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## Feature



### How Safe Are Building Facades?

Inspecting for Unsafe Conditions

by Michael Petermann and Jeffrey Erdly

The late Clayford T. Grimm, ASTM member and masonry guru, wrote in the March 2000 issue of *The Construction Specifier* that “Masonry falls off a building facade somewhere in the United States about every three weeks. Over the past few years in the United States, at least 49 such masonry failures have killed 30 persons and injured 81.”

There are over 15,000 buildings currently subject to local municipal laws in various cities throughout the United States that require periodic inspection of building facades. These local laws are typically known as facade ordinances. The purpose of these ordinances is to identify unsafe conditions — loose facade components or materials — that may fall and cause damage to property, or injury and possibly death to pedestrians. These ordinances have come about because of previous damage to property, injury to pedestrians, and loss of life suffered in some of our cities as noted by Grimm. Some cities have stringent requirements for personnel required to do the inspections while others do not (see sidebar right). Some cities require hands-on inspection (touching of facade components or materials) of all facades by licensed architects or engineers while other cities only require visual inspection of street-facing facades by architects, engineers, or contractors.

ASTM [Subcommittee E06.55](#) on Performance of Exterior Wall Systems has approved a standard practice that outlines the requirements and procedures for conducting facade inspections. The standard is intended for adoption by model building codes, local municipalities, or private owners of multiple buildings, such as universities. The availability of this standard will make it



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possible for many cities that do not have a facade ordinance to adopt one. Cities with existing ordinances may wish also to adopt ASTM's new standard.

### A Brief History of Facade Ordinances

The concept of laws protecting the public from building facades is not new. In fact, Hammurabi's Code of Laws (1700 B.C.) had several provisions related to the safety of buildings (see sidebar right). However, the roots of "modern" facade ordinances are relatively young and date back to only 1976 A.D. when the first facade ordinance in the United States, outside of seismic zones, was passed in Chicago, Ill. Unfortunately, Chicago's ordinance was repealed on a technicality because when the new laws were published, the section on the facade ordinance was omitted, according to the 1996 proceedings of the Chicago Committee on High Rise Buildings. After a long hiatus, a new facade ordinance went into effect in 1996 in Chicago. The longest continuous facade ordinance in effect dates back to 1980 and is in New York City.

What is most common about the existence of these facade ordinances is that, in most cases, they were developed at the expense of either serious injury to pedestrians or even death. Some of the older ordinances have also been modified over time by high profile facade failures. In Columbus, Ohio, City Councilman Ben Espy lost part of his leg one day in 1984 when a large section of a building's cornice fell to the sidewalk, as reported in the June 29, 1984, edition of the Cincinnati Enquirer. Three other pedestrians were injured. Columbus's facade ordinance became known locally as the Espy Law. In the case of New York City, an 18-year-old college student perished when a piece of masonry fell from a Manhattan building and struck her in the head in 1979. In Chicago in 1974, a 48-year-old woman was killed after masonry fell approximately 16 stories and struck her. More recently, Chicago lost one of its residents when a piece of glass struck a mother who was walking along the street with her 3-year-old daughter. Despite the lessons learned in several cities that have facade ordinances, many other cities still do not have facade ordinances.

### Was Chicken Little Right? Is the Sky Falling?

On Dec. 7, 1997, only two months after the initial task group meeting of E06.55.05 on Facade Inspections, brick rained down from the 33rd floor of a 39 story Manhattan office building located at 540 Madison Ave., slightly injuring two passersby and closing Madison Avenue at the height of the Christmas shopping season. While New York City had in force the country's oldest continuous facade inspection law, "Local Law 10," which only required the visual inspection of street-facing building facades, the site of this collapse was not covered because it was a side facade demarking the property line. The raining debris penetrated through the roof of the adjacent five story building and also onto the sidewalk and street.

New York City's Local Law 10 required only remote visual inspection of certain facades. Problems with this scope and type of facade inspection had surfaced years before when two chunks of granite fell from the Manhattan Municipal Building. The following excerpt contained in an editorial from the Dec. 9, 1991, issue of ENR, titled "Chicken Little, the Sky Is Falling," identified these deficiencies and their possible cause:

Cities that have facade ordinances on the books:

Boston, Columbus, Milwaukee, Pittsburgh, Chicago, Detroit, New York, St. Louis

Excerpts from Hammurabi's Code of Laws:

**229** If a builder build a house for some one, and does not construct it properly, and the house which he built fall in and kill its owner, then that builder shall be put to death.

**230** If it kill the son of the owner, the son of that builder shall be put to death.

**231** If it kill a slave of the owner, then he shall pay slave for slave to the owner of the house.

**232** If it ruin goods, he shall make compensation for all that has been ruined, and inasmuch as he did not construct properly this house which he built and it fell, he shall re-erect the house from his own means.

**233** If a builder build a house for some one, even though he has not yet completed it; if then the walls seem toppling, the builder must make the walls solid from his own means.

*The problem is that the city's facade law – written for public safety – requires only visual inspection from some distance of buildings taller than six stories every five years. The Municipal Building had been inspected, as required, a year before the stones were discovered.*

*A facade law that does not require physical inspection is seriously flawed. Instead of protecting the public, it can actually create danger by giving even responsible building owners a false sense of security about the condition and safety of their facades. A physical inspection often is required to pinpoint deterioration, such as rusted connections and supports that are hidden from view.*

*How did that visual-only provision find its way into the law? Powerful real estate interests, says one New York City-based consulting engineer. The cost of a physical inspection, which typically requires hanging scaffolds, can exceed the cost of visual examination by \$5,000 to \$20,000 depending on the age, configuration and design of a building, says the consultant.*

### **Striking a Balance Using Consensus Standards**

ASTM International's new standard E 2270, Practice for Periodic Inspection of Building Facades for Unsafe Conditions, is the result of six years' work by industry stakeholders who, without the pressures of competing political and owner interests, created a practical standard following the rigorous consensus process that is the hallmark of ASTM. Formation of the Facade Inspection Task Group was approved during the spring of 1997, and its first meeting was held in San Diego, Calif., in October of that year. Two opposing concerns were identified during the first task group meeting: some were concerned that a standard that was too demanding of building owners would preclude its adoption by municipalities, rendering it useless, while others wanted a much higher standard than current facade ordinances required. Additional concerns evolved over the qualifications of those performing facade inspections as well as concern over the potential disruption to historic facades. These competing concerns were addressed through consensus development of the standard. The standard is designed for adoption by authorities who will have to decide which buildings within their jurisdiction require the inspection. The new standard provides a comprehensive benchmark based upon review of the existing facade ordinances and the experience of members of subcommittee E06.55 on Performance of Exterior Wall Systems.

The ASTM members who created this standard represent leading forensic architectural and engineering firms practicing in North America. Additional participants included industry associations, material manufacturers, public and private institutional facility owners, and contractors. Members who currently perform facade inspections in the cities with an existing ordinance brought their experience to the table to assist in preparation of the document.

### **Conducting Facade Inspections for Unsafe Conditions**

Facade inspections should be performed by licensed architects or engineers who are knowledgeable in the design and construction of building facades. But more importantly, the facade inspector should have experience in the stability and deterioration mechanisms relating to the specific materials and assemblies of the facade being inspected. It is important that the building owner

carefully consider the experience of the facade inspector (architect or engineer) because someone's life or livelihood may depend upon it. There is no state-sanctioned test or licensing of facade inspectors. None of the existing facade ordinances qualifies the facade inspector beyond being a licensed architect or engineer. When the economy is slow, some design architects and engineers will pursue facade inspection work to help make ends meet. However, they are sometimes ill-prepared for performing the inspection and can be remiss in identifying the type of facade construction as well as the potential deterioration mechanisms.

Periodic facade inspections are typically conducted in three steps.

- Step 1 involves reviewing the service history of the facade as typically documented in past reports or repair campaigns, and possibly preparing elevation drawings if none already exist;
- Step 2 involves performing the inspection, which includes a visual survey under proper lighting conditions, a close-up inspection of select facade portions where the inspector can touch the facade surface, and probing select building facades to inspect for hidden deterioration; and
- Step 3 involves analyzing the findings of the inspection and preparing a report that is submitted to the building owner and local building authority.

### **What Do Those Facade Inspectors Look For?**

Facade ordinances are typically thought of as safety inspections. In reality, the facade inspector can not inspect for safety by looking for safe conditions. To inspect for safety, the facade inspector would have to essentially confirm the architectural design and structural engineering of the facade, which would require a tremendous amount of time and cost to building owners. Instead, facade inspectors are looking for unsafe conditions. These are typically factors that are not designed into the facade, such as cracks in materials, bulging in an otherwise flat wall, leaning of facade units or assemblies, and other anomalies that a keen, experienced facade inspector will notice ([Figure 1](#)).

Building owners can greatly assist the facade inspector by maintaining good documentation on the service history of the building facade. Previous periodic inspection reports should be easily accessible and contain good quality photographs of conditions found. The facade inspector will use the previous report for comparison to current conditions.

Prior to performing the close-up inspection, the inspector will perform a general visual survey of the facade, looking for anomalies (signs of deterioration). The visual survey is typically performed with the aid of binoculars. A telephoto camera is also used to photograph signs of deterioration which can be cracks, water stains, spalls (sections where materials come apart), or displacement (typically outward shifting of a facade unit). The inspector needs to be knowledgeable of the exterior wall type to appreciate the potential causes of deterioration.

After performing a visual survey, the facade inspector will discern where close-up access is required to perform a detailed inspection that includes touching the facade surface and possibly probing the facade. Access for close-up inspection can be obtained from several methods including an existing permanent platform such as balconies or fire escapes, a temporary platform such as a contractor's scaffold, or through the use of mountain climbing

techniques (also known as industrial rope access) ([Figure 2](#)).

If probing of the facade (cutting openings to look inside the wall) is required, several methods can be used. Methods for probing include insertion of a fiber optic borescope (similar to medical borescopes), disassembly of facade components, or selectively cutting materials. In the case of historic buildings, extreme caution should be used conducting probes to ensure that minimal to no damage is done to the historic facade ([Figure 3](#)).

After completion of the facade inspection, the inspector prepares a report for the owner and for submission to the local building authority. Deteriorated conditions found by the inspector are classified into three categories — “unsafe conditions,” “requires repair/stabilization,” and “ordinary maintenance.” Conditions classified as unsafe should be brought to the attention of the owner and local building authorities immediately, prior to preparing any written report. The owner will have to take immediate precautions to protect pedestrians and property from falling facade debris. Precautions owners usually take involve the erection of a protection scaffold, installation of temporary netting or straps to retain facade materials or components in place, or simply removing the unsafe condition.

Owners should understand that facade inspection reports are simply reports that classify deteriorated conditions. The facade inspection rarely includes the use of diagnostic tests to confirm the underlying cause of the observed deterioration. The deterioration may be part of a large systemic failure or may be independent of other symptoms. Further inspection, beyond the scope of inspecting for unsafe conditions, may be required and may include nondestructive testing of wall surfaces and laboratory testing of removed materials, which are typical techniques used by facade consultants in diagnosing systemic failures and designing repairs for building facades.

### **Only the Beginning**

Facade inspection is currently part art and part science. Society has yet to develop a reliable test method for detecting unsafe conditions in building facades. There is plenty of work to do and with the help of ASTM, further development of facade inspection tests, techniques, or procedures is promising. In the meantime, it should never be forgotten that the underlying purpose of the inspection is to avert needless injury or loss of life. //

Interested in becoming involved in further development of facade inspection practices or guides? Join ASTM E06.55!

Do you have experience performing facade inspections? Would you like to help develop the art and science of inspecting facades? Periodically inspecting facades for unsafe conditions is a relatively new field of work that requires additional standardization. Join subcommittee E06.55 at our next group meeting in Tampa, Fla., in October. Contact E06 Staff Manager [Steve Mawn](#) at ASTM (phone: 610/832-9726).

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