Introduction

This report provides documentation for an Excel workbook named "Retaining Wall Stability 2.05," which was developed by the Center for Geotechnical Practice and Research (CGPR) in the Department of Civil and Environmental Engineering at Virginia Tech. The first version of the workbook was developed for Virginia Tech classes by Mike Duncan and Robert Mokwa in 1998. The current version, which involves several new features and refinements, was developed in 2002 by Mike Duncan and Bingzhi Yang, with support from the CGPR.

The following sections of the report describe the features of the workbook, suggest how it can be used efficiently, and describe the methods of analysis and assumptions it employs. The symbols and equations used in the spreadsheet are listed in the appendices.

Features

The Retaining Wall Stability 2.05 Workbook includes 3 worksheets:

1. Retaining Wall Stability Computation Sheet 2.05 (see Figure 1).
2. Bearing Capacity Computation Sheet for Granular Soils 1.00 (See Figure 2).
3. Bearing Capacity Computation Sheet for Cohesive Soils 1.00 (See Figure 3).

As can be seen at the bottom of Figure 1, the retaining wall stability spreadsheet computes the factor of safety against sliding, the position of the resultant on the base, and the factor of safety against overturning around the toe of the wall. It also computes stem thickness and footing thickness based on structural requirements (these are advisory, not intended for structural design), and the volume of concrete per foot of wall, which provides an approximate indication of wall cost.

As can be seen at the left side of Figures 2 and 3, the bearing capacity worksheets use data transferred from the wall stability worksheet to compute bearing capacity factors of safety for retaining walls founded on granular or cohesive materials. As shown at the right sides of Figures 2 and 3, these bearing capacity worksheets can also be used, with values input directly into the sheets, to calculate bearing capacity factors of safety for other footings subjected to eccentric and inclined loads.

Suggestions for Use

Because the spreadsheets show computed results as quickly as data is entered, they can be used efficiently to determine wall dimensions that satisfy requirements with regard to safety against sliding, bearing capacity and overturning. A procedure for using the spreadsheets is shown in Figure 4. Initial estimates of wall dimensions are entered, along with values of soil properties and surcharge loads. If the computed factors of safety are found not to be acceptable, the dimensions of the wall can be adjusted to achieve stability. Possible modifications include changing the width of the base (B), changing the position of the stem on the base (b_t), changing stem and footing thickness, adding a key, or changing the depth of the key (D_k).