Type of Projects

- Determine Pavement Structure
- Analyze Pavement Structure
- Estimate Material Cost
- Calculate Life-Cycle Cost

- Projects created with "Determine Pavement Structure" can be edited though the other projects?

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Determine Paver

Scenario Information

Scenario
- Name
- Description
- State*

Pavement Design
- Est. Year Completion*
- Roadway Classification*
- Project Type*
- Structural Evaluation Method*

Roadway Classification
- Parking Lot - Light Duty
- Parking Lot - Heavy Duty
- Residential/Collector
- Local
- Arterials/Highway
- Interstate

if Classificaiton is Light Duty

Project Type
- New - Asphalt

if other

if AC Overlay on Asphalt is picked

Project Type
- New - Asphalt
- New - Concrete
- Porous
- AC Overlay on Asphalt
- AC Overlay on Concrete or Composite

Structural Evaluation Method
- Condition Survey
- NDT

Design Parameters

Design Parameters
- Design Period*: 15(d)
- Reliability Level*
- Combined Standard Error*: 0.4(d)

Reliability Level
- 50%(d)
- 60%
- 70%
- 75%
- 80%
- 85%
- 90%
- 95%
- 99%

Serviceability
- Initial Serviceability Index*: 4.5(d)
- Terminal Serviceability Index*: 2(d)
- Change in Serviceability (ΔPSI)*: 2.5(d)

Climate
- Nearest City*
- Mean Annual Wind Speed
- Mean Annual Temperature
- Mean Annual Precipitation

- Nearest City depends on state picked
- Annual Means have default values when city is chosen

Traffic & Loading

Traffic Data
- Method of Evaluating ESALs*

Using AADT

Traffic Data
- Completion Year Traffic*
- Load Equivalency Factor*
- Completion Year ESALs*

Completion Year Traffic(Calculation)
- Average Annual Daily Traffic (AADT)*
- Lanes Measured (AADT x value)*
- Directional Lanes(AADT x value)*
- Year of Traffic Count*
- Historical Traffic Growth Rate*
- Completion Year Traffic

Lanes Measured
- One-Way, value=1(d)
- Two-Way, value=0.5

Directional Lanes
- 1, value=1.0(d)
- 2, value=0.9
- 3, value=0.8
- 4+, value=0.75

Annual ESALs

Traffic Data
- Completion Year ESALs*

Traffic Growth
- Design Period: 15(d)
- ESAL Growth Rate*
- Total Design ESALs (W18)*

Traffic Growth
- Design Period: 15(d)
- Future Traffic Growth Rate*
- ESAL Growth Rate*
- Total Design ESALs (W18)*

Design ESALs

Traffic Growth
- Total Design ESALs (W18)*

ment Structure

Pavement Structure

Pavement Sub-Structure

Design Guidance

ment Structure
)

- Modulus of Rupture (S'_c)*
- Elastic Modulus (E_c)*
- Poisson's Ratio (μ)*

Pavement Joint and Edges (PCC)

- Joint Spacing (L)*
- Load Transfer Coefficient (J)*
- Edge Support (E)*

Pavement Diagram (PCC)

- PCC layer, Base layers, Subgrade

Reliability Level

- Base Layer Type
- Base Modulus (E_b)*
- Base Thickness (H_b)*
- Drainage Factor (C_d)*
- Slab/Base Friction Coefficient*
- Eff. Modulus of Subgrade Reaction (k)*

Scoped Design

- Chart with rigid layer, base layer, and subgrade
- Layer Thicknesses(in)

Design Notes

- Text for notes, can be updated

Base Layer Type

- Fine-grained soil, 1.3
- Sand, 1.2
- Aggregate, 1.4
- Lime-stabilized clay, 3.0
- Asphalt-treated gravel, 5.8
- Cement-treated gravel, 34

- Value of Slab/Base Friction will change based on the Base Layer Type

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Determine Pa

Scenario: When selects Project Ty Porous

Scenario Information

Scenario
- Name
- Description
- State*

Pavement Design
- Est. Year Completion*
- Roadway Classification*
- Project Type*
- Structural Evaluation Method*

Roadway Classification
- Parking Lot - Light Duty
- Parking Lot - Heavy Duty
- Residential/Collector Local
- Arterials/Highway Interstate

if Classificaiton is Light Duty

Project Type
- New - Asphalt

if other

Project Type
- New - Asphalt
- New - Concrete
- Porous
- AC Overlay on Asphalt
- AC Overlay on Concrete or Composite

if AC Overlay on Asphalt is picked

Structural Evaluation Method
- Condition Survey
- NDT

Porous Layers

Layers
- Layer Type
- Thickness (inches)
- Layer Coef. (a)
- Subgrade Soil Type
- Modulus (PSI)

Layer Type
- Asphalt - Open Graded
- Recharge Bed (Base)
- Subgrade

Thickness (inches)
- 6 in (d)
- 19 in (d)
- N/A

Layer Coef. (a)
- 0.44 a (d)
- 0.1 a (d)
- N/A

Subgrade Soil Type
- N/A
- N/A
- Soil Type(d)

Soil Type
- Select a Soil Type(d)
- A-1-a
- A-1-b
- A-2-4
- A-2-5
- A-2-6
- A-2-7
- A-3
- A-4
- A-5
- A-6
- A-7-5
- A-7-6

Modulus (PSI)
- N/A
- (Blank) psi (d)
- Calculated psi

Calculate psi(Subgrade Modulus)
- Calculation Method*

if Calculation Method R-value is selected

R-Value
- R-Value*
- Subgrade Modulus (M_R) (psi)

if Calculation Method CBR is selected

CBR
- CBR*
- Subgrade Modulus (M_R) (psi)

- This page formatted as a table, an example will follow
- Calculate psi is a form

Design Parameters

Design Parameters
- Design Period*: 15(d)
- Reliability Level*
- Combined Standard Error*: 0.4(d)

Reliability Level
- 50%(d)
- 60%
- 70%
- 75%
- 80%
- 85%
- 90%
- 95%
- 99%

Serviceability
- Initial Serviceability Index*: 4.5(d)
- Terminal Serviceability Index*: 2(d)
- Change in Serviceability (ΔPSI)*: 2.5(d)

- Nearest City dep on state picked
- Annual Means ha default values wh is chosen

avement Structure

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ends

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hen city

Traffic & Loading

Guidance (Design Guidance)

Climate

- Nearest City*
- Mean Annual Wind Speed
- Mean Annual Temperature
- Mean Annual Precipitation

Traffic Data

- Method of Evaluating ESALs*

Using AADT

Design ESALs

Scoped Design

- Chart with recharge bed and subgrade
- Layer Thicknesses(in)

Design Notes

- Text for notes, can be updated

Traffic Data

- Completion Year Traffic*
- Load Equivalency Factor*
- Completion Year ESALs*

Annual ESALs

Traffic Growth

- Total Design ESALs (W18)*

Traffic Data

- Completion Year ESALs*

Traffic Growth

- Design Period: 15(d)
- ESAL Growth Rate*
- Total Design ESALs (W18)*

Completion Year Traffic(Calculation)

- Average Annual Daily Traffic (AADT)*
- Lanes Measured (AADT x value)*
- Directional Lanes(AADT x value)*
- Year of Traffic Count*
- Historical Traffic Growth Rate*
- Completion Year Traffic

Lanes Measured

- One-Way, value=1(d)
- Two-Way, value=0.5

Directional Lanes

- 1, value=1.0(d)
- 2, value=0.9
- 3, value=0.8
- 4+, value=0.75

Traffic Growth

- Design Period: 15(d)
- Future Traffic Growth Rate*
- ESAL Growth Rate*
- Total Design ESALs (W18)*

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Determine Paver

Scenario Information

Scenario
- Name
- Description
- State*

Pavement Design
- Est. Year Completion*
- Roadway Classification*
- Project Type*
- Structural Evaluation Method*

Roadway Classification
- Parking Lot - Light Duty
- Parking Lot - Heavy Duty
- Residential/Collector
- Local
- Arterials/Highway
- Interstate

if Classificaiton is Light Duty

Project Type
- New - Asphalt

if other

Project Type
- New - Asphalt
- New - Concrete
- Porous
- AC Overlay on Asphalt
- AC Overlay on Concrete or Composite

if AC Overlay on Asphalt is picked

Structural Evaluation Method
- Condition Survey

Pavement Layers

New AC Overlay
- Layer Coeff. (a)*: 0.44(d)
- Minimum Thickness*: 1(d)

Existing Pavement Layers*
- Layer Type
- Thickness
- Action(Edit, Delete)
- Add Layer

Add Layer
- Layer Type*
- Thickness (in)*

Layer Type
- Layer Type(d)
- Asphalt - Dense Graded
- Asphalt - Open Graded
- Aggregate Base
- Cement treated base
- Bituminous treated base
- Asphalt stabilized base
- Subbase
- Other

Subgrade
- Subgrade Soil Type*
- Subgrade Modulus (M_R)*
- Calculate

Soil Type
- Select a Soil Type(d)
- A-1-a
- A-1-b
- A-2-4
- A-2-5
- A-2-6
- A-2-7
- A-3
- A-4
- A-5
- A-6
- A-7-5
- A-7-6

- Warns user that first layer type must be Asphalt Dense/Open Graded

Calculate psi(Subgrade Modulus)
- Calculation Method*

if Calculation Method R-value is selected

R-Value
- R-Value*
- Subgrade Modulus (M_R) (psi)

if Calculation Method CBR is selected

CBR
- CBR*
- Subgrade Modulus (M_R) (psi)

Condition Layers

Alligator Cracking*
- Low
- Medium
- High

for each level

Low/Med/High
- 0%(d)
- <10%
- >10%

Tranverse Cracking*
- Low
- Medium
- High

Cores
- Were cores taken on the roadway?*
- Were cores of cracks taken?*

roadway/cracks/mill
- No(d)
- Yes

Distressed Pavement
- Mill/Remove Distressed Asphalt?*
- Depth to remove*: 1inches(d)

Scenario selects R AC Over Condition

ment Structure

o: When user
Project Type to be
lay on Asphalt &
n Survey

Layer Coefficients

Layers

- Layer Type
- Existing Thickness
- AASHTO Recommendation
- Layer Coef. (a)
- Drainage Coef. (m)
- SN

- Layers are input by user from Pavement Layers Page
- Each Layer has own individual AASHTO Recommendation

- Only Layer and Drainage Coef. can be changed by user
- SN changes based on changes by Drainage and Layer Coef.

Design Parameters

Design Parameters

- Design Period*: 15(d)
- Reliability Level*
- Combined Standard Error*: 0.4(d)

Reliability Level

- 50%
- 60%
- 70%
- 75%
- 80%
- 85%(d)
- 90%
- 95%
- 99%

Serviceability

- Initial Serviceability Index*: 4.5(d)
- Terminal Serviceability Index*: 2(d)
- Change in Serviceability (ΔPSI)*: 2.5(d)

Climate

- Nearest City*
- Mean Annual Wind Speed
- Mean Annual Temperature
- Mean Annual Precipitation

- Nearest City depends on state picked
- Annual Means have default values when city is chosen

Traffic & Loading

Traffic Data

- Method of Evaluating ESALs*

Using AADT

Design ESA

Traffic Data

- Completion Year Traffic*
- Load Equivalency Factor*
- Completion Year ESALs*

Annual ESALs

Traffic Growth

- Total Desig ESAL (W18)

Traffic Data

- Completion Year ESALs*

Completion Year Traffic(Calculation)

- Average Annual Daily Traffic (AADT)*
- Lanes Measured (AADT x value)*
- Directional Lanes(AADT x value)*
- Year of Traffic Count*
- Historical Traffic Growth Rate*
- Completion Year Traffic

Traffic Growth

- Design Period: 15(d)
- Future Traffic Growth Rate*
- ESAL Growth Rate*
- Total Design ESALs (W18)*

Lanes Measured

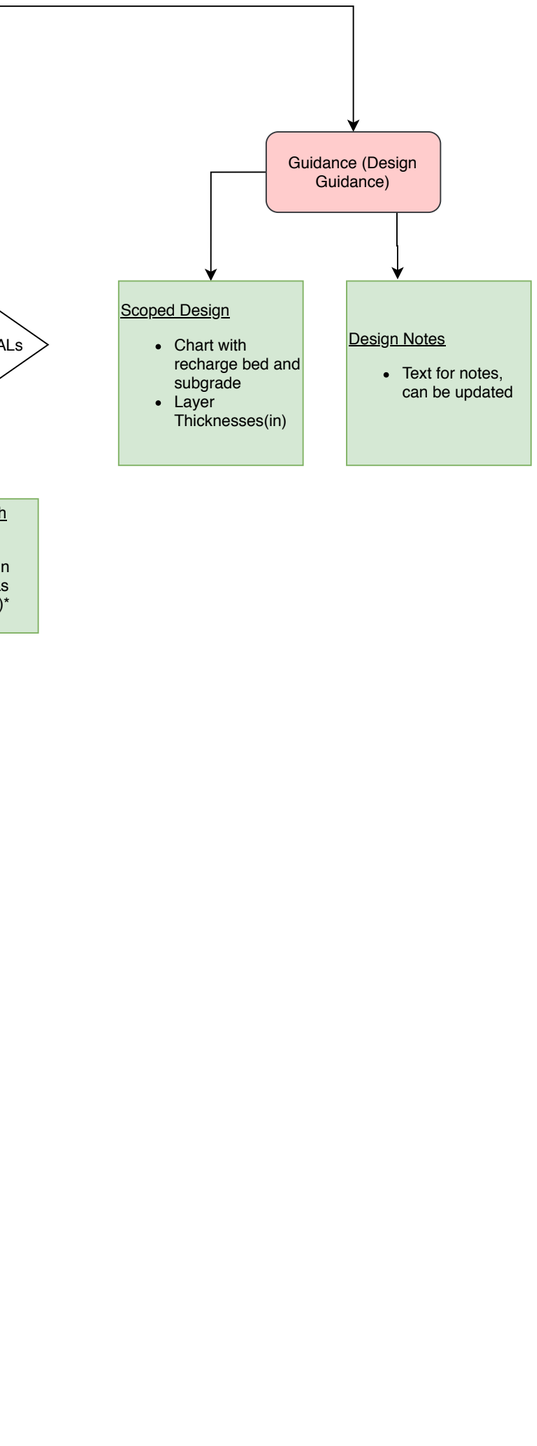
- One-Way, value=1(d)
- Two-Way, value=0.5

Directional Lanes

- 1, value=1.0(d)
- 2, value=0.9
- 3, value=0.8
- 4+, value=0.75

Traffic Growth

- Design Period: 15(d)
- ESAL Growth Rate*
- Total Design ESALs (W18)*


Guidance (Design Guidance)
Scoped Design
Chart with recharge bed and subgrade
Layer Thicknesses(in)
Design Notes
Text for notes, can be updated
ALs

- NDT

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Scenario: When user selects Project Type to be AC Overlay on Asphalt & Condition Survey

Determine Paveme

Scenario Information

Scenario
- Name
- Description
- State*

Pavement Design
- Est. Year Completion*
- Roadway Classification*
- Project Type*
- Structural Evaluation Method*

Roadway Classification
- Parking Lot - Light Duty
- Parking Lot - Heavy Duty
- Residential/Collector
- Local
- Arterials/Highway
- Interstate

if Classificaiton is Light Duty

Project Type
- New - Asphalt

if other

Project Type
- New - Asphalt
- New - Concrete
- Porous
- AC Overlay on Asphalt
- AC Overlay on Concrete or Composite

if AC Overlay on Asphalt is picked

Structural Evaluation Method

Pavement Layers

New AC Overlay
- Layer Coeff. (a)*: 0.44(d)
- Minimum Thickness*: 1(d)

Existing Pavement Layers*
- Layer Type
- Thickness
- Action(Edit, Delete)
- Add Layer

Add Layer
- Layer Type*
- Thickness (in)*

Layer Type
- Layer Type(d)
- Asphalt - Dense Graded
- Asphalt - Open Graded
- Aggregate Base
- Cement treated base
- Bituminous treated base
- Asphalt stabilized base
- Subbase
- Other

Subgrade
- Subgrade Soil Type*
- Subgrade Modulus (M_R)*
- Calculate

Soil Type
- Select a Soil Type(d)
- A-1-a
- A-1-b
- A-2-4
- A-2-5
- A-2-6
- A-2-7
- A-3
- A-4
- A-5
- A-6
- A-7-5
- A-7-6

- Warns user that first layer type must be Asphalt Dense/Open Graded

Calculate psi(Subgrade Modulus)
- Calculation Method*

if Calculation Method R-value is selected

if Calculation Method CBR is selected

CBR
- CBR*
- Subgrade Modulus (M_R) (psi)

R-Value
- R-Value*
- Subgrade Modulus (M_R) (psi)

Nondestructive Testing(NDT)

Backcalculation Results
- Design Subgrade Modulus (M_R)*
- SN_{eff} *

Calculate Subgrade Modulus
- Applied Load(P)*: lbs
- Radial Distance*: (r)
- Deflection of radial distance*: (d_r)
- C-value*: .33(d)
- Subgrade Modulus (M_R)

Calculate SN_{eff}
- Deflection(d_O)*: in
- Contact Pressure(p)*: psi
- Load Plate Radius(a)*: in
- Pavement Thickness(D)*: 5(d)in
- Design Subgrade Modulus(M_R)*:1(d)psi
- (E_p)*: psi
- (SN_{eff})*

Cores

Distress

ent Structure

Were cores taken on the roadway?*
Were cores of cracks taken?*

Answers to questions
- Yes
- No(d)

sed Pavement

Mill/Remove Distressed Asphalt?*
Depth to remove*: 1(d)inches
Estimated Structural Coefficient(a_rem)*: 0(d)

Design Parameters

Design Parameters
- Design Period*: 15(d)
- Reliability Level*
- Combined Standard Error*: 0.4(d)

Reliability Level
- 50%
- 60%
- 70%
- 75%
- 80%
- 85%(d)
- 90%
- 95%
- 99%

Serviceability
- Initial Serviceability Index*: 4.5(d)
- Terminal Serviceability Index*: 2(d)
- Change in Serviceability (ΔPSI)*: 2.5(d)

Climate
- Nearest City*
- Mean Annual Wind Speed
- Mean Annual Temperature
- Mean Annual Precipitation

- Nearest City depends on state picked
- Annual Means have default values when city is chosen

Traffic & Loading

Traffic Data
- Method of Evaluating ESALs*

Using AADT

Traffic Data
- Completion Year Traffic*
- Load Equivalency Factor*
- Completion Year ESALs*

Completion Year Traffic(Calculation)
- Average Annual Daily Traffic (AADT)*
- Lanes Measured (AADT x value)*
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- Year of Traffic Count*
- Historical Traffic Growth Rate*
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- One-Way, value=1(d)
- Two-Way, value=0.5

Directional Lanes
- 1, value=1.0(d)
- 2, value=0.9
- 3, value=0.8
- 4+, value=0.75

Traffic Growth
- Design Period: 15(d)
- Future Traffic Growth Rate*
- ESAL Growth Rate*
- Total Design ESALs (W18)*

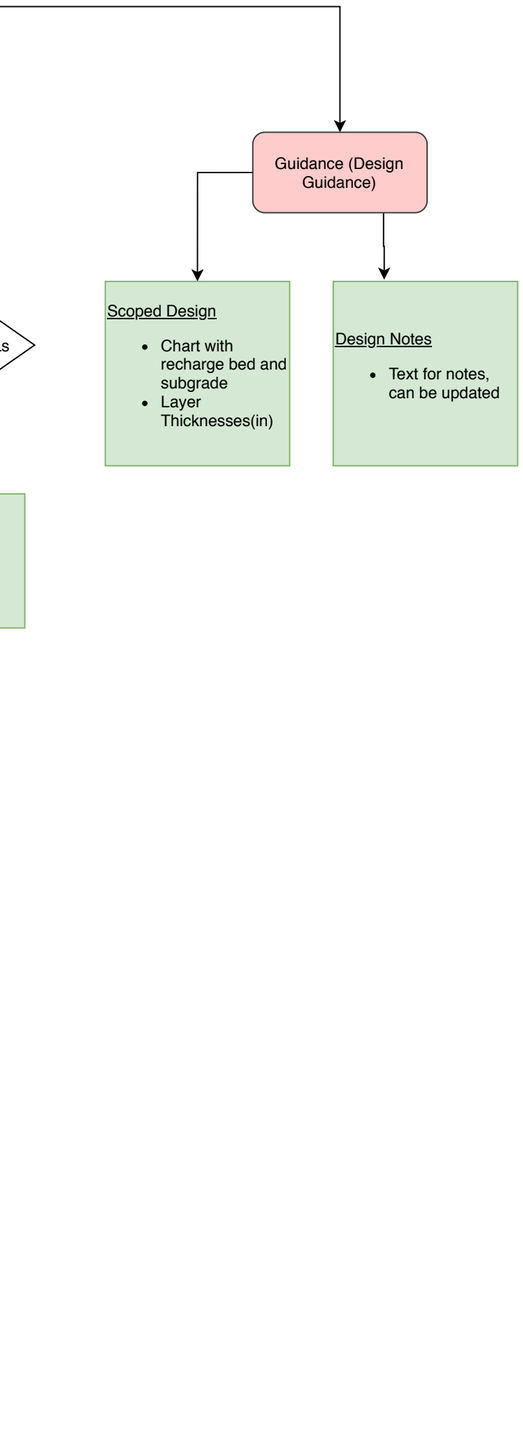
Annual ESALs

Traffic Data
- Completion Year ESALs*

Traffic Growth
- Design Period: 15(d)
- ESAL Growth Rate*
- Total Design ESALs (W18)*

Design ESAL

Traffic Growth
- Total Design ESALs (W18)*


Guidance (Design Guidance)
Scoped Design
Chart with recharge bed and subgrade
Layer Thicknesses(in)
Design Notes
Text for notes, can be updated

- Condition Survey
- NDT

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Determine Pavement Structure

Scenario Information

Scenario

- Name
- Description
- State*

Pavement Design

- Est. Year Completion*
- Roadway Classification*
- Project Type*
- Structural Evaluation Method*

Roadway Classification

- Parking Lot - Light Duty
- Parking Lot - Heavy Duty
- Residential/Collector
- Local
- Arterials/Highway
- Interstate

if Classificaiton is Light Duty

Project Type

- New - Asphalt

if other

Project Type

- New - Asphalt
- New - Concrete
- Porous
- AC Overlay on Asphalt
- AC Overlay on Concrete or Composite

if AC Overlay on Asphalt is picked

Structural Evaluation Method

- Condition Survey
- NDT

Guidance (Design Guidance)

Design

- A structural pavement design is not necessary for light-duty parking lots. Cars and light duty trucks do not damage pavements; therefore, most states have a standard set of designs for these facilities. Please refer to the resources provided below for this type of pavement.

Design Notes

- Text for notes, can be updated

Resources

- State's Asphalt Paving Association Website
- State's Asphalt Parking Lot Design Guide

Determine Pavement Structure

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Notes

Scenario Information

Guidance (Design Guidance)

Scenario

- Name
- Description
- State*

Pavement Design

- Est. Year Completion*
- Roadway Classification*
- Project Type*
- Structural Evaluation Method*

Design

- PaveXpress currently does not attempt to perform an AC Overlay on Concrete design. To perform a long-lasting rehabilitation design, please use the companion tool, called rePave at http://www.pavementrenewal.org.

Design Notes

- Text for notes, can be updated

Resources

Roadway Classification

- Parking Lot - Light Duty
- Parking Lot - Heavy Duty
- Residential/Collector
- Local
- Arterials/Highway
- Interstate

if Classificaiton is Light Duty

Project Type

- New - Asphalt

if other

Project Type

- New - Asphalt
- New - Concrete
- Porous
- AC Overlay on Asphalt
- AC Overlay on Concrete or Composite

if AC Overlay on Asphalt is picked

Structural Evaluation Method

- Condition Survey
- NDT