Guide for the Design and Construction of Concrete Parking Lots

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Concrete parking lots serve many kinds of public facilities, commercial developments, businesses, and multifamily housing projects. They primarily accommodate parked vehicles, but may also provide maneuvering areas and access for delivery vehicles. The design and construction of concrete slabs for parking lots and outside storage areas share many similarities with the design and construction of streets and highways, but they also have some very distinct differences. A full appreciation of the differences and the modification of design and construction procedures to take these differences into account can result in economical concrete parking lots that will provide satisfactory service for many years with little maintenance.

This guide includes information on site investigation, thickness determination, design of joints and other details, durability considerations, paving operations, and quality-assurance procedures during construction. Maintenance and repair are also discussed.

Keywords: concrete pavement; curing; dowels; finishing; joints; load transfer; parking lot; subgrade; thickness; traffic loads.

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CHAPTER 1—INTRODUCTION AND SCOPE

1.1—Introduction

Concrete parking lots have many similarities to other types of concrete pavement. On the other hand, parking lots differ from other pavements in that most of the area is intended for storage of vehicles and other goods rather than for movement of vehicles. The design of concrete parking lots should follow generally accepted procedures for concrete pavements as outlined in this guide. Load-bearing capacity, drainage, crack control, life-cycle cost, constructibility, and maintainability are other characteristics that are important in the design and construction of concrete pavements, including parking lots.

Typically, concrete parking lots do not serve the same broad spectrum of traffic loading, from light vehicles to heavy trucks, as highways and arterial streets. Facilities designed to accommodate both light vehicles and heavier delivery trucks may employ traffic controls to separate and channel the heavier trucks away from areas designed for automobiles and light trucks. Facilities designed for heavier vehicles are likely those facilities where relatively accurate predictions of vehicle sizes and numbers are possible. Facilities intended to serve only light vehicles may have concrete parking lot slabs with thicknesses influenced by the practical limitations of the material and environmental effects rather than by the pavement stress created by vehicle loads. Durability-related distress is often the most critical maintenance concern for lightly loaded concrete parking lot pavements, which are subject to the effects of fuels and lubricants leaked from vehicles as well as environmental influences. Vehicles in parking areas usually travel at low speeds, diminishing the importance of smoothness tolerances. Because parking lots must also accommodate pedestrians, designs and geometrics should reflect pedestrian safety considerations including crosswalks, a slip-resistant surface texture, and nighttime illumination.

Concrete parking lots range in size from small, such as at corner convenience stores, to medium, such as at multi-unit housing projects, to large, such as those for shopping centers and office or commercial developments. Most parking areas include driveways, some of which need to accommodate relatively heavy loads. Special consideration may be needed if access to dumpsters is to be included. Accordingly, concrete parking lots are constructed with a wide variety of construction equipment, ranging from hand tools and vibratory screeds to large highway paving equipment or laser screeds.

Because of the relatively high stiffness of concrete pavements, loads are spread over larger areas of the subgrade compared with asphaltic pavements. As a result, thinner concrete pavements can be used for the same subgrade material. Additional benefits of using concrete to construct parking lots include the following:

- Concrete surfaces resist deformation from maneuvering vehicles;
- Concrete surfaces drain well with only minimal slopes;
- Concrete has relatively simple maintenance requirements;
- Traffic lane and parking stall markings can be incorporated into the jointing pattern;
- Concrete is minimally affected by leaking petroleum products;
- The light-reflective surface of concrete can be efficiently illuminated with minimal energy requirements; and
- Concrete parking lots reduce the impacts of the urban heat island effect relative to those of asphalt parking lots by producing lower surface temperatures, thus providing a cooler urban environment and reducing ozone production.