ClarkDietrich

# Eliminating Wall System Noise in High-Rise Buildings

August 2026



Nearly a century ago, the Chrysler Building in New York City became the world's first "supertall" skyscraper—defined as standing at least 300 meters (984 feet) in height. Since then, the race toward the sky has only accelerated. Today, 249 supertall buildings and four "megatall" buildings (600 meters/1,968 feet or taller) define skylines around the globe. Remarkably, 64 percent of the world's 100 tallest buildings have been completed in just the past decade[1], indicating an exponential demand for super- and megatall buildings.

While these structures are marvels of modern engineering, their unprecedented heights bring unique challenges. One issue that has drawn growing attention is noise within non-structural wall systems. Creaks, clicks, and groans—especially during windy conditions—have long been part of high-rise life, but the growing prevalence of supertall buildings has brought the problem further into focus.

This white paper will examine the underlying cause of these noises and present a proven, innovative solution designed to eliminate the disruptive sounds and improve occupant comfort in the next generation of high-rise construction.

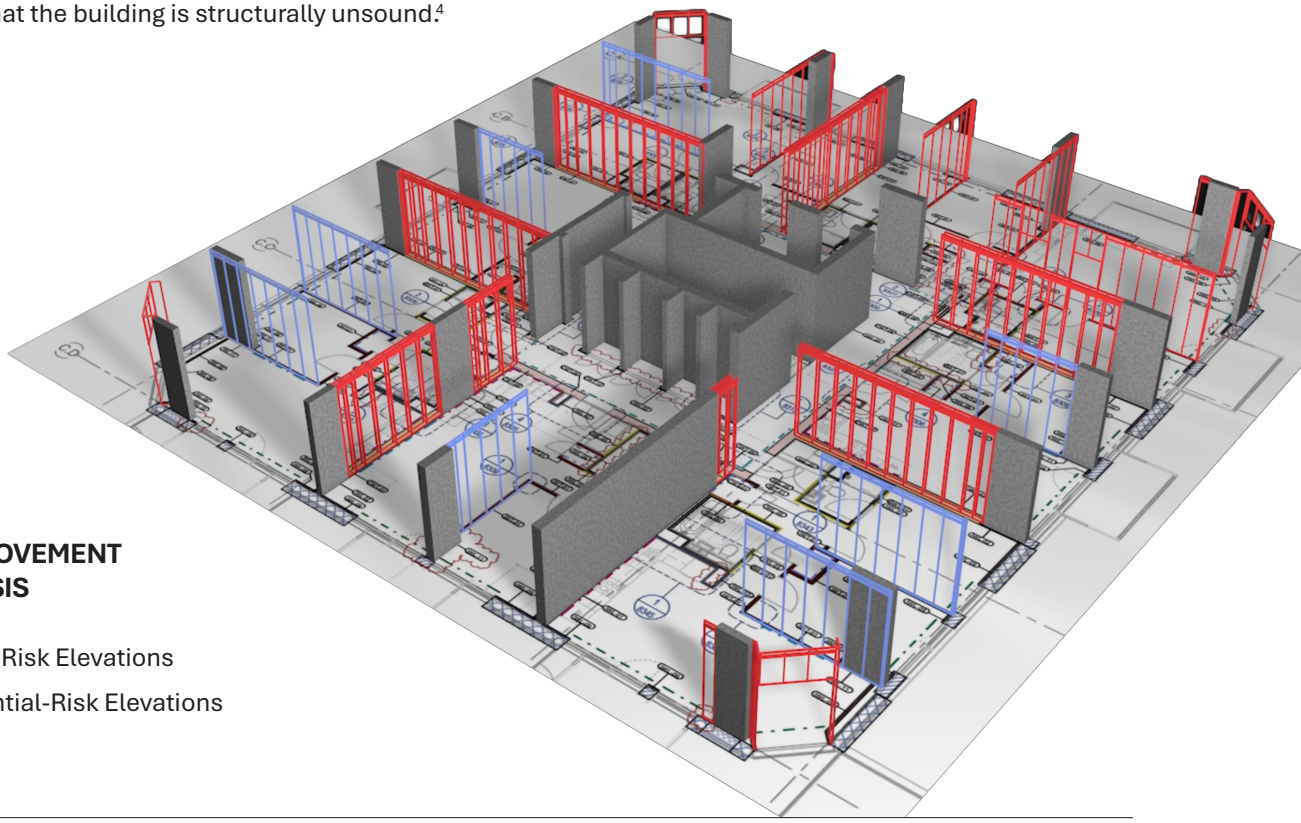


# Noise in High-Rise Buildings

In 2017, actress Traci Ann Wolf spoke with *The Guardian* about her life as a high-rise resident. Living in an apartment on the 50th floor of a lower Manhattan skyscraper, she said, "The building creaks like an old boat, and you can even feel it sway."[2] Another Manhattan residence has notoriously made headlines for a swath of issues, noise being one of them. A 2021 *New York Times* article said residents "complained of creaking, banging, and clicking noises in their apartments."[3]

High-rise creaks aren't exclusive to New York City, either. In 2023, a photographer on the 52nd floor of a residential skyscraper in Melbourne, Australia, posted online a video of loud creaking, even saying, "There is no way people could live with this level of creaking." Others online commented that the noise was "terrifying" and nightmarish. But as Dr. Ehsan Noroozinejad told *Yahoo News Australia*, these sounds are "common" for tall buildings and are not an indicator that the building is structurally unsound.[4]

"These noises often stem from the friction between non-structural elements and the building's main structural system, especially during windy conditions," the senior researcher specializing in resilient construction and infrastructure told the news outlet. Although creaking is an expected phenomenon in tall buildings, he noted that firms are increasingly working to implement sound mitigation strategies, reflecting the "growing recognition of the importance of... the lived experience of tenants in high-rise buildings." Indeed, noise in wall systems has a negative impact on occupant comfort and, therefore, perception of building quality.



**BUILDING MOVEMENT RISK ANALYSIS**

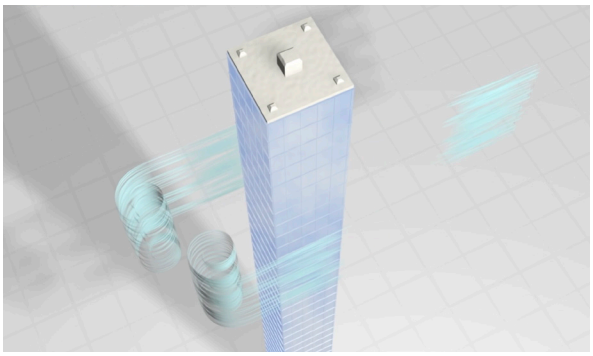
- High-Risk Elevations
- Potential-Risk Elevations

# The Effects of Wind

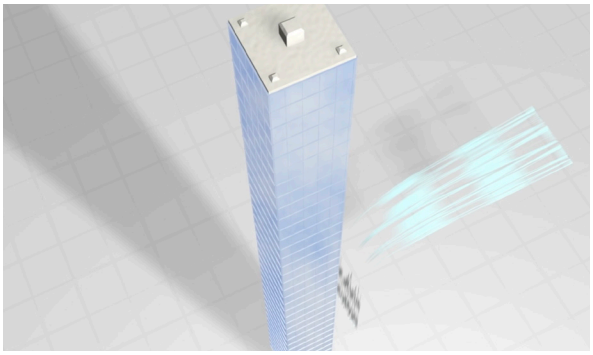
In order to effectively mitigate noise in wall systems, it's important to first understand the root of the issue—which, ultimately, is movement. Tall buildings are inherently designed to move in response to external influences, the greatest of which is wind.

When wind hits a building, several things can happen, including vortex shedding, downdrafts, and aerodynamic effects:

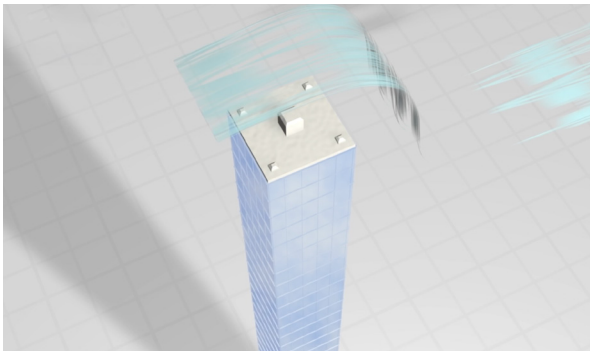
- **Vortex shedding** occurs due to a differential of wind speed or pressure on opposite sides of the structure, with vortexes being formed on the leeward side. In this instance, the building acts as a bluff obstacle; wind flows around the structure and creates pockets of low pressure on the opposite side. These low-pressure pockets then become a suction force, exacerbating swaying motions on the structure.[5]
- **Downdrafts** are formed when air movement hits the windward face of the building and is diverted down to street level and the base of the structure. This is why metropolitan areas with numerous co-located tall buildings often feel windier at street-level than suburban areas or cities with fewer—and shorter—buildings. In addition to making things windier for the passers by, this canyon effect also places more pressure on the base of the structure.
- **Aerodynamic effects** influence where the force of air pressure is channed around the architectural features. Corner softening, tapering, building cutouts, setbacks, and twists are all common design techniques that make a structure more aerodynamic, which helps to weaken the vortexes formed.[5]



Typical Wind Types—Vortex Shedding



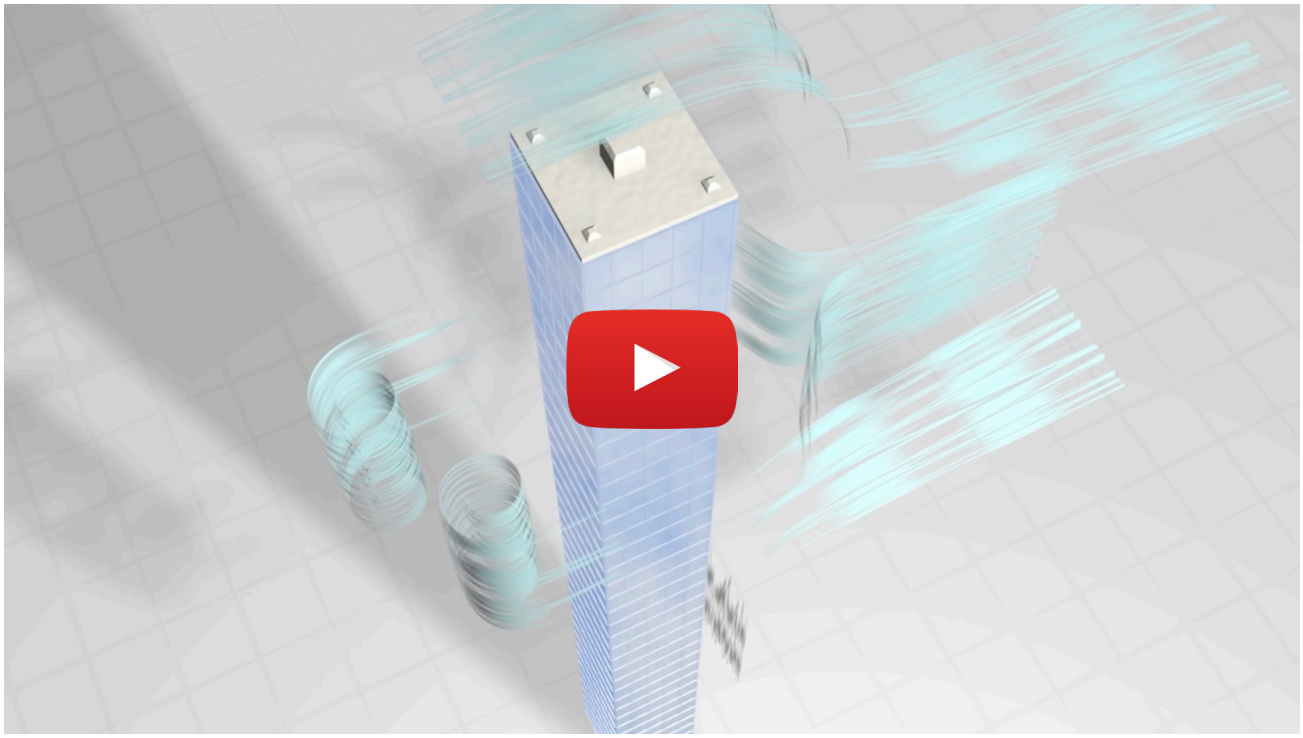
Typical Wind Types—Downdraft



Typical Wind Types—Aerodynamic

With these three principal wind effects combined, it is easy to understand how a building is under constant external pressure. Further compounding the issue is a structure's proximity to neighboring buildings, which can contribute leeward vortexes or wind shadow. Combining all of these displacements, tall buildings have the potential to be influenced by a 360-degree wind effect. In response to these external forces, there is an evident displacement between the ceiling soffit and the slab, often 1–2 millimeters (mm) per floor.

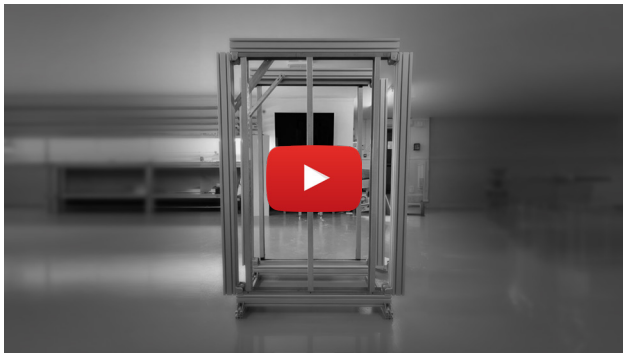
Through three-dimensional digital models, displacement relationships can be better understood. Because the studs are fixed at the base track, any movement is confined to the head-of-wall, where the studs are unconstrained. Additionally, the farther away a drywall steel frame is from the center of building rigidity (also known as center of stiffness), the greater the displacement. Notably, the displacement direction is directly linked to wind direction, meaning tall building movement at a floor level is omnidirectional and at the whim of the weather. As such, internal wall systems need to be built in a manner that ensures the system moves harmoniously with the structure to avoid not only deformation and damage, but also noise generation.



Video: Mitigating Sounds in Metal Stud Framing with ProSTUD® Motion Frame®

# The Source of the Creaking

In 2020, a group of researchers at the University of Exeter created a flexible rig into which a 50 mm, 2" steel stud drywall sample construction was built. The goal was to replicate the force of wind on a building and study the impact it had on the non-structural wall systems, ultimately identifying the exact cause of creaking.



Video: (Identifying the Source) Mitigating Sounds in Metal Stud Framing with ProSTUD® Motion Frame®

The team applied lateral loads to wall head tracks under two scenarios:

- Large movement (25 mm) at "normal" speed, using the rig's full range of motion.
- Small movement (1–2 mm) at slow speed, matching real building displacement.

To account for a building's omnidirectional movement, the test applied loads to the X-axis and to the Z-axis.

After multiple tests, the findings were not surprising, but the scale of movement versus the audible outcome was. While the large, faster movements produced noise, they did not recreate the commonly reported creaking sounds. The small, slower movements, however, *did* replicate the creaking. Though the displacement was nominal, the impact was significant, as the makeup of the wall amplified the sound. Noise could occur when load was applied in-line with the wall or at an angle.

In the end, results from the tests showed that the drywall test sample fell victim to stiction—defined as the "force required to cause one body in contact with another to begin to move"[6] —at the stud-head interface. In other words, the movement caused a stick-and-slip friction effect on the metal framing components. This happens when wind causes the building to sway, moving the floor slab and ceiling just enough to break the friction between the wall stud and the head track. The parts then move quickly for a moment, but the force can't keep them moving at that speed, so they slow down until the force builds up again, repeating the cycle.

> *"After multiple tests, the findings were not surprising, but the scale of the movement versus the audible outcome was."*

# An Innovative Solution

Following the preliminary tests, it became clear that the only way to eradicate the noise generated from a building's movement was to eradicate the effect of stiction on the steel members within the wall system. So, the research team inserted an injection-molded soft body connector where the test wall's vertical member connected to the head track. When running the same tests against the rig with the new connector in place, the noise was eliminated in both the linear and angled load applications.

Produced by North America's largest manufacturer of cold-formed steel framing and accessories, the innovative product—ProSTUD® Motion Frame® Connector—is designed to accommodate omnidirectional displacement and mitigate noise associated with the movement of steel framing members. The component twist-locks into the stud and is retained within the C-shaped runner for easy installation.

Importantly, the product can be used in both new construction and retrofit applications. The component is made from fire-retardant glass, reinforced nylon, 6.60 halogen material, and an encapsulated steel insert for fire performance, and has a UL Yellow Card™ verifying that it contains no hazardous materials. Motion Frame carries UL certification that reflects not only its fire performance, but also its ability to maintain that performance under the very conditions it was designed to address: movement. It is listed in UL-certified, dynamic head-of-wall joint systems—incorporating complementary ClarkDietrich products—rated for one and two hours with Class II or III Movement Capabilities under UL 2079.[7] These listings verify that the assembly maintains its fire-rated performance while accommodating the cyclic, multidirectional displacement inherent at the head-of-wall in tall buildings—a meaningfully higher bar than a static wall assembly rating alone.



The Motion Frame Connector has also been incorporated into wall assemblies independently tested and certified for acoustic performance by Riverbank Acoustical Labs under ASTM E90 and E413.[8] These assemblies achieve Sound Transmission Class (STC) ratings ranging from 51 to 60, depending on configuration—a performance range well-suited to the acoustic demands of high-rise residential and commercial occupancies.

By allowing unrestricted 360-degree movement between the slab and soffit and removing the frictional conditions that cause sound, the connector is a game-changer for high-rise buildings. It is a practical solution where movement direction cannot be predicted, and creates a quieter and more comfortable environment for a building's occupants.

Beyond wind-induced movement, the ProSTUD® Motion Frame® Connector also addresses a critical concern in seismic design: the need for non-structural wall systems to accommodate interstory drift without generating noise or sustaining damage. During a seismic event, lateral forces cause floors to shift relative to one another, which places significant stress on the head-of-wall connection. By allowing unrestricted omnidirectional movement at the stud-head interface, the Motion Frame Connector enables wall systems to flex with the building's response to seismic activity rather than resist it—reducing the risk of stud buckling and track deformation. This makes it a valuable solution not only for high-rise buildings in wind-prone regions, but also for structures in seismically active zones where resilient, performance-driven wall systems are increasingly a design priority.

Upon the release of this white paper, Motion Frame Connector is the only available product offering a "dynamic" movement solution for head-of-wall fire ratings per UL 2079 and tested STC ratings.

As buildings grow taller and more complex, innovative solutions like the ProSTUD Motion Frame Connector will be essential to address the nuanced challenges of modern high-rise construction. By combining engineering insight with practical product design, the industry can meet the demands of height, performance, and comfort—ensuring that the world's tallest structures are as enjoyable to inhabit as they are impressive to behold.



Video: ProSTUD® Motion Frame® Installation Video for Retrofit Construction

ClarkDietrich

9050 Centre Pointe Dr. Suite 400
West Chester, OH 45069

P 513.870.1100
F 513.870.1300

clarkdietrich.com

To learn more about the ProSTUD® Motion Frame® Connector, visit clarkdietrich.com/products/motion-frame-connector or contact your ClarkDietrich sales representative to request a product sample.

1 "Tallest Buildings," Council on Tall Buildings and Urban Habitat.
2 "'The building creaks and sways': life in a skyscraper," *The Guardian*.
3 "The downside to life in a supertall tower: leaks, creaks, breaks," *The New York Times*.
4 "Aussie captures 'terrifying' sound in high-rise apartment," *Yahoo News Australia*.
5 "How Tall Buildings Tame the Wind," *The BTM*.
6 "Stiction," *Merriam-Webster*.
7 UL System Nos. HW-D-0976 and HW-D-0977.
8 Motion Frame STC Summary, ClarkDietrich.

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