varia ecoresin® | light diffusing systems

The use of 3form Varia Ecoresin as a light-diffusing system is a very popular application and has attracted much attention to the Varia Ecoresin product line. We are pleased to provide this additional information with respect to the conditions of use of Varia Ecoresin as it applies to the stated requirements for light-diffusing systems as described in the 2009 International Building Code® (IBC).

Varia Ecoresin panels are produced from ecoresin (a polyester-based material). Further, ecoresin has been independently tested and meets the criteria for approved "Light transmitting Plastic" as described in the IBC and also has a Class B rating for flame spread as characterized by ASTM E 84 or UL 723. In 1" thickness Varia Ecoresin produced from ecoresin attains a class A under these methods. Varia Ecoresin was developed for the architectural and design marketplace with one intent being that the panels could be utilized in what is characterized by the IBC as "light-diffusing systems".

Light-diffusing systems are defined by the 2003 IBC as follows:

> LIGHT-DIFFUSING SYSTEM. Construction consisting in whole or in part of lenses, panels, grids or baffles made with light-transmitting plastics positioned below independently mounted electrical light sources, skylights or light-transmitting plastic roof panels. Lenses, panels, grids and baffles that are part of an electrical fixture shall not be considered as a light-diffusing system.

Varia Ecoresin, when used in a light-diffusing panel systems complies with the conditions expressed in Section 2606.7.2 of the IBC:

> 2606.7.2 Installation. Light-transmitting plastic diffusers shall comply with Chapter 8 (Interior Finishes) unless the light-transmitting plastic diffusers will fall from the mountings before igniting at an ambient temperature of at least 200°F (93°C) below the ignition temperature of the panels. The panels shall remain in place at an ambient room temperature of 175°F (79°C) for a period of 15 minutes.

To date, there is no standardized test protocol to demonstrate the material compliance of this section of the IBC. As such, IBC-certified laboratories do not conduct assessments of light-diffusing systems. In the absence of a certified performance test, the thermal properties of Varia Ecoresin are such that engineering judgment is often employed to justify the use of Varia Ecoresin panels in light-diffusing systems.

The first criteria of section 2606.7.2, is that the diffuser must fall from its mountings at a temperature of 200°F below the ignition temperature selected material. The ignition temperature of the Varia Ecoresin is 716°F (as measured by ASTM D 1929). Hence, the Varia Ecoresin panels are required to fall from their mount at a temperature of 516°F. Given that the ecoresin sheet extrusion temperature is near 450°F, at which temperature the material is a viscous liquid, fallout of the panels will undoubtedly occur prior to reaching the 516°F limit.

The second requirement is that the panels must remain in place for at least 15 minutes at an ambient room temperature of 175°F. Analysis of the Varia Ecoresin thermal properties and experience with Varia Ecoresin in a variety of applications, indicate that this requirement can be also be easily achieved. Below is detailed information to provide additional background:

- The glass transition temperature, or the temperature at which Varia Ecoresin will begin to lose its rigidity, is 178°F. It should be noted that material is still solid above this temperature but it can now be described as "leathery" rather than "glassy".

- To begin the onset of the glass transition state and eventual deformation of a thermoplastic, the panel core and reverse-side surface must also approach the material's softening temperature. Consideration of the panel thickness should be made as the material core and reverse-side will take additional time to heat up and approach the glass transition temperature throughout the cross section of the panel. With a driving force of 175°F and the low-pressure heat deflection point of 181°F, this time could be significant.

- Experience with typical thermoforming conditions of Varia Ecoresin panels require that the sheet be clamped and heated in a ~250°F oven to a sheet temperature of 230-250°F. This is usually done by clamping the top and bottom perimeters of the sheet and heating for 25-30 minutes. During this time, the material becomes flexible like a tough leather but remains fixed in the clamped position. Based on this experience, it is highly reasonable to expect Varia Ecoresin to be able to remain attached for much greater than 30 minutes at a controlled temperature of 200°F as needed for a light-diffusing system or interior finish application.

- As such, we do recommend that the Varia Ecoresin panels in light-diffusing systems be fixed, either with a.) Point-fastening through the panel or b.) By using a top and bottom clamping frame that allows at least ¾" engagement of the Varia Ecoresin panel in the frame.

One further point regarding the use of light-diffusing systems - Section 2606.7.1 of the code states:

> 2606.7.1 Support. Light –transmitting plastic diffusers shall be supported directly or indirectly from ceiling or roof construction by use of noncombustible hangers. Hangers shall be at least No. 12 steel-wire gage (0.106 inch) galvanized wire or equivalent.

We recommend designs for light-diffusing systems to specify either wire supports or metal frames in order to comply with the IBC. We hope this document provides sufficient background on the ability to use 3form Varia Ecoresin panels in light-diffusing systems. Please contact 3form directly at: 877-649-2670 should you have further questions.