The Historic Dimension Series

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Historic Aluminum Windows:
Foiling the Myth

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Stop recycling! Historic aluminum windows are worth the effort of preserving and must be saved!!!

Most people's first thought of aluminum windows is that they are not worth saving. This mimics the same argument that was heard about the historic wood windows we work so hard to preserve today. Aluminum windows are the new historic windows and are just as much worth the effort to maintain and preserve as their wooden counterparts. Through proper maintenance, cyclical cleanings, necessary repairs, and storm windows, an historic aluminum window can perform as well as an historic wood window and its modern counterparts.

A Little Background

It is best to start with a short history of the metal window. Metal windows were first available around 1860 but did not gain in popularity until approximately 1890. This was due, in part, to their resistance to fire. At that point in time, two factors led to the rise of use in metal windows. The first being that technological advances in the steel rolling industry created a path to fabricate rolled steel window frames and sashes, which made them comparably affordable to wood windows. Secondly, as large urban fires had ravaged many cities, fire was at the forefront of concern when building new structures. This concern for fire safety led to changes in building codes, which required metal windows in industrial structures and multi-story buildings.

Aluminum was first extracted from ore in 1825 by Danish chemist Hans-Christian. Techniques to produce aluminum emerged in a somewhat cost-effective way in 1889. This lightweight, 100% recyclable metal has since become a foundation of our country's infrastructure. Used in packaging, automotive, energy, construction, transportation, aerospace, and even defense applications, aluminum's impact is so profound that historians may one day look back on our times and declare this "The Age of Aluminum."

People are surprised to learn that aluminum windows were first used in 1912 as windows in buses, railroad cars, and trolleys. By the 1930s, aluminum windows were making an appearance in commercial construction and were made to look like their wood or steel predecessors. Originally designed and implemented in commercial applications, by the end of World War II, aluminum windows were hitting their stride in residential applications. Touted as being maintenance-free, affordable, and lighter than wood, their ease of use and durability was appealing to homeowners.

Aluminum - More Durable Than Wood

All the arguments for replacing aluminum windows are the same as were heard for replacing historic wood windows. They are too drafty, and they are too hard to operate, require too much maintenance, and so forth. The same is being said now of historic aluminum windows, and all the answers for saving them are the same.

Historic aluminum windows were available as double-hung sash windows, like their wooden counterparts, as well as awning, sliding, and casement windows. With the

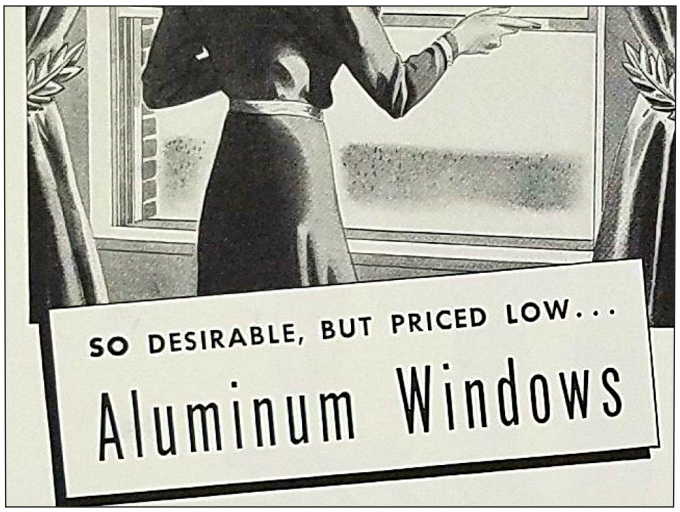

Fig. 2: stock photo advertising benefits of aluminum windows

development of awning and casement windows, interior screens were used rather than the exterior screens used with double-hung sash windows. This is because awning and casement windows use a window crank to open outward rather than manually having to operate a double-hung sash window up or down to open and close. The addition of an interior screen aided routine maintenance as they could easily be removed from the structure's interior for cleaning.

The bulk of energy loss from a structure is lost from a lack of insulation in the attic and basement or crawlspace. Only 30% of a home's total energy loss is from windows and doors. With the addition of an interior storm window, the window now performs as a double insulated glass modern window. Exterior storm windows will not be suggested as a solution in this brief as they take away from the aesthetic of the home and would not allow a historic aluminum casement or awning window to open. Interior storm windows are almost invisible, easy to operate and maintain, increase the energy performance of a single-pane aluminum window system, and do not take away from the home's exterior aesthetic.

As with historic wood windows, ease of operation depends on maintenance and repairs. It is actually easier to maintain the function of a historic aluminum window than a historic wood window. Historic aluminum windows do not require layer upon layer of paint for protection. Cyclical cleaning will keep corrosion at bay, replacing gaskets will keep energy loss at bay, and lubricating moving parts will keep improper function at bay. Replacing window cranks and other operable parts of the historic aluminum window do not require complete removal of the window as it does with the historic wood window. A window crank in a historic aluminum window can be replaced without having to remove the entire window sash, but replacing a window weight in a historic wood window, takes some deconstruction.

Fig. 3: stock photo advertising benefits of aluminum windows

The original windows of a home are part of its aesthetic. Replacing them changes the history of the home as well as its original intent. Just as vinyl windows would be out of place in a Victorian Revival or Arts and Crafts Bungalow, they are just as out of place in a Mid-Century Modern Ranch. If an architect originally intended for wood windows to be installed, then that is what would have been installed. The architect that specified aluminum windows had their appearance as well as function at the core of their specification for this aspect of the plan. For example, the horizontal lines of a historic aluminum awning window, whether open or closed, emphasizes the design style of mid-century modern architecture. Replacing a historic aluminum window is just as blasphemous as replacing historic wood windows, yet there is still some convincing that must be done to save historic aluminum windows.

Saving historic aluminum windows, at its most basic, keeps them out of the landfill. Yes, aluminum is recyclable, but more often than not, the time is not taken to recycle them. It is much easier and more cost-effective for the builder or trade contractor to toss them in the waste container on site. Rather than load them up and haul them away, only to unload them at the local metal recycling yard, it is typical to find them in the dumpster. On the subject of being cost-effective, it is also more cost-effective to leave them in place because it saves the labor in removing them, the cost of the new window that replaces it, and the labor to install new windows, and do not forget that trip to the landfill to dispose of them. The existing historic aluminum window is also more durable and fabricated from higher quality materials than a modern window. In the short term and the long term, leaving historic aluminum windows in place saves money.

Fig. 4: Tru-seal aluminum triple awning window (closed)

Fig. 5: Tru-seal aluminum triple awning window (opened)

If the case has been made to save the historic wood window with great success, then certainly a more durable historic aluminum window with less maintenance is worth the effort of preservation. Change is inevitable, and preservationists know that in order to keep preservation relevant, there must be changes in our thought process. Aluminum windows are the new historic window, and it is time we changed the narrative on preserving them.

Tru-seal Case Study

A historic Tru-seal aluminum triple awning window will be used in this brief as a case study of maintenance, cleaning, components, sourcing parts, and repair. This window was fabricated and installed in 1955 and remains in place at the time of this brief in 2020.

The Tru-seal awning window was manufactured in Fenton, Michigan, by the Industrial Machine Tool, Co., Inc. According to their 1955 catalog, specifications for these awning windows, in short, are as follows – all frame and vent members shall be of extruded 63S-T5 aluminum alloy with approximately 3/32" thickness – weatherstripping shall be of vinyl or equivalent, no rubber felt or substitute material shall be used, the design of the weatherstrip shall be such as to deflect and resist any wind pressure on it when in the closed position – screens shall be supplied with rolled or extruded section set in a rabbet in the frame and secured with clips – recommended glazing using Tru-seal snap-on aluminum glazing bead for permanence and appearance plus ease of glazing to save time and costs; however, windows may be glazed from outside using spring glazing clips and aluminum sash putty.

The Tru-seal aluminum window components consist of master frame, sash, torque bar, torque bar arm, torque bar holder, linkage set, link arm, weatherstripping, crank with worm drive for opening and closing – no latches needed, interior screen and screen clips.

Unlike a historic wood window, all parts and components are easily accessible with the window in place. No deconstruction is needed to access moving parts. The crank with worm drive action is easily removed by three screws. Two of the screws are fastened to the interior window frame, and the other screw fastens the arm to the crank. This is an easy repair that most homeowners can make themselves and would be an easy repair for a builder or trade contractor. It is quite dissimilar from re-attaching a window weight of a historic wood window which requires deconstruction to access the weight, installing new sash cord, re-construction, prep work prior to painting, and painting the deconstructed area if not the whole window.

This window glass is held in place with the snap aluminum glazing, making it extremely easy to remove if a pane of glass has been broken. Remove the snap aluminum glazing strip on the sides first and then remove the top and bottom pieces in order to remove the glass. Do not rush removing the snap aluminum glazing. Be gentle, and it will come out easily, taking care not to bend the strip. Carefully remove the existing broken glass with gloved hands for safety. There will more than likely be some sealant surrounding the perimeter of the sash. This can be removed with a 5 in 1 scraping tool or putty knife. Be careful not to scratch any visible components of the window when removing the existing sealant. Install a fresh bead of new clear sealant around the perimeter of the sash, install the new glass, and reverse the procedure for removing the snap glazing to reinstall. Since this window is a mill finish with no paint, the job is complete. This is unlike the glazing of a historic wood window which involves the task of removing the putty glazing, push pins, and glass, reinstalling these compo-

Fig. 6: mild detergent and non-abrasive scouring pad

nents, and then finally priming and painting to match the existing surface — a much more labor-intensive task to say the least.

Cyclical cleaning with a mild detergent, such as dish soap and soft scouring pad or sponge, is all it takes to keep the aluminum frames and sashes looking fresh and keeping corrosive materials from damaging the window. If a historic aluminum window has advanced cleaning needs, the National Park Service suggests using an aluminum jelly cleaner, pumice, and a scouring pad. With a far more advanced cleaning need, the National Parks Service suggests using a diamond abrasive pad in conjunction with Duro Aluminum Cleaner in gel form. This advanced cleaning method requires other measures to protect surrounding surfaces from damage and should only be used as a last resort for preservation.

The Tru-seal window used in this case study came clean with the use of dish soap mildly diluted with water and a non-abrasive scouring pad. It was impressive to see the difference the cleaning made. When cleaning the historic aluminum window, care should be taken only to remove the surface debris and not affect the rich patina that has taken decades to create. The patina of the historical aluminum window is part of its aesthetic and should be maintained if possible.

Tru-seal windows were fabricated with a vinyl extruded lip seal for weatherstripping. The weatherstripping of this window was in great shape considering its age. Still flexible and in place with only mild discoloration, it is maintaining its performance and does not need to be replaced or repaired at the time of this brief. This component of the aluminum window may prove difficult to source. It is more than likely that the exact same extruded lip seal will not be readily available or out of

Fig. 7: the surface is fresh and clean after a quick scrub

production, but that is not to say that it is impossible to find the exact match. The best option for replacing the weatherstripping, if needed and the exact match cannot be found, will be to find something similar and use that in place of the original. This may take a small amount of customization at the hands of the installer but will prove effective. For the sake of this case study, a similar vinyl extruded lip seal was sourced at a local glass repair shop and, with a small amount of customization, worked as well as the original. If you cannot source a similar extruded lip seal from your local glass repair shop or window supplier, other resources for extruded vinyl lip seals are trimlok.com and cleanseal.com.

Lubrication of moving parts, such as torque bar and worm drive, once a quarter or at the time of the cyclical cleaning will keep the operation of the historic aluminum window running smoothly. Use of a dry lubricant is recommended for this application. Dry lubricant is able to give the moving parts the necessary lubrication without collecting dust and grime as other standard lubricants do. Make sure that the dry lubricant you are using is safe to use on metal and aluminum. Clean excess lubricant and debris from the moving components. Lubricate as needed. After lubricating the moving parts of the Tru-seal historic aluminum window, much smoother operation was obtained. This simple solution provided ease of use in a matter of moments, unlike repairs to a historic wood window.

Parts can be sourced through your local glass repair shop or through companies that specialize in these types of parts online. CR Laurence, for example, is a window parts distributor that has many components of historic aluminum windows. Cranks, torque bars, handles, and latches were readily available through them as well as other suppliers that can be found online or locally. It may be more difficult than going to your favorite hardware store to find the parts, but at the time of this brief, they are available through other sources. If a part is needed for a historic aluminum window and cannot be

Fig. 8: careful removal of snap aluminum window glazing

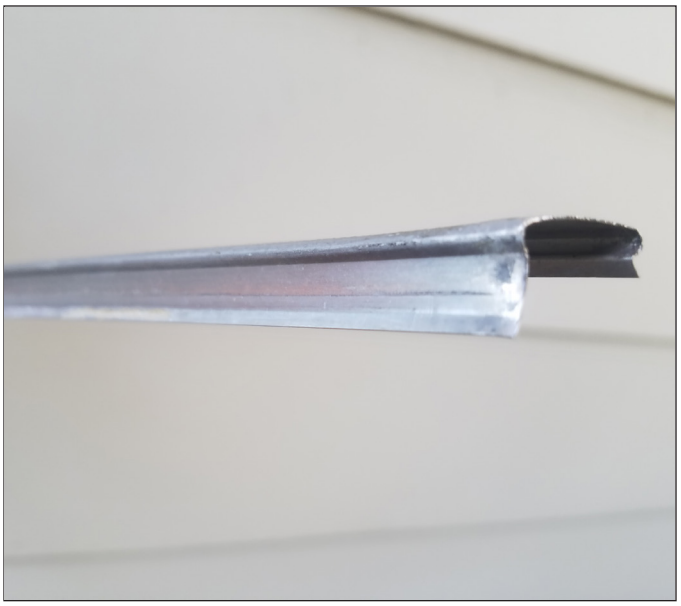

Fig. 9: Tru-seal snap aluminum window glazing

found through a distributor or supplier, it can be custom fabricated at a local metal fabrication shop.

Interior Storm Units Increase Energy Efficiency

Some historic aluminum windows are double-hung like their historic wood window counterparts. Other historic aluminum windows are awning windows, such as the one used in this case study, or casement windows that open out rather than up or down. Exterior storm windows are a great way to increase energy efficiency with a single pane double hung window, but if installed on an awning or casement window, will make it inoperable. This is where interior storm windows are a great solution to improving the energy efficiency of your single pane historic aluminum awning or casement window.

The US Department of Energy – energy.gov – says that the interior storm window offers greater convenience than exterior storm windows. Interior storm windows are easier to install and remove, they require less maintenance because they are not exposed to the elements, and since they seal tightly to the window, they are more effective at reducing air infiltration. They also note that interior storm windows are often the best choice for apartments and houses with more than one level. The installation of storm windows, whether interior or exterior, is capable of producing an energy savings of 12 – 33% on heating and cooling costs.

Indow Windows – indowwindow.com – has created an easy to use interior storm window system that is more affordable than complete window replacement. This system uses a sheet of acrylic glazing, which is of much higher quality than plexiglass, with a patented compression gasket that is fit to the exact dimensions of the window casing. The compression gasket is a silicon tube, with a similar look to window trim, that compresses into the frame of your existing window keeping out drafts and noise. This gasket eliminates the need for mounting hardware, which alters the existing window frame, and allows for expansion and contraction. They are easy to install and remove, as well as being energy efficient. This system also reduces exterior noises by 50 – 70%.

Indow Windows has several different options in their product line and varying pricing for each option. There is the standard line, which is a typical homeowner application and the most affordable. For some other options there is the premium grade which comes with shading, higher acoustic performance and privacy grade. The final option, and most costly option, is the commercial and commercial acoustic grade. The standard grade is the most affordable, and the commercial-grade is the most expensive. The cost of each grade is based on the size of the window. There are three gasket colors to choose from – white, brown, and black. Additionally, there are options for grades of shading available from a light tint to complete blackout. Compared to the cost of buying new windows, removing the existing windows, removal of existing window trim, installing the new windows, installing new window trim, exterior siding repair, disposing of the old windows and touch up painting around the new windows, an interior storm window is the most affordable option.

A study by the US Department of Energy showed that Indow inserts installed in a historic home in Seattle, Washington, with single-paned glass wood windows produced a 22% reduction in heating, ventilation, and air conditioning energy use. The installation of Indow Windows interior storm windows also netted an 8.6% reduction in envelope leakage. The result would be comparable for a single-pane historic aluminum window.

Another study done by Portland State University showed that installing Indow inserts reduced noise penetration into a space by 10 – 20 decibels. Modeling

Fig. 10: Tru-seal torque bar and torque bar arm

Fig. 11: lubrication of moving parts using dry lube

of Indow Windows in this study indicated a 10% savings in gas consumption while actual field tests of four homes measured 19%. This discrepancy is likely due to the additional thermal benefits resulting from the Indow insert's warmer interior surface, which would result in improved thermal comfort at lower room temperatures.

For larger windows, a safety system is installed to prevent the interior storm from falling out during a high-pressure event. The safety hardware is inconspicuously installed with one small screw. The 1/8" inch thick acrylic weighs 1 pound per square foot, and the ¼" acrylic weighs 1.75 pounds per square foot. Egress is also taken into consideration with the installation of the Indow insert by meeting all safety regulations for ease of removal if needed during an emergency.

As discussed earlier, although exterior storm windows are a viable solution for double-hung wood windows, the historic aluminum awning or casement window could not operate with an exterior storm window, making the system that Indow Windows has created is such a relevant solution for energy savings and noise reduction. The affordability, sustainability, and aesthetic of an interior storm window clearly make this the right choice over complete window replacement.

Aluminum Windows - The New Historic Window

Not all historic aluminum windows are the same. The quality of all aluminum windows varies by manufacturer. Some are single-pane glass, while others are double insulated glass. There are fixed glass windows, double-hung sash windows, casement windows, sliding windows, and awning windows. Some aluminum windows have snap aluminum glazing, while others have glazing putty to secure the glass. The weatherstripping of historic aluminum windows ranges from felt to rubber or vinyl. While there are different components and styles of historic aluminum windows, the fact remains that they are durable and relatively easy to maintain and repair.

Historic aluminum windows are far less prone to warping; they are weather-proof, corrosion-resistant, and virtually immune to the harmful effects of UV rays, ensuring optimal performance with a long lifespan. Their strong window frames will last longer than wood frames. Because aluminum is light, malleable, and easy to work with, manufacturers were able to produce window frames that offer high levels of wind, water, and airtightness, which means exceptional energy efficiency. Historic aluminum windows are also far less expensive to maintain than wood frames, and since aluminum is a durable substance, it will keep its shape over time. Therefore, with proper maintenance and care, historic aluminum windows will continue to open and slide smoothly for decades.

Conclusion

With all of the positives surrounding historic aluminum windows, why is there still a question of preserving them? The historic aluminum window is easier to maintain than the historic wood window. The historic aluminum window is easier to repair than the historic wood window. The historic aluminum window will last longer with deferred maintenance and repairs than the historic wood window. If an interior storm window is added, the energy efficiency is comparable to a historic wood window. Preservationists must stay in alignment with their ideals by staying relevant to change. In order for preservationists to stay relevant, a change in narrative is needed - historic aluminum windows are worth the effort of preserving and must be saved.

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Fig. 12: Tru-seal window crank

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Fig. 13 & 14: Indow Interior storm window (above) with close up view of patented compression gasket (below)

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Figure 2 – 1939 Alcoa Aluminum Windows Vintage Ad, Pinterest, saved from vintagedmirer.com, courtesy of Joyfully Blessed
Figure 3 – Pinterest photo courtesy of www.collectionsthoughtsandthings.com
Figures 13 & 14: Photos of interior storm windows courtesy of Indow Windows

The Historic Dimension Series is a collection of briefs prepared by UNCG students under the direction of Professor Jo Ramsay Leimenstoll. For information on other topics in the series please visit the website at go.uncg.edu/hds