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**Armstrong World Industries Pty Ltd  
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# **Chemical Emissions Testing of Armstrong Ultima Square Edge Ceiling Panel – Formaldehyde**

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# **1 EXECUTIVE SUMMARY**

Cetec Pty Ltd has tested the formaldehyde emissions from Armstrong Ultima Square Edge ceiling panel product. This product was tested using the general methods and principles outlined in ASTM D5116 “Standard Guide for Small -Scale Environmental Chamber Determinations of Organic Emissions from Indoor Material/Products”.

The Armstrong Ultima Square Edge product had acceptable formaldehyde emissions.

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## 2 INTRODUCTION

Armstrong World Industries (Australia) Pty Ltd is a global leader in the design and manufacture of floors, ceilings and cabinets. Mr. Paul McDonald, Marketing & Strategic Accounts Manager, commissioned Cetec Pty Ltd to undertake an emission study of the Ultima Square Edge ceiling panel product.

Presently there is intense activity in Australia regarding building sustainability or “green buildings”. Organisations have formed to drive the adoption of “green building” practice; e.g. Green Building Council of Australia, or to recognise environmentally friendly products; e.g. Ecospecifier or Good Environmental Choice Australia.

Building products are coming under scrutiny for their environmental impact. One parameter of interest is the emission of formaldehyde from construction materials. Formaldehyde at low levels can cause irritation of the eyes, nose and respiratory tract and so is not conducive to a healthy indoor environment.

Armstrong World Industries requested Cetec to undertake chemical emissions testing of Armstrong Ultima Square Edge product to quantify the potential formaldehyde that may be present.

Formaldehyde emissions from Armstrong Ultima Square Edge ceiling panel were determined using an environmental chamber. Cetec Pty Ltd conducted the study in Melbourne during June – July 2008.

## 3 METHODOLOGY

The test program involved the determination of formaldehyde emission rate within 24 hours of receipt of test material. The methodology followed ASTM D5116 “Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Material/Products”.

### 3.1 Material

Armstrong supplied ceiling panel product in a sealed carton as detailed in Table 1. Cardboard had been applied around the edges of a stack of ceiling tiles and then the carton shrink-wrapped tightly. Figure 1 shows as example of the Armstrong Ultima Square Edge ceiling panel product.

**Table 1: Sample Identification and Description – Ceiling Panel**

<b>Sample Identification</b>	<b>Description</b>
<b>64274</b>	Armstrong Ultima Square Edge Ceiling Panel (RH99 board - item 1913)

Inside the sealed carton were several stacked product panels from which a test panel was selected from the middle. A portion of this test panel was then prepared for testing in an environmental chamber.



**Figure 1: Armstrong Ultima Square Edge board showing the product face pattern.**

## 3.2 Methods

The environmental test chamber used was as described by ASTM D5116<sup>(1)</sup>.  
Experimental conditions comprised:

- Temperature: 23<sup>0</sup>C±1°C;
- Relative Humidity: 50%±5%;
- Air exchange rate of 1 per hour; and
- Product loading of 0.5 m<sup>2</sup>/m<sup>3</sup>.

Upon opening the received package a test sample was prepared and immediately placed into an environmental chamber.

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<sup>1</sup> ASTM D5116-06, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Material/Products.



Air from the environmental chamber was passed through specific absorbent material to trap the formaldehyde emitted by the test material at 24 hours. Formaldehyde was analysed using a HPLC-UV technique.

## 4 RESULTS

### 4.1 Concentration & Emission Levels

Table 2 summarises for the test material the concentration of emitted chemical species together with the calculated average emission rates.

**Table 2: Formaldehyde Emissions Data**

Laboratory Identification	Product	24-Hours	
		Specific Area Emission Rate (mg/m <sup>2</sup> /hr)	Concentration (mg/m <sup>3</sup> )
64274	Armstrong Ultima Square Edge Ceiling Panel	Formaldehyde: 0.014	0.007 (0.08 mg/L)

The formaldehyde emissions from the Armstrong Ultima Square Edge product met the Good Environmental Choice Australia Furniture and Fittings standard (GECA 28 (2005) section 3.2.1.3) of 0.18 mg/m<sup>3</sup> maximum (TWA). Formaldehyde emissions from the ceiling tile material were acceptable.

## 4.2 Environmental Chambers

While larger buildings are more likely to have mechanical ventilation systems that can filter out some pollutants, buildings are designed to be air-tight to save energy, resulting in less fresh air intake and a general build up of pollutants from building materials in the indoor environment. For this study, small environmental chambers adopting passive adsorption techniques were used better mirror the real indoor environment compared to an active system; in addition diffusive emissions are not affected by airflow.

The formaldehyde emission rates and concentrations in the chamber measured in this study are likely to be higher than concentrations in a real environment because:

1. The chamber concentrations were for fresh material and measured in a static environment. Even with limited natural ventilation in a building and assuming a declining emission with age; the chamber method should result in higher concentration than in a non-industrial environment.
2. Concentrations depend on the amount of floor surfaces in the premises and the air exchange rate. In most cases, the area-to-volume ratio in the chamber will differ from the ratio in a commercial office. The lesser the loading ratio, the lower the total concentration of the materials in the environment.
3. Indoor air quality is affected by a number of factors including the ability of other surfaces to adsorb formaldehyde. Some furnishing within a room may act as sink for formaldehyde of low volatility, which may then be re-emitted over extended times at lower rates, resulting in lower emissions.

## 5 CONCLUSION

Cetec Pty Ltd has completed the materials emission testing of Armstrong Ultima Square Edge ceiling panel. The product had acceptable formaldehyde emissions.

The product conformed to the criteria of Good Environmental Choice Australia Furniture and Fittings standard (GECA 28 (2005)). The formaldehyde level of 0.007 mg/m<sup>3</sup> was below the specification of 0.18 mg/m<sup>3</sup>.



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