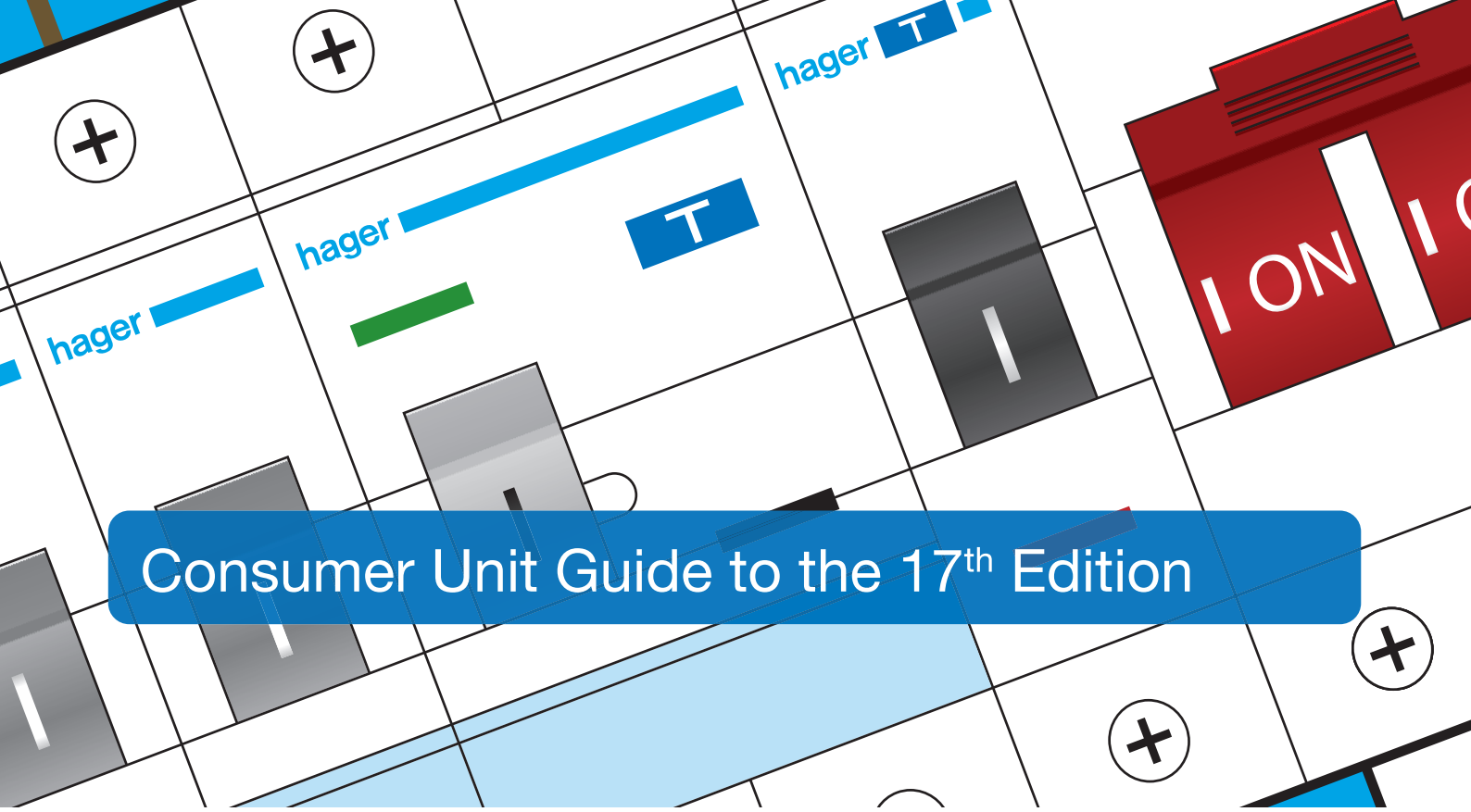


Consumer Unit Guide to the 17th Edition

hager

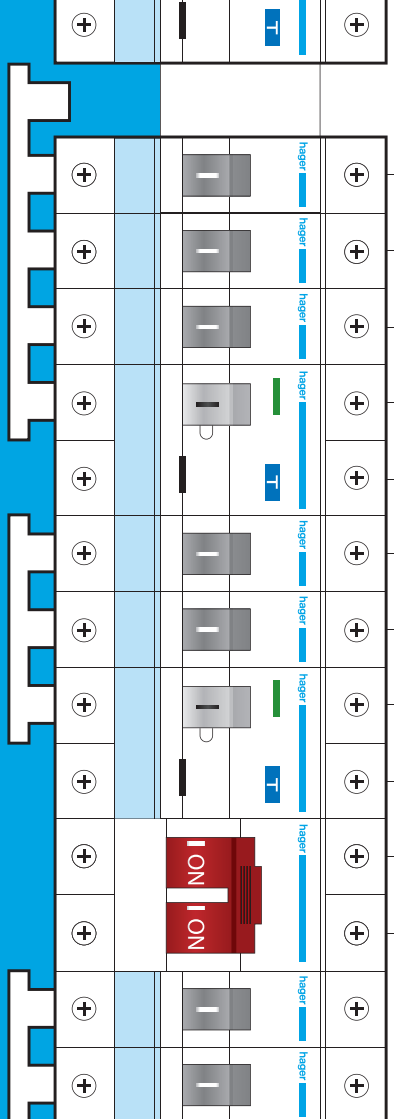
Introduction

For well over one hundred years the Wiring Regulations have provided the rules which must be followed to make sure that electrical installations are safe. The introduction of the 17th Edition of the Wiring Regulations on the 1st January 2008 has major implications for all Electrical Contractors, Designers and Consultants.

Installations designed from 1st July 2008 must comply with this new set of Regulations. Several new Regulations will have an impact upon circuit design and consumer unit layout.

This guide will help you understand the new Wiring Regulations and current Building Regulations, providing the necessary facts to construct compliant installations including Consumer Units.

If after reading this guide you would like to find out further information regarding the new regulations Hager are offering tailored training seminars throughout 2008. If you are interested in registering interest in attending one of these seminars please visit www.hager.co.uk



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Since 2005 the Building regulations for England and Wales has made direct reference to Electrical Installations, increasing the influence on how Electrical Equipment is installed in buildings.

Building Regulations

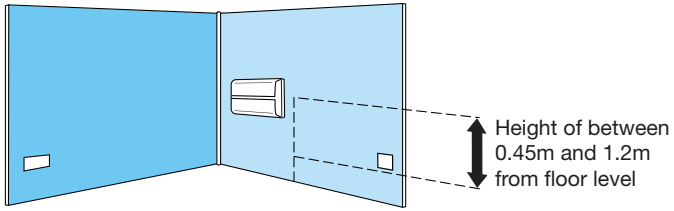
Part P of the building regulations relates to the electrical safety in dwellings. The approved document prescribes that consumer units should be located so that they are easily reachable where this is necessary to comply with Part M of the building Regulations.

Part M requires that reasonable provision be made for people to gain access to a building and use its facilities. The approved document prescribes that switches, socket outlets and "other equipment" needs to be at appropriate heights, these are defined as between 0.45m and 1.2m from finished floor level.

Other equipment may be taken to include the consumer unit, as it contains devices such as MCB's and RCD's that may need operation or resetting by the user of the dwelling.

The consumer unit should therefore be accessible, with the devices mounted at a height no greater the 1.2m above the floor. In addition the consumer unit should not be in a location that would make it difficult to access such as an under stairs cupboard. Neither should it be placed in a position where is likely to be damaged by impact.

Therefore depending on the layout of the dwelling a flush consumer unit may be considered.



"Consumer Units should be easily reachable and be mounted with the switches at a height of between 0.45m & 1.2m above floor level"

Requirements of 17th Edition Wiring Regulations BS 7671:2008

This section aims to explain some of the new Regulations contained within the 17th Edition Wiring Regulations, regarding the consumer unit and final circuits.

Firstly however, to fully understand what is required we need to consider some definitions from Part 2 of the Regulations.

Ordinary Person – Someone who is neither skilled or instructed
e.g. General public / Home owner

Skilled Person – A person with technical knowledge or experience to enable him/her to avoid dangers which electricity may create
e.g. Qualified Electrician

Instructed Person – A person who has been adequately advised or supervised to enable him/her to avoid dangers which electricity may create
e.g. Facilities Manager

Typically commercial installations will be under the control of a Skilled or Instructed Person. However domestic and some commercial installations will not. This is particularly important, as certain Regulations only apply to installations not under the supervision of a Skilled or Instructed Person.

A significant change is the introduction of Regulations requiring additional protection by RCDs.

There are 3 points of consideration,

1. Socket Outlets
2. Cables buried in walls
3. Locations containing a bath or shower

> ***“Certain Regulations only apply to installations not under the supervision of a Skilled or Instructed Person i.e. Ordinary persons”***

The Regulations have introduced new requirements regarding socket outlets, particularly where used by ordinary persons e.g. Home owners.

Sockets Outlets

The definitions for persons are important to consider when we look at the requirements for protection of circuits supplying socket outlets.

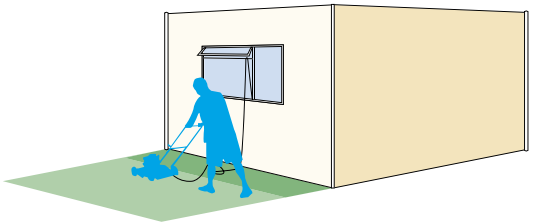
Regulation 411.3.3 requires that an RCD of not exceeding 30mA be provided for:

i. Socket outlets up to 20A that for general use by “ordinary persons”.
ii. Mobile equipment up to 32A that is for use outdoors.

Exceptions to 411.3.3 are permitted where:

iii. Use of socket outlets is under the supervision of someone “skilled” or “instructed”.
iv. Specifically labelled or otherwise suitably identified socket outlets provided for a particular item of equipment.

This is a change from the 16th Edition that required only socket outlets ‘reasonably expected’ to supply equipment used outside the equipotential zone to have RCD protection e.g. used for an Electric lawn mower. Now under the requirements of the 17th edition it is likely that every socket outlet in a domestic installation will require RCD protection not exceeding 30mA.



This may also apply to some commercial installations, like small offices or shops etc where there is no control on the use of those socket outlets. Consideration should also be given to areas where free access to socket outlets is available to the general public e.g. airport lounges.

“Socket outlets for general use in a domestic installation require RCD protection not exceeding 30mA”

Significant changes affect installations where cables are buried in the wall. This is the normal practice in dwellings.

Cables buried in the wall

Here we need to consider Section 522, Selection and erection of wiring systems in relation to external influences. The particular requirements of this section apply to cables which are concealed in a wall or partition at a depth of less than 50mm, or where metal partitions are used.

The definitions for persons are once again important for this section.

> ***"Where buried cables are not mechanically protected additional protection by an RCD not exceeding 30mA must be provided"***

There are 5 options of installing cables in walls. The cables shall:

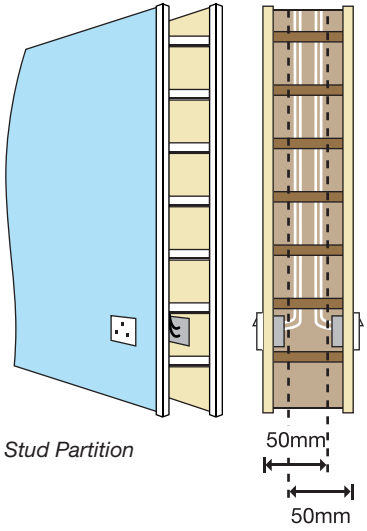
i. incorporate an earthed metal covering which is suitable as a protective conductor. Eg SWA cable.
ii. Be enclosed in earthed metal conduit, such that is suitable as a protective conductor.
iii. Be enclosed in earthed metal trunking, such that is suitable as a protective conductor.
iv. Be protected against damage from penetration by nails or screws.
v. Be installed in a safe zone.

This is much the same as the 16th Edition requirements and the usual option is to install cables in a dedicated safe zone. However, where an installation is not under the supervision of someone skilled or instructed, regulation 522.6.7 applies.

In this regulation where (v) only from above is used then the cable must have additional protection by the use of a RCD not exceeding 30mA. This would apply where thermoplastic (PVC) wiring systems are used, this is typical in most domestic installations and some commercial installations.

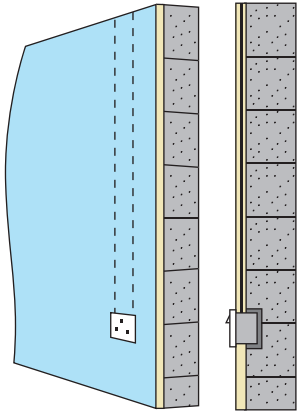
Cables buried in the wall

Requires RCD Protection



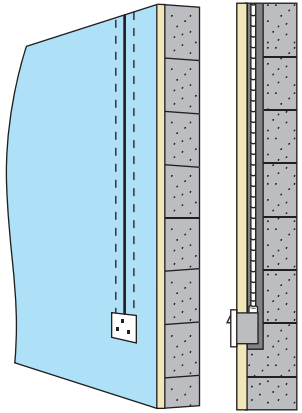
Stud Partition

Requires RCD Protection



Brick / Block or Plaster

Does Not require RCD Protection



Earthed Metal Condut

Although additional regulations relating to bathrooms etc are not new, there are some important changes to consider.

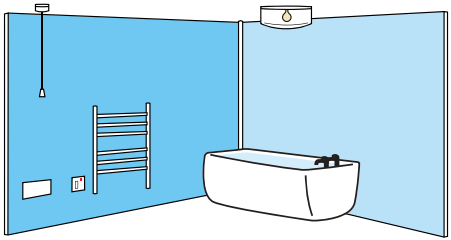
Section 701, Locations containing a bath or shower

Regulation 701.411.3.3 requires that all circuits within this location shall be additionally protected by an RCD not exceeding 30mA. This would mean 230V lighting, the 230V supply to the source for SELV, a shower circuit and bathroom heater for example will all need RCD protection.

A standard 13A socket outlet is now permitted in this location provided however the socket outlet is more than 3m from the boundary of zone 1.

The 16th Edition required local supplementary bonding be provided connecting together all exposed and extraneous conductive parts in the zones. This is no longer required in this location provided the following conditions are met:

- All final circuits of the location comply with the automatic disconnection requirements according to regulation 411.3.2.
- All circuits are RCD protected in accordance with 701.411.3.3.
- All extraneous-conductive parts of the location are effectively connected to the protective equipotential bonding according to regulation 411.3.1.2 (Previously termed main equipotential bonding).



Circuits in locations containing a bath or shower should be protected by an RCD

“All circuits in locations containing a bath or shower shall be protected by an RCD not exceeding 30mA”

Other Considerations

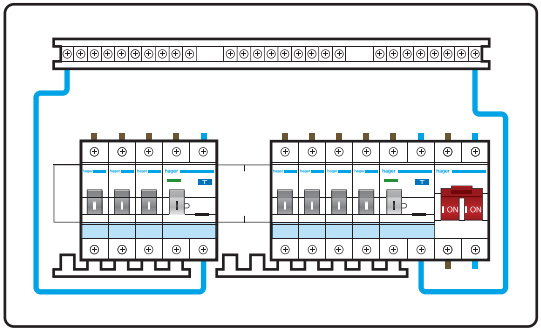
There are additional Regulations and Codes of Practice that need to be considered during the design of an installation. These will affect the choice of consumer unit.

Division of Installation

Section 314 calls for the installation to be so divided to:

a. Avoid hazards and minimize inconvenience in the event of a fault
b. Reduce the possibility of unwanted tripping of the RCD due to excessive protective conductor currents.

To comply with these requirements the circuits of an installation should not be connected to a single RCD, as this could lead to loss of supply to the entire installation in the event of a fault on one circuit, clearly inconvenient for the user of the building.



“All circuits of an installation should not be connected to a single RCD”

The Wiring Rules & Building regulations are not the only documents that need to be consulted, another important document relates to smoke alarms.

BS 5839-6:2004 Fire detection and Fire alarm systems for buildings

This Code of Practice has particular requirements for dwellings.

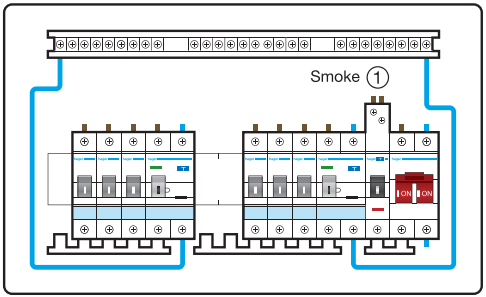
This document makes reference to the power supply to such systems and mentions RCD's. The circuit supplying these systems should preferably not be protected by an RCD. This however is going to be difficult to achieve if the circuit supplying these systems is buried in the walls and standard domestic wiring systems are used. Indeed the supply cables would need to be specially protected in earthed metal conduit etc. for RCD protection not to be used.

Options for circuits supplying fire or smoke alarms in dwellings protected by an RCD include:

i. The RCD serves only that circuit. For example with the use of an RCBO

ii. The RCD operates independently of any RCD feeding socket outlets or portable equipment

So consideration of these points is necessary during the design stage and particular care is needed to select the appropriate consumer unit and wiring system to ensure compliance. BS 5839-6 should always be studied to ensure that all relevant recommendations are complied with.



"Where RCD protection is needed for smoke detector circuits one option is to supply that circuit only"

The following options, each with their own benefits, can be considered by the installation designer.

Consumer Unit Arrangements

Not Permitted

A consumer unit with a 30mA RCD main switch would not be suitable for 3 main reasons:

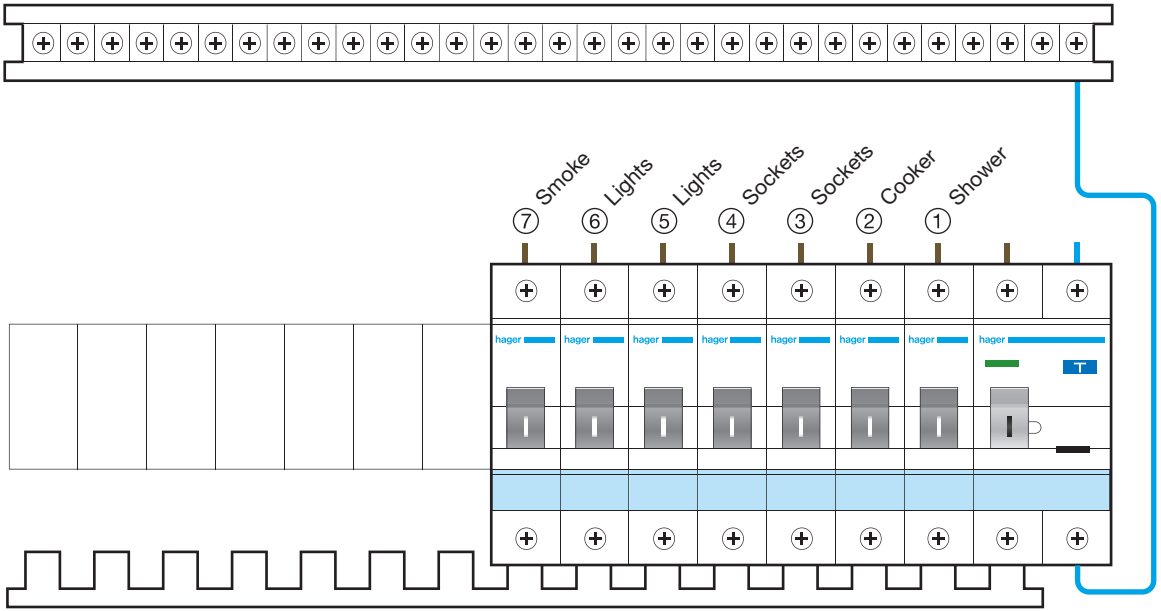
- The Fire detection circuit and the socket outlet circuits share a common RCD. This could reduce the reliability of the mains supply to the Fire detection circuit as appliances and portable equipment are likely causes of RCD tripping.

- The cumulative effects of electronic equipment in the modern home, is such that some current is likely to flow in the protective conductor. A 30mA RCD will trip between 15-30mA. This could cause unwanted tripping, regulation 314.1 (iv) refers.

- Any fault would result in the loss of all the lighting, this could in itself cause a hazard and the lack of power to the fridge/freezer circuit for example would be very inconvenient. Regulation 314.1 (i) asks the designer to consider this eventuality.

An example is shown over page.

“A consumer unit with a 30mA RCD main switch should not be used to protect all the circuits”


⑦ Smoke
⑥ Lights
⑤ Lights
④ Sockets
③ Sockets
② Cooker
① Shower
hager

Consumer Unit Arrangements

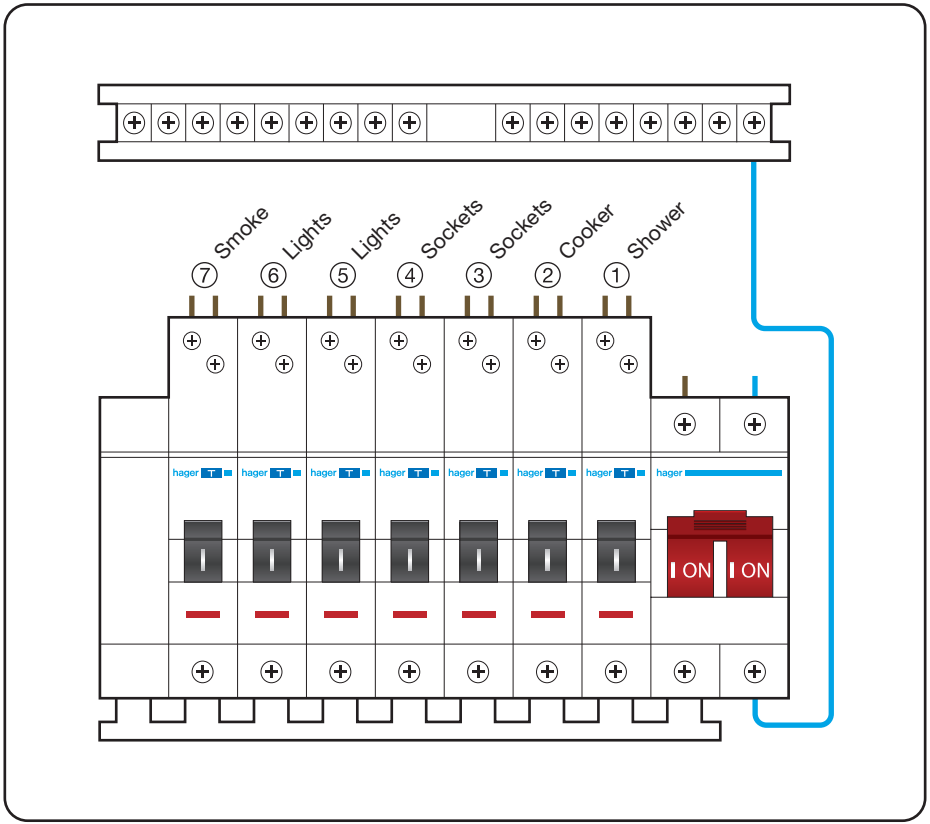
Option 1

Main Switch with RCBO's On All Circuits

A standard main switch disconnector controlled consumer unit could be used with every circuit having individual RCD protection at 30mA. This could be achieved by selecting RCBO's for every outgoing circuit instead of the usual MCB's. A fault on any circuit would not affect other circuits and hence all relevant regulations would be met by such a design.

An example is shown over page.

"Selecting RCBO's for every outgoing circuit meets all relevant regulations"


Smoke
Lights
Lights
Sockets
Sockets
Cooker
Shower
7
6
5
4
3
2
1
hager
ON
ON

Consumer Unit Arrangements

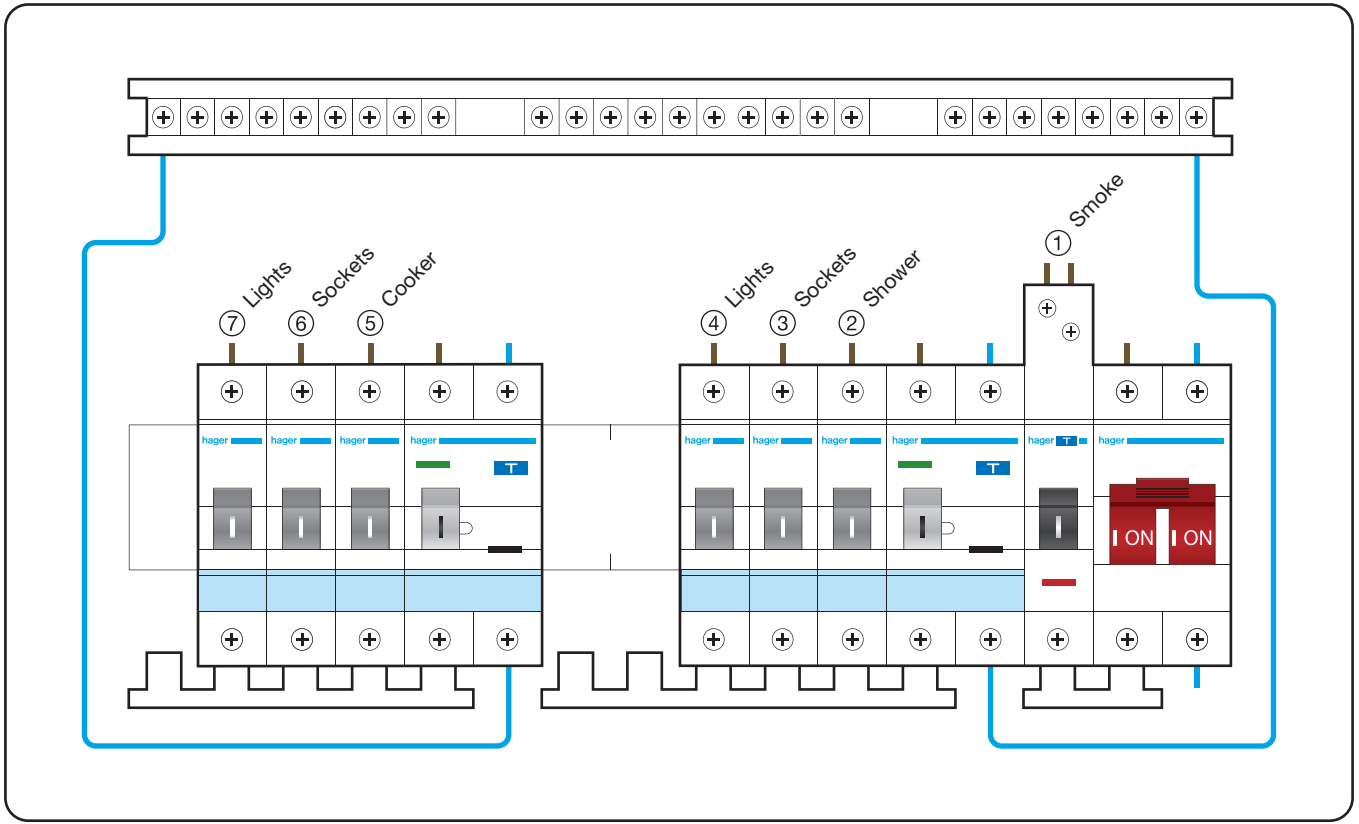
Option 2

Split Load Twin RCCB plus Dedicated RCBO

This arrangement provides a dedicated 30mA RCBO for the smoke detector circuit, but combines the rest of the circuits across two further 30mA RCCB's. Careful arrangements of the circuits can reduce the likelihood of nuisance tripping, thereby limiting the inconvenience or potential hazards that a loss of supply can cause by limiting the number of circuits affected.

An example is shown over page.

"This arrangement provides a dedicated RCBO for the smoke detector circuit"


7 Lights
6 Sockets
5 Cooker
4 Lights
3 Sockets
2 Shower
1 Smoke
hager
ON
ON

Consumer Unit Arrangements

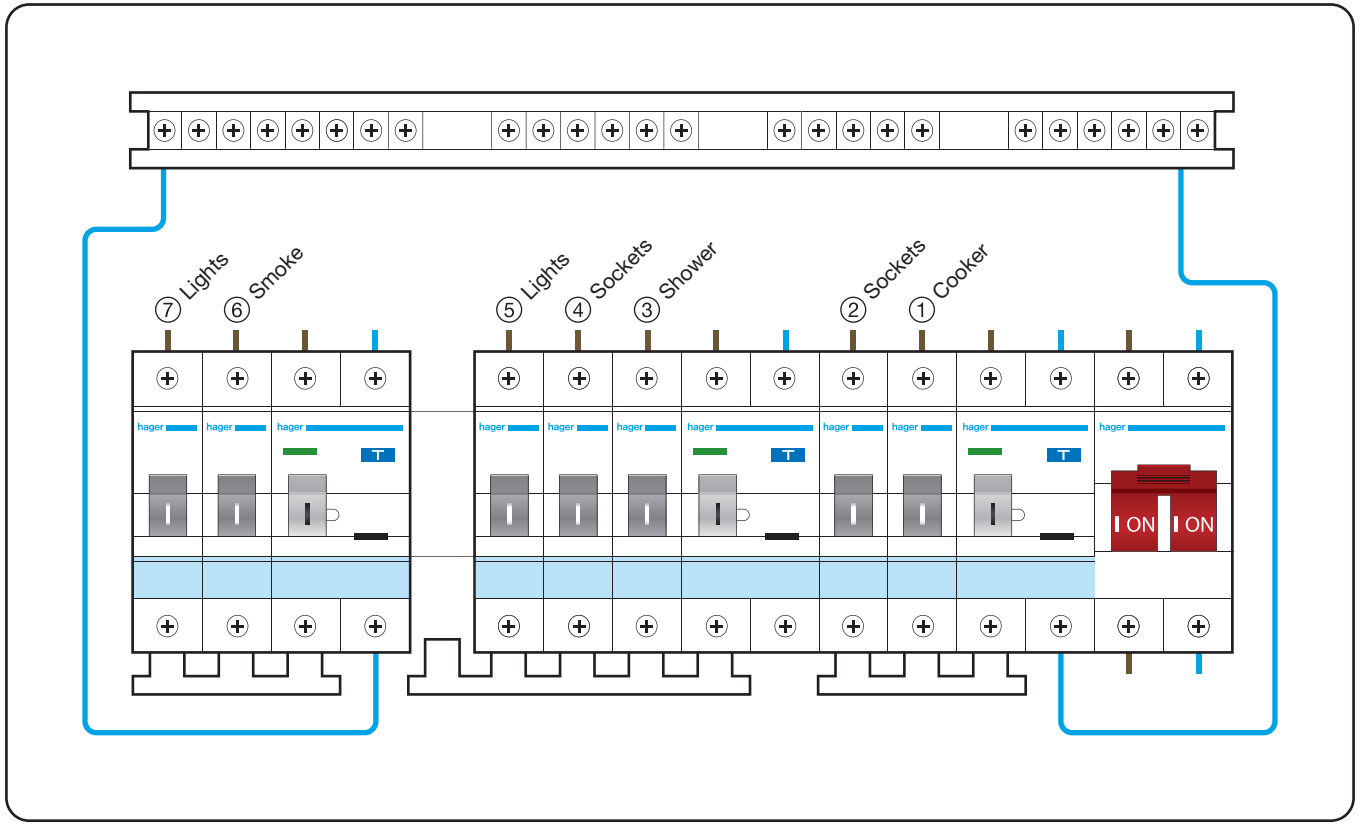
Option 3

Split Load 3 RCCB Board

This arrangement provides a 30mA RCCB for the smoke detector circuit which could also supply other circuits e.g. lighting, and combines the rest of the circuits across two further 30mA RCCB's. Careful arrangements of the circuits can reduce the likelihood of nuisance tripping, thereby limiting the inconvenience or potential hazards that a loss of supply can cause by reducing the number of circuits affected.

An example is shown over page.

"This arrangement provides a RCD for the smoke detector circuit which could also supply other circuits e.g. lighting"


⑦ Lights
⑥ Smoke
⑤ Lights
④ Sockets
③ Shower
② Sockets
① Cooker
hager
ON
ON

Consumer Unit Arrangements

Option 4

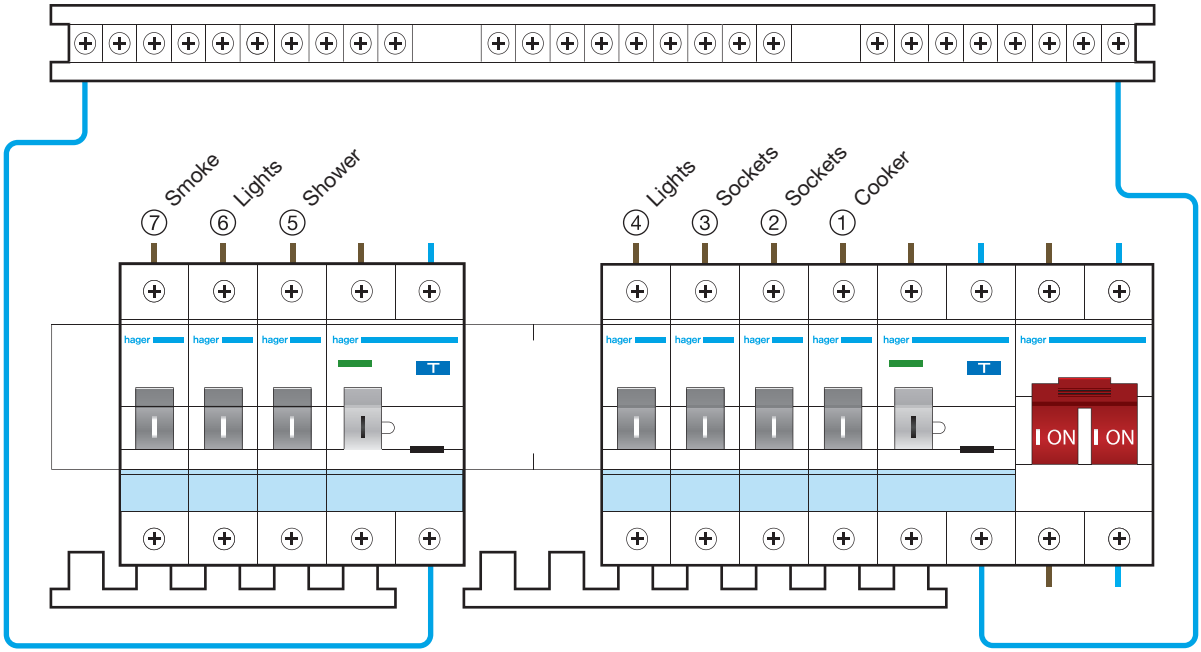
Split Load Twin RCCB

This arrangement provides two separate 30mA RCCBs with the circuits spread across both. The design of the circuit arrangements ensure the smoke detector is not fed from the same RCD as socket outlets to improve the reliability of the mains supply to the Fire detection circuit as appliances and portable equipment are likely causes of RCD tripping.

Careful arrangement of the other circuits can reduce the likelihood of nuisance tripping, thereby limiting the inconvenience or potential hazards that a loss of supply can cause. However with all socket outlets being supplied from one RCD certain compromise must be accepted.

An example is shown over page.

“One option is for the smoke detector not to be supplied from the same RCD as socket outlets”


7 Smoke
6 Lights
5 Shower
4 Lights
3 Sockets
2 Sockets
1 Cooker
hager
ON
ON

Consumer Unit Arrangements

Option 5

Split Load Twin RCCB plus unprotected circuit

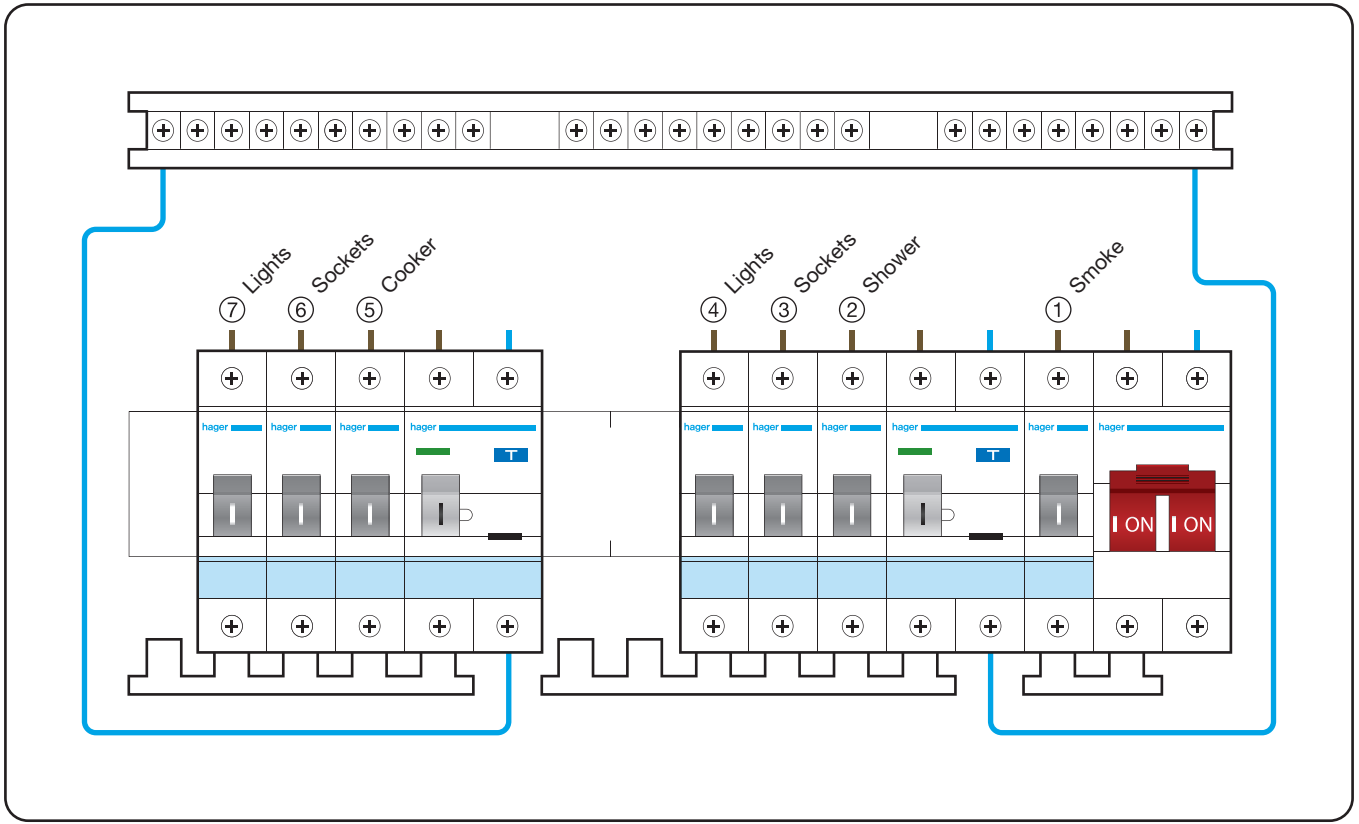
Under the 17th Edition requirements it is still possible to install some circuits in domestic premises that are not fed via an RCD. Different wiring systems would need to be used. The cost of installation could rise considerably if most circuits were installed using armoured cable or earthed metal conduits.

The smoke alarm circuit could be installed in such a way to negate the need for RCD protection, this may be possible by using one of the other wiring methods described in 522.6.6 for the length of run that the cable is in the wall (use of earthed metal conduit for example). Or depending on the layout of the property there maybe an attached garage for example where surface wiring might be possible. The requirements of that regulation are therefore not applicable.

The level of compliance with the Regulations would therefore be the same as option 2 Split Load Twin RCCB plus Dedicated RCBO.

An example is shown over page.

"If the smoke alarm circuit is not to be protected by an RCD it must be installed using a method from (i) to (iv) of regulation 522.6.6"


7 Lights
6 Sockets
5 Cooker
4 Lights
3 Sockets
2 Shower
1 Smoke
hager
ON
ON

Conclusions

It is clear that domestic installations conforming to the 17th Edition of the Wiring Regulations are likely to require increased use of RCD (Residual Current Devices) and careful consideration from designers and installers is required to meet the requirements of the regulations.

Training Seminars

In addition to the products required, Hager are committed to training our customers on the latest regulations. To help with the introduction of the 17th Edition Hager are planning a series of training seminars during 2008 to help explain the differences, what the implications are, and how Hager can help with the transition.

Training seminars are arranged throughout the UK and come at no cost to you. To register your interest please visit www.hager.co.uk and click on the IEE Wiring Regulations link.

Partner in training

Types of Residual Current Devices normally used in Consumer Units

RCD – Residual Current Device

A generic term for devices providing earth fault protection.

RCBO - Residual Current Operated Circuit-Breaker with Integral Overcurrent Protection

A mechanical switching device designed to make, carry and break currents under normal service conditions and to cause the opening of the contacts when the residual current attains a given value under specified conditions. In addition it is designed to give protection against overloads and/or short circuits and can be used independently of any other overcurrent protective device within its rated short circuit capacity.

RCCB - Residual Current Operated Circuit-Breaker without Integral Overcurrent Protection

A mechanical switching device designed to make, carry and break currents under normal service conditions and to cause the opening of the contacts when the residual current attains a given value under specified conditions. It is not designed to give protection against overloads and/or short circuits and must always be used in conjunction with an overcurrent protective device such as a fuse or circuit-breaker.

Consumer Unit

MCB

RCCB

RCBO

Board Arrangements (all with 100A main switch)	**References**		**Total Ways**	**Benefits / Considerations**
Main Switch with RCBO's On All Circuits 1 x 100A switch, 4 to 20 outgoing ways	**VC110** **VC114** **VC116** For other types see page 1.2 of the Hager General Catalogue	**VC110G** **VC114G** **VC116G**	4 to 20	Selecting RCBO's for every outgoing circuit meets all regulations
Split Load Twin RCCB plus Dedicated RCBO (6A RCBO for Smoke detector / Alarm circuit) 2 x 63A RCCB, 1 x 6A RCBO 5/4/1 Split load 2 x 63A RCCB, 1 x 6A RCBO 7/6/1 Split load 2 x 80A RCCB, 1 x 6A RCBO 5/4/1 Split load 2 x 80A RCCB, 1 x 6A RCBO 7/6/1 Split load	 **VC754R** **VC776R** **VC854R** **VC876R**	 **VC754RG** **VC776RG** **VC854RG** **VC876RG**	 10 14 10 14	This arrangement provides a dedicated RCBO for the smoke detector circuit
Split Load 3 RCCB Board 2 x 80A RCCB, 1 x 40A RCCB 5/5/2 Split load	**VC8552**	**VC8552G**	12	This arrangement provides a RCD for the smoke detector circuit which could also supply other circuits e.g. lighting
Split Load Twin RCCB 2 x 63A RCCB 5/5 Split load 2 x 63A RCCB 6/6 Split load 2 x 80A RCCB 5/5 Split load 2 x 80A RCCB 6/6 Split load 2 x 80A RCCB Configurable	 **VC755H1** **VC766H1** **VC855H** **VC866H** **VC816C**	 **VC755H1G** **VC766H1G** **VC855HG** **VC866HG** **VC816CG**	 10 12 10 12 16	One option is for the smoke detector not to be supplied from the same RCD as socket outlets
Split Load Twin RCCB plus unprotected circuit 2 x 80A RCCB 5/4/1 Split load 2 x 80A RCCB 7/6/1 Split load	 **VC854U** **VC876U**	 **VC854UG** **VC876UG**	 10 14	If the smoke alarm circuit is not to be protected by an RCD it must be installed using a method from (i) to (iv) of regulation 522.6.

Devices	MCBs	RCBOs
6A	**MTN106**	**ADN106**
10A	**MTN110**	**ADN110**
16A	**MTN116**	**ADN116**
20A	**MTN120**	**ADN120**
25A	**MTN125**	**-**
32A	**MTN132**	**ADN132**
40A	**MTN140**	**ADN140**
50A	**MTN150**	**-**
63A	**MTN163**	**-**

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