



Engineering Recommendation G81 Part 4
Issue 3 2016

Framework for new industrial and commercial
underground connections
Part 4 Design and planning

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First published, 2006; Revision and Amendment 1, 2008

Revised, 2016

Amendments since publication

Issue	Date	Amendment
1	2006	First issue
2 + A1	2008	Revision and Amendment 1: Reference to ENA Engineering recommendation G5/4 updated to G5. Reference to ENA Engineering recommendation P2/5 updated to P2. Reference to Electricity and Pipe Line Works (assessment of environmental effects) Regulations removed. Reference to Electricity Works (Environmental Impact Assessment)(England and Wales) Regulations changed to refer to the document amended in 2007. Reference to Electricity Safety, Quality and Continuity Regulations 2002 changed to refer to document amended in 2006.
3	2016	Minor revision to reflect changes in the Ofgem Competition in Connections regime and updating of reference publications and legislation. This issue includes the following principal technical changes. Clause 1: Scope amended to generally cover HV underground connections up to and including 20 kV to account for changes in ER G88. Added definition for "End Customer" Earth loop resistance changed to earth loop impedance. Added definition of "ADMD" and "IDNO". Added requirement for fault level contribution from distributed generation to be considered.

		<p>Clause 4: Changed 'Building Regulations 2010' to 'Building Regulations (applicable to the location)' to reflect different Building Regulations apply for different locations of the UK. Added explanatory footnote.</p> <p>Clause 6.2.2: Added requirement for any relevant requirements in the Meter Operation Code of Practice Agreement (MOCOPA®) to be adhered to.</p> <p>Clause 6.10 Added requirement for substations not be located on land that is exposed to the risk of flooding, wherever possible.</p> <p>Annex C.1.1:</p> <p>Replaced reference to Ofgem Final Proposals document with Host DLH Connection Charging Methodology/Statement.</p> <p>Reference to CDM Regulations changed from "2007" to "2015".</p> <p>Details of all other technical, general and editorial amendments are included in the associated Document Amendment Summary for this Issue (available on request from the Operations Directorate of ENA).</p>
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Foreword

This Engineering Recommendation (EREC) is published by the Energy Networks Association (ENA) and comes into effect from date of publication. 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 G81 Part 4”.

This EREC replaces and supersedes ER G81 Part 4 2008 (as amended).

This document is a “qualifying standard”, being listed in Appendix 2 of The Distribution Code, and has been revised under the governance of the Distribution Code Review Panel and in association with the Ofgem Electricity Connections Steering Group.

EREC G81 is a suite of engineering documents that sets out a national framework to facilitate competition in new connections. EREC G81 Parts 4-6 are associated with commercial and industrial connections and associated new HV and HV/LV distribution substations, where the requirements are documented as follows:

- Part 4 – Design and planning (this document).
- Part 5 – Materials specification.
- Part 6 – Installation and records.

Since EREC G81 was last amended in 2008 the contestability of connection work has been extended to include jointing of metered and unmetered supplies to existing low voltage mains cables and to jointing of high voltage cables¹. In addition, a significant number of references in the documents have been superseded and new references relevant to EREC G81 have been published. These changes and resultant changes to requirements are captured in this revision. The opportunity has been taken to align the document with the current ENA engineering document template and ER G0 governing the rules for structure, drafting and presentation of ENA engineering documents.

This document is intended to be used by Independent Connection Providers (ICPs) and Independent Distribution Network Operators (IDNOs) that undertake new connections under the Ofgem Competition in Connections regime.

Where the term “shall” or “must” is used in this document it means the requirement is mandatory. The term “may” is used to express permission.

NOTE: Commentary, explanation and general informative material is presented in smaller type, and does not constitute a requirement.

If there are queries about this document, please discuss them with the Host Distribution Licence Holder (Host DLH) in whose area it is proposed that work is to be undertaken. In the event that it is not possible to resolve the question with the Host DLH, please seek advice from the Connections Policy Team, Ofgem, 9 Millbank, London SW1P 3GE.

¹ See Ofgem decision letter dated 8 May 2012 [1].

1 Scope

This document sets out the minimum requirements for design and planning of new low voltage and high voltage (generally up to and including 20 kV) underground electricity networks and associated distribution substations for industrial and commercial connections undertaken under the Ofgem Competition in Connections regime. It is one of the following suite of documents governing this work.

- Adoption Agreement².
- Design and planning framework (EREC G81 Part 4).
- Materials specifications framework (EREC G81 Part 5).
- Installation and records framework (EREC G81 Part 6).
- Underground unmetered connections framework.

This document must be read in conjunction with these documents as some issues, for example equipment ratings, are dependent on the way equipment is specified, designed or installed.

NOTE: This suite of documents applies only to new installations and is not to be applied retrospectively.

This document sets out and makes reference to design and planning requirements which have to be met for a Host DLH to adopt contested HV and LV networks and associated new HV and HV/LV distribution substations supplying industrial and commercial connections generally up to and including 20 kV. This includes industrial and commercial connections on both 'greenfield' and 'brownfield' sites.

This document supplements but does not amend, abridge or override any statutory legislation referred to within this document.

This suite of documents principally applies to connections of industrial and commercial developments although some relevant design aspects associated with multi-occupied premises, e.g. blocks of offices or shops, have been summarised from ER G87. Detailed arrangements associated with planning, connection and operation of new installations involving an interface between the Host DLH and IDNOs are specifically addressed in ER G88.

This suite of documents does not include any requirements in respect of generator or traction supply connections. These are subject to separate consideration.

2 Normative references

The following referenced documents, in whole or part, are indispensable for the application of this document and must be complied with unless otherwise agreed in writing with the Host DLH. The latest editions of these documents including all addenda and revisions shall apply unless otherwise agreed with the Host DLH.

NOTE: It is not appropriate to cross-reference all relevant requirements from the following publications in this document. Where a publication is not specifically cross-referenced in the main clauses of this document then all relevant requirements are deemed to apply.

Standards publications

BS 7671, *Requirements for electrical installations (IET Wiring Regulations, Seventeenth Edition)*

² Also known as "Agreement to Adopt".

BS EN 50160, *Voltage characteristics of electricity supplied by public electricity networks*

BS EN 61508, *Functional safety of electrical/electronic/programmable electronic safety related systems*

BS EN 60909 (all Parts), *Short-circuit currents in three-phase a.c. systems*

BS HD 60269-2, BS 88-2, *Low-voltage fuses. Supplementary requirements for fuses for use by authorized persons (fuses mainly for industrial application). Examples of standardized systems of fuses A to J*

Energy Network Association publications³

ENA TS 12-8, *The application of fuselinks to 11 kV/425 V and 6.6 kV/415 V underground distribution networks*

ENA TS 41-24, *Guidelines for the design, installation, testing and maintenance of main earthing systems in substations*

ENA TS 41-36, *Switchgear for service up to 36 kV (cable and overhead conductor connected)*

ER G5, *Planning levels for harmonic voltage distortion and connection of non-linear equipment to transmission and distribution networks in the UK*

ER G12, *Requirements for the application of protective multiple earthing to low voltage networks*

ER G14, *Protective multiple earthing: recommended principles of testing to ensure correct polarity*

ER G39, *Model code of practice covering electrical safety in the planning, installation, commissioning and maintenance of public lighting and other street furniture*

ER G74, *Procedure to meet the requirements of IEC 909 for the calculation of short-circuit currents in three phase AC power systems*

ER G78, *Recommendations for low voltage supplies to mobile phone base stations with antennae on high voltage structures*

ER G87, *Guidelines for the provision of low voltage connections to multiple occupancy buildings*

ER 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)*

ER P2, *Security of supply*

ER P17 (all Parts), *Current rating guide for distribution cables*

ER P25, *The short-circuit characteristics of Public Electricity Suppliers low voltage distribution networks and the co-ordination of overcurrent protective devices on 230 V single phase supplies up to 100 A*

³ ENA documents can be obtained via the ENA web site: www.energynetworks.org.

ER P26, *The estimation of maximum prospective short-circuit current for three phase 415 V supplies*

ER P28, *Planning limits for voltage fluctuations caused by industrial, commercial and domestic equipment in the United Kingdom*

ER P29, *Planning limits for voltage unbalance in the UK for 132 kV and below*

ER S15 (all Parts), *Standard schematic diagrams*

NOTE: It is likely that Host DLHs will have their own standards.

ETR 138, *Resilience to flooding of grid and primary substations*

National Joint Utilities Group (NJUG) publications

Volume 1, *NJUG Guidelines on the Positioning and Colour Coding of Underground Utilities' Apparatus*

Volume 4, *NJUG Guidelines for the Planning, Installation and Maintenance of Utility Apparatus in Proximity to Trees*

Health & Safety Executive (HSE) publications

GS6, *Avoiding danger from overhead power lines*

HSG47, *Avoiding danger from underground services*

HSG150, *Health and safety in construction*

Balancing & Settlement Code

Balancing & Settlement Code (BSC) Procedure BSCP 520 Unmetered Supplies Registered in Settlement Meter Registration Service (SMRS)

MOCOPA[®] Meter Operation Code of Practice Agreement

Ofgem agreed publications

The Distribution Code

Standard Conditions of the Electricity Distribution Licence

3 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

3.1

After Diversity Maximum Demand (ADMD)

maximum demand of an individual consumer property that includes diversity of load usage for the purpose of calculating site/substation maximum demand

3.2

Applicant

company wishing to undertake the contestable work

3.3

BS

British Standard