

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

Chief Examiner's report – **June 2024**



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, 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

The content of this document is, unless otherwise indicated, © The City and Guilds of London Institute and may not be copied, reproduced or distributed without prior written consent.

However, approved City & Guilds centres and candidates studying for City & Guilds qualifications may photocopy this document free of charge and/or include a PDF version of it on centre intranets on the following conditions:

Centre staff may copy the material only for the purpose of teaching candidates working towards a City & Guilds qualification, or for internal administration purposes.

Candidates may copy the material only for their own use when working towards a City & Guilds qualification.

The Standard Copying Conditions (which can be found on our website) also apply.

Please note: National Occupational Standards are not © The City and Guilds of London Institute. Please check the conditions upon which they may be copied with the relevant Sector Skills Council.

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

5-6 Giltspur Street

London, UK

EC1A 9DE

T +44 (0)192 4930 801

F +44 (0)192 4930 800

www.cityandguilds.com

centresupport@cityandguilds.com

Contents

1	Introduction	22	Feedback on candidate performance	2	General feedback
	2Cable Design Calculations	3	Knowledge of BS 7671 (Design)	3	Knowledge of BS
	7671 (Selection and Erection)	4	Verification	4	Special Locations and Appendices
	National pass rate	4	Past examination series	54	Forthcoming Exam Dates
	55	Note regarding 18th Edition of IET Wiring Regulations 2022		5	

1 Introduction

The purpose of this document is to provide centres with feedback on the performance of candidates in the **June 2024** examination for 2396-402 Design, Erection and Verification of Electrical Installations.

The Chief Examiners' Report is intended to give centres and candidates guidance in preparing 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 **June 2024** question paper was found to be in accordance with the scheme requirements.

The examination entry for this series was approximately **190**.

This examination was considered to be correctly levelled and compared as being very similar level of challenge to other recent series papers.

Questions in this series covered a wide range of subjects across the assessment criteria and BS 7671.

Strengths demonstrated in this series included knowledge and understanding of Fundamental Principles in BS 7671 as well as the requirements for the Assessments of General Characteristics.

Candidates must understand the difference between what (AO1 recall) and why (AO2 understanding). Where questions ask why, quoting BS 7671 will not attract marks. Being able to answer why a particular requirement is there demonstrates understanding of risks. For example, many candidates were able to identify that a bathroom location increases the risk of electric shock, but few were able to explain why this is the case in any detail. Some candidates even focussed on non-electrical risks such as slips, trips and falls due to the wet area. Whilst it is appreciated that these are genuine risks, they are not a reason why a bathroom is designated as a special location within BS 7671.

Centres are advised to work on answering techniques with candidates and work on simple areas such as not repeating the question in the answer or setting out calculated responses logically and making final answers clear. Centres are also encouraged to work with candidates in practising the identification of key words and the meaning of verbs. For example, a question using the verb 'describe' requires more than a simple statement of requirements. 'Explain', similarly, requires a greater demonstration of understanding.

Section A: Cable Design Calculations

Generally, most candidates undertook the design calculation procedure for live conductors well. Candidates are encouraged to focus on the sequence indicated in the question as sometimes responses can become disjointed and, as a result, do not arrive at an answer for a particular stage required by the question.

It is surprising how many candidates undertake a full design procedure for live conductors, but do not actually provide a conductor csa as part of their answers.

When determining the earth fault loop impedance for the protective conductor, many applied a 1.02 factor for ambient temperature even though the cpc was incorporated in the cable. Perhaps some candidates were applying Table I2 from the IET On-Site Guide which only applies to inspection and testing adjustments, and not design. Candidates at this level should be aware that when a cpc is the same csa as the live conductors, table 54.7 is satisfied and an adiabatic equation is not required.

It seemed evident that many candidates were not aware of the difference between an overload and a fault current, as defined in BS 7671, when applying the requirements of Chapter 43.

Knowledge of BS 7671 (Design)

One question, based on the requirements of Parts 1 and 3 of BS 7671 is usually well answered, but in this series several candidates did not recognise the key phrase 'fundamental principles', giving some convoluted and incorrect answers to a question that is considered fairly basic. The term "fundamental principles", and this part of BS 7671, is key to designers and is considered in industry as the designer's checklist.

Another question asked about values or tolerances for supply characteristics that are not nominal. Although worth only two marks, a large number lost these marks by stating nominal voltage and nominal frequency, which as the responses suggest, are nominal. Others gave answers which did not relate to numerical values or tolerances.

A large number of candidates were unable to explain the purpose of earthing and bonding, and instead quoted the requirements for ADS as a whole. It was clear that the fundamentally different purposes of earthing and bonding are **not** understood well enough at a basic level. This is a basic area of understanding without which designers and installers of electrical installations cannot be considered competent.

The difference between earthing and bonding is embedded at Level 2 and should be second nature at Level 4.

Many candidates still struggle to explain the consequences of the dangers that can arise from the use of PME supply arrangements. A common deficiency was stating that voltages above true earth potential may be experienced on extraneous conductive parts but not recognising that this would also be true of anything connected to the MET. Some thought that in the event of an open-circuit PEN conductor the neutral return path would have to be via the protective conductor of the supply, failing to appreciate the essential nature of a PEN conductor or what the C represents in TN-C-S.

In another question, half the candidates used Z_e to calculate short circuit current (I_{SCC}). Candidates must understand the difference between short circuits and earth faults, which is something regularly highlighted in these reports.

A small number of candidates managed to calculate the sum and outcome as $0.23 + 0.70 = 0.30$. As a result, the answer to the question was incorrect.

Having calculated a fault current, the majority of candidates were then able to verify that the short-circuit protection was adequate, although a number of candidates tried to apply the adiabatic form from Chapter 54. This is a continuing mistake across every series.

A question on maximum demand scored well generally, although it was often difficult to award marks where candidates did not reference or explain their reasoning. Several candidates, curiously, referred to a shower circuit when there was no such circuit in the installation described.

Knowledge of BS 7671 (Selection and Erection)

A question required candidates to explain the design considerations for standard protective conductors and give examples of each. This question was poorly answered in most cases, with many candidates simply giving a csa or referring to a table and not giving clear examples. As mentioned in this report for question 4, an understanding of earthing and bonding and the distinct requirements for protective conductors should be fundamental knowledge at this level for designers.

Verification

Many candidates are still unaware of the reason for connecting all protective conductors to earth when undertaking an insulation resistance test. Many gave responses such as “to ensure the safety of the tester if a fault were to occur” and many responses referred to parallel paths, as if a continuity test were being undertaken instead of insulation resistance. This test connection procedure has been a requirement of BS 7671 for some years now, so it is disappointing that the reasons for it are not understood.

Special Locations and Appendices

Few candidates answered well on the question ‘explain the hazards and additional risks’ in a bathroom or shower room location, instead writing down requirements. This type of question is a regular feature of this examination, and candidates are being asked to demonstrate an understanding of why the requirements for special locations exist, not just to recite those requirements. Designers need to understand risks that particular locations give to ensure those risks are reduced through careful design.

When asked to explain what the 0.8 factor represents, which is used to adjust maximum Z_s limits from BS 7671, and allow direct comparison of measured values for compliance, a large number of candidates answered that it was an adjustment for ambient temperature variations. Few candidates demonstrated any connection to conductor operating temperature.

In a question relating to the application of voltage drop limitations, many candidates simply listed the factors which affect current-carrying capacity, rather than voltage drop. Few answered the actual question, which was regarding how voltage drop limitations are applied across an installation.

National pass rate

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

Exam series	Distinction (%)	Merit (%)	Pass (%)	Fail rate (%)
June 2024	0.76	10.61	26.52	62.12

Past examination series

Exam series	Distinction (%)	Merit (%)	Pass (%)	Fail rate (%)
June 2023	3.88	10.08	31.01	55.04
June 2022	2.27	6.06	25.76	65.91

3 Forthcoming Exam Dates

5th of December 2024

13th of March 2025

12th of June 2025

4 Note regarding 18th Edition of IET Wiring Regulations 2022

Centres must be reminded that permitted materials for this examination **must** comply with the requirements within the permitted materials document on the qualification webpage. This means that notes or sheets giving design calculation procedures are **not** allowed. The permitted publications for this exam are BS 7671, IET GN3 and the IET On-site Guide **only**.

As Amendment 2 of BS 7671 is now established. This **must** be used for all assessments within this qualification. Future assessments, including December 2024, may contain questions relating to amendment 3 of BS 7671 which is due to be published in August 2024.

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