

ASHRAE and IECC Update

Thomas D. Culp

Birch Point Consulting

rep. Aluminum Extruders Council, National Glass Association



NFRC technical procedures referenced in energy codes:

		ASHRAE 90.1	IECC	CA Title 24
NFRC 100	U-factor	X	X	X
NFRC 200	SHGC and VT	X	X	X
NFRC 400	Air Leakage	X	X	X
NEW! NFRC 203	VT_{annual} for TDD	X (2019)	Pending for 2021	X (2019)
NFRC 300 NFRC 301	Center-of-glass properties where needed for cool walls, shade device infills, LSG, etc.	X		indirectly



Next steps ... 2021 IECC and ASHRAE 90.1-2019

- ASHRAE 90.1-2019 is complete, and will be published early Oct.
 - Complete update to commercial fenestration criteria.
- 2021 IECC proposals went through first public hearing this spring; next hearing in Oct, then final online vote in Nov-Dec.

General IECC preliminary hearing results:

- *Residential:*
 - lots of debate about different performance-based compliance paths, envelope backstops, PV, but **only small changes to prescriptive requirements.**
- *Commercial:*
 - Unanimous approval to **align fenestration requirements** with ASHRAE 90.1.
 - Continued expansion of **daylighting** – better controls, more spaces.
- *Both:* new **climate zone map** aligned with ASHRAE



Preliminary 2021 IECC Residential Fenestration Requirements

- Small changes to U-factor shown in blue:

Climate Zone	1	2	3	4	5	6	7	8	
U-factor	NR	0.40	0.35	0.35	0.32	0.32	0.32	0.32	2015 IECC
	NR	0.40	0.32	0.32	0.30	0.30	0.30	0.30	2018 IECC
	NR	0.35	0.30*	0.30*	0.30*	0.30*	0.30*	0.30*	2021 IECC prelim
	0.40	0.40	0.30	0.30	0.27 ^x	0.27 ^x	0.27 ^x	0.27 ^x	Energy Star v6

* New footnote allows up to U-0.32 in windborne debris regions or > 4000 ft elevation.

- All proposed changes to SHGC were disapproved.

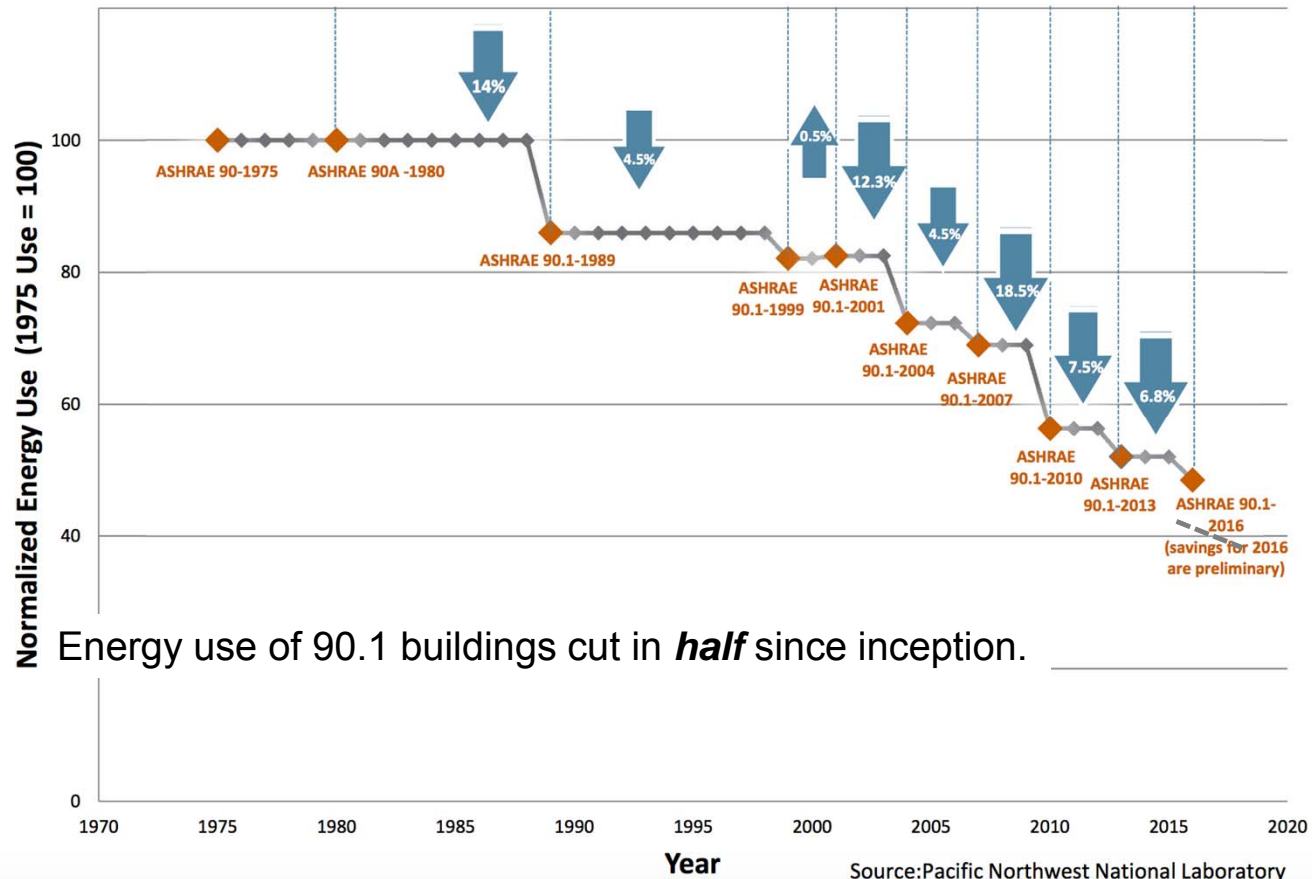
Climate Zone	1	2	3	4	5	6	7	8	
SHGC	0.25	0.25	0.25	0.40	NR	NR	NR	NR	2015 IECC
	0.25	0.25	0.25	0.40	NR	NR	NR	NR	2018 IECC
	0.25	0.25	0.25	0.40	NR	NR	NR	NR	2021 IECC prelim
	0.25	0.25	0.25	0.40	NR ^x	NR ^x	NR ^x	NR ^x	Energy Star v6

^x Energy Star: For northern zone, U up to 0.30 allowed with SHGC >= 0.42.



ASHRAE 90.1 Stringency

Improvement in ASHRAE Standard 90.1 (Year 1975-2016)



Energy use of 90.1 buildings cut in **half** since inception.

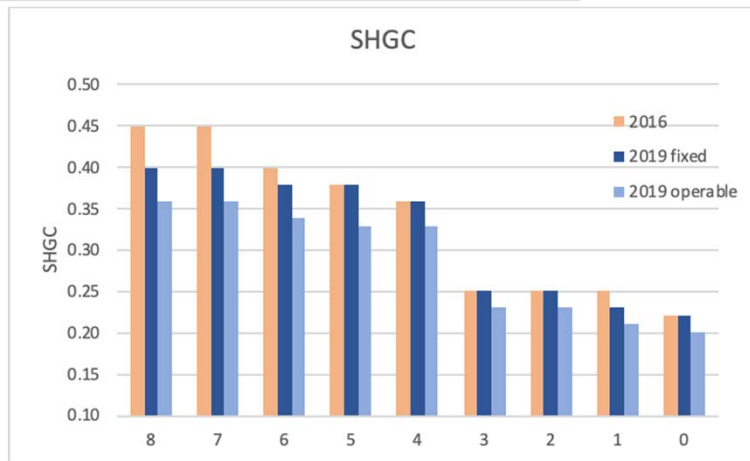
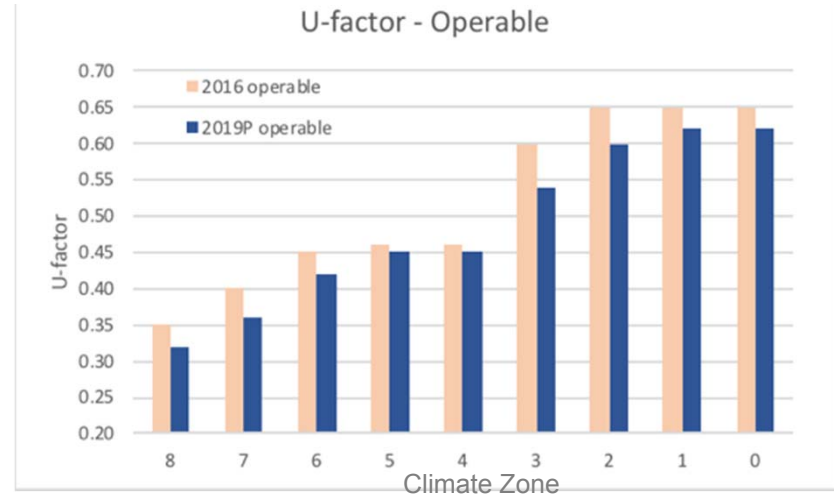
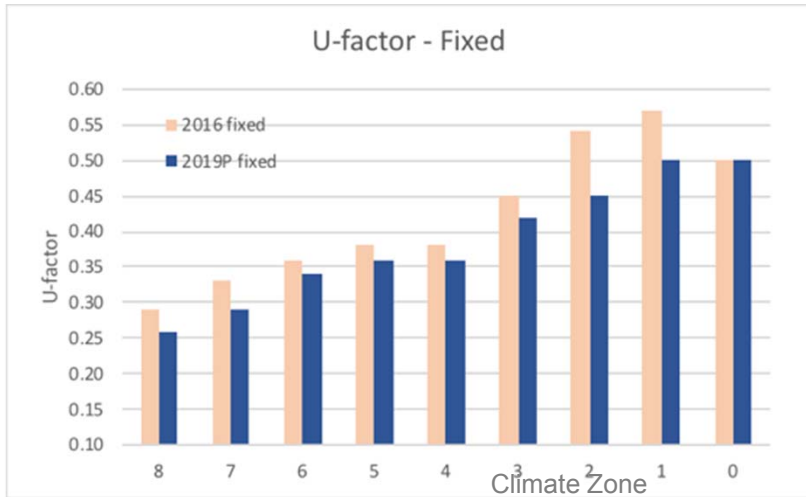


Updated Commercial Fenestration Requirements

- 90.1-2019 and 2021 IECC will continue to push improved framing, warm edge spacers, argon gas fill, and 4th surface low-e coatings while still being cost effective and practical
... and with no reductions in window area.
 - 5-17% reduction in U-factor;
only modest reductions in SHGC – but new criteria for fixed vs. operable SHGC.
 - In many cases, very roughly a “zone shift” between 90.1-2016 and 90.1-2019: what was required in Zone 7 will move to Zone 6, Zone 6 to Zone 5, etc.
 - 90.1 and IECC will use same product categories, without regard to material type.



ASHRAE 90.1-2019 and preliminary 2021 IECC criteria vertical fenestration



This assumes the values for 2021 IECC do not change in the fall hearing.



Commercial Vertical Fenestration U-factors, 2009-2021

Note: Starting with 90.1-2019, both 90.1 and IECC will only have fixed, operable, and entrance door categories that apply to both metal and nonmetal

Climate Zone	0	1	2	3	4	5	6	7	8	
Nonmetal framing	0.32	0.50	0.40	0.35	0.35	0.32	0.32	0.32	0.32	90.1-2013
	0.32	0.50	0.37	0.33/0.35	0.31	0.31	0.30	0.28	0.25	90.1-2016
	<i>Same as metal framing fixed or operable</i>									2018 IECC
	<i>Same as metal framing fixed or operable</i>									90.1-2019, 2021 IECC
Fixed	0.50	0.57	0.57	0.50	0.42	0.42	0.42	0.38	0.38	90.1-2013
	0.50	0.57	0.54	0.45/0.49	0.38	0.38	0.36	0.33	0.29	90.1-2016
		0.50	0.50	0.46	0.38	0.38	0.36	0.29	0.29	2018 IECC
	0.50	0.50	0.45	0.42	0.36	0.36	0.34	0.29	0.26	90.1-2019, 2021 IECC
Operable	0.65	0.65	0.65	0.60	0.50	0.50	0.50	0.40	0.40	90.1-2013
	0.65	0.65	0.65	0.60	0.46	0.46	0.45	0.40	0.35	90.1-2016
		0.65	0.65	0.60	0.45	0.45	0.43	0.37	0.37	2018 IECC
	0.62	0.62	0.60	0.54	0.45	0.45	0.42	0.36	0.32	90.1-2019, 2021 IECC
Entrance door	0.83	1.10	0.83	0.77	0.77	0.77	0.77	0.77	0.77	90.1-2013
	0.83	1.10	0.83	0.77	0.68	0.68	0.68	0.68	0.68	90.1-2016
		1.10	0.83	0.77	0.77	0.77	0.77	0.77	0.77	2018 IECC
	0.83	0.83	0.77	0.68	0.63	0.63	0.63	0.63	0.63	90.1-2019, 2021 IECC

This assumes the values for 2021 IECC do not change in the fall hearing.



Commercial Vertical Fenestration SHGC, 2009 - 2021

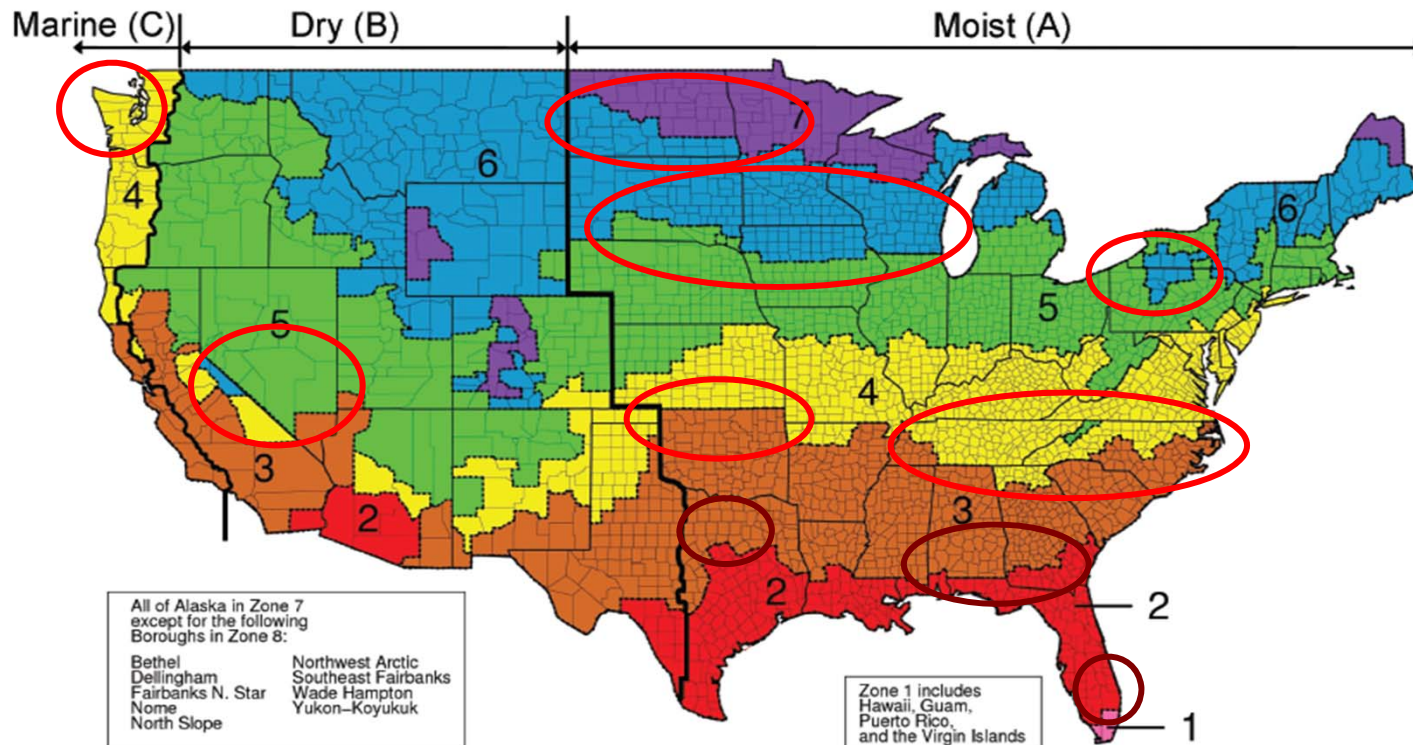
Climate Zone	0	1	2	3	4	5	6	7	8		
SHGC		0.25	0.25	0.25	0.40	0.40	0.40	0.45	0.45	90.1-2007	2009 IECC
										90.1-2010	2012 IECC
										90.1-2013	2015 IECC
	0.22	0.25	0.25	0.25	0.36	0.38	0.40	0.45	0.45	90.1-2016	2018 IECC
Fixed:	0.22	0.23	0.25	0.25	0.36	0.38	0.38	0.40	0.40	90.1-2019	2021 IECC
Operable:	0.20	0.21	0.23	0.23	0.33	0.33	0.34	0.36	0.36		

This assumes the values for 2021 IECC do not change in the fall hearing.

- These are the main SHGC requirements for the overall building, but there are variations based on *external shading* and *orientation*.
- New SHGC requirements in 90.1-2019 and 2021 IECC have separate SHGC for fixed vs. operable products, similar to U-factor.
- In reality, changes are small, as both require the same glazing type – it is just accounting for the higher frame-to-glass ratio in operable products.
- Only real change is zone 1, where 0.23/0.21 SHGC will require new lower SHGC triple silver products and/or tint with low-e.



OLD climate zone map (ASHRAE 90.1-2013 and before, 2018 IECC and before)



Areas that changed zone are circled.

NEW climate zone map (ASHRAE 90.1-2016 and after, 2021 IECC)

