



Electricity Specification 400RL1

Issue 1

July 2012

Installation of Low Voltage Internal Rising and Lateral Mains and Services

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**Approved for issue by the
Technical Policy Panel**

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Issue and Amendment Summary

Amendment No. Date	Brief Description and Amending Action
<p>0 12/04/2012</p>	<p>Draft 1</p> <p>First Issue, Issued for IQA/Bolton at Home trail installations</p> <p>Prepared by: P J Whittaker</p> <p>Approved by the Standards Steering Group and signed on its behalf by: P J Whittaker</p>
<p>0 05/07/2012</p>	<p>Issue 1</p> <p>Includes clarification of preferred options for cable routes and positioning of MSDBs. Protection of the cable runs through public areas confirmed as “in Trunking or on Trays with Metal capping”.</p> <p>Prepared by: P J Whittaker</p> <p>Approved by the Standards Steering Group and signed on its behalf by: P J Whittaker</p>

INSTALLATION OF LOW VOLTAGE INTERNAL RISING AND LATERAL MAINS AND SERVICES

1. INTRODUCTION

This specification should be read in conjunction with the latest versions of all the related documents detailed below.

Prior to the commencement of any installation work, a full and comprehensive design shall have been completed and agreed with Electricity North West Limited (herein after referred to as Electricity North West) to demonstrate compliance with this specification.

Contractors undertaking work should be an NICEIC approved contractor, unless otherwise agreed in writing by Electricity North West. The completed installation shall be in compliance with the Electricity Safety, Quality and Continuity Regulation (2002) (ESQCR). The workmanship shall be of an appropriate standard as agreed and audited by Electricity North West, and in accordance with BS7671. All persons involved in work activities shall be suitably accredited as competent to carry out the installation work described in this specification and where necessary, formally assessed and appropriately authorised in accordance with Electricity North West, Code of Practice CP614.

The contractor shall ensure that all specified work is undertaken in accordance with the Construction (Design and Management) Regulations 2007. Appropriate site risk assessments shall be undertaken to the satisfaction of Electricity North West and shall be completed prior to the initiation of work. The Contractor and all persons employed by him (including sub-contractors) shall comply fully with the Health and Safety at Work Act 1974, The Electricity at Work Regulations 1989, with all other Statutory Safety Requirements, Approved Codes of Practice and appropriate Guidance Notes and Standards. All work shall be undertaken in accordance with the Electricity North West, Distribution Safety Rules. In compliance with the Electricity at Work Regulations 1989, the Constructor will ensure that all persons engaged in any work activity, where technical knowledge and/or experience is necessary to prevent danger, shall possess such knowledge and experience as appropriate, having regard to the nature of the work.

2. SCOPE

This specification details the requirements for the design, installation and commissioning of new build and replacement of Low Voltage internal mains and services, to be installed in multi-occupied building and owned and operated as part of the electricity North West distribution network.

Where the installation forms part of a network which is to be owned and operated by a Building Network Operator(BNO), who is other than Electricity North West, this specification shall not apply and the BNO network shall be installed in compliance with Energy Networks Association, Engineering Recommendation G87

3. DEFINITIONS

- Approval: Sanction by the Electricity North West Cable Circuits Policy Manager that specified criteria have been satisfied.
- Contract: The agreement between Electricity North West and the Contractor for the execution of the Works including therein all documents to which reference may properly be made in order to ascertain the rights and

obligations of the parties under the said agreement.

Contractor:	The person or person's firm or company, including personal representatives, successors and permitted assigns, whose tender has been accepted by Electricity North West.
Specification:	The Specifications and schedules (if any) agreed by the parties for the purpose of the Contract.
Sub-Contractor:	Any person (other than the Contractor) named in the Contract for any part of the Works or any person to whom any part of the Contract has been sub-let with the consent in writing of the Electricity North West Cable Circuits Policy Manager, and the legal representatives, successors and assigns of such person.
Supplier:	Any person or person's firm or company who supplies goods to Electricity North West or to its contractor.
Tender:	An offer in writing to execute work or supply goods at a fixed price.
Tenderer:	The person or person's firm or company, including personal representatives, successors and permitted assigns, invited by Electricity North West to submit a tender.

The following additional terms have also been defined.

CNE	Combined Neutral Earth system
Designer	As defined within the Construction (Design and Management) Regulations 2007.
Low Voltage (LV)	An a.c. voltage not exceeding 1000 volts measured between the phase conductors..
High Voltage (HV)	Any voltage exceeding Low Voltage.
Incoming Cable	The cable connecting the premises to the external LV electricity distribution network.
Internal Main	A cable, installed within a building, supplying more than one consumer and which interconnects between an HEAVY DUTY Cut-Out and an MSDB or between MSDBs.
Internal Service	A cable connected to a Distribution Fuse Board, protected by a suitable fuse and supplying a single consumer.
Multi Way Service Distribution Board (MSDB)	A fused multi-way enclosure which incorporates facilities for connecting consumer's service cables and Internal main distribution cables.
New Build works	Works undertaken on premises where assets are installed for the first time on new build developments.
NICEIC approved	A registered contractor, as defined under the NICEIC Approved

contractor	Contractor Scheme.
Replacement works	Works undertaken to replace legacy assets within pre existing housing stock.
SNE	Separate Neutral Earth system.
Data Management Section	Electricity North West Data Management Section 8 th Floor, Linley House, Dickinson Street, Manchester Email to: DatamanagementDSMC@enwl.co.uk

4. GENERAL REQUIREMENTS FOR APPROVALS AND ASSURANCE

4.1 Product not to be changed

No change in the product, packaging or labelling shall be made after Approval has been granted without prior notice to the Electricity North West Cable Circuits Policy Manager, and receipt of a written agreement to the proposed change from the Electricity North West Cable Circuits Policy Manager.

4.2 Electricity North West Technical Approval

- 4.2.1 The Tenderer shall submit, with this Tender, proposals for testing which will demonstrate, to the satisfaction of the Electricity North West Cable Circuits Policy Manager, compliance with this Specification. Such tests shall be carried out without expense to Electricity North West.
- 4.2.2 Alternatively, the Tenderer may submit technical reports and other data that he considers will demonstrate, to the satisfaction of the Electricity North West Cable Circuits Policy Manager, compliance with this specification. Acceptance of this evidence shall be at the discretion of the Electricity North West Cable Circuits Policy Manager but will not be unreasonably withheld.
- 4.2.3 Approval shall be 'factory specific' and is not transferable to another factory without the written approval of the Electricity North West Cable Circuits Policy Manager.
- 4.2.4 The supplier and product shall comply with all the relevant requirements of Electricity North West documents EPD311 and CP311.

4.3 Quality Assurance

- 4.3.1 The Tenderer shall confirm whether or not approval is held in accordance with a Quality Assurance Scheme accredited under ISO 9000. If not, he shall submit a statement of the quality assurance procedures employed to control the quality of the product, including the performance of Suppliers and Sub-Contractors.
- 4.3.2 The right is reserved for the Electricity North West Cable Circuits Policy Manager to require, from time to time, the repeat of such tests as he may deem to be reasonably necessary to demonstrate continued compliance with the Specification.
- 4.3.3 The Tenderer shall submit, with his Tender, a list of tests and inspections which are carried out on the product prior to despatch which shall demonstrate, to the satisfaction of the Electricity North West Cable Circuits Policy Manager, fitness for installation and service.
- 4.3.4 The Tenderer shall provide free of charge to Electricity North West such samples as may, in the opinion of the Electricity North West Cable Circuits Policy Manager, be reasonably required for inspection and/or retention as quality control samples. The Electricity North West Cable Circuits Policy Manager will confirm the requirement for samples at the time of Tendering.

- 4.3.5 The right is reserved for the Electricity North West Cable Circuits Policy Manager to make, from time to time, such inspections of the Tenderer's facilities as he may deem to be reasonably necessary to ensure compliance with this Specification and any Contract of which it forms a part.
- 4.3.6 The Tenderer shall submit, with his Tender, such details of product packaging disposal, as will enable Electricity North West to comply with the requirements of BS EN ISO 14001: 2004 - Environmental Management Systems.

4.4 Formulation

The Tenderer shall submit, with his Tender, such details of the formulation and use of the product and associated substances as will enable Electricity North West to comply with the obligations of the Health and Safety at Work Act 1974 and the Control of Substances Hazardous to Health Regulations 2002, in the use, storage and disposal of the product. The Tenderer may stipulate, prior to submission of such information, that he requires it to remain confidential and the Electricity North West Cable Circuits Policy Manager will, if requested, confirm his agreement to this prior to receipt of the information.

4.5 Identification Markings

- 4.5.1 The Tenderer shall submit, with his Tender, details of markings which it is proposed to apply to the product or packaging to identify manufacturing batches or items. The forms and content of such markings shall be subject to the Approval of the Electricity North West Cable Circuits Policy Manager, and shall in all cases include the Electricity North West Approved Description and Commodity Code Number.
- 4.5.2 The Tenderer shall submit, with his Tender, such details of marking gross weight on components, assemblies and packages, as will enable Electricity North West to comply with the Health and Safety Manual Handling Operation Regulations 1992, for components, assemblies and packages supplied with a gross weight over 1kg. The forms and content of such markings shall be subject to the Approval of the Electricity North West Cable Circuits Policy Manager.

4.6 Minimum Life Expectancy

The minimum life expectancy of all products covered by this Specification is 60 years.

4.7 Product Conformity

Preference will be given to those suppliers who can provide suitable Product Conformity Certification to a recognised or specified standard, or an equivalent certification.

5. DESIGN

5.1 Internal Mains and Services – Design Requirements

All new and remedial internal mains and services shall be designed in compliance with the ESQCR. All designs shall be undertaken by an appropriately qualified and competent person who undertakes the role of Designer in compliance with the Construction (Design and Management) Regulations 2007. All works shall be designed, so that it can be constructed and tested in such a manner as to ensure the safe continuous operation under the environmental and electrical conditions prevailing at the specified site. The design shall also ensure that suitable access is provided to all assets to facilitate inspection, repair and maintenance as appropriate.

In all case the preference is employ rising sub-mains, serving no more than three floors, where the sub-main terminates into a Multi-Way Service Distribution Boards (MSDB) on the middle floor of three. Service to individual properties are then connected from the MSDB using appropriate rising and lateral routing through the building, as indicated in figure 1. Other routing may be consider where the structural constraints of the building dictate that a different design is necessary.

5.2 Replacement Works to Legacy Assets

Where replacement work is to be undertaken on existing legacy internal mains installations, it may not be appropriate for a full design submission to be undertaken. For each specific location, Electricity North West shall determine the required design calculations and drawings as part of the scope of works, detailed below. Prior to the initiation of all Replacement works, Electricity North West shall provide a site-specific scope of works, detailing: -

- Geographical/postal location of property
- Outline scope of replacement/new build works and design requirements in accordance with Figure 1
- Existing or number of proposed service locations
- Existing network capacity and maximum demand, voltage regulation and location.
- Type of earth terminal that consumers connected to the local network may be offered
- High level site specific risk assessment

Replacement work to existing legacy multi occupied installations shall always be designed as detailed in Figure 1 using SNE cable within the building. Where alterations or modifications are to be undertaken within an existing legacy installation, Electricity North West may require additional works to be completed to each individual consumer's installation to ensure the compatibility of the replacement installation with the legacy wiring installations, specifically earthing arrangements.

Consumers supplied from an existing legacy network shall be offered an earth terminal, in compliance Electricity North West, Code of Practice CP332. Irrespective of the earthing system utilised by the feeding network (which may be PME or SNE up to the cut-out at the intake point within the building) the consumer will only be provided with an SNE service arrangement. PME arrangements shall not be offered.

5.2 New Build Works

Prior to the commencement of installation work at a New Build works site, the proposed electrical design shall be submitted to Electricity North West for comment and acceptance. New build multi occupied installations shall be designed as detailed in Figure 1 using SNE cable within the building. Prior to the initiation of any site works, the designer shall provide a site specific scope of works, detailing: -

- Geographical/postal location of property
- Outline scope of new build works and design in accordance with Figure 1
- Number of existing or proposed service locations

The submission shall include calculations detailing:

- load and diversity estimates
- cable sizing
- de-rating of cables due to grouping
- voltage regulation.
- Earth loop impedance values
- Fuse discrimination

Schematic diagrams shall be included detailing

- Load
- volt drop
- cable cross sectional area
- proposed electrical layouts
- point of connection to Electricity North West's network
- Earth loop impedance values
- Fuse discrimination

New build multi occupied buildings containing individual properties shall always be constructed to offer an SNE supply to individual properties, in compliance with CP332. Each property within the multi occupied buildings 'equipotential zone' shall be offered an SNE earth, supplied via an SNE cable (TN-C-S) as detailed in Figure 2 (Provision of SNE service to individual properties by utilising SNE Service Cables originating from a PME service to the building). Prior to the energisation of each property, an Electrical Installation Certificate, as set out in BS 7671 Appendix 6, shall be provided to Electricity North West, detailing compliance.

6. INSTALLATIONS

6.1 INTERNAL MAINS – INSTALLATION REQUIREMENTS

All new and remedial internal mains and services assets shall be installed and adopt the standards of construction necessary to comply with BS7671. All new build and replacement installations shall comply with the Building Regulations of England and Wales, specifically, Part P (Electrical Safety) and Part B (Fire Safety). For New build only one incoming supply cable should be installed into multi-occupied premises, unless otherwise agreed in writing by Electricity North West. The most appropriate location for the incoming supply cable should be determined at an early stage and agreed with Electricity North West. The physical security of the supply equipment including the incoming supply cable and switchgear should be considered when determining the layout of the equipment.

6.2 Installation Drawings

Prior to the commencement of all New build (and where deemed necessary by Electricity North West, also for Remedial works), suitable CAD drawings, in a pre-agreed format, detailing the proposed electrical installation, shall be prepared and submitted to Electricity North West for comment including:

‘General Arrangement’ drawings, detailing: installation date, cable routes, length of run, cable type, substation spatial envelopes and containment methods adopted.

6.3 Approved Equipment

All equipment installed on the Electricity North West network shall be provided in compliance with the relevant Electricity North West specifications and approved in accordance with Electricity North West’s Electricity Policy Document. EPD311.

Cables:

Internal Mains and Service cables shall be Approved and designed with a Low Smoke Zero Halogen (LSOH) sheath. Cables shall be of an Approved type as detailed in Electricity North West specifications ES400C8 and ES400C11. Each dwelling shall have an individual split concentric service cable connection direct from the MSDB or Heavy Duty Cut-Out. Service cables shall be connected to the MSDB/Heavy Duty Cut-Out over the three phases to ensure a balanced load. All cables shall be suitably protected against mechanical damage, by installation on surface mounted metallic tray, covered by metal capping, secured by high security screws or metal banding. Alternatively mounting with trunking is acceptable. In all cases in accordance this shall be in accordance with BS7671. The choice of location should be sympathetic to the design of the building and be as unobtrusive as practical. Should the building owner wish to subsequently box in the cable routes for aesthetic reasons, this will be done by the owner at their own expense. If subsequently it becomes necessary to remove the covering to gain access for testing and repair of the cables, making good and redecoration shall be also be at the building owners expense.

Service Termination:

Service termination equipment shall be mounted inside the property in a position acceptable to Electricity North West, which facilitates inspection. Minimum spatial requirements are as detailed in G87.

Cut-Outs

The service Cut-Out in each property shall be as detailed in Electricity North West ES332 - 100A House Service Cut-Outs.

Metering:

For New build installations - metering is the responsibility of the Meter Operator appointed by the Consumer's supplier and shall be installed in accordance with section 6 of G87.

Remedial work at Legacy installations – It is the responsibility of the contractor undertaking Internal Mains and Service installation works to establish the suitability of each consumer installation for reconnection to the distribution network via the new service installation, prior to works being initiated. Where this is not possible due to access restrictions, the reconnection will be withheld until access is gained and testing is completed.

Revenue Protection – It is the responsibility of the contractor undertaking Internal Mains and Service installation works to report any damage, interference, illegal abstraction or misuse of equipment on discovery to Electricity North West.

Switchgear:

The MSDB(s) shall be of an approved type as detailed in ES502. Their collective capacity shall be matched to the maximum number for dwellings within a building together with provision for a 'landlords' supply to cater for common area lighting, small power, lifts etc. Integral incoming supply fuses will be required in all MSDB's, however, this may not be achievable in existing properties where the incoming cable is already adequately terminated into a Heavy Duty Cut-Out. Switchgear shall be located in an area that is readily accessible from a communal area, i.e. in or off a stairwell, lobby or hall and the selected location must afford continuous and unrestricted access to Electricity North West personnel.

The distribution board should be sited as close as is reasonably practicable, to the centre of the building. This measure ensures that the length of internal service cables is kept to a minimum and of similar length when feeding properties on the same floor of a building, as far as is reasonable practicable. Notwithstanding the above, where the Internal Mains and Services designs cannot cater for central location, or in some cases even where this requirement can be accommodated, the length of internal service cables shall be limited to prevent unacceptable volt drop at the service positions within individual properties.

It may therefore be more economic and practical to install additional distribution boards, which can take the form of either sub-distribution boards, supplied from a main distribution unit, or completely separate distribution boards independently connected to the incoming supply. Where sub-distribution boards are supplied from a main distribution board, the interconnecting internal main (sub mains) cable must in all cases be provided with a means isolation and protection. This will be afforded by fuse links, preferably within a MSDB although a suitable fused Heavy Duty Cut-Out may be acceptable in some instances. The fuse link at the origin of the internal main should adequately discriminate with the incoming fuse links in the sub-distribution board.

MSDB's shall not be located in, or require access through, the premises of an individual consumer. MSDB's shall not be located in inappropriate positions:

- Directly beneath, within, or immediately adjacent to the bottom of a vertical service duct containing water pipes or rubbish shoots, where leaks could result in water ingress to the electrical installation.
- In an area which constitutes a hostile environment i.e. where steam or water vapour are present.
- In a position where it may be subjected to mechanical damage under normal circumstances e.g. Behind a door which when opened could strike the unit, at low level in a garage or access way used by vehicular traffic.
- Where there is insufficient headroom i.e. at the rear of an under stairs cupboard.
- Where there is inadequate working space around the unit -a minimum clearance of 1000mm should be available in front of the equipment.
- In areas where it may be particularly susceptible to fire damage i.e. communal bin stores.
- At head height protruding from the wall of say a corridor where there is a risk of personal injury.
- Where access could be obstructed or restricted.

The foregoing list is not exhaustive and is indicative of the requirement of BS7671.

At the intake there is usually a requirement for an incoming fuseway, distribution busbars and outgoing fuseways, this may be accomplished using combinations of existing and new equipment such as a Heavy Duty Cut-Out and an MSDB. However for new installations and where it is required within the scope of works of the project to replace the legacy Heavy Duty Cut-Out as well as the building network, this can be achieved by the installation of a single piece of equipment which combines all of these features.

Where a dedicated room or cupboard is provided for MSDB accommodation an appropriate dual access locking mechanism shall be fitted and agreed with Electricity North West. In high-risk legacy properties, the landlord, or building owner may, by agreement with Electricity North West, deem it necessary to provide a more secure location for distribution equipment, retaining control and responsibility for entry to the switchroom. In such circumstances they shall be responsible for providing 24 hour access to Electricity North West personnel.

Containment:

All surface mounted cables in communal areas shall be mechanically protected using suitable means as determined by BS7671. Metal trunking or conduit or metal tray work and capping, as appropriate are Electricity North West's preferred choice. All containment and mechanical protection shall be installed in compliance with BS7671.

Isolation Switch:

Where Remedial or New build works are undertaken, an approved 100 amp Double Pole isolating switch shall be installed between the Meter Operators meter and the Consumer's consumer unit, as detailed in Electricity North West Electrolink No. 4 (Drawing No. 900000-53-068).

7. INSTALLATIONS RECORDS

As-Constructed drawings and schedules shall be submitted to Electricity North West following completion of the works and before and no later than the time of energisation of the first service. Drawings shall be in geo-schematic format, including both plan and elevation views in order to show the location of equipment and routing of cabling within the building. Cabling schedules shall give details of cable types and size, individual route lengths and measures values of Earth Loop Impedance. Phase connection details shall also be included. Examples are given in Appendix C. The records shall be submitted in the specified electronic format only to the Electricity North West Project Manager and to the Data Management Section. In addition “Electrical Installation Certificate” together with the “Schedule of Test Results” as set out in Appendix 6 of BS7671 Requirement for Electrical Installation, (The IEE Wiring Regulations), shall be submitted, Where applicable, Operating Manuals and CDM Health & Safety Files, shall also be provided in an agreed and approved electronic format.

8. INSPECTION AND TESTING

Electricity North West reserves the right to access the site at all reasonable times for the purposes of inspection and auditing of the works, as may be considered necessary.

All new installations and remedial works shall be tested in accordance with BS7671. Energisation of each part of an installation shall be in accordance with Electricity North West Code of Practice, CP606 Procedure G16, Polarity and Phase Rotation Testing at LV Terminations and CP606, Procedure G20, Earth Loop Impedance Testing at Service Terminations.

9. DOCUMENTS REFERENCED

Electricity Safety, Quality and Continuity Regulations (2002)

Health and Safety at Work Act 1974

The Electricity at Work Regulations 1989

Construction (Design and Management) Regulations 2007

BS7671 Requirements for Electrical Installations – IEE Wiring Regulations.

BS7671 Appendix 6: “Electrical Installation Certificate” and “Schedule of Test Results”

BS7671: On Site Guide – IEE Wiring Regulations

BS7671: Inspection and Testing – IEE Wiring Regulations

BS EN ISO 14001: 2004 - Environmental Management Systems

Control of Substances Hazardous to Health Regulations 2002

Health and Safety Manual Handling Operation Regulations 1992

Building Regulations of England and Wales, specifically, Part B (Fire Safety) and Part P (Electrical Safety)

Energy Networks Association documents

G87 Guidelines for the Provision of Low Voltage Connections to Multi Occupancy Buildings

Electricity North West, Documents

Electricity North West, Distribution Safety Rules

Electricity Policy Documents

EPD311 Approval of Equipment

Codes of Practice

CP311 Equipment Approval Process

CP332 LV Service Connections and Application of PME

CP606 System Operations

Procedure G16 – Polarity and Phase Rotation Testing at LV Terminations

Procedure G20 - Earth Loop Impedance Testing at Service Terminations

CP614 Authorisation

Electricity Specifications:

ES332 100A House Service Cut-Outs

ES502 Multi-Way Service Distribution Boards

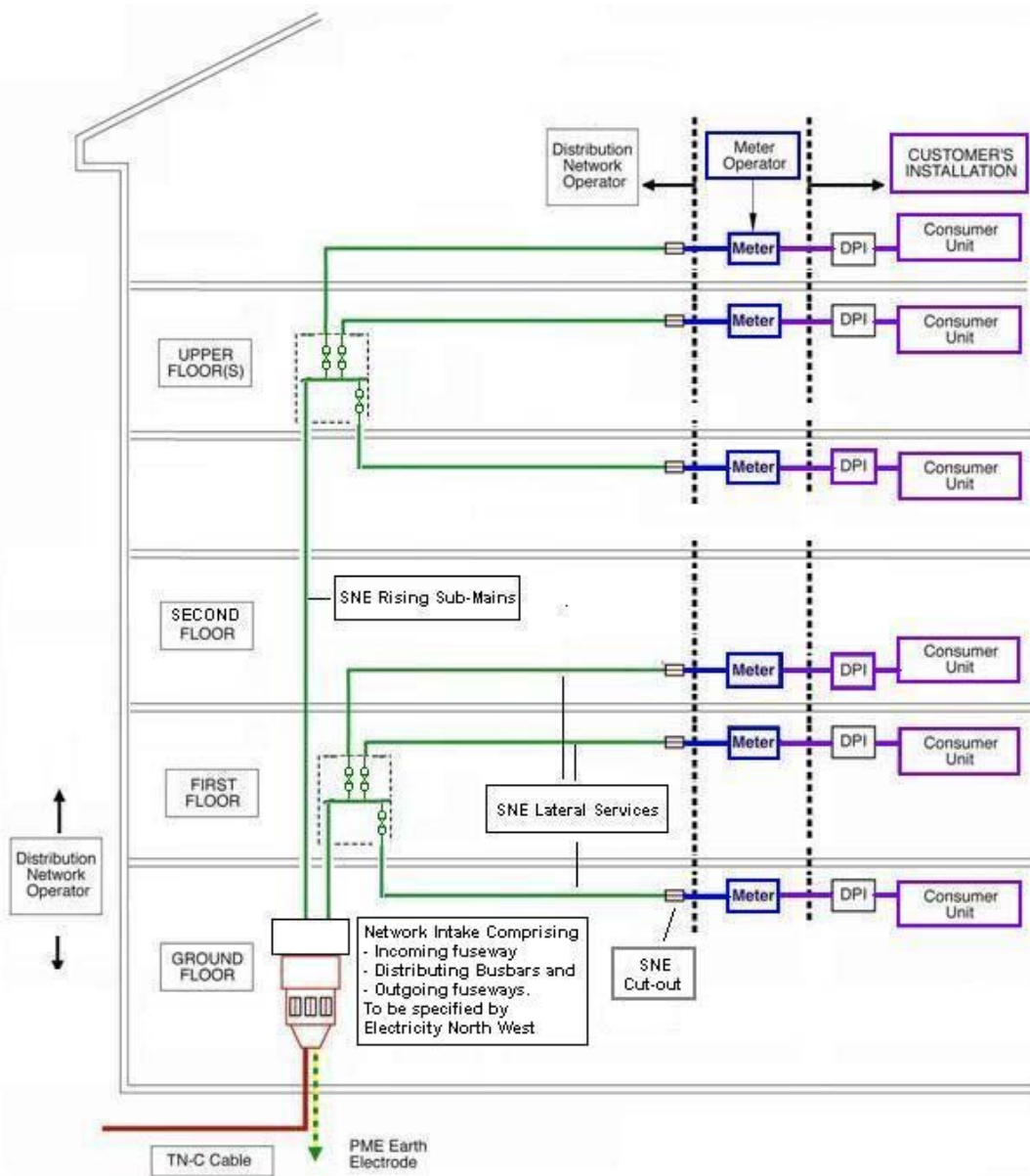
ES400C8 LV service cables

ES400C11 Low voltage Mains Cables

Electrolink No. 4, Meter board arrangements for new single phase domestic connection for up to 20kVA

APPENDIX A

Figure 1 – Typical PME supply to Multi Occupied Building

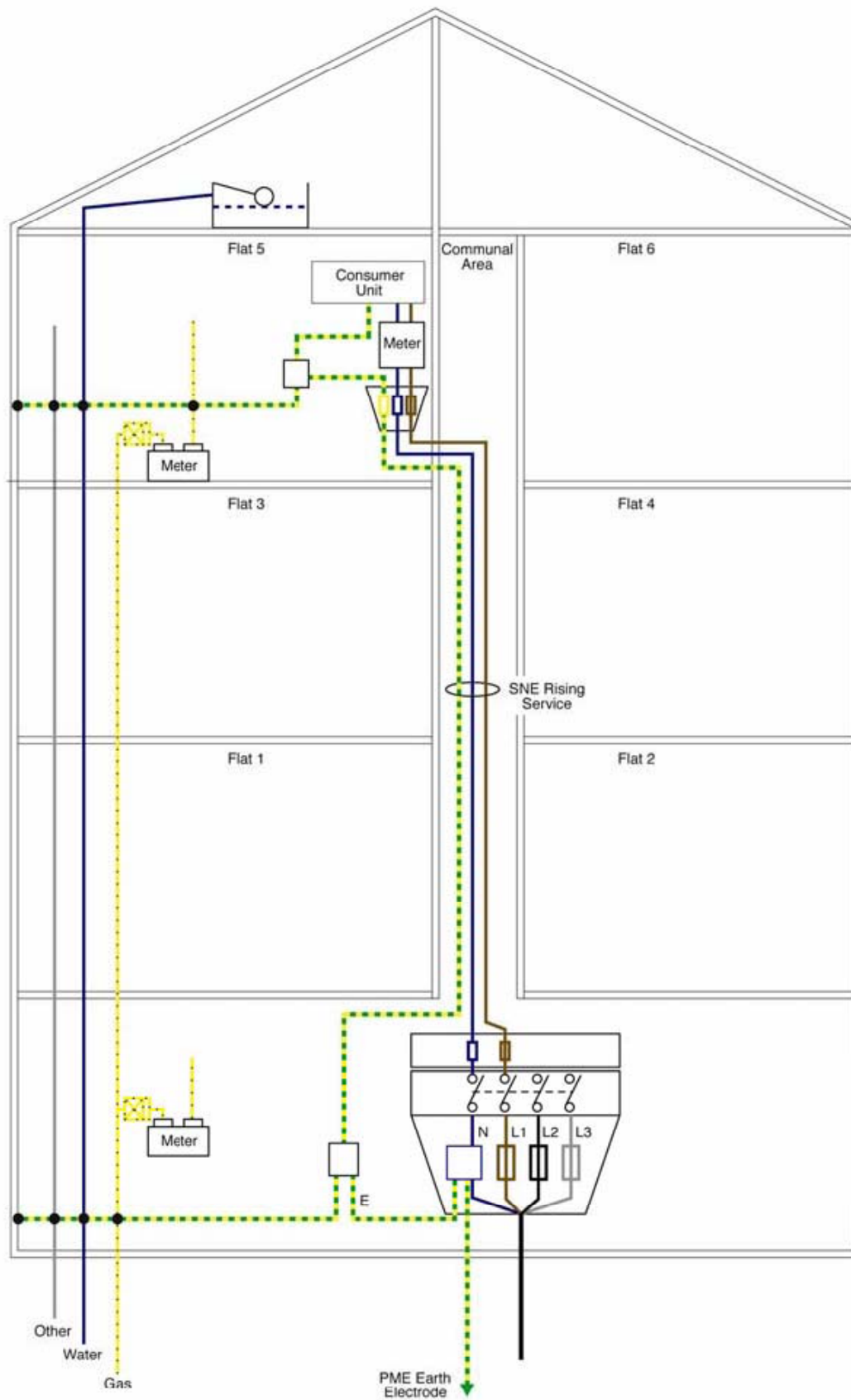


Note: Colour-coding has been used in this diagram to indicate which parties have responsibility for different parts of the installation, as follows:

- red - Electricity North West – external network
- blue – Meter Operator
- green – Electricity North West – internal network
- purple - Consumer's Installation

This drawing is for illustration only – specific requirements are detailed within the referenced Electricity North West drawings

Figure 2 - Provision of SNE service to individual properties by utilising SNE Service Cables originating from a PME service to the building.



APPENDIX B

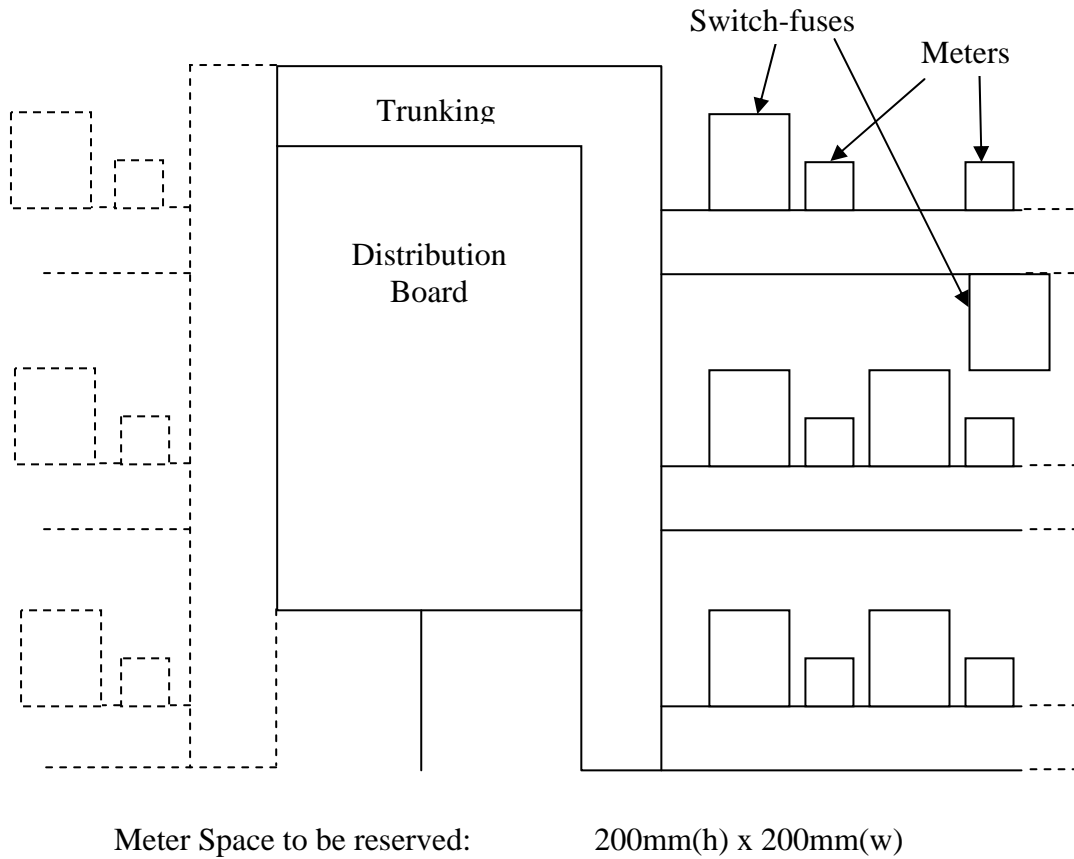


Figure B1 – Typical Distribution Board Installation at Group Metering locations

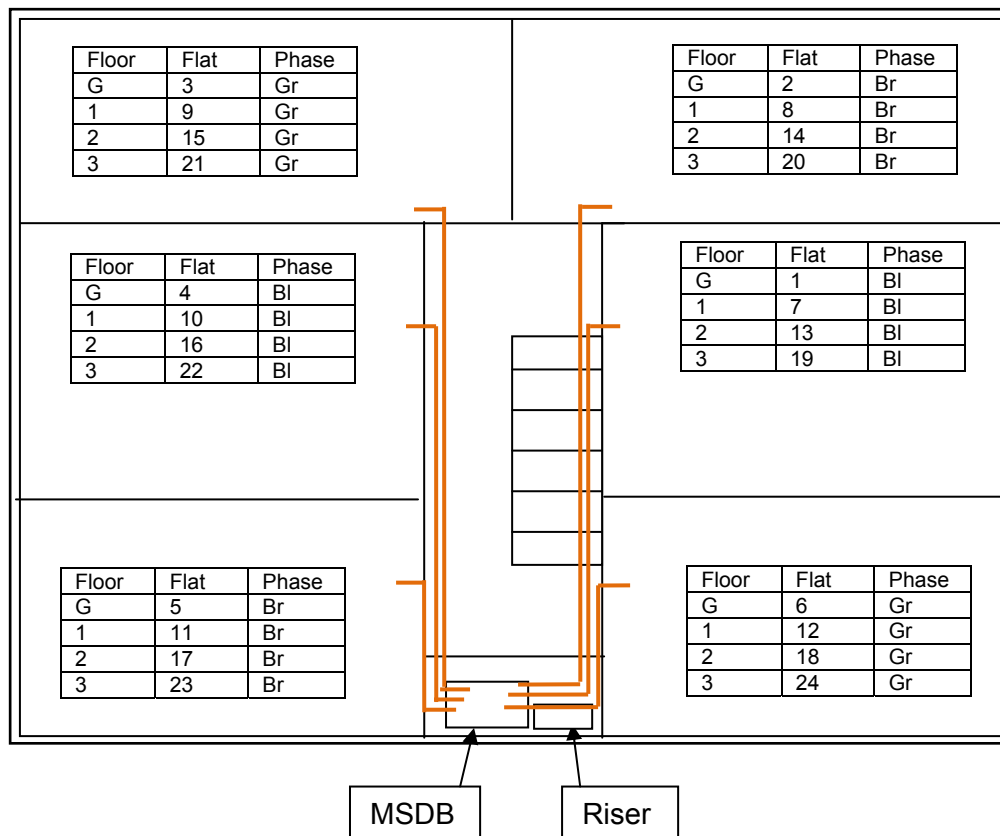
APPENDIX C

EXAMPLES OF "AS CONSTRUCTED" RECORDS

Plan view of floors

Example House

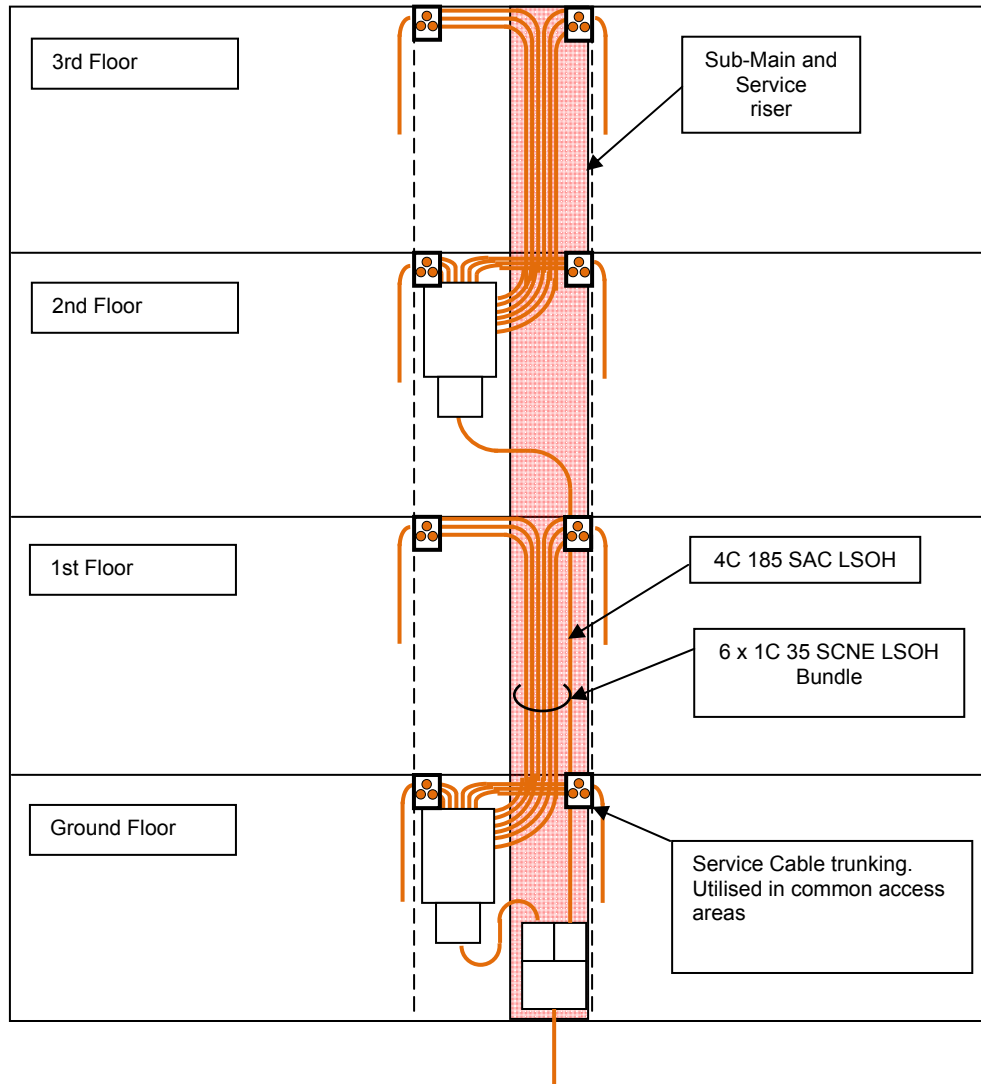
1 Unknown Street



Elevation view of Building

Example House

1 Unknown Street



Schedule of internal cabling

Schedule of Sub- Main Cables	Cable type	Length (m)
Ground floor – 2 nd Floor	4C 185mm ² X SAC LSOH	12.0

Schedule of Service Cables		Cable Type: 35mm ² SCNE LSOH								
		Flat No.	Length (m)	ELI (Ω)	Flat No.	Length (m)	ELI (Ω)	Flat No.	Length (m)	ELI (Ω)
7 Way MSDB Ground Floor	Brown	2	32	0.19	5	9	0.17			
	Black	1	20	0.18	4	20	0.18			
	Grey	3	32	0.19	6	9	0.17			
	Brown	8	39	0.20	11	16	0.17			
	Black	7	27	0.18	10	27	0.18			
	Grey	9	39	0.20	12	16	0.17			
	Brown									
	Black									
	Grey									
7 Way MSDB 2nd Floor	Brown	14	32	0.19	17	32	0.19			
	Black	13	20	0.18	16	20	0.18			
	Grey	15	32	0.19	18	32	0.19			
	Brown	20	39	0.20	23	16	0.17			
	Black	19	27	0.18	22	27	0.18			
	Grey	21	39	0.20	24	16	0.17			
	Brown									
	Black									
	Grey									