

Condo Chronicles: Navigating Condominium Fenestration Replacement and Restoration Projects

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This paper was presented at the 2024 IIBEC International Convention and Trade Show.

IN THE EVER-EVOLVING world of architectural design and construction, condominium fenestration replacement and restoration projects are complex endeavors that require strategic planning, expert execution, and an understanding of the intricate dynamics at play within a condominium complex. Challenges arise from the blend of shared ownership, communal living, and diverse stakeholder interests characteristic of condominium communities. The challenges and considerations presented in this article apply most directly to large tower or mid-rise condominium complexes; however, many points are also relevant for low-rise, multifamily residences and smaller condominium complexes.

Fenestration, which encompasses windows, doors, and their related components, plays a critical role in any building's performance, energy efficiency, functionality, and aesthetic appeal. Fenestrations are a distinctive part of the building enclosure, but, unlike the rest of the building enclosure, they may be owned by individual unit owners rather than being common property owned by the condominium association. For this reason, wholesale, property-wide replacement or restoration of fenestration is unusual in condominium complexes compared to single-owner residential buildings. Fenestration ownership structures may vary between condominium associations, and it is important for designers to understand who carries financial responsibility.

Condominium associations or individual unit owners may find that fenestration replacement or restoration is necessary to resolve water leakage, air leakage, thermal discomfort, operability issues, and/or structural issues. In our experience, wholesale fenestration replacement is only mandated across an entire building or complex when the issues with the existing fenestrations are so severe that they

are causing deterioration of adjacent building components or pose a safety concern, such as damage to the exterior framed structural framing components. Smaller, voluntary replacement or restoration projects that are executed by individual owners opting into the project are more common.

In this article, we delve into the complexities of fenestration replacement and restoration in condominiums from the perspective of design professionals who collaborate with condominium clients and property managers. We focus primarily on describing the common challenges associated with these types of projects, including logistical hurdles, financial implications, ownership responsibilities, adherence to building codes, performance requirements, and the potential impact of the projects on residents' daily lives. We aim to provide the various condominium complex stakeholders with a catalog of considerations for executing condominium fenestration projects, ensuring that they are well equipped to navigate the multifaceted challenges and opportunities presented by these intricate endeavors, and provide other design professionals with guidelines for their fenestration projects.

COMMON RELATIONSHIPS AND RESPONSIBILITIES

In a condominium complex, several parties play crucial roles in making decisions and executing fenestration replacement or restoration projects. Understanding the relationships among these

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parties is essential for design professionals and contractors involved in such projects. The following is a summary of the stakeholders and their roles and responsibilities as they relate to the fenestration systems.

Condominium Association

A condominium association is a legal entity that is governed by a board of trustees or directors (elected unit owners), which acts on behalf of all unit owners and is responsible for managing and maintaining the common/shared elements of the condominium complex. The responsibilities of a condominium association can vary depending on the specific bylaws and regulations of the condominium, as well as the state or local laws that govern condominiums.

The association is responsible for ensuring that any fenestration work executed at the property complies with the bylaws and regulations of the condominium. The association can require a unit owner to replace or make repairs to the unit's fenestration systems if those systems are affecting common area elements or the building structure. The association can also approve a defined procedure mandating certain requirements or products/assemblies for work executed by individual unit owners.

Unit Owners

Individual unit owners hold a stake in the condominium and contribute financially to the condominium association through monthly dues and other assessments. They have a vested interest in the maintenance and improvement of common elements, as these affect the value and livability of their units.

Unit owners may have differing opinions on the timing and scope of fenestration projects, which can lead to discussions or conflicts within the community. Unit owners commonly confuse what are considered common elements (owned by the association) and unit owner elements (owned by the individual unit owners). Even when unit owners are financially responsible for their unit's fenestration (as is the case in most condominiums), they are required to comply with any regulations approved by the association.

Property Manager

In professionally managed condominiums, the property manager is typically hired by the association to oversee day-to-day operations, including maintenance and repair projects, and act as a liaison between the association, unit owners, and external contractors and professionals. The responsibilities of a property manager can vary depending on the condominium

association. In some cases, a condominium may not have a property manager, and the association may perform the role of property manager.

Property managers often directly engage with and coordinate the work of design professionals, such as architects and engineers, on behalf of the condominium association to assess, plan, and execute fenestration projects. Property managers may act as the association representative during fenestration projects and assist with coordinating the project work with the individual unit owners.

Design Professionals

Design professionals (engineers and architects) are responsible for assessing the existing fenestration systems, determining the scope of work required, providing design recommendations, and specifying systems. They are engaged by and collaborate closely with the property manager and condominium association to ensure that the project aligns with the condominium's requirements, goals, and budget.

Design professionals are responsible for selecting or designing fenestration systems that comply with the technical project requirements, including aesthetic design, structural integrity, safety and performance requirements, and compliance with building codes. Design professionals must carefully assess the existing conditions, propose appropriate solutions, and oversee the project to minimize risks and potential liabilities for all involved stakeholders.

Contractors

Contractors are responsible for managing the construction process, which includes schedules, budgets, permits and city approvals, site management, safety, and managing work. They are responsible for ensuring that all work, material, and installation meet or exceed the quality standards and specifications outlined in the contract and comply with building codes and industry standards. Contractors provide guarantees that cover defects in materials and quality of work for a specified duration.

Contractors are responsible for coordinating the various trades as required to execute a fenestration replacement or repair project, including demolition, waterproofing, cladding, glazing, and interior finish subcontractors. Contractors need to work closely with the property managers and unit owners to execute the work to their satisfaction.

Fenestration Product Manufacturers

Fenestration product manufacturers are responsible for fabricating and providing

products that meet or exceed industry standards and project-specific requirements. Manufacturers need to obtain and maintain relevant certifications and documentation to demonstrate compliance with industry standards, building codes, and regulations. They offer product warranties that cover defects in materials or quality of work for a specified duration.

Fenestration manufacturers are responsible for fabricating fenestration systems that meet or exceed industry standards and the project specification requirements dictated by the project's design professionals. The manufacturers often offer technical support and assistance to design professionals and contractors during the fenestration design and installation process.

RESTORATION VERSUS REPLACEMENT

The first step in executing a fenestration project is for the design professional to evaluate existing conditions and help the property manager, unit owners, and condominium association determine the scope of work. The decision of whether to restore or replace existing fenestration can be difficult because several factors must be considered. The opportunities to improve air, water, structural, or operability performance of existing fenestrations may be too limited to provide the benefits sought by the owners, and the overall project cost of restoring fenestration can be similar to the cost of replacement. It can be difficult to justify the cost of restoring existing fenestration if restoration will achieve only marginal performance improvement. However, restoration may be dictated by historic preservation requirements or be a jurisdictional requirement for another reason. Restoration may also be appropriate if the condominium intends to perform an opt-in project, where the condominium association oversees a fenestration project that multiple unit owners opt in to as opposed to mandating a complex-wide project and does not want changes to select fenestration to alter the aesthetics of the building.

Design professionals should carefully review the relative feasibility, costs, and benefits of replacement and restoration projects and discuss the options with the project stakeholders before a condominium decides whether to proceed with a fenestration restoration or replacement project. Note that the issues discussed in the "Design- and Construction-Phase Considerations" section of this article apply to both restoration and replacement projects.



Figure 1. Storm windows installed at localized fenestration of a condominium building. Yellow arrow indicates a location with a storm window; red arrow indicates a location without a storm window.

RESTORATION-SPECIFIC CONSIDERATIONS

Performance

Restoration is typically constrained by the design of the existing fenestration, and therefore it offers limited opportunities to improve the air, water, and thermal performance of existing fenestration assemblies. The existing frames may be able to accommodate insulated glass units (IGUs). However, the increase in overall thermal performance will be minimal if the existing framing members are not thermally broken. In some cases, the configuration of existing frames that use monolithic glass cannot readily accept IGUs and needs to be modified. When fenestration is operable, new gaskets and hardware can be installed around the operable sashes to achieve improved air infiltration resistance and operability. However, the gaskets will often need to be adhered and will remain maintenance items. Storm windows can be installed outboard or inboard of the existing windows to provide some improvement to the thermal performance and air infiltration, thus improving occupant comfort (Fig. 1). However, storm windows can have a negative impact on the ease of operation, ventilation, and aesthetics.

Concealed Structural Deterioration

Existing interior and exterior finishes can conceal significant structural deterioration, and the true condition of existing steel or wood window frames will not be known until the finishes, glazing, and/or coatings are removed (Fig. 2a and 2b). This is primarily an issue with older wood and steel fenestrations.

Because it is difficult to estimate the extent of deterioration until the windows

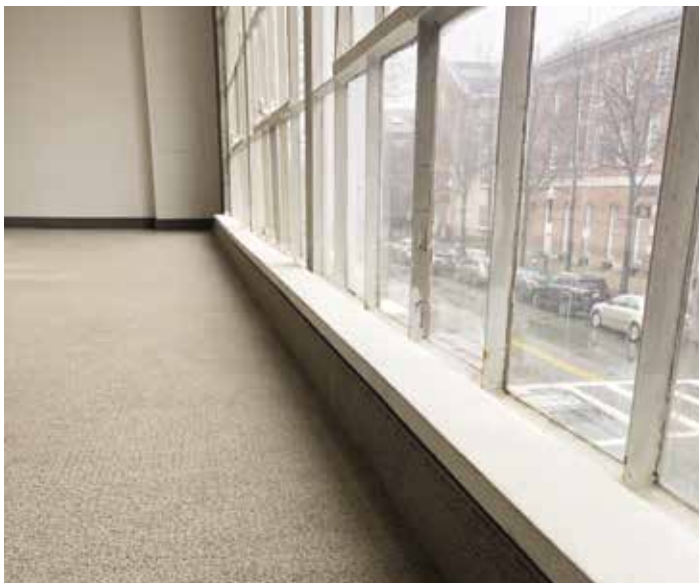


Figure 2a. Coating and glazing putty conceal corrosion of steel mullions. **Figure 2b.** Coating removal reveals extensive corrosion of steel mullions.

are disassembled and the existing finishes are removed, the design professional will be challenged to forecast project costs and advise clients about whether to pursue fenestration repairs or replacement. If there is severe deterioration in isolated locations, isolated framing members may need to be removed and replaced or reinforced, but if there is widespread deterioration, the scope (and cost) of the repair/replacement project will be much more extensive.

Contractor Interest/Availability

Window restoration is specialized construction that requires artisan contractors with skilled craftspeople to perform the repairs. Successful execution of a fenestration restoration project is dependent on the availability of skilled contractors willing to reglaze, reconfigure, and restore existing fenestration systems. Design professionals should assist the association in vetting qualified contractors while compiling a bid list. On past projects, we have found that few glazing contractors are qualified to do this type of restoration work, and even fewer are willing to undertake repair of existing fenestration and to provide warranties, especially for one-off work. This work may have more perceived risk than replacement with a fully integrated system, and it may result in higher construction costs than a replacement project. It is critical that the design professional educate the condominium association about these considerations and implications prior to the association determining whether to perform a restoration or replacement project.

Cost

Unit owners and condominium associations may assume that restoring existing fenestration is less costly than replacement. However, the cost of restoration can depend heavily on the extent of the restoration and the expertise of the contractors performing the work. Depending on these factors, the overall cost of restoration may be less than, comparable to, or even more than the cost of replacing existing fenestrations with new ones. The comparative cost of restoration versus replacement is often dependent on the type of replacement window that is being proposed. If the overall project cost to restore windows is less than or comparable to replacement, restoration may still be less cost-effective over the long term, as the service life of restored fenestration is usually not as long as that of new fenestration. To assist the condominium association with determining how to proceed, the design professional should provide approximate cost-per-square-foot

estimates and estimated service life for both restoration and several replacement options for consideration.

Expectations

It is difficult to predict the performance of restored fenestrations, as they will not be rated assemblies that meet rigorous water penetration and air infiltration field-testing standards. We generally recommend using mock-ups to assess the proposed restoration procedures, testing the mock-ups for performance in general accordance with ASTM E1105 (*Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference*)¹ and ASTM E783 (*Standard Test Method for Field Measurement of Air Leakage Through Installation Exterior Windows and Doors*),² and comparing the testing results to the expected performance of new fenestrations. However, this phase is often not performed at condominiums because it adds to the project cost, can be disruptive for owners, and extends the overall project schedule. It is critical that all owners who participate in a restoration project understand the limitations of restoration and that the project may not fully restore

functionality, alleviate occupant discomfort, improve energy efficiency, or address water leakage issues over the long term. Additionally, owners should understand that restored fenestrations may require more frequent maintenance than new fenestration assemblies, depending on the extent of surface preparation performed and quality of new coatings on existing windows that require recoating.

REPLACEMENT-SPECIFIC CONSIDERATIONS

Existing Profiles and Sight Lines

Some existing types of fenestration, especially older, non-thermally-broken steel- or wood-framed units, have narrow profiles that can only be achieved by replacing the units with similar products that match the original profile. Replacement with more affordable standard fenestration products, such as aluminum- or composite-framed systems, can result in increased sight lines. In many cases, installing alternate fenestration products to improve performance can also affect building aesthetics. Following an opt-in replacement project, the sight lines would vary between the new and existing fenestrations (**Fig. 3**). Therefore, if most owners in a condominium do



Figure 3. Sight lines at the replacement fenestration (indicated with the arrow) are thicker than existing fenestration profile next to it.

not support a proposed fenestration replacement project where sight lines would be increased, the condominium may choose to perform an opt-in restoration project in lieu of an opt-in fenestration replacement project to avoid varied fenestration sight lines around the building.

Code Requirements

Fenestration replacement projects are typically considered by code officials as Level 1 Alterations under the *International Existing Building Code*³ and must meet current *International Energy Conservation Code* (IECC)⁴ prescriptive requirements. In several states, including Massachusetts, the 2021 version of the IECC has been adopted with additional state-specific amendments that include more stringent *U*-value requirements.

These new *U*-value requirements can be difficult to meet with standard thermally broken aluminum-framed fenestration. Many of the aluminum-framed assemblies that we would typically specify for larger mid- to high-rise condominium fenestration replacement projects cannot meet the new *U*-value requirements, even with triple glazing and multiple e-coatings. The inability to meet code requirements is more pronounced if the building has smaller fenestration units, as it is difficult for smaller units (which have low glazing-to-frame ratios) to meet *U*-value requirements. Adding triple glazing may be cost prohibitive for owners and may have structural implications due to the increased weight of glazing, leading the condominium to instead choose vinyl or aluminum-clad wood replacement fenestration products, which have better thermal performance than aluminum-framed products. Filing for an energy code variance through the authority having jurisdiction is possible; however, the feasibility of this option depends on the jurisdiction, and our experience is that most local jurisdictions will not consider higher cost to unit owners as a reason to waive energy code requirements.

Interior Finish Impacts

During fenestration replacement projects, interior finishes may be affected if the new frames are deeper than the existing frames or if the interior finishes need to be removed to install a continuous interior air seal between the new frame and the rough opening. Removing and replacing interior finishes in condominium units can be challenging, as the existing conditions can vary by unit, and unit owners have differing expectations of modifications inside their homes. If owners have added decorative trim, wood stools, wainscoting, shades, or other intricate

interior finishes, removal and replacement is not as simple as cutting and patching drywall. It can be difficult for contractors to price this work, and it is time-consuming to document and catalog all existing conditions for contractor pricing. To avoid misaligned expectations, it is critical that both the contractor and the owners acknowledge who is responsible for performing and paying for interior finish replacement and painting. In our experience, it is best practice to limit the impact of a fenestration project on interior finishes as much as possible. If the new frames are wider than the existing frames, we recommend maintaining the interior plane of the existing fenestration and accommodating the added depth on the exterior side of the opening. However, that option is not always possible, depending on the construction of the exterior wall assembly and the alignment between the new frame and existing cladding.

DESIGN- AND CONSTRUCTION-PHASE CONSIDERATIONS

Once the scope of work is defined, the next steps of the project are design and construction. Successful fenestration projects in a condominium complex require effective communication and collaboration among the design professionals, property managers, condominium association, and fenestration suppliers to ensure that the project meets

quality, safety, and budgetary goals while addressing the needs and concerns of unit owners and the condominium association. The considerations identified in the following sections should be reviewed and discussed by the project team throughout the design and construction phases.

Failure Mechanism

A fenestration project is commonly precipitated by performance failure of the fenestration units. Types of performance failure include water penetration or air leakage to the interior, condensation within IGUs, operability issues, or occupant discomfort. It is critical that the failure mechanisms are identified and the contributing factors are thoroughly diagnosed so that they can be addressed by the fenestration project. If adjacent construction or interior conditions contribute to the failure, a fenestration replacement or restoration project will need to address these contributing factors; otherwise, the performance failures may continue once the project is complete.

One common example is water leakage through perimeter conditions (Fig. 4 and 5). Owners may observe active water leakage or deteriorated interior finishes around an existing fenestration and assume that replacing the fenestration will address water-intrusion issues. However, the fenestration perimeter flashings may not be properly integrated with the adjacent



Figure 4. Water leakage at interior appears at window head; however, the leakage path is through exterior masonry wall above.



Figure 5. Interior finish damage beneath fenestration was caused by water accumulating between the storm window and the original fenestration unit.

exterior wall assemblies. If the fenestration is restored or replaced but the perimeter flashings are not modified to properly integrate with the adjacent exterior wall assemblies, it is likely that water leakage will continue after the replacement window is installed.

Execution Method and Cost Implications

It is important to determine how the project will be executed early in the design phase. Once the design professional has been engaged and has determined the required scope of work, the project team must determine how to execute the project. The three most common ways to execute fenestration replacement or restoration are a wholesale building/complex project, a multiunit opt-in project, and a single-unit/one-off project. In the following sections, we discuss considerations for each execution method.

Wholesale Building/Complex Project

Over the long term, the most economical option for conducting a fenestration restoration project is to restore or replace all fenestration for the building/complex at once. This approach takes advantage of economy of scale, and the total cost per fenestration (including material, labor, and access costs) is generally lower than other execution options. Many manufacturers will reduce the price per fenestration if the

total quantity of units ordered is above a certain threshold specific to the manufacturer. Contractor overhead costs, front-end costs, and design professional fees are also spread among owners from the entire condominium complex. Performing replacement or restoration for the entire complex also ensures that the fenestration life cycles of all units are aligned, which makes future maintenance and replacement easier to track.

However, performing a wholesale project can be politically and legally challenging, especially when unit owners own the fenestration within their units, as it is unlikely that all owners will want to proceed with a fenestration project simultaneously. Executing a mandatory fenestration project could require changing condominium documents so that the association assumes ownership of the fenestration, passing a required quorum vote, or pressuring unit owners to pay for work that they may not be willing or able to pay for.

In a wholesale project, the design professional is engaged to develop construction documents for the entire building or complex, with the assumption that the work will be completed at once. Furthermore, when a project is large and costs are shared among the unit owners, it may be cost-effective to engage the design professional to perform construction administration during the construction phase. The design professional can provide responses to contractors' requests for information and

perform quality assurance reviews, which generally improve the overall quality of the final installation and limit risk to the condominium association. Additionally, compared with a small project, a large, wholesale project will generally be more likely to attract experienced contractors, increasing the odds for success on complex projects.

Multiunit Opt-In Projects

Multiunit opt-in fenestration projects are hybrids between wholesale and one-off projects. A multiunit execution strategy provides some of the economy of scale and cost-sharing benefits provided by a wholesale project without the complication of forcing all unit owners to participate in the project. In many cases, the design professional's fees are covered by the condominium association, as the design documents can also serve as a basis for future one-off fenestration projects. Because the costs are shared among multiple owners, it may be affordable to engage the design professional to perform limited construction administration and quality assurance reviews during the construction phase.

Single-Unit/One-Off Projects

Performing a fenestration replacement or restoration project at a single unit will be the most financially burdensome option for that unit's owner and will likely have less design professional involvement and oversight than a wholesale or multiunit project. If a single unit owner decides to replace or restore the fenestration within their unit independently, they will likely engage a contractor directly. Unless the association has a predetermined process in place that provides owners direction on how to replace or restore fenestration, the unit owner in this scenario will rely on the contractor that they hire to act as the design professional. The quality of the final installation will thus be highly dependent on the skill and knowledge of the contractor. In our experience, a one-off fenestration project will attract a residential contractor, who may have limited experience performing fenestration restoration or replacement under the direction of a design professional. If a unit owner opts to perform a fenestration project on their own, there is a risk that the project will not address the underlying cause of performance failure. For example, a single-unit fenestration replacement will likely not involve exterior access or removal of exterior wall components. The perimeter conditions would likely be limited to interior-installed sealant, which may not provide a continuous seal to the water-resistant barrier within the exterior wall assembly, depending



Figure 6. One-off fenestration replacement where the perimeter air/water barrier is limited to sealant.

on the type of exterior wall assembly (**Fig. 6**). If water leakage was occurring through the tie-in between the existing fenestration and exterior wall, replacing the fenestration with a new fenestration without providing an improved tie-in to the exterior wall will not address the underlying cause of the leakage, and it is likely that leakage will recur.

The best method for executing one-off fenestration projects is to engage a design professional to develop construction documents for the entire complex with the assumption that fenestration will be replaced on a one-off or as-needed basis. Such documents include standard replacement or restoration details and a specification package listing recommended materials and manufacturers. Research regarding product availability is required, as many manufacturers will not provide products in very limited quantities. A challenge with this execution method is that it is difficult to ensure that the work is completed per the design documents without design professional involvement during construction. One-off replacements significantly increase liability risk for design professionals, as they have less control over the final installation.

Access

Fenestration projects typically require exterior access to the building. Condominium

associations may request that the project be completed with interior-only access, but that approach may limit the contractor's ability to provide adequate tie-ins to adjacent wall construction and dictate how much of the fenestration can be assembled in a factory instead of on site. While field-fabricating portions of fenestration offers flexibility, fabricating in the field increases the risk of issues with the quality of work; can increase overall cost because it requires increased field labor; increases the risk of weather-related delays; and can extend overall construction schedules. Fenestration systems that are factory built offer greater quality control, improved consistency between products, ideal environmental conditions for sensitive material installation, and warranties.

Interior-only access can also pose safety risks when fenestration is removed or replaced. Exterior access can significantly increase project costs, as work will require either an aerial lift rental and associated street permits, pipe staging or scaffolding, or swing staging. Exterior access is typically more affordable for larger projects because the access costs are spread among more units.


Occupant Disruption

Any fenestration project will affect the unit occupants while work is being completed within their living spaces. The area surrounding

the fenestration will likely be isolated from the remainder of the unit for the duration of the project, altering the amount of natural light and living space within the unit. If scaffolding or pipe staging is required to perform the work, views from units will be obscured, and occupants will be near the work zone. While increasing the number of fenestration units included in the project scope offers cost efficiencies, it may increase the duration of tenant disruption and discomfort. Once a construction schedule is determined, it is vital to communicate with the condominium association, unit owners, and tenants to ensure that the expectations regarding timelines and disruptions are clear.

CONCLUSION

When fenestrations require replacement or restoration, the execution of the project will require careful consideration and planning. Successful fenestration projects in a condominium building/complex require effective communication and collaboration among all stakeholders. Design professionals, contractors, property managers, and fenestration suppliers must work together to ensure that the project meets quality, safety, and budgetary goals while addressing the needs and concerns of unit owners and the condominium association. Careful planning, documentation, and risk management are essential to minimize potential liabilities and disputes.

Considering the intricate nature of executing fenestration work within condominium buildings/complexes, condominium associations should be proactively equipped to address fenestration failures and provide guidance to unit owners who wish to replace or restore their fenestration on a one-off basis. The best strategy is to proactively provide association-approved contract documents for fenestration replacement or restoration and establish a well-defined procedure that delineates for individual unit owners the criteria governing fenestration replacement and restoration. This strategy is critical, as in the absence of clear guidelines, unit owners could install fenestration products that may not align with the preferences of various stakeholders or use installation procedures that adversely affect other parts of the building enclosure. Even if there is no immediate need for wholesale or large-scale fenestration replacement or restoration, it is prudent for condominium associations to forecast potential future projects and factor that forecast into their financial planning. 

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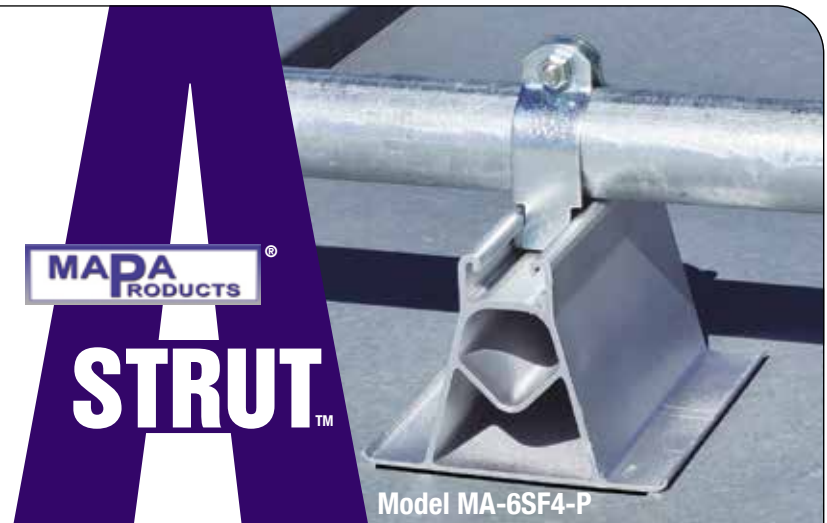
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