

Edge Deletion of Sputtered LoE® Coatings

All Cardinal CG LoE® products, with the exception of LoE i89® and LoE x89®, use silver to improve the Ufactor and lower the Solar Heat Gain Coefficient (SHGC).

These LoE coatings have protective layers over the silver, but they are on the face of the coating, not on the coating edge. The silver at the glass edge is directly exposed to the environment. If coating corrosion due to moisture or adverse chemicals occurs, it will occur from the edge and propagate from this point.

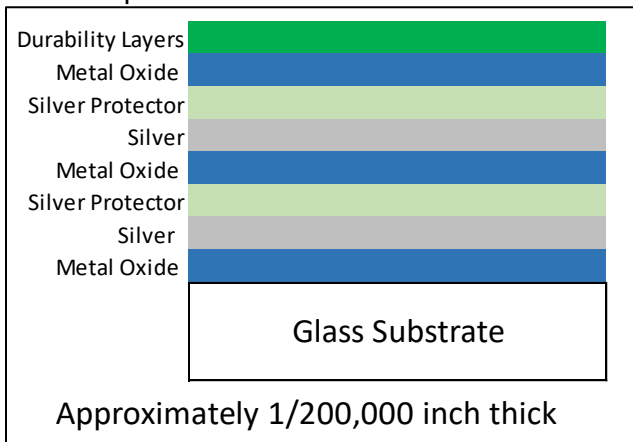


Fig. 01: Typical double silver layer Low-E coating

Procedures

It is recommended all Cardinal's LoE coatings containing silver be completely deleted around the periphery of the glass, as shown in Fig. 02. Since the LoE coating contains multiple coating layers, all layers should be removed to ensure adequate and consistent adhesion of the sealants. The coating should be deleted using an edge grinding technique that removes all of the coating down to the glass surface. The deletion should reach to a height that does not contact the sealant(s) or, in a dual-seal system, to a minimum of half the primary sealant height.

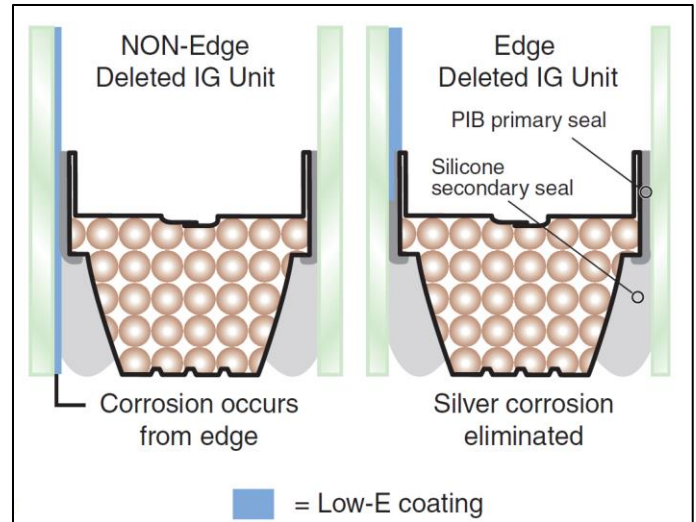


Fig. 02: Edge deletion

Cardinal's edge deletion process does not cause damage to the glass, which would reduce glass strength. Independent testing on non-edge deleted and edge deleted glass samples has shown that there is not a concern for glass strength reduction with edge deletion.

Advantages of edge deletion:

- Bonding of sealants to glass, not to the coating.
- Reduction of the potential for coating corrosion.
- Reduction of the potential for delamination of the LoE coating.
- Reduction in the potential for seal integrity compromise.

If the LoE coating is not edge deleted, corrosion and delamination of the coating can take place and the insulating glass (IG) unit seal integrity compromised. In the long run, the cost of replacing an IG unit far outweighs the cost of edge deletion.

Testing and Past Experience

Tests conducted by Cardinal IG on edge deleted and non-edge deleted IG units indicate that silver corrosion can occur on the non-edge deleted LoE coating.

Competitive double silver low emissivity (Low-E) coatings were tested without edge deletion. These samples were fabricated using a dual seal construction with PIB (polyisobutylene) as the

primary seal and silicone as the secondary seal. The samples were exposed to accelerated weathering of 140° F, 100% relative humidity and UV light, a test known in the industry as the P-1 test. This test was chosen because Cardinal IG and some other IG and sealant manufacturers have used it to determine the durability and weatherability of IG unit constructions.

Significant corrosion of the silver in the Low-E coating was visible after 4 weeks of this test. The failure mechanism involved corrosion beginning at the edge and then progressing into the silicone secondary seal, through the primary PIB seal and into the viewing area of the IG unit. The corrosion and failure mechanism are important because PIB sealants are considered to be the best IG sealant materials for resisting moisture permeation. Since the PIB primary seal did not stop the corrosion of the Low-E coating, corrosion of Low-E coatings will most likely occur with any other sealant material when exposed to the same test conditions.

These tests showed that corrosion of the silver can create the following anomalies:

- Visual obstruction in the daylight opening of the IG unit.
- Premature seal failure of the IG unit (caused by a splitting of the coating layers resulting in moisture entering the airspace of the IG unit)

As shown in Fig. 03, corrosion occurs from the edge of the glass because the silver in the coating stack is completely exposed.

The same tests conducted for 1 year on Low-E coatings that had undergone edge deletion showed no degradation of the coating, with the seal of the IG unit intact. Obviously, the IG or window manufacturer cannot control the exposure of the glass edge to moisture or acidic conditions (e.g., acid rain or household cleaning solutions). Therefore, it is difficult to design a system that will not expose the edge seal of an IG unit to these conditions.



Fig. 03: Coating corrosion due to no edge deletion

Fabrication and Sealants

It is believed that the best unit construction with LoE coatings is a dual-seal unit with polyisobutylene primary sealant and a compatible secondary sealant. Other sealant systems have been successfully used with Cardinal LoE products. For current recommendations on sealant compatibility contact your Cardinal CG sales representative and the sealant manufacturer.

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