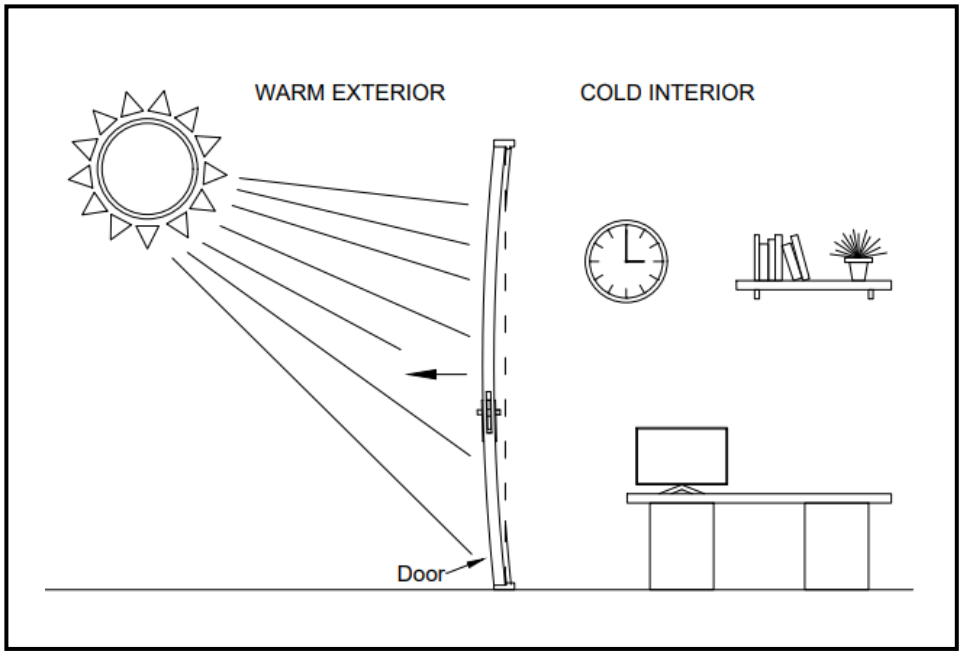
THERMAL BOWING IN ALUMINUM DOORS

Thermally broken aluminum windows and doors are designed with an insulating barrier that improves energy efficiency by reducing heat transfer between indoors and outdoors. This feature not only helps maintain comfortable interior temperatures and energy costs but also enhances overall thermal performance in extreme temperatures. While these doors deliver superior thermal performance, they can still experience temporary effects like thermal bowing under certain conditions, a natural response to temperature differences.

What is Thermal Bowing?

Thermal bowing refers to the bending or warping of a structural component caused by uneven temperature distribution across the surfaces. This is a common occurrence in aluminum doors exposed to significant temperature differences between the interior and exterior environments. When one side of the unit is heated more than the other, thermal expansion occurs unequally.



Like most metals, aluminum expands when heated and contracts when cooled. When one side of a door panel is exposed to heat, it causes that side to expand. Meanwhile, the unheated side remains a cooler temperature and doesn't expand. The differential expansion causes the door to bow or warp toward the side that is hotter.

Common Contributing Factors:

- Sunlight Exposure: Direct sunlight heats one side more than the other.
- Temperature Differences: Indoor vs. outdoor extremes.
- Wind/Airflow: Can cool one side, causing temperature imbalance.
- Color/Finish: Dark colors absorb more heat.
- Door Orientation: Position relative to sun/wind.
- Air Conditioning/Heating: Air vents near door create hot/cold spots.

Temporary Functional Impairment:

When a door panel becomes thermally bowed, it may not align properly with the frame. The misalignment can make the door more difficult to open, close, or lock.

As the indoor and outdoor temperatures equalize, eliminating the temperature differential on either side of the door, the door will gradually return to its original state and resume normal functionality.

THERMAL BOWING IN ALUMINUM DOORS CONTINUED

Mitigation Strategies:

- Architectural Shading: Install awnings, overhangs, or louvers to protect doors from direct sunlight.
- Landscaping: Trees or shrubs can provide natural shading and reduce temperature extremes near doors.
- HVAC Placement: Positioning heating and cooling vents away from door surfaces to minimize localized temperature differences.

The Benefits of Thermally Broken Aluminum:

Thermally broken aluminum doors offer exceptional energy efficiency by significantly reducing heat and cold transfer between the interior and exterior of the home. The thermal break (polyamide reinforced with glass fibers) serves as an insulating barrier within the aluminum panel, reducing conductivity. While thermally broken aluminum may experience temporary thermal bowing due to temperature differences, the design enables better thermal performance and improved energy efficiency. Non-Thermally broken aluminum doors allow heat and cold to pass through more easily, reducing energy efficiency.