T Level Technical Qualification in Building Services Engineering for Construction - Electrotechnical

Centre Standardisation Materials

Version 1.1
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For external use

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Introduction

Electrotechnical engineering (8710-33) (353)

These standardisation materials have been produced to support centre assessors when marking the Occupational Specialism assessment.

The materials are produced to support staff in the process of marking, including how to effectively use marking grids to mark using assessment themes.

The Occupational Specialism assessments for the T Level in Building Services Engineering are externally set summative assessments which are internally marked by assessors. It is the centre's responsibility to ensure candidate's work is marked in a standard way across the centre, using the specified marking grids, in order to rank performance on a single mark scale.

The marking materials must be considered alongside the Technical Qualification Occupational Specialism assessment guide.

It is recommended that all assessors, including any unlikely to mark, are included in early discussions around the use of the marking grids, as all assessors should understand the basis of marking. This is because it could shape their teaching by helping candidates practise, bringing their skills and knowledge together to complete a problem, and helping them learn to explain and justify their choices in terms of subject knowledge in preparation for summative assessment.

Assessors must study the Technical Qualification Occupational Specialism assessment guide which provides detailed information about the assessment themes and the marking grids, to ensure they are clear about the different assessment themes and how they may show up in evidence across the range of tasks.

If there is more than one assessor carrying out marking at the centre, this process should be carried out as part of a group activity to ensure markers are clear and in agreement about what sorts of evidence are relevant for assessment and which assessment theme they fit into.

The following materials should form the basis for pre-standardisation and discussion could take place using evidence from trial runs/formative assessment activities. Standardisation should also take place using the evidence from the actual assignment set for that year, so along with utilising this tool, please ensure activities surrounding the live assignment also take place.

Thank you for accessing these support materials. Please note that the Practical Observation form has been updated since the publication of these materials. The Practical Observation form included in the live assessment materials is the version that must be used when assessing the Occupational Specialism.

Guide to marking the T Level Occupational Specialism Assessment – recording: link

Please review the accompanied recording to support standardisation activities.

Within this pack, you will find:

- Links to the assessment materials and relevant Guide Standard Exemplification Materials
- Links to the Sample Assessment Materials
- Exemplar candidate evidence from two candidates – Candidate A and Candidate B
- Guidance on the exemplar marking
- A partially completed candidate record form, reflecting marking of a number of the assessment themes within this assessment

Candidate A

Assessment details

This standardisation pack has been developed to reflect the requirements of the **Electrotechnical engineering – Sample** version. The assessment pack can be access on the City & Guilds website, here.

The evidence used for the exemplar marking in this pack is based on the **Guide Standard Exemplification** materials for this occupational specialism that can be located, here.

Task 1 - Planning the installation

(Assessment themes: Health and safety, design and planning, reporting and information)

For task 1 candidates need to produce the following pieces of evidence:

- Completed assessment of general characteristics form
- Completed lighting design schedule
- Completed materials take-off sheet
- Completed design grid

For illustration, the guided exemplification materials (GSEM) for Task 1 contain examples of candidate evidence for the following assessment requirements only:

- Completed assessment of general characteristics form
- Completed lighting design schedule
- Completed materials take-off sheet
- Completed design grid

Task 1 - Candidate evidence

1.1.1. Completed assessment of general characteristics form

Chapter/regulation from BS 7671	What needs assessing specific to this installation	How this impact the installation
Chapter 31	Purpose of the installation	Is it suitable for the intended use
311.1	Maximum demand and diversity	Maximum demand and diversity and volt drop need checking
312.3	Earthing system	The earthing system needs assessed to ensure that it is suitable for the installation.
313.1	Supplies	You need to get the following information by calculation, measurement, or inspection • Nominal voltage (s) • Current and frequency • PSCC at origin • Loop test at origin • Suitability for the requirements of the installation and maximum demand
314.1	Has the circuits been divided to provide for	• Inconvenience in case of a fault • Take into of hazards from failure of a single circuit. • Reduce unwanted tripping of RCD's
Chapter 32 Appendix 5	Classification of external influences	Has the external influences:

		Environment, such as IP codes and if there is risk of corrosion Utilisation, Has thought been given to those who may use the building such as disabled Buildings for buildings CA
Chapter 33	Compatibility	Need to ensure that equipment will not have harmful effects on other parts.
Chapter 34	Maintenance	To ensure the installation remains safe by maintenance.
Chapter 35	Safety services	Has the designer considered the safety services of the following? • Emergency lighting • Fire detection
Chapter 36	Assessment of continuity of service	Any alterations of circuits need to be checked to ensure that: • The earthing system is safe. • Selection of devices to ensure selectivity, protective device closest to fault disconnects first. • Number of circuits.

1.1.2. Lighting design schedule

Lighting design schedule

Area	Utilisation factor	Light loss factor	spacing	height	Required lux level	Calculation	Lumens required per luminaire
Workshop/print room	0.7	0.65	2.25 m	2.4 m	500 lux	L - 5.25 m W - 3.75 m $\frac{5.25 \times 3.75 \times 500}{6000 \times 0.90 \times 0.65}$ = 4 LIGHTS REQUIRED	6000
Office sales area	0.75	0.8	2.8 m	2.4 m	300 lux	L 8.75 W 3.75 $\frac{8.75 \times 8.25 \times 300}{6000 \times 0.75 \times .80}$ = LIGHTS REQUIRED	6000

Figure 4 lighting design schedule

ROOM INDEX CALCULATION = NO OF POINTS = $\frac{L \times W \times E}{LOL \times UF \times MF}$

L = Length
W = WIDTH
E = LUX
LOL = LIGHT OUT PUT
UF =
MF = maintence factor

1.1.3. Materials take off sheet

Equipment/Materials	Quantity
6/4-way distribution board (100/80 amp)	1
32amp mcb	1
16amp mcb	1
6amp mcb	1
20mm plastic conduit	
20mm saddles	2
20mm adaptors/bush	
20mm tee-box	1
20mm angle-box	1
PVC surface mounted switch boxes	2
100mm metallic tray	
100mm metallic tray bend	1
50x50mm steel trunking	
20mm steel conduit	
20mm steel conduit couplers	8
20mm steel conduit saddles	6
20mm brass bushes	12
Lighting LED Fluorescent	2
2-way lighting switches	2
16amp isolator BSEN 60309 (Metal clad)	1

Metal clad switched double sockets	4
Single core cable 2.5mm (Brown)	15 metres
Single core cable 2.5mm (Blue)	15 metres
Single core cable 2.5mm (Green/Yellow)	15 metres
Single core cable 1.5mm (Brown)	10 metres
Single core cable 1.5mm (Blue)	2 metres
Single core cable 1.5mm (Green/Yellow)	4 metres
SWA (Steel wire armoured) cable 2-core 2.5mm	2 metres
SWA (Steel wire armoured) gland pack	1
Tools and Plant	
Marking tool/Pencil	1
Tape measure	1
Conduit bending spring	1
Conduit bending machine	1
Stock and die set (20mm)	1
Bush spanner 20mm	1
Drill (Battery/Mains)	1
Selection of drilling bits (Steel/Masonry) 6mm etc	1
20mm Hole cutter/saw	1
Saw	1
Pipe Grips/footprints	2
Adjustable spanner	2
Selection of metal files (reamer)	2/3

Knife	1
Side cutters	1
Pliers	1
VDE Screwdriver Philips/Pozi small	1
VDE Screwdriver Philips/Pozi medium	1
VDE Screwdriver Philips/Pozi large	1
VDE Screwdriver flat head small	1
VDE Screwdriver flat head medium	1
VDE Screwdriver flat head large	1
Cable/wire strippers	1
Hammer	1
Spirt levels	2
PPE	
Overalls/protective clothing	
Steel toe capped boots	
Goggles/glasses	

1.1.4. Design grid

Consumer unit located in workshop VOLTAGE DROP TO COMPLY WITH BS 7671		Nominal Voltage (U) 230 V		Earthing Arrangement TN-C-S		External Earth Fault Loop Impedance (Z_e) 0.3 Ω		
Circuit	1	2	3	4	5	6	7	8
Description	Ring-final office	Radial-final sockets workshop	Radial-sockets kitchen x2 twin	Boiler supply	Outbuilding DB	4.5 kW printing machine	Lighting office	Lighting workshop/kitchen/ toilets
No. outlets	6 x 2-gang	4 x 2-gang	2 x 2-gang	1	1	1	7	5
Type of wiring	70 °C thermoplastic single-core non-sheathed	70 °C thermoplastic single-core non-sheathed	70 °C thermoplastic single-core non-sheathed	70 °C thermoplastic multi-core flat profile	70 °C thermoplastic 3-core PVC SWA	70 °C thermoplastic 3-core PVC SWA	70 °C thermoplastic single-core non-sheathed	70 °C thermoplastic single-core non-sheathed
Design Current (I_b)	22 A	15 A	9 A	4 A	16 A	[redacted]	1.6 A	0.7 A

FIGURE 2

19.56A

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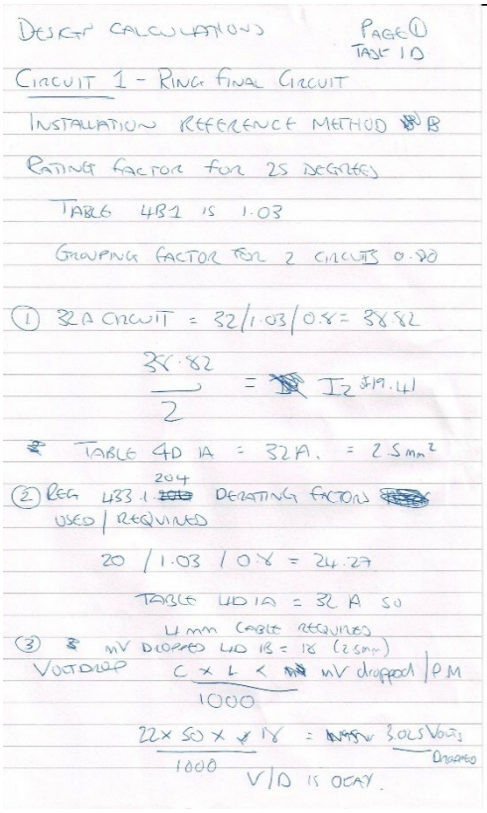
Type and Nominal rating (I_n)	32 A B	20 A B	20 A B	16 A B	16 A C	20 B	6 A C	6 A C
Length (metres)	50 m loop	11 m	10 m	8 m	27 m	6 m	65 m	20 m
Installation method	B	B	B	B	C	C	B	B
Ambient temperature ^0C	25 ^0C	25 ^0C	25 ^0C	30 ^0C	30 ^0C	30 ^0C	30 ^0C	30 ^0C
Rating Factor Ambient air temp. C_a	1.03	1.03	1.03	1	1	1	1	1
Total circuits in group	2	2	2	1	1	1	2	2
Rating factor grouping C_g	0.80	0.80	0.80	1	1	1	0.80	
Minimum current capacity ($<I_t$)	38.83/2 [19.41] 24.27 EACH *	24.27	24.27	16	16	20A	7.5	7.5
mV/A/m	18	11	11	29	18	29	29	29
Actual Voltage drop	4.95	1.815	0.99	~~0.648~~ 0.928	7.776	3.40	3.016	0.4016
Minimum conductor csa mm^2	2.5	4	4	1.5	2.5	1.5	1.5	1.5

Figure 2

* BOTH LEGS OF RING FINAL CIRCUIT

Page 2

1.1.5. Design grid calculations



DESIGN CALCULATIONS PAGE ① TASK 10

CIRCUIT 1 - RING FINAL CIRCUIT

INSTALLATION REFERENCE METHOD B

RATING FACTOR FOR 25 DEGREES

TABLE 4B1 IS 1.03

GROUPING FACTOR FOR 2 CIRCUITS 0.80

① 32A CIRCUIT = 32 / 1.03 / 0.8 = 38.82

38.82 / 2 = I_z 19.41

TABLE 4D 1A = 32A. = 2.5 mm^2

② REG 4B3 204 DERATING FACTORS USED / REQUIRED

20 / 1.03 / 0.8 = 24.27

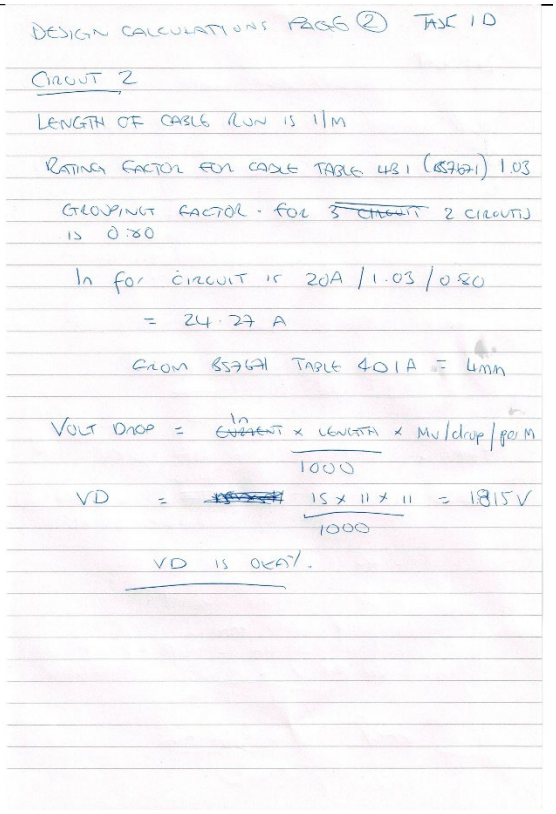
TABLE 4D1A = 32 A SO 4 mm CABLE REQUIRED

③ mV DROPPED 4D 1B = 18 (2.5mm)

VOLTDROP C × L × mV dropped / PM / 1000

22 × 50 × 18 / 1000 = 3.05 Volts Dropped

V/D IS OKAY.



DESIGN CALCULATIONS PAGE ② TASK 10

CIRCUIT 2

LENGTH OF CABLE RUN IS 11M

RATING FACTOR FOR CABLE TABLE 4B1 (BS7671) 1.03

GROUPING FACTOR FOR 2 CIRCUITS IS 0.80

In for CIRCUIT IS 20A / 1.03 / 0.80

= 24.27 A

FROM BS7671 TABLE 4D1A = 4mm

VOLT DROP = In × LENGTH × MV/drop/perM / 1000

VD = 15 × 11 × 11 / 1000 = 1.815V

VD IS OKAY.

Task 2 - Installation, commissioning and decommissioning

(Assessment themes: Health and Safety, Design and planning, Systems and components, Inspecting and testing systems and components, Reports and information)

For task 2 candidates need to produce the following pieces of evidence:

- Assessor observation of installation:
    - Safe isolation
    - Installation of cables and wiring systems
    - Inspection and testing
- Completed Electrical Installation Certificate
- Schedule of inspections
- Schedule of test results
- Copy of the Guidance for recipients

For illustration, the guided exemplification materials (GSEM) for Task 2 contain examples of candidate evidence for the following assessment requirements only:

- Assessor observation of installation:
    - Safe isolation
    - Installation of cables and wiring systems
    - Inspection and testing
- Completed Electrical Installation Certificate
- Schedule of inspections
- Schedule of test results

The following task 2 candidate assessment requirements have not been included as example candidate evidence for this version of the guided exemplification materials.

- Copy of the Guidance for recipients

Photographic evidence required:

Installation of cables and wiring systems

- Measuring and marking out **(photograph 1a and 1b)**
- Containment being installed and saddles **(photograph 2, 3, 4)**
- Installation of SWA and glanding **(photograph 5)**
- Cables being installed into the containment **(photograph 6)**
- Cutting conduit **(photograph 7)**
- Terminations being prepared and completed **(photograph 8, 9)**
- Final installation **(photograph 10)**

Inspection and testing

- Testing equipment being nulled/zeroed **(photograph 11)**
- R1+R2 and polarity being confirmed **(photograph 12 – 13)**
- Testing of final ring circuit **(photograph 14 – 18)**
- Insulation resistance tests **(photograph 19)**
- Reenergised installation **(photograph 20 – 24)**

1.1.1. Task 2 - Candidate evidence

1.1.6. Practical Observation Form – Safe isolation process

Assessment ID	Qualification number
8710-353	8710-33
Candidate name	**Candidate number**
Candidate A	CG12345
Centre name	**Assessment theme**
City & Guilds	Health and safety

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	**Notes –** *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
Safe Isolation	The candidate took some time to consider the safe isolation process of the distribution board. They referred to their method statement frequently throughout and wrote it out prior to commencing with the task. Correct voltage indicators were selected and the candidate carried out a visual inspection of the voltage indicators and they knew that there should be less than 3mm tip showing and finger guards but did not however identify that this was from the requirements of GS38. The voltage indicators were correctly proved on the proving unit. Permission was asked to safely isolate the circuit. The circuit was switched off and locked off. The candidate retained the key. The assessor had to prompt the candidate by asking what they were going to do with the key now the circuit was locked off, the candidate then placed the key in their pocket. Test were performed in the correct manner to ensure the installation was not energised.

Task	**Notes –** *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
	Signage was posted next to the locked off device. The voltage indicator was then reproved on the proving unit.

1.1.7. Practical Observation Form – Installation of cables and wiring systems

Assessment ID	Qualification number
8710-353	8710-33
Candidate name	**Candidate number**
Candidate A	CG12345
Centre name	**Assessment theme**
City & Guilds	Health and safety, systems and component

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	**Notes –** *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
Installation	The candidate prepared the workspace with consideration the majority of health and safety requirements and showed some good housekeeping, correct PPE was selected for use such as hard hat, boots, safety googles and High Viz waistcoat. The candidate used their equipment & materials list during collection to ensure they had all the materials they needed. However, this was lacking in some detail in terms of quantities and this caused some delays as the candidate had to ask the store person for the extra materials required. All tools were used in a and effective safe manner. The installation was safely isolated and locked off prior to the installation commencing. The workspace was reasonably maintained in terms of tidiness of tools materials and equipment throughout the task, but the work area did become cluttered at times during the installation. Candidate did not make any reference to pre-existing marks or damage to the wall prior to marking out for their installation, tape measure and level were used appropriately, the candidate made an error and had to remark the wall prior to fixing some components. The candidate required some prompts to progress. For example, when deciding the spacing distances of the saddles and making off the SWA ends, which took a second attempt due to the SWA armoring not being cut straight this was rectified easily once the armoring was re-terminated. Sequencing was not always logical, for example, conduit and trunking were cut before components were installed resulting in incorrect lengths due to

Task	**Notes –** *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
	some inaccuracies in the component positioning. All equipment was installed within a permitted tolerance. However, working to the extremes of these tolerances resulted in some gaps in places. Good use was made of the spirit level to check that containment and component installation is level/plumb, but in some cases, installation was not true. For example, the saddles on the conduit feeding the sockets outlets were off center. All components were installed in the locations detailed in the dimensioned drawing. The final installation did not appear to be neat in terms of cable core routing, however the cable ends were prepared and terminated correctly with no exposed conductors and no damage to the insulation. All devices were installed and connected as per the system design specification. The candidate did not always work to a high level of tolerance throughout the installation which impacted on the final aesthetics of the installation.

1.1.8. Photographic evidence

Please Note: The photographic evidence included in this pack are to provide context to the assessments observed. Centres are not expected to collect the volume of evidence presented here and must refer to the current evidence guidance given in the C&G Assessor Guide.

Evidence description	Photo
Photograph 1a and 1b Marking out & measurements being carried out multiple times before fixing components	1a.  1b. 

Photograph 2

Some measurements of the conduit are inaccurate, again the use of a tape measure shows this is outside the required tolerance.

Photograph 3 & 4

Back box / Containment being installed which shows that it has not been levelled correctly on the first attempt and them a follow up photo showing it is has been rectified and now level.

3.

4.

Photograph 5

SWA gland with armouring which are not straight or not terminated correctly within the gland.

Photograph 6

Cables being installed into the containment where there is evidence of trapped cable chaffing. This does not however expose the cables conductors

Photograph 7

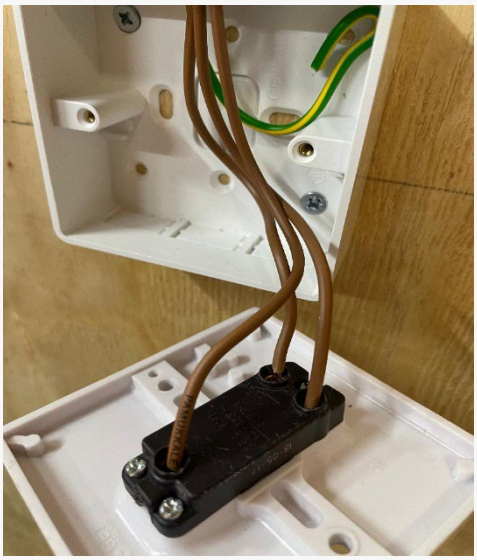
The candidate cutting PVC conduit safely with the conduit secured.

The finished cut has slight inaccuracies.

The candidate de-burred the conduit end.

Photograph 8

Terminated conductors being slightly different lengths showing the dressing of the cables that is not aesthetically pleasing.



Photograph 9

Photo of SWA not being installed neatly on the tray.

Photograph 10

Final installation capturing an acceptable standard with some non-safety critical errors that impact competed installations aesthetics. E.g. Conduits and saddles are not level or square, screw missing from the saddle above socket 3, cleat on SWA cable is on the 90-degree bend and the last cable tie on the tray is missing. Cables are untidy on the LED flood lights, and the stand-off bracket on the horizontal leg of the tray has a screw missing.

1.1.9. Practical Observation Form– Inspection and Testing

Assessment ID	Qualification number
8710-353	8710-33
Candidate name	**Candidate number**
Candidate A	CG12345
Centre name	**Assessment theme**
City & Guilds	Health and safety, Inspection & Testing

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	**Notes –** *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
Inspection & Testing	**Inspection & Testing** Safety aspects considered. Safe isolation procedures undertaken, for example the correct safe isolation procedures were undertaken prior to the inspection and testing being carried out. The candidate has demonstrated a good standard of work whilst considering the inspection and testing and applied, consistent skills, which meets industry standards. The candidate has followed the correct process for completing the inspection of the installed circuits but was at points hesitant in relating it to the electrical installation certificate and reflected that within the electrical installation certificate. They have demonstrated an ability to sequence tasks logically in a focused manner. The test instruments were correctly prepared by carrying out a visual inspection prior to starting testing, a prompt was required whilst inspecting the test leads. They took some time to think about the use of the equipment

Task	**Notes –** *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
	in relation to zeroing the test instrument for continuity tests, this however did not impact on safety. The candidate followed the correct testing sequence with no prompting for R1+R2, insulation resistance. Prompting was required for the ring final circuit figure of eight test in relation to the R1+R2 for the circuit. The circuit was correctly re-energised after gaining permission, polarity was taken correctly whilst carrying out the live testing after seeking permission reenergizing the circuit. Good skills and consistent skills were demonstrated for the Zs and RCD testing which met industry standards.

1.1.10. Photographic evidence

Please Note: The photographic evidence included in this pack are to provide context to the assessments observed. Centres are not expected to collect the volume of evidence presented here and must refer to the current evidence guidance given in the C&G Assessor Guide.

Evidence description	Photo
Photograph 11 and 12 Testing equipment being nulled/zeroed first shows incorrect process and second should show the tester showing the leads are zeroed.	11.  12. 

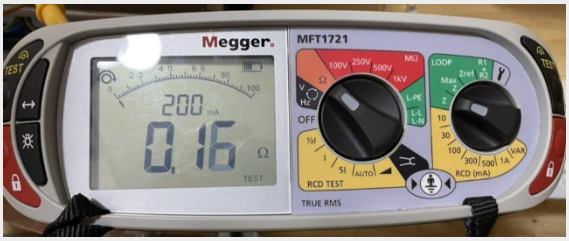
Photograph 13, 14 a & b.

Method 1 continuity (R1+R2) and polarity being confirmed with the test leads inserted in the wrong port on the test equipment.

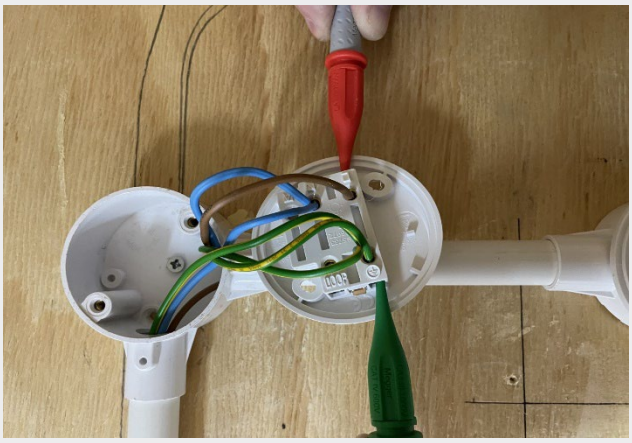
Second and third photo shows correct port being used and the test being taken and the result.

13.

14a.



14b.



Photograph 15-17

The ring final circuit being tested and shows the correct readings on the end to end to ends of the circuit. and then reading once rectification had taken place.

15.

16.

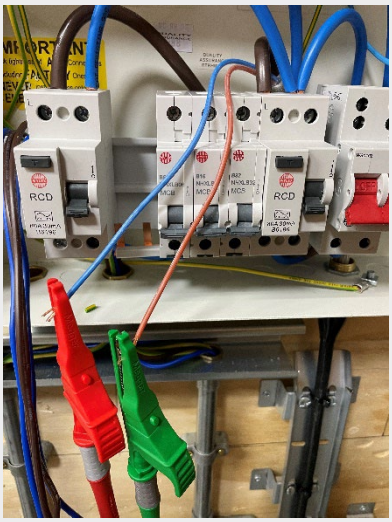
17.

Photograph 19

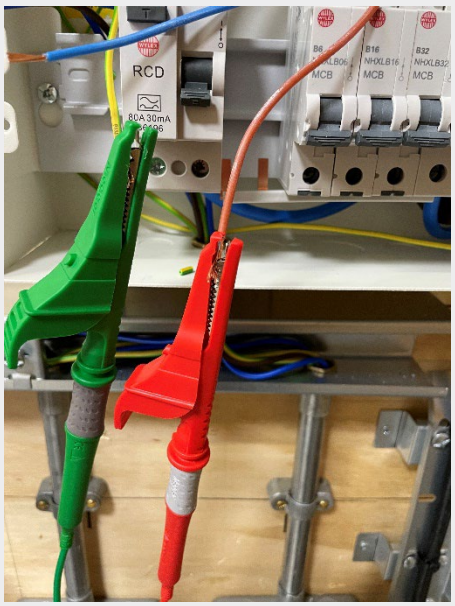
Insulation resistance tests being carried out. This is a safety critical test and must be carried out in a safe manner due to the test voltage of 500 volts DC

19a.

19b.



19c.

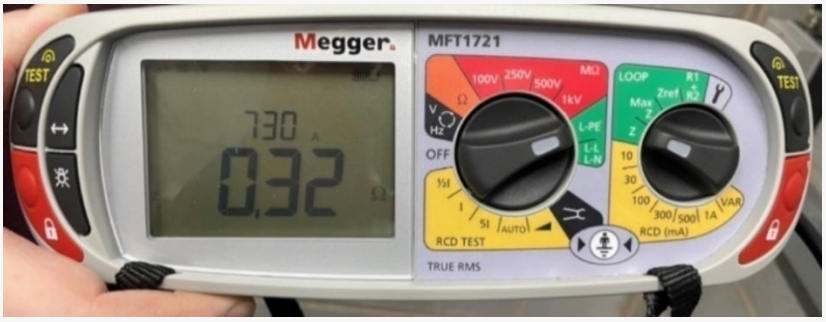


19d.

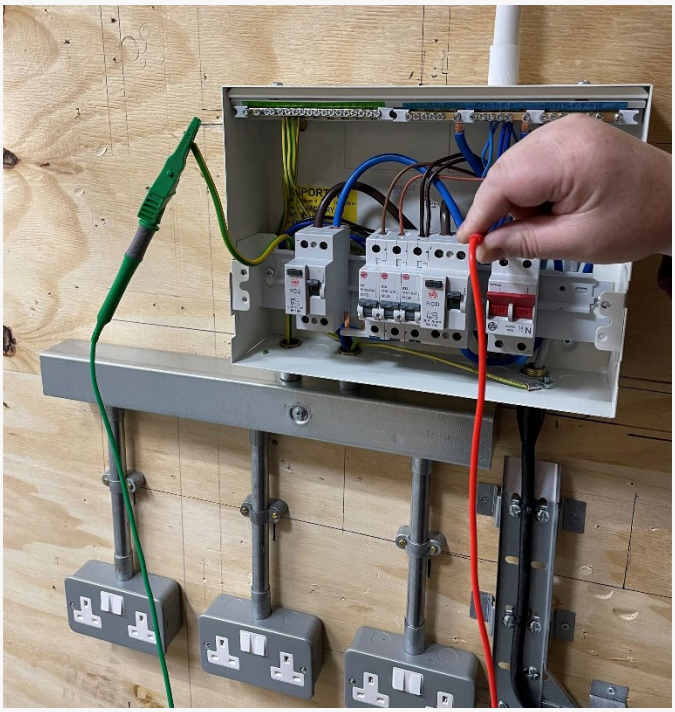
Photograph 20 - 25

Re-energised installation being testing. Photo shows the Ze being taken, this was first carried out with the main earth connected creating a parallel path, a second photo shows the test being performed correctly with the MET disconnected.

20.

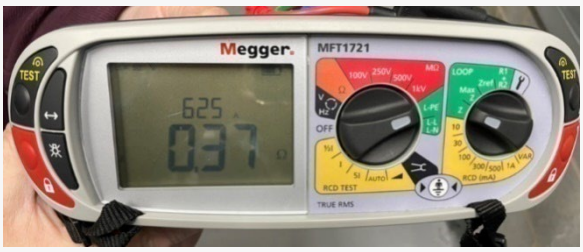


21.

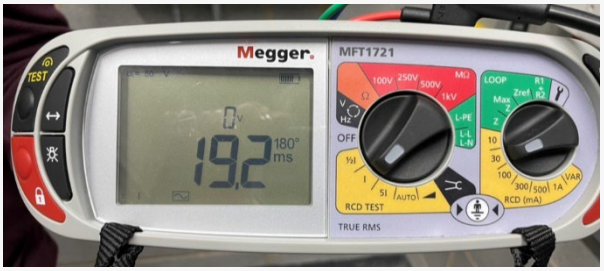


Photos required of PFC being taken, earth fault loop impedance and RCD tests being carried out.

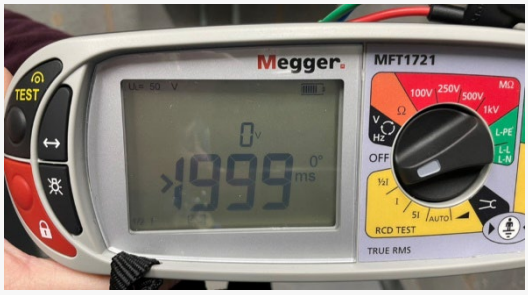
22.


Megger
MFT1721
625
0.37
TEST
OFF
RCD TEST
TRUE RMS

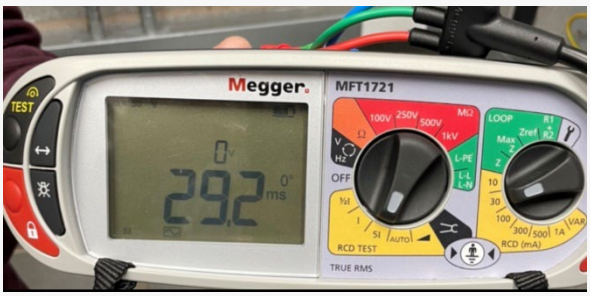
23.


Megger
MFT1721
0v
19.2
180°
ms
TEST
OFF
RCD TEST
TRUE RMS

24.


Megger
MFT1721
0v
>1999
0°
ms
TEST
OFF
RCD TEST
TRUE RMS

25.


Megger
MFT1721
0v
29.2
0°
ms
TEST
OFF
RCD TEST
TRUE RMS

1.1.11. Electrical Installation Certificate and schedule of inspections

(REQUIREMENTS FOR ELECTRICAL INSTALLATIONS - BS 7671 [IET WIRING REGULATIONS])

DETAILS OF THE CLIENT

Mr John James

22, Johnston Street, Seaton. AC30 1DC

INSTALLATION ADDRESS

22, Johnston Street, Seaton. AC30 1DC

DESCRIPTION AND EXTENT OF THE INSTALLATION

Description of installation**: Domestic/Commercial workshop, lighting and small power**

Extent of installation covered by this Certificate**: All circuits installed as per the schedule of results. As well as the associated containment as per figure 2.**

(Use continuation sheet if necessary) see continuation sheet No: .....

New installation	☑
Addition to an existing installation	☐
Alteration to an existing installation	☐

FOR DESIGN

I/We being the person(s) responsible for the design of the electrical installation (as indicated by my/our signatures below), particulars of which are described above, having exercised reasonable skill and care when carrying out the design and additionally where this certificate applies to an addition or alteration, the safety of the existing installation is not impaired, hereby CERTIFY that the design work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with BS 7671:2018, amended to ..**N/A**..... (date) except for the departures, if any, detailed as follows:

Details of departures from BS 7671 (Regulations 120.3, 133.1.3 and 133.5): **None**

Details of permitted exceptions (Regulation 411.3.3). Where applicable, a suitable risk assessment(s) must be attached to this Certificate. **None**

Risk assessment attached

The extent of liability of the signatory or signatories is limited to the work described above as the subject of this Certificate.

For the DESIGN of the installation: **(Where there is mutual responsibility for the design)

Signature: .**PC Jenkin** Date: **07/02/21** Name (IN BLOCK LETTERS): .**CLIVE JENKIN** Designer No 1

Signature: ..... Date: ..... Name (IN BLOCK LETTERS): ..... Designer No 2**

FOR CONSTRUCTION

I being the person responsible for the construction of the electrical installation (as indicated by my signature below), particulars of which are described above, having exercised reasonable skill and care when carrying out the construction hereby CERTIFY that the work for which I have been responsible is to the best of my knowledge and belief in accordance with BS 7671:2018, amended to **....N/A.....(**date) except for the departures, if any, detailed as follows:

Details of departures from BS 7671 (Regulations 120.3 and 133.5): **None**

The extent of liability of the signatory is limited to the work described above as the subject of this Certificate.

For CONSTRUCTION of the installation:

Signature: .**PC Jenkin** Date:_____ Name (IN BLOCK LETTERS): **CLIVE JENKIN** Constructor

FOR INSPECTION & TESTING

I being the person responsible for the inspection & testing of the electrical installation (as indicated by my signature below), particulars of which are described above, having exercised reasonable skill and care when carrying out the inspection & testing hereby CERTIFY that the work for which I have been responsible is to the best of my knowledge and belief in accordance with BS 7671:2018, amended to ....**N/A.....(**date) except for the departures, if any, detailed as follows:

Details of departures from BS 7671 (Regulations 120.3 and 133.5): **None**

The extent of liability of the signatory is limited to the work described above as the subject of this Certificate.

For INSPECTION AND TESTING of the installation:

Signature: **Candidate A** Date: _____ Name (IN BLOCK LETTERS): **Candidate A** Inspector

NEXT INSPECTION

I/We the designer(s), recommend that this installation is further inspected and tested after an interval of not more than .5. years/~~months.~~

PARTICULARS OF SIGNATORIES TO THE ELECTRICAL INSTALLATION CERTIFICATE

Designer (No 1)

Name: **PC Jenkin** Company: **Honister Installation Ltd**
Address: **1 Grassmoor, Cockermouth**
..... Postcode: **CA99 1ER.** Tel No: **01234 567890**

Designer (No 2)
(if applicable)

Name: .....**N/A.....** Company:.....
Address: .....
..... Postcode: ..... Tel No: .....

Constructor

Name: **PC Jenkin** Company: **Honister Installation Ltd**
Address: **1 Grassmoor, Cockermouth**
..... Postcode: **CA99 1ER** Tel No: **01234 567890**

Inspector

Name: **PC Jenkin** Company: **Honister Installation Ltd**
Address: **1 Grassmoor, Cockermouth**
..... Postcode: **CA99 1ER** Tel No: **01234 567890**

SUPPLY CHARACTERISTICS AND EARTHING ARRANGEMENTS

Earthing arrangements	Number and Type of Live Conductors		Nature of Supply Parameters	Supply Protective Device
TN-C TN-S TN-C-S ✓ TT IT	AC 1-phase, 2-wire ✓ 2-phase, 3-wire 3-phase, 3-wire 3-phase, 4-wire	DC 2-wire 3-wire Other	Nominal voltage, U / U_0 (1) .400/230 V Nominal frequency, f (1) 50 Hz Prospective fault current, I_{pf} (2) 1.6 kA External loop impedance, Z_e (2) 0.14 Ω *(Note: (1) by enquiry* *(2) by enquiry or by measurement)*	BS (EN) ...88..... Type .....2..... Rated current ....100.. A
	Confirmation of supply polarity ☑			

Other sources of supply (as detailed on attached schedule**) N/A**

PARTICULARS OF INSTALLATION REFERRED TO IN THE CERTIFICATE

Means of Earthing	**Maximum Demand**
Distributor's facility	Maximum demand (load) .....60..... kVA / Amps Delete as appropriate
Installation earth electrode	**Details of Installation Earth Electrode** *(where applicable)* Type **N/A** (e.g. rod(s), tape etc) ..... Location ..... Electrode resistance to Earth ..... Ω

Main Protective Conductors

Earthing conductor	Material .....**CU.**..... csa ...**16.**..... mm^2	Connection / continuity verified ☑
Main protective bonding conductors (to extraneous-conductive-parts)	Material .....**CU.**..... csa ....**10**..... mm^2	Connection / continuity verified ☑

To water installation pipes ☑	To gas installation pipes ☑	To oil installation pipes **N/A**	To structural steel **N/A**
To lightning protection **N/A**	To other Specify **N/A**		

Main Switch / Switch-Fuse / Circuit-Breaker / RCD

Location **Workshop.** ..... BS(EN) **60947-5** No of poles ***2***	Current rating **100.** A Fuse / device rating or setting .**N/A.** A Voltage rating **230.** V	**If RCD main switch** Rated residual operating current ($I_{\Delta n}$) **N/A...** mA Rated time delay ..... ms Measured operating time .... ms

COMMENTS ON EXISTING INSTALLATION (in the case of an addition or alteration see Regulation 644.1.2):

.....
.....**N/A.**.....
.....
.....
.....
.....

....
SCHEDULES   The attached Schedules are part of this document and this Certificate is valid only when they are attached to it. .1.....   Schedules of Inspections and ....1..... Schedules of Test Results are attached.   (Enter quantities of schedules attached).

SCHEDULE OF INSPECTIONS (for new installation work only) for

DOMESTIC AND SIMILAR PREMISES WITH UP TO 100 A SUPPLY

NOTE 1: This form is suitable for many types of smaller installation, not exclusively domestic.

All items inspected in order to confirm, as appropriate, compliance with the relevant clauses in BS 7671. The list of items and associated examples where given are not exhaustive.

NOTE 2: Insert ✓ to indicate an inspection has been carried out and the result is satisfactory, or N/A to indicate that the inspection is not applicable to a particular item.

Item No	DESCRIPTION	Outcome See Note 2
1.0	**EXTERNAL CONDITION OF INTAKE EQUIPMENT (VISUAL INSPECTION ONLY)**	
1.1	Service cable	☑
1.2	Service head	☑
1.3	Earthing arrangement	☑
1.4	Meter tails	☑
1.5	Metering equipment	
1.6	Isolator (where present)	N/A
2.0	**PARALLEL OR SWITCHED ALTERNATIVE SOURCES OF SUPPLY**	
2.1	Adequate arrangements where a generating set operates as a switched alternative to the public supply (551.6)	
2.2	Adequate arrangements where a generating set operates in parallel with the public supply (551.7)	N/A
3.0	**AUTOMATIC DISCONNECTION OF SUPPLY**	
3.1	**Presence and adequacy of earthing and protective bonding arrangements:**	
	• Distributor's earthing arrangement (542.1.2.1; 542.1.2.2)	☑
	• Installation earth electrode (where applicable) (542.1.2.3)	N/A
	• Earthing conductor and connections, including accessibility (542.3; 543.3.2)	☑
	• Main protective bonding conductors and connections, including accessibility (411.3.1.2; 543.3.2; 544.1)	☑
	• Provision of safety electrical earthing/bonding labels at all appropriate locations (514.13)	☑
	• RCD(s) provided for fault protection (411.4.204; 411.5.3)	N/A
4.0	**BASIC PROTECTION**	
4.1	**Presence and adequacy of measures to provide basic protection (prevention of contact with live parts) within the installation:**	
	• Insulation of live parts e.g. conductors completely covered with durable insulating material (416.1)	☑
	• Barriers or enclosures e.g. correct IP rating (416.2)	☑
5.0	**ADDITIONAL PROTECTION**	
5.1	**Presence and effectiveness of additional protection methods:**	

	• RCD(s) not exceeding 30 mA operating current (415.1; Part 7), see Item 8.14 of this schedule	☑
	• Supplementary bonding (415.2; Part 7)	N/A
6.0	**OTHER METHODS OF PROTECTION**	
6.1	**Presence and effectiveness of methods which give both basic and fault protection:**	
	• SELV system, including the source and associated circuits (Section 414)	N/A
	• PELV system, including the source and associated circuits (Section 414)	N/A
	• Double or reinforced insulation i.e. Class II or equivalent equipment and associated circuits (Section 412)	N/A
	• Electrical separation for one item of equipment e.g. shaver supply unit (Section 413)	N/A
7.0	**CONSUMER UNIT(S) / DISTRIBUTION BOARD(S):**	
7.1	Adequacy of access and working space for items of electrical equipment including switchgear (132.12)	
7.2	Components are suitable according to assembly manufacturer's instructions or literature (536.4.203)	☑
7.3	Presence of linked main switch(es) (462.1.201)	☑
7.4	Isolators, for every circuit or group of circuits and all items of equipment (462.2)	☑
7.5	Suitability of enclosure(s) for IP and fire ratings (416.2; 421.1.6; 421.1.201; 526.5)	☑

Item No	DESCRIPTION	Outcome See Note 2
	CONSUMER UNIT(S) / DISTRIBUTION BOARD(S) continued	
7.6	Protection against mechanical damage where cables enter equipment (522.8.1; 522.8.5; 522.8.11)	☑
7.7	Confirmation that ALL conductor connections are correctly located in terminals and are tight and secure (526.1)	☑
7.8	Avoidance of heating effects where cables enter ferromagnetic enclosures e.g. steel (521.5)	
7.9	Selection of correct type and ratings of circuit protective devices for overcurrent and fault protection (411.3.2; 411.4, 411.5, 411.6; Sections 432, 433; 537.3.1.1)	☑
7.10	**Presence of appropriate circuit charts, warning and other notices:**	
	• Provision of circuit charts/schedules or equivalent forms of information (514.9)	☑
	• Warning notice of method of isolation where live parts not capable of being isolated by a single device (514.11)	N/A
	• Periodic inspection and testing notice (514.12.1)	☑
	• RCD six-monthly test notice; where required (514.12.2)	☑
	• AFDD six-monthly test notice; where required	N/A
	• Warning notice of non-standard (mixed) colours of conductors present (514.14)	N/A
7.11	Presence of labels to indicate the purpose of switchgear and protective devices (514.1.1; 514.8)	☑
8.0	**CIRCUITS**	
8.1	Adequacy of conductors for current-carrying capacity with regard to type and nature of the installation (Section 523)	☑
8.2	Cable installation methods suitable for the location(s) and external influences (Section 522)	☑
8.3	Segregation/separation of Band I (ELV) and Band II (LV) circuits, and electrical and non-electrical services (528)	☑
8.4	Cables correctly erected and supported throughout, with protection against abrasion (Sections 521, 522)	☑
8.5	Provision of fire barriers, sealing arrangements where necessary (527.2)	☑
8.6	Non-sheathed cables enclosed throughout in conduit, ducting or trunking (521.10.1; 526.8)	☑
8.7	Cables concealed under floors, above ceilings or in walls/partitions, adequately protected against damage (522.6.201, 522.6.202, 522.6.203; 522.6.204)	☑
8.8	Conductors correctly identified by colour, lettering or numbering (Section 514)	☑
8.9	Presence, adequacy and correct termination of protective conductors (411.3.1.1; 543.1)	☑
8.10	Cables and conductors correctly connected, enclosed and with no undue mechanical strain (Section 526)	☑
8.11	No basic insulation of a conductor visible outside enclosure (526.8)	☑

8.12	Single-pole devices for switching or protection in line conductors only (132.14.1; 530.3.3; 643.6)	☑
8.13	Accessories not damaged, securely fixed, correctly connected, suitable for external influences (134.1.1; 512.2; Section 526)	☑
8.14	Provision of additional protection/requirements by RCD not exceeding 30mA:	
	• Socket-outlets rated at 32 A or less, unless exempt (411.3.3)	☑
	• Supplies for mobile equipment with a current rating not exceeding 32 A for use outdoors (411.3.3)	N/A
	• Cables concealed in walls at a depth of less than 50 mm (522.6.202; 522.6.203)	N/A
	• Cables concealed in walls/partitions containing metal parts regardless of depth (522.6.202; 522.6.203)	N/A
	• Final circuits supplying luminaires within domestic (household) premises (411.3.4)	☑
8.15	**Presence of appropriate devices for isolation and switching correctly located including:**	
	• Means of switching off for mechanical maintenance (Section 464; 537.3.2)	☑
	• Emergency switching (465.1; 537.3.3)	N/A
	• Functional switching, for control of parts of the installation and current-using equipment (463.1; 537.3.1)	☑
	• Firefighter's switches (537.4)	N/A
9.0	**CURRENT-USING EQUIPMENT (PERMANENTLY CONNECTED)**	
9.1	Equipment not damaged, securely fixed and suitable for external influences (134.1.1; 416.2; 512.2)	☑
9.2	Provision of overload and/or undervoltage protection e.g. for rotating machines, if required (Sections 445, 552)	☑
9.3	Installed to minimize the build-up of heat and restrict the spread of fire (421.1.4; 559.4.1)	☑
9.4	Adequacy of working space. Accessibility to equipment (132.12; 513.1)	☑
10.0	**LOCATION(S) CONTAINING A BATH OR SHOWER (SECTION 701)**	
10.1	30 mA RCD protection for all LV circuits, equipment suitable for the zones, supplementary bonding (where required) etc.	N/A

11.0	**OTHER PART 7 SPECIAL INSTALLATIONS OR LOCATIONS**	
11.1	List all other special installations or locations present, if any. (Record separately the results of particular inspections applied)	N/A

Inspected by:

Name (Capitals) CANDIDATE A **Signature Candidate A**

GENERIC SCHEDULE OF TEST RESULTS

DB reference no: CU7
Location: WORKSHOP
Z_s at DB (Ω): 0.14Ω
I_{pf} at DB (kA):
Correct supply polarity confirmed: ☑
Phase sequence confirmed (where appropriate): ☐

Details of circuits and/or installed equipment vulnerable to damage when testing: LOADS PLUGGED IN.

Details of test instruments used (state serial and/or asset numbers)
Continuity: 116384-75
Insulation resistance:
Earth fault loop impedance:
RCD:
Earth electrode resistance:

Tested by:
Name (Capitals): PC JENKIN
Signature: C JENKIN Date:

Circuit details											Test results													
		Protective device							Conductor details		Ring final circuit continuity (Ω)			Continuity (Ω) ($R_1 + R_2$) or R_2		Insulation Resistance Test Voltage	Insulation Resistance (MΩ)		Polarity	Z_s (Ω)	RCD		AFDD	Remarks (continue on a separate sheet if necessary)
Circuit number	Circuit Description	BS (EN)	type	rating (A)	breaking capacity (kA)	RCD $I_{\Delta n}$ (mA)	Maximum permitted Z_s (Ω)*	Reference Method	Live (mm²)	cpc (mm²)	r_1 (line)	r_n (neutral)	r_2 (cpc)	($R_1 + R_2$)	R_2	V	Live - Live	Live - Earth		Maximum measured	Disconnection time (ms)	RCD test button operation	Manual AFDD test button operation	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25
1	RING FINAL	B	B	32	6	30	1.37	B	2.5	1.5	0.6	0.6	0.97	0.38	—	500	>1000	>1000	✓	0.57	25	✓		
2	RADIAL CIRCUIT		B	16	6	—	2.37		2.5	1.5				0.29			>1000	>1000		0.4				
3	LIGHTING		B	6	6	—	7.28	B	1.5	1.0				0.51			>1000	>1000		0.71				

6 1 0 0 9 -

* Where the maximum permitted earth fault loop impedance value stated in column 8 is taken from a source other than the tabulated values given in Chapter 41 of this Standard, state the source of the data in the appropriate cell for the circuit in the 'Remarks' column (column 25) of the schedule.

Task 3 – Carrying out maintenance

(Assessment themes: Health and safety, systems components, working with faults)

For task 3 candidates need to produce the following pieces of evidence:

- Six completed report cards
- Assessor observations:
  - Fault diagnosis
  - Fault rectification

For illustration, the guided exemplification materials (GSEM) for Task 3 contain examples of candidate evidence for the following assessment requirements only:

- A sample completed report card
- Assessor observations:
  - Fault diagnosis
  - Fault rectification

The following task 1 candidate assessment requirements have not been included as example candidate evidence for this version of the guided exemplification materials.

- Six completed report cards

1.1.2. Task 3 - Candidate evidence

1.1.12. Job card

Report sheet One
Job card reference number: **RF 1 (Ring final)** (Needs to reflect the relevant fault reference, as stated in the award standards)
Description of work done/ tests carried out to locate fault (if any) Carried out investigation work on the ring final circuit, as the client had informed me that the circuit protective device was not holding in the on position. Having safely isolated the circuit, I carried out the appropriate inspection and testing procedures. I started by testing the continuity of the conductors to see if there was a break and carried out a continuity test on all conductors and got the following results that were ok. L = 0.30Ω N = 0.31Ω E = 0.51Ω Next I carried out an insulation resistance test on the circuit. The following results were obtained. L-N 0.00MΩ L-E ≥1000MΩ N-E ≥1000MΩ which told me there was a live to neutral fault **The nature of the fault** Short-circuit condition between live and neutral conductors. **Brief description including material if required to fix the fault.** ring final circuit had to be re-wired. **Action required to ensure rectification is suitable.** Re-test

1.1.13. Practical Observation Form - Diagnosis and rectification of faults

Assessment ID	Qualification number
8710-353	8710 - 33
Candidate name	**Candidate number**
Candidate A	CG12345
Centre name	**Assessment themes**
City & Guilds	Health and safety, systems and components, working with faults

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	**Notes –** *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
Fault diagnosis	Initial interaction with the customer is slow, with limited eye contact, head down with arms folded although this improved as the candidate moved on with the fault diagnoses Candidate asked some questions that might help with the initial fault diagnosis such ascertaining the protective device was not holding in the on position. Health and Safety procedures were considered such as using the correct PPE, safe Isolation and locking off the circuit being worked on and tagging out prior to commencing work, the approach to be taken to commence the task was explained by the candidate. Tools and test equipment were used in a safe manner to industry standards, the candidate did however have to reprove their test leads were correctly inserted to the equipment as the reading first taken were not as the candidate expected, this was easily rectified without any prompting from the assessor. A logical sequence of electrical tests was applied to identify the faulty component on most tests, but the candidate lacked confidence and had to be prompted on occasion, overall, the

Task	Notes – *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
	candidate's fault-finding techniques were carried out with some success demonstrating appropriate knowledge of fault-finding techniques, however some of the faults such as fault RF1 trail and errors was evident with unnecessary tests being carried out. The candidate's selected repair method was acceptable, but this lacked details. Little consideration was given to possible damage to customer's property.
Fault rectification	Candidate implemented all the health and safety preparations required. The candidate showed a logical approach to the rectification for most of the faults, but did not apply this consistently to all faults such as RF1 where the candidate stated the ring final circuit required rewiring, but did not consider identifying the part of the ring that required rectification showing a limited approach. The approach to rectify the other faults showed some consideration of a logical process and tool use was sound but with some errors that affected the quality of finish. The system is operational and checked, however not all replaced components and materials were disposed of correctly.

Guidance on the exemplar marking

Marking Grids for each assessment theme are found within the Assignment Assessor Pack and gives guidance on banding descriptors, marks available within each band as well as indicative content that provides guidance on knowledge, understanding and skills within the assessment theme.

For the purposes of these materials the Marking Grids used can be found in the Sample Assessment Materials here.

Within this standardisation pack, a partially completed CRF form has been provided that outlines how an assessor has awarded marks against the candidate evidence for a number of the assessment themes using the Marking Grid included in the Sample Assessment Materials.

For exemplification purposes, an explanation of how the marker has determined the mark to be awarded is provided, this exemplary document showing

- How the marker has first considered the marking bands available and determined within which band the evidence best fits
- Subsequently, consideration within the determined band and justification for the mark to be awarded within that band.

Candidate Record Form (CRF) – Electrotechnical Engineering (8710-353)

Health and safety												
	Band 1				**Band 2**				**Band 3**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Band 2	**Band justification** Across the evidence generated for each task, such as performance observation forms, the evidence suggest that the majority of the work was undertaken in a very safe manner with many risk mitigation methods identified and applied throughout the tasks meaning band 1 has been exceeded. None of the evidence suggests that risk probability was explored or demonstrated, and the candidate did not apply dynamic risk assessing once the initial risk management techniques were applied. This therefore does not match band 3 so band 2 applies.											
Mark 6	**Mark justification** The safe isolation process was correct on each occasion; however the candidate was a little hesitant on the first occasion. PPE was effectively used throughout, but probability not fully considered and good housekeeping was not maintained at all times during the practical installation, a mid-range mark is selected- 6 marks											

Design and planning – Documentation						
	Band 1		**Band 2**		**Band 3**	
	1	**2**	**3**	**4**	**5**	**6**
Band **1**	**Band justification** All items on the assessments of general characteristics form are complete with correct information in the correct areas (although information is minimal, see technical information marking). Materials take off sheet is not the correct document and the pro-former one in the pack has not been used. The candidate generated document lacks a symbol column and resembles a material list rather than take off sheet and lacks detail such as quantities and details of all items listed. Design grid contains some errors but is generally accurate with the exception of some dimensions. As a result of the major errors in the take off sheet, the evidence does not meet band 2 as documents are not generally acceptable and therefore band 1 applies.					

Mark	Mark justification
2	The majority of the documentation provided is to a good standard with the exception of the take-off sheet so the higher mark in this band applies- 2 marks

Working with faults									
	Band 1			Band 2			Band 3		
	1	2	3	4	5	6	7	8	9

Band	Band justification
1	Poor interaction with client with minimal methods of interacting and gathering information applied. Some knowledge of fault finding applied with limited logical procedures applied. Some of the evidence does meet some aspect of band 2 but further evidence such as RF1 matches band 1 more such as minimal technical detail, minimal reports completed and the description relating to rectification lacked depth and technical detail. As a result, most of the evidence matches band 1

Mark	Mark justification
3	As the evidence has aspects of matching band 2, just not quite enough, the highest band 1 mark has been given- 3 marks

Internal assessor name	Date
Internal assessor signature	

Total mark
*/90

* Please Note that the Total Mark (90) applies to the full assignment including all 7 Assessment Themes

3. Candidate B

Assessment details

This standardisation pack has been developed to reflect the requirements of the **Electrotechnical engineering – Sample** version. The assessment pack can be access on the City & Guilds website, here.

The evidence used for the exemplar marking in this pack is based on the **Guide Standard Exemplification materials** for this occupational specialism that can be located, here.

Task 1 – Planning the installation

(Assessment themes: Health and safety, design and planning, reporting and information)

For task 1 candidates need to produce the following pieces of evidence:

- Completed assessment of general characteristics form
- Completed lighting design schedule
- Completed materials take-off sheet
- Completed design grid

For illustration, the guided exemplification materials (GSEM) for Task 1 contain examples of candidate evidence for the following assessment requirements only:

- Completed assessment of general characteristics form
- Completed lighting design schedule
- Completed materials take-off sheet
- Completed design grid

3.1.1. Task 1 - Candidate evidence

1.1.14. Completed assessment of general characteristics form

Chapter/regulation from BS 7671	What needs assessing specific to this installation	How this impact the installation
Chapter 31	Purpose of the installation	Is it suitable for the intended use
311.1	Maximum demand and diversity	The installation needs to be assessed as to the maximum demand and diversity applied with in thermal limits and voltage drop to ensure that cables mains cables are not over sized
312.3	Earthing system	The earthing system needs assessed to ensure that it is suitable for the installation, regarding loss of PME.
313.1	Supplies	The following items need to be determined by calculation, measurement, enquiry, or inspection • Nominal voltage (s) • Current and frequency • PSSC at origin • EFLI at origin • Suitability for the requirements of the installation and maximum demand • Type and rating of over current protective device at origin of the installation
314.1	Has the circuits been divided to provide for	The installation is divided into circuits to ensure: • Inconvenience in case of a fault i.e. more than one lighting circuit in a large office • Ease of inspection and testing i.e. being able to only isolate selected circuits while other circuits are available • Take into of hazards from failure of a single circuit. • Reduce unwanted tripping of RCD's due to high earth leakage, use RCBO on circuits or increasing the number of circuits used with less sockets on especially where there are many computers. • Prevent energising of a circuit that is intended to be isolated.
Chapter 32 Appendix 5	Classification of external influences	External influences (environment) should be checked to ensure that: • Correct IP codes used • Corrosion • Impact • Utilisation

		Thought should also be given to those who may use the building: • BA1 Ordinary persons • BA3 handicapped. • Classification code BE Materials with fire risk associated. Buildings classification codes require consideration: CA - codes is the building. CA1 - non-combustible. CA2 - combustible. CB - the building structure.
Chapter 33	Compatibility of characteristics	We need to ensure that equipment in the installation will not have harmful effects: • Earth leakage current from equipment not being electrically tested may operate RCD's. • Some equipment has DC feedback. therefore type AC RCD's will not operate under fault conditions, Type A, F or B RCD's may be required.
Chapter 34	Maintenance	The designer needs to consider the interval to the first periodic inspection and test.
Chapter 35	Safety services	Safety services require consideration as below: • Emergency lighting • Fire alarms • CO detection
Chapter 36	Assessment of continuity of service	Any alterations of circuits need to be checked to ensure that: • The earth system is safe, certain equipment outside cannot be connected to a PME. • Selection of devices to ensure selectivity, protective device closest to fault disconnects first. • Number of circuits. • Are they now multiple power supplies i.e. photovoltaic panels? • Are monitoring devices now needed i.e. dc monitoring for any added car charging units.

1.1.15. Lighting design schedule

Room Index Calculation

The lighting design calculation is as follows:

$$\frac{L \times W \times E}{LDL \times uF \times mF}$$

L = length

W = width = The plan shows *two fittings*

E = Lux level required

LDL = Lumen output of each luminaire

uF = utilisation factor

mF = Maintenance factor (light loss factor).

Batten 6000 lumen

Bulkhead 1360 lumen

Area	Utilisation factor	Light loss factor	spacing	height	Required lux level	Calculation	Lumens required per luminaire
Workshop/print room	0.7	0.65	1.25m	2.4 m	500 lux	L = 5.25 m W = 3.75 m 5.25 x 3.75 x 500 6000 x 0.7 x 0.65 **= 3.6** To achieve 500 lux within this area 3.6 fittings are required therefore I would suggest installing 4 light fittings in the workshop/print area.	6000
Office sales area	0.75	0.8	2.8m	2.4 m	300 lux	Length 8.75 m Width 8.25 m 8.75 x 8.25 x 300 6000 x 0.75 x 0.80 **= 6.01** 6.01 fitting required so 6 lights are required.	6000

1.1.16. Materials take off sheet

Equipment/Materials	Quantity
4+4-way split load metal distribution board (that includes – 100/80 amp 30Ma RCD protection)	1
32amp mcb/rcbo type B	1
16amp mcb/rcbo type B	1
6amp mcb/rcbo type B	1
20mm PVC conduit	3/5 metres
20mm PVC saddles	2
20mm PVC adaptors/bush	3
20mm PVC tee-box	1
20mm PVC angle-box	1
PVC surface mounted switch boxes	2
100mm metallic tray	2 metres
100mm metallic tray bend	1
50x50mm steel trunking	2 metres
50x50mm steel trunking end caps	2
20mm steel conduit	2/3 metres
20mm steel conduit couplers	10
20mm steel conduit saddles	6
20mm brass bushes	12
Lighting LED Fluorescent	2
2-way PVC lighting switches	2

16amp isolator BSEN 60309 (Metal clad)	1
Metal clad switched double sockets	4
Single core cable 2.5mm (Brown)	15 metres
Single core cable 2.5mm (Blue)	15 metres
Single core cable 2.5mm (Green/Yellow)	15 metres
Single core cable 1.5mm (Brown)	10 metres
Single core cable 1.5mm (Blue)	2 metres
Single core cable 1.5mm (Green/Yellow)	4 metres
SWA (Steel wire armoured) cable 2-core 2.5mm	2 metres
SWA (Steel wire armoured) BW gland pack (20s)	1
Consumables (Fixings etc)	
Screws/plugs	Boxes
Cable ties (pack)	1
Conduit glue Tin	1
Tools and Plant	
Marking tool/Pencil	1
Tape measure	1
Conduit bending spring (20mm)	1
Conduit bending machine	1
Stock and die set (20mm)	1
Bush spanner 20mm	1
Power Drill (Battery/Mains)	1
Selection of drilling bits (Steel/Masonry) 6mm etc	1

20mm Hole cutter/saw	1
Hacksaw	1
Pipe Grips/footprints	2
Adjustable spanner	2
Selection of metal files (reamer)	2/3
Electricians Knife	1
Side cutters	1
Pliers	1
VDE Screwdriver Philips/Pozi small	1
VDE Screwdriver Philips/Pozi medium	1
VDE Screwdriver Philips/Pozi large (No.3)	1
VDE Screwdriver flat head small (No.1)	1
VDE Screwdriver flat head medium (No.2)	1
VDE Screwdriver flat head large	1
Cable/wire strippers	1
Hammer	1
Centre punch	1
Scriber	1
Spirt levels	2
Set square	1
Testing instrument (Multi-functional)	1
AVI (approved voltage indicator)	1
Clean cloths	2

PPE	
Overalls/protective clothing	
Steel toe capped boots	
Goggles/glasses	

1.1.17. Design grid

Consumer unit located in workshop VOLTAGE DROP TO COMPLY WITH BS 7671		Nominal Voltage (U) 230 V		Earthing Arrangement TN-C-S		External Earth Fault Loop Impedance (Z_e) 0.3 Ω		
Circuit	1	2	3	4	5	6	7	8
Description	Ring-final office	Radial-final sockets workshop	Radial-sockets kitchen x2 twin	Boiler supply	Outbuilding DB	4.5 kW printing machine	Lighting office	Lighting workshop/kitchen/ toilets
No. outlets	6 x 2-gang	4 x 2-gang	2 x 2-gang	1	1	1	7	5
Type of wiring	70 ^{0}C thermoplastic single-core non-sheathed	70 ^{0}C thermoplastic single-core non-sheathed	70 ^{0}C thermoplastic single-core non-sheathed	70 ^{0}C thermoplastic multi-core flat profile	70 ^{0}C thermoplastic 3-core PVC SWA	70 ^{0}C thermoplastic 3-core PVC SWA	70 ^{0}C thermoplastic single-core non-sheathed	70 ^{0}C thermoplastic single-core non-sheathed
Design Current (I_b)	22 A	15 A	9 A	4 A	16 A	19.56 A	1.6 A	0.7 A
Type and Nominal rating (I_n)	32 A B	20 A B	20 A B	16 A B	16 A C	20 A B	6 A C	6 A C
Length (metres)	50 m loop	11 m	10 m	8 m	27 m	6	65	20 m
Installation method	B	B	B	B	C	C	C	B
Ambient temperature ^{0}C	25 ^{0}C	25 ^{0}C	25 ^{0}C	30 ^{0}C	30 ^{0}C	30 ^{0}C	30 ^{0}C	30 ^{0}C
Rating Factor	1.03	1.03	1.03	1	1	1	1	1

Ambient air temp. C_a								
Total circuits in group	2	2	2	1	1	1	2	2
Rating factor grouping C_g	0.80	0.80	0.80	1	1	1	0.80	0.80
Minimum current capacity ($<I_t$)	24.27each cable	24.27	24.27	16	16	20 A	7.5	7.5
mV/A/m	11	11	11	29	18	29	29	29
Actual Voltage drop	3.025	1.815	0.99	0.928	7.776	3.40	3.016	0.406
Minimum conductor csa mm^2	4.0	4	4	1.5	2.5	1.5	1.5	1.5

1.1.18. Design grid calculations

Design Calculations / Assumptions

Circuit 1, Ring final circuit in office area

This will be a mixture of conduit and dado trunking reference method B

Rating factor for 25 degrees 70°C from table 4B1 1.03

Grouping for 2 circuits method B, from table 4C1 0.80

a) Application of In 32 A= 32/1.03/0.8 = 38.83 A this is divided by 2 to give Iz of each cable 38.83/2 =19.41Table 4D1A column 4 =24A next size up is a 2.5mm^2

b) Taking account of regulation 433.1.204 derating factors are applied to In of 20 A for each cable, therefore 20 /1.03/0.8 =24.27 table 4D1A column 4 =32 A next size up is a 4mm conductor.

c) 4D1B Column 3 mv/A/m for 2.5mm is 18 and 4mm is 11

The voltage drop for 2.5mm ring final circuit is $\frac{22 \times 50 \times 18}{1000 \times 4} =$ 4.95 V

The voltage drop for a 4.0mm cable is

VD = Ib x L x mV/A/m

$\frac{22 \times 50 \times 11}{1000 \times 4}$ 3.025 V

$\frac{}{1000 \times 4}$ 1000 x4

Voltage dropped is acceptable 5% of 230 V is 11.5 V

Circuit 2

Assuming floor to ceiling is 2.4 m in height

Assuming dado trunking is 0.75 m from finished floor level

From distribution board to last socket is 11 m

Rating factor for 25 degrees 70°C from table 4B1 1.03

Grouping for 2 circuits method B from table 4C1 0.80

In = 20A /1.03/0.8 = 24.27 A

table 4D1A column 4 = 4mm

4D1B Column 3 mV/A/m for 4mm is 11

Voltage drop is $\frac{VD = Ib \times L \times mV/A/m}{1000}$ $\frac{15 \times 11 \times 11}{1000}$ = 1.815 V

Voltage drop acceptable 5% of 230 V is 11.5 V

Circuit 3

Rating factor for 25 degrees from table 4B1 1.03

Grouping for 2 circuits from table 4C1 0.80

In = 20A /1.03/0.8 = 24.27 A

table 4D1A column 4 = 4mm

4D1B Column 3 mv/A/m for 4mm is 11

Voltage drop is $\frac{VD = Ib \times L \times mV/A/m}{1000}$ $\frac{9 \times 10 \times 11}{1000}$ 0.99 V

Voltage drop acceptable 5% of 230 V is 11.5 V

Circuit 4

Voltage drop is $\frac{VD = Ib \times L \times mV/A/m}{1000}$ $\frac{4 \times 8 \times 29}{1000}$ = 0.982 V

Voltage drop acceptable 5% of 230 V is 11.5 V

Circuit 5

Voltage drop is $\frac{VD = Ib \times L \times mV/A/m}{1000}$ $\frac{16 \times 27 \times 18}{1000} = 7.776$ V

Voltage drop acceptable 5% of 230 V is 11.5 V

Circuit 6

4.5 kW printer

$\frac{4500 \text{ W}}{230} = 19.56$ A

In = BS EN 60898 20 A type B

Height from floor to ceiling 2.4 m

Length is from DB to floor level 6 m

It is 20 A

mV/A/m is from table 4D4B column 3 is 29

Voltage drop is $\frac{VD = Ib \times L \times mV/A/m}{1000}$ $\frac{19.56 \times 6 \times 29}{1000} = 3.04$ V

Minimum conductor CSA from table 4D4A column 2.21A = 1.5mm

Voltage drop acceptable 5% of 230 V is 11.5 V

Circuit 7

The circuit length is 65 m

Installation method conduit trunking method B

Grouping for 2 circuits from table 4C1 0.80

mV/A/m table 4D1B column 3 = 29

Voltage drop is $\frac{VD = Ib \times L \times mV/A/m}{1000}$ $\frac{1.6 \times 65 \times 29}{1000}$ = 3.016 V

Voltage drop acceptable 3% of 230 V is 6.9 V

Circuit 8

Installation method conduit trunking method B

mV/A/m table 4D1B column 3 = 29

Voltage drop is $\frac{VD = Ib \times L \times mV/A/m}{1000}$ $\frac{0.7 \times 20 \times 29}{1000}$ = 0.406 V

Voltage drop acceptable 3% of 230 V is 6.9 V

Task 2 – Installation, commissioning and decommissioning

(Assessment themes: Health and Safety, Design and planning, Systems and components, Inspecting and testing systems and components, Reports and information)

For task 2 candidates need to produce the following pieces of evidence:

- Assessor observation of installation:
  - Safe isolation
  - Installation of cables and wiring systems
  - Inspection and testing
- Completed Electrical Installation Certificate
- Schedule of inspections
- Schedule of test results
- Copy of the Guidance for recipients

For illustration, the guided exemplification materials (GSEM) for Task 2 contain examples of candidate evidence for the following assessment requirements only:

- Assessor observation of installation:
  - Safe isolation
  - Installation of cables and wiring systems
  - Inspection and testing
- Completed Electrical Installation Certificate
- Schedule of inspections
- Schedule of test results

The following task 2 candidate assessment requirements have not been included as example candidate evidence for this version of the guided exemplification materials.

- Copy of the Guidance for recipients

Photographic evidence:

Installation of cables and wiring systems

- Measuring and marking out **(photograph 1,2)**
- Conduit being cut, containment being installed and saddles **(photograph 3, 4, 5)**
- Installation of SWA and glanding **(photograph 5)**
- Cables being installed into the containment **(photograph 6)**
- Preparing terminations **(photograph 7)**
- Terminations being completed **(photograph 8, 9)**
- Final installation **(photograph 10)**

Inspection and testing

- Testing equipment being nulled/zeroed **(photograph 11&12)**
- R1+R2 and polarity being confirmed **(photograph 13)**
- Testing of final ring circuit **(photograph 14 – 16)**
- Insulation resistance tests **(photograph 17)**
- Reenergised installation **(photograph 18 – 22)**

3.1.2. Task 2 - Candidate evidence

1.1.19. Practical Observation Form - safe isolation

Assessment ID	Qualification number
8710-353	8710-33
Candidate name	**Candidate number**
Candidate B	CG12345
Centre name	**Assessment theme**
City & Guilds	Health and safety, systems and components

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	Notes – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.
Safe Isolation	Candidate was very confident in describing the industry requirements for the safe isolation procedure and how they planned to proceed with the task. They described the process in a clear logical sequence. Candidate correctly inspected the multifunction tester and its leads to ensure it was safe to use, they selected all the equipment required for the task, including correct PPE, voltage indicator, proving unit, lock off kit and correct signage. The candidate correctly checked the testing equipment and confirmed operation before continuing with tests to prove supply was dead. The candidate could clearly articulate the purpose of each step in ensuring the electrical supply was correctly isolated. Candidate correctly identified signage and placed notices to advise the system was isolated and tested.

Task	Notes – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.
	Candidate always retained the lock off key on their person whilst working on the circuit.

1.1.20. Practical Observation Form - Installation of cables and wiring systems

Assessment ID	Qualification number
8710-353	8710 – 33
Candidate name	**Candidate number**
Candidate B	CG12345
Centre name	**Assessment theme**
City & Guilds	Health and safety, systems and components

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	Notes – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.
Installation	The candidate prepared the workspace with consideration to health and safety and good housekeeping, correct PPE was selected for use such as hard hat, boots, safety googles and Hi-Viz waistcoat. The candidate used their equipment & materials list during collection to ensure they had all the materials they needed; this contained accurate quantities were requested. All tools were used in a proficient and safe manner. The installation was safely isolated prior to the work commencing, the candidate was confident when approaching this and followed each required step in a professional manner. The workspace was maintained well in terms of tidiness of tools materials and equipment throughout the task. Candidate marked the wall out with a tape measure, level and pencil appropriately. The candidate progressed in a highly confident, logical manner. All critical alignments from the plan were all to a high standard. Sequencing was logical, for example, the installation was set out boxes installed, and the conduit was then cut prior to

Task	Notes – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.
	being installed to ensure accuracy. All equipment was installed to the required measurements. Ongoing use was made of the spirit level to check that containment and component installation were level / plumb. All components were installed in the locations detailed in the dimensioned drawing. The final installation did was neat and to industry standards, all cable ends were prepared and terminated correctly with no exposed conductors and no damage to the insulation. All devices were installed and connected as per the system design specification. The final work produced was of an excellent standard and aesthetically pleasing.

1.1.21. Photographic evidence

Please Note: The photographic evidence included in this pack are to provide context to the assessments observed. Centres are not expected to collect the volume of evidence presented here and must refer to the current evidence guidance given in the C&G Assessor Guide.

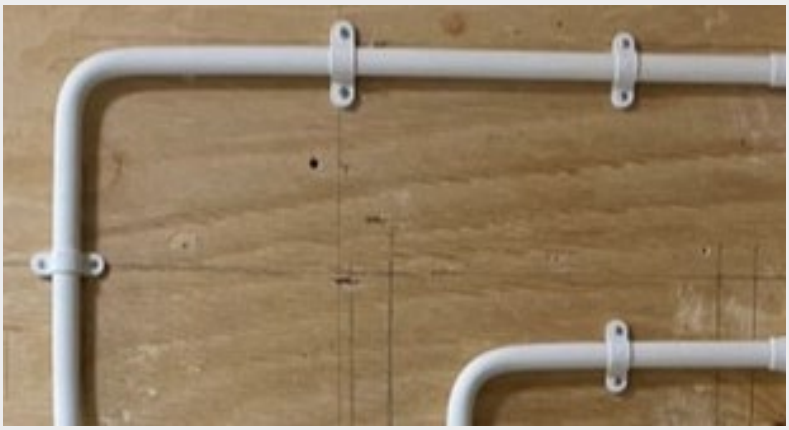
Evidence description	Photo
Photograph 1 Marking out & measurements which show correct measurements	
Photograph 2, Level being used to ensure back box is straight.	

Photograph 3

Candidate using a hacksaw to cut the conduit. Conduit is secured in a vice.

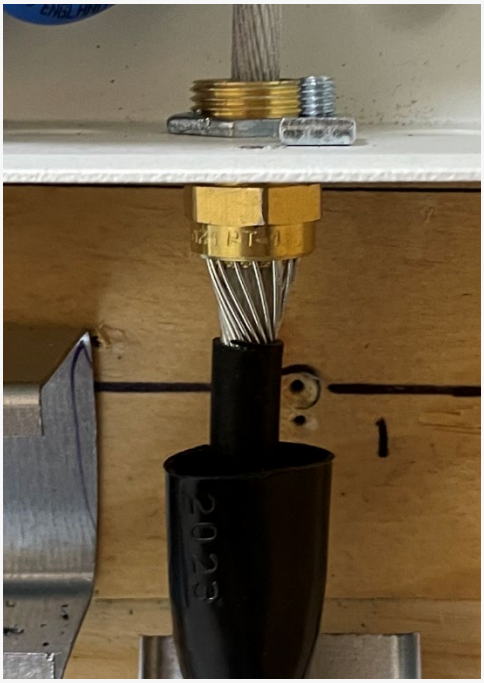
Photograph 4

Containment (conduit) being installed and saddles being to the required measurements in compliance with the plan.



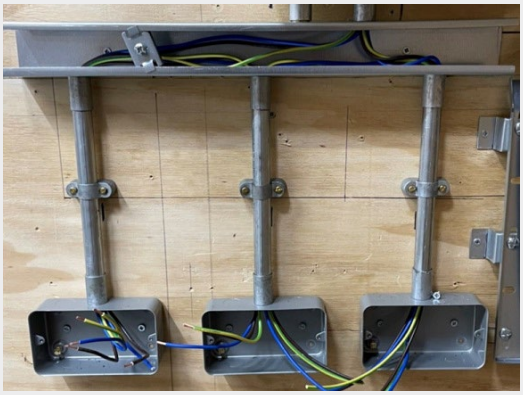
Photograph 5

Installation of SWA and glanding installed neatly and associated glanding and earthing ring have been used



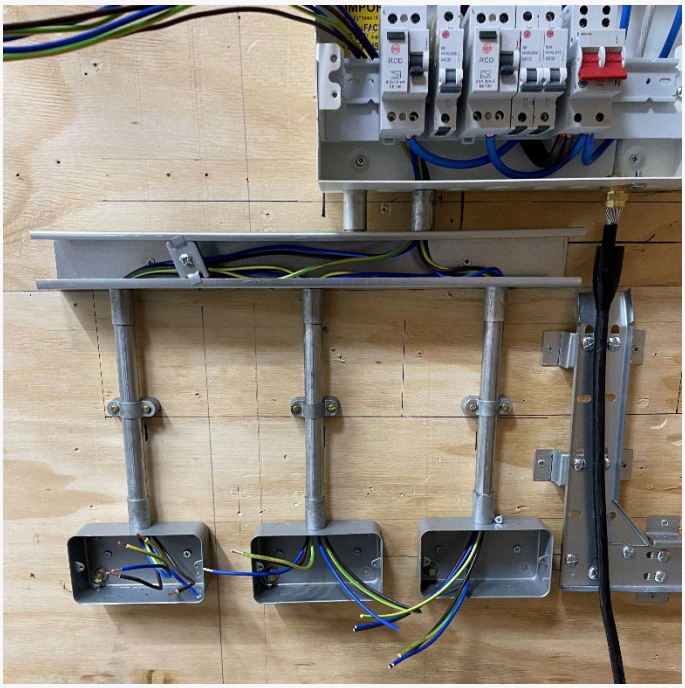
Photograph 6

Cables being installed into the containment.



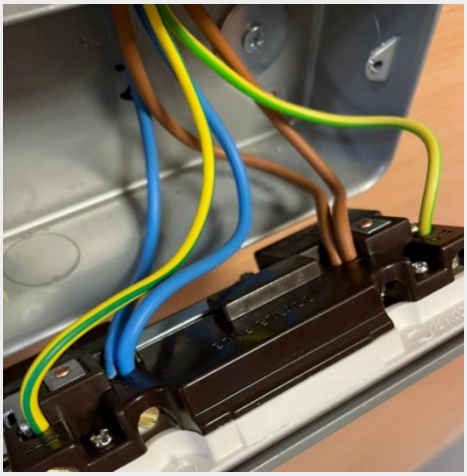
Photograph 7

Terminations being prepared.



Photograph 8

Socket outlet showing completed terminations for the circuits installed showing no exposed copper with cables being dressed correctly into the back boxes.

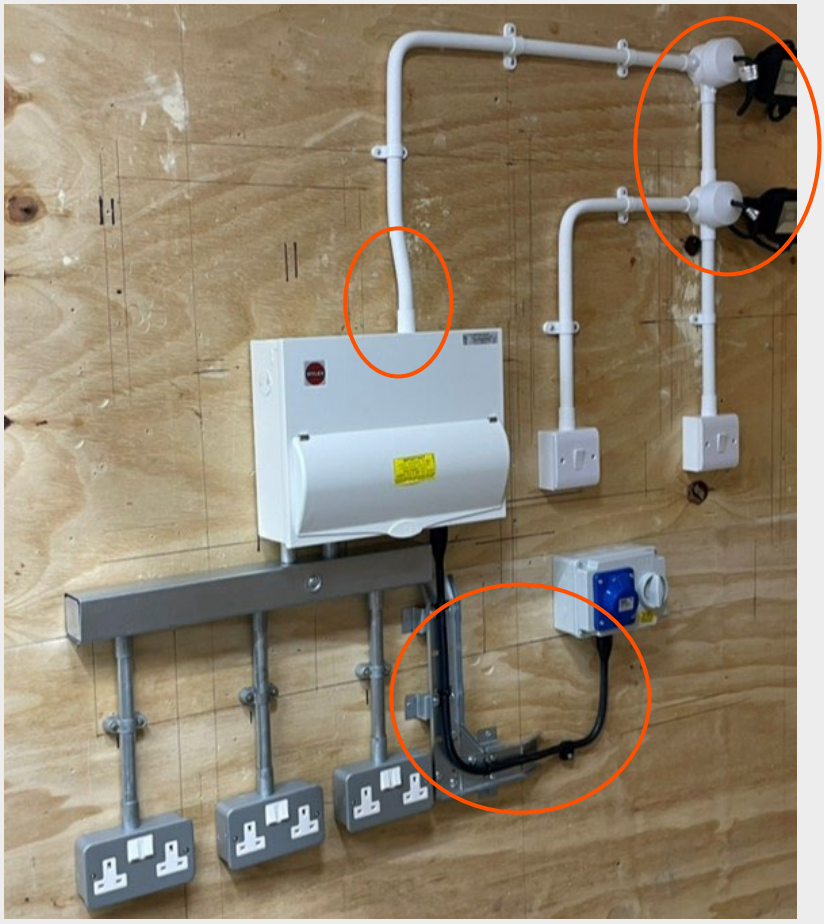


Photograph 9

Light switch showing completed terminations for the circuits installed showing no exposed copper with cables being dressed correctly into the back boxes.

Photograph 10

Final installation capturing a high standard of aesthetics in the completed installation



1.1.22. Practical Observation Form - Inspection and testing

Assessment ID	Qualification number
8710-353	8710 – 33
Candidate name	**Candidate number**
Candidate B	CG12345
Centre name	**Assessment theme**
City & Guilds	Health and safety, systems and components, inspection and testing of systems and components

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	Notes – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.
Inspection & Testing.	All safety aspects were considered, for example the correct safe isolation procedures were undertaken prior to the inspection and testing being carried out. Inspection – The candidate has followed the correct process for completing the inspection of the installed circuits and reflected that within the electrical installation certificate. They have demonstrated an ability to sequence tasks logically and had a highly focused inspection technique showing extreme care in the accuracy in the work. Testing – The test instruments were correctly prepared prior to starting testing. The correct range was selected (ohms) and nulling of test leads for continuity testing was carried out. The candidate differentiated between method 1 and method 2 continuity tests, they went on to carry them out using method 1 (R1+R2) the candidate connected a link between the individual circuits line and CPC's and took the reading at the furthest point from the DB.

Task	Notes – detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.
	Ring circuit continuity was completed to the requirements of guidance note 3, the candidate without any hesitation. Insulation resistance tests were carried out after all vulnerable equipment was removed. The circuit is correctly re-energised after gaining permission, polarity was taken correctly whilst carrying out the Ze at the origin with the main earth cable disconnected. PFC correctly carried out, polarity was observed prior to the Zs being measured all results were checked against table 41.3 of BS7671, the candidate explained the coloration between this and table B6 of the On-Site Guide. All RCD tests were completed in the correct manner. They followed the correct testing sequence with no prompting and with justification and explanation of action and potential consequences.

1.1.23. Photographic evidence

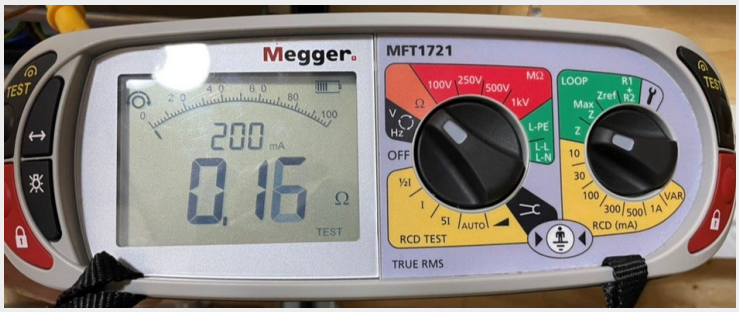
Please Note: The photographic evidence included in this pack are to provide context to the assessments observed. Centres are not expected to collect the volume of evidence presented here and must refer to the current evidence guidance given in the C&G Assessor Guide.

Evidence description	Photo
Photographs 11 and 12 Insert photo of testing equipment being nulled / zeroed correctly	11.  12. 

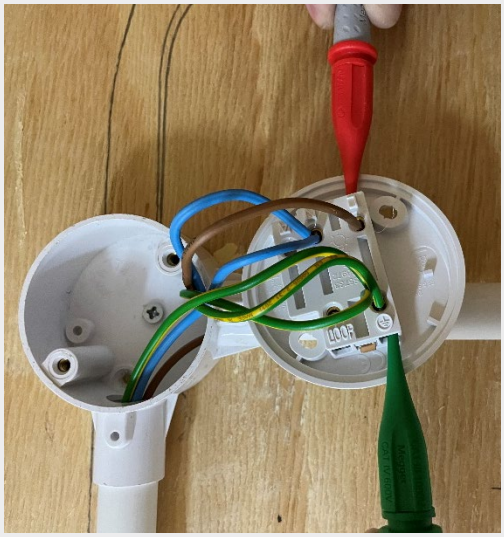
Photograph 13 a. & b.

Method 1 continuity (R1+R2) and polarity being confirmed on the lighting circuit.

13a.



13b.



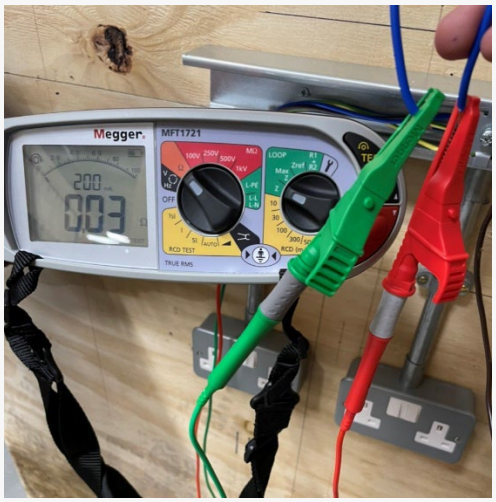
Photograph 14-16

Ring final circuit being tested without any errors in practice

14.

15.

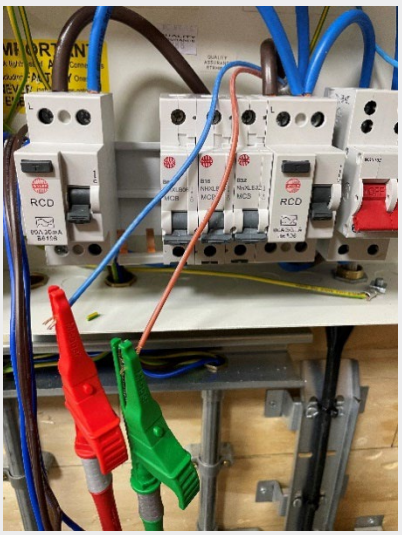
16.



Photographs 17 a-d

Insulation resistance tests being carried out, the candidate had isolated any vulnerable parts.

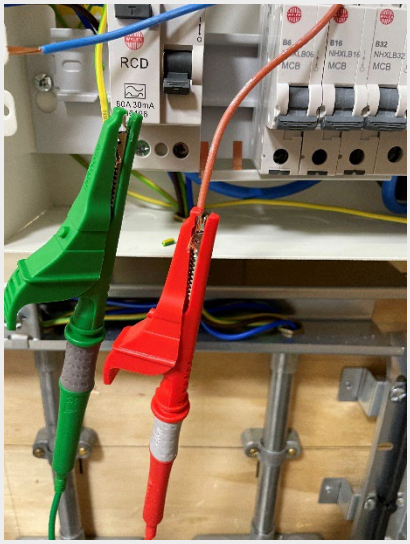
17a.



17b.


RCD
80A 30mA
B6196
MCB

17c.


RCD
MCB
MCB
MCB

17d.


Megger
MFT1721
545
999
MΩ
TEST
RCD TEST
TRUE RMS
LOOP
RCD (mA)

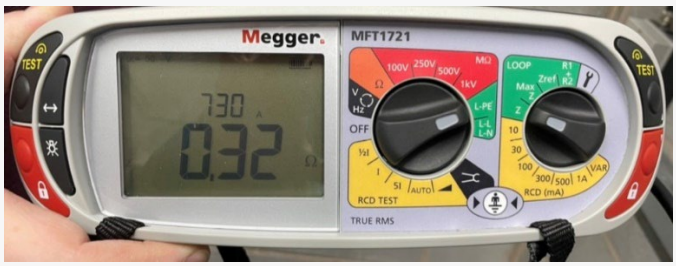
Photograph 18- 22

Re-energised installation being testing. Ze tested with MET disconnected to eliminate parallel paths

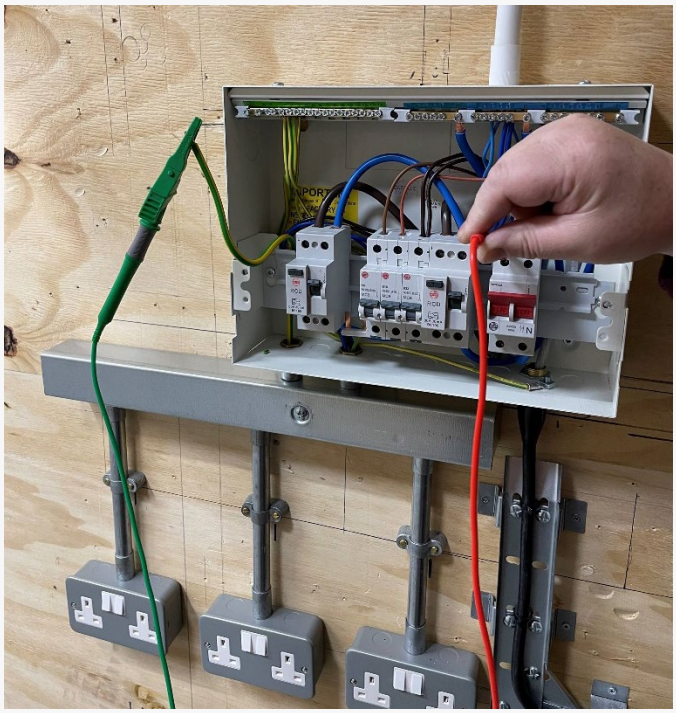
Photos also show PFC being taken, polarity being confirmed, earth fault loop impedance and

RCD tests being carried out.

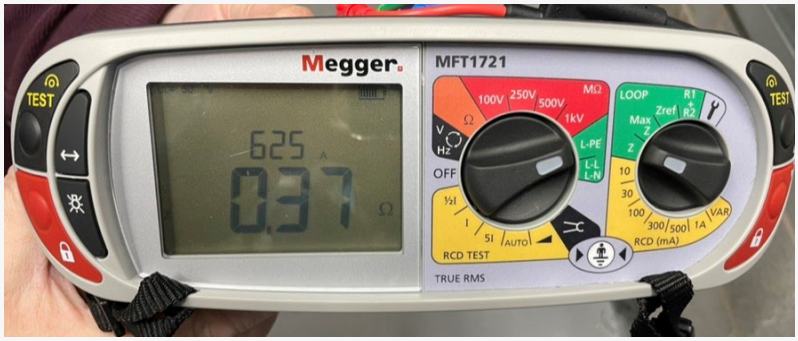
18.



19.

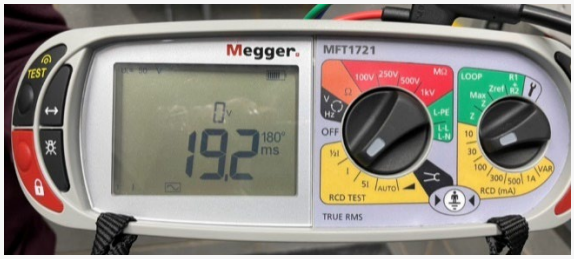


20.

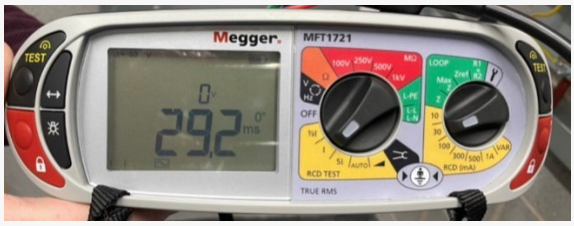


Photograph 21-25 (RCD Testing).

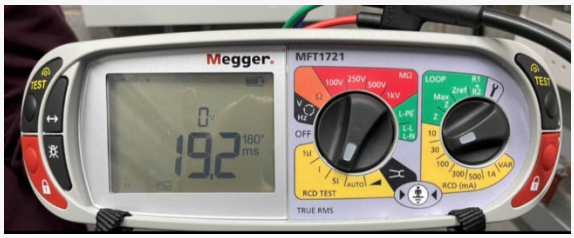
21.



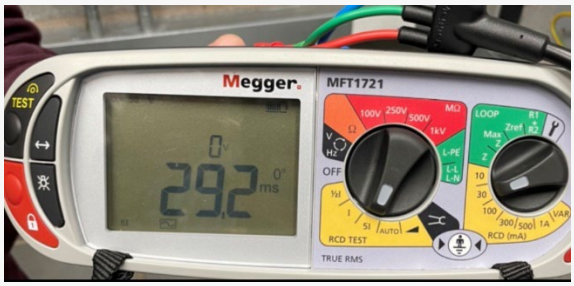
22.



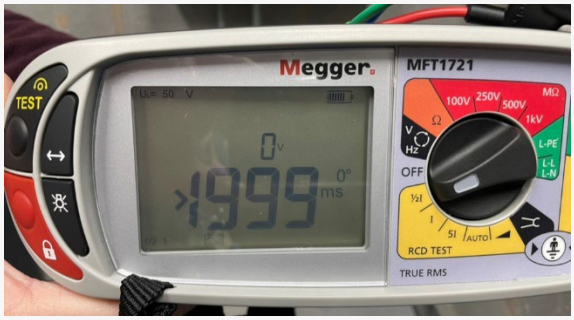
23.



24.



25.


Megger
MFT1721
TEST
100V
250V
500V
1kV
MΩ
Ω
V
Hz
OFF
L-PE
L-L
L-N
½I
I
5I
AUTO
RCD TEST
TRUE RMS
0
>1999
ms
0°

1.1.24. Electrical Installation Certificate and schedule of inspections

(REQUIREMENTS FOR ELECTRICAL INSTALLATIONS - BS 7671 [IET WIRING REGULATIONS])

DETAILS OF THE CLIENT

Mr John James

22, Johnston Street, Seaton. AC30 1DC

INSTALLATION ADDRESS

22, Johnston Street, Seaton. **AC30 1DC**

DESCRIPTION AND EXTENT OF THE INSTALLATION

Description of installation**: Domestic/Commercial workshop, lighting and small power**

Extent of installation covered by this Certificate**: All circuits installed as per the schedule of results. As well as the associated containment as per figure 2.**

(Use continuation sheet if necessary) see continuation sheet No: .....

New installation ☑

Addition to an existing installation ☐

Alteration to an existing installation ☐

FOR DESIGN

I/We being the person(s) responsible for the design of the electrical installation (as indicated by my/our signatures below), particulars of which are described above, having exercised reasonable skill and care when carrying out the design and additionally where this certificate applies to an addition or alteration, the safety of the existing installation is not impaired, hereby CERTIFY that the design work for which I/we have been responsible is to the best of my/our knowledge and belief in accordance with BS 7671:2018, amended to ..**N/A**..... (date) except for the departures, if any, detailed as follows:

Details of departures from BS 7671 (Regulations 120.3, 133.1.3 and 133.5): **None**

Details of permitted exceptions (Regulation 411.3.3). Where applicable, a suitable risk assessment(s) must be attached to this Certificate. **None**

Risk assessment attached

The extent of liability of the signatory or signatories is limited to the work described above as the subject of this Certificate.

For the DESIGN of the installation: **(Where there is mutual responsibility for the design)

Signature: .**PC Jenkin** Date: **07/09/20** Name (IN BLOCK LETTERS): .**CLIVE JENKIN** Designer No 1

Signature: ..... Date: ..... Name (IN BLOCK LETTERS): ..... Designer No 2**

FOR CONSTRUCTION

I being the person responsible for the construction of the electrical installation (as indicated by my signature below), particulars of which are described above, having exercised reasonable skill and care when carrying out the construction hereby CERTIFY that the work for which I have been responsible is to the best of my knowledge and belief in accordance with BS 7671:2018, amended to **....N/A.....(**date) except for the departures, if any, detailed as follows:

Details of departures from BS 7671 (Regulations 120.3 and 133.5): **None**

The extent of liability of the signatory is limited to the work described above as the subject of this Certificate.

For CONSTRUCTION of the installation:

Signature: .**PC Jenkin** Date: Name (IN BLOCK LETTERS): **CLIVE JENKIN** Constructor

FOR INSPECTION & TESTING

I being the person responsible for the inspection & testing of the electrical installation (as indicated by my signature below), particulars of which are described above, having exercised reasonable skill and care when carrying out the inspection & testing hereby CERTIFY that the work for which I have been responsible is to the best of my knowledge and belief in accordance with BS 7671:2018, amended to ....**N/A.....(**date) except for the departures, if any, detailed as follows:

Details of departures from BS 7671 (Regulations 120.3 and 133.5): **None**

The extent of liability of the signatory is limited to the work described above as the subject of this Certificate.

For INSPECTION AND TESTING of the installation:

Signature: **Candidate B** Date: ☐ Name (IN BLOCK LETTERS): **Candidate B** Inspector

NEXT INSPECTION

I/We the designer(s), recommend that this installation is further inspected and tested after an interval of not more than .5. years/~~months.~~

PARTICULARS OF SIGNATORIES TO THE ELECTRICAL INSTALLATION CERTIFICATE

Designer (No 1)

Name: **PC Jenkin** Company: **Honister Installation Ltd**
Address: **1 Grassmoor, Cockermouth**
..... Postcode: **CA99 1ER.** Tel No: **01234 567890**

Designer (No 2)
(if applicable)

Name: .....**N/A.....** Company:.....
Address: .....
..... Postcode: ..... Tel No: .....

Constructor

Name: **PC Jenkin** Company: **Honister Installation Ltd**
Address: **1 Grassmoor, Cockermouth**
..... Postcode: **CA99 1ER** Tel No: **01234 567890**

Inspector

Name: **PC Jenkin** Company: **Honister Installation Ltd**
Address: **1 Grassmoor, Cockermouth**
..... Postcode: **CA99 1ER** Tel No: **01234 567890**

SUPPLY CHARACTERISTICS AND EARTHING ARRANGEMENTS

Earthing arrangements	Number and Type of Live Conductors		Nature of Supply Parameters	Supply Protective Device
TN-C TN-S TN-C-S ✓ TT IT	AC 1-phase, 2-wire ✓ 2-phase, 3-wire 3-phase, 3-wire 3-phase, 4-wire	DC 2-wire 3-wire Other	Nominal voltage, U / U_0 (1) .400/230 V Nominal frequency, f (1) 50 Hz Prospective fault current, I_{pf} (2) 1.6 kA External loop impedance, Z_e (2) 0.14 Ω *(Note: (1) by enquiry* *(2) by enquiry or by measurement)*	BS (EN) ...88..... Type .....2..... Rated current ....100.. A
	Confirmation of supply polarity ☑			

Other sources of supply (as detailed on attached schedule**) N/A**

PARTICULARS OF INSTALLATION REFERRED TO IN THE CERTIFICATE

Means of Earthing	**Maximum Demand**
Distributor's facility	Maximum demand (load) .....60..... kVA / Amps Delete as appropriate
Installation earth electrode	**Details of Installation Earth Electrode** *(where applicable)* Type **N/A** (e.g. rod(s), tape etc) ..... Location ..... Electrode resistance to Earth ..... Ω

Main Protective Conductors

Earthing conductor	Material .....**CU.**..... csa ...**16.**..... mm^2	Connection / continuity verified ☑
Main protective bonding conductors (to extraneous-conductive-parts)	Material .....**CU.**..... csa ....**10**..... mm^2	Connection / continuity verified ☑

To water installation pipes ☑	To gas installation pipes ☑	To oil installation pipes **N/A**	To structural steel **N/A**
To lightning protection **N/A**	To other Specify **N/A**		

Main Switch / Switch-Fuse / Circuit-Breaker / RCD

Location **Workshop.** ..... BS(EN) **60947-5** No of poles ***2***	Current rating **100.** A Fuse / device rating or setting .**N/A.** A Voltage rating **230.** V	**If RCD main switch** Rated residual operating current ($I_{\Delta n}$) **N/A...** mA Rated time delay ..... ms Measured operating time .... ms

COMMENTS ON EXISTING INSTALLATION (in the case of an addition or alteration see Regulation 644.1.2):

.....
.....**N/A.**.....
.....
.....
.....
.....
.....
.....

SCHEDULES

The attached Schedules are part of this document and this Certificate is valid only when they are attached to it. .1.....

Schedules of Inspections and ....1..... Schedules of Test Results are attached.

(Enter quantities of schedules attached).

SCHEDULE OF INSPECTIONS (for new installation work only) for

DOMESTIC AND SIMILAR PREMISES WITH UP TO 100 A SUPPLY

NOTE 1: This form is suitable for many types of smaller installation, not exclusively domestic.

All items inspected in order to confirm, as appropriate, compliance with the relevant clauses in BS 7671. The list of items and associated examples where given are not exhaustive.

NOTE 2: Insert ✓ to indicate an inspection has been carried out and the result is satisfactory, or N/A to indicate that the inspection is not applicable to a particular item.

Item No	DESCRIPTION	Outcome See Note 2
1.0	**EXTERNAL CONDITION OF INTAKE EQUIPMENT (VISUAL INSPECTION ONLY)**	
1.1	Service cable	☑
1.2	Service head	☑
1.3	Earthing arrangement	☑
1.4	Meter tails	☑
1.5	Metering equipment	☑
1.6	Isolator (where present)	N/A
2.0	**PARALLEL OR SWITCHED ALTERNATIVE SOURCES OF SUPPLY**	
2.1	Adequate arrangements where a generating set operates as a switched alternative to the public supply (551.6)	N/A
2.2	Adequate arrangements where a generating set operates in parallel with the public supply (551.7)	N/A
3.0	**AUTOMATIC DISCONNECTION OF SUPPLY**	
3.1	**Presence and adequacy of earthing and protective bonding arrangements:**	
	• Distributor's earthing arrangement (542.1.2.1; 542.1.2.2)	☑
	• Installation earth electrode (where applicable) (542.1.2.3)	N/A
	• Earthing conductor and connections, including accessibility (542.3; 543.3.2)	☑
	• Main protective bonding conductors and connections, including accessibility (411.3.1.2; 543.3.2; 544.1)	☑
	• Provision of safety electrical earthing/bonding labels at all appropriate locations (514.13)	☑
	• RCD(s) provided for fault protection (411.4.204; 411.5.3)	N/A
4.0	**BASIC PROTECTION**	
4.1	**Presence and adequacy of measures to provide basic protection (prevention of contact with live parts) within the installation:**	
	• Insulation of live parts e.g. conductors completely covered with durable insulating material (416.1)	☑
	• Barriers or enclosures e.g. correct IP rating (416.2)	☑
5.0	**ADDITIONAL PROTECTION**	
5.1	**Presence and effectiveness of additional protection methods:**	
	• RCD(s) not exceeding 30 mA operating current (415.1; Part 7), see Item 8.14 of this schedule	☑
	• Supplementary bonding (415.2; Part 7)	N/A
6.0	**OTHER METHODS OF PROTECTION**	
6.1	**Presence and effectiveness of methods which give both basic and fault protection:**	
	• SELV system, including the source and associated circuits (Section 414)	N/A
	• PELV system, including the source and associated circuits (Section 414)	N/A
	• Double or reinforced insulation i.e. Class II or equivalent equipment and associated circuits (Section 412)	N/A
	• Electrical separation for one item of equipment e.g. shaver supply unit (Section 413)	N/A

7.0	**CONSUMER UNIT(S) / DISTRIBUTION BOARD(S):**	
7.1	Adequacy of access and working space for items of electrical equipment including switchgear (132.12)	☑
7.2	Components are suitable according to assembly manufacturer's instructions or literature (536.4.203)	☑
7.3	Presence of linked main switch(es) (462.1.201)	☑
7.4	Isolators, for every circuit or group of circuits and all items of equipment (462.2)	☑
7.5	Suitability of enclosure(s) for IP and fire ratings (416.2; 421.1.6; 421.1.201; 526.5)	☑

Item No	DESCRIPTION	Outcome See Note 2
	CONSUMER UNIT(S) / DISTRIBUTION BOARD(S) continued	
7.6	Protection against mechanical damage where cables enter equipment (522.8.1; 522.8.5; 522.8.11)	☑
7.7	Confirmation that ALL conductor connections are correctly located in terminals and are tight and secure (526.1)	☑
7.8	Avoidance of heating effects where cables enter ferromagnetic enclosures e.g. steel (521.5)	☑
7.9	Selection of correct type and ratings of circuit protective devices for overcurrent and fault protection (411.3.2; 411.4, 411.5, 411.6; Sections 432, 433; 537.3.1.1)	☑
7.10	**Presence of appropriate circuit charts, warning and other notices:**	
	• Provision of circuit charts/schedules or equivalent forms of information (514.9)	☑
	• Warning notice of method of isolation where live parts not capable of being isolated by a single device (514.11)	N/A
	• Periodic inspection and testing notice (514.12.1)	☑
	• RCD six-monthly test notice; where required (514.12.2)	☑
	• AFDD six-monthly test notice; where required	N/A
	• Warning notice of non-standard (mixed) colours of conductors present (514.14)	N/A
7.11	Presence of labels to indicate the purpose of switchgear and protective devices (514.1.1; 514.8)	☑
8.0	**CIRCUITS**	
8.1	Adequacy of conductors for current-carrying capacity with regard to type and nature of the installation (Section 523)	☑
8.2	Cable installation methods suitable for the location(s) and external influences (Section 522)	☑
8.3	Segregation/separation of Band I (ELV) and Band II (LV) circuits, and electrical and non-electrical services (528)	☑
8.4	Cables correctly erected and supported throughout, with protection against abrasion (Sections 521, 522)	☑
8.5	Provision of fire barriers, sealing arrangements where necessary (527.2)	☑
8.6	Non-sheathed cables enclosed throughout in conduit, ducting or trunking (521.10.1; 526.8)	☑
8.7	Cables concealed under floors, above ceilings or in walls/partitions, adequately protected against damage (522.6.201, 522.6.202, 522.6.203; 522.6.204)	☑
8.8	Conductors correctly identified by colour, lettering or numbering (Section 514)	☑
8.9	Presence, adequacy and correct termination of protective conductors (411.3.1.1; 543.1)	☑
8.10	Cables and conductors correctly connected, enclosed and with no undue mechanical strain (Section 526)	☑
8.11	No basic insulation of a conductor visible outside enclosure (526.8)	☑
8.12	Single-pole devices for switching or protection in line conductors only (132.14.1; 530.3.3; 643.6)	☑
8.13	Accessories not damaged, securely fixed, correctly connected, suitable for external influences (134.1.1; 512.2; Section 526)	☑
8.14	Provision of additional protection/requirements by RCD not exceeding 30mA:	
	• Socket-outlets rated at 32 A or less, unless exempt (411.3.3)	☑
	• Supplies for mobile equipment with a current rating not exceeding 32 A for use outdoors (411.3.3)	N/A
	• Cables concealed in walls at a depth of less than 50 mm (522.6.202; 522.6.203)	N/A
	• Cables concealed in walls/partitions containing metal parts regardless of depth (522.6.202; 522.6.203)	N/A
	• Final circuits supplying luminaires within domestic (household) premises (411.3.4)	☑

8.15	**Presence of appropriate devices for isolation and switching correctly located including:**	
	• Means of switching off for mechanical maintenance (Section 464; 537.3.2)	☑
	• Emergency switching (465.1; 537.3.3)	N/A
	• Functional switching, for control of parts of the installation and current-using equipment (463.1; 537.3.1)	☑
	• Firefighter's switches (537.4)	N/A
9.0	**CURRENT-USING EQUIPMENT (PERMANENTLY CONNECTED)**	
9.1	Equipment not damaged, securely fixed and suitable for external influences (134.1.1; 416.2; 512.2)	☑
9.2	Provision of overload and/or undervoltage protection e.g. for rotating machines, if required (Sections 445, 552)	☑
9.3	Installed to minimize the build-up of heat and restrict the spread of fire (421.1.4; 559.4.1)	☑
9.4	Adequacy of working space. Accessibility to equipment (132.12; 513.1)	☑
10.0	**LOCATION(S) CONTAINING A BATH OR SHOWER (SECTION 701)**	
10.1	30 mA RCD protection for all LV circuits, equipment suitable for the zones, supplementary bonding (where required) etc.	N/A

11.0	**OTHER PART 7 SPECIAL INSTALLATIONS OR LOCATIONS**	
11.1	List all other special installations or locations present, if any. (Record separately the results of particular inspections applied)	N/A

Inspected by:

Name (Capitals) CANDIDATE B..... **Signature Candidate B**.....

GENERIC SCHEDULE OF TEST RESULTS

DB reference no CU1
Location WORKSHOP
Z_s at DB (Ω) 0.14Ω
I_{pf} at DB (kA) 1.6kA
Correct supply polarity confirmed ☑
Phase sequence confirmed (where appropriate) N/A ☐

Details of circuits and/or installed equipment vulnerable to damage when testing
LOADS RUNNING IN;
LED LIGHTING, MACHINES

Details of test instruments used (state serial and/or asset numbers)
Continuity 116384-75
Insulation resistance 〃
Earth fault loop impedance 〃 N/A (116384-75)
RCD N/A (116384-75)
Earth electrode resistance N/A

Tested by:
Name (Capitals) PC JENKIN
Signature C JENKIN Date 07.09.2020

Circuit details												Test results														
		Protective device							Conductor details			Ring final circuit continuity (Ω)			Continuity (Ω) ($R_1 + R_2$) or R_2		Insulation Resistance Test Voltage	Insulation Resistance (MΩ)		Polarity	Z_s (Ω)	RCD		AFDD	Remarks (continue on a separate sheet if necessary)
Circuit number 1	Circuit Description 2	BS (EN) 3	type 4	rating (A) 5	breaking capacity (kA) 6	RCD $I_{\Delta n}$ (mA) 7	Maximum permitted Z_s (Ω*) 8	Reference Method 9	Live (mm²) 10	cpc (mm²) 11	r_1 (line) 12	r_n (neutral) 13	r_2 (cpc) 14	($R_1 + R_2$) 15	R_2 16	V 17	Live - Live 18	Live - Earth 19	20	Maximum measured 21	Disconnection time (ms) 22	RCD test button operation 23	Manual AFDD test button operation 24	25
1	RING FINAL		B	32	6	30	1.37	B	2.5	1.5	0.6	0.6	0.97	0.38	N/A	500	>1000	>1000	✓	0.57	25	✓	N/A	
2	RADIAL CIRCUIT	60	B/C	16/20	6	-	2.37	E	2.5	1.5	N/A	N/A	N/A	0.29	N/A	500	>1000	>1000	✓	0.4	N/A	N/A	N/A	
3	LIGHTING	5	B	6	6	-	7.28	B	1.5	1.0	N/A	N/A	N/A	0.51	N/A	500	>1000	>1000	✓	0.71	N/A	N/A	N/A	
		60																						
		5																						

61009 — N-CPC >1000MΩ

* Where the maximum permitted earth fault loop impedance value stated in column 8 is taken from a source other than the tabulated values given in Chapter 41 of this Standard, state the source of the data in the appropriate cell for the circuit in the 'Remarks' column (column 25) of the schedule.

Task 3 – Carrying out maintenance

(Assessment themes: Health and safety, systems components, working with faults)

For task 3 candidates need to produce the following pieces of evidence:

- Six completed report cards
- Assessor observations:
  - Fault diagnosis
  - Fault rectification

For illustration, the guided exemplification materials (GSEM) for Task 3 contain examples of candidate evidence for the following assessment requirements only:

- A sample completed report card
- Assessor observations:
  - Fault diagnosis
  - Fault rectification

The following task 1 candidate assessment requirements have not been included as example candidate evidence for this version of the guided exemplification materials.

- Six completed report cards

3.1.3. Task 3 - Candidate evidence

1.1.25. Job Card

Report sheet **One**
Job card reference number: **RF 1 (Ring final)** (Needs to reflect the relevant fault reference, as stated in the award standards)
Description of work done/ tests carried out to locate fault (if any) Carried out investigation work on the ring final circuit, as the client had informed me that the circuit protective device was not holding in the on position. Having safely isolated the circuit, I carried out the appropriate inspection and testing procedures. Due to the nature of the fault condition, I presumed that the circuit had a short-circuit fault condition. I therefore carried out an insulation resistance test on the circuit. Before doing this, I consulted the appropriate literature (IET on-site-guide). I prepared the circuit for testing by removing all loads. Then, I set the multi-functional instrument to the correct range on the test instrument. The range set for performing insulation resistance testing MΩ. I then undertook tests between line-neutral, line-circuit protective conductor and neutral-cpc. These tests were undertaken at the distribution board. The following results were obtained. L-N 0.00MΩ L-CPC ≥1000MΩ N-CPC ≥1000MΩ The results highlighted the circuit having a short circuit condition, between the line and neutral conductors. I then had to split the ring final circuit, to try and locate the fault. Once located, I could look to rectify the faulty circuit condition. **The nature of the fault** Short-circuit condition between line and neutral conductors. Both conductors had been crushed together by the trunking lid. **Brief description including material if required to fix the fault.** Part of the ring final circuit had to be re-wired. New single-core 2.5mm cable Brown and Blue to be installed, to replace the faulty conductors. Approximately 8-10 metres.

Action required to ensure rectification is suitable.

Once the new conductors had been installed, I must conduct the following tests:

Ring final circuit continuity

Insulation resistance

Polarity

These tests must all have satisfactory results, before being able to energise the circuit and put it back into operational service.

Estimated the repairs would take approximately three days to rectify, this includes making good the after chasing out and subsequent inspection, testing and certification being issued.

1.1.26. Practical Observation Form - Diagnosis and rectification of faults

Assessment ID	Qualification number
8710-353	8710-33
Candidate name	**Candidate number**
Candidate A	CG12345
Centre name	**Assessment theme**
City & Guilds	Health and safety, systems and components, working with faults

Complete the table below referring to the relevant marking grid, found in the assessment pack. Do not allocate marks at this stage.

Task	**Notes –** *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
Fault diagnosis	Candidate used excellent interaction skills with the customer from the outset, good eye contact and body language used, and they used a strong questioning technique to gather the evidence to ascertain what may have happened to cause the circuit to fail. These included what was the last action prior to the circuit failing? Who was using the circuit? Was this how the circuit was normally used? Was any extra load added to the circuit causing it to fail? Did the fault occur when something was plugged in? Used equipment accurately and effectively to conduct electrical tests required to identify the faulty part of the circuit. Techniques carried out systematically included questioning and analysis of testing results which were completed in the correct order displaying accurate knowledge of fault-finding techniques applying a logical approach throughout.

Task	**Notes –** *detailed, accurate and differentiating notes which identify areas of strength and weakness are necessary to distinguish between different qualities of performance and to facilitate accurate allocation of marks once all evidence has been submitted.*
Fault rectification	Candidate implemented all the health and safety preparations required to take care of components and customer property. The candidate identified that the part of the ring final circuit required rewiring and was clearly documented what was required to carry this out. The approach to rectify the fault follows an efficient and logical process and tool use was excellent resulting in a high-quality finish in repairing the fault error free and the system is operational and checked. Replaced components and materials were disposed of correctly.

Guidance on the exemplar marking

Guidance on the exemplar Marking Grids for each assessment theme are found within the Assignment Assessor Pack and gives guidance on banding descriptors, marks available within each band as well as indicative content that provides guidance on knowledge, understanding and skills within the assessment theme.

For the purposes of these materials the Marking Grids used can be found in the Sample Within this standardisation pack, a partially completed CRF form has been provided that outlines how an assessor has awarded marks against the candidate evidence for a number of the assessment themes.

For exemplification purposes, an explanation of how the marker has determined the mark to be awarded is provided, this exemplary document showing

- How the marker has first considered the marking bands available and determined within which band the evidence best fits
- Subsequently, consideration within the determined band and justification for the mark to be awarded within that band.

Health and safety						
	Band 1		**Band 2**		**Band 3**	
	1	**2**	**3**	**4**	**5**	**6**
Band 2	***Band justification*** *The candidate has demonstrated that they have exceeded the requirements of the lowest marking band through safe demonstration of work practices, and through consideration of risks beyond a limited level.* *The candidate response does not meet the requirements of the third marking band as the evidence lacks detail in relation to any mitigating factors considered, as well as omissions in the risk assessment process.* *Therefore, the mark to be awarded sits within the middle marking band.*					
Mark 3	**Mark justification** The risk assessment covers a good range of hazards and health and safety procedures have been followed during the preparation period and whilst working on the practical tasks, although there is no evidence of wearing protective glasses whilst cutting bricks. The risk assessment does not identify all of the associated risks and also does not consider the risk factors to allow the demonstration of understanding in implementing control measures and therefore reducing the risk rating. *Due to the reasons outlined here –the response has been determined to be at the lower end of the middle marking band and a mark of 3 has been awarded.*					

Candidate Record Form (CRF) – Electrotechnical engineering (8710-353)

Candidate name	**Candidate number**
Candidate B	CG12345
Centre name	**Centre number**
City & Guilds	123456

Marker Notes – Please always refer to the relevant marking grid for guidance on allocating marks and make notes which describe the quality of the evidence and justification of marks. Expand boxes as required

Health and safety												
	Band 1				**Band 2**				**Band 3**			
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
Band **3**	**Band justification** Performance Observation (PO) forms indicate that, throughout all tasks, Health and safety guidance was followed. Risks were identified and risk reduction methods implemented. Potential for harm and likelihood of harm was analysed for practical tasks before work was undertaken. Dynamic risk assessments could have been better as tasks progressed and risks changed. There was a tendency for the candidate to rest tools on top of steps or trunking leading to a risk of falling. As mitigation was assessed for all tasks, and generally followed, band 3 descriptors apply.											
Mark **9**	**Mark justification** Although all Health and Safety was meticulously planned, the candidate did not necessarily mitigate risks that arose during the task. As a result, lower band 3 marks apply- 9 marks											

Design and planning – Documentation						
	Band 1		**Band 2**		**Band 3**	
	1	**2**	**3**	**4**	**5**	**6**
Band **3**	**Band justification** Design lighting calculations well laid out. Good use of assessment of general characteristics form showing good detail. High standards of research using BS 7671. Abbreviations are effective and technical language is consistent throughout all documents.					

	Materials schedule is accurate (although symbols are missing due to centre error) although some technical descriptions could be improved. Design grid accurate and detailed with calculations well planned and accurate. The evidence and descriptions above match the descriptors for band 3
Mark **5**	**Mark justification** There are some minor inaccuracies or omissions in some documents and partial layout issues in the calculation sheet that could have been overcome by using equation tools so not maximum score- 5 marks.

Working with faults

	Band 1			**Band 2**			**Band 3**		
	1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**

Band **3**	**Band justification** The performance observation form clearly indicates a thorough and considered approach was taken to each fault with systematic and logical steps taken to analyse data and information. Interactions with the client was excellent with accurate questioning used to gather information. Publications were efficiently used to determine anticipated results. Demonstrations of understanding when analysing data, considering faults and exploring rectification methods was high. Manufacturer's instructions were followed at all appropriate stages during the fault diagnosis. Reports accurately reflected fault location methods, the nature of the fault and actions required. The evidence matches descriptors given in band 3.
Mark **9**	**Mark justification** All work was undertaken to the highest standard with no criticism in any of the evidence suggesting the highest band 3 marks should be awarded - 9 marks

Internal assessor name	**Date**
Internal assessor signature	

Total mark
*/90

* Please Note that the Total Mark (90) applies to the full assignment including all 7 Assessment Themes

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About City & Guilds

Since 1878 we have worked with people, organisations and economies to help them identify and develop the skills they need to thrive. We understand the life changing link between skills development, social mobility, prosperity and success. Everything we do is focused on developing and delivering high-quality training, qualifications, assessments and credentials that lead to jobs and meet the changing needs of industry.

We work with governments, organisations and industry stakeholders to help shape future skills needs across industries. We are known for setting industry-wide standards for technical, behavioural and commercial skills to improve performance and productivity. We train teams, assure learning, assess cohorts and certify with digital credentials. Our solutions help to build skilled and compliant workforces.