

**Title: Voltex DS Geotextile
Waterproofing Membrane**

**Determination of Methane & Radon
Gas Permeability**

Certificate of Test Number: 23075

Customer's Name & Address:

CETCO Europe Ltd
Birkenhead Road
Wallasey
CH44 7BU
United Kingdom of Great Britain & Northern Ireland

Our Ref: N950/TR0042

VTC Job No: 3TL1 – 1.350.02

Your Ref: 32PO/227221 dated 16 June 2015

Date: 07 August 2015

Date samples received: 12 June 2015

Samples received from: CETCO Ireland Ltd


Sample No: 149827 – 149830

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TECHNOLOGY 
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1. INTRODUCTION

This certificate of test describes the methane permeability testing carried out at the request of CETCO Europe Ltd on 19 June 2015 at VINCI Technology Centre (VTC), Leighton Buzzard.

The test was carried out in accordance with In-House Test Procedure TP950/05/13569 Issue 1 and "Rilem Report 12, Performance Criteria for Concrete Durability, E & FN Spon, London, UK pp 226 – 230".

2. SAMPLE DESCRIPTION

Technology Centre received the following specimens from CETCO Europe Ltd on 12 June 2015. All specimens were A5 sized sheets of membrane. The membranes were given unique VTC sample numbers for reference purposes only.

Table 1

VTC Ref.	Clients Sample Description
149827–149830	4№ A5 Voltex DS Bentonite Geotextile Waterproofing System with Polyethylene Liner sheets

3. TEST PROCEDURE

3.1 Specimen preparation

One randomly selected specimen from each membrane type was immersed in distilled water for approximately 6hrs to activate the bentonite clay within the geotextile. After immersion, the specimen was allowed to air dry at laboratory conditions ($23\pm 2^{\circ}\text{C}$) for 24hrs to harden to form the waterproof membrane as used in service. After drying, the stiffened sheet of the material was trimmed so as an approx. 90mm diameter test specimen could be sealed in a circular steel rig by epoxy resin in such a way that both faces of the geotextile were exposed.

After encapsulation the test specimens were left to condition in laboratory conditions until the day of test.

3.2 Methane Gas Permeability Test

Methane gas at approximately 20kPa above atmospheric pressure was passed over one face of the sample, and any gas flow passing through the sample was determined via a gas bubble-meter.

4. TEST RESULTS

The results for the testing are contained in Table 2 overleaf.

METHANE / RADON GAS PERMEABILITY RESULTS

Table 2

Client Reference	VTC Ref	Specimen Thickness (m)	Exposed Area (m ²)	Methane Gas Permeability (K _{gas}) (m/s)	Radon Gas Permeability (K _{gas}) (m/s)
Voltex DS Geotextile Waterproofing System with Polyethylene Line	149827	6.72 x10 ⁻³	4.302 x10 ⁻³	2.19 x10 ⁻⁹	8.37 x10 ⁻¹⁰

Date of test: 19 June 2015

Note: The Methane gas permeability gained is used to calculate the Radon Gas Permeability. The Radon Gas Permeability calculated result is not to be used for any radioactive absorbance calculations.

5. SPECIFICATION

The permeability specification for non-geological barriers is as follows:

For inert waste: K_{gas} <1.00 x10⁻⁷ m/s.

Taken from Council Directive 193/31/EC dated 04/1999.

END OF CERTIFICATE