
Introduction

Preparing for the Exam

120 Solved Surveying Problems is designed to prepare you for the California Special Civil Engineer Examination in surveying. California is currently the only state that requires candidates for licensure as civil engineers to pass such an exam in addition to other registration requirements. Whether you enter into a program of self-study or of formal instruction, as suits your personal learning approach, there is no better way to increase your proficiency and improve your chances of passing this state exam than by solving practice problems.

Begin your exam preparation by reviewing a wide range of textbooks in this field. You'll need a solid understanding of the fundamentals and principles of engineering surveying. As others have found, excellent results come from studying *Surveying Principles for Civil Engineers* and *1001 Solved Surveying Fundamentals Problems*, both produced by Professional Publications. *120 Solved Surveying Problems* is designed to complement those references.

Next, make intensive problem-solving practice a key to your success. To bolster your preparedness, use *120 Solved Surveying Problems* to practice until you feel confident. Each problem in this book is fully worked-out and details the relevant points and essential steps for a successful solution. You can then simulate the exam experience using *Civil Surveying Sample Exams for the California Special Civil Engineer Examination*, which contains two complete 2½ hour practice tests.

After solving these problems, you will be better able to identify your strengths and weaknesses in all subject areas of the Engineering Surveying Test Plan, which will help you make an informed decision regarding further review and preparation for the California Special Civil Engineer Examination. When you concentrate on strengthening your weak areas, you will be far better prepared and will improve your performance on the official exam.

Engineers who have taken the civil surveying exam frequently comment that there is not enough time to

complete the questions. It is therefore imperative that you improve your problem-solving speed by becoming proficient in the use of a calculator—particularly with respect to computations involving angles. Angles, bearings, and distances are fundamental to virtually all survey applications. Unfortunately, most calculators do not easily handle degrees, minutes, and seconds, and the default angular unit is decimal degrees. You should make a point of learning the functions that enable rapid computation of trigonometric functions as well as addition, subtraction, and multiplication of angles directly in degrees, minutes, and seconds.

Pay special attention to the following topics, which are fundamental to surveying and form a necessary core of knowledge: coordinate geometry (COGO) functions (such as inverse, side shot, bearing-bearing intersection, traverse, areas), differential leveling, horizontal and vertical curves, earthwork volumes, and datums.

About the Exam

The California Special Civil Engineer Examination is given twice a year, in April and October. It tests the entry-level competency of a candidate to practice civil engineering within the profession's acceptable standards for public safety. This exam is open book and is administered over a 2½ hour period. The exam contains 50 multiple-choice problems derived from content areas as outlined in the board-adopted Engineering Surveying Test Plan and distributed as follows.

Equipment and Field Activities	20%
Field Measurements	10%
Calculations	40%
Office Procedures	30%

For each question, you will be asked to select the best answer from four choices. You'll record your answers on a machine-scorable answer sheet that will be provided to you when the exam is administered. Your calculations should be performed in the official test book, and they will not be credited or scored. Also, answers marked in

the official test book will not be scored, and additional time will not be permitted to transfer answers to the official machine-scorable answer sheet.

The point values of each exam question are printed in the official test booklet. Points are assigned depending on the significance, difficulty, and complexity of the question.

What to Take to the Exam

You should come to the exam prepared with the following materials. Be sure to set them out ahead of time and devise a convenient way to carry them into the examination room with you.

- admission notice
- photo ID
- reference materials (only as much as you can carry in one trip)
- non-QWERTY keyboard calculator (it must not have communicating or text-editing capability)
- spare calculator batteries
- scales
- triangles
- compass
- protractor

Test-Taking Strategy

The California Special Civil Engineer Examination in surveying is a difficult test and requires thorough preparation in all areas, including multiple-choice test-taking techniques. Easy and difficult questions, with variable point values, are distributed throughout the exam. Besides contending with the nature and difficulty of the exam itself, many examinees spend too much time on difficult problems and leave insufficient time to answer the easy ones. You should avoid this. The following system can be very beneficial to you.

step 1: Work on the easy questions immediately and record your answers on your official machine-scorable answer sheet.

step 2: Work on questions that require minimal calculations and record your answers on your official machine-scorable answer sheet.

step 3: When you get to a question that looks “impossible” to answer, mark a “?” next to it in your

official test booklet, and go ahead and guess. Mark your “guess” answer on your answer sheet and continue.

step 4: When you face a question that seems difficult but solvable, mark an “X” next to it in your official test booklet; you may need considerable time to search for relevant information in your books, references, or notes. Continue to the next question.

step 5: When you come to a question that is solvable but you know requires lengthy calculations or is time consuming, mark a “+” sign next to the question in your official test booklet. For this question, you know exactly where to look for relevant information in your books, references, or notes.

Based on the number of exam questions and allotted time, on the average you should not spend more than 2.5 minutes per question. Thus, a lengthy or “time-consuming” question is one that will take you more than 2 minutes and 30 seconds to answer. Quickly and confidently, decide whether a question should receive a “+” or an “X;” the intent of this test-taking strategy is to save you precious time.

After you have gone over the entire exam, your official test booklet will clearly show which questions you have already answered and those that still require your attention.

You should now go over the exam a second time, with the following approach in mind.

step 1: The best and most successful approach is to go back and tackle: (a) the “+” questions, (b) the “X” questions, and (c) the “?” questions. As you proceed, eliminate your pluses, Xs, and question marks.

step 2: Recheck your work for careless mistakes.

step 3: Set aside the last few minutes of your exam period to fill in a guess for any unanswered lines on your official machine-scorable answer sheet. There is no penalty for guessing. Only questions answered correctly will be counted toward your score.

Exam Scoring

For the California Special Civil Engineer Examination in surveying, the board-adopted test plan lists the content areas of the exam and their assigned scoring percentages. The percentages assigned to each content area

are the approximate proportion of total test points; however, the test plan does not reveal the total test points in advance (it varies from exam to exam). This makes it difficult to anticipate the exact number of problems for each content area of the exam.

The official exam is graded against a “cut score”—a predetermined minimum passing score that varies from exam to exam. Historically, if you score above 60% of the total examination point value, you have a chance of passing.

On the official exam, after initial scoring, any problem that the board finds to be flawed may be deleted. In the event of deletion, the point value of the deleted problem becomes zero and the total number of points possible on that exam is adjusted accordingly.