Engineering Experiment Station Bulletin

University of Kentucky
College of Engineering

PROCEEDINGS
OF THE
KENTUCKY HIGHWAY CONFERENCE

ENGINEERING EXPERIMENT STATION BULLETIN SERIES
Published by the University of Kentucky, Lexington

VOL. 4 JUNE 1950 NO. 4
UNIVERSITY OF KENTUCKY
ENGINEERING RESEARCH

PROCEEDINGS
of the
KENTUCKY HIGHWAY CONFERENCE

held at the University of Kentucky
MARCH 2-3, 1950
sponsored by
College of Engineering
University of Kentucky and
Kentucky Department of Highways

Edited by
E. EVERETT ELSEY
Associate Professor of Engineering Research

BULLETIN NO. 16
JUNE 1950

The Engineering Experiment Station
College of Engineering
University of Kentucky
Lexington
UNIVERSITY OF KENTUCKY
ENGINEERING EXPERIMENT STATION

ORGANIZATION

Herman L. Donovan
President

Leo M. Chamberlain
Vice President of the University

Frank D. Peterson
University Comptroller

ENGINEERING EXPERIMENT STATION

College of Engineering

Daniel V. Terrell
Director and Dean of Engineering

Ernest A. Bureau
Head, Department of Electrical Engineering

Charles S. Crouse
Head, Department of Mining & Metallurgical Engineering

Estel B. Penrod
Head, Department of Mechanical Engineering

Robert E. Shaver
Head, Department of Civil Engineering

Andre J. Meyer
Director, Aeronautical Research Laboratory

E. Everett Elsey
Editor of the Engineering Experiment Station Bulletins
### ENGINEERING EXPERIMENT STATION

**University of Kentucky**

**College of Engineering**

**Publications**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>1</td>
<td>Facilities for Performing Engineering Research</td>
</tr>
<tr>
<td>1</td>
<td>4</td>
<td>4</td>
<td>Development of the Heat Pump — Estel B. Penrod, Professor and Head, Department of Mechanical Engineering.</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>5</td>
<td>Air Entrainment in Cement Concrete — L. E. Gregg.</td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>6</td>
<td>Measurements, Analysis, and Statistical Nature of Deionization Time in a Mercury Vapor Thyratron.—H. Alex Romanowitz, Professor of Electrical Engineering.</td>
</tr>
<tr>
<td>2</td>
<td>3</td>
<td>7</td>
<td>The Silicosis Hazard in the Monument Industry of Kentucky.—Charles Mason Davidson.</td>
</tr>
<tr>
<td>3</td>
<td>1</td>
<td>9</td>
<td>A Preliminary Report on the Iron Ore Resources of Kentucky.—C. S. Crouse, Head, Department of Mining and Metallurgical Engineering. James L. Wyatt, Graduate Assistant, Department Metallurgical Engineering.</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>10</td>
<td>An Investigation of the Weir Sand Producing Reservoir for Secondary Recovery Possibilities.—W. E. Lang, Production Engineer.</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>11</td>
<td>Panel Cooling Design Including Lighting Load.—Merl Baker, Assistant Professor of Mechanical Engineering.</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>14</td>
<td>Earth Heat Pump Research.—Estel B. Penrod, Head, Department of Mechanical Engineering.</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>15</td>
<td>The Determination of Constant Altitude Range Performance of Turbojet-Propelled Aircraft.—Wm. F. Savage. Asst. Professor, Dept. of Mechanical Engineering.</td>
</tr>
</tbody>
</table>
The Engineering Experiment Station of the College of Engineering was established on July 1, 1946, by an act of the Board of Trustees of the University of Kentucky. Its objectives are:

1. To organize, initiate and promote engineering research of special interest to the State.
2. To aid and consult with industry regarding its research problems.
3. To promote the conservation and utilization of the State’s resources.
4. To provide support for research training in the fundamental and applied sciences.

The management of the Engineering Experiment Station is vested in a Director and an Executive Committee which controls its policies and operation. They are as follows:

Director: Dean of the College of Engineering
Head of the Department of Civil Engineering
Head of the Department of Electrical Engineering
Head of the Department of Mechanical Engineering
Head of the Department of Mining and Metallurgical Engineering
Director of Aeronautical Research Laboratory

To make available to the interested public the results of its Industrial Research and investigations, the Engineering Experiment Station publishes and distributes a series of bulletins each year.

For copies of publications or for other information address:

Engineering Experiment Station
University of Kentucky
College of Engineering
Lexington 29, Kentucky
# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Topic</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conference Program</td>
<td>9</td>
</tr>
<tr>
<td>Welcoming Address</td>
<td>15</td>
</tr>
<tr>
<td>The Importance of Adequate Right of Way for Rural Road Improvement</td>
<td>18</td>
</tr>
<tr>
<td>R. D. Thompson</td>
<td></td>
</tr>
<tr>
<td>Balancing Expenditure for Grading, Draining, and Surfacing</td>
<td>22</td>
</tr>
<tr>
<td>L. C. Pendley</td>
<td></td>
</tr>
<tr>
<td>Each County Needs a Qualified County Road Engineer</td>
<td>28</td>
</tr>
<tr>
<td>Judge Brady Stewart</td>
<td></td>
</tr>
<tr>
<td>Address</td>
<td>32</td>
</tr>
<tr>
<td>Robert B. Brooks</td>
<td></td>
</tr>
<tr>
<td>State, County, and Municipal Roads in a Balanced Highway System</td>
<td>44</td>
</tr>
<tr>
<td>W. P. Curlin</td>
<td></td>
</tr>
<tr>
<td>Municipal Problems</td>
<td>48</td>
</tr>
<tr>
<td>N. W. Neel</td>
<td></td>
</tr>
<tr>
<td>Responsibility of the Engineer in the Field</td>
<td>51</td>
</tr>
<tr>
<td>Hon. John A. Keck</td>
<td></td>
</tr>
<tr>
<td>Kentucky's Rural Highway Program</td>
<td>56</td>
</tr>
<tr>
<td>Hon. Emerson Beauchamp</td>
<td></td>
</tr>
<tr>
<td>Some Aspects of Atomic Energy</td>
<td>60</td>
</tr>
<tr>
<td>Dr. W. S. Webb</td>
<td></td>
</tr>
<tr>
<td>Experience in Activating a Master County Road System</td>
<td>65</td>
</tr>
<tr>
<td>E. C. Rogers</td>
<td></td>
</tr>
<tr>
<td>Interpretation of Plans and Specifications</td>
<td>73</td>
</tr>
<tr>
<td>A Panel Discussion</td>
<td></td>
</tr>
<tr>
<td>Low Cost Bridges for Secondary Roads</td>
<td>90</td>
</tr>
<tr>
<td>G. Wood Smith</td>
<td></td>
</tr>
<tr>
<td>Toll Facilities in the Highway Program</td>
<td>96</td>
</tr>
<tr>
<td>Craig P. Hazelton</td>
<td></td>
</tr>
<tr>
<td>Economics in Erection of Long Span Continuous Bridges</td>
<td>104</td>
</tr>
<tr>
<td>Harry A. Balke</td>
<td></td>
</tr>
<tr>
<td>Road Side Improvement</td>
<td>115</td>
</tr>
<tr>
<td>Dr. N. R. Elliott</td>
<td></td>
</tr>
<tr>
<td>Effect of Surface Irregularities on the Riding Qualities of High Type</td>
<td>120</td>
</tr>
<tr>
<td>Pavements</td>
<td></td>
</tr>
<tr>
<td>Harvey J. Field, Jr.</td>
<td></td>
</tr>
<tr>
<td>Traffic Control</td>
<td>129</td>
</tr>
<tr>
<td>W. P. Ringo</td>
<td></td>
</tr>
<tr>
<td>Problems of the District Engineer—Technical and Otherwise</td>
<td>134</td>
</tr>
<tr>
<td>B. T. Moynahan</td>
<td></td>
</tr>
</tbody>
</table>
ACKNOWLEDGEMENT

Appreciation of the efforts of all those who made the Kentucky Highway Conference a success is gratefully expressed. Additional thanks are due the authors of the following papers. These extra contributions of their time, knowledge, and experience were most beneficial.
FOREWORD

Feeling the need for a further exchange of ideas on better roads, the College of Engineering, University of Kentucky and the Kentucky Department of Highways again cooperated in sponsoring a two-day conference early last March.

The results of this conference as evidenced by the attention, attitude, and comments of those who attended were quite gratifying. The talks delivered are set forth in this bulletin as a record for the visitors at the conference and as information for others.

It is hoped that these meetings will be a means of closer cooperation and understanding not only among members of the Highway Department but with all State, County, and City officials whose work is connected in any way with the motor transportation system of the State.
KENTUCKY HIGHWAY CONFERENCE

PROGRAM

University of Kentucky
Lexington, Kentucky

THURSDAY, MARCH 2

MORNING
8:30 - 10:00
Registration – Memorial Hall

10:00 - 11:30
Session 1 – Memorial Hall

Presiding – D. V. Terrell, Dean, College of Engineering University of Kentucky

Welcoming Address – Leo M. Chamberlain, Vice President, University of Kentucky

Kentucky’s Rural Highway Program – Hon. Emerson Beauchamp, Commissioner of Rural Highways, Kentucky Department of Highways

Announcements

AFTERNOON
12:00 - 1:15
Luncheon – Student Union Building (Purchase Tickets Not Later than 10:00 a.m.)
Introduction — E. Everett Elsey, Associate Professor Engineering Research, University of Kentucky

Address — Some Aspects of Atomic Energy — Dr. W. S. Webb, Head of Department of Physics, University of Kentucky

1:30 – 4:30

Session 2 — Memorial Hall

County Road Programs

Presiding — Judge S. R. Cheek, County Judge, Boyle County, Kentucky

1. "Experience in Activating a Master County Road System"— E. C. Rogers, County Engineer, Madison County, Tennessee, Jackson, Tennessee

2. "The Importance of Adequate Right of Way for Rural Road Improvement"— R. D. Thompson, County Road Engineer, Lincoln County, Kentucky

3. "Balancing Expenditure for Grading, Draining and Surfacing"— L. C. Pendley, Asst. Prof. of Civil Engineering, University of Kentucky

4. "Each County Needs a Qualified County Road Engineer"— Judge Brady Stewart, County Judge, McCracken County, Paducah, Kentucky

Discussion
NIGHT

6:30

Dinner — Student Union Building – Ball Room (Purchase Tickets Not Later than 1:30 p.m.)

Toastmaster — J. Frank Grimes, President, Kentucky Section of American Society of Civil Engineers

Address — Robert B. Brooks, Consulting Engineer, St. Louis, Mo.

FRIDAY

9:00

Session 3a.— Room 205, Anderson Hall

County and City Officials

Presiding — W. O. Snyder, Executive Secretary Kentucky Association of Highway Contractors

1. State, County, and Municipal Roads in a Balanced Highway System — W. P. Curlin, Deputy Commissioner of Highways

2. Municipal Problems — N. W. Neel, City Engineer, Henderson, Kentucky

Discussion
Session 3b.— Memorial Hall

Construction — Maintenance — Design

Presiding — D. H. Bray, State Highway Engineer

1. Responsibility of the Engineer in the Field — Hon. John A. Keck, Commissioner of Highways

2. Interpretation of Plans and Specifications, Panel Discussion — L. E. Gregg, Associate Director of Highway Materials Research Laboratory — Moderator
   
   C. B. Owens — Division of Construction
   W. S. Todd — Division of Construction
   C. L. Logan — Bureau of Public Roads
   A. O. Niser — Division of Design
   J. A. Bitterman — Division of Tests
   M. F. Johnson — Division of Maintenance

Session 3c.— Room 204, Anderson Hall

Structural Discussions

Presiding — S. A. Mory, Jr., Professor of Structural Engineering, University of Kentucky

1. Low Cost Bridges for Secondary Roads — G. Wood Smith, Vice President, Sverdrup & Parcel, Consulting Engineers, St. Louis, Missouri

2. Toll Facilities in the Highway Program — Craig P. Hazelet of Hazelet and Erdal, Consulting Engineers, Louisville, Kentucky

3. Economics in Erection of Long-Span Continuous Steel Bridges — Harry A. Balke, Consulting Engineer, Cincinnati, Ohio

Discussion
AFTERNOON

12:15 – 1:30

Luncheon – Student Union Building Ball Room (Purchase Tickets Not Later Than 4:00 p.m. Thursday)

Presiding – D. V. Terrell, Dean, College of Engineering, University of Kentucky

University Picture – “The University of Kentucky – A Place, A Spirit”

1:45 – 4:30

Session 4 – Memorial Hall

Presiding – R. E. Shaver, Head, Department of Civil Engineering, University of Kentucky

1. Road Side Improvement – N. R. Elliott, Professor of Landscape Architecture, University of Kentucky

2. Effect of Surface Irregularities on the Riding Qualities of High Type Pavements – Harvey J. Field, Jr., Assistant Research Engineer, Highway Materials Research Laboratory, University of Kentucky

3. Traffic Control – W. P. Ringo, Director of Traffic, Kentucky Department of Highways

4. Problems of the District Engineer – Technical and Otherwise – B. T. Moynahan, District Engineer, Sixth District, Kentucky Department of Highways

Discussion