

Building Envelope and Structural Maintenance Recommendations and Code Requirements

Presented to BOMA Chicago
September 27, 2022

Presenters:

William D. Bast, PE, SE, SECB

Lee Fink, AIA, LEED AP BD+C

SOCOTEC – OUR SERVICES



BUILDING ENVELOPE

- New & Existing Buildings
- Roofing & Waterproofing
- Building Envelope Commissioning
- Façade Inspections
- Garage Inspections



SPECIALTY ENGINEERING

- Failure & Materials Analysis
- Advanced Analysis /Fitness For Service
- Nondestructive Engineering
- Commissioning/ Retro-Commissioning



ENERGY & SUSTAINABILITY

- Energy Efficiency
- Energy Modeling
- Sustainability /Green
- (LEED,BREEAM, Passive House, etc.)
- Renewable Energy



CODE ADVISORY

- Plan Review, Interpretation & Variances
- Zoning Feasibility, Approvals & Permitting
- Flood Compliance/ Mitigation/ Resiliency
- Violation Resolution

- Our Chicago office includes technical architects and structural engineers who specialize in building envelope and forensic engineering
- Our colleagues across the globe support other service lines including Sustainability, Low Carbon, Testing, Inspection and Certification services
- SOCOTEC provides "Technical advice, compliance and risk management in the construction and infrastructure sectors, throughout the lifecycle of assets"



WILLIAM D. BAST

PE, SE, SECB

Principal, Regional Director - Midwest

PROFESSIONAL EXPERIENCE

LPI, INC. – A SOCOTEC COMPANY

Principal, Regional Director – Midwest, from 2020

THORNTON TOMASETTI, INC.

Principal, 1998-2020

SKIDMORE, OWINGS & MERRILL

Associate, 1983-1987

QUALIFICATIONS

EDUCATION

- M.S.C.E., 1983, Lehigh University
- B.S.C.E., 1979, Lehigh University

REGISTRATIONS

- Professional Engineer in: IL, IN, KY, MD, MI, MO, OH, PA, WI, IA, AR, FL
- Structural Engineer in IL

CERTIFICATIONS

- Structural Engineers Certification Board Scaffold Safety Training, 1926 Certificate of Completion

PROFESSIONAL AFFILIATIONS

- National Council of Structural Engineers Associations (NCSEA)
- Structural Engineers Foundation
- Structural Engineers Association of Illinois (SEAOI)
- American Society of Civil Engineers (ASCE)
- Certified Structural Peer Reviewer (City of Chicago)



LEE FINK

AIA, LEED AP BD+C

Associate

PROFESSIONAL EXPERIENCE

LPI, INC. – A SOCOTEC COMPANY

Associate – From 2020

THORNTON TOMASETTI, INC.

Associate, 2015-2020

LOEBL SCHLOSSMAN & HACKL

Project Architect, 2014-2015

HOLABIRD & ROOT

Architect, 2011-2014

QUALIFICATIONS

EDUCATION

- Bachelor of Architecture – Illinois Institute of Technology – 2011

REGISTRATIONS

- Registered Architect in: AZ, IL

CERTIFICATIONS

- LEED AP BD+C
- City of Chicago / OSHA Scaffold

PROFESSIONAL AFFILIATIONS

- American Institute of Architects (AIA)

History of Ordinances

FAÇADE ORDINANCES ACROSS THE U.S.



	Market Size	Year	Building Criteria	Frequency	Extent of Inspection
New York	+16,000 buildings	1980	+6 stories	Every 5 years. Buildings are grouped into 3 filing cycles (A,B & C)	Up-close/hands-on inspection required every 60' along a public right of way
Chicago	2,500 buildings	1996	+80' in height	Critical Exams: Required every 4, 8, or 12 years depending on building classification Short Form Reports: Every other year or at the halfway point of the critical exam cycle	Critical Exams require 1 hands-on inspection per elevation Short Forms/Ongoing inspections are visual only.
Boston	+1,000 buildings	1995	+70' in height or 'High-rise' or >35,000 SF	Every 5 years	Visual only for buildings <125'. Up-close inspection required for buildings over 125'
Jersey City	TBD	2021	+6 stories (+4 stories for masonry facades)	Façade inspections: Every 5 years with the inaugural inspection deadline of 12/31/2023 Structural inspections: Every 10 years with the inaugural inspection deadline of 12/31/2022	Visual only
Florida	+16,000 Condo Assoc.'s requiring inspections	2022	+3 stories	Structural inspections: Once every 10 years for buildings 30 years old. Once every 10 years for buildings 25 years old within 3 miles of the coast.	Visual only

FAÇADE ORDINANCE

- Person killed by falling debris from 17-story building in Chicago in 1974.
- Façade ordinance introduced in 1976 – not formally adopted until 1996 after three separate collapses over a four-day period in 1994.



TANK COLLAPSE



SOCOTEC

- Tank collapse from Brewster Building, July 2013.
- Tank Inspection Ordinance introduced in 2014.



ROPE ACCESS SYSTEM

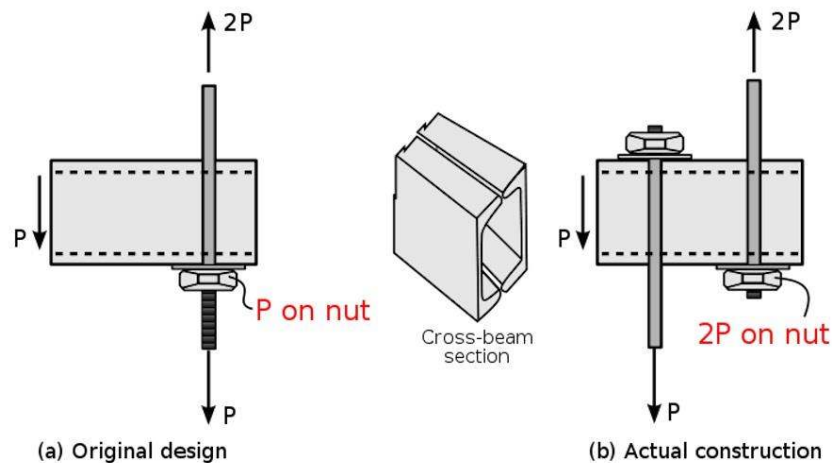


- Anchorage systems require certification annually and testing every 10 years.
- Added to OSHA Regulations January 17, 2017.



OTHER COLLAPSES

- Hyatt Regency, Kansas City, MO
- July 17, 1981: collapse of two stacked walkway structures.
- 114 dead and 216 injured.
- Design/Construction error. Deadliest structural failure in over 100 years.



OTHER COLLAPSES

- Champlain Towers South, Surfside, FL
- June 24, 2021: portion of condominium building collapsed.
- 98 dead.
- 40-year inspection (required per Florida Building Code, Broward County Edition) noted severe deficiencies.



Façade Ongoing and Critical Exams

PROCESS – ONGOING EXAMS

- Identify any imminently hazardous conditions at the façade from the ground using binoculars and zoom lens camera.
- Visual inspection only.
- An Ongoing Inspection and Repair Report for Exterior Walls and Enclosures every 2 years. Must be stamped by registered professional.



CHICAGO
Department of Buildings

120 South LaSalle Street, Chicago, IL 60602

Form EW-1 2021
(Due on or Before November 1, 2021)

Ongoing Inspection and Repair Program Report for Exterior Walls and Enclosures

- Address of Building: 120 South LaSalle Street, Chicago, IL 60602
 Name of Building: 120 South LaSalle
 Contact Person (On Site): Rich Newman Phone: +1 416-799-7588
 Email address: rich@arguson.ca
- Principal Occupancy of Building: Commercial
- Name of Owner / Agent: Arguson Projects, Inc.
 Address of Owner / Agent: 2555 North Sheridan Way, Suite 400
 City: Mississauga, CANADA State: Ontario Zip: L5K 2P8
 Contact Person: Rich Newman Phone: +1 416-799-7588
 Email address: rich@arguson.ca
- Description of Building and Exterior Walls
 a. No. of Stories: 23
 b. Bldg. Height: 190'
 c. Plan Dimensions: 190' x 190'
 d. Year Constructed: 1928
 e. Category: Class III
 f. Composition of Exterior (Check all that apply):
 Brick [x] Terra-Cotta [x]
 Stone [x] Concrete [x]
 Cast. Blk. [x] Stucco [x]
 Glass [x] Windows [x]
 Metal [x] Soffit [x]
 Concrete [x]
- Have you reviewed previous ordinance Reports or other reports on file for this Building?
☒ YES Dates of prior Reports: 2019 02/12/2018
☐ None Available
- Please check one of the following summarizing the condition of the facade. Use the back of this sheet (or attach separate report) to briefly describe the nature and extent of inspections, repairs, maintenance or corrective actions taken during the reporting period, and recommended to be performed within the next reporting cycle. (Refer to the Rules and Regulations for Maintenance of High-Rise Exterior Walls and Enclosures for definitions and additional reporting requirements.)
☐ SAFE CONDITION
☒ SAFE WITH REPAIR AND MAINTENANCE PROGRAM Describe repair and maintenance required and time frame to prevent deterioration into and unsafe condition.
☐ UNSAFE AND IMMINENTLY HAZARDOUS The Department of Buildings must be notified by phone at (312) 743-7209 and by mail at Department of Buildings 2045 W. Washington, Chicago IL 60612.
 Name of Building Department Employee Contacted: _____
 Date Contacted: _____
 Protective Enclosures Recommended: ☐ YES ☐ NO
- Licensed Professional
 Name: William D. Bast, P.E., S.E., S.E.C.B.
 Firm: LPS, Inc. a SOCOTEC Company
 Address: 1 East Wacker Drive - Suite 2700
 City: Chicago, State: IL Zip: 60601
 Phone: +1 773 943 7356
 Email: William.Bast@socotec.us
 Date: 11/09/2021 Seal Exp. 12/30/22
 Signature of Professional: *William D. Bast*

Fileable PDF available at www.chicago.gov/buildings

PROCESS – CRITICAL EXAMS

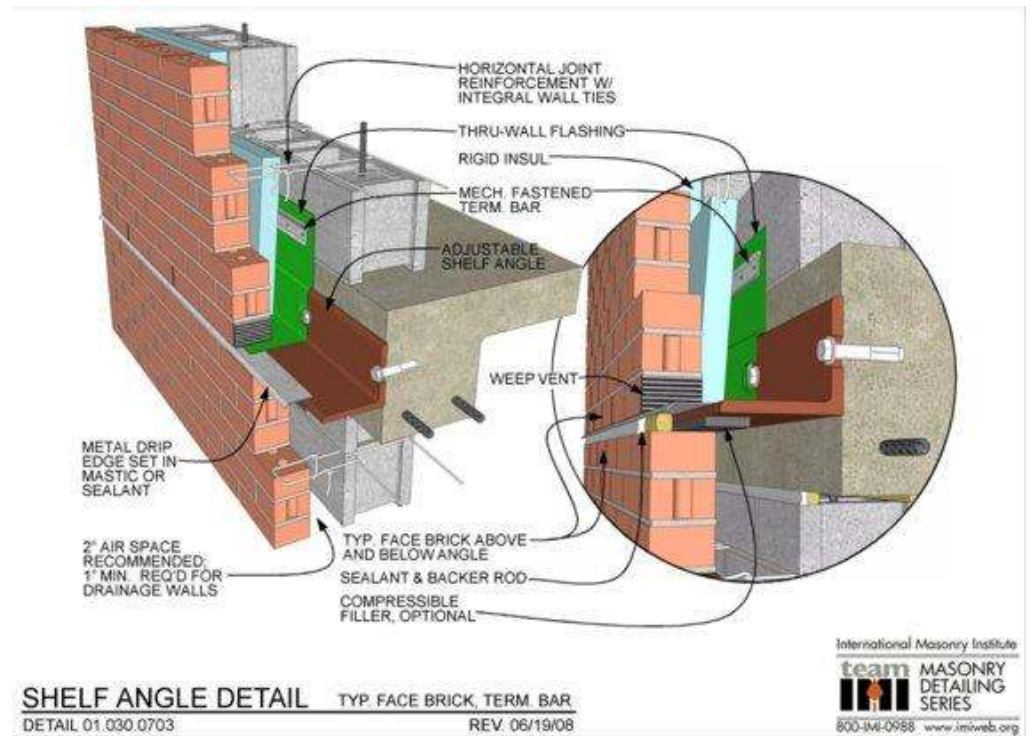


- Triggered if imminently hazardous conditions noted from ongoing exams.
- Requires at least one close-hand inspection.
- Critical Exams may be performed in lieu of or in addition to Short Form inspections.
- Critical Examinations occur every 4, 8, or 12 years depending on the building classification.

Building Classification	Critical Exam Frequency
Category I	Every 12 years
Category II and IV	Every 8 years
Category III	Every 4 years

EXTERIOR WALL CLADDING SYSTEMS

- Veneer
- Sealant
- Insulation
- Air / Vapor Barrier
- Substrate (concrete, CMU, sheathing, etc.)
- Anchors
 - Gravity (Dead Load)
 - Lateral (Wind Load)



CASE STUDY – LIMESTONE

"Half-moon" spalls near anchor points.

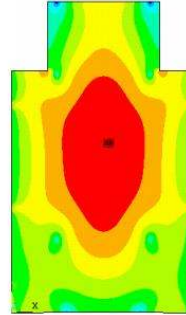


Stains from dirt and lichen build-up.



CASE STUDY – MARBLE

- Water Tower Place, Chicago
- Thin-stone marble façade built in 1976.
- Performed strength analysis of stone after re-supporting it with additional anchors in 2006.



CASE STUDY – GRANITE

"Half-moon" spalls near anchor points.

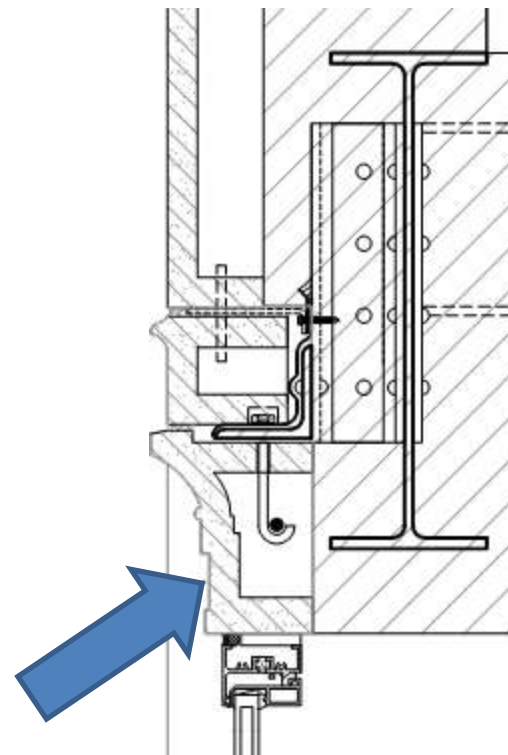


Corrosion on steel angle and lug support.

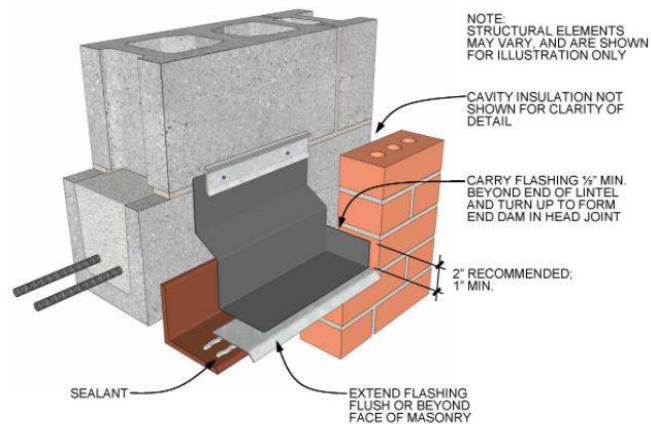


CASE STUDY – TERRACOTTA

High-Risk Facade



CASE STUDY – BRICK



END DAM DIAGRAM FIELD-FORMED FLASHING END DAM
DIAGRAM 01.410.0201 REV. 02/04/11

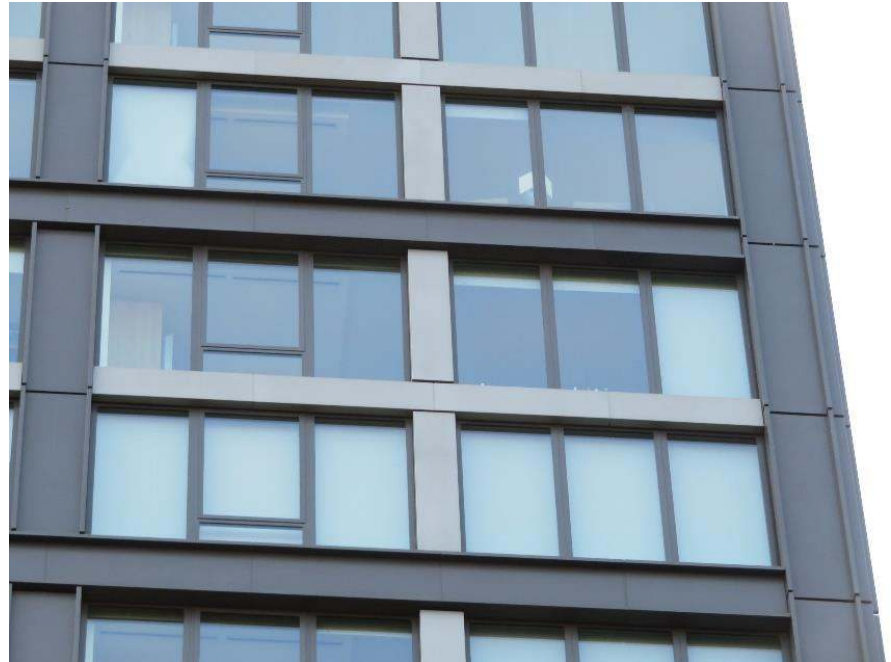


CASE STUDY – BRICK



CASE STUDY – METAL

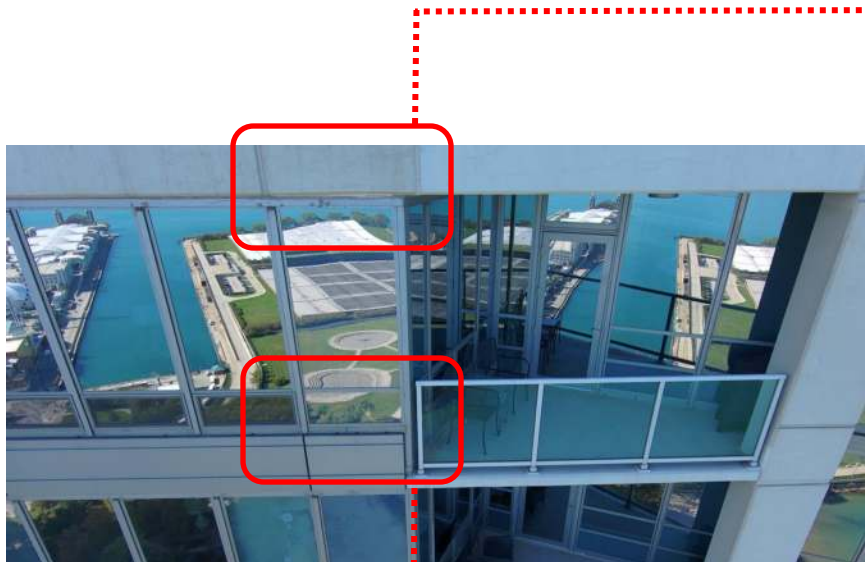
- Performed scaffold drops as well as visual from afar.
- Missing fasteners discovered.



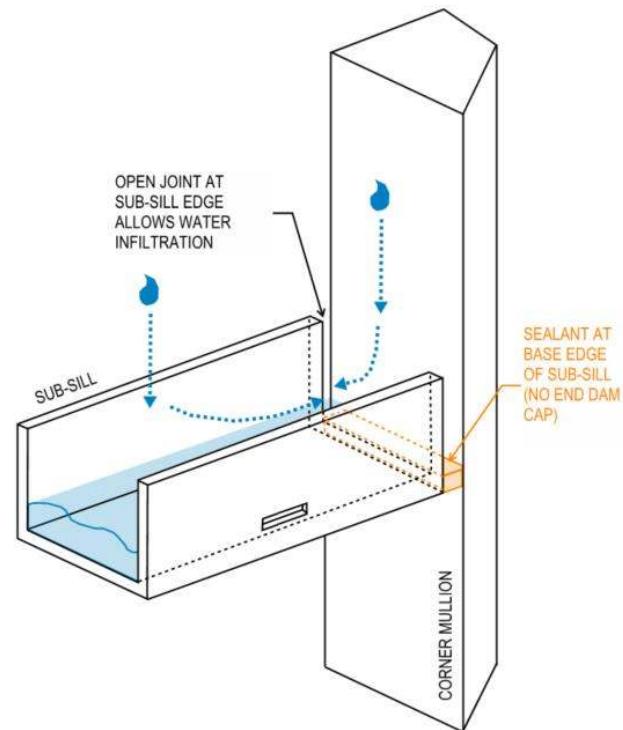
CASE STUDY – GLASS, WINDOWS, CURTAIN WALLS



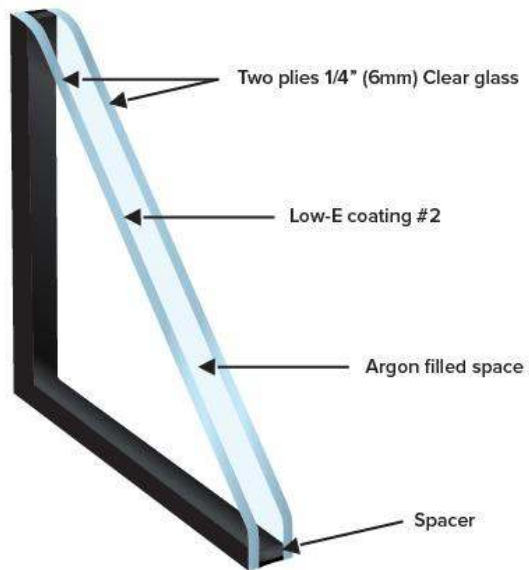
SOCOTEC



SOCOTEC



CASE STUDY – GLASS, WINDOWS, CURTAIN WALLS



CASE STUDY – GLASS, WINDOWS, CURTAIN WALLS



Raw Material Glass Production
(Shanghai, China)



Glass Assembly (Owatonna, MN)



Window Assembly (Itasca, IL)

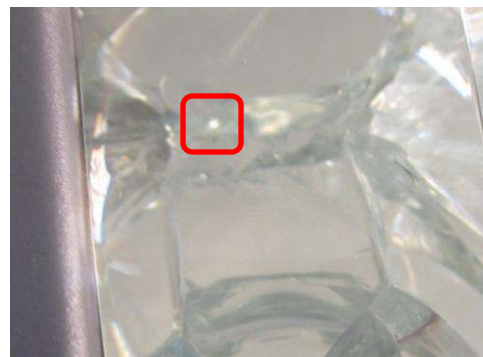


Installation (Chicago, IL)



Transport to Site

CASE STUDY – GLASS, WINDOWS, CURTAIN WALLS



Façade Access Anchorage Requirements

OSHA REGULATION SECTION 1910.27(b)(1)(i)



- *“Before any rope descent system is used, the building owner must inform the employer, in writing that the building owner has identified, tested, certified, and maintained each anchorage so it is capable of supporting at least 5,000 pounds (2,268 kg), in any direction, for each employee attached. The information must be based on an annual inspection by a qualified person and certification of each anchorage by a qualified person, as necessary, and at least every 10 years.”*

VISUAL INSPECTION

- Required every year.
- Produce summary report providing any recommendations for repair



LOAD TESTING

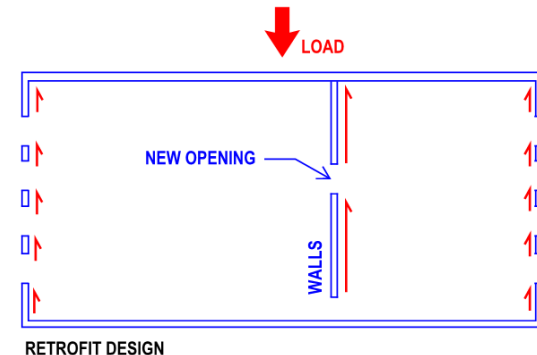
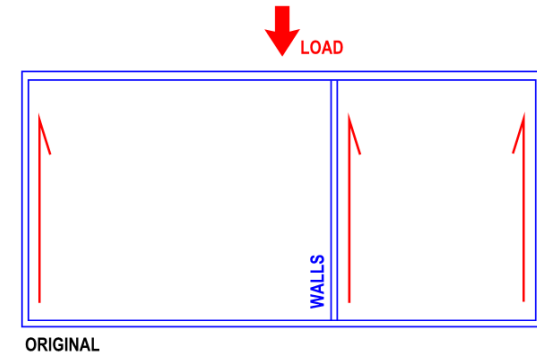
- Required every 10 years.
- Test anchorages for 5,000 lb load held in place for a period of five minutes.



Design Code Requirements

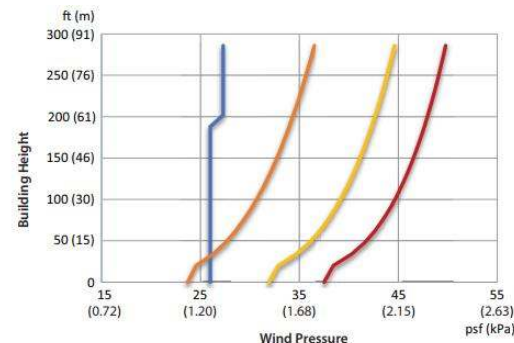
SEISMIC UPGRADES

- Seismic design now required in updated 2019 Chicago Building Code.
- Has implications for building renovations – especially low-rise brick buildings.
- Show no member utilization has increased by 10% to avoid strengthening – increased Engineering.

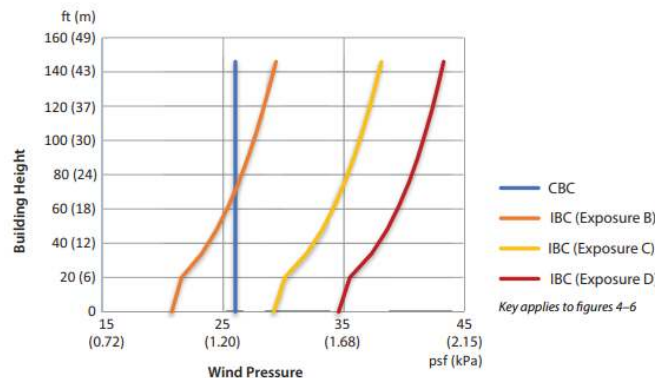


WINDOW LOAD UPGRADES

- Wind load calculation process updated in 2019 Chicago Building Code.
- Design implications similar to Seismic.
- Wind typically governs over Seismic for taller buildings.



Prototype 2
20-story Office Building
286 feet (87.2 meters) tall
180 x 130 feet
(54.9 x 39.6 meters)



Prototype 3
10-story Office Building
160 feet (48.8 meters) tall
150 x 130 feet
(45.7 x 39.6 meters)

Key applies to figures 4–6

REF. FOR FIGURES: CTBUH

<https://global.ctbuh.org/resources/papers/download/4300-chicago-building-code-modernization-comparison-of-prototype-building-designs.pdf>

PEER REVIEWS

111 W Wacker



Other Considerations

40 YEAR INSPECTIONS



Dear : Property Owner

Our records reflect that you are the registered owner of the building identified above. In accordance with the Florida Building Code, Building Section 110.15 (Broward County Administrative Provisions), you are hereby notified that the above referenced building is due for a 40 Year Building Safety Inspection. You are required to furnish, or cause to be furnished, within ninety (90) days from the date of this Notice of Required Building Safety Inspection, the Broward County Board of Rules and Appeals Building Safety Inspection Certification Form to the Hallandale Beach Building Inspections Division, prepared by a Florida registered Professional Engineer or Architect registered in the State of Florida, certifying that each such building or structure **is structurally and electrically safe**, or has been made structurally and electrically safe for the specified use for continued occupancy, in conformity with the minimum inspection procedural guidelines as issued by the Board of Rules and Appeals. Any renovations completed to the structure(s)

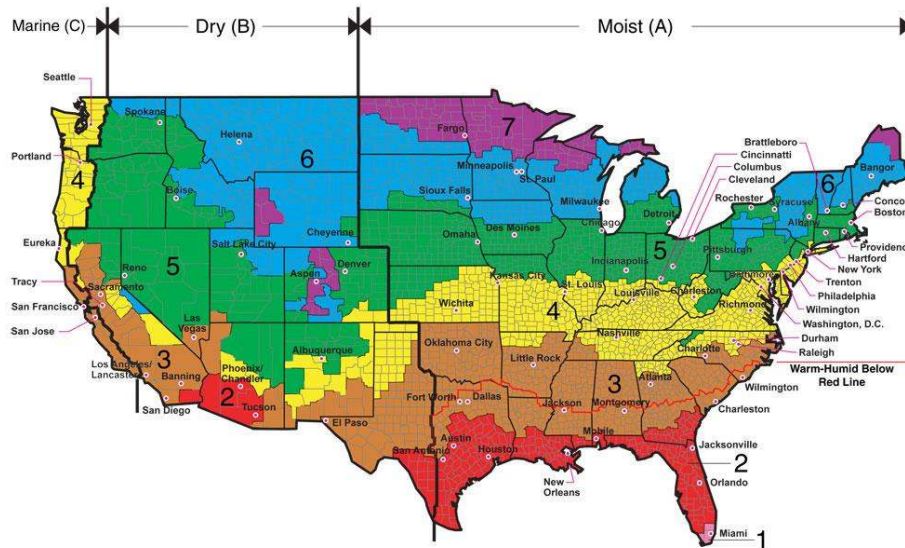
EXPOSED IRON INSPECTIONS

- Required every 5 years in Chicago.
- Sign structures, antennae, canopies, marquees, fire escapes, flagpoles, cornices, smokestacks, window washing and exterior maintenance systems, and other structures and equipment of metal construction permanently mounted or installed on the exterior of the building, or a freestanding metal sign structure exceeding 25 feet in height



ENERGY CODES AND BENCHMARKING

ASHRAE 90.1



All of Alaska in Zone 7 except for the following Boroughs in Zone 8: Bethel, Dellingham, Fairbanks, N. Star, Nome North Slope, Northwest Arctic, Southeast Fairbanks, Wade Hampton, and Yukon-Koyukuk

Zone 1 includes: Hawaii, Guam, Puerto Rico, and the Virgin Islands

Steel Framed Walls, Above Grade

ASHRAE 90.1—2004

ASHRAE 90.1 2007 & 2010

Zone	Non-Residential	Residential	Non-Residential	Residential
1	13	13	13	13
2	13	13	13	13 + 7.5
3	13	13 + 3.8	13 + 3.8	13 + 7.5
4	13	13 + 7.5	13 + 7.5	13 + 7.5
5	13 + 3.8	13 + 7.5	13 + 3.8	13 + 7.5
6	13 + 3.8	13 + 3.8	13 + 7.5	13 + 7.5
7	13 + 7.5	13 + 7.5	13 + 7.5	13 + 15.6
8	13 + 7.5	13 + 10.0	13 + 7.5	13 + 18.8

Energy Benchmarking

Chicago Energy Benchmarking Ordinance Requirements:

The Chicago Energy Benchmarking Ordinance focuses on creating information that will enable better decision-making. It does not require buildings to make any mandatory investments. The ordinance has three requirements:

1. **Benchmark energy use** (annually): Covered buildings will track basic building information and whole-building energy use (electricity, natural gas, and any other fuels, including common spaces and tenant-occupied spaces) using [ENERGY STAR Portfolio Manager](#), a free online tool offered by the US EPA.
2. **Verify energy data** (every 3 years): In the first year in which buildings benchmark, and every third year thereafter, buildings will have energy and building data reviewed by an in-house or 3rd-party professional with a license or training credential recognized by the City.
3. **Report to the City** (annually): Click the [2022 Chicago Energy Benchmarking Reporting Link](#) (through ENERGY STAR Portfolio Manager) and follow and follow the prompts to send benchmarking data to the City of Chicago no later than June 1st.

Please visit the Chicago Energy Benchmarking [Instructions & Guidance Materials](#) webpage for detailed descriptions of ordinance requirements and how to comply.

RECOMMENDED MAINTENANCE

SEALANT REPLACEMENT - POLYURETHANE

10-15 years

SEALANT REPLACEMENT - SILICONE

20-25 years

HISTORIC FAÇADE CLEANING

5-10 years

WATER REPELLENT APPLICATION

5-10 years

WINDOW / GLASS REPLACEMENT

30-40 years

CONTACT



CHICAGO OFFICE

1 East Wacker, 27th Floor
Chicago, IL 60601
+1 773 943 7355

William Bast
+1 312 639 1052
William.bast@socotec.us

Lee Fink
+1 773 636 5675
Lee.fink@socotec.us

www.socotec.us

NEW YORK HQ

151 West 42nd Street, 24th Floor
New York, NY 10036
+1 212 689 5389

Chelsea Coppinger
+1 646 549 6045
Chelsea.coppinger@socotec.us