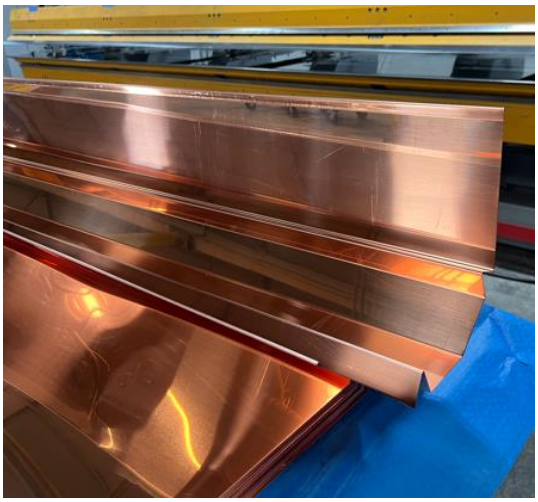
WHITE PAPER

Best Practices for Use of Single Skin/Plate Metal for Exterior Cladding: Fabrication

Overview

For the appearance and performance of Single Skin/Plate metal to be premium quality, there are two very different, but equally important, tasks to be focused on. The first of these tasks is the fabrication of the single skin / plate metal from the "as manufactured" format to the desired end product. The second task is the installation of the fabricated cladding. In some instances, the installed appearance and/or performance is not as expected by the client. After reading this paper the reader will be aware of specific items to be considered in the fabrication of single skin/plate metal for exterior cladding and the end goal of a high-quality project.



This is the first of two papers that will discuss these important aspects.

Fabrication is the first step in this process, but only after metal selection takes place. The fabrication of single skin/plate must be done correctly.

Metal Selection

Metal type

One of the first decisions to be made is the type of metal to be fabricated. Different metals are available in different product widths. Certain metal products are also only available in sheet stock rather than coil format. This is important because the sheet stock material has a fixed maximum width and length. Coil format, on the other hand, has a maximum width but allows the fabricator an almost unlimited selection of finished product length. As we will discuss later, the fabrication equipment also must be considered when deciding the maximum length of a finished product. Natural metals, pre-painted and anodized aluminum, metallic coated steels, and basic steel materials are often available in coil format. Thicker plate products, and some natural metals are only available as sheet stock.

Metal thickness

Metal thickness is a key consideration. Thickness impacts the bending strength and the ability for a tight radius in the finished product. Product thickness may also impact the visual appearance of the finished product as “oil canning” which is surface waviness potentially caused by significant changes in metal temperature. Common metal thicknesses for rolled products include 22 to 24 gauge (Steel) and 0.032” to 0.050” (aluminum sheet). Fabricated aluminum plate will typically be in the 0.063” to 0.190” range. A variety of thicknesses for natural metals such as zinc, copper, etc. are available for fabrication.

Material thickness helps to dictate bending strength and available methods of fabrication. Thickness may also have an impact on when the metal is finished (i.e., paint finishes and anodizing). Thinner gauge materials are most often painted prior to fabrication. Heavier material, beyond 0.080 aluminum, will be more likely to require painting or anodizing after fabrication.

Metal Fabrication

Panel profile

Panel profile is an important aspect for several reasons. First, the less flat surface area designed into the panel, the less susceptible the panel is to oil canning once installed providing shape or profile adds dimensional strength to the finished product that would not be there if the panel were flat. One must also keep in mind the available width of the starting coil or stock sheet because the more panel profiling included, the less overall final panel width is available. For instance, a heavily profiled panel requiring a coil width of 48” could end up only yielding a coverage width of 12”-18”. Profiling may be a structural requirement for the panel to resist the deflection due to imposed loads as required by code.

Profile width

The influence of the panel profile on the panel width has already been covered; however, the impact of thermal expansion on the profile must also be considered. Thermal expansion could cause distortion or even metal failure depending upon the geometry of the profile and how the panel is fixed to the structure. Another consideration for profile width is the limitations of the fabrication equipment. The construction of the fabrication equipment may make it impossible to have significant bends in the same direction closer than a certain dimension.

METAL CONSTRUCTION ASSOCIATION
8735 W. Higgins Road, Suite 300, Chicago, IL 60631
847.375.4718 | mca@metalconstruction.org | www.metalconstruction.org

Profile depth

As with profile width, profile depth has an impact on panel deflection as well as the amount of coverage finished product will provide. In addition, the fabrication equipment may have limitations on how deep bends can be made and how close together those deep bends can be. Another consideration for profile depth is the ability to stack or "nest" the finished panels for shipping to the finisher or the jobsite provided the profile angle is no greater than about 80 degrees.

Surface condition

The surface condition of the panel, whether smooth, embossed, or striated, is often not a fabrication consideration if the panels are protected with some type of heavy masking. This masking is applied to specifically protect the metal surface, whether pre-finished or not, from damage during fabrication, transport, and handling. Once installed, the masking is removed as quickly as possible to avoid excessive exposure to the elements which can lead to possible difficulty in masking removal.

Fabrication equipment

As previously mentioned, a final significant consideration that must be made is the fabrication equipment used. Bed length impacts the maximum length of the final panel and the die configuration impacts how close together bends can be and what the profile depth can be. While there is some adjustability in profile depths there does come a point, based on the equipment used by the fabricator, where a desire profile cannot be attained. Prefinished metals may also be subject to die marks from certain equipment such as press brakes. Masking is a consideration based on equipment used also. Rolled panels are typically available in longer lengths, but consideration should be given to the effect of expansion and contraction on these longer lengths.

There is always the possibility of on-site (field) fabrication. Typical techniques include on-site roll-forming and final field adjustments needed to make installation possible. As with the shop fabrication discussed above, limitations on die profiles for roll forming and the capabilities of field tools must be taken into consideration. Field fabrication should be specifically planned for and is generally kept to a minimum due to the limitations of the equipment available.

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Summary

While there is great flexibility in the type of metal used and the finished profile, there are limitations to what can be fabricated for actual installation. These limitations may vary from fabricator to fabricator and the designer should be aware of the fabricator's limitations before final project design. While color and final appearance are important, fabricators are generally well aware of how to maximize the structural performance of the profile with the equipment available. That is why the fabricators should be key contributors in the final design of any panel project.

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