Design Policy Update webinar

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Agenda

1. EPD283 Use of 300mm^2 cable
2. CP333 Distribution Substation Earthing Design
3. Introduction to Engineering Recommendation G5
4. Reminder of the structure of G5
5. G5 Assessment: Stage 1
6. G5 Assessment: Stage 2
7. Summary of G5/5 and summary of changes
8. Changes to planning and compatibility limits in G5/5

Electricity North West Planning Policy

EPD283 Use of 300mm^2 cable

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Policy change – Use of 300mm^2 cable

Policy was changed in April 2020 mandating the use of 300mm^2 low voltage cable in most situations.
The following documents were changed:

CP226

Distribution Network Design – Low Voltage

ES213

Design of New Connections for Housing Developments

ES281

Company Specific Appendices to G81 (Parts 1, 2 & 5)

In most situations 300mm2 cable must be used as standard
This applies to all new network to be owned by Electricity North West – with some exceptions
It does not apply to IDNO networks

These are defined on the next slide

Policy – EPD283

300mm^2 cable shall be used as standard for **all future works except**

Fault repair or minors works up to 30 metres in length where the existing conductor size is equivalent or smaller

Rising and lateral mains where it is impractical to install 300mm^2

Service cables feeding termination equipment rated **less than 400A**
for example a 95mm^2 cable may be used to supply a 200A distribution board

Feeders from transformers of 200kVA or less

Terminations where it is not possible to connect 300mm^2 SAC, for example wall boxes

Mains extensions for service cables longer than 30m

Examples where smaller cable may be used

transition joints may be required to connect 300mm^2 to small section cables

Implementation is from 1st September 2020
Any design submissions approved before this date may use previous policy

Electricity North West Planning Policy

CP333 Distribution Substation Earthing Design

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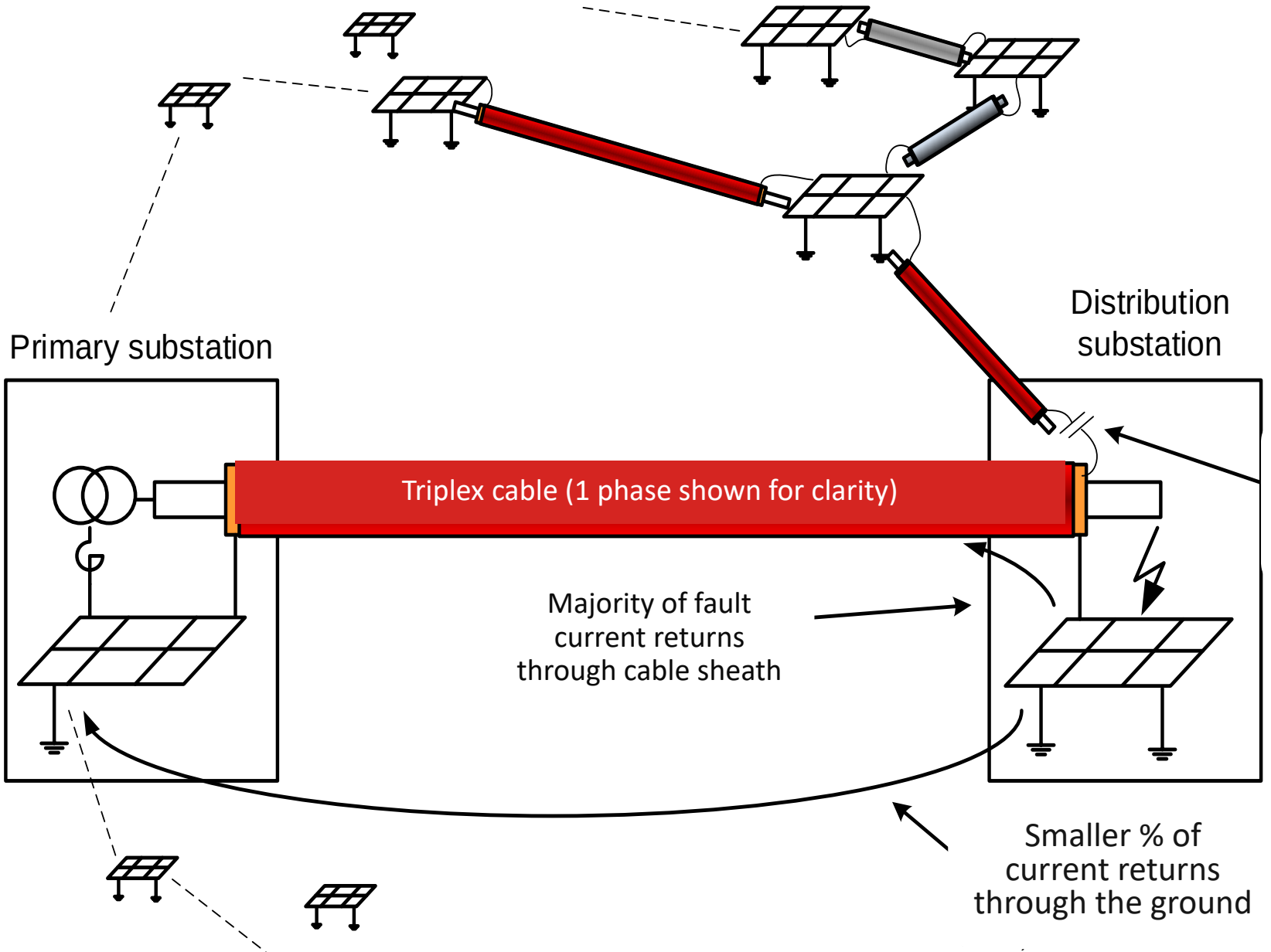
CP333 Substation Earthing Design



CP333 Has been amended to clarify Earth Potential Rise (EPR) calculations

In particular Rules for Ground Mounted Substations (section 5.2) clarified

CP333 Four Design Rules

There are four fundamental rules for ground mounted substations earthing design

The substation shall be safe in terms of touch potential

HV earth shall not exceed 10Ω unless special circumstances

The substation shall be Cold where reasonably practical

The EPR must not exceed 3kV

Calculations may include different elements of the earth system
The policy change clarifies which elements may be used for each rule

CP333 Substation Earthing Design

Rule	Design Requirement	Allowed to rely on:			
		Substation Electrode	Electrode effect of supplying cable	Parallel fault current path	Network contribution (Intact network)
1	Substation must be safe in terms of touch	✓	✓	✓	✗
2	The resistance of the HV electrode system in isolation of the network shall not, exceed 10 Ω unless special circumstances require.	✓	✓	✓	✗
3	The substation shall be designed to Cold where reasonably practicable, i.e. its EPR must not exceed 430V.	✓	✓	✓	✓
4	The EPR must not exceed 3kV	✓	✓	✓	✓

Implementation of G5/5

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Introduction

Engineering Recommendation G5

Issue 5 2020

Harmonic voltage distortion and the connection of harmonic sources and/or resonant plant to transmission systems and distribution networks in the United Kingdom

Implementation – 17th June 2020

There are major changes affecting Electricity North West and our customers

Reminder: G5 assessment have 3 Stages:

Stage 1

- ✓ Simplest
- ✓ Only for LV connections

Stage 2

- ✓ More detailed
- ✓ Site measurements
- ✓ LV and HV

Stage 3

- ✓ Very detailed
- ✓ Site measurements
- ✓ Detailed studies
- ✓ Mainly EHV

**** Today's webinar considers Stage 1 and Stage 2 only ****

It gives and overview and summarises information required. It is not intended to demonstrate the detailed workings of G5

Stage 1 - Summary of changes introduced in G5/5

G 5/5

- Stage 1 and 2 split into substages
- Up to 100th Harmonic
- Generic equipment type introduced
- Other G5/4 requirements remain

Stage 1- new process

LV only

Substages 1A, 1B, 1C and 1D

ONLY:

3-phase 6-pulse converters

3-phase active-front-end converters

3-phase 12-pulse converters

Single-phase rectifiers

1A

Assessment by compliance with IEC 61000-3-2

Less than 16Amps

1B

Assessment by compliance with IEC 61000-3-12

Less than 75Amps

1C

Assessment based on aggregate equipment rated power, short-circuit power at the PCC and technology type

1D

Assessment based on aggregate equipment rated power, short-circuit power at the PCC, technology type and background harmonic level

Stage 1A and 1B – Information Required

Stage 1A information

- Declaration of conformity with BS EN 61000-3-2
- Unconditional connection – no network information needed
- Applies to equipment <16A

Stage 1B information

Declaration of conformity with IEC 61000-3-12, either:

1. 'Compliant with IEC 61000-3-12', or
2. 'Compliant with IEC 61000-3-12 if short circuit power $S_{sc\ pcc}$ is greater or equal to xx'

Conditional connection – needs assessment

This is not new – this approach has been used for many years

Stage 1C and 1D– Information Required & overview

Stage 1C information

Confirmation of equipment type:

- 3 phase 6 pulse converter
- 3 phase active front end converter
- 3 phase 12 pulse converter
- Single phase rectifiers

Assessment is based on **equipment type** rather than harmonic current emissions of each device

Stage 1D information

- Very similar to Stage 1C
- Based on the same equipment type categories
- Uses **measured background harmonic voltages** rather than assumed

Stage 2

Substages 2A, 2B and 2C

HV and those connections failing to comply via Stage 1

2A

Assessment based on aggregate equipment rated power, short-circuit power at the PCC and technology type

2B

Assessment based on aggregate equipment rated power, short-circuit power at the PCC, technology type and measured background harmonic levels

2C

Prediction of the harmonic voltage distortion post-connection based on current emissions and a simple reactance model for the source with a multiplication factor to allow for any low-order harmonic resonance

Summary of G5/5

Stage	Substage	Information required	Site Background measurements?	Voltage
1	1A	Compliance statement IEC61000-3-2	✗	LV
	1B	Compliance statement IEC61000-3-12	✗	LV
	1C	Equipment Type (3 phase 6 pulse etc)	✗	LV
	1D	Equipment Type	✓	LV
2	2A	Equipment Type	✗	HV
	2B	Equipment Type	✓	HV
	2C	Harmonic current emissions	✓	LV & HV
3	-	Impedance profile, limits for incremental harmonic voltages and total harmonic voltages	✓	EHV

Planning and Compatibility Limits simplified table

Planning and Compatibility limits are now defined using voltages aligned to GB system

For us…	THD Planning Limit %FDN	Comment on G5/5 planning limits
LV	5%	Slight increase to some higher orders
HV: 11kV & 6.6kV	4.5% (previously 4%)	Slight increase to some higher orders

There have been some increases in planning and compatibility limits to match international standards. G5/ 5 now allows assessment up to the 100th harmonic: Electricity North West will only use up to the 50th of stage 1 and 2.