

TECHNICAL GUIDE

Oil Canning

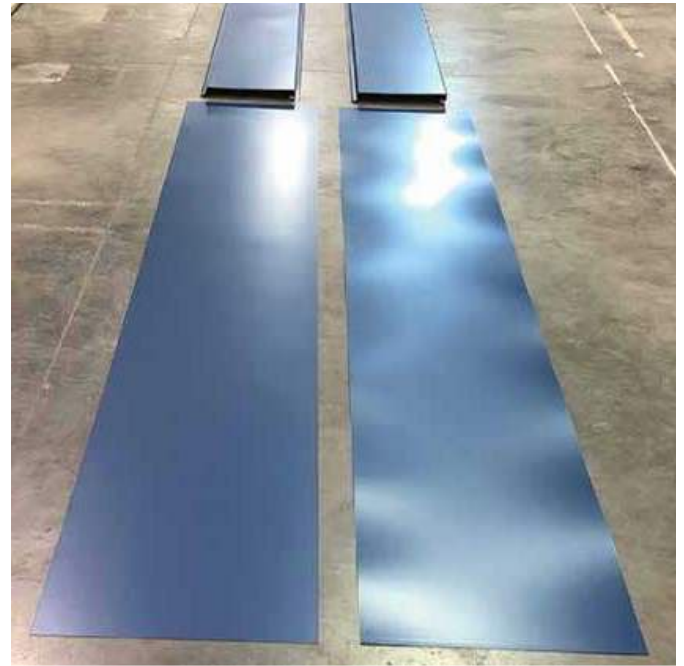
What is Oil Canning?

Oil canning refers to the visible waviness or rippling effect often seen in the flat areas of metal roofing panels, metal cladding panels, and auxiliary metal flashings. This phenomenon typically appears as a non-permanent, inconsistent distortion pattern, which can appear, vary, and / or disappear over time. The size and angle of these perceived waves can vary, with a higher likelihood of occurrence on panels with broader metal surfaces and directly facing the sun

Due to their wide, flat pans, architectural roofing and cladding profiles are more susceptible to oil canning. In contrast, traditional corrugated profiles, which feature narrower, fluted designs, are less prone to this effect.

As a visual phenomenon, oil canning can be more noticeable during specific times of the day and certain seasons, depending on the angle of sunlight striking the roof or wall. The metal's expansion and contraction with temperature variations also contribute to this effect

While often considered an undesirable aesthetic issue, oil canning is an inherent characteristic of all cold-rolled flat metal products.



It does not affect the structural integrity or waterproofing capability of the metal panels. Therefore, although it may be unwanted, oil canning is a common occurrence and is not grounds for rejection.

What Causes Oil Canning?

Several factors can alter the natural levels of stress or tension in metal panels and flashings, leading to the appearance of oil canning. Definitively identifying the major causes of oil canning in a single installation are very difficult to diagnose. Contributing factors include:

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- **Material Finish:** The colour of the panel alters its heat absorption index, affecting how much and how fast a panel expands and contracts. Darker tones increase heat absorption, causing the panel to expand more and faster than adjacent building products. Glossier finishes reflect sunlight more and accentuate oil canning, while matte surfaces tend to diffuse light and show less oil canning
- **Manufacturing Processes:** Inconsistent metal coil and sheet properties, and inconsistent rolling or forming processes during production can create uneven stresses in the metal, leading to oil canning.
- **Design and Structural Elements:** Large, unsupported flat areas or inadequate support structures in building design can worsen oil canning by allowing greater flexibility in the metal, leading to visible waves or ripples.
- **Installation and Construction Methodology:** Incorrect fixing, uneven or unstable substrates, movement of the primary structure, direct fixing of panels with no allowance for expansion and contraction, over-engagement of panels, over-driving of fasteners, panel movement constraints caused by adjacent building materials, panel handling, panel storage, and installation orientation can all contribute to an increase in oil canning
- **Environmental Factors:** Changes in temperature, humidity, and sunlight access, combined with incorrect fixing method, can cause thermal expansion or contraction issues, resulting in panel deformation
- **Site Orientation and Sun Access:** Panels with more exposure to sunlight will behave differently from those in more sheltered positions, expanding and contracting more, which can result in visual signs of oil canning
- **Material Thickness and Grade:** Different material thicknesses and the material alloy grade/composition can result in different behaviours, with thicker and stiffer options being less prone to deformation

How can oil canning be minimised?

Coil producers and panel manufacturers continually monitor their manufacturing processes to minimise the stresses that can contribute to oil canning, aiming to produce top-quality products for the construction market. Despite continued research, the factors contributing to oil canning persist in architectural roofing and wall panel products.

Designers, manufacturers, and installers can take steps to minimise the visible signs of oil canning, though the potential for its occurrence cannot be completely eradicated. Steps to reduce oil canning include:

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1. Design:

- Select panel systems that incorporate concealed clips to allow for panel engagement without direct fixing, resulting in less physical constraint when under thermal stress
- Add striations, clip reliefs, swages, or corrugations to break up the flat surface of a panel, making oil canning less apparent
- Select smaller and narrower panels to reduce the appearance of oil canning
- Use spacer mats or backing rods behind panels to reduce oil canning while incorporating acoustic and thermal insulation and extra drainage
- Use bespoke panel and flashing designs to avoid restriction of panel expansion and contraction capacity
- Select matte, diffusing, and textured surfaces to dissipate sunlight reflection, resulting in less visible signs of oil canning
- Use continuous substrates (e.g., plywood) to offer even support for fixing panels, resulting in less oil canning compared to direct batten fixing

2. Manufacturing:

- Adjust and improve manufacturing processes to ensure uniformity and precision in rolling, forming, and fabrication methods.
- Employ tension equalisation to minimise the potential for deformation by distributing stress evenly across the material.
- Handle, pack, and transport goods appropriately.

3. Installation:

- Ensure the structure and subframe are plumb and even to provide consistent panel support. The substrate should meet the manufacturer's guidelines for the selected system
- Use continuous substrates (e.g., plywood) for No.1 architectural roofing and cladding profiles to reduce oil canning, laying them with a layer of self-adhesive breathable waterproofing membrane for moisture protection
- When installing architectural roofing and cladding profiles over plywood, it is recommended to ventilate the back of the plywood. This will result in less heat gain, consecutively less oil canning, and better condensation management control

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- Use Geofabric spacer mats or backing rods between panels and substrates to reduce oil canning, increase thermal and acoustic insulation, and improve drainage
- Prioritise flashing details that allow for engagement without constraining panel movements from expansion and contraction
- Avoid over-driving screws into clips or panels to prevent uneven stress and increased oil canning
- Always follow manufacturer guidelines, including correct fastening techniques and allowances for thermal expansion or structural movement
- Store, unpack, handle, lift, and move goods appropriately on site

Should Oil-Canned Panels Be Rejected?

In short, no. The installed product (roofing or walling) remains structurally sound and waterproof. Oil canning is inconsistently aesthetic, varies based on factors such as temperature, time of day, and orientation, and is caused by multiple factors, making definitive diagnosis difficult.

Unless specific tolerance conditions are incorporated into contract documents and agreed upon by all parties during the quoting stage, oil canning is not a justifiable reason for panel rejection

Summary

Oil canning is an aesthetic issue and presents no threat to the material structural and waterproofing properties. No manufacturer can realistically guarantee its total elimination due to uncontrollable factors.

However, by combining the approaches outlined above throughout design, manufacturing, and installation, oil canning can be effectively minimised



Image 2: Oil Canning.