

2396-402 Level 4 Principles, Design, Erection and Verification of Electrical Installations.

Chief Examiner's report – March 2019



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1 Introduction

The purpose of this document is to provide centres with feedback on the performance of candidates in the March 2019 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 2019 question paper was found to be in accordance with the scheme requirements.

The examination entry for this series was approximately 115.

This examination contained no errors and was judged to be of the correct level covering the required parts of the test specification.

As BS 7671:2018 became the only current version from January 2019, this assessment only permitted answers reflecting these requirements.

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 given scenario within the question.

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.

Responses to questions in this series was generally very disappointing with many candidates not being able to demonstrate understanding. Items requiring recall of a procedure generally scored fairly well but where understanding of factors affecting selection or protective measures is required, most responses lacked understanding if these items were attempted at all.

Cable Design Calculations

The ability to size a simple circuit was poor for this series with many candidates unable to determine the design current correctly. In addition, it was surprising to see how candidates did not apply the rating factors correctly and this seems to be due to poor calculator skills. Centres should make candidates aware that brackets should be used in some calculations.

Few candidates were able to determine a minimum csa of live conductors based on voltage drop suitability and many simply seemed to return to that part of the question, once selecting a live conductor csa based on capacity, and then simply calculated the actual voltage drop. This would not have scored marks as this is not what the question required. Responses such as these show candidates are recalling a procedure rather than showing understanding of the subject.

Candidates generally apply a reasonable understanding of design earth fault loop impedance and the application of the adiabatic equation as Chapter 54 of BS 7671 however responses were generally poorer than previous series.

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 especially where a question requires calculations to a specific regulation.

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 or explanations. 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. However, few could identify suitable methods of applying diversity.

Very few candidates showed an understanding of the considerations needed where an RCD is used for fault protection including meeting the requirements of chapter 43.

Designers of electrical installations are expected to provide detailed risk assessments where additional protection is omitted from socket-outlets circuits yet very few candidates were able to identify what the risk assessment should address. This once again, like previous series, identifies that the understanding of why additional protection is provided is an area of knowledge few seem to understand. In some cases, candidates recited areas of a risk assessment for overvoltage protection which shows a clear lack of understanding.

Once again, the vast majority of candidates who, when asked to determine **short-circuit** current protection, determine **earth fault loop impedance** values and centres need to pay particular attention to this during delivery.

Knowledge of BS 7671 (Selection and Erection)

Generally, most candidates demonstrated good levels of understanding and recall in questions associated with selection and erection of electrical equipment used for isolation and switching.

One question relating to the minimum size of protective earthing and bonding conductors seemed to indicate that many candidates did not understand the factors affecting the size of earthing conductor for an installation and the installations main protective bonding conductors. It was very surprising how many candidates did not attempt to answer this question which is a basic subject a designer needs to have an understanding of.

It seems clear that a basic understanding of the difference between earthing and bonding was lacking by most candidates with many giving consideration to bonding as part of the earth fault path.

Verification

Very few candidates demonstrated a suitable level of understanding the requirements for testing separation of circuits, with most simply stating the requirements for testing the insulation resistance of a SELV circuit.

Very few candidates showed any understanding of the difference between an earth electrode resistance measurement and an earth fault loop impedance path measurement for a TT installation.

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.

On average, most candidates answered these questions to a reasonably good standard in relation to a conducting location with restricted movement.

3 National pass rate

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

Exam series	Distinction (%)	Merit (%)	Pass (%)	Fail rate (%)
March 2019	0.9	12.2	22.6	64.4

Past examination series

Exam series	Distinction (%)	Merit (%)	Pass (%)	Fail rate (%)
December 2018	2.8	7.8	29.0	60.3
June 2018	4.8	15.7	27.2	52.3
March 2018	2.5	7.5	34.8	55.3

4 Forthcoming Exam Dates are:

Thursday 13th June 2019

TBC – December 2019

5 Note regarding 18th Edition of IET Wiring Regulations

Please note that all 2019 series will only accept answers versioned to the 18th Edition of the IET Wiring Regulations (BS 7671:2018). Candidates are encouraged to ensure they have received a copy of the corrigendum to BS 7671:2018 published by IET and available at <https://electrical.theiet.org/bs-7671/updates/>

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