

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

Chief Examiner's report – March 2020



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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 2020 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 2020 question paper was found to be in accordance with the scheme requirements.

The examination entry for this series was approximately 116.

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. This assessment was not affected by amendment 2 of BS 7671 published February 2020.

Candidates must take care to read a question carefully and follow the verb in the question. Where a question begins with **Explain** or **Describe**, simply quoting text from BS 7671 will not attract marks. Candidates must ensure they 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.

Several questions required candidates to give a **specific number of responses**. A small but significant number of candidates give more answers than asked for, and whilst this isn't penalised, it could be a waste of the candidate's time. Only the first number of responses asked for will be considered for marking.

Centres should be encouraged to teach candidates the reasons why certain regulations exist, change or are introduced to BS 7671. Understanding why regulations change gives far better insight into why these regulations are essential, and the risks associated. Centres may wish to use resources such as 'Wiring Matters' produced by IET as well as the IET website where articles can be found giving background to some of the topics which are often raised within this assessment. These include risks such as those associated with PME arrangements, support for wiring systems in order to protect firefighters operating in buildings and structures and situations where some installations require surge protection.

Within this assessment, it was very disappointing that some of the most basic of questions were answered with very basic responses such as descriptions relating to PFC testing or the purpose of earthing and bonding. Whilst many were able to **state** what the requirements were, few were able to **explain** these applications including purpose and effects. Good design of an electrical installation is understanding the systems and risks associated with an electrical installation and designing out those risks using the correct system.

Centres should encourage potential candidates to have recently achieved City & Guilds 2382: Requirements for Electrical Installations, before enrolling onto this course or include a similar course of study as an addition to this course.

Cable Design Calculations

Most candidates were able to determine circuit design current and research the correct detail of the circuit from BS 7671.

Whilst the majority of candidates did correctly determine the correct, minimum csa of live conductors for current carrying capacity, voltage drop still provided a challenge for some as it seems they do not use all the information in the scenario.

A surprising number of candidates were unable to correctly calculate earth fault loop impedance on this series. Some candidates did not even attempt the calculation, which should be considered an absolute basic requirement for an electrical designer to be able to undertake. Some candidates persist in using tabulated, rather than actual, fault current figures when undertaking adiabatic calculations, which should be in line with Chapter 54 of BS 7671. A few candidates used the wrong adiabatic formula, despite the question being specific. Centres are encouraged to reference IET guidance as to the correct procedures.

Whilst many candidates did undertake the calculation, unfortunately, many did not seem to read the question and determine the **minimum** acceptable csa of cpc and instead simply selected a csa to work with.

Whilst some candidates did justify their answers, many were still simply providing calculated values with no justification or reason as to whether these values were compliant or not.

Knowledge of BS 7671 (Design)

Very few candidates were able to match the fundamental principles of fault protection with the Protective Measures given in Chapter 41, with many seemingly ignoring the word 'fault' in the question and instead giving methods of basic protection.

Once again, disappointingly few candidates were able to understand the difference between, or purpose of, earthing and bonding. When candidates were required to respond on a question relating to the purpose of earthing, many provided responses relating to bonding. Candidates **must** be able to understand the difference between, and purpose of these protective conductors to effectively design them.

It is clear that many do not fully read questions correctly as many responded to a question, which clearly stated the presence of a metallic service pipe, with answers specifying and relating to plastic pipes.

Most candidates provided suitable responses to questions where items from BS 7671 needed recalling or listing.

Like most series before this one, a large number of candidates who, when asked to determine **short-circuit** current protection, determined **earth fault loop impedance** values and centres need to pay particular attention to this during delivery. A short circuit is between live conductors and an earth fault is between Line and Earth. Using an earth loop impedance value to determine short circuit will not attract marks. In addition, the correct adiabatic equation used for short circuit protection is contained in Chapter 43 and should not be confused with the one in Chapter 54 and its values of k.

A question relating to a Calculated Risk Level for surge protection attracted mixed responses with many simply quoting the wording from BS 7671 rather than explaining what needs to be taken into account when determining if protection is required.

Knowledge of BS 7671 (Selection and Erection)

A question relating to the selection and erection of RCDs in a given type of installation initially had responses which started well but, as the question proceeded, the answers were not consistent with the scenario and instead were more realistic to dwellings.

It seems that few candidates are familiar with the requirements of Chapter 53 and, in particular, the selection of RCDs based on electrode resistances.

A question requiring design considerations relating to emergency switching, stroboscopic effects and undervoltage protection was reasonably well answered but again, like many responses in this series, answers lacked key detail and were brief. Whilst responses do not need to be wordy, they do need to make sense and contain some technical content.

Verification

Whilst many could explain why an RCD is tested at intervals using the test button, few could explain why the interval is now six-months instead of three. Centres should be encouraged to research this reason as knowing why would put much more emphasis on getting consumers to actually carry out the test.

Descriptions relating to PFC testing were at best poor, lacking in key detail. Few responses described any form of procedure with many confusing this test with an external earth fault loop impedance test.

A question relating to the results of an earth electrode resistance test attracted mixed responses with many being able to determine values but fewer knowing how to verify them.

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 an agricultural installation and a conducting location with restricted movement. It should however be noted that many candidates begin their responses well detailing some of the risks, such as 'reduced body resistance' but end up reciting requirements. The intention of the questions is to address why the requirements are there, not what each requirement states.

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 2020	3.4	9.4	17.1	70.1

Past examination series

Exam series	Distinction (%)	Merit (%)	Pass (%)	Fail rate (%)
March 2019	0.9	12.2	22.6	64.4
June 2019	0.0	4.6	30.3	65.2
December 2019	7.6	13.5	28.1	50.1

4 Forthcoming Exam Dates are: TBC

5 Note regarding 18th Edition of IET Wiring Regulations

Please note that all 2020 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/> Future assessments may require candidates to have amendment 1 of BS 7671 (2020) which can also be downloaded from the IET website above, including its corrigendum. Should any question come under the scope of amendment 1, it will be marked to amendment one and its corrigendum only.

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