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Innovative Materials and Equipments for Pavement Surface Repairs

Volume III: Data Base Users Guide

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Executive Summary

The need for improved materials and procedures for pavement maintenance activities is evident to most people. Methods and materials that last longer and perform better would be a tremendous boon, not only to the traveling public's image of our roads, but also to the already stretched budgets of the maintenance departments. One of the major goals of the Strategic Highway Research Program (SHRP) is to further the state of knowledge in the pavement maintenance area. This goal is being accomplished by research activities that are being sponsored in several key areas. These areas include a study of pavement maintenance effectiveness (SHRP H-101), maintenance measuring equipment (SHRP H-103 and H-104), work zone safety improvement (SHRP H-108 and H-109), and the development of improved maintenance equipment (SHRP H-105 and H-107). Consideration is also being given to the implementation of the findings from SHRP research (SHRP H-110).

The research reported herein was performed under SHRP Project H-105, *Innovative Materials and Equipment for Pavement Surface Repairs*. This study was begun in late 1988, and the research effort was completed in April 1990. The results of this study were used in the development of *Experimental Design and Research Plans (EDRP)*, which formed the basis of a Request for Proposals to conduct a field evaluation of these materials in SHRP Project H-106. The overall goals of this project can be summarized as follows:

- To identify material, procedures, and equipment for patching potholes in asphalt concrete (AC) and repairing spalls in portland cement concrete (PCC) that are more effective and more efficient in preventing pavement deterioration than existing methods.

- To identify materials, procedures, and equipment to use in filling and sealing cracks in both AC and PCC pavements, and resealing joints in PCC pavements, that are more effective in preventing the intrusion of water

into the pavement structure, and that are more efficient than existing methods.

- To develop a set of experimental plans to test new or improved maintenance materials and to develop a set of plans to guide the development of improved maintenance equipment.

The study also sought to identify laboratory tests whose results might be good indicators of field performance. The existence of such "performance-related specifications" would greatly enhance maintenance departments' ability to identify which new or untried materials show the greatest promise and therefore warrant field testing.

The research effort for H-105 was divided into five major pavement maintenance activities:

- AC pothole repair
- AC crack repair
- PCC spall repair
- PCC joint resealing
- PCC crack sealing

For each maintenance activity, information was collected to assist in the evaluation of the performance of materials used for these repairs and the procedure used to prepare the pavement and place the materials.

In this report, the findings from the H-105 research effort pertaining to the evaluation of pavement maintenance materials are presented. Three volumes were prepared under the general heading *Innovative Materials and Equipment for Pavement Surface Repairs*. Volume I, *Summary of Material Performance and Experimental Plans*, includes a discussion of the general methodology used in the conduct of this research study and an analysis of the results from the survey of maintenance materials users. Literature related to the above-noted maintenance activities was also evaluated and incorporated in the study. The result was a list of pavement maintenance materials recommended for further study in field trials and a list of laboratory tests that could be evaluated for their ability to relate to field performance.

The second volume of the report, *Synthesis of Operational Deficiencies of Equipment Used for Pavement Surface Repairs*, describes the deficiencies of the equipment currently used to perform these maintenance activities. The information presented in this volume was collected from questionnaires sent to states, contractors, and other agencies. The data gathered in this part of the study was used to develop the experimental plans for SHRP

Project H-107, which addresses the development or modification of improved pavement maintenance equipment for performing crack sealing and pothole repair.
The third volume of the report, *Data Base Users Guide*, is a user's manual that describes the use and manipulation of the data base used in this project. The data base contains information and performance histories of many patching and sealing materials, as well as performance information on various types of equipment used for pavement maintenance.

Abstract

Pavement maintenance activities generally account for a significant portion of an agency's operating budget. This can be attributed to the high initial costs associated with maintenance activities, the historically poor performance of maintenance repair which often necessitates additional maintenance work, and the exorbitant safety and legal costs associated with the need for traffic control of these activities. As such, any improvements or advancements in this area could result in substantial cost savings.

In an effort to address these areas of concern, SHRP has initiated a major research project on the materials and equipment used for five of the more common maintenance activities: portland cement concrete (PCC) crack sealing; PCC joint resealing; PCC spall repair (partial-depth); asphalt concrete (AC) crack sealing and filling; and AC pothole repair. The objectives of this study are to identify materials, procedures, and equipment for these maintenance activities that are more effective and more efficient than past methods.

Volume III of this three-volume report consists of a user's manual describing the use and manipulation of the ORACLE Relational Data Base Manager utilized in this project. The data base contains product information and performance histories of many patching and sealing materials, as well as performance information on various types of equipment for patching and sealing activities. ORACLE was selected because of its sophisticated sorting and querying capabilities. This report also contains supplemental information on the development of the data base, as well as a copy of the questionnaire used in the research effort.

1

Materials and Equipment Data Base User's Manual

Introduction

Under SHRP contract H-105, *Innovative Materials & Equipment for Pavement Surface Repairs,* a comprehensive data base was created which contains information data on agencies, users, manufacturers, material type and function data, equipment type and function data, and comments on the use and performance of each material and piece of equipment. There are 136 sources of input data from 39 State Highway Agencies (93 sources from States, 7 sources from Counties, 2 sources from Cities, 1 source from Tollways, and 2 sources from Consultants), 10 Canadian Provinces, 12 English Counties, and 8 *Roads & Bridges* questionnaire responses. The *Roads & Bridges* sources include contractors, manufacturers, and State Agencies. The respondents cited a total of 243 manufacturers and contractors for the materials and equipment they use.

The data base used for the SHRP H-105 project is the ORACLE Data Base System. This system is used with DOS and is 100% compatible with IBM and IBM-compatible hardware. It is recommended that a computer with a 80386 microprocessor be used with this system, and that it have at least 3 Mb RAM and 25 Mb free hard disk space. This will allow for ORACLE program operation and future data base growth.

Data Base Set-Up

A "read me" file, entitled SHRP.INF, has been placed on the program diskette. This "read me" file will instruct the operator of the data base on the procedure for proper set-up and installation of the SHRP H-105 Data Base files onto the hard disk. Note that the ORACLE

system must be properly installed before using ORACLE. Complete instructions follow on the use of the data base.

For this discussion, all references to words or letters in quotes (such as "shrp" or "d") indicate that those words or letters should be typed in. The references to <RETURN> or <ENTER> indicate that the return or enter key is to be hit. Symbols such as <Shift-F10>, <Shift-Tab>, and so on, indicate that while the Shift key is depressed, the F10 or Tab key is hit.

To enter the ORACLE Data Base System type the following information:

1. "ORACLE", <ENTER> - this will activate the ORACLE system and invoke the necessary memory needed to run the program.

2. "CD\SHRP", <ENTER> - this admits the user into the SHRP directory.

3. "SHRP", <ENTER> - this allows user access to the data base and the information stored in it.

Data Base Entry

After the user has typed in the commands for data base entry, the Main Menu for the SHRP H-105 Materials & Equipment Data Base will be shown on the screen. This menu offers the user the following options:

1. *Update and View the Data Base*
2. *Data Base Administration*
3. *Exit*

To get into the actual data base files, the user can either enter the number 1 and hit <RETURN>, or use the up/down arrow keys to toggle to option 1 and hit <RETURN>. If the user inadvertently enters the number 2 and <RETURN>, just hit <Esc> to return to the main menu. The *Data Base Administration* menu will be discussed later in the manual. If the user happens to hit number 3, this will exit the user out of the program. The user can re-enter the data base main menu by typing "SHRP", <ENTER>.

Once the user successfully enters option 1, the following sub-menu appears on the screen:

1. *Information Source*
2. *Material*
3. *Equipment*
4. *Installation*
5. *Performance*
6. *Material Questionnaire*
7. *Equipment Questionnaire*
8. *Previous Menu*

The *Information Source* option contains information about the individual submitting the questionnaire data, equipment data, materials data, etc. The individual's name, street, title, city, state, zip code, phone number, country, and affiliation are given. This option screen also allows for the same type of data to be entered about material and equipment manufacturers. When referring to these manufacturers, this is called *Manufacturer's ID* or *Manufacturer's Source.*

The *Material* option contains the name or brand name of the material, the ID code for the source of information, the ID code for the manufacturer, the code for the type of material, and the code for the type of distress that this material is used for. At this time, these are the only fields that contain information for the material record.

The *Equipment* option contains the name or brand name of the piece of equipment, the ID code for the source of information, the ID code for the manufacturer, and the code for the distress procedure the equipment is used for. At this time, these are the only fields that contain information for the equipment record.

There is no *Installation* or *Performance* data entered for these options.

The *Material Questionnaire* option contains a related material ID code, a related information source ID code, the type of distress this material is used for, life expectancy in wet and dry conditions above and below 32° F, the years that the material has been used by this particular information source, and a coded comment line for additional information about this particular material or its use, including specifications, standards, maintenance procedures, reports, research, or innovations.

The *Equipment Questionnaire* option contains a related equipment ID code, a related information source ID code, equipment use code, advantages of using this type of equipment, disadvantages of using this type of equipment, any performance/safety modifications to this

equipment by user, maintenance, contractors, or manufacturer, any research or evaluations of this equipment's performance, and a general comments line.

Figures 1-19 showing the screen options available for data input, modification, and query are attached in appendix A.

Data Base Input, Query, and Modification

Figure 20 in appendix B shows the outline of the SHRP H-105 Data Base Design. All of the screens or options are linked directly to the *Information Source*. Because of this significant link, it is advised that initial data entry begin with this option. From this point on, all screens of data will be referred to as a "record" and all lines of data within that record will be referred to as a "field". Once all pertinent data has been entered for the *Information Source* record, the system automatically assigns this record an ID number. This ID number will be used when referring to this specific information or manufacturer source. The system also assigns ID numbers to each record in the *Equipment* option and the *Materials* option.

Within any record, the field line is highlighted when the cursor is on it. To proceed to the next line hit <ENTER> or <Tab>. To back up to the previous line hit <Shift-Tab>, and to move the cursor left or right use the left or right arrow keys. The space bar can also be used to move the cursor to the right. Once a record of data has been input, it is advisable to save that entry by hitting <F10>. It is not necessary to save each record immediately after it is input, but the timely saving of data helps to insure minimal loss of input data should a problem occur with the program.

To proceed to the next blank screen for data input, hit either the down arrow or <PgDn>. Once the user has input the information or manufacturer source data, <Esc> will allow the user to leave this menu option. If data has not been saved, the prompt "Do you want to commit the changes you have made?" will appear at the bottom of the screen. A "Y" or "N" input is required from the user before the program will continue; "Y" will save any input and "N" will escape the option without saving any additional data. This prompt will occur on any screen the user is on if the data has not been saved before trying to exit. Note that any data previously saved will not be erased or deleted.

The user can now continue on to the *Material* or *Equipment* option to enter data. Data is input in the same manner as the *Information Source* option. These records ask the user to enter an Information Source ID Code and a Manufacturer Source ID Code. This ID code is the number that the system assigned each *Information Source* record when it was input. The user can keep manual track of the ID source numbers or toggle with the <ENTER> or <Tab>

keys to the ID field line to obtain the source number. While on this field line, by hitting <F5>, the system will send the user to the *Information Source* screen. The user now has the option of querying any record in search of the particular source ID number to complete the *Material* or *Equipment* record. Note that the *Equipment* record has two screens for data input instead of one screen. The second screen can be accessed by toggling past the last field of the first screen. The format of the second *Equipment* screen depends on the Equipment Use ID for that record entered on the first screen. After entering data on the second screen, hit <F10> to save. The user can toggle through all the fields on the second screen and the system will automatically exit the user back to the first screen, or <Esc> back to the first screen.

To query all data records input for any option screen, hit <F8> while on that option screen. All records entered will then be called up in the order they were entered. The user can toggle through each record by using the up/down arrow keys until the required record is found. Once the needed information is noted by the user, hit <Esc> to return to the original screen and enter the information in the proper field. An alternate and quicker way to query information is as follows:

1. Toggle with <ENTER>/<Shift-Tab> keys to any line on option screen where user knows some of the actual input.

2. <F7> to inform the system of query.

3. Enter query.

4. <F8> will call up all information that fits the query entered.

This alternative allows the user to call up more specific data than can be obtained just by hitting <F8>. Below are examples of the correct way to enter any queries for Step 4:

A. "SAW" - will search and recall all records where that field of query has SAW and only SAW listed in it.

B. "SAW%" - will search and recall all records where that field of query begins with SAW (such as SAW, PAVEMENT).

C. "%SAW%" - will search and recall all records where that field of query contains the word SAW (such as DIAMOND BLADE CONCRETE SAW).

D. "T__", or "22_" - will search and recall all records where that field of query starts with a T and has two additional characters following it or the field begins with 22 and has one additional character following it (such as TAR, THE, 223, 22M). The user can use as many blank character symbols as desired.

E. Note that the % character is a "wild character" and can be used in any query to call up items that are similar.

If the user is more specific with the query statement, such as entering complete names in a field, entering more than one field of data for a query, or entering an actual ID code number, then the user will find it easier to obtain the exact data needed for the query.

The data input for the *Material Questionnaire* option and the *Equipment Questionnaire* option are input in the same manner as the *Material* and *Equipment* options. These records are linked to the Information Source ID Code as well as to the Material/Equipment ID Code. The Material/Equipment Code is assigned by the system so that each record entered can be obtained in the same manner as listed above for the Information Source ID Code. The field for Distress ID Code in each of the questionnaire options needs to be entered in the same manner as in the *Material* or *Equipment* records that the questionnaire record is linked to.

Within the *Material Questionnaire* screen there is a field line for comments on new or innovative materials or procedures. This is a reference field line. To enter a comment use the following procedure:

1. Toggle with the <ENTER> or <Tab> key to field line.

2. <F5> to enter **Comment Table** for data input.

3. Type in a Comment ID number to reference the comment.

4. Toggle to Comment line and type in comment.

5. <F10> to save comment.

6. <Esc> to return to *Material Questionnaire* screen.

7. Type in the number of the comment you have just entered for this record.

8. <F10> to save record.

To modify or query a comment already in the table, follow the procedure outlined for query and modification of other reference tables on the next page.

Once a comment has been entered into this reference table, it can be used in additional *Material Questionnaire* records if it is applicable. Just enter the Comment ID for the comment on the field line and the comment will be called up to the screen. Then hit <F10> to save.

At the end of each field line on all of the record screens, there is either a letter or combination of letters. These letters are a reminder of the type of input needed for that particular field of data. Below is a listing of the field line letters and their definition:

T - indicates **Text** data is to be entered.
N - indicates **Numerical** data is to be entered.
L - indicates **List** data to be called up (data listed and stored in a table that pertains only to this field).
R - indicates **Reference** to a table for data code (coded data listed but not stored in a table).
RK - indicates **Reference Key** (same as **R**).
K - **Key** data assigned by the system in ascending record order.
NK - indicates **Numerical Key** (same as **K**).
***** - value used with certain fields to jump between blocks.

When the user is on a line that ends with **R or RK**, it means that a **Reference Table** exists containing codes that are needed for entry in this field. To access the **Reference Table** and the codes for the corresponding field:

1. Toggle with <ENTER>/<Shift-Tab> keys to field line that has a **Reference Table** for coded entry.

2. <F5> to enter **Reference Table**.

3. <F7> to inform system of query.

4. Enter query.

5. <F8> will call up all information that fits the query entered.

The user can also query the **Reference Tables** by hitting <F5> on the field line and then <F8> to call up the entire **Reference Table**. This option gives the user a chance to see all of the data in the table. A listing of the **Reference Tables** is in appendix C. Additional data can be added to any of the tables to meet the users' needs.

List Table information that is noted with an **L** at the end of the field line is obtained in the following way:

1. Toggle to field line ending in **L**.
2. <F9> to call up **List Table** data.
3. The first line of table data will appear in the field line space.
4. To continue toggling through the list data, <Tab> or <ENTER> until the appropriate data is found.
5. Once the correct data is called up, <Shift-F10> will select that line of list data.
6. <ENTER> will toggle the user to next field line for data entry.
7. If the user does not chose any list data before the last **List Table** data line, the system will automatically chose this last data line for that field line.

The user can also enter, query, and modify the **List Table** data in the same manner as described for **Reference Tables**.

Two additional ways to enter data if records are similar are as follows:

1. Enter data as outlined before in a record.
2. Save record and proceed to next blank screen (down arrow or <PgDn>).

3. Toggle to the field line that is same or similar and hit <F3>. This will duplicate the field from the previous record to the new record. This can be used on as many fields per record as necessary.

4. Any changes to the field line can be done through modification of entry.

5. If all or most of the new record is the same as the previous record, the user can hit <F4> to duplicate the entire previous record. Necessary changes can then be made.

These methods of data input are very helpful if the user has several records of data that have the same or similar attributes (such as same equipment advantages and disadvantages but a different model number or materials with the same life expectancy data but used for different distresses). Data on the new record can be modified to meet the criteria needed without the tedious task of typing all the same data in again.

If the user needs to modify any data for any reason, follow the same steps for querying the data as listed above. Once the record has been called up to the screen, the appropriate changes can be made to the record. Be sure to save the record before exiting.

There are many function keystroke commands that are available to the user for data input, query, and modification. At any time, the user can hit <F1> to get an on- screen listing of the keystroke commands. A list of keystroke commands is also available in appendix D.

The screens and data input for the *Information Source* option, *Material* option, *Equipment* option, *Material Questionnaire* option, and *Equipment Questionnaire* option are all directly correlated to the original questionnaire sheets sent out to the different agencies for their responses. Appendix E contains a copy of these questionnaires.

Data Base Administration

Option 2 on the Main Menu for the SHRP H-105 Materials & Equipment Data Base is for *Data Base Administration.* To use this option, enter the number 2 and hit <RETURN> or use the up/down arrow keys to toggle to this option line and hit <RETURN>. Once the user enters this option, the following sub-menu appears:

1. Lookup Table Maintenance

2. Backup the Data Base

3. *SQL*

4. *Previous Menu*

The *Lookup Table Maintenance* option in this sub-menu allows the user direct access to all of the **Reference Tables** without entering the actual data base files. Entering this option as described above will call up the following sub-menu:

1. *Affiliation*

2. *Pavement Type*

3. *Distress Type*

4. *Equipment Use*

5. *Sequence Numbers*

6. *Material Questionnaire Comments*

7. *Material Types*

8. *Previous Menu*

The user can enter any option needed to access a particular **Reference Table**. Use the method outlined above for querying and modification of these tables. Note that the number 5 option in this sub-menu, *Sequence Numbers*, is used for changing the next starting ID number for the different screen records. Normally, these starting sequence numbers need not be changed. If a need arises for changing these numbers, use only higher numbers that have not been used for ID numbers before for that record. If any numbers in the record are duplicated, the original record data will be overwritten by the new data.

As before, <Esc> will exit the user back to the previous screen menu, or the user can enter the number 8 to exit.

In the *Data Base Administration* sub-menu, the option *Back Up the Data Base* is used for saving and backing up the entire data base to a floppy diskette. By entering this option in the prescribed manner, the system will automatically back up the data base. Please consult your

computer programmer about this option or any additional options set up by the programmer for data base back up.

The *SQL* option is used for entering queries and obtaining data from the data base through written and coded commands. Again, please consult your computer programmer about this option.

Hit <Esc> or the number 4 and <RETURN> to exit back to the previous menu.

Additional Notes

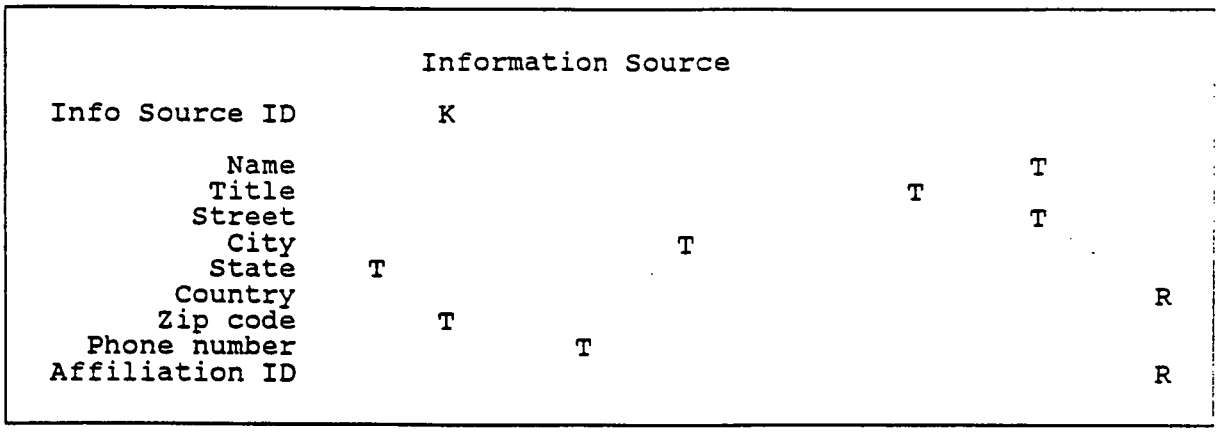
1. -99 was used as a default number in the *Material* records. This signifies that the material listed was used under certain conditions, but that no life expectancy data for that condition was recorded by the respondent.

2. **GENERIC SOURCE** was used to designate a manufacturer of a material or piece of equipment when actual manufacturer was not listed or was not known.

3. In the *Material* and *Equipment* records, there are records with "**COMMENT ONLY**" listed. This signifies that the respondent made only a comment about a material or piece of equipment but gave no other relevant information about its use.

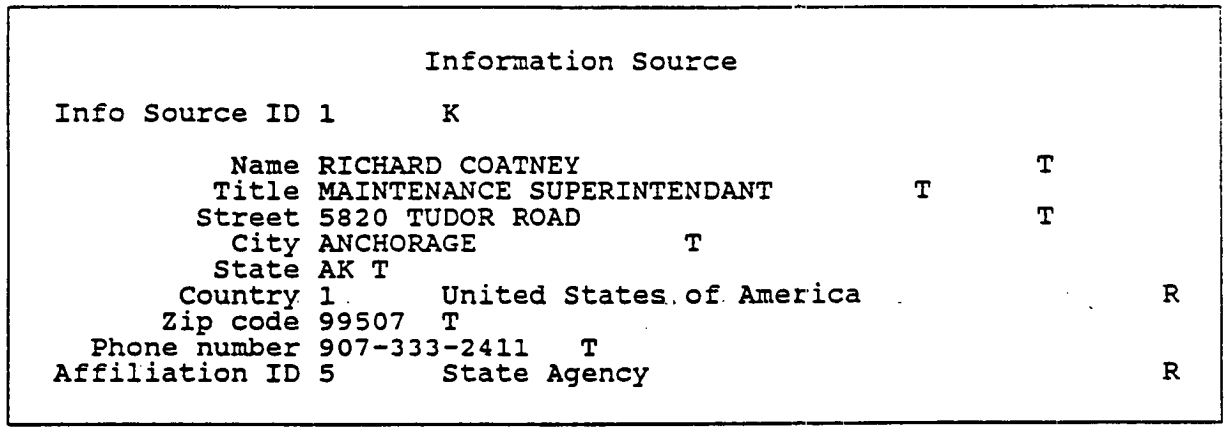
APPENDIX A

DATA INPUT SCREENS



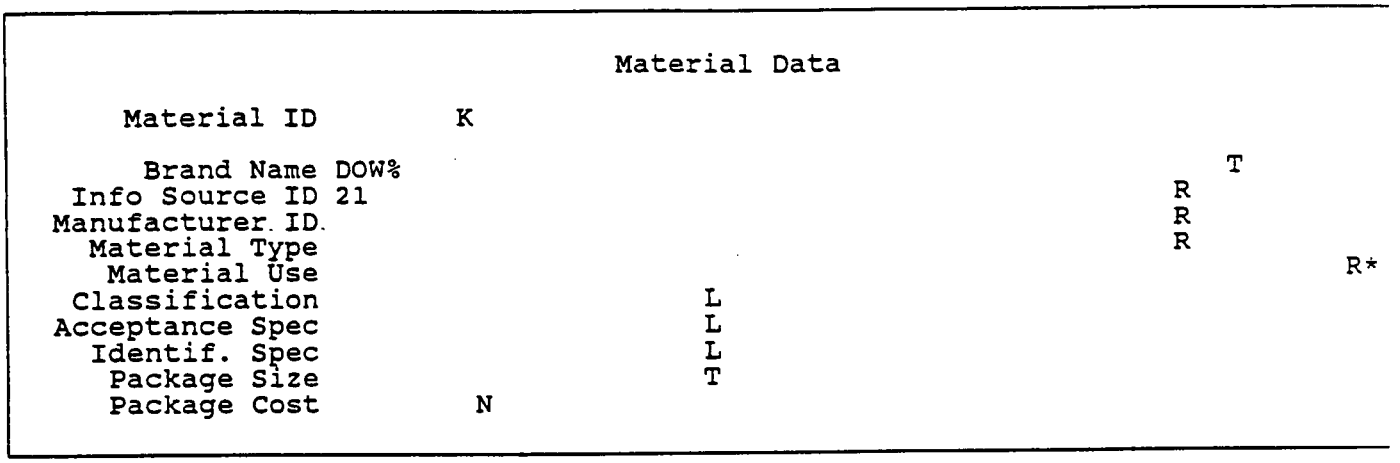
Enter a query; press F8 to execute, Shift-F10 to cancel.
Char Mode: Replace Page 1 ENTER QUERY Count: *0

Figure 1. Information Source screen ready for data input or query.



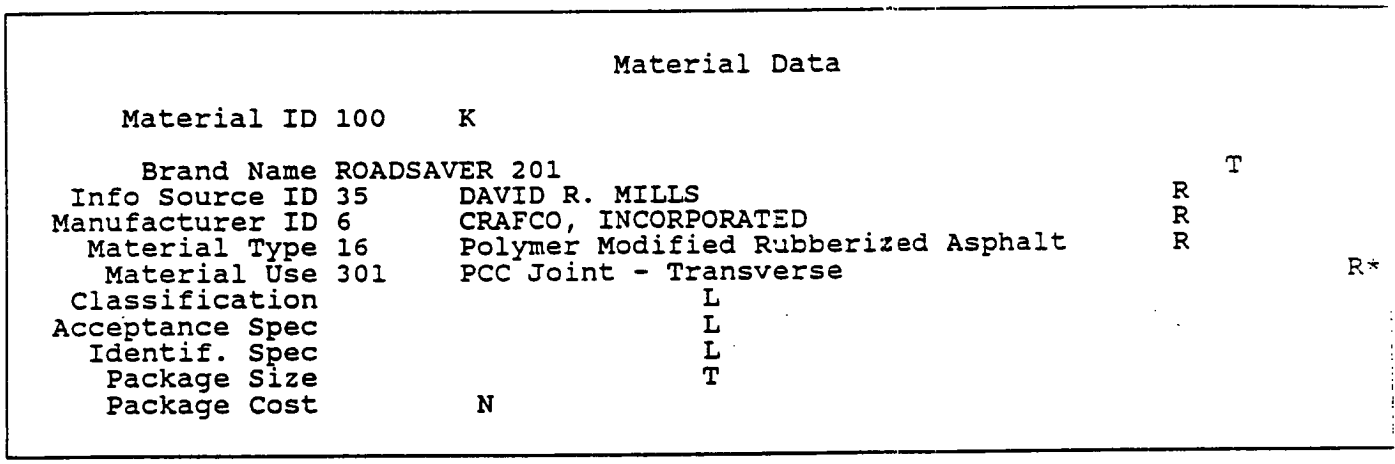
Char Mode: Replace Page 1 Count: *1

Figure 2. Completed Information Source record.



Enter a query; press F8 to execute, Shift-F10 to cancel.
Char Mode: Replace Page 1 ENTER QUERY Count: *0

Figure 3. Material Data screen in query mode requesting record search for any brand name beginning with the letters "DOW" and having an Information Source ID number of "21".

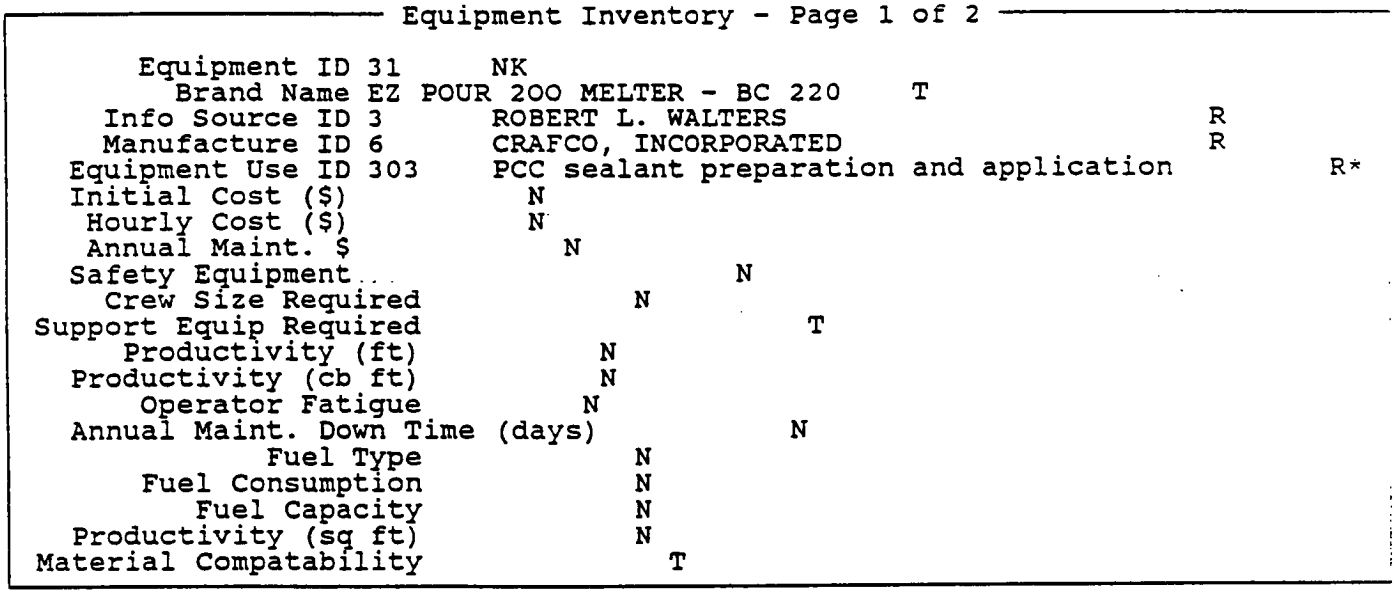


Material Data

Material ID	100 K		
Brand Name	ROADSAVER 201		T
Info Source ID	35	DAVID R. MILLS	R
Manufacturer ID	6	CRAFCO, INCORPORATED	R
Material Type	16	Polymer Modified Rubberized Asphalt	R
Material Use	301	PCC Joint - Transverse	R*
Classification		L	
Acceptance Spec		L	
Identif. Spec		L	
Package Size		T	
Package Cost	N		

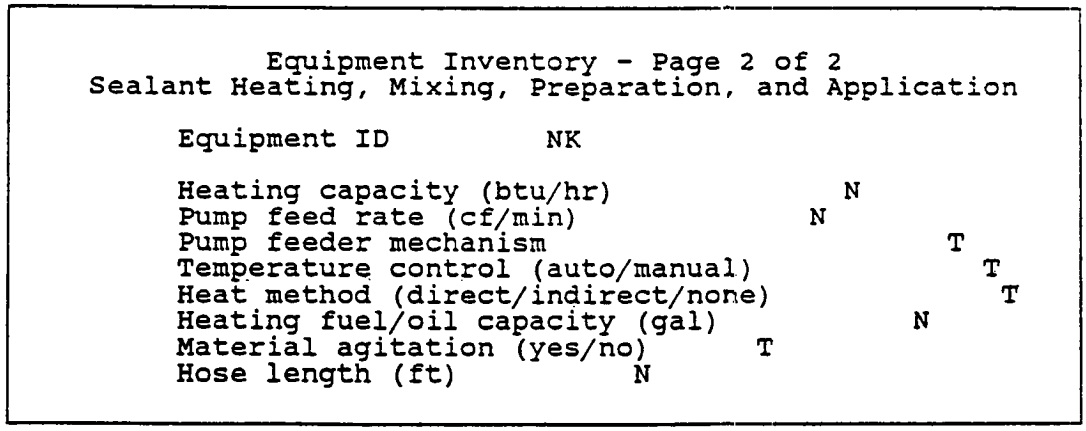
^ v Char Mode: Replace Page 1 Count: 10

Figure 4. Completed Material Data record.



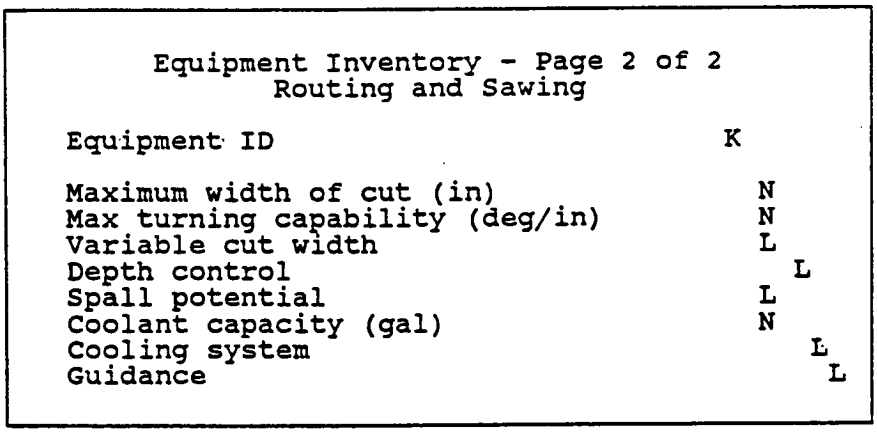
^ v Char Mode: Replace Page 1 Count: 31

Figure 5. Completed Equipment Inventory record - screen 1.



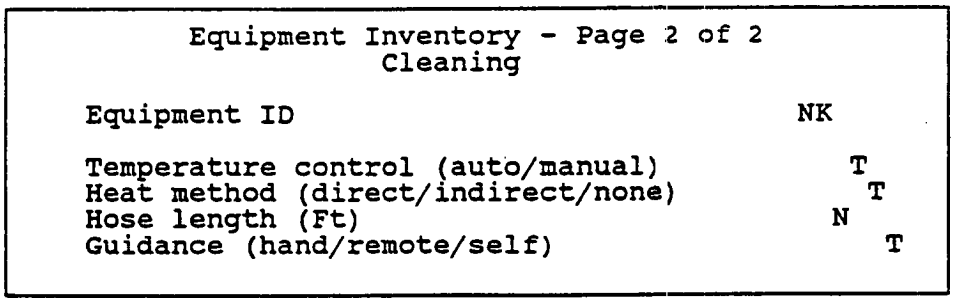
Char Mode: Replace Page 6 Count: *0

Figure 6. Equipment Inventory screen 2 for sealant heating, mixing, preparation, and application equipment use.



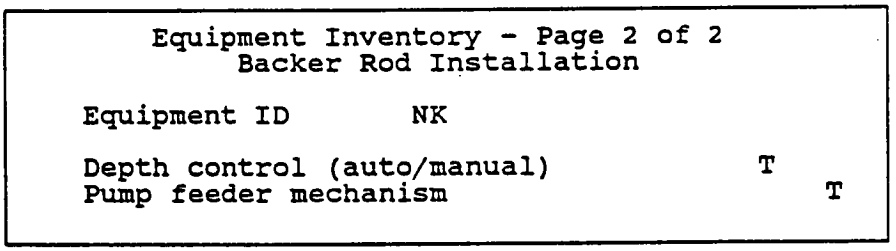
Char Mode: Replace Page 3 Count: *0

Figure 7. Equipment Inventory screen 2 for routing and sawing equipment use.



Char Mode: Replace Page 4 Count: *0

Figure 8. Equipment Inventory screen 2 for cleaning equipment use.



Char Mode: Replace Page 5 Count: *0

Figure 9. Equipment Inventory screen 2 for backer rod installation equipment use.

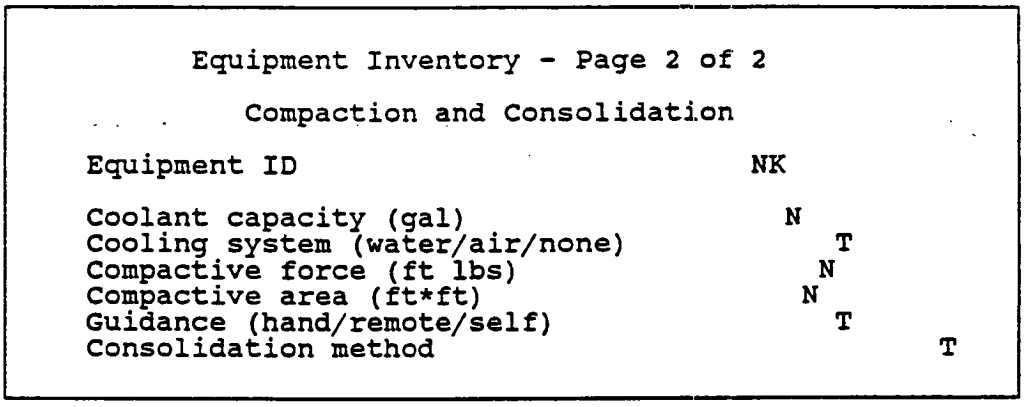


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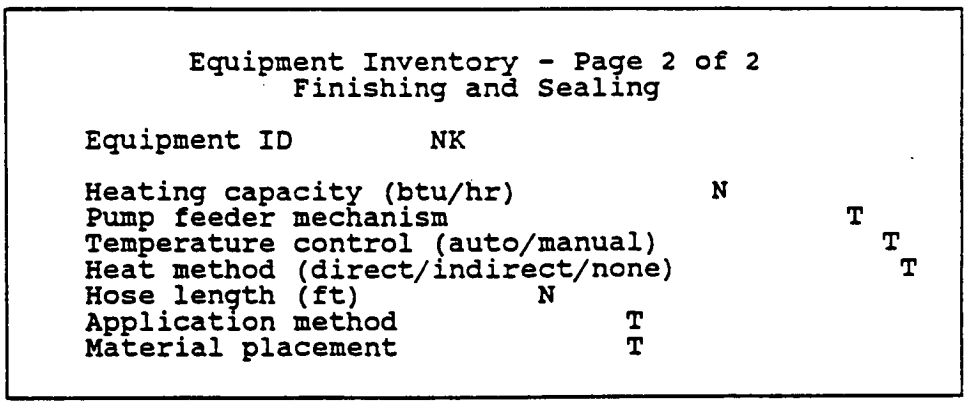
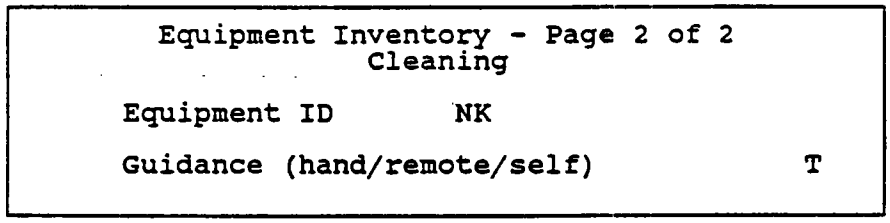
Figure 10. Equipment Inventory screen 2 for compaction and consolidation equipment use.



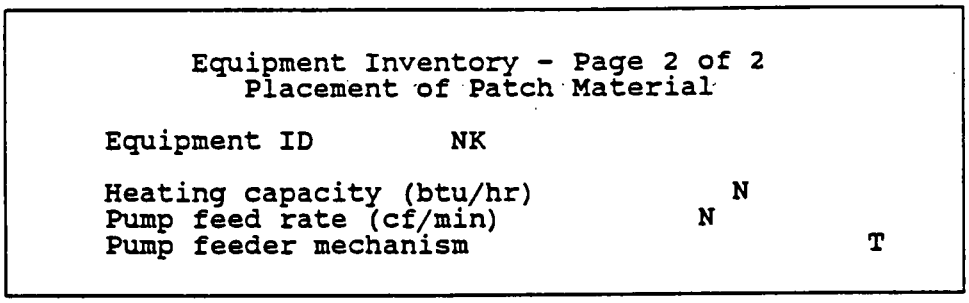
Char Mode: Replace Page 8 Count: *0

Figure 11. Equipment Inventory screen 2 for finishing and sealing equipment use.



Char Mode: Replace Page 9 Count: *0

Figure 12. Additional Equipment Inventory screen 2 for cleaning equipment use.



Char Mode: Replace Page 10 Count: *0

Figure 13. Equipment Inventory screen 2 for equipment used for placement of patch material.

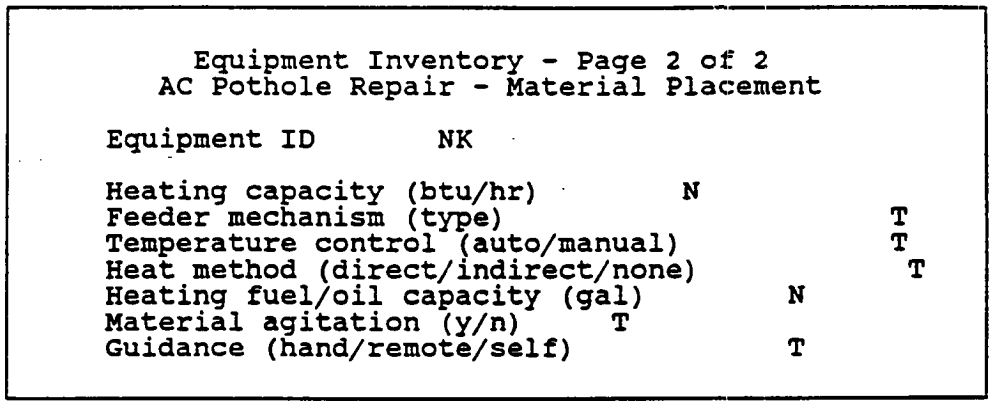


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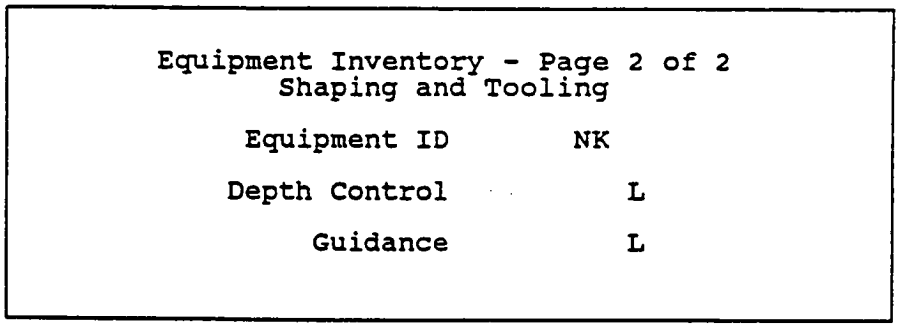
Figure 14. Equipment Inventory screen 2 for equipment used for AC pothole repair - material placement.



Char Mode: Replace Page 2 Count: *0

Figure 15. Equipment Inventory screen 2 for shaping and tooling equipment use.

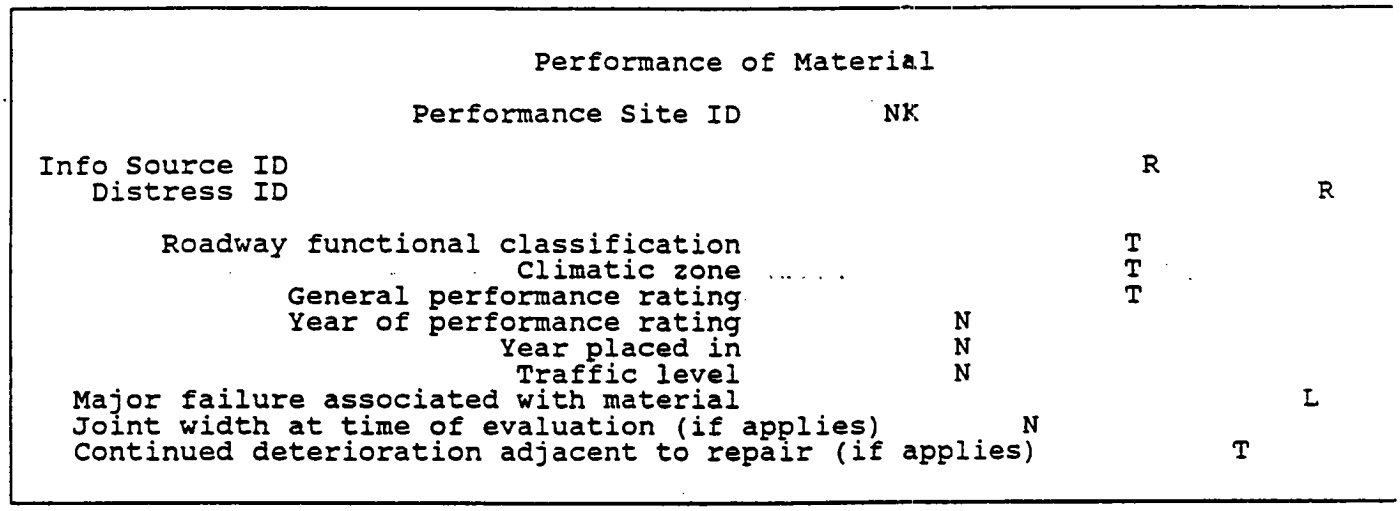
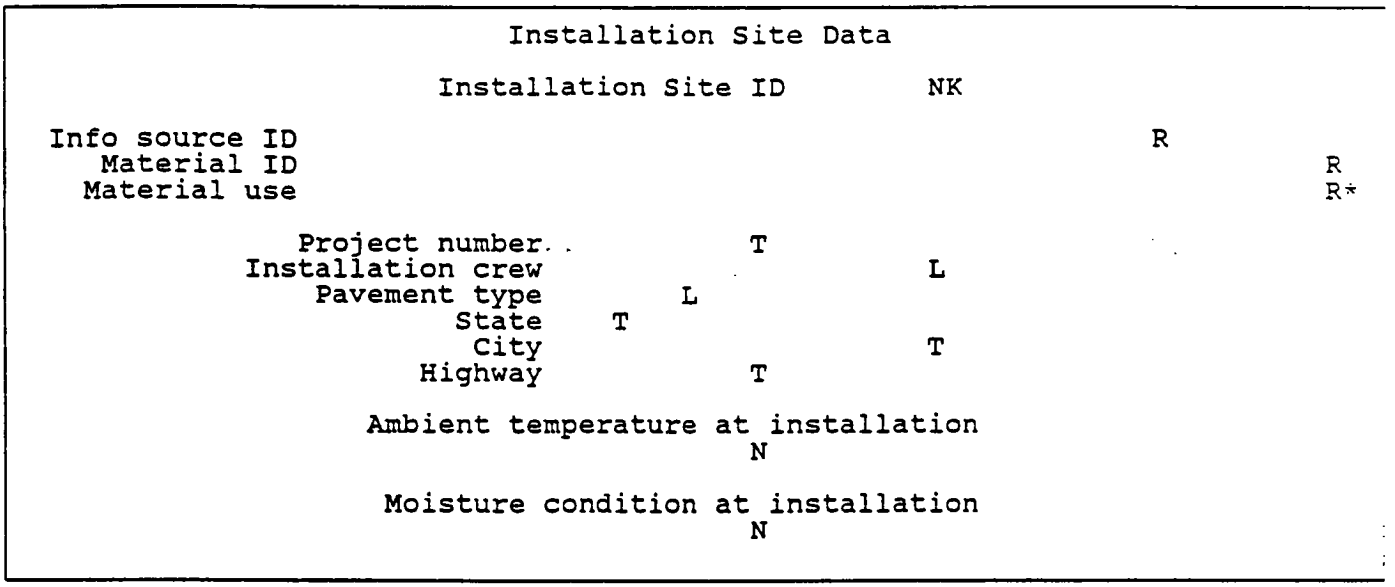


Figure 16. Material Performance screen ready for data input or query.



Char Mode: Replace Page 1 Count: *0

Figure 17. Installation Site Data screen ready for data input or query.

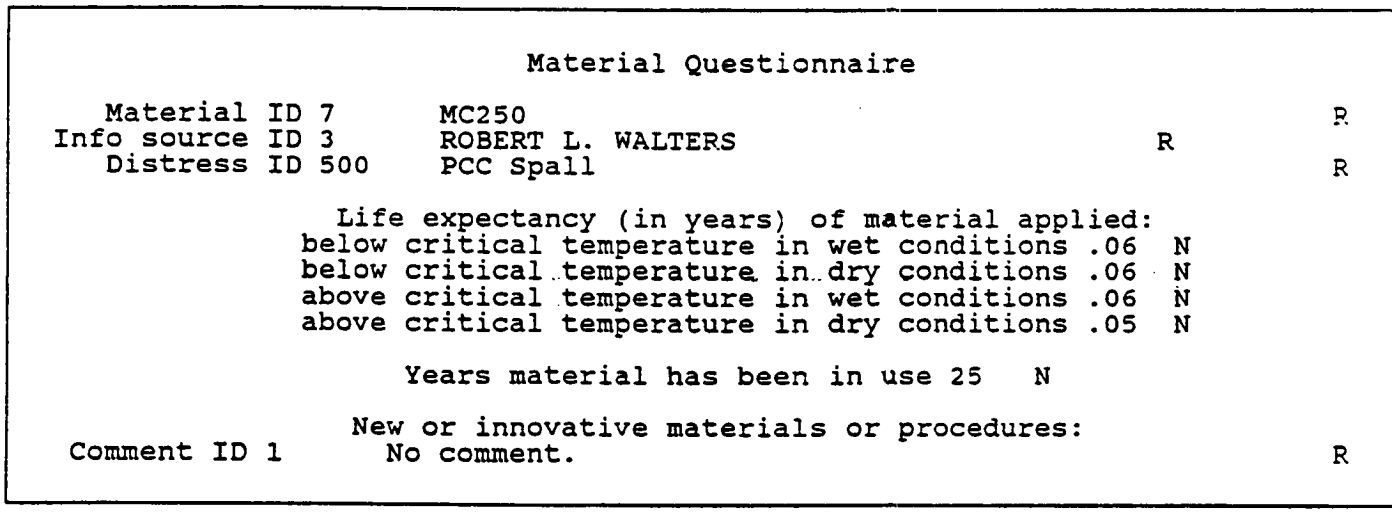
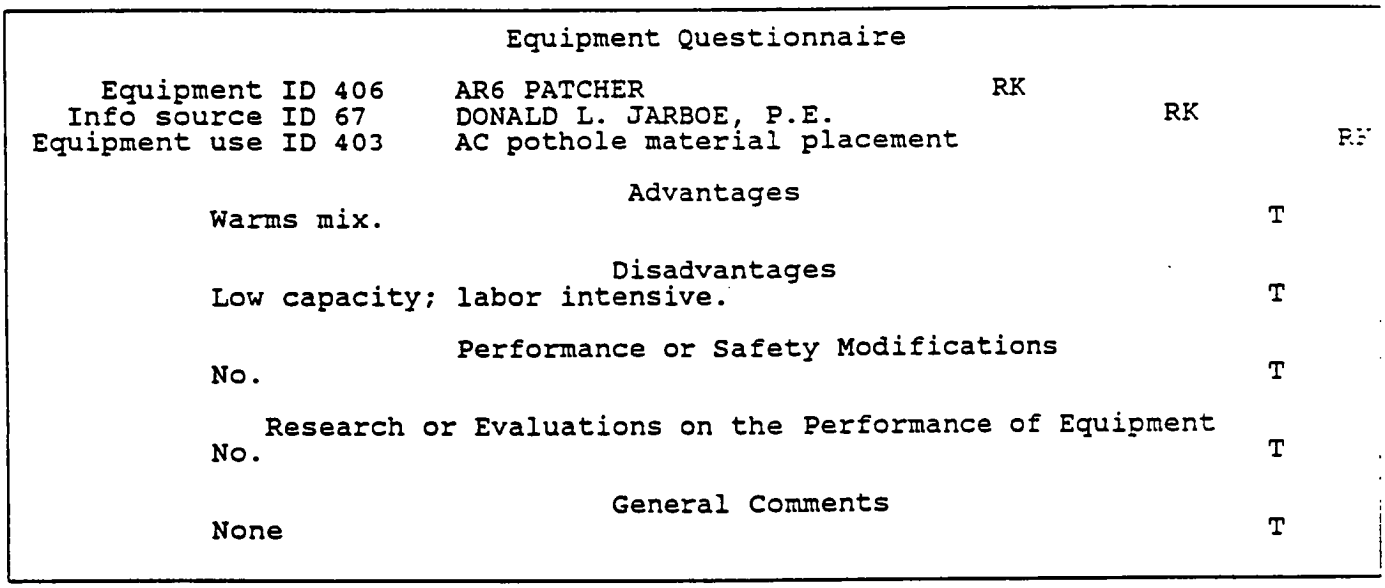


Figure 18. Completed Material Questionnaire screen.



Equipment Questionnaire

Equipment ID 406 AR6 PATCHER RK
Info source ID 67 DONALD L. JARBOE, P.E. RK
Equipment use ID 403 AC pothole material placement RK

Advantages

Warms mix. T

Disadvantages

Low capacity; labor intensive. T

Performance or Safety Modifications

No. T

Research or Evaluations on the Performance of Equipment

No. T

General Comments

None T

v Char Mode: Replace Page 1 Count: 19

Figure 19. Completed Equipment Questionnaire screen.

APPENDIX B

DATA BASE DESIGN

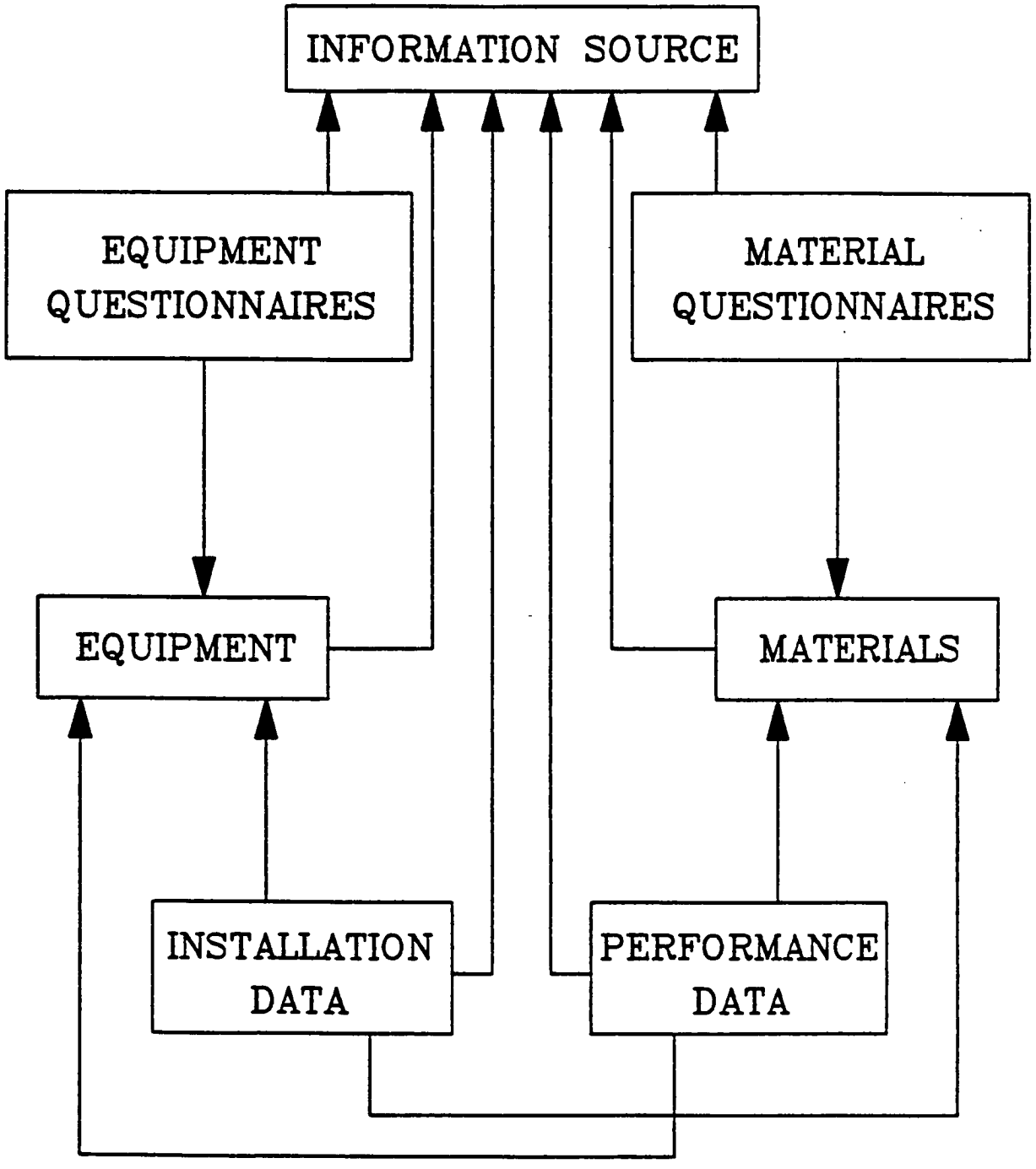


Figure 20. SHRP H-105 Data Base Design.

APPENDIX C

REFERENCE TABLES

Table 1. Distress references for maintenance materials.

CODE	DISTRESS DESCRIPTION
0	Nonspecific
100	AC Crack
101	AC Crack - Transverse
102	AC Crack - Longitudinal
103	AC Crack - Longitudinal (Lane/Lane)
104	AC Crack - Longitudinal (Lane/Shoulder)
105	AC Crack - Longitudinal (Other)
200	PCC Crack
201	PCC Crack - Transverse
202	PCC Crack - Longitudinal
300	PCC Joint
301	PCC Joint - Transverse
302	PCC Joint - Longitudinal (PCC/PCC Joints)
303	PCC Joint - Longitudinal (PCC/AC Joints - Lane/Shoulder)
400	AC Pothole
401	AC Pothole Developed From Transverse Cracks
402	AC Pothole Developed From Longitudinal Cracks
403	AC Pothole Developed From Alligator Cracking
404	AC Pothole Not Developed From Crack Deterioration
500	PCC Spall
501	PCC Spall - Developed From Transverse Cracks
502	PCC Spall - Developed From Longitudinal Cracks
503	PCC Spall - Developed From Transverse Joints

Table 1. Distress references for maintenance materials (continued).

CODE	DISTRESS DESCRIPTION
504	PCC Spall - Developed From Longitudinal Joints (PCC/PCC - Lane/Lane)
505	PCC Spall - Developed From Longitudinal Joints (PCC/PCC - Lane/Shoulder)
506	PCC Spall - Developed From Longitudinal Joints (PCC/AC - Lane/Shoulder)
507	PCC Spall - Not Developed From Cracks

Table 2. Procedure references for maintenance equipment use.

CODE	EQUIPMENT USE
100	AC Crack Routing/Sawing
101	AC Crack Cleaning/Drying
102	AC Crack Backer Rod Installation
103	AC Crack Sealant Heating, Mixing, and Application
104	AC Crack Shaping/Finishing
200	PCC Crack Routing/Sawing
201	PCC Crack Cleaning
202	PCC Crack Backer Rod Installation
203	PCC Crack Sealant Heating, Mixing, and Application
204	PCC Crack Final Shaping/Tooling
300	PCC Joint Resealing - Routing/Sawing
301	PCC Joint Cleaning
302	PCC Joint Backer Rod Installation
303	PCC Joint Sealant Preparation and Application
304	PCC Joint Final Shaping/Tooling
400	AC Pothole Edge Shaping
401	AC Pothole Cleaning/Drying
402	AC Pothole Priming
403	AC Pothole Material Placement
404	AC Pothole Compaction/Consolidation
405	AC Pothole Finishing/Sealing
500	PCC Spall Edge Shaping
501	PCC Spall Deterioration Area Cleaning

Table 2. Procedure references for maintenance equipment use (continued).

CODE	EQUIPMENT USE
502	PCC Spall Patch Material Placement
503	PCC Spall Compaction/Consolidation
504	PCC Spall Finishing/Sealing

Table 3. Maintenance material type.

CODE	MATERIAL TYPE
0	Other
1	AC Hot Mix (Temporary)
2	AC Hot Mix (Permanent)
3	AC Cold Mix (Temporary)
4	AC Cold Mix (Permanent)
5	Epoxy
6	Polymer
7	PCC
8	Polymer/Rubber
9	Asphalt
10	Emulsion
11	Cutback
12	Asphalt Rubber
13	Silicone
14	Fiberized AC Sealant Material
15	Compression Seal
16	Polymer Modified Rubberized Asphalt
17	Emulsion and Rejuvenator
18	Emulsion and Polymer
19	Proprietary Cold Mix
20	Polyester
21	Magnesium Phosphate
22	Modified HAC
23	Warm Mix Polymer/Fiberized
24	Prop. AC Hot Mix (Temporary)
25	Prop. AC Hot Mix (Permanent)
26	Prop. AC Cold Mix (Temporary)
27	Prop. AC Cold Mix (Permanent)
28	Polyurethanes
29	Polysulfide Polymer
30	P. A. Filler
31	PVC Coal Tars
32	Latex Modified PCC
33	Fiber Modified PCC
34	Gypsum
35	High Alumina Cements
36	Methyl Methacrylate
37	Polyester-Styrene
38	Acrylic
39	Furfuryl Alcohol
40	Epoxy Resin System
41	Epoxy Polysulfide Binder
42	Epoxy Polysulfide Grout
43	Epoxy Repair Paste

Table 3. Maintenance material type (continued).

CODE	MATERIAL TYPE
44	Plastic Joint Mat
45	Polymerized Emulsion
46	Emulsion Hot Mix (Temporary)
47	Emulsion Hot Mix (Permanent)
48	Non-Shrink Grout
49	Emulsion Aggregate
50	AC Hot Mix/Cold Laid (Temporary)
51	AC Hot Mix/Cold Laid (Permanent)
52	Fly Ash
53	Latex Modified Emulsion
54	Limestone Rock Asphalt w/Proprietary Cold Mix
55	Oil & Chip
56	Flexible Concrete Repair
57	Epoxy-Mortar/Concrete
58	Fiberized AC Patch Material

Table 4. Affiliation references.

CODE	AFFILIATION
0	Government Research
1	Private Research
2	Manufacturer
3	Contractor
4	Federal Agency
5	State Agency
6	County Agency
7	Consultant
8	Other
9	Foreign Agency
10	City Agency

Table 6. Country references.

CODE	COUNTRY
1	United States of America
2	Canada
3	England
4	Norway
5	Sweden

APPENDIX D

FUNCTION KEYS

Table 7. Data base function keys.

FUNCTION	KEYSTROKE(S)	FUNCTION	KEYSTROKE(S)
Right	-> Arrow	Clear Record	Shift-F4
Scroll Right	Ctrl ->	Clear Block	Shift-F5
Next Field	Tab	Clear Form/Rollback	Shift-F7
	Enter	Delete Record	Shift-F6
Next Primary Field Key	Shift-F3	Create Record	F6
Next Record	PgDn	Duplicate Field	F3
	Down Arrow	Duplicate Record	F4
Scroll Down	Ctrl-Enter	Enter Query	F7
Next Set of Records	Ctrl-N	Count Query Hits	Shift-F2
Next Block	Ctrl-PgDn	Execute Query	F8
Left	<-Arrow	Commit Transaction	F10
Scroll Left	Ctrl <-	Exit/Cancel	Shift-F10
Previous Field	Shift-Tab		Esc
Previous Record	PgUp	Print	Shift-F8
	Up Arrow	Redisplay Page	Shift-F9
Scroll Up	Ctrl-Backspace	Help	F2
Previous Block	Ctrl-PgUp	List Field Values	F9
Insert/Replace	Ins	Display Error	Shift-F1
Delete Character	Del	Block Menu	F5
Delete Backward	Backspace	Show Function Keys	F1
Clear Field	Crtl-End		

APPENDIX E

QUESTIONNAIRES

EQUIPMENT AND PROCEDURES FOR SEALING CRACKS ON ASPHALT CONCRETE (AC) PAVEMENTS

EQUIPMENT AND PROCEDURES FOR SEALING CRACKS ON ASPHALT CONCRETE (AC) PAVEMENTS

— ROUTING / SAWING —

1. Please list the equipment used for routing and/or sawing cracks on AC pavements prior to sealing. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(Roman Router, #3)	(follows crack well)	(bits don't last)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURS FOR SEALING CRACKS ON ASPHALT CONCRETE (AC) PAVEMENTS

— CLEANING / DRYING —

1. Please list the equipment used for cleaning out and drying cracks on AC pavements prior to sealing. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(Smith Hot Lance, #2100)	(cleans crack well)	(hard to control, burns hot)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR SEALING CRACKS
ON ASPHALT CONCRETE (AC) PAVEMENTS

— BACKER ROD INSTALLATION —

1. Do you currently use tools or equipment for installing backer rods or filler material to limit the amount of sealant or to improve the shape of the sealant? If so, please list the equipment used and provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.....

Equipment Type	Advantages	Disadvantages
(maint. shop made eqpt.)	(very inexpensive)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR SEALING CRACKS
ON ASPHALT CONCRETE (AC) PAVEMENTS

— SEALANT HEATING, MIXING, AND APPLICATION —

1. Please list the tools or equipment used for heating, mixing, and applying crack sealant material. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first two lines are examples of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(Ramary Applicator, modified)	(maintains uniform temp)	(takes too long)
(Wright Hot Kettle)		(dangerous, burns sealant)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR SEALING CRACKS
ON ASPHALT CONCRETE (AC) PAVEMENTS

— SHAPING / FINISHING —

1. Please list any tools or equipment used for shaping or finishing the sealant material after installation, such as squeegees. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(squeegee on Mueller wand)	(can use different widths)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR SEALING CRACKS ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

EQUIPMENT AND PROCEDCURES FOR SEALING CRACKS ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS)

— ROUTING / SAWING —

1. Please list the equipment used for routing and/or sawing cracks on PCC pavements prior to sealing. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(Roman Router, #3)	(follows crack well)	(excessive spalling)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDCURES FOR SEALING CRACKS ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS)

— CRACK CLEANING —

1. Please list the equipment used for cleaning out cracks on PCC pavements prior to sealing. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(high speed air blast eqpt.)	(none)	(does not clean adequately)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDCURES FOR SEALING CRACKS ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS)

— BACKER ROD INSTALLATION —

1. Do you currently use tools or equipment for installing backer rods or filler material to limit the amount of sealant or to improve the shape of the sealant? If so, please list the equipment used and provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(maint. shop made eqpt.)	(very inexpensive)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDCURES FOR SEALING CRACKS ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS)

— SEALANT MIXING, HEATING, AND APPLICATION —

1. Please list the tools or equipment used to mix, heat, and apply crack sealant material on PCC pavements. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(Ramary Applicator, modified)	(maintains uniform temp)	(takes too long)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDCURES FOR SEALING CRACKS ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS)

— FINAL SHAPING / TOOLING —

1. Please list any tools or equipment used for shaping or finishing the crack sealant material after installation. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(applicator tip on wand)	(can use different widths)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR RESEALING JOINTS ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

EQUIPMENT AND PROCEDURES FOR RESEALING JOINTS
ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

— SAWING / ROUTING —

1. Please list the equipment used for preparing joints on PCC pavements prior to resealing, including sealant removal and refacing equipment. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(Kayshun Saw, Model #100)	(easy to maneuver)	(doesn't remove old seal well)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR RESEALING JOINTS ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

— CLEANING —

1. Please list the equipment used for cleaning routed and/or sawed joints on PCC pavements prior to resealing. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(sand blasting equipment)	(none)	(damages joint face)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURS FOR RESEALING JOINTS
ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

— BACKER ROD INSTALLATION —

1. Do you currently use tools or equipment for installing backer rods or filler material to limit the amount of sealant placed in the joint or to improve the shape factor of the sealant? If so, please list the equipment used and provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(maint. shop made eqpt.)	(very inexpensive)	(uneven depth)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

— SEALANT PREPARATION AND APPLICATION —

1. Please list the tools or equipment used for mixing, heating, and applying joint sealant material. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(Ramary Applicator, modified)	(maintains uniform temp)	(takes too long)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR RESEALING JOINTS
ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

— FINAL SHAPING / TOOLING —

1. Please list any tools or equipment used for shaping or finishing the sealant material after installation (such as squeegees). Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(none- use self-leveling seal)	(none)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES

FOR POTHOLE REPAIRS

ON ASPHALT CONCRETE (AC) PAVEMENTS

EQUIPMENT AND PROCEDURES FOR POTHOLE REPAIRS ON ASPHALT CONCRETE (AC) PAVEMENTS

— SHAPING THE POTHOLE EDGES —

1. Please list the equipment used for shaping or establishing the edges of potholes on AC pavements prior to removal of the deteriorated pavement. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(Kayshun Saw, Model #100)	(easy to maneuver)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

— CLEANING / DRYING POTHOLE —

1. Please list the equipment used for removing the deteriorated pavement after the pothole boundaries have been established and drying the pothole area if the pavement is wet. Provide the manufacturer and model number if available. Briefly note any advantages/disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(Gantz Hot Lance)	(dries pavement)	(has burned pavement)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR POTHOLE REPAIRS ON ASPHALT CONCRETE (AC) PAVEMENTS

— PRIMING —

1. Do you currently use tools or equipment for placing primer in the pothole before placing the patch material? If so, please list the equipment used and provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(sprayer)	(provides good coverage)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR POTHOLE REPAIRS ON ASPHALT CONCRETE (AC) PAVEMENTS

— MATERIAL PLACEMENT —

1. Please list any tools or equipment used to heat, mix, or place the patch material for potholes in AC pavements. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(Stanley Hot Box, #60)	(keeps mix hot)	(takes too long to heat)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR POTHOLE REPAIRS ON ASPHALT CONCRETE (AC) PAVEMENTS

— COMPACTION / CONSOLIDATION —

1. Do you currently use tools or equipment for compacting or otherwise consolidating the patch material after it is placed in the pothole? If so, please list the equipment used and provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(none– compacted by traffic)	(none)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

— FINISHING / SEALING —

1. Do you currently use tools or equipment for finishing or sealing the surface of a patched pothole? If so, please list the equipment used and provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(none)	(none)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR PARTIAL-DEPTH SPALL REPAIR ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

EQUIPMENT AND PROCEDURES FOR PARTIAL-DEPTH SPALL REPAIRS ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

— SHAPING THE SPALL EDGES —

1. Please list the equipment used for shaping or establishing the edges of spalls on PCC pavements prior to removal of the deteriorated pavement. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(Kayshun Saw, Model #100)	(easy to maneuver)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR PARTIAL-DEPTH SPALL REPAIRS ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

— CLEANING DETERIORATED AREAS —

1. Please list the equipment used for removing the deteriorated pavement after the spall boundaries have been established. Provide the manufacturer and model number if available. Briefly note any advantages/disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(sand blast)	(promotes bond)	(takes time)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

— PLACEMENT OF PATCH MATERIAL —

1. Please list the tools or equipment used to heat, mix, or place the patch material. Provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(small mixer for patch mix)	(very portable)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

EQUIPMENT AND PROCEDURES FOR PARTIAL-DEPTH SPALL REPAIRS ON PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

— CONSOLIDATION / COMPACTION —

1. Do you currently use tools or equipment for consolidating or otherwise compacting the patch material after it is placed in the spalled area? If so, please list the equipment used and provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(1" diameter spud vibrator)	(removes voids)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

— FINISHING / SEALING —

1. Do you currently use tools or equipment for finishing or sealing the surface of the patched spall? If so, please list the equipment used and provide the manufacturer and model number if available. Briefly note any advantages and/or disadvantages of each piece of equipment. If you do not use this procedure, please briefly explain why. The information in parentheses in the first line is an example of the type of information that is being requested.

Equipment Type	Advantages	Disadvantages
(none- screed by hand)	(none)	(none)

2. Has your agency made any performance/safety modifications to this equipment? Please describe the modifications and their degree of success.

3. Are you aware of any research or evaluations on the performance of this equipment? Please provide details or attach reports.

MATERIALS AND PROCEDURES FOR PAVEMENT SURFACE REPAIRS

MATERIALS AND PROCEDURES FOR PARTIAL-DEPTH SPALL REPAIR OF PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

1. List the partial-depth repair materials (both temporary and permanent) for PCC pavements that you have used and their estimated life expectancy (in years) for the application conditions indicated. If available, please attach your approved product list for this maintenance activity.

Material	Type or Brand Name	LIFE EXPECTANCY, YEARS Applied Below 32 °F Wet Hole	Applied Below 32 °F Dry Hole	Applied Above 32 °F Wet Hole	Applied Above 32 °F Dry Hole	Years That Material Has Been In Use
AC Hot Mix (Temporary)						
AC Hot Mix (Permanent)						
AC Cold Mix (Temporary)						
AC Cold Mix (Permanent)						
Epoxy						
Polymer						
PCC						
OTHERS:						

2. For each material listed above, please attach available specifications, standards, maintenance procedures, reports, or other information regarding the use of the material. Please note any significant variations for the installation procedures for any of these materials on the back of this page.

3. Describe any materials or procedures that you would consider "new" or "innovative" for spall repair of PCC pavements.

Please return this questionnaire to the address below by April 30. Thank you very much for your assistance and cooperation.

RETURN TO: ERES Consultants, Inc.
1401 Regency Drive East
Savoy, Illinois 61874
(217) 356-4500

MATERIALS AND PROCEDURES FOR JOINT RESEALING OF PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

1. List the joint sealing materials for PCC pavements that you have used and their estimated life expectancy (in years) for the application conditions indicated. If available, please attach your approved product list for this maintenance activity.

A. TRANSVERSE JOINTS

Material	Type or Brand Name	LIFE EXPECTANCY, YEARS Applied Below 40 °F Wet Joint	Applied Below 40 °F Dry Joint	Applied Above 40 °F Wet Joint	Applied Above 40 °F Dry Joint	Years That Material Has Been In Use
Asphalt						
Emulsion						
Cutback						
Rubberized Asphalt						
Silicone						
Fiberized Asphalt						
Compression Seal						

B. PCC LANE-AC SHOULDER JOINT

Material	Type or Brand Name	LIFE EXPECTANCY, YEARS Applied Below 40 °F Wet Joint	Applied Below 40 °F Dry Joint	Applied Above 40 °F Wet Joint	Applied Above 40 °F Dry Joint	Years That Material Has Been In Use
Asphalt						
Emulsion						
Cutback						
Rubberized Asphalt						
Silicone						
Fiberized Asphalt						

C. LONGITUDINAL PCC TO PCC JOINTS

Material	Type or Brand Name	LIFE EXPECTANCY, YEARS Applied Below 40 °F Wet Joint	Applied Below 40 °F Dry Joint	Applied Above 40 °F Wet Joint	Applied Above 40 °F Dry Joint	Years That Material Has Been In Use
Asphalt						
Emulsion						
Cutback						
Rubberized Asphalt						
Silicone						
Fiberized Asphalt						

2. For each material listed above, please attach available specifications, standards, maintenance procedures, reports, or other information regarding the use of the material. Please note any significant variations for the installation procedures for any of these materials on the back of this page.

3. Describe any materials or procedures that you would consider "new" or "innovative" for joint resealing of PCC pavements.

Please return this questionnaire to the address below by April 30. Thank you very much for your assistance and cooperation.

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1401 Regency Drive East
Savoy, Illinois 61874
(217) 356-4500

MATERIALS AND PROCEDURES FOR CRACK SEALING OF PORTLAND CEMENT CONCRETE (PCC) PAVEMENTS

1. List the crack sealing materials for PCC pavements that you have used and their estimated life expectancy (in years) for the application conditions indicated. If available, please attach your approved product list for this maintenance activity.

Material	Type or Brand Name	LIFE EXPECTANCY, YEARS Applied Below 40 °F Wet Crack	Applied Below 40 °F Dry Crack	Applied Above 40 °F Wet Crack	Applied Above 40 °F Dry Crack	Years That Material Has Been Used
Asphalt						
Emulsion						
Cutback						
Rubberized Asphalt						
Silicone						
Fiberized Asphalt						
Polymerized Asphalt						

2. For each material listed above, please attach available specifications, standards, maintenance procedures, reports, or other information regarding the use of the material. Please note any significant variations for the installation procedures for any of these materials on the back of this page.

3. Describe any materials or procedures that you would consider "new" or "innovative" for crack sealing of PCC pavements.

Please return this questionnaire to the address below by April 30. Thank you very much for your assistance and cooperation.

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1401 Regency Drive East
Savoy, Illinois 61874
(217) 356-4500

MATERIALS AND PROCEDURES FOR POTHOLE REPAIR OF ASPHALT CONCRETE (AC) PAVEMENTS

1. List the pothole repair materials (both temporary and permanent) for AC pavements that you have used and their estimated life expectancy (in years) for the application conditions indicated. If available, please attach your approved product list for this maintenance activity.

Material	Type or Brand Name	LIFE EXPECTANCY, YEARS Applied Below 32 °F Wet Hole	Applied Below 32 °F Dry Hole	Applied Above 32 °F Wet Hole	Applied Above 32 °F Dry Hole	Years That Material Has Been Used
AC Hot Mix (temporary)						
AC Hot Mix (permanent)						
AC Cold Mix (temporary)						
AC Cold Mix (permanent)						
Proprietary Cold Mix						

2. For each material listed above, please attach available specifications, standards, maintenance procedures, reports, or other information regarding the use of the material. Please note any significant variations for the installation procedures for any of these materials on the back of this page.

3. Describe any materials or procedures that you would consider "new" or "innovative" for pothole repair of AC pavements.

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Savoy, Illinois 61874
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MATERIALS AND PROCEDURES FOR CRACK SEALING OF ASPHALT CONCRETE (AC) PAVEMENTS

1. List the crack sealing materials for AC pavements that you have used and their estimated life expectancy (in years) for the application conditions indicated. If available, please attach your approved product list for this maintenance activity.

Material	Type or Brand Name	LIFE EXPECTANCY, YEARS Applied Below 40 °F Wet Crack	Applied Below 40 °F Dry Crack	Applied Above 40 °F Wet Crack	Applied Above 40 °F Dry Crack	Years That Material Has Been Used
Asphalt						
Emulsion						
Cutback						
Rubberized Asphalt						
Polymerized Asphalt						
Fiberized Asphalt						

2. For each material listed above, please attach available specifications, standards, maintenance procedures, reports, or other information regarding the use of the material. Please note any significant variations for the installation procedures for any of these materials on the back of this page.

3. Describe any materials or procedures that you would consider "new" or "innovative" for crack sealing of AC pavements.

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