

Civil Engineer Examination

Engineering Surveying Test Plan

Effective January 2018

Definition of Engineering Surveying

Engineering Surveying is defined as those activities involved in the practice and application of surveying principles for the location, design, construction and maintenance and operation of engineered projects.

This area of practice is structured into four primary content areas:

- I.** Topographic Surveys (35%)
- II.** Construction Surveys (35%)
- III.** Accuracy and Error Analysis (10%)
- IV.** Preparation of Reports and Maps (20%)

BPELSG Civil Engineering: Engineering Surveying (CES) Test Plan -2017	
	Percentage of Questions on the Exam
I. Topographic surveys <u>Professional Activities:</u> 1. Distinguish the purposes and procedures of topographic surveys 2. Use of datums for horizontal and vertical control 3. Perform the measurement of elevations 4. Perform leveling calculations from field data to determine elevations	35%
Test questions on these professional activities may include one or more of the following:	
A. Control surveys (purpose and procedures)	
B. Route surveys (horizontal and vertical alignment)	
C. Topographic surveys (e.g., surface and underground)	
D. Leveling Methods (e.g., differential, trigonometric)	
E. Horizontal and vertical datums	
F. Aerial photogrammetry	
II. Construction surveys <u>Professional Activities:</u> 1. Distinguish the purposes and procedures of construction surveys 2. Perform the measurement of horizontal distances 3. Perform the measurement of angles 4. Perform traverse survey calculations 5. Determine potential construction conflicts (e.g., utilities, existing/proposed structures, substructures) 6. Apply construction surveying methods and procedures (e.g., construction staking)	35%
Test questions on these professional activities may include one or more of the following:	
A. Horizontal and vertical control layout	
B. Procedures for establishing points on a line (horizontal and vertical)	
C. Procedures for locating a single point	
D. Calculating and setting horizontal, slope, and vertical distances	
E. Measuring horizontal angles (e.g., azimuths, bearings, backbearings, deflections)	
F. Calculating and setting horizontal curves (e.g., radius, curve length, tangent)	
G. Calculating and setting vertical curves (e.g., high/low point, intermediate point, rate of grade)	

H. Calculating and setting compound and reverse curves	
I. The relationship between grade lines and cross-sections	
J. Alignment and grade layout (e.g., street and utilities)	
K. Determining vertical distances and interference (e.g., plan and profile, cross-sections)	
L. Calculating offset distances	
M. Construction staking procedures (e.g., stationing, stake marking)	
III. Accuracy and Error Analysis	10%
<u>Professional Activities</u> 1. Identify accuracy requirements for maps 2. Identify accuracy requirements and limitations for measured survey data	
Test questions on these professional activities may include one or more of the following:	
A. Purpose and application of surveying equipment (e.g., total station, level, GPS, EDM)	
B. Equipment errors (e.g., temperature and tension corrections)	
C. Calculating error analysis (e.g., curvature and refraction, random and systematic errors)	
D. Error of closure (e.g., horizontal and vertical)	
E. Datum adjustments	
F. Map accuracy standards	
IV. Preparation of Reports and Maps	20%
<u>Professional Activities:</u> 1. Perform reduction of field data 2. Perform calculations to determine quantities of construction materials 3. Prepare topographic and planimetric maps 4. Interpret maps 5. Perform rectangular coordinate system calculations	
Test questions on these professional activities may include one or more of the following:	
A. Creating and checking level notes	
B. Calculating areas	
C. Calculating volumes (e.g., interpolating cut and fill)	
D. Interpolating elevations from topographic data	
E. Plotting topographical features from field information (e.g., contour intervals, fixed works, field points)	
F. Plotting profiles and cross-sections	
G. Map scales	
H. Applications of Geographic Information Systems (GIS)	