Project No. E-20-647 (R6109-0A0)

Project Director: John Moskaluk

Director: John Moskaluk
Georgia Department of Transportation

Type Agreement: Task Order No. 5 under BOA #90

Award Period: From 3/1/86 To 4/1/87 (Performance) 1/1/87 (Reports)

Sponsor Amount:
Estimated: $ 93,750
Funded: $ 93,750

Cost Sharing Amount: $ 18,205

Title: Technology Transfer Program for Local Transportation Agencies (4th year Program)

ADMINISTRATIVE DATA

1) Sponsor Technical Contact:
   Sam Volo
   Georgia Dept. of Transportation
   Office of Materials & Research
   15 Kennedy Dr.
   Forest Park, GA 30050-2599
   363-7567

2) Sponsor Admin/Contractual Matters:
   Percy B. Middlebrooks, Jr.
   Chief, Operations Research Branch
   Office of Materials & Research
   15 Kennedy Dr.
   Forest Park, GA 30050-2599
   363-7567

Defense Priority Rating: N/A

Military Security Classification: N/A

REstrictions

See Attached N/A Supplemental Information Sheet for Additional Requirements.

Travel: Domestic travel requires sponsor approval where total will exceed greater of $500 or 125% of approved proposal budget category.

Equipment: Title vests with Sponsor. However, none proposed or anticipated.

COMMENTS:

Follow-on to Project E-20-624
GEORGIA INSTITUTE OF TECHNOLOGY

SPONSORED PROJECT TERMINATION/CLOSEOUT SHEET

Date 5-22-87

Project No. E-20-647

Includes Subproject No.(s) N/A

Project Director(s) M.J. Moskaluk

Sponsor Georgia Department of Transportation

Title Technology Program for Local Transportation Agencies (4th year Program)

Effective Completion Date: 4/1/87 (Performance) 4/1/87 (Reports)

Grant/Contract Closeout Actions Remaining:

☐ None

☒ Final Invoice or Final Fiscal Report

☒ Closing Documents

☒ Final Report of Inventions — Questionnaire sent to P.I.

☒ Govt. Property Inventory & Related Certificate

☐ Classified Material Certificate

☐ Other

Continues Project No. E-20-624 Continued by Project No. E-20-606

copies to:

Project Director
Research Administrative Network
Research Property Management
Accounting
Procurement/GTRI Supply Services
Research Security Services

Reports Coordinator (OCA)?:

Library
GTRC
Project File
Other Duane H.

Angela DuBose
Russ Embry

FORM OCA 69.285
### Project Objectives, Status, Progress

**PROJECT GOAL**: To communicate to local transportation agencies the availability and application of new technology that bridges the gap between research and implementation in the area of roadways, bridges, and transit.

**OBJECTIVES**:

- To enhance the existing programs of technology services of GDOT and Georgia Tech.
- To improve and further promote communication on technical transportation issues between GDOT/Georgia Tech and the local agencies.
- To help insure that appropriate technology consistent with the needs of the local agencies in mind is made available.
- To encourage implementation of effective procedures, practices, and materials at local levels.
STATUS: A report on the third year activities of the Center was completed and submitted to the Georgia DOT on March 10, 1986. Since then, the Center has responded to 43 requests for technical assistance, and prepared the Spring and Summer issues of Tech Trans. In addition, seven sessions of the Roadway Maintenance Workshop were held between April and June, 1986. A total of 332 participants from 57 counties and 87 cities attended the seven sessions. A statewide summary of the workshop is attached. A seminar on "Transportation Resource Management" was held at the Radisson Inn Hotel on April 17-18, 1986. The seminar was attended by 11 people.

WORK PLANNED FOR NEXT PERIOD: In response to several requests from local officials, the Center will build a videotape library to include training presentations on subjects of interest. The tapes will be made available to local agencies on free loan. Seven sessions of a workshop on Traffic Applications of Microcomputers is scheduled for August, 1986.

PROBLEMS: None

John Moskaluk, Director
Georgia Tech
Technology Transfer Center
WORK PLAN SCHEDULE

TECHNOLOGY TRANSFER PROGRAM
FOR
LOCAL TRANSPORTATION AGENCIES

<table>
<thead>
<tr>
<th>Research Tasks</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
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<tbody>
<tr>
<td>Task A: Compile &amp; Maintain Mailing List</td>
<td></td>
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<tr>
<td>Task B: Publish Quarterly Newsletter</td>
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<td>Task C: Provide Technology Transfer Materials</td>
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<td>AS REQUIRED</td>
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<tr>
<td>Task D: Provide Information Service</td>
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<td>AS REQUIRED</td>
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<tr>
<td>Task E: Conduct Seminars and Training Sessions</td>
<td>10 WORKSHOPS REQUIRED PER YEAR</td>
<td></td>
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<tr>
<td>Task F: Evaluate Effectiveness of Program</td>
<td>8 WORKSHOPS COMPLETED TO DATE</td>
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<td></td>
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</tbody>
</table>

| Approved Schedule | | |
| Work Completed Schedule | | |
ROADWAY MAINTENANCE WORKSHOP

APRIL - JUNE, 1986

SUMMARY

CONTENTS

Statewide
Gainesville
Tennille
Thomasston
Tifton
Jesup
Cartersville
Atlanta
# Roadway Maintenance Workshop

## Statewide Summary

<table>
<thead>
<tr>
<th>Workshop Locations and Dates Held</th>
<th>People Attending</th>
<th>Counties Represented</th>
<th>Cities Represented</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Gainesville</td>
<td>54</td>
<td>9</td>
<td>10</td>
</tr>
<tr>
<td>May 20-22, 1986</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Tennille</td>
<td>45</td>
<td>9</td>
<td>13</td>
</tr>
<tr>
<td>May 6-8, 1986</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Thomaston</td>
<td>50</td>
<td>10</td>
<td>17</td>
</tr>
<tr>
<td>May 13-15, 1986</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Tifton</td>
<td>50</td>
<td>11</td>
<td>14</td>
</tr>
<tr>
<td>April 29-May 1, 1986</td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>5. Jesup</td>
<td>55</td>
<td>9</td>
<td>16</td>
</tr>
<tr>
<td>April 22-24, 1986</td>
<td></td>
<td></td>
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<tr>
<td>6. Cartersville</td>
<td>13</td>
<td>4</td>
<td>3</td>
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<tr>
<td>May 27-29, 1986</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Atlanta</td>
<td>65</td>
<td>5</td>
<td>14</td>
</tr>
<tr>
<td>June 3-5, 1986</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>332</strong></td>
<td><strong>57</strong></td>
<td><strong>87</strong></td>
</tr>
</tbody>
</table>

- Percent of state's 159 counties represented: 35.85
- Average workshop: 47.4 persons, 8.1 counties, 12.4 cities
- Comparison to 1983/84 Roadway Maintenance Workshop:
  - 10.3% more persons (332 vs. 301)
  - 12.3% fewer counties (57 vs. 65)
  - 52.6% more cities (87 vs. 57)
**RESEARCH PROJECT PROGRESS REPORT**  
**DEPARTMENT OF TRANSPORTATION**  
**STATE OF GEORGIA**

<table>
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<tr>
<th>Project No.</th>
<th>Project Title</th>
<th>Report No.</th>
<th>Report Period</th>
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<tr>
<td>RTA-HPR(1)</td>
<td>TECHNOLOGY TRANSFER PROGRAM FOR LOCAL TRANSPORTATION AGENCIES</td>
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<td>from July 1, 1986 to December 31, 1986</td>
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<th>Project Director(s)</th>
<th>Funding Sources(s)</th>
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<tr>
<td>GEORGIA INSTITUTE OF TECHNOLOGY</td>
<td>M. JOHN MOSKALUK</td>
<td>100% FHWA FUNDING</td>
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<tr>
<td>ATLANTA, GEORGIA 30332</td>
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</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Starting Date</th>
<th>% Time Expended</th>
<th>Schedule Status</th>
<th>Completion Date</th>
<th>Funds Authorized</th>
<th>Funds Expended</th>
<th>Fiscal Year Funding</th>
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</thead>
<tbody>
<tr>
<td>March 1, 1986</td>
<td>100% TIME</td>
<td>On</td>
<td>December 31, 1986</td>
<td>$93,750</td>
<td>$81,818, 87%</td>
<td>Authorized $50,409, Expended, 54%</td>
</tr>
<tr>
<td>4/1/87</td>
<td>54%</td>
<td>Ahead</td>
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<table>
<thead>
<tr>
<th>Objectives, Status, Progress</th>
<th>Report Date 2/2/87</th>
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**PROJECT GOAL:** To communicate to local transportation agencies the availability and application of new technology that bridges the gap between research and implementation in the area of roadways, bridges, and transit.

**OBJECTIVES:**

- To enhance the existing programs of technology services of GDOT and Georgia Tech.
- To improve and further promote communication on technical transportation issues between GDOT/Georgia Tech and the local agencies.
- To help insure that appropriate technology consistent with the needs of the local agencies in mind is made available.
- To encourage implementation of effective procedures, practices, and materials at local levels.
STATUS: The three major tasks of the project are: conduct training seminars, publish a quarterly newsletter, and respond to requests for information and assistance. Four training workshops were held during 1986. A total of 930 participants attended the sessions and 3480 publications were distributed at the workshops. Four quarterly newsletters were published and a total of 7,100 copies of those newsletters were distributed. In addition, the Center received 23 requests for technical assistance and 410 requests for publications. Technical requests included assistance in such topics as drainage, road surface treatment, geotextiles, traffic signal timing, and downtown traffic circulation planning.

The Center has also assisted the GDOT Bureau of Public Transportation in the selection and specification of microcomputers for several local transit operations. Local agencies assisted are Albany, Athens, Augusta, Macon, and Savannah. For several agencies, microcomputer installation and training assistance was also provided.

PROBLEMS: None

__________________________
M. John Moskaluk, Director
Georgia Tech
Technology Transfer Center
### FOURTH YEAR WORK PLAN SCHEDULE

<table>
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<tr>
<th>Research Tasks</th>
<th>Months of the Year</th>
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<td>1 2 3 4 5 6 7 8 9 10 11 12</td>
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<td><strong>Task A:</strong></td>
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<tr>
<td>Compile &amp; Maintain Mailing List</td>
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</tr>
<tr>
<td><strong>Task B:</strong></td>
<td></td>
</tr>
<tr>
<td>Publish Quarterly Newsletter</td>
<td></td>
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<tr>
<td><strong>Task C:</strong></td>
<td></td>
</tr>
<tr>
<td>Provide Technology Transfer Materials</td>
<td>AS REQUIRED</td>
</tr>
<tr>
<td><strong>Task D:</strong></td>
<td></td>
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<tr>
<td>Provide Information Service</td>
<td>AS REQUIRED</td>
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<tr>
<td><strong>Task E:</strong></td>
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</tr>
<tr>
<td>Conduct Seminars and Training Sessions</td>
<td>10 WORKSHOPS REQUIRED PER YEAR</td>
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<tr>
<td><strong>Task F:</strong></td>
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<tr>
<td>Project Documentation Quarterly Progress Report</td>
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<tr>
<td>Evaluation Report</td>
<td>Final Report</td>
</tr>
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</table>
GEORGIA TECH
TECHNOLOGY TRANSFER CENTER

FOURTH YEAR
ANNUAL REPORT

Prepared By:
Georgia Tech
Technology Transfer Center

Submitted To:
Georgia Department of Transportation
Office of Materials and Research

MARCH, 1987

GEORGIA INSTITUTE OF TECHNOLOGY
A UNIT OF THE UNIVERSITY SYSTEM OF GEORGIA
SCHOOL OF CIVIL ENGINEERING
ATLANTA, GEORGIA
GEORGIA TECH
TECHNOLOGY TRANSFER CENTER

ANNUAL REPORT

MARCH, 1987

SCHOOL OF CIVIL ENGINEERING
GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30032
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<th>Page</th>
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<td>Background</td>
<td>1</td>
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<td>Center Activities</td>
<td>4</td>
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<td>Mailing list</td>
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<td>Publication list</td>
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<tr>
<td>Video Tape Library</td>
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<td>Workshops</td>
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<tr>
<td>Newsletters</td>
<td>7</td>
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<tr>
<td>Publication Distribution</td>
<td>8</td>
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<tr>
<td>Technical Assistance</td>
<td>8</td>
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<tr>
<td>Conclusion</td>
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</table>

### Appendices

#### Appendix A
- Mailing List
- Publication List
- Video Tape List

#### Appendix B - Newsletters
- Vol. 4 No. 1 - Winter 1986
- Vol. 4 No. 2 - Spring 1986
- Vol. 4 No. 3 - Summer 1986
- Vol. 4 No. 4 - Fall 1986
INTRODUCTION

The performance of the Georgia Tech Technology Transfer Center remained high during the fourth year of operations. The Center sponsored several training courses, published four quarterly newsletters, responded to numerous requests for technical information and publications.

This report presents counts and summaries of the units (i.e. publications distributed, workshops conducted, on-site visits, etc.), associated with each activity as maintained by the Center.

BACKGROUND

In Georgia, there are 159 county and 310 city jurisdictions that have been defined as local agencies to participate in the Technology Transfer to Local Transportation Agencies. All of these jurisdictions are included on the Center’s mailing list. In fact, many of the agencies are represented on the list by multiple individuals.

There is no standardized form of government for local agencies. For counties, the form can be one commissioner to a board of commissioners. Larger counties have a board of commissioners with 3 to 7 people on the board. Counties may or may not have a county manager. In the case of only one commissioner, there would be no manager. In fact, this elected official could be the roadway superintendent, the
garbage collection crew, as well as the motor grader operator. Small jurisdictions have a rather small agency budget with no budget dedicated to roadway maintenance or operation. Cities operate much like counties. The smaller the city, the smaller the budget, therefore, the smaller the roadway maintenance crew will be.

The GDOT has divided the State into 7 Districts. Each GDOT District is staffed with a District Engineer, Maintenance Engineer, Construction Engineer, Traffic Engineer and a Training Officer. Within any particular District, there are a number of counties for which the District has GDOT responsibility. In addition, there are District Resident Engineers which have GDOT responsibility for four to five counties. Resident Engineers work on a daily basis with their assigned counties. During the years, a strong working relationship has developed between the local agency staff and the GDOT District Engineers. Much of the technical assistance received by the local agencies occurs because of the omnipresence of the GDOT Engineers working in each District. Scheduled training courses (workshops) are not presented to local agencies by GDOT.

When the Center started its operation, it quickly realized the advantage of using the GDOT relationship with the local jurisdictions as a vehicle to get the Program underway and to began establishing credibility. To this end,
the Center has developed a strong working relationship with each District Engineer, GDOT liaison person (Mr. Sam Vollo) and with many other GDOT Engineers. Further, a strong working relationship has been established with the FHWA liaison person (Mr. Andy Hughes) and other FHWA staff.

Center activities are monitored by two committees. These committees are the Technical Advisory Committee and Policy Advisory Committee. The Technical Advisory Committee is composed of Mr. Andy Hughes (FHWA), Mr. Sam Vollo (GDOT) and M. John Moskaluk (Georgia Tech). The prime function of this committee is to oversee the daily activities of the Center and to provide guidance to the Center Director.

The Policy Advisory Committee is composed of Commissioner Thomas Moreland (GDOT), Mr. Thomas Stapler (GDOT), Mr. Louis Papet (FHWA), Mr. Erwin Kee (FHWA Advisory), Mr. Jerry Griffin (Association County Commissioners), Mr. James Burgess (Georgia Municipal Association), Dr. J. Edmund Fitzgerald (Georgia Tech), and the Technical Advisory Committee. The function of this committee is to provide policy guidance to both the Technical Advisory Committee and to the Center Director. For example, the final decision to conduct a particular workshop rests with the Policy Committee. Further, the committee deals with the broad issues about how the Center conducts
its business and determines if a particular issue is worthy of the Center's attention.

Center Staff consists of John M. Moskaluk, Center Director, and his assistant, Marty Milliner.

CENTER ACTIVITIES

The following is a brief description of the third year activities undertaken by the Center.

Mailing List

The mailing list has grown since March 1986 from approximately 1500 to over 1800 addresses. This represents a 20% increase. The Mailing List can be sorted by employee type, agency, and district category.

Included on the Mailing List are Street Superintendents, City and County Engineers, City and County Maintenance Personnel, Law Enforcement Officials, County Commissioners, Area Planning and Development Commissions (APDC's), State Legislators, City Mayors, County Road Advisors, Georgia District Engineers, Federal Coordinators, Technology Transfer Centers, and others.

The Center has during the past year updated the mailing list after obtaining current directories from the Georgia Municipal Association, Association County Commissioners, Georgia State Capitol, and the Federal Highway Administration.
Publication List

The Microcomputer software for the IBM-PC which was developed by the Center staff to maintain, update, revise, and print the mailing list has been improved to include the Center's publication list. This list currently includes over 308 publications and can be sorted by subject and author.

Video Tape Library

The Center is currently in the process of building a video tape library. At the present time, the Center has twenty-two video tapes (VHS) which may be borrowed two at a time for a two week basis. The tapes are loaned free of charge to anyone who requests them. Updates on available tapes are made in the newsletter.

Workshops

Workshops are the most important service provided by the Center. Therefore, discussions are held before each workshop with local officials, GDOT, FHWA, and others to evaluate topics of potential benefits to local agencies. These discussions, along with summaries of returned questionnaires, provide the Policy Committee with the necessary information to make the final decision on workshop topics. The workshop duration and schedule for all 7 Districts are then selected so that maximum participation
can be achieved. Finally, instructors are chosen from GDOT, FHWA, local agencies, or consultants. To date most of the workshop instructors have been GDOT personnel.

The criteria used in making each of the above decisions are shown below:

<table>
<thead>
<tr>
<th>DECISION</th>
<th>CRITERIA</th>
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<tr>
<td>Workshop topic</td>
<td>Potential benefits</td>
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<tr>
<td></td>
<td>Needs</td>
</tr>
<tr>
<td></td>
<td>Maximum participation</td>
</tr>
<tr>
<td>Duration</td>
<td>Maximum participation</td>
</tr>
<tr>
<td></td>
<td>Efficient coverage</td>
</tr>
<tr>
<td>Schedule</td>
<td>Maximum participation</td>
</tr>
<tr>
<td>Instructors</td>
<td>Knowledge of subject</td>
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<tr>
<td></td>
<td>Understanding of local agency needs</td>
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<td></td>
<td>Cost</td>
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</tbody>
</table>

Sixteen workshop sessions were held during the last year with a total attendance of 579 averaging 36 participants per workshop. The following is a list of the workshops and the corresponding number of participants:

<table>
<thead>
<tr>
<th>WORKSHOP TITLE</th>
<th>TIMES HELD</th>
<th>PARTICIPANTS</th>
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<tbody>
<tr>
<td>Microcomputers</td>
<td>- - - - - - - - 8 - - - - - - 195</td>
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<tr>
<td>Road Surface Management</td>
<td>- - - - - - - 1 - - - - - - 52</td>
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<tr>
<td>Roadway Maintenance</td>
<td>- - - - - - - 7 - - - - - - 332</td>
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Newsletters (TECH TRANS)

Four quarterly newsletters were published by the center and distributed as shown below:

<table>
<thead>
<tr>
<th></th>
<th>COPIES</th>
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<tr>
<td>Winter 1986</td>
<td>1650</td>
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<tr>
<td>Spring 1986</td>
<td>1800</td>
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<tr>
<td>Summer 1986</td>
<td>1800</td>
</tr>
<tr>
<td>Fall 1986</td>
<td>1850</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>7100</strong></td>
</tr>
</tbody>
</table>

The contents of each Newsletter include the following:

- **Editor's Note**: This column is devoted to informing the readers about what is happening at the Center and reporting on past events.

- **Articles**: Each Newsletter contains two or more articles. Topics for these articles are selected by the season of the year or by what events are occurring in the State.

- **Maintenance Tips**: Selected maintenance tips are published. Tips are obtained from the State maintenance personnel and from other publications.

- **Briefs, Trends, and Facts**: On the lighter side, several short newsworthy topics are published. Some of the items included under this heading are: historical facts, miscellaneous trends, general transportation related news, financial data, and humorous items.

- **Publications**: Newly obtained or previously not advertised research reports and articles are listed so that local agencies can obtain a copy by requesting it from the Center.

- **Meetings and Seminars**: A selective list of upcoming meetings, seminars, or conferences are listed so that the local agencies are aware of future events and can attend if they desire.

The newsletter has given the Center the opportunity to reach out to local officials and announce our services as
well as other Rural Technical Assistance Program (RTAP) services which are of great benefit to them.

Publication Distribution

Publications are distributed in two ways. 1) During seminars and workshops, publications related to the subject area are handed out to each of the participants. 2) Publications are sent by request to local officials. The same software used for the mailing list has recently been updated to maintain the Center’s publication list in order to speed up the retrieval of information when a request for publication is received. The Center has during the past year distributed 3890 publications.

Technical Assistance

The Center has during the past year responded to 36 requests for technical assistance. Requests for assistance are made during workshops, by telephone, or by mail.

Typical areas of technical assistance provided were in microcomputer applications in transportation, roadway surface treatment, signalized intersection analysis, drainage, highway geometric design, vehicle maintenance, risk management, pavement and roadway maintenance, and traffic control and operations. Responses to these requests were provided by telephone, by mail, or by on-site visits.
In addition to the technical assistance provided in response to the 36 requests made last year, the center assisted Georgia Transit Authorities in their microcomputer operations. This assistance was provided thru eleven on-site visits made by the Center Director, M. John Moskaluk, to the Cities of Albany, Athens, Augusta, Macon, and Savannah.

CONCLUSION

The general feeling among local officials in Georgia is that the Center provides needed services. These services allow local agencies to benefit from the latest advances in both technologies and methodologies.

Benefits of the Center's services are not realized by local agencies until these services had been rendered. Once an agency has taken advantage of a service provided by the Center, it always seeks additional assistance.

In most cases, local officials do not have an opportunity to learn about "better" techniques for conducting their everyday activities. The Center provides these officials with such opportunity by reaching out to them through newsletters and training courses. On the whole, the Center has been able to contribute to the betterment of transportation in the State of Georgia.

It is expected that more services will be provided by the Center during the next year. The Center is receiving
more requests for technical assistance, it is gaining momentum in establishing credibility with local agencies, and it still enjoys an excellent working relationship with FHWA and the Georgia DOT. A lot of work has yet to be completed. The Center is relatively young and is still growing.
APPENDIX A
MAILING LIST
<table>
<thead>
<tr>
<th>Name</th>
<th>Position</th>
<th>Address</th>
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<tbody>
<tr>
<td>JEROME WOODS</td>
<td>Police Chief</td>
<td>6960 MAIN ST., LITHONIA, GA 30058</td>
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<td>HON. ROY BARNES</td>
<td>District 33</td>
<td>4841 BROOKWOOD DR., MABLETON, GA 30059</td>
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<td>WILLIAM ANDREWS</td>
<td>Traffic Supervisor</td>
<td>CITY OF MARIETTA, 725 PAGE STREET MARIETTA, GA 30060</td>
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<td>HON. EARL E. SMITH CHM.</td>
<td>County Engineer</td>
<td>COUNTRY COURTHOUSE BOX 649 MARIETTA, GA 30060</td>
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<td>MR. JIMMY PRUITT</td>
<td>ASPH Super</td>
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<td>HON. JOE WILSON</td>
<td>District 20 POST 1</td>
<td>77 CHURCH ST., MARIETTA, GA 30060</td>
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<td>MS. SHARON BOX</td>
<td>Engineer</td>
<td>1624 SQUIRE DRIVE MARIETTA, GA 30060-575</td>
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<td>MR. DONALD GRIFFITH</td>
<td>C Cobb Co. RIDE SHARE COORD.</td>
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<td>MR. SAM SMITH</td>
<td>Mgr., COBB Co. AIRPORT</td>
<td>COBB COUNTY DOT PO BOX 649 MARIETTA, GA 30061</td>
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<td>BILL HUTSON</td>
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<td>HON. GEORGE DARDEN III</td>
<td>District 20 POST 3</td>
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<td>MR. JOHN W. WADE JR.</td>
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<td>COBB COUNTY D.O.T. PO BOX 649 MARIETTA, GA 30061</td>
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<td>COBB COUNTY D.O.T. PO BOX 649 MARIETTA, GA 30061</td>
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<td>MR. ART WINE</td>
<td>Div. Mgr./ROADS DIV.</td>
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<td>District 20 POST 2</td>
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<td>HON. JOHNNY ISAKSON</td>
<td>District 21 POST 2</td>
<td>3000 NORTHWOODS PARKWAY SUITE 330 MARIETTA, GA 30066</td>
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<tr>
<td>HON. W. L. MABRY</td>
<td>Mayor</td>
<td>517 ATLANTA ST., CITY HALL, ROSWELL, GA 30075</td>
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<tr>
<td>HON. WALTER REKUC</td>
<td>Director of P.W.</td>
<td>CITY OF ROSWELL 617 ATLANTA ST., ROSWELL, GA 30075</td>
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<tr>
<td>HON. LUTHER COLBERT</td>
<td>District 23</td>
<td>435 HOUSE WAY, ROSWELL, GA 30076</td>
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<td>HON. FRED EIKEN</td>
<td>District 21 POST 1</td>
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RAY ADAMS
ELECTRIC MEMBERSHIP CORP
155 TEMPLE RD.
P.O. BOX 629
CARROLLTON, GA 30117

SAM ROSAMOND
ROAD SUPERINTENDENT
CARROLL CO.
CARROLLTON, GA 30117

MAYOR TRACY STALLIONS
CITY OF CARROLLTON
P.O. BOX 1246
CARROLLTON, GA 30117

W. GEORGIA AREA OFFICE
GEORGIA TECH
201 TANNER STREET
P.O. BOX 676
CARROLLTON, GA 30117

DUDLEY CROSSON
PROGRAMS COORDINATOR
CITY OF CARROLLTON
P.O. BOX 1246
CARROLLTON, GA 30117

HON. TRACY TEAL
CARROLL CO. COMM.
P.O. BOX 338
CARROLLTON, GA 30117

HON. WAYNE GARNER
DISTRICT 30
25 AZALEA TR.
CARROLLTON, GA 30117

HON. GERALD JOHNSON
DISTRICT 70
P.O. BOX 815
CARROLLTON, GA 30117

MR. CHARLES FROST
TRAFFIC ENGINEER
P.O. BOX 1246
CARROLLTON, GA 30117

P. W. SUPERINTENDENT
P.O. BOX 529
CARTERSVILLE, GA 30120

CO. ROAD SUPERINTENDENT
P.O. BOX 543
CARTERSVILLE, GA 30120

MR. FELTON RUTLEDGE
DISTRICT ENGINEER
U.S. 41 SOUTH
CARTERSVILLE, GA 30120

HON. FRANK MOORE CHM.
BARTOW CO. COMM.
P.O. BOX 543
CARTERSVILLE, GA 30120

HON. ALEX T. DENT
MAYOR
P.O. BOX 648
CARTERSVILLE, GA 30120

HON. BOYD PETTIT III
DISTRICT 19
P.O. BOX 1256
CARTERSVILLE, GA 30120

CO. ROAD SUPERINTENDENT
COURTHOUSE
JACKSON, GA 30122

HON. JERRY WALLEY
MAYOR
P.O. BOX 65
CITY HALL
CEDARTOWN, GA 30125

STREET SUPERINTENDENT
P.O. BOX 65
CEDARTOWN, GA 30125

COUNTY ENGINEER
COURTHOUSE
CEDARTOWN, GA 30125

HON. JERRY WALLEY
MAYOR
P.O. BOX 65
CITY HALL
CEDARTOWN, GA 30125

MR. RICKEY O'NEAL
CONSTRUCTION INSPECTOR
PUBLIC WORKS
CUMMING, GA 30018

JIM REDMOND
COUNTY ENGINEER
RM 145 COURTHOUSE SD.
CUMMING, GA 30018

HON. LEROY HUBBARD CHM
FORSYTH CO. COMM.
P.O. BOX 128
CUMMING, GA 30018

HON. JERRY WALLEY
MAYOR
P.O. BOX 65
CITY HALL
CEDARTOWN, GA 30125

COUNTY ENGINEER
COURTHOUSE
CEDARTOWN, GA 30125

HON. JERRY WALLEY
MAYOR
P.O. BOX 65
CITY HALL
CEDARTOWN, GA 30125

MR. HARRY GRAVITT
MAYOR
201 OLD BUFORD ROAD
CITY HALL
CUMMING, GA 30018

HON. BILL BARNETT
DISTRICT 10
P.O. BOX 755
CUMMING, GA 30018

CO. ROAD SUPERINTENDENT
COURTHOUSE
DALLAS, GA 30132

HON. BILL BARNETT
DISTRICT 10
P.O. BOX 755
CUMMING, GA 30018

CO. ROAD SUPERINTENDENT
COURTHOUSE
DALLAS, GA 30132

HON. DONALD WATSON CHM.
PULASKI CO. COMM.
COUNTY COURTHOUSE
DALLAS, GA 30132

HON. CHARLES WATTS
DISTRICT 41
505 HARDEE ST.
DALLAS, GA 30133

HON. JIM FRANK SMITH CHM
HARALSON CO. COMM.
P.O. BOX 488
BUCHANAN, GA 30133

HON. CHARLES CAMP
MAYOR
P.O. BOX 219
CITY HALL
DOUGLASVILLE, GA 30133

HON. CHARLES CAMP
MAYOR
P.O. BOX 219
CITY HALL
DOUGLASVILLE, GA 30133

J. P. GOSSETT
POLICE CHIEF
P.O. BOX 213
DOUGLASVILLE, GA 30133

J. B. GOSSETT
PUBLIC SAFETY DIR.
CITY OF DOUGLASVILLE
P.O. BOX 813
DOUGLASVILLE, GA 30133

HON. CHARLES CAMP
MAYOR
P.O. BOX 219
CITY HALL
DOUGLASVILLE, GA 30133
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<td>MARY JO KLEINE</td>
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<td>HON. WAYNE PATTERSON</td>
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<td>H. L. Gossett</td>
<td>Director of P.W.</td>
<td>City of Riverdale, GA 30274</td>
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<td>Boyd Commings</td>
<td>Supt. of Water &amp; Sewer</td>
<td>City of Riverdale, GA 30274</td>
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<td>Richard Smith</td>
<td>Supt. of St. Maint.</td>
<td>City of Riverdale, GA 30274</td>
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<tr>
<td>Hon. Frank Bailey Jr.</td>
<td>Dist. 72 Post 5</td>
<td>P.O. Box 777, Riverdale, GA 30274</td>
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<tr>
<td>Jerry King</td>
<td>Police Chief</td>
<td>816 S. Atlanta St., Roswell, GA 30274</td>
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<tr>
<td>Mayor John Cooper</td>
<td>City of Senia</td>
<td>P.O. Box 104, Senia, GA 30276</td>
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<td>James Darrell Monroe</td>
<td>C.O.I.</td>
<td>Gwinnett County, GA 30278</td>
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<td>Hon. Emmett Clower</td>
<td>Mayor</td>
<td>2460 Main St., City Hall, GA 30278</td>
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<tr>
<td>Leland Adams</td>
<td>Public Transportation District Representative</td>
<td>Ga Dot, P.O. Box 711, Thomaston, GA 30286</td>
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<tr>
<td>Mr. Bobby Melton</td>
<td>District Engineer</td>
<td>GDOT District 3, P.O. Box 711, Thomaston, GA 30286</td>
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<tr>
<td>Hon. R. G. Kelley</td>
<td>Mayor</td>
<td>City of Stockbridge, GA 30281</td>
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<tr>
<td>Hon. Frank Sherrill</td>
<td>Mayor</td>
<td>City of Stockbridge, GA 30281</td>
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<tr>
<td>Hon. Charles Kersey</td>
<td>Mayor</td>
<td>P.O. Box 672, Thomaston, GA 30286</td>
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<td>Hon. W. F. Harris</td>
<td>District 27</td>
<td>1261 Willingham SFRS Rd., Thomaston, GA 30286</td>
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<td>Hon. Martin Adams</td>
<td>District 79</td>
<td>709 Greenwood Rd., Thomaston, GA 30286</td>
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<tr>
<td>Mr. Alton Dawson</td>
<td>Superintendent of Roads</td>
<td>Uspn County, P.O. Box 859, Thomaston, GA 30286</td>
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<tr>
<td>Mayor Mary Brown</td>
<td>City of Turin</td>
<td>P.O. Box 86, Turin, GA 30289</td>
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<tr>
<td>Mayor Homer Murdoch</td>
<td>Town of Tyrone</td>
<td>P.O. Box 262, Tyrone, GA 30290</td>
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<tr>
<td>Emerson Esterline</td>
<td>Union City Police</td>
<td>5047 Union St., Union City, GA 30291</td>
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<td>Mayor Bobby Fronebarger</td>
<td>Police Chief</td>
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<td>John Morris</td>
<td>Public Works Dir.</td>
<td>5047 Union St., Union City, GA 30291</td>
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<td>Hon. Bobby Brown</td>
<td>Mayor</td>
<td>P.O. Box 267, Woodbury, GA 30293</td>
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<td>Mayor Howard M. Rawlins</td>
<td>City Engineer</td>
<td>P.O. Box 385, Zebulon, GA 30295</td>
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<td>Mayor Marion E. King</td>
<td>P.O. Box 377, Zebulon, GA 30295</td>
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<tr>
<td>Mr. Brent Keller</td>
<td>Director of Public Works</td>
<td>P.O. Box 2371, Peachtree City, GA 30295</td>
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(Addresses and positions may vary by city and may not be exhaustive.)
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<tr>
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<td>MR. HERSCHEL CLARK</td>
<td>PROGRAM MANAGER</td>
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<td>MR. JOHN GREER</td>
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HON. RANDOLPH CARR
DISTRICT 109
P.O. DRAPER K
SWAINSBORO, GA 30401

HON. W. H. THOMAS CHM.
WHEELER CO. COMM.
COUNTY COURTHOUSE
ALAMO, GA 30411

HON. JOHN GODBEE
DISTRICT 110
401 LANE ST.
BROOKLET, GA 30415

CO. ROAD SUPERINTENDENT
COURTHOUSE
ALAMO, GA 30411

COUNTY ENGINEER
COURTHOUSE
CLAXTON, GA 30417

HON. WILLIAM DELOACH CHM.
EVANS CO. COMM.
COUNTY COURTHOUSE
CLAXTON, GA 30417

HON. BARRETT DELOACH
MAYOR
P.O. BOX 229
CITY HALL
CLAXTON, GA 30417

DAYNE DELOACH
WATER & SEWER SUP'T
CITY OF GLENNVILLE
134 S. MAIN ST.
GLENNVILLE, GA 30427

HON. JOSEPH KENNEDY
DISTRICT 4
P.O. BOX 246
CLAXTON, GA 30417

HON. CHARLIE ROWLAND
MAYOR
124 SOUTH MAIN ST.
CITY HALL
GLENNVILLE, GA 30427

HON. EMORY BARGERON
DISTRICT 108
P.O. BOX 447
LOUISVILLE, GA 30434

STREET SUPERINTENDENT
417 N. STATE ST.
LYONS, GA 30436

HON. WILLIS H. THOMAS
COMM. OF WHEELER CO.
P.O. BOX 181
ALAMO, GA 30411

HON. JOHN GODBEE
DISTRICT 110
401 LANE ST.
BROOKLET, GA 30415

HON. JOSEPH KENNEDY
DISTRICT 4
P.O. BOX 246
CLAXTON, GA 30417

HON. WILLIAM DELOACH CHM.
EVANS CO. COMM.
COUNTY COURTHOUSE
CLAXTON, GA 30417

HON. BILL THOMAS JR.
COUNTY ENGINEER
COURTHOUSE
CLAXTON, GA 30417

HON. JOHN GODBEE
DISTRICT 110
401 LANE ST.
BROOKLET, GA 30415
HON. JOE WOOD  
DISTRICT 9 POST 1  
P.O. BOX 1417  
GAINEVILLE, GA 30503

HON. BOBBY LAWSON  
DISTRICT 9 POST 2  
P.O. BOX 53  
GAINEVILLE, GA 30503

HON. EDGAR L. JENKINS US REP DIST 9  
301 GREEN ST  
PO BOX 1015  
GAINEVILLE, GA 30503

HON. LARRY CAUDELL  
GEORGIA DEPT. OF TRANS.  
P.O. BOX 1057  
GAINEVILLE, GA 30504

HON. JACK ERVIN  
DISTRICT 11 POST 2  
ROUTE 1 BOX 217  
BALDWIN, GA 30511

HON. CARLTON COLWELL DISTRICT 4 POST 1  
P.O. BOX 850  
BLAIRSVILLE, GA 30512

HON. RICHARD STANLEY CHM.  
FANNIN CO. COMM.  
P.O. BOX 487  
BLUE RIDGE, GA 30513

HON. CARLTON COLWELL  
DISTRICT 4 POST 1  
P.O. BOX 850  
BLAIRSVILLE, GA 30512

HON. GLEN GOOD  
UNION CO. COMM.  
COUNTY COURTHOUSE  
BLAIRSVILLE, GA 30512

HON. CHARLES MARTIN  
DISTRICT 60  
479 HILL ST.  
BUFORD, GA 30518

HON. OLIVE FORDE CHM.  
HABERSHAM CO. COMM.  
COUNTY COURTHOUSE  
CLARKESVILLE, GA 30523

HON. THOMAS HUGHES  
MAYOR  
30 GARNETT STREET  
BUFORD, GA 30518

HON. RON MILLER CHM.  
FRANKLIN CO. COMM.  
BOX 156  
CARNESVILLE, GA 30521

HON. OLIVE FORDE CHM.  
HABERSHAM CO. COMM.  
COUNTY COURTHOUSE  
CLARKESVILLE, GA 30523

HON. RICHARD STANLEY CHM.  
FANNIN CO. COMM.  
P.O. BOX 487  
BLUE RIDGE, GA 30513

HON. CHARLES MARTIN  
DISTRICT 60  
479 HILL ST.  
BUFORD, GA 30518

HON. OLIVE FORDE CHM.  
HABERSHAM CO. COMM.  
COUNTY COURTHOUSE  
CLARKESVILLE, GA 30523

ST. ROAD SUPERINTENDENT  
COUNTY COURTHOUSE  
CLARKESVILLE, GA 30523

HON. TONY RAMEY  
MAYOR  
P.O. BOX 702  
CLAYTON, GA 30525

HON. MAX WATTS CHM.  
RABUN CO. COMM.  
COUNTY COURTHOUSE  
CLAYTON, GA 30525

HON. WILLIAM DOVER DISTRICT 11 POST 1  
TIMBROOK ROUTE 2  
HOLLYWOOD, GA 30523

HON. THOMAS DOSTER MAYOR  
P.O. BOX 257  
CLAYTON, GA 30527

MR. LEWIS CANUP  
COUNTY ADM.  
HABERSHAM CO.  
PO BOX 927  
CLARKESVILLE, GA 30523

MR. CLIFTON RAMEY  
ROAD SUPT.  
RABUN CO.  
PO BOX 925  
CLAYTON, GA 30525

HON. LANIER CHAMBERS CHM.  
WHITE CO. COMM.  
COUNTY COURTHOUSE  
CLEVELAND, GA 30528

HON. LAUREN MCDONALD DISTRICT 12  
RT. 5 DOGWOOD TR  
COMMERCIAL, GA 30529

HON. HARRY STEPHENSON  
MAYOR  
P.O. BOX 348  
CLAYTON, GA 30525

CO. ROAD SUPERINTENDENT  
COUNTY COURTHOUSE  
CLAYTON, GA 30525

HON. WALTER SUTHERS DISTRICT 6  
P.O. BOX 789  
CARNESVILLE, GA 30521

HON. WILLIAM DOVER DISTRICT 11 POST 1  
TIMBROOK ROUTE 2  
HOLLYWOOD, GA 30523

HON. LAUREN MCDONALD DISTRICT 12  
RT. 5 DOGWOOD TR  
COMMERCIAL, GA 30529
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<tr>
<td>HON. DON HIGGINS</td>
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<td>LAVONIA, GA 30553</td>
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<td>CO. ROAD SUPERINTENDENT COURTHOUSE</td>
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Note: The table includes information about various local officials and their positions, along with their contact details and the cities and states they represent.
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<th>Title</th>
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<tr>
<td>HON. JAMES SPILLERS</td>
<td>MAYOR</td>
<td>P.O. BOX 476</td>
<td>BUTLER, GA 31006</td>
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<tr>
<td>MR. ROBERT P. GREY</td>
<td>CITY ENGINEER</td>
<td>CITY OF BYRON P.O. BOX 376</td>
<td>BYRON, GA 31008</td>
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<tr>
<td>HON. CHARLES KILLEBREW</td>
<td>MAYOR</td>
<td>P.O. BOX 8</td>
<td>COCHRAN, GA 31014</td>
</tr>
<tr>
<td>TOMMY TRUITT</td>
<td>PUBLIC WORKS SUPT.</td>
<td>CITY OF CULLODEN BOX 37</td>
<td>CULLODEN, GA 31016</td>
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<tr>
<td>HON. KENNETH McNEELY</td>
<td>MAYOR</td>
<td>P.O. BOX 534</td>
<td>DUBLIN, GA 31021</td>
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<tr>
<td>HON. ALBERT FRANKS</td>
<td>MAYOR</td>
<td>P.O. BOX 638</td>
<td>DUBLIN, GA 31021</td>
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<tr>
<td>HON. J. P. MARSHALL</td>
<td>MAYOR</td>
<td>P.O. BOX 191</td>
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<td>MR. ROBERT P. GREY</td>
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CO. ROAD SUPERINTENDENT 
COURTHOUSE
MCRAE, GA 31055

HON. GENE WILLIAMS
TELFAIR CO. COMM.
COUNTY COURTHOUSE
MCRAE, GA 31055

HON. CHESTER RYALS JR
MAYOR
P.O. BOX 157
CITY HALL
MCRAE, GA 31055

HON. RONNIE WALKER
DISTRICT 19
P.O. BOX 461
MCRAE, GA 31055

JOHN GAY
DIRECTOR
DEPT. OF GRANTS & RES
HOUStON COunTy
200 CARL VINSON PKY
WARNER ROBINS, GA 31056

MAYOR SAMUEL HOLLINSHE
P.O. BOX 63
MARSHALLVILLE, GA 3105

STREET SUPERINTENDENT
P.O. BOX E
MILLEDGEVILLE, GA 31061

T. W. COUCH
ROAD SUPER'T
BALDWIN COunTY
P.O. BOX 738
MILLEDGEVILLE, GA 31061

HON. CULVER KIDD
DISTRICT 25
P.O. BOX 370
MILLEDGEVILLE, GA 3106

HON. SAMMY HALL CHM.
BALDWIN CO. COMM.
COUNTY CORTHUSE, RM. 6
MILLEDGEVILLE, GA 31061

HON. JAMES BAUGH
MAYOR
P.O. BOX 1708
CITY HALL
MILLEDGEVILLE, GA 31061

HON. JAMES BAUGH
MAYOR
P.O. BOX 1708
CITY HALL
MILLEDGEVILLE, GA 31061

HON. BOBBY PARHAM
DISTRICT 105
P.O. BOX 600
MILLEDGEVILLE, GA 31061

MR. JIM GENTRY
EXECUTIVE DIRECTOR
OCONEE APDC
P.O. BOX 707
MILLEDGEVILLE, GA 31061

STREET SUPERINTENDENT
P.O. BOX 600
MILLEDGEVILLE, GA 31061

CO. ROAD SUPERINTENDENT
COURTHOUSE
MILLEDGEVILLE, GA 31061

HON. LEWIS MCKENZIE
DISTRICT 14
P.O. BOX 565
MONTEZUMA, GA 31063

STREET SUPERINTENDENT
P.O. BOX 269
MONTICELLO, GA 31064

HON. FRANK ATKINS CHM.
JASPER CO. COMM.
COUNTY CORTHUSE
MONTEZUMA, GA 31064

HON. LEWIS MCKENZIE
DISTRICT 14
P.O. BOX 565
MONTEZUMA, GA 31063

HON. HENRY HOOPER
MAYOR
115 E. GREENE ST.
CITY HALL
MONTICELLO, GA 31064

MAYOR FRANK KELLEY
CITY OF MONTEZUMA
SOUTH DOOLY STREET
MONTEZUMA, GA 31063

HON. LEWIS MCKENZIE
DISTRICT 14
P.O. BOX 565
MONTEZUMA, GA 31063

HON. JOHN M. LUCKIE
COUNTY BOARD OF COMM.
P.O. BOX 297
O.SLETHORPE, GA 31068

STREET SUPERINTENDENT
P.O. BOX 600
MILLEDGEVILLE, GA 31061

MR. F. MARION HAY
CITY MANAGER
CITY OF PERRY
P.O. BOX A
PERRY, GA 31059

MR. WAYNE CHAPMAN
TRAFFIC CONTROL
HOUSTON CO. BOARD OF C
2618 KINGS CHAPEL RD.
PERRY, GA 31069

HON. LEWIS WHEELS
MAYOR
P.O. BOX 312
OSLETHORPE, GA 31068

HON. HENRY HOOPER
MAYOR
115 E. GREENE ST.
CITY HALL
MONTICELLO, GA 31064

HON. FRANK ATKINS CHM.
JASPER CO. COMM.
COUNTY CORTHUSE
MONTEZUMA, GA 31064

CO. ROAD SUPERINTENDENT
COURTHOUSE
MONTICELLO, GA 31064

HON. ROBERT R. SCARHURST
COURTHOUSE
OSLETHORPE, GA 31068

MR. WAYNE CHAPMAN
TRAFFIC CONTROL
HOUSTON CO. BOARD OF C
2618 KINGS CHAPEL RD.
PERRY, GA 31069

MAYOR GEORGE C. GRIGGS
P.O. BOX 113
PINEMOURT, GA 31070

HON. LEWIS WHEELS
MAYOR
P.O. BOX 312
OSLETHORPE, GA 31068

HON. LARRY WALKER
DISTRICT 115
P.O. BOX 1264
PERRY, GA 31069

HON. LARRY WALKER
DISTRICT 115
P.O. BOX 1264
PERRY, GA 31069

HON. LEWIS WHEELS
MAYOR
P.O. BOX 312
OSLETHORPE, GA 31068

MAYOR JERRY WALKER
P.O. BOX 278
ROBERTA, GA 31078
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<td>Hon. Robert Fountain Chm.</td>
<td>BIBB Co. Engineer</td>
<td>County Court, Room 408</td>
<td>MACON</td>
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<td>Hon. Herbert Holston</td>
<td>AAA Director</td>
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<td>Hon. Mike Wolfe Chm.</td>
<td>Laurens Co. Comm.</td>
<td>P.O. Box 201</td>
<td>DUBLIN</td>
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<td>Hon. David Lucas</td>
<td>District 102</td>
<td>448 WOOLFOLK ST.</td>
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<td>Hon. Frank Pinkston</td>
<td>District 100</td>
<td>852 WALNUT ST.</td>
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<td>Mr. Charles Howell</td>
<td>Executive Director</td>
<td>Middle Georgia APDC 711 Grand Building</td>
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<td>City Engineer</td>
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<td>Linda Hampton</td>
<td>Services Director</td>
<td>Elder Americans Council of Middle Georgia</td>
<td>MACON</td>
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<td>S.S. Allen Busbee</td>
<td>Operations Officer</td>
<td>Bibb County 4500 Knight Rd.</td>
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<td>Bob Witherington</td>
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<td>Bibb Co. Comm. P.O. Box 4708</td>
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<td>Mr. Bill Wible</td>
<td>Traffic Engineer</td>
<td>P.O. Box 216</td>
<td>BLOOMINGDALE</td>
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<td>L. E. Owens</td>
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<td>Mr. Richard Moore</td>
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<td>HON. BOBBY PHILIPS</td>
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</table>
WALTER WACTER  
CHIEF DEPUTY  
LOWNDES CO. SHERIFF  
111 ROSEWELL DR.  
VALDOSTA, GA 31601

VICKIE ELLIOTT  
COMM. SERVICES COORD.  
P.O. BOX 1645  
VALDOSTA, GA 31601

HON. FRED DELOACH CHM.  
LOWNDES CO. COMM.  
BOX 1349  
VALDOSTA, GA 31601

HON. JAMES BECK  
DISTRICT 148  
2427 WESTWOOD DR.  
VALDOSTA, GA 31601

HON. LOYCE TURNER  
DISTRICT 8  
P.O. BOX 157  
VALDOSTA, GA 31601

JOHN LAWSON  
TRANSPORTATION PLANNER  
SOUTH GEORGIA APDC  
P.O. BOX 1223  
VALDOSTA, GA 31603

MARTY LEFLIES  
COMPTROLLER  
SOUTH GEORGIA APDC  
P.O. BOX 1223  
VALDOSTA, GA 31603

JARIE WALKER CHM.  
COOK CO. COMM.  
COUNTY COURTHOUSE  
ADEL, GA 31620

HON. ARLIE WALKER CHM.  
COOK CO. COMM.  
COUNTY COURTHOUSE  
ADEL, GA 31620

CO. ROAD SUPERINTENDENT  
COUNTY COURTHOUSE  
ADEL, GA 31620

WAYNE GIDDENS  
ASSISTANT PUBLIC WORKS  
CITY OF ADEL  
P.O. BOX 658  
ADEL, GA 31620

JOHN FLYTHE  
CITY MANAGER  
CITY OF ADEL  
P.O. BOX 658  
ADEL, GA 31620

HON. D. E. WEBB  
MAYOR  
102 SOUTH CHURCH ST.  
CITY HALL  
HAHIRA, GA 31632

HON. W. F. ROZEMAN  
MAYOR  
P.O. BOX 658  
CITY HALL  
ADEL, GA 31620

HON. JAMES SHAW  
MAYOR  
P.O. BOX 250  
CITY HALL  
MORVEN, GA 31638

HON. CHESTER DAY  
MAYOR  
P.O. BOX 711  
COUNTY COURTHOUSE  
HAHIRA, GA 31632

HON. JIM WHITE CHM.  
LANIER CO. COMM.  
COUNTY COURTHOUSE  
LAKELAND, GA 31635

HON. JERRY COFFEE  
MAYOR  
P.O. BOX 658  
CITY HALL  
LAKEVILLE, GA 31635

HON. JAMES SHAW  
MAYOR  
P.O. BOX 250  
CITY HALL  
LAKEVILLE, GA 31635

HON. DON PANTIN  
DISTRICT 149  
ROUTE 1 BOX 160  
LAKELAND, GA 31635

EVELYN BALDREE  
COMMUNITY SERVICE  
255 NORTH DAVIS  
NASHVILLE, GA 31639

HON. DEWEY HAND  
MAYOR  
P.O. BOX 455  
CITY HALL  
NASHVILLE, GA 31639

HON. JOE STALLINGS CHM.  
BERRY CO. COMM.  
P.O. BOX 446  
NASHVILLE, GA 31639

HON. HANSON CARTER  
DISTRICT 146  
P.O. BOX 711  
NASHVILLE, GA 31639

EVELYN BALDREE  
COMMUNITY SERVICE  
255 NORTH DAVIS  
NASHVILLE, GA 31639

HON. DEWEY HAND  
MAYOR  
P.O. BOX 455  
CITY HALL  
NASHVILLE, GA 31639

HON. JOE STALLINGS CHM.  
BERRY CO. COMM.  
P.O. BOX 446  
NASHVILLE, GA 31639

HON. HANSON CARTER  
DISTRICT 146  
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NASHVILLE, GA 31639
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<td>CO. ROAD SUPERINTENDENT</td>
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A BASIC ASPHALT EMULSION MANUAL
- THE ASPHALT INSTITUTE, 1980 115+ BOX
  Agency - 6  Subject - 6  Newsletter - 9

ABSTRACTS 1984
- UMTA , 1984 40+ 3
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ACCOUNTING WITH LOTUS 1-2-3
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APPLICATION OF ADHESIVES TO STEEL BRIDGES
- FHWA , 1984 176 1
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- HERPCC PURDUE UNIV, 1983 42 2
  Agency - 8  Subject - 9  Newsletter - 6

A WORLD OF TECHNOLOGY SHARING
- FHWA, 1984 64 1
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CANDIDATE SIGNAL WARRANTS FROM GAP DATA
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CENTRIFUGAL TESTING OF MODEL PILES AND PILE GROUPS
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CHECKLIST FOR PREPARING BASIC MOTOR GRADER
(29000 LBS. CLASS) SPECIFICATIONS
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IN POTHOLE REPAIR
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BRIDGE DECKS
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CONSUMER INFORMATION CATALOG
- CONSUMER INFORMATION CENTER, 1986 16 1
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COORDINATION OF TRANSPORTATION RESOURCES: THE GEORGIA EXPERIENCE
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DECAY IN WOOD BRIDGES
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DECISION PROCEDURES IN TRANSIT STATION DESIGN
- UNIV OF VIRGINIA, 1981 59 1
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DESCRIPTIONS OF TRANSIT MAINTENANCE MANAGEMENT INFORMATION SYSTEMS UMTA
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DESIGN EXAMPLES FOR STEEL BOX GIRDERs
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DETERMINATION OF PEAK DISCHARGE AND DESIGN HYDROGRAPHS FOR SMALL WATERSHEDS IN INDIANA
- PURDUE UNIV., 1964 106 1
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DEVELOPMENT OF A HIGH PRESSURE WATER JET FOR THE RAPID REMOVAL OF CONCRETE
- DAEDALEAN ASS INC. MD, 1983 52+ 1
  Agency - 6  Subject - 14  Newsletter - 0

DEVELOPMENT OF A MAINTENANCE MANAGEMENT SYSTEM FOR GA COUNTIES
- UNIV GA, 1975 59 1
  Agency - 11  Subject - 8  Newsletter - 0

DEVELOPMENT OF THE CALIFORNIA PAVEMENT MANAGEMENT SYSTEM VOL. 1
- CA DOT, 1978 198+ 2
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- CA DOT, 1978 59 1
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- CALTRANS, 1980 80+ 2
  Agency - 6  Subject - 10  Newsletter - 0

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- EXPERIMENTAL PROJECTS PROGRAM, 1984 21 1
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- CHARLES MACHINE WORKS, 1986 100+ 1
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DRAINAGE OF HIGHWAY PAVEMENTS
- TYE ENG INC VA, 1984 136 2
  Agency - 6  Subject - 13  Newsletter - 6

DURABLE PAVEMENT MARKING MATERIALS WORKSHOPS
- DINGLE ASS. INC DC, 1981 19 1
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DUST CONTROL ON UNPAVED ROADS
- PUDUE UNIV, 1983 18+ 1
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- UNIV KANSAS, 1983 28 1
  Agency - 12  Subject - 12  Newsletter - 0

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- FHWA, 1985 21 5
  Agency - 6  Subject - 2  Newsletter - 0

THE ROLE OF REHABILITATION IN TRANSIT FLEET REPLACEMENT
- PUGET SOUND COUN OF GOV, 1983 50+ 1
  Agency - 24  Subject - 1  Newsletter - 0
THICKNESS DESIGN ASPHALT PAVEMENTS FOR HEAVY WHEEL LOADS

- ASPHALT INST., 1986 72 1
  Agency - 35 Subject - 6 Newsletter - 0

TIEBACKS

- SCHNABEL FOUNDATION CO MARYLAND, 1983 219+ 1
  Agency - 6 Subject - 18 Newsletter - 0

TIEBACKS EXECUTIVE SUMMARY

- SCHNABEL FOUNDATION CO MD, 1982 15 1
  Agency - 5 Subject - 18 Newsletter - 0

TIME BASED COORDINATION UNIT
SPECIFICATIONS

- STORCH ENGS. CT, 1982 39 1
  Agency - 6 Subject - 20 Newsletter - 0

TRAFFIC CONTROL FOR STREET AND HIGHWAY CONSTRUCTION AND MAINTENANCE OPERATIONS

- BYRD TALLAMY MACDONALD & LEWIS VA, 1972 320+ 1
  Agency - 6 Subject - 2 Newsletter - 0

TRAFFIC CONTROLLER SYNCHRONIZER FIELD TEST EVALUATION

- OFF OF R&D, 1982 20+ 1
  Agency - 6 Subject - 10 Newsletter - 0

TRAFFIC DETECTOR HANDBOOK

- FHWA, 1985 318 1
  Agency - 6 Subject - 10 Newsletter - 0

TRAFFIC ENGINEERING SERVICES FOR SMALL POLITICAL JURISDICTIONS

- AMER PUB WORKS ASS, 1977 133 2
  Agency - 6 Subject - 10 Newsletter - 0

TRAFFIC SIGN HANDBOOK FOR LOW VOLUME RURAL ROADS

- NY DOT, 1985 103 1
  Agency - 32 Subject - 10 Newsletter - 0

TRAFFIC SIGNAL MAINTENANCE

- GA DOT, 1982 20+ 1
  Agency - 15 Subject - 10 Newsletter - 0
TRAFFIC SIGNAL OPTIMIZATION PROGRAMS
-A COMPARISON STUDY
- C LATERBLOD KANSAS, 1984 54 2
  Agency - 6  Subject - 10  Newsletter - 2

TRAFFIC SIGNAL TIMING A BIBLIOGRAPHY
- UNIV OF CALIF , 1983 20 1
  Agency - 19  Subject - 10  Newsletter - 0

TRAFFIC SIGNAL TIMING --BEFORE AND AFTER STUDIES: A BIBLIOGRAPHY
- UNIV CALIF , 1982 6 1
  Agency - 19  Subject - 10  Newsletter - 0

TRAFFIC STRIPE REMOVAL
- FHWA , 1980 50 1
  Agency - 6  Subject - 16  Newsletter - 0

TRANSIT MANAGEMENT WORKSHOP
- UNIV WIS , 1982 5 1
  Agency - 1  Subject - 1  Newsletter - 0

TRANSIT SUBSIDY ALLOCATION TECHNIQUES
- THE OMEGA GROUP INC. WASH DC, 1983 31+ 1
  Agency - 24  Subject - 1  Newsletter - 0

TRANSIT WORKS: 10 RURAL CASE STUDIES
- IND DOT , 1982 100 1
  Agency - 24  Subject - 1  Newsletter - 0

TRANSPORTATION ENERGY CONTINGENCY PLANNING:
QUANTIFYING THE NEEDS FOR TRANSIT ACTIONS
- NY DOT , 1983 111 1
  Agency - 24  Subject - 21  Newsletter - 0

TRANSPORTATION ENERGY PLANNING:
TRANSIT FUEL SUPPLIES UNDER DECONTROL
- CABOT CONS GROUP WASH DC, 1982 38 1
  Agency - 24  Subject - 21  Newsletter - 0

TRANSPORTATION ENERGY MANAGEMENT:
CURRENT TRANSIT OPERATOR ACTIVITIES
- METRO SEATTLE, 1982 24+ 1
  Agency - 24  Subject - 21  Newsletter - 0
TRANSPORTATION ENERGY MANAGEMENT:
TRANSPORT OPERATOR FACILITIES VOLUME 1 OFFICE GUIDE
- METRO SEATTLE, 1982 35 1
  Agency - 24 Subject - 21 Newsletter - 0

TRANSPORTATION ENERGY MANAGEMENT:
TRANSPORT OPERATOR FACILITIES VOLUME 2 FIELD GUIDE
- METRO SEATTLE, 1982 105 1
  Agency - 24 Subject - 21 Newsletter - 0

TRANSPORTATION INSTITUTIONAL BOTTLENECKS AND BARRIERS TO US EXPORTS THE PORT EXPERIENCE
- US DOT, 1984 157 1
  Agency - 24 Subject - 33 Newsletter - 0

TRANSPORTATION IN GEORGIA: 1983...A TURNING POINT
- GDOT, 1983 25 1
  Agency - 15 Subject - 27 Newsletter - 0

TRANSPORTATION OF HAZARDOUS MATERIALS
- PUBLIC TECH WASH DC, 1980 50 1
  Agency - 17 Subject - 3 Newsletter - 0

TRANSPORTATION NEEDS AND PROGRAMS SUMMARY
- PUBLIC TECH INC., 1982 283 1
  Agency - 24 Subject - 4 Newsletter - 0

TRANSPORTATION SYSTEMS MANAGEMENT IMPLEMENTATION AND IMPACTS
- CASE STUDIES US DOT, 1982 300+ 1
  Agency - 24 Subject - 1 Newsletter - 0

TRANSPORTATION SYSTEMS MANAGEMENT IMPLEMENTATION AND IMPACTS
- FINAL REPORT US DOT, 1982 115 1
  Agency - 24 Subject - 1 Newsletter - 0

TRANSPORTATION WORKPLACE SURVEY
- NAT ANALYSTS, 1981 300+ 1
  Agency - 15 Subject - 4 Newsletter - 0

TRENDS BEFORE THE SAN DIEGO TROLLEY
- SAN DIEGO, 1982 176 1
  Agency - 1 Subject - 1 Newsletter - 0
TRUSS RATING AND ANALYSIS PROGRAM TRAP JR
- RTAP TECH TRANSFER CENTER, 1986 100+ 2
  Agency - 40 Subject - 32 Newsletter - 16

UPGRADING DEFICIENT THROUGH TRUSS BRIDGES
- SHELDIA ASS. MD, 1983 122 2
  Agency - 6 Subject - 12 Newsletter - 4

URBAN TRANS PLANNING IN THE UNITED STATES: A HISTORIC OVERVIEW
- US DOT, 1986 143 1
  Agency - 24 Subject - 1 Newsletter - 0

USE OF UTPS FOR SUBAREA HIGHWAY ANALYSIS: A CASE STUDY
- USDOT, 1985 56 1
  Agency - 24 Subject - 32 Newsletter - 0

UTCS FUNCTIONAL HARDWARE SPECIFICATIONS HANDBOOK
- FHWA, 1986 100+ 2
  Agency - 6 Subject - 32 Newsletter - 16

USER-SIDE SUBSIDY PROGRAMS FOR SPECIAL NEEDS TRANSPORTATION
- UMTA, 1983 97+ 2
  Agency - 1 Subject - 1 Newsletter - 0

USER'S MANUAL MICROCOMPUTER PROGRAM FOR BRIDGE ANALYSIS AND RATING
- FHWA, 1985 100+ 2
  Agency - 6 Subject - 32 Newsletter - 16

VALUE ENGINEERING CONTRACT PROVISIONS ON FEDERAL-AID HIGHWAY CONSTRUCTION PROJECTS
- FHWA, 1984 24 1
  Agency - 6 Subject - 28 Newsletter - 0

VALUE ENGINEERING STUDY OF DRAINAGE MAINTENANCE
- FHWA, 1982 19+ 1
  Agency - 6 Subject - 13 Newsletter - 0

VEHICLE MAINTENANCE PRACTICES AMONG GRANTEES
- WASH DOT, 1981 27+ 1
  Agency - 24 Subject - 1 Newsletter - 0
VIDEO TAPE LIST
ST-201 The Winners--The Losers (13 minutes)
Safe use of lift trucks including inspection and hazards facing operators.

M-201 The Snowfighters (21 minutes)
Methods, procedures, and equipment for snow removal on streets and highways.

M-202 Down Is Up (20 minutes)
Preventive maintenance is stressed to reduce down time on construction sites.

M-203 The Choice Is Yours (18 minutes)
Preventive maintenance on diesel engines is stressed to get maximum life from the engine.

M-204 Signals: Read 'Em or Weep (20 minutes)
Indications of problems with equipment.

M-208 Roadway Maintenance Cost Analysis--Part I (50 minutes)
Discusses equipment costs including depreciation, fuel, oil, grease, maintenance, repair, and capital investment.

M-208 Roadway Maintenance Cost Analysis--Part II (50 minutes)
Discusses maintenance operating costs relating to labor, equipment, materials, and overhead.

M-209 Roadway Maintenance Cost Analysis--Part III (50 minutes)
Discusses the cost of deferred maintenance.

M-210 Roadway Maintenance Cost Analysis--Part IV (50 minutes)
Gives ideas on how to present budget data to county commissioners and city councils.

M-211 Maintenance of Highway Safety Hardware (45 minutes)
How to provide safe roadside environments through periodic maintenance of the road side and its safety hardware.

M-211 Maintaining Granular Surfaced Roads (18 minutes)
Instructional guide to enable road grader operators to provide better maintenance of granular surfaced roads.

Snow Removal on Iowa's Secondary Roads (20 minutes)
Instructional guide for snowplow operators for winter road maintenance of secondary roads.
M-212 **Ditchmaster** (10 minutes)
Demonstration of the ditchmaster, a cost effective machine for improving roadside drainage and maintenance.

**Lee-Boy Asphalt Maintainer** (15 minutes)
Demonstration of the Lee-Boy, an asphalt maintenance machine.

**Rosco Asphalite Maintainer** (15 minutes)
Demonstration of a pot hole repair machine.

M-213 **Techniques for Pavement Maintenance and Rehabilitation Using Asphalt--Part I**
**Introduction** (15 minutes)
Introduction to series of tapes dealing with using asphalt for pavement maintenance and rehabilitation.

**Asphalt Components, Materials, Tests and Basics of Design** (10 minutes)
Discusses the components of an asphalt paving structure from subgrade to the asphalt top.

M-215 **Techniques for Pavement Maintenance and Rehabilitation using Asphalt--Part III**
**Sealing of Joints in Portland Cement Concrete** (25 minutes)

**Surface Treatment of Pavement** (54 minutes)
Discusses objectives and methods of applying seal coats, spraying of liquid asphalt, surface condition variables, spraying oil onto pavement and spreading aggregate.

M-216 **Techniques for Pavement Maintenance and Rehabilitation Using Asphalt--Part IV**
**Cost Analysis** (20 minutes)
Discusses methods and strategies for determining which method of maintenance is needed. Cost analysis is emphasized.

**Recycling Procedures** (35 minutes)
Describes recycling procedures with asphalt and shows some of the equipment used.

DC-204 **Tied Concrete Shoulder** (10 minutes)
Shows construction of tied concrete shoulders, undersealing of existing pavement and full-depth repair of the pavement.

**Recycling D-Cracked Concrete Pavement** (12 minutes)
Discusses the reasons for the use of concrete recycling over conventional methods of construction.

Bonded Concrete Overlay (12 minutes)
Shows a bonded concrete overlay on existing concrete pavement.

DC-205 Interstate Reconstruction - Part I (12 minutes)
Recycling existing D-Cracked pavement as aggregate for new concrete pavement.

Whitetopping (7 minutes)
Discusses placing a concrete overlay on distressed asphalt concrete.

Design for Quality (12 minutes)
Shows recycling of concrete pavement and replacement with continuously reinforced concrete pavement, bonded concrete overlay and tied concrete shoulders.

DC-206 Interstate Reconstruction - Part II (13 minutes)
Shows add-on tied concrete shoulders, diamond grinding for smoothness and establishing new transverse joints.

Recycling Continuously Reinforced Concrete Pavement (10 minutes)
Shows the recycling of existing continuously reinforced concrete pavement as aggregate for new concrete pavement.

Unbonded Concrete Overlay (12 minutes)
Construction of a full-depth unbonded overlay over a reinforced concrete pavement.

DC-207 Testing of Asphalt Cement (24 minutes)
Procedures for various tests of asphalt cement including flashpoint, penetration, ductility solubility, spot softening point, specific gravity and thin film over tests.

Determination of Asphalt Content in Paving Mixtures (20 minutes)
Procedures for determining asphalt content for proper life and serviceability of asphalt cement.

Budgeting for Rehabilitation (25 minutes)
Present economic situation of restoring paved highways and evaluation of pavements for determination of priority for restoration.

Asphalt Emulsion Spray Applications (20 minutes)
Reasons for using asphalt emulsions, what constitutes asphalt emulsions, how they work, and processes for applying asphalt emulsions.

Aggregate Blends (40 minutes)
Demonstrates graphical procedure for blending
aggregate sources to meet proper specifications.

DC-208  AASHO Road Test
Construction and Materials (27 minutes)
Discusses materials and construction of extensive test facilities constructed in 1956 by AASHO to test different types of road surfacings, bases, bridges and methods of construction.
Pavement Research (37 minutes)
Objectives, methods, and principal results of pavement research in the AASHO Road Test.
The Road to Better Roads (14 minutes)
Summarizes the purposes and procedures of the AASHO Road Test and discusses what is being done today to improve roads.
APPENDIX B - NEWSLETTERS
The next time you are in Washington, D.C., you are invited to visit the Federal Highway Administration’s (FHWA) research laboratories at the Turner-Fairbank Highway Research Center (TFHRC). TFHRC is located approximately nine miles (15 km) north of the city on the George Washington Parkway.

The laboratories at TFHRC are used for in-house studies of chronic highway problems, quick response to emergency problems, and development of staff capabilities. These indoor and outdoor laboratories provide significant support to the five major research categories—highway operations, pavement technology, safety, traffic operations, and structures and hydraulics.

The laboratories in the Fairbank Building are:

- **Aerodynamics Laboratory.** The George S. Vincent Memorial Wind Tunnel has been modified to test scale models of suspension and cable-stayed bridges under controlled laminar or turbulent flow conditions. Through the use of the wind tunnel, researchers can check new designs of suspended bridges as well as investigate the aerodynamic behavior of existing long span bridges.

- **Concrete Technology Laboratory.** In this laboratory, reinforced concrete bridge corrosion problems are researched, test samples are made for a unique outdoor bridge deck exposure site, and special concrete mixture designs are tested.

- **Bituminous Mixtures Laboratory.** The laboratory is used to perform and determine suitability of mix designs for asphalt concrete using various mixing and compaction procedures; analyze in service asphalt concrete pavements by extraction, recovery tests, and other measurement methods; evaluate the water damage susceptibility of asphalt-aggregate combinations; and determine the effectiveness of various laboratory testing procedures and their relations to field performance.

- **Chemistry Laboratory Complex.** This complex consists of the Chemistry; Spectroscopy and Chromatography; Paint and Coatings; Electron Microscopy; and Asphalt Testing Laboratories, which are dedicated to staff research and providing solutions to unique technical problems submitted on a quick-response basis by state highway agencies and FHWA field and headquarters units.

- **Concrete Technology Laboratory.** In this laboratory, reinforced concrete bridge corrosion problems are researched, test samples are made for a unique outdoor bridge deck exposure site, and special concrete mixture designs are tested.

The laboratories in the Turner Building are:

CONTINUED ON PAGE 6
NEWS BRIEFS

The 1985 American Public Works Association's (APWA) Distinguished Service Award went to Ray Barnhart, Administrator, Federal Highway Administration. Barnhart is the fifth person to receive this award since its first presentation in 1972.

According to the Federal Highway Administration (FHWA), the nation's highway system will require $16.5 billion a year through the turn of the century to maintain 1983 road conditions. The figures do not include additional $10 billion a year for bridge repairs.

The Road Information Program (TRIP) estimates that driving over bad roads costs the average driver an extra $210 annually. This is equivalent to a total additional cost exceeding $30 billion a year. Waste fuel accounts for approximately 78 percent of the additional cost.

The latest technology in road testing is a machine that uses laser to measure the roughness, ruts, cracks, surface texture, and cross profiles of pavements. This Swedish-built machine uses two microcomputers to record data as minute as cracks a tenth the width of a fingernail. Used in Oakland, California to test 822 miles of streets, the machine has saved the city over $300,000.

Three communities, two in Virginia and one in California, received Grand Awards from the American Automobile Association (AAA) for their efforts in Pedestrian Protection. The AAA Grand Award was given to Henrico County and the city of Marion, Virginia, and to the city of San Jose, California.

EDITOR’S NOTE

This is the first TechTrans issue of 1986, and as you probably have noticed its color has changed. TechTrans will keep this color throughout 1986.

During the past year, the Georgia Tech Technology Transfer Center conducted various workshops, responded to numerous requests for technical assistance, and distributed over 6,000 newsletters. We hope that 1986 will be a more productive year for the Center and for your agency.

The following is a summary of the Center activities during 1985.

WORKSHOPS

<table>
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<th>Title</th>
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<td>Rights-Of-Way Acquisition</td>
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<tr>
<td>Hydraulics</td>
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<tr>
<td>Geotextiles</td>
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<td>Inform Traffic Control Devices Manual</td>
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<td>Bridge Rehabilitation</td>
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Total Participants = 547

TECHNICAL ASSISTANCE

The Center responded to 29 requests for technical assistance.

NEWSLETTERS

Copies Distributed

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<td>19</td>
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<tr>
<td>City of Waycross</td>
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<td>9</td>
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Total Counts = 144
MAINTENANCE TIPS

ABUTMENT REPAIR

Abutment repair is needed when cracks occur at abutments, endwalls, wingwalls, and/or retaining walls. These cracks are the result of base settlement, improper construction techniques, and/or weather deterioration. They are found in bridges with heavy loads or within a year after construction of a new structure.

Abutment cracking is not a severe problem when it is properly repaired and maintained. If not repaired, structural failure may occur, forcing closure of the bridge and extensive structural repairs. The repair method is outlined below.

CREW REQUIRED

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<td>Laborers</td>
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EQUIPMENT REQUIRED

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<td>Air compressor</td>
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MATERIAL REQUIRED

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<th>Cement/sand/aggregate</th>
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<tbody>
<tr>
<td>Lumber</td>
<td>Lumber</td>
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</table>

REPAIR PROCEDURE

1. Place signs and other safety devices.
2. Remove material from around section to be repaired.
3. Apply bonding agent (neet cement can be used).
4. Replace deteriorated section with concrete.
5. Cure and rub new concrete.
6. Clean up area and remove signs.

-----------------------------------------------

STRUCTURAL PAINTING

Structural painting is needed when there is bridge deterioration due to lack of painting or general unsightliness due to vandalism.

Steel structural members of bridges should be painted every 6-8 years to prevent deterioration and ultimate structural failure. Intermittent painting may be required to correct damage caused by vandalism. While lack of painting over periods exceeding 8 years may create a deficiency, damage by vandalism does not lead to a severe deficiency.

The proper method of painting bridge structures is described below.

CREW REQUIRED

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</tr>
<tr>
<td>Laborers</td>
<td>2</td>
</tr>
<tr>
<td>Flagmen</td>
<td>2</td>
</tr>
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</table>

EQUIPMENT REQUIRED

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</tr>
</thead>
<tbody>
<tr>
<td>Dump truck</td>
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</tr>
<tr>
<td>Air compressor</td>
<td>1</td>
</tr>
<tr>
<td>Sandblaster</td>
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<tr>
<td>Paint sprayers</td>
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</table>

MATERIAL REQUIRED

<table>
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<th>Sand</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paint</td>
<td>Paint</td>
</tr>
</tbody>
</table>

REPAIR PROCEDURE

1. Place signs and other safety devices.
2. Position scaffold.
3. Sandblast only area that can be primed on same day.
4. Apply primer.
5. Allow drying time. Apply finish coat.
6. Remove scaffold and clean up.

-----------------------------------------------
MICROCOMPUTERS, MODEMS HELP ELIMINATE TRAFFIC JAMS

Microcomputers and modems can improve traffic flow and reduce congestion for motorists nationwide. For example, one closed-loop system, using a microcomputer and a modem, helps monitor traffic flow at key intersections. When traffic patterns change because of rush hour or other reasons, the system changes the timing of traffic signals to accommodate the increased traffic. The signals can be changed automatically according to either the time of day or the amount of traffic passing through the intersection. Signals can also be set manually by means of the microcomputer from a central location.

The system saves motorists the time and frustration of traffic jams and helps regional planning by giving officials information on traffic growth and problems.

The system is composed of three elements: local signal controllers, on-street "masters," and a centrally located Apple IIe microcomputer. The local signal controllers are linked with the "master" by two pairs of dedicated cable while masters communicate with the central microcomputer using a Hayes Micromodem IIe over standard dial-up lines.

The local signal controllers use up to eight sensors embedded in the roadway to detect the volume and speed of traffic. The information is transmitted to a master, which then changes the timing of traffic lights to maintain traffic flow. The timings are set from a library of 60 traffic patterns based on the time of day and sensor data.

The master continually monitors up to 60 local controllers to ensure that they are working properly and that traffic is moving well. Whenever a traffic signal goes out or other malfunctions occur, an error message is sent through the modem to the microcomputer in the central office. In many cases, the traffic engineers can correct the malfunction by sending a signal back to the master. If the controller still does not work, maintenance personnel can be sent to the scene. In the meantime, faulty traffic signals automatically begin flashing.

Gwinnett County, a suburb northeast of Atlanta, has supplemented the fail-safe mechanism with a device that "pages" a repairman. When a local controller fails, the modem dials a paging service, which then relays a 10-digit code to a technician. The code tells the technician both the location and cause of the problem, according to James Gwias, traffic signal engineer for the county.

"The use of computers to control traffic flow is not new," says Joe Thomas, chief traffic engineer for the city of Atlanta. "What's new is the use of a microcomputer and a modem to do a job that used to be done by a mainframe.

In Atlanta, the closed-loop system is currently installed at Hartsfield International Airport and in the Cleveland Avenue neighborhood. The system was installed at the Atlanta airport to accommodate both the unpredictable nature of peak air travel arrivals and departures and employee shift changes resulting from round-the-clock operations. Atlanta is also planning to install another system in the northern part of the city.

The system was first installed in Atlanta in February, 1984, and has been working well, Thomas reports. "At first we had doubts whether the system could withstand the rigors of operating on the street," he said. "In the summer, temperatures inside the master control box hit 130°F and fall to -8°F in the winter. But we've never had a failure with the modem and are extremely pleased with its performance."

How do you determine if your streets are clean? At the 91st Annual APWA Congress in Los Angeles, this question was raised in a meeting involving contractors and city officials. One official said "they are clean if I say they are clean." Another stated that street cleanliness was measured by the number of complaints they received. Some felt that the frequency with which the streets are swept determined the cleanliness. It is difficult to measure street cleanliness. The fact that leaves have fallen or mud and sand have washed into the streets or litter is up to the curb tops is fairly obvious, but does little to determine the cleanliness level or to compare the cleanliness of one section of town to others. When Savannah decided they wanted an equal level of street cleanliness throughout the city, it was apparent that some reliable measure had to be devised to quantify those levels. Savannah's Equal Cleanliness System has been in operation for three years and the rating of the cleanliness level of streets is the key to success.

Savannah is divided into Planning Units for purposes of comparing cleanliness levels in different parts of the city. Every curbed and paved street within each of the planning units is scheduled for sweeping a weekly, bi-weekly, or monthly day-time schedule or a weekly, twice a week, or four times a week night-time schedule. The schedules are set up according to predicted and in order to achieve equal cleanliness. The schedules are rewritten if one area of town is rated lower than the others.

The rating system is complex and time consuming, but necessary if equal levels of cleanliness is to be obtained. A separate schedule is written annually so that every curbed and paved street is rated once during the year. Four days a week, the day-time supervisor rates approximate ten streets. The rater has pictures and descriptions of cleanliness levels with zero as the worst and four as the best. Except when the supervisor is sick or on vacation, no one else rates the streets. Each street is rated halfway between the time it was last swept and the time it is scheduled to be swept next. Representative streets from all planning units are rated each quarter and trends are plotted to determine which areas need more or less attention.

The goal is to have all the curbed and paved streets in each Planning Unit at the 3.0 level. Special attention is given to neighborhoods with ratings significantly below 3.0, and sweeping frequencies are changed if they remain low.

Changes in schedules are not made based on any one quarterly rating. The ratings fluctuate in a fairly predictable pattern throughout the year depending on rainfall patterns, wind patterns, and leaf fall patterns. Neighborhoods that are being monitored are compared during the same quarter of two successive years, since the conditions are assumed to be similar.

Whenever unpredictable rainfall patterns are encountered, it is extremely difficult to make a statistical determination of the cause of a low quarterly rating in any given neighborhood. During period of unseasonable heavy rain and wind, all neighborhoods fall below the predicted rating for that quarter.

The leaf fall pattern varies from year to year. If we have heavy winds when the leaves first start to fall, they pile up deep and are extremely difficult to sweep up. The result is low ratings for a short

CONTINUED ON PAGE 8 COL. 1
Environmental Instrumentation Laboratory. Designed to operate in conjunction with a mobile field measuring laboratory, the laboratory serves principally to develop instrumentation systems for traffic noise research and analysis of field data using noise simulation models and desktop computer systems.

Human Factors Laboratory. Fundamental studies conducted in this laboratory evaluate the potential effectiveness of new or modified traffic control devices through improvements in conspicuity, legibility, and message identification and comprehension.

Highway Driving Simulator (HYSIM) Laboratory. HYSIM, a first generation, fully interactive research simulator, is used to evaluate drivers' reactions to new or modified highway signs, signals, markings, or other traffic control devices; measure driver performance in various roadway situations and environmental conditions; and review the relative effectiveness of developmental traffic control systems.

Highway Electronics Laboratory. This laboratory is used to conduct staff studies and provide electronic support to the Offices of RD&T and other elements of FHWA; to develop prototype traffic control devices; and to design, fabricate, and maintain specialized instrumentation systems for other laboratories at the TFHRC.

Hydraulics Laboratory. A 6-ft x 70-ft (1.8 m x 12.3 m) tilting flume with a 15-ft³/s (0.42 m³/s) flow capacity is used for scale modeling of highway drainage design problems associated with large drainage structures and culverts, storm water runoff from highways or adjacent watersheds, and streambed stability near bridge piers.

Pavement Performance Laboratory. Evaluations of both pavement material components and full-scale pavement sections are conducted in this laboratory to verify design procedures and develop predictive design equations.

Roadside Safety Library (RSL). This data library serves as a central clearinghouse for all analysis, design, and testing information related to highway safety appurtenances.

Structures Laboratory. This laboratory permits environmentally controlled static and dynamic load experiments of large-scale bridge models or full-scale bridge sections or components to identify and solve serviceability and load capacity problems of highway bridges and to evaluate new concepts for inspecting, strengthening, and rehabilitating bridges and increasing their load capacity.

The outdoor laboratories are:

Bridge Foundation Test Facility. This is a foundations testing facility for evaluating new design and construction concepts for spread footings and pile foundations.

Federal Outdoor Impact Laboratory (FOIL). This specialized crash impact testing facility is used for inexpensive physical testing of sign and luminaire supports using a reusable "bogie" test vehicle.

Pavement Test Facility. This facility is for accelerated mechanical testing of pavements to determine their field performance.

In addition, TFHRC houses the following general support facilities: the RD&T Computer Center; a mechanical design and fabrication shop; the RD&T Report Center; the Technical Reference Section; a vehicle preparation area in which vehicle data collection instrumentation systems or special test vehicles are developed, calibrated, and maintained; and the Technology Laboratory to determine better methods for timely technology transfer and to establish improved methods for using microcomputer technology and communicating new technology to field users.
TRAFFIC ENGINEERING SERVICES FOR SMALL POLITICAL JURISDICTIONS

The report, Traffic Engineering Services for Small Political Jurisdictions, describes several ways in which smaller jurisdictions, less than 50,000 population, can obtain traffic engineering services. The more beneficial and productive methods for obtaining these needed services are:

1. Increasing emphasis on training programs for in-house staff.
2. Increasing emphasis on the use of in-house traffic engineering technicians, supplemented by outside professional level traffic engineers.
3. Using regional or "circuit" traffic engineers who serve a number of jurisdictions on a part-time or as-needed basis, and who may be funded by a consortium of local jurisdictions, or by any combination of funding sources.
4. Using traffic engineers employed by larger jurisdictions and State agencies by formal contract or other type of agreement.
5. Using private traffic engineering firms on an as-needed basis.
6. Using college and university traffic engineering professionals.
7. Using automobile associations, insurance companies, service clubs, and the media to gain support of the citizenry for improved services.
8. Seeking an exchange of ideas and possible solutions to problems or attending professional association meetings, seminars, and workshops.

A copy of this report, FHWA-RD-77-6, may be obtained from this Technology Transfer Center. Additional information about the findings of this report may be obtained from Mr. Howard H. Bissell, Traffic Safety Research Division, 12-50, 6302 Georgetown Pike, McLean, Virginia 22101; Mr. Bissell's telephone number is (703) 285-2428.
period of time. A steady leaf fall over a long period results in low ratings over the entire period.

In analyzing the results of the ratings, it is important to look for trends over a long period of time. The need for change in a particular neighborhood that is rated low every quarter is easy to recognize. The neighborhoods that get statistically close to 3.0 must be closely monitored and the seasonal variations considered before schedule changes are made.

In order for a rating system to work, every paved and curbed street must be scheduled for sweeping and must be swept when it is scheduled. This can only be accomplished if the department responsible for sweeping has enough personnel and equipment to meet the schedules every single sweeping day. The cooperation of the Maintenance Department is essential. Sweepers must receive priority maintenance. They must be repaired as soon as they break down, even if the repairs must be made on weekends. The parts historically required to keep sweepers operating must be purchased and stocked locally.

How clean are your streets? Do you have a way to measure the levels of cleanliness and document the results? Are steps taken to increase sweeping in areas that do not meet the minimum standards? Is your city willing to invest the money required to attain a high level of cleanliness in all areas of the city? If equal levels of cleanliness are important in your city, all these questions need to be addressed and answered. Savannah is committed to equal cleanliness at a high level, and the rating system current in use is the key to successful accomplishment of our goal.

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pretimed controllers, attention turns to synchrolizers and the concept of the background cycle as the foundation for learning the operation of advanced traffic-adjusted systems. Other topics include system features of NEMA controllers, before and after studies of effectiveness, communication-system technology, sensor location, zone delineation, and others.

There will be six hours of hands-on workshop sessions, supplemented by several written work problems, two field trips, and several films. Also each participant receives a computer solution of the optimal timing of an arterial of his or her own.

REGISTRATION

The fee for the course is $550. This amount includes all necessary classroom materials. For registration information write to: Department of Continuing Education, Georgia Institute of Technology, Atlanta, Georgia 30332-0385. Telephone, 404/894-2400

ACKNOWLEDGMENT

The Technology Transfer (T^2) Program is a nationwide effort financed jointly by the Federal Highway Administration and individual State Departments of Transportation. Its purpose is to translate into understandable terms the latest state-of-the-art technologies in the areas of roads, bridges, and public transportation, to local and county highway and transportation personnel.

The T^2 Center at (Georgia Tech) is sponsored by the Georgia Department of Transportation and provides information and counsel to more than 500 municipalities and counties in our state. This newsletter is designed to keep you informed about new publications, new techniques, and new training opportunities that may be helpful to you and your community. Individuals wishing to receive future copies of this newsletter at no cost may send their requests to Mr. John Moskaluk, School of Civil Engineering, Georgia Tech, Atlanta, Georgia 30332.
PORTLAND CEMENT ASSOCIATION COURSE

Troubleshooting Concrete Field Problems
April 7-11, 1986
Skokie, Illinois

Cement and concrete industry customers and technical problem-solving personnel will benefit from this Portland Cement Association class.

The course is designed especially for those responsible for handling field problems for contractors, precasters, inspection and testing agencies, architects, and federal, state, county and city engineering departments. It will focus on identifying and discussing problems of durability, ready mix concrete production and transportation, admixture use, concrete placement, fabrication and construction and precast prestressed concrete structures, slabs on grade, quality control procedures, strength test evaluation, repair and maintenance of concrete surfaces and structures, and ways to determine in-place concrete strengths.

The five-day course will be conducted at the Portland Cement Association Cement and Concrete Center, Skokie, Illinois. Enrollment is limited to 28 to assure individual attention. The registration fee is $975.

For more information, contact the registrar, Educational Services Department, Portland Cement Association, 5420 Old Orchard Road, Skokie, Illinois 60077 - Telephone (312) 966-6200.

The Fourth International Conference on Low-Volume Roads
August 16-20, 1987
Ithaca, New York

This five-day conference provides an opportunity for the exchange of up-to-date information on research that is applicable to the problems of low-volume roads. The conference is sponsored by the Transportation research Board (TRB), National Research Council and is held once every four years. The previous conference was held in Tempe, Arizona and was attended by over 185 people, representing nearly all of the states in the U.S. plus 20 foreign countries.

A meeting announcement and a call for papers will be published before the end of the year. If you are not a member of TRB, but you would like to receive the meeting announcement, write to Neil Hawks, Transportation Board, 2101 Constitution Avenue N.W., Washington, DC 20418 - Telephone (202) 334-2957.

Traffic Signal Operation in Coordinated Systems
March 17-21, 1986
Atlanta, Georgia

This Workshop will be held at the Traffic Signal Laboratory of the School of Civil Engineering - Georgia Institute of Technology, Atlanta. Dr. Peter S. Parsonson, Ph.D., P.E., a professor at Georgia Tech, will direct the workshop assisted by Mr. Joe Thomas, Chief, City of Atlanta Traffic Engineering Division.

The workshop is open to nationwide enrollment and aimed at professional engineers and signal-design technicians. It begins with the construction of time-space diagrams, manually and by computers, for preferential and balanced flows, and then proceeds to the methods for implementing these time-space relationships on the street by means of various types of controllers, coordination units of computer software. After the treatment of the coordination of
The following publications are available free from the Georgia Tech Technology Transfer Center. If you would like to have any of these publications, please let us know. You can call the Center at (404) 894-2360 or 1-800-282-1275.

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STREET MAINTENANCE BEGINS WHEN CONSTRUCTION ENDS

by Joe D. Hindman
Public Service Director, City of Hapeville

When a city street construction project has been completed, accepted from the contractor, and final payment has been made to him, a new facility is available for use by the traveling public. By the same token, a new responsibility is created to preserve the new investment and to serve and protect the interests of the traveling public. This is true not only of newly constructed streets but also for all streets of our cities and towns. Sudden failures, damage by storms, gradual deterioration, and unexpected obstructions can cause personal injury, death, or delay. "Street Maintenance" is defined as the function of protecting the street structure and keeping it in condition for safe use.

Maintenance Budgets: A certain portion of the street department funds should be set aside for street maintenance and may be referred to as the "Maintenance Budget." The amount of this portion of the budget is usually determined by making a study of cost records of previous years and estimating the amount of money needed to maintain the streets through the coming year. These estimates are made on an annual basis.

Maintenance Operations: Maintenance work in most cities follows the same general pattern. Much of it consists of maintaining the road surfaces or that portion of the street used by the moving vehicle. Estimates show that almost half of the total maintenance budget is used for this purpose. The remainder is spent on maintaining shoulders, drainage structures, curbing repair and special services. Special services include such items as street sweeping which eliminates a build up of dirt and sand along the shoulder or curbline that tends to narrow the usable street surface. This build up also holds moisture which causes damage to the pavement edges. Another major item under special services is the maintenance of traffic and street signs and pavement marking, including crosswalks.

Pavement Rating Systems for Asphalt Streets: For those individuals with the responsibility of maintaining city streets, deciding which streets should get first attention is often difficult. One factor complicating the decision is the variety of types of pavement distress; some serious, others rather insignificant. This system utilizes the experience of an Engineer, Maintenance Superintendent, or Foreman to assign a numerical value to each type of pavement defect, taking into account both the extent of distress and its relative seriousness. The sum of these numerical values provide a fairly accurate, though subjective index of the general condition of the road. The index can be useful in setting maintenance priorities.

The rating system is intended for cities not having the benefit of specialized street engineering experience and without

CONTINUED ON PAGE 5
As you probably know, publications available at the Georgia Tech Technology Transfer Center were advertised in the Winter issue of Tech Trans. The Center has during the last two months received numerous requests for these publications. While we were pleased to receive that many requests, we unfortunately have depleted all available copies of several publications. Consequently, there remains a few unanswered requests.

The Center has ordered additional copies of publications in heavy demand so that all requests can be satisfied. We regret not being able to provide all publications promptly.

Traffic data collection equipment is available at the Center for use by local agencies. If your agency has a need for such equipment, please contact us. We will train you in the use of the equipment and allow you to keep it for a period of time. The sooner you request the equipment, the sooner you will get it. This service, like all our services, is free of charge. Call us now at 404-894-2360 or 1-800-282-1275.

The Center is currently building a videotape library for use by local agencies. Videotapes on various subjects of interest to transportation officials in Georgia will be made available for free loan. These tapes should provide you with convenient, cheap, and effective training of your personnel. We wish to thank Mr. Don P. Bartles, Columbia County Public Works Director, who suggested the videotape library for the center.

If you have any ideas, suggestions, or opinions on how we can best serve you and others in Georgia, please let us know.

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**MANAGEMENT VS. CRISIS REACTION**

by Barbara Gole
Director of Public Works
Indianapolis, Indiana

Some organizations react to problems only when there is a crisis such as a break in a sewer line. This method of managing complex capital plants tends to consume most resources in putting out fires.

Addressing infrastructure problems on a policy rather than on a project basis is an important aspect of capital budgeting at all levels of government.

Assessment is the first step in infrastructure management. Information needed to determine requirements for repair, renovation, and replacement must be obtained. The degree of success depends in part upon an organization's ability to know the condition of its existing capital infrastructure. Assessments yield important information without which it is almost impossible to determine the requirements for replacement and renovation. You must have up-to-date information in a variety of categories such as inventory of assets, condition of assets, needs and wants, fund availability, operating costs, and available alternatives. The information gathered and the results and data base generated are then used in the planning process and ultimately fed into the organization's budget.

Extensive planning characterizes successful organizations. Successful organizations prepare long-range master plans and link these, multi-year plans, and mid-year plans with annual capital and operating budgets. Multi-year capital plans serve as the critical link between an organization's goals, objectives, and outputs and its anticipated revenues or resources. Multi-year capital plans are guides for identifying current and future fiscal requirements. They offer decision makers a long-range perspective without which they cannot readily see implications of their decisions. Many other benefits accrue from multi-year capital planning including development of a preferred scenario for the future, working out priorities among wants...
State truck and bus safety programs will receive $17 million in fiscal year 1986 in grants from the Federal Highway Administration's Motor Carrier Safety Assistance Program. The safety programs include roadside spot checks, safety audits of intra-state trucking firms, and enforcement of hazardous materials regulations. Georgia will receive $408,403.

Highway and bridge experts from the United States and 23 other Western Hemisphere nations gathered in Los Angeles last September at the Pan American Highway Maintenance Conference.

The four-day conference covered all aspects of road maintenance administration, including such topics as resource management, prioritization of needs, equipment management, increasing manpower efficiency, and exchanging the latest state-of-art highway technologies.

The conference provided an excellent opportunity for member nations to exchange ideas, experiences, and technologies on a wide range of topics of common interest. It also helped in a significant way to strengthen the bonds of friendship among all of the participating countries by making them focus on common solutions to common problems. Several delegations suggested that a next step might be to hold a series of regional workshops to address some of the problems which are unique to each particular geographic area.

- Lester P. Lamm, formerly with the FHWA, succeeded John A. Clements, to become the new president of the Highway Users Federation (HUF). The HUF is a national coalition of 400 businesses, industries, and associations promoting improved highway transportation safety and efficiency.

Mr. Lamm had been an FHWA executive for 13 years during which he worked with six Secretaries of Transportation and five Federal Highway Administrators in directing more than $100 billion in highway and bridge improvements. He began his public career with the forerunner of the Federal Highway Administration in 1955. He became the FHWA's executive director, the agency's top career official, in 1973. In 1982, he was appointed FHWA deputy administrator.

- National Roadside Vegetation Management Association (NRVMA) has announced the first awards program to recognize outstanding roadside vegetation management programs called the "Excellence in Roadside Vegetation Management" awards.

The competition is open to all qualified candidates from state, county or municipal agencies, universities and industry. The association is planning to conduct the competition in four categories: state transportation departments; cities and municipalities; and academic or industry contributors. Winners will be announced at the 1986 NRVMA convention in St. Louis in October. Further information is available from:

NRVMA Awards Program
c/o Dorf & Stanton
111 Fifth Ave
New York, NY 10003
CHECKLIST FOR PUBLIC MEETINGS AND PRESENTATIONS

BOOK ADDRESSES SPEAKER'S NIGHTMARE:
WHAT HAVE I FORGOTTEN?

A guide book prepared for the Federal Highway Administration by Helen Heuhaus Consulting provides insights into Improving the Effectiveness of Public Meetings and Hearings. The following is a checklist taken from this publication which may be useful to those persons who are preparing a public meeting or presentation.

- Become thoroughly familiar with the proposed project and its geographic area.
- Define the goals and objectives of the meeting.
- Define the project community.
- Inventory in-house resources and limitations (including budget, time, equipment, and people's skills).
- Develop a project mailing list.
- Determine the meeting format.
- Select a site, date, and time for the meeting.
- Inspect the proposed meeting site.
- Confirm the meeting site in writing.
- Complete all administrative details (including paper work related to insurance, fees, licenses, parking, custodial services, and security provisions).
- Select and begin to prepare appropriate displays, handouts, and audio-visual aids.
- Identify the meeting panel, select a conductor, and firm up overall staffing arrangements.
- Begin to prepare the technical presentation. Determine how and by who it will be given.
- Establish and formalize the guidelines and procedures for meeting conduct (including time limits, speaking order, and recording techniques).
- Select and begin to prepare appropriate notification documents.
- Develop the meeting agenda.
- Review displays, handouts, and audio-visual aids and revise them as necessary.
- Complete an in-house briefing.
- Revise the technical presentation, if necessary.
- Test all audio-visual equipment to make sure that it is in good working order.
- Arrange for the transport, display, and/or use of exhibits, handouts, audio-visual equipment, and other meeting aids.

access to conventional testing facilities. It is designed to apply to relatively low-volume streets that carry fewer than 1,000 cars and 50 trucks per day.

Making the Inspection: An effective way of inspecting pavement is first to drive slowly over the street to get an overall impression of its condition; then to make a thorough inspection on foot, making rough notes on the type and extent of the distress as he goes along. When the inspection is completed, the rating form is filled out. It may be useful to drive again slowly over the pavement after filling out the rating form. Since the system is based on personal judgment, better results are obtained when two or more experienced individuals independently rate the pavement and the results are averaged.

Rating a Street: As mentioned earlier, some defects affect the performance of a pavement more than others. Under this rating system, the less serious problems are assigned values between 0 and 5. Defects of a more serious nature, those directly related to the strength of the pavement are rated 0 to 10. A rating of 0 means that the pavement is free of that particular type of distress.

When assigning a rating to a particular type of defect, it is important to consider both its extent and severity. For example, a rating of 10 for "rutting" would indicate that it occurs on much or all of the road, and that the ruts are probably deep enough to be a safety hazard, especially during rain, and an impediment to traffic at all times. On the other hand, a rating of 1 for "corrugations" would indicate that corrugations, although evident, are not numerous and that at present the distortions are not very large.

After each defect is rated, the individual rating is added. This sum is then subtracted from 100, and the result is simply called the "condition rating."

Interpreting the Condition Rating: There are two ways that the condition rating can be used. First, as a relative measurement; it provides a rational method for ranking roads and streets according to their condition. Secondly, as an absolute measure, the condition rating provides a general indicator of the type and degree of repair work necessary. As a general rule, if the condition rating is between 80 and 100, normal maintenance operations such as crackfilling, pot hole repair, or perhaps a seal coat are usually all that is required. If the condition rating falls below 80, it is likely that an overlay will be necessary. In this event, it may be advisable to contact your Department of Transportation District Engineer for assistance. If the condition rating is below 30, chances are that major reconstruction is necessary.

Causes of Pavement Defects: A general understanding of the cause of a pavement defect is essential before an attempt is made to remedy it. Similarly, efficient use of the maintenance budget requires that proven methods be used to prevent recurrence of a problem. Listed are the most common defects and a brief statement of their usual cause and the suggested means of repair. If more detailed assistance is needed in determining either the cause of a defect or the proper method of its repair, it may be advisable to contact your District Maintenance Engineer.

1. Transverse Crack. A crack that follows a course approximately at right angles to the pavement center line.

   This frequently is caused by movement in the pavement beneath the asphalt layer (reflection cracking). Can also result from stresses induced by low-temperature contraction of the pavement.

   Requires filling with asphalt emulsion slurry. This is usually (but not necessarily) followed by a seal coat or overlay over entire surface.

2. Longitudinal Crack. A crack that follows a course approximately parallel to the center line.
This usually results from a weak joint between paving lanes. These cracks can also result from earth movements, particularly on embankments. Two close-spaced longitudinal cracks in a wheel path usually indicate bending stress induced by rutting. Longitudinal cracks can also occur as a result of movement in the pavement beneath the asphalt layer (reflection cracking). For repair, see "Transverse Crack."

3. Alligator Cracks. Interconnected cracks forming a series of small polygons, the pattern resembling an alligator's skin.

Caused by excessive deflection of the surface over unstable subgrade or lower courses of the pavement. The unstable support usually is the result of saturated granular bases or subgrade. Requires deep patching.

4. Shrinkage Cracks. Interconnected cracks forming a series of large polygons, usually having sharp angles at the corners. Caused by volume change in the asphalt mix or in the base subgrade.

Requires crack filling with asphalt emulsion slurry followed by a surface treatment or a slurry seal over the entire surface.

5. Rutting. Longitudinal depressions that form under traffic in the wheel paths and have a minimum length of approximately 20 feet. Caused by consolidation or lateral movement under traffic in one or more of the underlying courses, or by displacement in the asphalt surface layer itself.

Ruts should be filled with hot plant mixed material to restore proper cross section. This should be followed by a thin overlay.

6. Corrugations. Transverse undulations at regular intervals in the surface of the pavement consisting of alternate closely spaced valleys and crests.

Caused by a lack of stability in asphalt layers. Requires repair before resurfacing. If the corrugated pavement has an aggregate base with a thin surface treatment, a satisfactory corrective measure is to scarify the surface, mix it with the base, and recompact the mixture before resurfacing. If the pavement has more than two inches of asphalt surfacing and base shallow corrugations can be removed with pavement planing machine, better known as "heater-planer." This is followed with seal coat or overlay.

7. Raveling. The progressive disintegration from the surface downward or edge inward by the dislodgment of aggregate particles.

Caused by lack of compaction during construction, construction during wet or cold weather, dirty or disintegrating aggregate, too little asphalt in the mix, or overheating of the asphalt mix. Usually requires a seal coat.

8. Showing. Lateral displacement of paving material due to the action of traffic, generally resulting in the bulging of the surface. Caused by lack of stability in asphalt layers.

Requires removal of affected area, followed by deep patching.

9. Pot Holes. Bowl-shaped holes of varying sizes in the pavement, often the result of progressive deterioration of other defects such as alligator cracking.

Usually caused by a combination of weaknesses in the pavement resulting from...
Conclusion: The city street system must be maintained with as much wisdom as we can offer since it is vital to the life of a community. It is necessary for the city to be aware of the citizen's feelings and to be receptive of their ideas and proposals. When a bad condition is reported by a citizen, it is necessary to take prompt action on their complaints.

References:
Urban Public Works Administration, The Asphalt Institute, Highway Engineering From Urban Georgia, March 1985

ACKNOWLEDGMENT

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The T2 Center at Georgia Tech is sponsored by the Georgia Department of Transportation and provides information and counsel to more than 500 municipalities and counties in our state. This newsletter is designed to keep you informed about new publications, new techniques, and new training opportunities that may be helpful to you and your community. Individuals wishing to receive future copies of this newsletter at no cost may send their requests to:

M. John Moskaluk
Technology Transfer Center
School of Civil Engineering
Georgia Tech
Atlanta, GA 30332

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MAINTENANCE TIPS

LITTER REMOVAL

Litter along the shoulders and right of way due to inconsiderate motorists is a major maintenance problem. It is normally found along any stretch of roadway but is more common along roads with high or very low volumes of traffic.

Litter does not create a severe problem unless objects are large enough to do damage to mowers or clog side ditches that may result in drainage problems. Litter removal is normally performed to provide a pleasing roadway to the motorists. The requirements for cleaning roadside litter is outlined below.

CREW REQUIRED

| Laborers | 2 |
| Truck driver | 1 |

EQUIPMENT REQUIRED

| Dump truck | 1 |

DAILY PRODUCTION PER CREW

4 - 7 miles of roadway

REPAIR PROCEDURE:

1. Place signs and other safety devices. Equip truck with flashing red light.
2. Place large items in truck.
3. Collect small items in litter bags. Place full bags along shoulder. Truck driver empties litter bags into truck and returns empty bags to laborers.
4. Cover truck bed to contain litter.
5. Dump litter at designated site.
6. Remove signs.

MACHINE MOWING

Machine mowing is the proper method of maintaining high grass. High grass, as a result of insufficient mowing during the growing season, is defined as roadside vegetation with an overall height of 12 inches or a condition where roadway visibility is reduced.

High grass causes an unpleasing roadway and may block visibility. If not maintained, it will cause shoulders to become overgrown and may also create poor drainage ditch erosion and pavement failures. More importantly, it can result in a serious safety hazard by restricting sight distance. The maintenance method is outlined below.

CREW REQUIRED

| Laborers | 3 |

EQUIPMENT REQUIRED

| Mowers | 2 |
| Truck | 1 |

DAILY PRODUCTION PER CREW

15 - 20 acres

REPAIR PROCEDURES:

1. Place mowing signs.
2. Use largest mowing first and follow with smaller.
3. Cut one swath beyond slope or 50 feet from roadside.
4. Mow each section with odd number of swaths. This will help to eliminate "deadheading".
5. Mow grass to 5 inches height.
6. Remove signs.
Several magazines are available free of charge to qualified individuals in the highway industry. When requesting a subscription, use letterhead and give your title. If your title is not informative, describe your job responsibilities in order to help the publisher decide whether you qualify for a free subscription.

- **American City and County** (published monthly). Urban development and street maintenance. For subscription information write to American City and County, 6255 Barfield Road, Atlanta, GA 30328.

- **Better Roads** (published monthly). Rural road construction, maintenance, and innovation. Write to Better Roads, P.O. Box 558, Park Ridge, IL 60068.


- **Highways and Heavy Construction**. A nationally distributed monthly publication. Write to 875 3rd Avenue, New York, NY 10022.

- **Airport Services Management**. A nationally distributed monthly publication. Write to Fulfillment Department, Airport Services management, 731 Hennepin Avenue, Minneapolis, MN 55403.

- **Metropolitan**. A nationally published monthly magazine on mass transit subjects. Write to Editorial Offices, Metropolitan, Bobit Publishing Company, 2500 Artesia Blvd., Redondo Beach, CA 90278.

- **ATSA Signal**. A quarterly publication designed for those interested in permanent signing, delineation, and/or traffic control in construction areas. Write to American Traffic Services Association, Inc., Stafford Executive Building, Route 4, Box 18, Stafford, VA 22554.

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**STREET AND HIGHWAY MAINTENANCE MANUAL**

The APWA Street and Highway Maintenance manual is an in-depth study of the changes in management systems and highway technology which have advanced the practice of street maintenance since the publication of the APWA's first guide to the field in 1963. The practical, hands-on information included in the Manual reflects the state of the art in management practices and operations procedures.

Part I includes topics such as Administration and Management, Operating Policies and Procedures, and Maintenance Management Systems, as well as Pavement Management Systems. Part II covers topics such as Maintenance of Roadway Surfaces, Aggregate Surfaces, Maintenance of Drainage Facilities, Bridge Maintenance, Maintenance of Traffic Control and Safety Devices, and Snow and Ice Control.

This publication is available in a three-ring binder containing over 550 pages of operating procedures, forms and standardized repair methods. An invaluable publication for cities and counties, it can be obtained for $50 (or $65 to non-APWA members) from:

American Public Works Association
Publications Department
1313 East 60th Street
Chicago, IL 60637
The purpose of this course is to provide consulting engineering firms, contractors, airport authority personnel and others interested in airport pavements with the latest in airport design, construction and rehabilitation techniques. Brief overview of the topics to be covered in the course is as follows:

A. DESIGN AND CONSTRUCTION OF NEW PAVEMENTS

1. Future Pavement Needs and Funding for Civil Airports
2. Future Pavement Needs for Military
3. Airport Pavement Construction
4. Report on Atlanta Airport Construction
5. Airport Pavement Design and Jointing

B. GENERAL AVIATION AIRPORTS PROJECTS

C. DESIGN OF GENERAL AVIATION AIRPORTS

D. PROPOSED CHANGES FAA DESIGN PROCEDURES

E. REBUILDING AND RESTORATION OF AIRPORT PAVEMENTS

1. Concrete Resurfacing Design
2. Concrete Resurfacing Construction and "Fast Track" Concrete Resurfacing
3. Elsworth Air Force Base Concrete Overlay
4. Overview of Concrete Pavement Recycling
5. Restoration of Martin State Airport Runway, Maryland
6. Installation of Load Transfer Devices, St. Louis Airport
7. Specifications for Concrete Overlays, Recycling and CPR

The course is sponsored by The Federal Aviation Administration, The American Concrete Pavement Association, and The Portland Cement Association. The two day course will be held at the Atlanta Airport Hilton in Atlanta, Georgia.

The registration fee is $45.00 per person For further information on registration please write to:

American Concrete Pavement Association
2625 Clearbrook Drive
Arlington Heights, IL 60005

ROADWAY MAINTENANCE WORKSHOP

By the time you get this newsletter, the Roadway Maintenance Workshop sponsored by this Technology Transfer Center will be underway. The workshop covers topics such as asphalt maintenance deficiencies, asphalt pavement repair methods, unpaved roadways, off-road maintenance, roadside maintenance, equipment selection and maintenance, and bridge structures deficiencies and repair. If you have not attended the workshop yet, and wish to attend, check the schedule below and make plans to participate in one of the remaining sessions. For further information, please call the Center at (404) 894-2360 or 1-800-282-1275.

<table>
<thead>
<tr>
<th>GDOT DISTRICT OFFICE</th>
<th>WORKSHOP DATE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Jesup - District 5</td>
<td>April 22-24</td>
</tr>
<tr>
<td>Tifton - District 4</td>
<td>April 29-30</td>
</tr>
<tr>
<td>Tennille - District 2</td>
<td>May 1</td>
</tr>
<tr>
<td>Thomaston - District 3</td>
<td>May 6-8</td>
</tr>
<tr>
<td>Gainesville - District 1</td>
<td>May 13-15</td>
</tr>
<tr>
<td>Cartersville - District 6</td>
<td>May 20-22</td>
</tr>
<tr>
<td>Atlanta - District 7</td>
<td>May 27-29</td>
</tr>
<tr>
<td></td>
<td>June 3-5</td>
</tr>
</tbody>
</table>
Determining what part of the existing capital infrastructure it would be wise to save, developing long-range financial requirements, and providing a vehicle for presenting the organization's direction to its members and interested parties. Short-term plans generally consist of detailed descriptions of projects that form the basis of the budget and set in motion the organization's day-to-day operations.

Preparation of short-term plans should result in an annual update of multi-year plans. When an organization plans for physical capital needs, it is important for it to consider whether future needs and resources will grow, remain relatively stable, or decline. This helps determine the best mix of capital investments. An organization in a declining cycle would probably choose mainly to maintain, preserve, and replace existing capital stock rather than add to its current inventory. A growing organization would tend to add new capital items, while a stable one would concentrate on balancing preservation and acquisition.

Successful organizations select their projects in a logical sequence from their multi-year plans. Generally, once a project is in a multi-year plan, it moves forward each year in the plan until it is in the capital budget. Sometimes, however, projects in a plan are dropped and other projects appear in the budget without having been in the plan previously. This is to be expected in the case of emergencies or changes in priorities and financing. It is not expected that the multi-year plans be ignored in selecting projects for funding. There is a tendency for some organizations to select projects based upon availability of funds rather than on identified needs. Usually, these organizations have not gathered information on existing assets or identified current and future needs.

The final element of a successful infrastructure maintenance program is controlling funds for and time expended on capital acquisition projects. This is done to maximize benefits from limited resources dedicated to capital improvements. Controls help identify and alleviate inefficiencies due to poor management practices. Monitoring funds for capital investment, reviewing status of on-going projects, determining causes of deviations from schedules, and performing post-completion studies are all characteristic of good control.

Growing organizations have abundant resources and can afford fewer controls than organizations in a stable or declining cycle. Regardless of the growth stage, controlling funds for and time expended on capital acquisition projects helps maximize benefits of the limited resources dedicated to capital improvement.

Successful organizations set priorities for long-range capital improvements and go a step further by designating funding mechanisms to protect funds allocated for priority capital projects. A continuous review of the status of ongoing physical capital projects to ensure that previously established targets of time, money, and scope are being met are found in successful organizations. The most important element is the reporting system to inform top management when project targets are not being met or cannot be met, in addition, the determination of the causes for both cost and time variances are an important factor.

In summary, the differences between management and crisis reaction consists of following a four-part framework:

- Assessing the condition of the infrastructure and identifying short- and long-term goals.
- Planning alternatives to satisfy the organization's short- and long-term goals.
- Selecting alternatives and setting priorities among the various short- and long-term needs and establishing short-term funding allocations.
- Monitoring and controlling work schedules and financing.

From APWA Reporter, August, 1985.
ADDRESS CORRECTION CARD ENCLOSED.

PLEASE CORRECT YOUR ADDRESS IF DIFFERENT AND RETURN THE CARD
A stripe painting device developed in Australia has an electronic brain that automatically activates and aligns the sprayguns. The RCA Super Striper uses a hydraulically operated airless paint system, can operate at speeds of up to 50 mph, and has a built-in sensing system to permit operation day or night. The paint is heated and mixed by a stalled torque converter, which has sensors to maintain the temperature of the paint at optimum spraying consistency.

Iowa is the latest state to adopt a mandatory seat belt law. The law went into partial effect on July 1, with warnings given to violators. Beginning on January 1, 1987, drivers and front seat passengers will be fined $10, plus court costs, if not wearing their belts.

State governments have been adopting seat belt laws since a July 11, 1984, ruling by U.S. Secretary of Transportation Elizabeth Dole. Unless two-thirds of the nation's population is covered by state seat belt laws by April 1, 1989, mandatory restraint systems will be required of 1990 model year cars.

Seat belts improve safety in two ways. They protect a passenger from hitting the windshield or dashboard of the car. At 30 mph, this "second collision" has the same impact as falling off of a 3 story building. The second benefit of seatbelts is that they prevent a passenger from being thrown from the car.

- Saved by a seat belt? The Automotive Safety Foundation and the Highway Users Foundation are offering a free lapel pin and certificate to anyone who submits a written statement describing how a seat belt saved his or her life.

Include circumstances of the crash, the date, location, names and addresses of persons involved, and send to: Saved-by-the-Belt, Automotive Safety Foundation, 1776 Massachusetts Avenue NW, Washington, DC 20036.

- Bobby Jackson of Villa Rica, Georgia, won the $10,000 first prize at the Case Excavator Rodeo in Phoenix, Arizona. He guided a bowling ball hung from a bucket lip through a maze of obstacles. This was the fourth consecutive year that he
EDITOR'S NOTE

Between April and June, 1986, seven sessions of the Roadway Maintenance Workshop were held in the GDOT district offices. These sessions attracted a total of 332 participants from 57 counties and 87 cities.

The Georgia Tech Technology Transfer Center appreciates the cooperation of all individuals who were involved in coordinating, instructing, and attending the workshop. Special thanks are due to the GDOT District Engineers and to Mr. Stanley Lord, State Maintenance Engineer, and his staff.

A workshop on traffic engineering applications of microcomputers is scheduled for all GDOT district offices during the month of August. Make plans now to attend. More information on this workshop is included in the workshop announcement section of this newsletter.

Many retired engineers around the state have years of valuable traffic engineering experience. Those engineers are sometimes willing to provide traffic engineering services to small political jurisdictions on an intermittent basis.

The Technology Transfer Center would like to develop a list of such individuals for use by local agencies. If you know someone who is retired, or will be retiring this year, please have him/her contact this center. Your cooperation will be greatly appreciated. If everyone cooperates in developing this list, many small political jurisdictions will benefit.

reached the championship round of competition. The event recognizes the top hydraulic excavators in the country.

- A bill to raise the speed limit on interstate highways to 70 mph has been introduced by Senator J. James Exon, Jr. (D-NB). The bill was sent to the Senate Committee on Commerce, Science, and Transportation.

In Nebraska, the state legislature passed a bill raising the limit to 70 mph on Interstates within the state. If signed by Governor Bob Kerry, Nebraska could lose some of its federal-aid highway funds.

Under the 55 mph national speed limit law, a state could lose up to 10% of its federal-aid highway funds if more than half of its drivers exceed 55 mph. Three states, Arizona, Maryland, and Vermont, have action pending against them by the FHWA concerning this provision.

- Raising the drinking age has reduced by 13% the number of young drivers involved in fatal highway crashes, according to a study by the National Highway Traffic Safety Administration. The study included thirteen states that recently raised the drinking age to 19, 20 or 21.
INFORMATION FOR FLAGGERS

Flagging is provided at worksites to stop traffic intermittently as necessitated by work progress or to maintain continuous traffic flow past the worksite at reduced speeds to help protect the work crew. Flagging is one of the most important duties at the worksite since the lives of workers and the travelling public are in the hands of the flagger.

The flagger must, at all times, be clearly visible to approaching traffic for a sight distance sufficient to permit proper response by the motorist to the flagging instructions and to permit traffic to reduce speed before entering the worksite area. This sight distance will vary according to the operational speed of traffic. When on duty, the flagger should be appropriately dressed to alert the motorist to his/her presence. Orange clothing such as vest shirt or jacket shall be worn during daylight. The use of orange head gear is encouraged. At night, this clothing should be reflectorized. Immodest or sloppy dress should not be permitted. Neat appearance helps gain respect and makes the flagger's job more effective.

Hand signaling devices, such as red flags, STOP/SLOW paddles and lights are used in controlling traffic through work areas. The flag is the most common device used during daylight hours. Flags used for signaling purposes must be a minimum of 24 inches by 24 inches square, made of good grade red material, and securely fastened to a staff approximately 3 feet in length. The free edge should be weighted or staves placed in the flag diagonally to ensure that the flag will hang vertically, even in heavy winds.

Sign paddles must be at least 18 inches wide, with 6-inch letters. A rigid handle must be provided. This combination sign may be fabricated from sheet metal or other light, semi-rigid material. The background of the STOP face should be red with white letters and borders. The background of the SLOW face is orange with black letters and borders. All such paddle signs should be reflectorized, unless the paddle will only be used during daylight hours. Paddle signs are most effective.

Keep an extra one handy and keep them clean.

One consideration in choosing the flagging position is to maintain color contrast between the flagger's garments and the background. While awaiting traffic, the flagger should stand in a conspicuous position on the right edge of the travelled lane facing the direction of approaching traffic. At a "spot" worksite, the flagger may need to stand on the shoulder to the left of the travelled lane or opposite the barricaded section in order to operate effectively. The flagger should NEVER STAND IN AN OPEN TRAFFIC LANE. He/she should be clearly visible to approaching traffic at all times. A position should be taken so that motorist visibility is not impaired by curves, hills, and parked vehicles or equipment. The flagger must stand alone and not permit other workers to stand around him or her.

To give sufficient warning to workers at the worksite of approaching danger, such as an out-of-control vehicle, the flagger should stand at least 150 feet from the worksite and not further than 250 feet. Flagging stations must be adequately protected and preceded by proper advance warning signs.

From Country Roads and City Streets, West Virginia University, Vol. 2, No. 1.
GASOLINE OR DIESEL -- WHICH ENGINE IS THE MOST ECONOMICAL FOR A HEAVY DUTY CITY VEHICLE?

Written by Thomas M. Wilcox, P.E.
City Engineer, Fulton, Missouri

What type of engine will you specify for your next dump truck or heavy duty vehicle? Why? Can you justify your choice? These questions were recently foremost in my mind when a member of the Fulton City Council questioned my recommendation to specify a two-ton dump truck with diesel engine and automatic transmission. The councilman raising the question believed we could save the city money (and of course, our budget was tight) by specifying a gasoline engine and a five-speed transmission with two-speed rear axle. According to the councilman's sources, the savings could amount to approximately $5,000.

The vehicle specifications we were using had been used for the last four years without any major changes and the street department personnel were pleased with the vehicles they had been receiving. I hadn't analyzed the economic advantage or disadvantage of the various heavy duty vehicles lately. However, I remembered thinking about this four years ago when we switched from gasoline to diesel engines and concluding that we would definitely save money and have a more dependable vehicle as well. It was clearly appropriate at this time to justify my previous beliefs on this subject.

Our office keeps daily records of the costs of operation and repair on all of our vehicles, so the information was readily available for comparing the annual costs on the two types of vehicles. The results were indeed surprising! The numbers shown in the truck operating costs comparison table included all costs of operating and repairs, such as: Fuel, lubricants, filters, tires, parts and labor for the necessary repairs. Items not included are taxes, insurance, storage and cost of drivers. Truck Number 1 is a 1980 Ford gasoline V-8, 270-2v with manual transmission; Truck Number 2 is a 1982 Ford diesel V-8, 8.2 liter, with an automatic transmission.

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**TRUCK OPERATING COST COMPARISON TABLE**

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating Cost, $</th>
<th>Miles Driven</th>
<th>Cost/Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>3,565</td>
<td>8,969</td>
<td>0.3975</td>
</tr>
<tr>
<td>1983</td>
<td>2,428</td>
<td>5,206</td>
<td>0.4664</td>
</tr>
<tr>
<td>1984</td>
<td>2,352</td>
<td>2,784</td>
<td>0.8450</td>
</tr>
<tr>
<td>1985*</td>
<td>6,307</td>
<td>3,309</td>
<td>1.9061</td>
</tr>
<tr>
<td>TOTAL</td>
<td>14,652</td>
<td>20,268</td>
<td>0.72</td>
</tr>
</tbody>
</table>

**Truck No. 2: Diesel Engine**

<table>
<thead>
<tr>
<th>Year</th>
<th>Operating Cost, $</th>
<th>Miles Driven</th>
<th>Cost/Mile</th>
</tr>
</thead>
<tbody>
<tr>
<td>1982</td>
<td>2,906</td>
<td>11,919</td>
<td>0.2438</td>
</tr>
<tr>
<td>1983</td>
<td>3,308</td>
<td>10,830</td>
<td>0.3054</td>
</tr>
<tr>
<td>1984</td>
<td>2,876</td>
<td>15,612</td>
<td>0.1842</td>
</tr>
<tr>
<td>1985*</td>
<td>4,784</td>
<td>9,296</td>
<td>0.5146</td>
</tr>
<tr>
<td>TOTAL</td>
<td>13,874</td>
<td>47,657</td>
<td>0.29</td>
</tr>
</tbody>
</table>

*1985 figures are for first 10 months only.
The net difference in the operational costs/mile of the two trucks based on almost four years of data is:

\[
0.72 - 0.29 = 0.43 \text{ per mile}
\]

Assuming an average mileage driven of 10,000 miles per year, the diesel engine would save $4,300 per year. Since we normally keep our dump trucks 10 years, the savings over the service life of the truck would be as much as $43,000 ignoring any potential advantage due to added trade-in value.

Based on this analysis, it appeared to be a wise investment to spend $21,347 for a new diesel truck as compared to $18,900 for a new gasoline powered truck (these prices included a trade-in allowance). Apparently, the diesel truck would pay back the $2,447 cost difference at a time about 2/3 the way through the first year of use, and then continue to save the city approximately $358 per month.

At the next city council meeting, I distributed my cost analysis and recommended that we proceed with the purchase of the new diesel truck. The council agreed, and even the councilman who had questioned the wisdom of the purchase voted for it!


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GEORGIA TECH

TECHNOLOGY TRANSFER CENTER

1-800-282-1275

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LEVELING WITH PREMIX

Leveling is required when there is rutting or corrugations.

Rutting is a longitudinal depression that forms in wheel paths. It is caused when pavement is permanently deformed under traffic. It normally occurs in wheel paths of a new pavement due to improper compaction during construction or in wheel paths of older pavements because of inadequate thickness for the traffic volume on the road.

Corrugation is pronounced ridges and valleys (ripples) occurring less than 2 feet apart, crosswise to the direction of traffic. This distress is sometimes referred to as "washboarding". Corrugations are normally caused by unstable mixes produced by a) an excess of asphalt, b) an asphalt cement that is too soft a binder, c) a mix with too many fines in the aggregate, or d) a mix with rounded aggregate. Corrugations normally occur where a bump causes vehicles to spring or where there is braking and acceleration of vehicles such as at intersections.

Equipment operators 3
Truck drivers 3-5
Rakemen 2
Laborers 2
Flagmen 2

12-14

Equipment required:

Dump trucks 3-5
Distributor truck 1
Roller 1
Power broom 1
Motor grader 1
Asphalt spreader 1

Hot premix asphalt concrete
Liquid asphalt tack coat

Repair procedures:

1. Place signs and other safety control devices.
2. Clean loose material off surface with power broom.
3. Apply light uniform coat of tack material covering entire surface to receive leveling course.
4. Spot dump premix from trucks along area to be leveled.
5. Spread premix with motor grader; layers should be less than 3 inches thick.
6. Hand rake excess premix over the butt joints and feather the edges.
7. Roll each layer of premix immediately after spreader
8. Clean loose materials from roadway with power broom.
9. Clean up area and remove signs.

COMPLETE OVERLAY WITH PREMIX

Complete overlay is required when there is extensive cracking or potholes, or insufficient roadway profiles.

Potholes are small (less than 3 feet in diameter) depressions in the pavement surfaces. They are normally irregular in shape, have sharp edges, and vertical sides near the top. Potholes are usually caused by poor design practices such as too thin an asphalt surface, poor drainage, or inadequate base. Potholes are liable to occur in any location. Further, localized distress such as alligator cracking can quickly develop into pot holes when water is present.

Poorly designed or constructed roadway profiles allow water to pond on the pave-
ment due to insufficient crown and/or low points in the pavement grade. Insufficient roadway profiles are caused by improper techniques in placing the pavement surface or inadequate design for drainage. They are normally found on old sections of road, but may occur on roads recently resurfaced.

Crew required for complete overlay with premix:

<table>
<thead>
<tr>
<th>Equipment operators</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truck drivers</td>
<td>3-5</td>
</tr>
<tr>
<td>Rakemen</td>
<td>2</td>
</tr>
<tr>
<td>Laborers</td>
<td>2</td>
</tr>
<tr>
<td>Flagmen</td>
<td>2</td>
</tr>
</tbody>
</table>

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12-14

Equipment required:

<table>
<thead>
<tr>
<th>Equipment</th>
<th>Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dump trucks</td>
<td>3-5</td>
</tr>
<tr>
<td>Distributor truck</td>
<td>1</td>
</tr>
<tr>
<td>Roller</td>
<td>1</td>
</tr>
<tr>
<td>Power broom</td>
<td>1</td>
</tr>
<tr>
<td>Asphalt spreader</td>
<td>1</td>
</tr>
</tbody>
</table>

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7-9

Material required:

<table>
<thead>
<tr>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hot premix asphalt</td>
</tr>
<tr>
<td>Liquid asphalt tack coat</td>
</tr>
</tbody>
</table>

Repair procedure:

1. Place signs and other safety control devices.
2. Close the lane being repaired to traffic.
3. Clean loose material from surface using a power broom.
4. Apply a light but uniform covering of asphalt tack material from distributor truck.
5. Spread mix in place with asphalt spreader; no lift should be placed that exceeds 3 inches in thickness; care should be taken to assure proper roadway profile (e.g. a crown greater than 1% and no low spots in pavement).
6. Rake edge of pavement to prevent sudden drop off.
7. Roll each layer immediately after placement.
8. Repeat for other lanes as necessary.
9. Broom area to remove loose material from roadway surface.
10. Clean up area and remove signs.

ACKNOWLEDGEMENT

The Technology Transfer (T2) Program is a nationwide effort financed jointly by the Federal Highway Administration and individual State Departments of Transportation. Its purpose is to translate into understandable terms the latest state-of-art technologies in the areas of roads, bridges, and public transportation, to local and county highway and transportation personnel.

The T2 Center at Georgia Tech is sponsored by the Georgia Department of Transportation and provides information and counsel to more than 500 municipalities and counties in our state. This newsletter is designed to keep you informed about new publications, new techniques, and new training opportunities that may be helpful to you and your community. Individuals wishing to receive future copies of this newsletter at no cost may send their requests to:

M. John Moskaluk
Technology Transfer Center
School of Civil Engineering
Georgia Tech
Atlanta, GA 30332
Considerations for wood decay, conditions and casual organisms, are presented for the engineer as basic information for the inspection and maintenance of wood bridges. Included are the requirements for fungus growth conditions conductive to decay, natural decay resistance of wood used in bridge construction, wood preservation treatments, and limitations for such treatments.

Inspecting bridges for decay covers preparation for inspection, visual search for evidence of decay and conditions conductive to decay, equipment required, and the mechanics of detailed examinations.

Maintenance and preventive maintenance measures for the control of decay are considered in regard to member replacement and structural modification.

Moisture control and in-place treatment methods are recommended with details for their application to prevent initiation of decay or to arrest decay before it causes significant structural damage.

The purpose of this booklet is to provide facts about the causes and costs of potholes in a short and easy-to-understand format. It is intended for highway engineers, superintendents, and maintenance managers.
IMPROVING GUARDRAIL INSTALLATIONS ON LOCAL ROADS AND STREETS
Federal Highway Administration
Office of Highway Safety
Office of Engineering

This pamphlet is intended as a general guide to effective, low cost methods of enhancing highway safety with guardrails. It is not intended as a design manual or a substitute for engineering knowledge, experience, or judgment. The guidelines and recommendations included in this pamphlet are based on actual situations and observations found in a series of national reviews. They reflect the actual needs and opportunities for highway safety improvements existing on many local roads and streets.

POTHOLE PRIMER:
A PUBLIC ADMINISTRATOR'S GUIDE TO UNDERSTANDING AND MANAGING THE POTHOLE PROBLEM
R. A. Eaton, R. H. Joubert & E. A. Wright
US Army Corps of Engineers
Special Report 81-121

Many factors contribute to the increase in pothole occurrence. This pamphlet consolidates these factors into 11 manageable categories so that readers could focus on each separately. The categories are:

1. Financing
2. Traffic growth
3. Safety, legal and public relations
4. Weather
5. Identifying and cataloging causes
6. Drainage
7. Preventive maintenance programs and pavement inventories
8. Utility cut control
9. Pothole patching procedures
10. Special focus on intersections and utility castings
11. Training and education

COMPARISON OF THREE COMPACTORS USED IN POTHOLE REPAIR
M. A. Snelling and R. A. Eaton
US Army Corps of Engineers
Special Report 84-31

This report is a summary of the results of a compaction study using recycled hot mix asphalt concrete conducted during August 1983. This study compared three kinds of compactors for optimum performance, and also considered such factors as temperature of the asphalt concrete mix, number of passes, size and depth of patches, and the number of lifts to fill the holes. Results showed that a vibratory roller and vibratory plate compactor could both compact patches to the desired 98% of laboratory density, but that a 200-lb lawn roller could not.

Temperature of the hot recycled mix is critical, with 250 F being the cut-off temperature. It was shown that if the mix is not compacted promptly after placement and is allowed to cool below 250 F, proper compaction may not be attained. Single lifts of 3-in., 6-in., and 9-in. depth were compacted to 98% density using the vibratory plate compactor on mix above 250 F in 18-x-24-in. holes. In larger 3-x-4-ft. holes, 98% density was obtained only with the steel wheel vibratory roller on patches placed in two 3-in-thick lifts. The number of coverages of the compactors influences densities obtained. By doubling coverages of the steel wheel vibratory compactor from 6 to 12, the density increased from 96.9% to 99.0%.

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SEMINARS...COURSES...CONFERENCES

TRAFFIC ENGINEERING APPLICATIONS
OF MICROCOMPUTERS
AUGUST, 1986

The Georgia Tech Technology Transfer Center invites you to participate in the workshop "Traffic Engineering Applications of Microcomputers". Sponsored jointly by the Technology Transfer Center, GDOT, and FHWA, the two-day workshop is planned for all seven Georgia DOT districts.

The objectives of the workshop are:

1. To introduce and orient local transportation agencies to microcomputer systems and programs.
2. To demonstrate the usefulness of microcomputers for traffic engineering tasks.
3. To provide local officials with hands-on experience with microcomputers.

Since spaces are limited to 30 participants per workshop, please register as soon as possible. No registration fee is required. For registration information call your district office or contact the Georgia Tech Technology Transfer Center at (404) 894-360 or toll-free at 1-800-282-1275.

WORKSHOP SCHEDULE

<table>
<thead>
<tr>
<th>DOT District Office</th>
<th>Workshop Date</th>
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</thead>
<tbody>
<tr>
<td>Atlanta, GA</td>
<td>August 4-5, 1986</td>
</tr>
<tr>
<td>Decatur</td>
<td>August 7-8, 1986</td>
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<tr>
<td>Columbus</td>
<td>August 11-12, 1986</td>
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<tr>
<td>Athens</td>
<td>August 14-15, 1986</td>
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<tr>
<td>Macon</td>
<td>August 18-19, 1986</td>
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<tr>
<td>Savannah</td>
<td>August 21-22, 1986</td>
</tr>
<tr>
<td>Atlanta, GA</td>
<td>August 25-26, 1986</td>
</tr>
</tbody>
</table>

This course is designed to help those people responsible for traffic engineering learn more about the basis of their work. The five-day program's main emphasis is on general principles of traffic engineering.

The course is open to nationwide enrollment, and is primarily intended for those persons responsible for traffic engineering with limited training in the field. It will be especially useful to consultants, city engineers, new members of the traffic engineering staff, and traffic officers responsible for traffic operations. Because enrollment is limited to allow opportunity for class discussions, participants should register as far in advance as possible.

Georgia Tech faculty and experienced traffic engineering personnel will teach the course. Dr. Donald O. Covault, Professor of Civil Engineering, is the academic administrator and prime instructor. Other traffic engineers from municipal, state and private organizations will also participate as lecturers.

The program includes the fundamentals of traffic flow, statistics, volume and speed studies, speed and delay studies, accident studies, intersection control, the Manual on Uniform Traffic Control Devices, highway and intersection capacity, traffic signalization, computer control of signals, traffic data acquisition equipment, and traffic planning studies.

The course fee of $600 includes all necessary classroom materials. For registration information, write to: Department of Continuing Education, Georgia Tech, Atlanta, GA 30332-0385.

To register by telephone, please call (404) 894-2400. Payment should be mailed immediately to ensure receipt before the course begins. If you must register within the 10 days prior to the course, please do not mail payment, but bring it with you on the first day of the class.
PORTLAND CEMENT ASSOCIATION COURSES

For information, contact the Registrar, Educational Services Department, Portland Cement Association, 5420 Old Orchard Road, Skokie, IL 60077, telephone (312) 966-6200.

Controlling Concrete Quality in Production and Construction
October 27-30, 1986
Skokie, Illinois

Employees of cement, aggregate and mixture suppliers, ready-mixed concrete producers, or anyone who needs to be certified as a Concrete Field Testing Technician - Grade I will benefit from the course.

Classroom work will cover materials, specifications and requirements for concrete inspection, records and reports, and inspection and testing of concrete before, during and after placement. Laboratory sessions will provide practice in determining unit weight, and casting compression-test cylinders.

The ACI Certification examination and performance evaluation will be conducted. Those individuals who pass will be awarded ACI Certification as a Concrete Field Testing Technician - Grade I.

The class is limited to 24 to ensure individual attention and the registration fee for the course is $800. The program is accredited by the Council for Noncollegiate Continuing Education, a national organization recognized by the U. S. Department of Education.

Use of High-Strength Concrete
September 29 - October 1, 1986
Skokie, Illinois

This new course will benefit owners; consultants; specifying engineers; ready-mixed concrete producers; cement, aggregate and admixture suppliers; testing laboratories; contractors; and others who need information and background on the use of high-strength concrete.

The program will address the latest technology relating to the design, material selection, production, testing, economics, and application of normal weight concrete with compressive strengths in the 9,000-12,000 psi range.

Specialists from PCA and the concrete industry, with backgrounds in concrete technology, ready-mixed concrete production and construction, will instruct and conduct laboratory demonstrations for the participants.

The three-day program will be conducted at the Portland Cement Association Cement and Concrete Center in Skokie, Illinois. Enrollment is limited to 28 to ensure individual attention. The registration fee is $800.

1ST "SHOP BUILT BRIDGE" COMPLETED

Oklahoma's first bridge using a new deck design was recently completed in Pottawatomie County. This design uses precast, steel reinforced, concrete beams, set side by side for the deck. The beams are poured in reusable steel forms at the maintenance yard.

Work started on the first set of forms in
May of 1985. County employees, under the supervision of County Commissioner James Cravens, performed the majority of the work. Technical assistance was provided by O.S.U. staff as needed. Once the forms were completed, eight beams were cast. They were poured two at a time and left in the forms until flexural strength specimens indicated a strength of 500 psi. A bridge just north of the community of Bethel in Pottawatomie County was selected for replacement. County forces removed the old bridge. O.S.U. purchased the materials necessary for the abutments and a contract was let for the labor and equipment to drive piling. Vertical walls, sheet piling type abutments, with HP 10*42 bearing piles and 45 degree wings were constructed. Once the abutments were completed, the prefabricated deck was hauled to the site and set in less than a day. The epoxy grout was then placed in the shear key block-out and the bridge was completed.

The total cost of the pilot bridge, excluding the cost of forms, was $30,600. This represents very little savings over a concrete box of comparable opening. However, on this first bridge, there was considerable wasted motion since everyone was inexperienced. This, coupled with unusually deep bedrock (bearing piles were 43' - 45' long), elevated the cost. It is still strongly felt that this design can produce savings of 15-20 percent over more conventional designs. Two more bridges of this design are presently under construction, one with Commissioner Jack Hayes in Pottawatomie County and one with Commissioner Harold Muran in Osage County. A fourth is being planned with Commissioner Glendon Combs in Pottawatomie County.

All participating Commissioners agree that this design is going to be a cost effective, fast method of small bridge replacement. They have also perceived a fringe benefit of having beams stock-piled in their yards. As Commissioner Muran said, "If I have some of these beams in the yard when one of those overweight oilfield trucks breaks all the stringers on a wooden deck, I can grab four or five of them and have that bridge open for the school buses the next day."

From: Oklahoma T2 Center Newsletter - October 1985.

M. JOHN MOSKALUK
TECHNOLOGY TRANSFER
SCHOOL OF CIVIL ENGINEERING
GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30332
EDITOR'S NOTE

Technology Transfer is not new. Perhaps, it is better known as information sharing, information exchange, or just assistance. Georgia Tech began its Technology Transfer Center for local transportation agencies in 1983 in cooperation with the Georgia Department of Transportation (GDOT) and the Federal Highway Administration (FHWA). It continues today, and its services are available to all local agencies.

Because of the Center's close association with the GDOT for the past several years, it is often mistakenly assumed to be part of the Department. It is not. While it is true that Georgia Tech is under contract with and receives much of its guidance from the GDOT as well as the FHWA, the Georgia Tech Technology Transfer Center is administered and operated by Georgia Tech at the School of Civil Engineering.

Center activities are oriented to provide a service to local agencies. They take the form of workshops, problem solving assistance, publication of a quarterly newsletter, and availability of reports. It is further acknowledged that the Center continues in operation because there is general agreement that local agencies NEED the kind of assistance that is provided by the Center.

Many of the local agencies have told us that the Center provides value through its assistance. In fact, some have said that benefits have been gained in the form of increase production and dollar savings.

If you agree that the Center provides a beneficial service or if you desire more information about how the Center can better serve your agency, please contact the Georgia Tech Technology Transfer Center. We are interested in your comments.
NEWS BRIEFS

Nominations are being accepted for the 1987 National Public Service Awards Program sponsored by the American Society for Public Administration and the National Academy of Public Administration. These awards pay tribute to public service practitioners whose careers exhibit the highest standard of excellence, dedication, and accomplishment.

Up to five awards are presented annually to public service practitioners who now work or who have spent most of their careers in public service. Awards recognize individuals who have made outstanding contributions on a sustained basis rather than those who have performed a single exceptional public service deed. Award winners are selected from all levels of public service (local, state, and federal governments, international and nonprofit organizations), but awards are not chosen by category. Nominees should have responsibility for accomplishing or causing to be accomplished significant programs or projects benefitting the general public.

Nominations are due by November 14. For information, contact National Public Service Awards, 1120 G Street, N.W., Suite 500, Washington, D.C. 20005; telephone (202) 393-7878.

Bridge repairs increased 56% during 1985 according to the Federal Highway Administration's annual report to Congress. The National Bridge Inventory lists 574,729 bridges, of which 243,917 were cited as structurally deficient or functionally obsolete. Under the Surface Transportation Assistance Act of 1982, $2.3 billion in federal funds were distributed in 1985 to help repair 16,550 structurally deficient bridges. Copies of the report are available from the FHWA Bridge Division in Washington, D.C.

Many motorists are willing to pay a toll for a road that offers faster and easier travel, according to a survey performed by the Roper organization. The survey results were recently published by the American Association of State Highway and Transportation Officials.

The toll survey was commissioned by the Transportation Infrastructure Advisory Group, AASHTO reports. Some 1,035 drivers were presented with four situations. In two, they were asked if they would choose to use an existing toll road or a nearby free highway. In two other cases, they were asked how they would vote - for or against a new toll road. Only 12% opposed toll roads in all four situations, while 88% favored the toll option in at least one of the four cases. The survey found that in every case drivers living in states that now have toll roads are more favorable to the toll road option than drivers in non-toll states. Those who actually use toll roads are more favorable to toll road options than those who do not.

Vibration shields made of plastic foil filled with air bubbles are now being used in Sweden to protect populated areas from vibration caused by adjacent heavy traffic. The shields, similar to the bubble wrappings used to protect delicate objects in the mail, are placed in trenches 5 to 20 meters in depth, and reduce the vibration in the area by 70 to 80 percent. The shields will make it possible to greatly reduce the width of highway and railroad rights-of-way.
NEW MICROCOMPUTER USER SUPPORT CENTER OPENS

The Federal Highway Administration (FHWA) has announced the opening of its new microcomputer user support center at the University of Florida Transportation Research Center, effective July 14, 1986. The new service is called the Center for Microcomputers in Transportation (McTrans).

The McTrans Center replaces three earlier microcomputer support centers operated by the Transportation Systems Center in Cambridge:

1. Microcomputer Applications in Highway Projects (MAHP) which dealt with local, regional and statewide highway planning;
2. Microcomputers in Transportation Planning (MTP), which dealt with urban and rural planning and TSM (Transportation Systems management); and,
3. Safety and Traffic Engineering Applications for microcomputers (STEAM) which dealt with general traffic engineering and safety.

In the interim period since these services ended, primary distribution of software has been handled jointly by the FHWA Offices of Traffic Operations and Highway Planning.

The primary role of McTrans will be to serve as a center for technology exchange for microcomputer software in the areas of transportation under the purview of the Federal Highway Administration.

The functions of the Center will be to distribute public domain software at a minimal cost to the user and to provide technical assistance in the use of the software.

In carrying out these functions the McTrans Center will facilitate the flow and exchange of microcomputer resources among professionals nationwide and abroad. The Center will reduce duplication of effort and standardize procedures.

Initially, the McTrans Center will offer, by and large, the same product line previously distributed by the three earlier services. There have been several updates and additions made.

Three new programs also will be distributed. First the microcomputer version of the NETSIM (Network Simulation) model will be available. NETSIM is a microscopic, stochastic simulation model that is the most widely accepted simulation model for network operations.

Another new product is the Signalized Intersection Capacity Analysis (SICA) program. This program, written by the Binghamton (New York) Metropolitan Transportation Study, implements Chapter 9, Signalized Intersection, of the 1985 Highway Capacity Manual.

Finally, the Computer Aided Instructions for NCHRP Report 263, "Simplified Procedures for Evaluating Low-Cost TSM Projects" is available. The documentation for this software includes NCHRP Report 263.

For further information or to get on the McTrans mailing list, write to:

The Center for Microcomputers in Transportation
University of Florida
346 Weil Hall
Gainesville, Florida 32611

Call the McTrans hotline:
904-392-0378
MAINTENANCE TIPS

SIGN REPAIR OR REPLACEMENT

Damaged signs are a severe hazard to motorists. They prevent adequate traffic control and do not provide motorists with advisory warning of roadway alignment.

Crew required for sign replacement of repair:

<table>
<thead>
<tr>
<th>Laborers</th>
<th>2</th>
</tr>
</thead>
</table>

Equipment required:

- Stake truck 1
- Post driver 1
- Hand tools

Material required:

<table>
<thead>
<tr>
<th>Signs</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Sign posts</td>
<td></td>
</tr>
<tr>
<td>Paint</td>
<td></td>
</tr>
</tbody>
</table>

Daily production per crew:

- 7-10 signs

Repair procedures:

1. Place warning signs and safety devices for motorists' and crew protection.

2. Note signs requiring replacement.

3. Replace signs which are difficult to read.

4. Straighten or replace bent posts. Paint as required.

5. Remove warning signs and safety devices.

Sign repair or replacement is required when signs are no longer visible or legible to the motorists.

Traffic signs may be damaged by accident, vandalism, or normal deterioration. The most common cause is vandalism, and signs damaged in this way are normally located on roads that have light traffic.

GUARD RAIL REPAIR

Guard rail repair is required when the guard rail is damaged by accident, vandalism, or normal deterioration. Damaged guard rail, with bent or broken sections, prevents the rail from providing its intended purpose and can lead to additional rail deterioration.

Guard rail is normally damaged during vehicular accidents. The damage can be found at any location where guard rail exists.

Guard rail is placed in locations to decrease accident hazards, and any section that does not perform this function constitutes a hazard to motorists. Guard rail that is bent or broken is unsightly and may further deteriorate, resulting in increased maintenance costs.

Crew required for guard rail repair:

| Equipment operator | 1 |
| Laborers | 3 |
| Flagmen | 2 |

Equipment required:

- Stake truck 1
- Post driver or auger 1

Material required:

| Guard rail section |  |
| Guard rail post |  |
| Guard rail blocks |  |

Daily production per crew:

- 60-100 linear feet

Repair procedure:

1. Place warning signs and other safety devices for motorists' and crew protection.

2. Remove damaged parts and straighten when possible.

CONT. ON PAGE 8
3. Realign loose posts and recompact.
4. Install new posts as required.
5. Install new rail. All repairs should be made to latest standards. Guard rail ends should turn away from roadway and/or taper down to a buried end. Bridge approach guard rail should be affixed to the bridge railing with no gaps. All guard rails should be offset from rigid posts by wooden 6x6 blocks.

ACKNOWLEDGEMENT

The Technology Transfer (T2) Program is a nationwide effort financed jointly by the Federal Highway Administration and individual State Departments of Transportation. Its purpose is to translate into understandable terms the latest state-of-art technologies in the areas of roads, bridges, and public transportation, to local and county highway and transportation personnel.

The T2 Center at Georgia Tech is sponsored by the Georgia Department of Transportation and provides information and counsel to more than 500 municipalities and counties in our state. This newsletter is designed to keep you informed about new publications, new techniques, and new training opportunities that may be helpful to you and your community. Individuals wishing to receive future copies of this newsletter at no cost may send their requests to:

M. John Moskaluk
Technology Transfer Center
School of Civil Engineering
Georgia Tech
Atlanta, GA 30332

YOU ARE INVITED TO SUBMIT
ARTICLES FOR OUR NEWSLETTER.
DEADLINE IS DECEMBER 5.

MAINTAINING GRAVEL ROAD SURFACES

GRAVEL

Gravels differ. Not all gravel is good for roads. Some soils may break into fine pieces under heavy traffic, may swell when wet, or may be so hard they are difficult to work. Good gravel is hard enough so it does not form dust yet loose enough to drain. It supports the weight of traffic and distributes traffic loads sufficiently so it does not destroy the subgrade.

BLENDING

To achieve a road that can be used in all types of weather, it is essential to achieve a proper blend of different size materials. Good road gravel contains a uniform mixture of stones with a mixture of sand and fines. Blending different sizes allows the pieces to lock and pack (compact) together to make a strong, tight surface. Usually the size of materials for a wearing surface is 3/4-inch or less.

Fines have the consistency of flour. The fines fill small spaces between the different size stones. It is an important part of the mixture because, with moisture, it acts as a cement to hold the larger materials together. Moist gravel will not dry to form a hard-wearing surface without the proper amount of fines.

MAINTAINING GRAVEL SURFACE

To keep a road in good condition, the road surface and shoulders must be periodically smoothed and reshaped with a grader blade.

This should be done when the gravel is moist. The dragging operation also rolls the gravel and helps compact the road surface as it is blended.

Properly-blended gravel and fines will dry to form a hard crust that provides a wearing surface. The crust carries the traffic load and sheds water until it is broken. Traffic and climatic conditions

CONT. ON PAGE 8
The purpose of preventive maintenance, or PM, is to keep road equipment in the best possible operating condition at all times. Some useful tips follow:

1. **Use as Many Vehicles of the Same Type as Possible for Your Entire Fleet.** It will be easier to find parts and will cut repair time.

2. **In Choosing Your Vehicles, Pay Attention to the Availability of Parts.** Some operators report delays of several weeks on replacement parts in some localities. Try to select a model for which parts can be found with the least possible delay.

3. **If Possible, Stockpile Frequently-Replaced Parts.** Brake parts are first in this category, followed by exhaust components, filters and lubricants.

4. **Buy the Best Quality Parts Available.** Parts must at least equal original equipment specifications.

5. **Make Sure That Whatever Equipment You Buy is as Tough and Simple as Possible, While Still Affording Drivers a Minimum Standard of Comfort.** Be sure that all equipment on your vehicle can stand up to considerable punishment.

6. **Make Sure That as Few Different People as Possible Operate Each Vehicle.** If possible, make one driver responsible for each vehicle, and let them know that the vehicle is "theirs" to take care of.

7. **Rustproof Every Vehicle Before It is Put Into Service.**

8. **Wax Each Vehicle at Least Once a Year.**

9. **If Possible, Hand-Wash Each Vehicle at Least Once a Week.** Pay attention to wheel wells and the rest of the underside of the vehicle where salt may accumulate.

10. **Make a Thorough Tightening an Important Part of Regular Maintenance.** At least once a week, go over each vehicle and make sure all screws, nuts, and bolts are properly adjusted to the manufacturer's torque specifications. A common cause of damage is that vehicles literally shake apart. Shock absorbers and steering parts have been known to separate completely and body parts sometimes fall off and get lost. Loose parts should be tightened before nut, bolt, and screw threads become stripped.

11. **Check the Condition of Wiring and Hoses.** Watch the ammeter: a small, constant discharge may indicate a short circuit. Antifreeze on the floor of the vehicle means a leak in the heater-defroster. Such leaks also cause windows to steam up and heater output to be reduced.

PAY ME NOW AND PAY ME LATER:
Roadway Neglect Inflates Users' Costs

There is a philosophy being popularized by a commercial for air filters, in which a mechanic, with a wry expression, tells a customer it will cost a few dollars to change the air filter now . . . or a few hundred dollars to change the motor later. "Pay me now or pay me later."

As a result of this kind of thinking and poor road management practices, the current approach to road maintenance in much of the highway community is "pay me now and pay me later." This attitude, in many instances, is caused by the lack of knowledge of true costs of road deterioration.

There is much waste resulting from deteriorated roadways—excess road maintenance and rehabilitation costs; excess fuel costs; excess vehicle maintenance costs; excess tire wear costs; and excess costs of increased accidents with injuries and death that defy the dollar sign. There are most costs in terms of lost time. Lost time costs vary considerably with the value placed on this time, but certainly commercial and industrial time losses are great, resulting in lower productivity and increased costs to consumers. In spite of this long list of waste caused by poorly managed roads, generally only one parameter, rider comfort, is used to judge road suitability.

Extensive research by The World Bank and others over the past 15 years has shown that the lack of earlier concern about roadway conditions has caused the waste of billions of dollars of scarce funds. Studies indicate that the fuel saving alone, gained by keeping a road in good condition, is sufficient to pay all the costs of maintenance and rehabilitation. The long list of other savings can then be put directly into the consumers' pockets and into transporation funds, to be spent in building up the transportation system, instead of watching it crumble.

The studies clearly indicate that if a road agency neglects the roadway, maintenance and overlay costs escalate, fuel waste soars, injuries increase, time loss increases, and so on. The higher maintenance cost soon causes taxes to increase and more and more dollars to be spent on fuel to travel the same distance on steadily worsening roads.

The citizen has been conditioned to believe that in order to keep costs down, the roadways must be allowed to fall in quality. "We have to reduce the level of service to hold down taxes," is a familiar bromide. Somehow the old saying "a stitch in time saves nine," has become a casualty of our throw-away society.

However, the road, once deteriorated, cannot be thrown away. It provides a basic service to individuals and the commercial/industrial community. When the road has deteriorated to the point of sufficient discomfort, loud voices will see that it is rehabilitated—at an inflated cost and after huge fuel waste.

For years we wasted untold millions of gallons of fuel due to insufficient building insulation and inefficient furnaces. Finally, we have learned, and a wave of conversion has and is taking place.

CONT. ON PAGE 9
will completely break down the crust over time and reshaping is necessary to rebuild the crust.

The speed at which a grader operates or can blade effectively will depend on the type of grader, its tire pressure, and the condition of the road surface. Going too fast will cause the grader blade to bounce, creating roughness in the road surface.

**RESHAPING**

Reshaping is necessary when the surface cannot be smoothed to an acceptable riding surface. The gravel, 8 inches or more in depth, may have to be reworked to eliminate large potholes, deep ruts, and flattened crown. The grader blade should cut well below the potholes and below the washboards. Reshaping involves remixing the soils to get a proper blend of fines and different size stones and blading and compacting this blended material into a properly crowned road surface. When remixing, it may be necessary to add more gravel or fines. The art of proper blending is not a cut-and-dried proposition. Experience is the best guide to correct blending. The quality of the crust and its length of useful life depend on the skill used in blending coarse and fine materials with moisture to form the desired crust.

**CROWN**

After the gravel is remixed, it is reshaped by blading to restore a proper crown and smooth surface. A proper crown has the center of the road higher than the shoulders and a straight, uniformly sloped line from the center of the road down to the shoulder edge on either side.

Keeping a crown on the road is probably the most important part of blading. Without a proper crown, water will stand and soak and soften the road surface.

The amount of crown or cross slope in the road should be 1/2 to 3/4 inch for each foot of width measured from the center of the road to the outside edge of the shoulder. This amount of crown should allow good drainage of surface water without washing off surface materials. This slope may vary in special cases.

**SHOULDERS**

The shoulders are the additional width along the outside edge of the roadway. These will be either gravel- or grass-covered on most roads. The slope of the shoulder from road edge to ditch foreslope must be equal or slightly greater than the road surface cross slope. This will allow for good drainage of surface water from the roadway. When reshaping the roadway, the shoulders should also be worked in the same manner.

The shoulders should be an extension of the road surface in order to allow water to run in sheets from the center of the road, off the sides of the road and shoulder and into the ditch. Be careful not to form a secondary ditch by leaving a ridge of materials between the road surface and the ditch.

**DUST CONTROL**

When a gravel road has dust blowing from it, the dust is the fines and, therefore, the binder is being lost. The road is eroding away. With an average daily amount of traffic, untreated gravel roads lose about one inch of surface per year. This is equal to about 500 tons of material in a year's time for each mile of unpaved road. To replace the lost gravel can cost from $1,000 to $1,500 per mile each year for materials alone.

It pays a town to stabilize the gravel with calcium chloride, salt, cements, or other agents. In the long run, it may actually be more cost-effective, while keeping the roads in better condition. Beside stabilizing the soil and reducing maintenance costs, a dust control program improves safety and reduces harmful effects to crops, the environment, and people.

Do not apply used motor oil for dust control. It is toxic and can enter the groundwater.

Reprinted from Fact Sheet T-225, Vermont Local Roads Program, St. Michael's College, Winookski, Vermont.
When will we stop wasting millions of gallons of fuel in order to enjoy the "luxury" of poor roads? We will stop the waste when the public is informed on the basic facts of road users' costs.

It should be pointed out strenuously that these inflated costs are not the end. The inevitable sequence is that insufficient maintenance funds are allocated and the road deteriorates to failure. This requires reconstruction at a cost up to ten times the cost of timely rehabilitation.

The two graphs below illustrate the rapidly rising cost of vehicle operation and road maintenance/rehabilitation due to neglect of the road system. Graphs are prepared on figures of 425 urban highway miles, 1,818 million vehicle miles per year, and 178 million gallons of fuel.

The citizen is exposed to double jeopardy: "pay me now" and "pay me later"

In all other aspects of energy misuse, action is well underway to change wasteful practices. It is time that the one area that uses the largest amount of the scarcest form of energy, cleaned up its act.

From The Wheel, Colorado Transportation Information Center, Summer, 1986.

Fuel Waste Per 100 Miles of Road Per Year — Urban
(Cost at $1.30 Per Gallon — 1980)

<table>
<thead>
<tr>
<th>Quality of Road</th>
<th>Cost Per 100 Miles Per Year</th>
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<tbody>
<tr>
<td>Good</td>
<td>$1.000,000</td>
</tr>
<tr>
<td>Fair</td>
<td>$1.490,000</td>
</tr>
<tr>
<td>Poor</td>
<td>$1.980,000</td>
</tr>
<tr>
<td>Very Poor</td>
<td>$2.970,000</td>
</tr>
</tbody>
</table>

1977 Cost Per 100 Miles Per Year, Urban-Surface Maintenance and Overlay

<table>
<thead>
<tr>
<th>Quality of Road</th>
<th>Cost Increase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Good</td>
<td>None</td>
</tr>
<tr>
<td>Fair</td>
<td>As quality decreases cost increases</td>
</tr>
<tr>
<td>Poor</td>
<td>Significant increase</td>
</tr>
<tr>
<td>Very Poor</td>
<td>Extreme increase</td>
</tr>
</tbody>
</table>


This manual was written especially for those involved in roadway maintenance on a day-to-day basis, whether through administration or engineering. It is not only a reference manual but a practical guide with forms and materials that can be reproduced and used directly by the agency. The 698-page manual is divided into two sections, one on the administrative end of maintenance and the other on operations. Some of the administrative topics discussed are reducing liability risks, employee safety, training needs and techniques, types of contracts and pavement management. On the operational end, the Manual topics include asphalt and PCC pavement maintenance, gravel road maintenance, maintenance of drainage facilities, bridges, roadway appurtenances and traffic control devices. It also includes sections on roadside landscaping and snow and ice control. The Manual can be obtained for $50.00 plus shipping and handling at the following address: American Public Works Association, 1313 East 60th Street, Chicago, IL 60637.

ASPHALT CEMENT CONTENT DIAGNOSTIC APPROACH FOR HOT MIX ASPHALT FACILITIES

Variations in asphalt cement content in hot mix asphalt mixes (HMA) can be the result of various problems in the production process, the sampling procedure or the extraction procedure. Such problems can, in turn, lead to costly specification-based penalties.

In an effort to help the hot mix contractor avoid these penalties and produce a top-quality product, the National Asphalt Pavement Association (NAPA) has issued this new publication, a step-by-step analysis of the potential areas where problems might arise and measures to take for correcting them.
The Federal Highway Administration (FHWA), through the National Highway Institute and the Office of Highway Safety, is offering two training courses on Local Highway Safety. These are special courses developed for the Rural Technical Assistance Program (RTAP) by Goodell-Grivas, Inc. with emphasis on the needs of local personnel responsible for highway safety.

These two presentations are designed for university faculty, Federal, State and local highway professionals who intend to promote and conduct highway safety training for counties, small cities (less than 50,000 population) and townships.

The 1-day presentation on Local Highway Safety Studies for local roads and streets provides simplified methods for analyzing accidents and developing safety and operational improvements. The course combines existing methods with new approaches and emphasizes what can be done with limited time, funds, and engineering equipment.

The 1-day presentation of Local Highway Safety Improvement Program will cover developing safety improvement programs for local highway agencies with due consideration for safety, cost, tort liability, and good planning procedures.

Each participant will receive a Participant Guide, Instructor Guide, 35 mm slides, and other related training material. In return they will be expected to present one or more sessions of the basic courses to representatives of local transportation agencies within their jurisdiction.

The fee for the courses is $20.00 per course (payable to the Radisson Inn and Conference Center). They are offered separately, but participants are encouraged to enroll in both. The deadline for registration is November 7, 1986. For further registration information, contact the Georgia Tech Technology Transfer Center at (404) 894-2360 or toll-free at 1-800-282-1275.
Troubleshooting Concrete Field Problems  
November 17-21, 1986  
Skokie, Illinois

Cement and concrete industry service and technical problem-solving personnel will benefit. The course is designed especially for those responsible for handling field problems for contractors, precasters, inspection and testing agencies, architects, and federal, state, county, and city engineering departments.

The class will focus on identifying and discussing problems of durability, ready mix concrete production and transportation, admixture use, concrete placement, fabrication and construction and precast prestressed concrete structures, slabs on grade, quality control procedures, strength test evaluation, repair and maintenance of concrete surfaces and structures, and ways to determine in-place concrete strengths.

The five-day class will be conducted at the PCA Cement and Concrete Center in Skokie, Illinois. Enrollment is limited to 28 to assure individual attention. The registration fee is $975.

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BACK-TO-THE BASICS REPAIR OF CONCRETE  
November 25, 1986  
Birmingham, Alabama

"Back-to-the Basics Repair of Concrete" is sponsored by the American Concrete Institute and the Central Alabama Chapter ACI. The seminar will deal with basic, how-to fundamentals related to concrete deterioration as well as cover current repair methods and materials with proven performance. Actual case histories of repairs will be presented including fire-damaged concrete structures, tunnels, bridges and parking structures. The seminar will conclude with a lecture on the important aspects and applications of corrosion protective systems.

Registration will be held on a first-come, first-served basis with limited enrollment. Fees are $165.00 for ACI members and $190 for non-members. Group discounts are available. For further registration information, write to: ACI Education Department, P. O. Box 19150, Detroit, MI 48219.

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Basic Concrete and Related Field Practice  
November 10-14, 1986  
Skokie, Illinois  
and
Advanced Concrete Technology  
December 1-5, 1986  
Skokie, Illinois

Courses on concrete that range from the basic to the advanced will be offered.

"Basic Concrete and Related Field Practice" is designed to enhance product knowledge of ready-mix producers, contractors, inspection and testing organizations, material suppliers, sales firms, and local, state, and federal agencies.

The five-day class will cover materials, and principles of quality concrete and construction. In laboratory sessions, mix design problems will be worked out and verified with test specimens, and finishing practices will be demonstrated. A special session will cover the mixing and transporting of ready mixed concrete. Sessions will be conducted by persons familiar with field problems to ensure discussions relevant to current construction practices. The registration fee is $900.

A course in "Advanced Concrete Technology" is being offered for those who have a background in concrete. The advanced class will cover concrete materials, including lightweight concrete, curing requirements, and factors causing concrete strength variations.

The class will cast specimens for later verification, determine in-situ strength of concrete, and perform standard tests for qualifying cement, aggregates, and admixtures used in the production and control of concrete.

The five-day class is limited to 28 and the registration fee is $900. Both classes are accredited by the Council for Noncollegiate Continuing Education and are approved for college credit. They will be conducted at PCA's Cement and Concrete Center in Skokie, Illinois.

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It applies to both batch and drum mix facilities and looks at asphalt cement content problems grouped into three categories: (1) consistently high; (2) consistently low; (3) varying—low to high. Included is a handy diagnostic chart to aid the facility operator in pinpointing the source of the problem.

It is available to non-NAPA members for $3.00 per copy and can be obtained from NAPA, 6811 Kenilworth Ave., Riverdale, MD 20737.

GUIDE FOR DESIGN OF PAVEMENT STRUCTURES,
American Association of State Highway and Transportation Officials, 1986.

The new American Association of State Highway and Transportation Officials (AASHTO) Guide for Design of Pavement Structures, adopted by the members of AASHTO at the October 1985 meeting has now been published. It may be purchased from AASHTO, 444 North Capital Street, NW, Suite 225, Washington, DC 20001. The guide costs $30.00 plus postage and handling charges of $3.50. Payment must accompany all orders.

M. JOHN MOSKALUK
TECHNOLOGY TRANSFER
SCHOOL OF CIVIL ENGINEERING
GEORGIA INSTITUTE OF TECHNOLOGY
ATLANTA, GEORGIA 30332