

**Supplementary Reference to  
NA000403R481 Guideline for  
Adoption of CMEN Earthing  
System**



# Supplementary Reference to NA000403R481 Guideline for Adoption of CMEN Earthing System

---

## Purpose and Scope

This document is a supplement to NA000403R481 Guideline for Adoption of CMEN Earthing System and demonstrate how the example calculation is executed through each step.

## Responsibilities

- Group Manager Engineering Standards & Technology is the Process Owner responsible for approving this Reference document.
- Engineering Manager Distribution Network Standards is responsible for maintaining this Reference document.
- Underground & Public Lighting Standards Engineer is the Subject Matter Expert (SME) for the content this Reference document.

## Definitions, Abbreviations and Acronyms

**CMEN** Common Multiple Earth Neutral

**HV** High Voltage

**LV** Low Voltage

**MEN** Multiple Earthed Neutral

**R<sub>NE</sub>** Resistance of network extension

**R<sub>E</sub>** Resistance of existing network

**R<sub>t</sub>** Design Earth Resistance

**Design Earthing Resistance** the overall resistance required to be obtained / achieved to comply with Curve A1. The value of this resistance is dependent upon the protection clearing time over the expected range of fault currents at the point of the network extension. The Design Earth Resistance is usually a combination of the existing resistance and the resistance of equipment to be connected.

**Disconnected Earth Resistance** the standalone earth mat resistance value without interconnection to the rest of the network. E.g. disconnected from the neutral, HV cable screens, etc.

## References

- Electricity Act 1994
- Electrical Safety Act 2002
- Electrical Safety Regulation 2002
- Electrical Safety Code of Practice 2010 Works
- Distribution Design Manual
- Overhead Construction Manual
- Public Lighting Construction Manual
- Underground Construction Manual



## Supplementary Reference to NA000403R481 Guideline for Adoption of CMEN Earthing System

Work Request:	WR000001
Design Name:	EXAMPLE

Prepared By:	A Bletchly
Checked By:	C Noel
Approved By:	C Noel

### Step 1: Define the possible CMEN area

The table below shall be completed with substation Site IDs and a Smallworld polt with the substation and MENs clearly identified attached to the calculation

Substation No.	Substation Site ID	Substation No.	Substation Site ID	Substation No.	Substation Site ID
1	SP0000001	21		41	
2	SP0000002	22		42	
3	SP0000003	23		43	
4	SP0000004	24		44	
5		25		45	
6		26		46	
7		27		47	
8		28		48	
9		29		49	
10		30		50	
11		31		51	
12		32		52	
13		33		53	
14		34		54	
15		35		55	
16		36		56	
17		37		57	
18		38		58	
19		39		59	
20		40		60	



# Supplementary Reference to NA000403R481 Guideline for Adoption of CMEN Earthing System

## Step 2: Identify the design earth resistance

0.290 Enter Design Earth Resistance in ohms.

## Step 3: Determine the existing system earthing resistance

Substation No.	Disconnected Earth Grid Resistance of Existing transformers in ohms [R <sub>earth</sub> ]	No. of <u>Known &amp; Independent</u> MENs at 30 ohms	No. of <u>Known &amp; Independent</u> MENs at 10 ohms	Substation No.	Disconnected Earth Grid Resistance of Existing transformers in ohms [R <sub>earth</sub> ]	No. of <u>Known &amp; Independent</u> MENs at 30 ohms	No. of <u>Known &amp; Independent</u> MENs at 10 ohms	Substation No.	Disconnected Earth Grid Resistance of Existing transformers in ohms [R <sub>earth</sub> ]	No. of <u>Known &amp; Independent</u> MENs at 30 ohms	No. of <u>Known &amp; Independent</u> MENs at 10 ohms
1	5	8		21				41			
2	5	8		22				42			
3	5	8		23				43			
4	5	8		24				44			
5				25				45			
6				26				46			
7				27				47			
8				28				48			
9				29				49			
10				30				50			
11				31				51			
12				32				52			
13				33				53			
14				34				54			
15				35				55			
16				36				56			
17				37				57			
18				38				58			
19				39				59			
20				40				60			

0.536 R<sub>E</sub>

## Supplementary Reference to NA000403R481 Guideline for Adoption of CMEN Earthing System

**Step 4: Determine the required disconnected resistance for the network extension**

0.290	$R_T$
0.536	$R_E$
0.632	$R_{NE}$

Number of Additional Substation in the Network extension	Maximum Disconnected Earth Grid Resistance of Each Substation in ohms
1	0.63
2	1.26
3	1.90
4	2.53
5	3.16
6	3.79
7	4.43
8	5.06
9	5.69
10	6.32
11	6.95
12	7.59
13	8.22
14	8.85
15	9.48
16	10.00
17	10.00
18	10.00
19	10.00
20	10.00

**Step 5: Establish the CMEN area**

**Step 6: Record the new CMEN area**