

Windows Plus Technical Guidance – Issue 1

Manufacture and Structural Requirements of Arched Composite Door Frames

1. Purpose of This Technical Bulletin

This technical bulletin has been issued by **Windows Plus** to provide formal manufacturer guidance on the design, manufacture, and structural requirements of arched uPVC frames used with composite door slabs.

This document is intended to provide technical guidance on the manufacture of arched uPVC frames used with composite door slabs, and to explain the structural reasons why **midrails are strongly recommended** when producing arched composite doors. It is designed for trade customers, installers, and specifiers to ensure long-term performance, durability, and compliance with best practice.

2. Formation of the uPVC Arch

2.1 Profile Preparation

Arched uPVC frames are produced using reinforced uPVC profiles specifically designed for bending. The profile is prepared by:

- Cutting to oversize length to allow for controlled forming
- Removing or modifying internal reinforcement where necessary to allow bending
- Inserting temporary formers or mandrels to maintain profile geometry during the process

2.2 Heat Bending Process

The arch is formed using a **controlled heat bending process**, where the uPVC profile is:

- Evenly heated in a calibrated bending oven or oil bath
- Brought to a precise temperature to soften the material without degrading its structural integrity
- Gradually bent around a fixed former that matches the required radius

Once the desired shape is achieved, the profile is:

- Actively cooled while held in position
- Allowed to stabilise to prevent spring-back or distortion

This process ensures a smooth, consistent arch that matches the door slab geometry.

2.3 Structural Characteristics of Bent uPVC

Although modern heat-bending techniques are highly accurate, it is important to understand that:

- Bent uPVC does not have the same inherent rigidity as straight, fully reinforced sections
- The arch section is subject to higher torsional and shear forces once glazed or door slabs are installed
- Reinforcement options in arched sections are limited compared to straight frames

For this reason, additional structural support within the overall frame design is critical.

3. Composite Door Weight Considerations

Composite door slabs are significantly heavier than traditional uPVC or panel doors due to their multi-layer construction, which typically includes:

- GRP skins
- High-density insulated core
- Timber or engineered subframes
- Multi-point locking systems and hardware

Depending on size and specification, a composite door slab can weigh **two to three times more** than a standard uPVC panel door.

This increased mass places additional stress on:

- The hinge side jamb
 - The arched head section
 - The overall frame geometry, particularly over time
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4. Importance of Midrails in Arched Frames

4.1 Structural Reinforcement

A **midrail** acts as a horizontal structural member within the door frame, effectively:

- Reducing the unsupported span of the arched head
- Distributing the door slab load more evenly across the frame
- Limiting deflection and flex within the arched section

This is particularly important where reinforcement in the arch itself is restricted.

4.2 Reduction of Twist and Frame Movement

Without a midrail, heavy composite slabs can cause:

- Progressive twisting of the frame
- Opening or closing tolerances to change over time
- Increased friction or binding during operation
- Premature wear on hinges and locking mechanisms

The inclusion of a midrail significantly reduces these risks by increasing overall frame stiffness.

4.3 Long-Term Performance and Warranty Considerations

From a long-term performance perspective, midrails:

- Help maintain correct sash-to-frame clearances
- Improve resistance to thermal movement
- Reduce the likelihood of call-backs related to door alignment

For arched composite doors, midrails should be considered **best practice rather than an optional extra**.

5. Design Recommendation

We **strongly recommend** that all arched composite door frames are manufactured with an integral midrail unless there are overriding architectural constraints.

This recommendation is based on:

- The weight characteristics of composite door slabs
- The structural limitations of bent uPVC profiles
- Long-term performance data and installation feedback

Where a midrail is not specified, the risk of frame distortion, operational issues, and reduced service life is significantly increased.

6. Summary

- Arched uPVC frames are produced using a controlled heat-bending process to achieve precise geometry
- Bent uPVC sections have reduced rigidity compared to straight reinforced profiles

- Composite door slabs are heavy and place high structural loads on arched frames
- Midrails provide essential reinforcement, reducing twist, deflection, and long-term movement

For these reasons, midrails are strongly advised in all arched composite door applications.

If you require further technical clarification or project-specific advice, please contact our technical team prior to order placement.

7. Legal, Warranty, and Specification Protection

7.1 Warranty and Liability Position

Arched composite door assemblies are subject to increased structural loading due to door slab weight and the inherent limitations of bent uPVC profiles. Windows Plus strongly recommends the inclusion of midrails as a structural reinforcement measure.

Where midrails are omitted against manufacturer guidance:

- Any increased risk of frame distortion, operational issues, or premature wear is accepted by the specifier or purchaser
- Warranty coverage may be limited or excluded for issues directly attributable to frame movement, twisting, or deflection
- Responsibility for long-term performance may transfer away from the manufacturer

This guidance is issued to protect all parties by ensuring informed specification decisions are made at order stage.

7.2 Installer Responsibility

Correct installation is essential to achieve the intended structural performance of arched composite doors. Installers must ensure:

- Frames are installed plumb, square, and adequately supported
- Correct packer placement and fixing points are used
- Door slab weight is fully supported during and after installation

Failure to install in accordance with accepted industry best practice may invalidate warranty coverage.

7.3 Customer-Facing Communication

Windows Plus recommends that customers are clearly informed that:

- Midrails are a structural component,

- Their inclusion significantly improves durability and operational stability
- Omission may compromise long-term performance

Clear communication at point of sale helps prevent future disputes.

7.4 Specification Control

To maintain product integrity, Windows Plus recommends:

- Midrails are specified as standard on all arched composite door frames
 - Any deviation from this guidance is clearly documented and approved at order stage
 - Priority is given to long-term structural performance over aesthetic preference
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8. Issue Control

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This document is subject to revision without notice as manufacturing methods, materials, and industry standards evolve.

8.1 Installer Responsibility and Tolerances

Where appropriate, installation guidance may reference:

- The importance of correct packers, fixings, and support points
- Maintaining square and plumb conditions during installation
- Allowances for thermal movement in arched frames

Correct installation is critical to ensuring the structural benefits of midrails are fully realised.