Guide for Construction of Concrete Pavements

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The primary focus of this guide is pavement construction. Modern slipform paving techniques and time-proven formed construction procedures are highlighted. Quality control, quality assurance, and construction inspection, as well as the environmental, economic, and societal benefits of concrete pavement, are also presented. This guide briefly reviews all aspects of concrete pavement construction for highways and, to some extent, local roads, streets, and airfields. Intended for field and office personnel, this guide provides a background on design issues that relate to construction and reviews material selection.

Keywords: concrete pavement; concrete pavement construction; concrete paving; fixed-form paving; paving materials; slipform paving; sustainability.

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CHAPTER 1—INTRODUCTION AND SCOPE

1.1—Introduction
In the United States, concrete pavements have been built for over a century. The first street constructed with concrete was built in Bellefontaine, OH, in 1891; a portion of which, built in 1893, still remains in service. Concrete pavements make up an integral part of the national primary and secondary highway system, farm-to-market road system, city streets, parking lots, and airport runways. Historically, concrete pavements have exhibited a higher initial cost than asphalt pavements, but recent construction and market forces have narrowed that gap. Moreover, the longer service life and lower maintenance costs associated with concrete make it a very attractive and sustainable paving material.

1.2—Scope
This guide briefly discusses the construction of hydraulic cement concrete pavements for highways, streets, local roads, and airfields. Design issues are presented in the context of their impact on construction. Today, the slipform method of paving is preferred for roadway construction. This modern construction method is capable of producing a sustainable, high-quality, smooth pavement that can be placed quickly and economically. This guide will focus on pavement constructed using slipform methods; however, where appropriate, formed pavement construction practices are also discussed.

This guide is intended to serve as a reference for field project management, inspectors, and construction personnel by providing background information, illustrations of best practice, and information helpful in solving day-to-day jobsite problems. Designers and specification writers will also find the guide helpful in preparing contract documents and selecting construction methods that assure quality construction under normal jobsite conditions using established and proven practices. Regardless of the type of equipment used, quality construction depends, in large measure, on the skill of crews involved in the construction process and quality of materials used.

CHAPTER 2—ACRONYMS AND DEFINITIONS

2.1—Acronyms
AAR: alkali-aggregate reactivity
ABS: anti-lock braking system
ACR: alkali-carbonate reactivity
ADTT: average daily truck traffic
ASR: alkali-silica reaction
ATB: asphalt-treated base
BPN: British Pendulum Number
BPT: British Pendulum Tester
CBR: California bearing ratio
COTE: coefficient of thermal expansion
CPX: close proximity
CRCP: Continuously reinforced concrete pavement
CT meter: circular texture meter
CTB: cement-treated base
CTE: coefficient of thermal expansion
DF tester: dynamic friction tester
EAC: exposed aggregate concrete
EICM: Enhanced Integrated Climatic Model
EOT: early-opening-to-traffic
FN: friction number
FWD: falling weight deflectometer
GPR: ground-penetrating radar
HPC: high-performance concrete
HRWR: high-range water reducers
HRWRA: high-range water-reducing admixture
IFI: international friction index
IRI: international roughness index
JPCP: jointed plain concrete pavement
JRCP: jointed reinforced concrete pavement
LCA: life cycle assessment
LCB: lean concrete base
LOI: loss on ignition
LTE: load transfer efficiency
LWAS: lightweight aggregate sand
M-E: mechanistic-empirical
MIT: magnetic imaging tomography
MOR: modulus of rupture
MPD: mean profile depth
MTD: mean texture depth
NCHRP: National Cooperative Highway Research Program
NDT: nondestructive testing
NGCS: next-generation concrete surface
OBSI: On-board sound intensity
PCC: portland cement concrete
PI: plasticity index
QA: quality assurance