

## Technical Bulletin – Tile Tolerances

There are two aspects to tile tolerances – the dimensional tolerances for tiles as supplied and installation tolerances for tiles after they are installed.

### **A Dimensional tolerances for tiles as supplied**

There are no Australian Standards for dimensional tolerances, however **ISO 13006 - 1998** can be used in conjunction with **AS 4459.1-1999** and **AS 4459.2-1999**.

There are three parts to the Standards for dimensional tolerances:

“**ISO 13006 - 1998** Ceramic tiles - Definitions, classification, characteristics and marking” defines terms and establishes classifications, characteristics and marking requirements for ceramic tiles of the best commercial quality (first quality). It answers the question: *What dimensional tolerances are allowed under the standard?*

“**AS 4459.1-1999** (also ISO 10545-1:1995) Ceramic tiles - Part 1: Sampling and basis for acceptance”, answers the question: *How many tiles from any one batch can be outside the tolerances described in ISO 13006 – 1998?*

“**AS 4459.2-1999** (also ISO 10545-2:1995) Ceramic tiles - Part 2: Determination of dimensions and surface quality” answers the question: *How do I measure individual tiles to obtain dimensional readings (e.g. straightness of sides, curvature) referred to in ISO 13006 – 1998?*

#### 1 *What dimensional tolerances are allowed under the standard?*

**ISO 13006: 1998(E)** lists 11 different categories of tiles, providing for more or less stringent tolerances in each category. Although cementitious tiles are not listed, Sadlerstone uses the most stringent of the categories as a basis for their preferred tolerances. ISO 13006 does not define the difference between “precision” and “natural”. As Sadlerstone is made of natural materials and is intended to demonstrate natural characteristics, it could be classed as a natural stone tile.

The following table from **ISO 13006: 1998(E)** gives an example of dimensional and surface quality requirements for extruded ceramic tiles with water absorption below 3%.

## Annex A (normative) Extruded Ceramic Tiles $E \leq 3\%$ Group AI

### A.1 Requirements

Dimensional and surface quality requirements .... shall be in accordance with table A.1

**Table A.1 — Requirements for extruded ceramic tiles, Group AI,  $E \leq 3\%$**

Dimensions and surface quality	Precision	Natural	Test
<b>Length and width</b>			
The manufacturer shall choose the work size as follows: a) for modular tiles in order to allow a nominal joint width of between 3 mm and 11 mm <sup>1)</sup> ; b) for non-modular tiles so that the difference between the work size and the nominal size is not more than $\pm 3$ mm. The deviation, in percent, of the average size for each tile (2 or 4 sides) from the work size ( $W$ ).	$\pm 1,0\%$ to a maximum of $\pm 2$ mm	$\pm 2,0\%$ to a maximum of $\pm 4$ mm	ISO 10545-2
The deviation, in percent, of the average size for each tile (2 or 4 sides) from the average size of the 10 test specimens (20 or 40 sides).	$\pm 1,0\%$	$\pm 1,5\%$	ISO 10545-2
<b>Thickness</b>			
a) The thickness shall be specified by the manufacturer.			
b) The deviation, in percent, of the average thickness of each tile from the work size thickness.	$\pm 10\%$	$\pm 10\%$	ISO 10545-2
<b>Straightness of sides</b> 2) (facial sides)			
The maximum deviation from straightness, in percent, related to the corresponding work sizes.	$\pm 0,5\%$	$\pm 0,6\%$	ISO 10545-2
<b>Rectangularity</b> 2)			
The maximum deviation from rectangularity, in percent, related to the corresponding work sizes.	$\pm 1,0\%$	$\pm 1,0\%$	ISO 10545-2
<b>Surface flatness</b>			
The maximum deviation from flatness, in percent:			
a) centre curvature, related to diagonal calculated from the work sizes;	$\pm 0,5\%$	$\pm 1,5\%$	ISO 10545-2
b) edge curvature, related to the corresponding work sizes;	$\pm 0,5\%$	$\pm 1,5\%$	ISO 10545-2
c) warpage, related to diagonal calculated from the work sizes.	$\pm 0,8\%$	$\pm 1,5\%$	ISO 10545-2
<b>Surface quality</b> 3)	A minimum of 95 % of the tiles shall be free from visible defects that would impair the appearance of a major area of tiles		ISO 10545-2

Using and example of a typical Sadlerstone tile (608 x 608 x 15mm), under ISO 13006, the following tolerances are allowed (square brackets indicate “natural” tiles):

Length and width of the long dimension: 606 to 610mm [or 602 to 612mm]

Thickness: 13.5 to 16.5mm

Straightness of sides: 3mm [3.6mm]

Rectangularity: 1%

Centre or edge curvature: 3mm [9mm]

Surface quality: 5% of tiles can have visible surface defects.

2 How many tiles from any one batch can be outside the tolerances described in ISO 13006 – 1998?

Table 1 in **AS 4459.1-1999** (also ISO 10545-1:1995) Ceramic tiles - Part 1: Sampling and basis for acceptance”, allows one tile in 10 to be outside the above dimensional tolerances – i.e. up to 10% of tiles as supplied.

3 How do I measure individual tiles to obtain dimensional readings (e.g. straightness of sides, curvature) referred to in ISO 13006 – 1998?

“**AS 4459.2-1999** Ceramic tiles - Part 2: Determination of dimensions and surface quality” shows illustrations of the methods for measuring straightness of sides, rectangularity and surface flatness. In the case of surface flatness, a straight edge on the diagonal can be used to measure centre and edge curvature and warpage.

## **B Installation tolerances for tiles after they are installed**

This is described in **AS 3958.1-1991** Ceramic tiles Part 1: Guide to the installation of ceramic tiles on page 53:

### **5.4.6 Tile finish and joints**

(a) When measured with a straightedge, the finished surface of the tiling should be flat and true to within a tolerance of +/- 4mm in 2m from the required plane.

© Joint widths should be consistent throughout the installation unless otherwise specified. The recommended joint widths are as follows:

9i) Floors:

(A) Dust-pressed tiles.....3mm

(B) Extruded tiles.....6mm

(ii) Walls:

(A) Dust-pressed tiles.....1.5mm

(B) Extruded tiles.....6mm

Wider joints may be required to accommodate larger tiles [etc]

### **5.4.7 Bonding**

In some installations small hollow sounding areas may be found. Although they do indicate incomplete bond they are not necessarily indicative of imminent failure. However, cases where more than 20% of the tile sounds hollow when tapped ('drummy') would have to be considered suspect over the long term. [etc.]

The above extracts from Standards describe dimensional tolerances for both tiles as supplied and for tile installations. Refer to Sadlerstone technical literature for discussion on other tile characteristics (e.g. tonal variation, slip resistance etc).