

# Certificate of Test

Supplement to Certificate of Test 8759 issued on 08 May 2007 and Certificate of Test 11333 issued on 05 February 2009 by Taylor Woodrow.

Certificate of Test 11333 was issued with 'Akzo Nobel Decorative Coatings Ltd' renamed to 'Crown Paints Limited'.

Certificate of Test 13164 is issued with 'Sandtex Trade High X-posure' renamed to 'Sandtex Trade X-treme X-posure'.

Since the issue of Certificate of Test 11333 Taylor Woodrow Technology has been rebranded as Technology Centre.

**Title: Determination of Carbon Dioxide Diffusion Coefficient of Sandtex Trade X-treme X-posure.**

**Certificate of Test Number: 13164**

**Client's Name & Address:**

Crown Paints Ltd  
P. O. Box 37  
Crown House  
Hollins Road  
Darwen  
LANCS BB3 0BG

Our Ref: N950/V018

TC Job No: 3NF3 – 1.151.09

Your Ref: PO 4501409336

Date: 24 June 2010

Date sample(s) received: 20 March 2007

Sample(s) received from: Crown Paints Ltd


Sample No: 143959

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This Certificate and the results shown are based upon the information drawings samples and tests referred to herein

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Tested by:   
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**TECHNOLOGY CENTRE** 

## 1. INTRODUCTION

This certificate of test describes the carbon dioxide diffusion testing carried out at the request of Crown Paints Ltd on 02-05-2007 at Technology Centre (TC), Leighton Buzzard, (formerly Taylor Woodrow Technology).

The test was carried out in accordance with In-House Test Procedure TP950/05/13569 Issue 1, which is in general accordance with EN 1062-6:2002.

## 2. SAMPLE DESCRIPTION

Technology Centre received one tin of Sandtex Trade X-treme X-posure (TC Ref 143959). The coating was given unique TC sample numbers for reference purposes only.

## 3. TEST PROCEDURE

### 3.1 Coating Application

The coating system was brush applied to four unglazed ceramic tiles approximately 90x70mm using a weighing procedure to achieve the coverage rate required. Two coats of Sandtex Trade X-treme X-posure was then applied at a rate of 84-94g/m<sup>2</sup>. Each coat was applied at 90° to the previous.

The coated sample was allowed to cure for 2-3 days in the laboratory and then conditioned at 23±2°C and 60±5% relative humidity for a minimum period of four weeks prior to testing.

### 3.2 Determination of Carbon Dioxide Diffusion Resistance

One coated tile (TC Ref. 143959/5) was sealed in a circular steel rig such that the coated and uncoated faces were exposed. Carbon dioxide (15% in oxygen) at a known pressure and flow rate was passed over the coated face of the plate and helium gas was passed over the opposite face at the same pressure and flow rate. The helium gas stream was continuously monitored by gas chromatography to analyse for carbon dioxide. Equilibrium conditions were achieved after approximately 24 hours and the steady state flux of carbon dioxide was then calculated from the percentage of carbon dioxide in the helium stream and the flow rate of this gas.

The diffusion coefficient for carbon dioxide ( $D_{CO_2}$ ) is calculated using Fick's Law of Diffusion and Crank's equation.

## 4. TEST RESULTS

### CARBON DIOXIDE DIFFUSION RESISTANCE

Table 1

Coating System Name	Sandtex Trade X-treme X-posure
TC Specimen No.	143959/5
$D_{CO_2}$ (cm <sup>2</sup> s <sup>-1</sup> )	7.55x10 <sup>-8</sup>
μ-value	1.97x10 <sup>+6</sup>
SD Value (R) (m)	150
Sc (cm)	38
Mean Dry Film Thickness (μm)	76
Date of Test	2 May 2007

Notes:

- i) R (equivalent air layer thickness) and Sc (equivalent thickness of concrete) are dependent on the film thickness and are calculated here for the dry film thickness (DFT) present on the test specimens.
- ii)  $D_{CO_2}$  and the diffusion resistance coefficient ( $\mu$ -value) are calculated using the mean DFT measured on a spare unused specimen.
- iii)  $D_{CO_2}$  for an uncoated plate is  $1.0 \times 10^{-3} \text{ cm}^2\text{s}^{-1}$ .
- iv) Sc is calculated assuming an average grade concrete where the  $\mu$ -value has been estimated as 400.
- v) Klopfer criterion for effective anti-carbonation coating is R greater than 50 metres.
- vi) EN 1062-6 Classification C<sub>1</sub> for Carbon Dioxide Permeability requires the SD value (R) greater than 50 metres.

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END OF CERTIFICATE