Sheet Steel Facts 13

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Position Paper on Oil-Canning: Specifying Wide Flat Panels in Metal Cladding

What is Oil-Canning?

Oil-canning is associated with all thin sheet metal products and occurs in the wide flat portions of the cladding profile. It is seen as a series of standing waves, or regular bumps and hollows alternating along the flat length of the panel. This waviness, when viewed under certain conditions, can be undesirable aesthetically and may not meet with the owner's expectations. The CSSBI wants to help avoid this situation.

The cladding manufacturers are aware of the potential for oil-canning in the cladding profiles and can help minimize the effect. It is important for the proper steps to be taken during manufacturing and installation to produce a quality finished product; therefore, specifiers should insist on product from a reliable, experienced cladding manufacturer, like a CSSBI member company.

Figure 1: Oil-canning on Wall Cladding

Quality control, however, cannot end on the shop floor. The building project needs the cooperation and knowledge of everyone involved to enhance the quality of the finished job. Oil-canning is a phenomenon that can be managed if the following factors are considered at the beginning of a project.

Common Factors that Affect Oil-Canning

Sheet Thickness: *Generally* the thicker the sheet, the flatter the profile can be maintained. For some products, however, this may not always be the case. The cladding manufacturer can advise on the best option.

Flat Width of Cladding Profile: The addition of stiffening ribs or ridges "breaks up" the surface and reduces the flat width of the profile. The narrower the flat width of the cladding element the harder it will be for that area to develop into noticeable oil-canning waves. If wide flat elements are necessary, then more attention should be paid to the other factors that can reduce the possibility of serious oil-canning.

Temperature: The expansion and contraction of the cladding sheet due to changes in temperature creates stresses that will exaggerate oil-canning. The surface temperature of the cladding will cycle throughout the year and even fluctuate daily. The amount of fluctuation depends on a number of variables such as project location, building orientation, cloud cover, surface finish, colour and solar absorption characteristics. The impact of temperature changes on the panel appearance can be exaggerated if the perimeter flashing conditions inadvertently restrain the panel. Only fasten one end of the sheet to allow for expansion and contraction. Shorter panel lengths can also help reduce these stresses. The use of expansion type hold-down clips that allow the panels to expand and contract can be helpful for metal roofing applications.

Cladding Orientation: Cladding panels can be installed either vertically or horizontally to achieve different architectural effects. The appearance of oil-canning in a vertical application is less pronounced than in a horizontal application due to the different way the eye of the observer perceives the standing waves.

Paint System and Colour: The nature of the paint system selected for the cladding is a strong contributor to controlling the visual impact of oil-canning. Lighter colours will reduce the visibility of oil-canning where the identical cladding in a darker colour will highlight any irregularities. Paint systems with textured finishes and lower gloss will also be less likely to show oil canning.

Cladding Slope: The slope of the wall or roof on which the cladding is mounted will affect the visibility of oil-canning by changing the angle of incidence of the reflected light. Vertical applications with the light striking the surface at high angles of incidence perpendicular to the length of the flat element will reduce the visibility of oil-canning waves.

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

Figure 2: Handling Sheets

Fastening: Over-engagement of the cladding panel and over-driving of fasteners are two installation-related factors that can contribute to oil-canning. Most panels accommodate transverse thermal expansion by flexing of webs and by “take-up” at side laps. When panels are over-engaged, these relief features are hindered or eliminated, particularly for the flat panels without corrugations. Installing the fasteners requires some control to ensure that the fastener is not over-driven. An over-driven fastener will pull down the cladding locally and can create noticeable deformations.

Erection: Installation of roof cladding involves walking on the sheets during the erection process. Local permanent deformation of the cladding can result if installers step on the wrong part of the sheet. An experienced installer should be aware of this possibility and take appropriate care.

Erection Tolerances: Out-of-straightness of the structural supporting members will increase oil-canning by inducing bending stresses into the profile when attaching the profile to a misaligned structure. As a last resort, the cladding panel can be shimmed to correct the most serious misalignment problems.

Movement of the Primary Structure: If the primary structure moves due to differential deflection, racking, drift or settlement the amount of oil-canning can be increased. This type of oil-canning can be temporary as the structure continues to move, or could be permanent depending on the root cause of the movement.

Subjective Assessment: The acceptance of oil-canning (if present at all) is a very subjective assessment between different observers. If the building project demands a very tight control on the possibility of oil-canning, then extra attention needs to be given while specifying the cladding product.

Preventative Measures

Some degree of oil-canning will occur in all flat panels, but only in a few cases is the amount considered unacceptable. It is important to recognize that it is always best to prevent oil-canning; corrective measures after the cladding is installed are usually very limited. Many uncontrollable factors contribute to oil-canning and no cladding manufacturer or installer can assure the total prevention of oil-canning on any project. Preventative measures that consider all of the contributing factors are the key to a successful project.

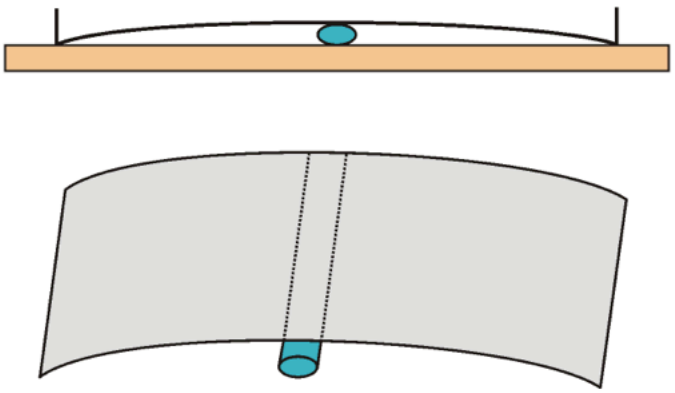

Figure 3: Backer Rod Installation

One approach for minimizing oil-canning on some profiles is to use a backer rod or some type of compressible material under the sheet as shown in Figure 3. The rod will cause the centre of the panel to “pillow” uniformly and reduce the visual effects of oil-canning when installed.

Conclusions

Oil-canning is an aesthetic issue only. Structural integrity is typically not affected. In the absence of specific contract requirements, oil-canning should not be the sole grounds for rejecting a cladding installation.

This Bulletin has tried to give an objective, factual explanation about the phenomenon of oil-canning in cladding profiles. The customer acceptance of sheet steel cladding will be enhanced if all parties to the building project recognize the factors that contribute to enhancing the appearance of wide flat profiles. This recognition should be made at the start of the project when there is still the opportunity to discuss any concerns with the cladding manufacturer.

For More Information

For more information on sheet steel building products, or to order any CSSBI publications, contact the CSSBI at the address shown below or visit the web site at www.cssbi.ca