

SSPC: The Society for Protective Coatings

PAINT APPLICATION GUIDE NO. 11

Protecting Edges, Crevices, and Irregular Steel Surfaces by Stripe Coating

1. Scope

This guide discusses the technique called “stripe coating” or “striping” as a way of providing extra corrosion protection measures on edges, outside corners, crevices, bolt heads, welds, and other irregular steel surfaces, including optional surface preparation techniques for sharp edges to improve coating performance. Some details, including the advantages and limitations of specific methods of obtaining additional coating thickness, are described to assist the specification writer in assuring that the project specification will address adequate corrosion protection.

2. Background

2.1 Sharp edges, outside corners, crevices, and welds are often sites where coating failures and corrosion begin due to reduced coating barrier protection (see Figure 1). Reduced coating thickness on these surfaces can be a result of application of inadequate amounts of coating, but the surface tension of the wet coating or coating shrinkage during the drying/curing process can also pull the film away from edges. Sharp edges resulting from cutting, burning, and shearing are especially difficult to coat adequately. Bolt threads combine the adverse effects of sharp edges and crevices.

2.2 The solutions to this problem include (1) eliminating the irregularities by grinding, mechanical sanding, or filing; (2) applying a thicker protective coating film to problem areas such as outside edges, pitted areas, and bolts; (3) applying a penetrating and/or good wetting coating to crevice areas and/or inside corners; or a combination of (1) and (2). In some cases, both grinding and stripe coating may be specified for a

given area. The option of choice is usually determined by the best cost/benefit ratio. Factors that enter into the cost/benefit analysis of edge protection include the severity of the exposure environment, interference with production during maintenance, and difficulty in accessing the structure to perform maintenance painting. These factors are unique to each project.

2.4 Sharp edges may be avoided at the prefabrication stage or remedied by grinding after construction, but at a much higher cost. When filing edges, care should be taken to assure that additional sharp edges are not created while modifying the original edge. It is generally much less expensive and easier to grind or chamfer edges in the shop than in the field.

2.5 Additional coating thickness can be obtained by applying an extra layer of coating to the areas requiring additional protection (the “stripe coat”). In some cases, the “stripe coat” may be followed by the application of a full coat of a coating with edge retention properties.

3. Preparing Outside Corners and Sharp Edges

3.1 Outside corners and sharp edges can be ground such that the edge is rounded to a 1.6 to 3.2 mm (1/16 to 1/8 inch) radius. An alternative to rounding is to chamfer the edge to a specified measurement, so instead of one 90-degree corner, there are two 135-degree corners (see Figure 2). The width of the flat ground area, i.e. the distance between the two 135-degree corners, is usually 1.6 to 3.2 mm (1/16 to 1/8 inch). Paint will not pull away from a 135-degree corner as much as from a 90-degree corner, resulting in more overall coating thickness. Further, subsequent abrasive blast cleaning provides some radius to the 135-degree corners.

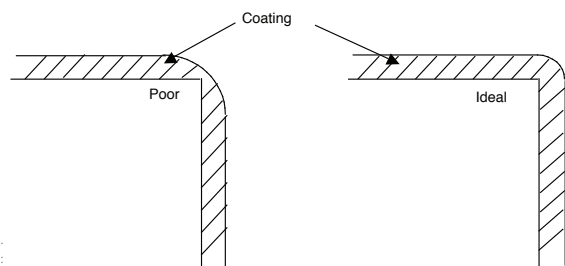


Figure 1. Schematic showing how coating thickness is reduced at a sharp edge.

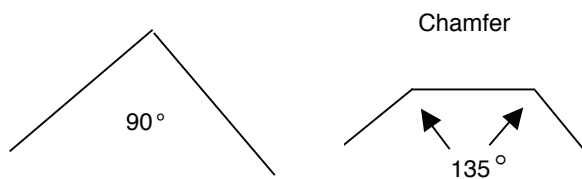


Figure 2. Chamfering reduces a sharp 90° corner to two 135° corners.

3.2 The increased performance resulting from rounding or chamfering edges depends on the service environment, the generic type of coating and on the radius or size of the chamfer. One research study¹ showed that rounding or chamfering had no measurable effect if an ethyl silicate inorganic zinc-rich (IOZ) coating was applied over blast cleaned steel. Therefore, there is no need to go to the added expense of grinding edges if ethyl silicate IOZ coating is specified. However, the same study indicated that rounding or chamfering edges before application of an alkyd or organic zinc-rich primer improved the coating's performance. Even with edge rounding or chamfering, it is necessary that proper spray application techniques be used.^{2,3} The use of coatings with edge-retention properties (see Section 4.7.3) may also minimize or eliminate the need for edge grinding.

3.3 Edge grinding is best done in the shop before blast cleaning where the work is accessible. A sample statement in a specification may read, "All corners and edges shall be rounded to a 2 mm radius (1/16 inch) or ground to a 2 mm (1/16 inch) chamfer." In addition to edges, rough surfaces are ground smooth. Flame cut edges are normally ground over their entire surface to remove the hardened surface layer resulting from flame cutting and permit creation of a profile. For immersion service and other services where increased corrosion can be expected, very rough welds should always be ground because many coatings cannot adequately protect them. NACE Standard RP0178 "Standard Recommended Practice: Fabrication Details, Surface Finish Requirements, and Proper Design Considerations for Tanks and Vessels to Be Lined for Immersion Service"⁴ provides guidance on finish requirements for welds.

4. Stripe Coat Application

A "stripe coat" is a coat of paint applied only to edges, welds, outside corners, bolt heads and threads, and crevices, either before or after a full coat is applied to the entire surface. These areas are difficult to coat due to coating shrinkage during cure. Shrinkage pulls coating away from sharp edges, resulting in low dry film thickness. Wet coating may flow over rather than into crevices. This results in a temporary creating bridge over the crevice that disappears as the coating cures and shrinks, leaving the crevice interior unprotected. Both areas are susceptible to premature corrosion. The practice of applying a "stripe coat" to such areas is frequently referred to as "striping."

The project specification normally specifies the areas are to be striped, how to apply the stripe coat (brush or spray), in what order to apply the stripe coat (before or after the full coat), which coats are to be striped, whether tinting of the stripe coat or use of another color of coating is required, and information on the drying/curing requirements between application of the stripe and full coat (may defer to the coating manufacturer).

4.1 Areas to Stripe: The facility owner normally determines whether stripe coating is warranted for some or all areas of the particular project. Sometimes only specified areas of outside corners, edges, welds, and crevices are striped. Situations where stripe coating is usually warranted are:

- Immersion service (e.g., interiors of fuel or water storage tanks; ship hulls)
- Areas with high corrosion rates (e.g. cooling towers and splash zones)
- Areas where access is difficult (e.g., towers, some bridges).
- Built up members (e.g., lattice bars and boxes)

Situations where stripe coating may not be cost effective are:

- Non-critical components (e.g., interior wall in living space on a ship)
- Mild exposure (e.g., SSPC environmental exposure zones 1A and 1B^{(1),5})
- Inside corners (can be adequately covered using proper spray technique)

Areas that are usually stripe coated include:

- Crevices
- Plate and sharp edges
- Plate seams
- Back-to-back angle seams (built up members)
- Pitted steel
- Bolt heads and nuts
- Rivet heads
- Welds
- Other sharp discontinuities
- Outside corners
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Stripe coating is most effective on edges that are either rounded or chamfered by grinding (see Section 3).

4.2 How to Stripe

4.2.1 Brushing is the preferred method of applying stripe coats. Unless otherwise specified, SSPC-PA 1 requires brush application of coatings to cracks, crevices, blind areas of all rivets and bolts, and all areas of limited access.^{(2),6} Brush application provides the highest quality stripe coat on most surfaces because it works the paint into the pores and crevices and allows the greatest control over the boundaries of the painted area. The coating should be allowed to dry to recoat according to the product data sheet before the full prime coat is applied. Coating manufacturers will usually provide guidance on the amount of dry time required before application of

⁽¹⁾ SSPC Environmental Zone 1A—Interior, normally dry (or temporary protection). Very mild (oil base paints now last six years or more). SSPC Environmental Zone 1B—Exterior, normally dry (includes most areas where oil base paints now last six years or more)⁴

⁽²⁾ SSPC-PA 1, Section 7.4.6.