MCA
OIL CANNING POSITION PAPER
INTRODUCTION

Oil canning can be defined as a perceived waviness in the flat areas of roofing and siding panels. Generally the period and amplitude of the wave depend on the continuous width of the flat.

Oil canning is an inherit part of light gauge cold formed metal products, particularly those with broad flat areas. Profiles having wide flat surfaces are often referred to as “architectural” roofing and siding panels. Such panels are distinguished from corrugated shapes as the latter are more fluted in design, have much narrower flats, and are less likely to exhibit oil canning.

BACKGROUND

Oil canning has a number of causes:

1) METAL COIL:
Residual stresses induced during coil production can contribute. Examples of other contributing features are:
a. Full center-the coil is longer in the middle of the strip; this is the most common example. (The graduation manifests as ripples or buckles near mid-coil).
b. Wavy edge-the coil is longer on the edge of the strip.
c. Camber-the deviation of a side edge from a straight line. (This is not always a problem).

These conditions exist to some extent in all metal and tend to become more exaggerated as the strength level of the rolled sheet product increases and also for thinner and wider sheet product. When excessive, each circumstance can cause oil canning after roll forming by the manufacturer.

2) FABRICATION:
a. Slitting-The slitting of a master coil can release and redistribute residual forces. The coil’s response can create or increase oil canning. The economics of rolling and coating wider coils makes slitting almost mandatory.
b. Forming-New residual stresses can be created during some forming operations. Architectural panel profiles typically require more forming along sides than in the middle, and often require more forming along one side than the other. This dictates that forming commences along the sides. This sequential “working” of the sheet will have a tendency to “trap” uneven metal contained within the coil in the panel central areas (corrugated ribbed profiles are most often worked from the center out, thereby “pushing” the uneven metal to the edges).

3) INSTALLATION:
a. Misalignment of the support system-Structural supports that are produced, fabricated and installed within allowable tolerances can create a “non-planar” or contoured bearing surface. Stresses induced while panels conform to this surface can contribute to oil canning.

b. Over engagement of panels-Most panels accommodate transverse thermal expansion by flexing of webs and by “take up” at side joints. When panels are over engaged, these relief features are hindered or eliminated. In the extreme the “over engagement” process itself can generate waviness. Either cause can contribute to oil canning.

c. Over driving of fasteners-This operation creates stresses in the panel and provides a “reading line” at the fasteners.

d. Longitudinal Expansion-The surface temperature of exposed panels cycles throughout the year and even fluctuates daily. The temperature and the cycle depend on many variables, e.g. project location and orientation, cloud cover, panel inclination, surface finish or color, system thermal insulation characteristics. The panels’ physical response is to expand or contract. If panels are restrained by “thru-fasteners”, clips or perimeter details, they try to accommodate or relieve thermal forces through several mechanisms, i.e. “slotting” around fasteners, out-of plane “bowing”, local distortion of flat areas-“waviness”. The magnitude of thermal force depends on the restraint provided (hence the panel stiffness and support stiffness), on the base materials’ physical properties and on the temperature differential between the support structure and the external skin.

Waviness can be amplified when there is uneven fastener restraint along the panel. Such restraint is common on “concealed fastener” systems having fasteners along one edge and an interlock along the other. Waviness caused by thermal forces differs from other forms of oil canning in that waves can appear and disappear as the sun rises and moves along the building.

e. Movement of the primary structure-Excessive differential deflection, racking, drift, or settlement within the primary structure can cause noticeable waviness within panel flats. This distortion can be temporary or sustained.

f. Handling-Carrying of panels in the flat or twisting of panels can induce a wavy appearance to a previously flat panel. Twisting can occur if one corner of a panel is used to lift a panel or to remove the panel from a bundle.

Coil producers and panel manufacturers attempt to minimize these conditions and produce quality products. On going research seeks improved production methods. Regardless all of the above factors can and do occur and can cause oil canning in an architectural roofing or siding product. While a number of factors are dictated by the panel design, there are steps that the designer, panel manufacturer, and erector can take to reduce chances of oil canning:

1) **COIL**:
Tension or stretcher leveling, a process whereby the metal is “stretched” in coil form beyond its yield point, will provide a flatter surface less prone to oil canning. In general the heavier the gauge the less likely a product is to oil can. The possibility of oil canning can be reduced by ordering tension leveled and resquared material.

2) DESIGN:
The addition of stiffening beads “breaks up” the flat surface and makes oil canning less apparent. Embossing will also help hide surface waviness in the metal. The selection of lower gloss coatings and lighter colors tend to minimize the visual effect of oil canning.

3) INSTALLATION:
More stringent specifications regarding the alignment of the supporting structure will focus attention on this critical aspect. Instructions to the erection forces regarding proper handling, spacing, and fastening should be a part of the manufacturers’ delivery packet.

CONCLUSION

Oil canning is an aesthetic problem. Normally structural integrity is not affected. However, structural integrity must be reviewed if the distortion results from an extreme external influence. Since many uncontrollable factors are involved, no manufacturer can realistically assure the total elimination of oil canning. With careful attention to the production and selection of material, to the panel design, and to installation practice, oil canning can be effectively minimized.

Unless specified tolerances have been accepted by the panel provider and panel manufacturer and are incorporated into the contract documents prior to fabrication, and if reasonable precautions have been taken, oil canning is not grounds for panel rejection.

BIBLIOGRAPHY

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METAL CONSTRUCTION ASSOCIATION
1101 14TH Street, N.W., Suite 1100
Washington, DC 20005
Telephone: (202) 371-1243
Fax: (202) 371-1090