

# **Guidance Note OUES/BS/E/GN007 Rev00**

## **Preferred Installation Methods**

Written by: S Harris – Electrical Engineer.  
Approved: R Gregg – Principal Electrical Engineer  
Date: 07/03/2019



This illustrated guidance note has been produced to assist contractors when installing electrical systems that are compliant with the Universities polices. The University accepts that it is not always possible to install as required due to site constraints.

***Where this is not possible instructions should be taken from OUES Electrical Section.***

The aim is to produce systems that are easily identifiable to operate and maintain whilst allowing easy access for adapting and extending the installation. It is hoped that the document will become a useful visual guide to enable works to be completed in a more comprehensive manner and avoid extensive defects list on items that are required at handover stage.

### **BS 7671 Regulation 134.1.1**

*Good workmanship by one or more skilled or instructed persons and proper materials shall be used in the erection of the electrical installation. The installation of electrical equipment shall take account of manufacturers' instructions.*

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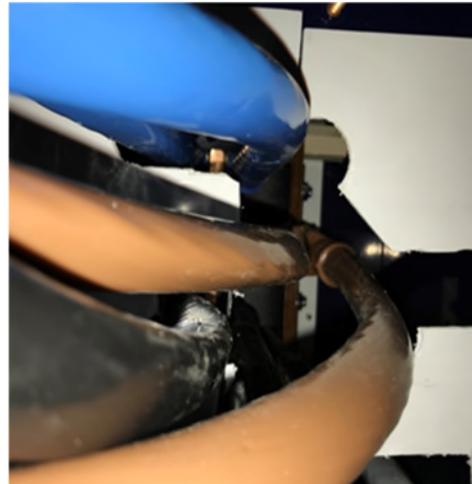
### **SWITCHGEAR AND SWITCHROOMS**

Prior to starting work in cable ways the contractor should make themselves familiar with:

**Guidance Note OUES/BS/E/GN005 Rev01 Electrical works in Switchboard Cableways.**

Generally LV switchpanels are manufactured to Form 4 Type 6 standard of protection and care should be taken when installing cables that the integrity of this protection is maintained.

Where Steel Wire Armoured (SWA) cables enter through gland plate's care should be taken to ensure that cables are installed in an appropriate manner to enable future cables to be installed.



Examples of integrity being compromised

### **CABLES ENTERING PANELS**

Cables should preferably be installed at the back of panel in a neat and orderly manner thereby enabling future installations to be installed more easily.

SWA cables should be labelled in accordance with current version of OUES Philosophy Document and banjos should be connected to the Earth bar. Each banjo/earth wire should be connected individually. It is not acceptable to use one nut and bolt and earth wire to connect several banjos.

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**NOT ACCEPTABLE**

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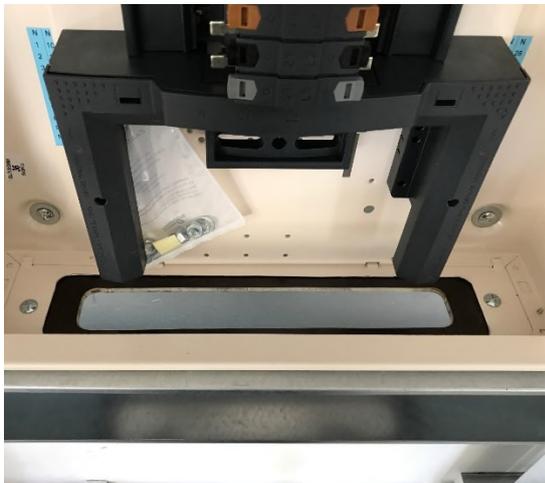
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### **DISTRIBUTION BOARD LAYOUT**



This is the University's preferred method of SWA cable installation into a Distribution board. This method complies with Code of Practice regarding live work whereby no live cables will be present in the distribution board when isolated locally



Paxolin fitted between trunking and dis-board. Bushes are not an acceptable method.

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Distribution boards shall have 25% spare capacity at handover.

Trunkings should be sized accordingly so as and when all DB's are full within risers trunking will still comply with space factors as laid out in BS 7671.



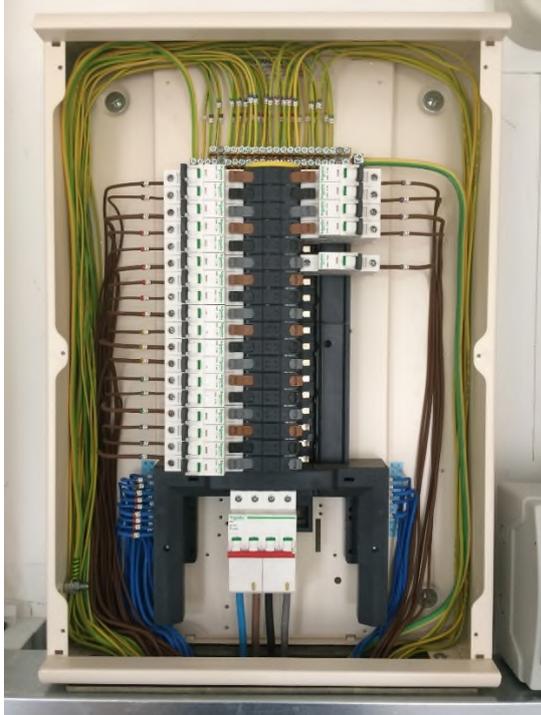
Cables supplying DB's should enter through bottom of DB. Cables should not pass through dis-board. 4 pole disconnecter is a requirement.

It is a requirement that shrouds are fitted to all incoming devices

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Identification numbers to cables are a BS requirement!



High integrity earthing, ring main cables to be in separate terminals.

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Distribution board should be presented as shown.

Circuit charts should not be installed behind door but fitted in a frame in an appropriate place adjacent.

Test labels and other information should be on rear of door.

Distribution boards shall be positioned so that they are fully accessible and can be worked on without the use of steps or other aids. Distribution boards should not be located in mechanical services plant rooms unless they serve the equipment within those areas.

Distribution boards should be protected throughout installation to prevent ingress of dust and debris.

Oxford University reserves the right to reject any distribution board at handover if distribution board has not been adequately protected.

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**Source**



**Remote End**

Labelling of SWA  
Cables.

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### **TRUNKING INSTALLATION**

Prior to working in trunkings contractors should read the following:

#### **Guidance Note OUES/BS/E/GN003 Rev01**



Trunking Connecting trunkings using bushes is not acceptable.

Trunking capacity should be maintained through walls and fire stopped as required.

Trunking lids shall be cut 50mm either side of a wall where trunkings pass through and securely fixed either side

Trunking lid shall be secured using appropriate fixings and should be fixed at regular intervals and at each end of lid.

Only screws supplied by manufacturer shall be used for joining trunking accessories.

Earth tags shall be used as supplied and in accordance with manufacturer's instructions

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Trunking should be clean and free of dust and debris

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**Examples of unacceptable installations**



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### **CONDUIT INSTALLATION**

White Saddles should be used when installing white conduits.



It is not acceptable to use galvanised saddles white conduit



White Saddles

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All exposed threads to be painted



### **UNACCEPTABLE INSTALLATIONS**



Kopex should be used in an appropriate manner i.e. for connections between isolators/plug and sockets and vibrating equip

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### **LIGHTING**

Prior to starting work on lighting systems the contractor should make themselves familiar with:  
**Guidance Note OUES/BS/E/GN006 Rev00 LIGHTING – WIRING COLOURS.**

#### **Flex 7's**

Flex 7's should be installed either parallel or at 90 degrees to surface conduit.



Unacceptable



Acceptable

#### **Flexes.**

Wiring from Lighting Control Modules (LCM's) should be installed in a tidy and appropriate manner, either on cable tray or basket. It is not acceptable to lay flexes on ceilings or to be tied to other containment systems.

### **TESTING OF LIGHTING CIRCUITS**

Oxford University expects the whole of the lighting circuit to be tested in accordance With BS7671 including flexes to all light fittings. It is not acceptable to test to the LCM only.

#### **BS. 131.2 TBC**

*Spare cores should be safely and securely terminated*

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*Unacceptable installation*

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### **SMALL POWER.**

#### **Socket Outlets**

All standard socket outlets shall be protected by a 30ma RCD's.

RCBO's shall not be used.

As a general arrangement upto 10 twin sockets outlets **per circuit** will be the norm. Permission can be granted to exceed this amount however it must be agreed in writing by OUES Electrical Section.

High Integrity circuits shall be wired in accordance with BS7671.

Radial Circuits are preferred over Ring circuits.

Cleaners sockets shall be wired on separate circuits and contain an integral RCD. These shall be the Passive (non-active) type and identified with a label stating 'CLEANERS SOCKET'

#### **Fused Spurs**

Fused spurs shall only be used for life safety systems unless agreed in writing by OUES Electrical Section.

#### **External Sockets**

Each individual item of mechanical services plant – pumps, motors, fume cupboard extract fans, boilers, pressurisation units, water heaters, etc., must be connected to the fixed electrical system via an interlocking plug and socket to provide safe isolation for mechanical maintenance.

Plug and sockets should not be used for variable speed inverter drives. Socket shall be RCD protected unless a documented risk assessment has been presented and approved by OUES Electrical Team.

- External sockets shall be IP67 rated and installed in accordance with **manufacturer's instructions**.
- All cables installed externally shall be **UV stable**
- All external services/equipment shall be protected by surge protection units.

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### CIRCUIT CHARTS

Contractors should ensure that all relevant information is recorded on database and circuit chart before installing chart.

Way	Size Type	Circuit Ref	Circuit Description	ZS ohms	PSC L-N	4A	PSC L-E	4A	Cable size	T
1	16 C	315 . 1	FUTURE MBSC & EXTRACT FAN SUPPLY						2.5 mm LS	
2	6 C	315 . 2	MBSC CONTACTOR CONTROL CIRCUIT						1.5 mm LS	
3		315 . 3	SPARE						mm	
4		315 . 4	SPARE						mm	
5		315 . 5	SPARE						mm	
6		315 . 6	SPARE						mm	
7		315 . 7	SPARE						mm	
8		315 . 8	SPARE						mm	

Chart should indicate that incoming device is shrouded or not. Stating **Yes/No** is not acceptable. Remote isolation must be stated, **To Be Confirmed** is unacceptable.

Charts should **not be** installed behind locked Distribution Board covers.

Hand written amendments should be made while database and chart are being updated. This should include contractors name and contact details and should be updated within 7 days from date on temporary chart.

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### **LIGHTNING PROTECTION SYSTEM (LPS)**

It is essential that when installing plant and equipment in areas covered by Lightning Protection Systems all new plant and equipment is connected to the Lightning Protection System.

**It is not acceptable to connect a cable to the fixed wiring system until the Surge Protection Device has been fitted. The plant equipment shall be bonded to the LPS prior to energisation.**

If unsure contractors, Mechanical and Electrical should contact the relevant engineer for guidance on how to proceed. It is not acceptable to walk away and hope that somebody else will do this work.

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### **FIRE SAFETY.**

**It is of the upmost importance that fire stopping is installed in accordance with relevant regulations.**



### **Guidance Note 4: Protection Against Fire, 8th Edition**

Guidance on protection against fire in electrical installations.

### **Cables & Fixings for Fire Safety.**

All cables need to satisfy the requirements of the Construction Products Regulation (CPR) in respect of their reaction to fire.

### **Chapter 52 Selection and erection of wiring systems.**

Regulation 521.11.201, which gives requirements for the methods of support of wiring systems in escape routes, has been replaced by a new Regulation 521.10.202, which requires cables to be adequately supported against their premature collapse in the event of a fire.

This applies throughout the installation, not just in escape routes, and is relevant to all cable types, not just power.

<https://www.fischer.co.uk/en-gb/products>

<https://www.linianclip.co.uk/>

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### **FIRE ALARM INSTALLATIONS**

Fire Alarms should be installed in accordance with BS 5839 and University Safety Office should be consulted where necessary.

Cables should be installed on separate containment or segregated where on shared trays or in trunkings. Cables should not be fixed to primary containment but installed on appropriate Containment.

#### **Wiring Methods.**



**Unacceptable**



**acceptable**

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### **MANUFACTURER'S INSTRUCTIONS.**

#### **BS 7671 Regulation 134.1.1**

Good workmanship by skilled or instructed persons and proper materials shall be used in the erection of the electrical installation. The installation of electrical equipment shall take account of manufacturer's instructions.



Manufacturer's instructions stated "Heater should be placed at least 750mm from any surface"

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### TESTING AND INSPECTION



### **Guidance Note 3: Inspection & Testing, 8th Edition**

This popular title provides practical guidance on the inspection and testing of electrical installations.

Initial verification.

During erection and on completion of an installation or an addition or alteration to an installation, and **before it is put into service**, appropriate inspection and testing shall be carried out by competent persons to verify that the requirements of this Standard have been met.

Appropriate certification shall be issued in accordance with Sections 631 and 632.

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### **COMMON DEFECTS ON INITIAL INSPECTION**

These are the most common items found on initial inspection and OUES feel that these should be picked up during contractor's final inspection/testing **prior to installation being offered back to OUES**

- 1 Missing circuit chart. Permanent or temporary.
- 2 Missing DB label/insecurely fixed label
- 3 No labelling to SWA cables/or incorrect labelling.
- 4 No lock to DB.
- 5 Trunking lid missing/lack of camlocks to lid.
- 6 No labelling to accessories.
- 7 Missing RCD test labels.
- 8 Lack of trunking capacity for future use.
- 9 Debris in trunking and DB's.
- 10 Emergency light fittings not labelled.
- 11 Missing information from circuit charts.
- 12 Cable ties in DB's.
- 13 Screws missing from DB cover.
- 14 Earth wire from banjo to earth bar.
- 15 Banjos bolted together with one earth wire to earth bar.
- 16 PVC conduits couplers not glued.
- 17 PVC conduit not supported with non-combustible saddles.
- 18 Cables in PVC trunking not supported with non-combustible fixings.
- 19 Connection of equipment to Lightning Protection systems on roofs.
- 20 Flex 7's installed in wrong orientation.
- 21 Loose connections in DB's. **Torque to manufactures instructions**
- 22 Earth link between earth bar and earth stud missing
- 23 Bonding links between trunking and trays missing
- 24 Neutrals & earths not in sequence
- 25 Incoming Shroud / Neutral covers and screws missing
- 26 Fire stopping missing in trunkings, between floors and around containment through walls
- 27 Metal cable ties not used on SWA cables on trays and ladder racks
- 28 Incorrect protection settings on MCCB's

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## CHECKLIST: Distribution Boards

DB Number: \_\_\_\_\_ Location: \_\_\_\_\_ Date of Inspection: \_\_\_\_\_

	Initial Inspection	Comments
1	Condition of DB.	
2	Identification Label.	
3	Door Lock.	
4	Voltage Flash.	
5	Shroud to Incoming Device.	
6	Neutral Cover in Place.	
7	Earth Wire from banjo to earth bar.	
8	High integrity earth connected correctly.	
9	Entry for cables via slots in trunking.	
10	<u>Swa</u> cable labelled correctly.	
11	Cable tray bonded.	
12	Trunking capacity adequate for future use.	
13	Trunking lid securely/adequately fixed.	
14	Circuit ways identified.	
15	Circuit chart fitted.	
16	Circuit chart complete.	
17	Cleanliness of Board and cupboard.	
18	Earth Bar Safety Label Fitted.	

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## Checklist: Switch Rooms & Risers

Site: \_\_\_\_\_ Area Inspected: \_\_\_\_\_ Inspected By: \_\_\_\_\_ Date: \_\_\_\_\_

	Initial Inspection	Comments
1	Access and working space.	
2	Door lock OUES master suited.	
3	Rubber mat.	
4	Shock charts & notices.	
5	Lighting/Emergency lighting.	
6	Condition of switchgear.	
7	Cables correctly terminated and identified.	
8	Banjo's correctly earthed.	
9	Earth bar fitted and cables Identified.	
10	Warning labels fitted to earth bar.	
11	Earth wires labelled.	
12	Integrity of Form4 Type 6 panel maintained.	
13	MCCB's identified. Set to designers requirements.	
14	Labels securely fixed.	
15	Flooring.	
16	Circuit charts fitted and correct.	
17	Schematic drawings fitted.	
18	Metering connected and reading at Malthouse.	
19	Fire stopping fitted where required.	
20	Fire Alarm fitted and commissioned.	
21	Leak Detection fitted and commissioned.	
22	Shock Chart Fitted.	