

## Architectural Glass Solutions by Stuart Dean

*Saving time, money, hassle and the environment through glass restoration and protection solutions*



### EXECUTIVE SUMMARY

Damaged architectural glass can be a problem for every company with a store or business front, especially when display or view windows are involved. Scratches, welding slag, chips, vandalism, atmospheric contaminants, condensation (in insulated glass) and more can cause unsightly issues that are unacceptable in your business environment. Key causes of glass damage range from manufacturer defects all the way to post-installation construction or cleaning damage, resulting in aesthetic, environmental and safety concerns.

Replacement of installed flat glass is expensive, time consuming and sometimes next-to-impossible, depending on location and customization of the glass. If you're like most businesses and are watching expenses, glass restoration may be the answer to damaged glass problems. You may not realize that there are targeted solutions available to remove many types of glass damage, on all kinds of glass. There are even solutions to help prevent damage before it begins. Stuart Dean's national service providers can deliver these solutions anywhere, through a network of properly equipped and highly trained technicians. Glass restoration can save businesses time, money, hassle and keep operations running smoothly.

### BACKGROUND

#### Glass Damage Causes

In many cases, it is almost as important to identify the cause of glass damage as it is to repair the glass damage itself. Finding a responsible party is vital when dealing with insurance claims and addressing liability concerns. Damage can happen to glass just about anywhere during its life cycle, from manufacture to distribution, and from installation to cleaning. Some major causes of damage include:

**Manufacturing and distribution damage** can happen at any point along the supply chain. Whether fabricating debris (below) is deposited on the glass in the manufacturing plant, or the glass retains chips or scratches during shipping and handling, it is important to target the cause.

**Construction damage** can occur during the installation process and after installation, from any number of subcontractors. Some examples include:

- Workers putting ladders and equipment against windows
- Lathers dragging wire lath across glass
- Plasterers wiping plaster off glass
- Painters dry razor blading paint off glass and sanding perimeter wood doors
- Welders grinding steel rails in area of glass, or causing welding slag to fall onto installed glass
- Masons smearing mortar on glass
- Tile contractors wiping tile grout off of glass

- Interior texture contractors scraping excess texture off a dry window and/or letting sanding pad ride on glass when sanding texture, prior to painting

**Cleaning damage** can occur most often when there is fabricating debris present on the glass. This type of debris is made up of tiny glass chips and glass dust particles that become baked onto the surface of some tempered glass during manufacture. These surface defects may create scratches during window cleaning with a scraper or other device. This is such a prevalent problem that the International Window Cleaner's Association (IWCA) recommends a tempered glass scratch liability waiver for all construction window cleaning contracts, and for maintenance contracts.<sup>1</sup>

**Environmental damage** is most commonly caused through etching from acid rain or water spots from hard water stains. Acid rain is a broad term used to describe several ways that acids fall out of the atmosphere. Sulfur dioxide (SO<sub>2</sub>) and nitrogen oxides (NO<sub>x</sub>) are the primary causes of acid rain. Acid rain occurs when these gases react in the atmosphere with water, oxygen, and other chemicals to form various acidic compounds.<sup>2</sup> It causes unsightly crusts and deposits to form on the surface of glass.

**Vandalism** can range from paint tagging to deep scratching in the glass from glass cutters. Sometimes, when vandals scratch glass, they push so hard that pieces of the glass will pop out around the edges of the scratch, making deep chips. Vandals also have been known to use hydrochloric acid or a glass-etching product sold in stores to write their names in the glass. The acid gives the glass a white, milky look.<sup>3</sup>

**Fog or condensation** between the panes of insulated glass can occur for several reasons. Most double-pane windows have two perimeter seals, an inner seal that resists water, aging and corrosion, and an outer seal that provides rigidity and strength. When these seals break down due to age, water exposure from perimeter puddles or excess heat, then moist air can make its way between the panes and cause fogginess.<sup>4</sup>

## GLASS REPLACEMENT VS. RESTORATION: GENERAL BENEFITS

Many people believe that the only way to solve glass damage is to replace the glass. This myth has cost companies thousands in unnecessary expenses.

**Economical:** The cost difference between repair and replacement varies with every single job, which makes the assessment and bidding of each individual job an important part of the glass restoration process. Many companies have realized a 90% savings by choosing restoration, equaling hundreds of thousands of dollars in some cases. In rare cases, damage may be cost-prohibitive to repair and replacement is the only option. A professional evaluation team is able to provide this information after inspecting a project.

**Environmental:** Architectural glass is not recycled. This means that when it is removed from a building due to damage, it ends up in the landfill. America generates more waste every year, growing in only 10 years from 247 million tons of non-hazardous waste to 409 million tons.<sup>5</sup> In addition, the energy costs with manufacturing and transporting new pieces of glass is enormous. Pollution emitted by glass manufacturing facilities includes CO<sub>2</sub> from burning fossil fuels, NO<sub>x</sub> and SO<sub>x</sub> air pollution, dust, noise pollutions and water pollution. Truck transportation contributes to air, noise, and water pollution, and diesel particulate matter is especially problematic for human health.<sup>6</sup> Concerns have been raised about the effect of transportation on the environment, particularly as part of the

debate on global warming. In 2005, transportation accounted for 27% of U.S. greenhouse gas emission, increasing faster than any other sector.<sup>7</sup> Clearly, it is the sustainable choice to leave existing glass in place and eliminate the need for making and moving new glass.

**Convenience:** When running a business or construction project, downtime can be disastrous to the bottom line. Damaged glass can delay the opening of a new project, or cause open businesses to close down for periods of time during replacement. Glass replacement normally includes product costs, demolition, installation, logistics, downtime and materials; creating an inconvenient environment for you and your customers. It can take several weeks for replacement glass to arrive, forcing businesses to endure damaged glass for long periods of time. Leaving existing glass in place and repairing through a convenient, fast process that delivers great results just makes good business sense.

## GLASS SURFACE RESTORATION

### A Short Primer

Restoring and repairing the surface of glass is different than any other kind of restoration work. Glass is an amorphous (non-crystalline) solid with a unique molecular structure. The glass restoration process is complex and is affected by the density, location and depth of the physical damage. Additionally, external factors such as weather, logistics and temperature directly affect the completion timeline and outcome of each project.

Special considerations when repairing glass such as heat, pressure, proximity to the edge and properties of the particular glass type must all be taken into consideration during the restoration process. For example, all glass has small imperfections and micro-cracks near its edge. Too much pressure can cause breakage at these imperfections, especially in annealed or laminated glass.

Another important component is proper damage evaluation. There are many types of scratches and imperfections that can occur on glass surfaces which must be accurately identified in order to be removed properly, with minimal distortion. When results are important, then the depth of knowledge that the restoration professional brings to the table is absolutely vital.

### Case Study: Four Seasons Resort in Jackson Hole

The expert team behind the development of Stuart Dean's Glass Restoration equipment completed a job that clearly illustrates many of the challenges that businesses may face with damaged glass.

Not long ago, the windows in Four Seasons Resort's \$4 million condominiums had suffered major damage during the construction process. These scratched windows impaired the view of the magnificent Teton Mountains near Jackson Hole, and could not be replaced due to surrounding construction projects and terrain. Owners of the multi-million dollar homes were ready to move in, but could not take occupancy until the glass was fixed.

A team of trained technicians was brought in and were able to use their glass restoration

## INSULATED GLASS RESTORATION

equipment and skills to restore the windows, saving the resort immeasurable amounts of time and money. In a similar job, glass restoration saved one company more than \$350,000 by repairing damage on 100 view windows in a new building.

### How Damage Begins

Sometimes unpleasant glass issues don't lie on the surface of the glass at all, but in between two panes of insulating glass—making it seem impossible to fix.

Insulated glass consists of two panes of glass separated by a space. The perimeter of the glass is sealed, allowing no movement of outside air into the space. The space itself can be filled with dehydrated air, or with a special gas. The type of glass, the type of spacer, and the type of gas used in the space contribute to the overall insulating efficiency of the glass, and also the total cost.<sup>8</sup>

Generally, the spacer is a hollow tube, usually aluminum pieces, used to keep the panes rigidly spaced. This tube usually holds small beads of a desiccant to keep windows from fogging up if a small amount of moisture penetrates the seal or is trapped between panes during manufacture. But once the desiccant is saturated or the seal around the perimeter of the two panes fails, moisture enters the gap and condenses on the inside of the glass, giving it a foggy appearance.<sup>9</sup>

### Stages of Fog Damage

There are several stages of fog damage to insulated glass, and it is important to catch foggy windows early and get them restored to avoid permanent damage and costly replacement.

#### Stage 1 - Foggy Window or Window Condensation

When the window reaches a threshold saturation point, moisture becomes visible as fog or condensation resulting from the falling dew point between the glass window panes. In the early stages of visible failure, a mist or fog may appear and disappear through the natural cycle of evaporation.

#### Stage 2 - River Bedding

As the moisture saturation point is further exceeded, permanent window damage can begin. When moisture becomes permanent, it will run down the surface of the glass using the same path as the first drop. Over 6 - 12 months this cycling activity will physically etch the surface of the window glass leaving a "river bedding" effect. Note that water droplets collect moisture on the ride down the glass surface meaning that riverbed damage is typically more aggressive at the bottom of the window.

#### Stage 3 - Silica Haze

Silica haze is a destructive chemical growth that can appear within a window even if it has never shown any visible signs of moisture. A closer look at the window will show unusual, snow-flake-like patterns with cross hatch patterns running at a 45 degree angles or a white chalky haze that begins to grow over the surface of the glass.

#### Stage 4 - Riverbed & Silica Haze

In addition to the dry type silica haze, windows that have been consistently moist or wet

## GLASS PROTECTION AND DAMAGE PREVENTION

---

will also develop silica haze and an additional damaging effect called “river bedding.” The damage caused by silica haze and river bedding is irreversible if the glass surface has been physically damaged.<sup>10</sup>

It is important to restore the insulated glass as early as possible during this damage cycle. The earlier silica haze or river bedding in windows is stopped the better the results.

Just like other architectural surfaces, glass can experience corrosion from exposure to environmental elements. This is due to both the physical and chemical properties of glass. While glass may look smooth, it actually consists of microscopic peaks and valleys. Depending on the type of environment, different contaminants fill these valleys and chemically react with the glass, firmly bonding to the surface and creating damage or cloudiness.<sup>11</sup>

Usually this contaminant layer is a silica rich substance that forms on the outside of the glass when exposed to water. The silica layer that forms by aqueous corrosion on most glass can affect optical properties, transport properties and mechanical strength. For normal windowpane glass, the layer forms slowly during the lifetime of the windows. However, in certain environments, corrosion can occur more rapidly.<sup>12</sup>

Glass corrosion can occur on architectural glass that is exposed to environmental pollutants, shower doors that are constantly exposed to hard water, marine glass that endures harsh salt water conditions and much more.

If corrosion has already occurred, then glass restoration technicians may implement a glass surface restoration technique, followed by a protective coating in order to prevent further damage. If a company wants to prevent damage from occurring, then the protective coating can be added as a preventative measure to avoid future restoration and/or replacement.

## SOLUTION: STUART DEAN GLASS SERVICES

---

Glass damage does not equal a simple equation. Types of damage range from fine scratches to deep chips and etching in surface glass, all the way to fog between the panes. Types of glass range from laminated to annealed and from tempered to insulated. Damage can be caused anywhere along the supply chain, or post-installation, and there are targeted, specialized repair techniques for each type of damage. The placement, type and severity of damage can all factor in when determining the best and most cost-effective solution.

Stuart Dean has made a commitment to glass restoration on an international level. The company has done this through investments in the equipment, standards, training, relationships, research and continued development needed to properly assess and complete glass restoration jobs quickly and professionally.

### Proper Assessment

Our technicians have been trained by highly experienced experts in the field of glass restoration to identify the cause of glass damage and provide clients with a detailed evaluation report. This report is vital when making insurance or liability claims. In

In addition, technicians assess each project individually to determine total cost based on many circumstances, such as severity and location of damage. Proper assessment by trained professionals on the job site can provide data on the most cost-effective way to solve the problem.

### **Specialized Repair**

Stuart Dean's Glass Restoration division utilizes proprietary equipment that runs the gamut of repair solutions: from polishing out minor surface defects to filling deep chips in the glass. Their insulated glass restoration system can remove up to 80% of the interior surface damage and stop any further degradation of the window glass surface.

Investments in research, development and sourcing have made Stuart Dean's technicians the best equipped in the industry for solving a plethora of glass repair needs. The nature of glass itself (an amorphous solid) requires the highly specialized skills of trained professionals for the proper assessment and potential repair of damage. In order to keep results as distortion-free as possible, friction, heat and pressure are all carefully monitored by our technicians during the repair process.

### **Surface Damage Repair: How it Works**

Stuart Dean's specialized damage removal process uses a patented, environmentally friendly composite on the surface of the glass to polish away damage without distorting the glass. Our machine is precision balanced to provide the correct RPMs for the customized polishing pads, and our technicians are highly trained to work at the correct pressure, heat and water dispensation for maximum results. These elements combine to create a solution that can bring glass surfaces back to like-new condition.

### **Insulated Glass Repair: How it Works**

Stuart Dean's process removes moisture from failed thermal pane windows, while restoring the much needed R-value. The foggy or condensation window problem really boils down to the inability of the window's desiccant material to absorb the moisture that naturally builds between thermal pane windows. Our window treatment can solve most of these problems and is backed by a 20-year warranty. With our insulated glass maintenance and restoration procedure, windows can last longer, stay out of landfills, retain their R-value and no longer have that hazy look from moisture build-up.

### **Glass Damage Prevention and Protection: How it Works**

To prevent damage to glass surfaces, Stuart Dean technicians use an advanced coating product that protects glass and ceramics against influences from outside such as dirt, grease, emissions and corrosion. It reduces maintenance and is easy to clean, has been based on a hybrid clean coating between inorganic and organic silicones.

### **National Network**

Many of the companies that Stuart Dean specializes in serving have locations across the nation. Supporting the client's brand and providing consistent results and professional service is Stuart Dean's specialty. There is no other national company that can provide glass restoration services like Stuart Dean.

## REFERENCES

---

- <sup>1</sup> IWCA Bulletin. "IWCA Tempered Glass Informational Bulletin 2004 - Scrapers & Fabricating Debris."
- <sup>2</sup> Environmental Protection Agency. "What is Acid Rain and What Causes It?" August 6th, 2002.
- <sup>3</sup> Weltin, Dan. "Vandalism: Graffiti Extends Beyond The Stereotypical Spray Paint." Contracting Profits Magazine. March 2005.
- <sup>4</sup> Carlson, Spike. "Why insulated window glass fogs." The Family Handyman. October 2000.
- <sup>5</sup> <http://www.zerowasteamerica.org/Statistics.htm>.
- <sup>6</sup> "Heavy-Duty Truck and Bus Engines." [dieselnet.com](http://dieselnet.com). September 6, 2008.
- <sup>7</sup> Environmental Protection Agency. "Trends in Greenhouse Gas Emissions." September 6, 2008.
- <sup>8</sup> "Understanding Insulated Glass." The Natural Handyman. [www.naturalhandyman.com](http://www.naturalhandyman.com)
- <sup>9</sup> Carlson, Spike. "Why insulated window glass fogs." The Family Handyman. October 2000.
- <sup>10</sup> Glass Mechanix. "Four Stages of Window Failure." [www.glassmechanix.com](http://www.glassmechanix.com)
- <sup>11</sup> Shevchko, V.V. and L.G. Red'ko. "Leachability of the surface of flat glass." Plenum Publishing Corporation, 1986.
- <sup>12</sup> Penn State (2001, July 9). Penn State Researchers Investigate Glass Corrosion. ScienceDaily. Retrieved January 18, 2010, from <http://www.sciencedaily.com/releases/2001/07/010709073402.htm>