

**Objective**

This assignment aims to develop an analysis tool to complement your reinforced concrete beam design project and to compute the cost-adjusted SWR from the beam data collected in the first week of Project #2.

Write a spreadsheet to determine the mix proportions using the ACI method for non-air-entrained and air-entrained concrete. Write your spreadsheet so that the user can enter values for the design variables (the maximum aggregate size, the desired slump, and the 28-day compressive strength) and for material constants (e.g., specific gravity, dry-rodded unit weight, absorption capacity, and fineness modulus). Use the VLOOKUP function to search the data tables by rows and the MATCH function to select the appropriate column. Click here for the Excel lookup function notes.

**Part 1.** Compute the mix design for an interior column. The 28-day compressive strength should be 6,000 psi. The slump should be between 1 and 2 inches, and the maximum aggregate size should not exceed 1.5 inches. The properties of the materials are as follows:

Cement: Type I, specific gravity = 3.15

Coarse Aggregate: Bulk specific gravity (SSD) = 2.65  
dry-rodded unit weight = 96 lb/ft<sup>3</sup>  
absorption capacity = 0.5%  
surface moisture = -0.5%

Fine Aggregate: Bulk specific gravity (SSD) = 2.60  
fineness modulus = 2.70  
absorption capacity = 1.1%  
surface moisture = 1.5%

**Part 2.** Compute the mix design for an exterior column under extreme freeze-and-thaw conditions. The 28-day compressive strength should be 5,000 psi. The slump should be between 1 and 2 inches, and the maximum aggregate size should not exceed 1 inch. The properties of the materials are as follows:

Cement: Type I, specific gravity = 3.15

Coarse Aggregate: Bulk specific gravity (SSD) = 2.65  
dry-rodded unit weight = 96 lb/ft<sup>3</sup>  
absorption capacity = 0.5%  
surface moisture = 0.5%

Fine Aggregate: Bulk specific gravity (SSD) = 2.60  
fineness modulus = 2.70  
absorption capacity = 1.1%  
surface moisture = 1.0%

**Part 3.** Read Chapters 11 and 12 in "*A Mind for Numbers*" by Barbara Oakley.