

**Information Guide  
for  
CONTROL OPERATOR**

**Test No. 2467**

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

REV0309

## Introduction

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

## Test Scheduling

Employees who apply for positions, bids, and transfers requiring testing before March 9, 2009, will be scheduled for testing by their Supervisor through Human Resources. For those who apply after March 9, 2009, both the employee and their Supervisor will be notified of a scheduled test date by Human Resources. Test times and dates for positions requiring testing will be specified in the bid/transfer/requisition/job posting. Employees should be prepared to test on the specified dates. Only employees who apply for positions requiring testing, and who meet basic qualifications, will be invited to test. Applicants will be scheduled through the recruiter. If you have any questions, please call 626-302-9830.

## 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 questions on this test are multiple-choice with four possible answers. Prior to March 9, 2009, your answers to the questions are indicated by filling in a circle on an answer sheet with a special mark-sense pencil. For your answers to be read accurately by the scanner, you must fill in the circles completely and erase completely any answer you wish to change. After March 9, 2009 you will take the exam on a computer. For more information on this, please see the next section of this study guide, Computer Based Testing.

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.

## Test Aids

You are allowed to use a non-programmable scientific calculator for the Control Operator Test.

**Calculators will be provided by the Test Administrator, and will be one of the following three models: Casio fx-250HC, Texas Instruments TI-30XA, TI 36-X.**

## Information Guide Feedback

At the end of this *Guide* you have been provided with an Information 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

**Effective March 9, 2009, all knowledge tests will be administered on the computer. This information will help prepare you for a knowledge test taken on or after March 9, 2009.**

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.

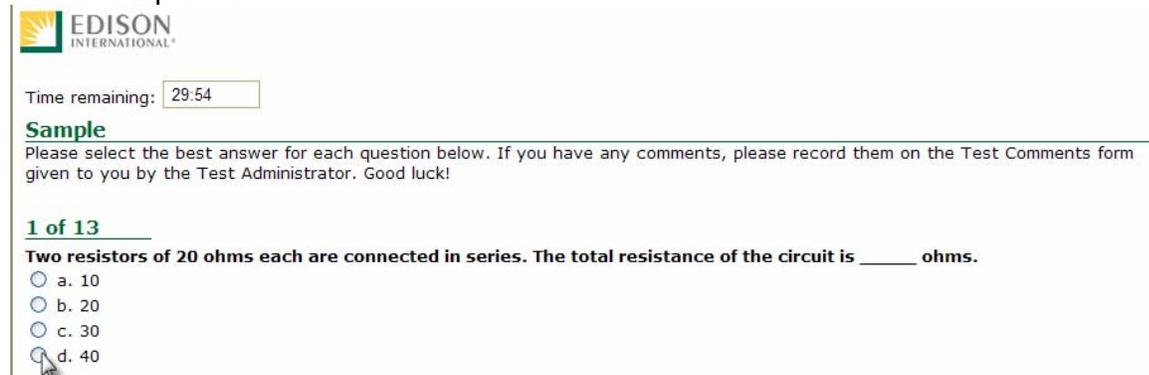
### Sample/Tutorial

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, to answer each 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. The amount of time you have remaining to take the test will always be shown in the top left corner of the screen. A sample is shown below:

1. 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.
2. 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.



The screenshot shows the Edison International test interface. At the top left is the Edison International logo. Below it is a timer showing "Time remaining: 29:54". A horizontal line separates the header from the main content. Below the line, the word "Sample" is written in green. Underneath, a message reads: "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!". Below this is the question number "1 of 13" in green. The question text is: "Two resistors of 20 ohms each are connected in series. The total resistance of the circuit is \_\_\_\_\_ ohms." Below the question are four radio button options: a. 10, b. 20, c. 30, and d. 40. A mouse cursor is pointing at option d.

3. 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.

- 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.



Time remaining:

### 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

- You can change your answers at any time during the test until the time runs out, or you click the "Submit" button.



# Test Taking Strategies

## Introduction

The Control Operator Test contains multiple-choice 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

*Be confident*

- 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.

*Be punctual*

- Arrive early enough to feel relaxed and comfortable before the test begins.

*Concentrate*

- 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*.

*Budget your time*

- You are allowed three hours to complete the test.
- Pace yourself carefully to ensure that you will have enough time to complete all items and review your answers.

*Read critically*

- 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.

*Make educated guesses*

- 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.

*Doublecheck mathematical 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 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

*Below are the major job knowledge categories that are covered on the Control Operator Test.*

## **A. Electrical, Mechanical, and Steam Operation**

Includes AC/DC theory, single line and elementary diagrams, piping and instrumentation drawings (P&IDs), electrical symbols, use of basic electrical test instruments (e.g., multimeter), terminology, basic math (e.g., multiplication, division), general principles of physics and water chemistry including thermal dynamics and fluid flow. Electrical transmission and the generating system operations including alternate and parallel routes, system power demand, generator output, and the total effect of changes in system operation on KVA output.

## **B. Inspection Criteria and Equipment Function and Terminology**

Standards of physical equipment integrity, instrumentation for operational checks and regulations and restrictions that apply to steam plant and combustion turbine operation specifically in the areas of steam turbine, combustion turbine and heat recovery steam generator (HRSG) start up, shut down and loading procedures. Knowledge related to purpose and function of steam plant equipment and electrical generation equipment as it relates to electrical generator loading following the manufacturer's recommended capability curve and the Grid Control Center VAR (voltage) schedule.

## **C. Emergency and Standard Operating Procedures**

Procedures established for normal routine operation and emergency situations as set forth in standard station orders and operating instructions used for monitoring and diagnosing turbine-generator operation and the control and safe operation of high pressure power plant boilers. Includes knowledge of steam plant and electrical transmission operating procedures.

## **D. Safety and Clearance Procedures**

First aid, firefighting, accident prevention programs, and methods of switching and clearing equipment and operating components. Knowledge of environmental rules and regulations and their application to power plant operation. Lockout/Tagout-Work Authorizations Cal/OSHA CCR Title 8 Section 3314 and Fed/OSHA Regulations Standard 29 CFR Section 1910.147. Accident Prevention Cal/OSHA General Industry Sections (3200-6184).

# Job Activities

*Below are the major job activities covered on the Control Operator Test.*

## 1. Maintenance

- Receives orders from and transmits data to Grid Operations Center and Switching Center for clearance of circuits and equipment for operation and maintenance of station generating and substation equipment. Performs remote control switching, tags controls to show equipment status, issues step-by-step disconnect switching orders and transmits clearances on equipment to work party, in accordance with operations. Performs functions of other Plant Operating personnel as required, including manual operation valves, pumps, dampers and other equipment as necessary. Operates remote controls for starting, stopping, actuating or regulating compressors, pumps, circulating water system, soot blowers, draft fans, air preheaters, fuel systems, 500kv and lower voltage switchgear, excitation and voltage regulation equipment, automatic boiler burner control and combustion control systems, communication equipment, feedwater conditioning and water quality monitoring, and other equipment arranged for remote operation from the control room. Analyzes data to help identify maintenance or regulatory compliance problems in the plant (e.g., CEMS equipment, hazardous waste). Performs general cleaning and housekeeping as necessary.

## 2. Monitoring/Troubleshooting

- Inspects the recording and indicating instruments on centralized control room panels and consoles. Inspects equipment and performs local inspection and operations outside of Control Room as necessary. Observes instruments to note abnormal operating conditions indicating possible system or station trouble and determines nature and cause of trouble from evidence available and takes appropriate corrective action. Performs safety inspections.

### 3. Operations

- Controls and directs loading of generators. Determines operating status of station equipment from previous shift personnel and log book entries. Directs the operation of equipment for starting, stopping, or regulating boiler-turbine generator units and auxiliary equipment. Assists, instructs, and trains other personnel as required. Directly administers the Work Authorization process following safety and environmental regulations, policies, and procedures that apply to the work site.

### 4. Documentation

- Maintains chronological logbook record of operations, maintenance, and other activities that affect the plant. Compiles records and reports.

## Study References

*The following books may be purchased by accessing the internet's various book sellers or at a local technical book dealer or used book store.*

- Combined Cycle Gas, Steam Turbine Power Plants, Second Edition  
By: Rolf Kehlhofer
- The Control of Boilers  
By: Sam Dukelow
- TPC Training Systems: Electrical Systems  
Series 201-210
- Monitoring and Diagnosis of Turbine-Driven Generators  
By: Avelino J. Gonzalez
- High Pressure Boilers, Second Edition  
By: Frederick M. Steingress and Harold J. Frost
- Electricity One-Seven, Revised Third Edition  
By: Harry Mileaf
- Physics The Easy Way, Third Edition  
By: Robert L. Lehrman
- Math The Easy Way, Third Edition  
By: Anthony Prindle and Katie Prindle
- Electric Machines, Drive, and Power Systems, Fifth Edition  
By: Theodore Wildi

*The following reference material requires Internet Access.*

- General Electric Steam Turbines for Combined Cycle, Conventional Fossil and Nuclear Electric Power Production  
From Google type: G.E. Steam Turbines  
Click on the link: "G.E. Power Systems Steam Turbines"
- Combustion Turbines and How They Work  
From Google type: Combustion Turbines and How They Work  
Click on the link: "How Gas Turbine Engines Work"  
Click on and review additional links on this website

- Nitrogen Oxides NOx Emission Reduction Systems  
From Google type: “Selective Catalytic Reduction”  
Click on and review the many links on this website
- Lockout/Tagout-Work Authorizations  
California Occupational Safety and Health Administration  
From Google type: [www.dir.ca.gov](http://www.dir.ca.gov)  
Click on the link: Department of Industrial Relations Home Page  
Click Regulations  
Click on CAL/OSHA  
Enter Query: Title 8 Section 3314  
Click Search  
Click on: CCR Title 8 Section 3314  
This brings up 3314, Cleaning, Repairing, Servicing and Adjusting Prime Movers, Machinery and Equipment.  
Click on and review the many links on this website
- Lockout/Tagout-Work Authorizations  
US Department of Labor  
Occupational Safety and Health Administration  
From Google type: [www.osha.gov](http://www.osha.gov)  
Click on the link: Occupational Safety and Health Administration Home Page  
On the Fed/OSHA mission statement page type “Lockout/Tagout” in the search window and click “go”.  
In the Document Section type: Lockout/Tagout  
In the Title Section type: 1910.147  
Limit search to Regulations Standards 29 CFR only  
Click on the above link.  
Listing appears 1910.147 The Control of Hazardous Energy (Lockout/Tagout)  
Open Document: The Control of Hazardous Energy (Lockout/Tagout) 1910.147.  
View and research other links on this website.
- Hazardous Waste  
US Environmental Protection Agency-EPA.  
From Google type: Hazardous Waste.  
Click on the link: Wastes: Hazardous Waste, Subtitle C of RCRA (Resource Conservation and Recovery Act).  
Review related links on this website.
- Waste Minimization  
From Google type: <http://www.epa.gov/wastemin/>  
Click on link: Minimization-Home Page  
Welcome to the National Waste Minimization Program link will appear.  
Review related links on this website.
- Accident Prevention

From Google type: [www.dir.ca.gov](http://www.dir.ca.gov)

Click on link: California Department of Industrial Relations-Home Page.

Click on regulations

Click on Cal/OSHA

In the query section type: Accident Prevention

Limit search: General Industry Sections (3200-6184)

Review related links on this website.

- Fire Protection

From Google type: [www.dir.ca.gov](http://www.dir.ca.gov)

Click on link: California Department of Industrial Relations-Home Page

Welcome to California-The Department of Industrial relations will appear.

Click on Regulations

Click on Cal/OSHA

In the query section type: Fire Protection

Limit search to: General Industry (Sections 3200-6184)

Review related links on this website.

