



**CITY OF PHOENIX  
PLANNING & DEVELOPMENT DEPARTMENT  
HISTORIC PRESERVATION OFFICE**

**Steel Casement Window Repairs**

Metal windows, including those that may appear to be beyond repair, can typically be restored if proper principles are followed. Common problems include: distortion of metal frame, excessive paint build-up, failed hinges and fittings, and rust. Surface rust typically appears worse than it is, as it occupies up to seven times the volume of unoxidized metal.

**Evaluation:**

The first step is to perform a careful evaluation of the condition of each window unit. Either drawings or photos can be used to record the location, operability and condition (sash, frame and sub-frame) of the windows. The evaluation should cover:

- presence and degree of corrosion
- number of layers and condition of paint
- deterioration of metal sections, including bowing, misalignment of sash or bent sections
- condition of glass and glazing compound
- presence and condition of all hardware, screws, bolts and hinges
- condition of masonry or concrete surrounds, including need for caulking or resetting improperly sloped sills

A professional contractor or window repair specialist can help you with this assessment. If this evaluation reveals that the windows are in basically sound condition, then rehabilitation is the first choice. Areas of light to medium rust, as well as layers of paint, can be readily removed. For windows in generally sound condition, but with select areas of extreme rust, damaged areas can be torched out with new metal sections spliced in and grinded smooth. Caulking, weather stripping and new thermal glass can improve energy ratings for metal casement windows.

**Metal Window Repairs:**

Restoration of steel casement windows is typically not complicated.

1. Before starting work, ensure that adjacent interior and exterior walls, sills and window jambs are shielded with plastic. Additional plastic may be needed if working on open window units from the outside, to ensure that debris does not enter inside and to protect flooring.
2. Remove rust and excess paint from all moving parts and components including hinges, using either chemicals (but not hydrochloric acids), or a hand-held mini grinder or rasping file. Heated removal methods should not be used. Well-bonded paint can remain, although the edges should be feathered by sanding.
3. Gently clean off any remaining rust, debris and loose paint with a wire brush. Any bare metal should be wiped with a cleaning solvent such as denatured alcohol and dried immediately, and then primed immediately to avoid rusting.

4. Using a wrench, ease and adjust casements that may have become distorted. Patch depressions with epoxy compounds with high steel fiber content, plumber's epoxy or auto body patching compound. If there is severe corrosion in select areas, you can torch out bad sections and then weld in and grind smooth new pieces with the window unit in place.
5. Prime exposed metal with a rust-inhibiting primer and repaint with up to two light compatible finish coats.
6. Replace cracked or broken glass, remove glazing compound (where needed) and apply new compound formulated for metal windows. Original glazing may contain asbestos materials, so ensure that you wear protective gear and follow proper containment procedures when removing these materials.
7. Clean, oil and lubricate hinges and all working parts. Repair damaged hinges and fittings and replace those which have been lost or which have been too badly damaged to repair either from stock or by having copies to match. Replace missing screws or fasteners.
8. Finish paint. Use paint that is compatible with the anti-corrosive primer. Use one coat if existing paint is remaining, or two light coats if sections are cleaned down to bare metal. Paint should overlap glass at least 1/8" to form a seal over glazing compound.
9. Caulk the masonry surrounds with a high quality elastomeric caulk suitable for metal. Caulking will help insulation factors with the windows substantially.

#### **Energy Efficiency:**

You can greatly enhance the energy performance of windows by applying weather stripping and security fittings. Spring-metal, vinyl strips, compressible foam tapes and sealant beads are other weather stripping options.

Replacement glass may be used to improve energy efficiency. Replacement glass must be clear or close-to-clear with a Visible Transmittance Rating (VTR) or Visible Light Transmittance (VLT) of .65 or 65% or higher. The original single glazed glass can be replaced with thicker pane glass (3/8" to 5/8" thick) provided that the rolled metal sections are at least 1" deep. Glass may also be replaced with single pane hard coat Low E glass. Dual pane glass replacements may be used if the rolled sections are deep enough to maintain the historic exterior appearance. These glass replacement treatments are not recommended for windows with stained, leaded or figured glass.

Clear windows films with a VTR or VLT of .65 or 65% or higher may be applied to glass to reduce solar heat gain. Energy efficiency can also be increased through installation of interior storm windows, thermal/insulated window treatments (blinds, curtains, etc.), exterior awnings (where appropriate) and plantings of new shade trees at window locations.

#### **Severe Rust Problems:**

If the corrosion is heavy with the rust penetrating deep into the metal, it is best to remove highly rusting metal frames for refurbishment in a workshop. However, if severe corrosion is only in select areas, it may be possible to torch out bad sections and to weld in and grind smooth new pieces with the window unit in place.

Once the glazing and any old putty have been removed from the metal frames, paint and rust should be cleared from the surface of the metal to enable its condition to be inspected. In severe cases, neither wire brushes nor grinders can remove the rust effectively. Suitable alternatives include, acid pickling and the use of air-borne abrasives. After cleaning it will be possible to identify those metal sections which are

too badly corroded to provide adequate structural support. Frequently, this will be the bottom rail or ‘sill’ which is liable to deteriorate through prolonged contact with moisture, and is more vulnerable than the jamb and head.

For steel windows that are removed and repaired off-site, future corrosion resistance can be achieved most effectively by hot dip galvanizing to BS 729. This simple process takes only minutes to carry out. The frames are fully immersed in a bath of molten lead and zinc at temperatures reaching 450 degrees Celsius, so that complete surface coverage is therefore achieved, including inner and outer surfaces, awkward corners and narrow gaps. However, hot dip galvanizing is a harsh process and can result in historic windows turning into “metal spaghetti.” Advice should therefore be taken from a Galvanizers Association member beforehand. Galvanized metal frames can be polyester powder coated to BS 6497 in a range of colors and finishes, matt, semi or high gloss. The applicators provide a warranty of 15 years but 20 years is not uncommon before re-painting is necessary.

### **Leaded Lights:**

It is important to remember that only specialist conservators should clean or work on stained glass, and some repairs to leaded lights, such as re-leading, may also benefit from their assistance. Before de-glazing frames with leaded lights, a useful recommendation is to cover both sides with a ‘cling-film’-type plastic; this lightly sticks to the glass and will help prevent the lights from falling apart in the process. However, if a light does need remaking, all the original glass should be kept for reuse and labeled, not thrown away. Inevitably some work will be required following removal – the belief that a leaded light can be reglazed without any repair work and not leak is a myth. Even if the leaded lights do not need re-leading, the perimeter lead will usually need to be replaced. In most instances the lead cement which holds the glass will also need repairing or replacing entirely.

### **List of Resources:**

<b>Continental Steel - (Steel Windows)</b> 3101 E. 46 <sup>th</sup> St., Tucson, AZ 85713	520-792-0151
<b>A &amp; S Window Associates, Inc. - (Steel Windows)</b> <a href="http://aswindowassociates.com">aswindowassociates.com</a> or <a href="mailto:aswindow@earthlink.com">aswindow@earthlink.com</a>	718-275-7900
<b>Hope’s Windows – (Steel Windows – including dual pane)</b> <a href="http://hopeswindows.com">hopeswindows.com</a>	716-665-5124
<b>Torrance Steel Window Co. – (Steel Windows)</b> 1819 Abalone Ave., Torrance, CA 90501	310-328-9181
<b>Glazing Putty for metal windows</b> DAP 1012 putty for metal windows Atlas Putty Products (Wonder Putty)	Local Hardware Store 800-373-2727
<b>Historic Glass</b> S.A. Bendheim Co, Inc. (Reproduction of old glass for windows & doors)	800-221-7379
<b>Window Hardware</b> Local Hardware Store Blaine Window Hardware Inc.	800-678-1919
<b>Glazing Removal Systems</b> The Steam Stripper from WRS (Window Restoration Systems)	<a href="http://steamstripper.com">steamstripper.com</a>