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Guidelines for the Provision of Low Voltage Connections to Multiple Occupancy Buildings

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FOREWORD

This Engineering Recommendation (EREC) is published by the Energy Networks Association (ENA) and comes into effect from July, 2015. It has been prepared under the authority of the ENA Engineering Policy and Standards Manager and has been approved for publication by the ENA Electricity Networks and Futures Group (ENFG). The approved abbreviated title of this engineering document is "EREC G87", which replaces the previously used abbreviation "ER G87".

Arrangements for electricity connections to Premises that comprise whole or part of Multiple Occupancy Buildings have historically not been standardised between licensed electricity Distribution Network Operators (DNOs). This has led to difficulties for many of the parties involved in such developments, especially when working across different DNO areas. The introduction of smart metering, expansion of Competition in Connections, the advent of multi-utility providers, the emergence of new licensed and licence exempt distribution companies, a review of the Electricity Safety, Quality and Continuity Regulations (ESQCR) and the introduction of Part P of the Building Regulations[1] have all contributed to the need to establish common arrangements in this Engineering Recommendation (EREC).

In preparing this EREC, regard has been taken of the following:

- Equivalent arrangements for gas supplies, as set out in IGE/G/1 and BS 6891 which define network boundaries.
- Arrangements for network boundaries on water supplies.
- Balancing the long term needs of the DNO for suitable access to its assets installed inside the building whilst giving Developers design freedom within the constraints of Building Regulations and BS 7671.
- Customer, Building Network Operator and Meter Operator needs relating to access to meters and electrical isolation.
- That the Electricity Act (The Act) and the Utilities Act 2000 (as amended) enables parties other than licensed electricity distributors (such as Landlords/property owners) to own and operate electricity distribution networks and distribute electricity if they are exempt from holding a electricity distribution licence.
- The views of range of IDNO and non-DNO organisations. Appendix D contains a list of non-ENA member organisations.
- The arrangements to support the Electricity and Gas (Internal Markets) Regulations 2011.

The aim of this document is to clarify roles and responsibilities in the operation of distribution networks within buildings, and to establish fundamental requirements for the provision of such connections. This will in turn provide clarity for Developers and DNOs over the design, construction and ownership of the electrical infrastructure within Multiple Occupancy Buildings. Where there are alternatives shown in this document, individual DNOs should be consulted to ascertain their specific policy.

[1] Part P only applies in England and Wales. Different sets of Building Regulations apply in England and Wales, Scotland and Northern Ireland. In case of doubt, the appropriate authority should be contacted.

The term “shall” is used in this document where a mandatory requirement is referenced (e.g. compliance with BS7671) or where there is only one satisfactory option for safety or technical reasons.

A guide is provided in Appendix F to assist new users of this document.

1 SCOPE

This document applies to LV connections provided by licensed electricity distributors to:

a) Individual Premises within a Multiple Occupancy Building; and

b) A Multiple Occupancy Building treated as a single Premises.

The document does not consider the connections between multiple structures on a single site.

This scope includes the provision of connections to all customers, whether domestic, commercial or industrial and to communal parts of a building (i.e. Landlord’s connection).

The provision of these LV connections may also involve the provision of HV assets, such as a substation dedicated to the building, however this does not generally change the requirements for LV assets. For guidance on the requirements for on-site substations, please refer to EREC G81 and its DNO-specific appendices.

Any interface requirements between licensed distributors are covered by EREC G88, and will therefore not be discussed in this document. Interfaces between licensed distributors and either licence-exempt distributors or final customers are within scope.

This document excludes:

a) Requirements for wiring within individual Premises, which is covered under BS7671 (the Wiring Regulations);

b) Requirements for distribution networks neither owned nor operated by DNOs, which are covered by the general requirements of ESQCR;

c) Issues within the scope of MOCOPA®, such as how Settlement metering is provided and connected, except to the degree that Multiple Occupancy Buildings create specific requirements; and

d) Commercial arrangements.

There are a wide variety of existing connection arrangements to/within Multiple Occupancy Buildings. It is not reasonably practicable to bring these sites in line with this EREC. Instead, this document describes the typical arrangements for new connections and provides clarity on their safe and efficient construction and operation.

2 DEFINITIONS

For the purposes of this EREC the following definitions apply.

The definition of certain other terms which relate to electrical installations may be found in BS 7671.

Boundary Metering

Meters installed at the Connection Point for the purpose of measuring the flow of electricity between the DNO distribution system and the BNO Network. The meters may or may not be employed for Settlement purposes.

Building Network Operator (BNO)

The organisation that owns or operates the electricity distribution network within a Multiple Occupancy Building, between the Intake Position and Customers' Installations.

The BNO may be the DNO, another licensed distributor or a third party exempt from holding an electricity distribution licence (e.g. a facilities management company).

Broadly speaking, either:

a) A licensed distributor may offer to adopt the Building Network, if they so desire and the assets meet the reasonable minimum standards of that licensee. In such cases the Building Network should be considered as an extension of that licensee's distribution network and part of the licensed distribution business; or

b) The Building Network would be licence exempt and therefore generally treated by the DNO as any other Customer's Installation, subject to the detailed provisions of this EREC.

If the BNO and any related undertaking distributes electricity exceeding the limits for class exemption[2], the BNO needs an electricity distribution licence granted by the Gas and Electricity Markets Authority or a specific exemption granted by the Secretary of State. Where the BNO is required to have an electricity distribution licence, the BNO shall be responsible for issuing MPANs in respect of Premises connected to the BNO Network.

Building Network/BNO Network

The network comprising cables or bus-bars, switchgear / fusegear and any associated ancillary equipment between the Intake Position and Customer's Premises.

BNO Main

BNO cable (or busbar) which connects more than one Customer

BNO Service

BNO cable which connects a single Customer

BSC

The Balancing and Settlements Code. Contains the governance arrangements for electricity balancing and settlement in Great Britain.

[2] Regulations established pursuant to Section 5 of The Act describe the class exemptions where a person is exempt from the requirement to hold an electricity distribution licence. At the date of publication of this document, Statutory Instrument SI 2001, No. 3270, "The Electricity (Class Exemptions from the Requirement for a Licence) Order 2001" as amended from time to time, describe such class exemptions

CNE

Combined neutral and earth. Generally applied to the description of cables or other equipment associated with a TN-C-S system (as defined in BS 7671).

Connection Point

The point of connection at which electricity may (upon energisation) flow between the DNO's Distribution System and the BNO Network.

CT

Current transformer.

Customer

The owner or occupier of a Premises, each having its own Metering Point, housed within a larger building.

Customer's Installation

The electrical installation within and servicing an individual Customer's Premises and including, where applicable, Customer-owned service cables (or "long tails").

Developer

The organisation(s) responsible for the provision of a new Multiple Occupancy Building including architects, designers, builders, electrical contractors, etc., as the context of this document requires.

Difference Metering Scheme

An arrangement whereby the flows of electricity to one or more specified Premises is determined by measuring the flow of electricity into (i) the Multiple Occupancy Building (i.e. Boundary Metering) and (ii) all other Settlements metered Premises connected to the BNO Network and subtracting the latter from the former.

Dispersed Metering

Settlement meters installed at the Customer's Premises.

Distribution Network Operator (DNO)

The organisation holding an electricity distribution licence, responsible for confirming requirements for the connection of equipment to its network and providing the incoming connection to the BNO Network.

Embedded Metering Point

A point of connection within a BNO Network in respect of which the Settlement measurement of electricity is or should be conducted by a Supplier by use of either physical or logical measurement in accordance with the BSC.

ESQCR

The Electricity Safety Quality & Continuity Regulations 2002 (as amended).

Grouped Metering

Settlement meters (for a number of Customers) physically located together either at the Intake Position or at another communal location.

HV

High voltage; i.e. exceeding Low Voltage.

Intake Position

The location within the building where the boundary between the DNO's network and the BNO Network or Customers' Installations occurs. Note that a single Intake Position may have more than one incoming service cable and cut-out, isolator, switch, switchfuse or circuit breaker.

Landlord

The owner(s) of all or individual parts of a Multiple Occupancy Building, who may be other than the BNO.

LS0H

Low smoke zero halogen.

LV

Low Voltage, i.e. a voltage not exceeding 1000V ac.

Metering Location

The place where metering equipment is to be located.

Meter Operator

An appointed agent approved for installing and maintaining electricity metering equipment.

Metering Point

A point at which Settlement metering is installed.

Metering Point Administration Number (MPAN)

A unique number provided for each Metering Point by the relevant licensed distributor for use in the settlement system.

Metering System

Has the meaning given to that expression in the BSC, and is a reference (unless the context otherwise requires) to the metering system or systems associated with the Connection Point or where relevant an Embedded Metering Point.

MOCOPA®

Meter Operation Code of Practice Agreement.

Multiple Occupancy Building

Any single building that has been sub-divided into more than one Premises, for example flats (including conversions) or factories that have been broken up into smaller industrial units. It includes communal areas (if any).

PME

Protective Multiple Earthing (of a CNE conductor). Associated with a TN-C-S system (as defined in BS 7671). May also refer to the type of earth terminal provided by a DNO at the Intake Position.

Premises

A part of a Multiple Occupancy Building occupied by a single Customer or, alternatively, the Multiple Occupancy Building itself (as the context so requires). Note that this term is used in both the singular and plural context.

Settlement

Has the meaning given to that term in the BSC.

SNE

Separate neutral and earth. Generally applied to the description of cables or other equipment associated with a TN-S system (as defined in BS 7671). May also refer to the type of earth terminal provided by a DNO at the Intake Position.

Supplier

An organisation authorised by electricity supply licence to supply electrical energy.

The Act

The Electricity Act 1989 (as amended).

TPN

Three phase and neutral.

3 CONNECTION ARRANGEMENTS

Section 16(1) of The Act places a duty on a DNO to offer to make a connection between the DNO's distribution system and any Premises (or other distribution system) when requested to do so by the owner or occupier of the Premises (or other distribution system).

When the DNO makes an offer it must state the extent to which the connection requestor's proposals are acceptable and may specify counter proposals.

Notwithstanding the duties placed on a licensed electricity distributor by Section 16(1) of The Act, it may not be reasonable in all the circumstances for a DNO to make connections at the individual Premises in a Multiple Occupancy Building. In such circumstances alternative connection arrangements may be required, as permitted under section 17(2)(c) of The Act, namely:

a) Provide a connection for each individual Premises at a communal position within the Multiple Occupancy Building or

b) Treat a Multiple Occupancy Building as a single Premises and provide a single connection for private distribution by the BNO.

The connection arrangements for Multiple Occupancy Buildings described in this document have been derived in order to:

- Facilitate safe design, construction and operation of Building Networks.
- Facilitate flexibility in design and ownership of Building Networks.
- Facilitate flexibility in the location of metering equipment.
- Ensure clear ownership boundaries and responsibilities.
- Limit the number of permutations to a sensible range of options.

In general, Multiple Occupancy Buildings may have connections to individual Premises made via one of three arrangements:

a) By a service that originates outside the building or

b) By a service that originates at an Intake Position or

c) By a service that originates at a point within a Building Network.

Typical examples of the application of these arrangements are described in sections 3.1 to 3.3 below. It should be noted that these are not prescriptive.

3.1 Services originating outside the building

3.2 This arrangement is suitable for single storey or low-rise (typically two storey) buildings (such as semi-detached or terraced type Premises for domestic, commercial or industrial Customers) in situations where DNO service cable access can be afforded easily at ground floor level from the exterior of the building to the Metering Point in individual Premises. Note that this arrangement may not be suitable where the building is of steel-framed construction or there are common metallic services (e.g. water or gas) because of earthing considerations (see section 5).Services originating at an Intake Position

This arrangement is suitable for single storey or low-rise buildings (such as maisonettes, flats above shops, a small block of flats, or their commercial or industrial equivalent) in situations where cable access can be afforded easily within the building from the Intake Position to the Metering Point in individual Premises or alternatively where Grouped Metering is provided at the Intake Position. Normally only a single Intake Position should be provided within the building in order to avoid interconnection of either live or protective conductors between Intake Positions. This arrangement is suitable where the building is of steel-framed construction or there are common metallic services and the arrangement in 3.1 is not appropriate. Where electrical installations within a Multiple Occupancy Building are separated (including the absence of common metallic services and any steel framework) and are likely to remain so, a single Intake Position for each installation (rather than to the Building as a whole) is permitted.

3.3 Services originating at a point within a Building Network

This arrangement is suitable for larger buildings (such as shopping malls, large blocks of flats or their commercial or industrial equivalent) where arrangements 3.1 and 3.2 are impractical for physical or electrical reasons. The DNO provides a connection to a single Intake Position and the BNO provides a private distribution network to deliver electricity supplies to individual Premises. Grouped Metering may be provided at several locations within the building or, alternatively, Dispersed Metering may be provided.

3.4 Firefighting and other standby supplies

The subject of firefighting is covered by BS 9999, which requires that certain high rise buildings have dedicated lifts and stairs for use by fire fighters to quickly reach floors affected by fire. These lift shafts and stair wells may also be force ventilated to clear smoke in a controlled manner. During the course of a fire the normal electricity supply may fail either as a deliberate act to make internal services safe or by the effect of the fire itself or water used in fire fighting. Compliance with BS 9999 and the carrying out of risk assessments covering firefighting supplies is the responsibility of the Developer.

BS 9999 requires that the internal circuits supplying the lifts and ventilation fans are specially protected against fire and water and that a secondary supply is made available which is independent of the primary supply. The Customer's switchgear is normally arranged to run these circuits from the primary supply with auto changeover equipment to select the secondary supply when required.

BS 9999 now provides for the secondary supply to be a standby generator capable of operating in fire conditions. Where regular maintenance of a standby generator would not be expected, the primary and secondary supplies may come from the local distribution network (e.g. separate external substations having independent high voltage supplies not originating from the same substation) via two physically separate routes to the fire-fighting shaft. Since protection against the occurrence of a fault on the high voltage system (unconnected with the fire) is required, a standby generator or an independent power supply is almost always essential.

Applications for secondary supplies from the local distribution network would normally be refused for the following reasons:

1. It cannot be assumed that the second connection will always be available during HV faults. Even if a second connection were to be derived from a separate source, a DNO cannot guarantee that this separation would be maintained.

2. It may be necessary to de-energise substations or feeders for fault location or maintenance work. It follows that a DNO cannot guarantee 100% availability of the second connection.

3. To be of practical use, the health of the second connection would need to be continuously monitored. DNOs cannot undertake this responsibility.

4. There are adverse safety implications (inadvertent re-energisation, stray earth and return currents) from having two connections. It is not prudent to introduce a safety risk in order to mitigate another.

The Developer should be made aware that, although a second connection may appear to be the cheapest option, it may not produce the desired level of safety and may engender an unwarranted sense of security. The Developer should be advised to install a standby generator.

There is no obligation under section 16 of The Act to provide a second connection to a Premises.

DNOs are not required by The Act to provide a connection where it is not reasonable in all the circumstances to do so. The issues listed above mean that in most circumstances it is not reasonable to provide a second point of connection. This is particularly the case where a safer and potentially more reliable option is for the Developer to install on-site generation.

3.5 Responsibility for the Building Network

Where a Building Network has not been adopted by a BNO, generally:

- Communal assets, e.g. trunking, are managed by the Landlord;
- Dedicated assets, e.g. services or long tails, are the responsibility of individual Customers. Such responsibility should be highlighted in individual lease agreements.

3.6 Common Arrangements

As previously noted, there is no one-size-fits-all solution for Multiple Occupancy Buildings. Common arrangements include:

- DNO-owned direct service from outside the building to a meter position in each Premises, e.g. terraced housing;
- service to a cut-out in a communal area, and DNO-owned branches from the top of the cut-out to meter positions in adjacent Premises;
- service to a cut-out in a communal area, and BNO or Customer-owned long tails from the top side of the cut-out to meter positions in adjacent Premises, e.g. maisonettes or flats above shops;
- service to a multi-way service board, with BNO or Customer-owned long tails to meter positions in each Premises;
- service to a multi-way service board, with Meter Operator-owned tails to meter positions in the same chamber, then Customer-owned long tails to distribution boards in each Premises; or
- service to a single Intake Position, then BNO Network within the building. For example, BNO Mains to multi-way service boards on each floor, with BNO Services to meter positions in each Premises.

Examples of the application of these arrangements are shown in Appendix A for illustration; however every case should be considered on its own merits before agreeing on the preferred option in a particular situation. Other criteria (e.g. earthing issues) may affect the choice of arrangement.

The Developer should have discussions with the DNO at the earliest opportunity to determine what the appropriate arrangement will be.

Diagrams showing different alternative locations for metering equipment are also included in Appendix A to further demonstrate metering arrangements supported for different categories of electricity Settlement metering.

It should be noted that a variety of historic arrangements may be encountered in older Multiple Occupancy Buildings. Some of these are not now recommended and are consequently not included in this document.

4 INSTALLATION REQUIREMENTS

4.1 Incoming DNO service

The requirements of this section apply to connection arrangements 3.2 and 3.3.

For connection arrangement 3.1 (individual services originating outside the building), the DNO service requirements will be identical to that used for single occupancy buildings.

4.1.1 Intake Position

This section relates to the physical requirements for the Intake Position. The technical requirements for equipment installed at Intake Positions are detailed in sections 4.2 and 4.4 of this document.

The location of the Intake Position should be considered at an early stage of a building design.

Consistent with the principles of the Construction (Design and Management) Regulations, ESQCR and other relevant legislation, Developers, distributors and Landlords must co-operate to ensure that Intake Positions, communal metering positions, risers and laterals can be safely accessed and maintained through the useful life of the building.

The Intake Position should be sited so that the incoming DNO cable is terminated as close as practicable to the point of entry into the building consistent with maintaining an adequate bending radius. The Intake Position should wherever possible be sited adjoining an outside wall of the building to minimise the length of incoming DNO cable within the building. If such cables have to be run for greater distances, then consideration should be given factors such as segregation, mechanical protection and minimising risks from fire. Specifically, the degree of fire protection for the Intake Position should at least match that of the adjacent escape route. Where DNO cables run within a building (other than short lengths of cable to an Intake Position adjoining an outside wall), it is recommended that cables with LS0H sheathing be used where any cable fire may affect publicly accessible areas.

Where smart metering is installed at the Intake Position, siting the latter adjoining an outside wall of the building will minimise attenuation of the smart meter WAN radio signal.

The Intake Position should be at or above ground floor level unless otherwise agreed with the DNO. Intake Positions below ground level are not normally permitted due to the risk of flooding causing supply disruptions to Customers. Causes of flooding include both natural events and inundation resulting from fire fighting activities. Similarly, the Intake Position should not be at the foot of a common riser containing water or heating pipes. Additionally, any metering installed at the Intake Position which relies on radio communication may not function correctly when located below ground.

The location of Intake Positions should also comply with all of the following requirements:

- It should comply with Building Regulations.
- It should not be a confined space as defined in the Confined Space Regulations 1997.
- It should be adequately segregated from gas and water services (a minimum separation of 150mm is required between gas equipment and electricity meters or apparatus and 25mm between gas equipment and electricity cables as specified in BS6400).
- 24 hour access for DNO staff and (if required) Meter Operator staff and Customers should be available.
- Adequate physical access and means of escape (a passageway at least 900mm wide) should be available.
- It should be lockable and secure and should not be used as a store cupboard (it is the Landlord’s duty to ensure that this requirement is met).
- Adequate lighting should be provided where required in accordance with Health and Safety Executive guidance document HSG 38.
- It should be weatherproof and dry in a non-corrosive atmosphere and naturally ventilated.
- The ambient temperature should not normally exceed 30°C.
- Sufficient space should be provided for the safe installation and operation of all necessary switchgear and any metering equipment.

4.1.2 Cable entry to building

Entry to the building should be via a 125mm or 150mm inside diameter rigid duct complying with ENA TS 12-24 and the DNO specification. The duct should extend to a position clear of the building and any concreted area. The duct installation should comply with ESQCR requirements. A draw cord should be provided for each incoming DNO cable. If the route is not straight, consideration should be given to the provision of draw pits to enable the cables to be installed. Ducts should be sealed against the ingress of gas.

Inside the building, for most installation arrangements the duct should terminate below the cut-out position into either:

a) A draw pit of 700mm depth, 1000mm length and 450mm width or

b) A slow bend with matching inside diameter having a minimum bending radius of 900mm.

Steel pipes can be used when specified by the DNO or Building Regulations. Single core cables should not be installed in individual steel ducts; each steel duct should contain a 3-phase set of cables.

Cables installed in long duct runs should be sized to take account of any derating imposed by such installation conditions.

Where it is necessary to run cables through basements or underground car parks they should be attached to suitable mechanically protected supports (such as ventilated steel cable trays fitted with ventilated steel covers) and sized to take account of any derating imposed by the resulting environment.

4.2 Mains and Services within Multiple Occupancy Buildings

The following paragraphs give general guidance on how and where the Building Network Mains and Service cables should be run.

The method of installation of Building Network Mains and Service cables should be such as to:

- Facilitate installation.
- Facilitate repair and replacement whilst minimising disruption to Customers and avoiding damage to building fabric (i.e. 100% rewire-able following construction works, secure yet accessible, e.g. lockable ducts/trays).
- Minimise risks to/from other services (e.g. gas and water).
- Provide protection from tampering, inadvertent contact and damage from other sources (e.g. water ingress).

The installation shall adopt the standards of construction and installation necessary to comply with BS 7671, Building Regulations and the Fire Regulations applicable to the building. The Developer is responsible for the provision of (and the BNO is responsible for the maintenance of) the Building Network including all protective bonding (see section 5).

The use of cables with LS0H sheathing is recommended for Building Network Mains and Services where any cable fire may affect publicly accessible areas.

BS 8313 “Code of Practice for Accommodation of Building Services in Ducts” gives general guidance on how ducts and risers should be installed within buildings. The Developer should liaise with all utilities including the DNO and the BNO at an early stage in the design of the building to provide sufficient space and routes for the installation of all the services.

All cables and ancillary equipment between the Intake Position and individual Premises should be installed in common access areas within the building and **not routed through the property of another Customer or third party.** These routes should be in secure areas of the building to minimise the risk of unauthorised access, illegal abstraction and vandalism.

Materials used for the construction of risers or containment systems used in common areas should be zero combustible in nature. Methods for securing cables in common areas (cable clips and cleats) should be constructed in such a way that the fixings do not fail in the event of a fire.

4.3 Security of electricity supplies and prevention of illegal abstraction

The BNO Network should be designed, installed and secured as far as reasonably practicable to prevent illegal abstraction of electricity from, interference to and inadvertent contact with the Intake Position or any part of the BNO Network connected to it.

The BNO (and, where appropriate, the Customer) is responsible for sealing (and resealing) access points on any part of any unmetered installation under their ownership.

Seals, locks or equivalent measures shall be fitted to all accessible equipment, e.g. cut-outs, isolators and meters, between the Intake Position and the Customer's isolator or distribution board in accordance with the requirements set out in Appendix 8 of MOCOPA® - Requirements for the sealing of metering and related distribution business equipment by MOCOPA® operators and distribution businesses[3]. The BNO should normally be responsible for fitting seals to BNO-owned equipment; however the DNO may elect to undertake this responsibility subject to the DNO having statutory or commercial rights to do so. Where the DNO agrees to issue MPANs under their distributor ID for Metering Points not directly connected to their network the requirement to fit seals, locks or equivalent measures is mandatory but the choice of sealing or locking of BNO equipment except for Metering Point adjacent isolation, rests with the BNO.

4.4 Equipment

The details in this section generally apply to larger installations. For installations with a demand not exceeding 69kVA three phase (100A/phase), standard DNO service equipment (e.g. 35mm^2 service cables and 100A cut-outs) will normally suffice.

4.4.1 DNO equipment at Intake Position

- Incoming cable – typically 95mm^2, 185mm^2 or 300mm^2.
- Incoming cable termination - typically 200A, 400A or 600A heavy duty cut-out.
- Metering (generally required only for connections to licence-exempt networks) – current transformer (CT) chamber with appropriate sized CTs.

Note that some DNOs may use alternative equipment arrangements such as: cable terminations with multiple outgoing ways; multiple and/or larger incoming cables; and the incoming cables may be terminated directly into Building Network switchgear.

[3] It is recommended that organisations which are not party to MOCOPA® follow the Appendix 8 requirements as they represent good practice.

4.4.2 Building Network equipment

- Main switch – rated at 200A, 400A or 600A to suit incoming supply capacity.
- Main earthing terminal – connected to DNO earth terminal at cut-out. The earthing arrangement at the Intake Position (TN-C-S/PME or TN-S/SNE) should be identified by the DNO.
- Distribution board (which may, alternatively, be part of the DNO installation at the Intake Position for Grouped Metering at that location) – comprising:
    - Busbars of suitable rating.
    - Provision for incoming meter tails or Building Network cable.
    - Provision for outgoing Building Network Mains or Service cable (where required).
    - Fuses or circuit breakers for individual services to Customers' Premises (and Landlord's supply) rated to:
        a) Discriminate with cut-out fuse or circuit breaker in Customers' Premises and
        b) Provide fault current protection to the Building Network Service cable.
- Building Network Mains and Services
    - The sizes and types shall comply with BS 7671.
    - All cables within a Multiple Occupancy Building shall have separate neutral and earth (protective) conductors.
    - Cables should be protected by a continuous earthed metallic screen. The sizes of the protective conductors shall be determined according to BS 7671. Steel wire armours may require augmenting by additional PE conductors.
    - Service cables should have a cross section suitably sized such that the cut-out fuse installed in each Customer's Premises provides overload protection to BS 7671.
    - Where cables are grouped together they shall be derated in accordance with BS 7671.
    - Service cables should be terminated at each meter position (including Landlord's supply) by a device that provides isolation for safe working and can be locked off or otherwise secured. This may be:
        a) A conventional fused cut-out;
        b) A cut-out with a link rather than a fuse; or
        c) An isolating switch.
    - The protective conductor should be terminated at the meter position on a suitable block.

There is nothing to preclude the use of an isolating switch, or a link in place of a fuse in a cut-out, provided that the electrical design is suitable.

4.4.3 Circuit identification

Circuit Breakers, fuses or isolators controlling further BNO equipment or services to individual Premises should be labelled unambiguously by the installer of the equipment to explicitly identify which remote distribution equipment or individual Premises the relevant circuit breakers, fuses or isolator controls. The remote distribution equipment or individual Premises service position should be similarly labelled by the installer of the equipment so that reference to the relevant source controlling circuit breaker, fuse or isolator can be established. Such labelling should be maintained by the BNO.

4.4.4 Protection co-ordination

Note that under certain circumstances BS 7671 allows the fault current device to be placed at the upstream end of the cable and the overload protection to be provided at the downstream end. This enables the upstream device to be sized so as to discriminate with the downstream device.

To obtain co-ordination between fuses the total I^2t of the downstream fuse must be lower than the pre-arcing I^2t of the upstream fuse. Reference should be made to BS 7671 and the data sheets of the chosen fuse manufacturer before finalising the design. Guidance is also available in IEC TR 61912-2.

Where circuit breakers are used within the network, they should also discriminate between each other and with any upstream or downstream fuses.

The BNO should specify the size of all fuses on its network (as should the DNO on theirs), including the size of the final distributor's fuse protecting the first part of the Customer's Installation.

The design of the electrical protection of the Customer's Installation is the responsibility of the Developer. The owner of the distributor's fuse may give permission for that fuse to be used to protect the first part of the Customer's Installation, but it remains the responsibility of the Developer to ensure that adequate protection is provided.

4.5 ESQCR & BS 7671

Regulation 25(2) of ESQCR requires the DNO to withhold connection where there is reason to believe that:

a) The BNO Network does not comply with ESQCR (which includes the need to comply with BS7671 where appropriate) or

b) The Customer's installation does not comply with BS7671.

This may occur where a reasonable doubt exists regarding the standard of electrical work or where a danger exists.

In order to demonstrate compliance with the requirements of ESQCR (as set out in the notes of guidance to ESQCR), all BNO distribution equipment shall be installed in line with the requirements of BS 7671 where appropriate, as well as complying with ESQCR.

Prior to energising the BNO Network the DNO may wish to inspect the installation or parts thereof to ensure compliance.

Normally the availability of an electrical installation certificate[4] from a competent electrical contractor will provide evidence that the Customer's Installation complies with BS 7671.

[4] To facilitate this process in situations where a connection has not been energised, a "pre-energisation" test certificate is considered acceptable.

It is emphasised that in order to ensure compliance with ESQCR, there must be co-operation between the various parties involved.

Permissible voltage variation (+10% / -6%) is an ESQCR requirement, which pertains to the point of "supply" from a distributor to a consumer's installation as defined in ESQC Regulation 27. The ESQCRs apply to all electricity distributors whether licensed or licence exempt and therefore a licence exempt BNO will be required to comply with ESQC Regulation 27 in respect of its connections to its own consumers. This will necessarily require a negotiated interaction of DNO and BNO network design for the BNO's given import and export power flow requirements and a narrower voltage range assured at the Intake Position by the DNO to enable the BNO to comply with ESQC Regulation 27 at its consumer's connections.

4.6 Work on BNO-owned and Customer-owned equipment

When isolation from the DNO network is required in order for work to be carried out on BNO-owned or Customer-owned equipment that cannot otherwise be isolated, the DNO should be contacted to arrange for such isolation to be provided.

The BNO and Customers have an obligation to ensure that any electrical installation work carried out in their premises is undertaken by suitably competent and appropriately authorised persons.

The DNO does not control access to equipment that they do not own (e.g. distribution boards or risers). It is the responsibility of the BNO or Customer to arrange access to such equipment, depending on which of them owns the asset.

5 EARTHING

5.1 Introduction

It has been common practice for many years to provide connections to individual Premises from distribution systems equipped with PME and for individual Premises to be afforded the facility of a PME earth terminal. There are a number of issues with regard to the application of PME within Multiple Occupancy Buildings, in particular the requirement for an end-of-main or end-of-branch earth electrode and problems associated with neutral currents flowing within structural steelwork or other common metallic services (e.g. copper water pipes). These are elaborated below for reference.

Where a distribution main or branch (whether owned by a DNO or BNO) ends within the building, the provision of an end-of-main (or branch) PME electrode as required under Regulation 9 of ESQCR may be problematic, particularly in the case of multi-storey buildings.

It has been accepted practice to regard the interconnection of the neutrals of two or more PME distributing mains as providing this end of main electrode. However, such connections combined with the main protective bonding conductors between the neutral/earth conductor and the structural steelwork and metallic services give rise to multiple parallel paths for neutral current within the fabric of the building.

Where multiple PME connections are provided to a building with structural steelwork or other common metallic services the main protective bonding conductors may carry neutral current (particularly if the neutral on the external mains is broken) resulting in overheating with consequential fire risk. There is also a risk of arcing between adjacent metalwork and a risk of shock or burns to persons working on such metalwork (e.g. a plumber repairing damaged pipework).

Within a building, the magnetic field problems caused by diverted neutral current can be eliminated close to the steelwork and substantially reduced in the vicinity of the Building Network if the latter utilises separate neutral and earth conductors.

Further information on earthing and the application of PME can be found in BS7671 and EREC G12.

5.2 Recommended practice

BNO Networks within Multiple Occupancy Buildings shall be designed on a separate neutral and earth basis, although incoming service connections from local PME distributors are permissible, as is a PME earth terminal at the Intake Position. The appropriate main protective bonding conductor terminations to structural steelwork and to metallic services should be made at this point of connection in accordance with BS 7671.

At an individual Customer's Installation, protective equipotential bonding between metallic services, extraneous conductive parts and the earth terminal shall be carried out in accordance with BS 7671. This will ensure that no harmful potentials appear between earthed metalwork and extraneous conductive parts within the Customer's Premises under fault conditions. For bonding purposes at the Customer's Installation, PME conditions should be considered to apply if a PME earth terminal is provided at the Intake Position.

A risk-based approach should be taken when considering the connection design options of single or multiple Intake Positions and the provision of PME or SNE earth terminals. This should take account of the possibility of diversion of neutral current through building steelwork and/or other metallic services.

A single Intake Position is the preferred design option for, amongst other reasons:

a) Avoiding problems caused by the flow of neutral current through the building steelwork or other common metallic services,

b) Avoiding having to apply continuous ratings to steel wire armour on cables used for the Building Network to cater for diverted neutral current and

c) Avoiding the need for equipotential bonding between the Intake Positions.

If it is not possible to design on the basis of a single Intake Position, then the risk assessment may require a non-PME connection option (e.g. SNE earth terminal).

All Intake Positions within a single building shall employ the same earthing method.

5.3 Individual service options

In some Multiple Occupancy Buildings with structural steelwork or other common metallic services where individual services are to be provided from a DNO's PME distribution main (e.g. low-rise flats or commercial/industrial units) it will be more difficult to avoid the problems identified earlier. There are several possible ways of addressing this which will vary to the extent that they are able to mitigate the problem.

- Provide a PME connection to a single Intake Position in the building with Grouped Metering. Customers' SNE cables would then be used to feed each of the separate Premises.
- Provide multiple separate SNE services to each of the Premises from an SNE distribution main or direct from a distribution substation fuseboard.
- Provide a PME connection to a single point of common coupling (e.g. a freestanding distribution pillar) and then distribute with SNE service cables in a star formation from this point to each of the separate Premises. Note that the neutral and earth conductors of the SNE cables SHOULD NOT be bonded together at any point other

than the pillar as this would result in a path for neutral current to be diverted into the building structure. (For example, this could occur if two or more street lamps are connected using CNE cable to provide a PME earth).

- Exceptionally, operate all Customer's Installations on the same site as TT systems (i.e. no DNO earth terminal provided). This will eliminate the problems but has disadvantages that may be unacceptable to the Customer.

5.4 Earthing and main protective bonding conductors

The earthing and main protective bonding conductors at the Intake Position and at each Customer's Premises shall be sized in accordance with BS 7671. Further information and guidance is provided by a number of organisations including the IET (their GN5, GN8 and On-Site Guide). Where there are a number of earthing conductors from a group of customers at an Intake Position that comprises a DNO multiway cut-out or distribution board, they should be marshalled at an accessible earth block to facilitate disconnection for testing. A single main earthing conductor should connect this block to the DNO-provided earth terminal.

5.5 Position of PME earth electrode

Where the DNO employs PME on the LV connection to the building it will be necessary to install a neutral earth electrode adjacent to the point of entry to the building of the incoming service cable unless an alternative earth return path is provided (e.g. the neutral conductor of a second incoming service cable). The associated earthing conductor may be run into the building alongside the service cable and connected to the neutral at the Intake Position.

6 METERING ARRANGEMENTS AND MPAN REGISTRATION

6.1 Metering Arrangements

Broadly speaking, there are five options for metering arrangements in Multiple Occupancy Buildings, specifically:

- Boundary Metering at the Intake Position.
- Grouped Metering at the Intake Position.
- Grouped Metering remote from the Intake Position.
- Dispersed Metering.
- Difference Metering

6.1.1 Boundary Metering

Boundary Metering for Settlement purposes is employed in a Multiple Occupancy Building with a Building Network (see 3.3 above) where the BNO is unlicensed and is deemed to be operating a private network and reselling energy to its tenants. Note that the BNO may, in turn, install sub-metering at its discretion; however, this metering is outside the scope of both this document and Settlement.

Boundary Metering for Settlement purposes is also employed where a Difference Metering Scheme to be established (see 6.1.5).

Boundary Metering for non-Settlement purposes may be employed when the BNO is licensed or the DNO has agreed to offer MPAN services to the BNO, as a practical means of commercially administering the usage of the DNO's connection to the BNO Network.

6.1.2 Grouped Metering at the Intake Position

Grouped Metering at the Intake Position is employed where access for a distribution network service can be easily afforded to a communal location but not to each individual Premises (see 3.2 above). Settlement meters for every Premises (one for each, including the Landlord's connection) are installed at a communal location adjacent to the Intake Position.

6.1.3 Grouped Metering remote from the Intake Position

Grouped Metering remote from the Intake Position is employed where a BNO employs a private distribution network to deliver electricity supplies from a single Intake Position to an individual Premises (see 3.3 above) and does not wish to utilise Dispersed Metering. Settlement meters for every Premises (one for each, including the Landlord's connection) are installed at one or more communal locations remote from the Intake Position.

6.1.4 Dispersed Metering

Dispersed Metering is employed where access for a distribution network service can be easily afforded to each individual Premises (see 3.1 above) or where a BNO employs a private distribution network to deliver electricity supplies from a single Intake Position to an individual Premises (see 3.3 above) and does not wish to utilise Grouped Metering.

6.1.5 Difference Metering

Where only a subset of Customers within the BNO network wish to have direct electricity market access a Difference Metering scheme will be established by the BNO's electricity supplier and data collector, based on the subtraction of Customer's half hourly metering data from metering data obtained from half hourly Settlement metering of the Intake connection from the DNO's network. Market arrangements currently only support this arrangement where all Customer and the Intake Settlement metering are half hourly traded Settlement metered, an arrangement typical of buildings housing multiple commercial premises.

6.2 Role of MPANs

Each Metering Point has a unique 13 digit Metering Point Administration Number, usually known as the MPAN or by its official title of Supply Number so that the electricity market can process the sales and purchases of energy from Customers, known generally as "Settlement". The MPAN is a number unique to the Metering Point and remains allocated to that Metering Point from the time the development starts until the service is disconnected. It does not move when the Customer moves.

The MPAN forms an essential key to enable the Customer to change electricity Supplier. It is the MPAN that Suppliers use to arrange for meters to be installed or changed. Suppliers have to print the Customer's MPAN on each bill.

The first 2 digits of an MPAN identify which distribution business has issued it, and receives metering data in respect of that site, and the final digit is a check digit to ensure uniqueness and correct reporting.

6.2.1 Issuing Authority

The issuing authority is the licensed distributor in respect of that Premises.

6.2.2 Premises supplied from a distribution network service

This section applies to:

- Boundary Metering.
- Grouped Metering at the Intake Position.
- Dispersed Metering where each Premises is supplied from a distribution network service.

In all cases the MPAN will be issued by the DNO and will employ the DNO's two-digit distributor ID.

6.2.3 Premises supplied from a building network service

This section applies to:

- Grouped Metering remote from the Intake Position.
- Dispersed Metering where the Premises is supplied from a building network service.

Where the BNO holds an electricity distribution licence, the MPAN will be issued by the BNO. Note that a third party may provide the MPAN administration on behalf of the BNO, but the obligation (and, critically, the two-digit distributor ID) belongs to this licensed BNO.

Where the BNO is unlicensed it is deemed to be operating a private network and reselling energy to its tenants. The default position is that Boundary Metering will be employed.

Where the BNO is unlicensed and does not wish to act as a reseller of energy, then subject to the DNO agreeing to do so, the DNO may issue an MPAN (with the DNOs two-digit distributor ID) for each individual Premises. Not all DNOs are obliged to issue MPANs for individual Premises that are not directly connected to their network.

Some DNOs whose electricity distribution licence contains a Section B are defined as Distribution Services Providers and are obliged to offer their meter point administration service and provide MPANs, though this remains subject to conditions being appropriate to do so. Currently only those DNOs in existence at the time of privatisation of the electricity supply industry are Distribution Services Providers. More recent new licensed electricity distributors have licencing that does not contain a Section B and are not Distribution Services Providers and although not mandated to offer meter point administration service and provide MPANs they may elect to do so as a wholly commercial service. Whilst the DNO may agree to extend its settlement arrangements to each individual Premises served by the BNO Network this does not detract from the obligations of the BNO in respect of inspecting, repairing, maintaining or replacing the BNO Network.

If the DNO agrees to offer its MPANs in respect of Embedded Metering Points inside the BNO network, the Boundary Metering at the Intake Position may remain for Settlements purposes under a Difference Metering Scheme if wholly half-hourly traded Settlement of Embedded Metering Points is being conducted. This is typical of larger commercial networks where a subset of embedded customers desire their own market access.

If the DNO agrees to offer its MPANs in respect of Embedded Metering Points inside the BNO Network, the Boundary Metering at the Intake Position should not be utilised for Settlements purposes if any of the points of use of electricity are metered on a non-half hourly basis, in which case ALL uses of electricity in the BNO Network, save for unavoidable losses, must be subject to Settlements metering and have MPANs issued by the DNO.

6.3 Creation of MPANs

MPANs are unique and last the life of the service. They last through changes of Supplier, Customer and meter. This means that it is essential for all parties involved to ensure that MPANs are accurately allocated to Premises in the first instance.

6.3.1 Criterion for a New MPAN

A new MPAN is required in any of the following circumstances when:

- A temporary site cabin is installed.
- A new building is erected.
- A new permanent building is erected at or near the previous location of a site cabin, even if the service is transferred.
- An existing building is sub-divided, and the internal electrical installation split to remove all reasonable prospect of cross connection.
- A second meter is installed in an existing Premises that operates on a different time pattern regime to the first (e.g. where there is a switched heating circuit independent of the main unrestricted or economy seven supply).
- Generation is connected export metering is required.

A new MPAN is not required in the following circumstances when:

- A temporary site cabin is relocated within the same site.
- A change of Customer occurs.
- A change of Supplier occurs.
- A meter is changed.
- A change of time pattern regime (e.g. from unrestricted to economy seven) occurs, so long as the Premises is supplied on one regime only.
- A temporary disconnection takes place (e.g. when a Premises is left vacant, with the intention of its being re-occupied).
- A service is replaced for repair or reinforcement without concurrent usage of the old and new services.

MPANs should be removed /withdrawn only when:

- The service to which they are related is permanently removed or
- In respect of MPANs for services connected to the BNO Network, the service from the BNO Network ceases to require or be required to have Settlement metering, for example where the service reverts to private electricity metering arrangements and the Intake Position reverts to Settlement metering.

6.3.2 Creation Process

MPANs are usually created when a Developer contacts the licensed distributor with an accepted plan showing the number of Premises to be connected (including the Landlord's connection). Some distributors restrict the creation of the MPAN to a time later in the process (e.g. when specific Premises are 'called off' for connection and payment received).

In either case, the licensed distributor will then create the MPANs and provide them to the Developer. The first Customer for each Premises, which may be the Developer, will need to register this MPAN with a chosen Supplier before a meter can be installed.

When an MPAN is created, it is associated with an address. Whether this is a plot or postal reference, that address is unique to that MPAN and cannot be changed afterwards (other than a plot-to-postal conversion, or changes by Royal Mail to the definitive address). Developers shall only use an MPAN for the Premises/plot/postal address to which it was originally allocated by the licensed distributor.

In order to avoid any doubt, the following applies:

- Once an MPAN has been allocated to one plot/address, it cannot be re-assigned to another plot/postal address.
- The MPAN for a construction supply cannot be reallocated to the Landlord's connection or other plot/postal address.
- MPANs originally allocated to plots/postal addresses cannot be appropriated for use as a Landlord's connection.
- An MPAN created for the Landlord's connection cannot be appropriated for another plot/postal address.

Failing to abide by these simple rules creates problems for Customers who will suffer from not being readily able to choose Supplier, nor even to receive the correct energy bills.

6.3.3 Plot to postal conversion

A key part of tracking MPANs accurately is the conversion from plot to final postal address. Here, plot includes references to flat/unit numbers in the conversion or erection of a Multiple Occupancy Building.

It is the Developer's responsibility to indicate to the licensed distributor the final postal address for each plot.

Distribution businesses retain the final responsibility to verify that address against the definitive Royal Mail list and it is recommended that plot to postal conversion is carried out in logical groupings of Premises, to minimise the risk of missing or duplicate addresses.

7 METERING REQUIREMENTS

7.1 General

Suppliers are responsible for Settlement metering and they appoint an agent, known as a Meter Operator, to install and maintain their Metering Systems.

Metering may be installed at various locations within a Multiple Occupancy Building (see 6.1 above). Metering requirements are broadly the same irrespective of whether they are allied to a distribution network or building network service, however, different requirements apply for Grouped Metering and Dispersed Metering, and for whole current metering and CT operated metering.

The introduction of smart metering requires additional considerations in respect of metering location. Smart metering requires communication links to be established externally to the Data Communications Company (DCC) and internally to an in-home display and also to the gas meter (where installed). It should be noted that some building materials (e.g. foil-backed insulation sheeting) can significantly attenuate radio signals and make reliable connectivity between the various components of the smart metering system much more difficult to achieve.

7.2 Metering Location Requirements

The Metering Location should be considered at an early stage of a building design and shall follow the principles set out in the MOCOPA®. Where reasonably practicable, metering equipment should be sited in or sensibly adjacent to the Premises whose consumption is being measured. Although The Act has provision for moving meters, the need for this should be avoided in a new installation by ensuring that the metering equipment is located in an appropriate position initially.

As the meters and associated equipment will need to be accessed at regular intervals by meter readers, Meter Operators, network operator staff or by Customers themselves, they must be placed in areas that have safe and easy access and at a height that makes meter reading straightforward, accounting for meter readers and Customers having varying degrees of physical ability.

Prepayment metering requires special consideration in view of the need for 24 hour access by Customers to payment mechanisms and to displays (including meter readings and prepayment credit details) and who may have limited mobility or other disabilities. For smart meters, this is facilitated by the provision of a PPMID (Prepayment Interface Device) which can be installed remotely from a smart meter in a position readily accessible to the Customerand for other meters if the meter is located either inside individual Premises or in an external meter cabinet immediately outside the Premises.

When contemplating the use of a Metering Location within an individual Premises the Developer should consider the on-going safety of the occupants, meter readers, Meter Operators, any other persons requiring access and the equipment from the following hazards, particularly in relation to a domestic Premises:

- Slips, trips and falls.
- Attack by pets.
- Assault by the occupier.
- Entry by bogus officials.
- Electrocution from badly maintained equipment.
- Interference or damage as a result of normal activities within the Premises.

Consistent with the principles of the Construction (Design and Management) Regulations, Developers, distributors and Landlords must co-operate to ensure that metering positions may be safely accessed and maintained through the useful life of the building.

Metering Locations should:

- Comply with Building Regulations.
- Comply with ESQCR.
- Not be a confined space as defined in the Confined Space Regulations 1997.
- Be installed no higher than 1800mm above floor level to avoid “working at height” issues.
- Be accessible by Customers, network operator staff, meter readers and Meter Operator staff 24 hours per day.
- Have adequate physical access and means of escape (a passageway at least 900mm wide and clear of obstructions). Accessibility to Customers must take account of the Disability Discrimination Act and Building Regulation requirements.

- Not be used as a storage area (it is the Landlord's duty to ensure that this requirement is met).
- Have adequate lighting in accordance with Health and Safety Executive guidance document HSG 38.
- Be weatherproof, dry, have a non-corrosive atmosphere and be naturally ventilated.
- Not have an ambient temperature which normally exceeds 30°C.

The following are examples of Metering Locations within an individual Premises which are likely to be unacceptable:

- A bathroom, washroom or toilet.
- An airing cupboard.
- A kitchen or pantry.
- Above a door.
- Under stairs.

7.3 Accommodation Requirements

All meter boards, meter boxes, meter cabinets, meter cupboards and the like should be provided by the Developer and become and remain the responsibility of the Customer or BNO.

Sufficient space should be provided for the safe installation and maintenance of all metering equipment and any associated network operator or Customer's equipment. Appendix B includes further details of spatial requirements for whole current metering.

Where the Metering Location is within a communal area the accommodation should be lockable and secure, notwithstanding the requirement for 24 hour access by Customers, network operator staff, meter readers and Meter Operator staff.

Comprehensible and durable labelling should be provided by the installer of BNO equipment to unambiguously identify metering and distribution equipment and unambiguously identify the circuit or individual Premises that equipment feeds. Such labelling should be maintained by the BNO.

Where a distribution network service is provided to an individual Premises and the Metering Location is an external meter box, the box should comply with the requirements of ENA TS 12-3 or BS 8567. Where a separate meter board is used, it should be manufactured from fire-retardant resin-impregnated chipboard in accordance with BS EN 312.

7.4 Equipment Requirements – Whole Current Metering

7.4.1 Means of isolation

A means of local isolation of phase conductors shall always be provided adjacent to meters to enable isolation of the incoming supply. This may be an isolating switch or (preferably) a fuse or link in a cut-out. This means of isolation must be able to be sealed by applying an industry standard wire rope and compressed ferrule seal in both:

- the closed or open position if an isolator,
- the fused or un-fused condition if a cut-out fuse carrier or
- the linked or unlinked condition if a cut-out fuse carrier (fitted with a link).

7.4.2 Meter tails

Meter tails interconnect the local isolating device (e.g. the cut-out), Settlement meter and Customer's incoming switchgear. They should comply with all of the following requirements:

- Meter tails should be copper conductor, insulated and sheathed, not less than 16mm² but sized appropriate to the distributor's fuse rating (for an 80A or 100A fuse this would normally be 25mm² but note that 35mm² conductors may not fit the terminals in a 100A meter).
- The meter should be connected to the local isolating device by meter tails (or an approved security bridge) installed and owned by the Meter Operator; the length of which should be kept to a minimum.
- The meter should be connected to the Customer's incoming switchgear by meter tails provided by the Developer and owned by the Customer, the length of which should be kept to a minimum.
- Mechanical protection of the tails between the meter and the Customer's incoming switchgear (e.g. trunking) should be provided by the Developer unless the tails are so short as to make this impracticable.
- Terminals should be compatible with 7-strand conductors.

In circumstances where Settlement metering is installed in or adjacent to the Customer's Premises, but the latter is remote from the distributor's fuse and there is no intervening Building Network, "long tails" may be installed between the distributor's fuse and the local isolating device (in accordance with 4.4.2) adjacent to the meter. Long tails should be provided with mechanical protection (e.g. trunking or armoured cable). A double pole or TPN isolator controlling the long tails should be located adjacent to the distributor's fuse and provided with incoming tails for connection to the latter. Long tails, any separate mechanical protection and associated isolating switches should be provided by the Developer and owned by the BNO or the Customer. Long tails should not be routed through the property of another Customer or third party.

7.5 Equipment Requirements – CT Operated Metering

7.5.1 Means of isolation

A means of local isolation of phase conductors shall always be provided adjacent to meters to enable isolation of the incoming supply. This will normally be a test terminal block and potential fuses.

7.5.2 Current transformers & test terminal blocks

CTs and test terminal blocks should be provided by the owner of the upstream network. In respect of Boundary Metering these should be provided by the DNO and in respect of Embedded Metering Points within the BNO network these should be provided by the BNO in consultation with the Meter Operator. Since metering CTs have a limited VA rating, there is a maximum permissible length of multicore cable that interconnects the CTs and the metering panel.

As a consequence, it is important to consider the position of the metering panel in relation to the location of the CT chamber. As a guide, the length of multicore cable should not exceed 5 metres: in all cases, this should be agreed between the provider of the CTs and the Meter Operator.

The metering must be accessible to the relevant Customer and Meter Operator; test terminal blocks must be accessible to Meter Operators with the appropriate competence.

For Settlement metering, CT test certificates must be held by the owner of the relevant equipment.

For Settlement purposes, the metering should comply with the relevant BSC meter code of practice.

For non-Settlement purposes, the owner of the metering should decide on the standard required.

APPENDIX A: CONNECTION ARRANGEMENT DRAWINGS

The drawings contained in this section are diagrammatic only and representative of typical arrangements. Not all of the indicated equipment may be required in every case. Other arrangements to suit particular DNO practices are not precluded. The Developer should have discussions with the DNO at the earliest opportunity to determine what the appropriate arrangement will be.

Note that the use of alternative or novel equipment types (such as rising main distribution boards with built-in “J” type fuseways) is not precluded by the arrangements shown on these drawings. All connection arrangements (but not the detail design of the BNO Network) shall be subject to DNO acceptance.

In all cases the BNO Network shall comply with BS 7671.

Fig. A1 shows examples of typical arrangements for terraced-type Multiple Occupancy Building.

Fig. A2 shows an LV connection from the DNO network with Grouped Metering at a single Intake Position for a small development (typically up to 4 Premises). Alternatively, Dispersed Metering may be provided as shown in Fig. A7.

Fig. A3 shows an LV connection from the DNO network to a single Intake Position for a development with a larger number of Premises. Grouped Metering or Dispersed Metering may be provided.

Fig. A4 shows an LV connection from the DNO network with Grouped Metering at the Intake Position for a development with a larger number of Premises.

Fig. A5 shows the general equipment layout for a BNO Network with a Grouped Metering arrangement.

Fig. A6 shows the general equipment layout for a BNO Network with a Dispersed Metering arrangement.

Fig. A7 shows an arrangement of Settlement metering, specifically metering of the Intake Position when not all of the customers (or the BNO’s) usage within the BNO’s network is Settlements metered, with a common half-hourly Data Collector (HHDC) deducting the internal Settlements metering measurements from the Intake Position Settlement meter to determine the amount of Settlement metered electricity to be billed to the BNO.

The connection arrangement in Fig. A3 may be combined with the appropriate BNO Network and metering arrangement (figs. A5 or A6) to detail the overall design.

Typical metering arrangements are shown – Settlement metering is the responsibility of the Supplier; Boundary Metering is the responsibility of the DNO; Difference Metering is the responsibility of the Supplier.

Note that colour-coding has been used on the drawings to indicate which parties have responsibility for different parts of the installation, as follows:

DNO – red

Meter Operator – blue

BNO – green

Individual Premises owner – black

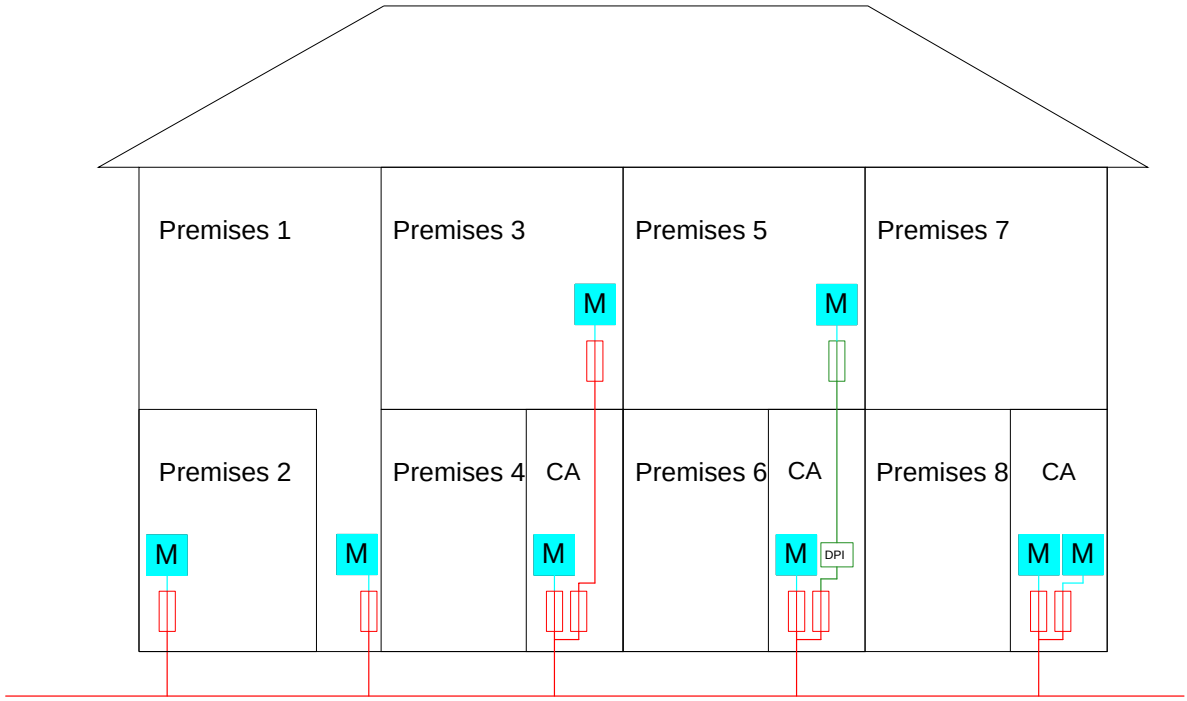

Figure A1 Typical arrangements for terraced-type Multiple Occupancy Building

Notes

- Premises 1 and 2 have separate individual services and cut-outs with metering in each Premises. Premises 1 and 2 have independent ground floor access.
- Premises 3 and 4 have cut-outs in the communal or shared area (labelled CA) adjacent to Premises 4 with metering in or adjacent to each Premises.
- Premises 5 and 6 have cut-outs in the communal or shared area (labelled CA) adjacent to Premises 6 with metering in or adjacent to each Premises. Premises 5 has a BNO-owned “long tail” The fuse next to the meter position for Premises 5 would be owned by the BNO and should be accessible to the customer for them to replace their own fuse. Neither the DNO, nor the Meter Operator would be responsible for providing or replacing the fuse adjacent to Premises 5’s meter. However the Meter Operator would be responsible for obtaining a suitably sized fuse from the BNO to effect energisation of the Settlement metered private connection.
- Note that although the arrangements for Premises 3/4 and 5/6 look similar, the key difference is the ownership of the cable and other equipment beyond the ground floor DNO cut-out that provide the connection to the upper floor Premises.
- Premises 7 and 8 have Grouped Metering in the communal or shared area (labelled CA) adjacent to Premises 8.
- DPI = double pole isolator.
- M = Settlement meter.
- For earthing details, refer to section 5 of this document.

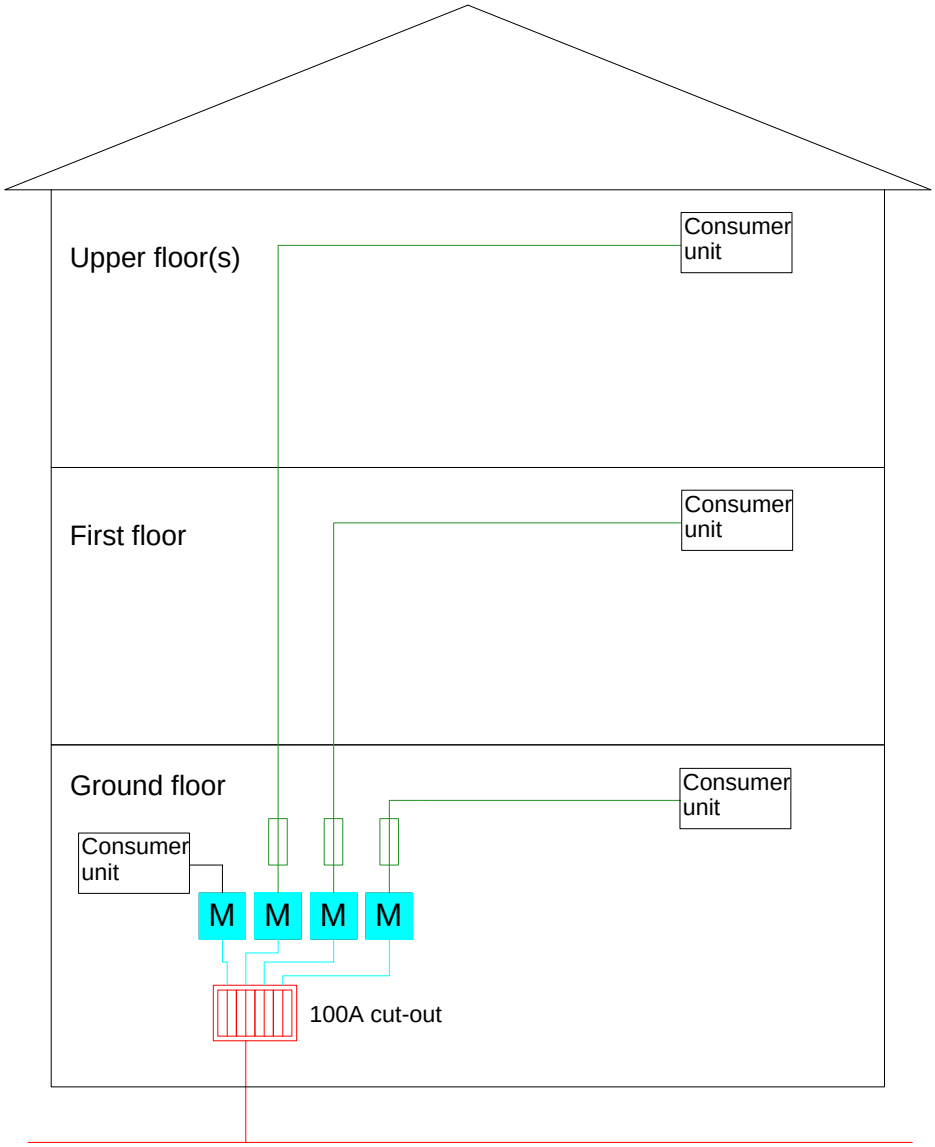

Figure A2 LV connection from DNO LV network (small development with Grouped Metering at Intake Position)

Notes

- Dispersed Metering (see Fig. A7) may be provided as an alternative to Grouped Metering.
- Alternative means of isolating the phase conductors after the meters such as isolators or circuit breakers may be installed.
- M = Settlement meter.
- For earthing details, refer to section 5 of this document.
- Note that equipment between the meter and the consumer unit may be owned by the Customer rather than the BNO as shown, depending on the circumstances.
- Note that no separate means of isolation is shown for the consumer unit immediately adjacent to the meter.

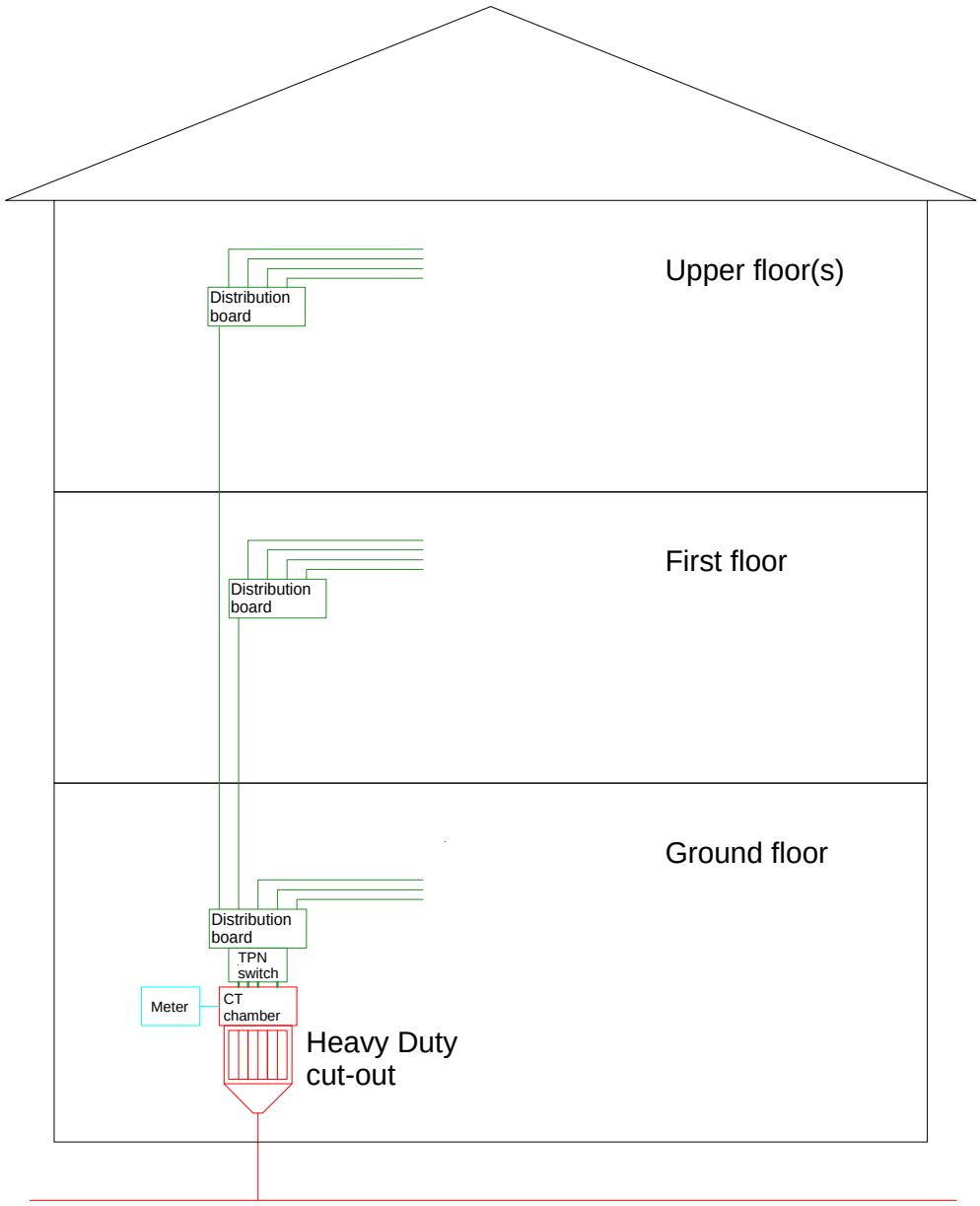

Figure A3 LV connection from DNO LV network (larger development)

Notes

- Grouped Metering or Dispersed Metering may be provided (see Figs A6 & A7).
- The CT chamber and associated meter may not always be installed.
- More than one heavy duty cut-out may be provided at the Intake Position in some circumstances.
- The TPN switch may not always be installed when the BNO is the DNO.
- For earthing details, refer to section 5 of this document.
- Alternatively, the supply may be metered in an adjacent substation with a BNO cable providing the connection between the substation and the TPN switch.

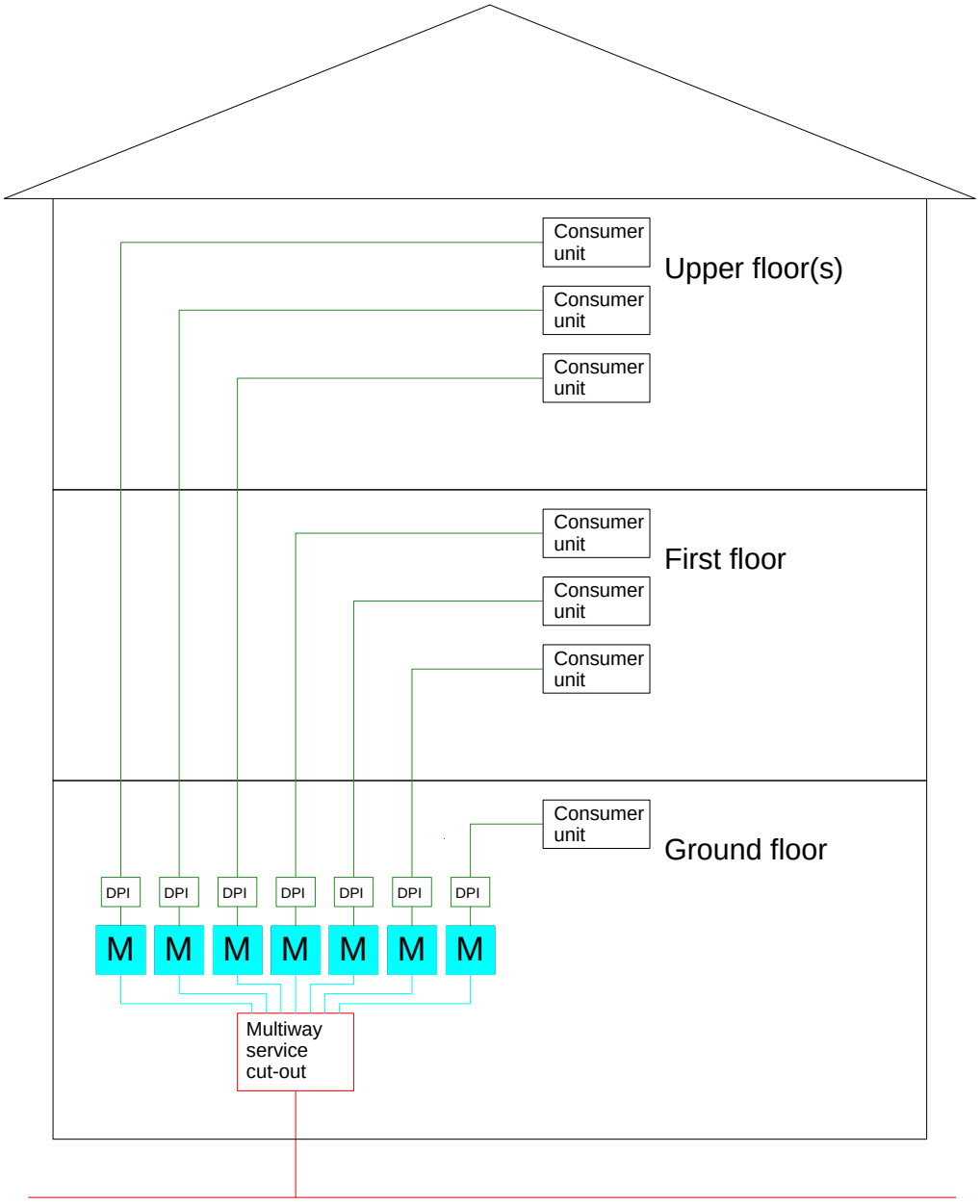

Figure A4 LV connection from DNO LV network (Grouped Metering at Intake Position)

Notes

- DPI = double pole isolator.
- M = Settlement meter.
- For earthing details, refer to section 5 of this document.
- Note that equipment between the meter and the consumer unit may be owned by the Customer rather than the BNO as shown, depending on the circumstances.

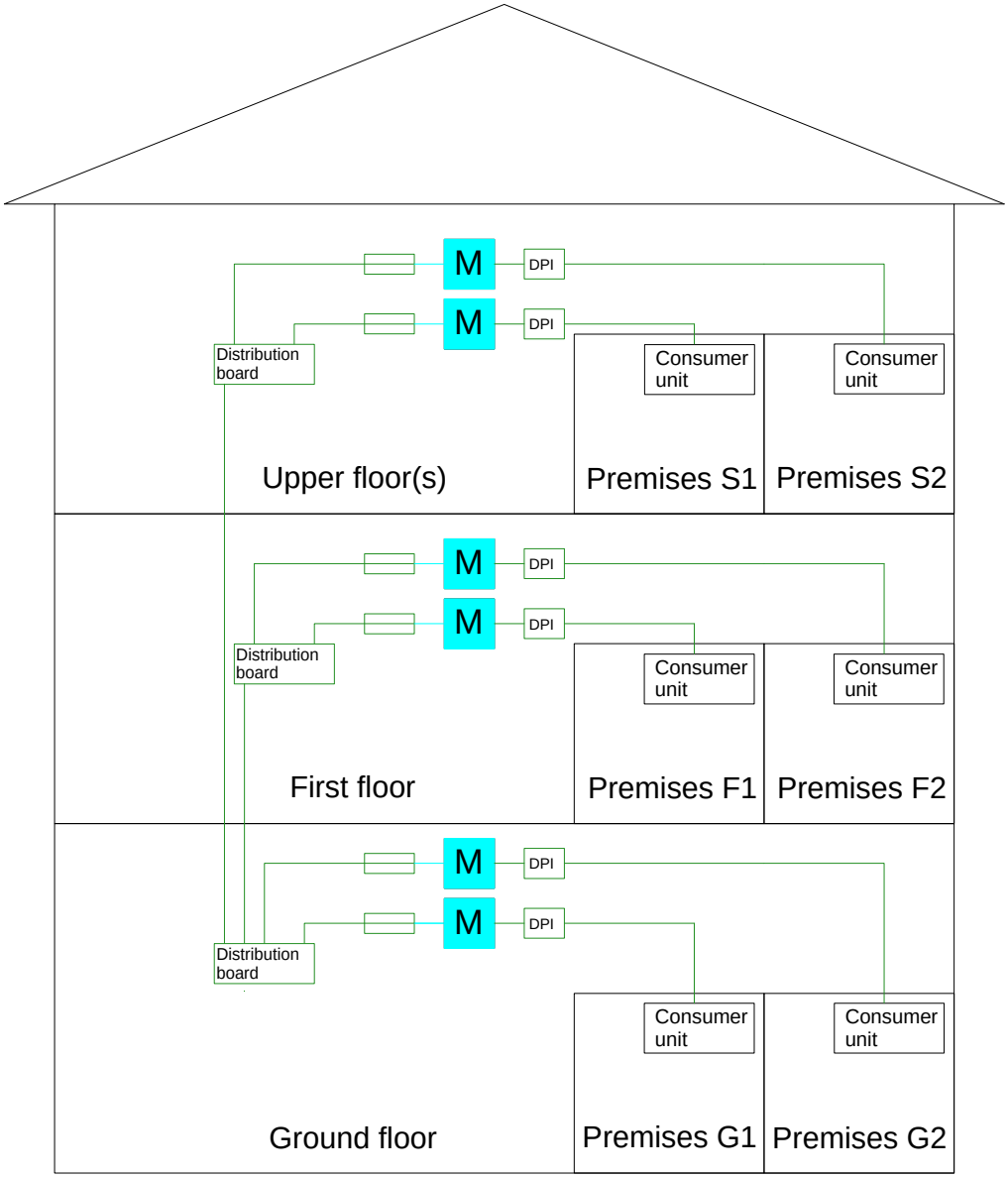

Figure A5 BNO Network with a Grouped Metering arrangement

Notes

- Connection arrangement as Fig. A3.
- Only two Premises per floor shown for clarity.
- DPI = double pole isolator.
- M = Settlement meter.
- For earthing details, refer to section 5 of this document.
- Note that equipment between the meter and the consumer unit may be owned by the Customer rather than the BNO as shown, depending on the circumstances.

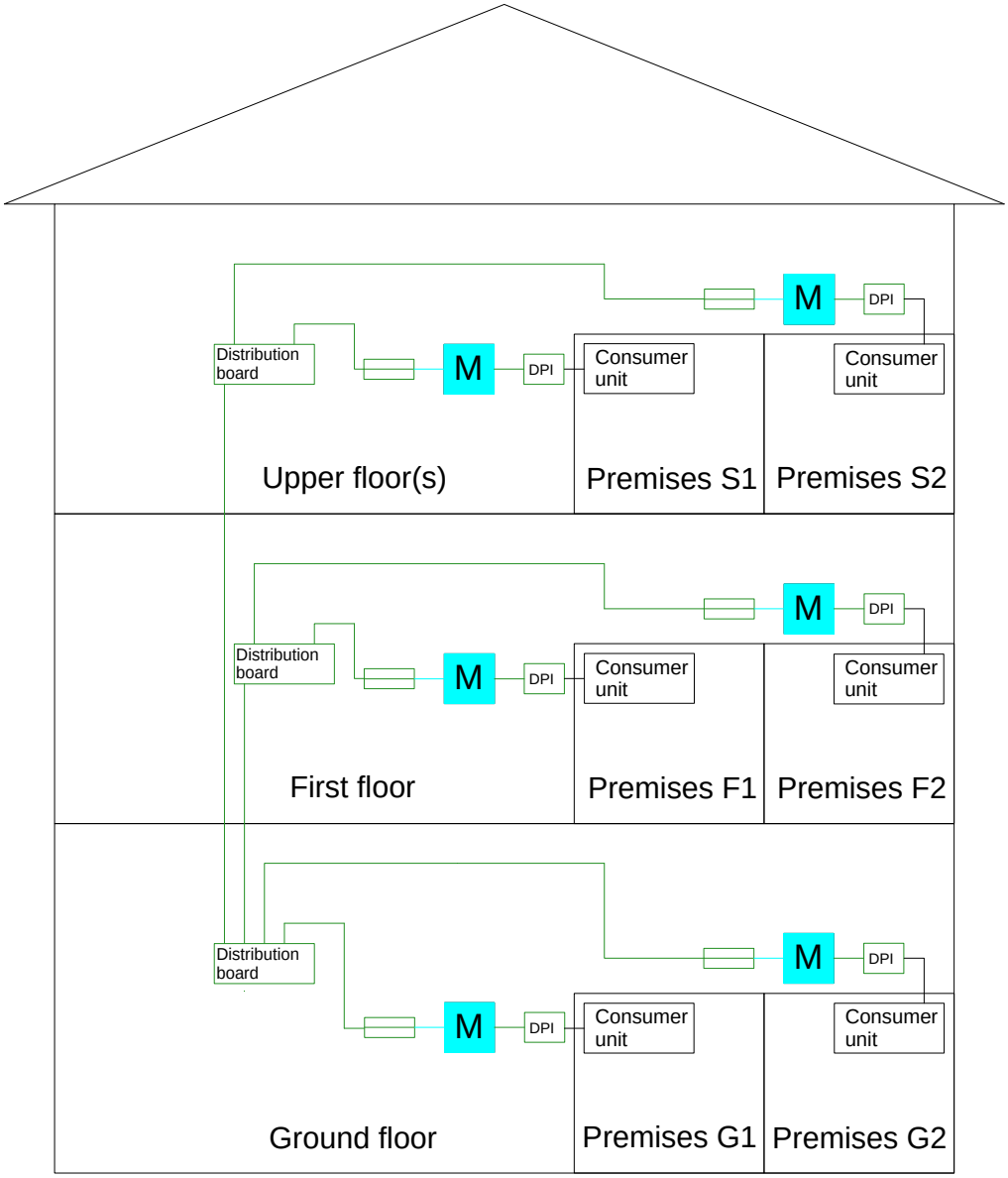

Figure A6 BNO Network with a Dispersed Metering arrangement

Notes

- Connection arrangement as Fig. A3.
- Only two Premises per floor shown for clarity.
- DPI = double pole isolator.
- M = Settlement meter.
- For earthing details, refer to section 5 of this document.

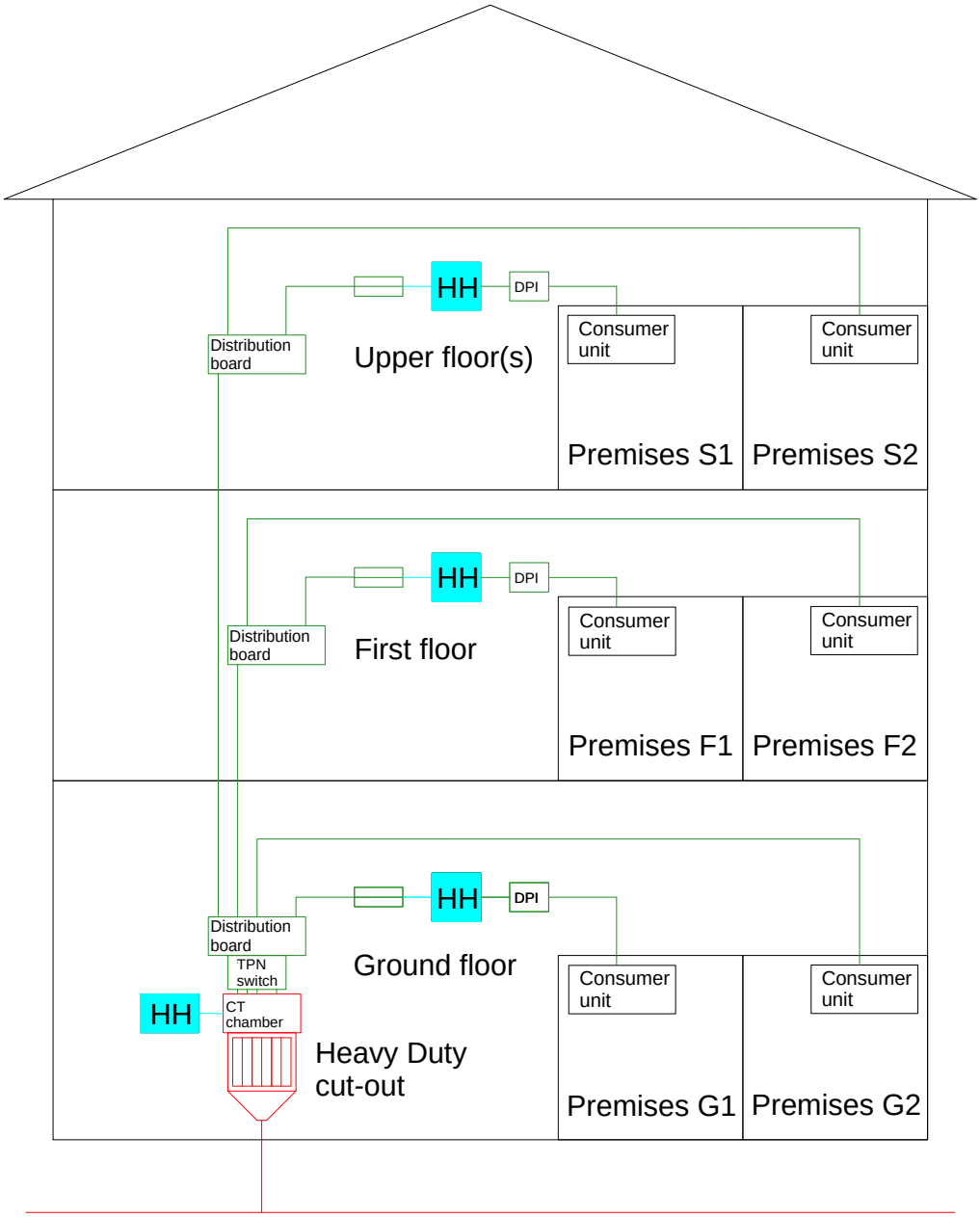

Figure A7 Difference Metering of BNO Network

Notes

- This arrangement of metering utilised by a common half hourly data collector when not all customers require direct electricity market access in order to determine the net usage by the private network and its privately billed customers.
- Only two Premises per floor shown for clarity.
- HH = half-hourly Settlements meter.
- DPI = double pole isolator.
- For earthing details, refer to section 5 of this document.

APPENDIX B: SPATIAL REQUIREMENTS FOR WHOLE CURRENT METERING

This Appendix is intended to provide guidance on the minimum spatial requirements applicable to new installations where whole current metering is to be installed.

The overall dimensions quoted are based on typical equipment currently used within the industry and include gaps to allow for cable routing etc. The overall space requirements stated below (and shown in the diagram) are aimed at providing an illustration of the area required for the safe installation and maintenance of service position equipment. The guidance assumes the extreme scenario of all ancillary metering equipment being required at the meter position. There is an acceptance that the contactor would not ordinarily be fitted at a multi-service position due to a 5 terminal smart meter solution being the preferred option.

Overall minimum space requirement per individual metered circuit

500mm (depth) x 350mm (width) (where cut-out fitted under the meter).

400mm x 400mm (where no cut-out is fitted under the meter). Note that the width of the available space may be reduced to an absolute minimum of 350mm in certain circumstances, but where this is the case the depth should be increased to 500mm.

Typical equipment dimensions

Single phase cut-out	200mm x 100mm
Meter	200mm x 150mm
Isolator	150mm x 75mm
Contactor	140mm x 100mm
Communications Hub	200mm x 100mm
Connector blocks	100mm x 100mm (for each block)

Maximum equipment depth does not normally exceed 175mm.

Three phase metering

With regard to 3-phase equipment, the spacing guidance quoted above would suffice in normal circumstances as the Communications Hub is typically found within the meter housing (or in a “hot shoe” within the meter tails) and the ancillary equipment would be limited to a TP&N isolator. However each installation should be considered individually and the guidance provided here taken into consideration.

Segregation

In addition to the space requirements identified above, where service position equipment is installed in close proximity to a gas or water installation, adequate segregation shall be provided. Current industry guidance currently states that a minimum separation of 150mm is required between gas equipment and electricity meters or apparatus and 25mm between gas equipment and electricity cables (as specified in BS6400), or where this is not possible a fire retardant shield shall be fitted. In all circumstances though, the design of the service position should allow for adequate segregation.

Safe working

In addition to the physical space requirements for the siting of service position equipment it is important to note that sufficient space must be made available for industry staff to install and replace relevant equipment in a safe manner. This includes the ability to maintain safe working, safe access to and safe egress from the service position. This distance should be at least 900mm from the furthest protrusion of the service position equipment.

Metering equipment should be located at a height not exceeding 1800mm above floor level to avoid “working at height” issues.

Space requirement diagrams

The diagrams overleaf are intended to provide an outline of the overall minimum space requirements which are required for the installation of service position equipment. By its nature this is a simplistic view and is intended only as a means to identify the overall area which would need to be made available in new installations. Equipment is arranged as shown for illustration only and it is accepted that the best use of space would be adopted. Note that the space requirements do not include or allow for any additional BNO or Customer equipment.

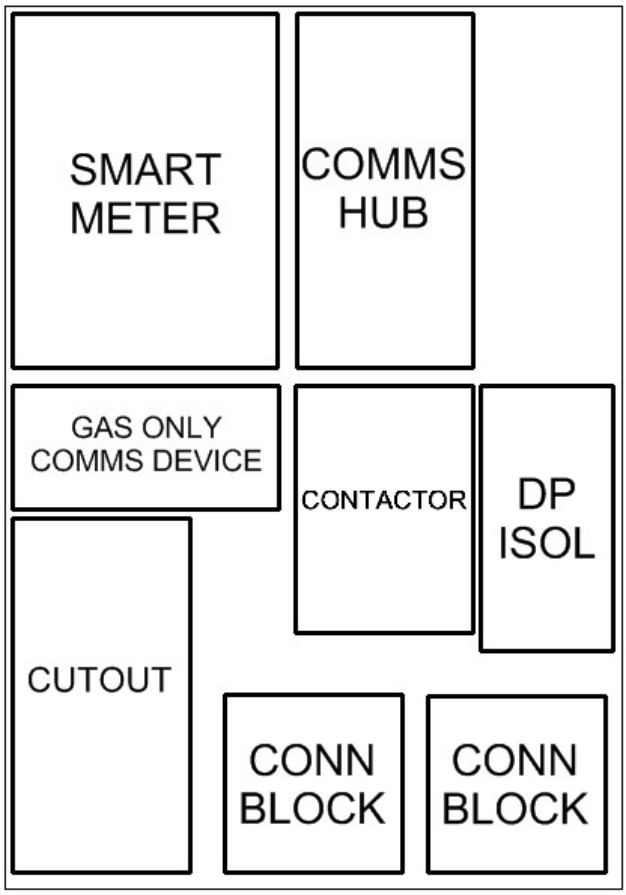

Figure B1 Metering Space Requirement (with cut-out) – 500x350mm

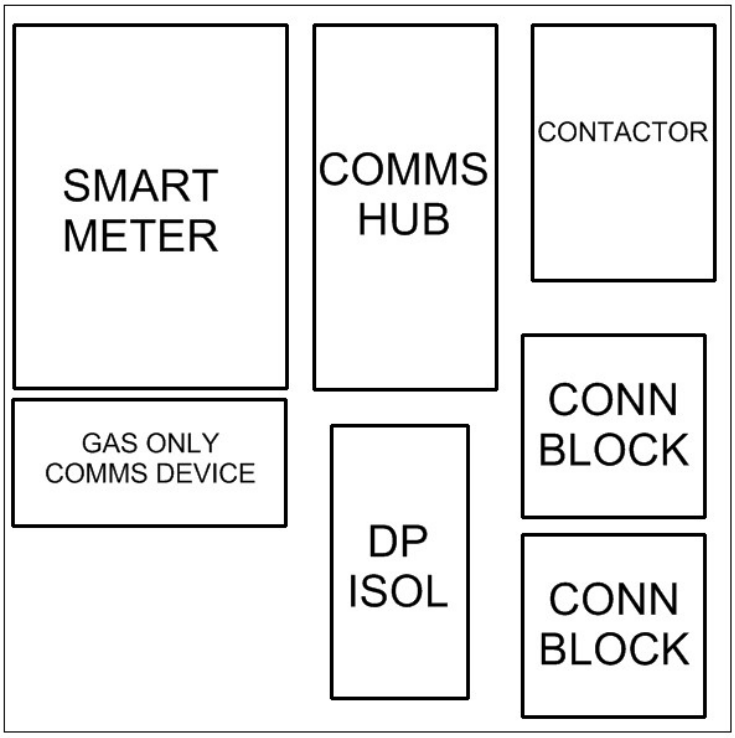

Figure B2 Metering Space Requirement (no cut-out) – 400x400mm

APPENDIX C: REFERENCES AND RELATED DOCUMENTS

BS EN 312	Particleboards. Specifications.
BS 6400	Specification for installation, exchange, relocation and removal of gas meters
BS 6891	Installation of low pressure gas pipework of up to 35mm (R1 1/4) in domestic premises (2nd family gas).
BS 7671	Requirements for electrical installations
BS 8313	Code of Practice for accommodation of building services in ducts
BS 8567	Outdoor electricity meter cupboards
BS 9999	Code of Practice for fire safety in the design, management and use of buildings
CIBSE Guide K	The Chartered institution of Buildings Services Engineers – Guide K: Electricity in Buildings
Electricity and Gas (Internal Markets) Regulations 2011	Regulations introduced in November 2011 entitling customers within private networks to have direct access to the electricity market via an electricity supplier and direct measurement of their own usage within a private network.
ENA EREC G12	Requirements for the application of protective multiple earthing to low voltage networks
ENA EREC G81	Framework for design and planning, materials specification, installation and record for low voltage housing development installations and associated, new HV/LV distribution substations
ENA EREC G88	Principles for the planning, connection and operation of electricity distribution networks at the interface between Distribution Network Operators (DNOs) and Independent Distribution Network Operators (IDNOs)
ENA TS 12-3	Outdoor meter cupboards
ENA TS 12-24	Plastic ducts for buried electric cables
ESQCR	Electricity Safety, Quality and Continuity Regulations 2002
HSG 38	Lighting at Work (published by The Health and Safety Executive)
IEC TR 61912-2	LV switchgear – overcurrent protective devices – selectivity under overcurrent conditions
IET GN5	Protection against electric shock
IET GN8	Earthing and bonding
IET On-site Guide	
IGE/G/1	Institution of Gas Engineers and Managers – Technical Standards: Defining the end of the Network, a meter installation and installation pipework
MOCOPA®	Meter Operation Code of Practice Agreement
BSC	The Balancing and Settlement Code
	The Electricity Act 1989
	The Utilities Act 2000
	The Building Regulations

Note that all referenced documents are subject to revision and the latest editions should be consulted to confirm the validity of any references to clauses or tables therein.

APPENDIX D: COLLABORATIVE NON-ENA MEMBER ORGANISATIONS

The following non-ENA member organisations were party to the production of this document by way of involvement in a number of the Working Group meetings that were open to external stakeholders:

Electrical Safety First (formerly the Electrical Safety Council)

The Association of Meter Operators

The Association of Residential Managing Agents

The Electrical Contractors' Association

The Health and Safety Executive

The Institution of Engineering and Technology

The National Inspection Council for Electrical Installation Contracting

The National Landlords' Association

The Office of Gas and Electricity Markets (Ofgem)

APPENDIX E: INTERIM GUIDANCE ON PROCESS ISSUES

This Appendix has been prepared to provide interim guidance on a range of “process” (i.e. non-technical) issues that have arisen as a result of consultation with external parties. The guidance is structured in the form of questions and answers. Note that some of these subject areas are not covered by legislation or determinations by Ofgem, so the contents of this Appendix represents the view of the Working Group (WG) charged with drafting this document.

Supply interruptions

Q: If a supply interruption is required by the DNO, has the DNO the responsibility to advise the BNO or the individual Customers or both?

A: Under the Electricity Standards of Performance Regulations 2010 the licensed DNO is obliged to notify an intended interruption of supply to the exempt BNO distributor, under Regulation 14(5) of those Regulations.

The embedded Customers are receiving an independent third party electricity supply from the licence exempt (BNO) network under the above Regulations via the licensed DNO distributor, with Part B Distribution Services Provider obligation in SLC 18.3 to provide MPANs.

However, just because the DNO provides its MPANs the WG does not not believe that the DNO has to serve notice on the BNO’s Customers, in the same way that a DNO would not inform an IDNO’s customers of an intended supply interruption.

The risk in the context of Licence exempt networks for the DNO is twofold, firstly that there is no occupying BNO in the sense of a person living or working in the premises for the DNO to notify of the intended interruption, and secondly, there may be no-one to pass on the supply interruption notice to the individual Customers.

The WG therefore recommend that it is sensible for the DNO use its best endeavours to serve notices on all the premises connected to a BNO network.

Q: If a supply interruption is required by the BNO, are they subject to the same requirements to give notice as the DNO and if so, do the same Guaranteed Standards apply?

A: The WG does not believe that Licence Exempt Distributors (i.e. BNOs) are bound by the Electricity Standards of Performance Regulations 2010 but that they are bound by the Electricity Act and ESQC Regulations.

The WG considers that this requires the Licence Exempt Distributor (BNO) to serve planned interruption of supply notices not less than 2 days prior to the intended interruption under ESQC Reg 29.

The Electricity Standards of Performance Regulations 2010 are issued pursuant to s39, 39A, 39B, 42A and 60 of the Electricity Act and being sections in Part 1 of the Electricity Act are covered by the definition in s6(9) of Part 1 that “electricity distributor” means only licensed

electricity distributors authorised by a distribution licence and this very clearly does not include Licence Exempt Distributors.

The ESQC Regulations are issued pursuant to s29 of the Electricity Act and do not refer to "electricity distributors", referring instead to "distribution of electricity" with the inference that safety regulations may be issued covering both licensed distributors and Licence Exempt Distributors.

This leaves an embedded Customer somewhat worse off in protection and compensation terms potentially.

Changes within a Building Network

Q: If we consider a building with a BNO system installed:

(a) If an existing Customer requires an increase in connection capacity, who do they approach and if the BNO is one such party, what requirements are there for the BNO to respond within certain timescales. Do the timescales for DNOs apply?

(b) If one of the dwellings is split into two dwellings, hence an additional supply is required – who needs to be approached and how would this process work? Do any Guaranteed Standards apply to the BNO?

A: (a) The Customer applies to the BNO. The WG view was that although it is open for legal debate, that the Electricity and Gas (Internal Markets) Rergulations 2011 may apply to existing private networks.

The BNO, as a Licence Exempt Distributor, is obliged to offer terms of connection for Third Party Supply under Reg 7 of Schedule 2ZA. This mirrors s16/16A of the Electricity Act and includes in Reg 7(5)(a) and 7(5)(b) confirmation that the terms include maintenance and also modifications of existing embedded connections. But legal opinion would be needed to check if the above Regulations applied to existing private networks where the Licence Exempt Distributor is not charging use of system. There does not appear to be any time limits of offering terms of connection like there is for a request to a licensed distributor.

A; (b) The Customer with the one embedded connection needing to be split should approach their BNO. The BNO would then set out its terms for disconnection of the existing embedded connection and the new construction of two replacement embedded connections.

The BNO would have to liaise with the current single supplier for the Customer's connection regarding meter removal and MPAN disconnection.

The BNO would have to also liaise with the licensed DNO to obtain two new MPANs, or one additional MPAN if the existing MPAN is remaining, for the two embedded metering points.

As this all is triggered and run by the Licence Exempt Distributor (BNO), they are not party to the BSC or MRA or licensed, so there is really no exact process.

The WG do not believe the Guarenteed Standards or the Connections Performance Standards apply to exempt distributors.

Charging for use of a Building Network

Q: Can an unlicensed BNO charge for use of the Bulding Network?

A: Under the Electricity and Gas (Internal Markets) Regulations 2011 there is a basis for any Licence Exempt Distributor to levy use of system charges to recover the cost of the maintenance, upkeep and replacement of the private building electricity network.

MOCOPA

Q: ER G87 lists requirement to comply with MOCOPA standards and when installing a multi supplier dispersed metering system over an Licence Exempt Distributor BNO network there must be a potential issue as the BNO is not a signatory on the MOCOPA document so the meter operators and supply companies could be at risk on an unlicensed network.

A: The WG agree that this is a known issue and has been flagged as a problem. With tens of thousands of private networks in the UK, from small Victorian conversions to airports and docks and with no statutory register of exempt status under the Electricity (Class Exemptions from the Requirement for a Licence) Order 2001 it is not even possible to readily identify all Licence Exempt Distributors let alone have such a large number of exempt distributors become party to existing industry governance mechanisms, mechanisms to which there are only 17 or so licensed distributors acceded.

Some might say that any supplier who is to provide a supply to a Customer connected to a private network could be seen to be doing so as a Third Party Supplier under the Electricity and Gas (Internal Markets) Regulations 2011 and a pre-requisite is that the Supplier (and their meter operator) liaises with the Licence Exempt Distributor to confirm technical, design, operational, safety and access arrangements ahead of installing meters and providing a supply to a Customer. As such, and so long as the Licence Exempt Distributor installs wiring in accordance with BS7671 and provides suitable metering positions in line with Engineering Recommendation G87 it is unlikely problems should arise.

From a commercial liability perspective, the basis of access into a licence exempt network by a Supplier should be subject to a bilateral commercial agreement between the exempt distributor and the Supplier. Licensed distributors have a single multiparty agreement for activities and liabilities with Suppliers called the Distribution Connection and Use of System Agreement (DCUSA) and this works given there are 60 or so suppliers and 17 or so licensed distributors.

Practically any Supplier working on a private network needs to obtain a bilateral agreement with the Licence Exempt Distributor or face a position of exposure to unlimited liability. Similarly, since the Licence Exempt Distributor may have consented to Third Party Supply to its Customers then it would also be exposed to unlimited liabilities without a bilateral agreement being in place.

APPENDIX F: USER GUIDE

This Appendix provides guidance to the user regarding the layout and content of this document. The sections of the document, with a brief description of their contents, are listed in the left-hand boxes below; examples of questions, the answers to which may be found in that section, are shown in the adjacent right-hand box.

Scope Describes what the document covers and what is excluded.	What kinds of connection arrangements are covered? What about existing connection arrangements?
Definitions Lists the terms in the document that are printed with Initial Capitals (defined terms).	What is a Building Network Operator? What constitutes a Multiple Occupancy Building?
Connection Arrangements Provides an overview of acceptable connection arrangements including firefighting and other standby supplies.	What connection arrangements are suitable for different types of Premises? Will a standby supply be provided? Who is responsible for the Building Network?
Installation Requirements Provides comprehensive information on equipment and installation practice, security, protection co-ordination and related matters.	What are the requirements for the Intake Position? What Building Network equipment should be used? What Building Network equipment should be sealed?
Earthing Describes recommended earthing practice including options when individual services are to be provided.	What are the requirements for a steel-framed building? Can a PME earth terminal be provided at the intake position? How should multiple earth conductors be connected to the DNO earth terminal?
Metering Arrangements and MPAN Registration Describes the options for metering arrangements and the role and creation of MPANs	Is Boundary Metering required? Can I utilise Dispersed Metering? Who issues MPANs?

Metering Requirements Describes requirements for Metering Locations and equipment requirements for whole current and current transformer operated metering.	Does smart metering have any special requirements? Where can I install metering in an individual Premise? Is a means of local isolation required?
Appendix A Provides representative diagrammatic typical connection arrangement drawings.	What is the connection arrangement for a large number of Premises?
Appendix B Provides details of space requirements for new whole current metering installations.	What segregation is required from gas or water installations?
Appendix C Provides a list of documents to which reference is made.	What is the full title of a particular BS specification?
Appendix D Lists the non-ENA member organisations party to the production of the document.	Was the Electrical Contractors' Association involved in the Working Group who prepared this document?
Appendix E Provides interim guidance on certain process issues.	Can an unlicensed BNO charge for use of the Building Network?