

# TECHNICAL TRAINING SOLUTIONS

ELECTRICAL COURSES

INSTRUMENTATION COURSES

MECHANICAL COURSES



**City & Guilds**  
Approved Centre

## C&G 2391

# ELECTRICAL INSPECTION AND TESTING

COURSE 340: 4.5 DAYS: Max 8 Candidates

Aimed at electrical personnel who either carry out or supervise the testing and inspection of installations, this course is designed for candidates who require the City & Guilds 2391 qualification. Most importantly, participants gain the skills and knowledge necessary to actually perform the inspection and testing procedures. The course also satisfies the NICEIC & ECA requirements for Qualified Supervisor status. The course incorporates a practical assessment and a theory examination.

## PARTICIPANTS

Prospective candidates should have recently completed the IET Wiring Regulations (City & Guilds 2382) qualification, course 310.

## COURSE PRESENTATION

The emphasis is on achieving success and Technical Training pride themselves on their success rate in the examinations. Participants are able to practice on purpose-built training rigs of simulated electrical installations. Full course documentation is provided.

### PRACTICAL

During the course, candidates learn how to inspect and test using training rigs that simulate real electrical installations, using the test equipment provided or their own.

Candidates then complete the C&G practical assessment.

### THEORY

During the course, candidates learn about the complex background technical information concerning the many issues associated with inspection and testing. Many practical examples of the types of questions that might come up in the examination are provided and advice on how these should be answered is provided.

Candidates then complete the C&G theory examination.

**Successful completion of the course leads to the Level 3 City & Guilds 2391-52 - Initial & Periodic Inspection and Testing of Electrical Installations**

# What do candidates on the 2391 Electrical Inspection and Testing courses actually do?

## PRACTICAL INSPECTION AND TESTING

We begin by looking at how electrical installations should be visually inspected, bearing in mind the type of inspection (minor works, periodic, or initial verification) required. Candidates are provided with course notes to guide them. Candidates go through the long list of inspection items that should be checked, practicing this on demonstration boards that we have specially designed for the course.



**One of the simulated electrical installations used on the course**

The course then looks at the required testing, and again we have specially designed practice boards that the candidates perform the testing on. These boards are also used for the live tests.



**One of the simulated electrical installations used on the course**

In order to perform the tests we use a range of industrial test instruments. To begin with we prefer individual test instruments for the testing (rather than multifunction types) as we find the candidates get used to these more easily at this stage of their training.



**One of the continuity and insulation resistance testers used on the course**



**One of the earth fault loop impedance testers used on the course**



**One of the RCD testers used on the course**

As well as the above testers we also like to get the candidates to use other types, or even encourage them to bring their own testers along.

We're quite keen on multi-function testers although some candidates can find these a bit daunting to begin with so we allow the candidates to choose which types they feel most comfortable with.



**One of the earth fault loop impedance testers used on the course**



**One of the Multi-Function testers used on the course**

Isolation procedures are a crucial part of the inspection and testing course. Voltage testers and proving units are used for this (as well as the necessary padlocks, mcb clasps etc). Without a sound appreciation of the procedures the risk of injury is heightened and any unsound practices lead to failure in the practical assessment. (Many of our candidates already know all about this but we need to ensure that they will perform the isolations to the criteria listed in the C&G assessment.)

The candidates are also taught how to correctly complete the IET paperwork - an important part of the 2391 assessment - so we give them the opportunity to practice this too. Below is one of our voltage testers and proving units used on the 2391 course and an example of some of the IET paperwork that one of our candidates completed:



**One of the voltage testers and proving units used on the 2391 electrical inspection and testing course**

Circuit Description	Insulation Resistance		Polarisation Index		Earth Fault Loop Impedance		Continuity		Remarks
	Min	Max	Min	Max	Min	Max	Min	Max	
Lighting circuit 1	0.5	1.5	1.5	2.0	0.2	0.4	0.1	0.2	Compliance to BS 7671:2008
Lighting circuit 2	0.5	1.5	1.5	2.0	0.2	0.4	0.1	0.2	Compliance to BS 7671:2008
Power circuit	0.5	1.5	1.5	2.0	0.2	0.4	0.1	0.2	Compliance to BS 7671:2008

**An example of one sheet of the IET paperwork that candidates on the electrical inspection and testing course complete**

The half-day practical assessment takes place during the course (normally on the third day). The practical assessment is conducted on specially-designed rigs which simulate a real electrical installation. The following is the board used for this assessment, on which candidates have to safely isolate and test for dead, perform a full inspection and test (consisting of an initial verification and a periodic test) and complete all the necessary IET paperwork as they proceed:



**The C&G approved assessment rig used for the practical assessment**

The assessment rig is subdivided into two parts so that both scenarios (a new installation and an existing one) are covered by the assessment. The candidates therefore have to produce the certificates that relate to both initial verification and periodic inspection, and the accompanying inspection and test results schedules. These should all be completed in their correct context, so that for example, the visual inspection would produce C codes for any faults found in the periodic testing but no faults could be reported within the initial verification.

The other parts of the C&G 2391 practical assessment are 1) A series of 14 short answer written questions, which the candidates need to complete on their own, for example: "Describe what is meant by IP2X" and 2) A set of photographs depicting various electrical faults for which they need to identify the fault and allocate it the appropriate C coding: for example one is a photograph of a metal light fitting that doesn't appear to be earthed and they would be expected to identify the fault, describe the danger and allocate it the correct C code.

Our examination rigs (and all the practice boards shown above) are all specially constructed so that they can be moved around the UK and beyond to provide the inspection and testing course on employers' premises.

In order to track the candidates' progress through the practical assessments we use an assessment record sheet so that we can be confident that every candidate is meeting the criteria laid down by City & Guilds. This also helps to boost the candidates' confidence because they feel that they are making progress through the assessment process.

Below is one of our C & G assessment record sheets and an example of one of the candidates' completed test results schedules:

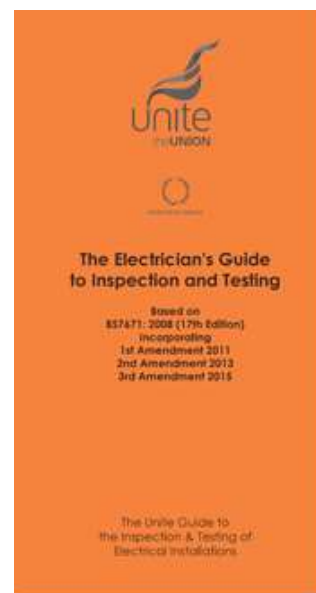
**The practical assessment tracking sheet**

**One of the IET forms completed by our candidates**

The above assessment is quite a difficult task for many candidates (particularly those who do not have much practical experience of inspection and testing) but we find that our candidates do quite well in this assessment as they pick up all the necessary skills and understanding in the 2 days of the course that precede it.

During the practical part of the 2391 course, candidates are issued with the electricians guide to inspection and testing book and quick-reference 'crib' sheets.

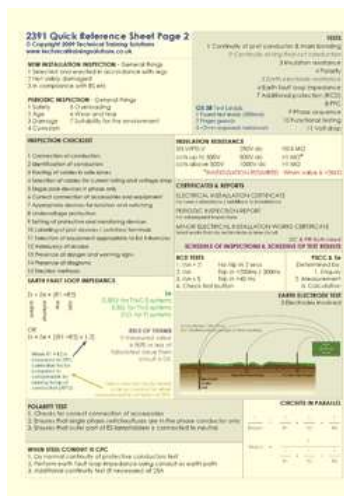
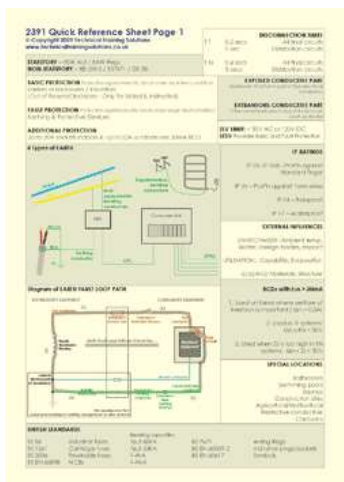
The electricians guide book contains all the most useful reference material about inspection and testing of electrical installations. The quick-reference crib sheets contain all the most important information that they need for the theory examinations.



**Candidates on the course are given their own copy of our electricians guide book to keep**

# THEORY of INSPECTION AND TESTING

In this part of the course candidates are briefed on the quick reference sheets. These help them to revise for the examination. The following are examples of the quick-reference revision sheets.



The reference sheets which help to prepare candidates for the exam

We then work through the course notes which have several examples of recent C&G exam papers. We suggest the best possible answers that they can give whilst discussing the technical issues. To help prepare candidates for the theory examination we study a comprehensive set of typical questions that they may encounter. Some of these are shown in the following extracts from the course notes:

**INSTRUCTOR'S NOTES**

**Examples of Multiple Choice Questions**

The questions that follow are typical examples of the sort of questions that you will encounter in the multiple choice assessment for 2391.

1/ For the safety of those carrying out work, labelling devices should always be locked off when work is carried out on a circuit. Which one of the following is the required number of keys to be available for such lock-off?

**ANSWER: ONE KEY**

2/ For the purposes of safe isolation, the voltage indicator must be checked for correct operation. Which one of the following would be the method for checking the instrument?

**ANSWER: CHECK THE INSTRUMENT ON A KNOWN LIVE CIRCUIT**

3/ In order to ensure that a three-phase circuit is suitably isolated, a range of tests with a suitable instrument is required. Which of the following is the correct range of tests required on a three-phase three-wire motor circuit?

**ANSWER: 1) 1-2, 1-3, 2-3, 2) 1-2, 1-3, 2-3, 3) 1-4, 2-4, 3-4, 4) 1-2, 1-3, 2-3, 1-4, 2-4, 3-4**

4/ Before carrying out a test of insulation resistance the inspector must ensure that

**ANSWER: THE CIRCUIT IS ISOLATED**

5/ The main protective bonding within a building is to be disconnected to allow inspection and testing. Which of the following should be carried out prior to disconnection to ensure the safety of all persons in the building?

**ANSWER: PARALLEL EARTH PATHS MUST BE REMOVED TO DIVIDE THE I.E. OF EARTH; SHOCK; PARALLEL EARTH PATHS MUST BE INTRODUCED TO MAINTAIN AN EQUIPOTENTIAL ZONE; THE MAIN SUPPLY MUST BE ISOLATED TO AVOID SURPRISE OPERATIONAL CURRENTS; ONLY THE CIRCUIT IN CLOSE PROXIMITY TO EXTENSIVE WORK MUST BE ISOLATED.**

**INSTRUCTOR'S NOTES**

20. What is the correct procedure should an inspector wish to secure a circuit which has already been isolated and locked by another person?

**ANSWER: C) Leave a notice on the lock stating others working leave off.**

21. What test cannot be safely undertaken unless an entire installation is securely isolated?

**ANSWER: B) Continuity of earth protective bonding.**

22. What action is required if an item discovered during a periodic inspection is classified C1?

**ANSWER: C) Remedial work should be undertaken immediately.**

23. What action should be taken if defects were discovered during an initial verification of a new installation?

**ANSWER: C) The defects should be noted on an Electrical Installation Condition Report.**

24. What action must be taken by the inspector if an exposed live part is found during a periodic inspection?

**ANSWER: C) The defect must be reported on the report and brought to the client's attention.**

**INSTRUCTOR'S NOTES**

Questions 34 to 36 relate to the following scenario:

A prospective fault current test is to be undertaken during the initial verification of a three-phase installation as shown in the diagram. A test result of 4 kA between L1 and neutral was the highest result recorded at the origin.

34. What is the purpose of this test?

**ANSWER: C) To ensure the DNO service fuse will disconnect within 3 seconds under fault.**

35. Which statement is a correct regarding fault test?

**ANSWER: C) A further test is required at DNO.**

36. What happens to the readings of PFC further into the installation if it is measured?

**ANSWER: C) The value increases due to increased circuit resistance.**

Some example pages from the course notes for the electrical inspection and testing course giving demo questions on the legal issues, calculations and formulae and measured values which candidates have to perform calculations on to determine if the circuits are compliant or not. These pages are from the instructor's version of the course notes so the correct answers are already marked (in red). Of course the candidates would have to select their own answers.

The theory examination usually takes place on the last afternoon of the course. It is a computer-based multiple-choice examination. The candidates are allowed two hours and there are 60 questions. It's an open-book test, so the candidates can refer to the wiring regs or the on site guide books during the exam.

*Some employers prefer that candidates learn about inspection and testing of electrical installations without having to undergo the City & Guilds examinations: Please call us if you would like to discuss this.*

**If you would like to see some of the equipment used on the electrical inspection and testing course for yourself, then please call us to arrange a visit to our offices in Kent. Alternatively, we can visit you anywhere in the British Isles.**



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