

# Earthmoving Operations

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\*This publication supersedes FM 5-434, 26 August 1994, and FM 5-164, 30 August 1974.

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## Preface

This field manual (FM) is a guide for engineer personnel responsible for planning, designing, and constructing earthworks in the theater of operations. It gives estimated production rates, characteristics, operation techniques, and soil considerations for earthmoving equipment. This guide should be used to help select the most economical and effective equipment for each individual operation.

This manual discusses the complete process of estimating equipment production rates. However, users of this manual are encouraged to use their experience and data from other projects in estimating production rates.

The material in this manual applies to all construction equipment regardless of make or model. The equipment used in this manual are examples only. Information for production calculations should be obtained from the operator and maintenance manuals for the make and model of the equipment being used.

*Appendix A* contains an English-to-metric measurement conversion chart.

The proponent of this publication is HQ TRADOC. Send comments and recommendations on Department of the Army (DA) Form 2028 directly to United States Army Engineer School (USAES), ATTN: ATSE-DOT-DD, Directorate of Training, 320 Engineer Loop Suite 336, Fort Leonard Wood, Missouri 65473-8929.

Unless this publication states otherwise, masculine nouns and pronouns do not refer exclusively to men.

## Chapter 1

# Managing Earthmoving Operations

Earthmoving may include site preparation; excavation; embankment construction; backfilling; dredging; preparing base course, subbase, and subgrade; compaction; and road surfacing. The types of equipment used and the environmental conditions will affect the man- and machine-hours required to complete a given amount of work. Before preparing estimates, choose the best method of operation and the type of equipment to use. Each piece of equipment is specifically designed to perform certain mechanical tasks. Therefore, base the equipment selection on efficient operation and availability.

### **PROJECT MANAGEMENT**

1-1. Project managers must follow basic management phases to ensure that construction projects successfully meet deadlines set forth in project directives. Additionally, managers must ensure conformance to safety and environmental-protection standards. The basic management phases as discussed in FM 5-412 are—

- Planning.
- Organizing.
- Staffing.
- Directing.
- Controlling.
- Executing.

### **EQUIPMENT SELECTION**

1-2. Proper equipment selection is crucial to achieving efficient earthmoving and construction operations. Consider the machine's operational capabilities and equipment availability when selecting a machine for a particular task. The manager should visualize how best to employ the available equipment based on soil considerations, zone of operation, and project-specific requirements. Equipment production-estimating procedures discussed in this manual help quantify equipment productivity.

### **PRODUCTION ESTIMATES**

1-3. Production estimates, production control, and production records are the basis for management decisions. Therefore, it is helpful to have a common method of recording, directing, and reporting production. (Refer to specific,