

# Catalogs of Pavement Designs



# Standard Pavement Designs and Mix Types Catalogs of Designs

Generic guidance on thickness, mix types and layers:

- Asphalt Institute, IS-139, etc.
- National Asphalt Pavement Association, IS-109

FPO, ODOT specific mix types and Layers

Review handout - Municipal Standard Pavement  
Designs

# Municipal Standard Pavement Designs

Average Daily Traffic	# heavy trucks/day	ESALs (20-year design)	Typical Application	Typical Pavement Build-up, Poor Soil note 1	Typical Pavement Build-up, Good Soil and Drainage note 1
0-500	<25	27,500	Minigreens streets and cul-du-sac with no future extensions	1-1/4" Type 1 1-1/2" Type 2 3-1/4"-301 6" -304 notes 2, 3, 4	Same
501-1,500	<75	87,500	Non through residential streets with no future extensions	1-1/4" Type 1 1-1/2" Type 2 3-3/4"-301 6" -304 notes 2, 3, 4	Same
1,501-3,500	<175	192,500	Through or connecting residential streets	1-1/4" Type 1 1-1/2" Type 2 5-1/4"-302 6" -304 notes 3, 4	1-1/4" Type 1 1-1/2" Type 2 4-1/4"-302 6" -304 notes 3, 4
<20,000	<1,000	1.5m	Arterial streets	1-1/2" 442 12.5mm Type A (446) (PG76-22M) 2-1/2" 442 19mm Type A (446) (PG76-22M) 5"-302 6" -304 notes 3, 4, 5, 6, 7	1-1/2" 442 12.5mm Type A (446) (PG76-22M) 2-1/2" 442 19mm Type A (446) (PG76-22M) 4"-302 6" -304 notes 3, 4, 5, 6, 7
N/A	<2,000	4m	Heavy Industrial streets	1-1/2" 442 12.5mm Type A (446) (PG76-22M) 2-1/2" 442 19mm Type A (446) (PG76-22M) 7"-302 6" -304 notes 3, 4, 5, 6, 7	1-1/2" 442 12.5mm Type A (446) (PG76-22M) 2-1/2" 442 19mm Type A (446) (PG76-22M) 6"-302 6" -304 notes 3, 4, 5, 6, 7
N/A	Designed for the heaviest legal trucks	N/A (Perpetual)	Perpetual Pavement	1-1/2" 442 12.5mm Type A (446) (PG76-22M) 2-1/2" 442 19mm Type A (446) (PG76-22M) 9"-302 6" -304 notes 3, 4, 5, 6, 7	1-1/2" 442 12.5mm Type A (446) (PG76-22M) 2-1/2" 442 19mm Type A (446) (PG76-22M) 8"-302 6" -304 notes 3, 4, 5, 6, 7

## Notes:

- 1 – Soil support poor, CBR=3; good, CBR = 7, good drainage means both surface and sub-surface drainage is provided.
- 2 – From City of Columbus standards
- 3 – All binder grades PG64-22, except where noted. (PGXX-XXM designates polymer modified binder)
- 4 – If agency preference is to use full-depth asphalt on the sub-grade, delete the 6" crushed-aggregate base (Item 304) and increase the asphalt-base thickness by 2".
- 5 – These surface and intermediate courses are highly rut-resistant materials. If high-stress conditions (starting, stopping, turning heavy vehicles) are not present, use conventional materials: 1-1/2" Type 1H (PG70-22M), 1-3/4" Type 2 (heavy) (PG64-22) and increase thickness of the 302 course accordingly.
- 6 – These pavement build-ups are intended for new construction of substantial quantity. Not all of these materials are feasible or practical for production in small quantities. There are alternatives for small quantities that can provide adequate rutting resistance. Consult your producer for recommendations.
- 7 – Larger, Heavier traffic projects can economically benefit from and should receive a detailed soil and traffic analysis and a specific pavement design.

# Designs for Parking Facilities

- In thin pavements, those designed for light loads, stresses imposed by environmental changes, expansion and contraction due to moisture and temperature changes and freeze and thaw, assume equal importance with those that result from vehicle loads. Thin asphalt pavements are less able to withstand these dimensional changes than thick, heavy-duty pavements. Thus, experience dictates that driveway pavements be governed by some minimum thickness of asphalt that can resist these forces of nature.

# Practical Applications

There are various pavement design recommendations in different publications from credible sources. Here we will emphasize the recommendations contained in the Asphalt Pavement Design And Construction Guide, published by Flexible Pavements of Ohio and mention the recommendations of the Asphalt Institute and the National Asphalt Pavement Association.

From the Flexible Pavements of Ohio, Asphalt Pavement Design and Construction Guide , Section 2.2, Page 1

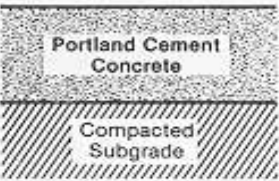
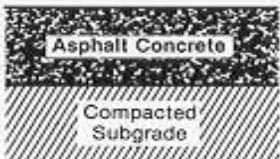
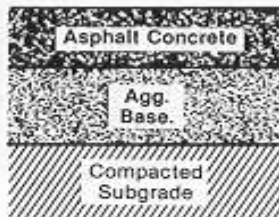
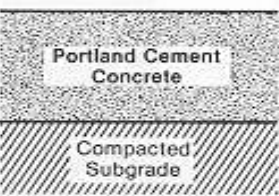
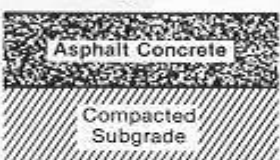
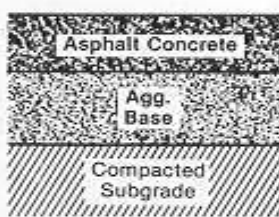
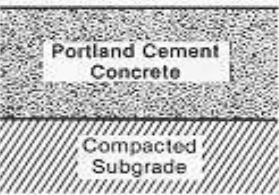
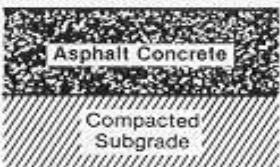
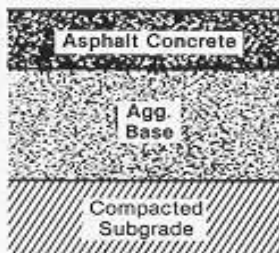
Recommended Minimum Thickness Designs ( in inches) for pavements designed for cars

Subgrade Support	Full Depth Asphalt-----with aggregate base		
		aggregate-----asphalt	
Poor (CBR 3)	6.5	6.0	4.5
Fair (CBR 5)	5.5	6.0	3.5
Good (CBR 7)	5.0	6.0	3.0

Note: these design are intended to ensure that only surface maintenance and not structural repair will be needed in the future

**TABLE 1**  
**Parking Lot Pavement Thicknesses**  
**For Passenger Cars**

from Asphalt Institute  
 publication IS-182

Sect. No.	Portland <sup>(1)</sup> Cement Concrete	Full Depth <sup>(2)</sup> Asphalt Concrete	Asphalt <sup>(2)</sup> Concrete With Agg. Base
<b>Good to Excellent Subgrade<sup>(3)</sup> - CBR - 17</b>			
1	5" 	4" 	3" 4" 
<b>Medium Subgrade - CBR - 8</b>			
2	6" 	4" 	3" 4" 
<b>Poor Subgrade - CBR - 3</b>			
3	6" 	4½" 	3" 6" 

<sup>1</sup> These thickness requirements are based on the AASHTO recommendation for a minimum pavement thickness of 6 inches with a sand gravel subbase for passenger car and light commercial vehicle usage (AASHTO *Interim Guide for Design of Pavement Structures*, 1972, Revised 1981, Wash., D.C.) and local government agency design practices permitting a 5-inch minimum pavement thickness for public parking lots for passenger cars on good to excellent subgrades.

<sup>2</sup> These thickness requirements are based on The Asphalt Institute's Thickness Design Procedures, (*Thickness Design-Asphalt Pavements for Highways and Streets*, The Asphalt Institute Manual Series No. 1 (MS-1) Sept. 1981, Wash., D.C.). These thickness requirements meet or exceed AASHTO recommendations. (AASHTO *Interim Guide for Design of Pavement Structures*, 1972, Revised 1981, Wash., D.C.).

<sup>3</sup> More detailed information on the load-bearing characteristics of varying soil types is presented in The Asphalt Institute's *Soils Manual* (MS-10).

**TABLE D: Full-Depth Hot Mix Asphalt Thickness Selection Chart**

Traffic Class	Design Period Years	Design ESAL	Full Depth Asphalt Thickness, inches				
			Very Poor Subgrade <sup>1</sup>	Poor Subgrade <sup>1</sup>	Medium Subgrade	Good Subgrade	Very Good Subgrade
I	5	3,000	4.5	3.5	3.0	3.0	3.0
	10	3,000	4.5	3.5	3.0	3.0	3.0
	15	5,000	5.0	4.0	3.0	3.0	3.0
	20	7,000	5.5	4.5	3.5	3.0	3.0
II	5	7,000	5.5	4.5	3.5	3.0	3.0
	10	14,000	6.0	5.0	4.0	3.0	3.0
	15	20,000	6.5	5.5	4.5	3.0	3.0
	20	27,000	6.5	6.0	4.5	3.0	3.0
III	5	27,000	6.5	6.0	4.5	3.0	3.0
	10	54,000	7.0	6.5	5.5	4.0	3.0
	15	82,000	7.5	7.0	6.0	4.5	3.5
	20	110,000	8.0	7.0	6.0	4.5	3.5
IV	5	270,000	9.0	8.0	7.0	5.5	4.0
	10	540,000	10.0	9.0	8.0	6.5	5.0
	15	820,000	10.5	9.5	8.5	7.0	5.5
	20	1,100,000	11.0	10.0	9.0	7.5	6.0



**TABLE F: Thickness Selection Chart Using Untreated Granular Base**

Traffic Class	Design Period Years	Design ESAL	Design Thickness Using Class II Treated Base, Inches									
			Very Poor Subgrade <sup>1</sup>		Poor Subgrade <sup>1</sup>		Medium Subgrade		Good Subgrade		Very Good Subgrade	
			Asphalt Surface & Base <sup>2</sup>	Minimum Granular Base	Asphalt Surface & Base <sup>2</sup>	Minimum Granular Base	Asphalt Surface & Base <sup>2</sup>	Minimum Granular Base	Asphalt Surface & Base <sup>2</sup>	Minimum Granular Base	Asphalt Surface & Base <sup>2</sup>	Minimum Granular Base
I	5	3,000	3.0	4.0	3.5	0.0	3.0	0.0	3.0	0.0	3.0	0.0
	10	3,000	3.0	4.0	3.5	0.0	3.0	0.0	3.0	0.0	3.0	0.0
	15	5,000	3.5	4.0	4.0	0.0	3.5	0.0	3.0	0.0	3.0	0.0
	20	7,000	3.0	6.0	4.5	0.0	3.5	0.0	3.0	0.0	3.0	0.0
II	5	7,000	3.0	6.0	4.5	0.0	3.5	0.0	3.0	0.0	3.0	0.0
	10	14,000	3.5	6.0	3.0	6.0	4.0	0.0	3.0	0.0	3.0	0.0
	15	20,000	4.0	6.0	3.5	6.0	4.5	0.0	3.0	0.0	3.0	0.0
	20	27,000	4.5	6.0	3.5	6.0	4.5	0.0	3.0	0.0	3.0	0.0
III	5	27,000	4.5	6.0	3.5	6.0	4.5	0.0	3.0	0.0	3.0	0.0
	10	54,000	5.0	6.0	4.0	6.0	5.5	0.0	4.0	0.0	3.0	0.0
	15	82,000	5.5	6.0	4.5	6.0	6.0	0.0	4.5	0.0	3.5	0.0
	20	110,000	6.0	6.0	5.0	6.0	6.0	0.0	4.5	0.0	3.5	0.0
IV	5	270,000	6.5	8.0	5.5	8.0	5.0	6.0	5.5	0.0	4.0	0.0
	10	540,000	7.5	8.0	6.5	8.0	5.5	6.0	6.5	0.0	5.0	0.0
	15	820,000	8.0	8.0	7.0	8.0	6.0	6.0	7.0	0.0	5.5	0.0
	20	1,100,000	8.5	8.0	7.5	8.0	6.5	6.0	7.5	0.0	6.0	0.0

Use Full-Depth Asphalt, see Table D

**Footnotes for  
Tables D, E and F:**

- <sup>1</sup> Very Poor and Poor subgrades should be replaced with higher quality materials. Guidelines for improving these soils to a higher classification are given in Section II.B. Subgrade Evaluation.
- <sup>2</sup> Hot Mix Asphalt composed of 1.5 inches of Hot Mix Asphalt surface mix plus binder or base mix. Mixes should meet requirements given in Sections I.C. Hot Mix Asphalt and III.B. Quality Control.
- <sup>3</sup> Cement treated and lime-fly ash base courses should not be constructed less than six inches thick.

**CAUTION:**

Layer thicknesses in these tables are not intended to account for the possibility of frost heave. Refer to "Soil conditions" in Section I.A and to Section II.B. The designer should ensure that all layers above the depth of frost penetration consist of HMA or other materials not susceptible to frost heave. Where this is uneconomical because frost penetration is extremely deep, recommendations of local geotechnical engineers should be followed.

# Typical Build-up for Parking Facilities

- Surface course – 1.25” 448, Type 1, PG 64-22
- Intermediate course – 1.75”, 448, Type 2, PG 64-22
- Base course if required –
  - 3” to 6 “, Item 301, PG 64-22 or
  - 4-7.75”, Item 302, PG 64-22
  - 4” – 6”, Item 304 Aggregate base

# ODOT Pavement Design Manual

<http://www.dot.state.oh.us/Divisions/Engineering/Pavement/Pages/Publications.aspx>



Section 200, Pavement Design Concepts

300, Rigid Pavement Design

400, Flexible Pavement Design contains instructions on thickness design, proper mix applications and layer build-ups.

500, Minor Rehabilitation

# Questions?



[www.flexiblepavements.org](http://www.flexiblepavements.org)