



Study Guide for Substation Operator

Test Number: 2866

Human Resources
Performance Assessment Services
Southern California Edison
An Edison International Company

REV100110

Introduction

The **Substation Operator Test 2866** is a job knowledge test designed to cover the major knowledge areas necessary to perform the job. This Guide contains strategies to use for taking tests and a study outline, which includes knowledge categories, major job activities, and study references.

Test Session

It is important that you follow the directions of the Test Administrator exactly. If you have any questions about the testing session, be sure to ask the Test Administrator before the testing begins. During testing, you may **NOT** leave the room, talk, smoke, eat, or drink. Since some tests take several hours, you should consider these factors before the test begins.

All cellular/mobile phones, pagers or other electronic equipment will NOT be allowed in the testing area.

All questions on this test are multiple-choice or hot spot questions. Multiple choice questions have four possible answers. Hot spot questions have a picture, and you must click the correct spot on the picture to answer the question. All knowledge tests will be taken on the computer. For more information on this, please see the next section of this study guide on *Computer Based Testing*.

- **The test has a three hour time limit.**
- **No test aids are allowed.**

You will receive a Test Comment form so that you can make comments about test questions. Write any comments you have and turn it in with your test when you are done.

Study Guide Feedback

At the end of this Guide you have been provided with a Study Guide Feedback page. If a procedure or policy has changed, making any part of this Guide incorrect, your feedback would be appreciated so that corrections can be made.

Computer Based Testing

Taking an SCE knowledge test on the computer is simple. You do not need any computer experience or typing skills. You will only use the keyboard to enter your candidate ID and password. You'll answer all questions by pressing a single button on the mouse.

Log in Screen

You will be seated at a testing station. When you are seated, the computer will prompt you to enter the candidate ID and password you received in your invitation e-mail. You **MUST** have your candidate ID and password or you will be unable to take the test. Once you have confirmed your identity by entering this information, you will see a list of tests available to you.

Sample/Tutorial

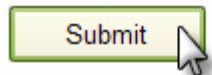
Before you start your actual test, a Sample/Tutorial Test is provided to help you become familiar with the computer and the mouse. From the list of exams that appear when you complete the log in, you will select Sample/Tutorial. You will have up to 10 minutes to take the Sample/Tutorial Test. The time you spend on this Sample Test does **NOT** count toward your examination time. Sample questions are included so that you may practice answering questions. In the Sample/Tutorial Test, you will get feedback on your answers. You will not receive feedback on your actual test.

Example

During the test, you may see several different types of items. Many of the questions will be multiple choice items. A few items will be pictures, where you'll have to click the spot on the picture that answers the question. Those picture questions are known as "Hot Spot" questions. More information on each type is below.

Overall Test Information

- When you begin the test, you can see the total time allowed for completion displayed at the top of the screen. You can scroll up to see that information at any time during the test.
- You can change your answers at any time during the test until the time runs out, or you click the "Submit" button. Once you click Submit, you can not change your answers.



Multiple Choice Questions

To answer each multiple choice question, you should move the mouse pointer over the circle (radio button) next to the answer of your choice, and click the left mouse button.

A sample is shown below:

1. In order to answer each question, first read the question and determine the response that best answers the question. Put the mouse pointer directly over the circle corresponding to that response.



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Time remaining: 29:54

Sample

Please select the best answer for each question below. If you have any comments, please record them on the Test Comments form given to you by the Test Administrator. Good luck!

1 of 13

Two resistors of 20 ohms each are connected in series. The total resistance of the circuit is ____ ohms.

a. 10

b. 20

c. 30

d. 40

2. While the pointer is over the circle corresponding to the best answer, click the left mouse button.



Click the left button when the pointer icon is over your answer choice.

3. The answer you selected should now have a green dot in the circle. If you need to select an alternate answer, simply move the pointer over that circle, and click again.



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Time remaining: 28:59

Sample

Please select the best answer for each question below. If you have any comments, please record them on the Test Comments form given to you by the Test Administrator. Good luck!

1 of 13

Two resistors of 20 ohms each are connected in series. The total resistance of the circuit is ____ ohms.

a. 10

b. 20

c. 30

d. 40

Hot Spot Questions

To answer each Hot Spot question, you should move the mouse pointer over the part of the image that best answers the question, and click the left mouse button. You will see a pointer appear in that spot. If you want to change your answer, simply move the mouse pointer to a new area on the picture and click again. The pointer will move to the new spot.

A sample is shown below:

1. In order to answer each question, first read the question and determine the place on the image that best answers the question. The pointer that will indicate your answer can always be seen in the bottom left of the image. It looks like this:



Put the mouse pointer directly over the spot on the image you want to select, and click the left mouse button.


The screenshot shows a web portal interface. At the top left, it says "1 of 8". Below that is the question: "On the screen below, where would you click to find out how much vacation time you have left?". The main content area is titled "About Me" and features a photo of a woman. Below the photo is a welcome message: "Welcome to the 'About Me' section". A text box below the photo says: "'About Me' has information about your benefits, programs that help you in your work and/or home life and more. Click on the links below to access the various areas." Below this is an "About Me Map" section with four links: "Overview", "Career & Jobs", "Pay", and "Time & Attendance". A red arrow points from a text box "Pointer starts out at the bottom left of the image." to a small black dot in the bottom left corner of the map. Another red arrow points from a text box "Place the mouse pointer on the spot you want to select, then click on the left button." to a mouse cursor hovering over the "Time & Attendance" link.

2. The pointer will move from the bottom left of the image and appear over the spot you selected.

1 of 8

On the screen below, where would you click to find out how much vacation time you have left?





About Me



Welcome to the "About Me" section

"About Me" has information about your benefits, programs that help you in your work and/or home life and more. Click on the links below to access the various areas.

About Me Map

 Overview An Overview of what's contained in this section of the Portal	 Career & Jobs Find out about career information and opportunities at Edison International.
 Pay Find information about base pay, job descriptions, Results Sharing, and recognition awards here.	 Time & Attendance Use this section to complete and submit your timesheet for approval, or to view your time-off balances and time

The pointer now appears over the correct answer.

3. To change your answer, simply move the mouse pointer to the new spot, and click again. The pointer graphic will move to the new spot you've selected. In order for your answer to be considered correct, the center of the pointer (•) must be over the correct spot on the graphic.

Test Taking Strategies

Introduction

The **Substation Operator Test 2866** contains multiple-choice questions and may also contain hot spot questions. The purpose of this section is to help you to identify some special features of a multiple-choice test and to suggest techniques for you to use when taking one.

Your emotional and physical state during the test may determine whether you are prepared to do your best. The following list provides common sense techniques you can use before the test begins.

Technique	Remarks
<i>Be confident</i>	<ul style="list-style-type: none"> - If you feel confident about passing the test, you may lose some of your anxiety. - Think of the test as a way of demonstrating how much you know, the skills you can apply, the problems you can solve, and your good judgment capabilities.
<i>Be punctual</i>	<ul style="list-style-type: none"> - Arrive early enough to feel relaxed and comfortable before the test begins.
<i>Concentrate</i>	<ul style="list-style-type: none"> - Try to block out all distractions and concentrate only on the test. You will not only finish faster but you will reduce your chances of making careless mistakes. - If possible, select a seat away from others who might be distracting. - If lighting in the room is poor, sit under a light fixture. - If the test room becomes noisy or there are other distractions or irregularities, mention them to the Test Administrator immediately.
<i>Budget your times</i>	<ul style="list-style-type: none"> - Pace yourself carefully to ensure that you will have enough time to complete all items and review your answers.
<i>Read critically</i>	<ul style="list-style-type: none"> - Read all directions and questions carefully. - Even though the first or second answer choice looks good, be sure to read all the choices before selecting your answer.
<i>Make educated guesses</i>	<ul style="list-style-type: none"> - Make an educated guess if you do not know the answer or if you are unsure of it.

- Changing answers*
- If you need to change an answer, be sure to erase your previous answer completely. On the computer, be sure that the new answer is selected instead of the old one.
- Return to difficult questions*
- If particular questions seem difficult to understand, make a note of them, continue with the test and return to them later.
- Double-check math calculations*
- Use scratch paper to double check your mathematical calculations.
- Review*
- If time permits, review your answers.
 - Do the questions you skipped previously.
 - Make sure each answer bubble is completely filled in. Erase any stray marks on your answer sheet. When testing on the computer, make sure each multiple choice question has a green dot next to the correct answer.

Remember the techniques described in this section are only suggestions. You should follow the test taking methods that work best for you.

Job Knowledge Categories and Study References

Below are the major job knowledge areas (topics) covered on the **Substation Operator Test 2866** and the associated study references. Listed next to each knowledge category is the number of items on the exam that will measure that topic. You can use this information to guide your studying. Some exams also contain additional pretest items. Pretest items will appear just like all of the other items on your exam, but they will not affect your score. They are an essential part of ensuring the **Substation Operator Test 2866** remains relevant to successful performance of the job.

There are a total of 92 items on the **Substation Operator Test 2866** and the passing score is 70%. This score was determined during the test validation process.

A. Fundamentals (4 items)

Includes knowledge of AC and DC electrical theory, applied electronics such as SAS, SDCRS, SKBU, and HMI/MMI physical and mechanical theory and applied math. Knowledge of substation equipments basic construction and operation. Knowledge of the types, function, and operation of switching center computer equipment, software and application of communication equipment. Knowledge of how to test and operate communication equipment such as PMA, PM2, and RCL.

B. Automatic Substations (7 items)

Knowledge of the operation and function of various types of automatic substations.

C. Prints and Diagrams (5 items)

Includes knowledge of types of schematics and diagrams. Knowledge of applications and symbology and ability to read and interpret of DC schematics, single line diagrams, SAS menu trees, block and logic flow diagrams.

D. Switching Devices (2 items)

Includes knowledge of the function, operation and rating of the types of substation switching devices, field switching devices, and reclosers. Knowledge of the procedures and practices for operating substation devices, field switching devices, and operating reclosers. Knowledge of how to inspect Circuit Breaker (CB): operating mechanism, bushings, terminals, oil levels, gas/air pressures, and disconnects. Knowledge of how to record counters and pressures for all types of CBs. Knowledge of how to operate disconnects, and CBs. Knowledge of how to perform routine test of delta breaker.

E. Transformers and Regulators (7 items)

Includes knowledge of types of transformers and regulators, function, operation and ratings. Knowledge of the procedures and practices for transformer loading and regulator operation. Ability to inspect transformer nitrogen system, pressure relief devices, pressure monitoring devices, cooling system, and regulators.

F. Voltage Control Equipment (7 items)

Includes knowledge of the function, operation and ratings of voltage control equipment, capacitors, and regulators. Knowledge of the procedures and requirements for operating regulators and capacitors. Knowledge of how to inspect and record details on appropriate form, capacitors, and regulators. Knowledge of how to bypass regulators and switch capacitors.

G. Substation Instrumentation and Alarms (4 items)

Includes knowledge of types of substation instrumentation, function, operation, and ratings. Knowledge of the effects of PTs and CTs on switching/outages. Knowledge of the function and ratios of PTs and CTs. Knowledge of types of alarms, categories, priorities, and equipment processing. Knowledge and application of procedures and requirements for testing alarms and annunciators and obtaining peak readings.

H. Auxiliary Substation Equipment (4 items)

Includes knowledge of various types of auxiliary substation equipment. Knowledge of procedures and requirements pertaining to auxiliary substation equipment. Ability to inspect auxiliary substation equipment.

I. System Protection (13 items)

Includes knowledge of the function, operation and settings of all types of protective relays. Knowledge of the procedures and requirements of making protective relays solid/automatic. Knowledge of how to inspect, record and reset protective relays. Knowledge of how to read and perform initial assessment of relay targets and analyze relay target information.

J. Normal Operations (10 items)

Includes knowledge of the responsibilities and authorities of SCE personnel. Knowledge of the SCE switching centers jurisdiction and the effects of SCE business goals/priorities on the power system operation. Knowledge of the procedures and requirements to: sectionalize and isolate sections of the power system, perform substation inspections, making parallels, and bypassing regulators and CBs. Knowledge of the application of planned loading limits. Knowledge of how to: sectionalize sections of power system, isolate sections of power system, interpret historical data, and recognize power flow system conditions.

K. Switching, Tagging, and Clearances (15 items)

Includes knowledge of the types and applications of switching orders and requests and switching techniques. Knowledge of the procedures and requirements for: clearances, tags, and warning blocks; isolating and grounding substation equipment; creating/checking switching programs; and issuing switching procedures. Knowledge of the procedures and practices for processing switching programs. Knowledge of how to analyze the impact of planned switching on the power system. Knowledge of how to: identify clearance boundaries, potential hazards, and inspect equipment to be operated. Knowledge of how to record MW, amps, and voltage readings, tap positions or equipment settings. Knowledge of how to positively identify each device before operating/isolating and grounding substation equipment. Knowledge of how to check parallels, recognize abnormal situations, issue/release clearances, coordinate switching and confirm operation of equipment as expected. Knowledge of how to perform a final check after completion of switching and tagging activities and verify that equipment has been properly isolated and grounded.

L. Emergency and Abnormal Operations (5 items)

Knowledge of the procedures and practices for analyzing and responding to alarms, DC system emergencies, and tracking brush fire areas. Knowledge of how to recognize abnormal conditions while performing station inspections and identify the cause of an emergency or abnormal condition. Knowledge of how to troubleshoot and analyze emergency situations using diagrams, manuals, etc. Knowledge of how to develop emergency switching programs without direction and take station to one source line.

M. Logging and Documentation (9 items)

Knowledge of the procedures and requirements for recording station inspections, performing substation inspections and recording results on appropriate form. Knowledge of logging interruption events, completing month end reports, peak readings, and replacing log books when necessary. Knowledge of how to record, issue and release clearances, station readings, station inspections in station log book, month end peak/bank readings, counters, etc.. Knowledge of recording switching in station log book, entry/exit times and purpose of visit in station log book. Knowledge of how to enter month end reports and peak readings into SDCRS.

STUDY REFERENCES FOR SUBSTATION OPERATOR TEST 2866

SOB No.	SOM (Substation Ops & Mtnc Policy & Proc) Section	Operators Manual Section	APM (Accident Prevention Manual) Section
		✓ 1.5	
		✓ 1.7	
		✓ 2.2	
✓ 6		✓ 2.3	
✓ 15		✓ 2.5	
✓ 17		✓ 2.7	
✓ 26		✓ Section 3 (entirely)	
✓ 33	✓ E-2	✓ 4.1	
✓ 41	✓ G-2	✓ 4.3	
✓ 50	✓ G-3	✓ 4.4	
✓ 130	✓ G-5	✓ 4.5	✓ Policy Section
✓ 131	✓ G-6	✓ 4.6	✓ 100 Section (General)
✓ 132	✓ G-9	✓ 4.7	✓ 400 Section (Substations)
✓ 133	✓ O-1	✓ 4.8	✓ 700 Section (Switching and Clearances)
✓ 301	✓ O-2	✓ 5.5	
✓ 305	✓ O-3	✓ 5.6	
✓ 309	✓ O-6	✓ 5.7	
✓ 322	✓ O-7	✓ 6.1	
✓ 1003		✓ 6.2	
✓ 1004		✓ 6.3	
✓ 1006		✓ 6.4	
✓ 1025		✓ 6.5	
		✓ 6.7	
		✓ 6.9	
		✓ 6.10	
		✓ 7.1	

Sample Questions

The following sample questions should give you some idea of the form the test will take.

1. Which relay type is made solid when clearing its associated line CB?
 - a. KD
 - b. Cey
 - c. HCB
 - d. None of the above

2. Corrections made to an unattended station log book are?
 - a. made only in red ink.
 - b. made only in blue ink
 - c. crossed out with a single line and initialed.
 - d. erased thoroughly and corrected.

3. Clearances on equipment at an unattended station may only be issued to a qualified person by:
 - a. the Switching Center having jurisdiction
 - b. the Acting Operator
 - c. the System Operator
 - d. the GCC

4. What are the two categories that DC load is divided into?
 - a. DC load and Non-DC load
 - b. Critical and non-critical load
 - c. Battery feed and Charger feed
 - d. Station Light and Power and all other station load

Sample Question Answers

1. D

2. C

3. B

4. B

Study Guide Feedback

Please use this page to notify us of any changes in policies, procedures, or materials affecting this guide. Once completed, return to:

Southern California Edison
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Rosemead, CA 91770

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