



SPECIFICATION

Specification And Testing of
Earth Installation for Street
Cabinets

ANE_HT_SP_002_RALL

1 Countries Which This Document Applies To

AT - Austria (UPC)	BE – Belgium (Telenet)	CH - Switzerland (UPC)	CZ - Czech Republic (UPC)	DE - Germany (Unitymedia)	HU - Hungary (UPC)	Applicable to All 12 x Countries
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IE - Ireland (Virgin Media)	NL – The Netherlands (Ziggo)	PL - Poland (UPC)	RO - Romania (UPC)	SK - Slovakia (UPC)	UK – United Kingdom (Virgin Media)	
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2 Issue Status

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4 Approval / Distribution List

Name	Department/ Function	Approver / Information	Approved: Yes/No
Gary Mitchinson	Director Access Network Engineering	Approver	Yes
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4.1 Intended User Group

Access Field Managers (AFMs)	Access Operational Managers (AOMs)	Access Planners	IP Edge (Planners)	Headend Engineers &/or Managers	NBO
<input type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
Access Architecture	Civils Engineering Managers	Access Engineering Managers	Access Engineering Directors	Engineering VPs	Core Engineering
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Contents

1	Countries Which This Document Applies To	2
2	Issue Status	2
3	Version History	2
4	Approval / Distribution List	3
4.1	Intended User Group	3
5	Introduction	5
5.1	Overview	5
5.2	Scope	5
5.3	Earth Requirements	6
5.4	Objectives	6
6	Works Adjacent to or in the Highway	6
7	Earth Installation Electrical Works	6
8	Alternative Method – Earth Ring In Buried Conducrete®	7
8.1	Earth Ring Solution Overview	7
8.2	Earth Ring Assembly Installation	8
8.2.1	Health & Safety Notice when using Conducrete®	8
8.3	Earth Ring Assembly Installation	8
9	Impedance Testing of Earth	12
9.1	Testing Methods	12
9.2	Testing After Completion of Installation Works	14

5 Introduction

5.1 Overview

The Virgin Media Civils, Cabling & Activation and MDU Contract 2010 v1 Series 500 – Chamber and Cabinet Works Section 5.13 details earthing options when installing a street cabinet with mains power present.

In some instances these required earth resistance is hard to achieve using these methods – installation can become costly and involve installing multiple earth rods to meet the earthing requirements.

This document details some alternatives to the solutions defined in the above mentioned contract.

These solutions are approved for use by the LG Access Network Engineering Team and can be tactically deployed to reduce install costs, particularly in areas where the earth resistance is harder to achieve.

5.2 Scope

This document is a supplement to Virgin Media Civils, Cabling & Activation and MDU Contract 2010 v1 Series 500 – Chamber and Cabinet Works.

The above document covers two earthing methods

1: Earth rod – this is the simplest method of achieving the earth resistance providing site conditions and location allow. If necessary multiple rods may be installed to achieve the earth resistance.

- *2: Earth plate – typically be used where this cannot be achieved by using earth rods. If necessary multiple earth plates may be installed to achieve the earth resistance.*

This document introduces a third method

- *3: Earth Ring Buried in Conducrete – this is the most efficient way of assuring the earth readings are in spec.*

Any of the above earthing methods can be used - however assuring the earth reading is compliant both at build and in the future is mandatory.

Liberty Global Access Engineering recommend the third option for all applications due to its superior performance and the fact it can prove more cost efficient than the other two methods.

5.3 Earth Requirements

Street cabinets connected to a DNO electrical supply meet the earth impedance thresholds of –

- less than 20 ohms for a TNCS (PME) earthing system
- or between 80 and 200 ohms for a TT earthing system

as per BS7671:2018 Wiring Regulations 18th Edition.

5.4 Objectives

- To create a safe environment for Virgin Media employees, Contractors, and members of the General Public.
- To ensure that all Virgin Media street cabinets conform to BS 7671:2018 (IEE Wiring Regulations 18th edition).
- To ensure that all installations meets the requirements of the local distribution network operator.

6 Works Adjacent to or in the Highway

- All works undertaken must comply with the current version of the Virgin Media Civils Contract Specification.

7 Earth Installation Electrical Works

- Materials, equipment and workmanship required under this Project shall comply with BS 7671:2018 Wiring Regulations, the Electricity at Work Act and the Rules and Regulations of the Electricity Supplier who provides the power supply.
- The Contractor shall ensure that enclosures following drilling, cutting or removal of cable entry knockouts are cleaned of all waste and surplus material prior to any further work being undertaken.
- The Contractor shall be a current member of either (or both) the National Inspection Council for Electrical Installation Contracting (NICEIC) or the Electrical Contractors Association (ECA), and must be able to demonstrate their compliance with the requirements of these organisations with particular attention paid to safety and quality.
- The Contractor shall ensure that all persons engaged upon the project to undertake electrical testing, inspection and remedial works are appointed as Competent Persons as defined in BS 7671:2018 Wiring Regulations.

8 Alternative Method – Earth Ring In Buried Conducrete®

The following section details the method for deploying an earth ring with Conducrete surround.

8.1 Earth Ring Solution Overview

The Earth Ring Assembly & Conducrete® – The earth ring assembly is a 6m length of 16mm CSA bare copper cable with a 5m green/yellow sheath insulated tail and a 3m green/yellow sheath insulated tail. Also, a 300mm green/yellow insulated tail is enclosed in a 50mm duct for future use, if required. It is encased in the Conducrete® earthing medium in a hole dug below the cabinet pad area to the dimensions of 1000 x 600 x 500mm (LWD).

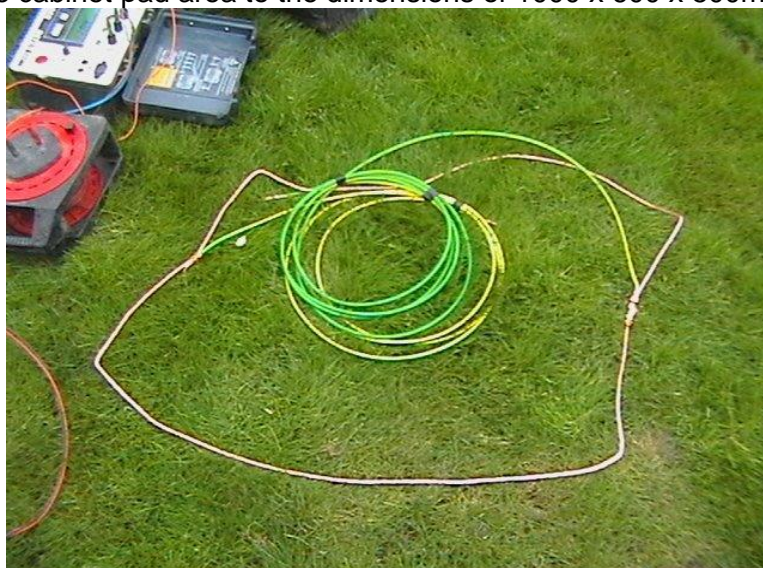


Figure 1: Earth Ring Assembly

- Conducrete® is a conductive concrete, which can dramatically enhance the performance of earthing/grounding systems for superior electrical protection of assets and can create safe zones in areas where traditional earthing methods are unsuitable.
- Conducrete® is provided in powder form and is available in 25kg bags (in line with manual handling requirements), or smaller 11.5kg bags. It is easy to install dry directly from the bag, or mixed with water in a slurry format and pumped into the trench or hole.

This is the preferred first choice of achieving the earth impedance value.

- If necessary, a 6m length of bare 16mm CSA earth cable encased in Conducrete® can be attached to the 16mm CSA bare copper earth ring assembly 300mm extension to extend the length to achieve the required earth impedance value.

8.2 Earth Ring Assembly Installation

8.2.1 Health & Safety Notice when using Conducrete®

- Avoid all personal contact with this product. Prolonged or repeated skin contact may cause irritation. Hypersensitive individuals may develop an allergic dermatitis. Perspiration on the skin combined with this product may be sufficient to cause burns.
- Washing facilities should be readily available when using this product. Periodically wash hands if exposed to dust and wash at the end of work. Wash thoroughly after handling and prior to eating and hand/mouth contact.
- Avoid breathing dusts. Do not use this product in a confined space without adequate local exhaust ventilation.
- Direct eye contact with this product may cause injuries.
- PERSONAL PROTECTIVE EQUIPMENT:
 - EYES: Chemical goggles EN 166B
 - SKIN: Rubber gloves BS EN 388 disposable over sleeves, disposable over shoes & disposable over leggings all in compliance with (PPE Directive 89/686/EEC).
 - RESPIRATORY: Wear a FFP3 approved dust respirator
 - Risk phrases: R20, R21, R22, R36, R37, R37, R38 & R66
 - P.P.E. requirements: eye protection, face mask, gloves & safety boots.

8.3 Earth Ring Assembly Installation

- Before any excavations commence ensure HSG47 (Avoiding Danger from Underground Services) guidance is followed.
- The earth ring excavation area should be dug below the VMSD1 Power Post cabinet as part of the VMSD1/VMVH1 Virtual Hub cabinet site.
 - The earth ring excavation area is 1000 x 600 x 500mm (LWD) below the VMSD1 cabinet footprint.
- Ensure the 5m length insulated earth tail of the earth ring assembly will extend from the VMSD1 area to the VMVH1 power compartment Main Earth Terminal. If not, consult Power & Infrastructure Engineering team for guidance.
- The 3m length insulated earth tail extends from the earth ring assembly to the VMSD1 Main Earth Terminal.
- Lay one unopened 25kg bag of Conducrete® into earth ring excavation. Conducrete® is a very fine, dry powder. Cut open the bag and carefully empty the contents into the excavation with the bag in the excavation. Level the Conducrete® with an appropriate shovel. Install a second 25kg bag of Conducrete® into the excavation following the same procedure.



- Lay the figure 8 folded earth ring assembly on the top of the two 25kg bags of Conducrete®.
- The 300mm extension earth cable must be encased in a 54mm x 300mm length black duct. This duct must extend to the outer edge of the Conducrete® for future access, if required. Note the position of this duct for future reference.



- Using the same precautions as with the previous two 25 kg bags of Conducrete®, install two more 25kg bags into the excavation to cover the earth ring.



- Level the Conducrete® to ensure complete coverage of the earth ring to an overall depth of 100mm.
- Carefully place clean excavated native soil over the levelled Conducrete® and manually compact it.
- Continue backfilling the earth ring excavation and compacting the soil.
- The Conducrete® absorbs moisture from the soil surrounding it, therefore no need to add any water to the dry Conducrete®



- Ensure the 5m insulated earth tail is routed to the VMVH1 (left end power compartment) and the 3m insulated earth tail to the VMSD1 (Main Earth Terminal).
- The 5m tail can be routed to the inter-cabinet 54mm black duct entry in the VMSD1 for routing to the VMVH1 Power Compartment. This duct will also have the SWA power cable and the inter-cabinet 16mm CSA insulated earth cable.



- Following this method statement the construction of the VMSD1, VMVH1 or other VM approved street cabinet root bases should continue as per the relevant specifications for the respective Cabinets.

9 Impedance Testing of Earth

All instruments used to take Earth Resistance measurements must be fully calibrated and the contractor shall supply a copy of the calibration certificate to Virgin Media's Project Manager.

• General Requirements

The testing of the earth electrode resistance should be undertaken in accordance with the Virgin Media Civils Specification Series 500 Clause 512, and must be undertaken by a suitably qualified Electrician as noted in section **Error! Reference source not found.** of this document.

All test results shall be recorded and copies of the results sent to the Virgin Media Project Manager for information and acceptance.

• Testing During Installation Works

The existing earth resistance must be measured and recorded prior to any remedial earthing works taking place.

A number of earth resistance measurements shall be taken and recorded during the installation of the earth electrode. Measurements shall be taken as follows:

1. Prior to any Earthing remedial works being undertaken.
2. Upon placing the earth electrode into the layer of conductive concrete.
3. After backfilling of the excavation has been completed.

9.1 Testing Methods

There are two methods available for obtaining earth resistance readings, as per the IEE Inspection and Testing Guidance Note 3. The type of method used to measure the earth resistance must be recorded and communicated to Virgin Media.

- **Fall of Potential** (Using a Fluke 1653B Multi Function Tester (MFT) and Fluke 1630 Earth Clamp kit) - This method can be used immediately after installation of the ring assembly, however it requires suitable ground conditions to enable the earth probes to be driven into the ground, hence it will only be suitable for cabinet sites with soft surrounding such as grass or unmade surfaces.
- **Electrical Measurement** - This method requires that the power supply be available into the cabinet(s) and hence cannot be made for some time after installation of the ring assembly. A high resistance earth found at this stage will require urgent retrofit work.
- **Earth Ring/Conducrete® Method**
 - Connect red test cable to test probe at furthest length from Fluke 1653B/1630 MFT/earth clamp.
 - Connect yellow test cable to test probe at middle distance from Fluke 1653B/1630 MFT/earth clamp meter.
 - Connect both test cables to correct test points on Fluke 1653B/1630 MFT/earth clamp.
 - Connect green test cable to Earth Ring insulated tail at VMHP1 root location.





- Turn Fluke 1653B/1630 MFT/earth clamp ON and perform impedance test.
- If the DNO has connected their power head in the VMHP1 power compartment, the PME earth impedance test can be done.
- Connect the VMHP1 insulated earth tail to the MET at the bottom centre of the power compartment.



- Perform the PME earth impedance test using the Fluke 1653B MFT.
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9.2 Testing After Completion of Installation Works

The site shall be re-visited between 2 and 3 weeks after the installation is completed and an earth resistance test undertaken, the details recorded and issue to the Virgin Media Project Manager.

- This will indicate the effect that the curing of the conductive concrete will have upon the earth electrode installation and its electrical performance.

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