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Industry insights

## Combating code violations at the door

Building pressure: The invisible, pervasive threat that could put your next project at risk—and it all starts at the door. Accessibility and life safety are concerns in all buildings, but uncontrolled pressure can increase these risks. Therefore, it is important to combat the ravages of building pressure, starting by selecting the correct door closer.

Closers are commonly used in commercial buildings to ensure doors are closed and securely latched as well as reduce the airflow through the building. When the correct closer is in place, it can reduce the potential risks caused by pressure differentials.

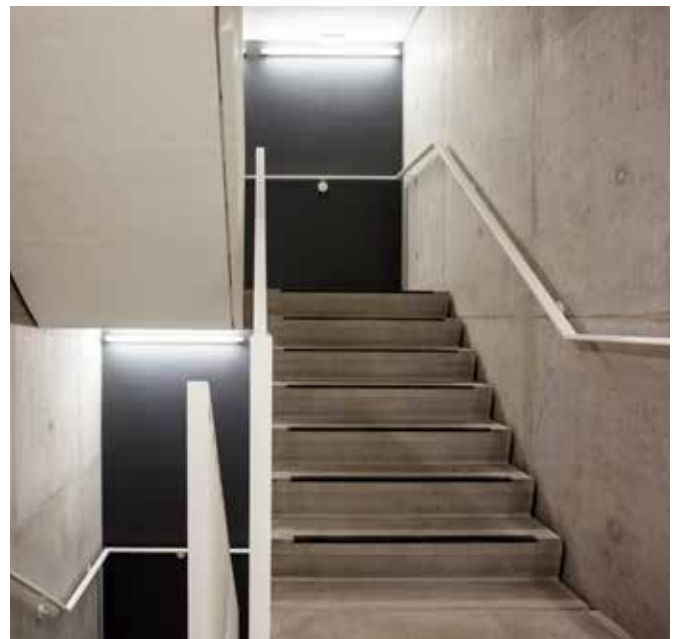
To understand how building pressure can put your building at risk for code violations, let's first explore what causes building pressure.

Building pressure is caused from a difference in temperature or pressure between two spaces separated by doors. As the air pushes into or out of a building—moving from an area of high pressure to one of lower pressure—it exerts incredible amounts of force on the doors and can prevent door closers from functioning properly. These significant pressure differentials often occur between the inside and outside of a building, but can also create problems between adjoining rooms or wings of a facility. Corridors, atriums and stairwells are particularly at risk. The more extreme the difference between interior and exterior temperatures, the greater the amount of pressure that will exist inside, predominantly in multi-story buildings.

**Pressure differential is created primarily by three forces: wind, temperature and the facility's HVAC system.**

### Wind

Air is typically forced into a building on the side facing into the wind, or the windward side, and is pulled out of a building on the side sheltered from the wind, the leeward side. Strong winds can create significant airflow through a building, dramatically increasing the amount of pressure in one area compared to another. The shape of the building can also create swirling winds or irregular wind pressures that impact the amount of negative or positive building pressure.



### Temperature

An extreme difference between interior and exterior temperatures can cause what is sometimes referred to as the chimney or stack effect in a facility. This can create a significant amount of airflow in areas such as stairwells, corridors and open atriums where the lower density of the warm air causes it to rise and displace the cooler air. This also occurs due to the difference in air density between the interior of the building and the exterior. The more extreme the difference between interior and exterior temperatures, the greater the amount of pressure that will exist inside, particularly in multi-story buildings.



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## HVAC Systems

Because buildings consist of a number of interconnected rooms of varying sizes and pressures, HVAC systems must attempt to equalize the temperature and pressurization of each by using fans to circulate and exhaust the air. Because air will naturally flow from high pressure areas to lower pressure, these systems are often used in high-rise buildings to deliberately increase the level of pressure within the lower levels of stairwells—helping to keep them free of smoke in the event of a fire.

While certainty of building pressure's effects within a building can be difficult to determine during the design phase, understanding the surroundings and considering these factors will help identify the potential risks for the building. That is where specifying the correct door closer comes into play. An effective door closer can help combat building pressure, reducing energy inefficiencies, fire and life safety risks and code violations.

## Creating code violations

There is a struggle between maintaining a properly latched door and complying with codes. If a building has too much positive pressure, it can result in doors that are unable to close and latch securely. Facility managers typically try to address this by adjusting the door closers or replacing them with larger ones. While this might do the trick, installing a closer that is too large to ensure the door closes and latches securely can result in serious code violations.

The Americans with Disabilities Act requires that interior non-fire doors must be operable with five pounds of force or less. Oftentimes, in an effort to compensate for building pressure, the door closer power is increased to enable the door to close and latch securely. The door will have enough force to shut, but the larger closing torques may reduce accessibility and violate the ADA standard—restricting access for elderly or disabled occupants. Additionally, when pressure differential is relatively large, a door closer with low opening force set to comply with ADA requirements may not be able to overcome the resistance and fully latch the door, allowing it to remain open.

Doors that are unable to latch securely are of particular concern in exit stairwells, which are subject to the most extreme effects of building pressure due to their construction. The doors to these exit enclosures are designed to act as barriers, preventing the spread of smoke and fire throughout a facility and maintaining a safe means of egress. However, if a door cannot latch securely because the closer cannot overcome the pressure differential, occupants may not be able to evacuate safely and the damage from the smoke and fire could be more extensive.

“There are limitations on opening force for both accessibility and egress,” says Allegion's Manager of Codes and Resources Lori Greene, DAHC/CDC, CCPR, FDAI, FDHI. “In addition, fire doors are required to have enough closing force to reliably close and latch the door.”

As mentioned, ADA standards require non-fire doors to open with no more than five pounds of force. Other manual doors, like fire doors, are limited by the model codes to 15 pounds to release the latch, 30 pounds to set the door in motion and 15 pounds to open the door to the fully-open position.

“It's important to be cautious when installing a closer with a larger spring size or increasing the closer speed to overcome stack pressure,” says Greene. “These methods may solve the problem but frequently result in openings that no longer meet these opening force limitations.”

Additionally, closer adjustment is often performed improperly and results in a door closing too quickly when the pressure difference is not impacting the opening, causing excess stress and wear on the hinges, latching hardware, frame and the door itself. This also creates the potential liability of someone being injured by an uncontrolled slamming door.

## Solutions

The effects of building pressure are known throughout the industry, but determining with certainty which openings—if any at all—will be affected can be tricky.

“It doesn't happen on every opening, nor does it happen in every building,” said Allegion Specification Manager for New England Bill Lawliss, AHC/CDC, CSI, CCPR. “There is not a perfect solution as you often don't know how great the pressure differentials will be until the building is completed.”



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While nobody can know for certain how building pressure will affect each opening, early preparation is possible. That's why building designers strive to be proactive during the design phase.

Allegion Strategic Architectural Account Manager T.J. Gottwalt agrees. "Architects want to do anything they can upfront to address issues before they become problems. Once I was looking at plans with an architect and noticed an exterior door was positioned in a manner that the north wind would grab the door as it was opened."

T.J. pointed out the issue and the architect changed the direction of the door. But what about when the direction of the door cannot be changed or repositioning wouldn't change the impact of building pressure? That's where the correct door hardware can make a world of difference.

Lawless' advice to architects and building designers is to be aware about potential issues upfront and plan for what might need addressed later. Will the building have pressurized stairwells? Is there high wind in the area? Will the building sit atop a hill? Think about the climate. Areas with extreme temperatures are much more susceptible to higher pressure differentials. How often will it be used? Who will use it, kids or adults?

All of these factors should be considered during the design phase of the project as they will help indicate what type of closer is needed to overcome the likelihood of building pressure. When it has been determined that an opening will be affected, Gottwalt recommends specifying a heavy duty closer, like the LCN 4040, or opt for an auto operator.

"If the opening is a handicap accessible opening, an auto operator is the way to go," he says. "In some cases, even if the opening is not required to be accessible, we would still consider it. If the door is going to see a high level of pressure or abuse, we will specify it for ease of use and convenience."



Another recommended product is an overhead stop to protect the door as it opens. "The LCN 4040 in conjunction with the Glynn-Johnson 100 Series overhead stop is ideal to control both the opening and closing," says Gottwalt.

When faced with the potential liability and security risks that the effects of building pressure can have on a facility's openings, many owners and facility managers try to address the problem with solutions that can negatively impact both safety and accessibility of the opening. Rather than increasing the spring size of a closer, the most cost effective solution is to use effective closers that will not simply close the door, but will also ensure code compliance. The best way to guarantee this happens—and reduce headache for your clients down the road—is to specify effective door hardware proactively, especially when it is likely that wind, temperature or the HVAC might cause concerns.

Seek out the advice of an architectural hardware consultant. Allegion trusted advisers are happy to help.

Allegion has a team of more than 100 specification writers located throughout the United States who would be happy to assist on your next project. [Contact an Allegion spec writer](#) or check out the [www.iDigHardware.com](http://www.iDigHardware.com) blog for information and updates on door hardware codes.

## About Allegion

Allegion (NYSE: ALLE) is a global pioneer in safety and security, with leading brands like CISA®, Interflex®, LCN®, Schlage®, SimonsVoss® and Von Duprin®. Focusing on security around the door and adjacent areas, Allegion produces a range of solutions for homes, businesses, schools and other institutions. Allegion is a \$2 billion company, with products sold in almost 130 countries. For more, visit [www.allegion.com](http://www.allegion.com).

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