IN-LB	Inch-Pound Units
SI	International System of Units

Design of Jointed Concrete Pavements for Streets and Local Roads—Guide

Reported by ACI Committee 325

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Design of Jointed Concrete Pavements for Streets and Local Roads—Guide

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This guide provides a perspective on a balanced combination of pavement thickness, drainage, and subbase or subgrade materials to achieve an acceptable pavement system for streets and local roads. Such concrete pavements designed for low volumes of traffic—typically less than 100 trucks per day, one-way—have historically provided satisfactory performance when proper support and drainage conditions exist. Recommendations are presented for designing a concrete pavement system for a low volume of traffic and associated joint pattern based upon limiting the stresses in the concrete or, in the case of reinforced slabs, maintaining the cracks in a tightly closed condition. Details for designing the distributed reinforcing steel and the load transfer devices are given, if required.

The thickness design of low-volume concrete pavements is based on the principles developed by the American Cement Association and others for analyzing an elastic slab over a dense liquid subgrade, as modified by field observations and extended to include fatigue concepts.

Keywords: dowel; flexural strength; joint; pavement; portland cement; quality control; slipform; subbase; tie bar.

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CONTENTS

CHAPTER 1—INTRODUCTION AND SCOPE, p. 2
1.1—Introduction, p. 2
1.2—Scope, p. 2
1.3—Background, p. 2

CHAPTER 2—DEFINITIONS, p. 3
2.1—Definitions, p. 3

CHAPTER 3—PAVEMENT MATERIAL REQUIREMENTS, p. 4
3.1—Support conditions, p. 4

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3.2—Properties of concrete paving mixtures, p. 7

CHAPTER 4—PAVEMENT THICKNESS DESIGN, p. 9
4.1—Basis of design, p. 9
4.2—Traffic, p. 9
4.3—Thickness determination, p. 10
4.4—Economic factors, p. 13
4.5—Environmental factors, p. 14
4.6—Life-cycle assessment, p. 14

CHAPTER 5—PAVEMENT JOINTING, p. 14
5.1—Slab length and related design factors, p. 15
5.2—Transverse joints, p. 17
5.3—Longitudinal joints, p. 19
5.4—Isolation joints, p. 20
5.5—Slab reinforcement, p. 21
5.6—Irregular panels, p. 21
5.7—Contraction joint sealants, p. 21

CHAPTER 6—SUMMARY, p. 24

CHAPTER 7—REFERENCES, p. 24
Authored documents, p. 26

APPENDIX A—PAVEMENT THICKNESS DESIGN CONCEPTS, p. 28
A.1—Load stresses and fatigue calculations, p. 28
A.2—Proprietary design software, p. 30
A.3—Joint spacing method, p. 30

APPENDIX B—SUBGRADE, p. 31
B.1—Introduction, p. 31
B.2—Soil classification, p. 31
B.3—Geotechnical investigations, p. 31
B.4—Expansive soils, p. 34
B.5—Frost action, p. 35
B.6—Pumping, p. 36

APPENDIX C—JOINTING DETAILS FOR PAVEMENTS AND APPURTENANCES, p. 36

APPENDIX D—PAVEMENT MAINTENANCE AND REHABILITATION, p. 40
D.1—Surface sealing, p. 41
D.2—Joint resealing and crack sealing, p. 41
D.3—Partial-depth repair, p. 41
D.4—Full-depth repair, p. 42
D.5—Undersealing and leveling, p. 42
D.6—Overlays, p. 42

CHAPTER 1—INTRODUCTION AND SCOPE

1.1—Introduction

The design of a concrete pavement system for a low traffic volume extends beyond the process of pavement thickness selection; it entails an understanding of the processes and the factors that affect pavement performance. It also encompasses appropriate slab jointing and construction practices that are consistent with local climatic and soil conditions.

Concrete pavements for city streets and local roads are often used in residential areas and business districts, and in rural areas to provide farm-to-market access for the movement of agricultural products. The term "low volume" refers to pavements subject to either heavy loads but few vehicles, or light loads and many vehicles. City streets and local roads also serve an aesthetic function because they are integrated into the landscape and architecture of a neighborhood or business district.

Concrete pavement performs well for city street and local road applications because of its durability while being continuously subjected to traffic and, in some cases, severe climatic conditions. Because of its relatively high stiffness, concrete pavements spread the imposed loads over large areas of the subgrade and are capable of resisting deformation caused by passing vehicles. Concrete pavements exhibit high wear resistance and can be easily cleaned if necessary. Traffic lane markings can be incorporated into the jointing pattern where the concrete's light-reflective surface improves visibility. Concrete pavement surfaces drain well on relatively flat slopes.

The major variables likely to affect the performance of a concrete pavement system for city streets and local roads are traffic, drainage, environment, construction, and maintenance. Each of these factors may act separately or interact with others to cause deterioration of the pavement. Due to the nature of traffic on city streets and local roads, the effects of environment, construction, and maintenance can play more significant roles in the performance than traffic. Nonetheless, complete information may not be available regarding certain load categories that make up the mixture of traffic carried on a given city street or local road.

1.2—Scope

This guide covers the design of jointed plain concrete pavements (JPCPs) for use on city streets and local roads, including driveways, alleyways, and residential roads that carry low volumes of traffic. This guide emphasizes the aspects of concrete pavement technology that are different from procedures used for design of other facilities such as highways or airports. The primary pavement type for streets and roads is a JPCP that is constructed without distributed steel reinforcement, with or without dowel bars, where the transverse joints are spaced at 15 ft (4.6 m) or less, depending on the pavement thickness. Roller-compacted concrete may also be used for streets and roads, and more information may be found in ACI PRC-327. This guide is not intended for pervious pavement design.

1.3—Background

The thickness of concrete pavement is generally designed to limit tensile stresses produced within the slab by vehicle loading, and temperature and moisture changes within the slab. Stresses resulting from wheel loadings applied near interior longitudinal or transverse joints are lower when good load transfer is provided by the joints. Therefore, the critical

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