

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

Chief Examiner's report – **December 2016**



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1 Introduction

The purpose of this document is to provide centres with feedback on the performance of candidates in the **December 2016** 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 **December 2016** question paper was found to be in accordance with the scheme requirements.

The examination entry for this series was approximately **245**.

In general, responses to questions for this series were to a low standard as many candidates did not maximise marks as they did not appear to understand the content contained within some of the questions. Any candidate who either simply quotes regulation numbers or recites the requirements of BS 7671, without interpretation, will not score well. In addition, good designers need to understand the risks associated with electrical systems and equipment in order to design out those risks.

In addition to understanding what the requirements of BS 7671 are, this assessment also tests a candidates understanding of **why** the requirements are there. As an example, many candidates are able to fully explain what the requirements for Additional Protection are, but few are able to demonstrate an understanding of what Additional Protection is in addition to. This is an essential skill needed by designers if they are to complete a risk assessment required by BS 7671; should Additional Protection by an RCD be omitted in certain situations.

Cable Design Calculations

Candidates on the whole show a good ability in the application of circuit design for both live conductors and cpc. Some candidates oversized the conductors as they possibly exercised caution, this was not penalised as long as it was not too excessive.

In contrast, a number of candidates did **not** show **all** of their calculations when justifying the cable current capacity. As the process carries marks, these candidates would not have scored the maximum available. Many candidates confirm cable csa for voltage drop but omit to show that the cable is suitable for current capacity.

Candidates generally apply a good understanding of design earth fault loop impedance and the application of the adiabatic equation. In contrast to this, a large proportion of candidates are unable to conclude whether their circuit calculations are acceptable or not.

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 also be very careful when applying temperature factors to calculations for maximum earth fault loop impedance values. Candidates are encouraged to apply factors during the design process then directly use the data within BS 7671 for comparison. In this situation, the application of further factoring as Appendix 14 is not required, as temperature is already compensated for. Care must also be taken when using data within the IET On-site

Guide, as these values are also adjusted for temperature. As a result, some candidates made temperature compensations twice.

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 only is not a suitable response.

A vast number of candidates were not able to demonstrate an understanding of the **why** Additional Protection is provided and situations that may lead to a greater risk of Basic Protection becoming compromised. Instead, the vast majority of candidates simply recited the requirements for where Additional Protection is required.

The majority of candidates did not manage to successfully verify values of short circuit current for a circuit. Instead, many either seemed confused with earth loop impedance values and/or were unable to determine if the circuit was suitably protected against short circuit current. Candidates need to understand that where a circuit relies on an RCD for earth fault protection, the circuit may not have adequate short circuit protection to the requirements of **Chapter 43** of BS 7671. Many, at this point, would refer to disconnection times for earth fault conditions instead of verifying the circuits suitability using requirements from Chapter 43.

One question relating to equipment installed in an escape route was generally answered very poorly if attempted at all. Designers need to understand risks that installed equipment poses as well as restrictions on the use of equipment. Few could explain practical measures which can ensure equipment does not impede escape. The few candidates who attempted the question seemed to focus on the selection of equipment such as LSF cables and BS requirements for equipment. Questions such as this require candidates to think beyond BS 7671 and consider the potential hazards of equipment, such as socket-outlets, when being used and an evacuation is required.

The vast majority of candidates answered questions relating to Fundamental Principles and General Characteristics very well.

Knowledge of BS 7671 (Selection and Erection)

One question, which required candidates to design a circuit suitable for equipment having high protective conductor currents, seemed to completely divide candidates. A small proportion would answer the question fully, most would simply quote what is written in BS 7671 while others did not answer at all.

Another question was related to the selection of an earthing conductor to an earth electrode. Once again, a proportion missed this question or appeared to guess without justifications while others were able to demonstrate a good understanding and interpret the requirements of Chapter 54 of BS 7671. Many candidates provided needless information relating to earth electrodes instead of keeping to the point of the question.

Verification

A majority of candidates were unable to explain the correct method of verifying Separation despite having Guidance Note 3 as permitted material. Many confused Separation with the method of testing SELV circuits. Many however demonstrated a good level of understanding of the information a designer would provide to an inspector.

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.

The majority of candidates were not able to suitably explain methods of short circuit protection for bare conductors on a SELV lighting system. Equally, few candidates understood the requirements for voltage drop associated with SELV lighting. Calculations for transformer kVA ratings were poor with many providing secondary current values instead.

Many candidates answered questions relating to marinas and caravan parks to a very good standard.

3 National pass rate

The national pass rate for the 2396-402 **December 2016** examination is as follows:

Exam series	Distinction (%)	Merit (%)	Pass (%)	Fail rate (%)
December 2016	3	12	25	60

Past examination series

Exam series	Distinction (%)	Merit (%)	Pass (%)	Fail rate (%)
June 2016	10	20	39	31
March 2016	15	28	28	29
December 2015	5	15	34	46

4 Forthcoming Exam Dates are:

- **March 2017**
- **June 2017**

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