



#### What's a Stretch Code and Why You Should be Paying Attention



Tom Culp NGA energy code consultant Owner, Birch Point Consulting MARK YOUR CALENDAR FOR THESE OTHER UPCOMING EVENTS

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This panel presentation will feature perspectives across the glass, glazing and architecture supply chain.

Learn about ways to balance a building's longevity and reuse with evolving code requirements impacting its energy performance and carbon footprint.

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For Architects, Designers & Students Only glass.org/blueprint-collaboration





#### What's a Stretch Code and Why You Should be Paying Attention



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### National Scene vs. The Local Angle

- At NGA and GICC, we focus on the **national model codes**:
  - International Energy Conservation Committee (IECC)
  - ASHRAE 90.1
  - ASHRAE 189.1 / International Green Construction Code (IgCC)
- All use *consensus process* with 29-48 committee members covering all stakeholder categories, 5-7 technical subcommittees, and public review.
- Strength from broad consensus, strong technical development, and national applicability.



## Code Adoption

• National model codes developed on 3 year cycle, then must be adopted at the state or local level ... some *fast*, some *slow*.



• *\$1 billion* appropriated to DOE through 2029 for state and local government grants to accelerate energy code adoption.



#### But not fast enough?

339 cities have decarbonization policies and specific emission reduction targets by 2030, 2040, etc.

To reach these goals, many are taking *local action*: Building Performance Standards Stretch / Reach Codes



#### Local Action: Building Performance Standards

- Set energy use or carbon emission limits on **existing buildings** along with associated \$\$\$.
- Will positively accelerate envelope retrofits including glazing and window replacement, commercial secondary glazing, low-e storm windows, over-facades





#### Local Action: Stretch Codes

- Some states allow municipalities to "voluntarily" adopt a stretch or reach code that goes beyond the main energy code.
- Voluntary adoption by the municipality ... but ... once it's adopted, it may, or may not, be voluntary to the architect or building owner. It depends on the location.



(Gray states not allowed to use mandatory stretch codes. Only as part of above-code incentive programs.)



## Local Action: Stretch Codes

- Can take different forms:
  - Tweaks to main energy code that go extra 15-20%
  - Major revisions and/or new energy efficiency requirements.
  - Added scope such as decarbonization, electrification
     (e.g. on-site solar, electric-ready provisions, EV charging station requirements)
- Well intentioned, but potential pitfalls:
  - Some follow good technical analysis and cost effectiveness requirements. Others don't.
  - <u>Not</u> developed through a consensus-based process with broad and balanced interests like the national model codes.
     Often decisions are made by just a few individuals.
  - Risk of technical mistakes, biases, favoring of certain material interests.



#### Local Action: Stretch Codes

• California, Colorado, Maryland, Massachusetts, New York, ... but today we'll briefly look at impact on fenestration from two:





#### New York State

• Current base code:



2020 Energy Conservation Construction Code of New York State (ECCCNYS)

- Based on 2018 IECC and ASHRAE 90.1-2016
- Will update based on 2024 IECC and ASHRAE 90.1-2022 next year.

#### • 2020 New York Stretch Code

- Developed by NYSERDA with technical input from NBI and others as an overlay of 2018 IECC and ASHRAE 90.1-2016.
- Currently only adopted by a handful of cities ... but one of them is **New York City**!
- New York City has local law that requires them to adopt the New York Stretch Code. They can also modify.
- **2023 New York Stretch Code** about to be published. Implementation date?



#### 2023 New York Stretch

- Initial draft was completely unrealistic for structural commercial fenestration, but following additional technical input, they are likely going to prescriptive criteria of U-0.28 fixed, U-0.32 operable.
  - For comparison, 90.1-2022 requires U-0.34-0.36 fixed, U-0.42-0.45 operable.
- Very aggressive, but achievable.
  - Triple glazing in a normal thermally broken frame.
  - Double glazing with #2/#4 low-e in high performance thermally broken frame.
  - Operable windows will be more challenging, but averaging also allowed.

(Side note: does not include separate requirements for windows above and below 95 ft like in the current NY City stretch code.)



# 2023 New York Stretch

- U-0.28 / 0.32 is *prescriptive* requirement.
  - Can use area-weighted averaging, envelope trade-offs, or whole building performance trade-offs to provide some flexibility.
- There is an envelope backstop, but it is based on the overall envelope performance calculated in accordance with ASHRAE 90.1 Appendix C (COMcheck).
- Flexible and technically based
  - Includes effects of *orientation, thermal mass, shading, daylighting.*
  - Looks at overall envelope (walls, windows, roof) can compensate one area for another.
  - If use high performance systems, can still do curtain wall and good window area to
    provide daylight and views that are critically important to occupant health and well-being.





## 2023 Massachusetts Stretch Energy Code

- "Voluntarily" adopted stretch code ... but not really voluntary.
   It becomes the mandatory energy code in that municipality once adopted.
- 300 municipalities including Boston have adopted prior versions, so basically all of Massachusetts.
- Automatic updates: the new 2023 version is automatically rolled out to all starting July 1, unless a city specifically votes to rescind their adoption (very unlikely).





#### 2023 Massachusetts Stretch Code

 Developed by MA Department of Energy Resources, using 2021 IECC as a framework but not really – major revisions, different compliance paths, and new items.

- There is also a new "*specialized opt-in code*" that municipalities can adopt with additional *electrification* requirements.
  - Addresses EV parking, all-electric buildings, mixed fuel buildings with on-site PV and electric-ready provisions, and net zero buildings.
  - Also requires Passive House for multifamily > 12,000 ft<sup>2</sup>.



## 2023 MA Stretch Compliance Paths

Very different compliance paths than IECC or ASHRAE 90.1. <u>Can be quite confusing.</u>

Boiling down 2 hours of training into 5 minutes:

- **Prescriptive Path** must meet specific envelope, lighting, HVAC criteria
- **Targeted Performance Path** based on TEDI performance TEDI = thermal energy demand intensity, annual heating or cooling demand based on envelope + ventilation from performance model.
- **Relative Performance Path** based on ASHRAE 90.1 App G performance
- Certified Performance Standard Path based on Passive House, HERS



#### 2023 MA Stretch Code Compliance Paths

	Prescriptive Path	Targeted Performance (TEDI)	<b>Relative Performance (90.1 App G)</b>
What buildings?	Nonresidential < 20,000 ft2	Offices, Schools, Dorms, etc > 20,000 ft2 AND ventilation < 0.5 cfm/ft2. Multifamily > 12,000 ft2. Others may use it too.	Other building types OR if ventilation > 0.5 cfm/ft2.
Main compliance	Prescriptive (envelope, HVAC, lighting)	Max heating and cooling TEDI limits	Max building performance factors
Electrification		100% space heating from heat pumps if > 50% glazed wall (including spandrel)	25% space heating from heat pumps



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Fenestration criteria if <i>under</i> 30% WWR (or 40% if meet daylighting criteria)	U-0.30 fixed, 0.32 operable SHGC-0.38 fixed, 0.33 oper	U-0.30 fixed, 0.32 operable SHGC-0.38 fixed, 0.33 oper <i>BUT</i> likely need much lower to comply with TEDI	U-0.30 fixed, 0.32 operable SHGC-0.38 fixed, 0.33 oper <i>BUT</i> might need lower to comply with BPF



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Fenestration criteria if <i>over</i> 30% WWR (40% if meet daylighting criteria)	Must meet envelope backstop with max area-weighted average U-factor (window + wall). <b>Max U drops to 0.25 in curtain wall, window wall, storefront.</b> Punched opening remains at U-0.30/0.32 but realistically must be <i>much</i> lower. Max WWR maybe 45%?		

**Mandatory!** No exceptions for fire-rated assemblies, blast-resistance, hurricane impact-resistant, etc. No trade-offs for dynamic glazing, PV generation in vision area, etc.

#### 2023 MA Envelope Backstop

- MA Stretch Code replaced the IECC C402.1.5 envelope component performance alternative, designed to *provide* flexibility, with a <u>double</u> envelope backstop, designed to *remove* flexibility.
- Triggered if building exceeds 30% / 40% WWR limit
   <u>OR</u> if prescriptive wall requirements are not met (even with low glazing area).
  - In "glazed wall system", mandatory fenestration U-factor drops to U <= 0.25.</li>
     No exceptions for fire-rated assemblies, blast resistance, hurricane impact resistance, etc.
  - **Glazed wall system** = curtain wall, window wall, storefront <u>including spandrel area</u>.
  - For glazed wall system < 50% of wall area, area-weighted total U-factor (wall + windows) <= 0.1285</li>
  - For glazed wall system > 50% of wall area, area-weighted total U-factor (wall + windows) <= 0.1600</li>
     AND must electrify with heat pumps for space heating capacity (25% or 100%).



## 2023 MA Envelope Backstop

window wall / storefront.

- Interesting the mostly triple glazing (or vacuum glazing) even with advanced U-0.25 will be mostly triple glazing (or vacuum glazing) even its under the mostly even its under the mostly even its under the mostly ev
- Strongly biased towards punched opening windows and against curtain wall / thermally-broken frames – will building owners pay for it? A More stringent requirements for glazed wall systems than individual windows,

WUTE SUMBENIL TEQUITEINEN IVE STALEU Wan Systems Warring Windows, regardless of area or other performance aspects like better daylighting, views, in losion or in charter the meal building wining area and the icsaruica vi ouici Periorinance aarea PV, etc. air leakage, perimeter thermal bridging, vision area or



a).

### 2023 MA Envelope Backstop

This is example of why backstops are such a bad idea:

- Backstops just *restrict design flexibility but save no energy* any changes in one place are compensated for in another.
- If done technically right (like 90.1, NY, or even just TEDI), they can at least provide flexibility between different envelope components and account for orientation, thermal mass, shading, daylighting, etc.
- If done technically wrong (like the mandatory U-0.25 in MA), they:
  - Ignore equivalent whole building performance,
  - Create potential life-safety conflicts,
  - Create biases towards certain product types or materials,
  - Ignore non-energy impacts like occupant health and well-being ...



## Buildings are for People!

#### The Human Aspect – Occupant Health and Wellness

Numerous studies show having access to daylighting and quality views provides better learning, faster healing, higher productivity, higher value.



#### ... or New-Age Brutalism?



Fake windows!?!

- Would *you* want to work here? Have *your* child learn here? Have *your* mother heal here?
- No daylight, no view? Ventilation, IAQ? Harm to occupant health and well-being? Increased embodied carbon / GWP?
- Buildings must serve their occupants.



#### Next Steps?

- New York: NY Stretch will be published very soon.
  - We will review, but if it is "aggressive, but achievable" without impacting occupant health and well-being, okay.
- Mass: We are in discussion with staff at Massachusetts DOER to see if we can make corrections without a big fuss. If not, ... ?
- Need better spandrel modeling and performance
   → Charles Pankow Foundation research project
- What about other places? Local action is popping up like whack-a-mole ... we need eyeballs on the ground.
- And to leave you with two final thoughts ...



For info or to donate: Mark Perniconi <u>mperniconi@pankowfoundation.org</u> Anne Ellis aellis@pankowfoundation.org



# We can do net zero in good buildings – it's all about balance

- Energy Efficiency + Renewables
- IEQ, Ventilation, Daylighting, Views
- Healthy spaces to live, work, learn, play, heal





Lick-Wilmerding High School, CA





Denver Water Admin Facility, CO

#### Think about it: What is the future of net zero buildings ... Jetsons or Flintstones?







#### **Questions?**



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# **Additional NGA Resources**



NGA Sustainability Initiatives



NGA Building Code Information

Browse glass.org/advocacy for additional tools



#### **SAVE the DATE**

NGA Glass Conference: Tacoma Jul 25-27, 2023 | Marriott Tacoma Downtown

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BEC Conference Mar 3-57, 2024 | Omni Nashville Hotel

**Glass Processing Automation Days | GPAD** March 5-6, 2024 | Omni Nashville Hotel



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