

St. Olaf College:

Saving the Birds One Fritted Glass Pane at a Time

Chemistry 124: Environmental Chemistry

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Introduction

Our nation's landscape is not what it used to be. Decades ago, many of our grandparents gazed out over open fields and farmhouses, untouched woods, and the cattails of wetlands. Today, the horizon is dotted with the outline of residential developments, commercial buildings, and most notable, skyscrapers. Our society has taken to modern industrialization and international trade, finding less need for farmers and their open field and a greater need for commercial businesses. Right or wrong, society has changed-- not only in what we choose to build and for what purposes, but *how* we build it. More and more, newer homes and buildings feature vaulted ceilings complete with large, dramatic windows. Entire walls of skyscrapers are made from glass, allowing plenty of light in and the opportunity for employees to see out. For years now we've been replacing the natural landscapes our grandparents may remember with cities of metal and glass, yet there seems to be a deeply engrained desire to remain in touch with the natural world around us—often achieved by visible connection through windows. Yet the gratification of this desire does not come without a price. It is obvious that large-scale windows increase the amount of light entering a building, in turn requiring more money for products to help shade these spaces. Yet the consequences are not merely monetary. The amount of annual avian impacts with glass structures recorded in the United States alone lies near the one billion mark (Yakutchik). According to Muhlenberg College Ornithologist Daniel Klem, this number of bird mortalities provides enough “sparrow-size creatures to wrap around the equator four times (Yakutchik). As one can see, our changing tastes in building techniques are taking their toll on both the pocketbook and the bird population. Yet, not all hope is lost. There is a possible solution to this growing problem. A building product known as ‘fritted-glass’ holds the potential to divert birds away from glass walls while at the same time providing a certain amount of light control

into and out of the structure. In this report, we will examine with more depth the properties of fritted glass, how it affects light control, and how it helps guard against avian impacts. Furthermore, we will discuss how fritted glass may be an ideal choice in the construction of St. Olaf's new Science Center in an effort to combine aesthetic beauty with environmental sustainability.

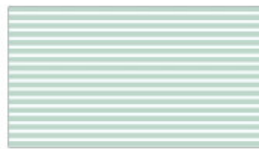
What Is Fritted Glass?

From a distance, the difference between fritted glass and regular plate glass is hardly detectable. A closer look, however, reveals that the fritted glass has a patterned coating that makes the glass appear nearly frosted. According to oldcastleglass.com, a patterned print effect is achieved by transferring silk-screen images onto annealed glass panes, and then processing those panes through a 'horizontal tempering furnace'. The furnace screens a ceramic enamel frit onto the surface of the glass in one of three patterns: dots, lines, or holes. Ceramic frit can be applied to glass with a fine mesh screen in order to achieve the desired pattern. Also, each glass section, or lite, can be designed to be transparent, translucent, or opaque, depending on the colors and patterns selected.

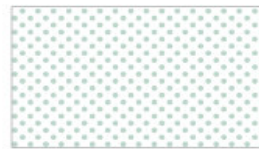
Standard Patterns



Dots—40% coverage;
1/8" dots staggered on 1/4" centers



Lines—50% coverage;
1/8" lines on 1/4" centers



Holes—60% coverage;
1/8" holes on 1/4" centers

Custom Patterns



To create your own design call 1-866-853-2278

Fritted Glass and Light Control

Light control, or put broadly--how light is limited or affected—is a byproduct of fritted glass. Because of its ceramic coating, the amount of light going into a building that uses fritted glass is noticeably lower than one constructed with regular plate glass. Based on perspective, this fact could be held as attractive to a potential buyer of the product.

With the establishment of what fritted glass is and how it is made, one can now progress to how it ‘works’. In terms of light control, fritted glass is effective in two ways. First, the ceramic frit that is bonded onto glass panes helps impede UV penetration. With the amount of UV rays reduced, less heat will be trapped within the building, allowing for lower cooling expenses. Second, a curtain wall of fritted glass helps to control the amount of visible light that enters a space. With the large, open spaces such as an atrium in a building, fritted glass would work to reduce the amount of excess light in the visible spectrum and simultaneously reduce glare within the building, making common spaces more comfortable and computer labs easier to use.

With respect to the new St. Olaf science center, the use of fritted glass to control light has many benefits. Heavy glass areas, like the center atrium, will see a reduction in the amount of solar heat captured within the space. Furthermore, this central gathering space will benefit from a lower intensity visible light spectrum, making it a more comfortable space for students and faculty to meet, socialize, and work. On bright days and with regular plate glass, such a space may be overwhelmed with light. Using fritted glass allows such large windows to frame important spaces in the building, and offers a compromise between excessive visible light and no light at all.

Fritted Glass and Avian Impacts

As mentioned in the introduction, it is estimated that nearly one billion birds die per year in the United States because of window impacts. Though avian impacts have been an issue since windows have been used in buildings, Joan Lowy of Scripps Howard News Service states that only with the development of “larger, stronger, and cheaper sheets of glass that the bird collision problem became sizable enough to be worrisome”(Lowy). The reason behind avian impacts is generally straightforward. Because regular panes of glass are reflective, birds perceive the glass as air or sky, and keep flying—usually to an unfortunate end. Lowy states “window collisions involving 225 species have been documented, which is a quarter of all bird species in the United States and Canada. The species not documented tend to be ones that live where there are relatively few buildings.” (Lowy). Clearly, the issue of avian impacts is one that will continue to increase as our glass buildings and cities grow.

With the problem recognized, steps to resolve it must be taken. Many institutions have turned to fritted glass to try and divert birds away from glassy towers and coexist safely in the same environment. Because of the pattern tempered onto the glass, reflection is minimized if not completely wiped out, allowing birds to clearly see a building obstruction.

The key to successful glass frit is the spacing of the pattern. The three standard patterns--the dot, line and hole—are ineffective if the spaces between each print are not close enough together. A pattern where the dots or lines are set too far apart allows a bird to believe that it can fit through the space, and to continue flying toward a building. Because of this, previous attempts to divert birds from windows using stick-on decals have proven futile if the decals are not placed “between two and four inches apart” (Lowy).

The effectiveness of using fritted glass to prevent avian contacts is still being evaluated. Swarthmore College, near Philadelphia, has recently constructed a new science center on campus to serve their 1,500 some students. Pioneering the first ‘real’ trials of fritted glass in relationship to bird impacts, Swarthmore has also installed a series of windows with video sensors called “thumpers”(Nielsen). According to John Nielsen of NPR, “the thumpers have recorded just two bird hits since the center was finished five years ago” (Nielsen). While no conclusive evidence has yet been drawn, it appears that there is a positive correlation between the presence of fritted glass on a building and lower avian impact rates.

Because St. Olaf is constructing its new science center near a heavily wooded area in which birds undoubtedly inhabit, the concern over avian impacts has been ever-present in the planning process. The south-facing side of the building is the area of most worry, with its large, wide windows expected to face directly into towards the campus’ woodlands. It is here where the use of fritted glass may be of most use in two different ways. First, peppering this side of the building with fritted glass will help to alert birds of the building, hopefully preventing any impacts. Second, a south facing window will allow in plenty of light and heat, both of which can be controlled by placing fritted glass on this side.

Manufacturing and Adventures in Business

In all of our research, we also went to great lengths to try and find a local manufacturer (within 500 miles of campus) that could supply St. Olaf with fritted glass should the college decide to move ahead with this product. After many phone calls to various potential candidates in both Minnesota and Wisconsin, we found ourselves directed to a company named Oldcastle glass, located in Albertville, MN. After vigorous attempts to contact Oldcastle, we spoke shortly with Nancy Disengn. She explained to us that that Oldcastle obtains their ‘base’ glass from a

company out of Pittsburgh name PPG. Upon receiving this glass, Oldcastle then cuts, frits, and tempers the glass. After this process, Oldcastle supplies their product to various glass installing companies around the Midwest, Minneapolis Glass being one of them.

With our hunt for local manufacturers we learned just how difficult it is to get in touch with knowledgeable company representatives. After being passed around the ranks several times with several companies, we were unsuccessful in completing an Environmental Impact Questionnaire. However, with what we feel to be a promising lead at Oldcastle Glass, it is our intention to follow up in the coming weeks in order to complete an Environmental Impact Questionnaire. There are several things we still need to know about Oldcastle, most of which we believe will be answered in an EIQ. However, another thing to consider strongly is cost. With close to 9000 square feet of glass area to cover on sections of the building, pricing will certainly be something to take into consideration.

Conclusion

As we move forward as a college, a nation, and a world, it will be important to recognize the changes that are happening around us. We are living in an age where it is imperative for human beings to recognize that their choices have consequences in all aspects of life, especially the environment. We need to recognize that even by doing little things, like installing a different type of glass to protect wildlife, we are helping to preserve a little bit of the natural environment that we are trying so desperately to hold on to—that our grandparents may have known. Even though the landscape may have changed, it is our responsibility that the changes we make are ones that our grandparents would be proud of.

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