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

Roller-Compacted Concrete Pavements—Guide

Reported by ACI Committee 327

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This guide provides owner-agencies, contractors, materials suppliers, and others with a thorough introduction to roller-compacted concrete (RCC) and its many paving applications. This guide describes RCC and how it works as a paving material, how it compares to conventional concrete pavement, its common uses and benefits, and potential limitations compared to other paving materials. Troubleshooting guidelines are provided, as well as detailed overviews of RCC properties and materials, mixture proportioning, structural design issues, production and construction considerations, and quality control.

Keywords: industrial pavement; inspection and testing; joints; pavement; pavement design; roller-compacted concrete (RCC); RCC mixture proportioning; RCC pavement construction; RCC production.

CONTENTS

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CHAPTER 1—INTRODUCTION

Roller-compacted concrete (RCC) is an economical, fast construction candidate for many pavement applications. Because early projects resulted in a relatively coarse surface, RCC was traditionally used for pavements carrying heavy loads in low-speed areas. In recent years, however, its use in commercial areas and for local streets and highways is common.

This guide is largely based on Harrington et al. (2010). The review panel for the Harrington report was made up largely of ACI Committee 327 members. With the cooperation of the Portland Cement Association (PCA), the report was used as the basis for this guide. Extensive changes were made during the committee review, including incorporating material from ACI PRC-325.10. Additional references and examples have been added.

CHAPTER 2—NOTATION AND DEFINITIONS

2.1—Notation

C = coefficient relating flexural and compressive strength
E = modulus of elasticity, psi (MPa)
f_c' = compressive strength, psi (MPa)
f_{cr}' = required average compressive strength, psi (MPa)
f_r = flexural strength (third-point loading), psi (MPa)
h = slab thickness, in. (mm)
k = modulus of subgrade reaction, psi/in. (MPa/mm)
s = standard deviation
ε = strain, in./in. (mm/mm)
σ = stress, psi (MPa)

2.2—Definitions

Please refer to the latest version of ACI Concrete Terminology for a comprehensive list of definitions.

CHAPTER 3—KEY ELEMENTS

3.1—Performance comparison of RCC to conventional concrete pavement

Roller-compacted concrete (RCC) gets its name from the heavy vibratory steel drum and rubber-tired rollers used to compact it into its final form. RCC has similar strength properties and consists of the same basic ingredients as conventional concrete—well-graded aggregates, cementitious materials, and water—but has different mixture proportions. The biggest difference between RCC and conventional concrete mixtures is that RCC has a higher percentage of fine aggregates that allow for tight packing and compaction.

Fresh RCC is stiffer than typical zero-slump conventional concrete, with a consistency that is stiff enough to remain stable under vibratory rollers, yet wet enough to permit adequate mixing and distribution of paste without segregation.

RCC is typically placed with an asphalt-type paver equipped with a standard or high-density screed, followed by a combination of passes with rollers for compaction. Final compaction is usually achieved within 1 hour of mixing.

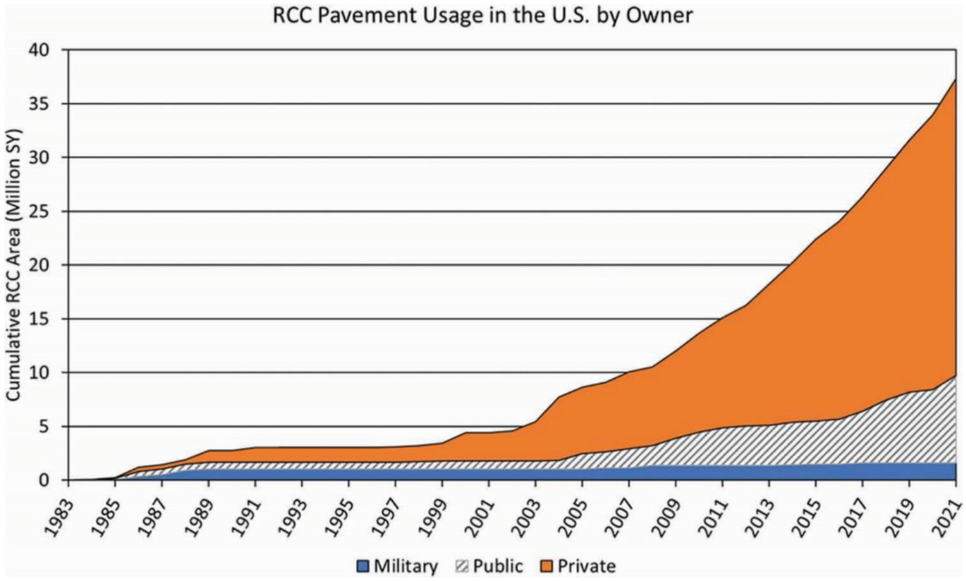

Fig. 3.1—Increasing use of RCC pavements (Tibbetts and Zollinger 2023). (Note: 1 yd^2 = 0.8 m^2.)

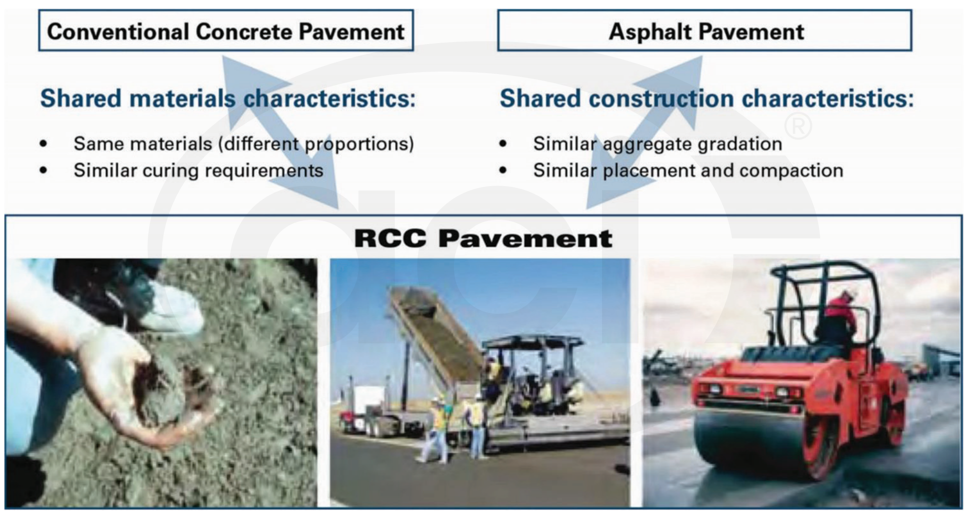

Fig. 3.2a—RCC combines aspects of conventional concrete and hot-mix asphalt paving materials and construction practices (Harrington et al. 2010).

Unlike conventional concrete pavements, RCC pavements are constructed without forms, dowels, or reinforcing steel. Joint sawing follows that for conventional concrete pavements with transverse joints spaced at no more than 15 ft (4.6 m) apart if required for aesthetic reasons.

RCC pavements are strong, dense, and durable. These characteristics, combined with construction speed and economy, make RCC pavements an excellent alternative for parking and storage areas including port, intermodal, distribution, compost, and military facilities, as well as for highway shoulders, streets, and highways. RCC can also be used in composite systems as base material.

The use of RCC for pavement construction in public and private applications has been growing steadily for the last couple of decades and has been increasing rapidly in the private sector in recent years (Fig. 3.1), particularly in the construction of low-volume roads and distribution centers (figure from Pittman and Anderton [2009] updated by Tibbetts and Zollinger [2023]).

3.2—Materials and structural performance properties

RCC pavements combine various aspects of conventional concrete pavement material practices with construction practices typical of asphalt pavements (Fig. 3.2a). However, while RCC pavements are compacted in the same manner and have similar aggregate gradations (Chapters 5 and 6) as asphalt pavements (Fig. 3.2b), the materials and structural performance properties of RCC are similar to those of conventional concrete pavement.

With well-graded aggregates, proper cementitious materials and water content, and dense compaction, RCC pavements can achieve strength properties higher than those of conventional concrete containing the same cementitious materials content, with low permeability.