

Data Entry

Flexible Pavement Design

FAARFIELD 1.305 Hands-On Training

Presented to: IX ALACPA Seminar on Airport Pavements
Ciudad de Panamá, Panamá

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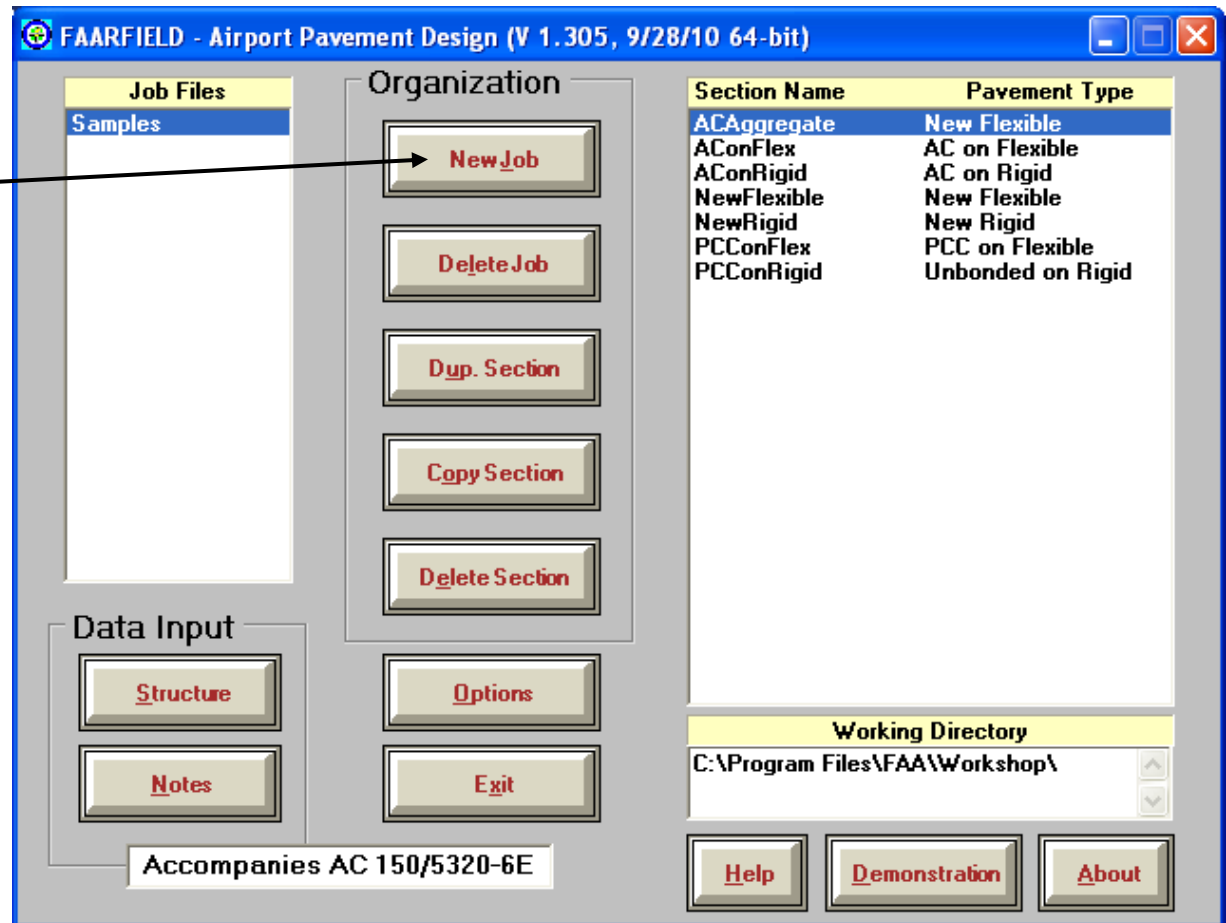


Federal Aviation
Administration

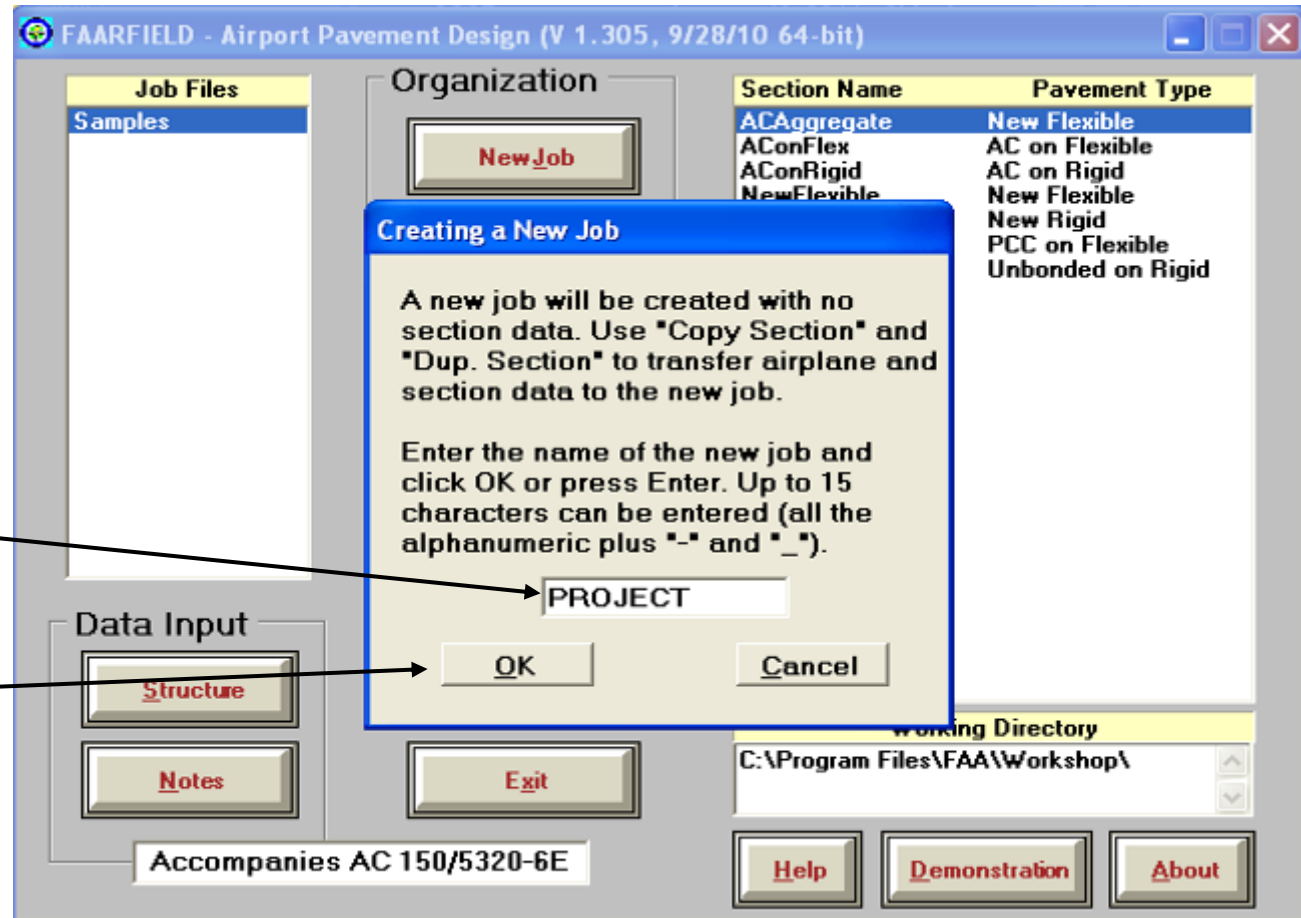


Starting Screen – No Job Files Created

Click on “New Job”



Creating/Naming a Job File

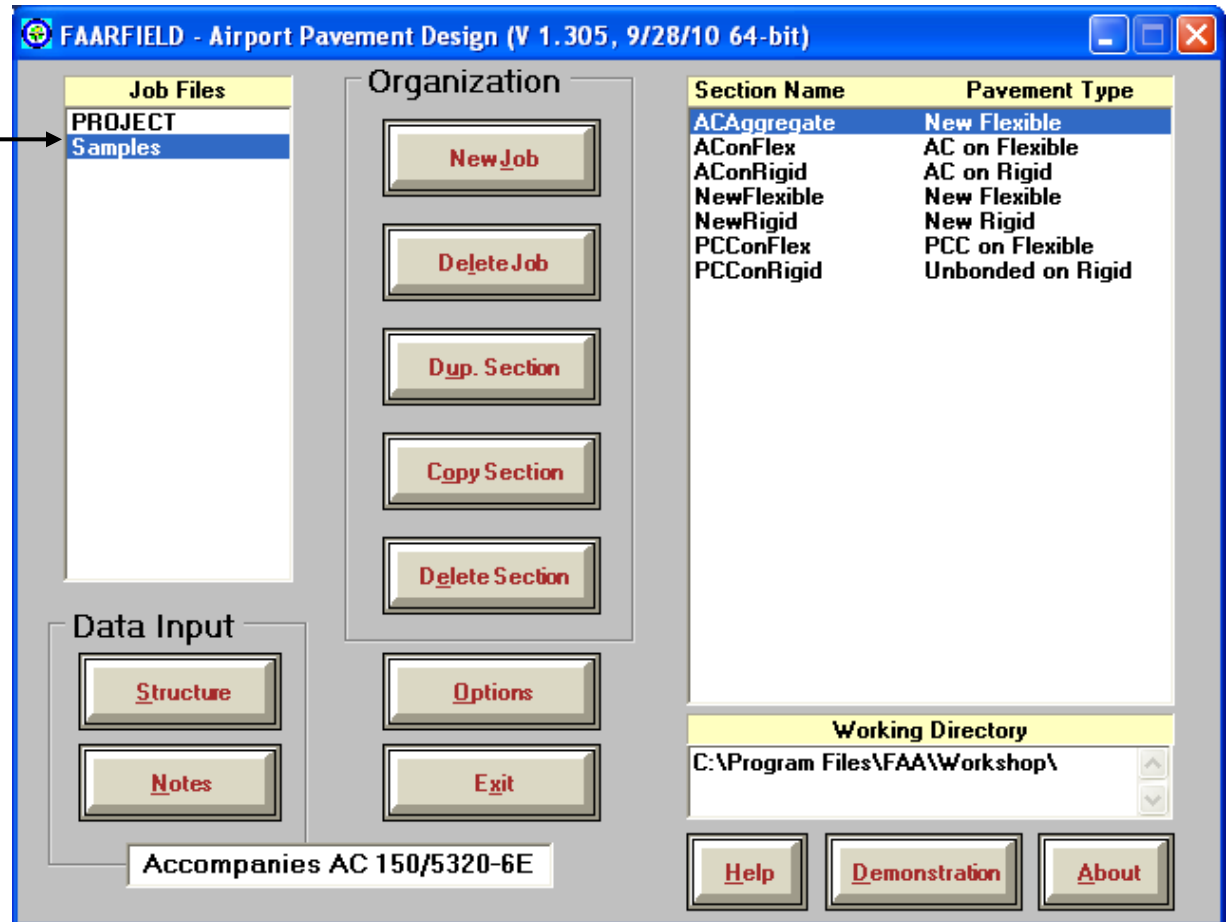


Enter Job Title

Click OK

Copy Basic Section/Pavement Type from Samples

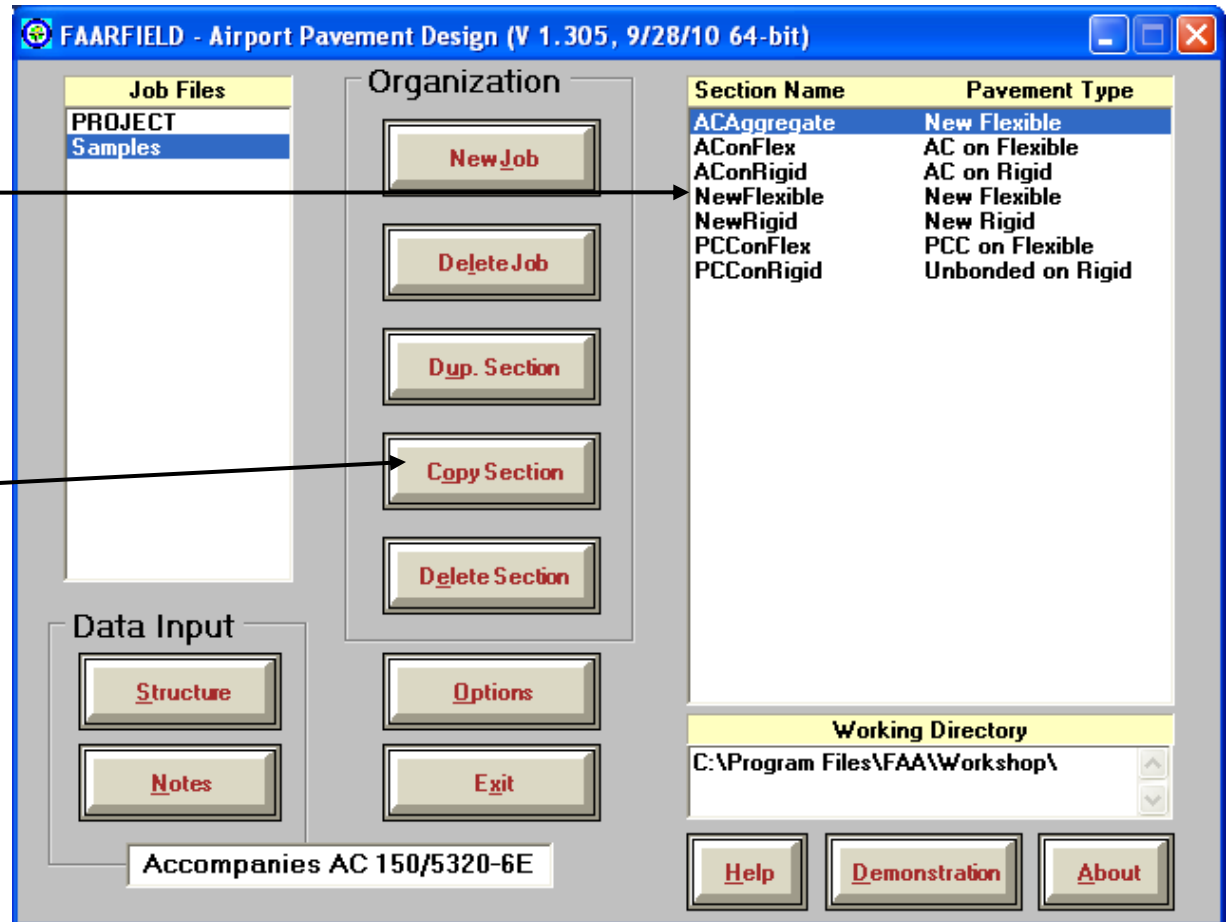
Click on “Samples” →



Copy Basic Section/Pavement Type from Samples

Default Basic Pavement Sections

Click on “Copy Section”



7 Basic Starting Structures in FAARFIELD

<u>Section Name</u>	<u>Pavement Type</u>
ACAggregate	New flexible on aggregate base
AConFlex	HMA overlay on flexible pavement
AConRigid	HMA overlay on rigid pavement
NewFlexible	New flexible on stabilized base
New Rigid	New rigid on stabilized base
PCConFlex	PCC Overlay on flexible
PCConRigid	Unbonded PCC on rigid

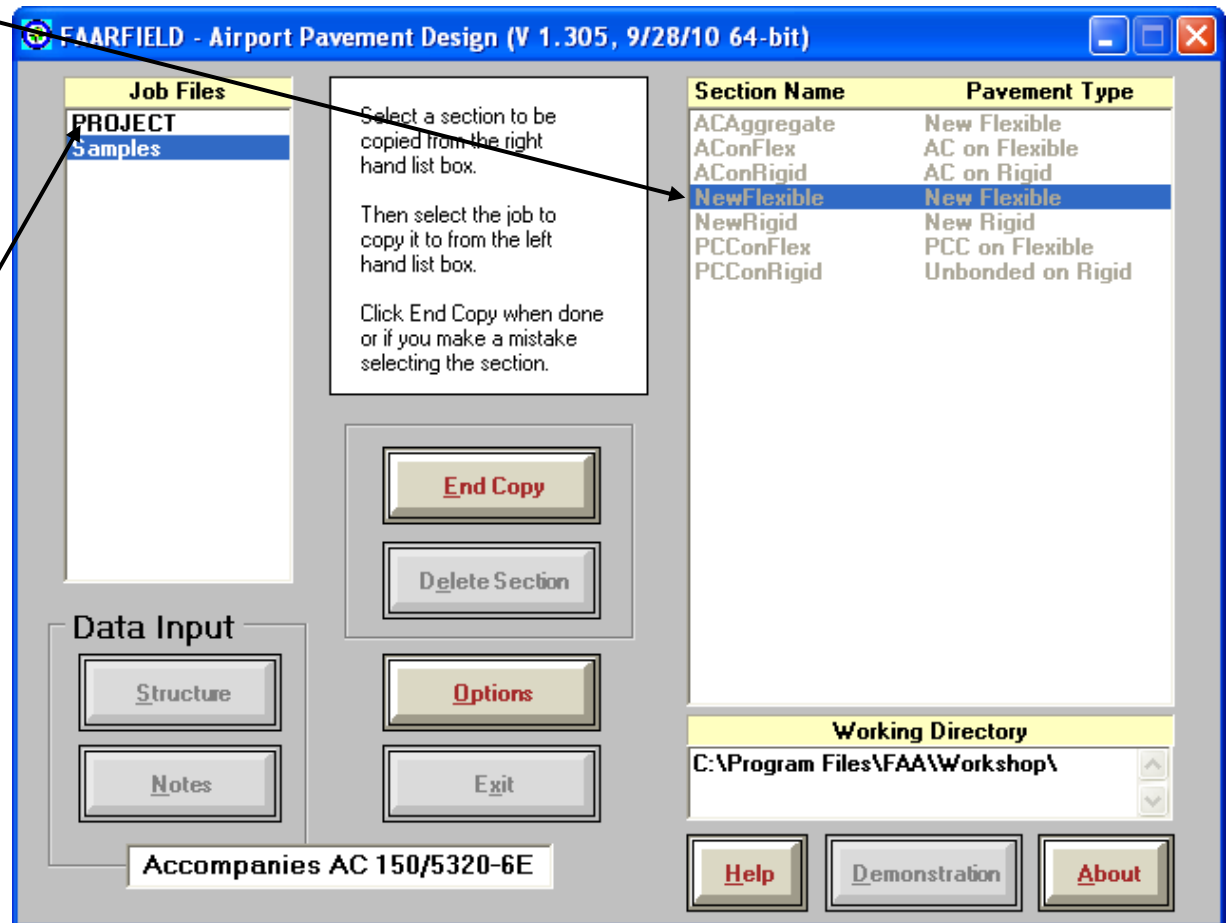
Be sure to select the pavement type that most correctly represents your design requirements.



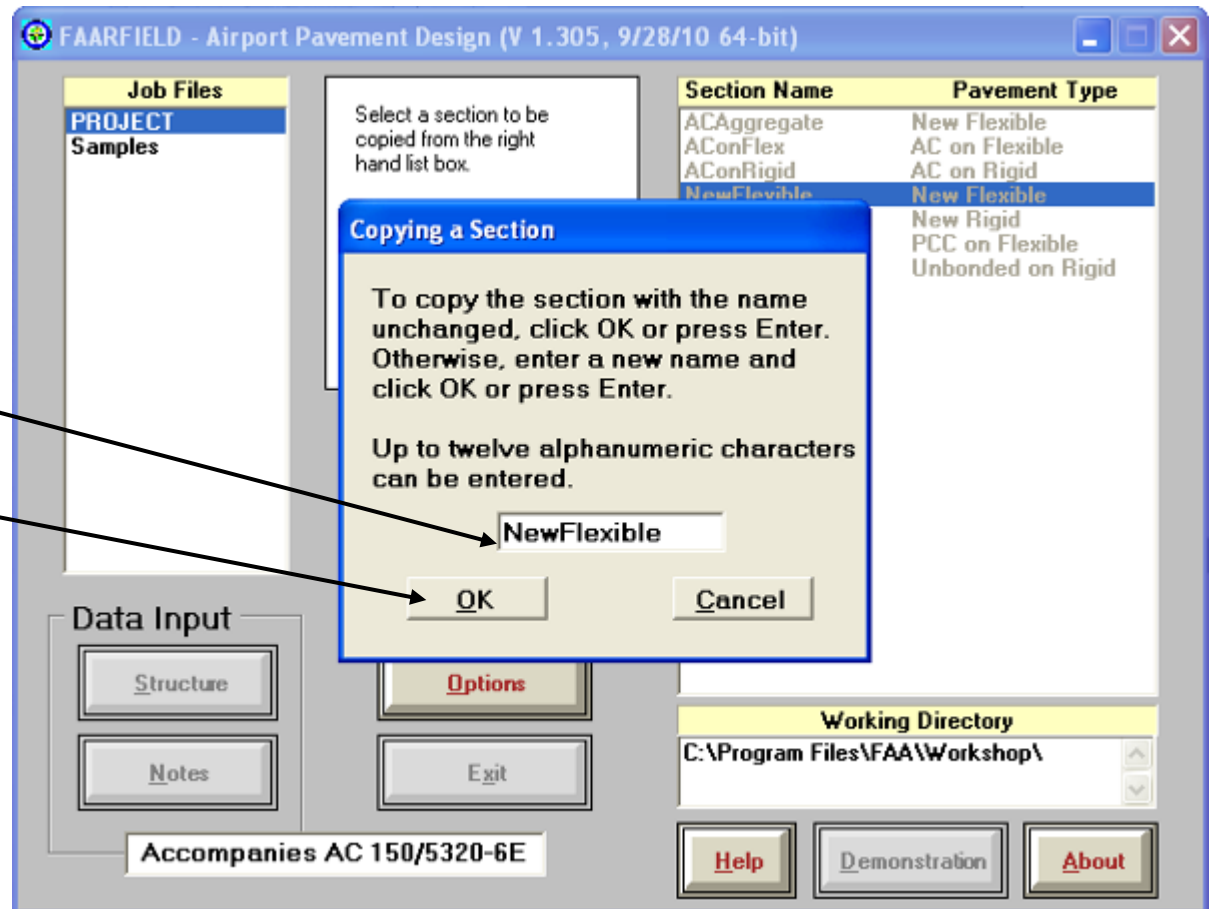
Copy a Sample Pavement Section

Click on desired pavement section.

Then click on the project where the section will be saved.



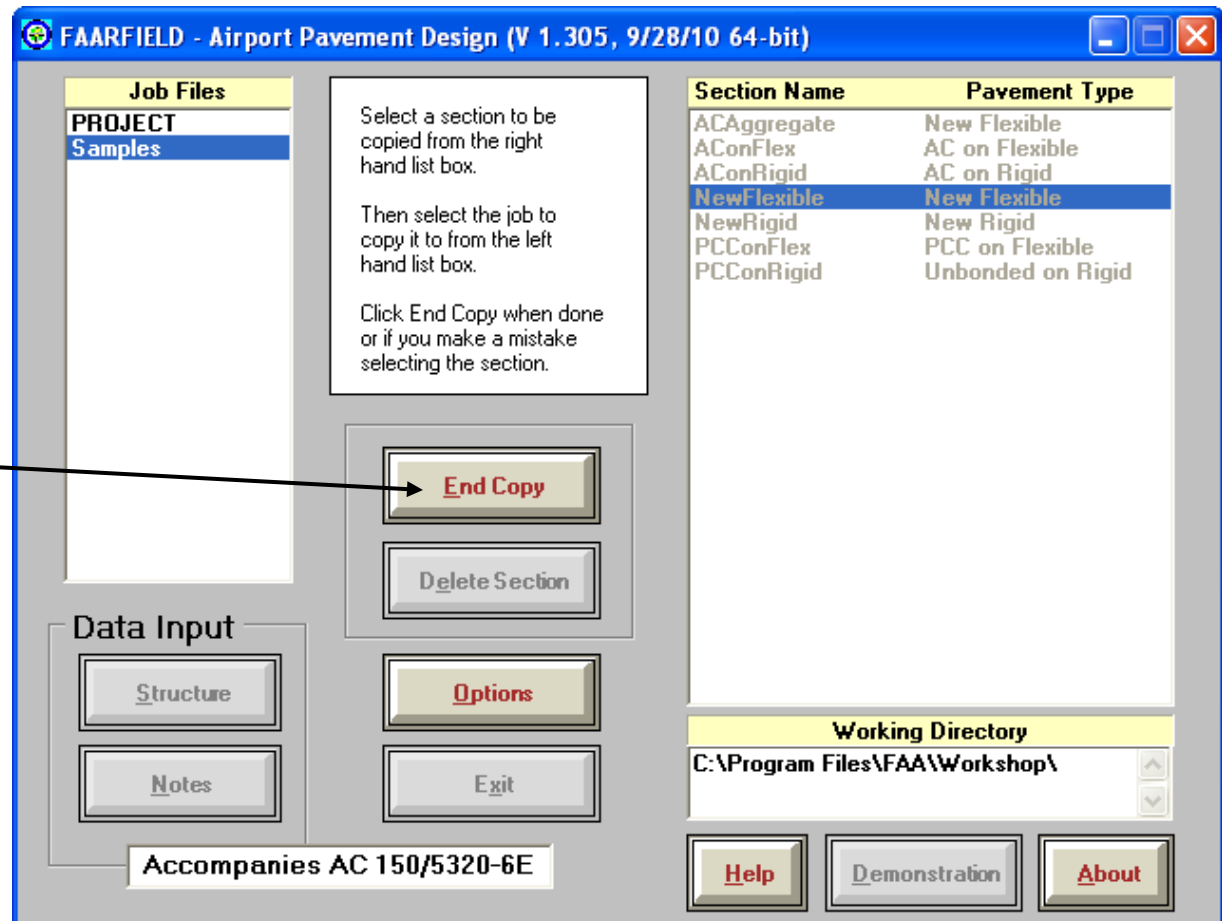
Create a New Job Title



Enter job title

Click OK

Create a New Job Title

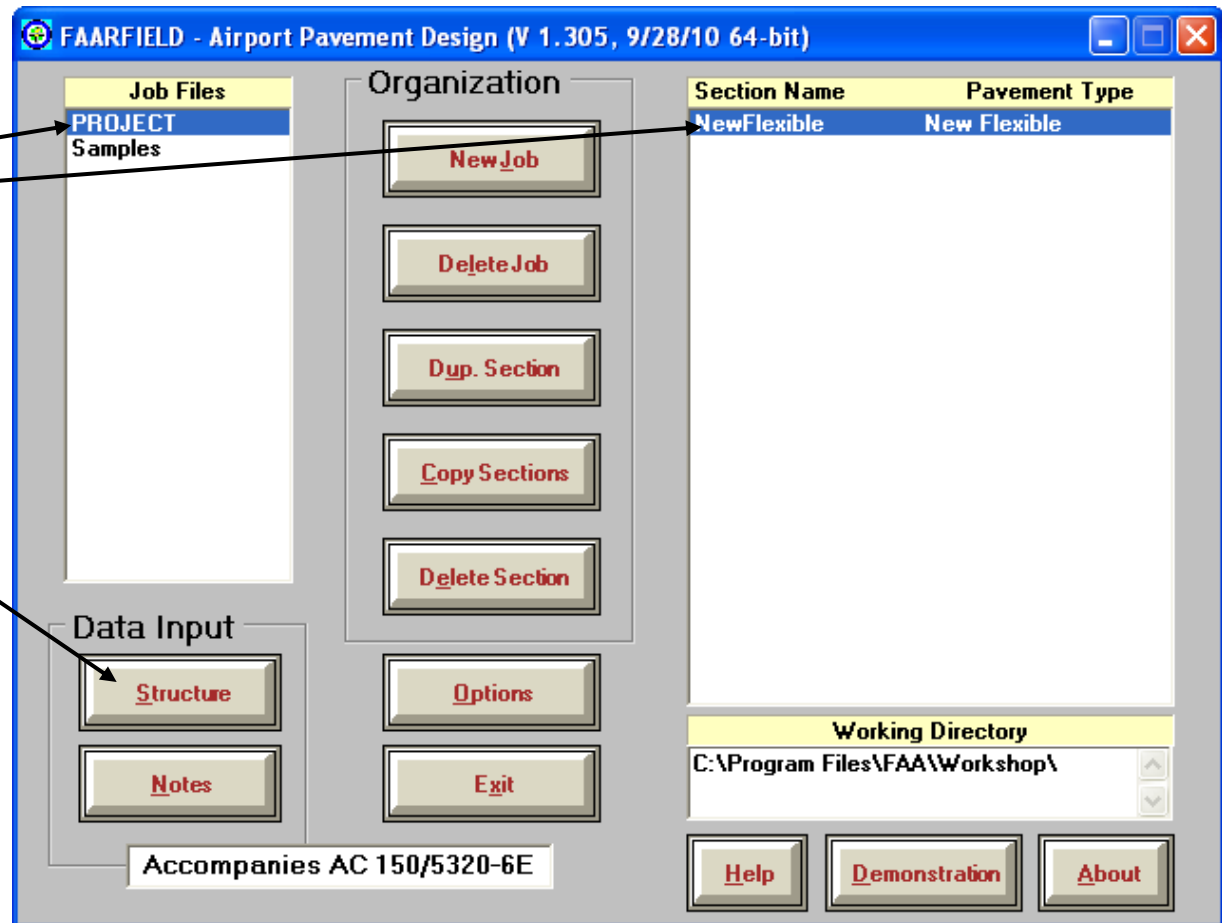


Click “End Copy”

Working With a Pavement Section

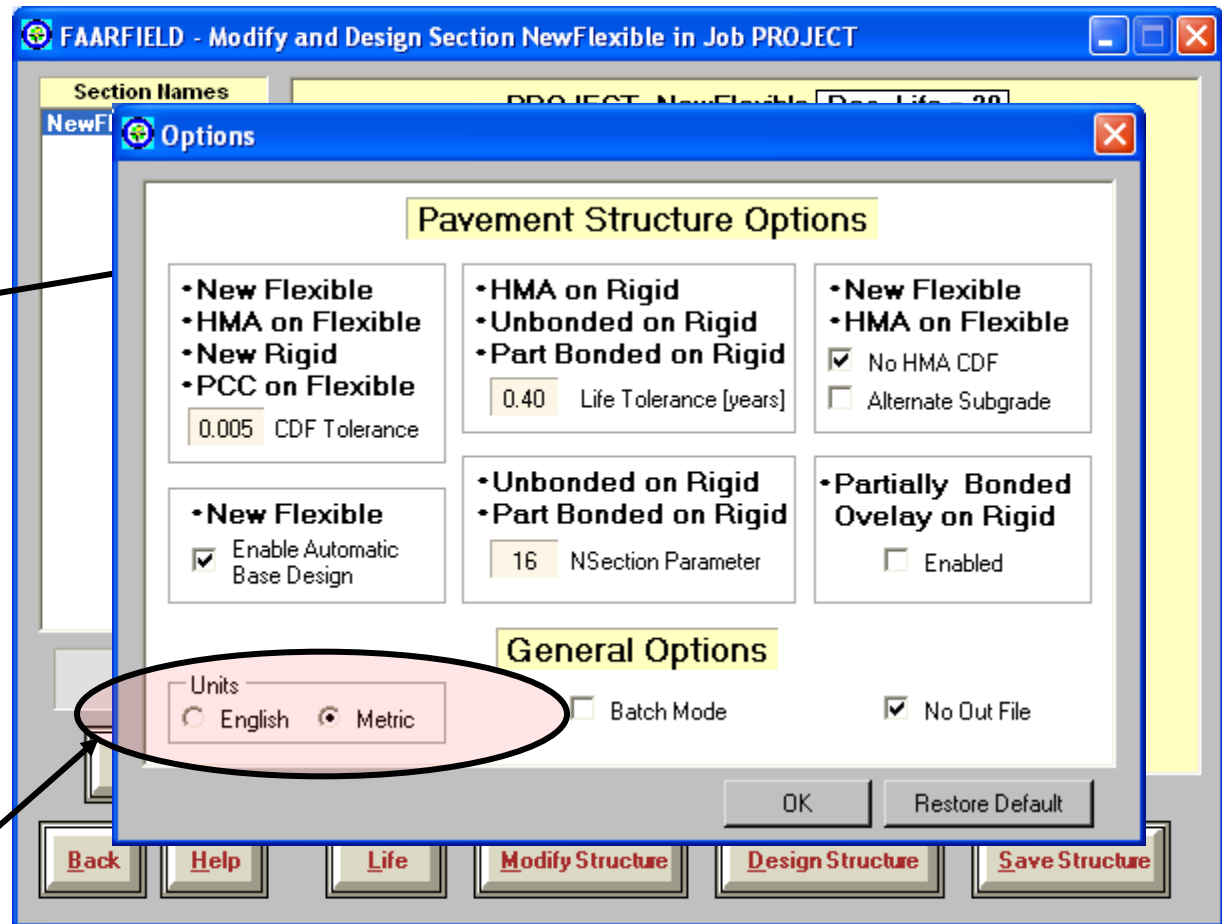
Select the job and
then the section you
want to analyze.

Click on “Structure”
to open the file.



Working With a Pavement Section

- The selected sample pavement will appear.
- By default, FAARFIELD uses U.S. units.
- To change to metric, hit Alt-O to bring up the Options window.
- Select “Metric” and hit OK.



Working With a Pavement Section

Thickness and modulus are now given in metric units.

Click on “Modify Structure” to modify the structure.

The screenshot shows the FAARFIELD software window titled "FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT". The interface includes a "Section Names" list on the left with "NewFlexible" selected. The main area displays a pavement section table with columns for "Layer Material", "Thickness (mm)", and "Modulus or R (MPa)". The table lists four layers: "P-401/P-403 HMA Surface" (127.0 mm, 1,378.95 MPa), "P-401/P-403 St (flex)" (203.2 mm, 2,757.90 MPa), "P-209 CrAg" (254.0 mm, 517.11 MPa), and "Subgrade" (CBR = 10.0, 103.42 MPa). A total thickness of 584.2 mm is shown at the bottom. The bottom of the window features a row of buttons: "Back", "Help", "Life", "Modify Structure", "Design Structure", and "Save Structure". An arrow points from the text "Click on 'Modify Structure' to modify the structure." to the "Modify Structure" button.

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	127.0	1,378.95
P-401/P-403 St (flex)	203.2	2,757.90
P-209 CrAg	254.0	517.11
Subgrade	CBR = 10.0	103.42

Total thickness to the top of the subgrade, t = 584.2 mm

Modifying a Pavement Section

Click on the box for the layer material type you want to modify.

FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	127.0	1,378.95
P-401/P-403 St (flex)	203.2	2,757.90
P-209 CrAg	254.0	517.11
Subgrade	CBR = 10.0	103.42

Total thickness to the top of the subgrade, t = 584.2 mm

Status

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Modifying a Pavement Section

Select the layer type you want to include in the pavement section.

(No modification for this example)

Click OK

(Cancel for this example)

FAARFIELD - Modifying Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
		78.95
		57.90
		7.11
		13.42

Layer Type Selection

☐ Undefined
☐ Subgrade

Aggregate
☐ P-208 (see Note)
☒ P-209 Crushed
☐ P-154 Uncrushed

HMA: All P-401 / P-403
☐ Surface
☐ Overlay

Stabilized (flexible)
☐ Variable
☐ P-401 / P-403 HMA

PCC: All P-501
☐ Surface
☐ Overlay fully unbonded
☐ Overlay partially bonded
☐ Overlay on flexible

Stabilized (rigid)
☐ Variable
☐ P-301 Soil Cement Base
☐ P-304 Cement Treated Base
☐ P-306 Econocrete Subbase
☐ Rubblized PCC Base

OK Cancel

Modifying Structure

Airplane

Back Help Life End Modify Add/Delete Layer Save Structure

Layer Placement Restrictions

- **There are restrictions on placement of certain pavement layers, e.g.:**
 - Cannot place an overlay below a surface course.
 - Cannot have two aggregate base layers (P-209 on P-209) in the structure.
 - Aggregate layer cannot be the surface layer.
- **Some layer changes cause changes in the pavement type.**
 - Changing the surface HMA layer to PCC will change the pavement type to new rigid.

Modifying a Pavement Section

Click on a property in this area to modify it.

Change the layer thicknesses in this example.

FAARFIELD - Modifying Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness [mm]	Modulus or R [MPa]
P-401/P-403 HMA Surface	127.0	1,378.95
P-401/P-403 St (flex)	203.2	2,757.90
P-209 CrAg	254.0	517.11
Subgrade	CBR = 10.0	103.42

Total thickness to the top of the subgrade, t = 584.2 mm

Status

Airplane

Back Help Life End Modify Add/Delete Layer Save Structure

Modifying a Pavement Section

- Click on the P-401 Surface thickness.
- Enter the new value of 125 mm.
- Hit OK.
- Next, change the P-401/P-403 stabilized base layer to 200 mm.

FAARFIELD - Modifying Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	127.0	1,378.95
		757.90
		17.11
Subgrade	CBR = 10.0	103.42

Total thickness to the top of the subgrade, t = 584.2 mm

Status

Airplane

Back Help Life End Modify Add/Delete Layer Save Structure

Asphalt Layer Thickness

Enter the new thickness in mm and click OK or press the Enter key on the keyboard.

Click Cancel at any time to retain the old value of thickness.

OK Cancel

125

Modifying a Pavement Section

- Click on the subgrade CBR to change the value.
- Enter the new value for the material property.
- Click OK.

*****Some materials will have limits on allowable values.***

FAARFIELD - Modifying Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
		757.90
		17.11
Subgrade	CBR = 10.0	103.42

Total thickness to the top of the subgrade, t = 579.0 mm

Status

Airplane

Back Help Life End Modify Add/Delete Layer Save Structure

St (Flexible)

Subgrade CBR can be set in the range 0.7 to 33.3 percent.

Enter the new value in percent and click OK or press Enter.

Click Cancel at any time to retain the old value.

OK Cancel

8

Layer Types in FAARFIELD

Layer Type	Fixed Modulus
P-401/P-403 HMA Surface	1,379 MPa (200,000 psi)
P-401/P-403 HMA Base	2,760 MPa (400,000 psi)
P-501 PCC Surface	27,600 MPa (4,000,000 psi)
P-306 Econocrete Base	4,830 MPa (700,000 psi)
P-304 Cement Treated Base	3,450 MPa (500,000 psi)
P-301 Soil Cement Base	1,724 MPa (250,000 psi)

- Layer moduli for P-209 crushed aggregate and P-154 uncrushed aggregate layers are determined internally in the program.

Modifying a Pavement Section

New values appear in the structure window.

When done changing properties, click End Modify

FAARFIELD - Modifying Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	200.0	2,757.90
P-209 Cr Ag	254.0	517.11
Subgrade	CBR = 8.0	82.74

Total thickness to the top of the subgrade, t = 579.0 mm

Status

Airplane

Back Help Life End Modify Add/Delete Layer Save Structure

Enter Traffic Mixture

Click on “Airplane”
to enter traffic mix

FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	200.0	2,757.90
P-209 CrAg	254.0	517.11
Subgrade	CBR = 8.0	82.74

Total thickness to the top of the subgrade, t = 579.0 mm

Status

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Enter Traffic Mixture

Use “Clear List” to clear the existing airplanes

FAARFIELD - Create or Modify Airplanes for Section NewFlexible in Job PROJECT

Airplane Group	Airplane Name (3)	Gross Taxi Weight (tns)	Annual Departures	% Annual Growth	De
Generic	DC10-10	207.745	2,263	0.00	45
Airbus	B747-200B	395.986	832	0.00	10
Boeing	Combi Mixed				
Other Commercial	B777-200 ER	287.804	425	0.00	8
General Aviation					
Military					
External Library					

Library Airplanes

- SwL-50
- Sngl Whl-3
- Sngl Whl-5
- Sngl Whl-10
- Sngl Whl-12.5
- Sngl Whl-15
- Sngl Whl-20
- Sngl Whl-30
- Sngl Whl-45
- Sngl Whl-60
- Sngl Whl-75
- Dual Whl-10
- Dual Whl-20
- Dual Whl-30
- Dual Whl-45
- Dual Whl-50
- Dual Whl-60
- Dual Whl-75
- Dual Whl-100

Buttons: Add, Remove, Save List, Clear List, Save to Float, Add Float, Back, Help, CDF Graph, View Gear

Float Airplanes

Enter Traffic Mixture

For each airplane:

Click on the
desired airplane
group.

Then select the
desired airplane
from the library and
click “Add”

Repeat for the
complete traffic
mixture.

FAARFIELD - Create or Modify Airplanes for Section NewFlexible in Job PROJECT

Airplane Group

- Generic
- Airbus
- Boeing
- Other Commercial
- General Aviation
- Military
- External Library

Library Airplanes

- A300-B2 SB
- A300-B2 std
- A300-B4 std
- A300-B4 LB
- A300-600 std
- A300-600 LB
- A310-200
- A310-300
- A318-100 std
- A318-100 opt
- A319-100 std
- A319-100 opt
- A320-100
- A320-200 Twin std
- A320-200 Twin opt
- A320 Bogie
- A321-100 std
- A321-100 opt
- A321-200 std

Airplane Name (1)	Gross Taxi Weight (tns)	Annual Departures	% Annual Growth	De
A320-100	68.400	600	0.00	12

Buttons: Add, Remove, Save List, Clear List, Save to Float, Add Float, Back, Help, CDF Graph, View Gear

Float Airplanes

Traffic Mix for This Example

No.	Name	Gross Wt., tns.	Annual Departures	Annual Growth, %
1	A320-100	68.400	600	0.00
2	A340-600 std	365.200	1,000	0.00
3	A340-600 std Belly	365.200	1,000	0.00
4	A380-800	562.001	300	0.00
5	B737-800	79.243	2,000	0.00
6	B747-400B Combi	397.801	400	0.00
7	B747-400 ER Pass.	414.130	300	0.00
8	B757-300	124.058	1,200	0.00
9	B767-400 ER	204.570	800	0.00
10	B777-300 ER	352.441	1,000	0.00
11	B787-8 (Preliminary)	220.446	600	0.00



Enter Traffic Mixture

- The job file *Workshop.JOB.xml* is included on your thumb drive handouts.
- The traffic list stored in this job file is the same as the one in this example.
- Hint: To avoid typing the airplane list by hand, try copying the above job file to the working directory and opening it in FAARFIELD.

Enter Traffic Mixture

Certain airplanes may appear in the list twice. This is to address the presence of wing gears and belly gears. →

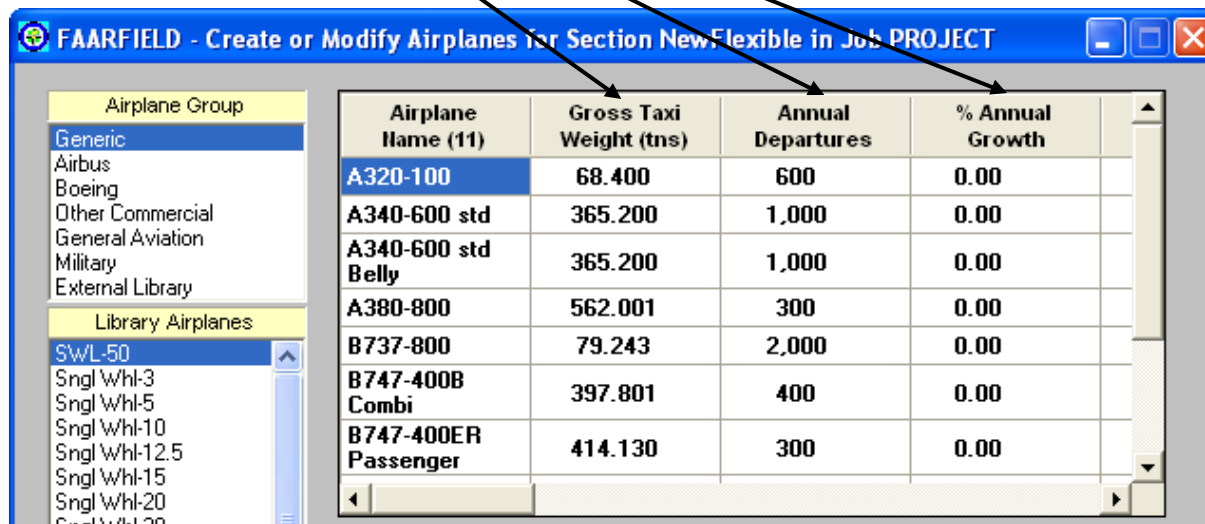
FAARFIELD treats these as two airplanes.

However, the weight and departures are interlocked.

Airplane Name (11)	Gross Taxi Weight (tns)	Annual Departures	% Annual Growth	
A320-100	68.400	600	0.00	
A340-600 std	365.200	1,000	0.00	
A340-600 std Belly	365.200	1,000	0.00	
A380-800	562.001	300	0.00	
B737-800	79.243	2,000	0.00	
B747-400B Combi	397.801	400	0.00	
B747-400ER Passenger	414.130	300	0.00	

Adjusting Airplane Information

Gross Taxi Weight, Annual Departures and % Annual Growth may be modified.



FAARFIELD - Create or Modify Airplanes for Section NewFlexible in Job PROJECT

Airplane Group	Airplane Name (11)	Gross Taxi Weight (tns)	Annual Departures	% Annual Growth
Generic	A320-100	68.400	600	0.00
Airbus	A340-600 std	365.200	1,000	0.00
Boeing	A340-600 std Belly	365.200	1,000	0.00
Other Commercial	A380-800	562.001	300	0.00
General Aviation	B737-800	79.243	2,000	0.00
Military	B747-400B Combi	397.801	400	0.00
External Library	B747-400ER Passenger	414.130	300	0.00

Library Airplanes

- SWL-50
- Sngl Whl-3
- Sngl Whl-5
- Sngl Whl-10
- Sngl Whl-12.5
- Sngl Whl-15
- Sngl Whl-20
- Sngl Whl-30

Adjusting Airplane Information

- Gross Weight

Enter the new weight and click OK

FAARFIELD - Create or Modify Airplanes for Section NewFlexible in Job PROJECT

Airplane Group	Airplane Name (11)	Gross Taxi Weight (tns)	Annual Departures	% Annual Growth
Generic	A320-100	68.400	600	0.00
Airbus	A340-600 std	365.200	1,000	0.00
Boeing	A340-600 std Belly	365.200	1,000	0.00
Other Commercial	A380-800	562.001	300	0.00
General Aviation				
Military				
External Library				

Library Airplanes

- SWL-50
- Sngl Whl-3
- Sngl Whl-5
- Sngl Whl-10
- Sngl Whl-12.5
- Sngl Whl-15
- Sngl Whl-20
- Sngl Whl-30
- Sngl Whl-45
- Sngl Whl-60
- Sngl Whl-75
- Dual Whl-10
- Dual Whl-20
- Dual Whl-30
- Dual Whl-45
- Dual Whl-50
- Dual Whl-60
- Dual Whl-75
- Dual Whl-100

Changing Airplane Gross Load

The default value of gross load for this airplane is 397.801 tonnes.

Enter a new value in the range:
238.680 to 497.251 tonnes.

397.801

OK Cancel

Save List Clear List

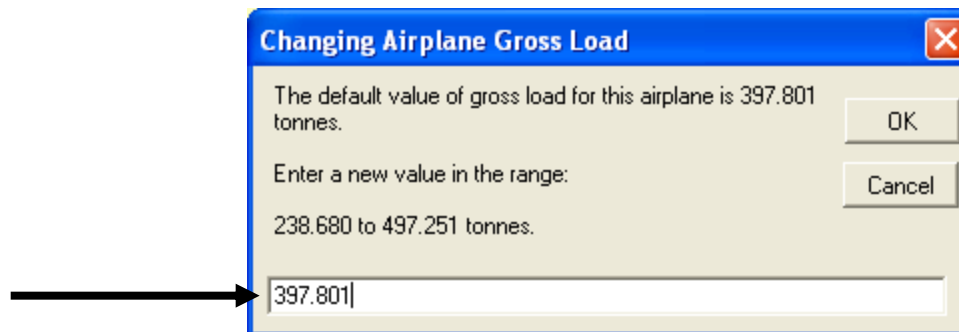
Save to Float Add Float

Back Help CDF Graph View Gear

Adjusting Airplane Information

- Gross Weight

- There are limitations on changes to airplane gross weights.
- A range is provided for each airplane which represents reasonable weights for the airplane:
 - Default Weight – 40%
 - Default Weight + 25%



Annual Departures in FAARFIELD

- Annual departures has the same meaning as in the previous design procedure.
- Arrivals are ignored.
- For design purposes, FAARFIELD uses the total annual departures, multiplied by the design period in years:
 - e.g., 1200 annual departures \times 20 years = 24,000 departures.

Adjusting Airplane Information

- % Annual Growth of Annual Departures

Click on the annual growth value to bring up the dialog box.

Enter the percent annual growth and click OK.

FAARFIELD - Create or Modify Airplanes for Section NewFlexible in Job PROJECT

Airplane Group	Airplane Name (11)	Gross Taxi Weight (tns)	Annual Departures	% Annual Growth
Generic				
Airbus	A320-100	68.400	600	0.00
Boeing	A340-600 std	365.200	1,000	0.00
Other Commercial	A340-600 std Belly	365.200	1,000	0.00
General Aviation	A380-800	562.001	300	0.00
Military				0.00
External Library				0.00

Library Airplanes

- SWL-50
- Sngl Whl-3
- Sngl Whl-5
- Sngl Whl-10
- Sngl Whl-12.5
- Sngl Whl-15
- Sngl Whl-20
- Sngl Whl-30
- Sngl Whl-45
- Sngl Whl-60
- Sngl Whl-75
- Dual Whl-10
- Dual Whl-20
- Dual Whl-30
- Dual Whl-45
- Dual Whl-50
- Dual Whl-60
- Dual Whl-75
- Dual Whl-100

Changing Incremental Departures

Enter a new value for percent incremental annual departures in the range:
-10.00 to 10.00

Click Cancel at any time to retain the old value.

0

OK Cancel

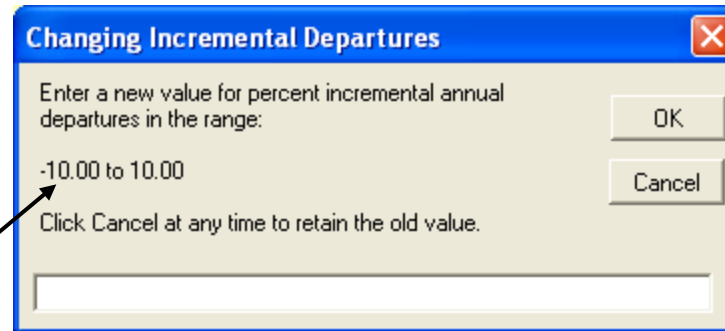
Save List Clear List

Save to Float Add Float

Back Help CDF Graph View Gear

Adjusting Airplane Information

- % Annual Growth of Annual Departures



- Allowable range of percent annual growth is +/- 10%.
- You can create the same effect by modifying the annual departures.

Viewing Airplane Information

Scroll over to reveal additional columns of information.

FAARFIELD - Create or Modify Airplanes for Section NewFlexible in Job PROJECT

Airplane Group	Airplane Name (11)	Gross Taxi Weight (tns)	Annual Departures	% Annual Growth
Generic	A320-100	68.400	600	0.00
Airbus	A340-600 std	365.200	1,000	0.00
Boeing	A340-600 std Belly	365.200	1,000	0.00
Other Commercial	A380-800	562.001	300	0.00
General Aviation	B737-800	79.243	2,000	0.00
Military	B747-400B Combi	397.801	400	0.00
External Library	B747-400ER Passenger	414.130	300	0.00

Library Airplanes

- SwL-50
- Sngl Whl-3
- Sngl Whl-5
- Sngl Whl-10
- Sngl Whl-12.5
- Sngl Whl-15
- Sngl Whl-20
- Sngl Whl-30
- Sngl Whl-45
- Sngl Whl-60
- Sngl Whl-75
- Dual Whl-10
- Dual Whl-20
- Dual Whl-30
- Dual Whl-45
- Dual Whl-50
- Dual Whl-60
- Dual Whl-75
- Dual Whl-100

Buttons: Add, Remove, Save List, Clear List, Save to Float, Add Float, Back, Help, CDF Graph, View Gear

Float Airplanes

Viewing Airplane Information

Available in FAARFIELD Airplane Screen:

Airplane Name (11)	Gross Taxi Weight (tns)	Annual Departures	% Annual Growth	Total Departures	CDF Contribution	CDF Max for Airplane
A320-100	68.400	600	0.00	12,000	0.00	0.00
A340-600 std	365.200	1,000	0.00	20,000	0.00	0.00
A340-600 std Belly	365.200	1,000	0.00	20,000	0.00	0.00
A380-800	562.001	300	0.00	6,000	0.00	0.00
B737-800	79.243	2,000	0.00	40,000	0.00	0.00
B747-400B Combi	397.801	400	0.00	8,000	0.00	0.00
B747-400ER Passenger	414.130	300	0.00	6,000	0.00	0.00
B757-300	124.058	1,200	0.00	24,000	0.00	0.00

P/C Ratio	Tire Press. (kPa)	Percent GW on Gear	Dual Spacing (mm)	Tandem Spacing (mm)	Tire Contact Width (mm)	Tire Contact Length (mm)	Tire Contact Area (mm^2)
0.00	1,380	47.5	927.1	0.0	303.1	485.0	115,442.5
0.00	1,606	32.8	1,397.0	1,981.2	381.6	610.6	529,468.5
0.00	1,531	29.3	1,168.4	1,981.2	261.3	418.0	555,703.5
0.00	1,338	95.0	1,348.7	1,699.3	394.6	631.4	195,717.9
0.00	1,407	47.5	863.6	0.0	323.1	517.0	131,218.1
0.00	1,379	95.0	1,117.6	1,473.2	365.6	585.0	167,973.5
0.00	1,572	95.0	1,117.6	1,473.2	349.4	559.0	153,393.5
0.00	1,379	47.5	863.6	1,143.0	288.7	462.0	104,767.9

Viewing Airplane Information

Values in CDF and P/C ratio columns will be zero when airplanes are first entered.

Save the list when finished entering, then click the Back button.

FAARFIELD - Create or Modify Airplanes for Section NewFlexible in Job PROJECT

Airplane Group	Airplane Name (11)	CDF Contribution	CDF Max for Airplane	P/C Ratio
Generic	A320-100	0.00	0.00	0.00
Airbus	A340-600 std	0.00	0.00	0.00
Boeing	A340-600 std Belly	0.00	0.00	0.00
Other Commercial	A380-800	0.00	0.00	0.00
General Aviation	B737-800	0.00	0.00	0.00
Military	B747-400B Combi	0.00	0.00	0.00
External Library	B747-400ER Passenger	0.00	0.00	0.00
	B757-300	0.00	0.00	0.00

Library Airplanes

- SWL-50
- Sngl Whl-3
- Sngl Whl-5
- Sngl Whl-10
- Sngl Whl-12.5
- Sngl Whl-15
- Sngl Whl-20
- Sngl Whl-30
- Sngl Whl-45
- Sngl Whl-60
- Sngl Whl-75
- Dual Whl-10
- Dual Whl-20
- Dual Whl-30
- Dual Whl-45
- Dual Whl-50
- Dual Whl-60
- Dual Whl-75
- Dual Whl-100

Buttons: Add, Remove, Save List, Clear List, Save to Float, Add Float, Back, Help, CDF Graph, View Gear

Float Airplanes

Performing the Pavement Design

The layer with the small arrow is the layer that will be adjusted to provide the structural design.

The location of the arrow is determined by the type of structure.

FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	200.0	2,757.90
P-209 CrAg	254.0	517.11
Subgrade	CBR = 8.0	82.74

Total thickness to the top of the subgrade, t = 579.0 mm

Status

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Layers Adjusted During Design

PAVEMENT TYPE	LAYER ADJUSTED
ACAggregate	P-154 Subbase
AConFlex	P-401 AC Overlay
AConRigid	P-401 AC Overlay
NewFlexible	P-209 Subbase
NewRigid	PCC Surface
PCConFlex	PCC Overlay on Flex
PCConRigid	PCC Overlay Unbond

For new flexible sections, the arrow can be moved by double-clicking next to the desired base or subbase layer in “modify structure” mode.

Design Life

Click on “Des. Life” to change the number of years for the design period.

When the dialog box appears, enter the desired number of years (1-50).

NOTE: The standard for FAA design is 20 years.

The screenshot shows the FAARFIELD software interface. The main window is titled 'FAARFIELD - Modifying Section NewFlexible in Job PROJECT'. It features a 'Section Names' list on the left with 'NewFlexible' selected. The main area displays a table of pavement layers:

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
		757.90
		17.11
Subgrade	CBR = 8.0	82.74

Below the table, it states 'Total thickness to the top of the subgrade, t = 579.0 mm'. A 'Changing Pavement Life' dialog box is open, prompting the user to enter a new value for life in years (1 to 50). The value '20' is entered in the text field. The dialog box includes 'OK' and 'Cancel' buttons. At the bottom of the main window, there are buttons for 'Modifying Structure', 'Airplane', 'Back', 'Help', 'Life', 'End Modify', 'Add/Delete Layer', and 'Save Structure'.

Performing the Pavement Design

You are now ready to design the structure. Simply click on “Design Structure.”

The program will keep you informed about the status of the design.

The program will adjust the design layer until a CDF of 1.0 is achieved.

FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	282.8	2,757.90
P-209 CrAg	477.0	354.63
Subgrade	CBR = 8.0	82.74

N = 5; Sublayers: Subgrade CDF = 1.00; t = 884.8 mm

Design Stopped 3.89; 2.56

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Result of the Pavement Design

FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	282.8	2,757.90
P-209 CrAg	477.0	354.63
Subgrade	CBR = 8.0	82.74

N = 5; Sublayers; Subgrade CDF = 1.00; t = 884.8 mm

Design Stopped
3.89; 2.56

Airplane

Back Help Life Modify Structure Design Structure Save Structure

The program has also determined the minimum base layer requirement.

Reviewing Airplane Data After Completing the Design

CDF and P/C ratio information is now available.

This information allows you to see which airplanes have the largest impact on the pavement design.

FAARFIELD - Create or Modify Airplanes for Section NewFlexible in Job PROJECT

Airplane Group	Airplane Name (11)	CDF Contribution	CDF Max for Airplane	P/C Ratio
Generic	A380-800	0.01	0.01	0.42
Airbus	B737-800	0.00	0.00	1.22
Boeing	B747-400B Combi	0.01	0.01	0.57
Other Commercial	B747-400ER Passenger	0.01	0.02	0.57
General Aviation	B757-300	0.00	0.00	0.73
Military	B767-400 ER	0.04	0.05	0.60
External Library	B777-300 ER	0.86	0.86	0.40
	B787-8 (Preliminary)	0.03	0.03	0.58

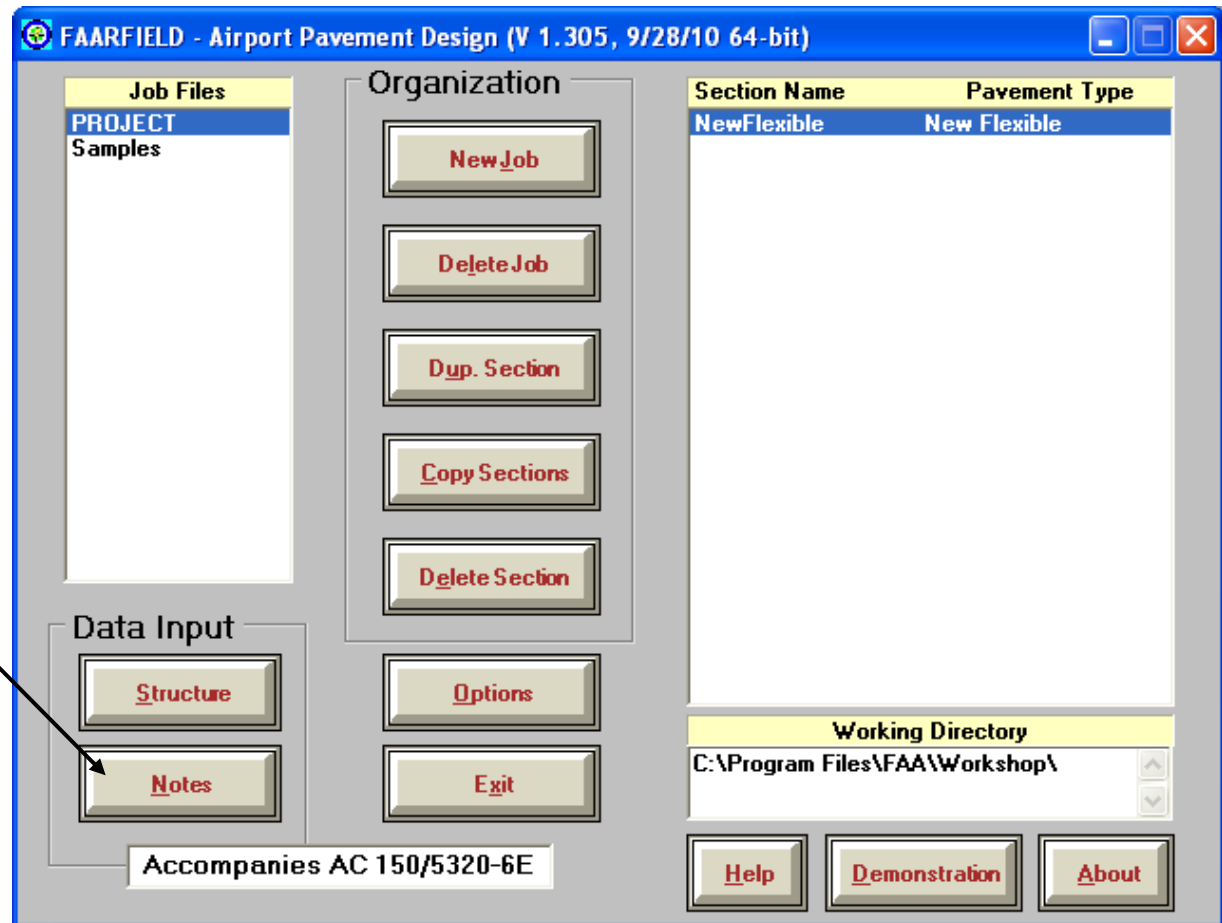
Library Airplanes

- SWL-50
- Sngl Whl-3
- Sngl Whl-5
- Sngl Whl-10
- Sngl Whl-12.5
- Sngl Whl-15
- Sngl Whl-20
- Sngl Whl-30
- Sngl Whl-45
- Sngl Whl-60
- Sngl Whl-75
- Dual Whl-10
- Dual Whl-20
- Dual Whl-30
- Dual Whl-45
- Dual Whl-50
- Dual Whl-60
- Dual Whl-75
- Dual Whl-100

Buttons: Add, Remove, Save List, Clear List, Save to Float, Add Float, Back, Help, CDF Graph, View Gear, Float Airplanes

Reviewing Design Information

To view a summary of the design information, click the “Notes” button.



Reviewing Design Information

You can view the summary data or copy it to other electronic media.

Data can also be exported in XML format to allow automated entry into FAA Form 5100.

The screenshot shows the 'FAARFIELD - Notes and Information for Job PROJECT' window. On the left, a 'Section Names' list contains 'NewFlexible'. The main area displays 'Design Information for Section NewFlexible'. It includes the software version 'FAARFIELD - Airport Pavement Design (V 1.305, 9/28/10 64-bit)', the section name 'Section NewFlexible in Job PROJECT', the working directory 'C:\Program Files\FAA\Workshop\', and design parameters: 'The structure is New Flexible. Asphalt CDF was not computed. Design Life = 20 years. A design for this section was completed on 08/24/11 at 14:04:39.' Below this is a table titled 'Pavement Structure Information by Layer, Top First'.

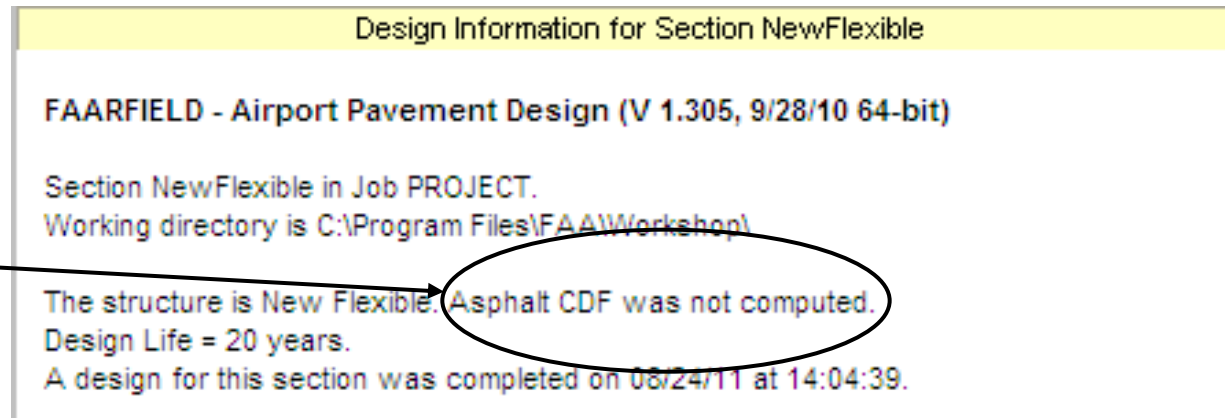
No.	Type	Thickness mm	Modulus MPa	Poisson's Ratio	Strength R, MPa
1	P-401/ P-403 HMA Surface	125.0	1,378.95	0.35	0.00
2	P-401/ P-403 St (flex)	282.8	2,757.90	0.35	0.00
3	P-209 Cr Ag	477.0	354.63	0.35	0.00
4	Subgrade	0.0	82.74	0.35	0.00

Below the table, it states 'Total thickness to the top of the subgrade = 884.8 mm'. Under 'Airplane Information', there are fields for 'Gross Wt', 'Annual', and '% Annual'. At the bottom, there are buttons for 'Help', 'Back', 'SaveXML', 'Save', 'Print', 'Design Info', 'Notes', and 'Copy'. Arrows from the text on the left point to the 'NewFlexible' section in the list and the 'SaveXML' button.

Reviewing Design Information

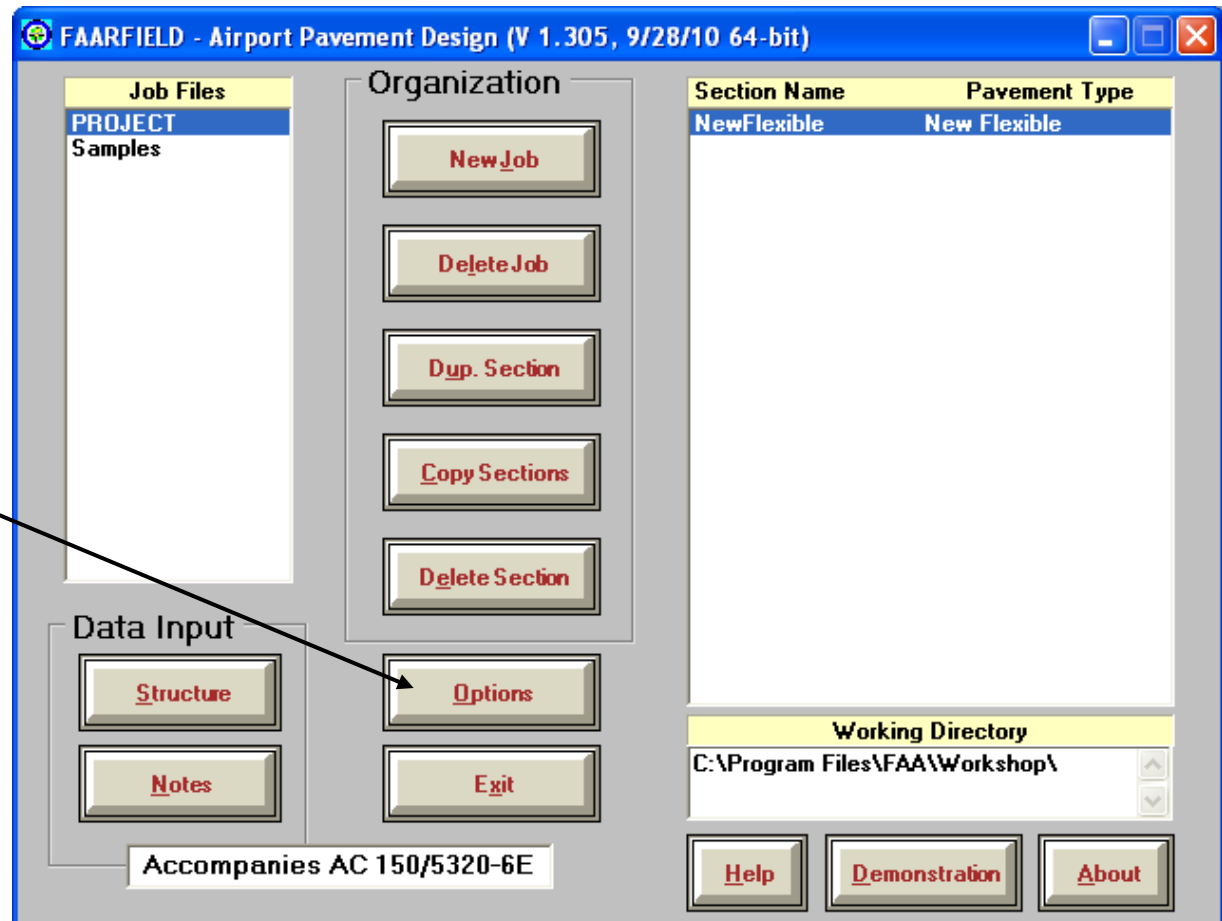
Notice the statement “asphalt CDF was not computed.”

This means the design assumed the failure was in the subgrade and did not calculate the fatigue in the bottom of the HMA layer.



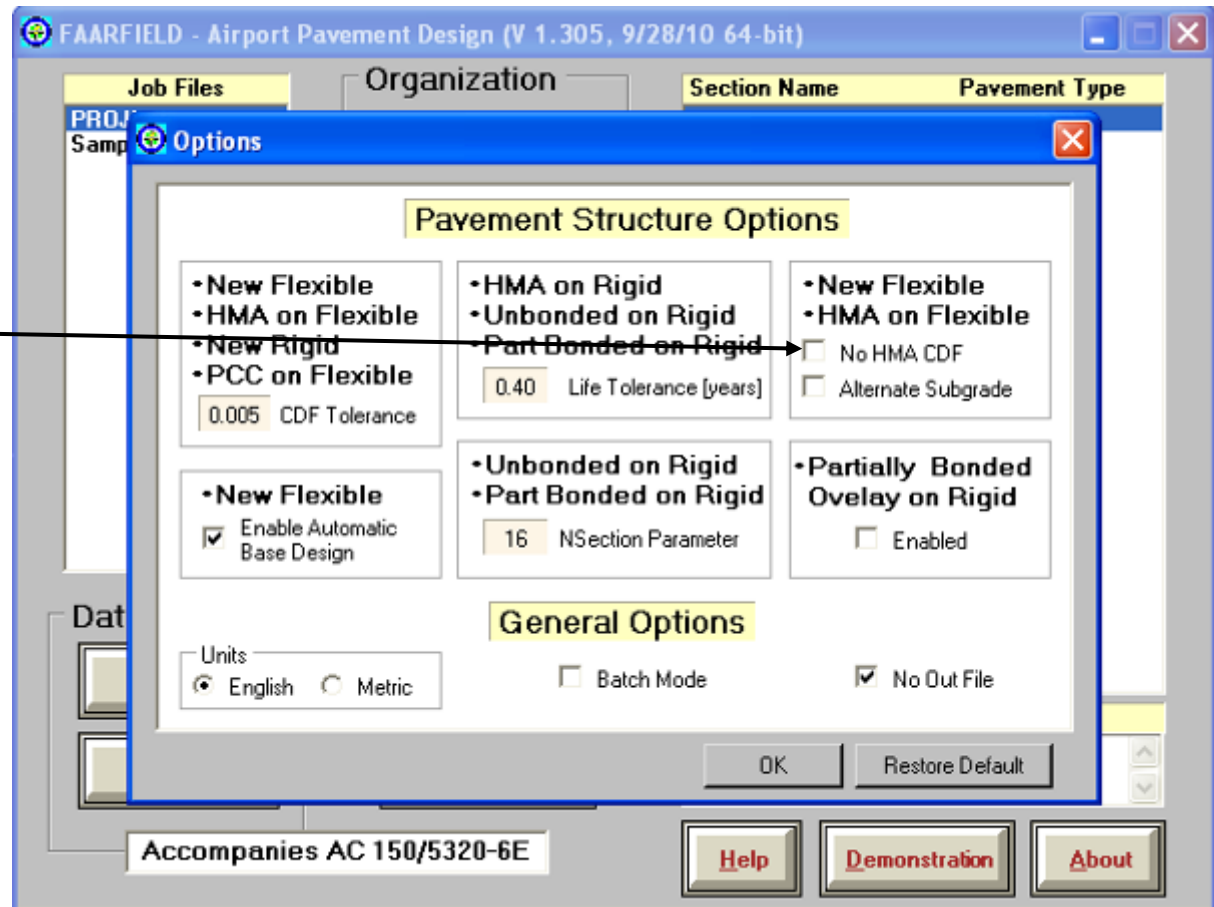
Computing Fatigue in the HMA Layer

The user can access the optional program features including the HMA layer CDF by clicking on the Options button from the starting screen, or by pressing ALT-O from anywhere in the program.



Computing Fatigue in the HMA Layer

To compute the HMA fatigue, uncheck the “No HMA CDF” box and re-run the design.



Computing Fatigue in the HMA Layer

As this example demonstrates, the controlling feature is almost always the subgrade.

(i.e., the subgrade CDF has reached 1.0 (failure) while the HMA CDF is still 0.06.)

FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	282.8	2,757.90
P-209 CrAg	477.0	354.63
Subgrade	CBR = 8.0	82.74

Design Stopped 9.36; 5.50

→

N = 1; HMA CDF = 0.06; Sublayers; Subgrade CDF = 1.00; t = 884.8 mm

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Minimum Base Course Requirements

- **FAARFIELD will automatically determine the minimum base layer requirements.**
- **Users can do this step manually if desired by deselecting this option.**
 - Remove subbase layer and increase subgrade CBR to 20.
 - Re-run the design to obtain the minimum base thickness.

Determine Minimum Base Thickness

FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	282.8	2,757.90
P-209 CrAg	477.0	354.63
Subgrade	CBR = 8.0	82.74

N = 1; HMA CDF = 0.06; Sublayers; Subgrade CDF = 1.00; t = 884.8 mm

Design Stopped
9.36; 5.50

Airplane

Back Help Life **Modify Structure** Design Structure Save Structure

Click on “Modify Structure”

Determine Minimum Base Thickness

FAARFIELD - Modifying Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	282.8	2,757.90
P-209 CrAg	477.0	354.63
Subgrade	CBR = 8.0	82.74

N = 1; HMA CDF = 0.06; Sublayers; Subgrade CDF = 1.00; t = 884.8 mm

Design Stopped 9.36; 5.50

Airplane

Back Help Life End Modify Add/Delete Layer Save Structure

Click on
“Add/Delete Layer”

Determine Minimum Base Thickness

FAARFIELD - Modifying Section NewFlexible in Job PROJECT

Section Names
NewFlexible

Select the layer to be added or deleted by clicking the mouse on the layer. The bottom layer cannot be selected.

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	282.8	2,757.90
P-209 CrAg	477.0	354.63
Subgrade	CBR = 8.0	82.74

N = 1; HMA CDF = 0.06; Sublayers; Subgrade CDF = 1.00; t = 884.8 mm

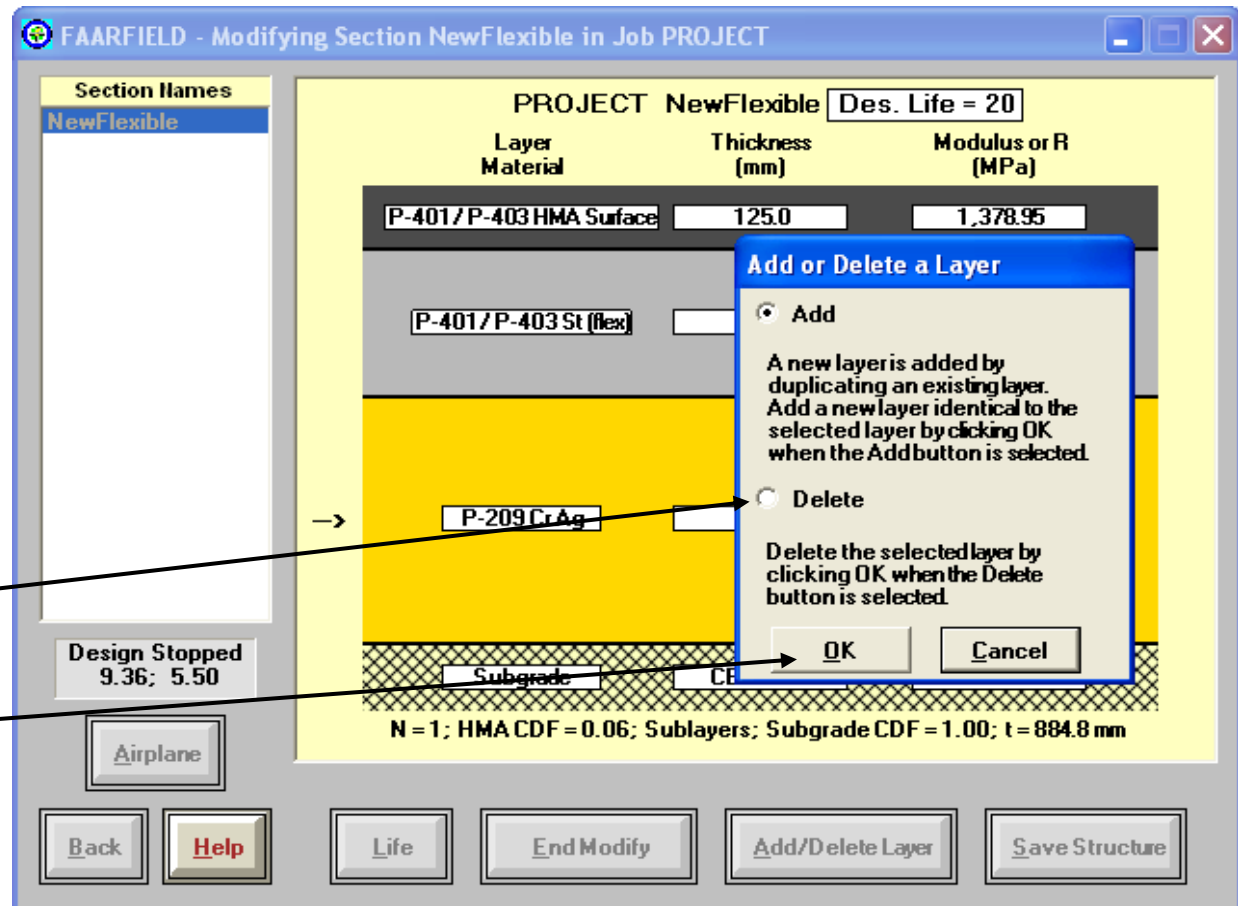
Design Stopped 9.36; 5.50

Airplane

Back Help Life End Modify Add/Delete Layer Save Structure

Click on the
subbase layer.

Determine Minimum Base Thickness



Check the Delete option.

Then click OK.

Determine Minimum Base Thickness

Change the P-401 base layer to P-209

Increase the subgrade CBR to 20

Then click "End Modify"

The screenshot shows the FAARFIELD software interface. The title bar reads 'FAARFIELD - Modifying Section NewFlexible in Job PROJECT'. The main window is divided into two panes. The left pane, titled 'Section Names', contains a list with 'NewFlexible' selected. The right pane, titled 'PROJECT NewFlexible Des. Life = 20', displays a table of layer materials, thicknesses, and moduli. The table has three columns: 'Layer Material', 'Thickness (mm)', and 'Modulus or R (MPa)'. The first layer is 'P-401/P-403 HMA Surface' with a thickness of 125.0 mm and a modulus of 1,378.95 MPa. The second layer is 'P-209 CrAg' with a thickness of 282.8 mm and a modulus of 517.11 MPa. The third layer is 'Subgrade' with a CBR of 20.0 and a modulus of 206.84 MPa. The subgrade is labeled 'Non-Standard Structure'. Below the table, the text 'N = 1; HMA CDF = 0.06; Sublayers; Subgrade CDF = 1.00; t = 407.8 mm' is displayed. At the bottom of the window, there are several buttons: 'Back', 'Help', 'Life', 'End Modify', 'Add/Delete Layer', and 'Save Structure'. The 'End Modify' button is highlighted. Arrows from the text on the left point to the 'P-209 CrAg' layer, the 'Subgrade' CBR value, and the 'End Modify' button.

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-209 CrAg	282.8	517.11
Subgrade		206.84

Non-Standard Structure

Subgrade CBR = 20.0

N = 1; HMA CDF = 0.06; Sublayers; Subgrade CDF = 1.00; t = 407.8 mm

Design Stopped 9.36; 5.50

Buttons: Back, Help, Life, End Modify, Add/Delete Layer, Save Structure

Determine Minimum Base Thickness

Click “Design Structure”

FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-209 CrAg	2828	517.11
Non-Standard Structure		
Subgrade	CBR = 20.0	206.84

N = 1; HMA CDF = 0.06; Sublayers; Subgrade CDF = 1.00; t = 407.8 mm

Design Stopped 9.36; 5.50

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Determine Minimum Base Thickness

The minimum P-209 base thickness is that necessary to protect the CBR 20 subbase material.

Now, convert P-209 to stabilized material.

FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401 / P-403 HMA Surface	125.0	1,378.95
P-209 CrAg	4525	519.25
Non-Standard Structure		
Subgrade	CBR = 20.0	206.84

N = 5; HMA CDF = 0.15; Sublayers; Subgrade CDF = 1.00; t = 577.5 mm

Design Stopped
4.56; 2.84

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Determine Minimum Base Thickness

- **Convert 452.5 mm of P-209 to stabilized base.**
- **For this example, use P-401 as stabilized material. Convert to P-401 by dividing the layer thickness by 1.6 as provided in AC 150/5320-6E, 314(d).**
 - $T_{P401Base} = T_{P209} / 1.6$
 - $T_{P401Base} = 452.5 \text{ mm} / 1.6 = 282.8 \text{ mm}$ (say 300 mm)
- **Program performs this calculation automatically when automatic base design is enabled.**

Final Thickness Design

- Reconstruct the original pavement section.

- Stabilized P-401 base at 300 mm

- P-209 as the improved subbase material (design layer).

- CBR returned to design value.

Click “End Modify”

FAARFIELD - Modifying Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	300.0	2,757.90
P-209 Cr Ag	452.5	519.25
Subgrade	CBR = 8.0	82.74

Design Stopped 4.56; 2.84

N = 5; HMA CDF = 0.15; Sublayers; Subgrade CDF = 1.00; t = 877.5 mm

Buttons: Back, Help, Life, End Modify, Add/Delete Layer, Save Structure

Final Thickness Design

Press ALT-O to bring up the Options window.

Uncheck "Enable Automatic Base Design)

Click OK

The screenshot shows the 'FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT' window. The 'Options' dialog box is open, displaying 'Pavement Structure Options' and 'General Options'. The 'Options' dialog has a blue title bar and a close button. The 'Pavement Structure Options' section includes several groups of options: 'New Flexible' (HMA on Flexible, New Rigid, PCC on Flexible) with a CDF Tolerance of 0.005; 'HMA on Rigid' (Unbonded on Rigid, Part Bonded on Rigid) with a Life Tolerance of 0.40 years; 'New Flexible' (No HMA CDF, Alternate Subgrade); 'Unbonded on Rigid' (Part Bonded on Rigid) with an NSection Parameter of 16; and 'Partially Bonded Overlay on Rigid' (Enabled). The 'General Options' section includes 'Units' (English, Metric) and 'Batch Mode' (No Out File). The 'OK' button is highlighted with a red arrow. The 'Restore Default' button is also visible. The background window shows 'Section Names' and 'PROJECT NewFlexible Des. Life = 20'.

Section Names

PROJECT NewFlexible Des. Life = 20

Options

Pavement Structure Options

- New Flexible
 - HMA on Flexible
 - New Rigid
 - PCC on Flexible
- 0.005 CDF Tolerance
- HMA on Rigid
 - Unbonded on Rigid
 - Part Bonded on Rigid
- 0.40 Life Tolerance [years]
- New Flexible
 - HMA on Flexible
- ☐ No HMA CDF
- ☐ Alternate Subgrade
- Unbonded on Rigid
 - Part Bonded on Rigid
- 16 NSection Parameter
- Partially Bonded Overlay on Rigid
- ☐ Enabled

General Options

Units

☐ English ☒ Metric

☐ Batch Mode ☒ No Out File

OK Restore Default

Back Help Life Modify Structure Design Structure Save Structure

Final Thickness Design

Then click “Design Structure”

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	300.0	2,757.90
P-209 CrAg	452.5	519.25
Subgrade	CBR = 8.0	82.74

N = 5; HMA CDF = 0.15; Sublayers; Subgrade CDF = 1.00; t = 877.5 mm

Design Stopped 4.56; 2.84

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Final Thickness Design

The final layer thickness requirements are now visible.

FAARFIELD - Modify and Design Section NewFlexible in Job PROJECT

Section Names
NewFlexible

PROJECT NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	300.0	2,757.90
→ P-209 CrAg	447.2	346.62
Subgrade	CBR = 8.0	82.74

N = 2; HMA CDF = 0.06; Sublayers; Subgrade CDF = 1.00; t = 872.2 mm

Design Stopped
4.64; 3.42

Airplane

Back Help Life Modify Structure Design Structure Save Structure



Thank You

¡Gracias!

Questions?

¿Preguntas?



Flexible Overlay Design

FAARFIELD 1.305

Hands-On Training

Presented to: IX ALACPA Seminar on Airport Pavements
Ciudad de Panamá, Panamá

By: David R. Brill, P.E., Ph.D.

Date: September 13, 2012



Federal Aviation
Administration



Asphalt Overlay Design

FAARFIELD - Modify and Design Section NewFlexible in Job Workshop

Section Names
NewFlexible

Workshop NewFlexible Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Surface	125.0	1,378.95
P-401/P-403 St (flex)	300.0	2,757.90
P-209 CrAg	447.1	346.60
Subgrade	CBR = 8.0	82.74

N = 2; Sublayers; Subgrade CDF = 1.00; t = 872.1 mm

Design Stopped
0.74; 0.48

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Click "Back"

Asphalt Overlay Design

FAARFIELD - Airport Pavement Design (V 1.305, 9/28/10 64-bit)

Job Files

Samples
Workshop

Organization

New Job

Delete Job

Dup. Section

Copy Section

Delete Section

Data Input

Structure

Notes

Options

Exit

Section Name

ACAggregate
AConFlex
AConRigid
NewFlexible
NewRigid
PCConFlex
PCConRigid

Pavement Type

New Flexible
AC on Flexible
AC on Rigid
New Flexible
New Rigid
PCC on Flexible
Unbonded on Rigid

Working Directory

C:\Program Files\FAA\FAARFIELD_1\

Help

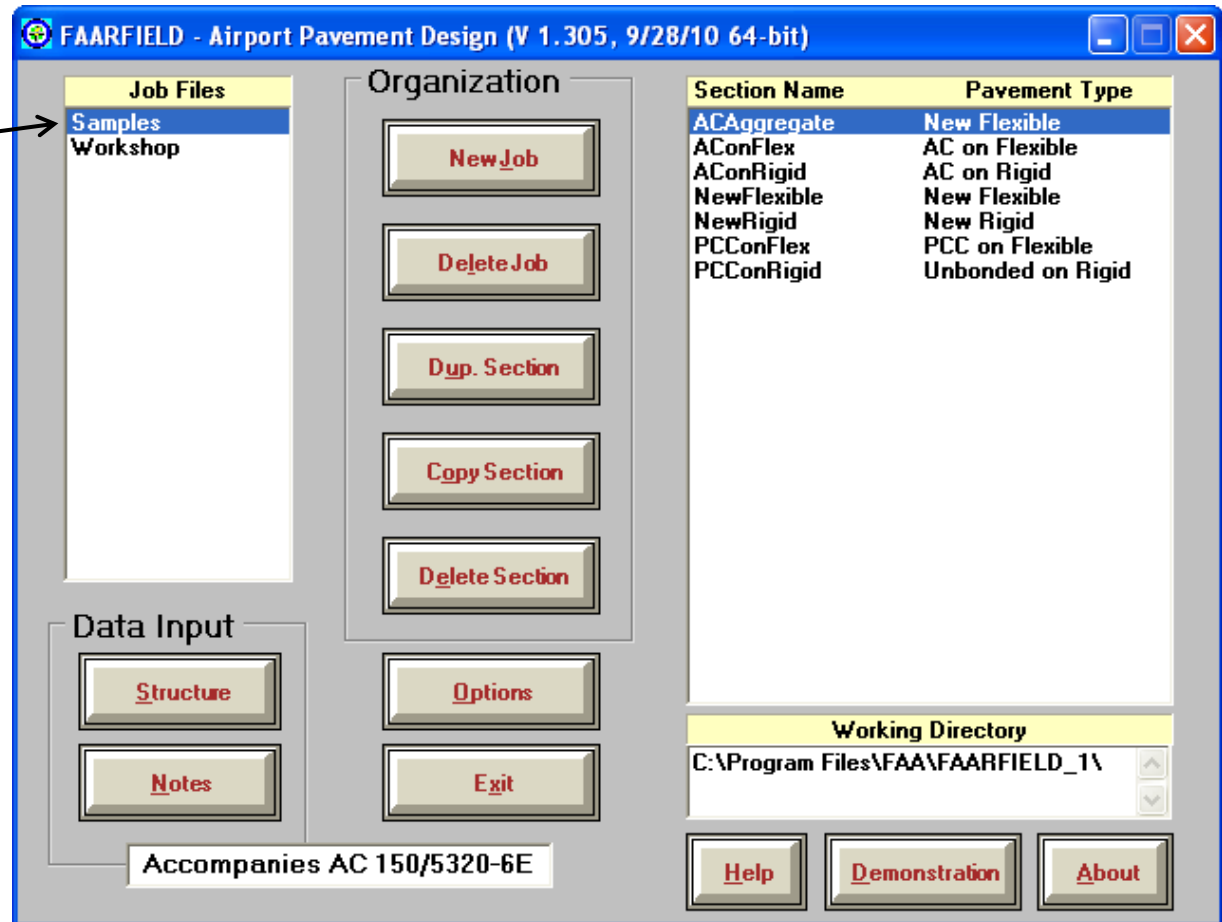
Demonstration

About

Accompanies AC 150/5320-6E

Asphalt Overlay Design - Copy Basic Section

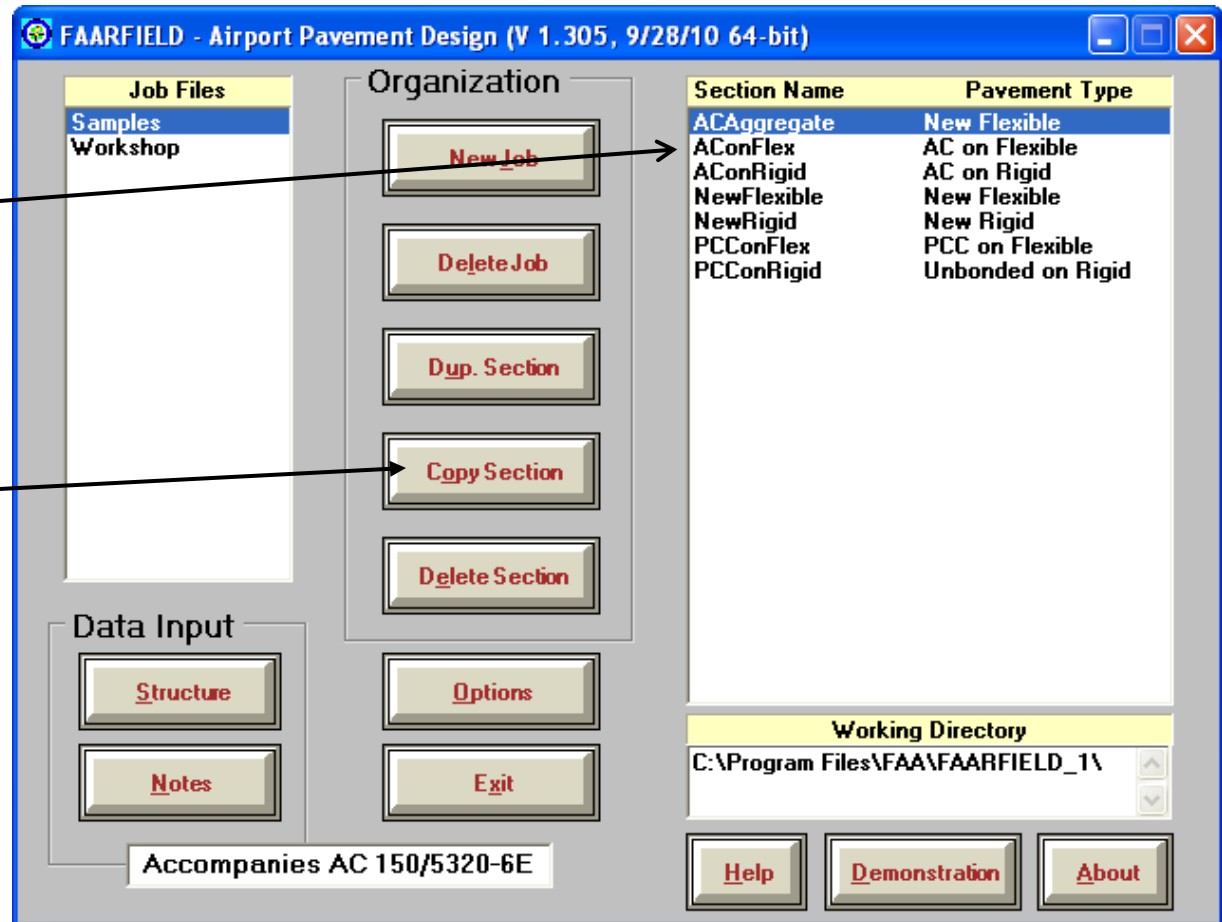
Click on "Samples"



Asphalt Overlay Design - Copy Basic Section

Default Basic Pavement Sections

Click on “Copy Section”



7 Basic Starting Structures in FAARFIELD

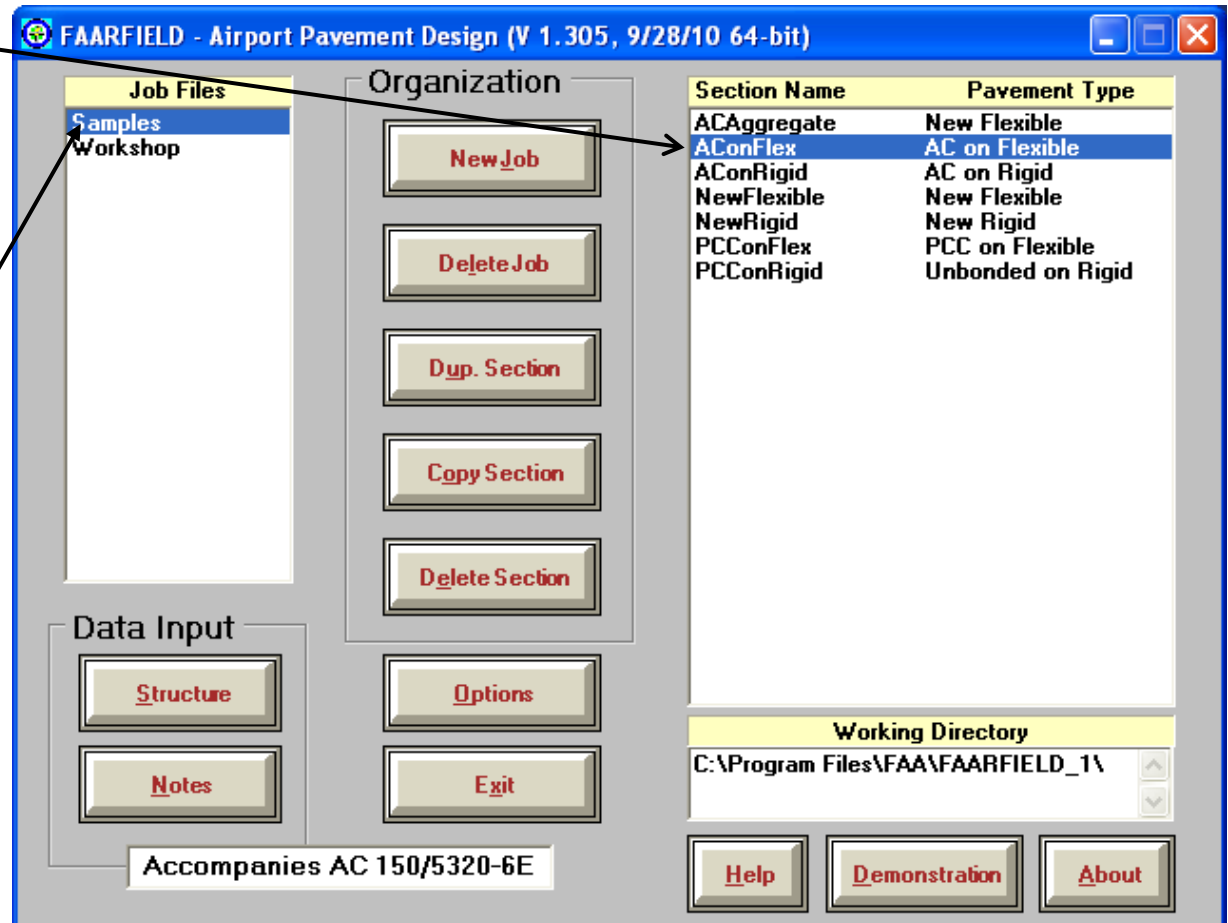
<u>Section Name</u>	<u>Pavement Type</u>
ACAggregate	New flexible on aggregate base
AConFlex	HMA overlay on flexible pavement
AConRigid	HMA overlay on rigid pavement
NewFlexible	New flexible on stabilized base
New Rigid	New rigid on stabilized base
PCConFlex	PCC Overlay on flexible
PCConRigid	Unbonded PCC on rigid

Be sure to select the pavement type that most correctly represents your design requirements.

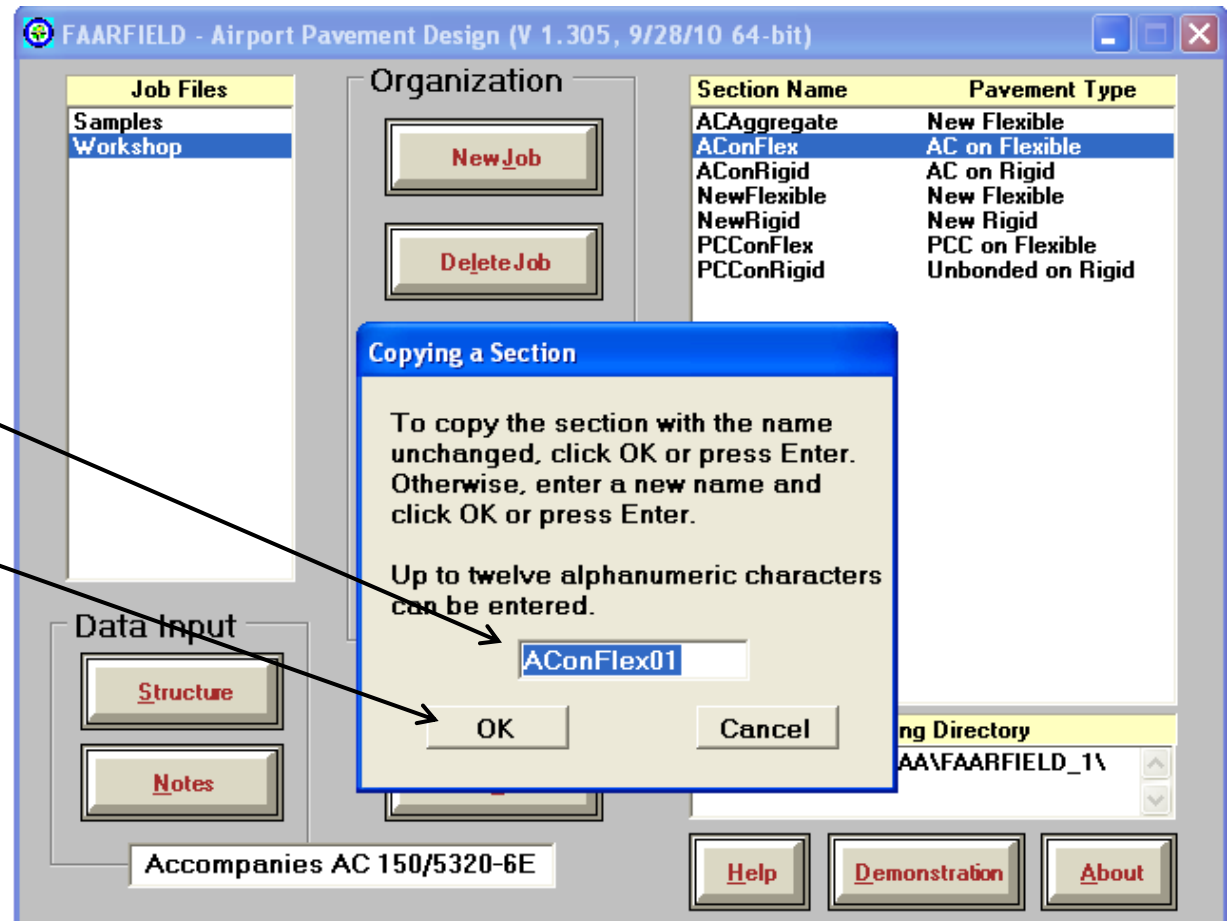
Asphalt Overlay Design / Copy a Sample Pavement Section

Click on desired pavement section.

Then click on the project where the section will be saved.



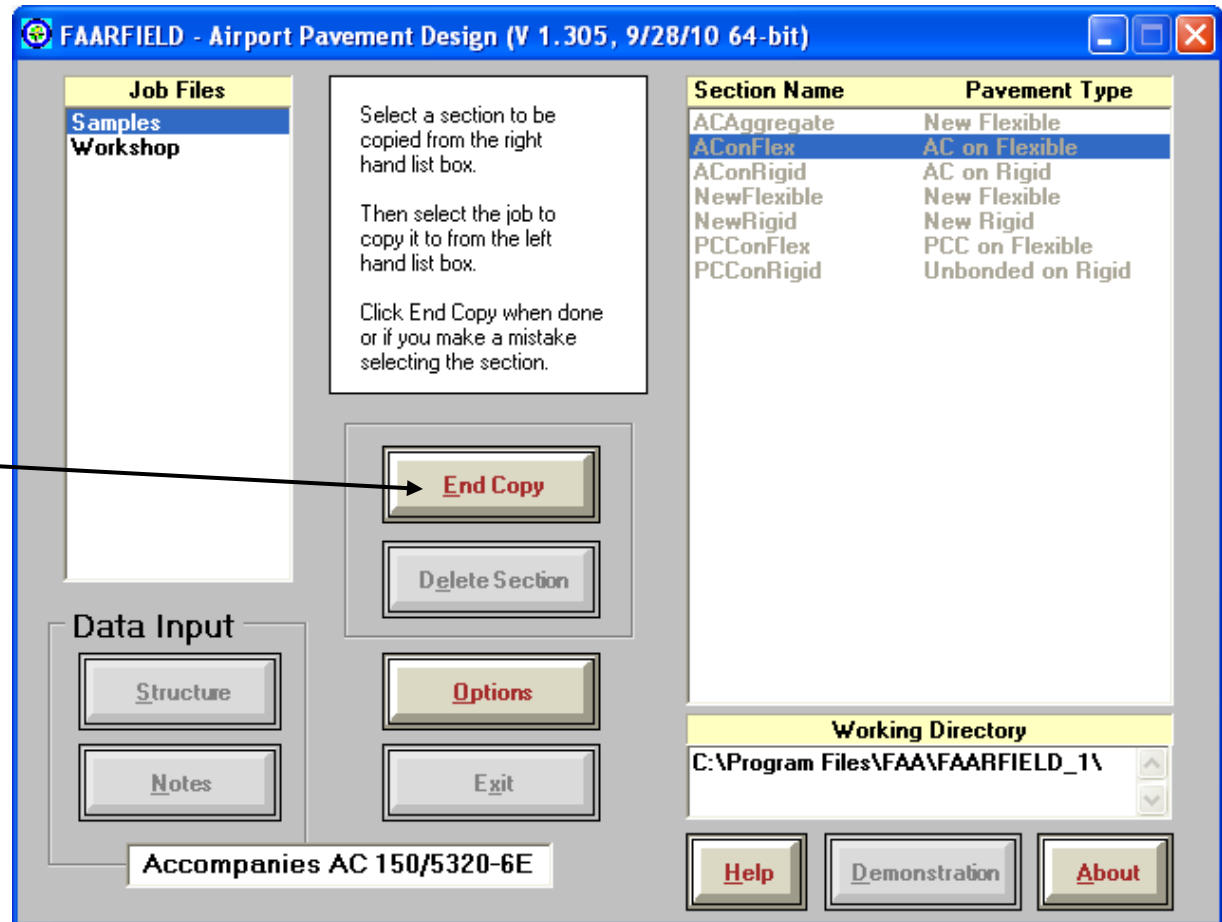
Asphalt Overlay Design / Create a New Job Title



Enter job title

Click OK

Asphalt Overlay Design / Create a New Job Title

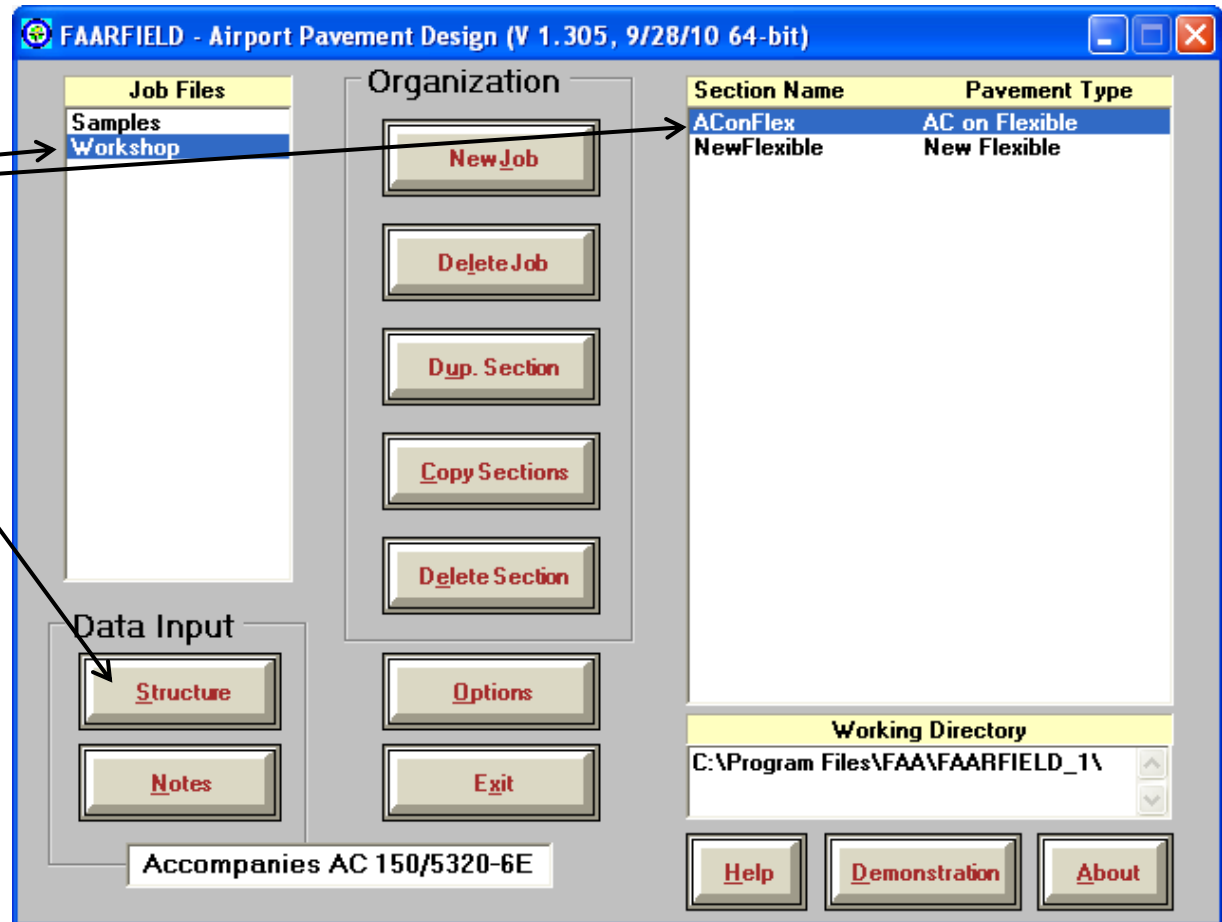


Click “End Copy”

Asphalt Overlay Design / Working With a Pavement Section

Select the job and then the section you want to analyze.

Click on “Structure” to open the file.



Asphalt Overlay Design

Default Cross Section

Click on “Modify Structure”.

The screenshot shows the FAARFIELD software interface. The title bar reads "FAARFIELD - Modify and Design Section AConFlex in Job Workshop". On the left, a "Section Names" list contains "AConFlex" and "NewFlexible". The main area displays a cross-section design for "Workshop AConFlex" with "Des. Life = 20". The design consists of the following layers:

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Overlay	101.6	1,378.95
P-401/P-403 HMA Surface	101.6	1,378.95
Variable St (flex)	254.0	1,034.21
P-209 CrAg	1524	517.11
Subgrade	CBR = 10.0	103.42

Total thickness to the top of the subgrade, t = 609.6 mm

At the bottom, there are buttons for "Back", "Help", "Life", "Modify Structure", "Design Structure", and "Save Structure". A red bracket on the left points to the "Section Names" list, and a black arrow points to the "Modify Structure" button.

Asphalt Overlay Design

Modify the cross section to reflect the existing structure.

Click on “Airplane”.

FAARFIELD - Modify and Design Section AConFlex in Job Workshop

Section Names
AConFlex
NewFlexible

Workshop AConFlex Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Overlay	100.0	1,378.95
P-401/P-403 HMA Surface	125.0	1,378.95
Variable St (flex)	275.0	1,034.21
P-209 CrAg	480.0	517.11
Subgrade	CBR = 8.0	82.74

Total thickness to the top of the subgrade, t = 980.0 mm

Status

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Asphalt Overlay Design

Add Airplane Information

Use the traffic mix from the new flexible pavement example.

Use the “Float Airplanes” functions to do this without having to enter the data a second time.

FAARFIELD - Create or Modify Airplanes for Section AConFlex in Job Workshop

Airplane Group	Airplane Name (11)	Gross Taxi Weight (tns)	Annual Departures	% Annual Growth
Generic	B737-800	79.243	2,000	0.00
Airbus	B747-400B Combi	397.801	400	0.00
Boeing	B747-400ER Passenger	414.130	300	0.00
Other Commercial	B757-300	124.058	1,200	0.00
General Aviation	B767-400 ER	204.570	800	0.00
Military	B777-300 ER	352.441	1,000	0.00
External Library	B787-8 (Preliminary)	220.446	600	0.00

Library Airplanes

- SwL-50
- Sngl Whl-3
- Sngl Whl-5
- Sngl Whl-10
- Sngl Whl-12.5
- Sngl Whl-15
- Sngl Whl-20
- Sngl Whl-30
- Sngl Whl-45
- Sngl Whl-60
- Sngl Whl-75
- Dual Whl-10
- Dual Whl-20
- Dual Whl-30
- Dual Whl-45
- Dual Whl-50
- Dual Whl-60
- Dual Whl-75
- Dual Whl-100

Buttons: Add, Remove, Save List, Clear List, Save to Float, Add Float, Back, Help, CDF Graph, View Gear

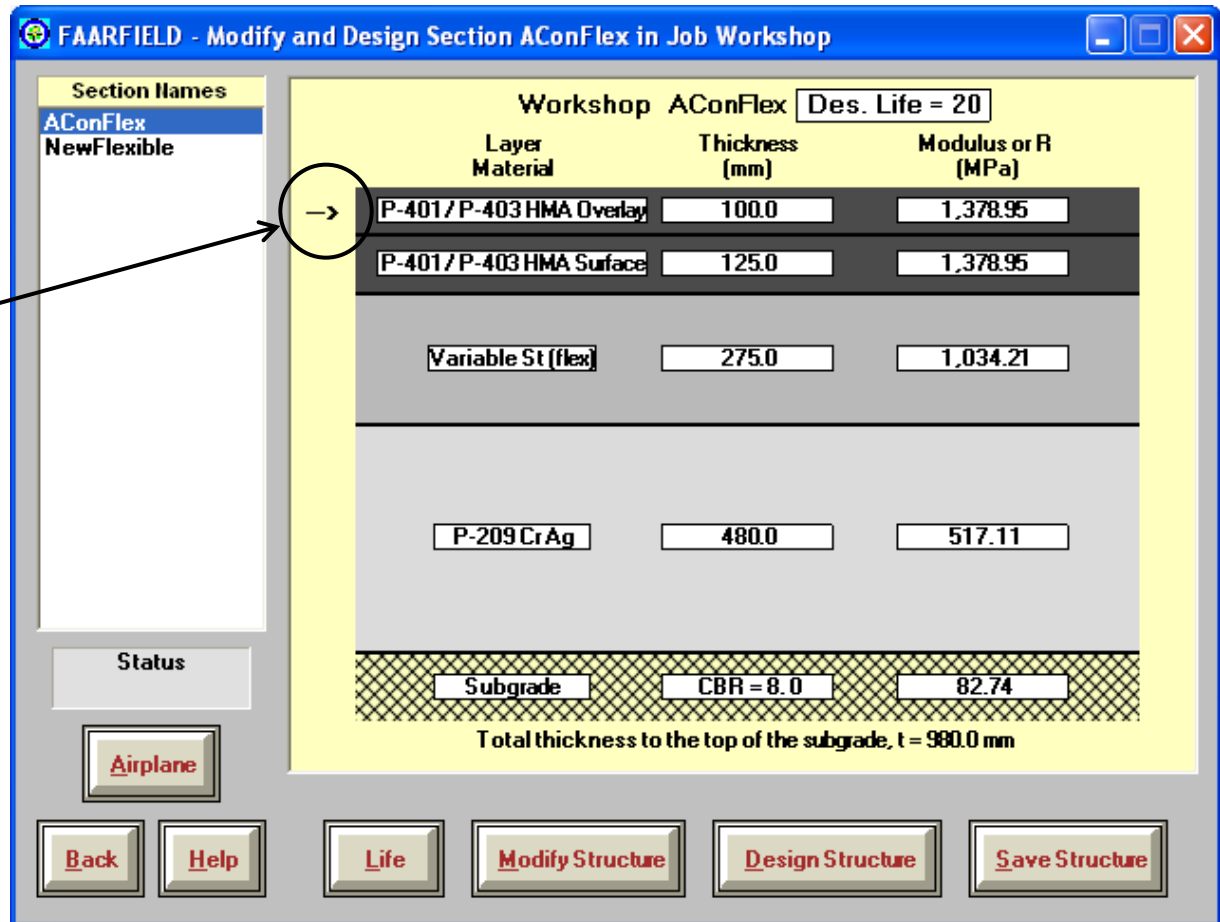
Float Airplanes

- A320-100
- A340-600 std
- A340-600 std Belly
- A380-800
- B737-800
- B747-400B Combi
- B747-400ER Passeng
- B757-300

Performing Overlay Design

The layer with the small arrow is the layer that will be adjusted to provide the structural design.

The location of the arrow is determined by the type of structure.



FAARFIELD - Modify and Design Section AConFlex in Job Workshop

Section Names
AConFlex
NewFlexible

Workshop AConFlex Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Overlay	100.0	1,378.95
P-401/P-403 HMA Surface	125.0	1,378.95
Variable St (flex)	275.0	1,034.21
P-209 CrAg	480.0	517.11
Subgrade	CBR = 8.0	82.74

Total thickness to the top of the subgrade, t = 980.0 mm

Status

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Performing Overlay Design

You are now ready to design the structure. Simply click on “Design Structure.”

The program will keep you informed about the status of the design.

FAARFIELD - Modify and Design Section AConFlex in Job Workshop

Section Names
AConFlex
NewFlexible

Workshop AConFlex Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
P-401/P-403 HMA Overlay	100.0	1,378.95
P-401/P-403 HMA Surface	125.0	1,378.95
Variable St (flex)	275.0	1,034.21
P-209 CrAg	480.0	517.11
Subgrade	CBR = 8.0	82.74

Total thickness to the top of the subgrade, t = 980.0 mm

Status

Buttons: Airplane, Back, Help, Life, Modify Structure, Design Structure, Save Structure

Result of Overlay Design

65.8 mm (2.6 in.)
P-401 HMA Overlay

FAARFIELD - Modify and Design Section AConFlex in Job Workshop

Section Names
AConFlex
NewFlexible

Workshop AConFlex Des. Life = 20

Layer Material	Thickness (mm)	Modulus or R (MPa)
→ P-401/P-403 HMA Overlay	65.8	1,378.95
P-401/P-403 HMA Surface	125.0	1,378.95
Variable St (flex)	275.0	1,034.21
P-209 CrAg	480.0	355.41
Subgrade	CBR = 8.0	82.74

N = 3; Sublayers; Subgrade CDF = 1.00; t = 945.8 mm

Design Stopped
1.13; 0.70

Airplane

Back Help Life Modify Structure Design Structure Save Structure

Software Available at:

- http://www.faa.gov/airports/engineering/design_software/
- <http://www.airporttech.tc.faa.gov/naptf/download/index1.asp>





Thank You

¡Gracias!

Questions?

¿Preguntas?

