

**BARBARA AIRFIELD
AIRFIELD PAVEMENT EVALUATION
REPORT**

TECHNICAL MEMORANDUM

Pavement Classification Number (PCN)

PROJECT: Barbara Airfield – New Runway, Taxiway and Apron

CONTRACT: 2018-N005

DATE: October 2020

REVISION NO.: 0

This Technical Note has been prepared for the purpose of evaluating the Pavement Classification Number (PCN) for the new runway and taxiway pavements at Barbara Airfield.

Assessment of the PCN for the pavements is based on the method given in the ICAO Aerodrome Design Manual - Part 3 and the FAA Advisory Circular AC 150/5335-5 - Standardized Method of Reporting Airport Pavement Strength - PCN.

It should be noted that the ACN-PCN system is only a method to report the relative pavement strength, and not intended as a pavement design procedure.

The PCN expresses the relative bearing strength of the pavement for unrestricted operations. If the representative aircraft has a lower ACN value than the PCN value of the pavement, unrestricted use of the pavement is permitted. If the PCN-value of the pavement is lower than the ACN-value of an aircraft, use of the pavement is restricted.

Aircraft Loading

Table 1 shows the Aircraft Classification Number (ACN) values for the design aircraft for all subgrade categories.

Design Aircraft	Gross Weight (tonnes)	Tire Pressure (kPa)	Annual Departures	Flexible Pavement Subgrade Category			
				A	B	C	D
<i>C-17</i>	265	951	1456	42.8	47.7	56.8	74.2
<i>A380</i>	562	1500	1456	58.8	63.8	75.5	102.5
<i>A320-100</i>	68.4	1380	1456	35.3	36.6	40.3	46.1
<i>B777-300</i>	300.3	1482	1456	52.6	58.8	72.5	100.2
<i>B787-8</i>	228.4	1572	1456	60	66.1	81.2	106.3
<i>B737-800</i>	79.2	1413	1456	42.8	45.3	50.3	55.2
<i>F16</i>	20.4	621	1456	13.7	16.1	17.5	18.3

PAVEMENT CLASSIFICATION NUMBER (PCN)

Design Aircraft	Gross Weight (tonnes)	Tire Pressure (kPa)	Annual Departures	Rigid Pavement Subgrade Category			
				A	B	C	D
C-17	265	951	1456	43.6	48	56.5	70.1
A380	562	1500	1456	56.4	66.0	78.4	90.5
A320-100	68.4	1380	1456	39.8	42.1	44.3	46.2
B777-300	300.3	1482	1456	53.8	68.9	88.9	108.2
B787-8	228.4	1572	1456	60.6	71.6	84.3	96.0
B737-800	79.2	1413	1456	49.2	51.7	54.1	56.1
F16	20.4	621	1456	14.9	15.4	15.8	16.1

Table 1 – Design Aircraft and ACN values for all subgrade categories

* Critical design aircraft assumed to operate with a single daily flight. A380 is ICAO Code E/F aircraft, which is greater than the Code D airfield category currently used as design basis. Operational restriction and airfield safety requirements for A380 aircraft could not be considered in the airfield design.

PCN Evaluation

The PCN evaluation is based on the technical evaluation method using the FAA COMFAA program and support applications.

Determining the PCN for rigid pavement is based on the premise of an improved subgrade support directly beneath the concrete pavement layer.

Similar, the PCN for flexible pavements is based on the equivalent thickness method, where the pavement structure under consideration is referenced to a standard section according to FAA requirements.

In terms of equivalent traffic it is assumed that the pass to traffic cycles (P/TC) ratio equals 2 as the airfield has a central taxiway configuration and it is assumed that aircraft can obtain fuel at the airfield.

At least one aircraft have 4 or more wheels per gear. The FAA recommends a reference section assuming 5in of asphalt and 8in of crushed aggregate for equivalent thickness calculations.

PAVEMENT CLASSIFICATION NUMBER (PCN)

Flexible Pavement

Runway and Taxiway Pavement

Evaluation subgrade CBR value = 15% (Category A)

Asphalt pavement evaluation thickness $t = 778$ mm

Evaluation PCN = 116

Rigid Pavement

Apron and Turn Pad on Runway Pavement

Evaluation subgrade CBR value = 10% (Category B)

Concrete pavement evaluation thickness $t = 400$ mm

Evaluation PCN = 79

PCN Recommendation

The proposed flexible and rigid pavement structure are more than adequate and therefore result in very high PCN values for certain aircraft. Given that the PCN is significantly higher than the ACN it is recommended to limit the PCN to 72 for rigid pavement, which correlates to Table 1 ACN value for the B787-8 aircraft considering subgrade category B (10% CBR) and PCN 60 for flexible pavement which correlates to Table 1 ACN value for the B787-8 aircraft considering subgrade category A (15% CBR) .

PCN for the flexible runway and taxiway is therefore as follow **60/F/A/W/T**

PCN for the rigid runway Turn Pad and Apron is therefore as follow **72/R/B/W/T**

Notes:

Numerical PCN Value: 60 for Flexible Pavement (Higher value could be specified but for no purpose)

Numerical PCN Value: 68 for Rigid Pavement (Higher value could be specified but for no purpose)

Pavement Type: F (Flexible Pavement)

Pavement Type: R (Rigid Pavement)

Subgrade Category: A based on CBR greater than 15 %

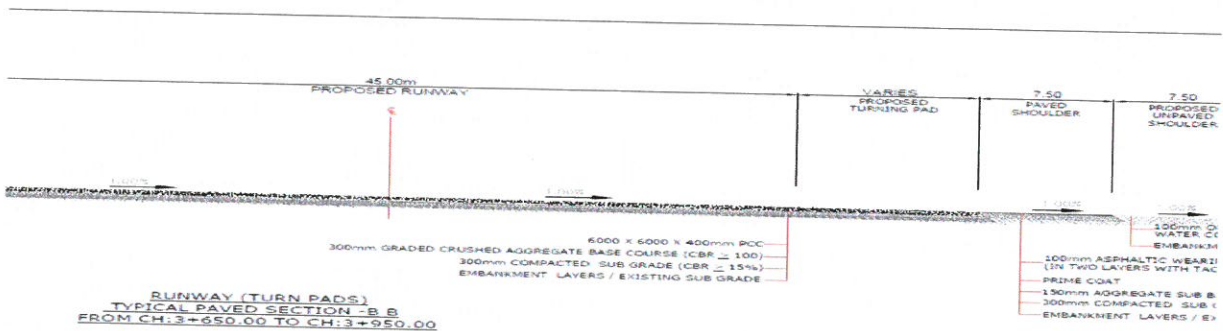
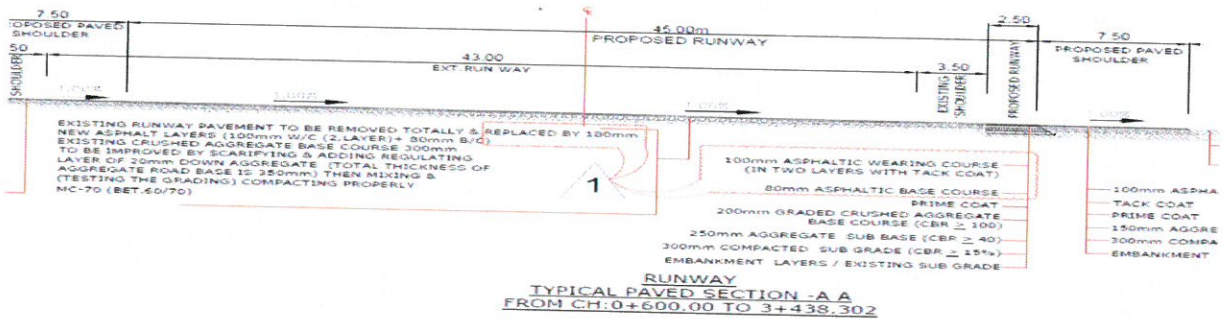
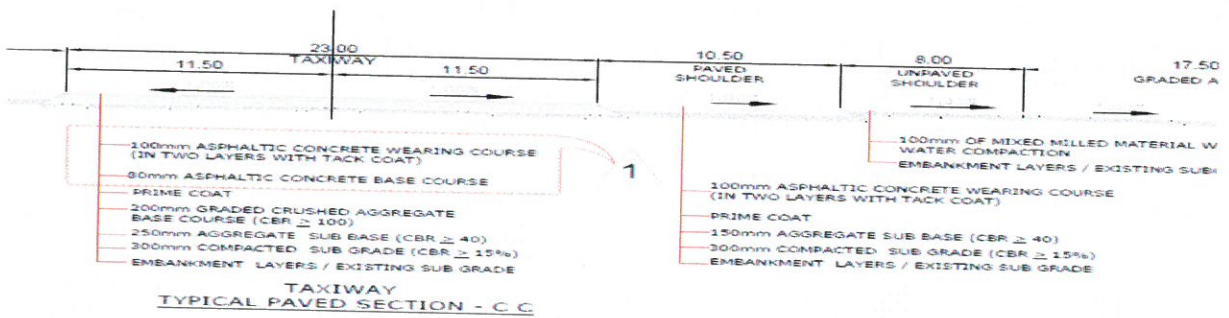
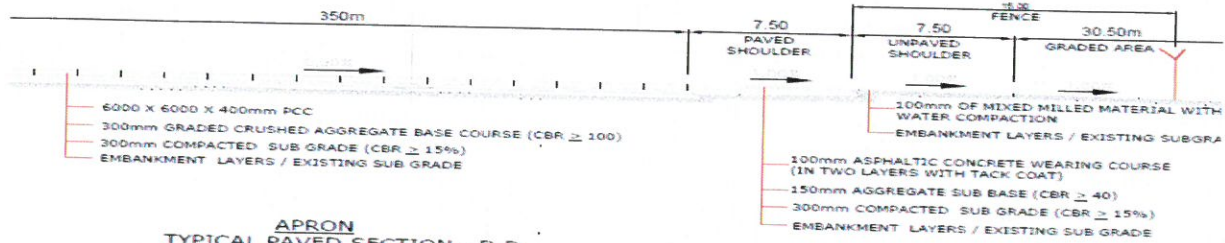
Subgrade Category: b based on CBR greater than 10 %

Allowable tire pressure: W (Unlimited - assuming a properly constructed asphalt pavement)

Method Used: T (Produced from technical study)

PAVEMENT CLASSIFICATION NUMBER (PCN)

Rigid and Flexible Pavement Sections



Flexible Pavements

Runway

Reference Guidance	AC 150/5335-5C App B	Existing Flexible Pavement Layers	ENTER Existing Layer Thickness
Flexible Pavement Structure Items	Fig. A2-2 Convert to P-209	Figs.A2-1&2 Convert to P-154	
P-401/3 P 403	1.6	<input checked="" type="checkbox"/> Use FAA	P-401/3 180.0 mm
P-306 ECONOCRTE	1.2		P-306 0.0 mm
P-304 CEM. TRTD	1.2	n/a	P-304 0.0 mm
P-209 Cr AGG	1.0	1.4	P-209 350.0 mm
P-208 Agg, P-211	1.0	1.2	P-208 0.0 mm
P-301 SOIL-CEM.	n/a	1.2	P-301 0.0 mm
P-154 Subbase	n/a	1.0	P-154 0.0 mm
Equivalent Thickness, mm			Subgrade CBR... 15.0

P-401/3 76.2
 P-209 152.4
 P-154 509.2

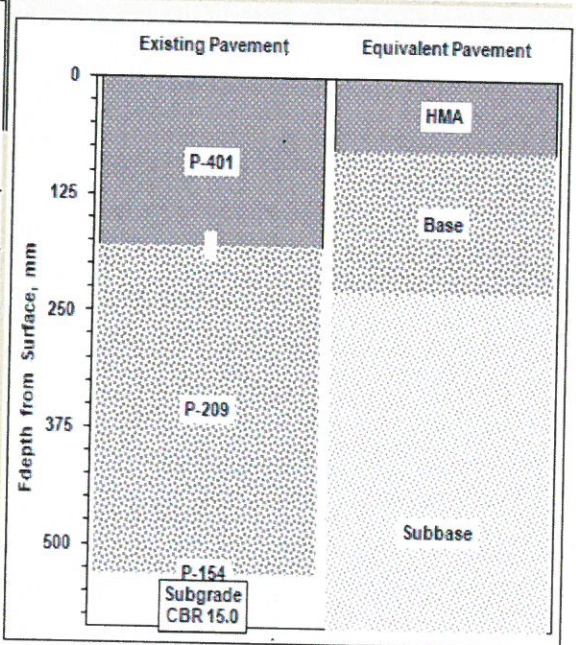
Total 737.8

ENTER Ref. Section Requirements

P-401 reference t 76.20 mm
 P-209 reference t 152.40 mm

Metric English

Loc_ID	Pavement ID
2018-N005	RNY-FLEXIBLE
Project Details	
BARBARA RNY	



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COMFAA Inputs

Evaluation thickness t = 738 mm
 Evaluation CBR = 15.0
 Recommended PCN Codes: F/A/X

Technical Evaluation

FAA AC 150/5335-5B (COMFAA v.3)

Evaluation pavement type is flexible and design procedure is CBR.
Alpha Values are those approved by the ICAO in 2007.

CBR = 15.00 (Subgrade Category is A(15))
Evaluation pavement thickness = 738.0 mm
Pass to Traffic Cycle (PtoTC) Ratio = 1.00
Maximum number of wheels per gear = 6
Maximum number of gears per aircraft = 2

At least one aircraft has 4 or more wheels per gear. The FAA recommends a reference section assuming 127 mm of HMA and 203 mm of crushed aggregate for equivalent thickness calculations.

Results Table 1. Input Traffic Data

No.	Aircraft Name	Gross Weight	Percent Gross Wt	Tire Press	Annual Deps	20-yr Coverages	6D Thick
1	C-17A	265.352	95.00	951	1,456	22,272	456.3
2	A380 (WLG) 562t	562.000	38.05	1,500	1,456	15,276	529.8
3	A320-100	68.400	94.00	1,380	1,456	7,540	396.2
4	B777-300 Baseline	300.278	94.84	1,482	1,456	21,155	505.5
5	B787-8	228.384	91.30	1,572	1,456	15,181	536.5
6	B737-800	79.243	93.56	1,413	1,456	8,186	438.6
7	S-45	20.412	95.00	621	1,456	5,203	239.2

Results Table 2. PCN Values

No.	Aircraft Name	Critical Aircraft Total Equiv. Covs.	Thickness for Total Equiv. Covs.	Maximum Allowable Gross Weight	ACN Thick at Max. Allowable Gross Weight	CDF	PCN on A(15)
1	C-17A	>5,000,000	524.8	428.404	618.64	0.0000	83.1
2	A380 (WLG) 562t	>5,000,000	694.1	612.595	549.50	0.0000	65.3
3	A320-100	>5,000,000	657.6	82.033	447.50	0.0000	43.5
4	B777-300 Baseline	21,155	505.5	503.372	716.83	0.0000	111.6
5	B787-8	>5,000,000	713.3	239.128	540.88	0.0000	63.6
6	B737-800	>5,000,000	737.0	79.403	444.77	0.0000	42.9
7	S-45	>5,000,000	501.6	44.179	369.13	0.0000	29.6
Total CDF =						0.0000	

Results Table 3. Flexible ACN at Indicated Gross Weight and Strength

No.	Aircraft Name	Gross Weight	% GW on Main Gear	Tire Pressure	ACN Thick	ACN on A(15)
1	C-17A	265.352	95.00	951	444.2	42.8
2	A380 (WLG) 562t	562.000	38.05	1,500	518.7	58.5
3	A320-100	68.400	94.00	1,380	403.5	35.3
4	B777-300 Baseline	300.278	94.84	1,482	492.2	52.6
5	B787-8	228.384	91.30	1,572	525.4	60.0
6	B737-800	79.243	93.56	1,413	444.2	42.8
7	S-45	20.412	95.00	621	250.9	13.7

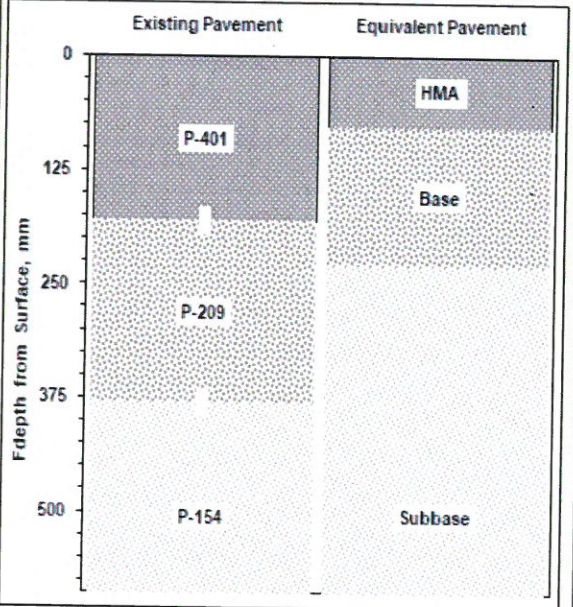
Technical Evaluation

FAA AC 150/5335-5B (COMFAA v.3)

Flexible Pavements

Taxiway

Reference Guidance Flexible Pavement Structure Items	AC 150/5335-5C App B		Existing Flexible Pavement Layers	ENTER Existing Layer Thickness
	Fig. A2-2 Convert to P-209	Figs.A2-1&2 Convert to P-154		
P-401/3 P 403	1.6		P-401/3	180.0 mm
P-306 ECONOCRTE	1.2	<input checked="" type="checkbox"/> Use FAA	P-306	0.0 mm
P-304 CEM. TRTD	1.2	n/a	P-304	0.0 mm
P-209 Cr AGG	1.0	1.4	P-209	200.0 mm
P-208 Agg, P-211	1.0	1.2	P-208	0.0 mm
P-301 SOIL-CEM.	n/a	1.2	P-301	0.0 mm
P-154 Subbase	n/a	1.0	P-154	250.0 mm



Equivalent Thickness, mm	Subgrade CBR...	15.0
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P-401/3 76.2
P-209 152.4
P-154 549.2
Total 777.8

Metric English

Loc_ID	Pavement ID
2018-N005	TXY-FLEXIBLE
Project Details	
BARBARA RNY	

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ENTER Ref. Section Requirements

P-401 reference t 76.20 mm
P-209 reference t 152.40 mm

COMFAA Inputs

Evaluation thickness t = 778 mm
Evaluation CBR = 15.0
Recommended PCN Codes: F/A/X

Technical Evaluation

FAA AC 150/5335-5B (COMFAA v.3)

Evaluation pavement type is flexible and design procedure is CER.
Alpha Values are those approved by the ICAO in 2007.

CBR = 15.00 (Subgrade Category is A(15))
Evaluation pavement thickness = 778.0 mm
Pass to Traffic Cycle (PtoTC) Ratio = 2.00
Maximum number of wheels per gear = 6
Maximum number of gears per aircraft = 2

At least one aircraft has 4 or more wheels per gear. The FAA recommends a reference section assuming 127 mm of HMA and 203 mm of crushed aggregate for equivalent thickness calculations.

Results Table 1. Input Traffic Data

No.	Aircraft Name	Gross Weight	Percent Gross Wt	Tire Press	Annual Deps	20-yr Coverages	6D Thick
1	C-17A	265.352	95.00	951	1,456	44,543	464.8
2	A380 (WLG) 562t	562.000	38.05	1,500	1,456	30,551	546.3
3	A320-100	68.400	94.00	1,380	1,456	15,080	419.6
4	B777-300 Baseline	300.278	94.84	1,482	1,456	42,309	516.6
5	B787-8	228.384	91.30	1,572	1,456	30,362	552.6
6	B737-800	79.243	93.56	1,413	1,456	16,371	457.9
7	S-45	20.412	95.00	621	1,456	10,407	251.5

Results Table 2. PCN Values

No.	Aircraft Name	Critical Aircraft Total Equiv. Covs.	Thickness for Total Equiv. Covs.	Maximum Allowable Gross Weight	ACN Thick at Max. Allowable Gross Weight	CDF	PCN on A(15)
1	C-17A	>5,000,000	524.8	463.593	653.11	0.0000	92.6
2	A380 (WLG) 562t	>5,000,000	694.1	654.398	572.42	0.0000	71.2
3	A320-100	>5,000,000	657.6	89.146	470.69	0.0000	48.1
4	B777-300 Baseline	>5,000,000	589.6	436.855	644.98	0.0000	90.4
5	B787-8	30,362	552.6	369.984	733.22	0.0000	116.8
6	B737-800	>5,000,000	737.0	86.142	466.16	0.0000	47.2
7	S-45	>5,000,000	501.6	45.098	389.14	0.0000	32.8
Total CDF =						0.0000	

When computing the numbers of coverages to failure, the coverages for none of the aircraft converged at a pavement thickness greater than 99 percent of the evaluation thickness. This means that the life of the pavement is unlimited and the pavement is very strong in relation to the aircraft loading. The relative aircraft load evaluations are also unreliable. Consider reviewing the procedures used to determine the evaluation thickness and the strength of the support. The thicknesses for unlimited operations of each of the aircraft are as follows.

Results Table 2a. Thicknesses for Unlimited Operations

C-17A	524.8
A380 (WLG) 562t	694.1
A320-100	657.6
B777-300 Baseline	589.6
B787-8	713.3
B737-800	737.0
S-45	501.6

Results Table 3. Flexible ACN at Indicated Gross Weight and Strength

No.	Aircraft Name	Gross Weight	% GW on Main Gear	Tire Pressure	ACN Thick	ACN on A(15)
1	C-17A	265.352	95.00	951	444.2	42.8
2	A380 (WLG) 562t	562.000	38.05	1,500	518.7	58.5
3	A320-100	68.400	94.00	1,380	403.5	35.3
4	B777-300 Baseline	300.278	94.84	1,482	492.2	52.6
5	B787-8	228.384	91.30	1,572	525.4	60.0
6	B737-800	79.243	93.56	1,413	444.2	42.8

Rigid Pavements

Runway Turn Pad and APRON

Ref. AC 150/5335-5C Appendix B Rigid Pavement Structure Items	Existing Rigid Pavement Layers	ENTER Existing Layer Thickness	Evaluation Layer Thickness	Improved k-value
Figure A2-7	P-401 Overlay(s)	0.0 mm/2.5	0.0	Overlay to P-501, 2.5 to 1
Rigid Pavement Thickness	P-501	400.0 mm	400.0	
ThirdPoint Flexural Strength	Flexural strength	4.8 Mpa		Foundation k= Maximum k-Below or Input k
Figure A2-6, default maximum k-value = 500 lb/in ³ . (135.7 MN/m ³) OR input k-value if greater.	P-401 and/or P-403	0.0 mm	0.0	No Stabilized
	P-306	0.0 mm		
Combined Top and Bottom Figure A2-5.	P-304	mm		
	P-209	300.0 mm	300.0	83
	P-208 and/or P-211	0.0 mm		
	P-301	0.0 mm	0.0	No Uncrushed
	P-154	0.0 mm		
Subgrade k-value		51.6 MN/m ³	700.00	83.06

COMFAA Inputs

k-value = 83.06 MN/m³

Rigid Pavement t = 400 mm

Flexural strength = 4.800 Mpa

Recommended PCN Codes: R/B/W

Enter Project Details

English

Metric

Clear Saved Data

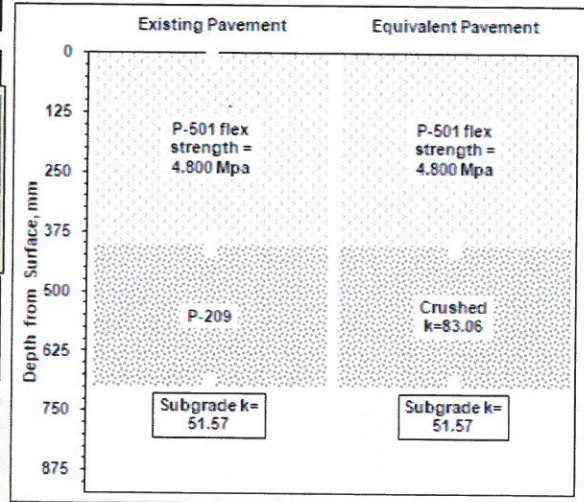
Format Chart

Arpt LOC-ID

Enter LOC-ID

Pavement ID

Enter Pave ID



Technical Evaluation

FAA AC 150/5335-5B (COMFAA v.3)

Evaluation pavement type is rigid

Equivalent coverages computed with the AC 150/5320-6C/D edge stress design method.

Maximum gross weight computed with the AC 150/5320-6C/D edge stress design method.

k Value = 83.0 MN/m³ (Subgrade Category is B(80))

flexural strength = 4,800 kPa

Evaluation pavement thickness = 400.0 mm

Pass to Traffic Cycle (PtoTC) Ratio = 2.00

Maximum number of wheels per gear = 6

Maximum number of gears per aircraft = 2

Results Table 1. Input Traffic Data

No.	Aircraft Name	Gross Weight	Percent Gross Wt	Tire Press	Annual Deps	20-yr Coverages	ED Thick
1	C-17A	265.352	95.00	951	1,456	44,543	315.2
2	A380 (WLG) 562t	562.000	38.05	1,500	1,456	15,276	349.5
3	A320-100	68.400	94.00	1,380	1,456	15,080	320.7
4	B777-300 Baseline	300.278	94.84	1,482	1,456	14,103	312.8
5	B787-8	228.384	91.30	1,572	1,456	15,181	364.4
6	B737-800	79.243	93.56	1,413	1,456	16,371	353.9
7	S-45	20.412	95.00	621	1,456	10,407	186.1

Results Table 2. PCN Values

No.	Aircraft Name	Critical Aircraft Total Equiv. Covs.	Thickness for Total Equiv. Covs.	Maximum Allowable Gross Weight	ACN Thick at Max. Allowable Gross Weight	CDF	PCN on B(80)
1	C-17A	2,045,067	386.4	286.777	324.71	0.0105	52.9
2	A380 (WLG) 562t	72,785	383.9	602.742	376.22	0.1008	72.8
3	A320-100	366,341	385.2	73.459	303.78	0.0198	45.8
4	B777-300 Baseline	554,955	385.5	318.158	383.06	0.0122	75.6
5	B787-8	34,397	383.2	244.699	390.59	0.2120	78.9
6	B737-800	62,864	383.7	85.989	336.14	0.1251	57.0
7	S-45	>5,000,000	381.2	21.487	187.22	0.0000	16.2
Total CDF =						0.4904	

Results Table 3. Rigid ACN at Indicated Gross Weight and Strength

No.	Aircraft Name	Gross Weight	% GW on Main Gear	Tire Pressure	ACN Thick	ACN on B(80)
1	C-17A	265.352	95.00	951	310.3	48.0
2	A380 (WLG) 562t	562.000	38.05	1,500	359.8	66.0
3	A320-100	68.400	94.00	1,380	292.1	42.1
4	B777-300 Baseline	300.278	94.84	1,482	366.8	68.9
5	B787-8	228.384	91.30	1,572	373.4	71.6
6	B737-800	79.243	93.56	1,413	321.4	51.7
7	S-45	20.412	95.00	621	182.9	15.4

Technical Evaluation

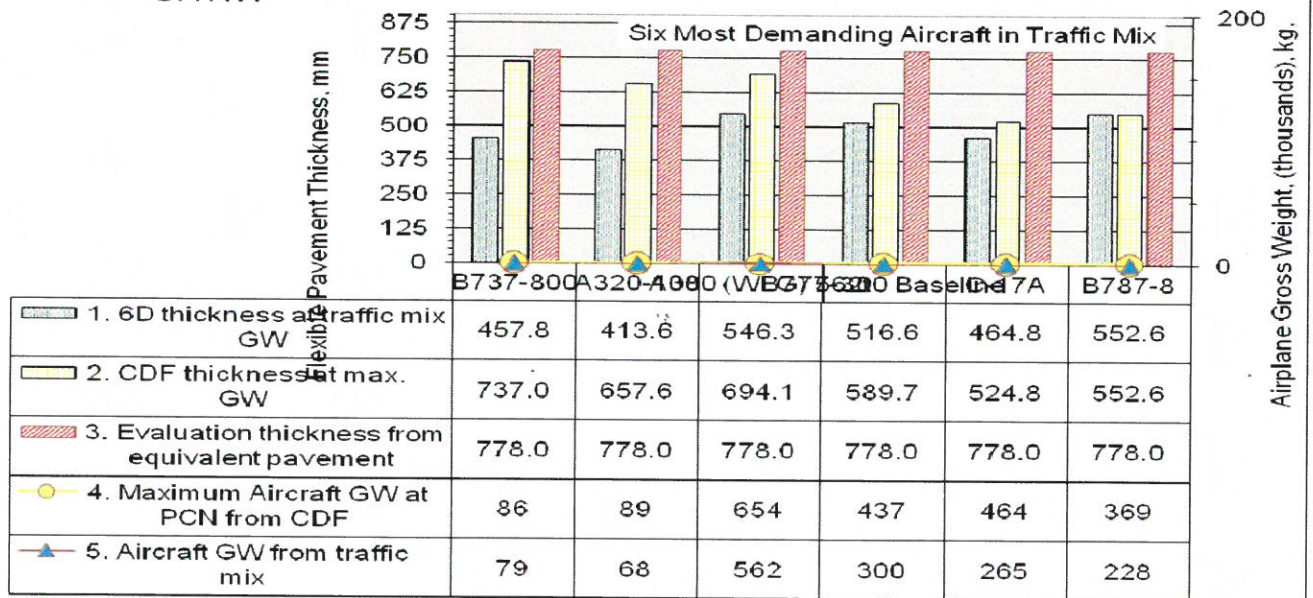
FAA AC 150/5335-5B (COMFAA v.3)

Flexible Pavements

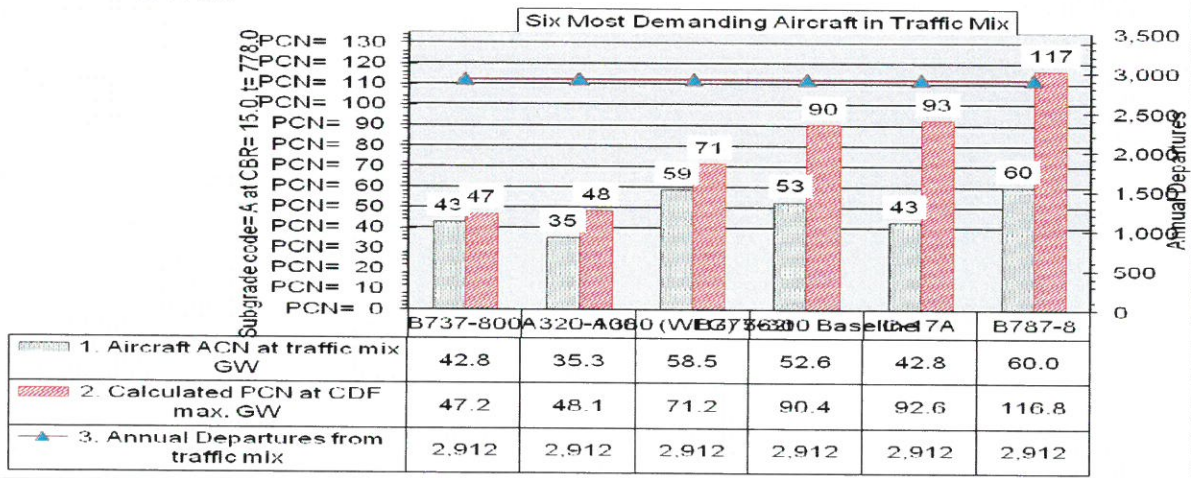
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Num	Plane	GWin	ACNin	ADout	6Dt	CDFt	GWcdf	PCNcdf	EVALt	SUBcode	KorCBR	PtoTC	FlexOrRig
6	B737-800	79	42.8	2,912	457.8	737.0	86	47.2	778.0	A	15.0	2.00	F
3	A320-100	68	35.3	2,912	413.6	657.6	89	48.1	778.0	A	15.0	2.00	F
2	A380 (WLG) 562t	562	58.5	2,912	546.3	694.1	654	71.2	778.0	A	15.0	2.00	F
4	B777-300 Baseline	300	52.6	2,912	516.6	589.7	437	90.4	778.0	A	15.0	2.00	F
1	C-17A	265	42.8	2,912	464.8	524.8	464	92.6	778.0	A	15.0	2.00	F
5	B787-8	228	60.0	2,912	552.6	552.6	369	116.8	778.0	A	15.0	2.00	F

GARW



GARW



Technical Evaluation

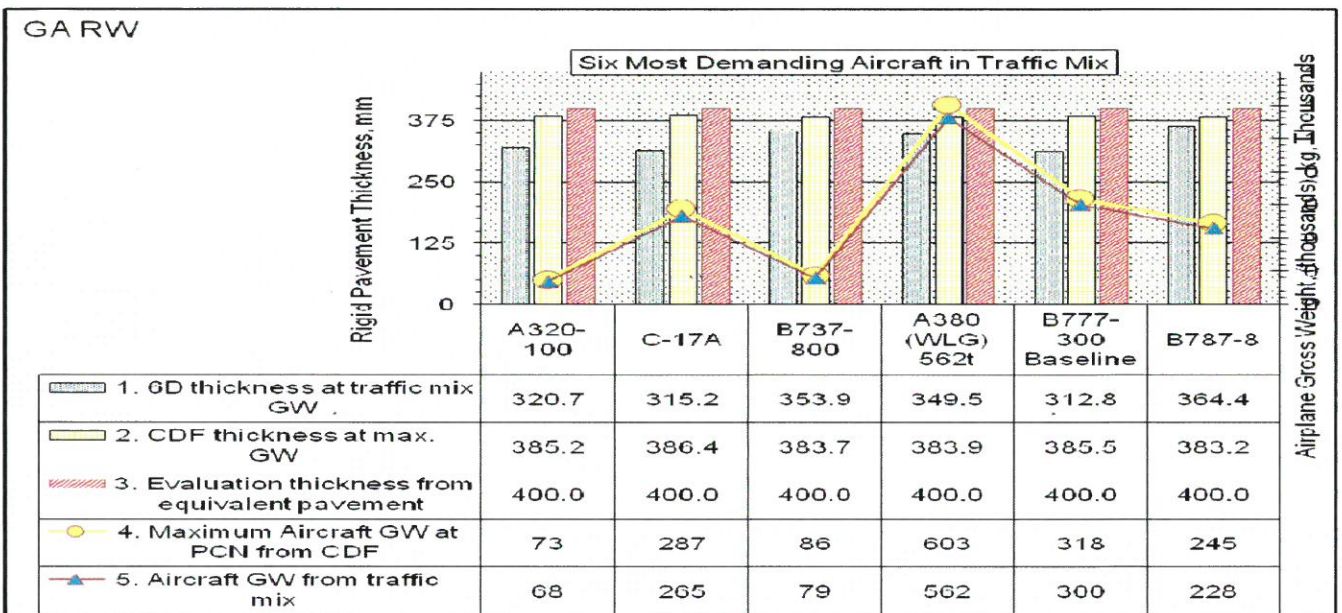
FAA AC 150/5335-5B (COMFAA v.3)

Rigid Pavements

GA RW

Num	Plane	GWin	ACNin	ADout	6Dt	CDFt	GWcdf	PCNcdf	EVALt	SUBcode	KorCBR	PtoTC	FlexOrRig
3	A320-100	68	42.1	2,912	320.7	385.2	73	45.8	400.0	B	83.0	2.00	R
1	C-17A	265	48.0	2,912	315.2	386.4	287	52.9	400.0	B	83.0	2.00	R
6	B737-800	79	51.7	2,912	353.9	383.7	86	57.0	400.0	B	83.0	2.00	R
2	A380 (WLG) 562t	562	66.0	2,912	349.5	383.9	603	72.8	400.0	B	83.0	2.00	R
4	B777-300 Baseline	300	68.9	2,912	312.8	385.5	318	75.6	400.0	B	83.0	2.00	R
5	B787-8	228	71.6	2,912	364.4	383.2	245	78.9	400.0	B	83.0	2.00	R

GA RW



GA RW

