

3form XT is a design-forward collection of materials specifically engineered for the extreme demands of exterior applications. With 3form XT materials, functional exterior applications become unique opportunities to bring distinctive design outdoors.

XT Materials

- Koda XT
- Chroma XT*
- Pressed Glass XT*

***Not all products available in XT formats. Please refer to the product specific specification sheets, www.3-form.com or contact your local sales representative for further information.**

Exterior Considerations

3form XT materials will be subject to a number of environmental conditions. Some of the considerations that may need to be addressed when using 3form XT materials are as follows:

- Expansion/Contraction
- Deflection/Stress
- Wind/Snow Load
- Insulation Values
- UV Stability
- Impact Resistance
- Cleaning and Care
- Bonding
- Panel Thickness
- Attachment Methods
- Color
- Heat/Cold Forming

Exterior Performance

3form XT panels have proven to be very effective in maintaining the integrity of the panels and design after extended periods of UV exposure.

½" is the standard gauge for XT products.

¼" minimum gauge for all XT products.

Expansion/Contraction Allowances

3form XT resin materials will expand and contract nominally with fluctuations in temperature. The following formulas calculate allowances that should be made in all applications:

- $\ell \times \Delta T \times 0.00004 = E/C$
- $\ell + E/C = \text{Frame Length}^*$
- $\ell \times \Delta T \times 0.00004 + df = \text{Diameter of hole}$

ℓ = Longest length of panel (in)

ΔT = Change in temperature of the material (°F)

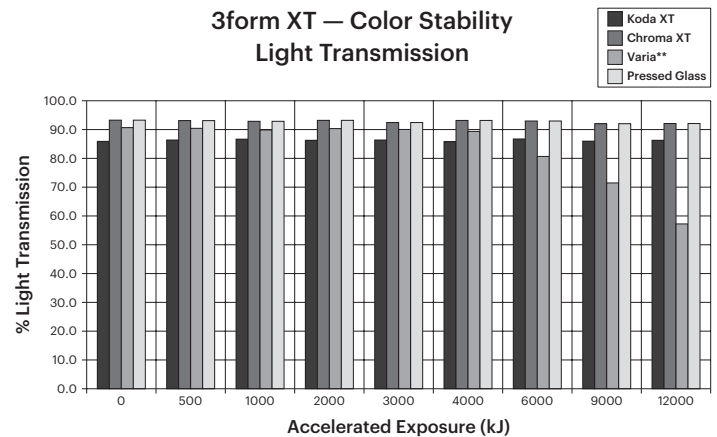
E/C = Amount of linear expansion/contraction

df = Diameter of fastener (in)

***1 inch minimum edge capture for all framed XT applications**

Color Stability

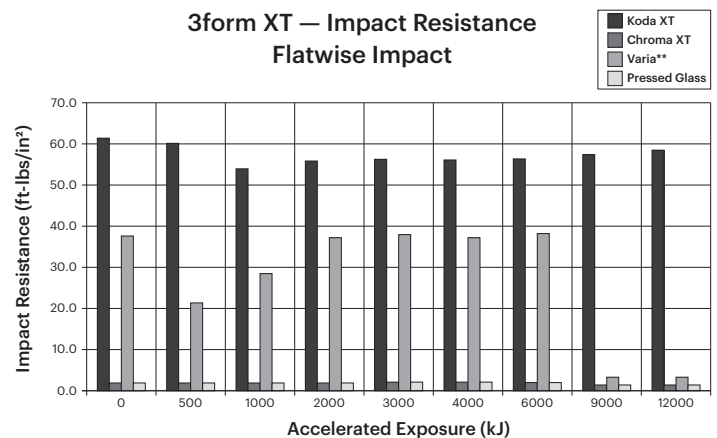
One important characteristic of a materials performance is the ability to maintain consistent aesthetics. The following chart demonstrates the performance of 3form XT resin materials in terms of maintaining consistent light transmission over time. It is shown that the 3form XT materials exhibit excellent performance following 12,000 kJ of exposure (representing approximately 10-years outdoor Florida exposure).



**Varia is shown for comparison sake only. It is not recommended for exterior applications due to heat resistance limitations.

Retention of Properties

Another important factor to consider is the ability of a material to maintain its physical integrity after exposure to solar radiation. The following chart depicts the impact strength is affected after 12,000 kJ of accelerated exposure.



**Varia is shown for comparison sake only. It is not recommended for exterior applications due to heat resistance limitations.

Examples:

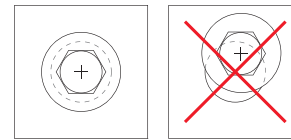
- 48"×96" panel that experiences a 100°F temperature change will expand/contract:
 $96" \times 100^\circ\text{F} \times 0.00004 \text{ in/in } ^\circ\text{F} = 0.384"$ (expansion)
- Framed Panels: 48" × 96" fully framed panel that experiences a 100°F temperature change will require a frame length:
 $96" + 0.384" = 96.384"$ (frame length)
- Point Supported Panels: 48" × 96" panel that experiences a 100°F temperature change using a ¼"-20 fastener will require a hole diameter:
 $96" \times 100^\circ\text{F} \times 0.00004 \text{ in/in } ^\circ\text{F} + \frac{1}{4}" = 0.634"$ (hole diameter)

Installers should take extra precautions if installation is occurring during low or high temperature extremes.

Allowances should also be made in the following situations:

- Channel depths in frames
- Holes for standoffs and other hardware
- Meeting points for multiple sheets of 3form XT materials

Hole diameters must be oversized to accommodate expansion/contraction of XT materials. All screws/fasteners must be secured on center within the oversized hole to allow for normal expansion/contraction. The tables below present the recommended hole diameters for point supported 3form XT materials.



Do

Do Not

Recommended Hole Diameter* - Standard Screw Size

Panel Length (in)	Screw Size															
	#6	#7	#8	#9	#10	#11	#12	#14	1/4"	#16	#18	#20	3/8"	1/2"	3/4"	1"
24	1/4"	1/4"	1/4"	1/4"	5/16"	5/16"	5/16"	5/16"	3/8"	3/8"	3/8"	7/16"	1/2"	5/8"	7/8"	1-1/8"
30	1/4"	1/4"	5/16"	5/16"	5/16"	5/16"	3/8"	3/8"	3/8"	3/8"	7/16"	7/16"	1/2"	5/8"	7/8"	1-1/8"
36	5/16"	5/16"	5/16"	5/16"	5/16"	3/8"	3/8"	3/8"	3/8"	7/16"	7/16"	7/16"	1/2"	5/8"	7/8"	1-1/8"
42	5/16"	5/16"	5/16"	3/8"	3/8"	3/8"	3/8"	7/16"	7/16"	7/16"	7/16"	1/2"	9/16"	11/16"	15/16"	1-3/16"
48	5/16"	5/16"	3/8"	3/8"	3/8"	3/8"	7/16"	7/16"	7/16"	7/16"	1/2"	1/2"	9/16"	11/16"	15/16"	1-3/16"
54	3/8"	3/8"	3/8"	3/8"	3/8"	7/16"	7/16"	7/16"	7/16"	1/2"	1/2"	9/16"	9/16"	11/16"	15/16"	1-3/16"
60	3/8"	3/8"	3/8"	7/16"	7/16"	7/16"	7/16"	1/2"	1/2"	1/2"	9/16"	9/16"	5/8"	3/4"	1"	1-1/4"
66	3/8"	7/16"	7/16"	7/16"	7/16"	7/16"	1/2"	1/2"	1/2"	9/16"	9/16"	9/16"	5/8"	3/4"	1"	1-1/4"
72	7/16"	7/16"	7/16"	7/16"	1/2"	1/2"	1/2"	1/2"	9/16"	9/16"	9/16"	5/8"	11/16"	13/16"	1-1/16"	1-5/16"
78	7/16"	7/16"	1/2"	1/2"	1/2"	1/2"	1/2"	9/16"	9/16"	9/16"	5/8"	5/8"	11/16"	13/16"	1-1/16"	1-5/16"
84	1/2"	1/2"	1/2"	1/2"	1/2"	9/16"	9/16"	9/16"	9/16"	5/8"	5/8"	5/8"	11/16"	13/16"	1-1/16"	1-5/16"
90	1/2"	1/2"	1/2"	9/16"	9/16"	9/16"	9/16"	5/8"	5/8"	5/8"	5/8"	11/16"	3/4"	7/8"	1-1/8"	1-3/8"
96	1/2"	9/16"	9/16"	9/16"	9/16"	9/16"	5/8"	5/8"	5/8"	5/8"	11/16"	11/16"	3/4"	7/8"	1-1/8"	1-3/8"
102	9/16"	9/16"	9/16"	9/16"	5/8"	5/8"	5/8"	5/8"	11/16"	11/16"	11/16"	3/4"	13/16"	15/16"	1-3/16"	1-7/16"
108	9/16"	9/16"	5/8"	5/8"	5/8"	5/8"	5/8"	11/16"	11/16"	11/16"	3/4"	3/4"	13/16"	15/16"	1-3/16"	1-7/16"
114	5/8"	5/8"	5/8"	5/8"	5/8"	11/16"	11/16"	11/16"	11/16"	3/4"	3/4"	3/4"	13/16"	15/16"	1-3/16"	1-7/16"
120	5/8"	5/8"	5/8"	11/16"	11/16"	11/16"	11/16"	3/4"	3/4"	3/4"	3/4"	13/16"	7/8"	1"	1-1/4"	1-1/2"

*Additional allowances should be made when using bushings or sleeves.

Recommended Hole Diameter* - Metric Screw Size

Panel Length (in)	Screw Size													
	M3.5	M4	M5	M6	M7	M8	M10*	M12	M14	M16	M18	M20	M22	M24
24	1/4"	1/4"	5/16"	5/16"	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	13/16"	7/8"	15/16"	1-1/16"
30	1/4"	1/4"	5/16"	3/8"	3/8"	7/16"	1/2"	9/16"	11/16"	3/4"	13/16"	15/16"	1"	1-1/16"
36	5/16"	5/16"	5/16"	3/8"	7/16"	7/16"	9/16"	5/8"	11/16"	3/4"	7/8"	15/16"	1"	1-1/16"
42	5/16"	5/16"	3/8"	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	13/16"	7/8"	15/16"	1-1/16"	1-1/8"
48	5/16"	3/8"	3/8"	7/16"	7/16"	1/2"	9/16"	11/16"	3/4"	13/16"	7/8"	1"	1-1/16"	1-1/8"
54	3/8"	3/8"	7/16"	7/16"	1/2"	1/2"	5/8"	11/16"	3/4"	7/8"	15/16"	1"	1-1/16"	1-3/16"
60	3/8"	3/8"	7/16"	1/2"	1/2"	9/16"	5/8"	11/16"	13/16"	7/8"	15/16"	1"	1-1/8"	1-3/16"
66	3/8"	7/16"	7/16"	1/2"	9/16"	9/16"	11/16"	3/4"	13/16"	7/8"	1"	1-1/16"	1-1/8"	1-3/16"
72	7/16"	7/16"	1/2"	1/2"	9/16"	5/8"	11/16"	3/4"	13/16"	15/16"	1"	1-1/16"	1-1/8"	1-1/4"
78	7/16"	1/2"	1/2"	9/16"	9/16"	5/8"	11/16"	13/16"	7/8"	15/16"	1"	1-1/8"	1-3/16"	1-1/4"
84	1/2"	1/2"	9/16"	9/16"	5/8"	5/8"	3/4"	13/16"	7/8"	15/16"	1-1/16"	1-1/8"	1-3/16"	1-1/4"
90	1/2"	1/2"	9/16"	5/8"	5/8"	11/16"	3/4"	13/16"	15/16"	1"	1-1/16"	1-1/8"	1-1/4"	1-5/16"
96	1/2"	9/16"	9/16"	5/8"	11/16"	11/16"	3/4"	7/8"	15/16"	1"	1-1/16"	1-3/16"	1-1/4"	1-5/16"
102	9/16"	9/16"	5/8"	5/8"	11/16"	3/4"	13/16"	7/8"	15/16"	1-1/16"	1-1/8"	1-3/16"	1-1/4"	1-3/8"
108	9/16"	9/16"	5/8"	11/16"	11/16"	3/4"	13/16"	7/8"	1"	1-1/16"	1-1/8"	1-1/4"	1-5/16"	1-3/8"
114	5/8"	5/8"	5/8"	11/16"	3/4"	3/4"	7/8"	15/16"	1"	1-1/16"	1-3/16"	1-1/4"	1-5/16"	1-3/8"
120	5/8"	5/8"	11/16"	11/16"	3/4"	13/16"	7/8"	15/16"	1"	1-1/8"	1-3/16"	1-1/4"	1-3/8"	1-7/16"

**Additional allowances should be made when using bushings or sleeves.*

Heat Resistance

3form XT materials will absorb different amounts of heat based on the makeup and location of the product. The amount of heat absorption will directly influence the amount of expansion/contraction the material will experience. It is not uncommon for dark colored XT materials to experience temperatures in excess of 150°F on hot days with direct sun exposure. Exceeding the maximum continuous use temperature of an XT material can lead to permanent deformation. Special consideration for color selection and expansion/contraction should be used when installing XT materials in South and West facing applications. The following table lists the continuous max use temperature for all XT products. If you have additional questions or concerns regarding the heat resistance of 3form XT products please contact the 3form Technical Help Desk at 877-649-2670.

Product	Maximum Continuous Use Temperature
Koda XT Standard and Custom Integral Colors	270°F (132°C)
Koda XT C3	200°F (93°C)
Pressed Glass XT	212°F (100°C)
Chroma XT	180°F (82°C)
Varia Ecoresin**	150°F (66°C)

****Varia Ecoresin is shown for comparison sake only. It is not recommended for exterior applications due to heat resistance limitations.**

Attachment Methods

3form XT materials can be supported by many different methods. The three most common support conditions for XT panels are Fully Framed Support, Fixed Simple Support and Point Support. In all cases holes must be smoothly bored as notches may result in cracking of the XT material in an application.

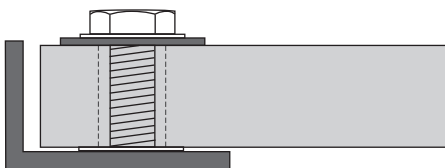
Fully Framed Support

The edges of fully framed supported XT panels must be completely captured by the support frame. A minimum edge capture of 1" is required for all fully framed XT panels. The frame structure should be designed to accommodate normal expansion/contraction of the XT material. A soft gasket (neoprene, Teflon, nylon, silicone) must be used between the XT panels and the support material. Care must be taken in order to ensure no metal is in direct contact with the 3form XT material. A cross-section of this support condition is shown below.



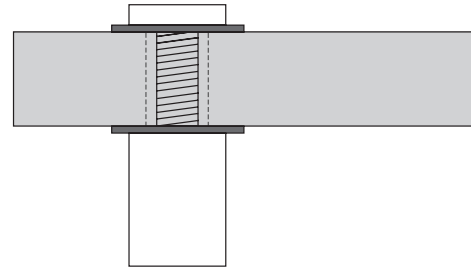
Fixed Simple Support

Fixed simple supported panels are typically supported on the underside by a frame type structure. A minimum edge capture of 1" is required for all fixed simple supported XT panels. A mechanical fastener must be used to secure the XT panels to the frame structure. Adhesive fastening is not permitted for XT applications. Mechanical fasteners are recommended to be hand tightened only and all holes must be over-sized per the recommended hole size tables in order to allow for normal expansion/contraction of the XT material. A soft gasket (neoprene, Teflon, nylon, silicone) must be used between the XT panels and the support material. Care must be taken in order to ensure no metal is in direct contact with the 3form XT material. A cross-section of this support condition is shown below.



Point Support

Point supported panels are panels that are supported at fixed points across the surface of the panel that allow for unsupported material spans. A soft gasket (neoprene, Teflon, nylon, silicone) must be used between the XT panels and the support material. Care must be taken in order to ensure no metal is in direct contact with the 3form XT material. A cross-section of this support condition is shown below. All holes must be oversized per the recommended hole size tables.



Adhesive Bonding

DO NOT use Loctite or other cyanoacrylate type thread locking materials with 3form XT materials. To more permanently secure hardware, use mechanical fastening solutions such as nylok blue patch or Teflon tape.

Adhesives are not recommended as a primary bonding method for 3form exterior materials due to complications with expansion/contraction. Silicone can be used for finishing but will need to be routinely maintained as expansion/contraction of the panel can cause the silicone to pull away from itself over time.

Panel Connections

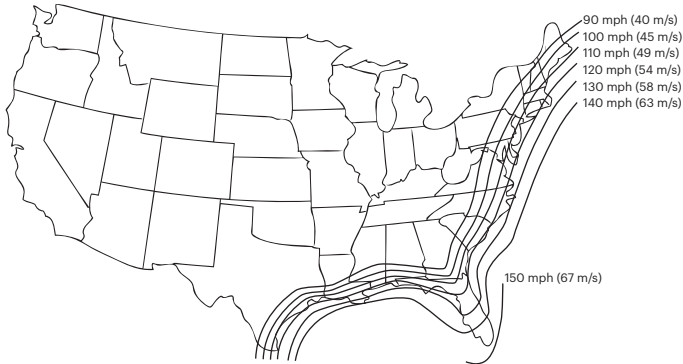
Adhesives should not be used on panel to panel connections as they do not allow for normal expansion/contraction of the XT material. Silicones can be used as a sealant along panel connections.

Deflection

3form XT materials will exhibit different amounts of deflection given a variety of factors; fastening techniques, applied loads, panel thickness and panel dimensions to list a few. The Deflection Charts for specific 3form products can be used as a guideline for support determining support spans. These charts can be found on www.3-form.com in the Tech Specs and Downloads section. If your application has specific engineering requirements, please contact the 3form Technical Help Desk at 877-649-2670 for additional direction.

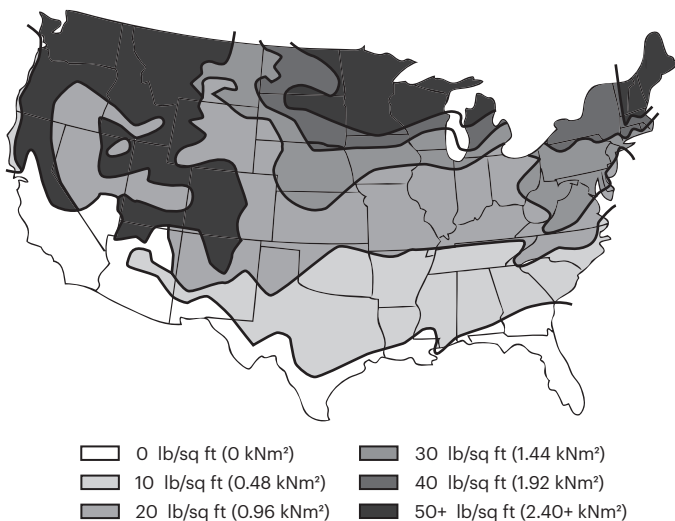
Wind Load

The design wind load for each XT application will be dependent on the project specific requirements set forth by local building codes. Typical wind loads (3-second gust) are shown in the figure below. Please refer to Chapter 16 of the International Building Code or contact the 3form Technical Help Desk at 877-649-2670 for additional direction.



Snow Load

The design snow load for each XT application will be dependent on the project specific requirements set forth by local building codes. Typical ground snow loads are shown in the figure below. Please refer to Chapter 16 of the International Building Code or contact the 3form Technical Help Desk at 877-649-2670 for additional direction.



Slope

3form recommends a minimum slope of ½":12" (½" of slope for every 12" of panel run).

Overhead Applications

3form XT materials are acceptable for use in overhead applications*. All materials pass the requirements for Safety Glazing - ANSI Z97.1 American National Standards for Safety Glazing Materials used in Buildings - Safety Specifications and Methods Test.

***Varia Ecoresin is NOT permitted for use in horizontal exterior applications.**

Edge Sealing

Certain XT design inter layers (organic and fabrics in particular) can wick moisture over time if the edges are exposed to water or moisture. These XT products should be sealed using an approved edge sealing treatment. XT products using color do not require edge sealing and are good options as an alternative to Color Weave. Edge sealing is required on all exposed edges, including any holes that are created to allow for point support fastening. If you have additional questions or concerns regarding edge sealing of 3form XT products please contact the 3form Technical Help Desk at 877-649-2670.

3form XT panels utilizing natural products as a decorative interlayer may change in appearance over time. Natural materials are also subject to inherent inconsistency in color, texture and shape.

Heat Forming

Heat forming is not available for all 3form XT products. The list of XT products that are available for heat formed applications are detailed below.

- **Koda XT** – Heat forming is available for all standard Koda Colors. Custom Integral Colors are also able to be heat formed. 3form Koda XT panels made with color technology cannot be heat formed.
- **Chroma XT** - All products*

* ½" is the standard gauge for XT products

¼" minimum gauge for all custom XT products

Thermal Insulation Values for XT Materials

Please refer to the 3form Insulation and Shading Values technical white paper for information on insulation and shading values of 3form materials. This document can be found on www.3-form.com in the Tech Specs and Downloads section.

Etching

3form does not recommend using products that have been laser etched in exterior applications as this process induces stress which can result in crazing/cracking.

Aqueous Applications – Chemicals

3form XT materials are well suited for use in and around aqueous environments (i.e. swimming pools, water fountains, reflecting ponds, etc...). The chemical resistance of each material will allow for long term general use; however, increased stress in the material from heat forming, support tension, can cause reduced chemical resistance. If you have questions or concerns regarding the use of 3form XT materials in aqueous environments please contact the 3form Technical Help Desk at 877-649-2670.

Storage

Panels should never be left in an exterior environment without first removing the protective masking. The maskings used on the panels are not intended to hold up to UV and water exposure. Also make sure panels are stored in a way and a location that will prevent damage or scratching of the material prior to installation.

Cleaning Instructions

3form XT materials should be cleaned periodically. A regular, quarterly cleaning program will dramatically help prevent noticeable weathering and dirt build-up.

Rinse the sheets with lukewarm water. Remove dust and dirt from 3form XT materials with a soft cloth or sponge and a solution of mild soap and/or liquid detergent in water. A 50:50 solution of isopropyl alcohol and water also works well. Rinse thoroughly with lukewarm water.

Always use a soft, damp cloth to blot dry. Rubbing with a dry cloth can scratch the material and create a static charge. Never use scrapers or squeegees on 3form XT materials*. Also avoid scouring compounds, gasoline, benzene, acetone, carbon tetrachloride, certain deicing fluids, lacquer thinner or other strong solvents.

***Squeegees are only acceptable for use on 3form Pressed Glass XT**

Do not:

- Use a squeegee
- Use strong solvents, highly alkaline or abrasive cleaning agents
- Clean in hot sun or at elevated temperatures
- Rub with a dry cloth

Pressure Washing

Pressure washing can also be an effective way to remove miscellaneous debris from surfaces of 3form XT material installations.

Pre-soak panels with a light water spray to loosen and remove incidental surface debris.

It is recommended that the water pressure for cleaning XT panels be 1,500 psi or less. Use a gradual sweeping motion over the application. Never concentrate water spray in a single position or on an edge of 3form XT material. Pressure nozzle should never be positioned closer than 8 inches (203 mm) from the panel surface. 3form XT materials are tough but can be damaged if high pressure is concentrated in a single position too long.

Test a portion of the sheet first before spraying. If the test piece shows any sign of material fatigue, abrasion or delamination, discontinue pressure washing and proceed with manual cleaning instructions as described above.

Coated or painted parts are not suitable for pressure washing as the finish may be stripped off. Pressure washing is also not suitable for XT panels that have been edge sealed or seamed. If using detergent, use mild detergents only. Rinse sheet with light water spray after washing.

Do not:

- Concentrate spray in single position
- Use more than 1,500 psi pressure
- Position pressure nozzle closer than 8" (203 mm) from panel
- Proceed with pressure washing if test piece shows detrimental effects to panel
- Pressure wash XT panels that have been painted or coated to maintain coating integrity
- Pressure wash XT panels with sealed edges to ensure edge seals remain in tact

If debris or dirt is not removed by pressure washing attempt to clean with manual procedures described in preceding section.

Important

If a cleaning material is found to be incompatible in a short-term test, it will usually be found to be incompatible in the field. The converse, however, is not always true. Favorable performance is no guarantee that actual end-use conditions have been duplicated. Therefore, these results should be used as a guide only and it is recommended that the user test the products under actual end-use conditions.

For more information, visit 3-form.com or call 877-649-2670.