

OIL CANNING

Description:

Oil Canning is an inherent characteristic of light gauge cold formed metal products, particularly products with broad flat areas. It is a visual phenomenon seen as waviness or distortion in the flat surfaces of metal roofing and siding products. Oil canning is subjective and is normally an aesthetic concern only and does not affect a products strength or performance. Environmental conditions such as temperature, time of day, annual seasons, amount and angle of sunlight (sunny vs. cloudy) can effect the appearance of oil canning.

Causes of oil canning:

Oil canning is caused by internal stresses within thin gauge metals. These stresses can be introduced during production of the coil and fabrication of the panels. Additionally, field installation conditions, installation techniques and construction tolerances can greatly impact the presence of oil canning. Thin gauge materials will not straighten out or compensate for irregular substrates or misaligned framing members.

- 1) **Metal Coil Production** - The process to transform steel into coil form can contribute to oil canning.
- 2) **Panel Fabrication** - The process of transforming steel coils into panels can induce oil canning.
- 3) **Misalignment of support system** – a support system with large tolerances may cause stresses on the panels as they are fixed to this surface. This stress on the panels can cause oil canning.
- 4) **Over engagement of panels** – Most panels allow for expansion and contraction by flexing of webs and slight room at the side joints. If the panels are pulled or pushed during engagement more than designed, the stress will cause deflection in the flat pan of the panel.
- 5) **Over driving of fasteners** – this operation causes stresses on the panel, particularly with concealed fastened panels connected directly into the support system. In addition, if the fasteners are not driven into the panels or clips at the same level of tension, normal expansion and contraction of the panels due to regular temperature changes can amplify visual waviness. This waviness caused by thermal forces (expansion and contraction) can appear and disappear daily as the sun rises and sets.
- 6) **Movement of primary structure** – if the primary structure of the building has excessive variation in deflection, racking, or drift, it can cause waviness in the flat of the panel, once installed. In addition, settlement of the primary structure can also cause oil canning. This oil canning could be temporary or permanent.
- 7) **Handling of panels** – The manner in which the panels are handled in the field can induce oil canning. Twisting the panels while lifting and removing from a bundle can induce a wavy appearance. Walking on panels can also cause oil canning.

Controlling or Minimizing Oil Canning:

1) Coils:

- a. Purchase quality coil stock within acceptable industry standards and tolerances.

2) Panel Production:

- a. Use sharpened and properly aligned slitting blades.
- b. Use tension leveler prior to roll forming.
- c. Keep roll forming equipment properly adjusted.
- d. Maintain a quality check for profile dimensions and angularity
- e. Provide proper handling, packaging, and transportation.

3) Design Options:

- a. Specify thicker gauge materials such as 22, 20, or 18 gauge vs. 24 gauge.
- b. Utilize narrow width panels or trim profiles
- c. Add striations or stiffening ribs in the flat of the panel or trim profiles.
- d. Specify low gloss paint finishes. Metallic colors tend to have a higher gloss and could emphasize waviness.
- e. Provide provisions to accommodate thermal stresses such as use of fasteners and clips that allow for expansion and contraction.
- f. Provide proper substrate for attachment.
- g. Orientation of panels (vertical vs. horizontal) may reduce the visual appearance of the waviness in the panels.

4) Installation:

- a. Properly align framing and assure the substrate is in-plane.
- b. Properly store and handle all materials.
- c. Follow approved Shop Drawing Details and industry standards.

- d. Only use materials supplied and/or approved by the manufacturer.
- e. Use proper installation tools, equipment, and techniques, including fasteners.
- f. Consider installing a foam backer rod to the back middle of flat surfaces to “pillow” the face.

Field Checking Panel Flatness:

There is no accepted Standard for field checking questioned flatness or oil canning. The following is a reasonable means to help determine the probable source or cause of oil canning. The intent is to systematically investigate the field conditions, handling, and installation process observing when the oil canning appears and therefore its most likely source or cause.

- 1) Examine the storage area and condition of the crated or packaged materials. Are the materials in a dry protected location, properly supported and retained in a natural manner that does not induce unusual twist or stress on the materials?
OBSERVE
- 2) Remove a panel or two from its packaging. Orient it horizontally; allowing it to hang down on its side yet supported along its top rib approximately every 8 to 10 feet by workers or other aligned supports. **OBSERVE**
- 3) Have the panel(s) transported in the normal manner, both horizontally and vertically, to the location where they will be installed. **OBSERVE**
- 4) Lay the panel(s) flat and loosely on the substrate to which they will be installed without any clips or other means of attachment. **OBSERVE**

- 5) Install panel into (or on to) already installed adjoining panel. **OBSERVE**
- 6) Install clips/fasteners as required and fasten appropriately to the substrate.
OBSERVE

With close and judicious observation, one should be able to determine at which step(s) oil canning first appeared, if any subsequent step(s) changed its appearance, and what possible steps may be initiated to minimize its presence.

Conclusion:

Oil canning is an aesthetic issue that is subjectively identified and evaluated. System performance and structural integrity are not affected unless the distortion is extreme. Since many uncontrollable factors are involved in inducing oil canning, no manufacturer can assure the total elimination of oil canning. Oil canning is not a cause for rejection. However, if attention is paid to the selection of material, panel design and installation practice, oil canning can be reduced or mitigated.

If oil canning is a concern or issue discovered in the field, please contact your sales representative before moving forward on your installation

References:

1. Metal Construction Association Technical Bulletin #95-1060, January 2003
2. American Iron & Steel Institute. "Sheet Steel Coils & Cut Lengths" Steel Products Manual, Oct. 1979
3. US Steel Sheet & Strip Handbook. July 1983
4. ASTM E 1514 - 93 Standard Specification for Structural Standing Seam Roof Panel Systems