Level 2 NVQ Diploma in Performing Engineering Operations (7682-20)

Unit No: 233

Wiring and Testing Electrical Equipment and Circuits

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Assessment Plan and Feedback

Assessment Plan
This unit will be completed by carrying out the practical assessments which must meet the criteria, being observed undertaking part of assessment 3 and answering the knowledge questions in line with the training programme displayed.
Feedback / Summative Decision
Maths and English Feedback

Candidate			
Signed Candidate		Date	

Assessor			
Signed Assessor		Date	

Assessment Decision & Verification Declaration

Candidate Declaration: I confirm that the evidence listed for this unit is authentic and a true presentation of my own work.			
Candidate Name			
Candidate Signature		Date	

Assessor Declaration: I confirm that this candidate has met the criteria for this unit with the evidence listed and the evidence is valid, authentic, reliable, current and sufficient.			
Assessor Name			
Assessor Signature		Date	

IQA declaration:

I have internally verified the assessment work on this unit by carrying out the following (please tick):

☐ sampling candidate and assessment evidence

☐ observation of assessment practice

☐ discussion with candidate

☐ other – please state:

I confirm that the candidate's sampled work meets the standards specified for this unit and may be presented for external verification and/or certification.

☐ Signed off by IQA for certification although not sampled

IQA Name	

IQA Signature		Date	

Awarding Body Standards

Replace this page with the awarding body standards

Evidence Index

		Performance Evidence 1	Performance Evidence 2	Performance Evidence 3	Additional Performance Evidence (if required)
Evidence Type		Witness	Witness	Obs/Witness	
Date					
Assessment Criteria					
1.1	**work safely at all times, complying with health and safety legislation, regulations and other relevant guidelines**	Unit 233 Page 12, 22	Unit 233 Page 12, 32	Unit 233 Page 12, 41	
1.2	**carry out all of the following activities during the wiring and testing activities:**				
a.	adhere to procedures or systems in place for risk assessment, COSHH, personal protective equipment and other relevant safety regulations	Unit 233 Pages 17 17a	Unit 233 Pages 27 27a	Unit 233 Page 37 37a	
b.	ensure the safe isolation of services during the wiring and testing activities			Unit 233 Page 38	
c.	follow job instructions, circuit drawings and test procedures at all times	Unit 233 Pages 14 15 21	Unit 233 Pages 24 25 31	Unit 233 Pages 34 35 40	
d.	check that the tools and test instruments to be used are within calibration date, and are in a safe and usable condition	Unit 233 Page 12	Unit 233 Page 32	Unit 233 Page 41	
e.	ensure that the electrical system is kept free from foreign objects, dirt or other contamination	Unit 233 Page 19	Unit 233 Page 29	Unit 233 Page 39	
f.	where appropriate, apply procedures and precautions to eliminate electrostatic discharge (ESD) hazards	**Not appropriate for this installation**			
g.	return all tools and equipment to the correct location on completion of the wiring and testing activities	Unit 233 Page 12	Unit 233 Page 32	Unit 233 Page 41	
1.3	**wire up three of the following electrical systems:**				
a.	domestic lighting circuits	Unit 233 Page 15 22			
b.	domestic power circuits	Unit 233 Page 15 22			
c.	motor start and control				
d.	vehicle heating or ventilating				
e.	vehicle lighting				
f.	vehicle starting and ignition				
g.	instrumentation and control circuits				
h.	alarm systems (such as fire, intruder, process control)				

i. electro-pneumatic or electro-hydraulic control circuits				
j. other control circuits (such as pumps, fans, blowers, extractors)				
k. air conditioning control circuits				
l. refrigeration control circuits				
m. heating/boiler control circuits				
n. aircraft lighting circuits				
o. power generation and control circuits				
p. avionic circuits and systems				
q. emergency lighting systems				
r. communication systems				
s. computer systems				
t. other specific electrical circuits (Industrial Lighting and Power)		Unit 233 Page 25 32		

1.4	**plan the wiring and testing activities before they start them**	Unit 233 Page 16	Unit 233 Page 26	Unit 233 Page 36	
1.5	**use appropriate sources to obtain the required specifications, circuit diagrams and test information**	Unit 233 Pages 12 14 15	Unit 233 Pages 12 24 25	Unit 233 Pages 12 34 35	
1.6	**obtain the correct tools and equipment for the wiring and testing operations, and check that they are in a safe and usable condition**	Unit 233 Page 12	Unit 233 Page 32	Unit 233 Page 41	
1.7	**use two of the following test instruments during the wiring and testing activities:**				
a.	multimeter	Unit 233 Page 21	Unit 233 Page 31	Unit 233 Page 40	
b.	insulation resistance tester				
c.	polarity tester/indicator				
d.	RCD tester				
e.	earth-loop impedance tester				
f.	other specific test equipment				
1.8	**mount and secure the electrical components safely and correctly, to meet specification requirements**	Unit 233 Page 12	Unit 233 Page 32	Unit 233 Page 41	
1.9	**wire circuits using three of the following types of cables:**				
a.	single core		Unit 233 Page 32		
b.	multicore				
c.	PVC twin and earth	Unit 233 Page 22			

d.	flexible (such as cotton or rubber covered)				
e.	data/communication				
f.	fibre-optics				
g.	screened				
h.	coaxial				
i.	ribbon cables				
j.	mineral insulated				
k.	armoured			Unit 233 Page 41	
l.	wiring loom/harness				
1.10	**connect up ten of the following electrical modules/components to produce circuits:**				
a.	isolators	Unit 233 Page 15 22	Unit 233 Page 25 32	Unit 233 Page 35 41	
b.	switches				
c.	sockets				
d.	contactors				
e.	motor starters				
f.	solenoids				
g.	relays				
h.	alarm devices				
i.	motors				
j.	pumps				
k.	heaters				
l.	blowers				
m.	lamp holders	Unit 233 Page 15 22			
n.	panel lamps				
o.	luminaires		Unit 233 Page 25 32		
p.	ballast chokes				
q.	consumer units	Unit 233 Page 15 22	Unit 233 Page 25 32	Unit 233 Page 35 41	
r.	residual current device (RCD)				
s.	instruments				

t.	transformers				
u.	panels or sub-assemblies				
v.	control devices				
w.	cable connectors			Unit 233 Page 35 41	
x.	fuses				
y.	circuit breakers	Unit 233 Page 15 22	Unit 233 Page 25 32		
z.	sensors				
aa.	actuators				
bb.	junction boxes				
cc.	terminal blocks				
dd.	electronic modules/units				
ee.	other electrical components	Unit 233 Page 15 22			
1.11	**install and terminate the cables to the appropriate connections on the components**	Unit 233 Page 12 18	Unit 233 Page 12 28	Unit 233 Page 12 39	
1.12	**apply wiring methods and techniques to include six of the following:**				
a.	positioning and securing of equipment and components	Unit 233 Page 20	Unit 233 Page 29	Unit 233 Page 39	
b.	levelling and alignment of components	Unit 233 Page 20	Unit 233 Page 29	Unit 233 Page 39	
c.	determining sizes and lengths of cables required	Unit 233 Page 18		Unit 233 Page 41	
d.	securing by using mechanical fixings (such as screws, nuts and bolts)	Unit 233 Page 22		Unit 233 Page 41	
e.	laying in cables without twisting or plaiting				
f.	feeding cables into conduit without twisting or plaiting		Unit 233 Page 30		
g.	leaving sufficient slack for termination and movement	Unit 233 Page 18	Unit 233 Page 28	Unit 233 Page 39	
1.13	**carry out eight of the following cable termination activities:**				
a.	stripping cable sheaths without damage to conductor insulation	Unit 233 Pages 18-20			
b.	removing cable insulation				
c.	connecting accessories (such as plugs, sockets multi-way connectors)				
d.	making mechanical/screwed/clamped connections		Unit 233 Pages 28-30		
e.	crimping (such as spade end, loops, tags and pins)		Unit 233 Page 25 29	Unit 233 Page 35 39	
f.	soldering and de-soldering				
g.	terminating armoured cables			Unit 233 Page 41	

h.	terminating mineral insulated cables				
i.	sealing/protecting cable connections				
j.	attaching suitable cable identification				
k.	securing wires and cables (such as clips, plastic strapping, lacing, harnessing)	Unit 233 Page 19	Unit 233 Page 30	Unit 233 Page 39	
l.	heat shrinking (devices and boots)				
m.	earth bonding		Unit 233 Page 25 29	Unit 233 Page 35 39	
n.	cable glands and grips				
1.14	**use appropriate test methods and equipment to check that the completed circuit is safe and meets all aspects of the specification**	Unit 233 Pages 21 22	Unit 233 Pages 31 32	Unit 233 Pages 40 41	
1.15	**carry out checks and adjustments, appropriate to the equipment and circuits being wired, to include three of the following:**				
a.	making visual checks (such as completeness, signs of damage, incorrect termination)	Unit 233 Page 18-20	Unit 233 Pages 28-30	Unit 233 Page 39	
b.	movement checks (such as loose fittings and connections)				
c.	testing that the equipment operates to the circuit specification				
d.	carrying out fault finding techniques (such as half-split, input/output, unit substitution)				
Plus, three more from the following:					
a.	protective conductor resistance values	Unit 233 Pages 21	Unit 233 Pages 31	Unit 233 Pages 40	
b.	insulation resistance values				
c.	continuity				
d.	voltage levels				
e.	load current				
f.	polarity	Unit 233 Pages 21	Unit 233 Pages 31	Unit 233 Pages 40	
g.	resistance				
h.	capacitance				
i.	power rating				
j.	frequency values				
k.	inductance				
l.	RCD disconnection time				
m.	specialised tests (such as speed, sound, light, temperature)				

1.16	**produce electrical circuits in accordance with one or more of the following standards:**				
a.	BS 7671/IET wiring regulations	Unit 233 Page 12, 22	Unit 233 Page 12, 32	Unit 233 Page 12, 41	
b.	other BS and/or ISO standards				
c.	company standards and procedures				
1.17	**deal promptly and effectively with problems within their control, and seek help and guidance from the relevant people if they have problems that they cannot resolve**	Unit 233 Page 12			
1.18	**leave the work area in a safe and tidy condition on completion of the wiring and testing activities**	Unit 233 Page 12	Unit 233 Page 32	Unit 233 Page 41	

Witness Statement

I confirm the candidate:	

Satisfied the criteria for Unit 233 Wiring and Testing Electrical Equipment & Circuits when he/she:

On **three separate occasions** during assessments the candidate:

- Worked safely at all times, complying with health and safety legislation, BS EN 7671 IET wiring regulations and other relevant guidelines
- Planned the wiring and testing activities before they started them
- Used appropriate sources to obtain the required specifications, circuit diagrams and test information
- Obtained the correct tools and equipment for the wiring and testing operations, and checked that they were in a serviceable condition checked that the test instruments to be used are within calibration date, and are in a safe and usable condition
- Mounted and secured the electrical components safely and correctly, to meet specification requirements
- Installed and terminated the single core, twin &earth and armoured cables to the appropriate connections on the components
- Used appropriate test methods and equipment to check that the completed circuit is safe and meets all aspects of the specification
- Dealt promptly and effectively with problems within their control, and sought help and guidance from the relevant people
- Left the work area in a safe and tidy condition on completion of the wiring and testing activities
- Completed all necessary documentation
- Returned all tools, test equipment and documentation to their appropriate storage areas

Assessor Signature:		Date:
Assessor Name:		

WIRING AND TESTING ELECTRICAL EQUIPMENT & CIRCUITS
CITY AND GUILDS UNIT 233

Description of Activity Domestic Lighting & Power Circuits	**Install 1.0mm^2 and 2.5mm^2 and terminate flat grey twin & earth cables in domestic lighting & power circuits Complete the Inspection Records**

Assessment 1 Evidence Pack:

Contents:

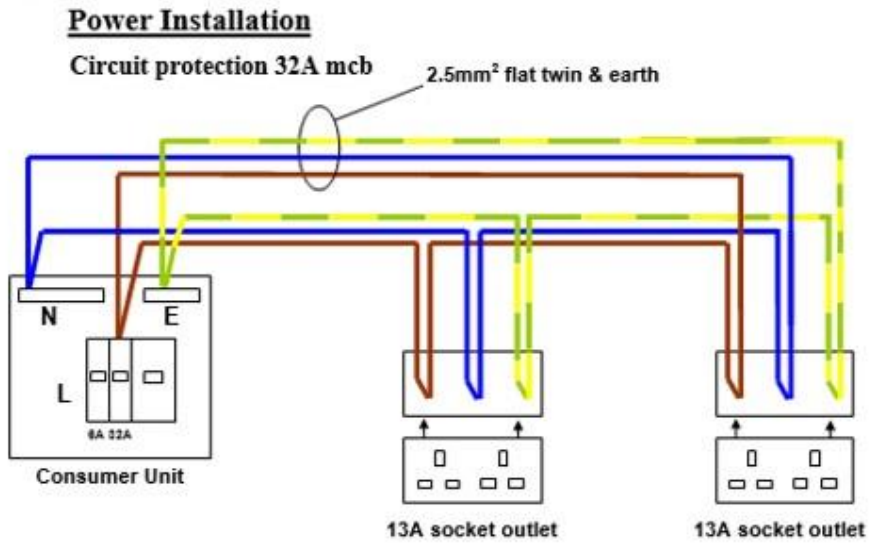
- Work Instructions
- Assessment Drawing covering (Domestic Lighting & Power Layout + wiring Diagram)
- Work Plan (Domestic Lighting & Power)
- 3Whats' Risk Assessment covering activities
- Schedule of Inspections
- Schedule of Test Results
- Witness Statement

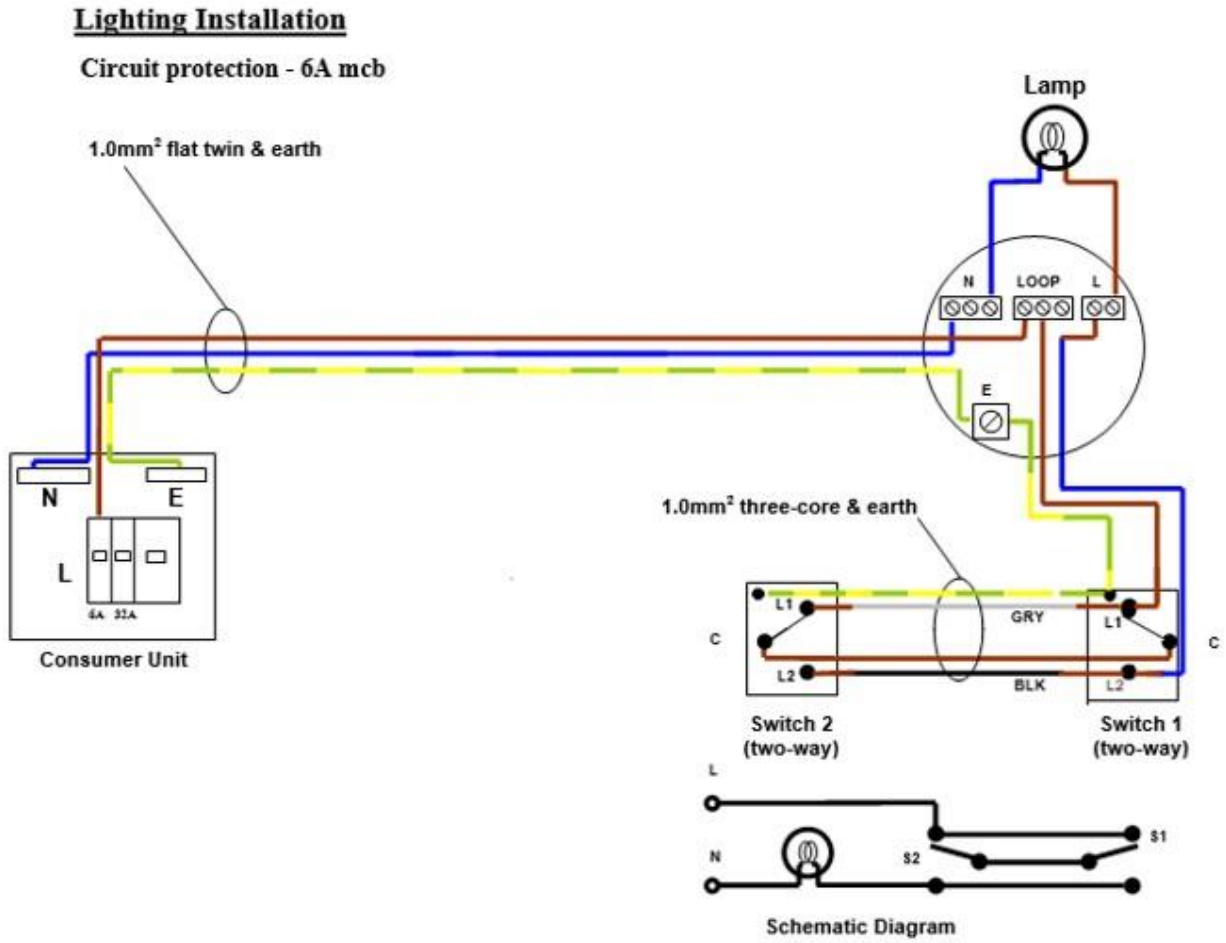
Assessment One Work Instruction

1. Wear personal protective equipment at all times
2. Complete risk assessment method statement
3. Collect tools and equipment
4. Ensure tools/equipment are safe for use
5. Check drawing covers domestic lighting and power circuits
6. Gather/check components and make sure no parts missing or damaged
7. Mount all components to backboard using woodscrew fixings and secure wiring using appropriately sized cable clips.
8. Make sure lighting and power boxes are mounted to correct height (as page 191) of the On-Site Guide, aligned and level
9. Mark out the cable routes between components for both lighting and power circuits
10. Allow only 6 mm cable sheath to enter switch boxes, ceiling rose and 12mm inside CU
11. Allow only 50mm excess cable lengths beyond components for termination purposes to allow for sufficient slack at terminations
12. Complete Visual Inspection sheets for lighting and power circuits correcting any wiring errors or damage components that may have occurred
13. Carry out testing for lighting and power circuits and fill out test certificate
14. Return tools/equipment and tidy area

ASSESSMENT 1 DRAWING

Domestic Lighting & Power Wiring & Testing





WORK PLAN ASSESSMENT ONE (Domestic) lighting & power	
TOOLS REQUIRED	**MATERIALS REQUIRED**

WRITE DOWN HOW YOU CARRY OUT THE TASK AND THE ORDER EACH STEP WILL BE TAKEN			
1		**12**	
2		**13**	
3		**14**	
4		**15**	
5		**16**	
6		**17**	
7		**18**	
8		**19**	
9		**20**	
10		**21**	
11		**22**	

3 What's – Risk Assessment

Note *Replace this page with the 3 what's – Risk Assessment*

Please note this is a 2 page document numbered 17, 17a
Numbers to be written by yourselves

Schedule of Inspections

Section/Item **Condition** **Comments**

Assessment No1 lighting and power cables	**Acceptable**		**Damaged**		
	Yes	**No**	**Yes**	**No**	
1. Are all cable sheaths entering the enclosures by required amount					
2. Are cables free from damage within fittings					
3. Are any cables damaged within Consumer unit					
4. Is there adequate slack on cores at points of termination					
5. Have correct size (c.s.a) and lengths of cable been installed					
6. Are all strands inside termination points					
7. Are there any exposed conductors visible at terminations					
8. Are all terminations adequately tightened					
9. Are cables terminated at right terminals					
10. Are live cores terminated in the right size mcb's					

11. Are any cores with damaged insulation in any part of the lighting or power installation					
12. Are switch wires wired correctly					
13. Are switch wires tightened at terminals					
14. Are screws free from damage					
15. Are enclosures free from dirt and debris					
16. Ensure cable sheaths are stripped without damage to core insulation					
17. Ensure lighting &power cables are installed vertically or horizontally. Not diagonally					
18. Cables must be secured to the mounting board using correct size clips					
19. Terminals must not be over-tightened					

21. Conductor core must not be exposed beyond the terminal					
22. Ensure circuit protective conductor (earth) is sheathed with yellow//green sleeving					
23. Ensure all components are level and secured correctly					
24. Ensure equipment is positioned & secured correctly					

Signed Candidate:		Date:
Candidate Name:		

Schedule of Test Results

DISTRIBUTION BOARD DETAILS													
DB Ref:	Consumer unit	**Z_s at this board**	N/A	**I_{pf} at this board**	N/A	**Main switch Type BSEN**	60497-3	**Rating:**	100 **Amps**	**Supply Conductors:**	N/A **mm²**	**Earth:**	N/A **mm²**

Distribution Board location	Workshop 1	**Supplied From:**	Socket	**No. Of Phases:**	1	**Supply Protective Device type: BSEN**	1362	**Rating:**	13 **Amps**
---	---	---	---	---	---	---	---	---	---

CIRCUIT DETAILS											TEST RESULTS													
Circuit Reference	**Circuit Designation**	**Reference Method**	**Number of points served**	**Circuit Conductors**		**Max Disconnection time Permitted (s)**	**Overcurrent devices**			**RCD**	**Maximum permitted Zs Ω**	**Circuit impedances Ω**					**Insulation resistance**				**Polarity**	**Maximum Measured Zs Ω**	**RCD**
				Live (mm^2)	**Cpc (mm^2)**		**Type BS EN**	**Rating (A)**	**Short circuit capacity (KA)**	**IΔn mA**		**Ring final circuits only (Measured end to end)**			**All circuits (At least One column To be completed)**		**Live/Live MΩ**	**Live/Neutral MΩ**	**Live/Earth MΩ**	**Neutral/Earth MΩ**			**At 5xIΔn ms**
												Γ1	**Γn**	**Γ2**	**R1+ R2**	**R2**							
1		C				.4	60898		6	30							N/A					N/A	N/A
2		C				.4	60898		6	30							N/A					N/A	N/A
3		C				.4	60898		6	30							N/A					N/A	N/A
4		C				.4	60898		6	30							N/A					N/A	N/A
5		C				.4	60898		6	30							N/A					N/A	N/A

Tested by: Name (Capitals)		**Signature:**		**Date:**	

Witness Statement

I confirm the candidate:	

Satisfied the criteria for Unit 233 Wiring and Testing Electrical Equipment and Circuits When he/she:

On **assessment 1** the candidate:

- Correctly identified and inspected all components and grey flat twin and earth cables required
- Correctly mounted and secured the consumer unit, lighting and power components required to backboard
- Correctly and safely connected all components, in accordance with the requirements of BS7671 IET Wiring Regulations
- Used appropriate sources to obtain the required specifications, circuit diagram and test information
- Carried out a visual inspection of the completed installation and rectified any faults found in accordance with the requirements of BS7671 IET Wiring Regulations
- Undertook the appropriate testing in accordance with the requirements of BS7671 IET Wiring Regulations and recorded all results.

Assessor Signature:		Date:
Assessor Name:		

WIRING AND TESTING ELECTRICAL EQUIPMENT & CIRCUITS
CITY AND GUILDS UNIT 233

Description of Activity **Industrial Lighting & Power circuits**	**Install 2.5mm^2 and 1.0mm^2 single core cables into steel & PVC conduit systems respectively and terminate in industrial lighting and power circuits** **Complete the Inspection Records**

Assessment 2 Evidence Pack:

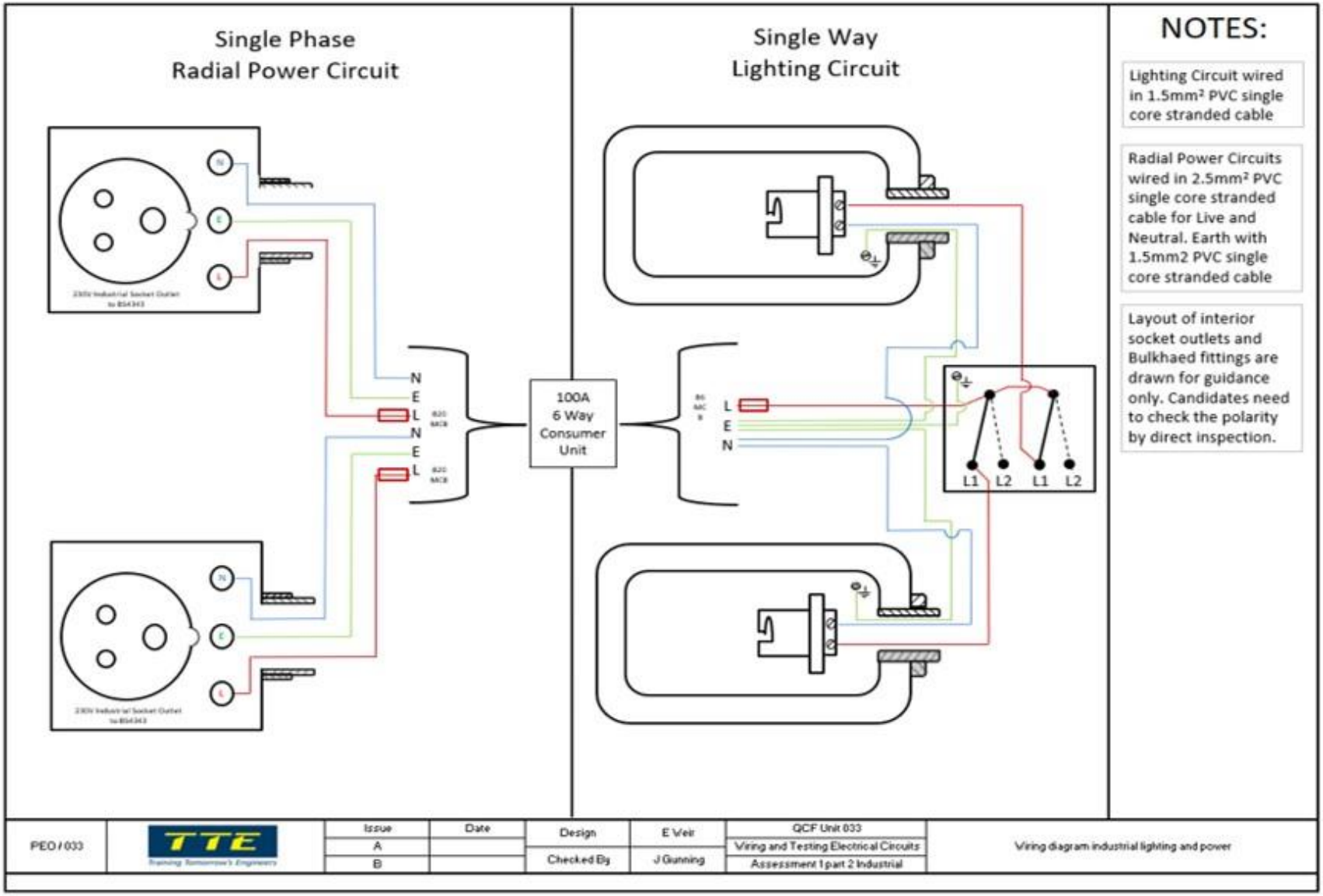
Contents:

- Work Instructions
- Assessment Drawing covering (Industrial Lighting & Power Layout + wiring diagram)
- Work Plan (Industrial Lighting & Power)
- 3Whats' Risk Assessment covering activities
- Schedule of Inspections
- Schedule of Test Results
- Witness Statement

Assessment Two Work Instruction

1. Wear personal protective equipment at all times
2. Complete risk assessment method statement
3. Collect correct tools and equipment required
4. Ensure tools/equipment are safe for use
5. Check drawing covers industrial lighting and power circuits
6. Gather/check components and make sure no parts missing or damaged
7. Ensure conduits (plastic and galvanised steel) and components are positioned correctly and securely attached to back wall using flat bar saddles and woodscrews
8. Use draw wire to draw wires into conduits for both lighting and power circuits
9. Make sure installed wires are drawn into conduits without twisting cores together
10. Ensure installed wires are of the correct csa and of the required length
11. Ensure bulkhead lighting fittings are earthed with secure and tight terminations
12. Complete Visual Inspection sheets for lighting and power circuits
13. Complete testing certificates for lighting and power circuits
14. Return tools/equipment and tidy area

Assessment 2 Drawing



WORK PLAN ASSESSMENT TWO (Industrial) lighting & power	
TOOLS REQUIRED	**MATERIALS REQUIRED**

WRITE DOWN HOW YOU CARRY OUT THE TASK AND THE ORDER EACH STEP WILL BE TAKEN			
1		**12**	
2		**13**	
3		**14**	
4		**15**	
5		**16**	
6		**17**	
7		**18**	
8		**19**	
9		**20**	
10		**21**	
11		**22**	

3 What's – Risk Assessment

Note *Replace this page with the 3 what's – Risk Assessment*

Visual Inspection Test Certificate

(Industrial Lighting & Power)

Before any testing takes place this visual inspection test certificate has to be completed that covers only items of equipment that have been used in your installation work.

Section/Item	**Condition**				**Comments**
Assessment No2 lighting and power cables	**Acceptable**		**Damaged**		
	Yes	**No**	**Yes**	**No**	
1. Are cables free from twists					
2. Are cables free from damage within fittings					
3. Are any cables damaged within Consumer Unit					
4. Is there adequate slack on wires at points of termination					
5. Are components free from any movement					
6. Are all conductor strands inside termination points					
7. Are there any exposed conductors visible at terminations					
8. Are all terminations adequately tightened					
9. Are cables terminated at right terminals					
10. Are live cores terminated in the right size mcb’s					

Continued on next page

11. Are any cores with damaged insulation in any part of the lighting or power installation					
12. Are switches wired correctly					
13. Are switch wires tightened at terminals					
14. Are screws free from damage					
15. Are enclosures free from dirt and debris					
16. Are power sockets wired in correct polarity terminations					
17. Are any strands visible at socket terminations					
18. Are core terminals tightened					
19. Are terminal screws free from damage					
20. Is steel conduit and metal trunking bonded to earth with crimp					
21 Check equipment & components are levelled & aligned correctly					
22 Check cable sizes & lengths are correct					
23 Secure all electrical components/equipment with wood screws + conduit saddles					
24 Ensure single core cables routed via trunking are without twisting or plaiting					

Continued on next page

25 Ensure single core wiring are installed into conduit without twisting & plaiting					
26 Check there is sufficient slack at all points of termination					
27 Ensure cable insulation is stripped without damage to conductors					
28. Ensure wiring installed inside CU has sufficient slack at terminations					
29 conduits must be held securely to the mounting board					
30 terminal screws must not be over-tightened					
31 conductors must not be bent double or twisted together to achieve an improved connection					
32 conductors must not be exposed beyond the terminals					
33 Ensure protective conductor (earth) is tightly secured to earth termination					
34 Ensure equipment is positioned & secured correctly					

Signed Candidate:		Date:
Candidate Name:		

Schedule of Test Results

DISTRIBUTION BOARD DETAILS														
DB Ref:	Consumer unit	**Z_s at this board**	N/A	**I_{pf} at this board**	N/A	**Main switch Type BSEN**	60497-3	**Rating:**	100 Amps	**Supply Conductors:**	N/A mm²	**Earth:**	N/A mm²	
Distribution Board location	Workshop 1	**Supplied From:**	Socket	**No. Of Phases:**	1	**Supply Protective Device type: BSEN**	1362	**Rating:**	13 Amps					

CIRCUIT DETAILS											TEST RESULTS											
				Circuit Conductors			Overcurrent devices			RCD		Circuit impedances Ω					Insulation resistance						RCD
Circuit Reference	Circuit Designation	Reference Method	Number of points served	Live (mm²)	Cpc (mm²)	Max Disconnection time Permitted (s)	Type BS EN	Rating (A)	Short circuit capacity (KA)	IΔn mA	Maximum permitted Zs Ω	Ring final circuits only (Measured end to end)			All circuits (At least One column To be completed)		Live/Live MΩ	Live/Neutral MΩ	Live/Earth MΩ	Neutral/Earth MΩ	Polarity	Maximum Measured Zs Ω	At 5xIΔn ms
												r_1	r_n	r_2	R1+ R2	R2							
1		B				.4	60898		6	30							N/A					N/A	N/A
2		B				.4	60898		6	30							N/A					N/A	N/A
3		B				.4	60898		6	30							N/A					N/A	N/A
4		B				.4	60898		6	30							N/A					N/A	N/A
5		B				.4	60898		6	30							N/A					N/A	N/A

Tested by: Name (Capitals)		**Signature:**		**Date:**	

Witness Statement

I confirm the candidate:	

Satisfied the criteria for Unit 233 Wiring and Testing Electrical Equipment and Circuits
When he/she:

On **assessment 2** the candidate:

- Correctly identified and inspected all components and single core cables required
- Collect correct tools and equipment required
- Ensure tools/equipment are safe for use
- Correctly mounted and secured the consumer unit and components required
- Correctly and safely connected all components, in accordance with the requirements of the IET Wiring Regulations
- Used appropriate sources to obtain the required specifications, circuit diagram and test information
- Carried out a visual inspection of the completed installation and rectified any faults found in accordance with the requirements of the IET Wiring Regulations
- Undertook the appropriate testing in accordance with the requirements of the IET Wiring Regulations and recorded all results.
- Returned all tools and equipment, left area clean & tidy

Assessor Signature:		Date:
Assessor Name:		

WIRING AND TESTING ELECTRICAL EQUIPMENT & CIRCUITS
CITY AND GUILDS UNIT 233

Description of Activity **Steel wire armoured power cable**	**Install and terminate 3 core 2.5mm^2 PVC covered steel wire armoured cable between local isolator and consumer unit using appropriate components and connections** **Complete the Inspection Records**

Assessment 3 Evidence Pack:

Contents:

- Work Instructions
- Assessment Drawing (Power supply wiring diagram)
- Work Plan
- 3 What's Risk Assessment
- Permit to Work
- Schedule of Inspections
- Schedule of Test Results
- Observation Questions
- Witness Statement

Assessment Three Work Instruction

1. Wear personal protective equipment at all times
2. Complete risk assessment and Permit to Work method statements
3. Collect correct tools and equipment required
4. Ensure tools/equipment are safe for use
5. Check drawing covers armoured cable installation
6. Gather/check components and make sure no parts missing or damaged
7. Ensure CU and Isolator are positioned and secured correctly
8. Mark out route armoured cable will take between isolator and CU
9. Ensure gland body lock nuts are securely tightened down at isolator and CU
10. Ensure cable cleats are equally spaced and secured to backboard using correct size woodscrews
11. Ensure cable has correct csa as per drawing and of the correct length
12. Fit appropriate coloured sleeves to identify those cores being used for earth and neutral
13. Ensure correct size crimp lugs are fitted to cpc at isolator and that its termination is tight
14. Ensure armoured cable is correctly bonded to earth terminal within 3 phase isolators
15. Complete Visual Inspection sheets correcting any errors if found necessary
16. Complete test certificate
17. Make sure Permit to Work is signed off
18. Return tools/equipment and tidy area

Assessment 3 Drawing

Replace this page with Peo/233 Assessment 3
Wiring diagram: Armoured power supply cable
(Switch & Fuse Unit to Consumer unit)

WORK PLAN ASSESSMENT THREE	
TOOLS REQUIRED	**MATERIALS REQUIRED**

WRITE DOWN HOW YOU CARRY OUT THE TASK AND THE ORDER EACH STEP WILL BE TAKEN			
1		**12**	
2		**13**	
3		**14**	
4		**15**	
5		**16**	
6		**17**	
7		**18**	
8		**19**	
9		**20**	
10		**21**	
11		**22**	

3 What's – Risk Assessment

Note *Replace this page with the 3 what's – Risk Assessment*

Permit to Work

Note *Replace this page with the Permit to Work*

Hand write page number 38

Visual Inspection Test Certificate

Before any testing takes place this visual inspection test certificate has to be completed that covers only items of equipment that have been used in your installation work.

Section/Item **Condition** **Comments**

Assessment No3 3 core 2.5mm^2 pvc, swa, pvc mains supply cable	**Acceptable**		**Damaged**		
	Yes	**No**	**Yes**	**No**	
1. Is cable adequately supported					
2. Are cable fixings fixed firmly					
3. Are both glands locking nuts firmly tightened					
4. Are armour wires made of correctly within gland					
5. Are there any armour wires bent at their ends					
6. Are all armour wires outside of cone					
7. Is back nut fitted correctly over armour wires					
8. Have gland bodies and back nuts been correctly assembled and secured					
9. Has the correct amount of inner sheath been removed at both ends of cable					
10. Has core insulation suffered any damage were inner sheaths been removed					
11. Has sufficient slack been left on cores for terminating					
12. Are cores terminated and armour bonded correctly at Consumer Unit & switch & fuse unit earth crimped					
13. Are correct size of cable and mcb's been fitted					
14. The equipment is aligned level and free from foreign objects, dirt or other contamination					

Signed Candidate:		Date:
Candidate Name:		

Schedule of Test Results

DISTRIBUTION BOARD DETAILS													
DB Ref:	Consumer unit	**Z_s at this board**	N/A	**I_{pf} at this board**	N/A	**Main switch Type BSEN**	60497-3	**Rating:**	100 **Amps**	**Supply Conductors:**	N/A **mm²**	**Earth:**	N/A **mm²**

Distribution Board location	Workshop 1	**Supplied From:**	Socket	**No. Of Phases:**	1	**Supply Protective Device type: BSEN**	1362	**Rating:**	13 **Amps**

CIRCUIT DETAILS											TEST RESULTS											
				Circuit Conductors			Overcurrent devices			RCD		Circuit impedances Ω					Insulation resistance						RCD
Circuit Reference	**Circuit Designation**	**Reference Method**	**Number of points served**	**Live (mm²)**	**Cpc (mm²)**	**Max Disconnection time Permitted (s)**	**Type BS EN**	**Rating (A)**	**Short circuit capacity (KA)**	**IΔn mA**	**Maximum permitted Zs Ω**	**Ring final circuits only (Measured end to end)**			**All circuits (At least One column To be completed)**		**Live/Live MΩ**	**Live/Neutral MΩ**	**Live/Earth MΩ**	**Neutral/Earth MΩ**	**Polarity**	**Maximum Measured Zs Ω**	**At 5xIΔn ms**
												Γ1	**Γn**	**Γ2**	**R1+ R2**	**R2**							
1		C				.4	60898		6	30							N/A					N/A	N/A
2		C				.4	60898		6	30							N/A					N/A	N/A
3		C				.4	60898		6	30							N/A					N/A	N/A
4		C				.4	60898		6	30							N/A					N/A	N/A
5		C				.4	60898		6	30							N/A					N/A	N/A

Tested by: Name (Capitals)		**Signature:**		**Date:**	

OBSERVATION ASSESSMENT FOR ASSESSMENT THREE

Did the candidate: -	Y	N
Wear correct PPE		
Identify and obtain valid documentation (drawings) and visual inspection + test documents as per C&G Standards requirements for both Domestic lighting & power installations		
Worked safely at all times, complying with health and safety legislation, regulations and other relevant guidelines. Carry out risk assessment.		
Identify the correct components to be used (as listed under the Standards)		
Measures off the correct amount of SWA cabling to be installed		
Use the correct size and types of cable specified (as per drawings and C&G Standards requirements)		
Install cables on backboard without damage to sheaths or insulation		
Install cables without damage to core insulation		
Remove sheaths and cable insulation by correct amount		
Make mechanically sound glanded connections for power circuit isolator to consumer unit		
Make earth bonded connections to non-current carrying metalwork		
Visually check wiring and components for completeness, signs of damage, loose fittings and terminations		
Use the correct test instruments and testing methods. Check instruments used within calibration date and tools are in a safe and usable condition		
Investigate any wiring faults, rectify and retest		
Check all aspects of the work met the criteria, including BS7671 IET. Wiring Regulations		
Tidy away all tool's documentation and equipment. Leave the area safe and tidy		

QUESTIONS ASKED	RESPONSE
1. Describe the specific safety practices and procedures that they need to observe when wiring and testing electrical equipment	
2. Explain what constitutes a hazardous voltage and how to recognise victims of electric shock	
3. Describe the basic principles of operation of the equipment/circuits being produced and the purpose of the individual modules/components used	
4. Describe the application and use of the circuit protection equipment	
5. Explain how to check that the positions selected for mounting the components do not interfere with or damage existing services	
6. Describe the tools and equipment used in the wiring and testing activities	

I confirm the T.O. explained the principles of the observation assessment to me and I agreed to this observation taking place.

Signed Candidate:		Date:
Candidate Name:		

I confirm the candidate complied with the requirements of the performance statement and the unit scope and proved competent.
The assessment took place at TTE Training Ltd.

Signed Assessor:		Date:
Assessor Name:		

NVQ LEVEL 2 PERFORMING ENGINEERING OPERATIONS (7682)

UNIT 233

Wiring and Testing Electrical Equipment and Circuits
Knowledge Statements

2.1	**Describe the specific safety practices and procedures that they need to observe when wiring and testing electrical equipment (including any specific legislation, regulations or codes of practice for the activities, equipment or materials)**
Covered during observation assessment	
2.2	**Describe the hazards associated with wiring and testing electrical equipment, and with the tools and equipment used, (such as using sharp instruments for stripping cable insulation), and how they can be minimised**
2.3	**Describe the importance of wearing appropriate protective clothing and equipment (PPE), and keeping the work area safe and tidy**
Previously stated in Unit 201 statement 2.14	

2.4	**Explain what constitutes a hazardous voltage and how to recognise victims of electric shock**
Covered during observation assessment	
2.5	**Explain how to reduce the risks of a phase to earth shock (such as insulated tools, rubber mating and isolating transformers)**
2.6	**Describe the interpretation of circuit diagrams, wiring diagrams, and other relevant specifications (including BS and ISO schematics, wiring regulations, symbols and terminology)**

2.7	**Describe the basic principles of operation of the equipment/circuits being produced, and the purpose of the individual modules/components used**
Covered during observation assessment	
2.8	**Describe the different types of cabling and their application (such as multicore cables, single core cables, solid and multi-stranded cables, steel wire armoured (SWA), mineral insulated (mi), screened cables, data/communications cables, fibre-optics)**
2.9	**Describe the application and use of a range of electrical components (such as plugs, switches, sockets, lighting and fittings, junction boxes, consumer units, relays, solenoids, transformers, sensors and actuators)**

2.10	Describe the application and use of circuit protection equipment (such as fuses and other overload protection devices, trips, residual current device (RCD))
Covered during observation assessment	
2.11	**Explain how to check that components meet the required specification/operating conditions (such as values, tolerance, current carrying capacity, voltage rating, power rating, working temperature range)**
2.12	**Describe the methods of mounting and securing electrical equipment/components to various surfaces (such as the use of nuts and bolts, screws and masonry fixing devices)**

2.13	**Explain how to check that the positions selected for mounting the components do not interfere with or damage existing services (such as cable harnesses, pipe work or electricity supplies)**
Covered during observation assessment	
2.14	**Describe the methods of laying in or drawing cables into conduit, trunking and tray work systems, and the need to ensure the cables are not twisted or plaited**
2.15	**Describe the techniques used to terminate electrical equipment (such as plugs and sockets; soldering; screwed, clamped and crimped connections, glands and sealed connectors)**

2.16	Describe the use of BS7671/IET wiring regulations when selecting wires and cables and when carrying out tests on systems

2.17	Describe the methods of attaching markers/labels to components or cables to assist with identification (such as colour coding conductors, using coded tabs)

2.18	Describe the tools and equipment used in the wiring and testing activities (including the use of cable stripping tools, crimping tools, soldering irons and torches, gland connecting tools)
	Covered during observation assessment

2.19	**Explain how to check that tools and equipment are free from damage or defects, and are in a safe, pat tested, calibrated and usable condition**
2.20	**Describe the importance of conducting inspections and checks before connecting to the supply (such as visual examination for loose or exposed conductors, excessive solder or solder spikes which may allow short circuits to occur, strain on terminations, insufficient slack cable at terminations, continuity and polarity checks, insulation checks)**
2.21	**Describe the care, handling and application of electrical test and measuring instruments (such as multimeter, insulation resistance tester, loop impedance test instruments)**

2.22	**Explain how to apply approved test procedures; the safe working practices and procedures required when carrying out the various tests, and the need to use suitably fused test probes and clips**
2.23	**Explain how to identify suitable test points within the circuit, and how to position the test instruments into the circuit whilst ensuring the correct polarity and without damaging the circuit components and the test equipment**
2.24	**Explain how to set the instrument's zero readings; obtaining instrument readings and comparing them with circuit parameters**

2.25	**Explain why electrical bonding / earthing is critical, and why it must be both mechanically and electrically secure**
2.26	**Describe the problems that can occur with the wiring and testing operations, and how these can be overcome**
2.27	**Describe the fault-finding techniques to be used if the equipment fails to operate correctly (such as half split, unit substitution and input/output)**

2.28	Explain when to act on their own initiative and when to seek help and advice from others
2.29	**Describe the importance of leaving the work area in a safe and clean condition on completion of the wiring and testing activities (such as returning hand tools and test equipment to is designated location, cleaning the work area, and removing and disposing of waste)**
	Previously stated in Unit 202 statement 2.27

Assessor	
Signed Assessor	