

**This document provides a hierarchy of general thermal stress guidelines. However, recommendations provided by the glass fabricator based on specific project or location requirements would typically take precedence.**

## **Hierarchy of Thermal Stress Management Considerations**

Our general thermal stress management guidance consists of the following points with descending order of precedence on when to implement heat-strengthened glass rather than annealed glass (unless fully tempered glass is specifically noted in this discussion or required for other reasons).

For applications subject to particularly severe thermal stress influences- for instance, particularly light-colored framing or pronounced partial shadowing- advanced analysis is recommended.

To mitigate thermal stress amplification, temporary construction protective films should be colorless and as thin as practical.

For laminated glazing subject to appreciable thermal loads, the interlayer supplier should be contacted for product durability guidance.

- All glass on spandrel and shadow box IG units.  
For inboard frit-opacified lites, fully tempered glass is recommended for thermal stress management based upon a potential glass strength reduction associated with frit application.  
In the absence of advanced analysis, fully tempered glass is recommended for thermal stress management of inboard and middle panes of shadow box IG units based upon heat buildup.  
For other conditions of inboard lites, fully tempered glass may be required upon severe exposure to thermal stresses. Among the factors which may influence the decision to temper the inboard lite are:
  - Exposure to partial shading
  - Particularly large units
  - High R-value insulation inboard of the glazing
  - Light-colored framing
  - A tinted outboard lite
  - Severe climatic exposure
- As indicated by our internal Thermal Stress Program (where stresses do not exceed 2,500 psi). (The extensive analysis of this program is not generally necessary in the absence of light-colored frames, pronounced partial shading, or other notable risk factors.)
- For glazing assemblies 35 sf or greater in area, the first coated lite and any lites outboard of it.
- For glazing assemblies subject to applied films that are not clear in appearance.
- For glazing assemblies in applications beyond the GANA Glazing Manual's recommendations on ventilation and interior shading devices.
- All tinted glass.
- Middle lites of commercial triple-glazed units.
- For outboard and inboard lites of triple-glazed units: Any lite that is coated with a product not similar to Neutral 78/65 or IS 20.
- All lites in commercial units with muntin bars.
- As indicated by a "Stop" (red) Thermal Stress Guideline from our Performance Calculator. A "Caution" (yellow) Thermal Stress Guideline indicates a borderline condition.

Please note that this document is provided as a convenience to you and is not to be construed as an assumption of responsibility or liability for design and application choices, which remain the responsibility of the design professionals involved in any project, nor as a modification of Guardian's standard warranties or as an additional warranty of any kind.

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