



TOWN OF MONUMENT

PAVEMENT DESIGN AND
CONSTRUCTION STANDARDS

Approved: _____
Date: _____

TOWN OF MONUMENT PAVEMENT DESIGN AND CONSTRUCTION
STANDARDS

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SUBSECTION 1

GENERAL INFORMATION

1.1 Authority

The administration of these standards, including interpretation, enforcement, revision, and waiver, is hereby delegated to the Director of Development Services. These standards are comprised of written standards of engineering practice, materials specifications, construction procedures, and publications generally acceptable within the construction industry. Interpretation of any discrepancies between sections of the specifications shall be made by the Director of Development Services.

1.2 Effective Date of Standards

These specifications shall be effective from the date they are approved by the Board of Trustees. The date shall be noted on the title sheet of the specifications. It shall be the responsibility of the holders of these standards to determine that the set in their possession is the current edition.

1.3 Revisions, Amendments, or Additions

These standards may be administratively revised, amended, or added to from time to time, and such revisions, additions, or amendments shall be binding and in full force and effect as of the date of their adoption.



SUBSECTION 2

TOWN CODE CHAPTER 16.48

Chapter 16.48 PAVEMENT DESIGN, CONSTRUCTION, AND MATERIALS SPECIFICATIONS

16.48.010 Purpose and Intent

This chapter covers the design, testing, construction, and material specifications for asphalt and concrete pavement, base course, and subgrade for public and private roads and streets, and privately owned parking areas, within the Town of Monument municipal boundaries. The intent of this chapter is to provide guidance to the development community in the preparation of design drawings, and in the construction of paved areas frequented by vehicular and pedestrian traffic, both within public right-of-way and on private property.

Since residents and visitors all use private streets and parking areas with as much frequency as public streets and roads, it is in the best interests of the Town to establish design and construction standards for privately owned streets and parking areas.

16.48.020 Governing Standards

A. Design and Construction of Public and Private Streets and Roads

Except as otherwise approved by the Department of Development Services, or modified or supplemented in this chapter, design, materials, equipment, details, and construction methods for asphalt and concrete pavement, base course, and subgrade for public and private roads and streets shall comply with the Pavement Design Criteria Manual of the City of Colorado Springs Engineering Department Engineering Criteria Manual, as amended from time to time. The Pavement Design Criteria Manual also references the Pikes Peak Region Asphalt Specifications (Version 2) by the Colorado Asphalt Pavement Association (C.A.P.A), City of Colorado Springs, and El Paso County Department of Transportation (April 2008). Both of these documents are hereby incorporated into this chapter by reference, with "Development Services Department" replacing "City Engineering" and "Development Services Director" replacing "City Engineer" wherever mentioned in the Pavement Design Criteria Manual.

Additionally, the following revisions and substitutions are incorporated into the Pikes Peak Region Asphalt Specifications:

1. In Table 1.002.1 – Aggregate Properties, the Town reserves the right to require the percentage of coarse aggregate retained on a #4 sieve to be 35% maximum, dependent upon conditions particular to the site and/or project.
2. In Table 1.004.4 – Testing Responsibilities, for Capital Projects and Overlays, the Town reserves the right to hire its own independent AMRL approved testing laboratory for quality assurance. For all development projects, the Town will allow the developer to decide whether he wants to have the

contractor hire the testing laboratory, or hire his own laboratory. All laboratories must be AMRL approved.

3. In Section 1.004 Hot Mix Asphalt Pavement Construction, subsection N. Testing and Inspection, subsection 4. Testing Frequencies and Tolerances, a sentence is to be added to the end of subsection 4 which reads, "Penalties for test failures may be assessed by the Town, including but not limited to an extension of the pavement warranty for up to one year.
4. In Section 1.004 Hot Mix Asphalt Pavement Construction, subsection N. Testing and Inspection, subsection 5. Contractor's Quality Control Program, subsection a. Testing Laboratory add "AMRL certified" as a requirement for the independent testing laboratory in the first sentence.

B. Design and Construction of Privately Owned Parking Areas

Technical specifications and requirements for the design and construction of privately owned parking areas are to be found in the Town of Monument Pavement Design and Construction Standards, which are hereby incorporated into this Code by reference.

C. Concrete Sidewalk

Refer to the Town of Monument Roadway Standards for specifications and requirements for concrete sidewalk pavement design, construction, and materials.

16.48.030 Porous Asphalt Pavement

A. Purpose

The Town will allow porous asphalt pavement, also referred to in the industry as an open-graded friction course, to be used on a case-by-case basis as a means of reducing the impact of paved surfaces on existing and proposed stormwater systems, and ultimately on streams, creeks, and other estuaries. Porous asphalt pavement has been shown to reduce ponding and standing water on pavement surfaces, resulting in a safer drainage surface during, and immediately after, rainstorms. It has also been determined to reduce the amount of sedimentation exiting a site due to its permeable nature, which results in improved water quality associated with runoff. Further, the reduction in size and, in some cases elimination, of stormwater detention basins, can have a beneficial effect on both the Town's stormwater quality management efforts and on private development, since a potentially greater portion of a site can be used for improvements.

B. Evaluation Criteria

A private development site may be eligible for the use of porous asphalt pavement if the following conditions are present:

1. Permeability of existing (in situ) soils on the site is 0.50 inches per hour or greater based on a standard percolation test. This is required so that the porous system will infiltrate into the existing soil at an adequate rate to minimize runoff and ponding.
2. The proposed porous asphalt pavement area can be protected from heavy traffic during construction that could over-compact the area.
3. The existing soil is proven to be capable of sustaining normal vehicular traffic loads without being compacted to the density usually required for subgrades underneath parking lots and roadways.
4. The minimum depth to an impervious subsurface layer, or high water table, is two feet.
5. The bottom of the infiltration bed can be designed and constructed to be flat.
6. The maximum slope of the porous asphalt surface can be designed to be no greater than 5 percent.
7. Runoff from adjacent areas on site can be routed to the infiltration bed, with maximum ratio of impervious to pervious area being five to one (5:1).

C. General Design Criteria

1. The cross-section of the pavement infiltration bed, and subgrade should generally follow the guidelines in Figure 1 below:

FIGURE 1

<u>PAVEMENT SURFACE</u>	<u>(MIN. SLOPE 2%)</u>
POROUS ASPHALT TOP COURSE	4" MIN. OPEN GRADED (16% VOIDS MINIMUM) HOT MIX ASPHALT (HMA)
FILTER COURSE	2" THICK LAYER OF ½-INCH CRUSHED STONE/AGGREGATE
RESERVOIR COURSE	8"-9" CRUSHED STONE (40% VOIDS)
FILTER FABRIC	<u>FROST DEPTH</u>
UNCOMPACTED, UNDISTURBED SUBGRADE SOIL	

2. For specific design considerations, refer to the National Asphalt Pavement Association (NAPA) Information Series 131 – “Porous Asphalt Pavements for Stormwater Management – Design, Construction, and Maintenance Guide”.

D. Construction of Porous Asphalt Pavement

Specific construction methods, materials specifications, and installation techniques are all contained in NAPA's Information Series 131 publication.

E. Post-Construction and Maintenance Considerations

Since asphalt permeability is a key factor in the long-term effectiveness of porous asphalt pavement systems, it is imperative that a maintenance program be established by the owner of the property. This maintenance program shall be submitted to the Department of Development Services for review, and approval of the program shall be issued by the Department prior to release of a certificate of occupancy for the intended use. At a minimum, the program shall address:

1. Regular inspection intervals by the owner and the Town.
2. Inspections following large storms, major snowfalls, and other events that may result in clogging of the porous asphalt surfaces, filter course, or reservoir course.
3. Regular cleaning, sweeping, and/or washing of the asphalt surfaces to keep the porosity at its optimum level. Frequency of the cleaning program must be included.
4. Prohibition of future seal-coating.

Sec. 16.48.040 Finishing of Paved Surfaces

After the pavement and shoulders have been completed, the contractor shall place in acceptable condition any portion of the right-of-way that has been distributed by his or her operations.

Sec. 16.48.050 Restriction of Traffic

The contractor shall arrange the work in such a manner as to cause a minimum of inconvenience to the traveling public and abutting property owners. The Town retains the authority to order the contractor to reschedule operations should traffic considerations become paramount. Any and all traffic barricades, warning signs, and flagmen will be provided by the contractor as required by the U.S. Department of Transportation Manual for Uniform Traffic Control Devices, as a minimum. More may be required depending on the construction site and conditions. The contractor shall verify that all heavy equipment utilized during construction will not damage existing roadways. Any damage that occurs as a result of the contractor's operations shall be repaired to the satisfaction of the Town at the expense of the contractor.

Sec. 16.48.060 Cooperation

All adjacent driveways and access to business areas within the limits of each project shall be kept open at all times, said access to be maintained by the contractor, and the excavated area shall be kept under close dust control.



SUBSECTION 3

CITY OF COLORADO SPRINGS PAVEMENT DESIGN CRITERIA MANUAL



SUBSECTION 4

PIKES PEAK REGION ASPHALT PAVING SPECIFICATIONS

**(CAPA, COLORADO SPRINGS,
EL PASO COUNTY)**



SUBSECTION 5

DESIGN AND CONSTRUCTION OF PRIVATELY OWNED PARKING AREAS

Design and Construction of Privately Owned Parking Areas

The following standards are based upon information included in the Colorado Asphalt Pavement Association's "Guideline to the Design and Construction of Asphalt Parking Lots in Colorado".

1. Pavement Design

A. Drainage Considerations

1. Irrigation systems should be designed to keep water away from the parking lot pavement subgrade as much as possible since saturation of subgrade soil tends to cause loss of strength and stability, which leads to more frequent and severe pavement failures.
2. Parking area surfaces should have a minimum slope of one-quarter inch per foot (2 percent).
3. Parking lots should be designed so that stormwater runoff collects in curb and gutter or crosspans and is routed to drainage inlets connected to a piped storm drain system with proper water quality controls and detention/retention mechanisms.

An exception to this criteria may be made for porous asphalt parking lots, which is contained in Section 16.48.040 of the Town Code.

B. Subgrade Preparation

1. Subgrade should be compacted to a uniform density of 95 percent of maximum density, using ASTM D698 (Standard Proctor) or ASTM D1557 (Modified Proctor).
2. Finished subgrade should not deviate from the required grade and cross-section by more than 1/2-inch in 10 feet.

C. Aggregate Base Course Construction

1. The aggregate base course should consist of one or more layers placed directly on the prepared subgrade, and should be spread and compacted with moisture control to the uniform thickness, density, and finished grade as required on the plans. The minimum thickness of the aggregate base course shall be 4 inches for nominal 3/4-inch aggregate. For larger aggregate, the minimum base course thickness should be increased proportionately based upon the aggregate size.

D. Hot Mix Asphalt (HMA) Placement

1. Prime Coat

An asphalt emulsified primer (AEP) may be applied over the aggregate base before placement of the HMA base course.

2. Hot Mix Asphalt Base Course

The HMA base course should be placed directly on the aggregate base course, or subgrade for full-depth asphalt, and spread and compacted to the thickness indicated in the approved pavement design. The HMA base course material must meet the specifications for the mix type specified.

3. Tack Coat

Before placing successive pavement layers, the previous course must be cleaned and a tack coat of diluted emulsified asphalt should be applied. A tack coat can only be eliminated if the previous layer is freshly placed and thoroughly cleaned.

4. Hot Mix Asphalt Surface Course

The surface course must be placed in one or more lifts to the finished grades as indicated on the approved plans. The material must conform to specifications for Superpave hot mix asphalt. The finished surface may not vary from the established grades by more than 1/4-inch in ten feet, when measured in any direction. As soon as the material can be compacted without displacement, rolling and compaction should take place until the surface is thoroughly compacted and no roller marks are visible.

5. Porous Asphalt Pavement Option

For areas where permeable subgrade material exists, porous asphalt pavement may be used to reduce stormwater runoff, and to reduce or eliminate the need for detention basins.

A separate section of these specifications is devoted to the design and construction of porous asphalt pavement.

E. Thickness Design

The thickness of the asphalt pavement section for parking lots must be determined by the engineer-of-record for the project, or a materials consultant qualified to determine the proper pavement thickness for the uses and types of vehicle loading expected for the developed site. Table 1 below provides

suggested thickness for various levels of traffic and subgrade classes, for HMA over an aggregate base course and for full depth asphalt.

Table 1 shows suggested thicknesses for HMA pavement, full depth HMA design and also with aggregate base course, for various subgrade CBR/R values and traffic levels.

Table 1
Suggested Thickness Design - Parking Lots

Traffic Level ¹		Subgrade Class			
		Poor CBR 3-6 R < 28	Fair CBR 8-9 R 33-41	Good CBR 10-19 R 43-82	Excellent CBR > 20 R > 83
		Hot Mix Asphalt over Aggregate Base Course, Inches			
Light	Up to 10,000 ESALs	2.8/13.0	2.6/8.6	2.6/8.0	2.6/4.0
	10-50,000 ESALs	3.5/18.0	3.5/11.0	3.5/8.0	3.5/8.0
Moderate	50-100,000 ESALs	4.0/17.0	4.0/12.0	4.0/8.0	4.0/8.0
	100-250,000 ESALs	5.0/18.0	4.5/13.0	4.5/8.0	4.5/8.0
Heavy	250-500,000 ESALs	5.8/12.0	5.5/9.5	5.5/8.5	5.5/8.0
	500-1,000,000 ESALs	6.0/23.0	6.0/16.5	6.0/7.0	6.0/6.0
		Full Depth Asphalt, Inches ²			
Light	Up to 10,000 ESALs	6.0	5.0	4.0	4.0
	10-50,000 ESALs	7.5	5.5	4.5	4.0
Moderate	50-100,000 ESALs	9.0	7.0	5.5	4.5
	100-250,000 ESALs	9.0	7.5	6.0	5.5
Heavy	250-500,000 ESALs	10.5	8.5	7.0	6.0
	500-1,000,000 ESALs	11.5	9.5	7.5	6.5

¹Light: Passenger Cars Moderate: Passenger Cars and Light Trucks Heavy: Heavy Industrial

²1. In (1) = 25 mm
 2. Excellent subgrade conditions are ideal for full depth paving. However, a minimum of 100 (4 inches) of HMA is recommended. In some cases, aggregate is needed to provide material to form grade and to provide a smooth surface to pave on. If needed, 100 mm (4 inches) of aggregate is recommended as a minimum thickness for this purpose.
 3. Full depth asphalt can be built on poor and fair soils only in dry conditions and when the subgrade soils may be brought up to optimum conditions and compacted to specified density.

Special truck lanes are sometimes required to expedite traffic to loading areas, trash dumpster areas, and equipment areas. Design thicknesses for those lanes or pavement areas should be increased to accommodate the expected loading. If a parking lot is small in size and has low traffic volume but has the weekly or bi-weekly trash truck, it would be more economical to construct the entire parking lot to handle the truck traffic than it would be to construct a heavy traffic lane just for trucks. A lot not constructed to handle heavy trucks will cost more in the long run because of continuing repairs to the pavement being destroyed by heavy trucks.

F. The "Superpave" Mix Design Method shall be used for all parking area asphalt pavement design, with the exception of parking areas using porous asphalt pavement.

For lower lifts, "SX" or "S" grading should be used, unless the parking area is expected to experience heavy traffic, in which case an "SG" grading is recommended for lower lifts.

For the top mat, "SX" grading should be used, although an "S" grading can be used for the top lift of parking areas expected to receive heavy traffic on a regular basis.

Non-Modified asphalt binders are recommended for use in all parking areas.

G. Placement of Asphalt Pavement

The thickness of an individual lift shall be limited to three times the nominal maximum aggregate size in the gradation.

The recommendations contained in the Construction Recommendations section of the Colorado Asphalt Pavement Association's "A Guideline for the Design and Construction of Asphalt Parking Lots in Colorado" should be followed as closely as possible.

Hot mix asphalt (HMA) curb is not recommended for use in any applications. Permission to install HMA curb will only be granted in special cases when no other options are available.



SUBSECTION 6

“GUIDELINES TO THE DESIGN AND CONSTRUCTION OF ASPHALT PARKING LOTS IN COLORADO”

**COLORADO ASPHALT PAVEMENT
ASSOCIATION (CAPA)**



SUBSECTION 7

“POROUS ASPHALT PAVEMENTS FOR STORMWATER MANAGEMENT – DESIGN, CONSTRUCTION, AND MAINTENANCE GUIDE”

**NATIONAL ASPHALT PAVEMENT
ASSOCIATION (NAPA)
INFORMATION SERIES 131**

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