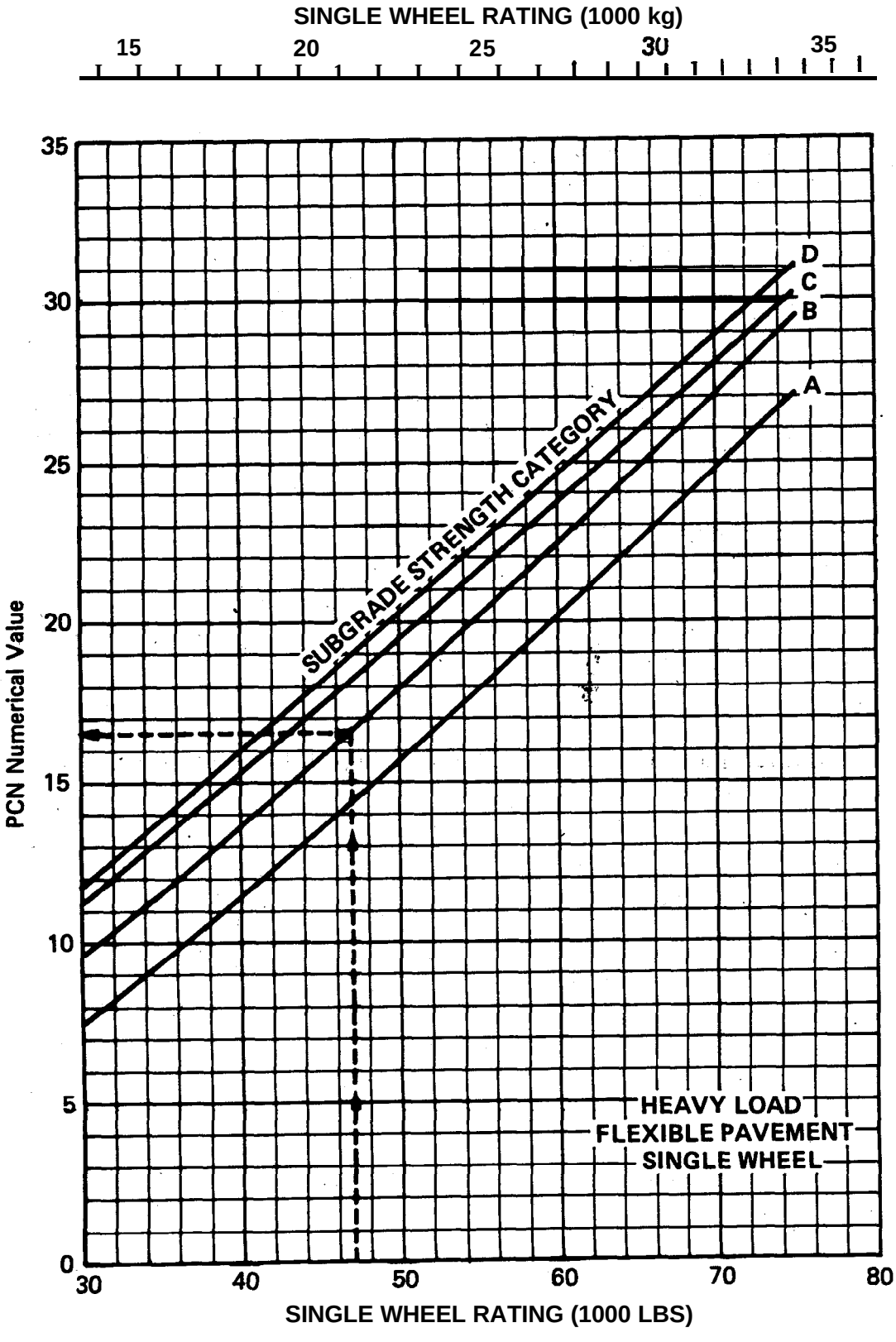

Figure 2-l. PCN Numerical Values for Single-Wheel Load Rating--Heavy Load Flexible Pavement

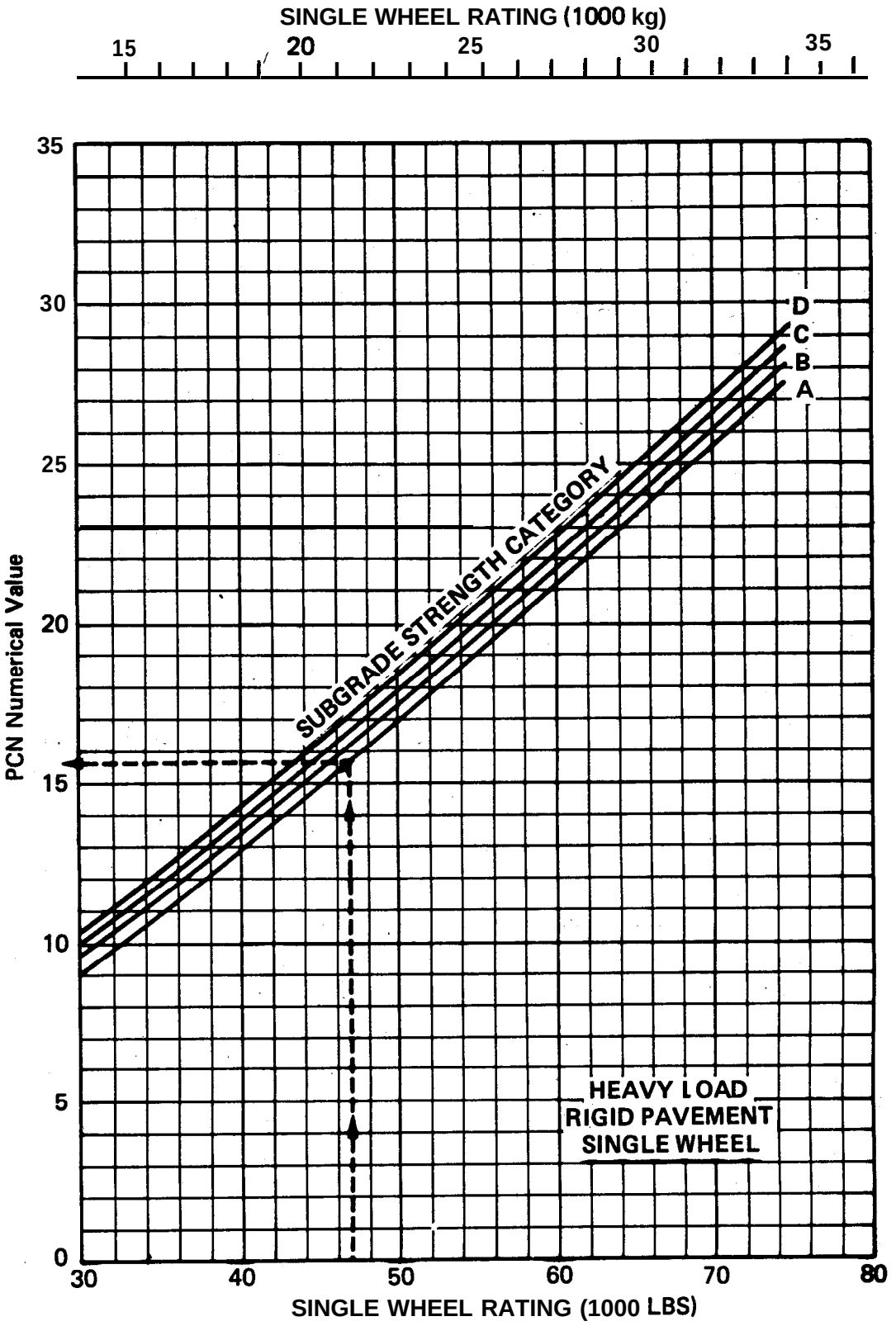

Figure 2-2. PCN Numerical Values for Single-Wheel Load Rating--Heavy Load Rigid Pavement

(2) Dual Wheel. Charts that convert aircraft gross weight to PCN numerical values for aircraft with dual-wheel landing gear were developed using the following characteristics.

TABLE 2-5. DUAL WHEEL ASSEMBLY

Gross Weight		Tire Pressure		Dual Spacing	
lbs.	kg	psi	MPa	in	cm
50,000	22 700	80	0.55	20	51
75,000	34 000	110	0.76	21	53
100,000	45 400	140	0.97	23	58
150,000	68 000	160	1.10		76
200,000	90 700	200	1.38	34	86

The charts that convert dual-wheel allowable gross weight to PCN values, for both flexible and rigid pavements, are shown in figures 2-3 and 2-4.

(3) Dual Tandem. Conversion charts to determine PCN numerical values from allowable dual-tandem loadings were developed assuming the following characteristics.

TABLE 2-6. DUAL TANDEM ASSEMBLY

Gross Weight		Tire Pressure		Dual Spacing		Tandem Spacing	
lbs	kg	psi	MPa	in	cm	in.	cm
100,000	45 400	120	0.83	20	51	45	114
150,000	68 000	140	0.97	20	53	45	114
200,000	90 700	160	1.10	21	66	46	117
300,000	136 100	180	1.25	26		51	130
400,000	181 400	200	1.38	30	76	55	140

Charts that convert dual-tandem loadings to PCN numerical values, for both flexible and rigid pavements, are shown in figures 2-5 and 2-6.

(4) Specific Aircraft. Allowable loadings are sometimes established for specific aircraft, such as the double-dual-tandem Boeing 747. Due to the large number of different aircraft and variations of models, it was considered impractical to develop and keep current a great number of conversion charts. To compute PCN numerical values for pavements evaluated for specific aircraft, it is necessary to use ACN values for the aircraft adjusted for the proper allowable load. Table 1 of appendix 2 lists ACN values for several selected aircraft.

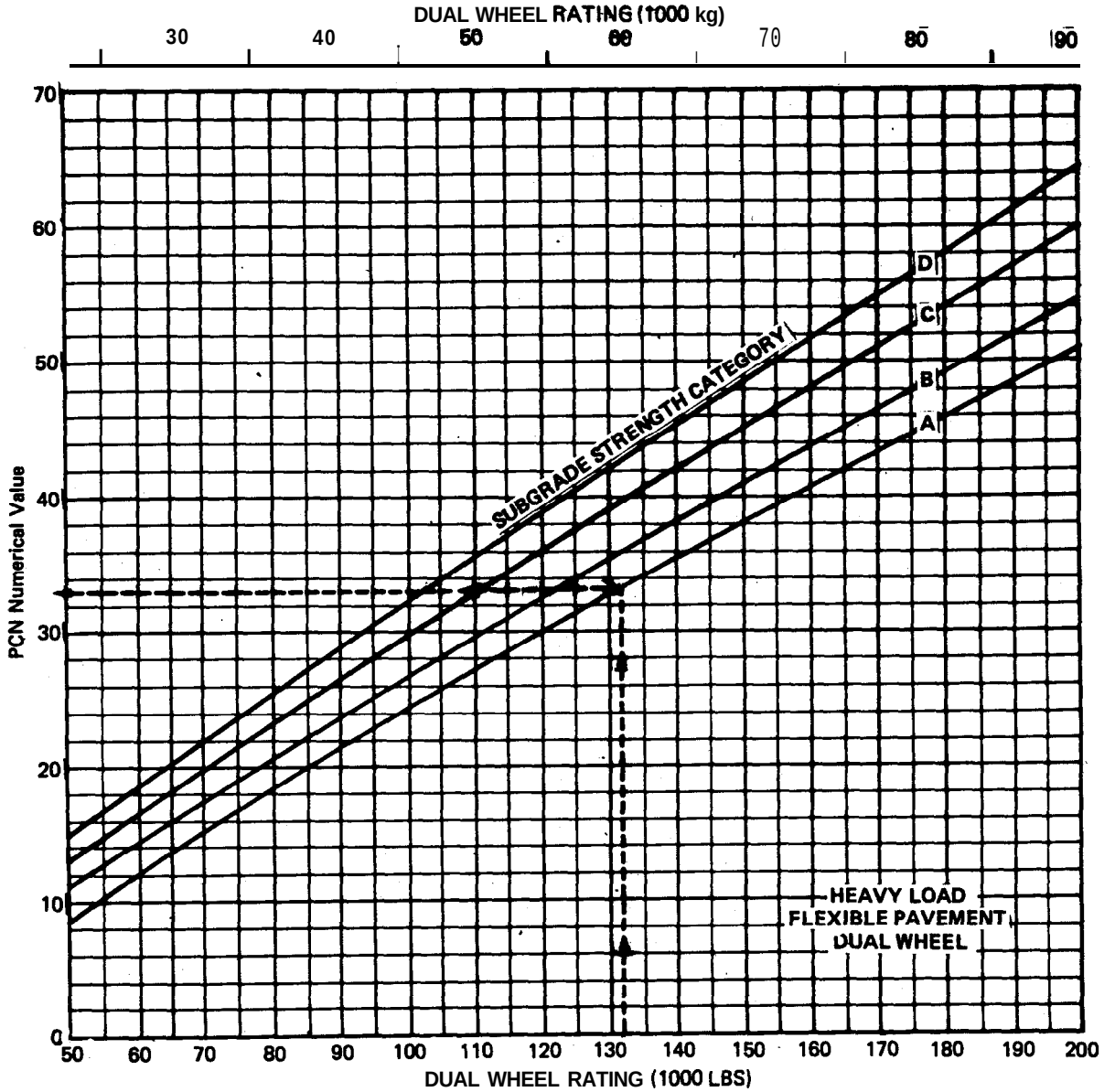

Figure g-3. PCN Numerical Values for Dual-Wheel Load Rating--Heavy Load Flexible Pavement

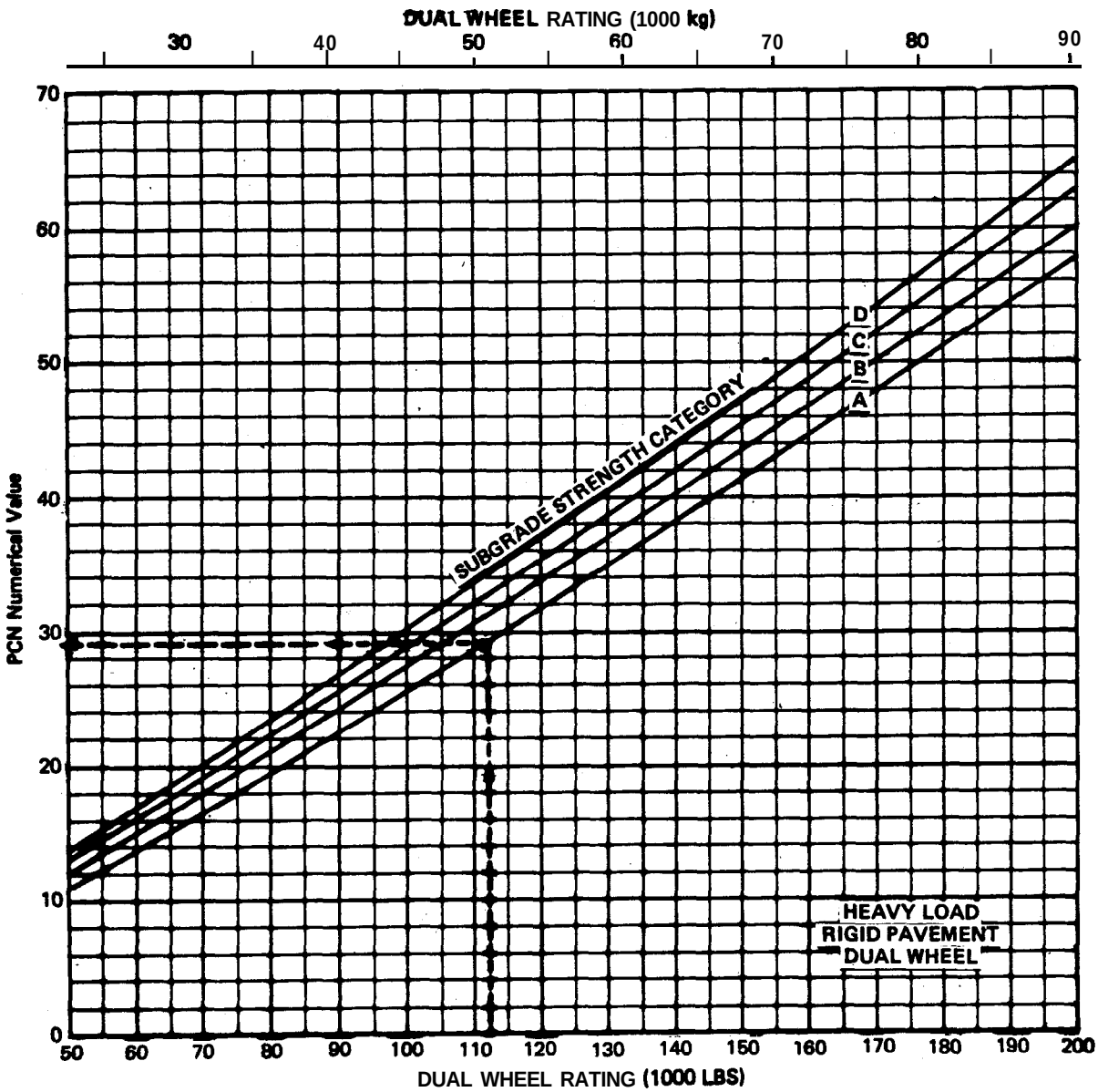

Figure 2-4. PCN Numerical Values for Dual-Wheel Load Rating--Heavy Load Rigid Pavement

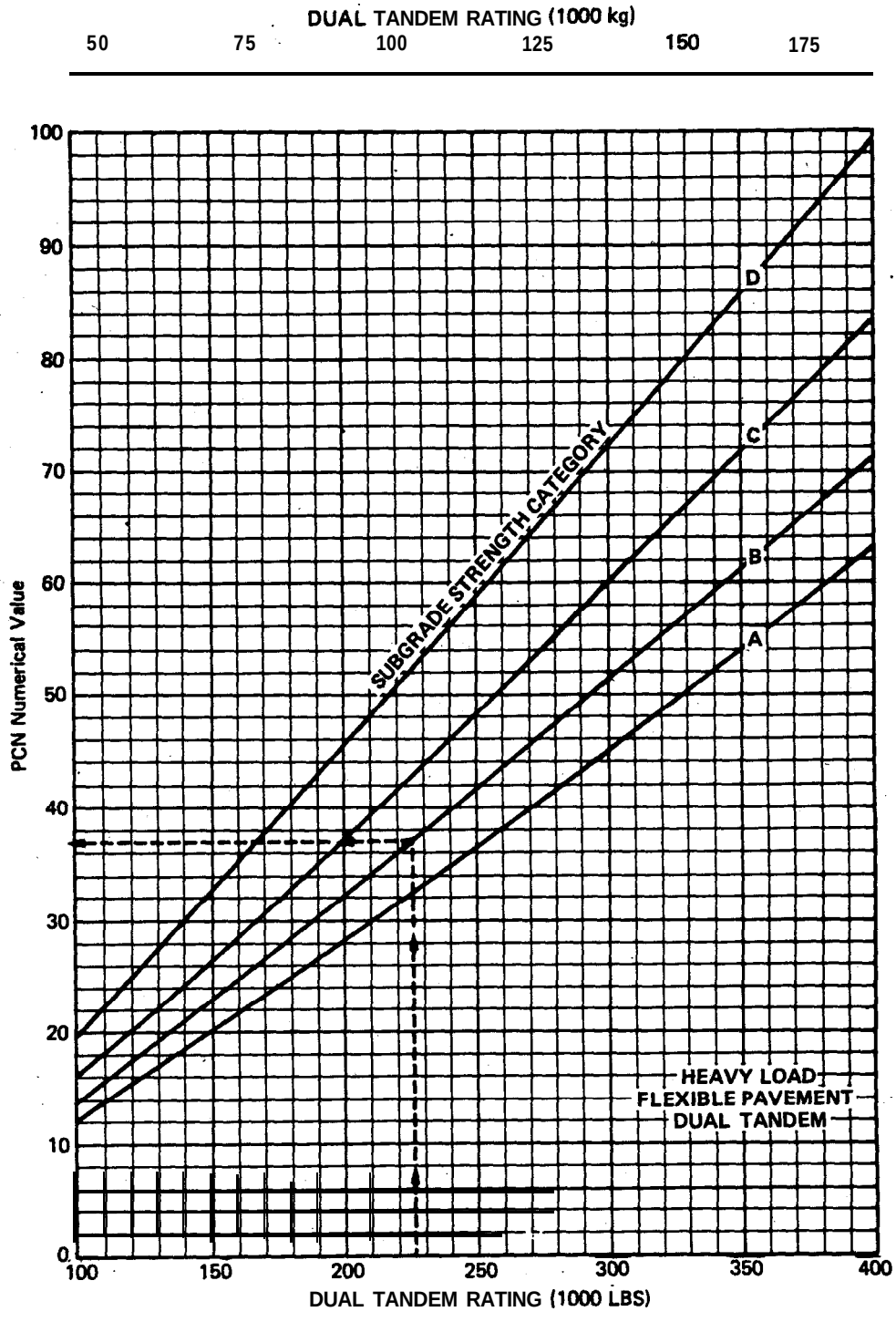

Figure 2-5. PCN Numerical Values for Dual-Tandem Load Rating--Heavy Load Flexible Pavement

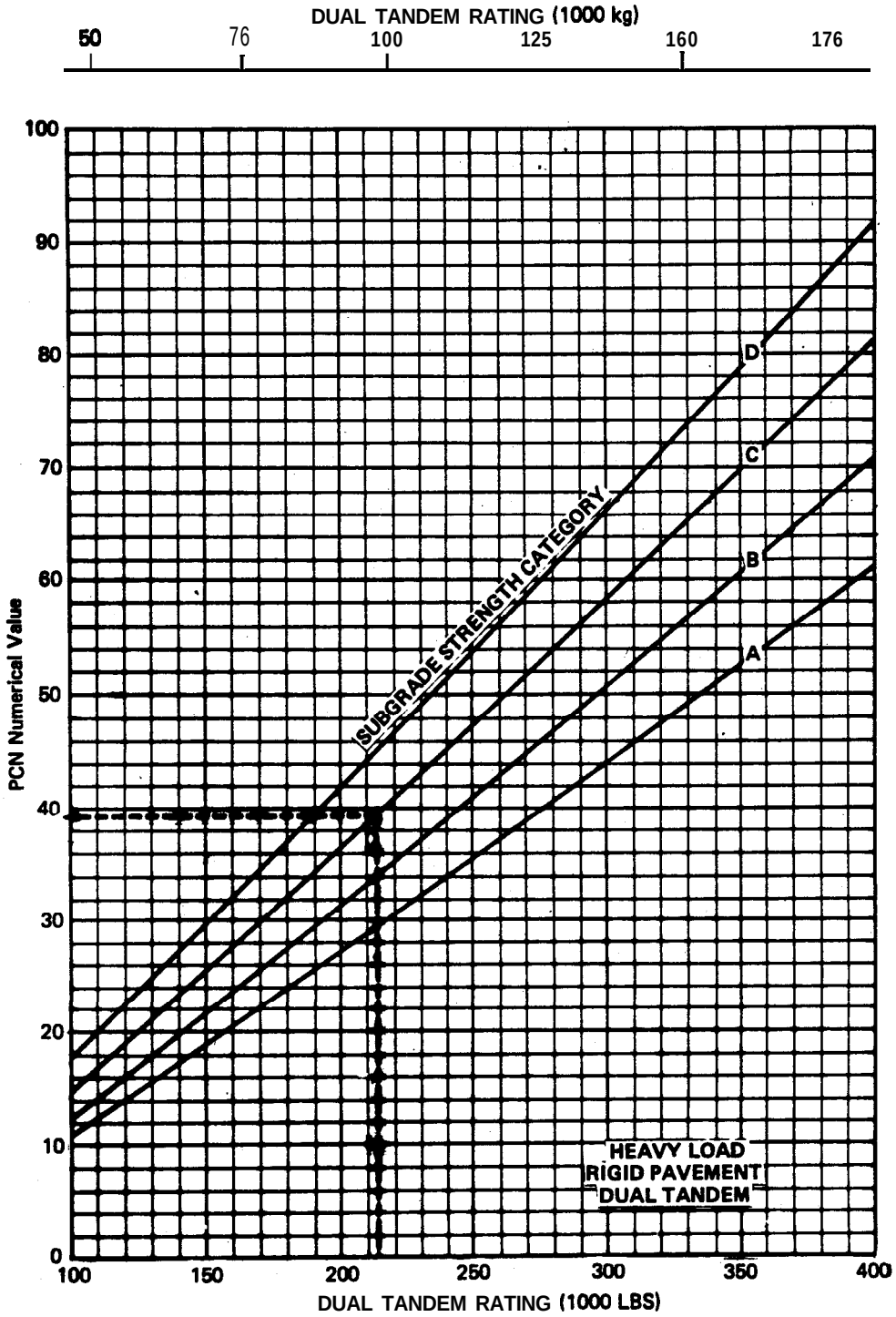

Figure 2-6. PCN Numerical Values for Dual-Tandem Load Rat&g--Heavy Load Rigid Pavement

The computation of the PCN numerical value from the ACN is appropriate since the ACN and PCN are computed using the same technical basis. The use of linear interpolation for loadings other than those listed in table 1 is sufficiently accurate for this determination. For example, assume a rigid pavement supported on a medium strength subgrade, code B, is capable of supporting operations of DC-10-10 aircraft weighing 390,000 pounds (177 270 kg). Referring to table 1 of appendix 2 for DC-10-10, rigid pavement, code B, yields ACN values ofr

@ 433,000 lbs (196 406 kg) ACN = 52

@ 240,171 lbs (108 940 kg) ACN = 25

$$\text{PCN for 390,000 lbs. (177 270 kg)} = 52 - \frac{433{,}000 - 390{,}000}{433{,}000 - 240{,}171} \times (52-25) = 52-6=46$$

Therefore, the PCN numerical value of a rigid pavement on a code B subgrade, evaluated for a DC 10-10 weighing 390,000 lbs. (177 270 kg) is 46.

15. EXAMPLES. Examples of PCN computations are given below to illustrate the procedures.

a. Dual Tandem. Assume a flexible pavement has been evaluated for 250,000 pounds (113 640 kg) gross weight on a dual-tandem gear. Past records show the subgrade to be F6. Tire pressures of 200 psi (1.38 MPa) are considered the maximum the flexible pavement surface can tolerate.

(1) Refer to table 2-2 and determine the subgrade category --it is low, code C.

(2) Enter figure 2-5 with the dual-tandem rating of 250,000 pounds (113 640 kg) and make a vertical projection to the code C subgrade strength line. From this intersection point make a horizontal projection to the left ordinate--the PCN numerical value of 48.

(3) In table 2-3 tire pressure limitation of 200 psi (1.38 MPa) corresponds to the medium category, code X.

(4) Therefore, the complete PCN for this example is:

48/F/C/X/T

b. Mixed Aircraft. Often pavements are rated for several different aircraft, but the PCN method system requires that pavement strength be reported in a single 5 character code. In the case where several strength ratings are given, the problem becomes one of selecting the proper PCN to report. Assume a rigid pavement has been evaluated as follows:

Single Wheel	- 75,000 lbs	+ (34 090 kg+)
Dual Wheel	- 180,000 lbs	(81 820 kg)
Dual Tandem	- 340,000 lbs	(154 550 kg)
L 1011-1	- 400,000 lbs	(181 820 kg)

The subgrade modulus, k value, is 350 pci (91 MN/m^3).

(1) The subgrade modulus is medium strength, code B, from Table 2-1.

(2) The PCN numerical values for the various evaluations are found as follows:

Single Wheel	- 28 +	(Figure 2-2)
Dual Wheel	- 53	(Figure 2-4)
Dual Tandem	- 59	(Figure 2-6)
L 1011-1	- 48	(Interpolate from table 1, appendix 2)

(3) The problem is illustrated graphically in figure 2-7. If the pavement has been performing satisfactorily under dual-tandem loads of 340,000 lbs (154 550 kg), the PCN numerical value is 59. Since the pavement is rigid, tire pressure would not normally be restricted and code W would apply. Therefore, PCN code for this example is:

59/R/B/W/T

(4) In this example, the variation in allowable loadings was purposely exaggerated to illustrate the procedure. In normal use, such large disparities in PCM numerical values would not be expected. The example also demonstrates the differences in load carrying capacity of various landing gear configurations.

16. LIGHT LOAD PAVEMENTS. The method of determining PCN values for light load pavements, designed to serve aircraft weighing between 29,999 pounds (13 000 kg) and 12,500 pounds (5 700 kg), is similar to the one used for heavy load pavements. The same five character code described in the previous paragraphs applies.

a. Flexible Pavments. A curve relating gross weight-bearing strength for flexible pavement to PCN numerical values is shown in figure 2-8. For light load pavements, a single curve is used because the light load pavement evaluation criteria do not discriminate among different landing gear configurations. A new curve is required because the materials in light load pavements are of lower quality than those in heavy load pavements. Use of this curve requires an input for gross weight-bearing strength and a subgrade strength category. The chart is entered with the gross weight-bearing strength. A vertical projection is made to the appropriate subgrade strength category line. At the point of intersection, a horizontal projection is made to the left ordinate for the PCN numerical value. Note that the PCN numerical value is reported to the nearest whole number.

b. Rigid Pavements. A curve relating gross weight-bearing strength for rigid pavements to PCN numerical values is sho in figure 2-9. For light load rigid pavements, a single line is used because landing gear configuration and subgrade strength are not variables in the evaluation process. Even though the subgrade strength category is not shown in figure 2-9, however, an input is required for this category in the five character PCN code. Use of figure 2-9 requires an input for gross weight-bearing strength. A vertical projection is made to the sloping pivot line. At the point of intersection, a horizontal projection is made to the left ordinate for the PCN numerical value. Note that the PCN numerical value is reported to the nearest whole number.

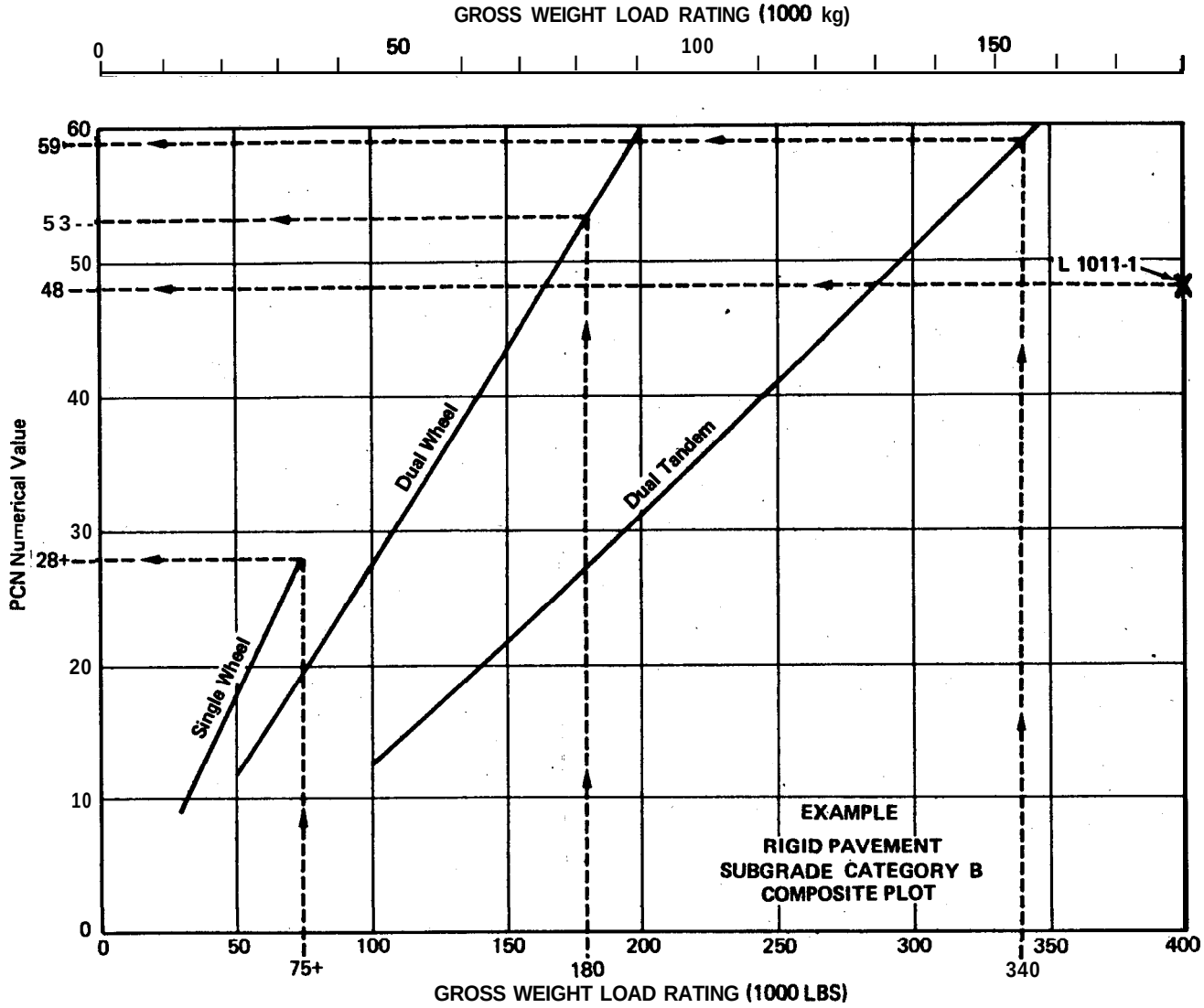

Figure 2-7. PCN Numerical Value for Various Load Ratings--Example Plot

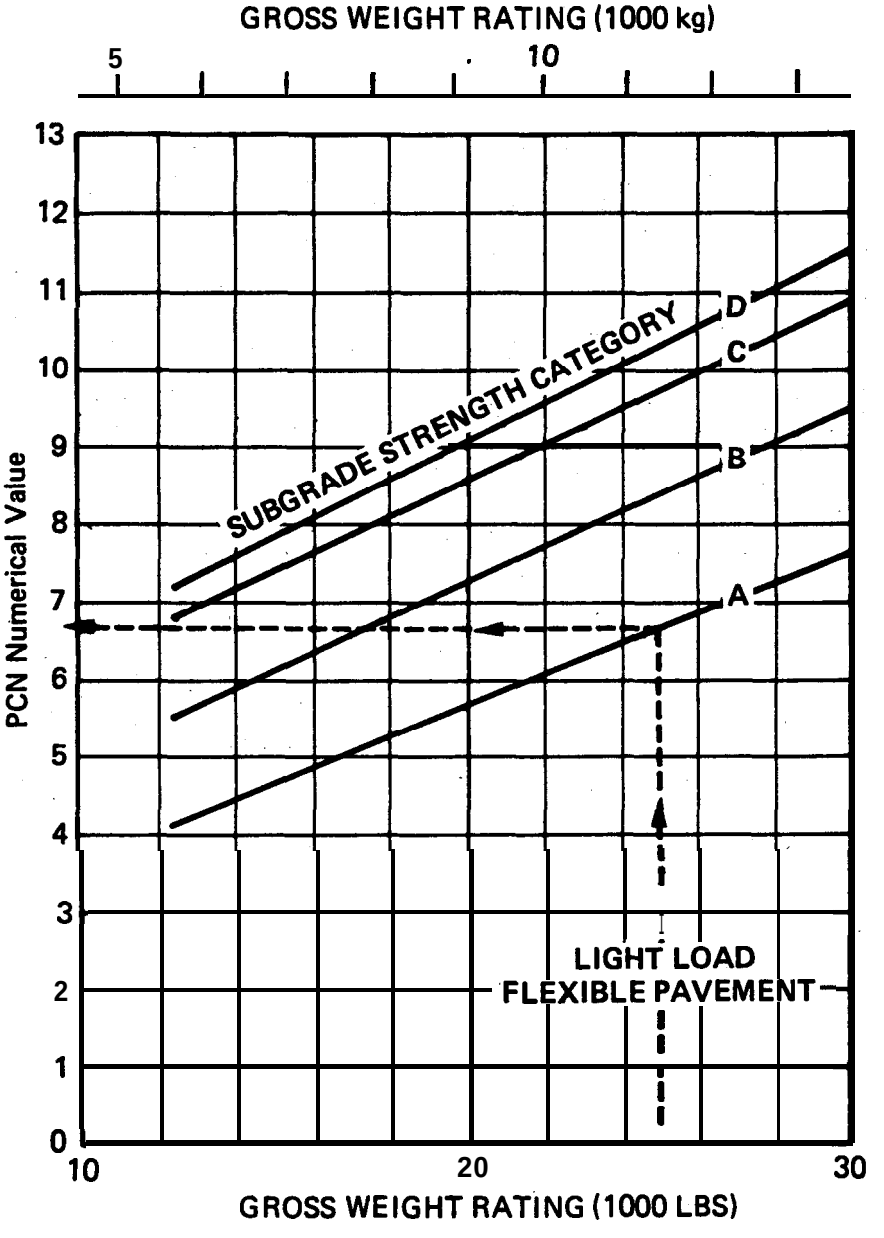

Figure 2-8. PCN Numerical **Values** For Gross Weight Rating--Light Load Flexible Pavement

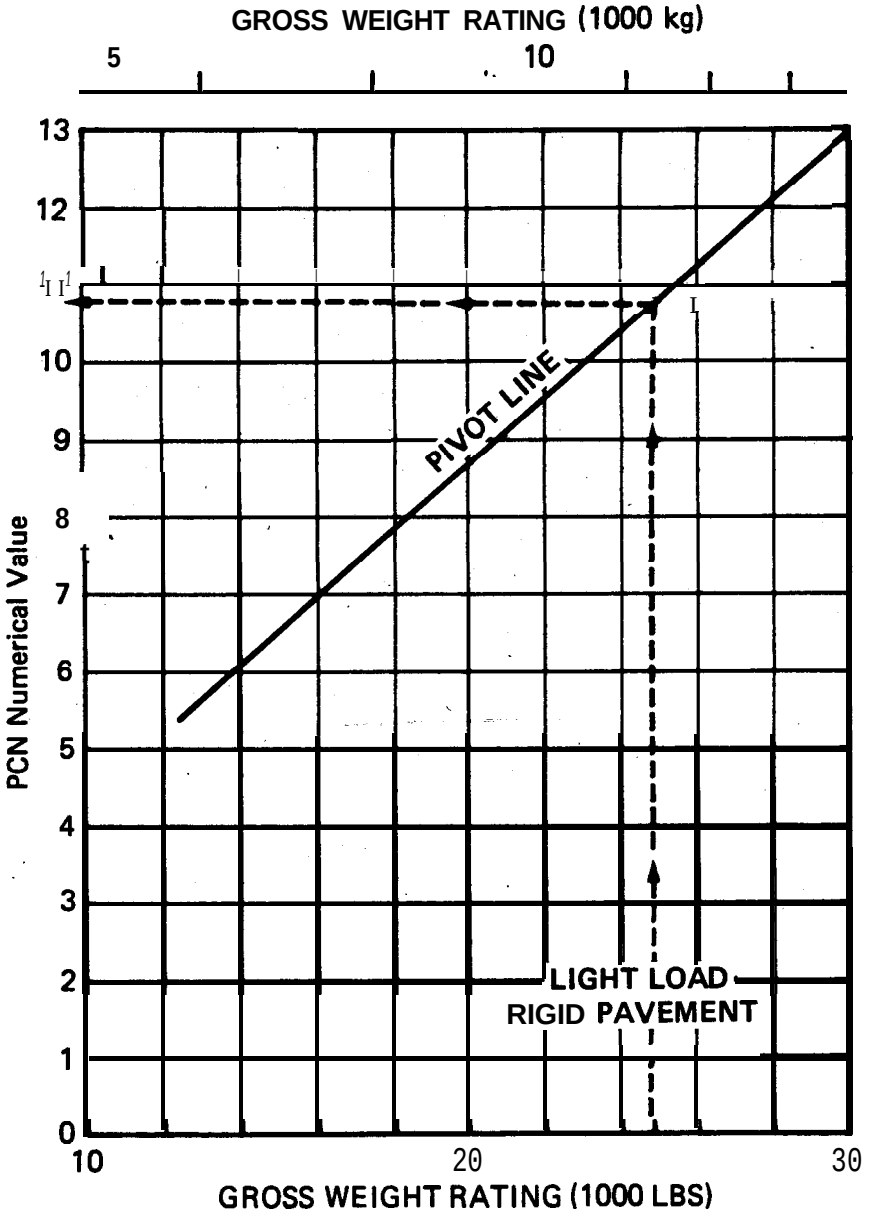

Figure 2-9. PCN Numerical Value for Gross Weight Rating--Light Load Rigid Pavement

17. PAVEMENTS OF LESS THAN 12,500 POUNDS (5 700 kg) BEARING STRENGTH. The PCN method of reporting pavement bearing strength will not be used for pavements with bearing strengths of less than 12,500 (5 700 kg). The bearing strengths of these pavements will continue to be reported as allowable weight in pounds.

18. SUMMARY. A summary consolidating all the information described in the preceding paragraphs is presented in table 2-7.

TABLE 2-7. PCN -- FIVE PART CODE

PCN	Pavement Type	Subgrade Strength[1]	Tire Pressure[2]	Method
Numerica	R - rigid	A	W	T - Technical
Value	F - flexible	B	X	U - Using Aircraft
		C	Y	
		D		

Note 1:
SUBGRADE STRENGTH:

		Flexible Pavement	Rigid Pavement	Soils Classification	
Code	Category	CBR	lbs/cu.in.	Unified	FAA
A	High	over 13	over 400	GW,GP,GM	Fa,F1,F2
B	Medium	8 - 13	201-400	GC,SW,SM,SP	F3,F4,F5
C	Low	4 - 8	100-200	SC,ML,CL,OL	F6,F7,F8,F9
D	Ultra-low	less than 4	less than 100	OM,CH,MH	F10

Note 2:
TIRE PRESSURE:

Code	Category	psi	MPa
W	High	no limit	no limit
X	Medium	146 - 217	1.01 - 1.50
Y	Low	74 - 145	0.51 - 1.00
Z	Ultra-low	0 - 73	0 - 0.50

APPENDIX 1. RELATED READING MATERIAL

The following publications were used in the development of this AC.

a. FAA Order 2100.13, FAA Rulemaking Policies, Department of Transportation, Federal Aviation Administration, Washington, D.C. 20591.

b. AC 150/5320-6, Airport Pavement Design and Evaluation. This publication is available free of charge from the Department of Transportation, Publications Section, M-442.32, Washington, D.C., 20590.

c. ICAO Bulletin, Official Magazine of International Civil Aviation, Airport Technology, Volume 35, No. 1, Montreal, Quebec, Canada H3A 2R2, January 1980.

APPENDIX 2. SELECTED ACN VALUES

1. This appendix lists ACNs for selected aircraft. These date were extracted from several sources including: Airplane Characteristics - Airport Planning (NAS 3601) by various airplane manufacturers; Aircraft Loading on Airport Pavements, ACN - PCN, Aircraft Classification Numbers for Ccnmercial Turbojet Aircraft, prepared by the U.S. Aviation and Industry Working Group, March 1983; and International Standards and Recommended Practices, Aerodromes, Annex 14 to the Convention on International Civil-Aviation, Guidance Material Related to the ACN - PCN Method of Reporting Pavement Strength, November 1983.

2. The ACN values shown in table 1 were computed in accordance with the procedure described in paragraph 4 of the main body of this AC.

3. Magnetic tapes of two computer programs for the computation of aircraft ACN values can be purchased from the ICAO for $200. Requests should be sent to the address below:

International Civil Aviation Organization
P.O. Box 400
Place de l'Aviation Internationale
Montreal, Quebec, Canada H3A2R2

The price includes systems maintenance, i.e., receipt of software change throughout the lifetime of the system.

In addition, ICAO (AGA Section) will provide printouts as follows:

a. For evaluation of aircraft on rigid pavements--$100 for computation of one ACN, plus $40 for each additional ACN determination included in the same request.

b. For evaluation of aircraft on flexible pavements--a minimum charge of $100 per request which may include up to four ACN computations, plus $10 for each additional ACN computation (beyond the initial four) included in the same request.

Table 1. ACNs For Several Aircraft Types on Rigid and Flexible Pavements

Aircraft Type	Weight lb.	Weight (kg)	Tire Pressure psi	Tire Pressure (MPa)	RIGID PAVEMENT SUBGRADE High A	Medium B	Low C	Ultra Low D	FLEXIBLE PAVEMENT SUBGRADES High A	Medium B	Low C	Very Low D
A-300	304,000	137 900	179	1.23	36	43	51	58	39	43	53	67
Model B2	188,914	85 690			19	22	26	30	21	23	26	35
A-300	332,700	150 900	205	1.41	42	50	58	66	44	49	59	75
Model B4	193,623	87 826			20	23	27	33	23	24	28	36
A-310	332,680	150 900	143	0.99	35	44	53	62	43	47	59	77
	169,200	76 750			15	17	21	24	17	18	21	29
A-320	146,385	66 400	173	1.19	38	40	42	44	33	34	38	44
Model 100	95,460	43 253			23	24	26	27	21	21	23	27
BAC 111	87,500	39 690	135	0.93	25	26	28	30	22	24	27	30
Series 400	49,600	22 498			14	14	15	16	11	13	14	16
BAC 111	98,500	44 679	82	0.57	22	25	27	28	20	24	29	32
Series 475	51,700	23 451			10	11	12	13	9	11	13	15
BAC 111	104,500	47 400	156	1.08	33	35	36	38	29	30	33	35
Series 500.	54,580	24 757			16	17	18	19	13	14	16	18
BAe 146	82,227	37 308	116	0.80	18	20	22	23	17	18	20	24
Series 100	50,692	23 000			10	11	12	13	10	10	11	13
BAe 146	82,227	37 308	75	0.52	16	18	19	21	13	16	19	23
Series 100	50,692	23 000			9	10	11	12	8	9	11	13
BAe 146	89,482	40 600	128	0.88	22	23	25	26	19	21	23	27
Series 200	50,692	23 000			11	12	13	14	10	10	11	13
BAe 146	89,482	40 600	88	0.61	19	21	23	24	16	20	22	27
Series 200	50,692	23 000			10	11	12	12	8	10	11	13

Table 1. ACNs For Several Aircraft Types on Rigid snd Flexible Pavements

Aircraft Type	Weight lb.	Weight (kg)	Tire Pressure psi	Tire Pressure (MPa)	RIGID PAVEMENT SUBGRADE High A	RIGID PAVEMENT SUBGRADE Medium B	RIGID PAVEMENT SUBGRADE Low C	RIGID PAVEMENT SUBGRADE Ultra Low D	FLEXIBLE PAVEMENT SUBGRADES High A	FLEXIBLE PAVEMENT SUBGRADES Medium B	FLEXIBLE PAVEMENT SUBGRADES Low C	FLEXIBLE PAVEMENT SUBGRADES Very Low D
B707-120	258,000	117 100	170	1.17	28	33	40	46	31	34	41	54
	127,500	57 600			13	13	16	18	13	14	16'	20
B 707-300/40	336,000	152 410	180	1.24	41	49	58	66	44	49	60	77
	135,500	61 460			13	14	17	19	14	15	17	21
B 720/720B	235,000	106 590	145	1.00	25	30	37	43	29	31	39	51
	115,000	52 160			10	11	14	16	11	12	14	18
B 727-100	170,000	77 110	165	1.14	46	48	51	53	41	4 3	49	54
	87,600	39 730			21	22	23	25	19	20	21	25
B 727-200	173,000	78 470	167	1.15	48	50	53	56	43	45	51	56
STANDARD	97,650	44 290			24	26	27	29	22	23	25	29
B 727-200	210,000	95 250	173	1.19	58	61	64	67	52	55	62	66
ADVANCED	97,600	44 270			22	24	26	27	20	21	24	28
B 737-100	111,000	50 350	157	1.08	27	29	31	32	25	25	29	33
	58,600	26 580			12	13	14	15	12	12	13	15
B 737-200	117,500	53 300	168	1.16	30	31	33	35	27	28	31	35
ADVANCED	59,900	27 170			13	14	15	16	12	12	lb	16
B 737-200	117,500	53 300	96	0.66	25	27	29	31	22	26	30	35
LOW PRESS	64,500	29 260			12	13	15	16	11	13	14	17
B 737-200	128,600	58 330	182	1.25	34	36	38	39	29	31	34	39
ADVANCED	63,100	28 620			14	15	16	17	13	13	15	17

Table 1. ACNs For Several Aircraft Types on Rigid and Flexible Pavements

Aircraft Type	Weight		Tire Pressure		RIGID PAVEMENT SUBGRADE				FLEXIBLE PAVEMENT SUBGRADES			
					High	Medium	Low	Ultra Low	High	Medium	Low	Very Low
	lb.	(kg)	psi	(MPa)	A	B	C	D	A	B	C	D
B 737-300	135,500 69,400	61 460 31 480	195	1.34	37 17	39 17	41 19	42 20	32 15	33 15	37 16	41 19
B 747-100	753,000 358,000	341 560 162 390	191	1.32	42 17	49 19	59 22	68 25	46 19	51 20	62 22	82 28
B 747-200 B, C, F	836,000 342,200	379 200 155 220	189	1.30	46 16	55 17	66 20	76 24	52 18	58 19	71 21	92 27
B 747-300	836,000 363,000	379 200 164 650	189	1.30	46 16	55 18	66 21	76 25	52 20	58 20	71 23	92 30
B 747SP	703,000 325,660	318 880 147 720	203	1.40	38 lb	44 16	53 19	60 22	41 17	45 18	54 20	72 25
B 757-200	291,000 130,900	109 320 59 380	170	1.17	27 12	32 13	38 16	44 19	29 13	32 14	39 16	52. 21
B 767-200	317,000 174,000	lb3 790 78 930	190	1.31	33 14	38 16	46 19	54 23	37 18	40 18	47 21	65 26
B 767-200ER AND-300	352,200 178,400	159 760 80 920	190	1.31	39 16	46 17	56 20	64 24	44 18	48 19	58 22	78 28
Canadair CL 44	211,000 89,000	95 708 40 370	162	1.12	25 9	30 10	35 11	40 13	27 9	30 10	36 11	47 14
Caravelle 12	123,370 70,105	55 960 31 800	128	0.88	16 8	19 9	22 10	25 12	17 9	19 9	21 10	26 12
Concorde	412,000 173,500	186 880 78 700	183	1.26	62 21	72 22	83 25	92 29	66 21	73 22	82 26	99 32

Table 1. ACNs For Several Aircraft Types on Rigid and Flexible Pavements

Aircraft Type	Weight		Tire Pressure		RIGID PAVEMENT SUBGRADE				FLEXIBLE PAVEMENT SUBGRADES			
					High	Medium	Low	Ultra Low	High	Medium	Low	Very Low
	lb.	(kg)	psi	(MPa)	A	B	C	D	A	B	C	D
Convair 990	255,000	115 666	185	1.28	41	48	54	60	40	45	53	64
	120,560	54 685			15	17	19	22	15	16	19	24
C-130 B Military	135,000	61 235	79	0.54	19	21	24	27	19	23	27	31
	69,300	31 435			9	10	11	13	8	9	10	11
C-130 H Military	155,000	70 305	96	0.66	29	31	34	37	25	29	30	38
	75,331	34 170			13	14	15	16	12	13	14	16
DC-3	25,200	11 430	45	0.31	6	7	7	7	4	6	8	9
	17,123	7 765			4	5	5	5	3	4	5	6
DC-8-55	328,000	148 781	188	1.30	46	54	63	69	45	51	61	75
	131,230	59 526			14	15	18	21	14	15	16	22
DC-8-62/72	353,000	160 121	187	1.29	47	56	65	73	49	56	67	83
	138,560	62 851			14	15	18	21	15	16	17	23
DC-8-63/73	358,000	162 389	195	1.34	50	60	69	78	52	59	71	87
	141,330	64 107			14	15	19	21	15	16	18	24
DC-9-32	109,000	49 442	152	1.05	28	31	33	34	26	28	31	34
	56,855	25 789			14	15	16	17	12	13	14	16
DC-9-51	122,000	55 388	170	1.17	35	37	39	40	30	32	36	39
	64,675	29 337			16	17	18	19	15	16	16	19
MD-81/87	141,000	63 957	170	1.17	41	43	45	46	36	38	43	46
	78,420	35 571			20	21	23	24	18	19	21	24
MD-82/88	150,500	68 266	184	1.27	45	47	49	50	39	42	46	50
	78,548	35 629			21	22	24	25	18	19	20	24

Table 1. ACNs For Several Aircraft Types on Rigid and Flexible Pavements

Aircraft Type	Weight lb.	Weight (kg)	Tire Pressure psi	Tire Pressure (MPa)	RIGID PAVEMENT SUBGRADE High A	Medium B	Low C	Ultra Low D	FLEXIBLE PAVEMENT SUBGRADES High A	Medium B	Low C	Very Low D
MD-83	161,000	68 266	195	1.34	49	51	53	55	42	46	50	54
	79,873	36 230			21	22	24	25	18	19	21	24
DC-IO-10	443,000	200 942	190	1.31	46	54	64	75	54	58	69	96
	232,100	105 279			22	24	27	31	24	25	28	36
DC-10-10	458,000	207 746	195	1.34	48	56	67	79	55	61		100
	232,100	105 279			22	24	'27	31	24	25	I f	36
DC-lo-30	558,000	253 105	170	1.17	44	53	64	75	53	59	70	97
-40	266,190	120 742			20	21	24	28	22	23	25	32
DC-lo-30	575,000	260 816	175	1.21	46	55	67	78	56	61	74	101
-40	273,500	124 058			20	21	25	29	23	23'	26	33
DC-lo-30	593,000	268 981	1 8 0	1.24	49	59	71	83	59	64 .	78	106
-40	273,500	124 058			20	21	25	29	23	2 3	26	33
DCH 7	43,000	19 505	107	0.74	11	12	13	1 3	10	11	12	14
(Dash 7)	26,450	11 998			6	6	7	7 '	5	6	6	8
Fokker 27	43,589	19 777	78	0.54	10	11	12	12	8	10	12	13
MK 500	26,181	11 879			5	6	6	7	4	5	6 .	7
Fokker 28	65,000	29 484	8 4	0.58	lb	15	17	18	11	14	16	19
MK 1000 LTP	34,500	15 650			6	7	8	9	5	6	7	9
Fokker 28	65,000	29 484	100	0.69	15	16	18	18	13	15	17	20
MK 1000 HTP	36,485	16 550			8	8	9	10	6	7	8	10
HS 125-400	23,370	10 600	112	0.77	6	6 ·	7	7	5	5	6	7
	12,530	S 683			3	3	3	3	2	3	3	3

Table 1. ACNs For Several Aircraft Types on Rigid and Flexlblc Pavements

Aircraft Type	Weight lb.	Weight (kg)	Tire Pressure psi	Tire Pressure (MPa)	RIGID PAVEMENT SUBGRADE High A	RIGID PAVEMENT SUBGRADE Medium B	RIGID PAVEMENT SUBGRADE Low C	RIGID PAVEMENT SUBGRADE Ultra Lou D	FLEXIBLE PAVEMENT SUBGRADES High A	FLEXIBLE PAVEMENT SUBGRADES Medium B	FLEXIBLE PAVEMENT SUBGRADES Low C	FLEXIBLE PAVEMENT SUBGRADES Very Low D
HS 125-600	25,000	11 340	120	0.83	7	7	7	8	5	6	7	8
	12,530	5 683			3	3	3	3	2	3	3	3
HS 748	46,500	21 092	86	0.59	10	11	11	12	8	9	11	13
	26,860	12 183			5	5	6	6	4	5	6	7
ILYUSHIN IL-62	356,200	161 570	239	1.65	47	54	62	70	48	52	61	76
	146,385	66 400			17	18	19	21	16	17	18	23
L1011-1	432,000	195 955	180	1.24	43	49	61	71	48	53	64	88
	240,000	108 864			21	2 4	29	35	24	26	29	35
L1011-100 and 200	468,000	212 285	175	1.21	45	5 4	66	78	53	60	72	97
	243,133	110 264			23	2s	30	37	24	26	28	36
L1011-500	4 9 8 , 0 0 0	225 889	184	1.27	51	57	70	82	5 6	63	77	104
	240,139	108 925			23	25	30	37	24	26	28	36
Trident 1E	134,835	61 160	149	1.03	32	34	37	39	23	28	27	32
	73,200	33 203			15	16	17	18	10	11	12	15
Trident 2E	145,500	65 998	155	1.07	37	39	42	44	26	28	31	36
	74,915	33 980			16	17	18	19	11	12	13	16
Trident 3	150,500	68 266	165	1.14	37	40	42	44	26	2 8	31	36
	86,110	39 060			18	20	21	23	11	12	lb	16
Vickers VC10-1150	335,000	151 953	147	1.01	38	46	56	65	44	50	61	tt
	158,600	71 940			16	17	20	23	17	18	21	27