Electricity Distribution

nationalgrid

# Company Directive

## G81 Part 5

## Industrial and Commercial Materials Framework

## Appendix A

Industrial and commercial materials framework appendix to be read in conjunction with:

ENA Engineering Recommendation G81 Part 5 “Framework for materials specification for industrial and commercial underground connected loads up to and including 11kV.

Unless otherwise stated the document applies across all 4 NGED licence areas.


**Author:** **Harry Curtis**


**Implementation Date:** **May 2025**

**Approved by:**

**Craig Sharp**

**Date:** **30th May 2025**

| | |
|---|---|
| **Target Staff Group** | **Network Services Teams, External stakeholders (ICP’s)** |
| **Impact of Change** | **Green – no impact on current working practices, restructure / minor amendments of document only.** |
| **Planned Assurance checks** | **Assurance will be assessed as part of design approval and inspection and monitoring regime.** |

**REVISION HISTORY**

| Document Revision & Review Table | | |
|---|---|---|
| **Date** | **Comments** | **Author** |
| May 2025 | • Clause 2 has added reference to SF6 being required for equipment under 20kV<br>• Clause 4 detail has been replaced with EE Spec references<br>• Clause 5 detail has been replaced with EE Spec and Standard Technique reference<br>• Clause 6 – used to detail apparatus list which has now been removed and replaced with Clause 7 – which links to the G81 product database<br>• LV and HV jointing – added as Clause 6<br>• Document re-branded to NGED specification | Harry Curtis |
| Nov 2022 | • Change of 11 + 33kV cable types<br>• Change of Approved suppliers for 11+33kV cables<br>• Change in approved type of 11kV terminations used in RMUs.<br>• Rebrand NG | Richard Summers |
| Sept 2018 | • Change to Approved suppliers of LV connectors<br>• Change to Approved supplier of marker tape / marker boards | Richard Summers |
| Feb 2018 | • Change in approved supplier for link disconnection boxes<br>• Change in approved street lighting cut-outs | Richard Summers |
| June 2017 | • Change of 33kV straight joints and stop ends supplier added to the list.<br>• Change to 33kV indoor and outdoor terminations added to the list.<br>• Change of Inner cone size 3 supplier added to the list.<br>• 66kV straight joints and stop ends supplier added to the list.<br>• 66kV outdoor terminations added to the list.<br>• Inner cone size 4 supplier added to the list. | Peter White |
| Feb 2017 | • 95mm² single core removed and note added to 95mm² triplex detailing its use as fault repairs on existing circuits and for the connection of padmount transformers.<br>• Approved 11 & 33kV EPR cable suppliers added to the list. | Peter White |
| April 2015 | • Removal of 315KVA ground mounted transformers<br>• Change in approved supplier for distribution ground mounted transformers | Andrew Reynolds |
| April 2015 | • Removal of all 4mm and 16mm service cables<br>• Additional 3PH LSF service cables now included | Richard Summers |
| Oct 2014 | • Change in Approved supplier for LV cables<br>• Change in Approved supplier for LV Cut-outs<br>• Change in Specification for marker tape<br>• Addition of combined CT/Cut-out panels<br>• Changes in the Approved 2 and 4 way Linkboxes from Tyco | Richard Summers |
| Oct 2014 | • Harmonization of all 11kV jointing and cable systems within WPD | Peter White |
| | | |

## Contents

## 1.0 INTRODUCTION

1.1 Information contained in this Framework Appendix must be read in conjunction with the National Framework Documents, the Adoption Agreement, and the other two National Grid Electricity Distribution (NGED) Industrial and Commercial Framework Appendices relating to Installation and Design and to cable recording techniques. Please see the NGED Housing Development Installation Framework Document Appendix for full details on supplies to Multi-Occupancy buildings.

1.2 This document includes details of the more common arrangements for supplying industrial and commercial underground connected loads at up to and including 11kV. The maximum LV load is 1000kVA. Arrangements for HV connected load are typically via a tee off circuit breaker (equivalent to a fuse switch) or via a ring main unit, with or without HV metering unit. There are other HV arrangements which are sometimes used by NGED, involving duplicate supplies, some with “wing” metering, or circuit breaker switchboards, which for the purposes of this document we will term “complex”. The availability to employ such complex arrangements may be dependent upon other connection arrangements within the same feeder / ring. Because of this, and since other issues such as protection, ownership and control are also inter-dependent, it is best to discuss such proposed complex arrangements with the NGED Planner at the outset. They can then provide copies of the correct inter-related NGED documents.

1.3 In the event of query please speak to the NGED Planner acting as the focal point of contact for the scheme.

If other than the listed materials or makers are proposed, please pass detailed information to the NGED Planner, who will make contact with the relevant Specifier within NGED to provide a response. Full details of any proposed variation are required, including;

- makers name and place of manufacture
- makers type reference
- rating information
- any applicable Control of Substances Hazardous to Health (COSHH) data sheets

## 2.0 High Voltage (HV) switchgear

**2.1** NGED require non-oil designs of HV switchgear and it should be noted that the EU has introduced legislation that from 1st Jan 2026 equipment under 20kV cannot contain SF6. The UK’s position on this is currently under review and NGED will align with the outcome of this decision. Primary Type Indoor HV circuit breakers must comply with the latest revision of NGEDs Engineering Equipment Specification (EE Spec) 185, which is based on ENATS documents. Since these will generally fall under the “complex” heading above, and introduce inter-dependant requirements please discuss such scheme proposals at an early stage with the NGED Planner who can then provide the appropriate correct mix of NGED documents, including battery and charger specifications, CT, VT requirements, and a listing of NGED approved protection relays. NGED will require to type approve HV switchgear, but this is usually straightforward if the proposed equipment has a Certificate of Conformity issued by the ENA Switchgear Assessment Panel.

**2.2** Where HV Metering Units are required, attention is drawn to the requirements of the Balancing and Settlement Code Procedure (BSCP) for CT and VT accuracy classes to be

based on circuit rating and not size of load. Provision of metering CT and VT test certificates and the burden at which these accuracy tests are required to be undertaken, needs to be discussed at an early stage with NGED Planner and the relevant Meter Provider / Operator. Also arrangements for location and housing of meters will need to be settled, whether HV or Low Voltage (LV).

## 3.0 HV/LV Transformers

3.1 HV/LV transformers are purchased to NGED specification based on Electricity Network Association Technical Specification (ENATS) 35-1. NGED specify maximum acceptable losses for the ratings of transformers employed; 500, 800 and 1000kVA as below.

| Three phase-rating KVA | 500 | 800 | 1000 |
|---|---|---|---|
| No load loss W | 510 | 650 | 770 |
| Load loss W | 5500 | 8400 | 10500 |

3.2 Limitation of transformer noise is important to NGED; please note that specified noise limits are included in ENATS 35-1 and the NGED spec, but are not included in BS EN60076.

3.3 Transformer oil must be certified as being free of PCBs (Polychlorinated Biphenyls) < 2ppm. Transformer oil must comply with BS 148.

## 4.0 LV Fuse cabinets, fuseboards and fuse pillars

**4.1** Shall comply with the requirements of the latest revision of EE SPEC 16 for distribution boards and the latest revision of EE SPEC 28 for intake cabinets.

## 5.0 HV/LV substation enclosures

**5.1** HV/LV substations shall be situated indoors; normally within a Glass Reinforced Plastic (GRP) enclosure. All GRP enclosures shall meet NGED specification as set out below. Dimensions are for unit type arrangements employing Schneider Ringmaster non extensible ring main or circuit breaker equipment. Please also see extensive information in NGED Framework Appendix 4 relating to the design of indoor substations / switchrooms.

GRP enclosures shall comply with the requirements of the latest revision of EE SPEC 19.

Standard drawings are available in the latest revision of Standard Technique: NC1V

## 6.0 LV & HV Jointing

LV joints and terminations shall normally be made ‘colour true’.
Much of the LV network runs at National Standard phasing. However, some isolated parts of the LV network may have non-standard phase rotation or may be 30 degrees displaced from National Standard due to historical crosses on the local HV system. There are also many instances of HV & LV cores being crossed and/or rolled between switchgear, transformer and LV feeder pillar in existing substations.

Where the project requires LV interconnection it may be necessary to cross the LV connections in the substation LV feeder pillar. Where a local 30 degree displacement exists the HV busbars of the substation may have to be commissioned non-standard. The Applicant should seek advice from NGED in these cases.

Most HV projects will require that a National Standard reference be established at an adjacent substation prior to jointing in the new substation. The Applicant should seek advice from NGED in all cases.

**HV cable terminations shall not be physically crossed inside cable boxes under any circumstances.** The correct phasing of the busbars shall be established by crossing cores outside of the cable box where necessary.
The colour conventions commonly encountered in the NGED include, but are not limited to:

| National Standard | Plant | | | New cables | | | Examples of local historical colours | |
|---|---|---|---|---|---|---|---|---|
| | HV | LV | HV or LV | Core Number | British Standard | Harmonised European Standard | PILSTA PILSWA | Leicester plain lead cables |
| L1 | A | a | U | 1 | Red | Brown | Red | Brown |
| L3 | B | b | V | 2 | Yellow | Black | Yellow or White | Green |
| L3 | C | c | W | 3 | Blue | Grey | Blue | Red |
| N | | n | N | 0 | Black | Blue | Green or Black | Blue |

The Applicant must not assume that any marking on cables or plant represent National Standard phases. *Some parts of the NGED system has non-standard phasing as a legacy of individual electric power undertaking's local standards inherited at nationalisation in 1947*.

## 7.0 NGED LIST OF MATERIALS AND SUPPLIERS

NGED maintain an approved product database, available here

**APPENDIX A**

## SUPERSEDED DOCUMENTATION

This document supersedes Issue M dated November 2022 which has now been withdrawn.

**APPENDIX B**

## RECORD OF COMMENT DURING CONSULTATION

No recorded comments.

**APPENDIX C**

## ASSOCIATED DOCUMENTATION

Engineering Recommendation G81 Part 2

**APPENDIX D**

## KEY WORDS

G81, Part 2, Appendices, Industrial and Commercial Materials Framework