2396-402 Level 4 Design, Construction Management and Initial Verification of Electrical Installations

www.cityandguilds.com
March 2018
Version 1.0

Chief Examiner's report – March 2018

About City & Guilds

City & Guilds is the UK's leading provider of vocational qualifications, offering over 500 awards across a wide range of industries, and progressing from entry level to the highest levels of professional achievement. With over 8500 centres in 100 countries, City & Guilds is recognised by employers worldwide for providing qualifications that offer proof of the skills they need to get the job done.

City & Guilds Group

The City & Guilds Group includes City & Guilds, ILM (the Institute of Leadership & Management, which provides management qualifications, learning materials and membership services), City & Guilds NPTC (which offers land-based qualifications and membership services), City & Guilds HAB (the Hospitality Awarding Body), and City & Guilds Centre for Skills Development. City & Guilds also manages the Engineering Council Examinations on behalf of the Engineering Council.

Equal opportunities

City & Guilds fully supports the principle of equal opportunities and we are committed to satisfying this principle in all our activities and published material. A copy of our equal opportunities policy statement is available on our website.

Copyright

Publications

City & Guilds publications are available from our website or from our Publications Sales department, using the contact details shown below.

Every effort has been made to ensure that the information contained in this publication is true and correct at the time of going to press. However, City & Guilds' products and services are subject to continuous development and improvement and the right is reserved to change products and services from time to time. City & Guilds cannot accept liability for loss or damage arising from the use of information in this publication.

City & Guilds
1 Giltspur Street
London EC1A 9DD
T +44 (0)844 543 0000
F +44 (0)20 7294 2413
www.cityandguilds.com
centresupport@cityandguilds.com

Contents

1 Introduction

The purpose of this document is to provide centres with feedback on the performance of candidates in the March 2018 examination for 2396-402 Design, Erection and Verification of Electrical Installations.

The Chief Examiners' Report has been reintroduced as a result of feedback from centres, to give them guidance in preparing candidates for the written examination.

2 Feedback on candidate performance

General feedback

The following comments are intended to help students prepare for the examination by having a better understanding of what is expected of them. The feedback within this report would also be valuable to tutors in understanding candidates' difficulties in answering questions and the areas where more guidance is required.

The March 2018 question paper was found to be in accordance with the scheme requirements.

The examination entry for this series was approximately 170.

This examination contained no errors and was suitable for the qualification specification and Level.

Candidates who simply quote text from permitted publications, such as BS 7671, will not score well where questions require an explanation or description. Candidates must interpret the requirements to suit any scenario within the question.

Candidates are encouraged to study the detail within each question and provide responses specific to that detail. Where candidates state a range of requirements, and not those specific to the question, marks will be lost.

Where questions are seeking **why** particular regulations or measures are required, candidates must take care to explain 'why' as opposed to 'what' the requirements are or 'how/where' they are applied.

Candidates and centres are also encouraged to understand the risks associated with PME supplies including why these supplies are not permitted in certain circumstances and why installations connected to these systems require more stringent bonding requirements. With more DNOs utilising these types of networks, the risks associated with them becomes more common.

Cable Design Calculations

Candidates on the whole show a good ability in the application of circuit design for both live conductors and cpc. A few candidates oversized the conductors as they did not determine the design current correctly. Some marks were still awarded, in this situation, for procedure.

Once again, a large number of candidates did **not** show **all** of their calculations when justifying the cable **current capacity** but instead simply sized for voltage drop and simply compared design current with tabulated current values without utilising rating factors. As the process carries marks, these candidates would not have scored the maximum available.

In addition, quite a number of candidates still provide a detailed set of calculations but totally forget to actually state the conductor size selected. This mistake seems to be happening more frequently.

In this question, many candidates failed to take into account voltage drop restrictions for a three-phase circuit as well as constraints placed due to the distribution circuit voltage loss. Instead, many simply quoted a maximum 5% loss for a 230 V circuit.

Candidates generally apply a good understanding of design earth fault loop impedance and the application of the adiabatic equation as Chapter 54 of BS 7671. Once again, candidates are not justifying their calculations with published data or previously determined data and consider it suitable to simply show a string of calculations with no justification.

Conclusions to questions are **as** important as the calculations used to arrive at an answer. A large part of the design process is justification of sizes selected. Candidates are encouraged to conclude their selections by making comparisons to permitted and/or calculated values.

Candidates must be made aware of the two forms of adiabatic equation and where it is suitable to apply each. Incorrect use of the equation requires a candidate to perform more calculations than is required for justification and, if looking at the wrong Chapter in BS 7671, incorrect values of 'k' may be used. Marks will be lost if the wrong data or calculation is utilised.

Knowledge of BS 7671 (Design)

A working knowledge of BS 7671 is required by all candidates. Some candidates are able to recite the requirements of BS 7671 but are unable to demonstrate how these requirements are applied by using examples. Candidates at this level must be able to interpret requirements. Quoting regulation numbers or content only is not a suitable response unless a question requires a candidate to **state** a requirement.

Most candidates were able to state the requirements from Fundamental Principles or General Characteristics. However, few could provide a detailed explanation of the considerations for maintainability with most simply quoting the requirements without any interpretation.

In addition, few candidates understood the relationship between continuity of service and the earthing system employed to support this.

Many candidates were unable to show an adequate understanding of the principles of a 230 V electrical separated supply with many confusing this with either SELV or a reduced low voltage system. A simple understanding of how this system provides shock protection was all that was required but many were unable to provide this. In contrast, many candidates were able to state suitable sources for a SELV supply as these are contained within BS 7671.

Whilst BS 7671 is a huge resource for designers, they still need to have an understanding of the measures employed by BS 7671 and the simple principles behind them.

When determining suitable short circuit protection for a spur section of a ring-final circuit, many candidates confused earth fault current with short circuit current and used cpc resistance values when determining short circuit values. In addition, many used the adiabatic equation and k values from Chapter 54 instead of that from Chapter 43.

Knowledge of BS 7671 (Selection and Erection)

It was surprising that few candidates were able to give suitable examples of where voltage warning signs are required with many instead, reciting the requirements within BS 7671.

Equally few could fully explain the considerations for the connection of flexible conductors to a machine. With many simply listing a range of external influences from BS 7671 instead of concentrating on the cable considerations.

A very small number of candidates are able to understand the risks associated with PME supplies and why Protective Bonding Conductors require larger sizes for these supplies. Many related their responses to faults within the installation instead of showing an understanding of the risks associated with open circuit or high resistance PEN issues relating to PME conditions and the effects this can have on earthed metallic equipment. These risks are of concern to electrical designers and are becoming more common place, especially with ageing PME networks.

Verification

Most candidates were able to demonstrate an understanding of insulation resistance testing, but key points were missing from many answers such as the instrument used and its preparation.

Many candidates who identified that the RCBOs required disconnecting went on to further explain that all RCBOs need to be in the on/closed position during the test. Descriptions of procedures need to be consistent.

Special Locations

As well as having an understanding of the requirements of BS 7671 for Special Installations or Locations, candidates at this level need to demonstrate a knowledge of the risks which lead to these further measures. A good understanding of the risks enables designers to select suitable measures including a better understanding of why certain requirements must be met.

Many candidates answered these questions to a reasonably good standard in relation to a location containing a bathtub or shower. Many however showed a weaker understanding of situations where the requirements for supplementary bonding may be omitted.

Many candidates also confused Low Voltage with Extra-Low Voltage systems. This was evident with responses to a question regarding equipment in zones within a bathroom location. Candidates need to take care in noting the information where questions stipulate particular operating voltages.

3 National pass rate

The national pass rate for the 2396-402 March 2018 examination is as follows:

Exam series	Distinction (%)	Merit (%)	Pass (%)	Fail rate (%)
March 2018	**3**	**8**	**37**	**52**

Past examination series

Exam series	Distinction (%)	Merit (%)	Pass (%)	Fail rate (%)
December 2017	**7**	**24**	**29**	**40**
June 2017	**9**	**18**	**26**	**47**
March 2017	**8**	**26**	**33**	**33**

4 Forthcoming Exam Dates are:

- **December 2018**
- **March 2019**
- **June 2019**

5 Note Regarding BS 7671:2018- 18th Edition of the IET Wiring Regulations

Centres please note.
The December 2018 series of this examination will be compatible for both 17th Edition (amendment 3) and 18th Edition of BS 7671.

The March 2019 series onwards will be versioned for the 18th Edition only.

Published by City & Guilds
1 Giltspur Street
London
EC1A 9DD
T +44 (0)844 543 0000
F +44 (0)20 7294 2413
www.cityandguilds.com

City & Guilds is a registered charity established to promote education and training