSTEM

# APPENDIX C

Summary of Responses to the Questionnaires Including:

a) Users and Number of Users of Techniques

b) Average of Data

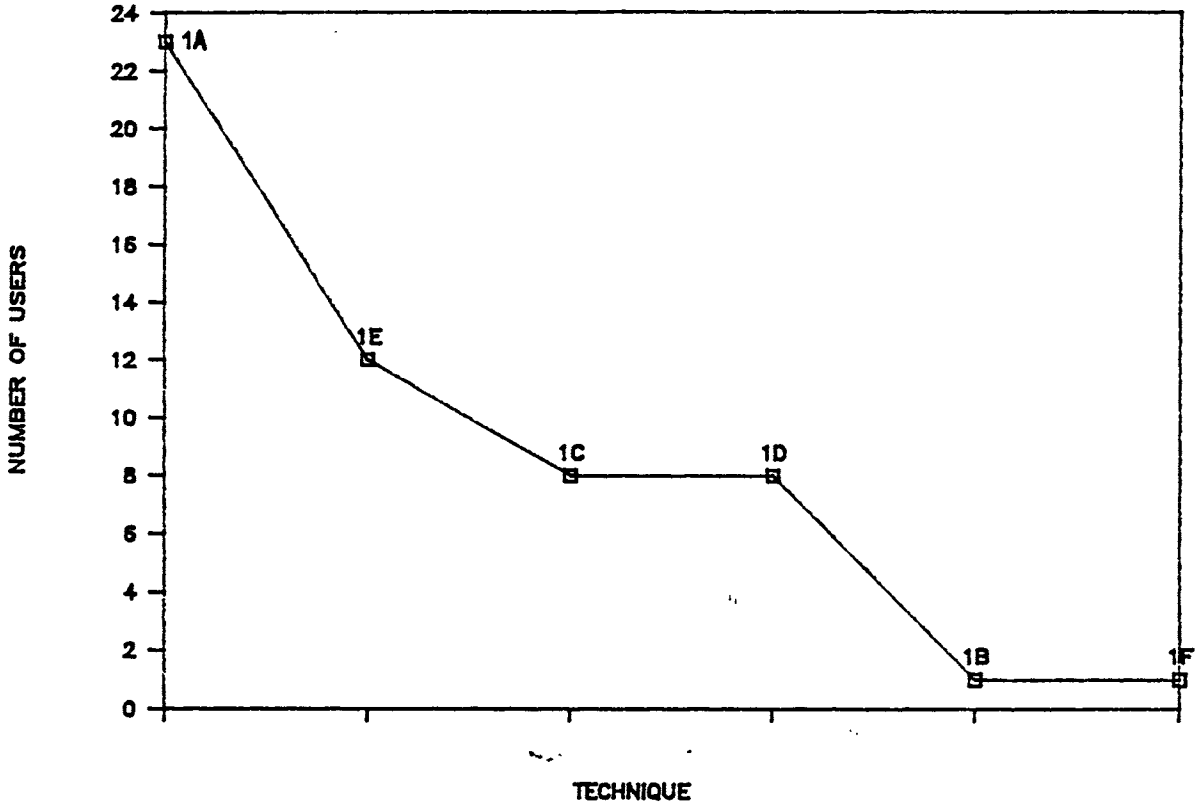
c) Technique Time Demand Graphs

d) Cost Distribution Graphs

e) Service Life Graphs

# RAPID PROTECTION SYSTEMS

USED IN THE UNITED STATES AND CANADA

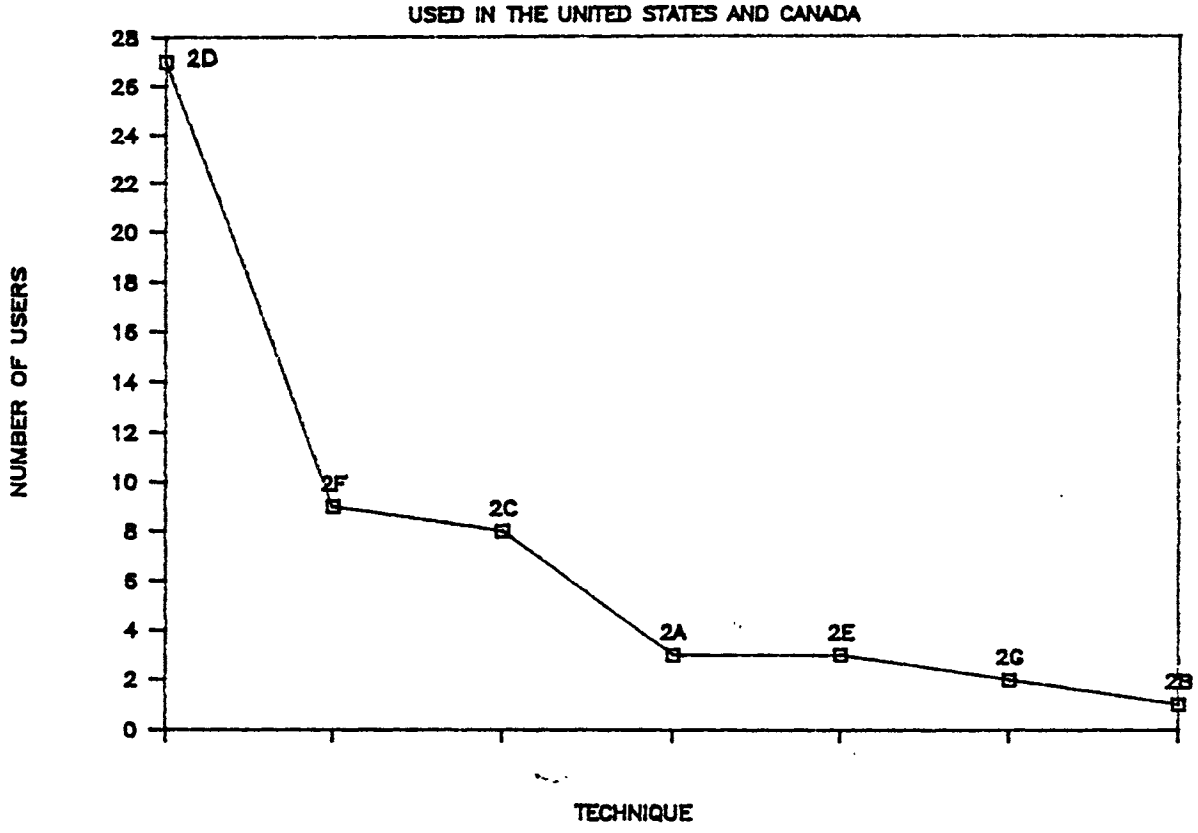



| TECHNIQUE KEY: | CODE NUMBER* | DOT/CSHRP USING TECHNIQUE |
|---|---|---|
| 1--BITUMINOUS CONC OVLY | 1A | ALTA, CT, DC, ID(2), LA MD, MO(2), NE, NH, NJ(2 NY, NC, NS, PA, SC, SD, TN(2), WA, WI |
| 2--PLMR OVLY | 1E | BC, CA, MS, NY, OH, SC, TN, VA(3), WA(2) |
| 3--HES PCC OVLY | 1C | ALTA, BC, ID, NJ, NY, MI WA(2) |
| 4--PENETRATING SEALER | 1D | ALTA(2), BC, CA, MD, NE OH, OK |
| 5--COATING | 1B | CA |
| 6--OTHER HYDRAULIC CEMENT OVLY | 1F | BC |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS
**IN SOME CASES THE NUMBER OF USERS PLOTTED WILL EXCEED THE NUMBER OF RESPONDENTS CITED AS CURRENTLY USING A SPECIFIED TECHNIQUE. A RESPONDENT MAY USE MORE THAN ONE TECHNIQUE WITH THE SAME SECOND ORDER HEADING WHICH DENOTED IN THE PARENTHESES FOLLOWING THE RESPONDENT'S CITATION WHEN THE SITUATION OCCURS.

# RAPID REHABILITATION SYSTEMS

USED IN THE UNITED STATES AND CANADA




| TECHNIQUE KEY: | CODE NUMBER* | DOT/CSHRP USING TECHNIQUE |
|---|---|---|
| 1--HES PCC PATCH | 2D | AR, CO(2), CT, IN(3), KS, KY, MD(3), MO, NH, NJ(2), NY, NC, NS, OK, PA, TN, TX, VA(3), WI |
| 2--OTHER HYDRAULIC CEMENT PATCH | 2F | CA(2), HI, IN, MT, OK, OR, SD, YT |
| 3--BITUMINOUS CONC PATCH | 2C | IN(2), KS(2), NJ(2), NS(2) |
| 4--CRACK SEALER | 2A | CA, OH, SD |
| 5--PLMR CONC PATCH | 2E | CA, NH, WY |
| 6--STEEL PLATE OVER CONC | 2G | DC, NH |
| 7--EXPANSION JOINTS/CONC HEADERS | 2B | CT |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS
**IN SOME CASES THE NUMBER OF USERS PLOTTED WILL EXCEED THE NUMBER OF RESPONDENTS CITED AS CURRENTLY USING A SPECIFIED TECHNIQUE. A RESPONDENT MAY USE MORE THAN ONE TECHNIQUE WITH THE SAME SECOND ORDER HEADING WHICH IS DENOTED IN THE PARENTHESES FOLLOWING THE RESPONDENT'S CITATION WHEN THE SITUATION OCCURS.

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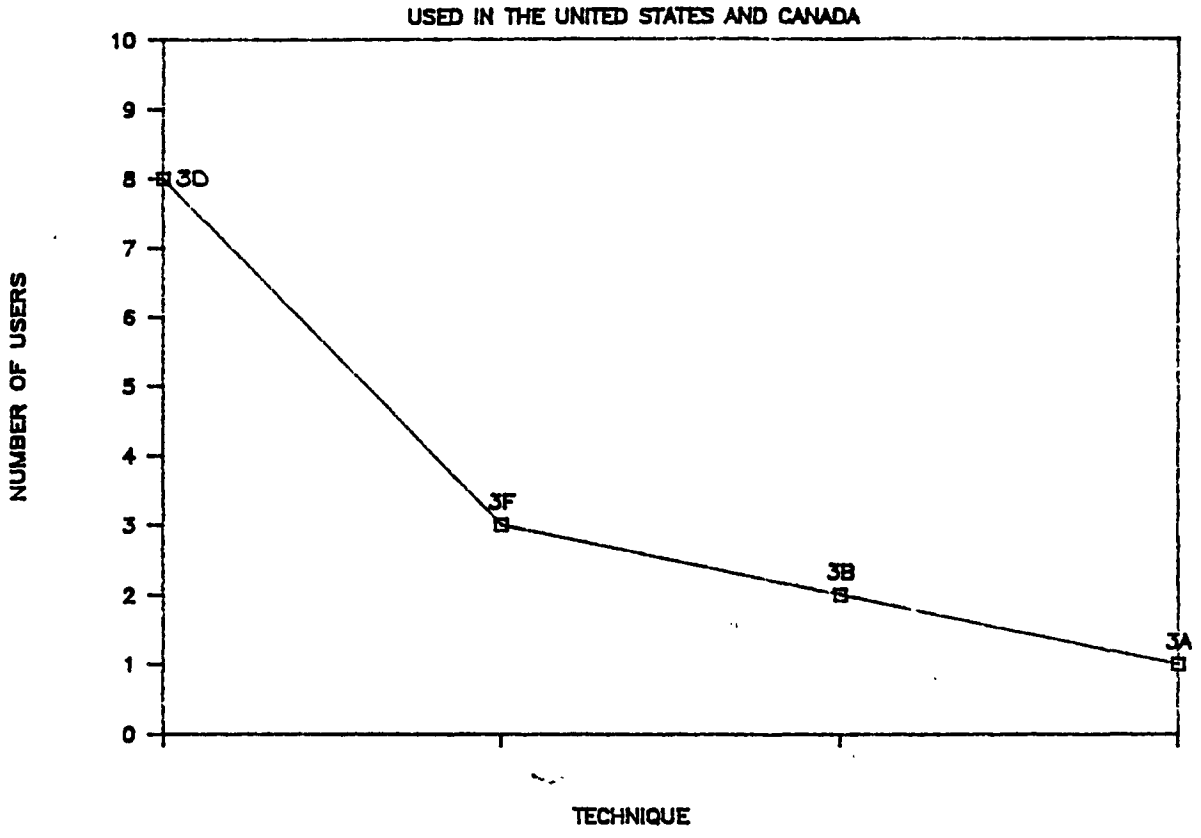
# RAPID REPLACEMENT SYSTEMS

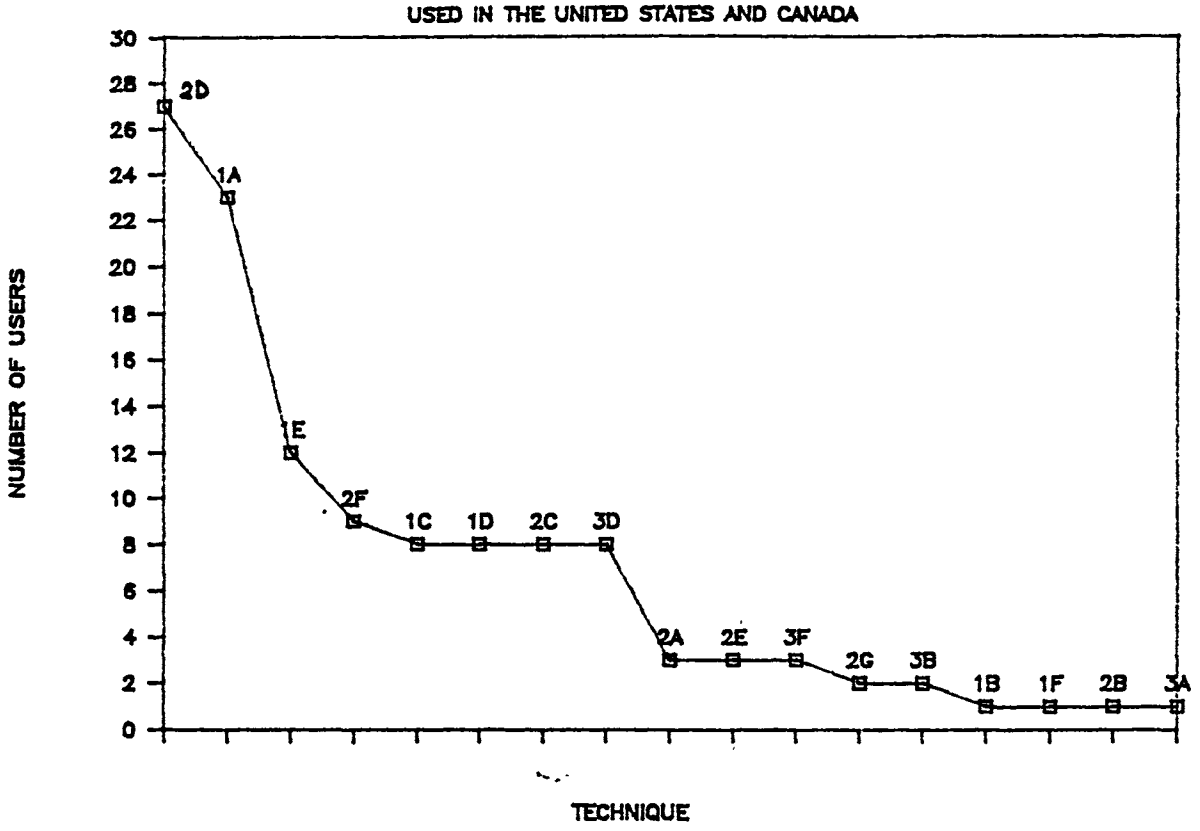



| TECHNIQUE KEY: | CODE NUMBER* | DOT/CSHRP USING TECHNIQUE |
|---|---|---|
| 1--SITE CAST HES PCC | 3D | CA, CO, NJ, NY, NS, OK, SC, WA |
| 2--OTHER SITE CAST HYDRAULIC CEMENT | 3F | IN, MT, OK |
| 3--PRECAST CONC | 3B | CA, WA |
| 4--POST-TENSIONED CONC | 3A | IL |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS
**IN SOME CASES THE NUMBER OF USERS PLOTTED WILL EXCEED THE NUMBER OF RESPONDENTS CITED AS CURRENTLY USING A SPECIFIED TECHNIQUE. A RESPONDENT MAY USE MORE THAN ONE TECHNIQUE WITH THE SAME SECOND ORDER HEADING WHICH DENOTED IN THE PARENTHESES FOLLOWING THE RESPONDENT'S CITATION WHEN THE SITUATION OCCURS.

# RAPID REPAIR SYSTEMS

USED IN THE UNITED STATES AND CANADA




| TECHNIQUE KEY: | CODE NUMBER* | DOT/CSHRP USING TECHNIQUE |
|---|---|---|
| 1--HES PCC PATCH | 2D | AR, CO(2), CT, IN(3), KS, KY, MD(3), MO, NH, NJ(2), NY, NC, NS, OK, PA, TN, TX, VA(3), WI |
| 2--BITUMINOUS CONC OVLY | 1A | ALTA, CT, DC, ID(2), LA, MD, MO(2), NE, NH, NJ(2), NY, NC, NS, PA, SC, SD, TN(2), WA, WI |
| 3--PLMR OVLY | 1E | BC, CA, MS, NY, OH, SC, TN, VA(3), WA(2) |
| 4--OTHER HYDRAULIC CEMENT PATCH | 2F | CA(2), HI, IN, MT, OK, OR, SD, YT |
| 5--HES PCC OVLY | 1C | ALTA, BC, ID, NJ, NY, MD, WA(2) |
| 6--PENETRATING SEALER | 1D | ALTA(2), BC, CA, MD, NE, OH, OK |
| 7--BITUMINOUS CONC PATCH | 2C | IN(2), KS(2), NJ(2), NS(2) |
| 8--SITE CAST HES PCC | 3D | CA, CO, NJ, NY, NS, OK, SC, WA |

| | | |
|---|---|---|
| 9--CRACK SEALER | 2A | CA, OH, SD |
| 10--PLMR CONC PATCH | 2E | CA, NH, WY |
| 11--OTHER SITE CAST HYDRAULIC CEMENT | 3F | IN, MT, OK |
| 12--STEEL PLATE OVER CONC | 2G | DC, NH |
| 13--PRECAST CONC | 3B | CA, WA |
| 14--COATING | 1B | CA |
| 15--OTHER HYDRAULIC CEMENT OVLY | 1F | BC |
| 16--EXPANSION JOINTS/CONC HEADERS | 2B | CT |
| 17--POST-TENSIONED CONC | 3A | IL |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS
**IN SOME CASES THE NUMBER OF USERS PLOTTED WILL EXCEED THE NUMBER OF RESPONDENTS CITED AS CURRENTLY USING A SPECIFIED TECHNIQUE. A RESPONDEN MAY USE MORE THAN ONE TECHNIQUE WITH THE SAME SECOND ORDER HEADING WHICH DENOTED IN THE PARENTHESES FOLLOWING THE RESPONDENT'S CITATION WHEN THE SITUATION OCCURS.

| RECORD NUMBER | CODE_NUM | AGENCY TYPE | AGENCY | SYSTEM TYPE | TECHNIQUE | SQUARE YARDS | TRAFFIC COST | SURFACE PREP COST | PLACING AND CURING | OTHER COST | TOTAL COST | SOME MAINTENANCE | MAJOR REPAIR | TRAFFIC CONTROL TIME | SURFACE PREP TIME | PLACING & CURING TIME | TOTAL TIME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | 1A | CAN | ALBERTA TRANS & UTIL, R&D | P | ASPHALT PAVING | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 72 | 1A | STA | DISTRICT OF COLOMBIA - PUBLIC WORKS | P | ASPHALTIC CONCRETE OVERLAY | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 124 | 1A | STA | LOUISIANA1 TRANS RSRCH CENTER | P | INCRSE CNC COVER DEPTH BY .5" | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 143 | 1A | STA | MARYLAND1 DOT - MATERIALS & RESEARCH | P | RMV AND RPL BIT CNC WEAR SURF | 333.0 | 1.88 | 1.30 | 1.90 | 0.00 | 5.08 | 8.0 | 13.5 | 1.0 | 3.0 | 1.0 | 5.0 |
| 172 | 1A | STA | NEBRASKA1 DEPT OF ROADS | P | ASPHALT OVERLAY | 533.0 | 0.00 | 0.00 | 0.00 | 0.00 | 23.50 | 0.0 | 0.0 | 0.5 | 2.0 | 5.5 | 8.0 |
| 245 | 1A | TPK | PENNSYLVANIA TURNPIKE COMMISSION | P | ID-2 OVERLAY | 116.6 | 70.47 | 0.00 | 450.00 | 0.00 | 520.47 | 10.0 | 15.0 | 2.0 | 4.0 | 4.0 | 10.0 |
| 249 | 1A | STA | PENNSYLVANIA1 DOT | P | ASPHALT OVERLAY | 300.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.5 | 4.5 | 1.5 | 3.5 | 7.0 | 12.0 |
| 324 | 1A | STA | WISCONSIN1 DOT | P | ASPHALT OV W/O MEM | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.0 | 7.5 | 0.0 | 0.0 | 0.0 | 0.0 |
| 60 | 1A2 | STA | CONNECTICUT1 DOT - BRIDGE DESIGN | P | PL BIT CONC ON MEMB WATERPRF | 500.0 | 3.00 | 0.00 | 25.00 | 0.00 | 28.00 | 10.0 | 20.0 | 3.0 | 4.0 | 9.0 | 16.0 |
| 95 | 1A2 | STA | IDAHO1 TRANSPORTATION DEPT | P | OVERLAY W/WATERPROOF MEMBRANE | 700.0 | 0.07 | 0.28 | 1.60 | 0.00 | 1.95 | 0.0 | 20.0 | 0.5 | 2.0 | 4.0 | 6.5 |
| 164 | 1A2 | STA | MISSOURI1 HWY & TRANS DEPT | P | ASPHALT OVERLAY W/ MEMBRANE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 181 | 1A2 | STA | NEW HAMPSHIRE1 DOT | P | ASPHALT OV ON BARR MEMBRANE | 600.0 | 12.50 | 2.00 | 22.00 | 7.50 | 44.00 | 0.0 | 15.0 | 1.5 | 10.0 | 4.0 | 15.5 |
| 192 | 1A2 | STA | NEW JERSEY1 DOT | P | MTRPRF MEM W/ASPH OVERLAY | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 197 | 1A2 | STA | NEW JERSEY2 DOT - MAINTENANCE ENGR | P | MTRPRF MEM W/ASPH OVRLY | 600.0 | 0.75 | 125.00 | 30.00 | 0.00 | 155.75 | 0.0 | 8.0 | 0.5 | 7.5 | 2.0 | 10.0 |
| 205 | 1A2 | STA | NEW YORK1 DOT - MATERIALS BUREAU | P | ASPHALT CNC OVERLAY W/MEMBRANE | 450.0 | 0.00 | 11.25 | 22.62 | 0.00 | 0.00 | 1.0 | 5.5 | 0.5 | 7.5 | 0.0 | 8.0 |
| 223 | 1A2 | CAN | NOVA SCOTIA DOT & COMMUNICATIONS | P | HOT MEMB & ASPHALT PAVEMENT | 800.0 | 0.00 | 0.00 | 0.00 | 0.00 | 10.94 | 8.0 | 15.0 | 0.5 | 6.0 | 13.5 | 20.0 |
| 271 | 1A2 | STA | SOUTH CAROLINA1 DEPT OF HWYS & TRANS | P | ASPHALT OV ON MEMBRANE | 710.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 1.0 | 1.0 | 3.0 | 5.0 |
| 280 | 1A2 | STA | TENNESSEE1 DOT | P | ASPHALT OVERLAY W/MEMB SEAL | 800.0 | 1.50 | 1.00 | 14.00 | 0.00 | 16.50 | 3.5 | 15.0 | 2.0 | 2.0 | 8.0 | 12.0 |
| 281 | 1A2 | STA | TENNESSEE1 DOT | P | RUBBERRIZED ASPH OVLY | 800.0 | 1.50 | 1.00 | 10.50 | 0.00 | 13.00 | 3.5 | 8.0 | 2.0 | 4.0 | 8.0 | 14.0 |
| 315 | 1A2 | STA | WASHINGTON1 STATE DOT | P | ACP W/MEMBRANE | 913.7 | 0.70 | 1.49 | 7.70 | 8.80 | 18.69 | 5.5 | 9.5 | 0.5 | 3.6 | 5.9 | 10.0 |
| 214 | 1A4 | STA | NORTH CAROLINA1 DOT | P | EPXY-BRDCST SND SYS/ASPHLT OV | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.0 | 10.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 94 | 1A5A | STA | IDAHO1 TRANSPORTATION DEPT | P | ASPHALT/CHIP SEAL COAT | 700.0 | 0.07 | 0.07 | 0.20 | 0.00 | 0.34 | 0.0 | 0.0 | 0.5 | 0.5 | 0.5 | 1.5 |
| 165 | 1A5A | STA | MISSOURI1 HWY & TRANS DEPT | P | POLYMR MODFD ASPHALT CHIP SEAL | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | - | 0.0 | 0.0 |
| 275 | 1A5A | STA | SOUTH DAKOTA1 DOT - RESEARCH PROGRAM | P | RUBBERIZED ASPHALT CHIP SEAL | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 2.50 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 39 | 1B1C | STA | CALIFORNIA1 DOT, NEW TECH & RSRCH | P | LOW-FUME METHACRYLATE PEUTE | 1000.0 | 0.11 | 3.87 | 2.97 | 0.00 | 6.95 | 10.0 | 20.0 | 2.0 | 0.5 | 3.0 | 5.5 |
| 75 | 1B1C | STA | FLORIDA DOT - MATERIALS OFFICE | P | HMW METHACRYLATE SEALER | 92873.0 | 0.03 | 0.23 | 4.21 | 0.00 | 4.47 | 7.5 | 25.0 | 88.0 | 22.0 | 53.0 | 163.0 |
| 206 | 1C | STA | NEW YORK1 DOT - MATERIALS BUREAU | P | PARTIAL OVERLAY WITH PCC | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 142 | 1C2C | STA | MARYLAND1 DOT - MATERIALS & RESEARCH | P | LATEX MODIFIED CNC OVERLAY | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 191 | 1C2C | STA | NEW JERSEY1 DOT | P | LMC OVERLAY | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 246 | 1C2C | TPK | PENNSYLVANIA TURNPIKE COMMISSION | P | RALUMAC OVERLAY | 4.7 | 0.00 | 0.00 | 2.51 | 0.00 | 2.51 | 3.0 | 10.0 | 1.0 | 0.5 | 4.0 | 5.5 |
| 319 | 1C2C | STA | WASHINGTON1 STATE DOT | R | LATEX MODIFIED CNC | 42.8 | 35.30 | 4.60 | 35.30 | 16.70 | 91.90 | 8.5 | 12.5 | 0.5 | 0.9 | 8.5 | 10.0 |
| 318 | 1C2D | STA | WASHINGTON1 STATE DOT | R | MICROSILICA MODIFIED CNC | 43.0 | 40.40 | 5.00 | 32.00 | 18.20 | 95.60 | 8.5 | 12.5 | 0.5 | 4.5 | 5.0 | 10.0 |
| 24 | 1C3A | CAN | BRITISH COLUMBIA MOTH | P | LOW SLUMP PCC OVERLAY | 424.0 | 0.28 | 36.00 | 41.00 | 0.00 | 77.28 | 0.0 | 22.5 | 0.5 | 4.2 | 3.3 | 8.0 |
| 93 | 1C3A | STA | IDAHO1 TRANSPORTATION DEPT | P | DENSE CONCRETE OVERLAY | 700.0 | 0.07 | 0.28 | 3.20 | 0.00 | 3.55 | 0.0 | 0.0 | 0.5 | 2.0 | 8.0 | 10.0 |

C7

| RECORD NUMBER | CODE_NUM | AGENCY TYPE | AGENCY | SYSTEM TYPE | TECHNIQUE | SQUARE YARDS | TRAFFIC COST | SURFACE PREP COST | PLACING AND CURING | OTHER COST | TOTAL COST | SOME MAINTENANCE | MAJOR REPAIR | TRAFFIC CONTROL TIME | SURFACE PREP TIME | PLACING & CURING TIME | TOTAL TIME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 1C4A5 | CAN | ALBERTA TRANS & UTIL, R&D | P | PYRMENT CNT/STL FIBRE MIX-2"OV | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 6 | 1D | CAN | ALBERTA TRANS & UTIL, R&D | P | PENETR SEALERS FOR CNC | 1000.0 | 0.00 | 0.00 | 0.00 | 0.00 | 5.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 24.0 |
| 8 | 1D | CAN | ALBERTA TRANS & UTIL, R&D | P | PENETR SEALERS FOR ASPHALT | 1000.0 | 0.00 | 0.00 | 0.00 | 0.00 | 2.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 24.0 |
| 26 | 1D5A | CAN | BRITISH COLUMBIA MOTH | P | SILANE SEALER | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 41 | 1D5A | STA | CALIFORNIA1 DOT, NEW TECH & RSRCH | P | SILANE SUPERSTRUCT BRDGE WORK | 1000.0 | 0.11 | 0.04 | 1.60 | 0.00 | 1.75 | 0.0 | 25.0 | 2.0 | 0.5 | 5.0 | 7.5 |
| 141 | 1D5A | STA | MARYLAND1 DOT - MATERIALS & RESEARCH | P | PL SILANE SEAL OVER PATCH MATL | 9.0 | 1.88 | 1.30 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 1.0 | 3.0 | 1.0 | 5.0 |
| 171 | 1D5A | STA | NEBRASKA1 DEPT OF ROADS | P | SILANE TREATMENT | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 4.50 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 229 | 1D5A | STA | OHIO1 DOT - MAITENANCE ENGR | P | SILANE SEALER | 400.0 | 0.50 | 0.00 | 0.00 | 0.00 | 10.00 | 5.0 | 10.0 | 2.0 | 2.0 | 2.0 | 6.0 |
| 234 | 1D5A | STA | OKLAHOMA1 DOT - BRIDGE DIVISION | P | APPL OF SILANE TO SURF OF DECK | 400.0 | 0.00 | 0.00 | 0.00 | 0.00 | 2.80 | 0.0 | 10.0 | 1.0 | 3.0 | 2.0 | 6.0 |
| 23 | 1E | CAN | BRITISH COLUMBIA MOTH | P | POLYMER CONCRETE OVERLAY | 424.0 | 0.36 | 46.80 | 53.30 | 0.00 | 100.46 | 3.0 | 0.0 | 0.5 | 4.2 | 3.3 | 8.0 |
| 209 | 1E | STA | NEW YORK2 DOT - MATERIALS BUREAU | P | THIN PLYMR OVLY--METHYL METHAC | 90.0 | 0.00 | 11.25 | 81.00 | 0.00 | 0.00 | 2.5 | 6.0 | 0.5 | 7.5 | 0.0 | 8.0 |
| 161 | 1E1 | STA | MISSISSIPPI1 STATE HIGHWAY DEPT | P | 2 LAYER OVLY: POLYMER CNC | 1500.0 | 0.20 | 0.30 | 3.50 | 0.00 | 4.00 | 10.0 | 15.0 | 2.0 | 5.0 | 5.0 | 12.0 |
| 316 | 1E1 | STA | WASHINGTON1 STATE DOT | P | THIN POLYMER CNC | 272.1 | 0.78 | 9.62 | 33.40 | 5.86 | 49.66 | 6.5 | 10.5 | 0.5 | 6.1 | 3.4 | 10.0 |
| 230 | 1E1B | STA | OHIO1 DOT - MAITENANCE ENGR | P | THIN EPOXY RESIN OVERLAY | 400.0 | 6.00 | 0.00 | 0.00 | 0.00 | 14.00 | 5.0 | 10.0 | 2.0 | 3.0 | 5.0 | 10.0 |
| 279 | 1E1B | STA | TENNESSEE1 DOT | P | 1/4" EPOXY OV W/SCATTERED SAND | 800.0 | 1.50 | 2.50 | 7.50 | 0.00 | 11.50 | 5.0 | 10.0 | 2.0 | 3.0 | 8.0 | 13.0 |
| 308 | 1E1B2 | STA | VIRGINIA1 TRANS RSRCH COUNCIL | P | MODIFIED EPOXY CNC OVERLAY | 500.0 | 1.00 | 3.00 | 27.00 | 0.00 | 31.00 | 7.0 | 10.0 | 0.5 | 4.0 | 5.0 | 9.5 |
| 309 | 1E1C2 | STA | VIRGINIA1 TRANS RSRCH COUNCIL | P | EPOXY-URETHANE CNC OVERLAY | 500.0 | 1.00 | 3.00 | 31.00 | 0.00 | 35.00 | 7.0 | 10.0 | 0.5 | 4.0 | 6.0 | 10.5 |
| 310 | 1E1D | STA | VIRGINIA1 TRANS RSRCH COUNCIL | P | POLYESTER/METHACRYLATE OVERLAY | 500.0 | 1.00 | 3.00 | 24.00 | 0.00 | 28.00 | 7.0 | 10.0 | 0.5 | 4.0 | 6.0 | 10.5 |
| 272 | 1E2B | STA | SOUTH CAROLINA1 DEPT OF HWYS & TRANS | P | EPOXY MORTAR OVLY PATCH | 10.0 | 800.00 | 0.00 | 11.11 | 0.00 | 811.11 | 0.0 | 0.0 | 1.0 | 3.0 | 4.0 | 8.0 |
| 40 | 1E2E | STA | CALIFORNIA1 DOT, NEW TECH & RSRCH | P | POLYESTER CNC-NON/CONDUCTIVE | 600.0 | 0.11 | 18.00 | 48.75 | 0.00 | 66.86 | 10.0 | 25.0 | 2.0 | 2.0 | 5.0 | 9.0 |
| 317 | 1E2E | STA | WASHINGTON1 STATE DOT | P | POLYESTER CNC (EXPERIMENTAL) | 149.9 | 14.18 | 37.83 | 52.00 | 20.28 | 124.29 | 6.5 | 10.5 | 0.5 | 6.7 | 2.9 | 10.0 |
| 25 | 1F1 | CAN | BRITISH COLUMBIA MOTH | P | HIGH ALUMINA CEMENT OVERLAY | 424.0 | 0.36 | 46.80 | 53.30 | 0.00 | 100.46 | 0.0 | 0.0 | 0.5 | 4.2 | 3.3 | 8.0 |
| 83 | 1Y | T^2 | FREDERICKSBURG, VA | P | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 110 | 1Y | STA | IOWA1 DOT: MATERIALS - RESEARCH | P | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 115 | 1Y | STA | KANSAS1 DOT - MATERIALS RSRCH CTR | P | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 146 | 1Y | STA | MARYLAND2 DOT - DISTRICT 4 | P | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 151 | 1Y | TPK | MASSACHUSETTS TURNPIKE AUTHORITY | P | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 267 | 1Y | T^2 | SHAWNEE COUNTY PUBLIC WORKS DEPT | P | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 285 | 1Y | STA | TEXAS1 DEPT OF HWYS/ PUB TRANS | P | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 290 | 1Y | TPK | THE TURNPIKE AUTHORITY OF KY | P | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 327 | 1Y | STA | WYOMING1 HIGHWAY DEPARTMENT | P | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 2 | 1Z | STA | ALASKA1 DOT, BRIDGE DESIGN | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 11 | 1Z | T^2 | ARE ENGINEERING CONSULTANTS | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 14 | 1Z | STA | ARIZONA1 DOT, HIGHWAYS DIV. | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 17 | 1Z | STA | ARKANSAS1 HIGHWAY & TRANSPORTATION DEPT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 49 | 1Z | TPK | CHESAPEAKE BAY BRIDGE/TUNNEL DIST | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 52 | 1Z | T^2 | CLARK COUNTY HWY DEPT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 55 | 1Z | STA | COLORADO1 DEPT OF HIGHWAYS | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 66 | 1Z | TPK | DELAWARE RIVER PORT AUTHORITY | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 90 | 1Z | STA | HAWAII1 DOT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 99 | 1Z | STA | ILLINOIS1 DOT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 103 | 1Z | STA | INDIANA1 DEPT OF HIGHWAYS | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 120 | 1Z | STA | KENTUCKY1 TRANS CABINET, DEPT OF HWYS | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 127 | 1Z | T^2 | LUFKIN, TX | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.30 | 0.00 | 0.0 | 0.0 | 3.0 | 0.0 | 0.0 | 0.0 |
| 130 | 1Z | TPK | MACKINAC BRIDGE AUTHORITY | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 134 | 1Z | STA | MAINE1 DOT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 137 | 1Z | CAN | MANITOBA H&T - BRIDGES & STRUCTURES | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 154 | 1Z | STA | MICHIGAN1 DOT - MATERIALS & TECHNOLOGY | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 157 | 1Z | STA | MINNESOTA1 DOT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| RECORD NUMBER | CODE_NUM | AGENCY TYPE | AGENCY | SYSTEM TYPE | TECHNIQUE | SQUARE YARDS | TRAFFIC COST | SURFACE PREP COST | PLACING AND CURING | OTHER COST | TOTAL COST | SOME MAINTENANCE | MAJOR REPAIR | TRAFFIC CONTROL TIME | SURFACE PREP TIME | PLACING & CURING TIME | TOTAL TIME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 168 | 1Z | STA | MONTANA1 DEPT OF HIGHWAYS | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 175 | 1Z | STA | NEVADA1 DOT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 178 | 1Z | CAN | NEW BRUNSWICK DOT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 187 | 1Z | TPK | NEW JERSEY HIGHWAY ATHY | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 200 | 1Z | STA | NEW MEXICO1 HIGHWAY DEPT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 217 | 1Z | STA | NORTH DAKOTA1 STATE HIGHWAY DEPT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 220 | 1Z | CAN | NORTHWEST TERR PUBLIC WORKS & HIWAYS | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 239 | 1Z | CAN | ONTARIO MOT - R&D BRANCH | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 242 | 1Z | STA | OREGON1 DOT - RESEARCH UNIT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 252 | 1Z | CAN | PRINCE EDWARD ISLAND TRANS & PW | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 256 | 1Z | T^2 | PULASKI, VA | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 264 | 1Z | CAN | SASKATCHEWAN HIGHWAYS & TRANS | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 293 | 1Z | TPK | THOUSAND ISLANDS BRIDGE ATHY | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 302 | 1Z | STA | UTAH1 DOT | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 305 | 1Z | STA | VERMONT1 AGENCY OF TRANSPORTATION | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 330 | 1Z | CAN | YUKON TERR. CON'TY & TRANS SERVICES | P | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 43 | 2A1C | STA | CALIFORNIA1 DOT, NEW TECH & RSRCH | R | LOW-FUMING METHACRYLATE PEUTE | 1000.0 | 0.11 | 3.87 | 2.97 | 0.00 | 6.95 | 10.0 | 20.0 | 2.0 | 0.5 | 6.0 | 8.5 |
| 231 | 2A1C | STA | OHIO1 DOT - MAITENANCE ENGR | R | HMW METHACRYLATE CRACK FILLER | 400.0 | 3.00 | 0.00 | 0.00 | 0.00 | 12.00 | 5.0 | 10.0 | 2.0 | 2.0 | 2.0 | 6.0 |
| 277 | 2A2 | STA | SOUTH DAKOTA1 DOT - RESEARCH PROGRAM | R | EPOXY INJECTION | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 61 | 2B | STA | CONNECTICUT1 DOT - BRIDGE DESIGN | R | CONC HEAD-EXPAN JT DEV INSTALL | 500.0 | 3.00 | 0.00 | 50.00 | 0.00 | 53.00 | 5.0 | 10.0 | 3.0 | 6.0 | 15.0 | 24.0 |
| 194 | 2C | STA | NEW JERSEY1 DOT | R | REM CL CNC-PL CNC PATCH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 195 | 2C1 | STA | NEW JERSEY1 DOT | R | ASPHALT PATCH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 102 | 2C1A | STA | INDIANA1 DEPT OF HIGHWAYS | R | COLD MIX ASPHALT PATCH | 1.0 | 100.00 | 10.00 | 60.00 | 0.00 | 170.00 | 0.1 | 2.0 | 1.0 | 0.1 | 0.5 | 1.6 |
| 117 | 2C1A | STA | KANSAS1 DOT - MATERIALS RSRCH CTR | R | COLD MIX ASPHALT PATCHES | 10.0 | 1.00 | 2.00 | 3.00 | 1.00 | 7.00 | 0.1 | 1.3 | 1.0 | 1.0 | 1.0 | 3.0 |
| 225 | 2C1A | CAN | NOVA SCOTIA DOT & COMMUNICATIONS | R | COLD MIX ASPHALT PATCH | 3.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0 | 1.0 | 0.5 | 0.5 | 0.5 | 1.5 |
| 104 | 2C1B | STA | INDIANA1 DEPT OF HIGHWAYS | R | HOT MIX ASPHALT PATCH | 1.0 | 100.00 | 10.00 | 60.00 | 0.00 | 170.00 | 0.3 | 2.0 | 1.0 | 0.1 | 0.5 | 1.6 |
| 118 | 2C1B | STA | KANSAS1 DOT - MATERIALS RSRCH CTR | R | HOT MIX ASPHALT PATCHES | 10.0 | 1.00 | 2.00 | 3.00 | 1.00 | 7.00 | 0.1 | 1.3 | 1.0 | 1.0 | 1.0 | 3.0 |
| 226 | 2C1B | CAN | NOVA SCOTIA DOT & COMMUNICATIONS | R | HOT MIX ASPHALT PATCH | 3.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 1.0 | 1.0 | 0.5 | 0.5 | 0.5 | 1.5 |
| 106 | 2D | STA | INDIANA1 DEPT OF HIGHWAYS | R | HIGH EARLY STRENGTH PATCH | 1.0 | 500.00 | 120.00 | 360.00 | 0.00 | 980.00 | 2.0 | 5.0 | 1.0 | 1.0 | 3.0 | 5.0 |
| 108 | 2D | STA | INDIANA1 DEPT OF HIGHWAYS | R | 4000# FLEX. STRNGTH/6 BAG CNT | 7.0 | 285.71 | 274.29 | 51.43 | 0.00 | 611.43 | 10.0 | 20.0 | 1.0 | 16.0 | 3.0 | 20.0 |
| 145 | 2D | STA | MARYLAND1 DOT - MATERIALS & RESEARCH | R | RMV CL CNTAM CNC-REPL MES PCC | 11.0 | 1.88 | 236.00 | 57.00 | 0.00 | 294.88 | 1.5 | 4.0 | 2.0 | 8.0 | 14.0 | 24.0 |
| 162 | 2D | STA | NEW HAMPSHIRE1 DOT | R | REMOV CNC-REPL MES CNC | 3.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.0 | 15.0 | 1.5 | 3.0 | 3.0 | 7.5 |
| 250 | 2D | STA | PENNSYLVANIA1 DOT | R | MES CONCRETE PATCH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 2.5 | 9.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 286 | 2D | STA | TEXAS1 DEPT OF HWYS/ PUB TRANS | R | REPAIR WITH HI ERLY STRNTH CNC | 6.0 | 0.00 | 0.00 | 0.00 | 0.00 | 260.00 | 0.0 | 0.0 | 1.0 | 6.0 | 16.0 | 23.0 |
| 18 | 2D4 | STA | ARKANSAS1 HIGHWAY & TRANSPORTATION DEPT | R | FAST SETTING DECK PATCH | 21.0 | 11.50 | 19.00 | 7.50 | 0.00 | 38.00 | 4.0 | 7.0 | 3.0 | 5.0 | 2.0 | 10.0 |
| 56 | 2D4 | STA | COLORADO1 DEPT OF HIGHWAYS | R | RMV SPALL CNC-PL RH PATCH MATL | 1.0 | 12.50 | 40.00 | 75.00 | 0.00 | 127.50 | 0.0 | 0.0 | 5.0 | 1.0 | 3.0 | 9.0 |
| 57 | 2D4 | STA | COLORADO1 DEPT OF HIGHWAYS | R | RMV SPALL TO STEEL/PL RH PATCH | 1.0 | 12.50 | 57.00 | 75.00 | 0.00 | 144.50 | 0.0 | 0.0 | 5.0 | 2.0 | 3.0 | 10.0 |
| 116 | 2D4 | STA | KANSAS1 DOT - MATERIALS RSRCH CTR | R | PATCH W/RAPID SET REPR MATL | 5.0 | 1.00 | 4.00 | 8.00 | 2.00 | 15.00 | 0.3 | 3.0 | 1.0 | 3.0 | 3.0 | 7.0 |
| 144 | 2D4 | STA | MARYLAND1 DOT - MATERIALS & RESEARCH | R | RMV CNC/RPL W/RAPHARD CEM MATL | 4.0 | 1.88 | 81.25 | 147.00 | 0.00 | 230.13 | 0.8 | 2.5 | 0.5 | 2.5 | 2.0 | 5.0 |
| 193 | 2D4 | STA | NEW JERSEY1 DOT | R | Q-SET MORTAR PATCH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 198 | 2D4 | STA | NEW JERSEY2 DOT - MAINTENANCE ENGR | R | RPLC CNC SLAB W/ QUIKSET CNC | 18.0 | 16.00 | 375.00 | 110.00 | 0.00 | 501.00 | 3.0 | 5.0 | 0.5 | 5.5 | 6.0 | 12.0 |
| 207 | 2D4 | STA | NEW YORK1 DOT - MATERIALS BUREAU | R | RAPID SET CNC | 1.0 | 0.00 | 247.50 | 282.50 | 0.00 | 0.00 | 7.0 | 10.0 | 0.5 | 1.0 | 1.3 | 2.8 |
| 215 | 2D4 | STA | NORTH CAROLINA1 DOT | R | FAST SET MORTARS | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 5.0 | 10.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 224 | 2D4 | CAN | NOVA SCOTIA DOT & COMMUNICATIONS | R | RAPID-SET MORTAR PATCH | 1.0 | 0.00 | 0.00 | 0.00 | 0.00 | 420.84 | 0.0 | 5.0 | 0.5 | 1.5 | 2.0 | 4.0 |
| 282 | 2D4 | STA | TENNESSEE1 DOT | R | PATCH W/QUICK SET CEM BSE MATL | 25.0 | 1.50 | 5.00 | 120.00 | 0.00 | 126.50 | 2.0 | 4.0 | 3.0 | 6.0 | 3.0 | 12.0 |
| 325 | 2D4 | STA | WISCONSIN1 DOT | R | QUICK SET MATL ON SMALL PATCH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 311 | 2D4A | STA | VIRGINIA1 TRANS RSRCH COUNCIL | R | "8" PATCH W/RAP HARD CNT | 15.0 | 1.00 | 120.00 | 180.00 | 0.00 | 301.00 | 5.0 | 10.0 | 0.5 | 6.0 | 5.0 | 11.5 |
| 121 | 2D4A11 | STA | KENTUCKY1 TRANS CABINET, DEPT OF HWYS | R | RAPID SET CONC PATCH--DURACAL | 2.0 | 57.00 | 171.00 | 210.00 | 0.00 | 438.00 | 1.0 | 4.0 | 1.0 | 3.0 | 3.0 | 7.0 |
| 166 | 2D4A11 | STA | MISSOURI1 HWY & TRANS DEPT | R | RPL DELAM CNC W/PATCH--DURACAL | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

| RECORD NUMBER | CODE_NUM | AGENCY TYPE | AGENCY | SYSTEM TYPE | TECHNIQUE | SQUARE YARDS | TRAFFIC COST | SURFACE PREP COST | PLACING AND CURING | OTHER COST | TOTAL COST | SOME MAINTENANCE | MAJOR REPAIR | TRAFFIC CONTROL TIME | SURFACE PREP TIME | PLACING & CURING TIME | TOTAL TIME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 235 | 2D4A11 | STA | OKLAHOMA1 DOT - BRIDGE DIVISION | R | USE OF HES CNC - DURACAL | 10.0 | 30.00 | 16.00 | 43.50 | 0.00 | 89.50 | 0.0 | 0.0 | 2.0 | 1.0 | 3.0 | 6.0 |
| 107 | 2D4A5 | STA | INDIANA1 DEPT OF HIGHWAYS | R | PYRAMENT PATCH | 1.0 | 500.00 | 120.00 | 360.00 | 0.00 | 980.00 | 2.0 | 5.0 | 1.0 | 1.0 | 3.0 | 5.0 |
| 312 | 2D48 | STA | VIRGINIA1 TRANS RSRCH COUNCIL | R | "B" PATCH W/VERY RAP HARD CMT | 15.0 | 1.00 | 120.00 | 200.00 | 0.00 | 321.00 | 5.0 | 10.0 | 0.5 | 6.0 | 3.0 | 9.5 |
| 313 | 2D48 | STA | VIRGINIA1 TRANS RSRCH COUNCIL | R | "A" PATCH W/VERY RAP HARD CMT | 25.0 | 1.00 | 70.00 | 130.00 | 0.00 | 201.00 | 5.0 | 10.0 | 0.5 | 6.0 | 3.0 | 9.5 |
| 147 | 2D4B1 | STA | MARYLAND2 DOT - DISTRICT 4 | R | CELROC 10-60 | 2.0 | 103.13 | 103.13 | 271.88 | 103.13 | 581.27 | 0.0 | 1.8 | 2.0 | 2.0 | 2.0 | 6.0 |
| 62 | 2D5 | STA | CONNECTICUT1 DOT - BRIDGE DESIGN | R | RENOV CONTAM-PATCH HES GPC | 500.0 | 3.00 | 20.00 | 50.00 | 0.00 | 73.00 | 5.0 | 10.0 | 3.0 | 6.0 | 15.0 | 24.0 |
| 328 | 2E | STA | WYOMING1 HIGHWAY DEPARTMENT | R | POLYMER CONCRETE | 3.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.5 | 2.0 | 9.5 | 12.0 |
| 184 | 2E2A | STA | NEW HAMPSHIRE1 DOT | R | REMOV-REPL EPXY/POLYMER CNC | 3.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.0 | 15.0 | 1.5 | 3.0 | 2.0 | 6.5 |
| 44 | 2E5A | STA | CALIFORNIA1 DOT, NEW TECH & RSRCH | R | POLYESTER CNC-NON/CONDUCTIVE | 600.0 | 0.11 | 18.00 | 48.75 | 0.00 | 66.86 | 10.0 | 25.0 | 2.0 | 2.0 | 5.0 | 9.0 |
| 45 | 2F1A1 | STA | CALIFORNIA1 DOT, NEW TECH & RSRCH | R | RHV PCC&PTCH W/MHAC BURKE 928 | 1.0 | 0.11 | 18.00 | 67.50 | 0.00 | 85.61 | 10.0 | 20.0 | 2.0 | 3.0 | 4.0 | 9.0 |
| 243 | 2F2 | STA | OREGON1 DOT - RESEARCH UNIT | R | MAG PHOS CNC PATCH | 0.5 | 15.00 | 150.00 | 150.00 | 100.00 | 415.00 | 2.0 | 4.0 | 1.0 | 1.0 | 1.0 | 3.0 |
| 247 | 2F2 | TPK | PENNSYLVANIA TURNPIKE COMMISSION | R | MAGNESIUM PHOSPHATE CONCRETE | 116.6 | 70.47 | 0.00 | 450.00 | 0.00 | 520.47 | 10.0 | 15.0 | 2.0 | 4.0 | 4.0 | 10.0 |
| 42 | 2F2C1 | STA | CALIFORNIA1 DOT, NEW TECH & RSRCH | R | REMOVE PCC-PATCH W/SET45 | 1.0 | 0.11 | 18.00 | 67.50 | 0.00 | 85.61 | 10.0 | 20.0 | 2.0 | 3.0 | 4.0 | 9.0 |
| 91 | 2F2C1 | STA | HAWAII1 DOT | R | RAPID SETTING CONC--SET 45 | 10.0 | 5.00 | 9.00 | 9.00 | 3.00 | 26.00 | 10.0 | 20.0 | 1.0 | 2.0 | 2.0 | 5.0 |
| 105 | 2F2C1 | STA | INDIANA1 DEPT OF HIGHWAYS | R | SET 45 PARTIAL DEPTH PATCH | 1.0 | 100.00 | 10.00 | 60.00 | 0.00 | 170.00 | 1.0 | 2.0 | 1.0 | 0.1 | 3.0 | 4.1 |
| 169 | 2F2C1 | STA | MONTANA1 DEPT OF HIGHWAYS | R | SET 45 PATCHING | 270.0 | 1.74 | 0.56 | 1.66 | 0.00 | 3.96 | 4.0 | 10.0 | 0.5 | 4.0 | 7.5 | 12.0 |
| 236 | 2F2C1 | STA | OKLAHOMA1 DOT - BRIDGE DIVISION | R | USE OF HES CNC - SET 45 | 10.0 | 30.00 | 16.00 | 43.50 | 0.00 | 89.50 | 0.0 | 0.0 | 2.0 | 1.0 | 3.0 | 6.0 |
| 276 | 2F2C1 | STA | SOUTH DAKOTA1 DOT - RESEARCH PROGRAM | R | PATCHING--SET 45 | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 331 | 2F2C1 | CAN | YUKON TERR. CON'TY & TRANS SERVICES | R | SET-45 | 1.0 | 100.00 | 50.00 | 50.00 | 40.00 | 240.00 | 0.0 | 0.0 | 0.5 | 0.5 | 1.0 | 2.0 |
| 73 | 2G1A | STA | DISTRICT OF COLOMBIA - PUBLIC WORKS | R | INSTL STL PLATE W/ PCC PATCH | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 183 | 2G1A | STA | NEW HAMPSHIRE1 DOT | R | REMOV-REPL NRML CNC/STL PLATE | 3.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 10.0 | 15.0 | 1.5 | 3.0 | 4.0 | 8.5 |
| 76 | 2Y | STA | FLORIDA DOT - MATERIALS OFFICE | R | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 111 | 2Y | STA | IOWA1 DOT: MATERIALS - RESEARCH | R | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 152 | 2Y | TPK | MASSACHUSETTS TURNPIKE AUTHORITY | R | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 210 | 2Y | STA | NEW YORK2 DOT - MATERIALS BUREAU | R | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 291 | 2Y | TPK | THE TURNPIKE AUTHORITY OF KY | R | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 3 | 2Z | STA | ALASKA1 DOT, BRIDGE DESIGN | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 9 | 2Z | CAN | ALBERTA TRANS & UTIL, R&D | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 12 | 2Z | T^2 | ARE ENGINEERING CONSULTANTS | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 15 | 2Z | STA | ARIZONA1 DOT, HIGHWAYS DIV. | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 27 | 2Z | CAN | BRITISH COLUMBIA MOTH | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 50 | 2Z | TPK | CHESAPEAKE BAY BRIDGE/TUNNEL DIST | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 53 | 2Z | T^2 | CLARK COUNTY HWY DEPT | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 67 | 2Z | TPK | DELAWARE RIVER PORT AUTHORITY | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 96 | 2Z | STA | IDAHO1 TRANSPORTATION DEPT | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 100 | 2Z | STA | ILLINOIS1 DOT | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 125 | 2Z | STA | LOUISIANA1 TRANS RSRCH CENTER | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 128 | 2Z | T^2 | LUFKIN, TX | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 131 | 2Z | TPK | MACKINAC BRIDGE AUTHORITY | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 135 | 2Z | STA | MAINE1 DOT | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 138 | 2Z | CAN | MANITOBA H&T - BRIDGES & STRUCTURES | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 155 | 2Z | STA | MICHIGAN1 DOT - MATERIALS & TECHNOLOGY | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 158 | 2Z | STA | MINNESOTA1 DOT | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 162 | 2Z | STA | MISSISSIPPI1 STATE HIGHWAY DEPT | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 173 | 2Z | STA | NEBRASKA1 DEPT OF ROADS | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 176 | 2Z | STA | NEVADA1 DOT | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 179 | 2Z | CAN | NEW BRUNSWICK DOT | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 188 | 2Z | TPK | NEW JERSEY HIGHWAY ATHY | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

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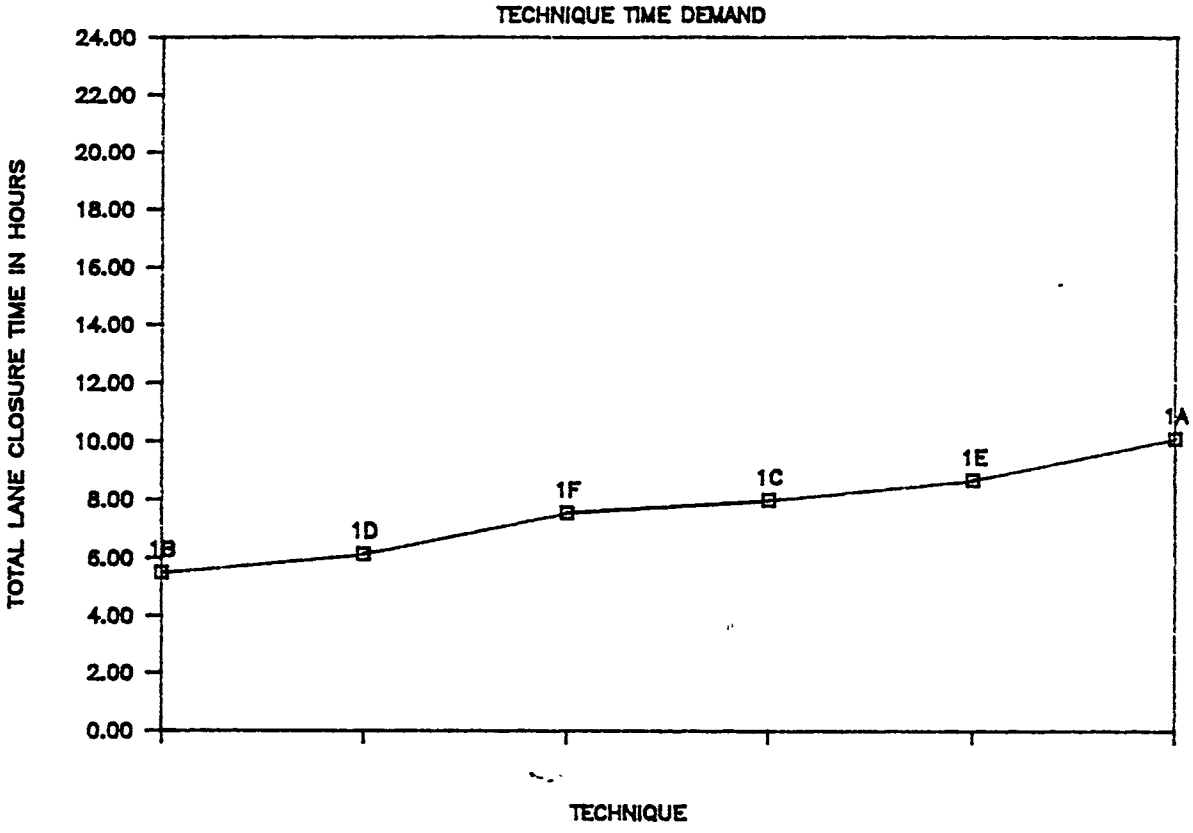
2388

| RECORD NUMBER | CODE_NUM | AGENCY TYPE | AGENCY | SYSTEM TYPE | TECHNIQUE | SQUARE YARDS | TRAFFIC COST | SURFACE PREP COST | PLACING AND CURING | OTHER COST | TOTAL COST | SOME MAINTENANCE | MAJOR REPAIR | TRAFFIC CONTROL TIME | SURFACE PREP TIME | PLACING & CURING TIME | TOTAL TIME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 218 | 2Z | STA | NORTH DAKOTA1 STATE HIGHWAY DEPT | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 221 | 2Z | CAN | NORTHWEST TERR PUBLIC WORKS & HIWAYS | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 240 | 2Z | CAN | ONTARIO MOT - R&D BRANCH | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 253 | 2Z | CAN | PRINCE EDWARD ISLAND TRANS & PW | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 265 | 2Z | CAN | SASKATCHEWAN HIGHWAYS & TRANS | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 273 | 2Z | STA | SOUTH CAROLINA1 DEPT OF HWYS & TRANS | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 294 | 2Z | TPK | THOUSAND ISLANDS BRIDGE ATHY | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 300 | 2Z | T^2 | UMPQUA NATIONAL FOREST | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 303 | 2Z | STA | UTAH1 DOT | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 306 | 2Z | STA | VERMONT1 AGENCY OF TRANSPORTATION | R | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 101 | 3A4 | STA | ILLINOIS1 DOT | RP | RPL W/PR-CST POST-TENSND PNLS | 135.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 12.5 | 30.0 | 1.0 | 4.0 | 5.0 | 10.0 |
| 46 | 3B2 | STA | CALIFORNIA1 DOT, NEW TECH & RSRCH | RP | PRECAST DECK SECT ON OLD GIRDR | 5000.0 | 0.22 | 0.00 | 0.00 | 0.00 | 800.00 | 30.0 | 50.0 | 2.0 | 8.0 | 8.0 | 18.0 |
| 248 | 3B2 | TPK | PENNSYLVANIA TURNPIKE COMMISSION | RP | PRECAST CONC DECK SLABS | 9839.0 | 264.25 | 203.27 | 274.42 | 211.40 | 953.34 | 20.0 | 40.0 | 25.0 | 27.0 | 27.0 | 79.0 |
| 320 | 3B2 | STA | WASHINGTON1 STATE DOT | RP | PRECAST STANDARD REIN PANELS | 22.3 | 14.70 | 0.00 | 160.00 | 66.70 | 0.00 | 17.5 | 35.0 | 2.9 | 0.0 | 7.1 | 10.0 |
| 47 | 3D | STA | CALIFORNIA1 DOT, NEW TECH & RSRCH | RP | CAST NEW DECK/USE OLD DECK FRM | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 30.0 | 50.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 208 | 3D | STA | NEW YORK1 DOT - MATERIALS BUREAU | RP | FULL OVERLAY WITH PCC | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 227 | 3D | CAN | NOVA SCOTIA DOT & COMMUNICATIONS | RP | CAST-IN-PL REINF CONCRETE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 34.32 | 8.0 | 15.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 274 | 3D | STA | SOUTH CAROLINA1 DEPT OF HWYS & TRANS | RP | FULL DEPTH PATCH W/HES CNC | 3.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 1.0 | 3.0 | 20.0 | 24.0 |
| 321 | 3D | STA | WASHINGTON1 STATE DOT | RP | CAST-IN-PL REIN CONC (FUTURE) | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 196 | 3D2 | STA | NEW JERSEY1 DOT | RP | COMPLETE DECK REPLMENT | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 58 | 3D3A | STA | COLORADO1 DEPT OF HIGHWAYS | RP | FULL DEPTH DECK REPAIR | 1.0 | 25.00 | 75.00 | 99.50 | 0.00 | 199.50 | 0.0 | 0.0 | 5.0 | 3.0 | 4.0 | 12.0 |
| 237 | 3D3A1 | STA | OKLAHOMA1 DOT - BRIDGE DIVISION | RP | USE OF HES CNC - DURACAL | 5.0 | 80.00 | 32.00 | 137.00 | 0.00 | 249.00 | 0.0 | 0.0 | 2.0 | 1.0 | 5.0 | 8.0 |
| 109 | 3F2C1 | STA | INDIANA1 DEPT OF HIGHWAYS | RP | SET 45 FULL DEPTH PATCH | 1.0 | 500.00 | 120.00 | 360.00 | 0.00 | 980.00 | 2.0 | 5.0 | 1.0 | 1.0 | 3.0 | 5.0 |
| 170 | 3F2C1 | STA | MONTANA1 DEPT OF HIGHWAYS | RP | SET 45 | 2.0 | 235.00 | 131.00 | 395.00 | 0.00 | 761.00 | 2.0 | 6.0 | 0.5 | 6.5 | 5.0 | 12.0 |
| 238 | 3F2C1 | STA | OKLAHOMA1 DOT - BRIDGE DIVISION | RP | USE OF HES CNC - SET 45 | 5.0 | 80.00 | 32.00 | 137.00 | 0.00 | 249.00 | 0.0 | 0.0 | 2.0 | 1.0 | 5.0 | 8.0 |
| 129 | 3H | T^2 | LUFKIN, TX | RP | REPLC BRDG W/ LARGE CULVERT | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 14.00 | 15.0 | 20.0 | 0.0 | 0.0 | 0.0 | 36.0 |
| 63 | 3Y | STA | CONNECTICUT1 DOT - BRIDGE DESIGN | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 77 | 3Y | STA | FLORIDA DOT - MATERIALS OFFICE | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 82 | 3Y | T^2 | FORT SCOTT, KS | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 85 | 3Y | T^2 | FREDERICKSBURG, VA | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 112 | 3Y | STA | IOWA1 DOT: MATERIALS - RESEARCH | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 119 | 3Y | STA | KANSAS1 DOT - MATERIALS RSRCH CTR | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 148 | 3Y | STA | MARYLAND2 DOT - DISTRICT 4 | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 153 | 3Y | TPK | MASSACHUSETTS TURNPIKE AUTHORITY | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 185 | 3Y | STA | NEW HAMPSHIRE1 DOT | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 199 | 3Y | STA | NEW JERSEY2 DOT - MAINTENANCE ENGR | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 211 | 3Y | STA | NEW YORK2 DOT - MATERIALS BUREAU | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 270 | 3Y | T^2 | SHAWNEE COUNTY PUBLIC WORKS DEPT | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 287 | 3Y | STA | TEXAS1 DEPT OF HWYS/ PUB TRANS | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 292 | 3Y | TPK | THE TURNPIKE AUTHORITY OF KY | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 329 | 3Y | STA | WYOMING1 HIGHWAY DEPARTMENT | RP | N/A | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 4 | 3Z | STA | ALASKA1 DOT, BRIDGE DESIGN | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 10 | 3Z | CAN | ALBERTA TRANS & UTIL, R&D | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 13 | 3Z | T^2 | ARE ENGINEERING CONSULTANTS | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 16 | 3Z | STA | ARIZONA1 DOT, HIGHWAYS DIV. | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 19 | 3Z | STA | ARKANSAS1 HIGHWAY & TRANSPORTATION DEPT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 28 | 3Z | CAN | BRITISH COLUMBIA MOTH | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 51 | 3Z | TPK | CHESAPEAKE BAY BRIDGE/TUNNEL DIST | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 54 | 3Z | T^2 | CLARK COUNTY HWY DEPT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

2390

| RECORD NUMBER | CODE_NUM | AGENCY TYPE | AGENCY | SYSTEM TYPE | TECHNIQUE | SQUARE YARDS | TRAFFIC COST | SURFACE PREP COST | PLACING AND CURING | OTHER COST | TOTAL COST | SOME MAINTENANCE | MAJOR REPAIR | TRAFFIC CONTROL TIME | SURFACE PREP TIME | PLACING & CURING TIME | TOTAL TIME |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 59 | 3Z | STA | COLORADO1 DEPT OF HIGHWAYS | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 68 | 3Z | TPK | DELAWARE RIVER PORT AUTHORITY | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 74 | 3Z | STA | DISTRICT OF COLOMBIA - PUBLIC WORKS | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 92 | 3Z | STA | HAWAII1 DOT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 97 | 3Z | STA | IDAHO1 TRANSPORTATION DEPT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 122 | 3Z | STA | KENTUCKY1 TRANS CABINET, DEPT OF HWYS | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 126 | 3Z | STA | LOUISIANA1 TRANS RSRCH CENTER | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 132 | 3Z | TPK | MACKINAC BRIDGE AUTHORITY | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 136 | 3Z | STA | MAINE1 DOT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 139 | 3Z | CAN | MANITOBA H&T - BRIDGES & STRUCTURES | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 156 | 3Z | STA | MICHIGAN1 DOT - MATERIALS & TECHNOLOGY | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 159 | 3Z | STA | MINNESOTA1 DOT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 163 | 3Z | STA | MISSISSIPPI1 STATE HIGHWAY DEPT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 167 | 3Z | STA | MISSOURI1 HWY & TRANS DEPT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 174 | 3Z | STA | NEBRASKA1 DEPT OF ROADS | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 177 | 3Z | STA | NEVADA1 DOT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 180 | 3Z | CAN | NEW BRUNSWICK DOT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 189 | 3Z | TPK | NEW JERSEY HIGHWAY ATHY | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 202 | 3Z | STA | NEW MEXICO1 HIGHWAY DEPT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 216 | 3Z | STA | NORTH CAROLINA1 DOT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 219 | 3Z | STA | NORTH DAKOTA1 STATE HIGHWAY DEPT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 222 | 3Z | CAN | NORTHWEST TERR PUBLIC WORKS & HIWAYS | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 232 | 3Z | STA | OHIO1 DOT - MAITENANCE ENGR | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 241 | 3Z | CAN | ONTARIO MOT - R&D BRANCH | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 244 | 3Z | STA | OREGON1 DOT - RESEARCH UNIT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 251 | 3Z | STA | PENNSYLVANIA1 DOT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 254 | 3Z | CAN | PRINCE EDWARD ISLAND TRANS & PW | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 258 | 3Z | T2 | PULASKI, VA | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 266 | 3Z | CAN | SASKATCHEWAN HIGHWAYS & TRANS | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 278 | 3Z | STA | SOUTH DAKOTA1 DOT - RESEARCH PROGRAM | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 283 | 3Z | STA | TENNESSEE1 DOT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 295 | 3Z | TPK | THOUSAND ISLANDS BRIDGE ATHY | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 301 | 3Z | T2 | UMPQUA NATIONAL FOREST | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 304 | 3Z | STA | UTAH1 DOT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 307 | 3Z | STA | VERMONT1 AGENCY OF TRANSPORTATION | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 314 | 3Z | STA | VIRGINIA1 TRANS RSRCH COUNCIL | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 326 | 3Z | STA | WISCONSIN1 DOT | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |
| 332 | 3Z | CAN | YUKON TERR. COM'TY & TRANS SERVICES | RP | NONE | 0.0 | 0.00 | 0.00 | 0.00 | 0.00 | 0.00 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 |

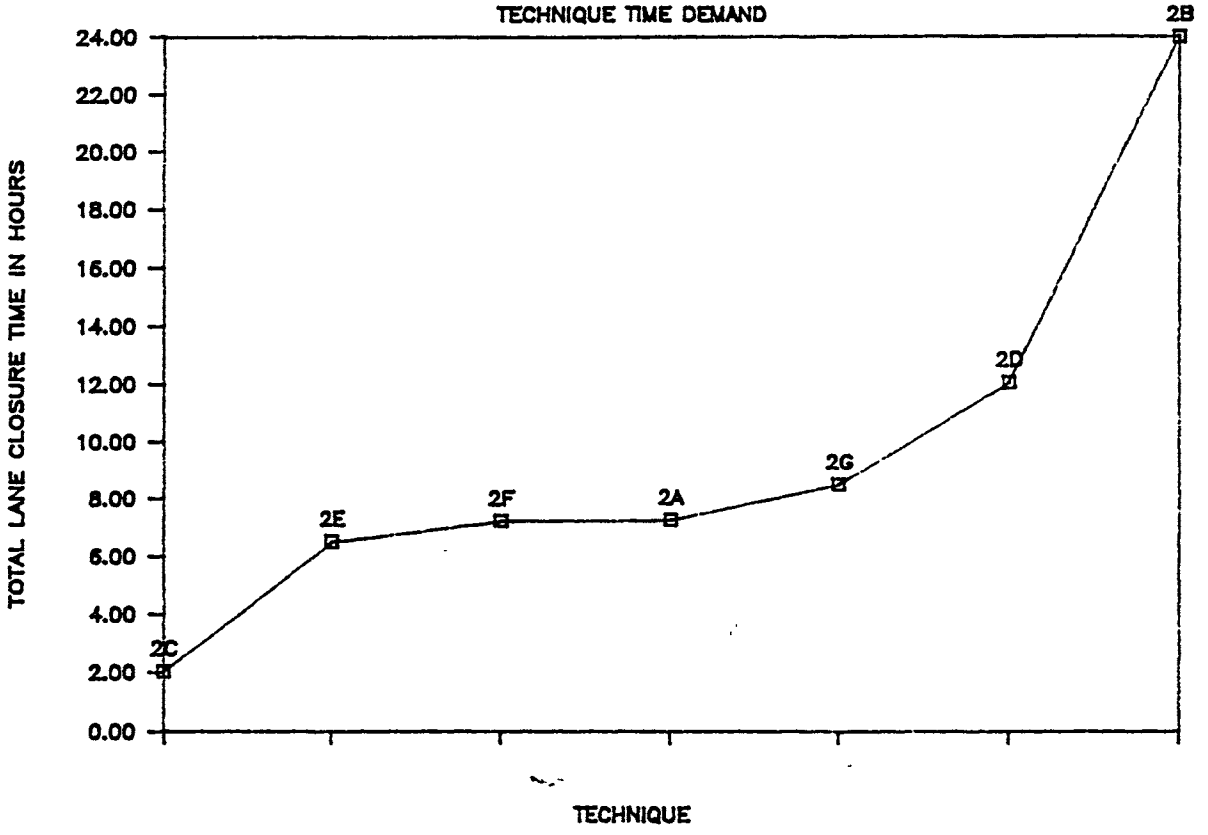
# RAPID PROTECTION SYSTEMS




| TECHNIQUE KEY: | CODE NUMBER* | TOTAL TIME (HOURS) | DOT/CSHRP PROVIDING DATA |
|---|---|---|---|
| 1--COATING | 1B | 5.50 | CA |
| 2--PENETRATING SEALER | 1D | 6.13 | CA, MD, OH, OK |
| 3--OTHER HYDRAULIC CEMENT OVLY | 1F | 7.55 | BC, IN |
| 4--HES PCC OVLY | 1C | 8.00 | BC, ID, PA TPK |
| 5--PLMR OVLY | 1E | 8.68 | CA, MS, OH, SC, TN, VA, WA |
| 6--BITUMINOUS CONC OVLY | 1A | 10.11 | CT, ID, MD, NE, NH, NJ, NY, NS, PA, SC, TN, WA |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS

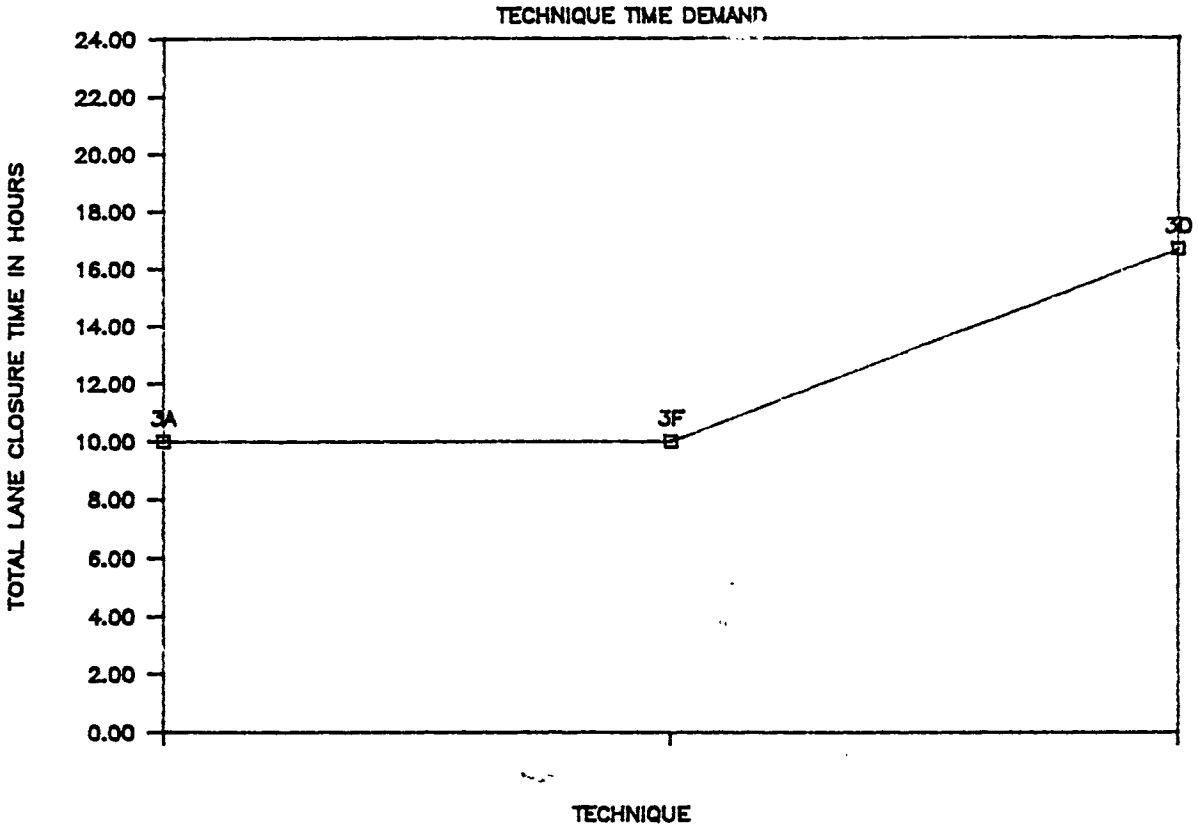
# RAPID REHABILITATION SYSTEMS




| TECHNIQUE KEY: | CODE NUMBER* | TOTAL TIME (HOURS) | DOT/CSHRP PROVIDING DATA |
|---|---|---|---|
| 1--BITUMINOUS CONC PATCH | 2C | 2.03 | IN, KS, NS |
| 2--PLMR CONC PATCH | 2E | 6.50 | CA, NH, WY |
| 3--OTHER HYDRAULIC CEMENT PATCH | 2F | 7.22 | CA, HI, IN, MI OK, OR, PA, YT |
| 4--CRACK SEALER | 2A | 7.25 | CA, OH |
| 5--STEEL PLATE OVER CONC | 2G | 8.50 | NH |
| 6--HES PCC PATCH | 2D | 12.07 | AR, CO, CT, KS KY, IN, LA, MI MO, NH, NJ, NY NS, OK, TN, TX VA |
| 7--EXPANSION JOINTS/CONC HEADERS | 2B | 24.00 | CT |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS

# RAPID REPLACEMENT SYSTEMS

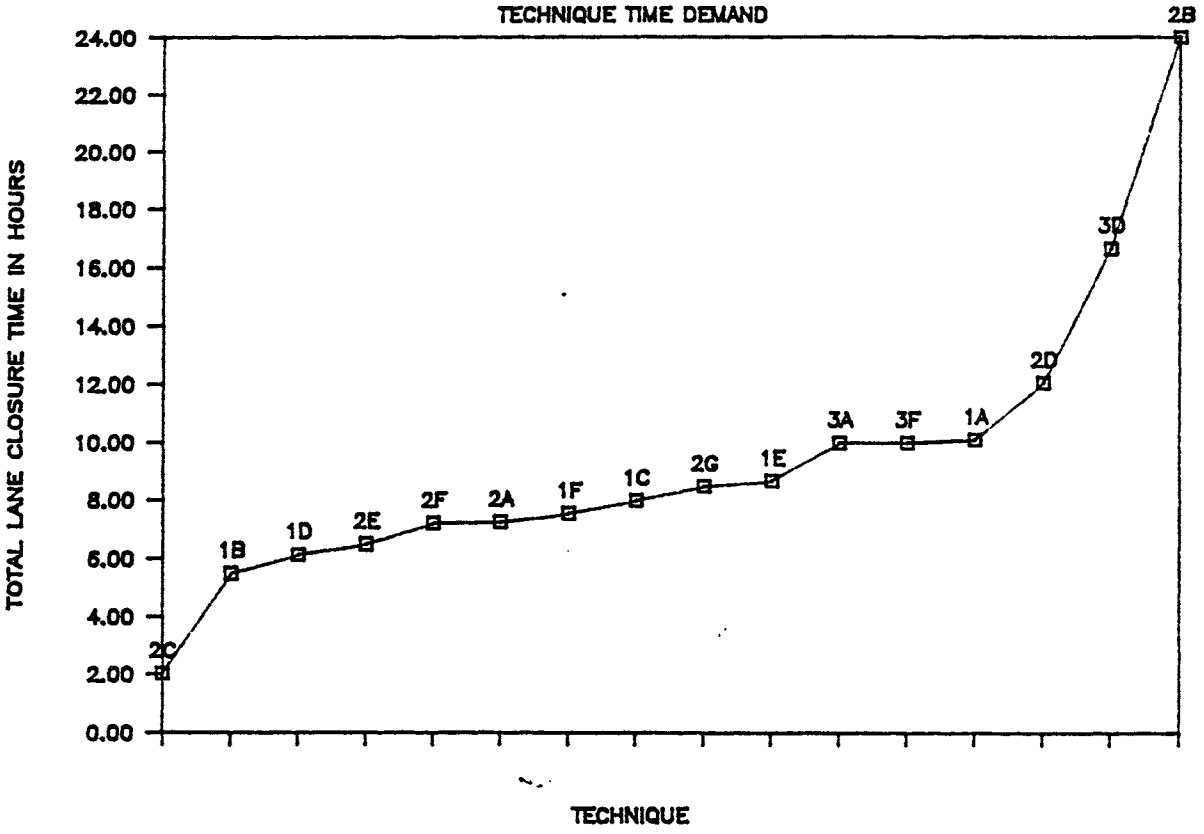



| TECHNIQUE KEY: | CODE NUMBER* | TOTAL TIME(HOURS) | DOT/CSHRP PROVIDING DATA |
|---|---|---|---|
| 1--POST-TENSIONED CONC | 3A | 10.00 | IL |
| 2--OTHER SITE CAST HYDRAULIC CEMENT | 3F | 10.00 | MT, OK |
| 3--SITE CAST HES PCC | 3D | 16.67 | CA, OK, SC |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS

2394

# RAPID REPAIR SYSTEMS

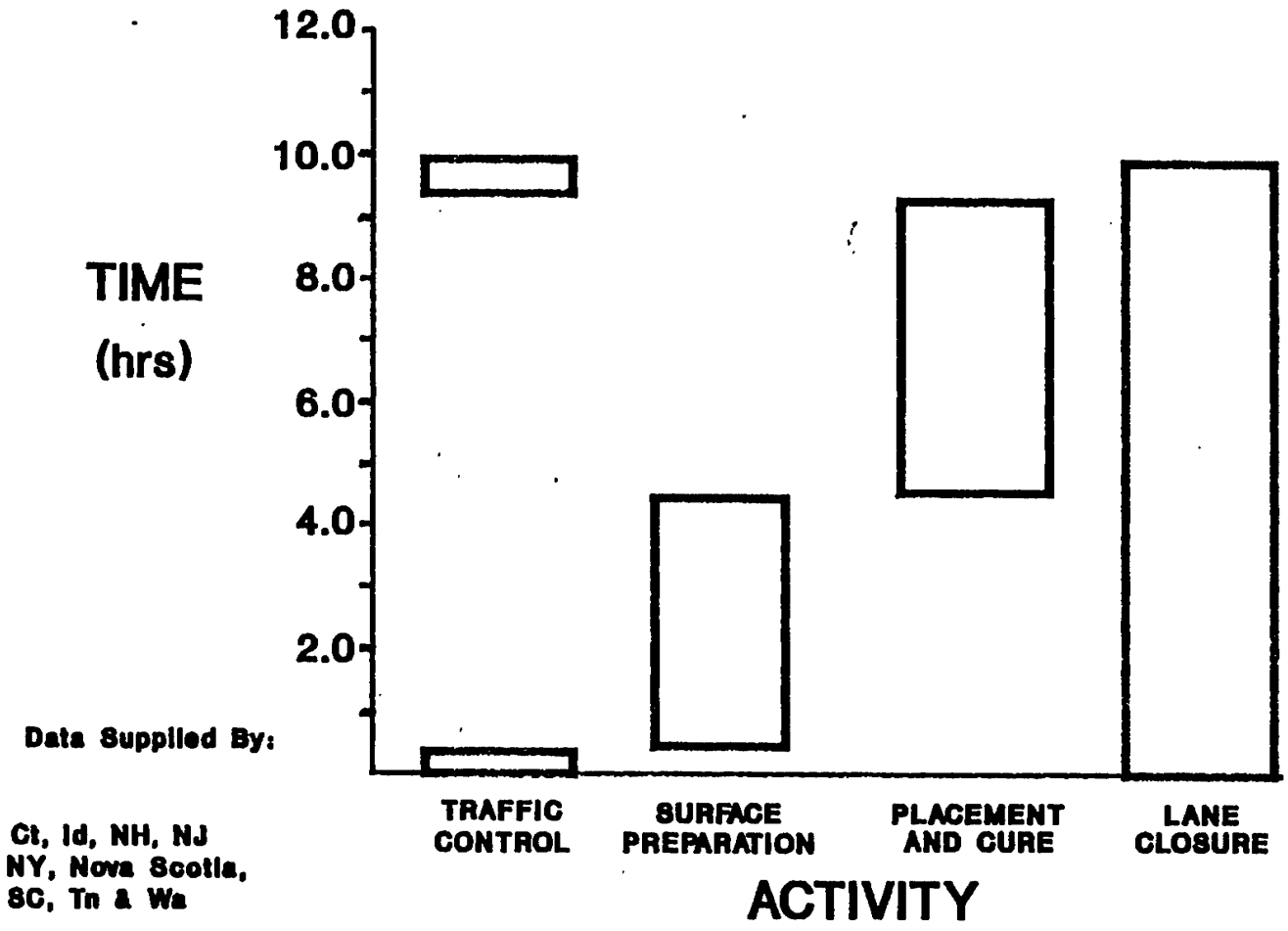



| TECHNIQUE KEY: | CODE NUMBER* | TOTAL TIME (HOURS) | DOT/CSHRP PROVIDING DAT |
|---|---|---|---|
| 1--BITUMINOUS CONC PATCH | 2C | 2.03 | IN, KS, NS |
| 2--COATING | 1B | 5.50 | CA |
| 3--PENETRATING SEALER | 1D | 6.13 | CA, MD, OH, O |
| 4--PLMR CONC PATCH | 2E | 6.50 | CA, NH, WY |
| 5--OTHER HYDRAULIC CEMENT PATCH | 2F | 7.22 | CA, HI, IN, M<br>OK, OR, PA, Y |
| 6--CRACK SEALER | 2A | 7.25 | CA, OH |
| 7--OTHER HYDRAULIC CEMENT OVLY | 1F | 7.55 | BC, IN |
| 8--HES PCC OVLY | 1C | 8.00 | BC, ID, PA TP |
| 9--STEEL PLATE OVER CONC | 2G | 8.50 | NH |
| 10--PLMR OVLY | 1E | 8.68 | CA, MS, OH, S<br>TN, VA, WA |
| 11--POST-TENSIONED CONC | 3A | 10.00 | IL |
| 12--OTHER SITE CAST HYDRAULIC CEMENT | 3F | 10.00 | MT, OK |
| 13--BITUMINOUS CONC OVLY | 1A | 10.11 | CT, ID, MD, N<br>NH, NJ, NY, N<br>PA, SC, TN, W. |
| 14--HES PCC PATCH | 2D | 12.07 | AR, CO, CT, K<br>KY, IN, LA, M<br>MO, NH, NJ, N<br>NS, OK, TN, T<br>VA |
| 15--SITE CAST HES PCC | 3D | 16.67 | CA, OK, SC |
| 16--EXPANSION JOINTS/CONC HEADERS | 2B | 24.00 | CT |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS

# TECHNIQUE TIME DEMANDS

## BITUMINUOUS CONCRETE OVERLAY

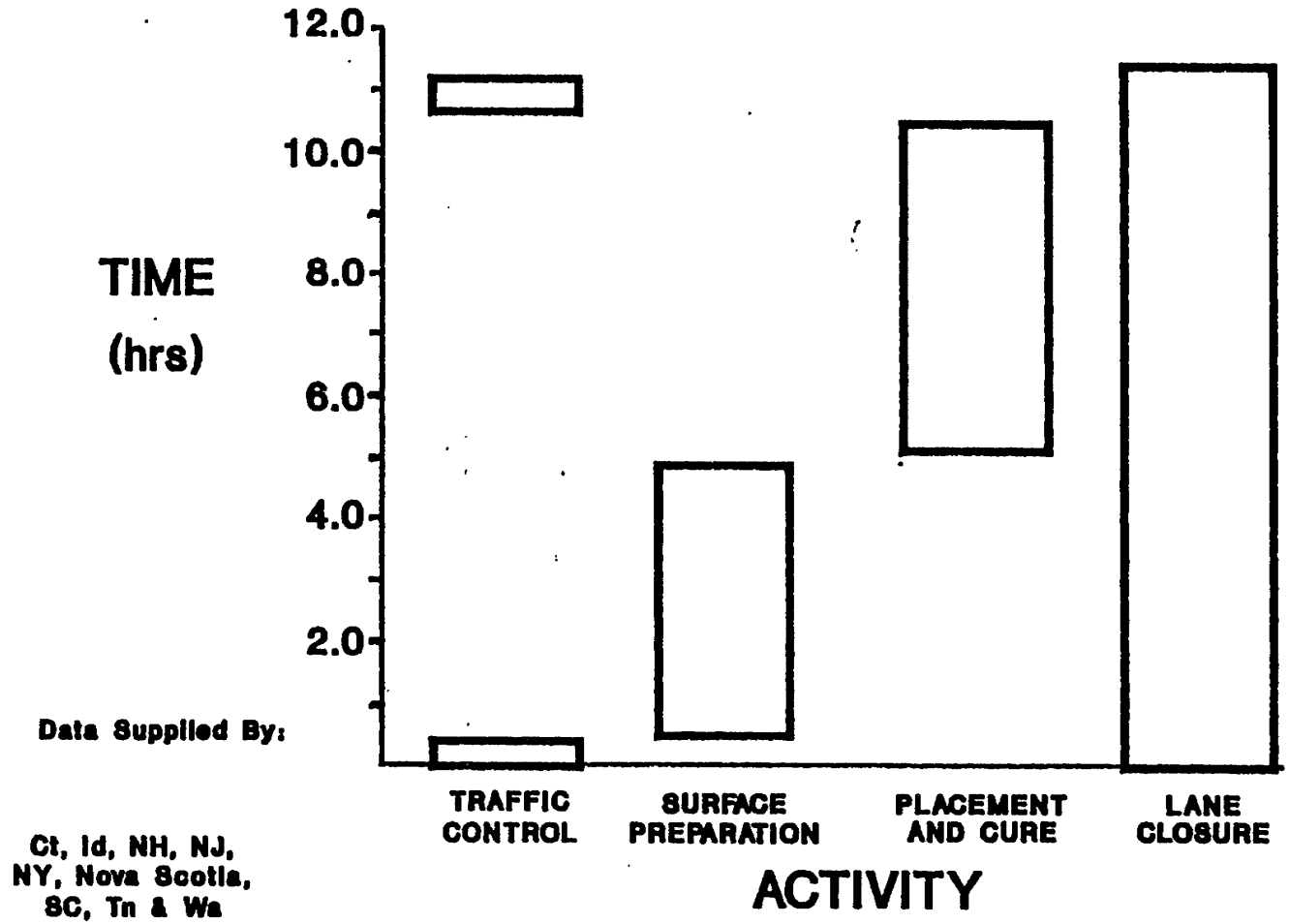



Data Supplied By:

Ct, Id, NH, NJ
NY, Nova Scotia,
SC, Tn & Wa

# TECHNIQUE TIME DEMANDS

## BITUMINOUS CONCRETE OVERLAY ON MEMBRANE

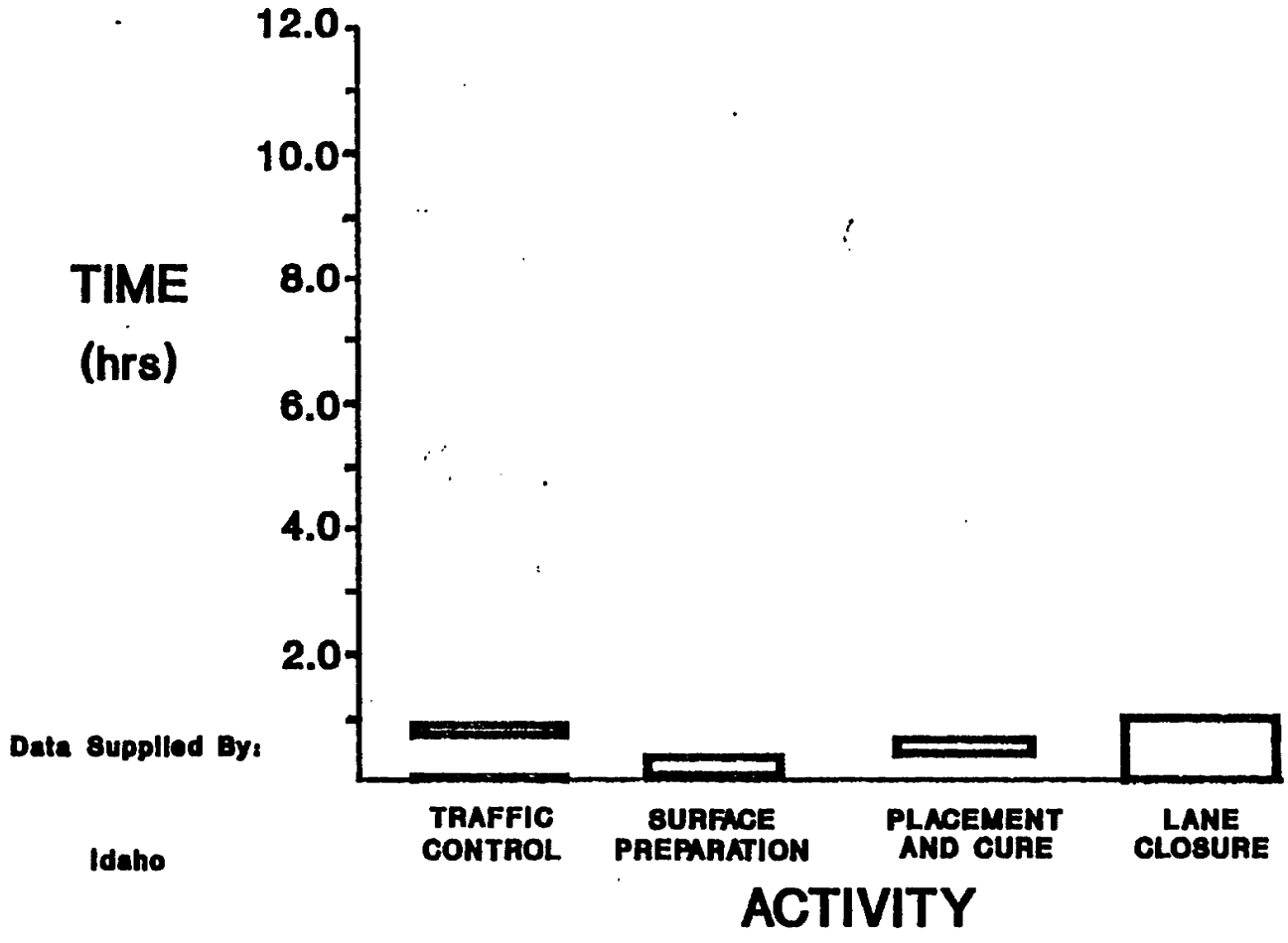



Data Supplied By:

Ct, Id, NH, NJ, NY, Nova Scotia, SC, Tn & Wa

# TECHNIQUE TIME DEMANDS

## BITUMINOUS CONCRETE OVERLAY / CHIP SEAL

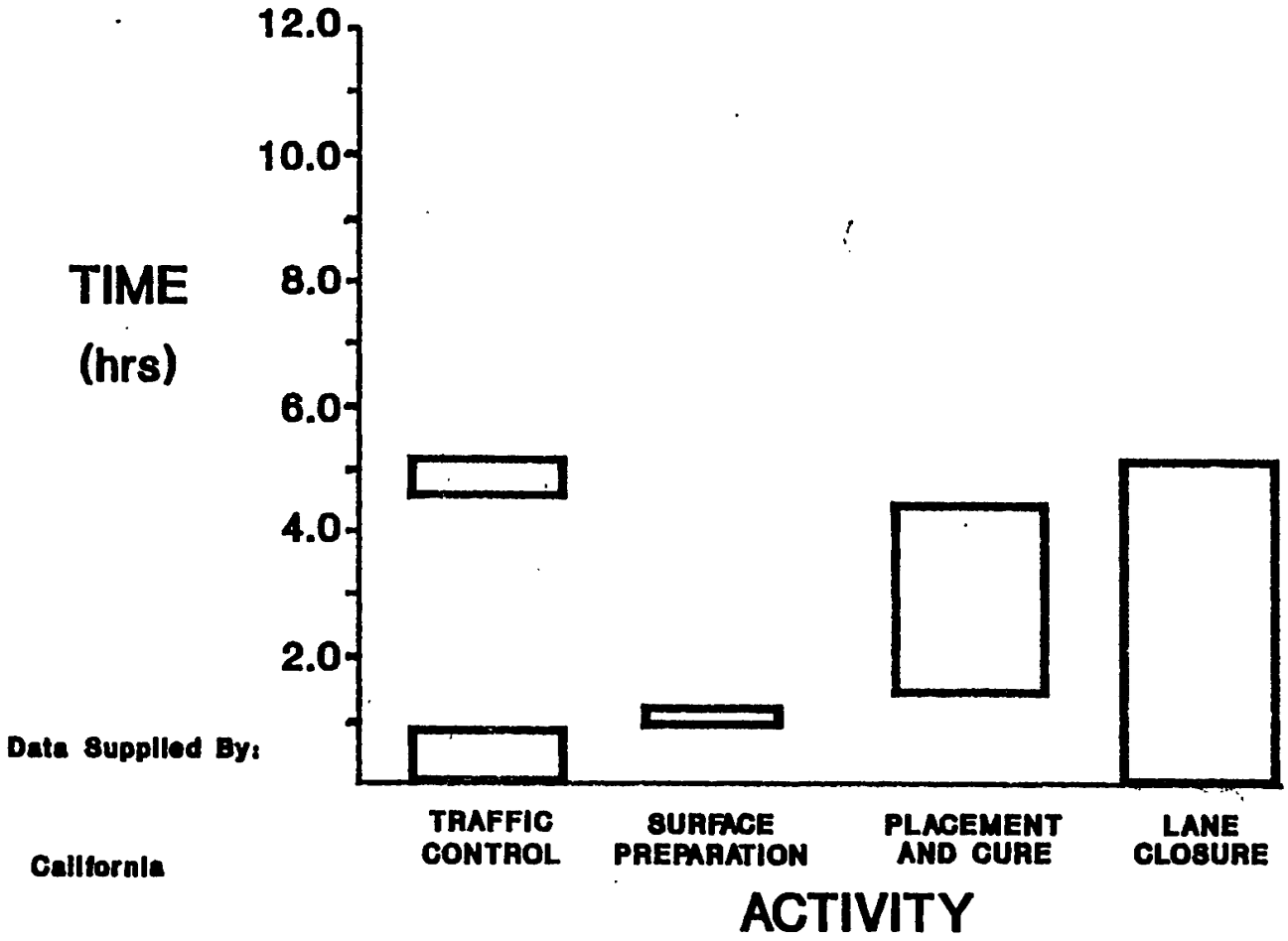



Data Supplied By:

Idaho

# TECHNIQUE TIME DEMANDS

## ACRYLIC COATING

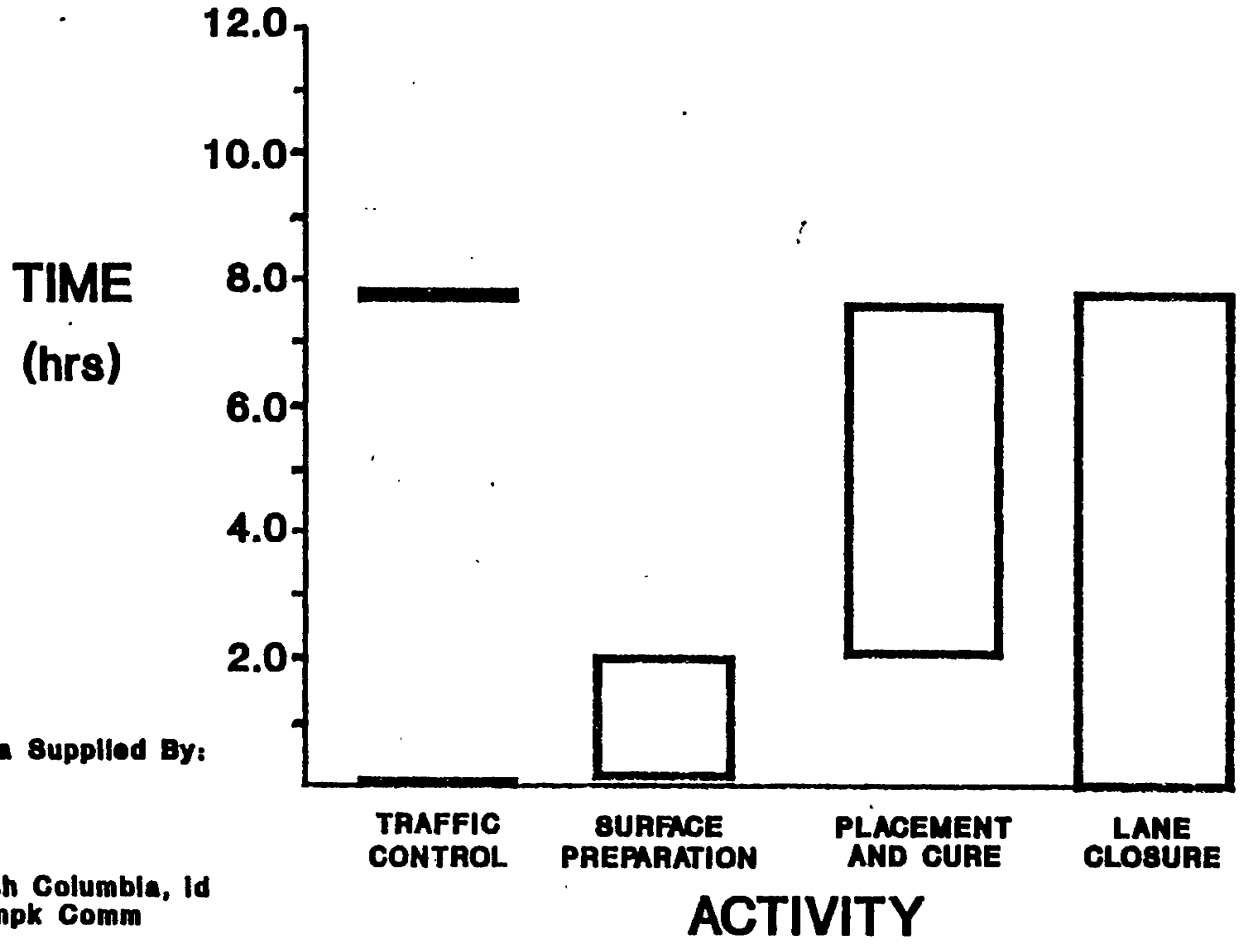



Data Supplied By:

California

# TECHNIQUE TIME DEMANDS

## PORTLAND CEMENT BASED OVERLAYS

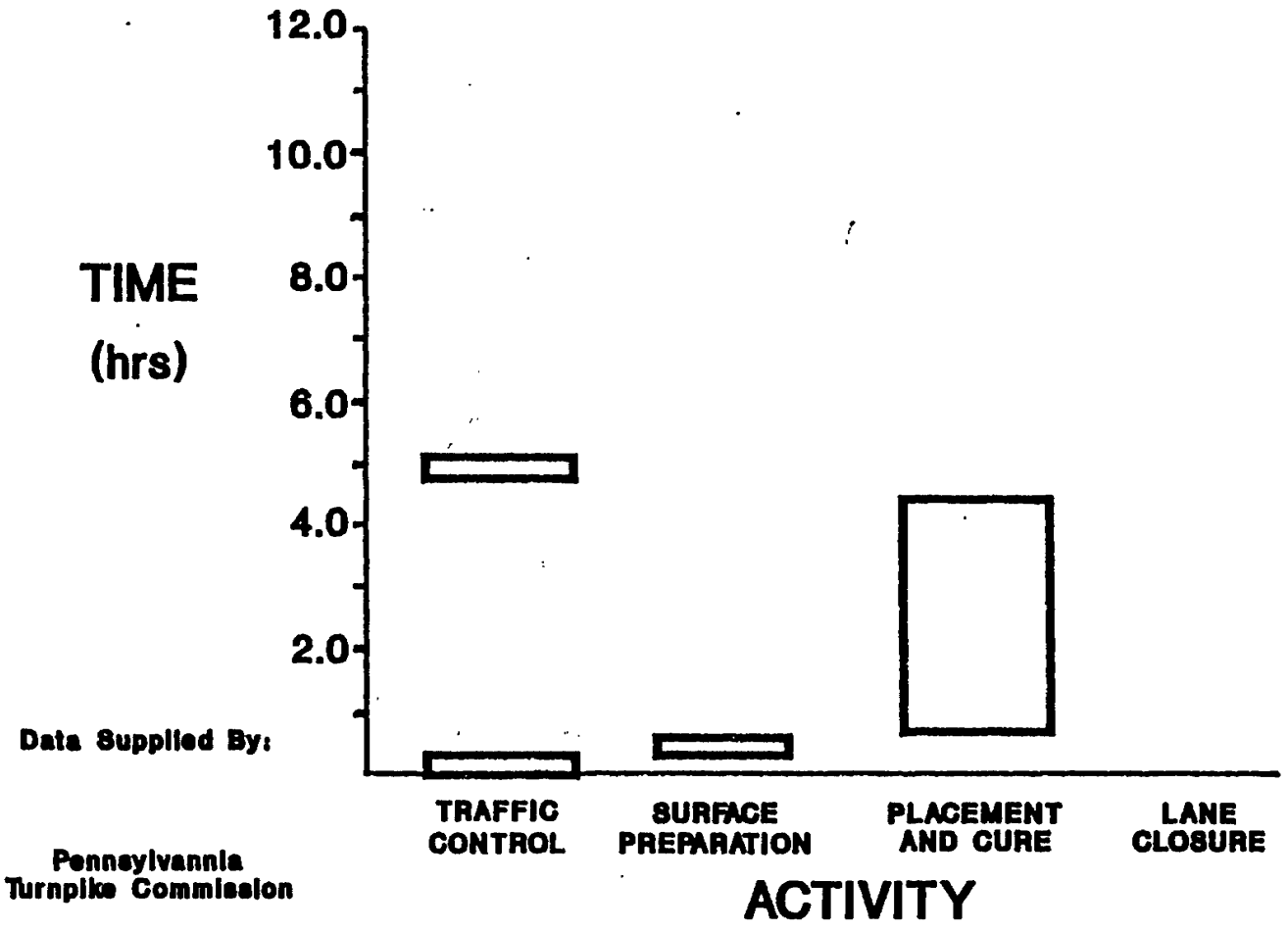



Data Supplied By:

British Columbia, Id
Pa Tnpk Comm

# TECHNIQUE TIME DEMANDS

## PORTLAND CEMENT OVERLAYS WITH ADMIXTURES

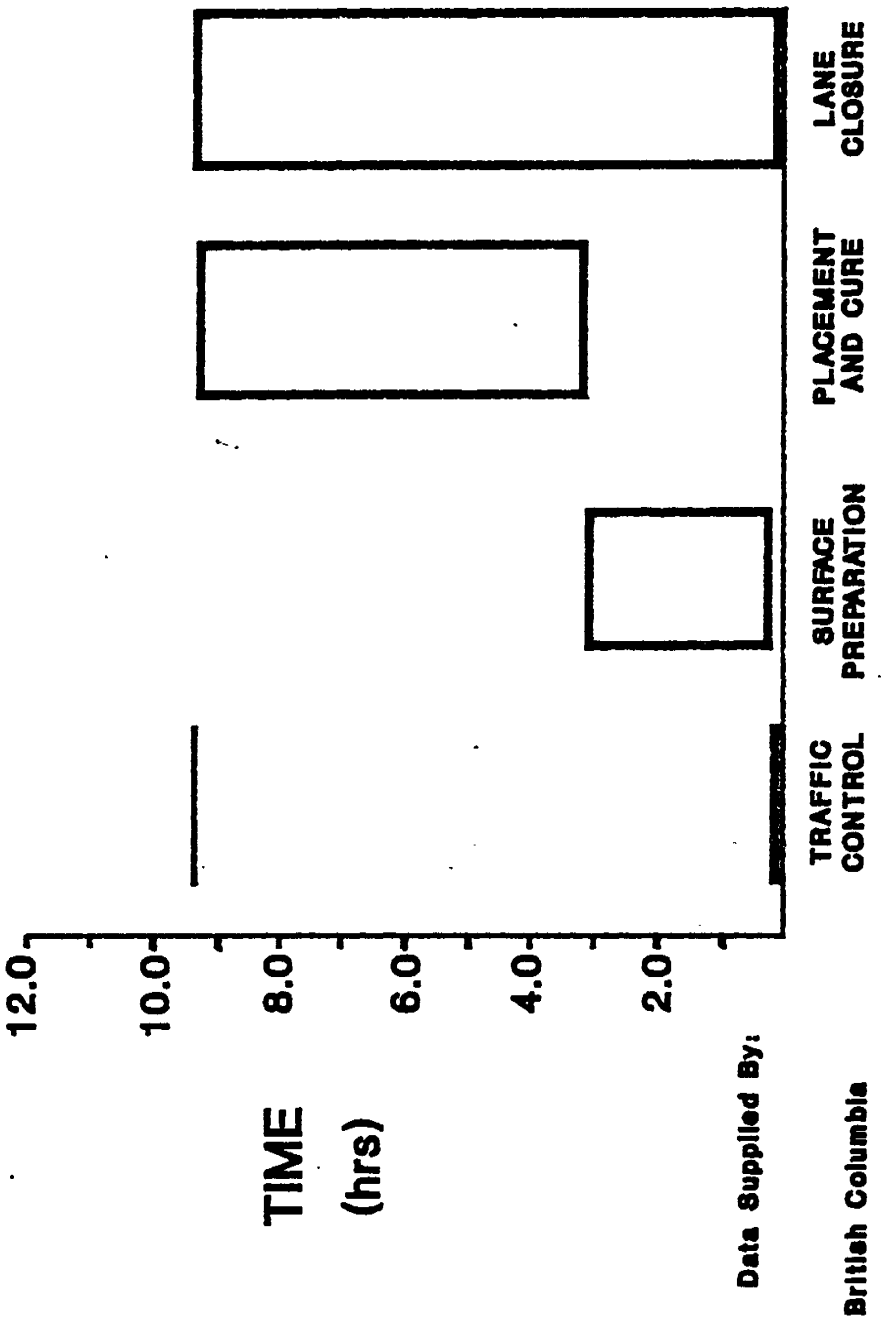



Data Supplied By:

Pennsylvannia
Turnpike Commission

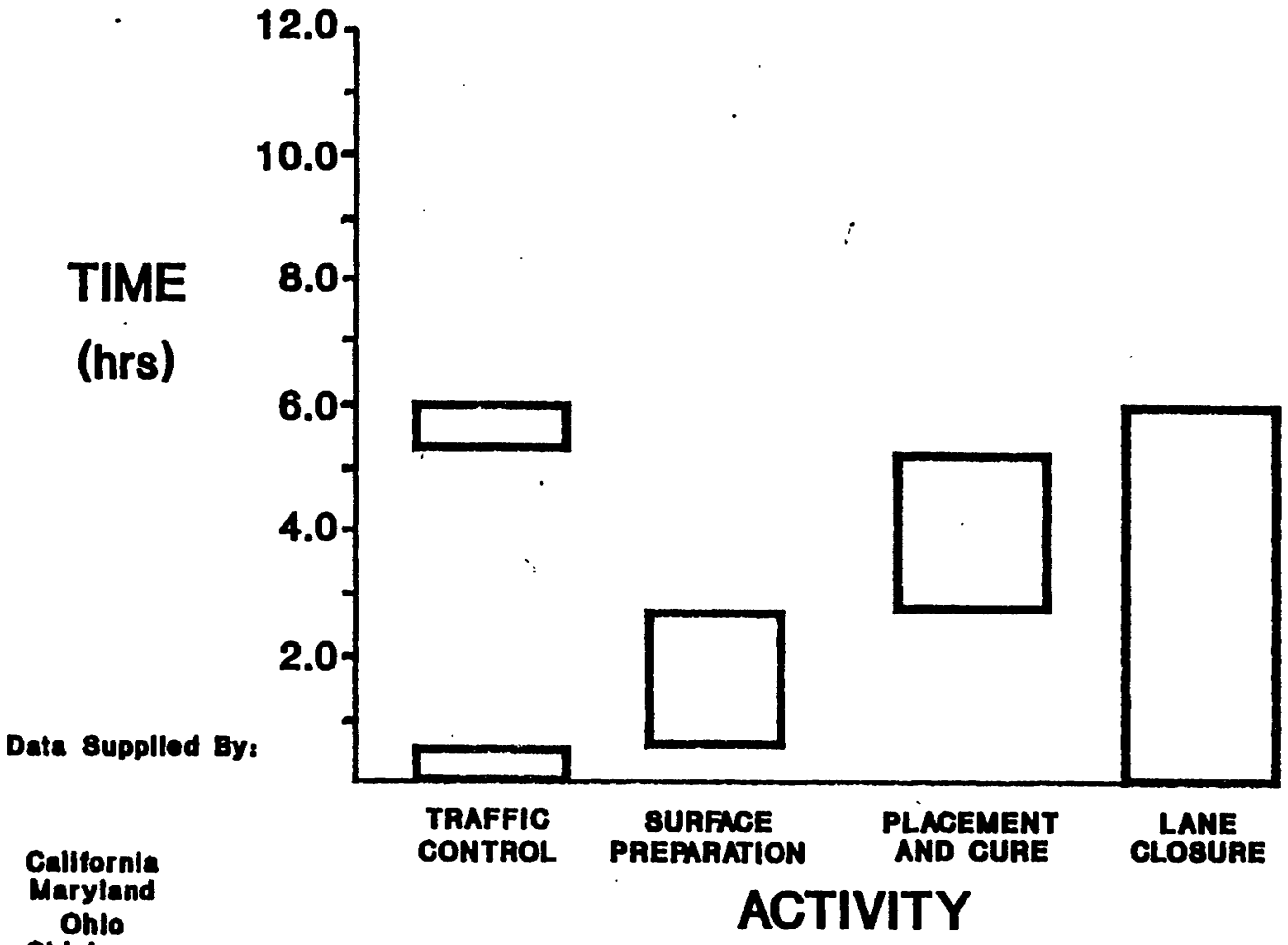
# TECHNIQUE TIME DEMANDS

## LOW SLUMP CONCRETE OVERLAY



# TECHNIQUE TIME DEMANDS

## SILICONE BASED PENETRATING SEALERS

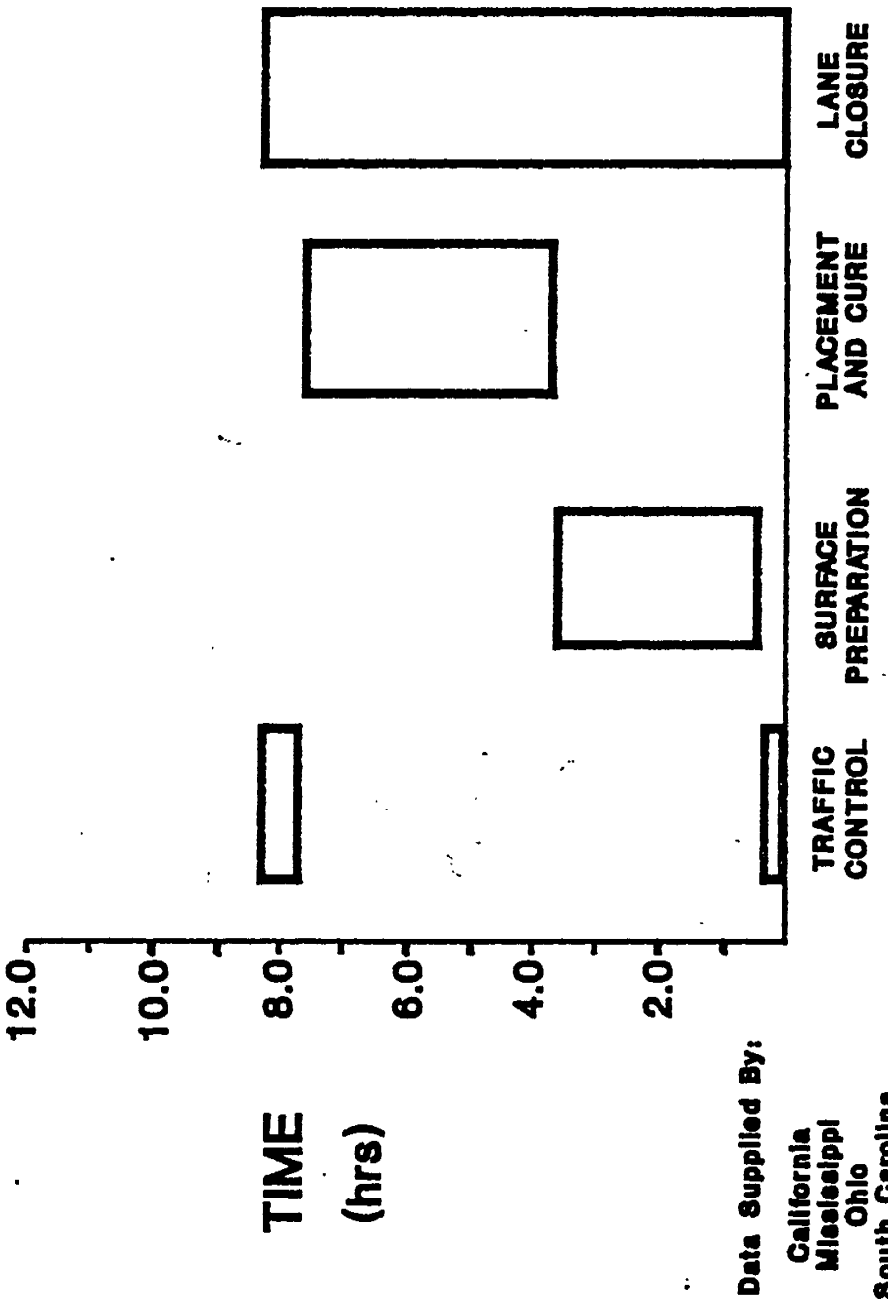



Data Supplied By:

California
Maryland
Ohio
Oklahoma

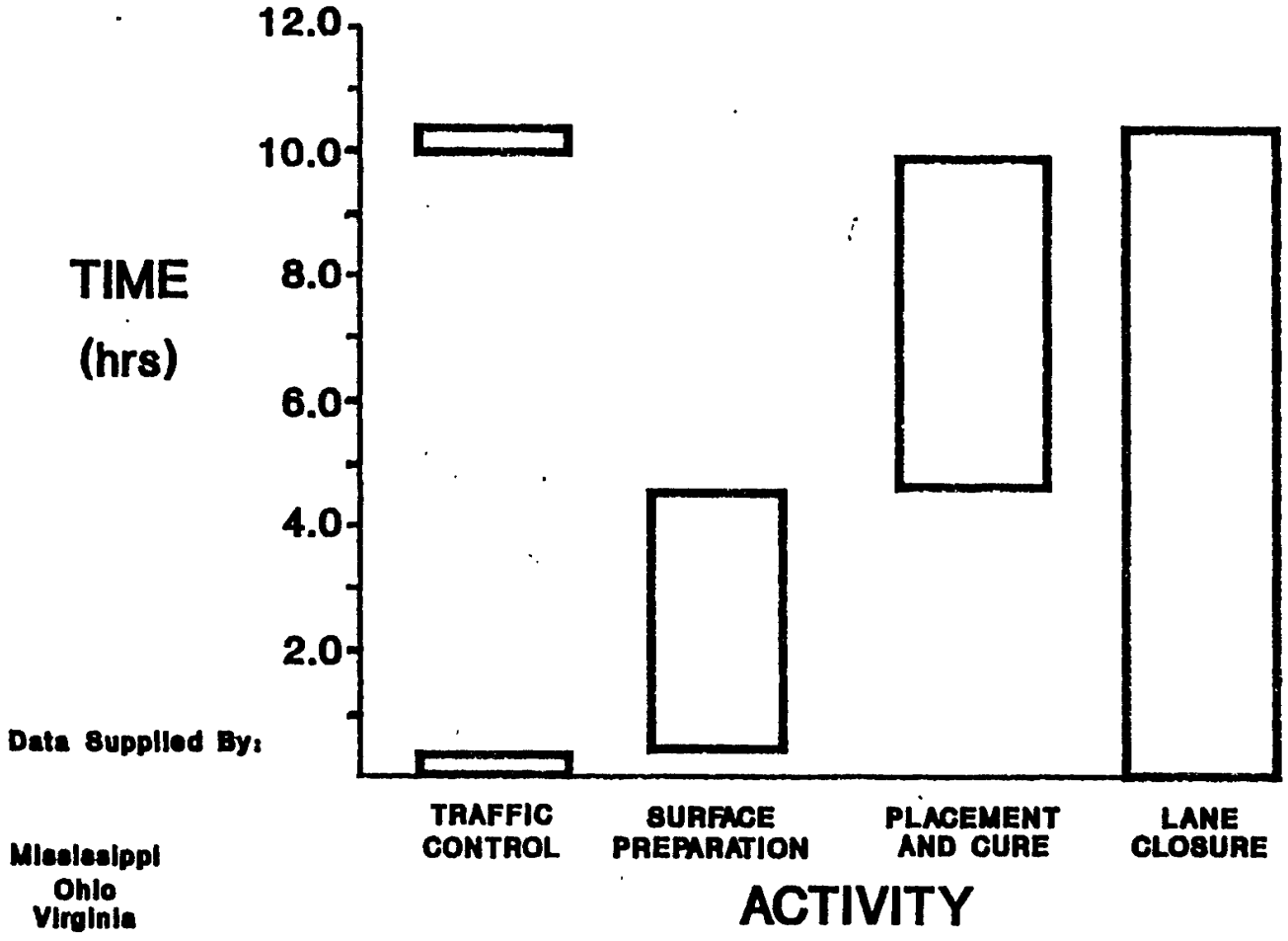
# TECHNIQUE TIME DEMANDS

## POLYMER CONCRETE OVERLAY



# TECHNIQUE TIME DEMANDS

## MULTIPLE LAYER POLYMER CONCRETE OVERLAYS

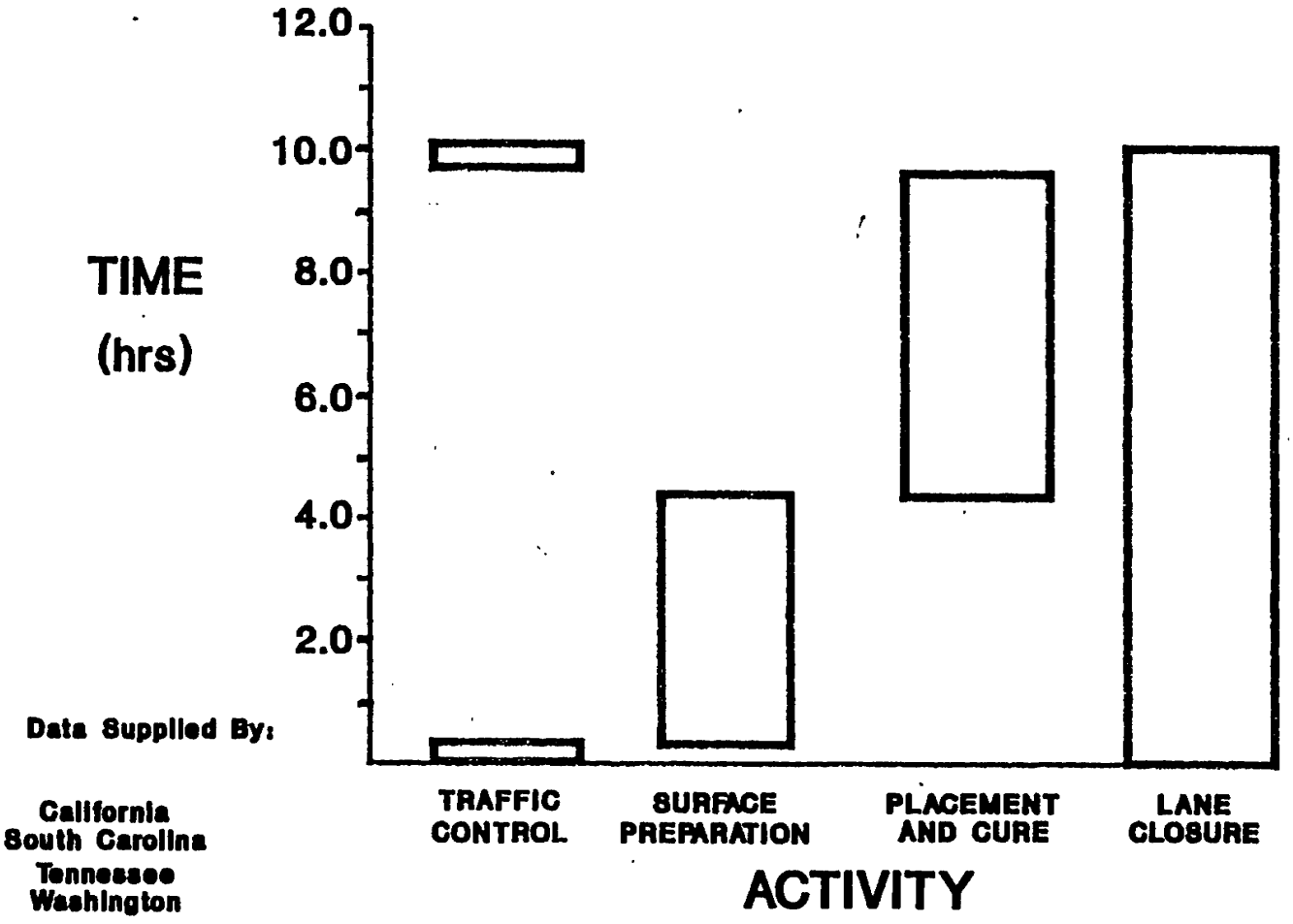



Data Supplied By:

Mississippi
Ohio
Virginia

# TECHNIQUE TIME DEMANDS

## PREMIXED POLYMER CONCRETE OVERLAY

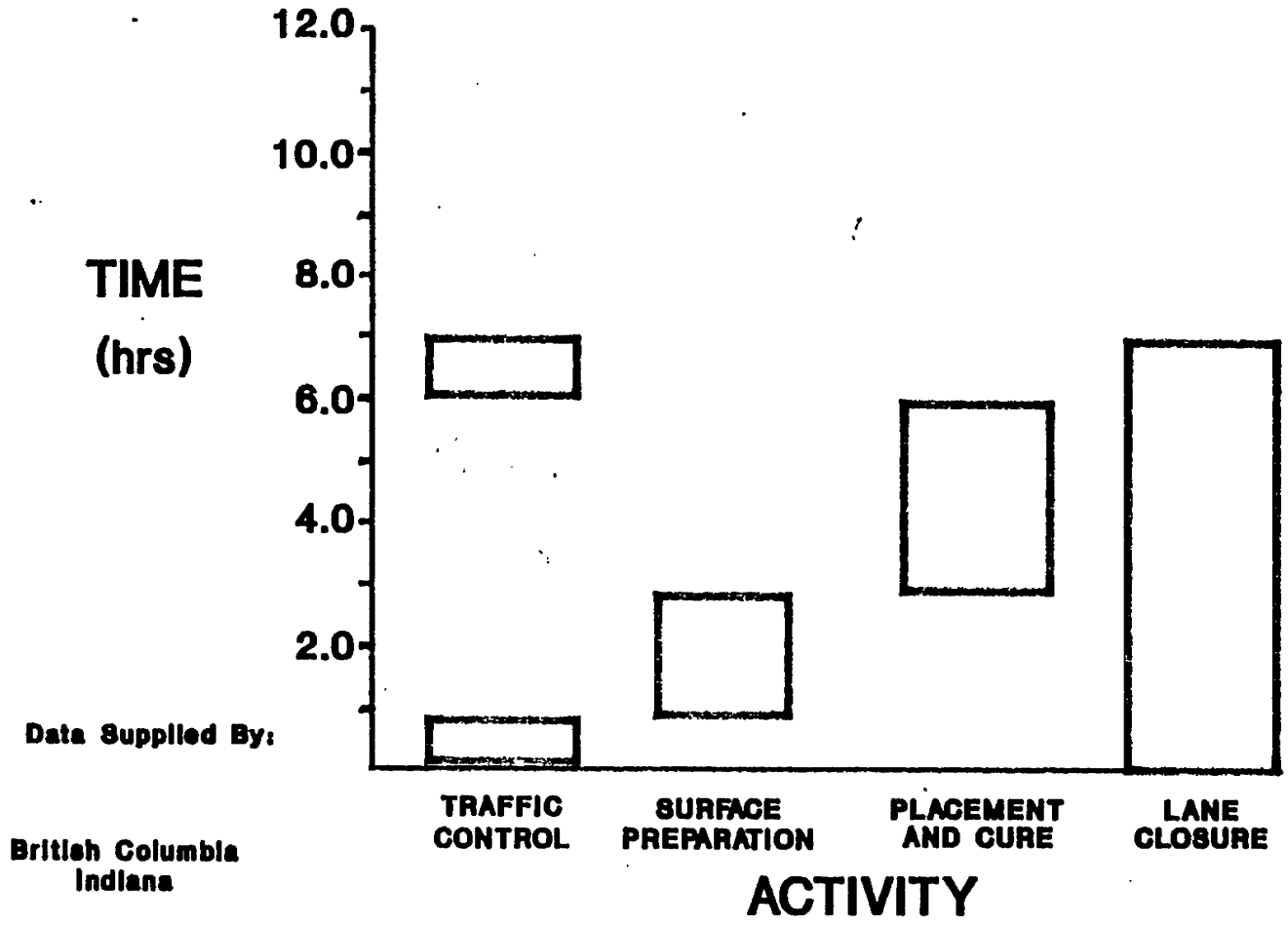



Data Supplied By:

California
South Carolina
Tennessee
Washington

# TECHNIQUE TIME DEMANDS

## OTHER HYDRAULIC CEMENT OVERLAYS

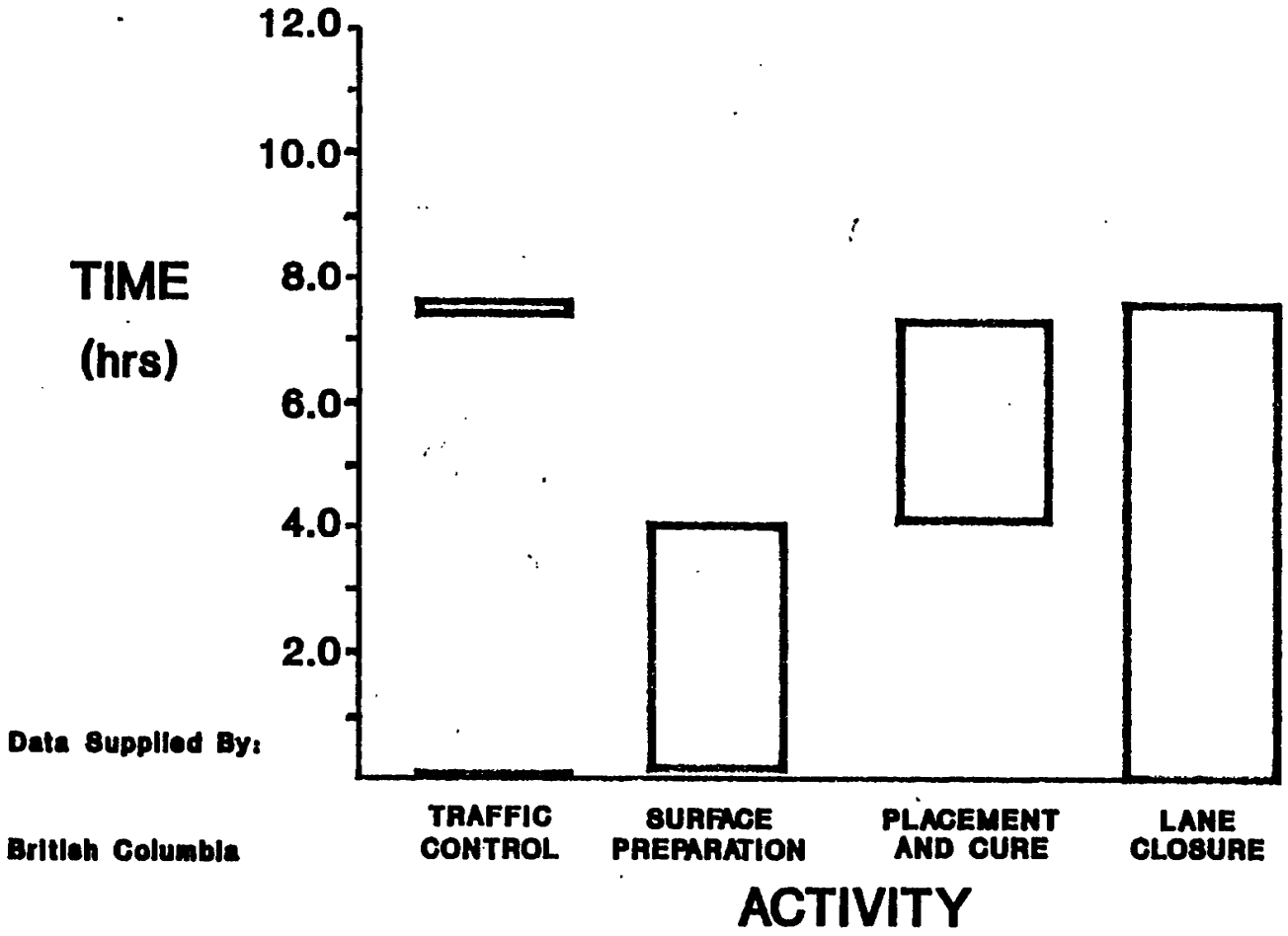



Data Supplied By:

British Columbia
Indiana

# TECHNIQUE TIME DEMANDS

## ALUMINA CEMENT OVERLAYS

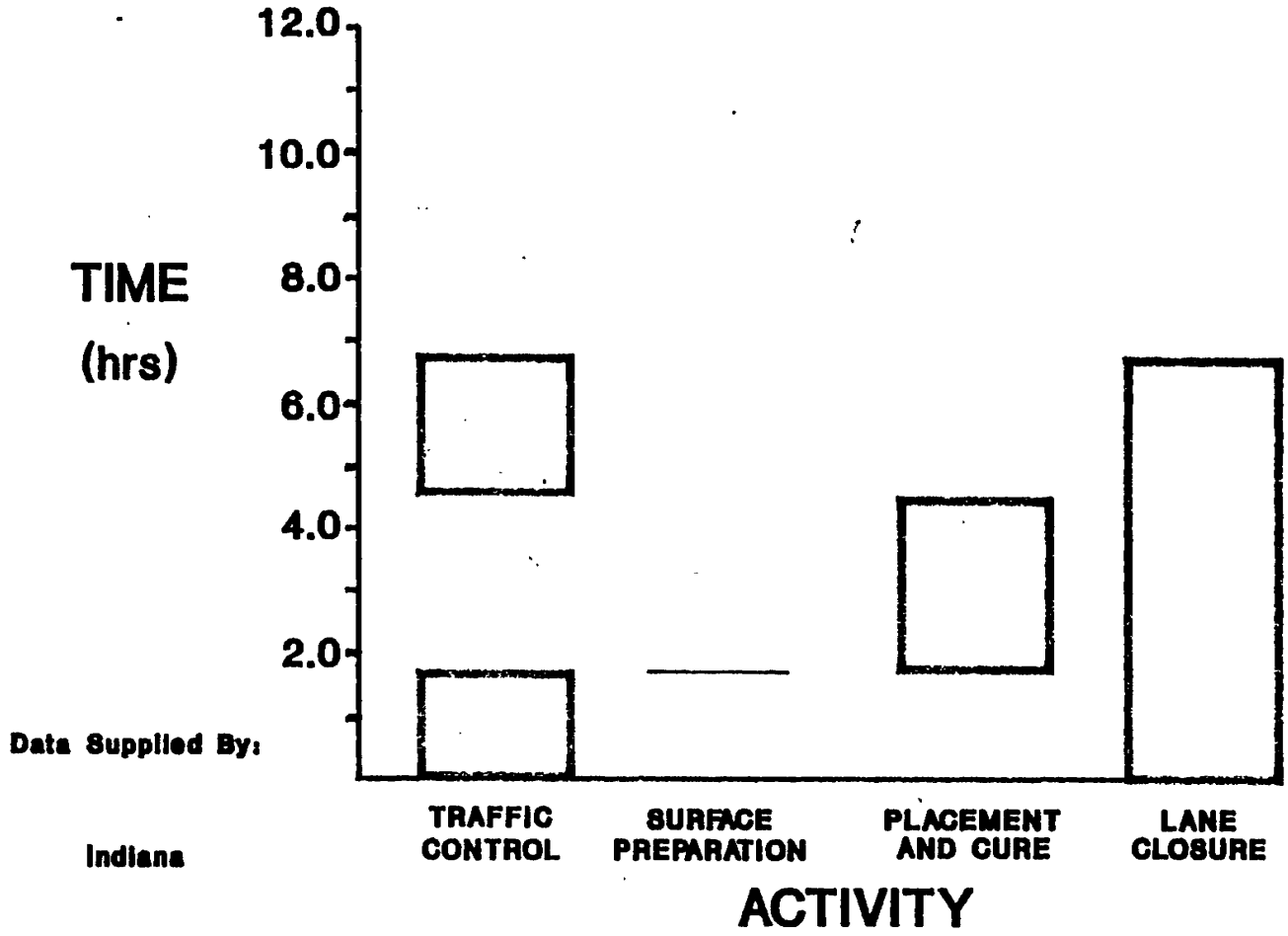



Data Supplied By:

British Columbia

# TECHNIQUE TIME DEMANDS

## MAGNESIUM PHOSPHATE CEMENT OVERLAY

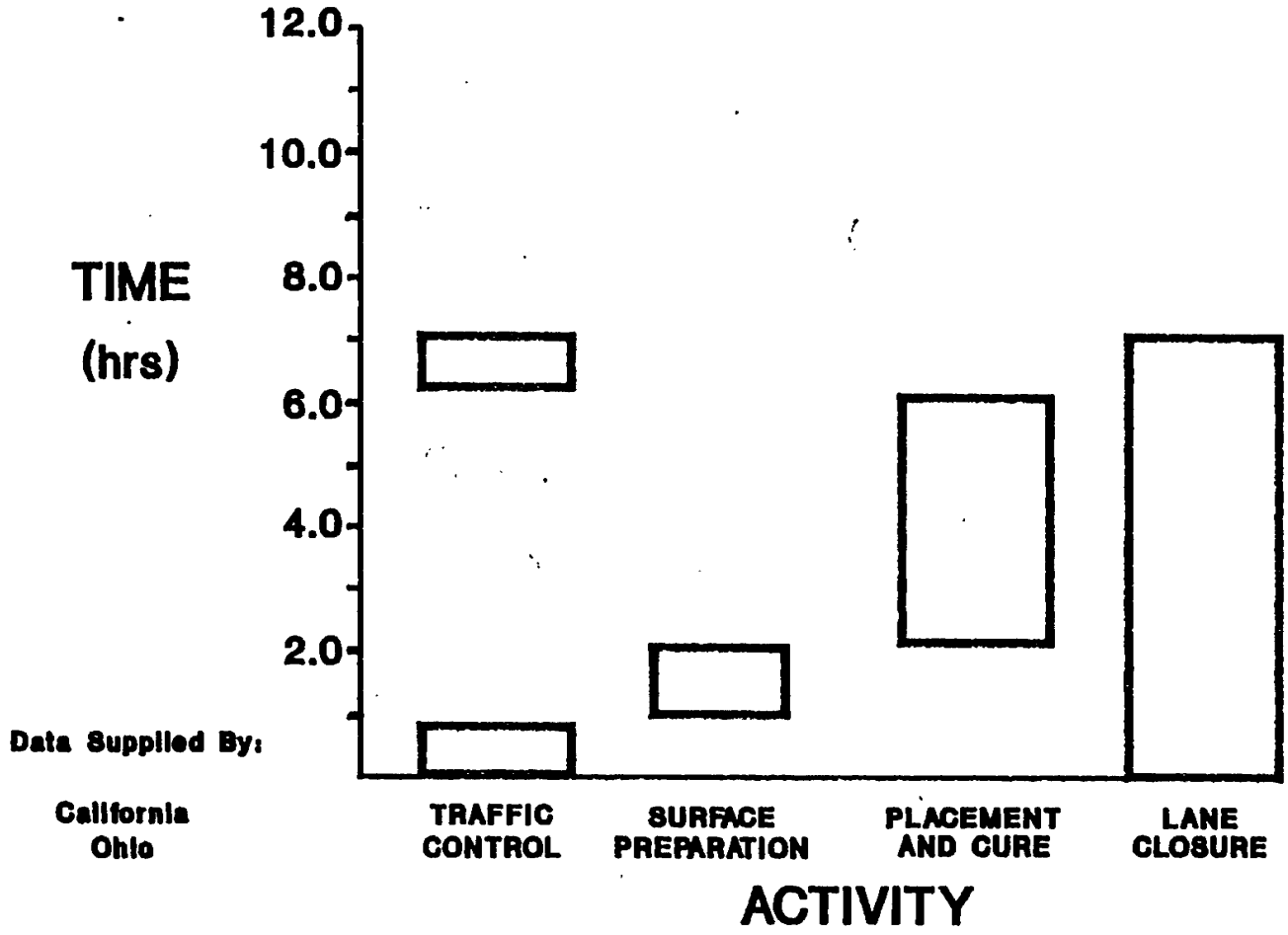



Data Supplied By:

Indiana

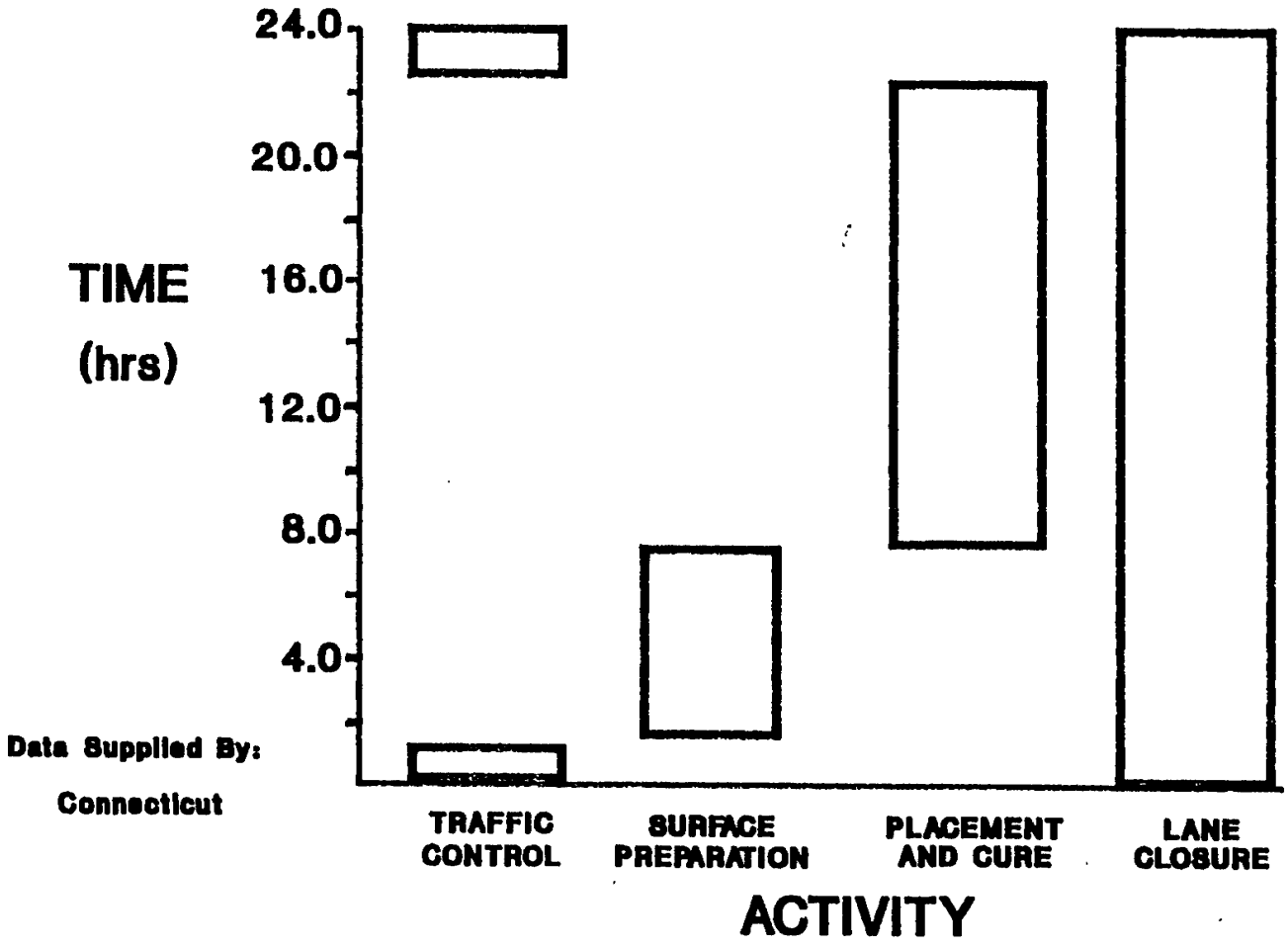
# TECHNIQUE TIME DEMANDS

## ACRYLIC CRACK HEALER SEALERS



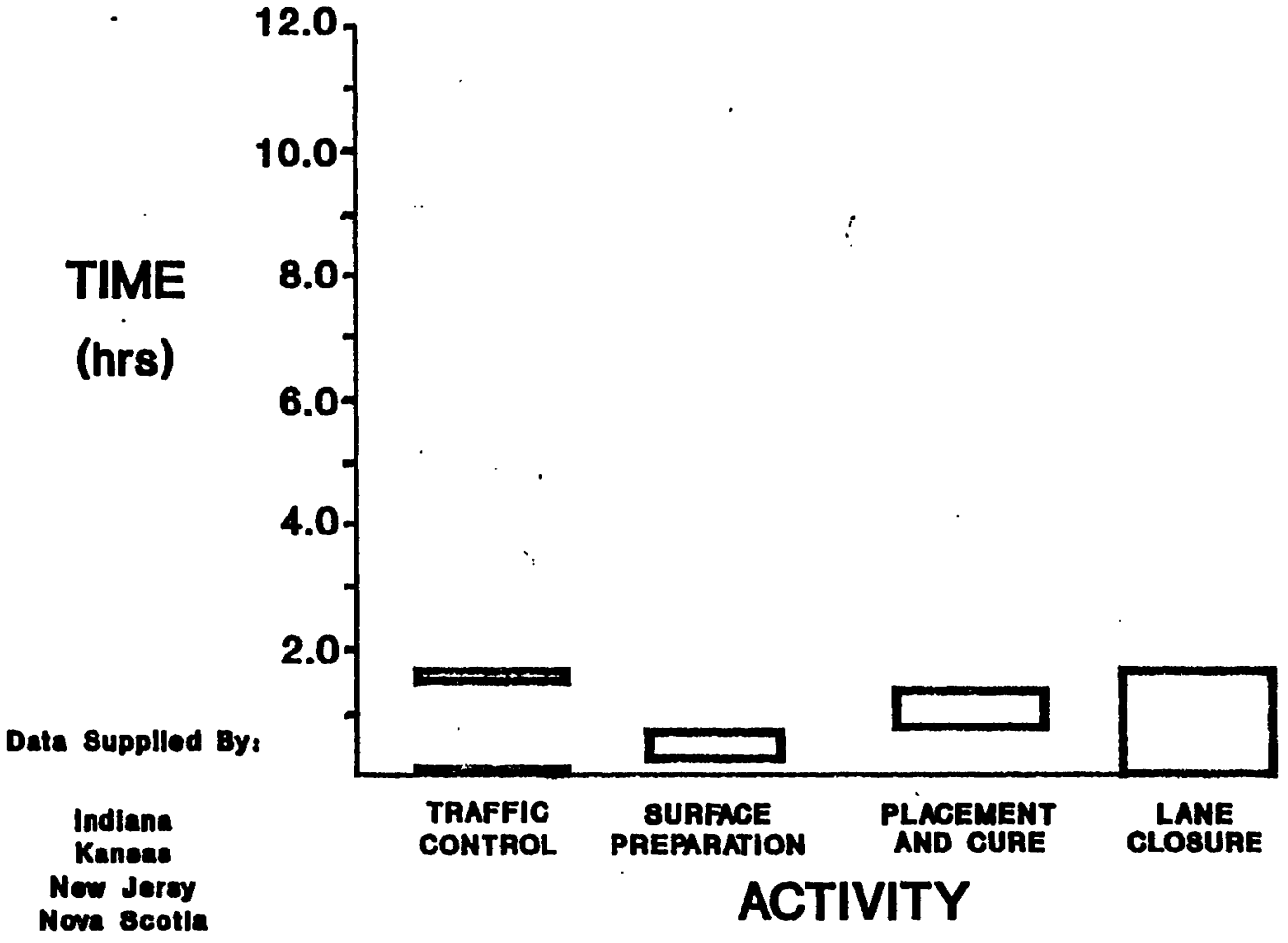
# TECHNIQUE TIME DEMANDS

## EXPANSION JOINTS AND CONCRETE HEADERS



# TECHNIQUE TIME DEMANDS

## PATCHING WITH BITUMINOUS CONCRETE

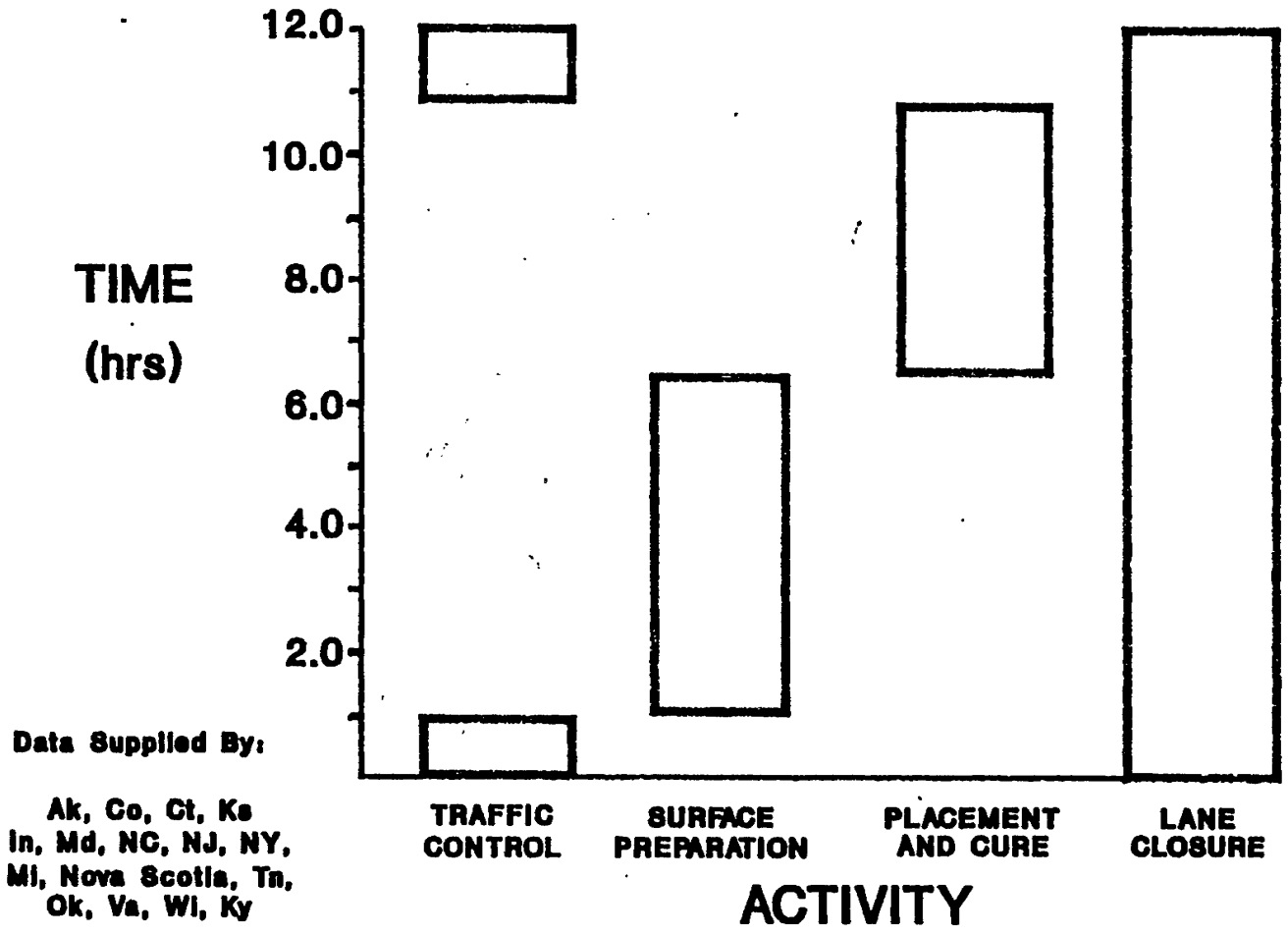



Data Supplied By:

Indiana
Kansas
New Jersey
Nova Scotia

# TECHNIQUE TIME DEMANDS

## PATCHING WITH HIGH EARLY STRENGTH CEMENT

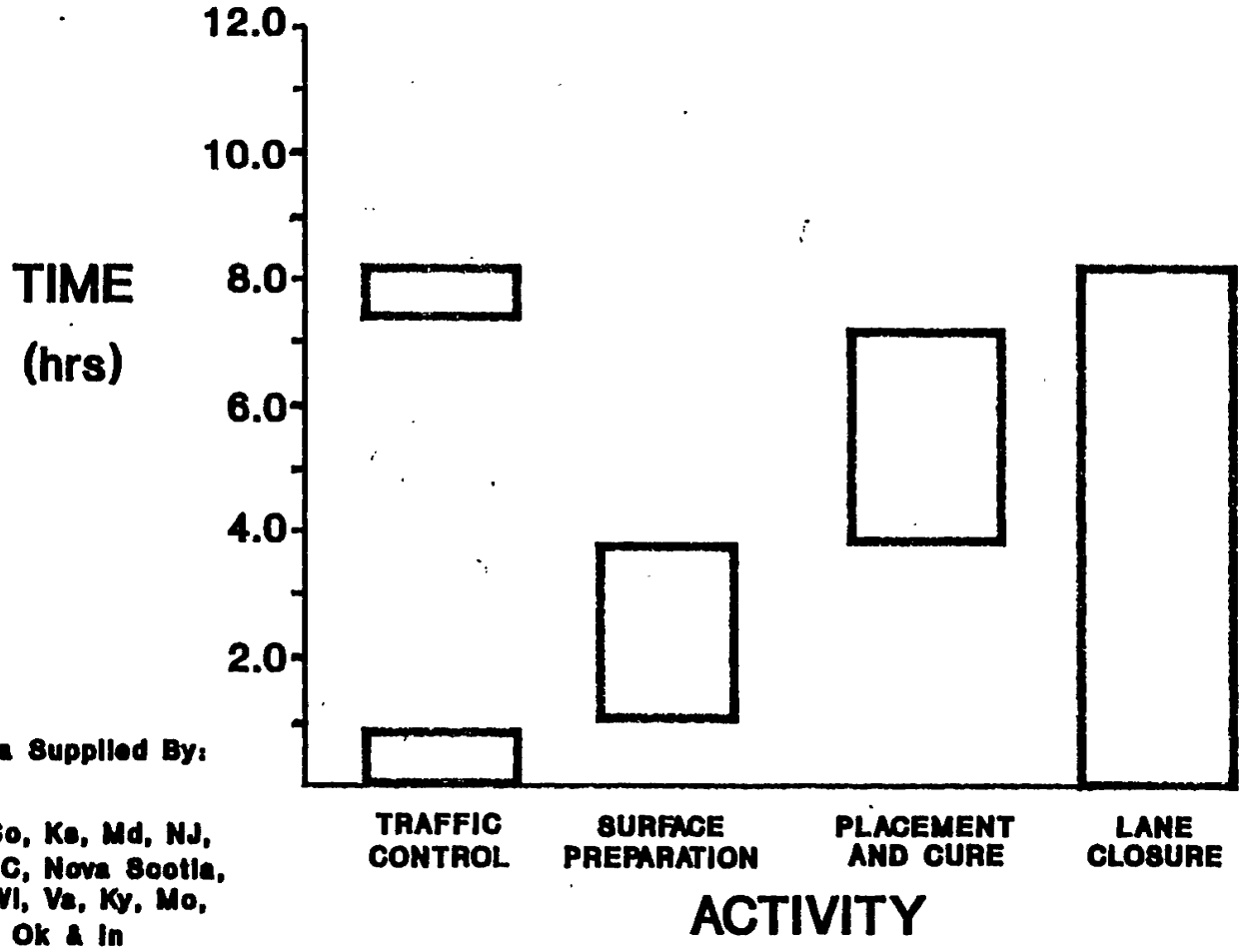



Data Supplied By:

Ak, Co, Ct, Ks
In, Md, NC, NJ, NY,
Mi, Nova Scotia, Tn,
Ok, Va, WI, Ky

# TECHNIQUE TIME DEMANDS

## PATCHING WITH RAPID HARDENING CEMENTITIOUS MATERIALS

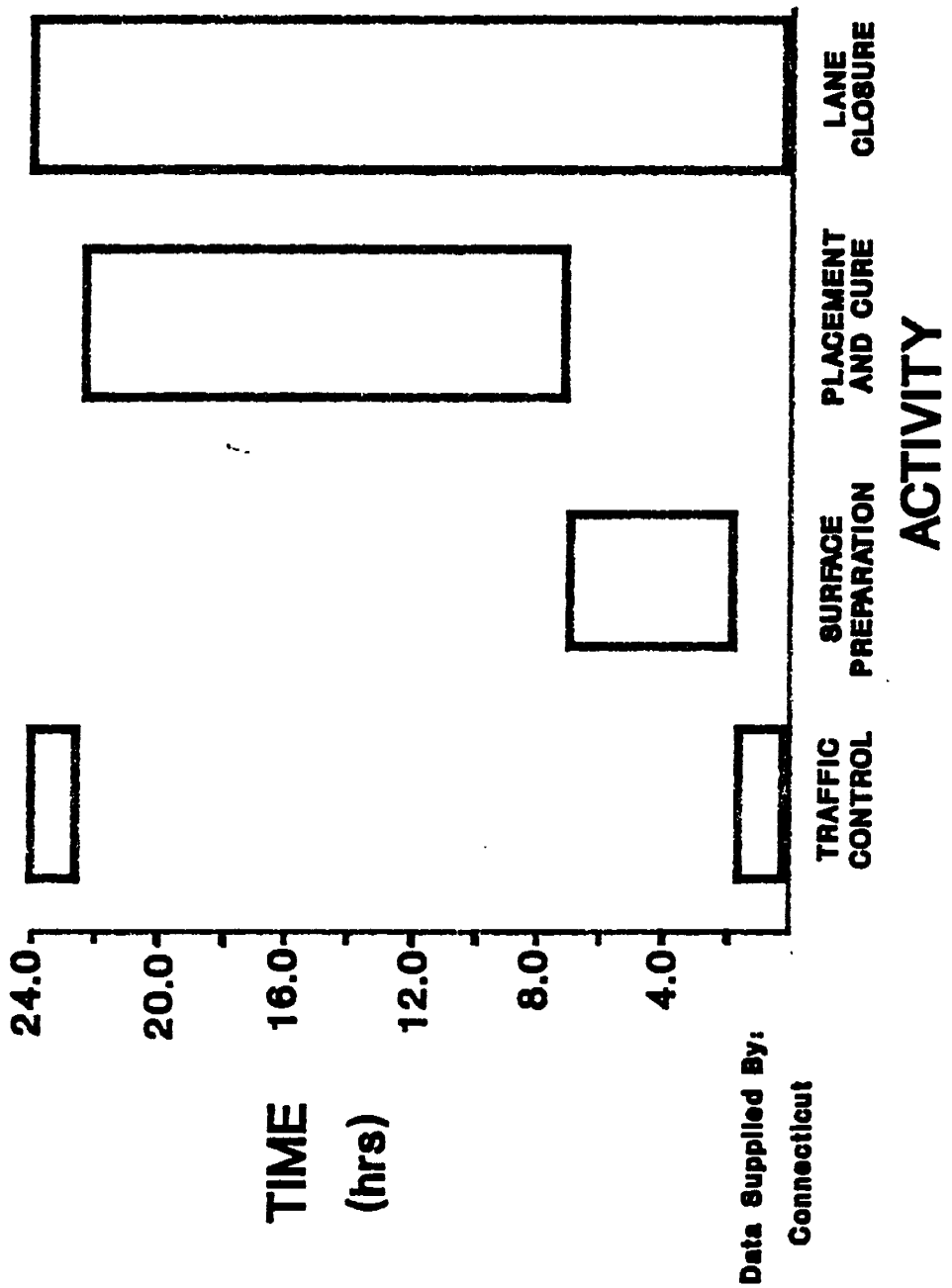



Data Supplied By:

Ar, Co, Ks, Md, NJ, NY, NC, Nova Scotia, Tn, Wi, Va, Ky, Mo, Ok & In

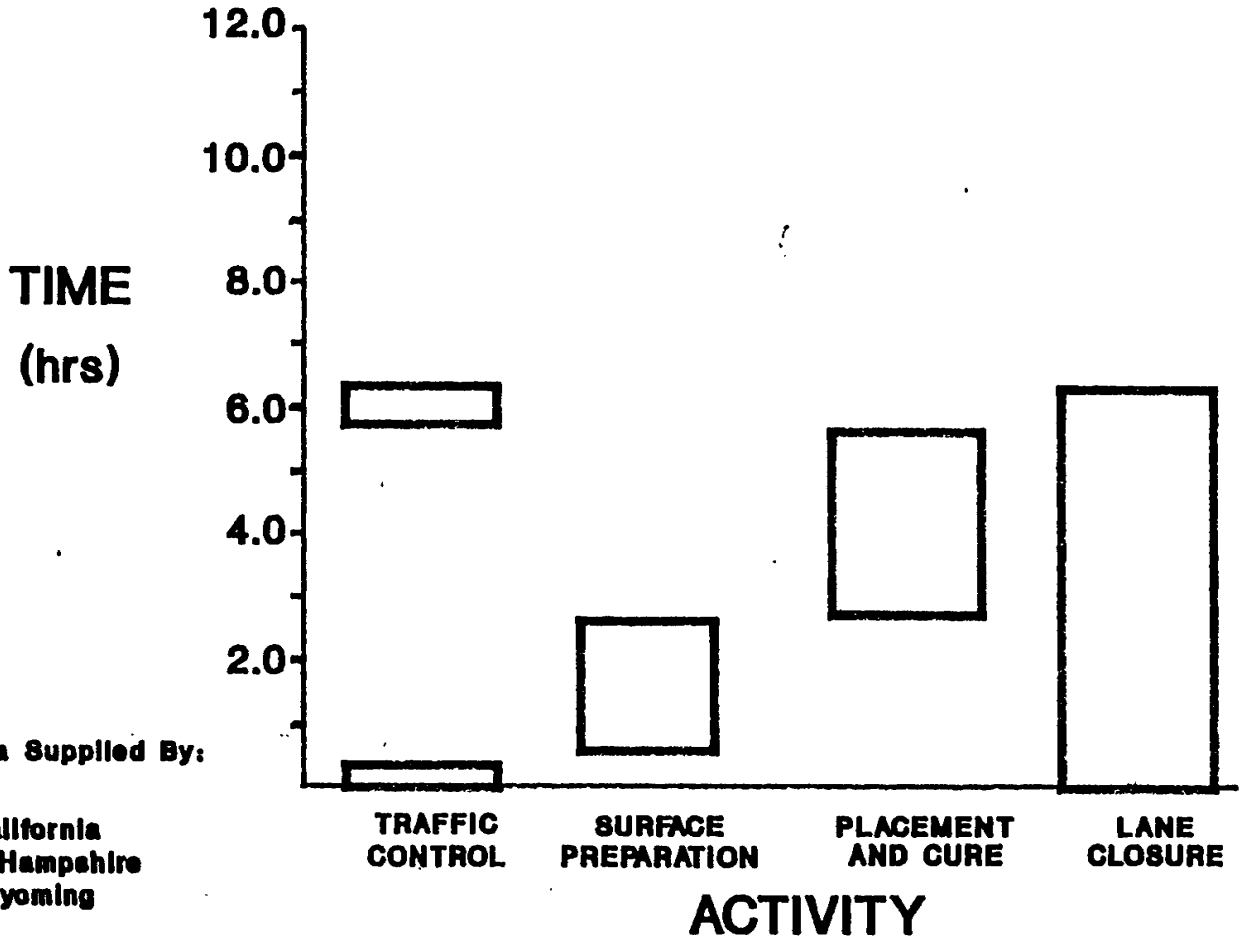
# TECHNIQUE TIME DEMANDS

## PATCHING WITH TYPE III CEMENT



# TECHNIQUE TIME DEMANDS

## PATCHING WITH POLYMER CONCRETE

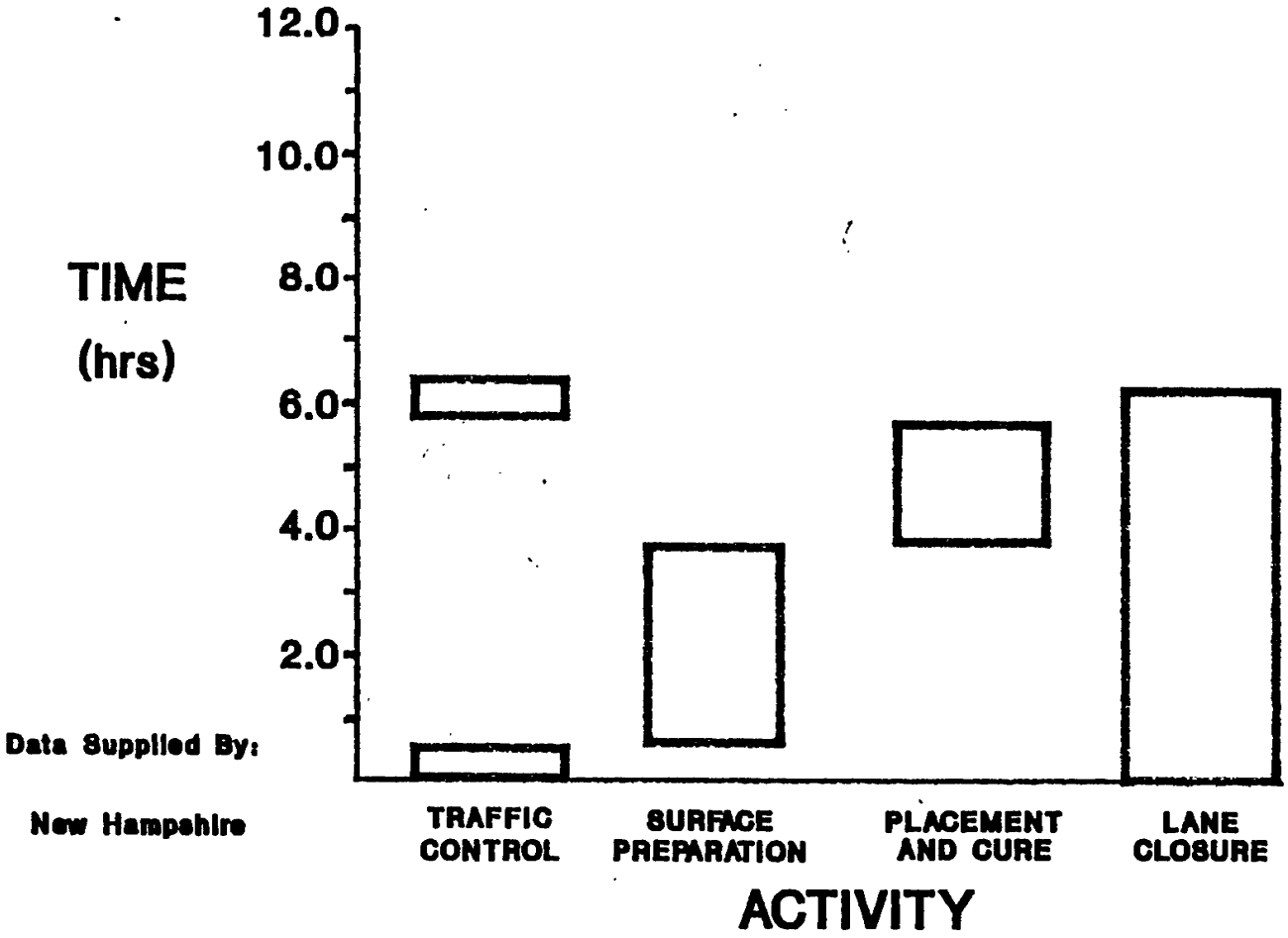



Data Supplied By:

California
New Hampshire
Wyoming

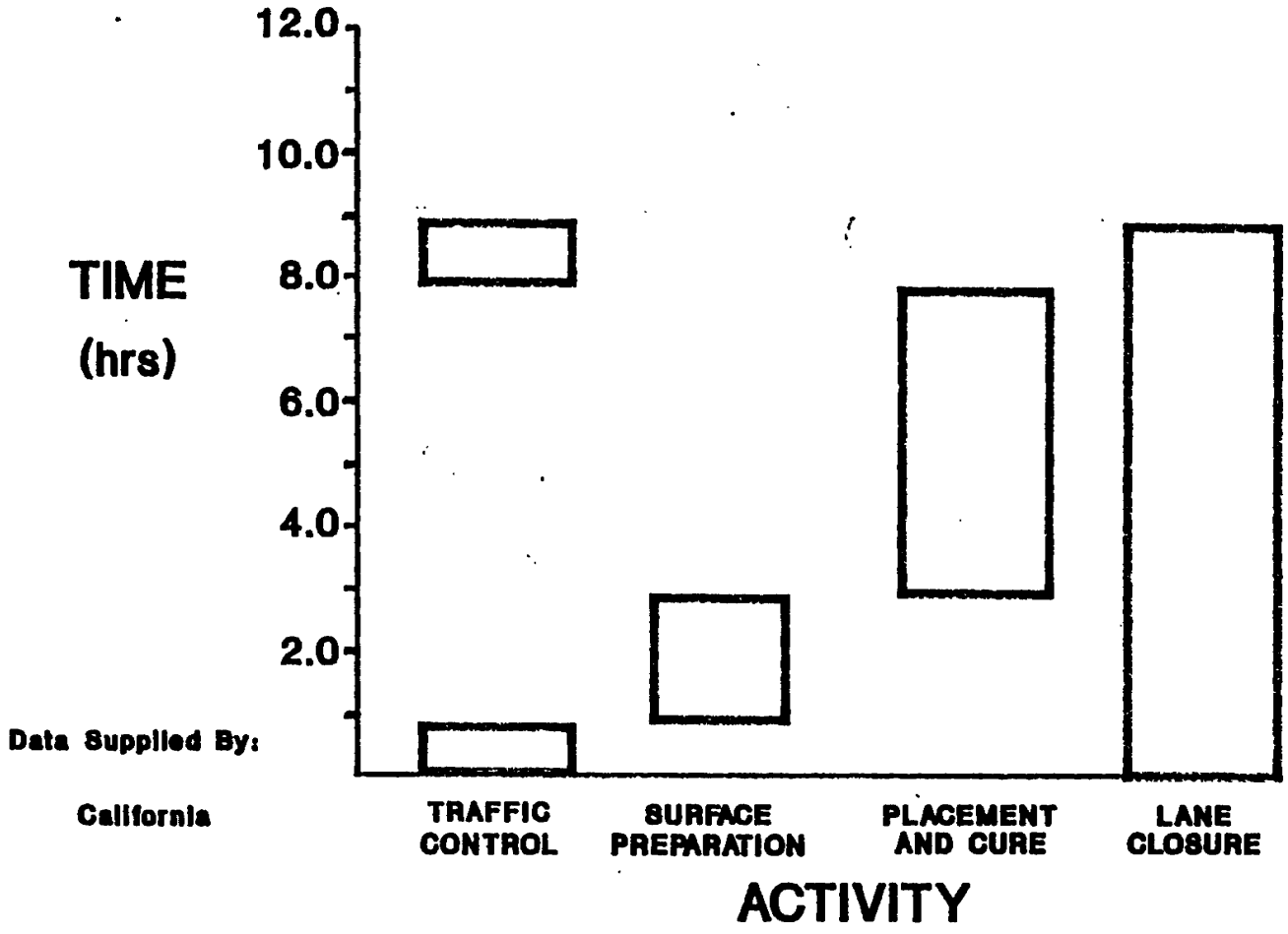
# TECHNIQUE TIME DEMANDS

## PATCHING WITH EPOXY POLYMER CEMENT



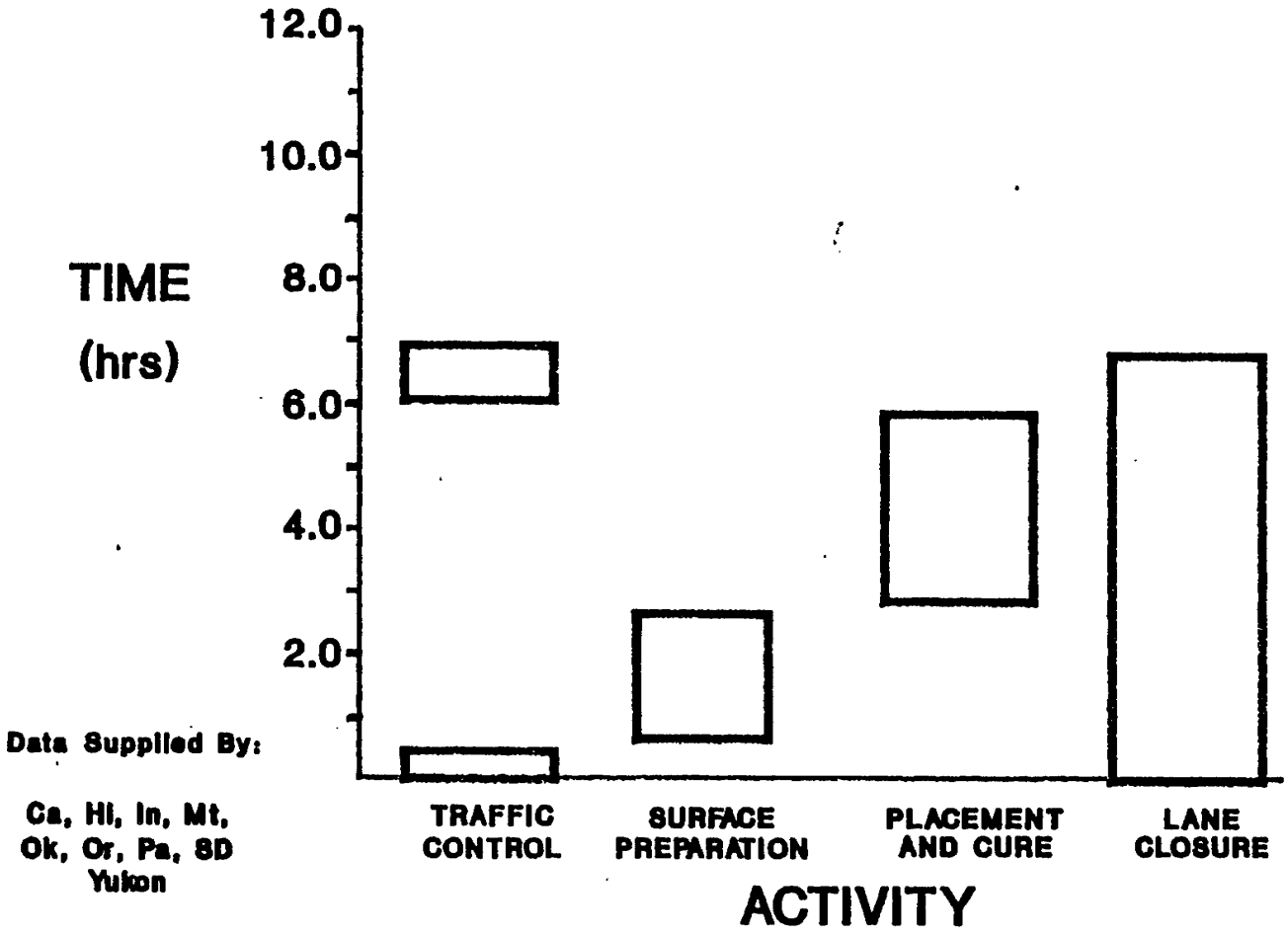
# TECHNIQUE TIME DEMANDS

## PATCHING WITH POLYESTER STYRENE CEMENT



# TECHNIQUE TIME DEMANDS

## PATCHING WITH OTHER HYDRAULIC CEMENT

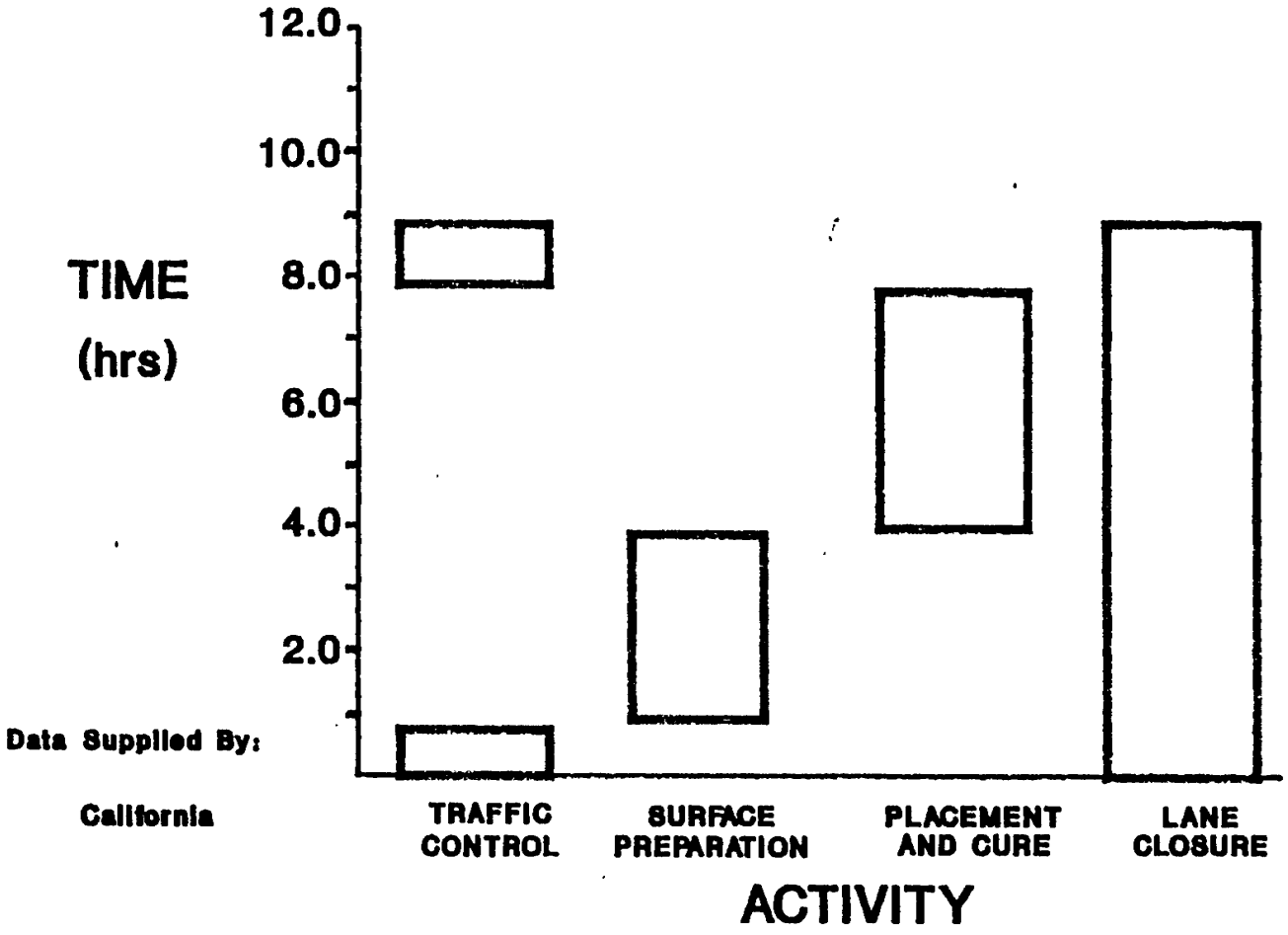



Data Supplied By:

Ca, Hi, In, Mt, Ok, Or, Pa, SD Yukon

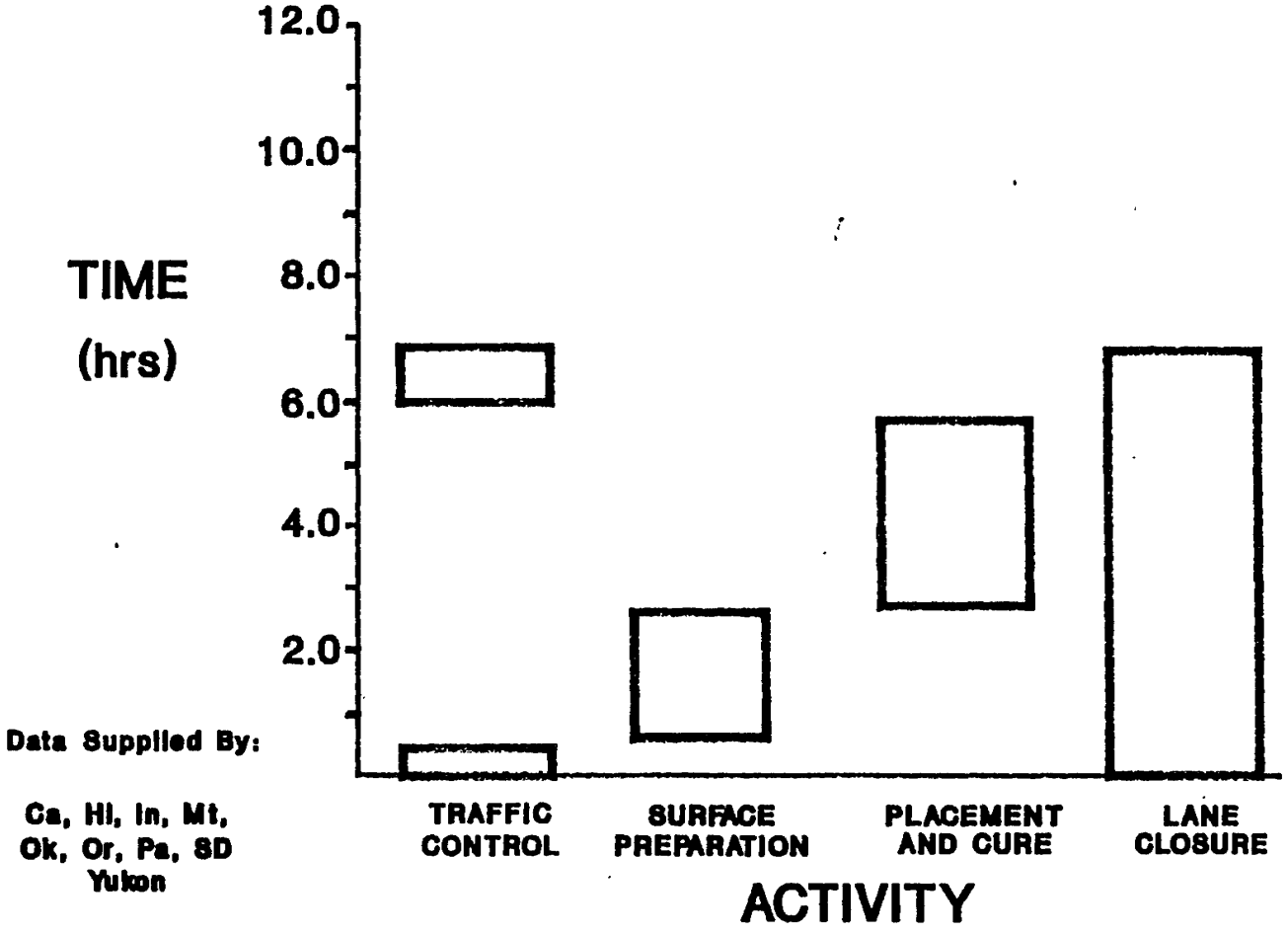
# TECHNIQUE TIME DEMANDS

## PATCHING WITH ALUMINA CEMENT



# TECHNIQUE TIME DEMANDS

## PATCHING WITH MAGNESIUM PHOSPHATE CEMENT

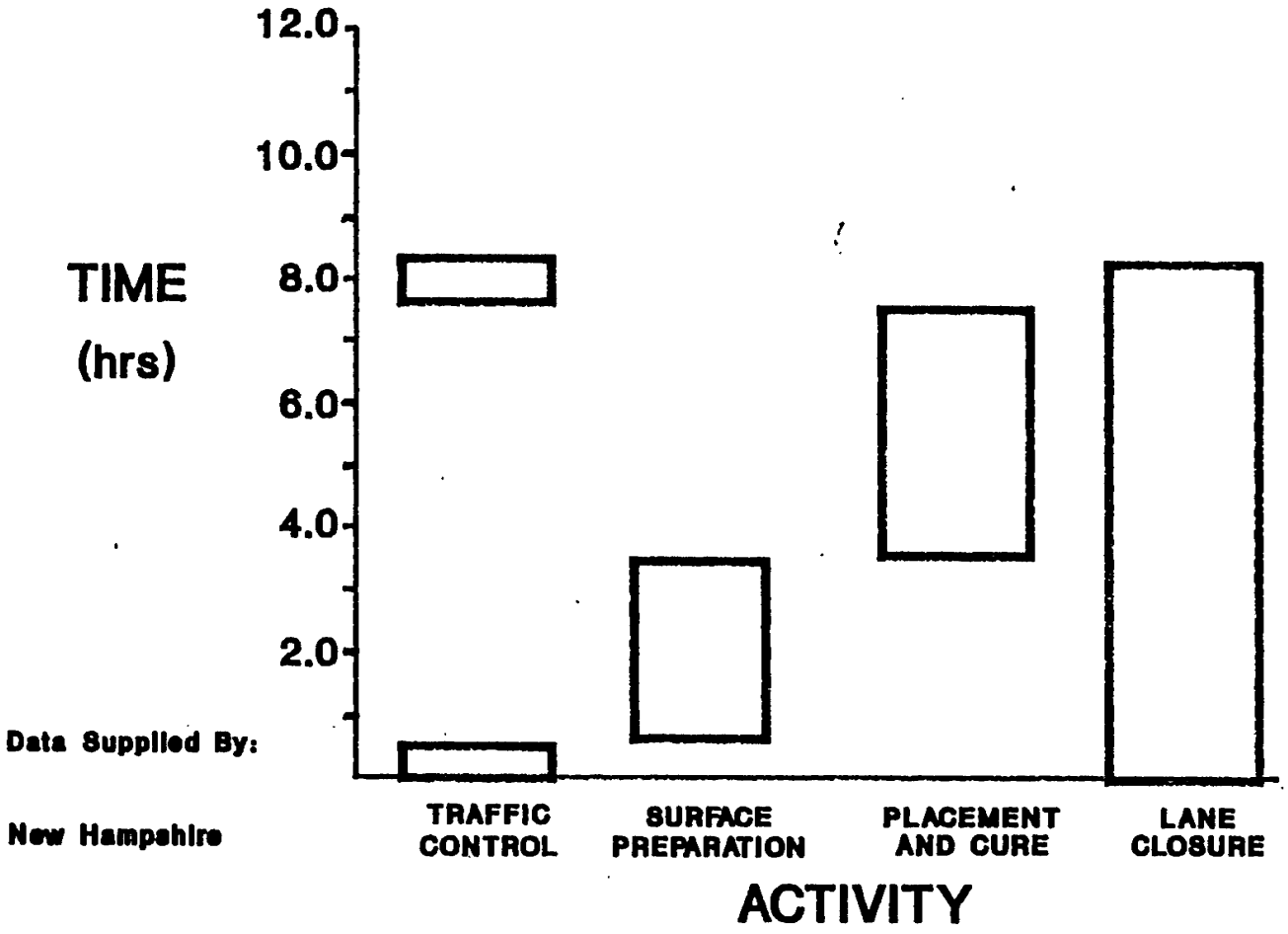



Data Supplied By:

Ca, HI, In, Mt, Ok, Or, Pa, SD Yukon

# TECHNIQUE TIME DEMANDS

## STEEL PLATE OVER CONVENTIONAL CONCRETE

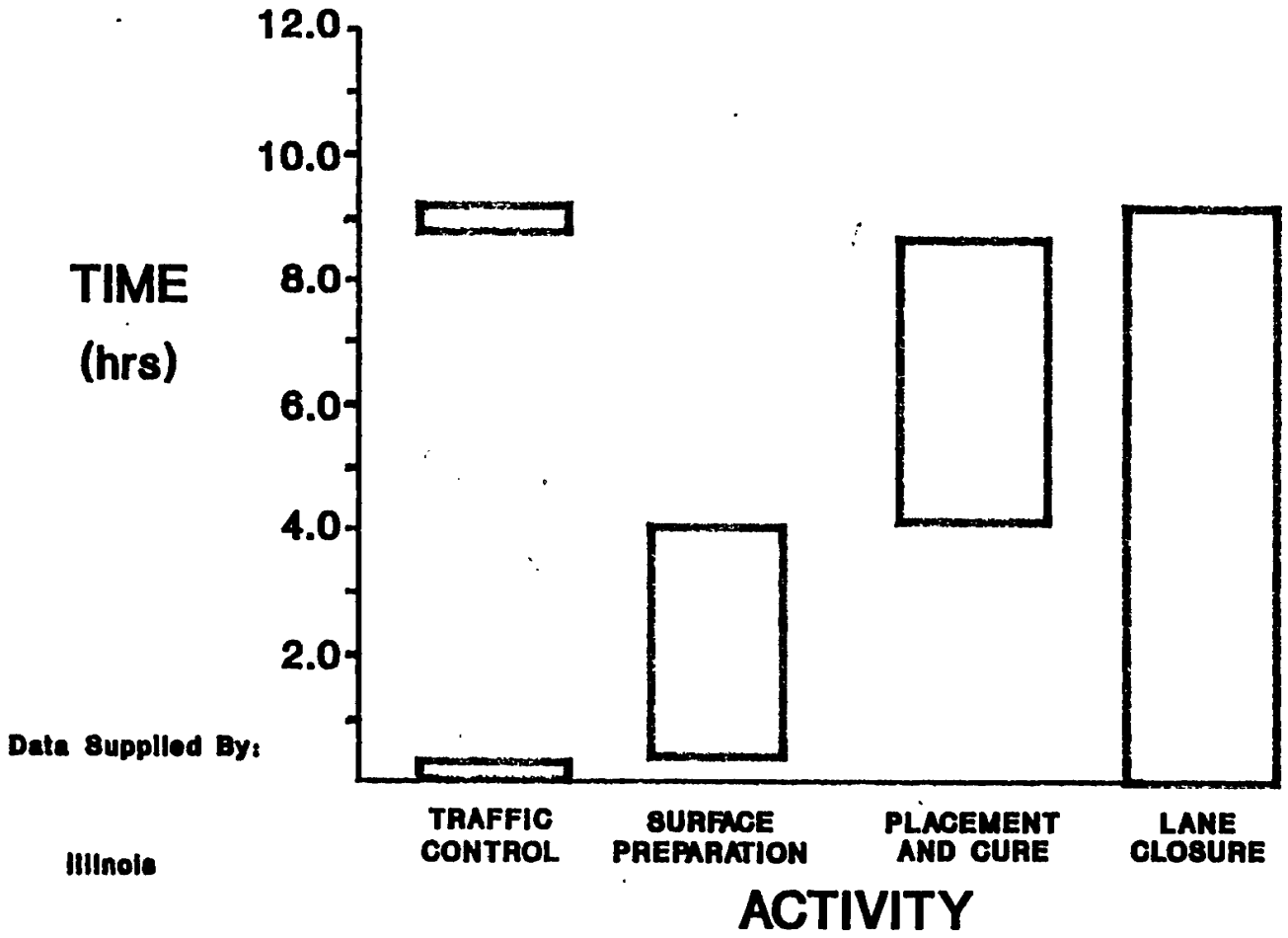



Data Supplied By:

New Hampshire

# TECHNIQUE TIME DEMANDS

## REPLACEMENT WITH POST-TENSIONED CONCRETE

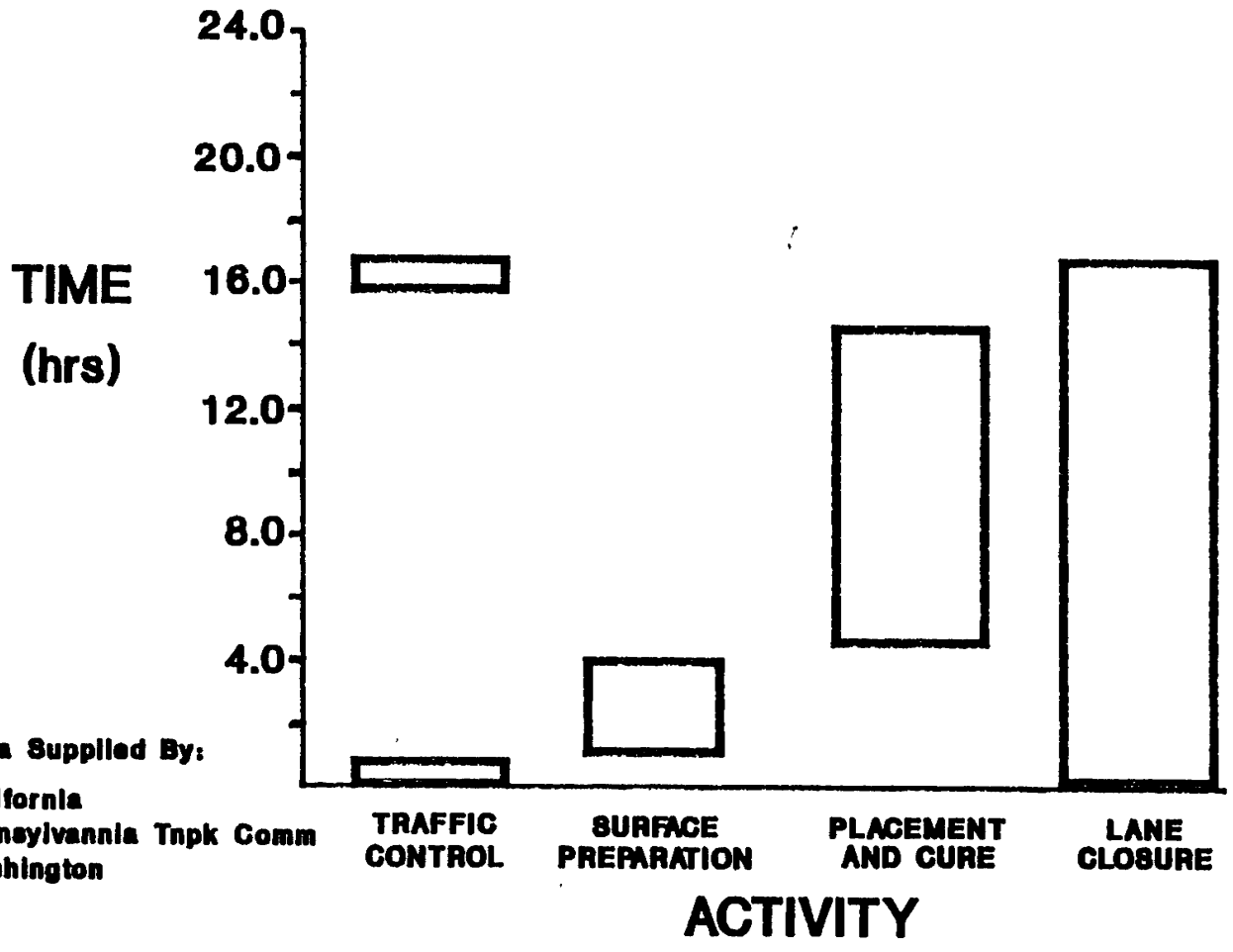



Data Supplied By:

Illinois

# TECHNIQUE TIME DEMANDS

## REPLACEMENT WITH PRECAST CONCRETE

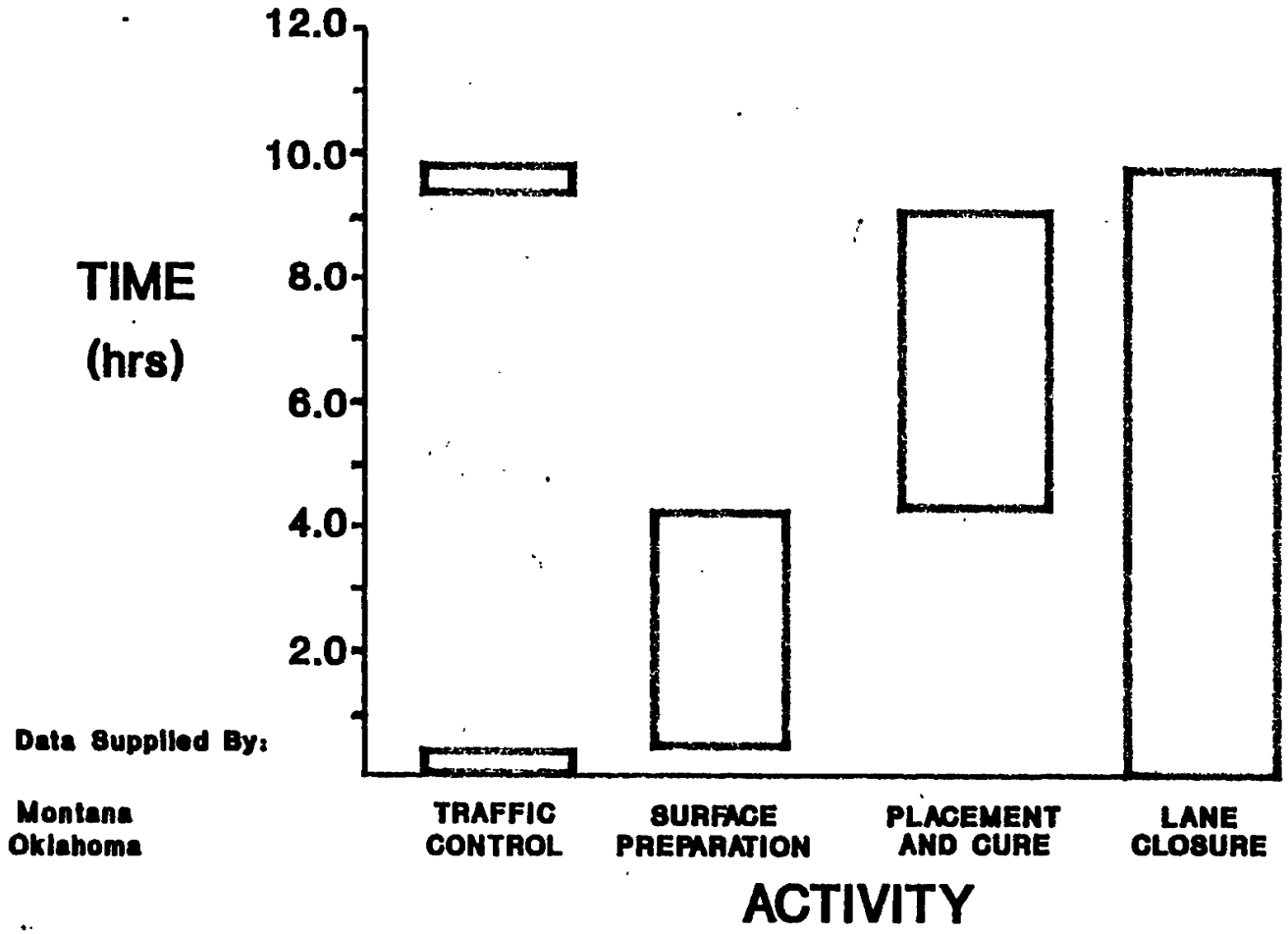



Data Supplied By:

California
Pennsylvannia Tnpk Comm
Washington

# TECHNIQUE TIME DEMANDS

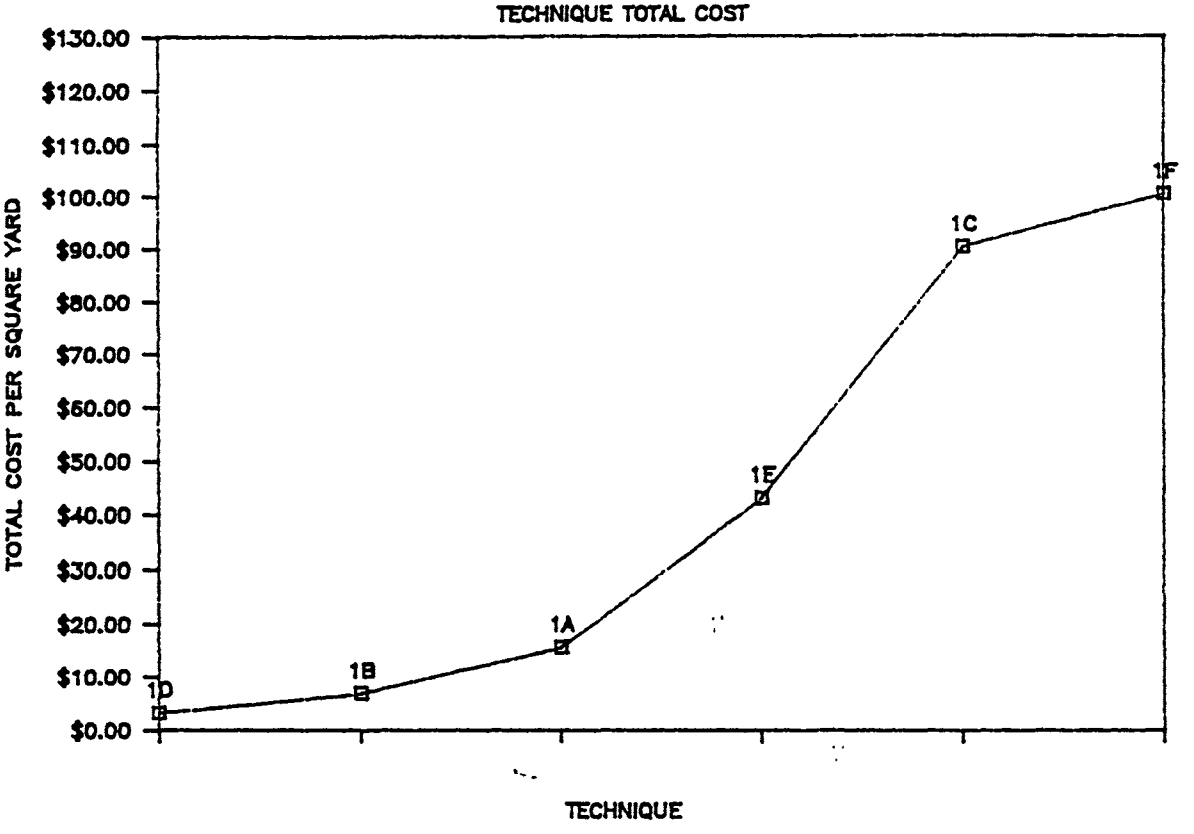
## OTHER SITE CAST HYDRAULIC CEMENT




Data Supplied By:

Montana
Oklahoma

# RAPID PROTECTION SYSTEMS

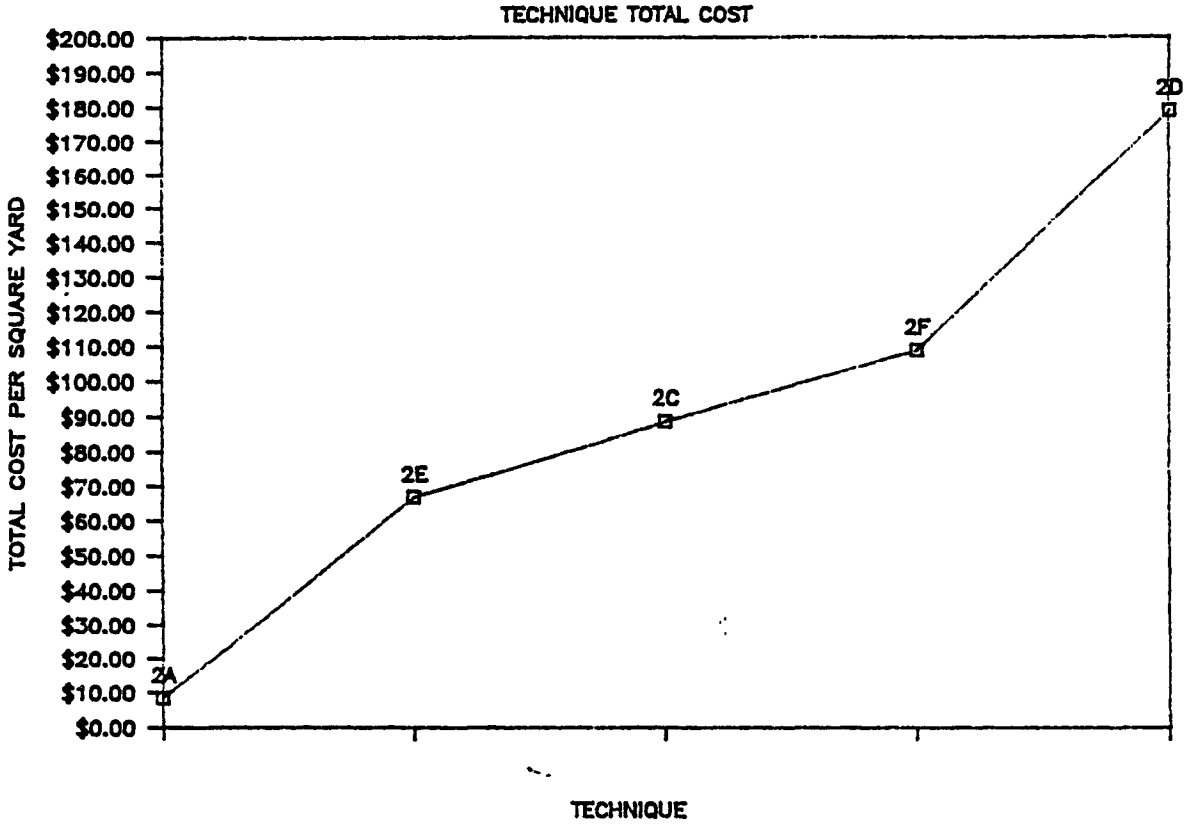



| TECHNIQUE KEY: | CODE NUMBER* | TOTAL COST ($/YD$^2$) | DOT/CSHRP PROVIDING DATA |
|---|---|---|---|
| 1--PENETRATING SEALER | 1D | $ 3.27 | ALTA, CA, MD, NE, OK |
| 2--COATING | 1B | $ 6.95 | CA |
| 3--BITUMINOUS CONC OVLY | 1A | $ 15.72 | CT, ID, MD, NE, NH, NY, NS, SD, TN, WA |
| 4--PLMR OVLY | 1E | $ 43.17 | BC, CA, MS, NY, OH, TN, WA, VA |
| 5--HES PCC OVLY | 1C | $ 90.38 | BC, WA |
| 6--OTHER HYDRAULIC CEMENT OVLY | 1F | $100.46 | BC |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS

2426

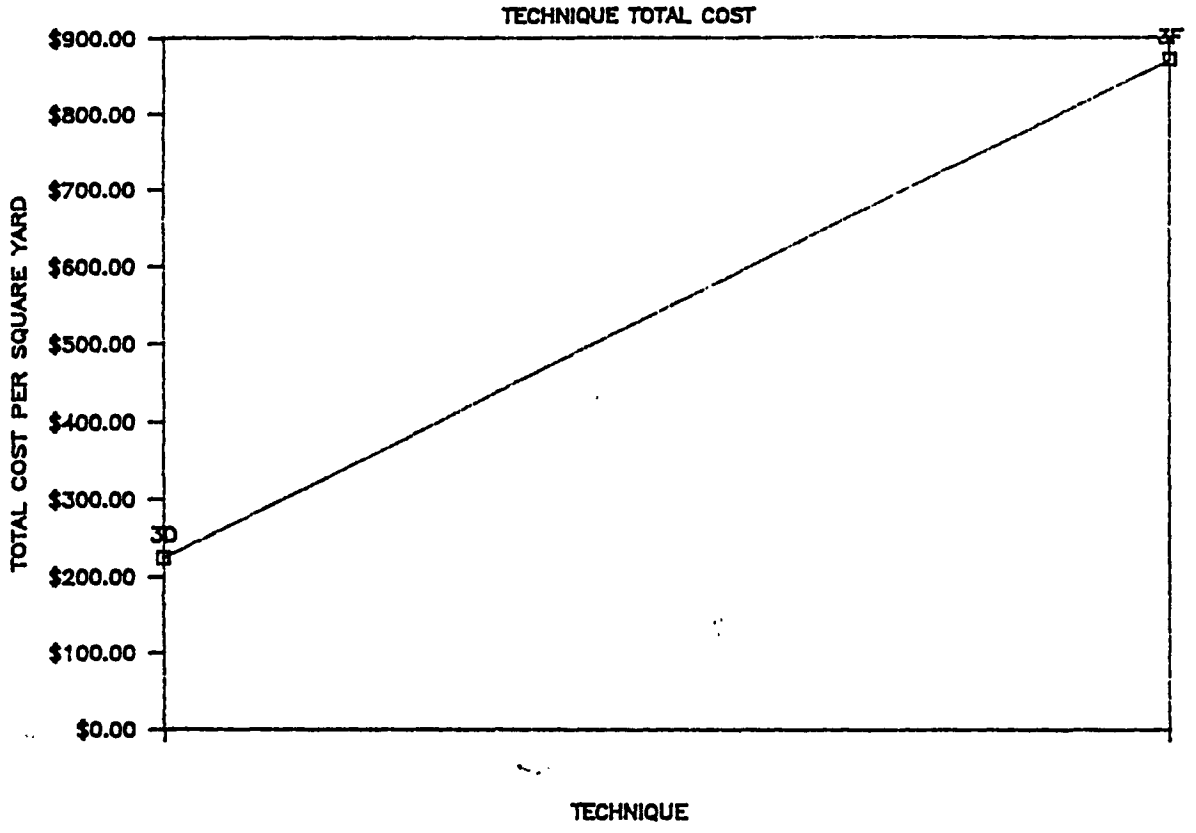
# RAPID REHABILITATION SYSTEMS




| TECHNIQUE KEY: | CODE NUMBER* | TOTAL COST ($/YD$^2$) | DOT/CSHRP PROVIDING DATA |
|---|---|---|---|
| 1--CRACK SEALER | 2A | $ 8.40 | CA, OH |
| 2--PLMR CONC PATCH | 2E | $ 66.86 | CA |
| 3--BITUMINOUS CONC PATCH | 2C | $ 88.50 | IN, KS, NS |
| 4--OTHER HYDRAULIC CEMENT PATCH | 2F | $108.75 | CA, HI, IN, MT, OK, YT |
| 5--HES PCC PATCH | 2D | $178.72 | AR, CO, CT, KS, KY, MD, NJ, NY, NS, OK, TN, TX, VA |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS

# RAPID REPLACEMENT SYSTEMS

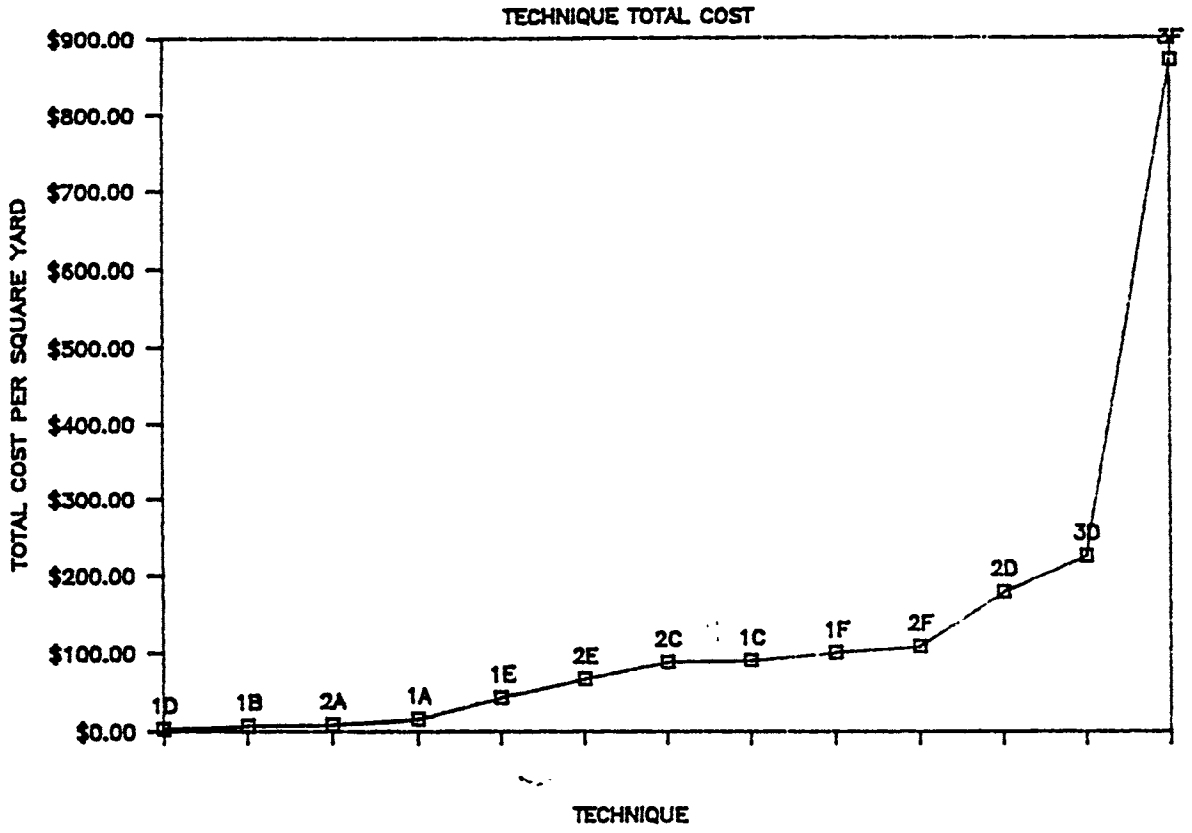



| TECHNIQUE KEY: | CODE NUMBER* | TOTAL COST ($/YD$^2$) | DOT/CSHRP PROVIDING DATA |
|---|---|---|---|
| 1--SITE CAST HES PCC | 3D | $224.25 | CO, OK |
| 2--OTHER SITE CAST HYDRAULIC CEMENT | 3F | $870.50 | IN, MT |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS

2422

# RAPID REPAIR SYSTEMS

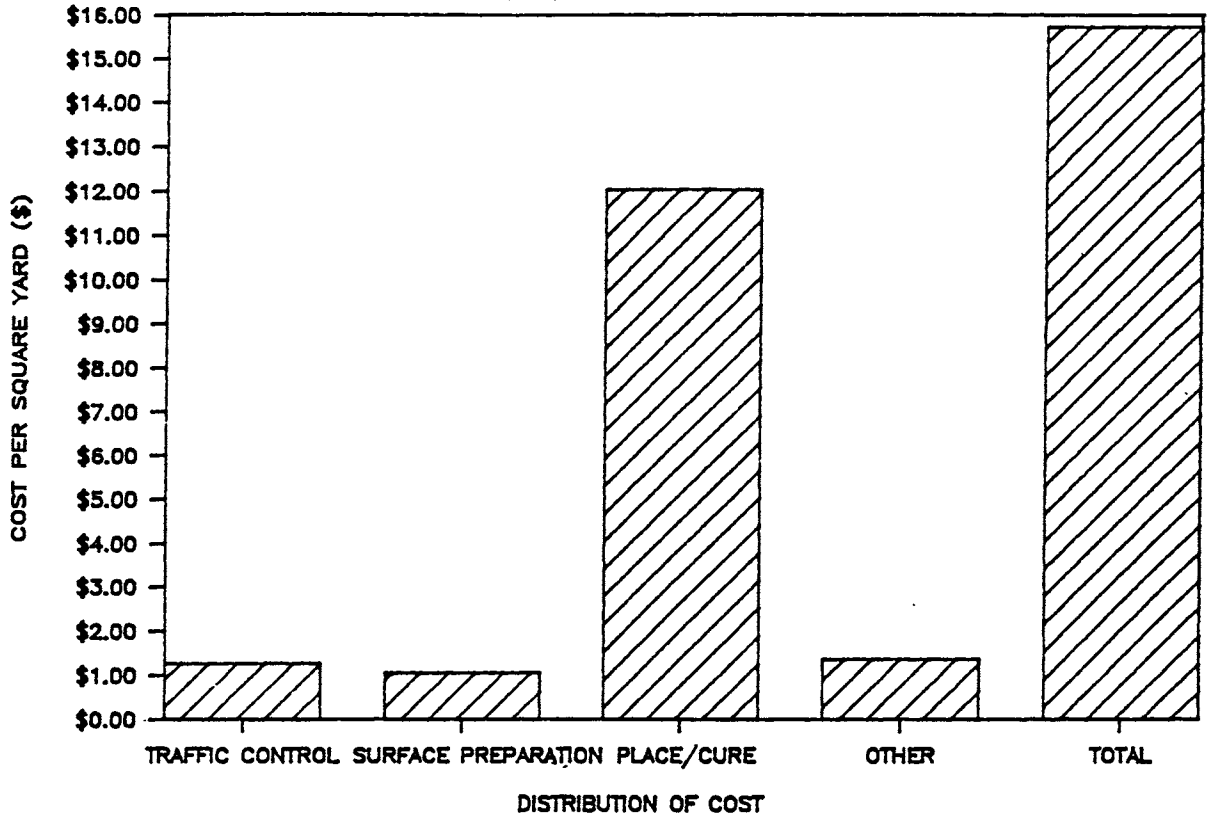



| TECHNIQUE KEY: | CODE NUMBER* | TOTAL COST ($/YD$^2$) | DOT/CSHRP PROVIDING DATA |
|---|---|---|---|
| 1--PENETRATING SEALER | 1D | $ 3.27 | ALTA, CA, MD, NE, OK |
| 2--COATING | 1B | $ 6.95 | CA |
| 3--CRACK SEALER | 2A | $ 8.40 | CA, OH |
| 4--BITUMINOUS CONC OVLY | 1A | $ 15.72 | CT, ID, MD, NE, NH, NY, NS, SD, TN, WA |
| 5--PLMR OVLY | 1E | $ 43.17 | BC, CA, MS, NY, OH, TN, WA, VA |
| 6--PLMR CONC PATCH | 2E | $ 66.86 | CA |
| 7--BITUMINOUS CONC PATCH | 2C | $ 88.50 | IN, KS, NS |
| 8--HES PCC OVLY | 1C | $ 90.38 | BC, WA |
| 9--OTHER HYDRAULIC CEMENT OVLY | 1F | $100.46 | BC |
| 10--OTHER HYDRAULIC CEMENT PATCH | 2F | $108.75 | CA, IL, IN, MT, OK, YT |
| 11--HES PCC PATCH | 2D | $178.72 | AR, CO, CT, KS, KY, MD, NJ, NY, NS, OK, TN, TX, VA |
| 12--SITE CAST HES PCC | 3D | $224.25 | CO, OK |
| 13--OTHER SITE CAST HYDRAULIC CEMENT | 3F | $870.50 | TN, MT |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS

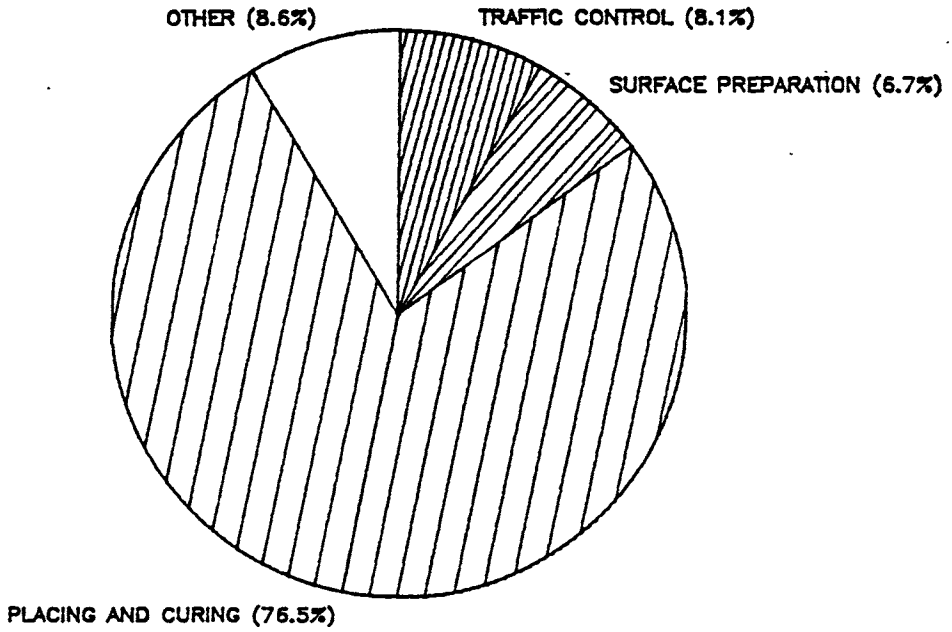
## COST DISTRIBUTION OF RAPID REPAIRS

BITUMINOUS CONC OVLY---1A



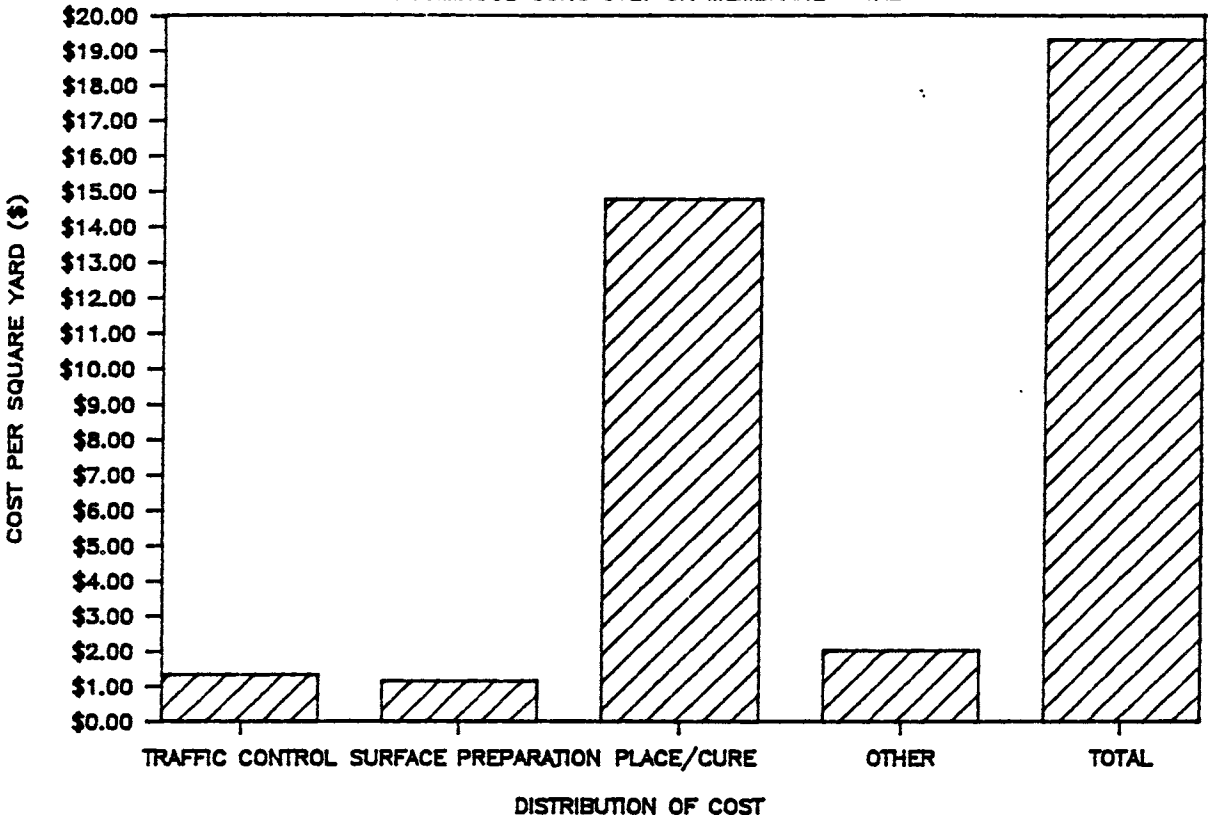

## PERCENTAGE DECOMPOSITION OF TOTAL COST

BITUMINOUS CONC OVLY---1A



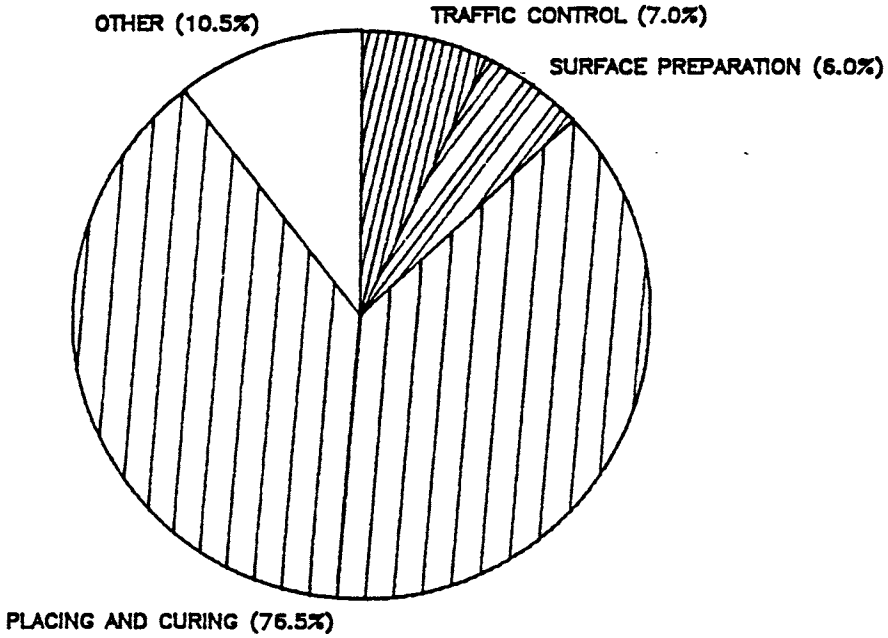
# COST DISTRIBUTION OF RAPID REPAIRS

BITUMINOUS CONC OVLY ON MEMBRANE---1A2



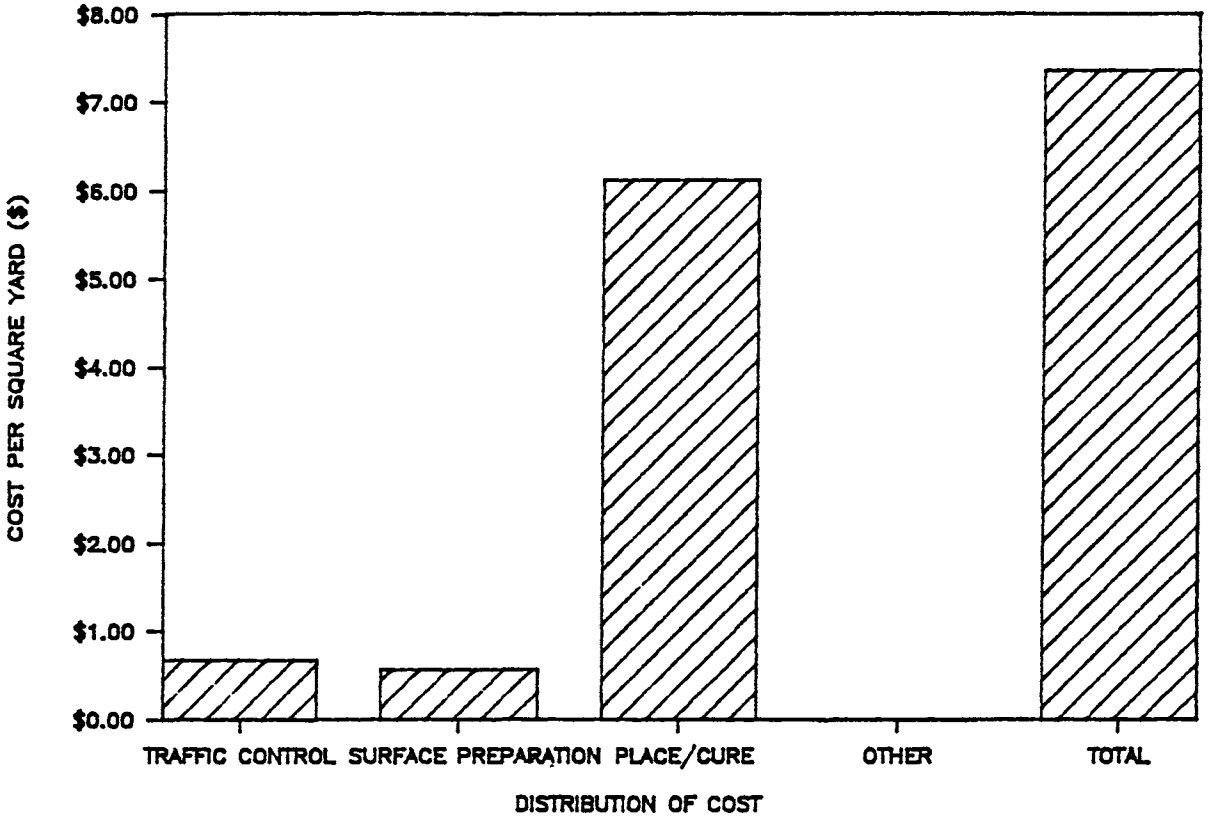

# PERCENTAGE DECOMPOSITION OF TOTAL COST

BITUMINOUS CONC OVLY ON MEMBRANE---1A2



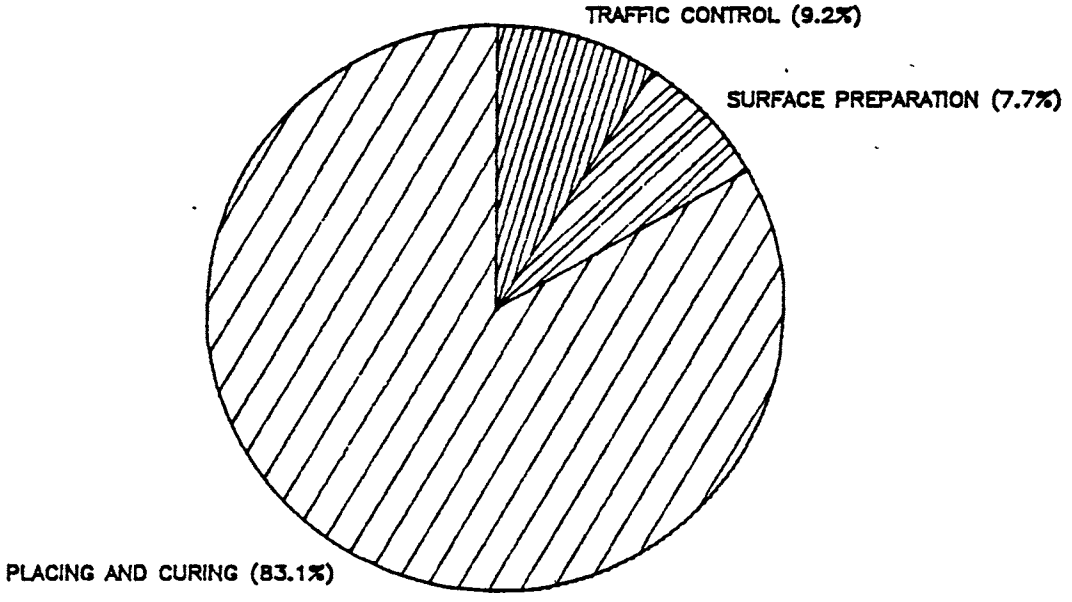
## COST DISTRIBUTION OF RAPID REPAIRS

BITUMINOUS CONC OVLY ON CHIP SEAL—1A5A



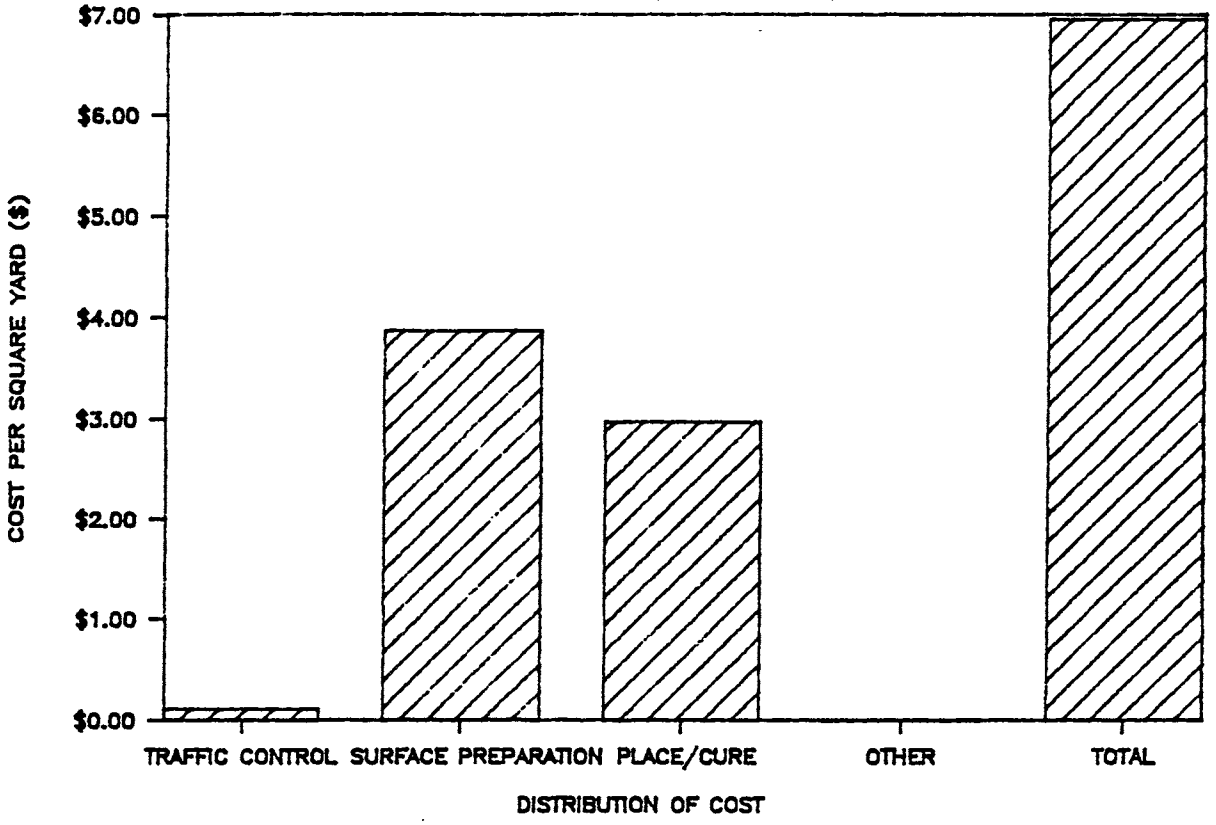

## PERCENTAGE DECOMPOSITION OF TOTAL COST

BITUMINOUS CONC OVLY ON CHIP SEAL—1A5A



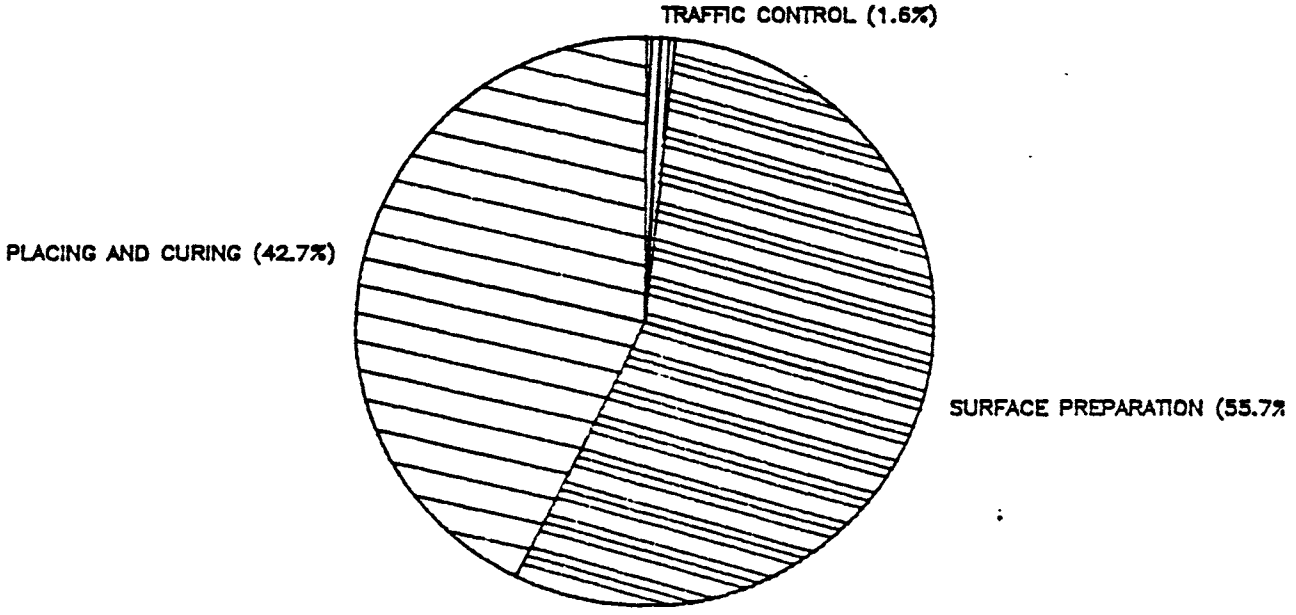
# COST DISTRIBUTION OF RAPID REPAIRS

HMW METHACRYLATE COATING—1B1C



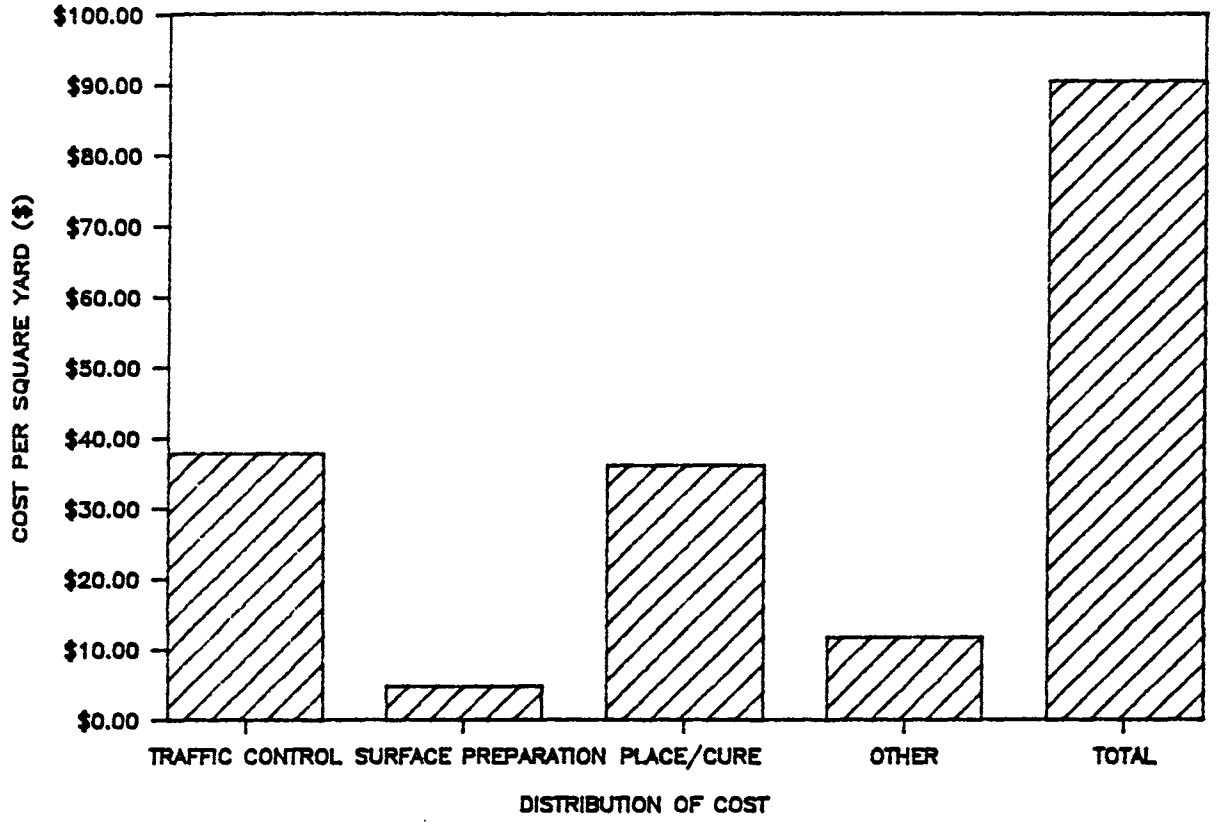

# PERCENTAGE DECOMPOSITION OF TOTAL COST

HMW METHACRYLATE COATING—1B1C



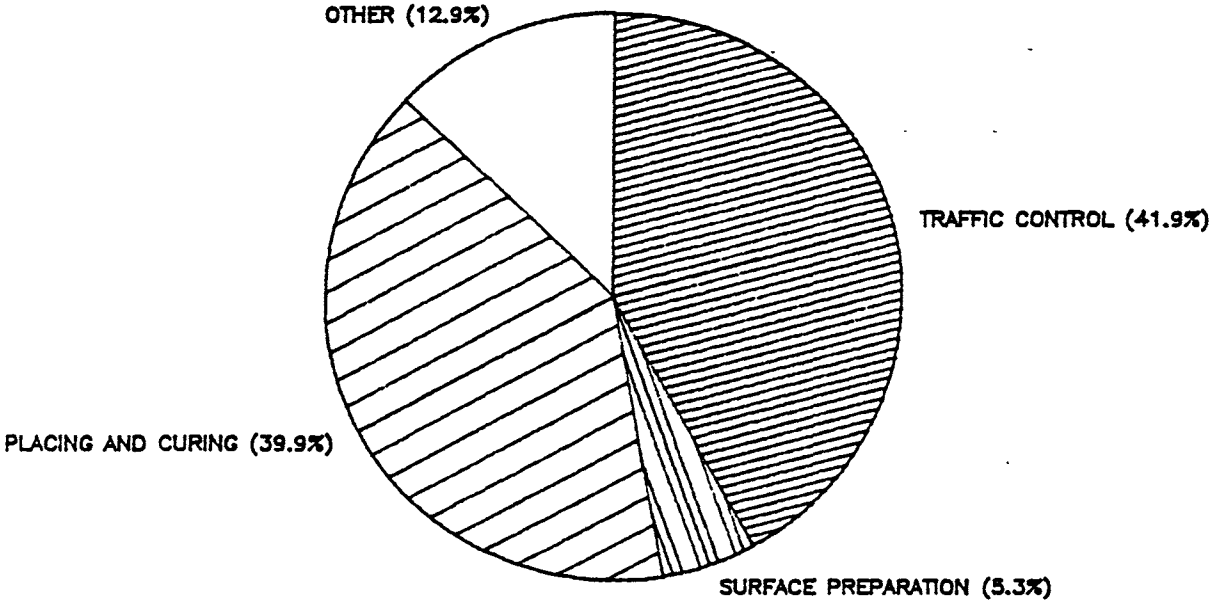
## COST DISTRIBUTION OF RAPID REPAIRS

HES PCC OVLY---1C



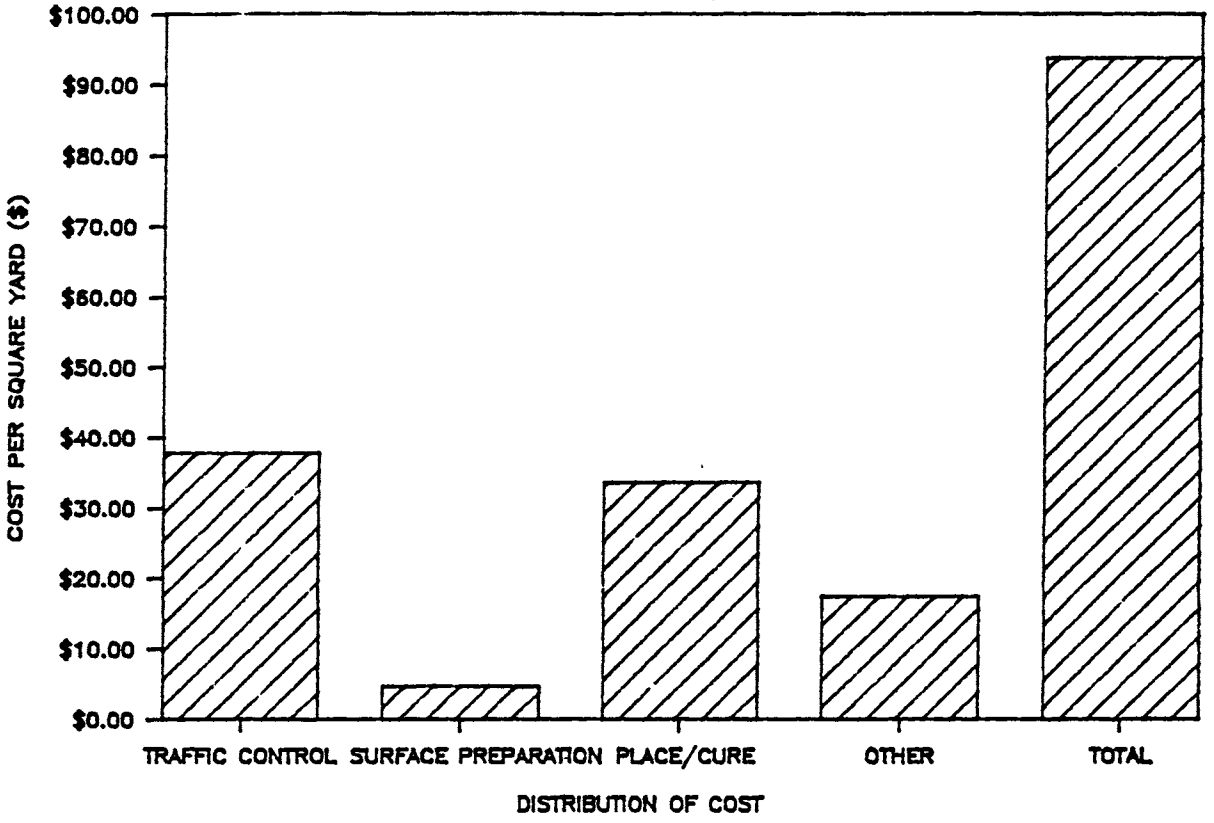

## PERCENTAGE DECOMPOSITION OF TOTAL COST

HES PCC OVLY---1C



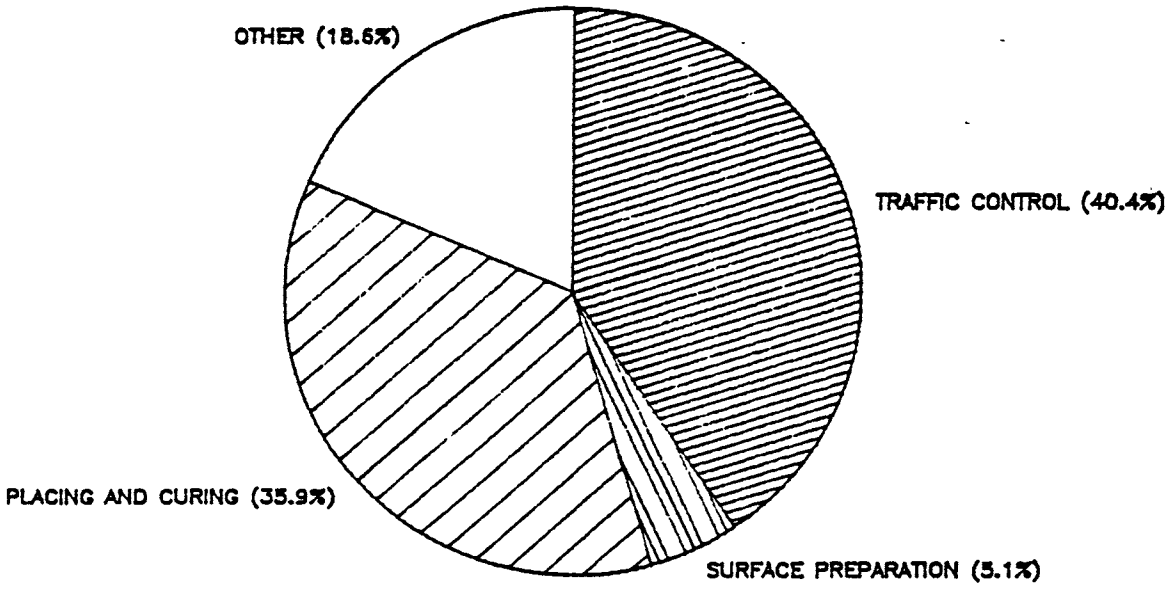
# COST DISTRIBUTION OF RAPID REPAIRS

HES PCC OVLY CONTAINING ADMIXTURES--1C2



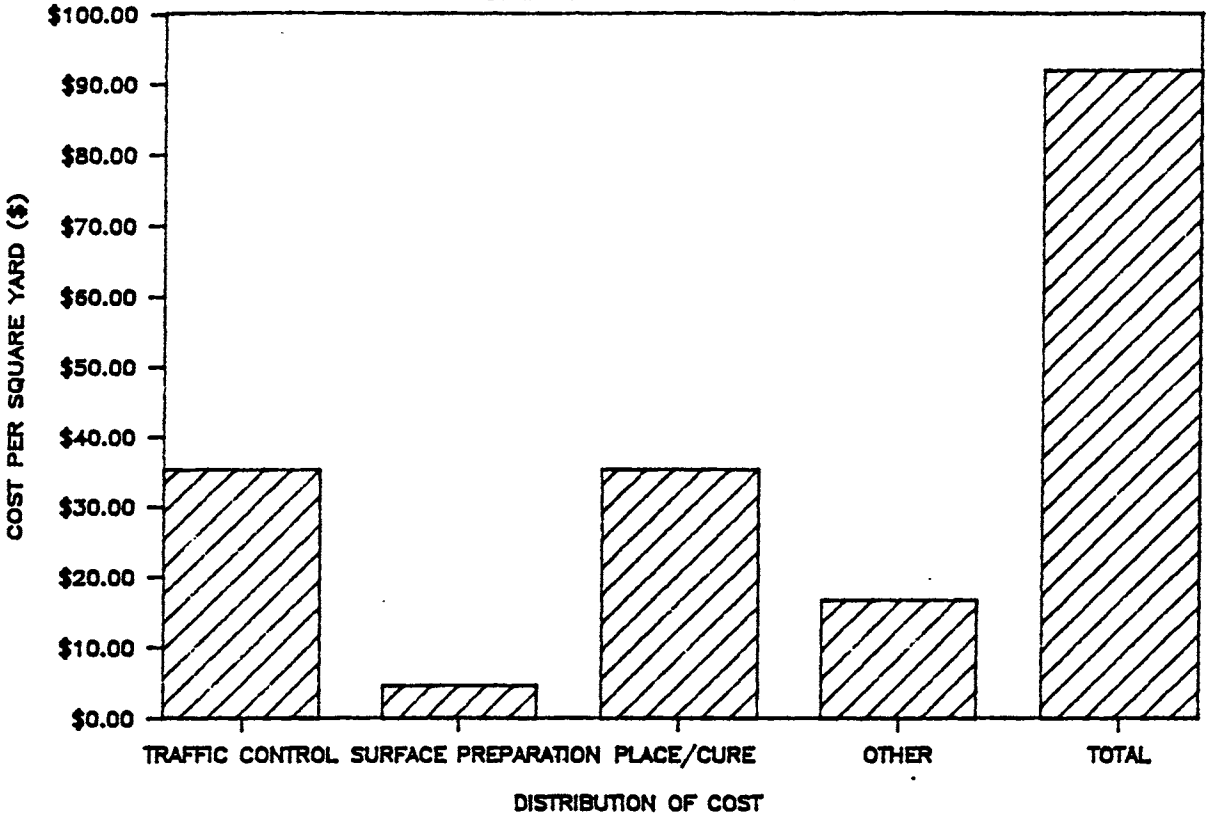

# PERCENTAGE DECOMPOSITION OF TOTAL COST

HES PCC OVLY CONTAINING ADMIXTURES--1C2



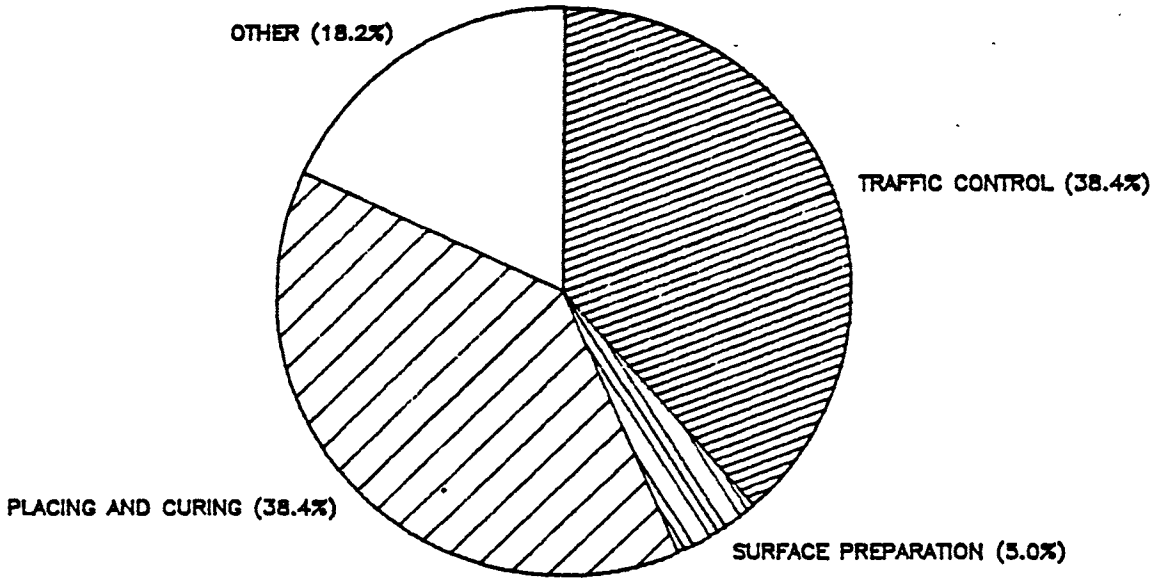
## COST DISTRIBUTION OF RAPID REPAIRS

LATEX MODIFIED CONC OVLY---1C2C



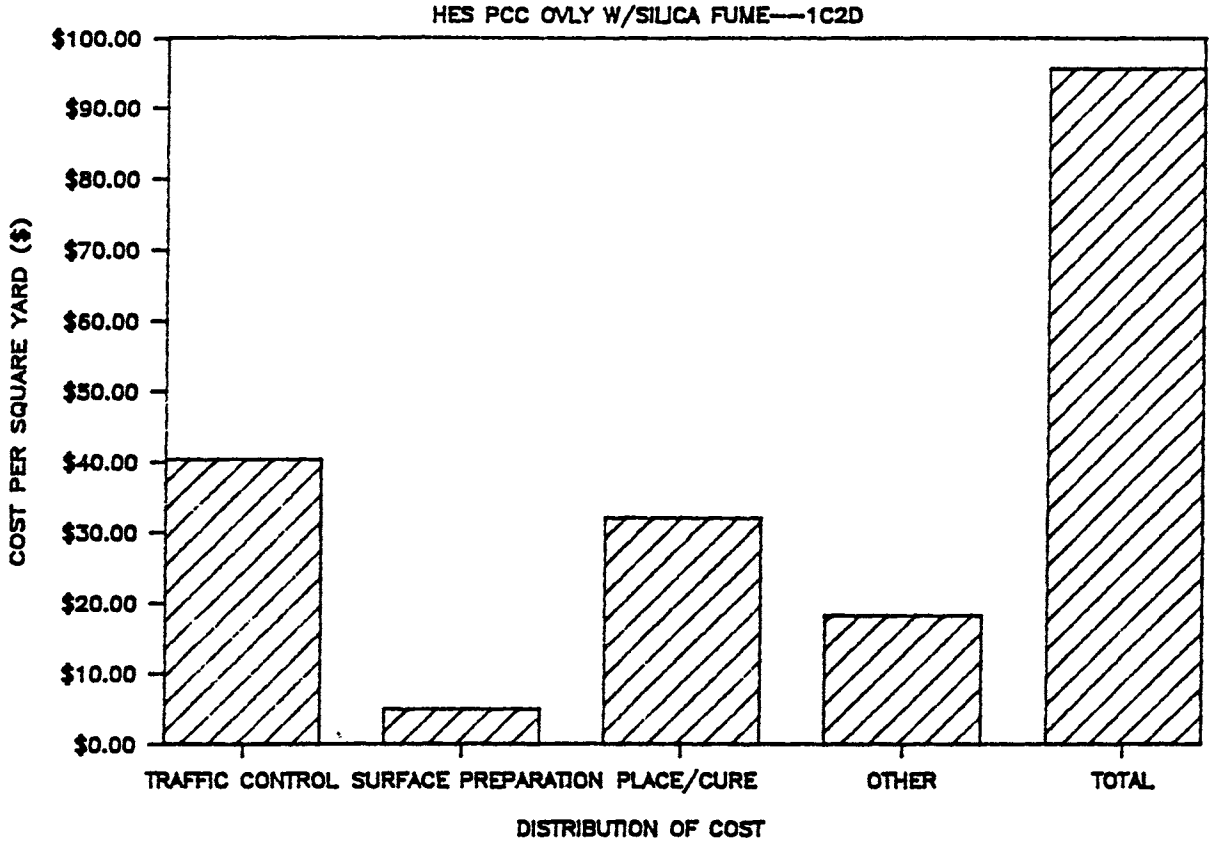

## PERCENTAGE DECOMPOSITION OF TOTAL COST

LATEX MODIFIED CONC OVLY---1C2C



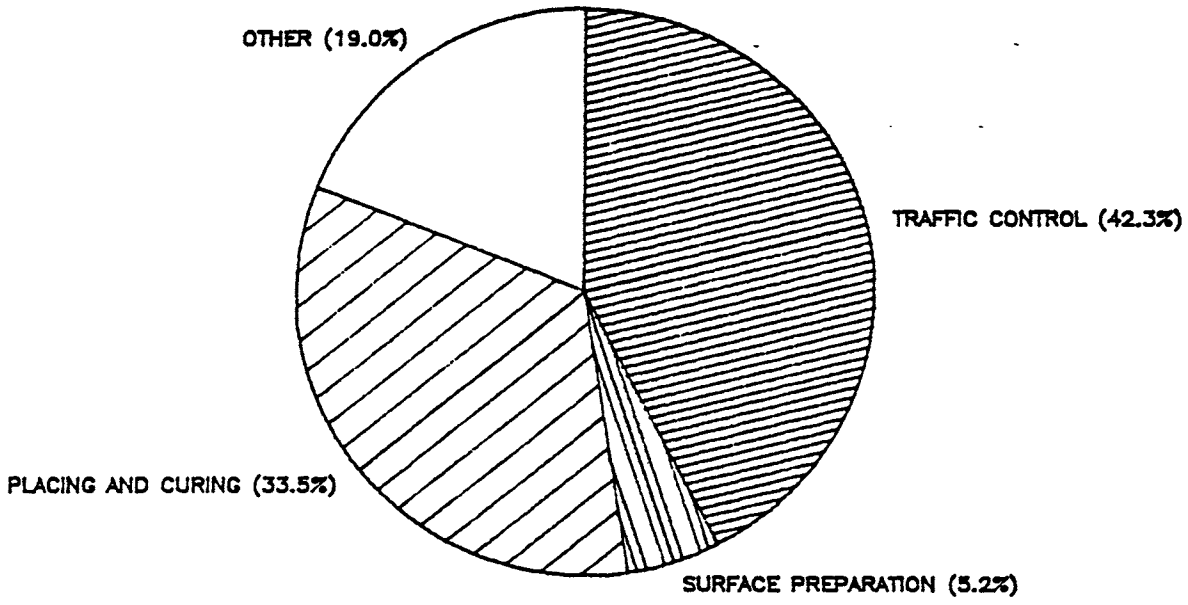
# COST DISTRIBUTION OF RAPID REPAIRS

HES PCC OVLY W/SILICA FUME—1C2D



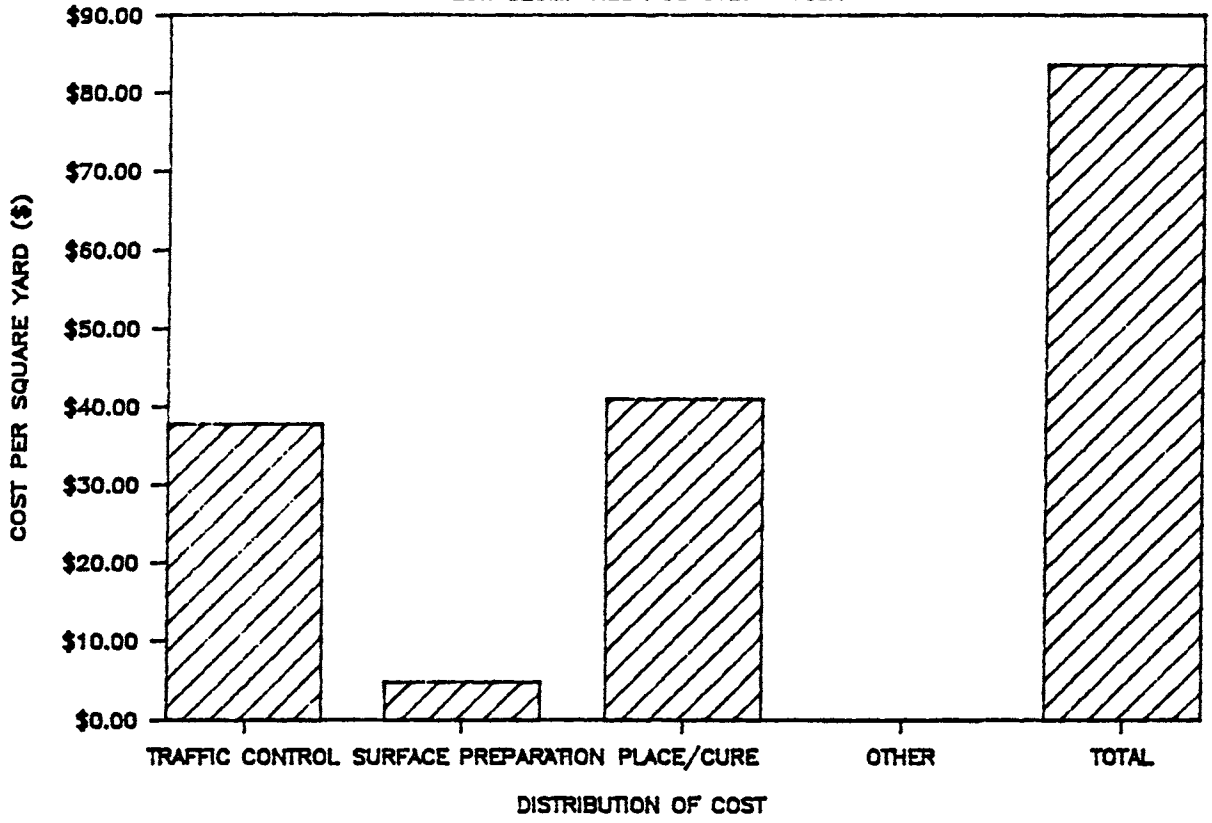

# PERCENTAGE DECOMPOSITION OF TOTAL COST

HES PCC OVLY W/SILICA FUME—1C2D



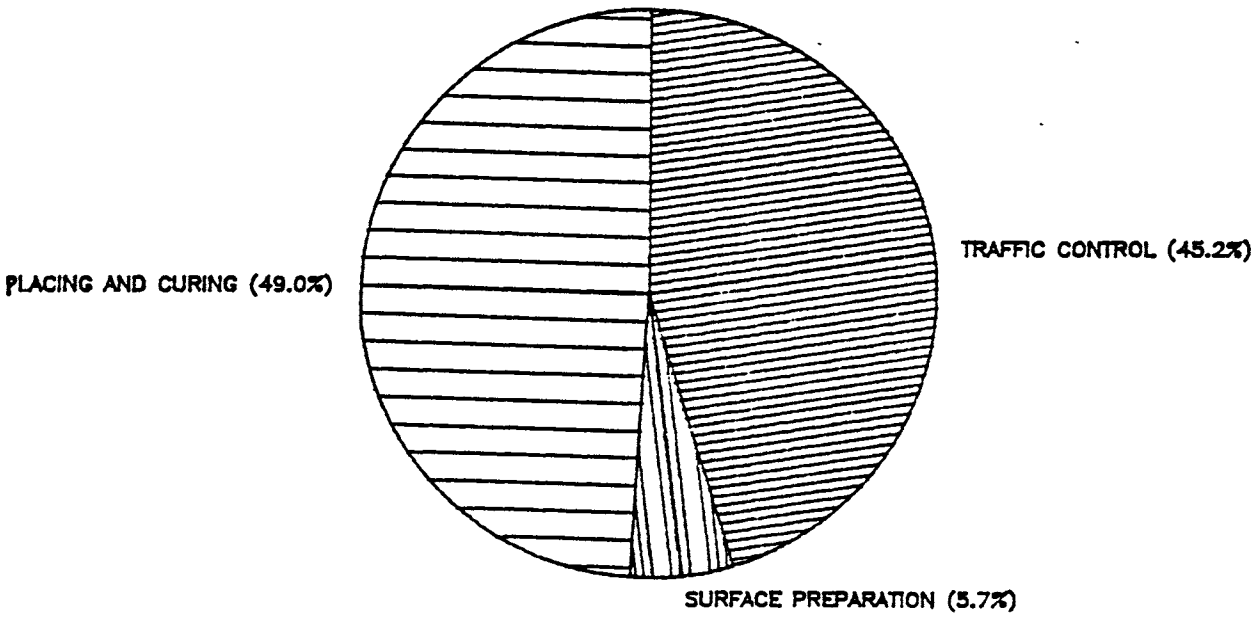
## COST DISTRIBUTION OF RAPID REPAIRS

LOW SLUMP HES PCC OVLY—1C3A



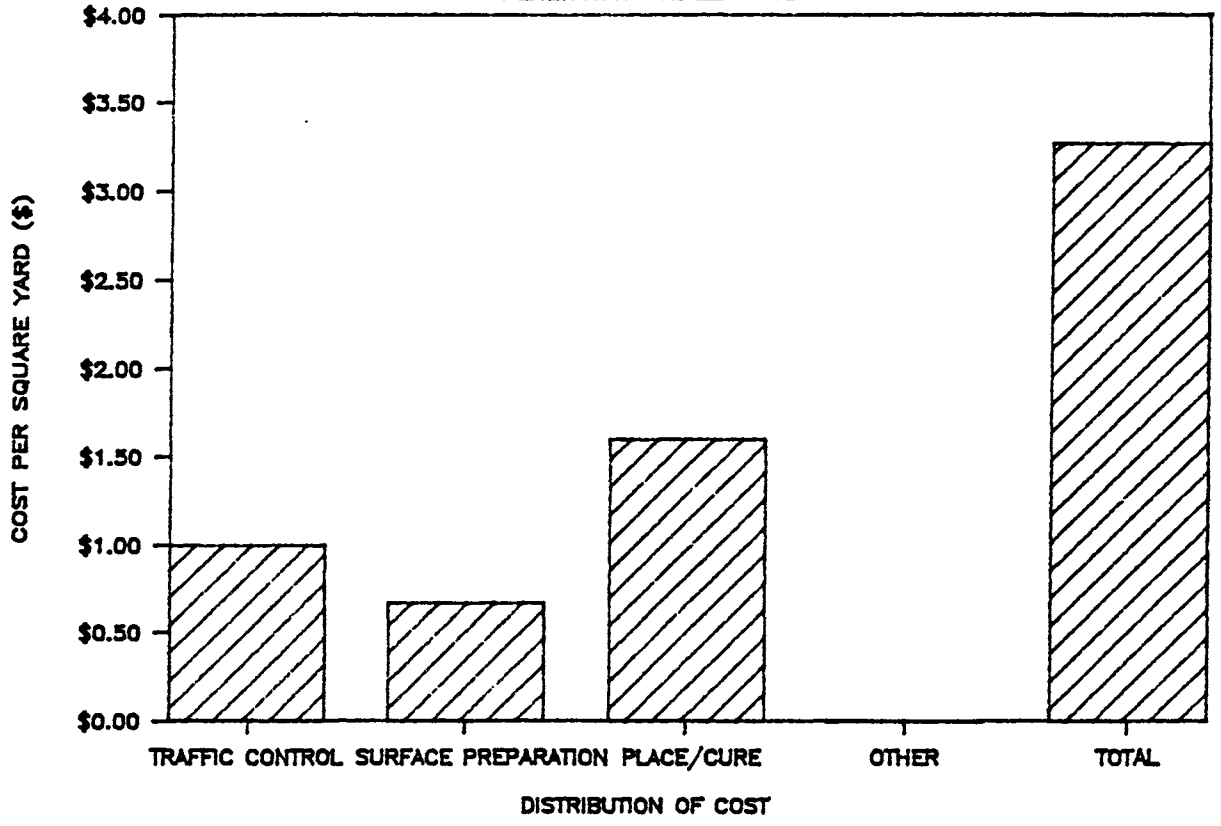

## PERCENTAGE DECOMPOSITION OF TOTAL COST

LOW SLUMP HES PCC OVLY—1C3A



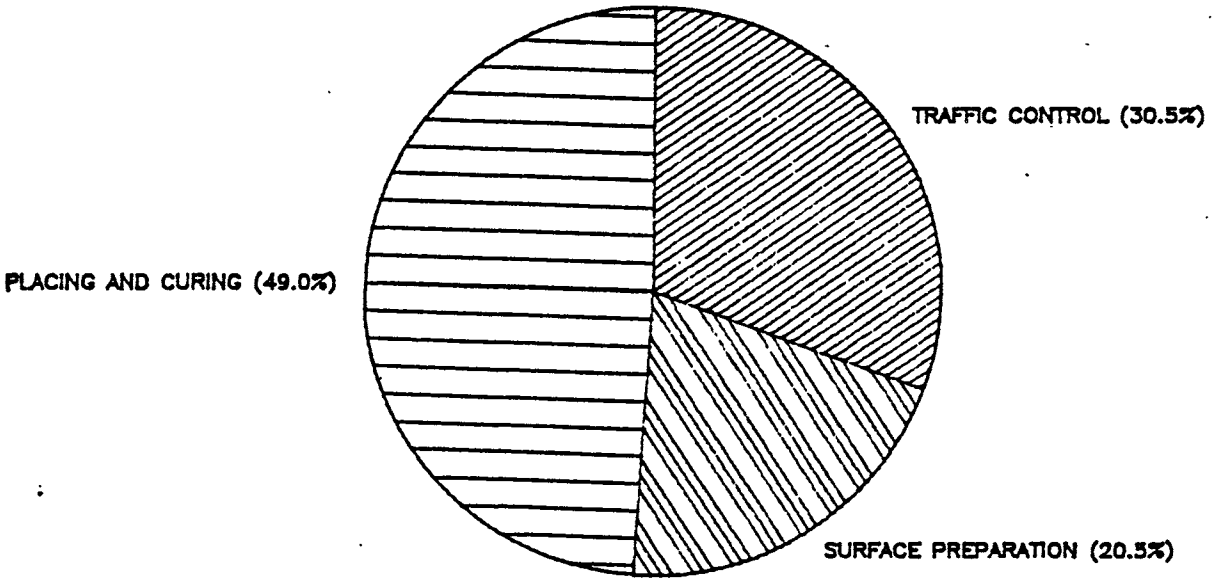
## COST DISTRIBUTION OF RAPID REPAIRS

PENETRATING SEALER—1D



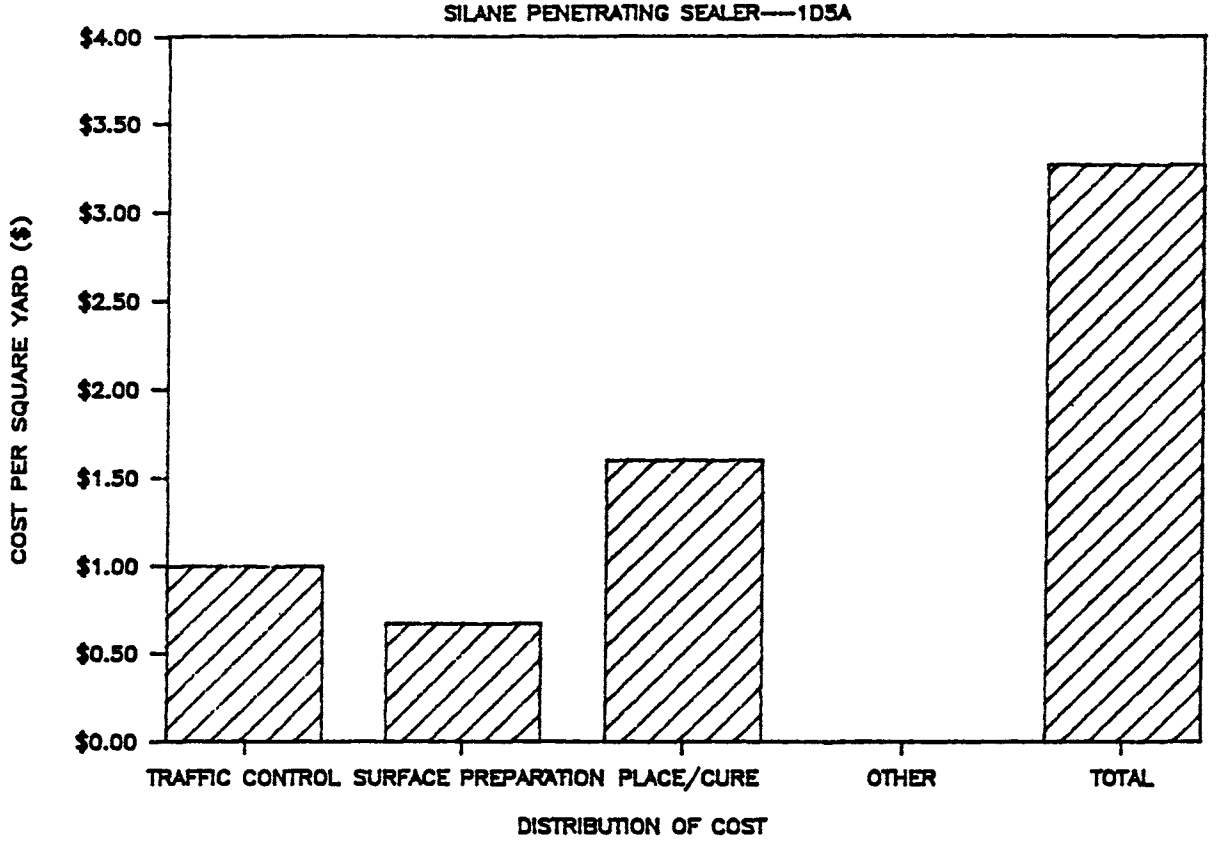

## PERCENTAGE DECOMPOSITION OF TOTAL COST

PENETRATING SEALER—1D



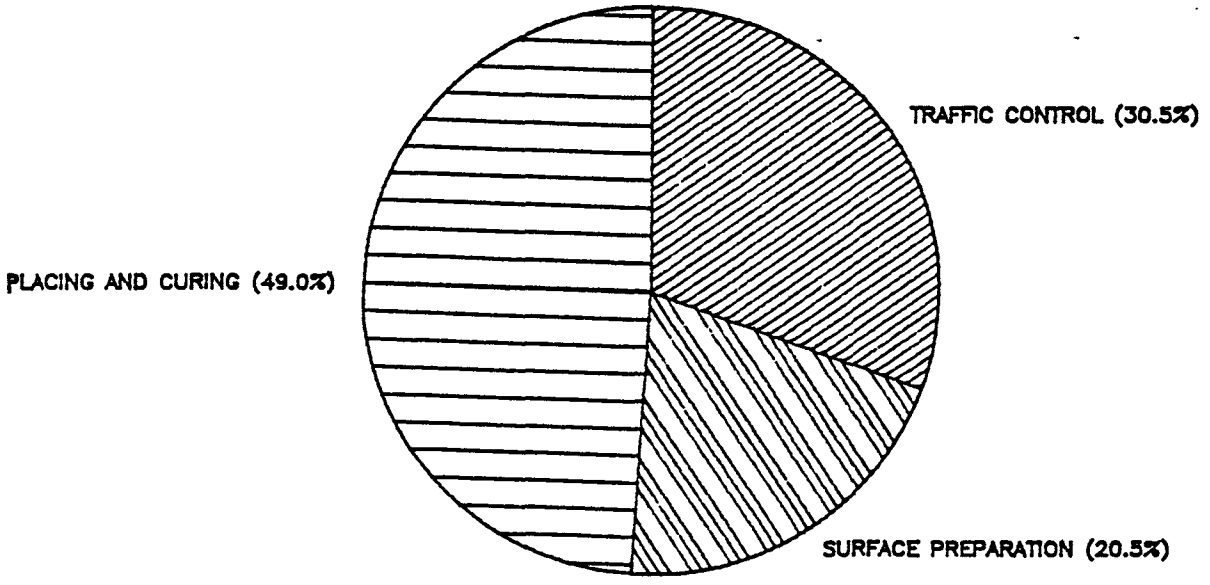
# COST DISTRIBUTION OF RAPID REPAIRS

SILANE PENETRATING SEALER—1D5A



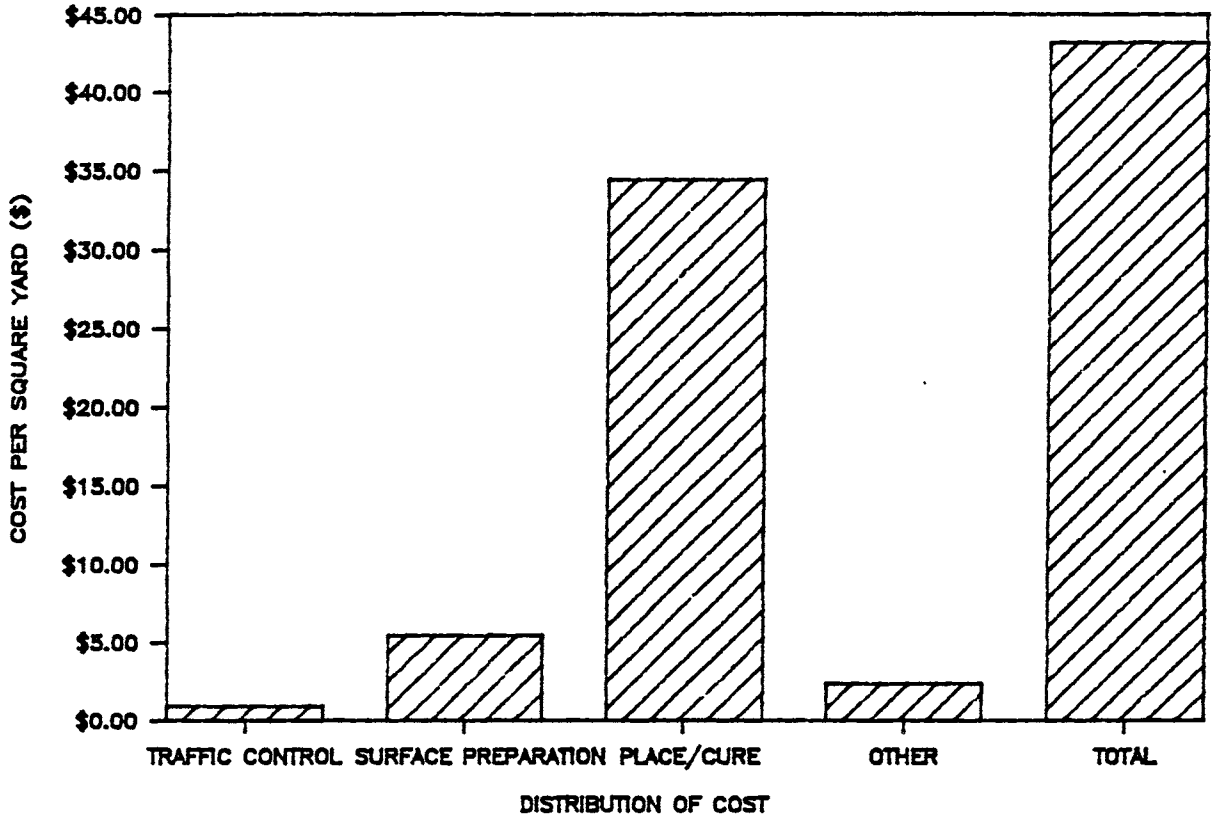

# PERCENTAGE DECOMPOSITION OF TOTAL COST

SILANE PENETRATING SEALER—1D5A



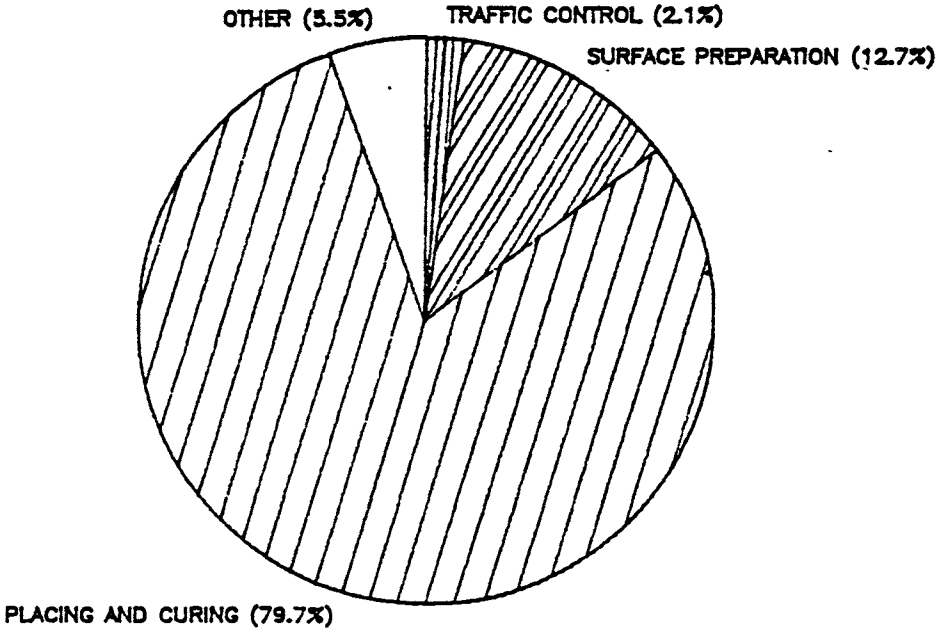
## COST DISTRIBUTION OF RAPID REPAIRS

PLMR OVLY---1E



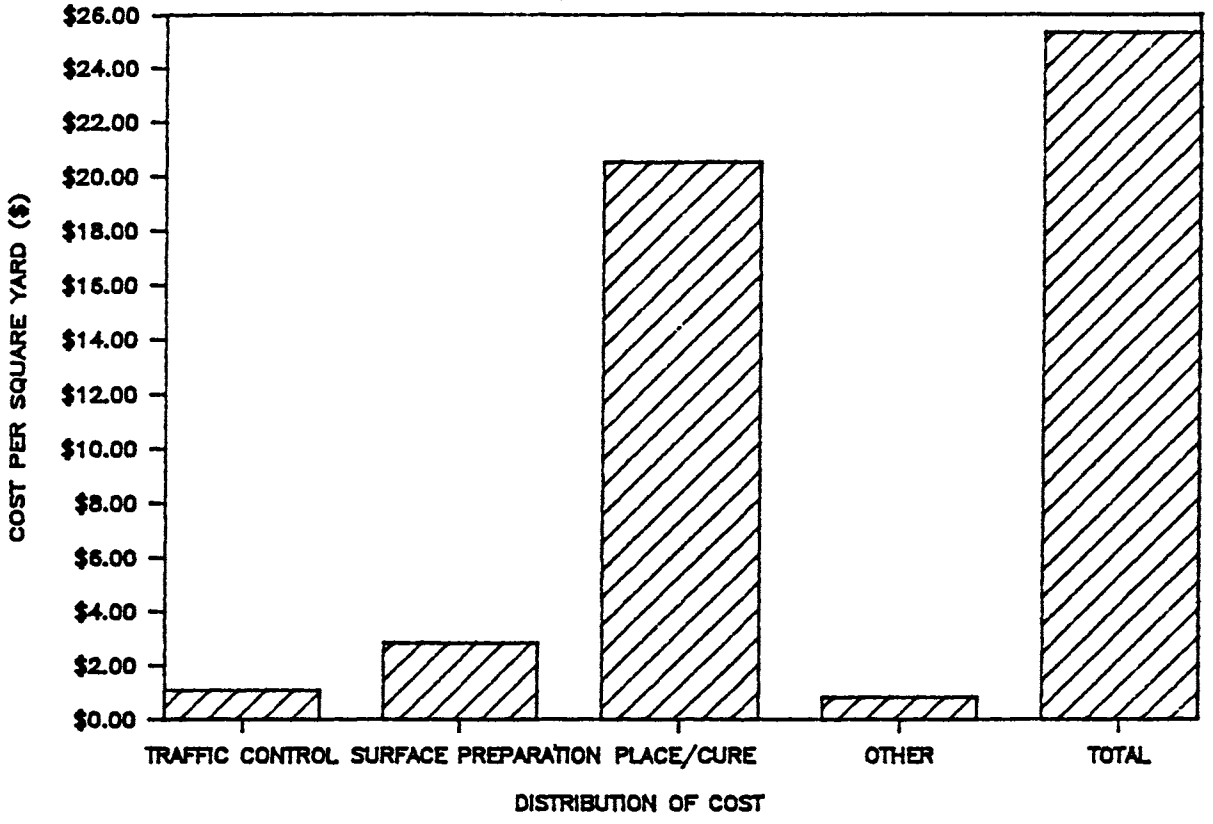

## PERCENTAGE DECOMPOSITION OF TOTAL COST

PLMR OVLY---1E



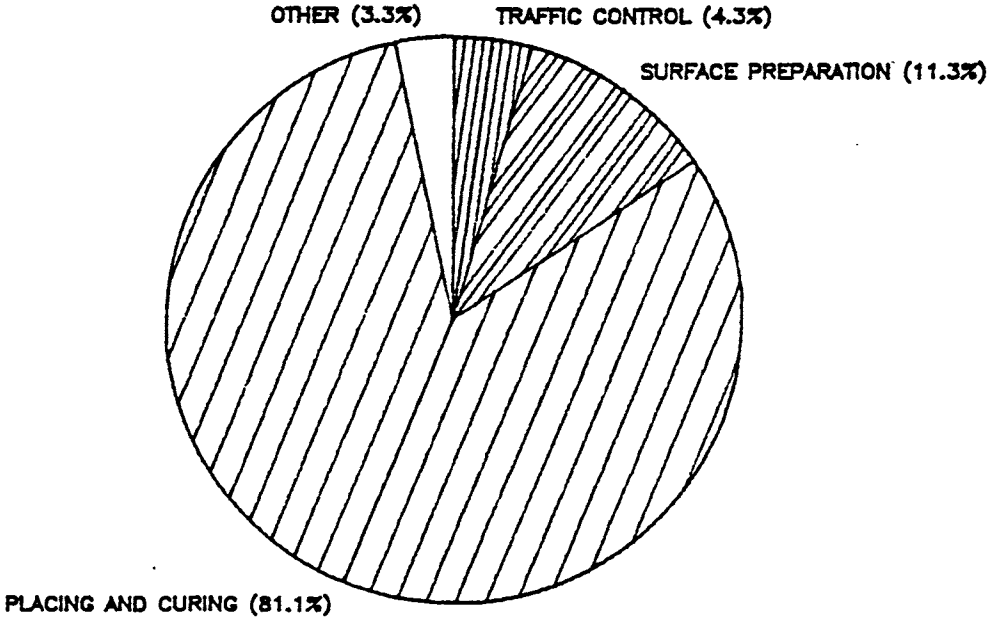
## COST DISTRIBUTION OF RAPID REPAIRS

MULT LYR PLMR OVLY—1E1



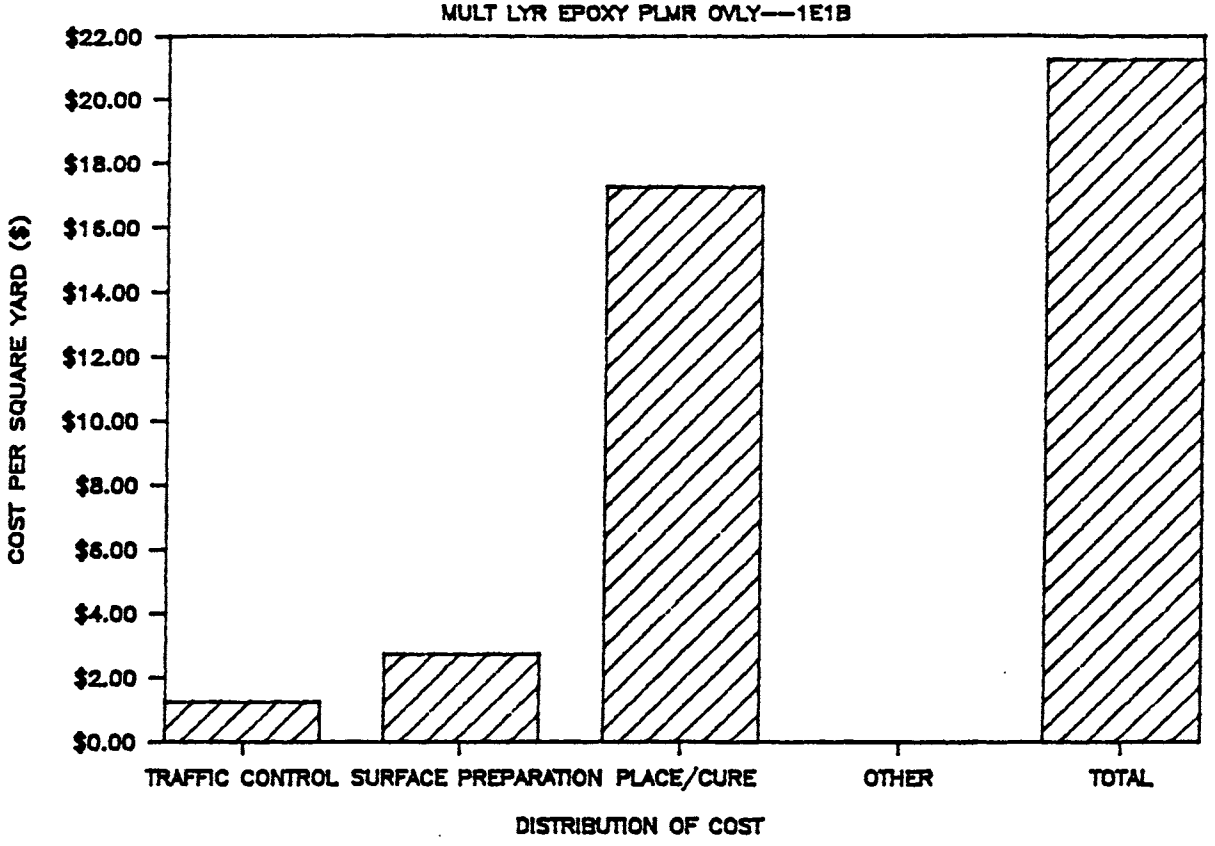

## PERCENTAGE DECOMPOSITION OF TOTAL COST

MULT LYR PLMR OVLY—1E1



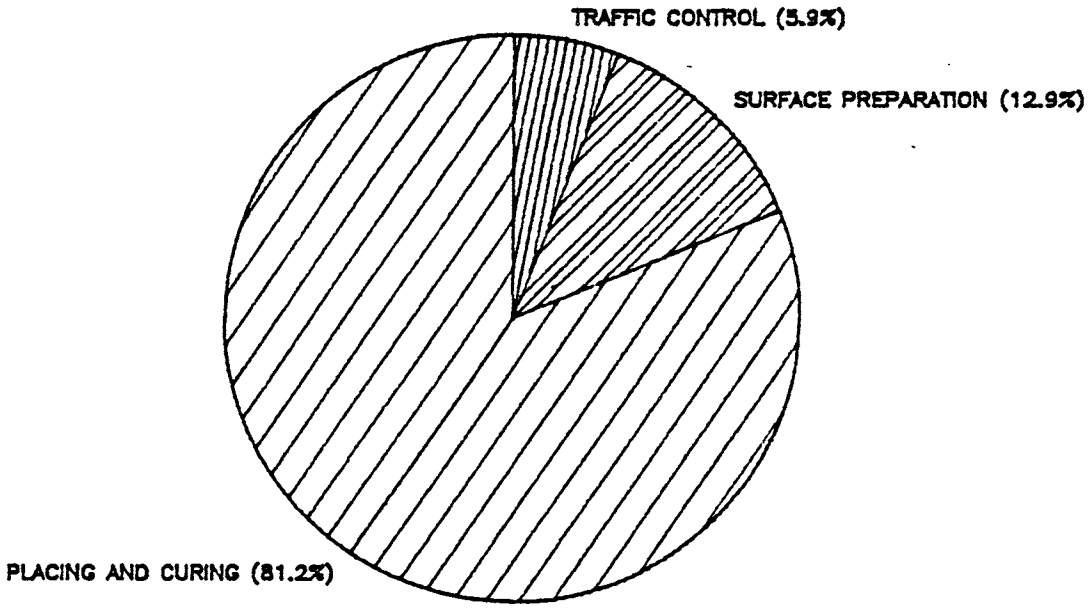
# COST DISTRIBUTION OF RAPID REPAIRS

MULT LYR EPOXY PLMR OVLY—1E1B



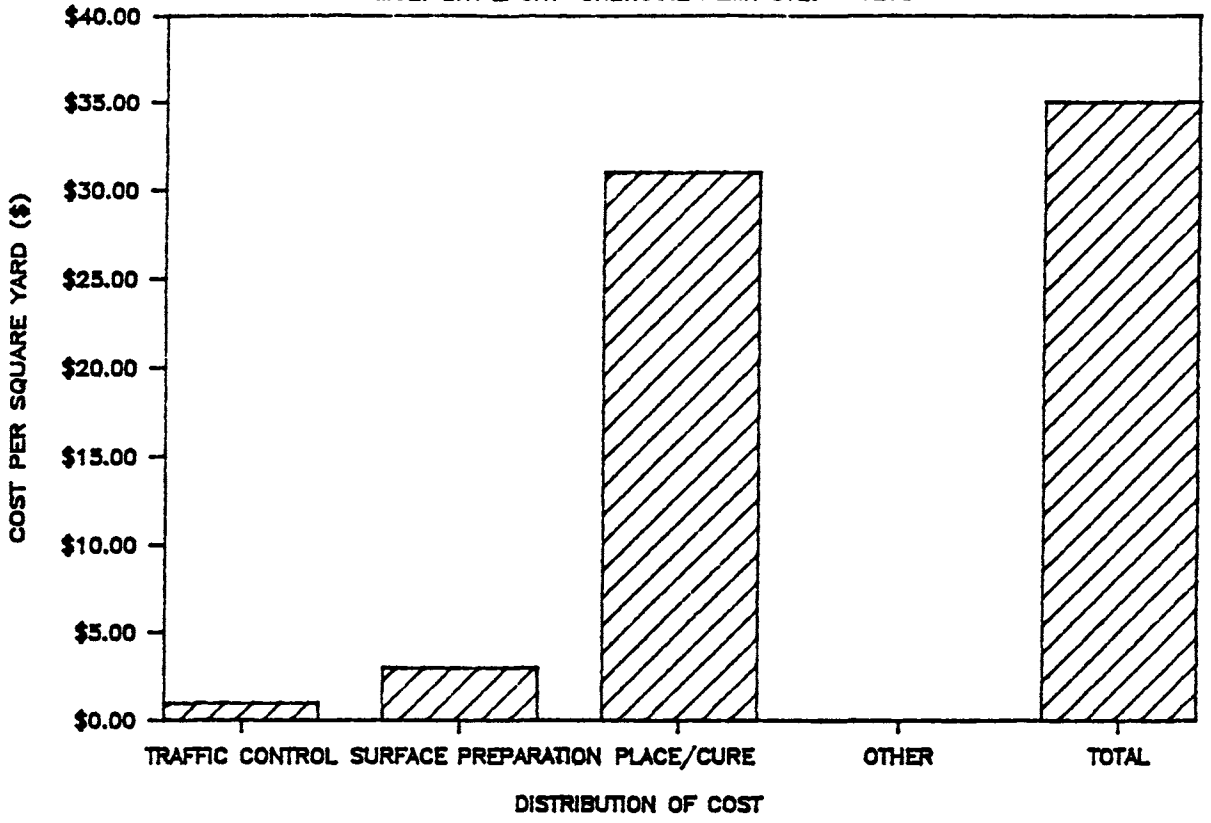

# PERCENTAGE DECOMPOSITION OF TOTAL COST

MULT LYR EPOXY PLMR OVLY—1E1B



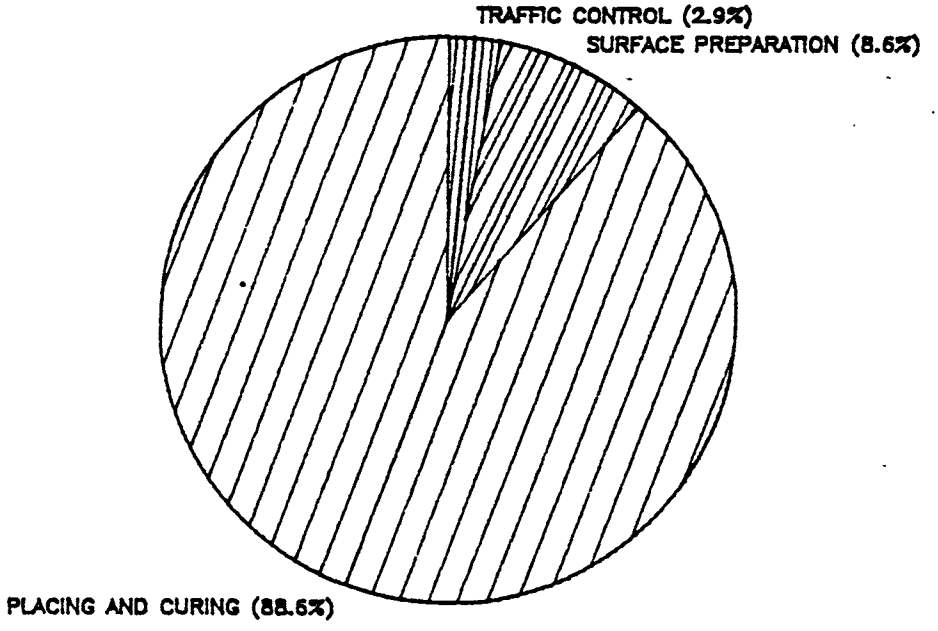
# COST DISTRIBUTION OF RAPID REPAIRS

MULT LYR EPOXY–URETHANE PLMR OVLY—1E1C




# PERCENTAGE DECOMPOSITION OF TOTAL COST

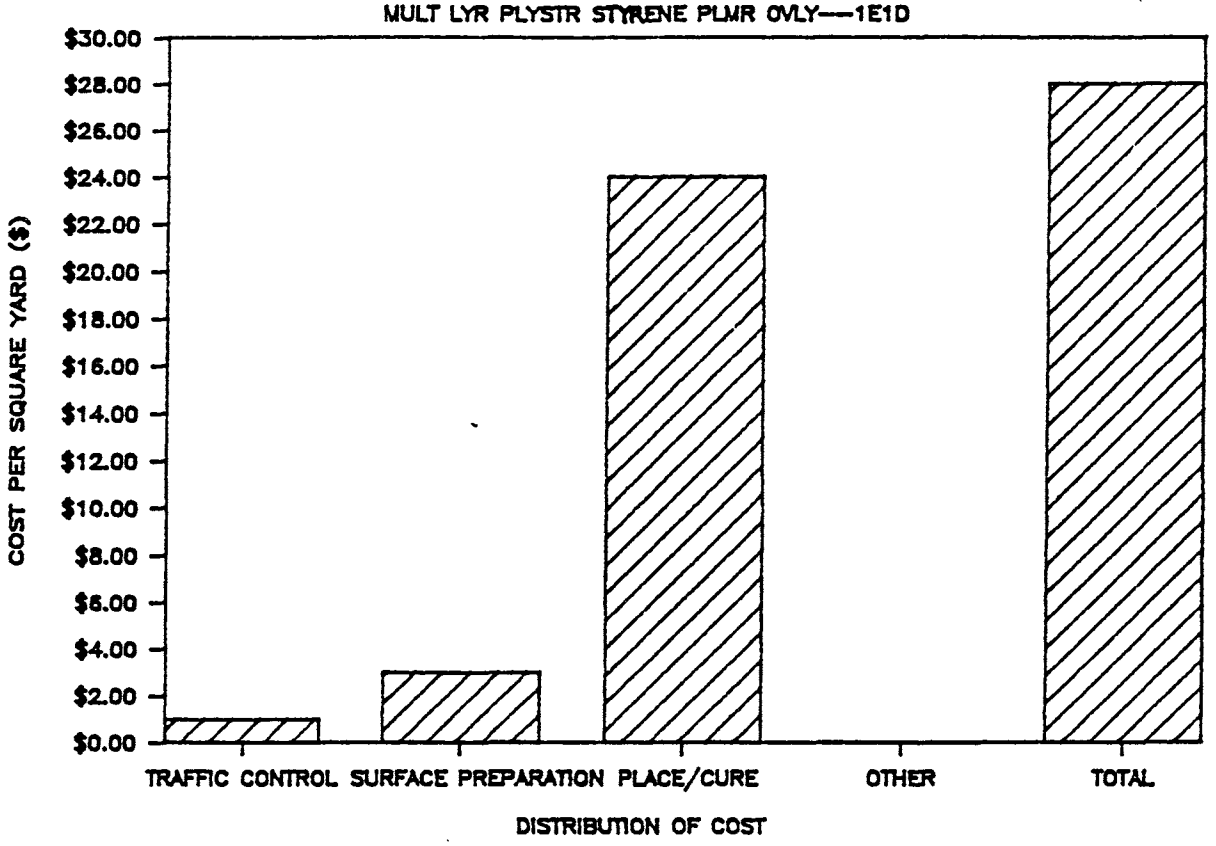
MULT LYR EPOXY–URETHANE PLMR OVLY—1E1C



2444

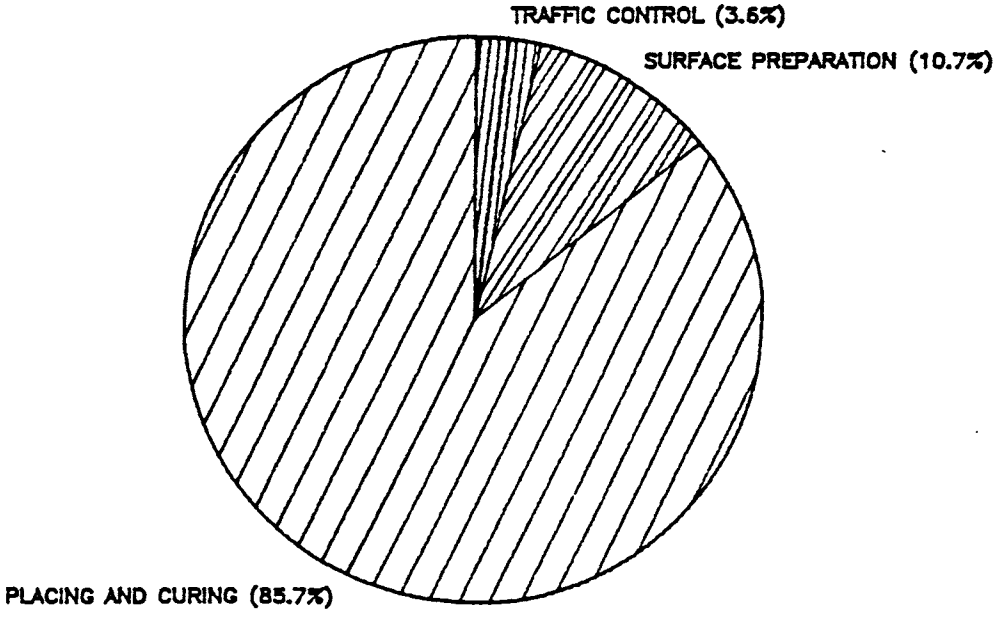
# COST DISTRIBUTION OF RAPID REPAIRS

MULT LYR PLYSTR STYRENE PLMR OVLY—1E1D



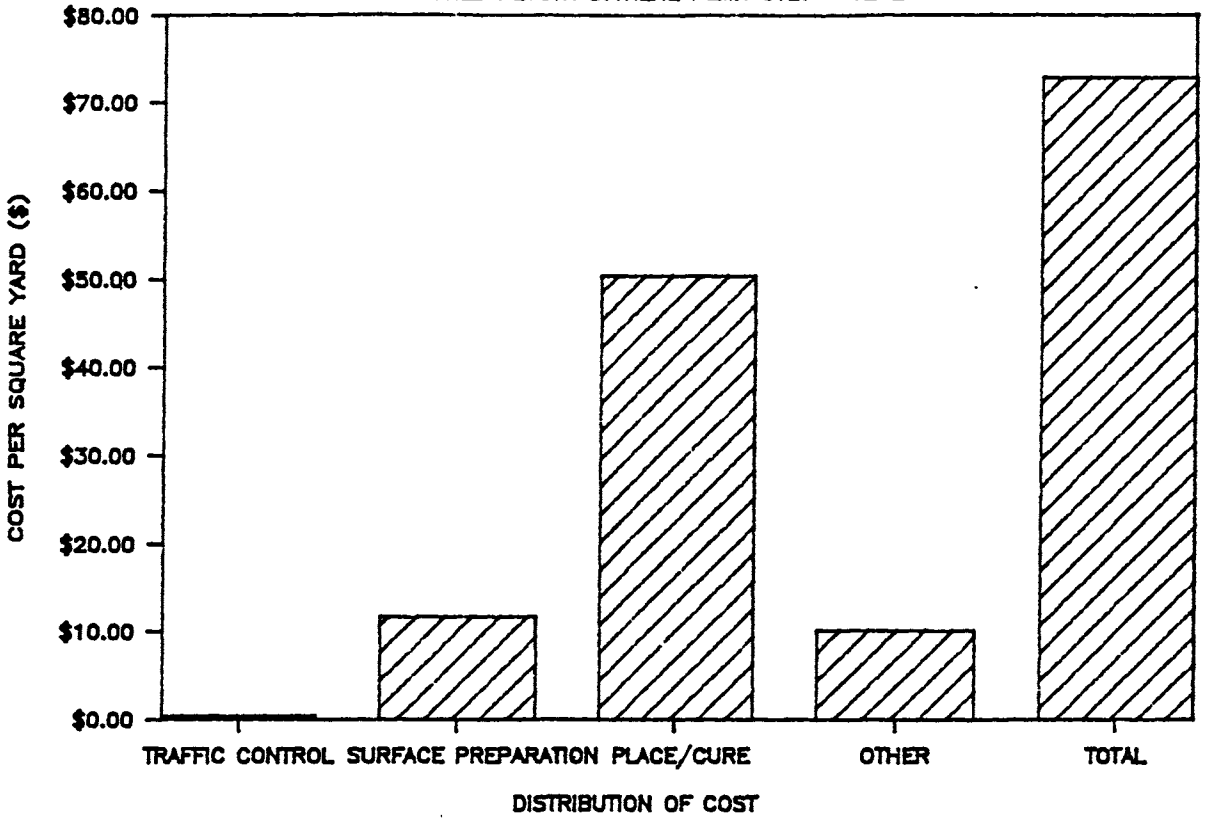

# PERCENTAGE DECOMPOSITION OF TOTAL COST

MULT LYR PLYSTR STYRENE PLMR OVLY—1E1D



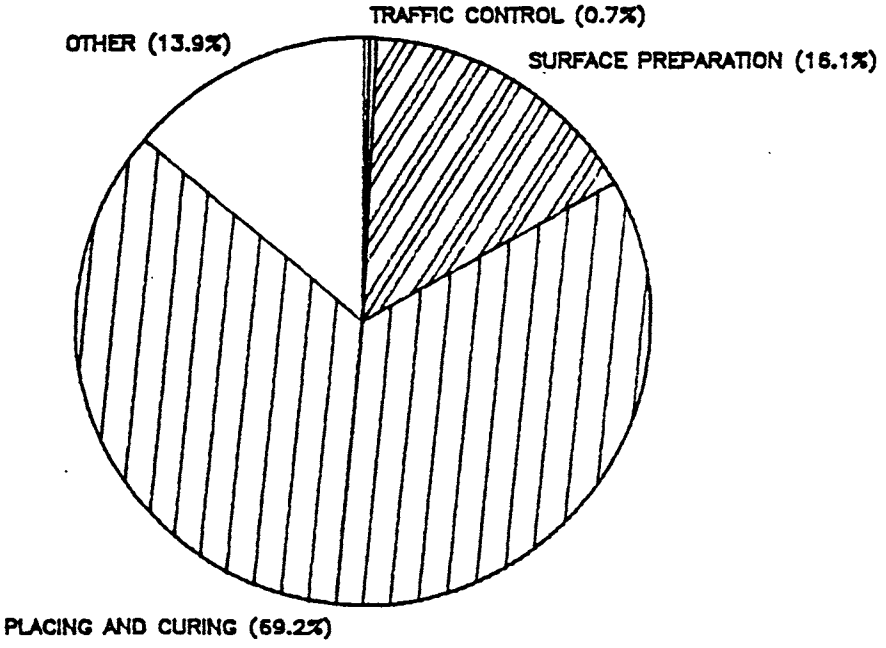
# COST DISTRIBUTION OF RAPID REPAIRS

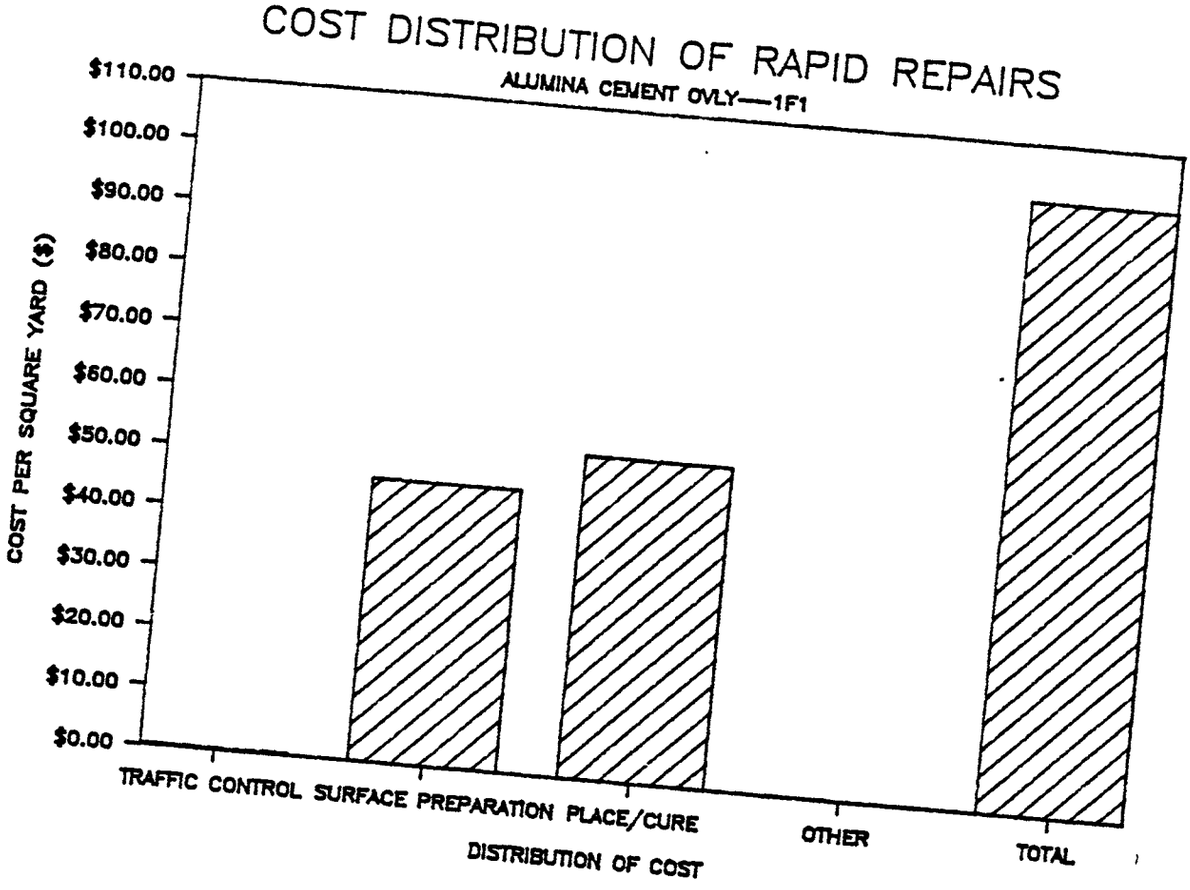
PREMIXED PLYSTR STYRENE PLMR OVLY---1E2E

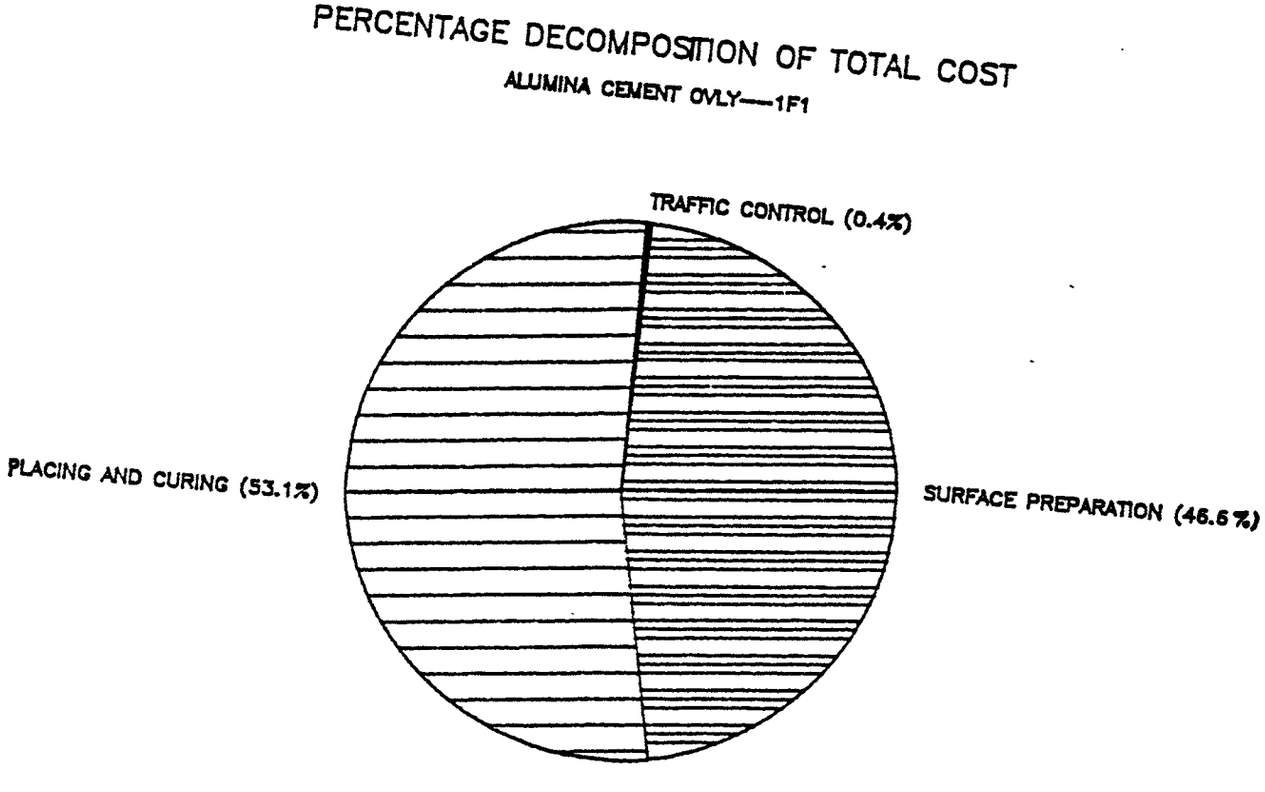



# PERCENTAGE DECOMPOSITION OF TOTAL COST

PREMIXED PLYSTR STYRENE PLMR OVLY---1E2E

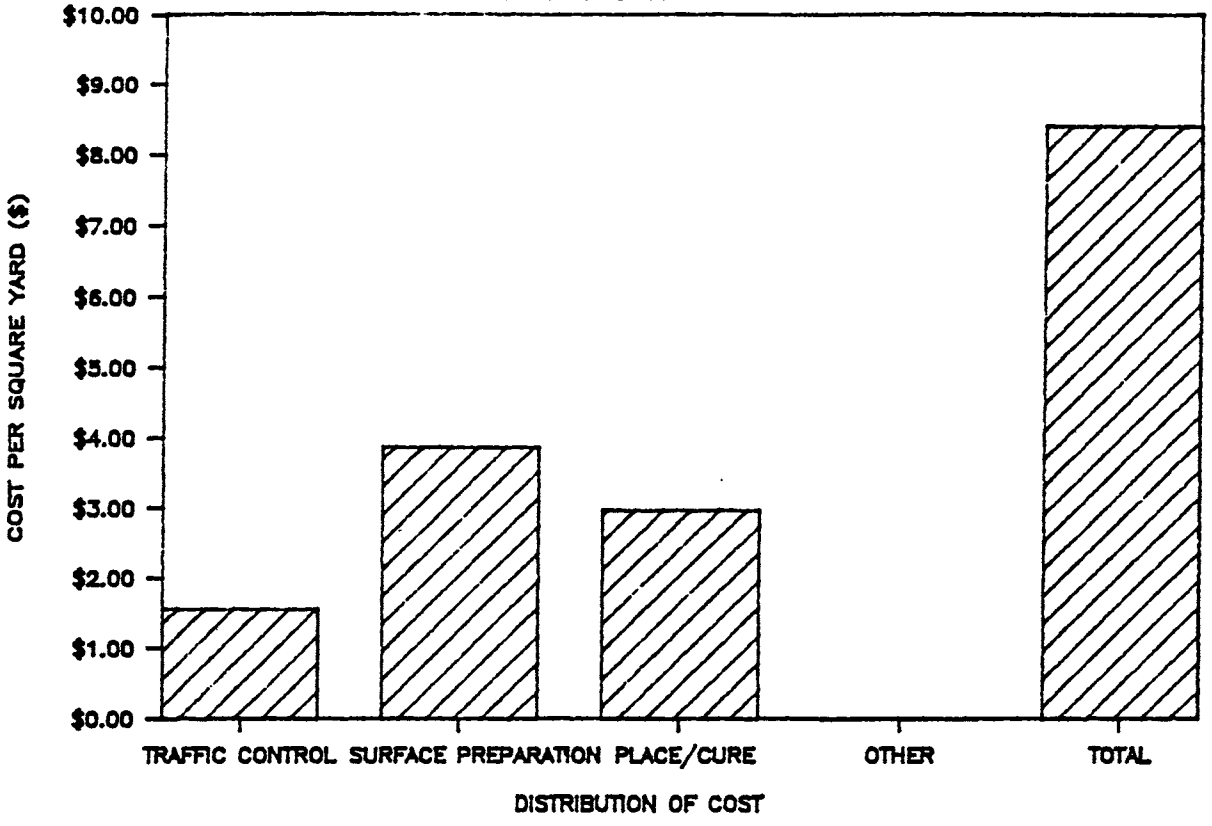



COST DISTRIBUTION OF RAPID REPAIRS
ALUMINA CEMENT OVLY—1F1
$110.00
$100.00
$90.00
$80.00
$70.00
$60.00
$50.00
$40.00
$30.00
$20.00
$10.00
$0.00
COST PER SQUARE YARD ($)
TRAFFIC CONTROL
SURFACE PREPARATION
PLACE/CURE
OTHER
TOTAL
DISTRIBUTION OF COST


PERCENTAGE DECOMPOSITION OF TOTAL COST
ALUMINA CEMENT OVLY—1F1
TRAFFIC CONTROL (0.4%)
PLACING AND CURING (53.1%)
SURFACE PREPARATION (46.6%)

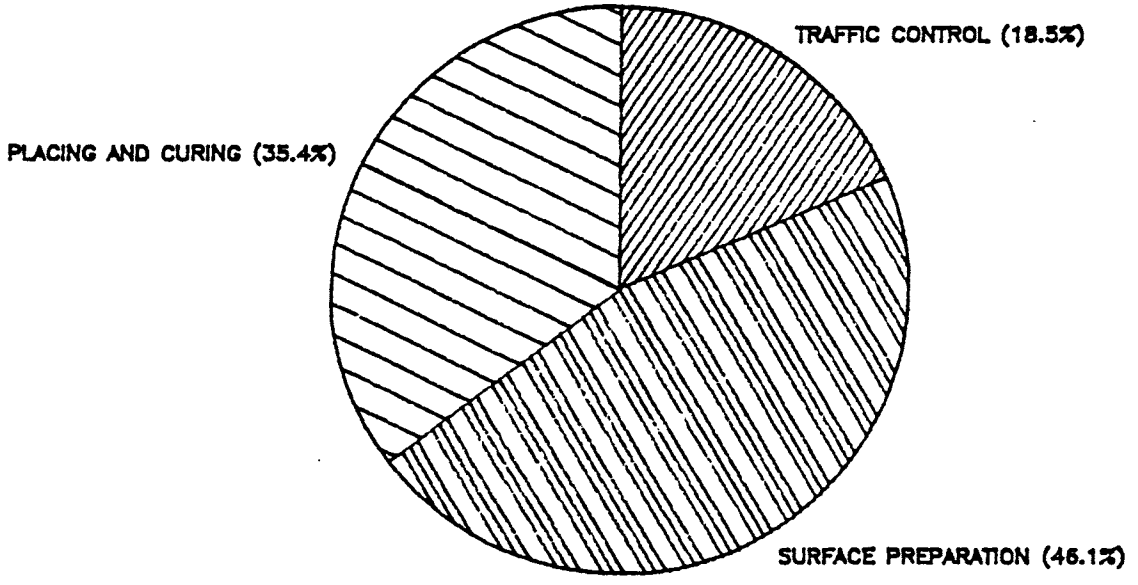
# COST DISTRIBUTION OF RAPID REPAIRS

HMW METHACRYLATE CRACK SEALER---2A1C



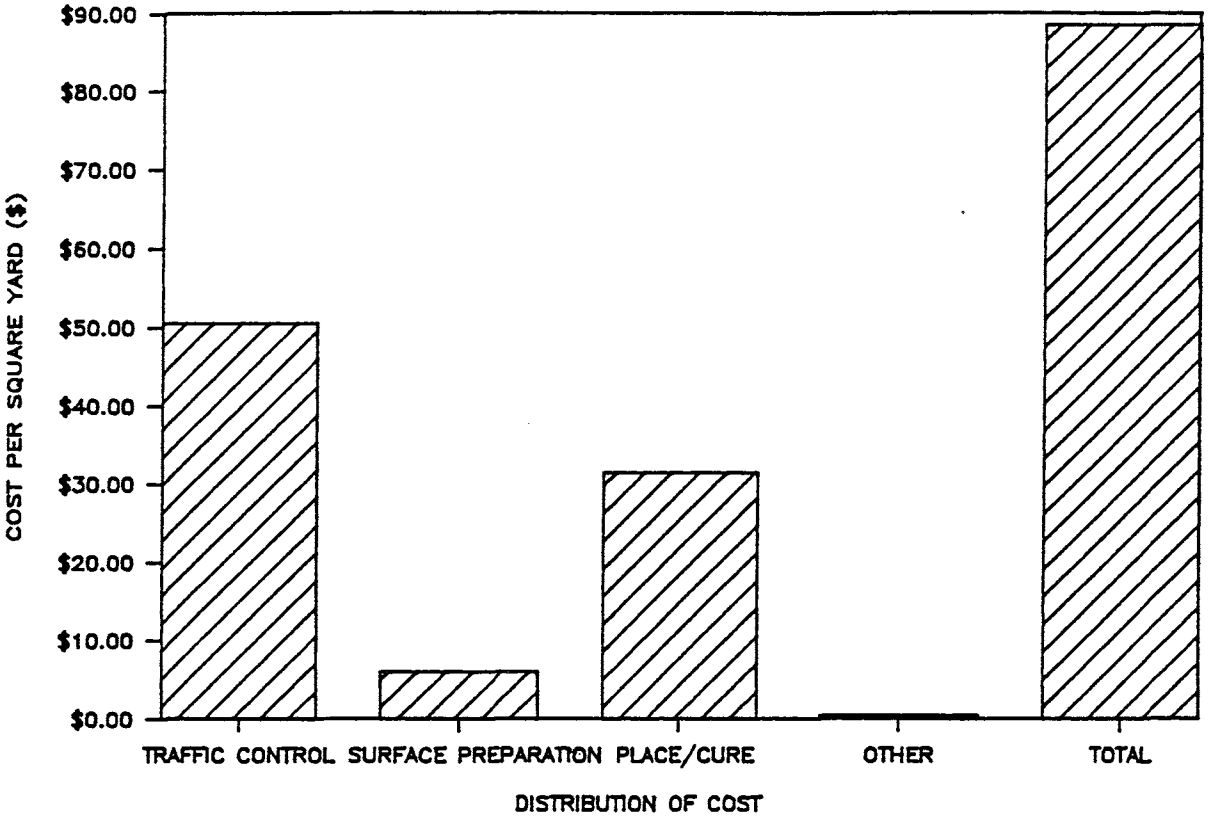

# PERCENTAGE DECOMPOSITION OF TOTAL COST

HMW METHACRYLATE CRACK SEALER---2A1C



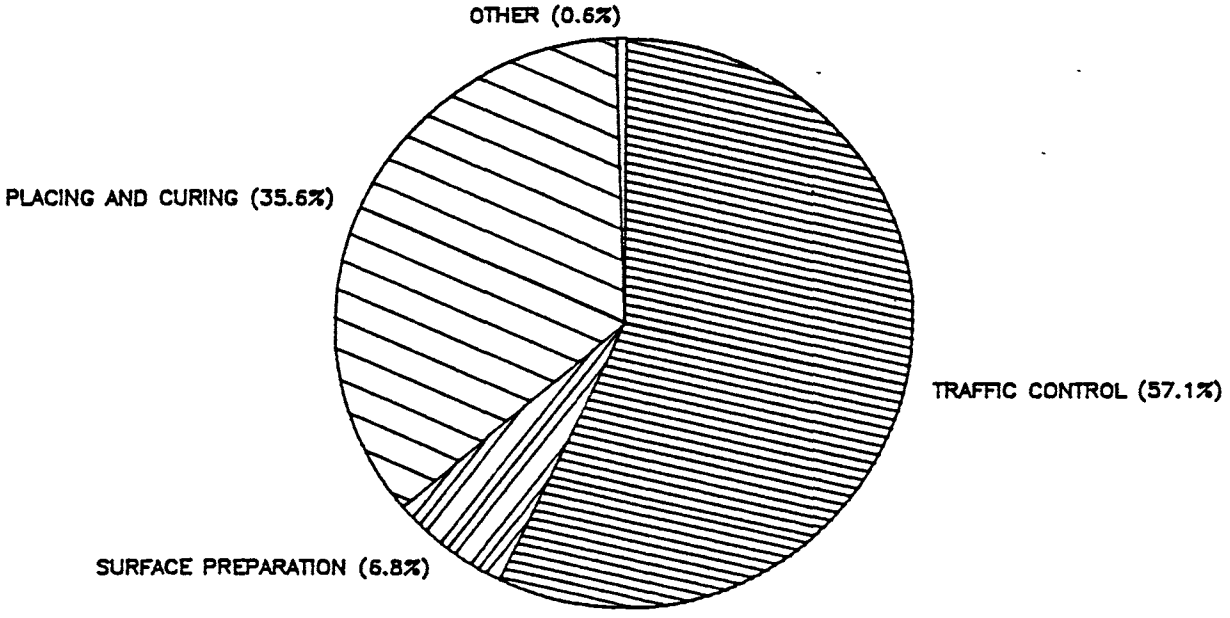
## COST DISTRIBUTION OF RAPID REPAIRS

ASPHALT PATCH---2C1



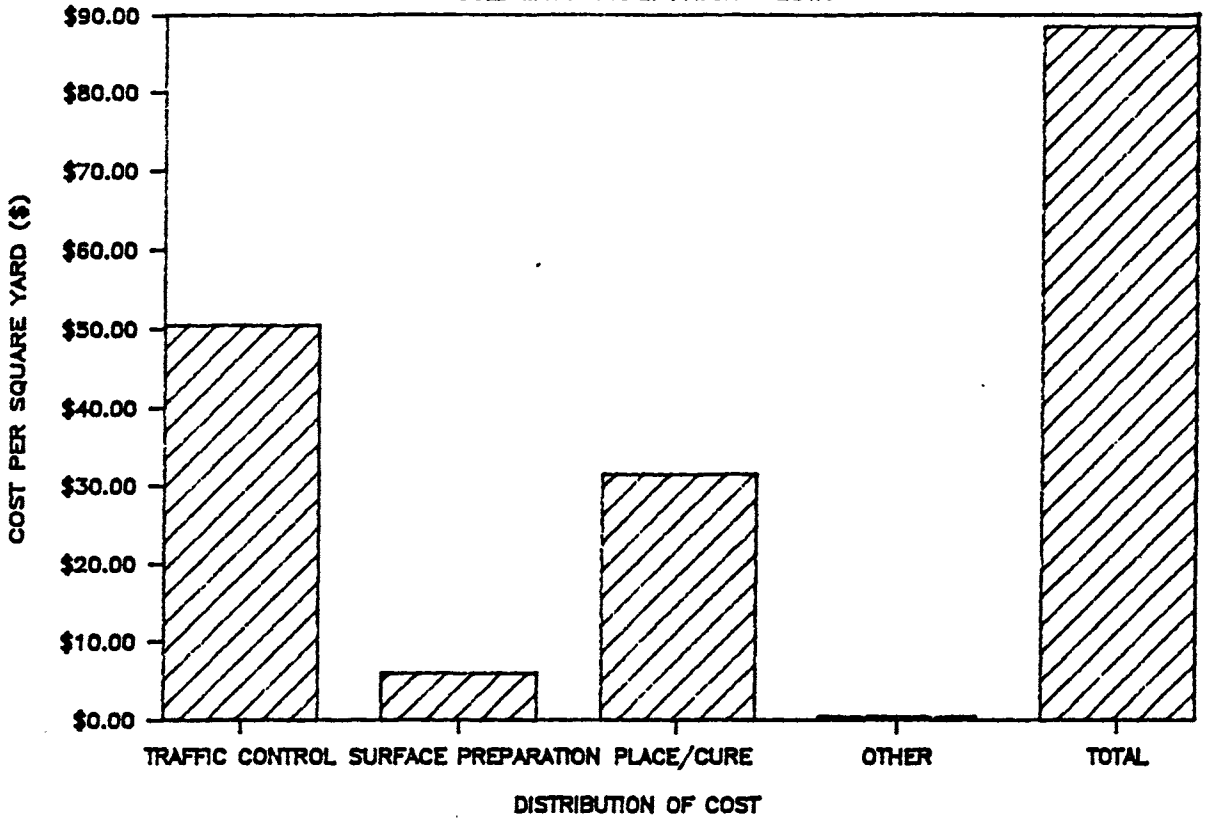

## PERCENTAGE DECOMPOSITION OF TOTAL COST

ASPHALT PATCH---2C1



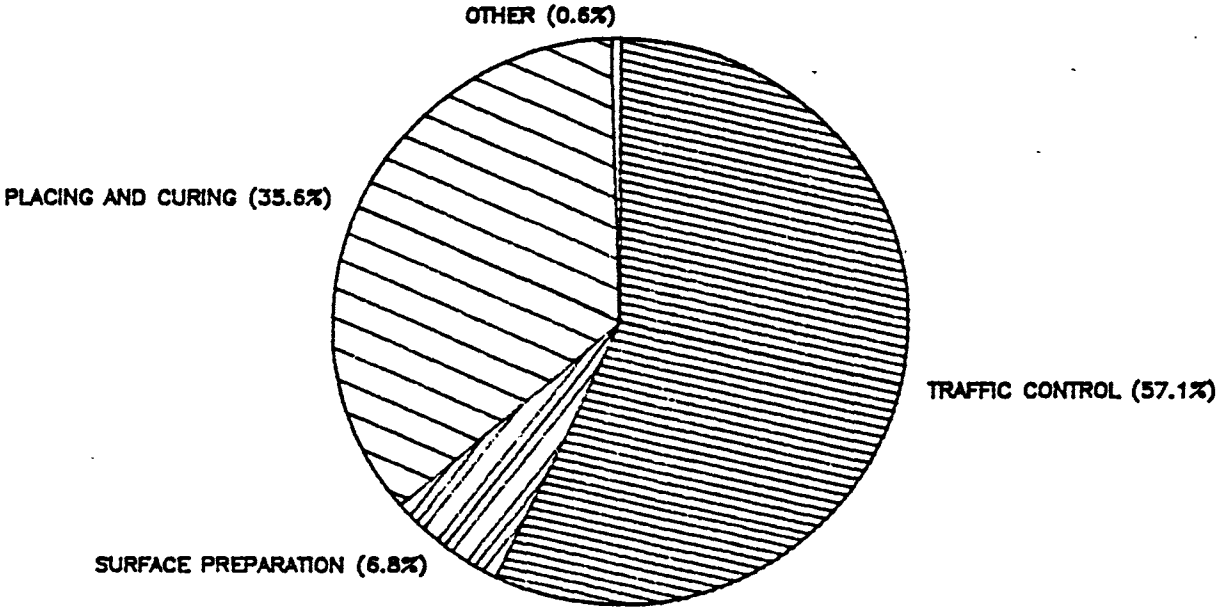
## COST DISTRIBUTION OF RAPID REPAIRS

COLD MIX ASPHALT PATCH—2C1A




## PERCENTAGE DECOMPOSITION OF TOTAL COST

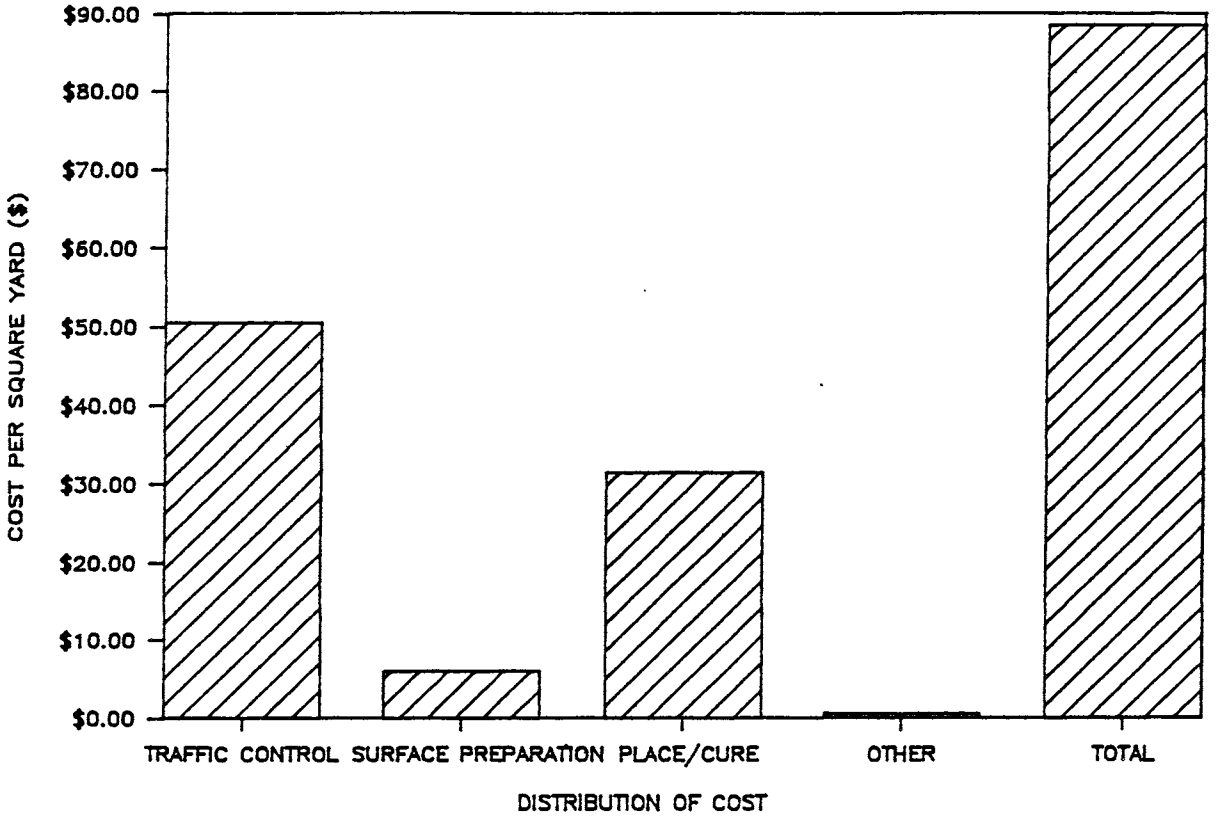
COLD MIX ASPHALT PATCH—2C1A



2450

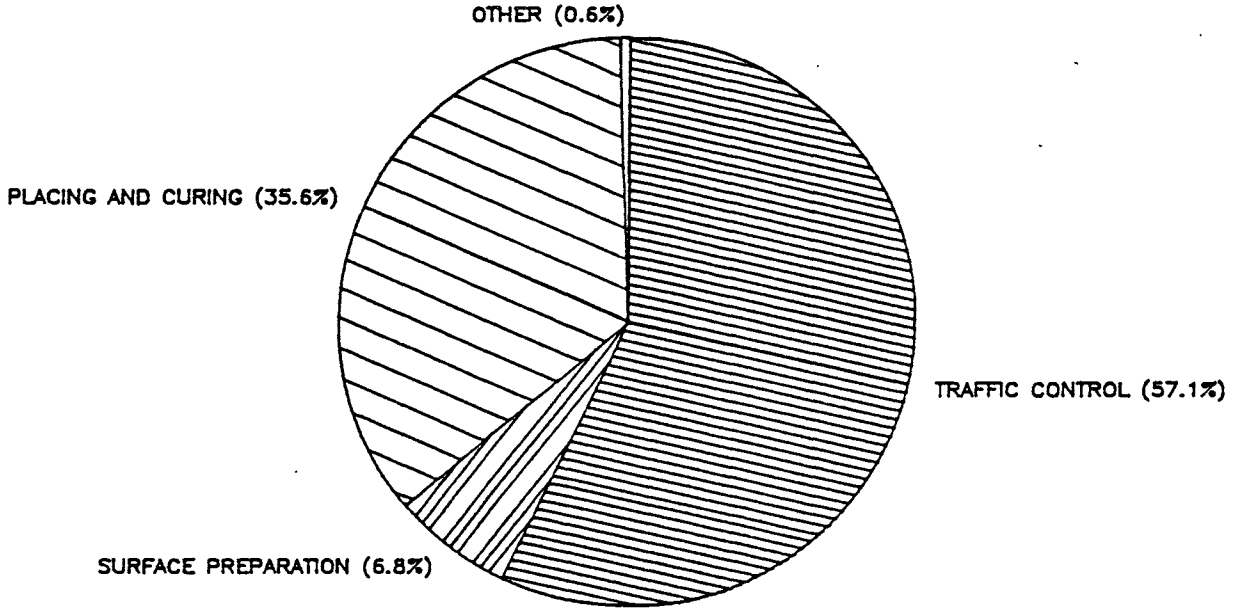
## COST DISTRIBUTION OF RAPID REPAIRS

HOT MIX ASPHALT PATCH---2C1B



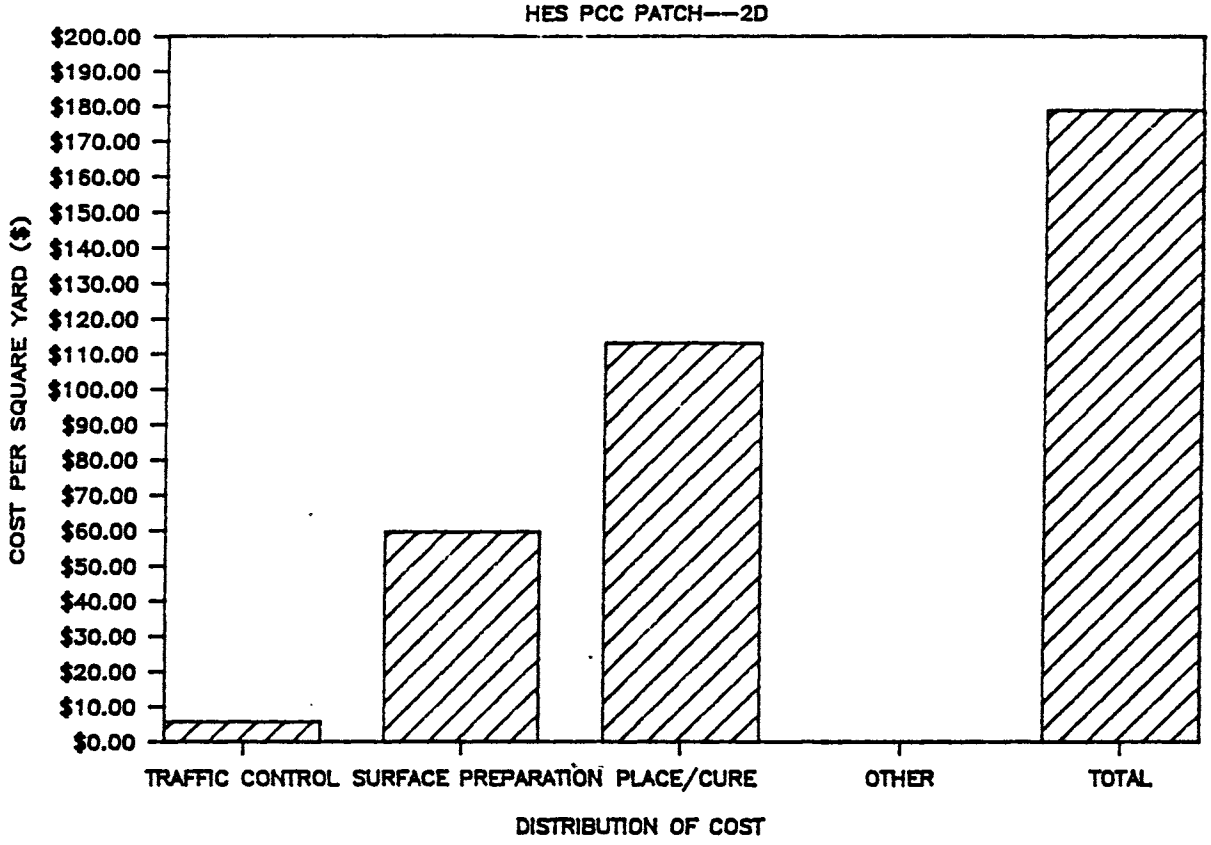

## PERCENTAGE DECOMPOSITION OF TOTAL COST

HOT MIX ASPHALT PATCH---2C1B



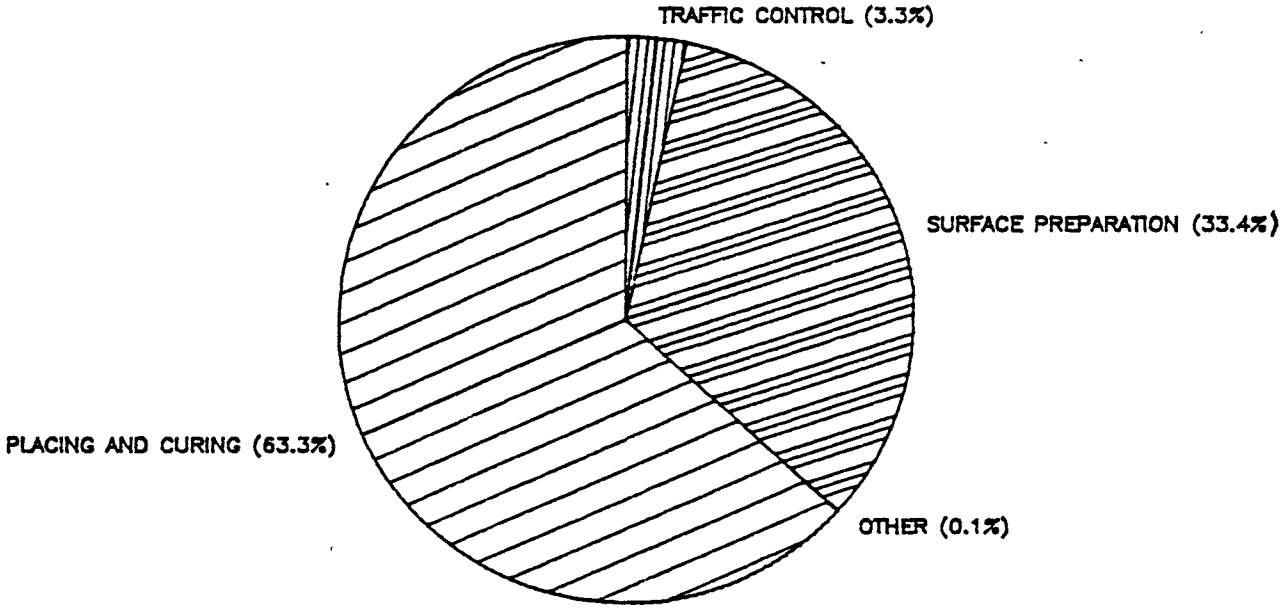
## COST DISTRIBUTION OF RAPID REPAIRS

HES PCC PATCH---2D




## PERCENTAGE DECOMPOSITION OF TOTAL COST

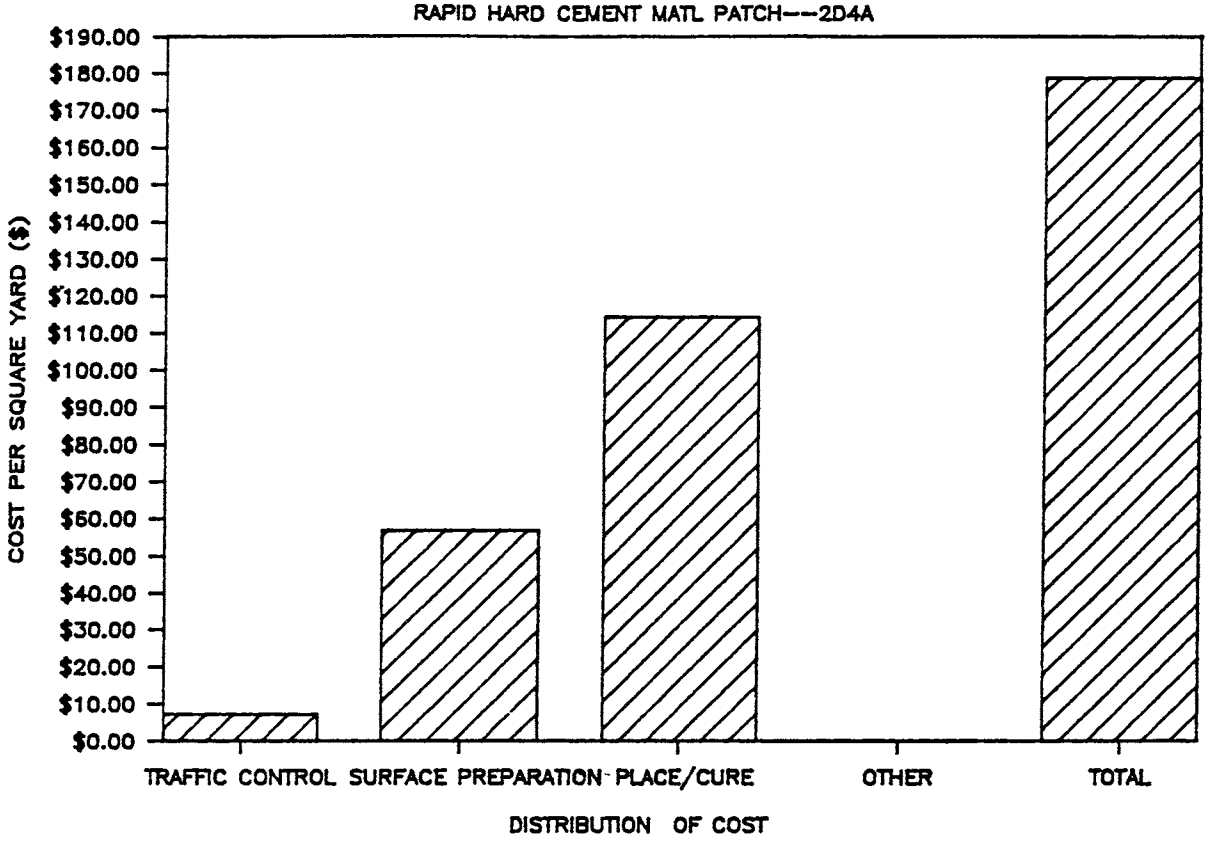
HES PCC PATCH---2D



-2452

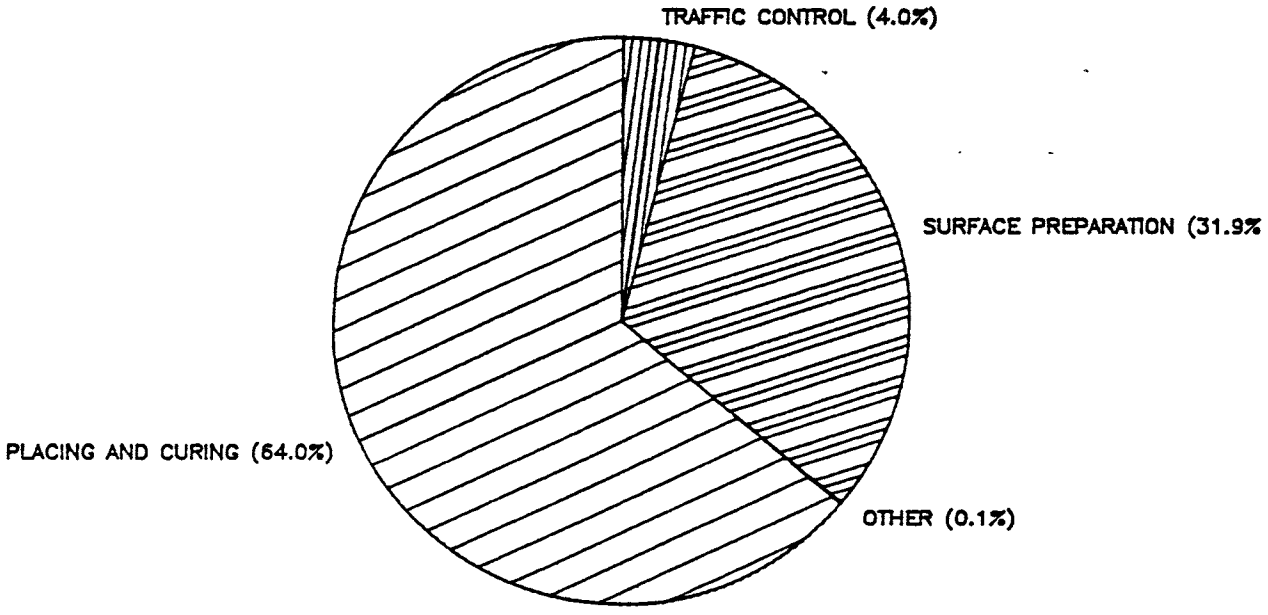
# COST DISTRIBUTION OF RAPID REPAIRS

RAPID HARD CEMENT MATL PATCH---2D4A



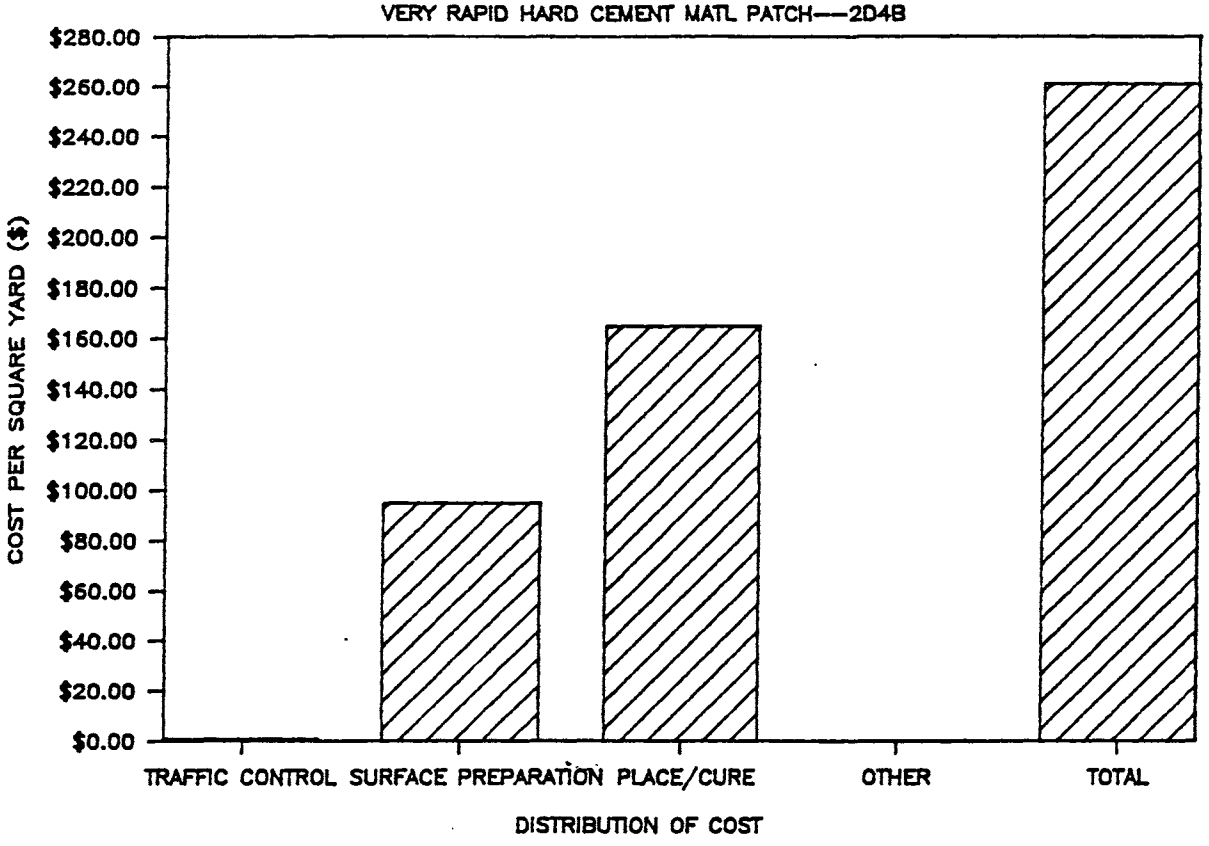

# PERCENTAGE DECOMPOSITION OF TOTAL COST

RAPID HARD CEMENT MATL PATCH---2D4A



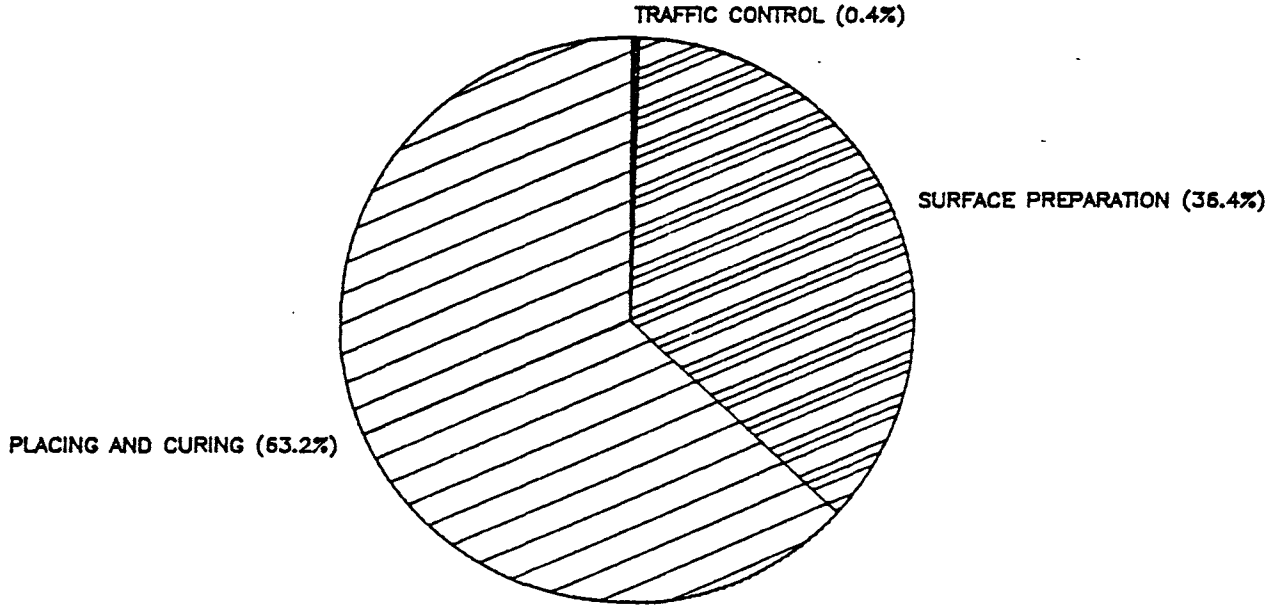
# COST DISTRIBUTION OF RAPID REPAIRS

VERY RAPID HARD CEMENT MATL PATCH---2D4B



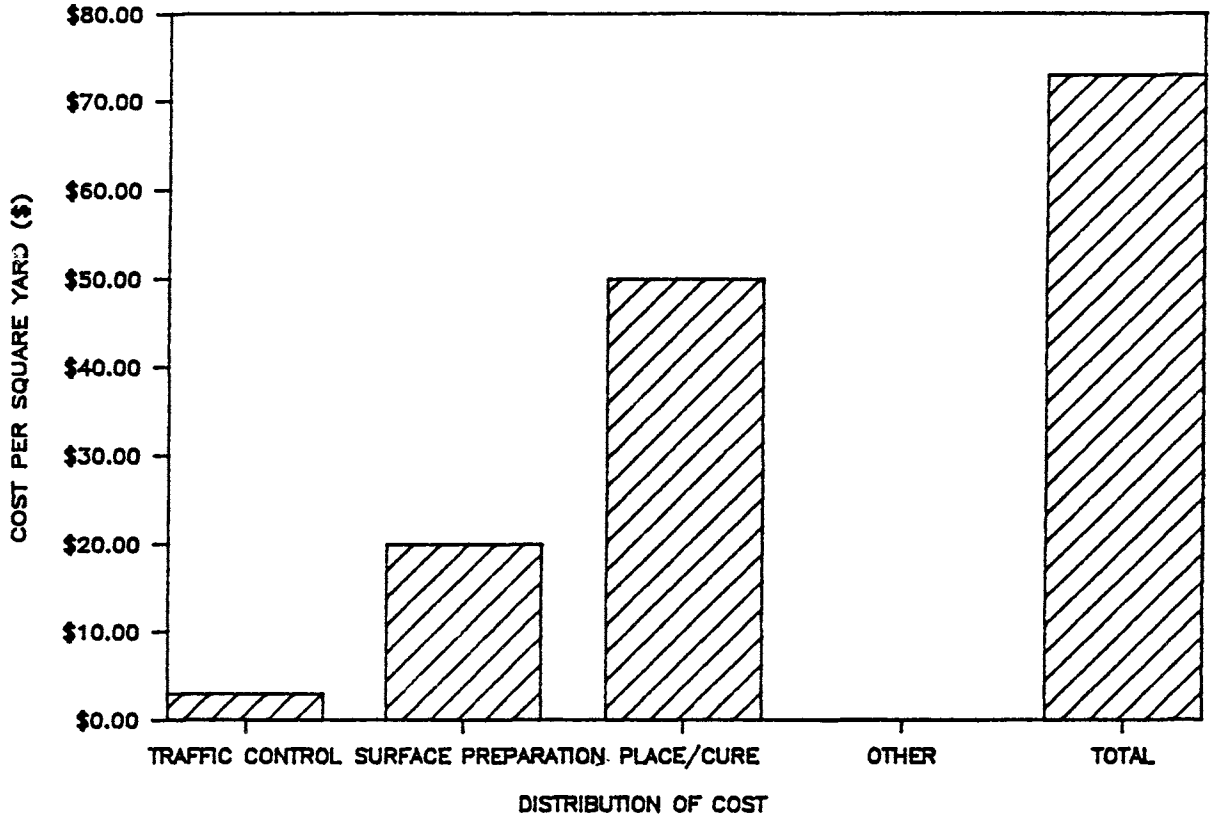

# PERCENTAGE DECOMPOSITION OF TOTAL COST

VERY RAPID HARD CEMENT MATL PATCH---2D4B



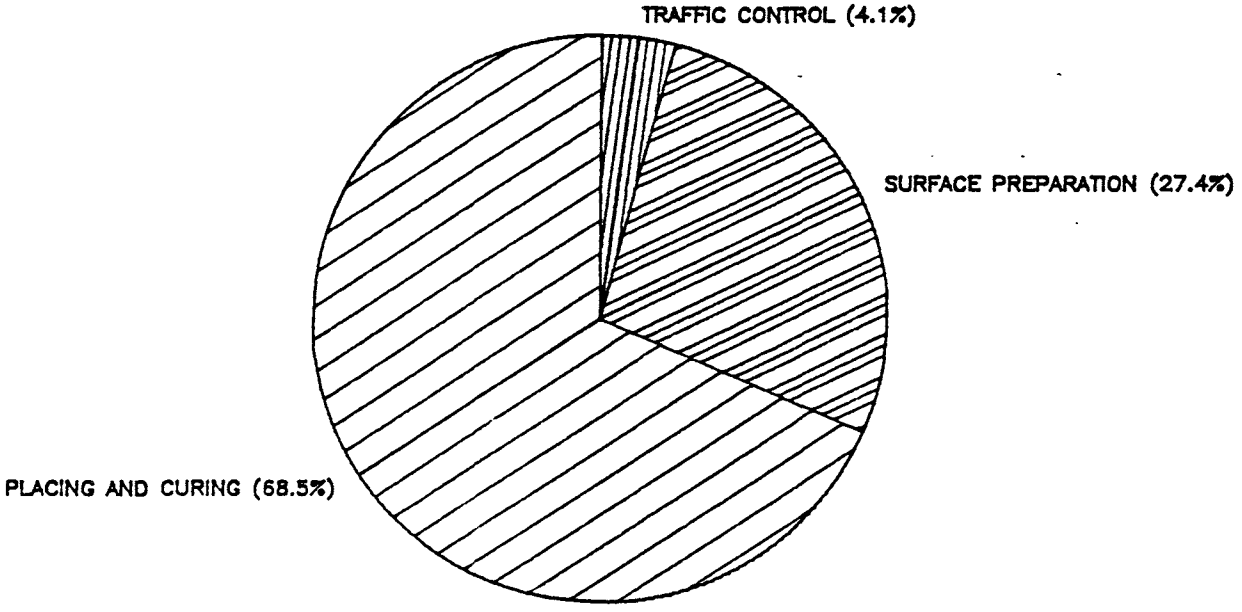
# COST DISTRIBUTION OF RAPID REPAIRS

HES TYPE III PCC PATCH---2D5



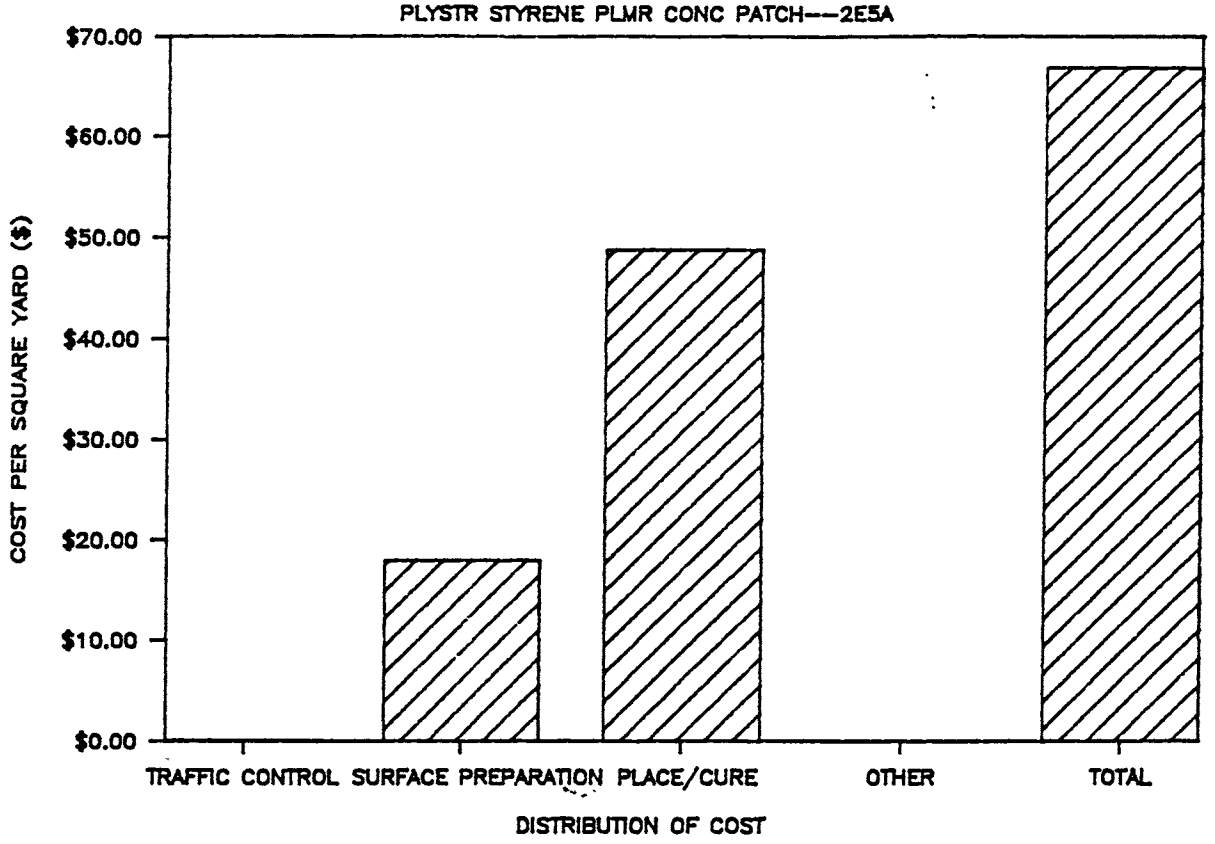

# PERCENTAGE DECOMPOSITION OF TOTAL COST

HES TYPE III PCC PATCH---2D5



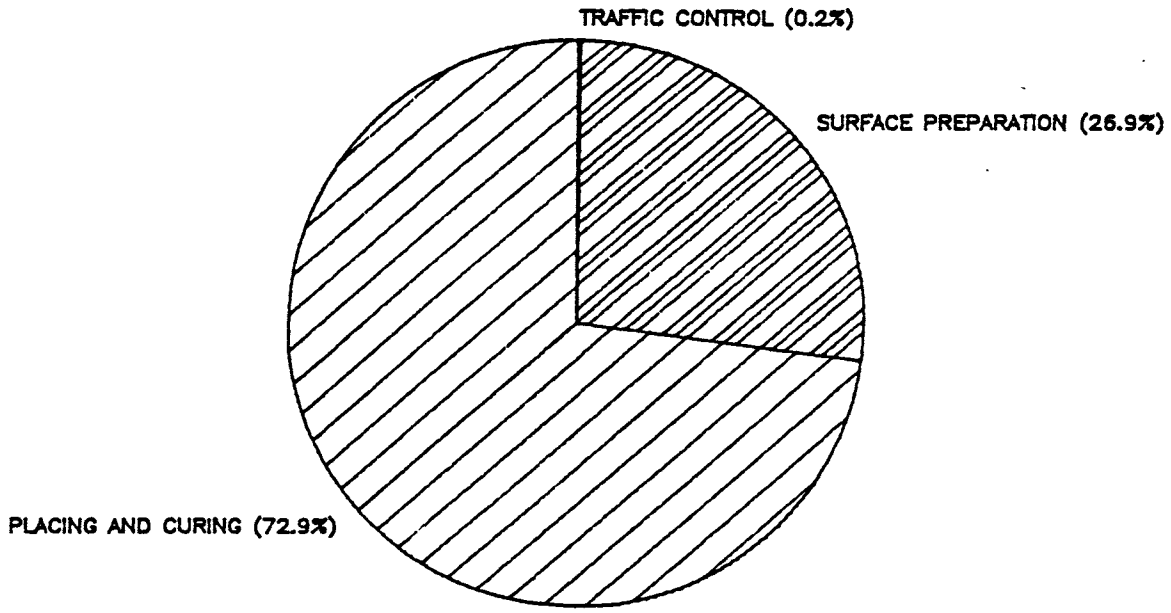
## COST DISTRIBUTION OF RAPID REPAIRS

PLYSTR STYRENE PLMR CONC PATCH--2E5A

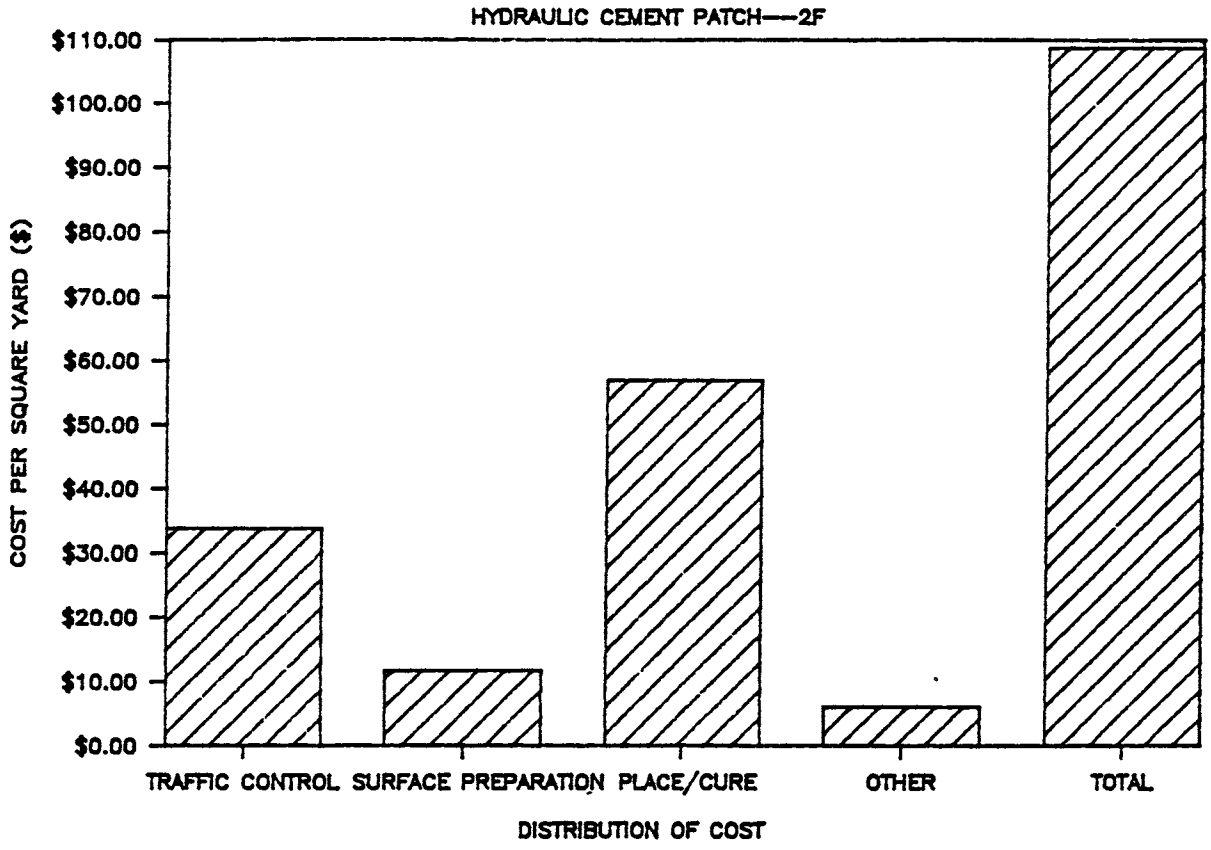



## PERCENTAGE DECOMPOSITION OF TOTAL COST

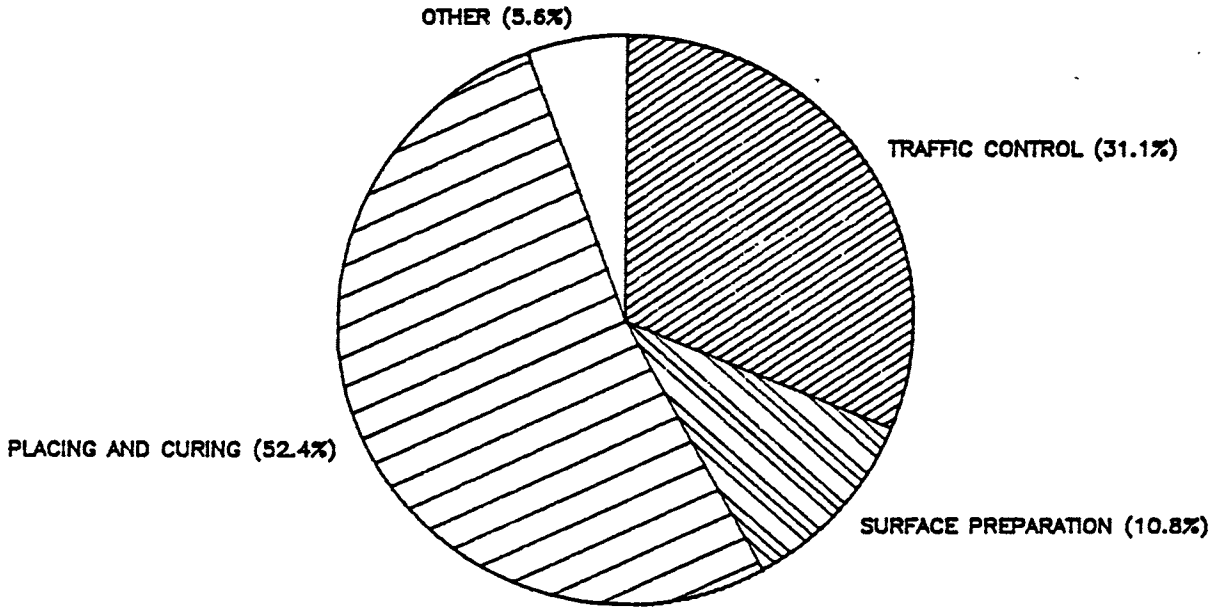
PLYSTR STYRENE PLMR CONC PATCH--2E5A



# COST DISTRIBUTION OF RAPID REPAIRS

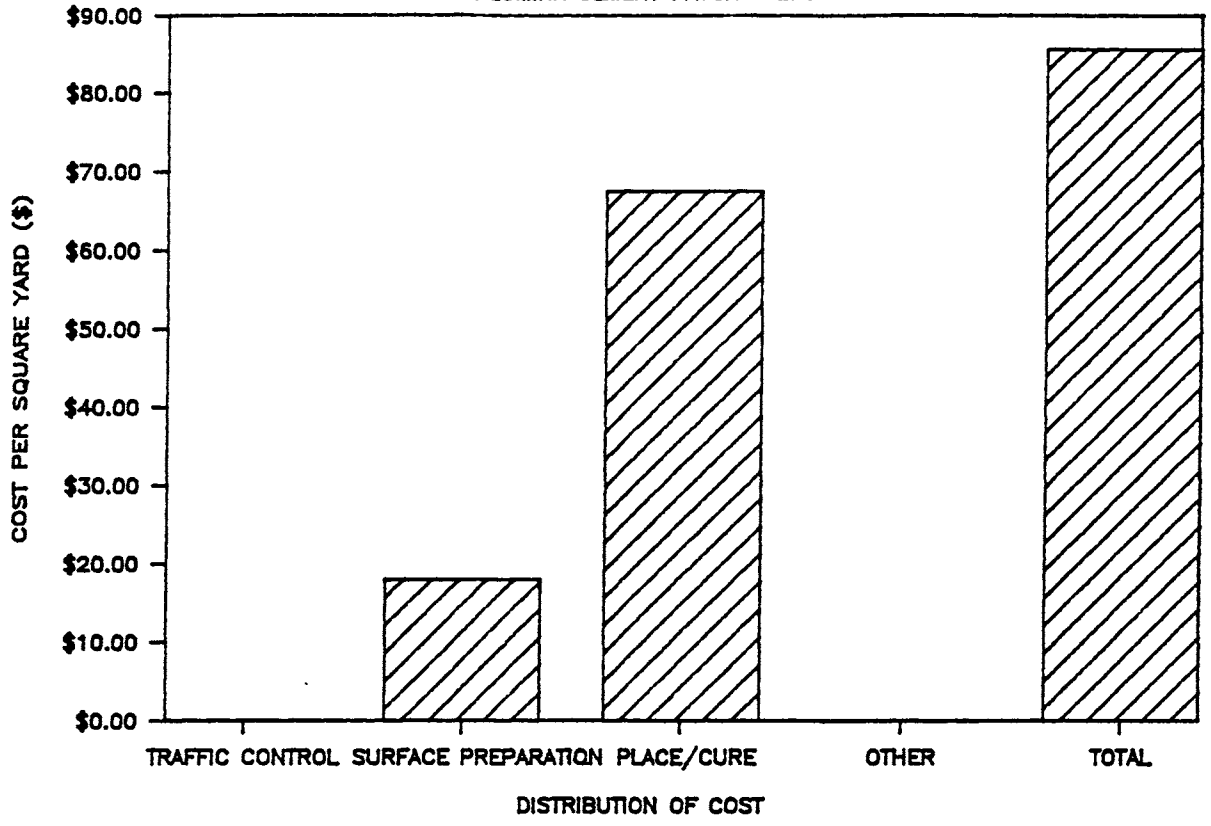



# PERCENTAGE DECOMPOSITION OF TOTAL COST



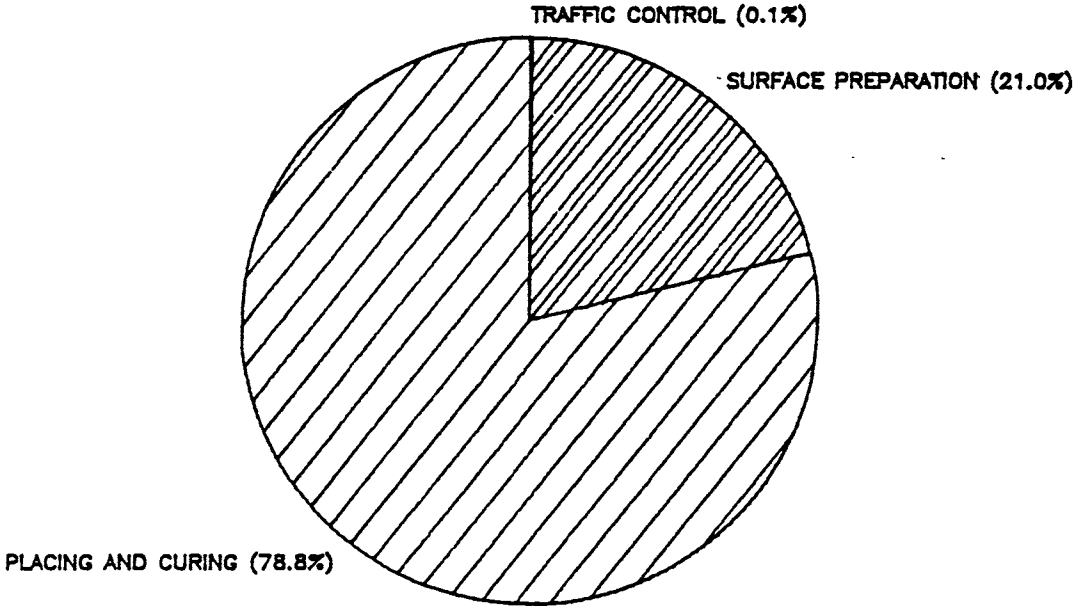
# COST DISTRIBUTION OF RAPID REPAIRS

ALUMINA CEMENT PATCH---2F1




# PERCENTAGE DECOMPOSITION OF TOTAL COST

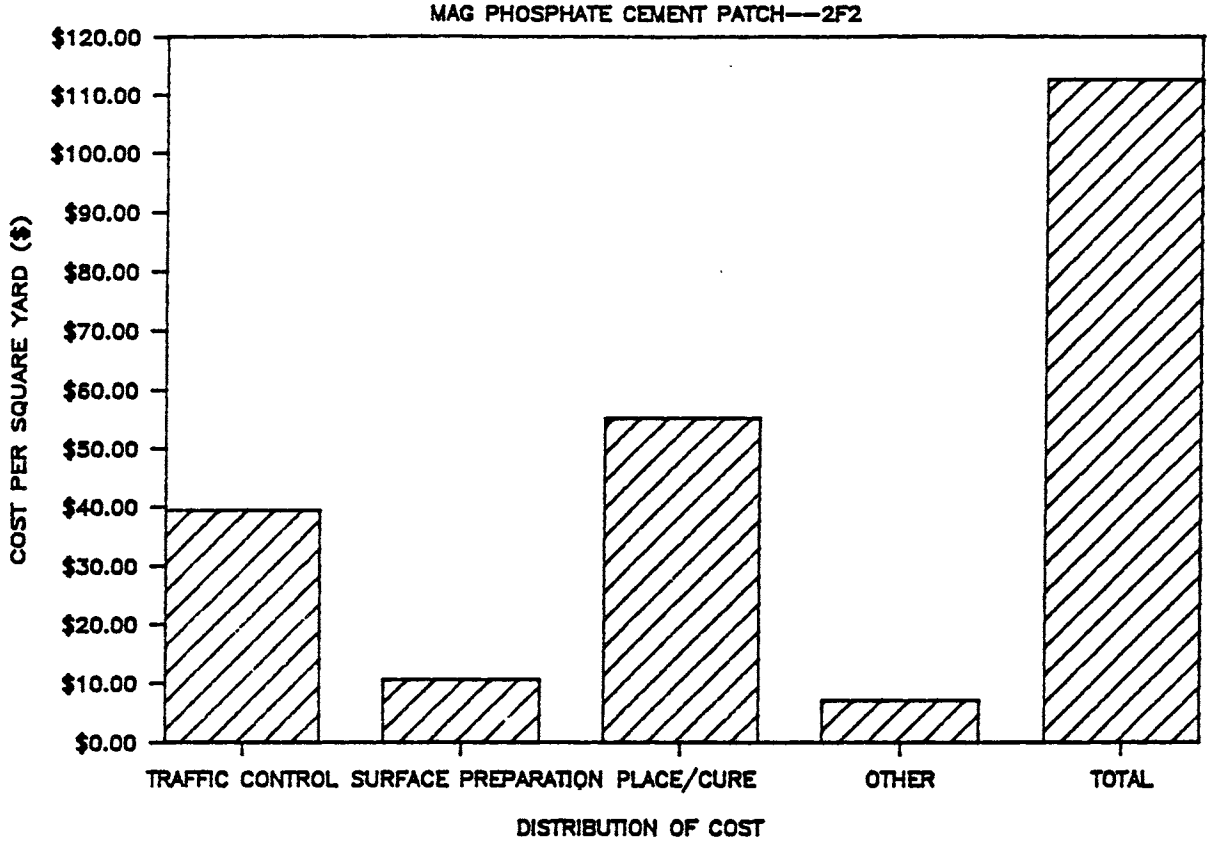
ALUMINA CEMENT PATCH---2F1



Cd

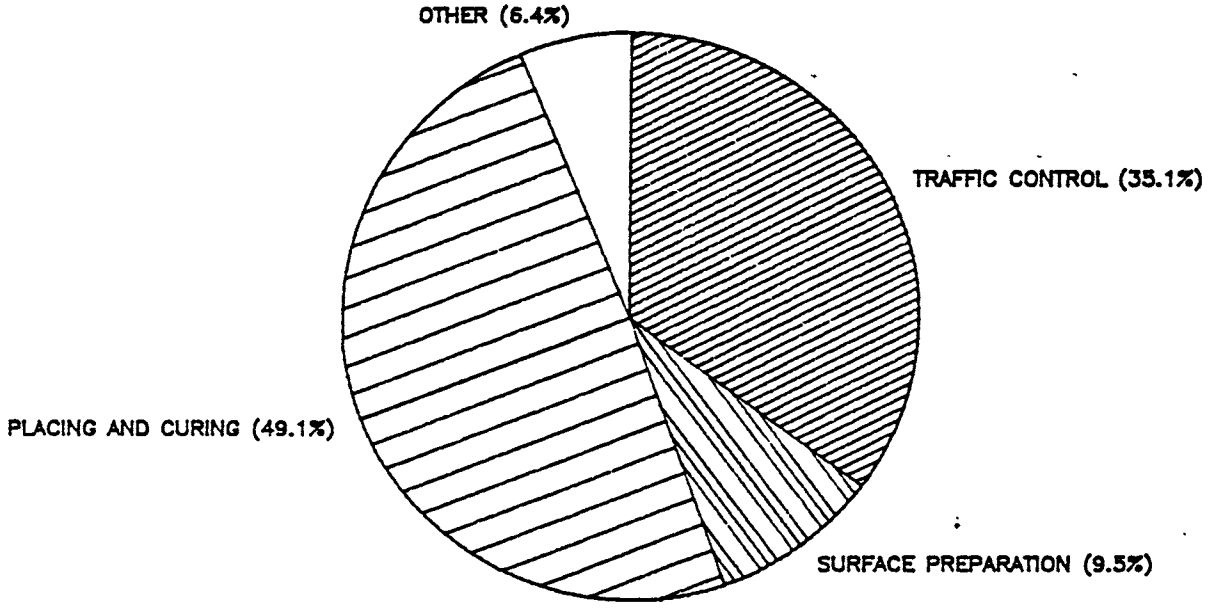
# COST DISTRIBUTION OF RAPID REPAIRS

MAG PHOSPHATE CEMENT PATCH—2F2



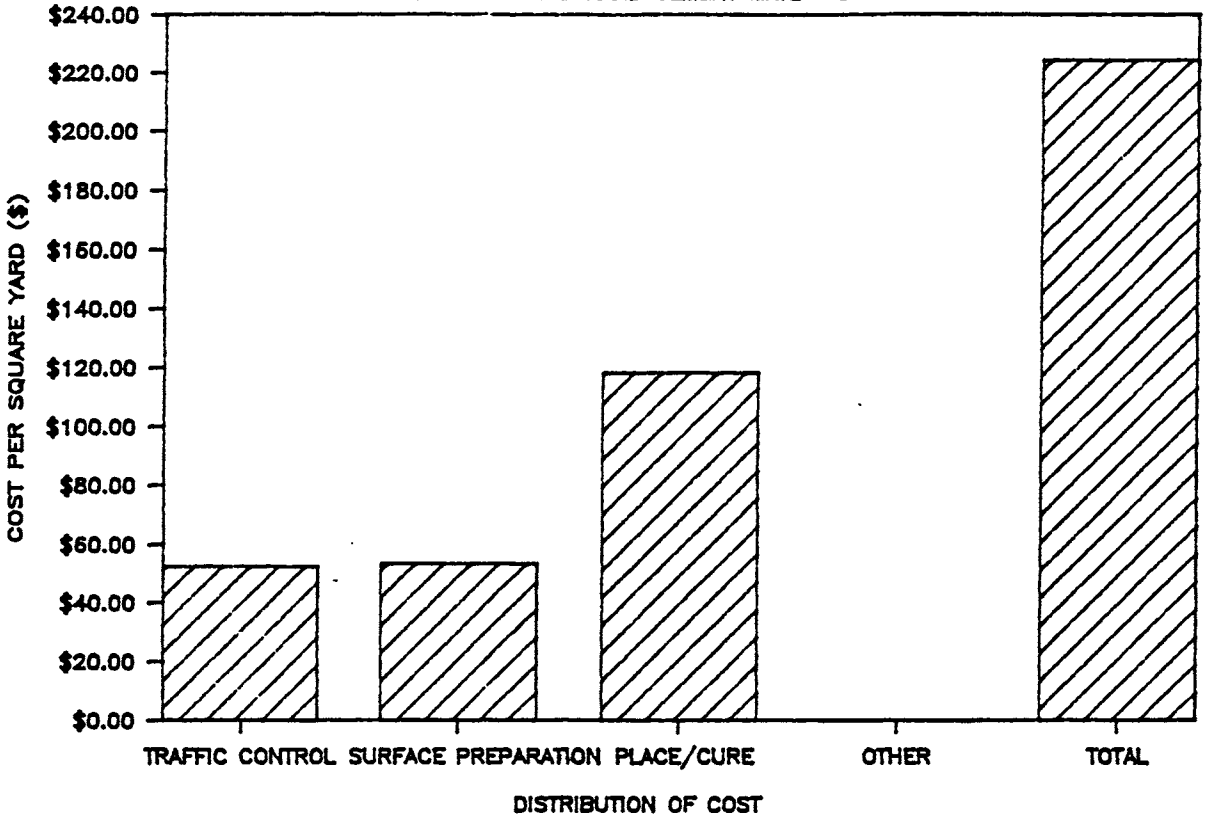

# PERCENTAGE DECOMPOSITION OF TOTAL COST

MAG PHOSPHATE CEMENT PATCH—2F2



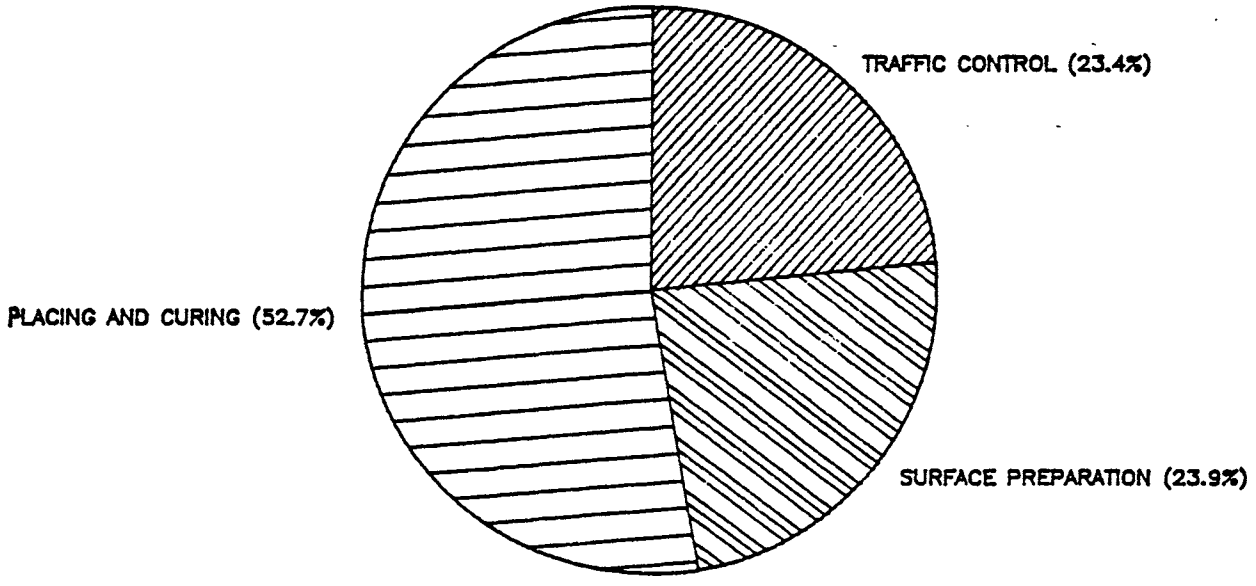
# COST DISTRIBUTION OF RAPID REPAIRS

SITE CAST RAPID HARD CEMENT MATL---3D3A



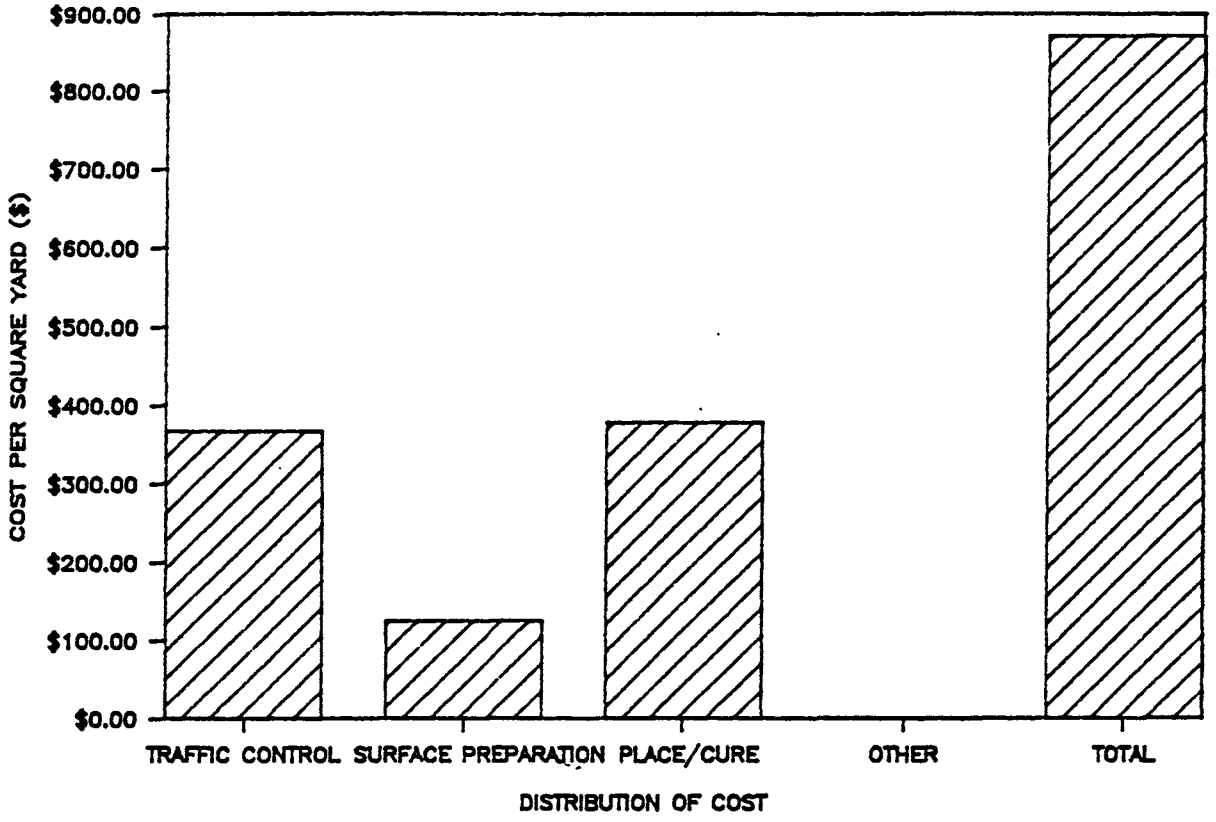

# PERCENTAGE DECOMPOSITION OF TOTAL COST

SITE CAST RAPID HARD CEMENT MATL---3D3A



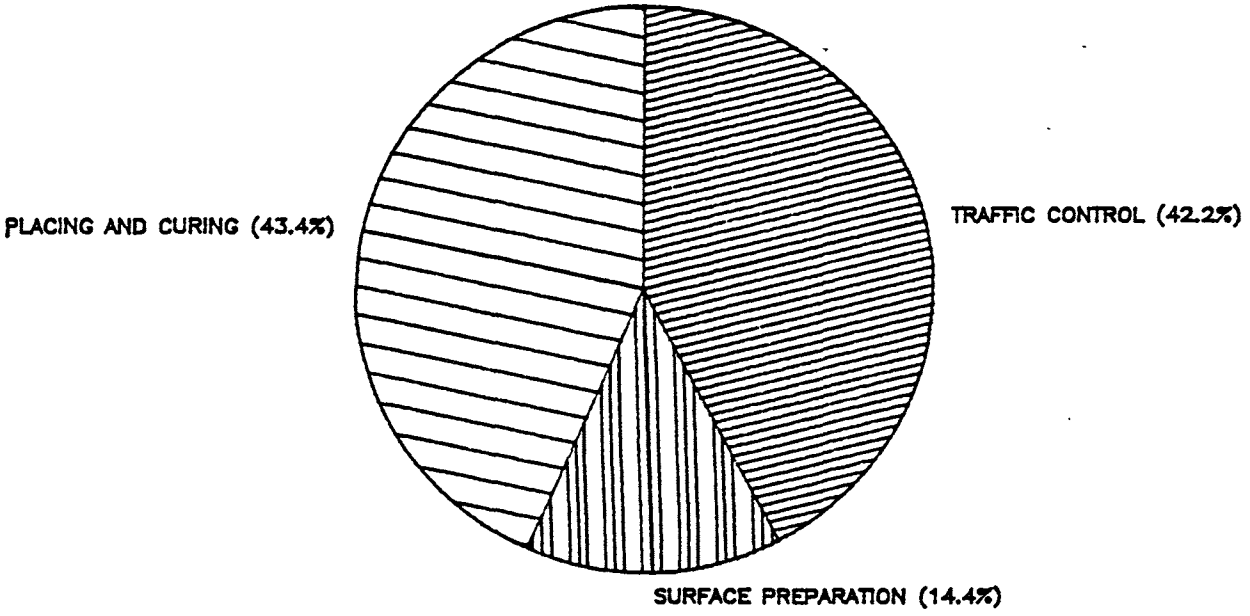
# COST DISTRIBUTION OF RAPID REPAIRS

SITE CAST MAG PHOSPHATE CEMENT---3F2




# PERCENTAGE DECOMPOSITION OF TOTAL COST

SITE CAST MAG PHOSPHATE CEMENT---3F2



SERVICE LIFE

The service life of a rapid repair technique is the period of time th repair, while receiving appropriate maintenance, is expected to remain above the quality standards established for that repair technique. When the repair fails to meet the established standards, it has come to the end of its service life. For the purposes of this project, the service life i referred to as the time until major repair is required, whereas maintenance, as its name suggests, is the time until routine maintenance i required following the initial repair.

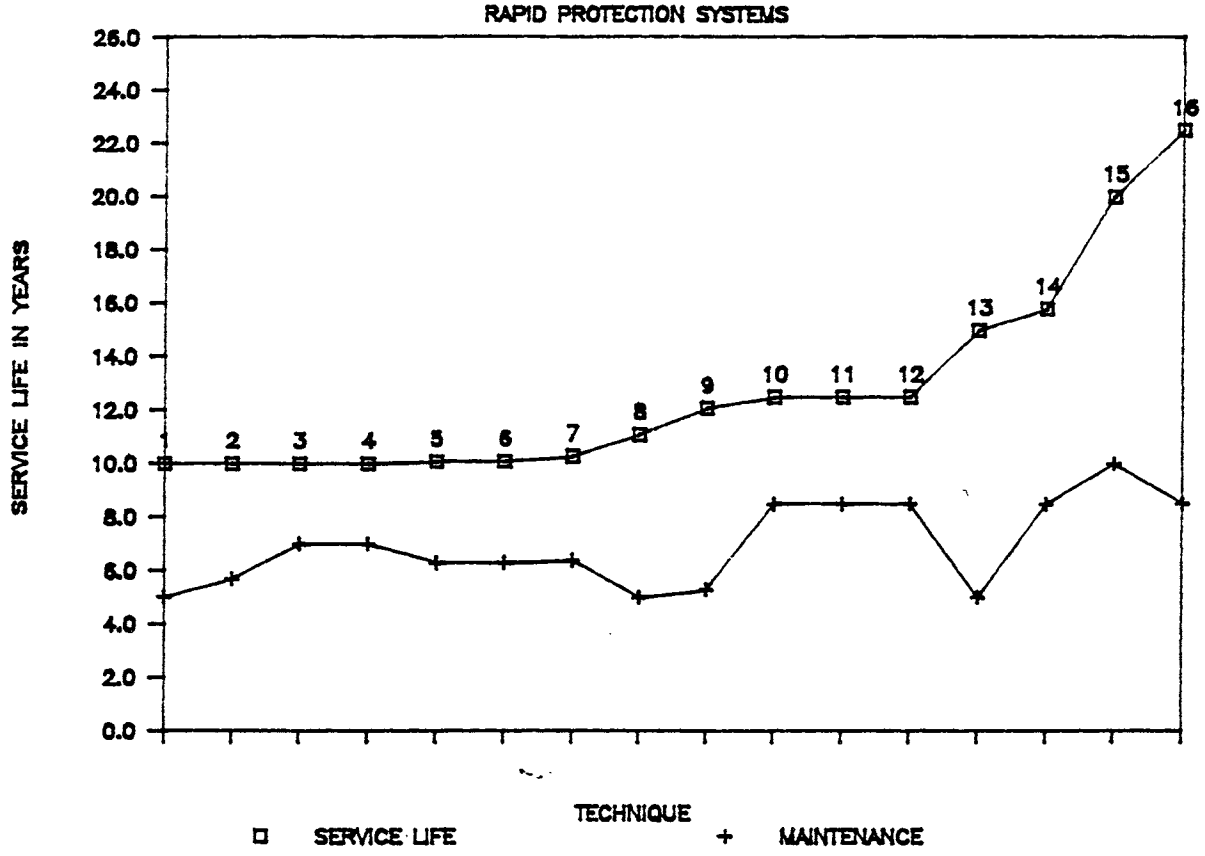
In the following graphs, the central line which is indicated by the numbered data labels is the service life of each technique. The second line is a plot of the time until maintenance is required. The first graph involves rapid protection systems, the second illustrates rapid rehabilitation systems, the third involves rapid replacement systems, and the fourth illustrates the service lives of all the rapid repair technique combined.

Included in the appendix are other service life graphs which are plot of not only the service life and maintenance required but also include curves depicting high and low responses to the question of service life as well as standard deviation curves.

The SERVICE LIFE graphs were based on information obtained from responses to the QUESTIONNAIRE ON RAPID REPAIR TECHNIQUES FOR BRIDGE DECKS SHRP C-103, TASK 4 distributed to each state's Department of Transportation. The state and province Departments of Transportation whicl provided data for a repair technique are denoted on each graph.

# SERVICE LIFE

RAPID PROTECTION SYSTEMS

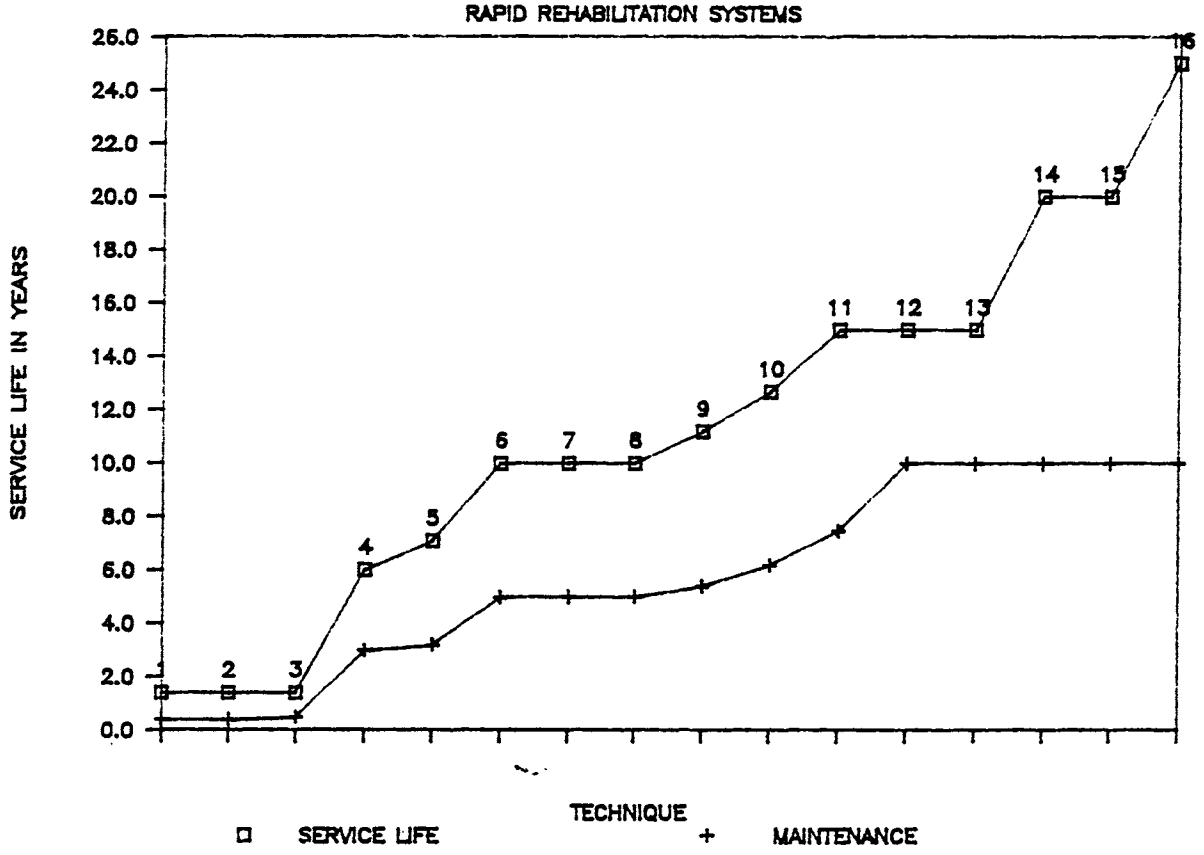



| TECHNIQUE KEY: | *CODE NUMBER | DOT/CSHRP PROVIDING DA |
|---|---|---|
| 1--BITIUMINOUS CONC OVLY | 1A4 | NC |
| 2--MULT LYR EPOXY PLMR OVLY | 1E1B | OH, TN, VA |
| 3--MULT LYR EPOXY-URETHANE PLMR OVLY | 1E1C | VA |
| 4--MULT LYR PLYSTR STYRENE PLMR OVLY | 1E1D | VA |
| 5--PLMR OVLY | 1E | BC, CA, NY, OH, TN, VA WA |
| 6--MULT LYR PLMR OVLY | 1E1 | OH, TN ,VA, WA |
| 7--PREMIXED PLYSTR STYRENE PLMR OVLY | 1E2E | CA, WA |
| 8--BITUMINOUS CONC OVLY | 1A | CT, ID, MD, NH, NJ, NY NC, NS, PA, TN, WA, WI |
| 9--BITUMINOUS CONC OVLY ON MEMBRANE | 1A2 | CT, ID, NH, NJ, NY, NS TN, WA |
| 10--HES PCC OVLY CONTAINING ADMIXTURES | 1C2 | WA |
| 11--LATEX MODIFIED CONC OVLY | 1C2C | WA |
| 12--HES PCC OVLY W/SILICA FUME | 1C2D | WA |
| 13--SILANE PENETRATING SEALER | 1D5A | CA, OH, OK |
| 14--HES PCC OVLY | 1C | BC, WA |
| 15--HMW METHACRYLATE COATING | 1B1C | CA |
| 16--LOW SLUMP HES PCC OVLY | 1C3A | BC |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS

# SERVICE LIFE

RAPID REHABILITATION SYSTEMS




| TECHNIQUE KEY: | *CODE NUMBER | DOT/CSHRP PROVIDING DATA |
|---|---|---|
| 1--ASPHALT PATCH | 2C1 | IN, KS, NS |
| 2--COLD MIX ASPHALT PATCH | 2C1A | IN, KS, NS |
| 3--HOT MIX ASPHALT PATCH | 2C1B | IN, KS, NS |
| 4--RAPID HARD CEMENT MATL PATCH | 2D4A | AR, KS, KY, IN, MD, NJ, NY, NC, NS, TN, VA |
| 5--HES PCC PATCH | 2D | AR, CT, IN, KS, KY, MD, NH, NJ, NY, NC, NS, PA, TN, VA |
| 6--EXPANSION JOINTS/CONCRETE HEADERS | 2B | CT |
| 7--VERY RAPID HARD CEMENT MATL PATCH | 2D4B | VA |
| 8--HES TYPE III PCC PATCH | 2D5 | CT |
| 9--MAG PHOSPHATE CEMENT PATCH | 2F2 | CA, HI, IN, MT, OR |
| 10--HYDRAULIC CEMENT PATCH | 2F | CA, HI, IN, MT, OR |
| 11--HMW METHACRYLATE CRACK SEALER | 2A1C | CA, OH |
| 12--EPOXY PLMR CONC PATCH | 2E2A | NH |
| 13--STEEL PLATE OVER CONVENTIONAL CONC | 2G1A | NH |
| 14--PLMR CONC PATCH | 2E | CA, NH |
| 15--ALUMINA CEMENT PATCH | 2F1 | CA |
| 16--PLYSTR STYRENE PLMR CONC PATCH | 2E5A | CA |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS

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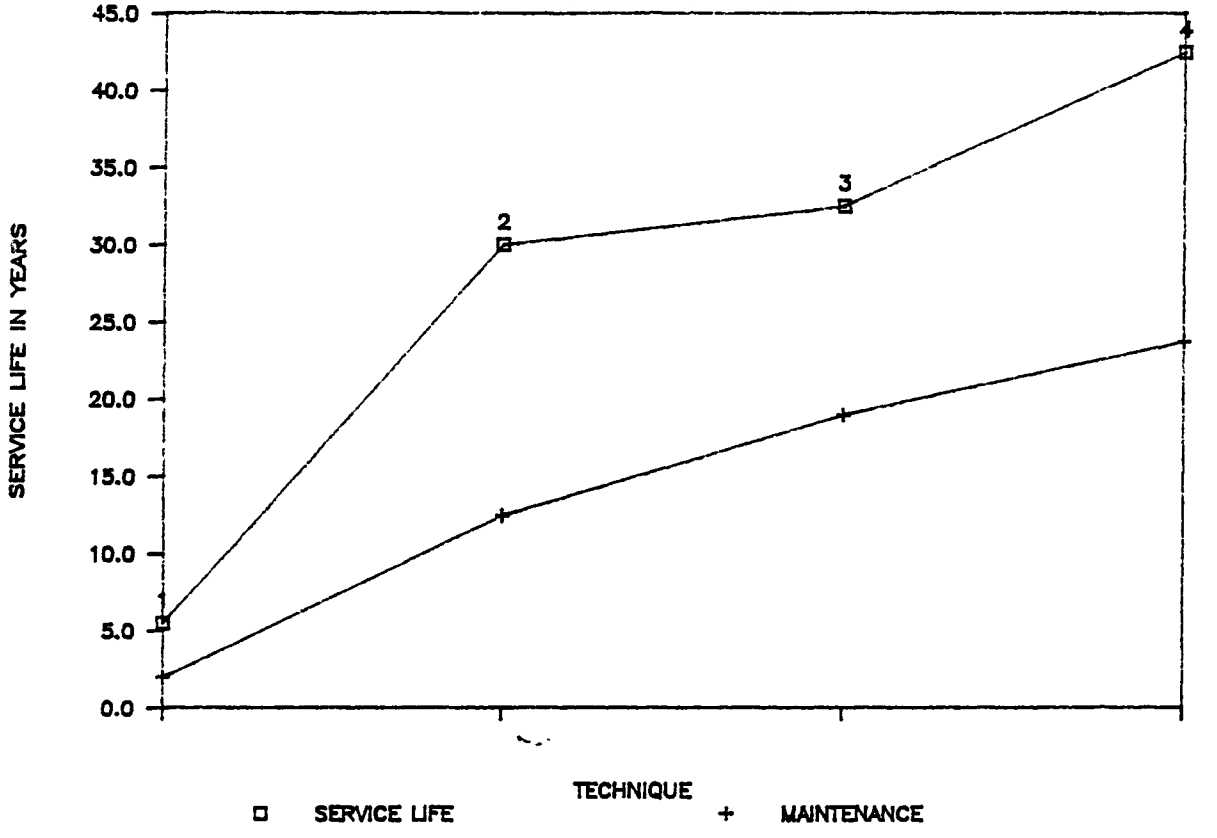
# SERVICE LIFE

RAPID REPLACEMENT SYSTEMS

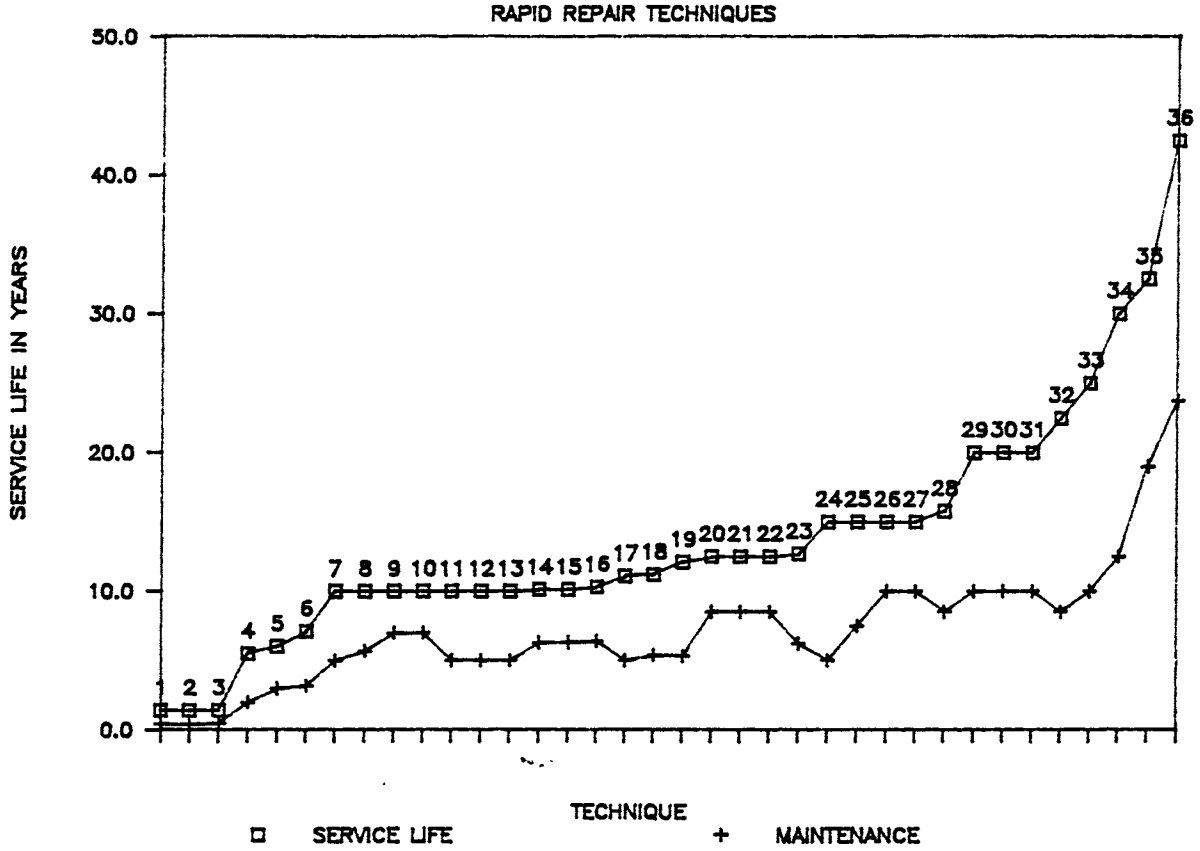



| TECHNIQUE KEY: | *CODE NUMBER | DOT/CSHRP PROVIDING DAT |
|---|---|---|
| 1--SITE CAST MAG PHOSPHATE CEMENT | 3F2 | IN, MT |
| 2--POST-TENSIONED PRECAST CONC SLABS | 3A4 | IL |
| 3--SITE CAST HES PCC | 3D | CA, NS |
| 4--PRECAST CONC SLABS | 3B2 | CA, WA |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS

# SERVICE LIFE

RAPID REPAIR TECHNIQUES




| TECHNIQUE KEY: | *CODE NUMBER | DOT/CSHRP PROVIDING DATA |
|---|---|---|
| 1--ASPHALT PATCH | 2C1 | IN, KS, NS |
| 2--COLD MIX ASPHALT PATCH | 2C1A | IN, KS, NS |
| 3--HOT MIX ASPHALT PATCH | 2C1B | IN, KS, NS |
| 4--SITE CAST MAG PHOSPHATE CEMENT | 3F2 | IN, MT |
| 5--RAPID HARD CEMENT MATL PATCH | 2D4A | AR, KS, KY, IN, MD, NJ, NY, NC, NS, TN, VA |
| 6--HES PCC PATCH | 2D | AR, CT, IN, KS, KY, MD, NH, NJ, NY, NC, NS, PA, TN, VA |
| 7--BITIUMINOUS CONC OVLY | 1A4 | NC |
| 8--MULT LYR EPOXY PLMR OVLY | 1E1B | OH, TN, VA |
| 9--MULT LYR EPOXY-URETHANE PLMR OVLY | 1E1C | VA |
| 10--MULT LYR PLYSTR STYRENE PLMR OVLY | 1E1D | VA |
| 11--EXPANSION JOINTS/CONCRETE HEADERS | 2B | CT |
| 12--VERY RAPID HARD CEMENT MATL PATCH | 2D4B | VA |
| 13--HES TYPE III PCC PATCH | 2D5 | CT |
| 14--PLMR OVLY | 1E | BC, CA, NY, OH, TN, VA, WA |
| 15--MULT LYR PLMR OVLY | 1E1 | OH, TN ,VA, WA |
| 16--PREMIXED PLYSTR STYRENE PLMR OVLY | 1E2E | CA, WA |
| 17--BITUMINOUS CONC OVLY | 1A | CT, ID, MD, NH, NJ, NY, NC, NS, PA, TN, WA, WI |
| 18--MAG PHOSPHATE CEMENT PATCH | 2F2 | CA, HI, IN, MT, OR |
| 19--BITUMINOUS CONC OVLY ON MEMBRANE | 1A2 | CT, ID, NH, NJ, NY, NS, TN, WA |

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| | | |
|---|---|---|
| 20--HES PCC OVLY CONTAINING ADMIXTURES | 1C2 | WA |
| 21--LATEX MODIFIED CONC OVLY | 1C2C | WA |
| 22--HES PCC OVLY W/SILICA FUME | 1C2D | WA |
| 23--HYDRAULIC CEMENT PATCH | 2F | CA, HI, IN, MT, OR |
| 24--SILANE PENETRATING SEALER | 1D5A | CA, OH, OK |
| 25--HMW METHACRYLATE CRACK SEALER | 2A1C | CA, OH |
| 26--EPOXY PLMR CONC PATCH | 2E2A | NH |
| 27--STEEL PLATE OVER CONVENTIONAL CONC | 2G1A | NH |
| 28--HES PCC OVLY | 1C | BC, WA |
| 29--HMW METHACRYLATE COATING | 1B1C | CA |
| 30--PLMR CONC PATCH | 2E | CA, NH |
| 31--ALUMINA CEMENT PATCH | 2F1 | CA |
| 32--LOW SLUMP HES PCC OVLY | 1C3A | BC |
| 33--PLYSTR STYRENE PLMR CONC PATCH | 2E5A | CA |
| 34-POST-TENSIONED PRECAST CONC SLABS | 3A4 | IL |
| 35--SITE CAST HES PCC | 3D | CA, NS |
| 36--PRECAST CONC SLABS | 3B2 | CA, WA |

*CODE NUMBERS CORRESPOND TO OUTLINE DIVISIONS