Breaking Tradition

By Lori Greene, AHC/CDC, CCPR, FDHI

For many of us, the current area of focus with regard to school safety and security is protection from intruders, and with good reason. Schools should be designed and equipped to keep children safe when they're away from home. But a danger is present in many of the schools and other buildings we visit that most of us aren't even aware of: traditional wired glass that can cause severe and life-threatening injuries when subjected to human impact.

Many people believe that traditional wired glass—the glass with criss-crossed wires creating diamonds or squares—is "safety glass" and that it is more secure than other types of glass. The reality is the exact opposite. The wires used in traditional wired glass weaken the glass—it is only half as strong as ordinary annealed glass. And when traditional wired glass breaks, it forms large, sharp pieces that are held in place by the wires. When an adult or child impacts the glass and an arm, leg, or other body part projects through, they will then typically pull the injured limb back through the broken glass, causing further injury.

While the threat of an intruder entering a school building is statistically unlikely, injuries related to traditional wired glass occur frequently. In 2002, an epidemiologic study of the Consumer Product Safety Commission (CPSC) injury data was conducted by a professor from Emory University, Philip L. Graitcer, DMD, MPH. Of the 2,554 glass door injuries that occurred in U.S. schools in a one-year period, Dr. Graitcer stated that he would "conservatively estimate that 90% of the 2,500 glass door injuries seen each year in the CPSC system involved wired glass." That is 2,250 wired glass injuries in our nation's schools in one year. These injuries are often debilitating and life-altering; some even result in death due to blood loss. Also compelling: the hundreds of thousands of dollars in damages paid annually in the legal cases that arise because of these injuries.

The Ontario School Boards' Insurance Exchange (OSBIE) compiled a statistical analysis of the risks of injuries after paying out more than $3,000,000 to settle injury claims. Their report states:

Unless noted, photos are courtesy of Ingersoll Rand Security Technologies

These doors were installed within the last six months and contain traditional wired glass, even though the doors are not fire-rated and the code requires impact-resistant glass in all doors.

Traditional wired glass with square pattern.

"OSBIE receives many reports of incidents and notices of claims with respect to injuries received by students seriously cut through impact with glass. Many of these injuries are cause by wired safety glass in schools. From 1987 to 2000 there have been 107 claims against schools for glass injuries. Over this period, costs related to glass injuries amounted to $3,154,202. More important than the dollars are the pain and suffering, permanent reduced mobility and scarring caused by these impacts with glass."

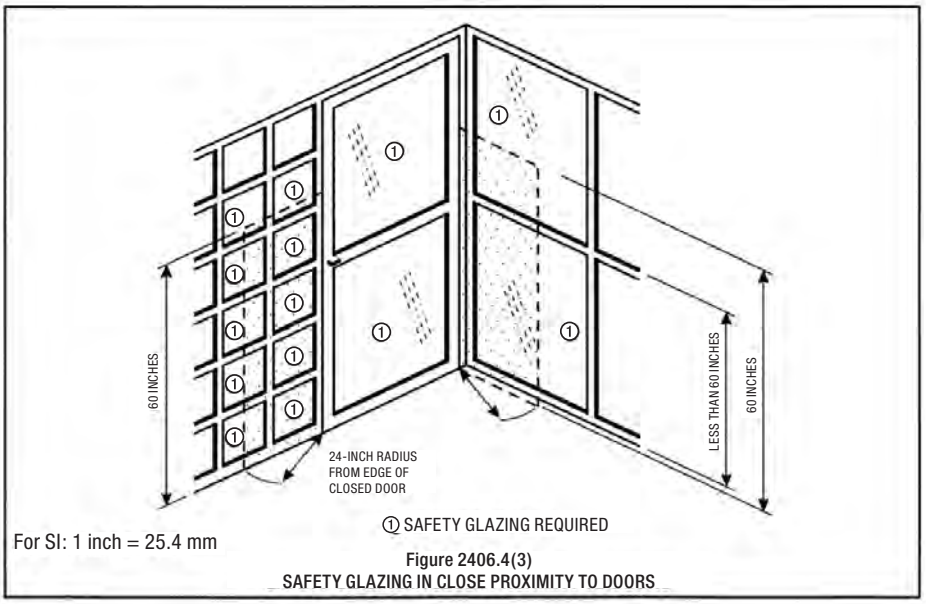
Safety Glass Standards

You may be wondering why wired glass was ever allowed to be installed in locations where human impact was likely, creating a hazard for decades to come. Prior to the 1960s, the building codes were silent on the subject of safety glazing. But because of numerous lawsuits, glass manufacturers recognized the need for industry standards. A task group was formed, and its studies found an average of 320,000 injuries per year from people impacting glass in doors and windows (in all building types, including residential). In 1966, the standard developed by this task group was accepted as a national standard called ANSI Z97.1, *American National Standard for Safety Glazing Materials Used in Buildings*.

When the Consumer Product Safety Commission was created in 1972, one of its first initiatives was to address the standards for safety glazing. *The Safety Standard for Architectural Glazing Materials*, CPSC 16 CFR Part 1201, was developed as a two-tiered standard that went beyond the requirements of ANSI Z97.1 and became law in 1977. ANSI Z97.1 has since been revised to include three levels of impact-resistance: Category A (similar to CPSC 16 CFR 1201 Category II), Category B (similar to Category I), and Category C (the original Z97.1 standard, with no equivalent in the CPSC standard). CPSC 16 CFR 1201 Category II and ANSI Z97.1 Category A provide the highest level of impact-resistance required by the safety glazing standards; the category required depends on the size and location of the glazing. ANSI Z97.1 Category C does not protect against human impact except for very young children and is no longer allowed by the IBC where safety glazing is required.

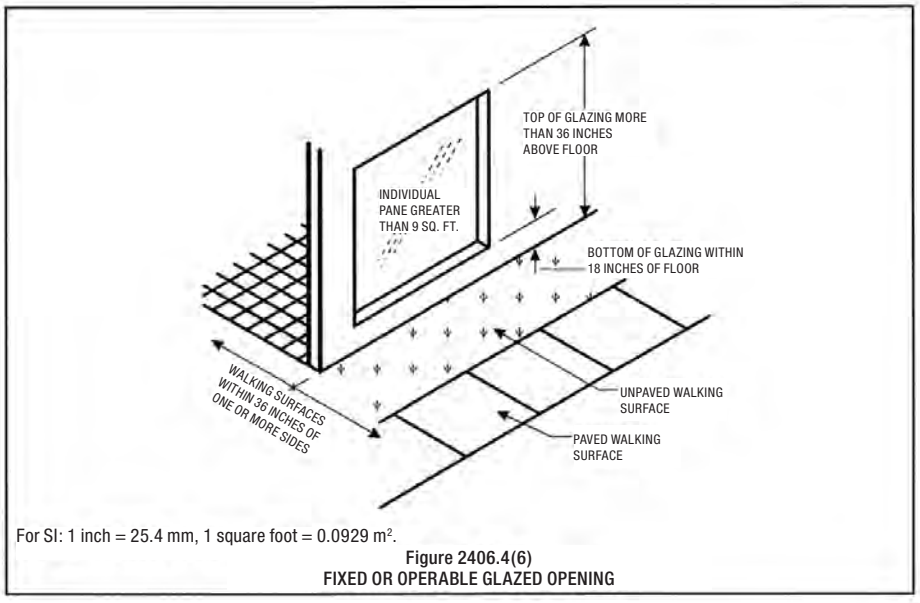
Code Changes

When the CPSC standard was created, there were no glazing products that met the impact-resistance and fire-resistance requirements. Traditional wired glass would withstand fire testing, including the hose stream test, but would not withstand the impacts required by the new standard. In 1977, a 2½-year exemption was granted for wired glass in fire door assemblies to give the glass industry time to develop glazing that met both fire



For SI: 1 inch = 25.4 mm

Figure 2406.4(3)
SAFETY GLAZING IN CLOSE PROXIMITY TO DOORS



For SI: 1 inch = 25.4 mm, 1 square foot = 0.0929 m^2.

Figure 2406.4(6)
FIXED OR OPERABLE GLAZED OPENING


Courtesy of Advocates for Safe Glass

and impact requirements. A court battle between the Japanese wired glass manufacturers and the CPSC ensued, and the CPSC was forced to abandon its efforts to regulate the product.

More than 20 years later, the 2000 edition of the International Building Code (as well as the model codes prior) still contained the exception allowing traditional wired glass in fire door assemblies, even though glazing materials had been developed that were able to withstand both fire and impact. Due in large part to Greg Abel, the father of a young adult who had been injured by putting his hand through wired glass in a door, the 2003 edition of the IBC was changed, and traditional wired glass was no longer allowed in any doors or other hazardous locations in Educational occupancies (K-12 schools and daycare centers). The 2006 edition of the IBC removed the exception completely, and traditional wired glass is no longer allowed in hazardous locations in any occupancy type when a jurisdiction has adopted this edition of the code. Unfortunately, not everyone is aware of this change, and traditional wired glass is still sometimes supplied for new buildings.

The 2003 edition of the IBC also expanded the section addressing glazing in athletic facilities. In these facilities, glazing that forms whole or partial wall sections, or that is used as a door or part of a door, must comply with the safety glazing requirements listed: CPSC 16, CFR Part 1201 Category II, or ANSI Z97.1 Category A. In effect, this section mandates impact-resistant glazing in all gymnasiums, basketball courts and other athletic facilities.

Hazardous Locations

According to the IBC, hazardous locations are those that are most prone to impact from a building occupant. In terms of doors, safety glazing is required for the following hazardous locations:

- Glass in ALL swinging, sliding and bifold doors and panels, except jalousies (the type of door with a lite made from horizontal slats). The exception to this is lites in doors where a 3" diameter sphere cannot pass through the exposed opening—

1. All of the doors and sidelites, as well as many windows in this university dormitory, contain traditional wired glass in a "chicken-wire" pattern.

2. This piece of wired glass is in an exterior window. Many of the existing pieces with this pattern have been broken and replaced with traditional wired glass in a square or diamond pattern.

Photo courtesy of Anemostat

Each piece of glass installed in a hazardous location is required to be marked with information about the manufacturer, glass type, and impact-resistance, as well as the fire-resistance if applicable.

this would not be considered a hazardous location.

- Sidelites or fixed or operable panels located with the nearest exposed edge of the glazing within a 24-inch arc of either vertical edge of the door and with the bottom exposed edge of the glazing less than 60 inches above the walking surface. (Refer to the IBC for exceptions.)
- Fixed or operable panels meeting ALL of the following conditions: Exposed area of an individual pane more than 9 square feet, with the exposed bottom edge less than 18 inches above the floor and the exposed top edge more than 36 inches above the floor, and a walking surface within 36 inches horizontally of the glazing. (Refer to the IBC for exceptions related to a protective bar or insulated glass.)

In addition, safety glazing is required in many instances when in close proximity to wet surfaces (pools, hot tubs, showers, saunas, etc.), in guards and railings, or when adjacent to stairways, landings and ramps. The requirements depend on the location of the glass, particularly the height above the walking surface.

Each pane of safety glazing installed in hazardous locations must have a permanent identification mark that includes the manufacturer's designation, the safety glazing standard with which the product complies, and the type

Comments from Victims or Parents of Victims of Wired Glass Accidents

"Our grandson was rollerblading at school when he went through the upper part of the wired glass in the door. He lost half his blood and suffered nerve, tendon, artery and muscle damage."

"My 14-year-old son went to open a school door as it was closing on him. His hands were full so he put up his foot, and he required approximately 80 stitches in his lower calf."

"My son's wrist was severely injured by wired glass in his school. It is the second such injury with the same set of doors in four months!"

"I was severely injured when I had a door slammed into me. I received over 400 stitches to both arms."

"My son almost died from the loss of blood. He severed five tendons, his ulnar nerve, and an artery. His right hand is 58% disabled for life.

"I could have died in front of my children. The glass that injured me was replaced with the exact same type. It only takes an instant to scar your body beyond recognition and scar the ones who love you. We must see this through to protect others from our fate."

—Compiled by Advocates for Safe Glass from reports by wired glass victims

"I'm proud that Oregon became the first state in the nation to ban the use of wired glass in hazardous locations, and my local school district in Eugene, Oregon, took it one step further and replaced or retrofitted all the existing wired glass in its older schools. Under our new code, any existing wired glass that becomes damaged must be replaced with acceptable fire-rated, impact-resistant glazing. After one or two injuries, it became clear that it was more cost-effective to change out the old wired glass before it broke than to pay out on a settlement. Most importantly, however, our school district valued the safety of its children over the cost savings of cheap wired glass."

—Vicki Walker, Retired Oregon State Senator

"When your intelligence tells you that something will create an injury and that it seems conceptually clear that injury will occur, it is primitive to wait until a number of people have lost their lives, or sacrificed their limbs, before we attempt to prevent those accidents."

—Testimony of A. Elkin, Chairman of the National Commission on Product Safety

"Wired glass isn't safety glazing. No one disputes that fact, not even wired glass manufacturers. Recall the facts. Only half as strong as regular annealed glass, wired glass breaks easily on impact and is more dangerous when broken. The exposed wires are razor-sharp and act like a spider web to trap a victim's body part in the opening, severing arteries, nerves and tendons, resulting in permanent severe injury, including paralysis, reduced mobility, disfigurement, even amputation."

—Greg Abel, Advocates for Safe Glass

and thickness of the glazing. It also includes information about the fire-resistance characteristics of the glazing, if applicable. Look for the CPSC 16, CFR 1201 or ANSI Z97.1 designations on the etching or label on the glass to determine if meets the requirements for impact.

Existing Glass

The changes to the building codes will help ensure that glazing in new schools will be safe, but what about the millions of pieces of traditional wired glass in existing doors, sidelites and windows? There is wired glass on the market today that meets the current code requirements for impact-resistance, but the vast majority of wired glass installed in existing buildings does not. Many schools have already begun to evaluate their existing wired glass and prioritize the glazing for replacement or the application of a safety film that will increase the impact-resistance. A suggested list of wired glass locations that should be reviewed, starting with those most prone to human impact, includes:

1. Athletic facilities, gymnasiums, basketball courts
2. Doors and sidelites that are not fire-rated. Traditional wired glass has not been allowed by code in these locations for decades.
3. Doors where the glass is behind or directly adjacent to the hardware, where impact is likely, especially high-traffic doors with door closers
4. Sidelites and large windows
5. Fire doors with smaller glass lites not adjacent to the hardware. These locations carry the lowest risk of injury.

While we must do our best to protect students from intruders, fire and other hazards that they may encounter at school, we also need to consider the potential for injuries caused by traditional wired glass. In the interest of security, many schools are now considering the replacement of existing glass with products that will withstand forced entry tactics. In addition, all of the wired glass should be evaluated and replaced or remediated as soon as it is feasible.

You can read much more about the requirements for safety glazing by visiting www.iDigHardware.com/glass. I would like to thank Greg Abel of Advocates for Safe Glass for assisting me with my research and education on wired glass, and for taking the initiative to stand up to the wired glass industry and see these code changes through. You can read more about Greg and his remarkable efforts to change the International Building Code to make all buildings safer at www.afsgi.org or www.safeglass.us.

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