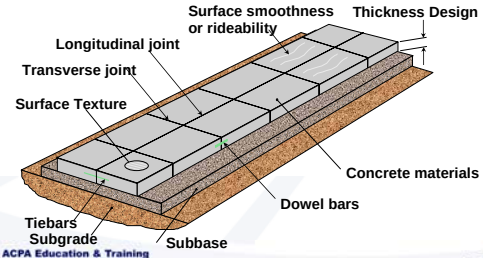
Concrete Pavement Types, Design Features, and Performance

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Basic Components of a Concrete Pavement

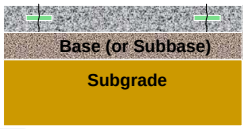


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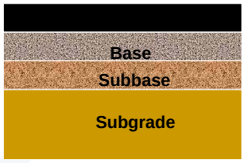
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Terminology Comparison – Rigid and Flexible Pavements

Concrete Section



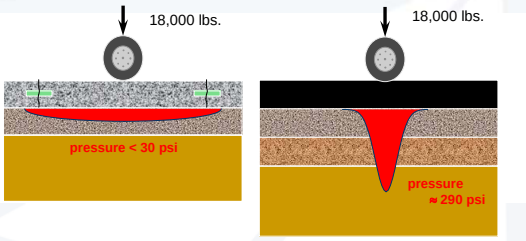
Asphalt Section



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Stress Dissipation in Pavements



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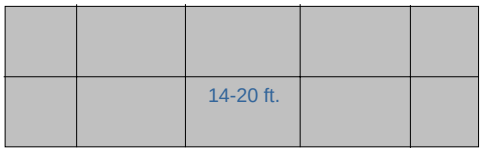
Concrete Pavement Types

- Jointed Plain (JPCP)
  - Undoweled
  - Doweled
- Jointed Reinforced (JRCP)
- Continuously Reinforced (CRCP)

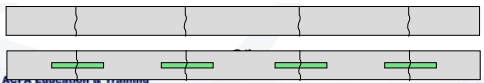
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Jointed Plain (JPCP)



Plan



Profile

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JPCP

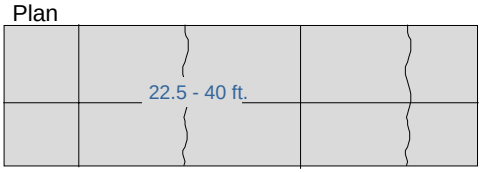


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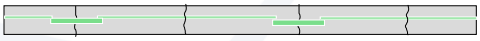
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Jointed Reinforced (JRCP)

Plan



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JRCP

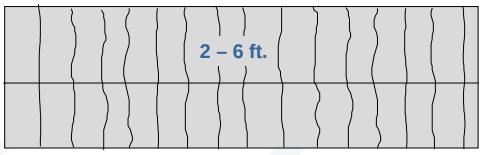


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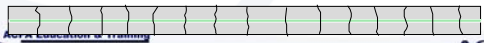
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Continuously Reinforced (CRCP)

Plan



Profile



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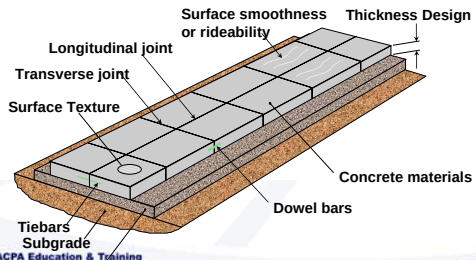
CRCP



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Basic Components of a Concrete Pavement



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Comparative Performance of In-Service Highway Pavements

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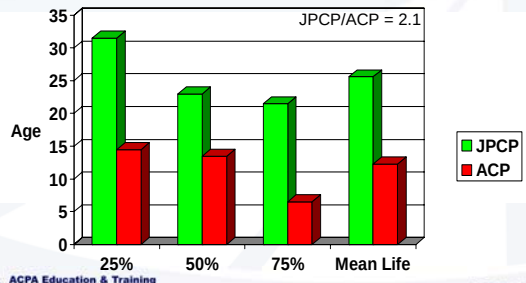
Selected Highway Corridors

- I-40 in Western Tennessee
- I-90 in Western South Dakota
- I-15 in Utah South of Salt Lake City
- I-40 in Eastern Oklahoma
- I-285, & SR 400 in Georgia North of Atlanta

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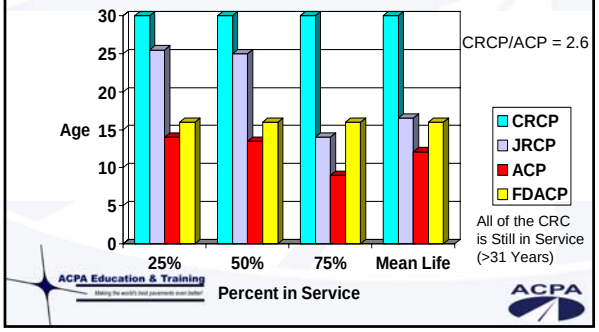
Survival Analysis Results - I-40 in TN



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Survival Analysis Results - I-90 in SD



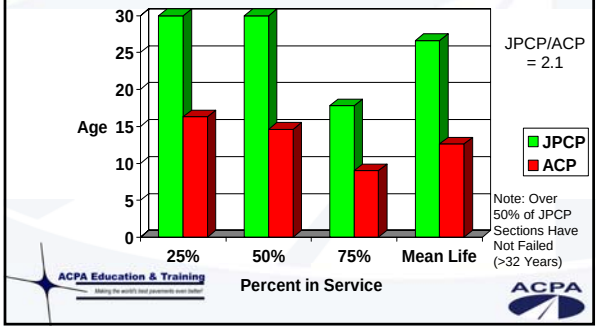
CRCP/ACP = 2.6

All of the CRC is Still in Service (>31 Years)

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Survival Analysis Results - I-15 in UT



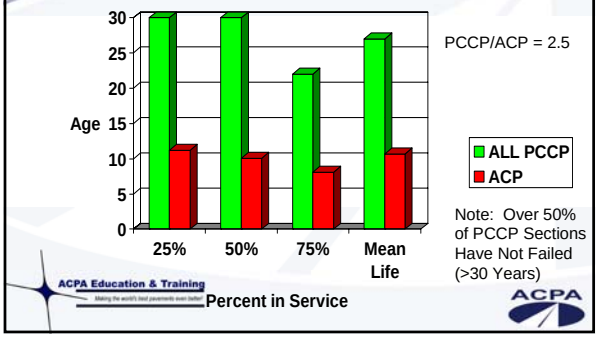
JPCP/ACP = 2.1

Note: Over 50% of JPCP Sections Have Not Failed (>32 Years)

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Survival Analysis Results - I-40 in OK



PCCP/ACP = 2.5

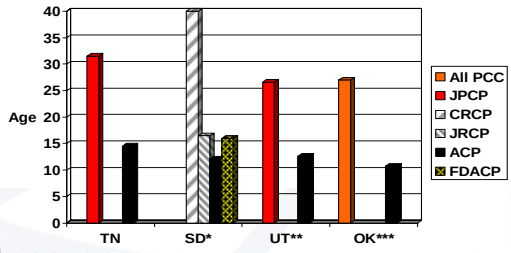
Note: Over 50% of PCCP Sections Have Not Failed (>30 Years)

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Survival Analysis Results

Avg. Mean life



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Questions?

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AASHTO 1998 Rigid Pavement Design Procedure and Software

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AASHTO Design Guide: Evolution

- AASHO Road Test (ART), 1958-1960
- AASHO Interim Guides, 1961 & 1962
- Revised Interim Guide, 1972
- Revised Chapter III (rigid), 1981
- AASHTO Guide for the Design of Pavement Structures, 1986
- AASHTO Guide for the Design of Pavement Structures, 1993 (overlays)
- Supplement to the AASHTO Guide for the Design of Pavement Structures, 1998 (rigid pavement design)

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LTPP

AASHO Road Test (ART) → Basis of AASHTO Design Guide



LTPP

TYPICAL JPCP PAVEMENT
(designed according to 1972-1989 versions AASHTO design guides)



LTPP

Rigid Pavement Design Deficiencies

- Major shortcomings of JPCP designs based on 1972-1986 versions of the AASHTO Guide :
  - inadequate joint load transfer,
  - long joint spacing,
  - erosion of base/subbase,
  - poor subdrainage
  - etc.
- Deterioration occurs early
- Rehabilitation needed

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Development of Supplemental AASHTO Design Procedure for JPCP

- Serious deficiencies noted in 1986 AASHTO procedure
- Studies showed major flaws in base/subgrade support procedures
- No easy fixes
- Improved structural (3D finite element) model for JPCP was developed to correct deficiencies

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Development, Validation, Adoption: 1998 Supplemental Rigid Pavement Design Procedure

- Developed under NCHRP Project 1-30 (University of Illinois at Urbana-Champaign)
- Validated under FHWA/LTPP research study (ERES Consultants/ARA)
- Adopted by AASHTO as Supplementary Rigid Pavement Design Procedure (1998)
- FHWA/LTPP - Supplementary Rigid Pavement Design Spreadsheet (ERES Consultants/ARA)

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1998 AASHTO JPCP Design Procedure

- Improved structural modeling
- Improved subgrade characterization
- Base course as structural layer
- Transverse joint spacing
- Climate at site is considered directly
- Shoulder type and slab width
- Joint faulting and cracking checks

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Use of LTPP Data to Verify 1998 AASHTO Design

- Design procedure verified using field data from LTPP
- Inputs to 1998 AASHTO design model obtained
- Actual traffic log ESALs compared to predicted log W (ESALs)
- No significant bias found in predicting serviceability of pavements in four climatic zones

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Rigid Pavement Design Spreadsheet: Features

Information sheet containing spreadsheet "User Guide"

I. Input Sheet - General Information

- The general information section requests information about the agency. This information is not required for the analysis, but the information entered here may be displayed on the "Results" sheet.

II. Input Sheet - Design Information

- All design inputs are required except sensitivity analysis. No default values are used.
- Information can be retrieved from the "Saved Data" sheet using the "Retrieve Data" button. The existing data can be replaced or saved as a new set using the "Save Data" button.
  Clicking on the "Retrieve Data" button opens the "Saved Data" sheet. Select the appropriate row to be retrieved and click on the "Export" button.
  If the retrieval is successful, the data are retreived. Changes can be made and saved as a new data set using a different value for the search ID. The data can also

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Users of the RPD Software

- State and Provincial Highway Engineers
- Consulting Engineers

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Benefits of Rigid Pavement Design Software

- Provides key answers not previously addressed:
  - How do I adequately characterize the subgrade support?
  - What is the best base type for the conditions?
  - What is the optimum joint spacing?
  - Will this pavement fault or have corner breaks?

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Software Demonstration

- Order software:
  - LTPP homepage
  - www.tfhrc.gov
  - LTPP customer service
  - Call 865-481-2967

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