COMMERCIAL & RESIDENTIAL GARAGE DOOR DIVISION
DASMA TECHNICAL DATA SHEET
Door & Access Systems Manufacturers Association International
#185

1300 Sumner Avenue
Cleveland, Ohio 44115-2851
Phone: 216-241-7333 • Fax: 216-241-0105
E-mail: dasma@dasma.com

Thermal Bowing of Garage Doors with Bonded Core Sections

Thermal bowing is an inherent characteristic on garage doors with insulated bonded core sections and is not considered a product defect. Insulated bonded cores are associated with sandwich insulated panel construction, predominantly featuring steel facings and foam cores. This Technical Data Sheet describes the different factors where thermal bowing occurs and identifies various industry recommendations to minimize its effect.

****

⚠WARNING

The garage door is typically the largest moving object in the house, and many of its components are under high tension. Improper installation or maintenance of a garage door can create a hazardous condition that can cause serious injury or even death.

Because of potential dangers involved, all repairs and adjustments must be performed by a trained door systems technician using proper tools and instructions.

****

What is Thermal Bowing?

Thermal bowing is caused by thermal expansion, which is the tendency of matter to change in volume in response to a change in temperature. Most materials increase in volume when the temperature rises. Thermal bowing occurs in insulated bonded core panels, where an interior and exterior skin are bonded to an insulated core and there is a significant temperature difference between the interior and exterior skins. If one panel is significantly warmer than the other, the warmer skin will grow relative to the cooler skin and cause the door to bow in the direction of the warmer skin. It is important that end users recognize this inherent phenomenon and apply an appropriate garage door manufacturer recommended solution.

All insulated panels will exhibit some thermal bowing when subjected to a temperature difference from one side of the insulated panel to the other (see Figure 1).

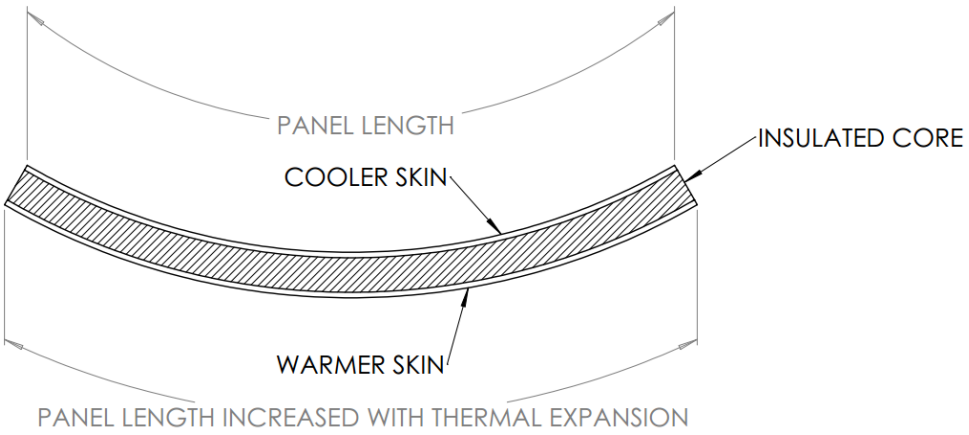

Figure 1

What Are Influences That Can Create Thermal Bowing?

- Amount of temperature difference. The greater the temperature difference from the outside environment to the inside garage space, the greater the potential thermal bowing. However, thermal bowing is not restricted to outward movement. For example, in a cold winter environment a heated garage might mean that a garage door might have a tendency to bow inward.

- Door size. The larger the door, the more potential bow. Without reinforcement, the thermal bow on 20' wide garage door could exceed several inches.

- Darker color door. A brown, insulated garage door facing the sun on a hot day with an air-conditioned garage or warehouse space will have more thermal bowing than an equivalent white garage door in the same application. As with a greater outdoor temperature than indoor garage temperature, thermal bowing will be outward. The darker color, the more this tendency exists when facing the sun.

- Door design. Door designs that inhibit heat transfer from the exterior to interior, or vice versa, have the potential for greater thermal bowing than garage doors that do not inhibit this heat transfer. Insulated garage doors that are "thermally-broken" inhibit heat transfer, since the heat transfer path is 'broken' from one side of the door to the other.

- Construction material of door skin. Different materials have different rates of thermal expansion. Aluminum and plastics have greater thermal expansion rates than steel.

- Exposure to sun. A south facing door in direct sunlight will be more likely to experience thermal bowing than a north facing door out of direct sunlight.

What are other issues related to Thermal Bowing?

Besides a measureable bow, field issues reported with thermal bowing include top section rubbing on the top of the garage door opening header (outward thermal bow) or a gap between the top section and the top of the opening (inward thermal bow).

What Can Be Done About Thermal Bowing?

While thermal bowing cannot be eliminated when the previous influences are present, it can be minimized to where it has no appreciable effect on garage door performance. Preventive measures typically involve door reinforcement that reduces thermal bowing. This could include, but is not limited to, the application of horizontal struts across the back of the garage door. The size and number of struts across the back of the door can vary depending on the various factors listed above and the amount of thermal bow.

Extreme instances of thermal bowing might require more extensive reinforcement, including:

- large, dark colored, thermally-broken (non-thermally-conductive material placed between the door's exterior and interior facings) insulated garage door
- facing the sun on a hot day
- air-conditioned garage door space

Other techniques to address thermal bowing depend on the door system and the adjustability of either the track assembly or the jamb/header seal. Please contact the product manufacturer for their recommendations on minimizing thermal bowing.