

High Performance Window Forum

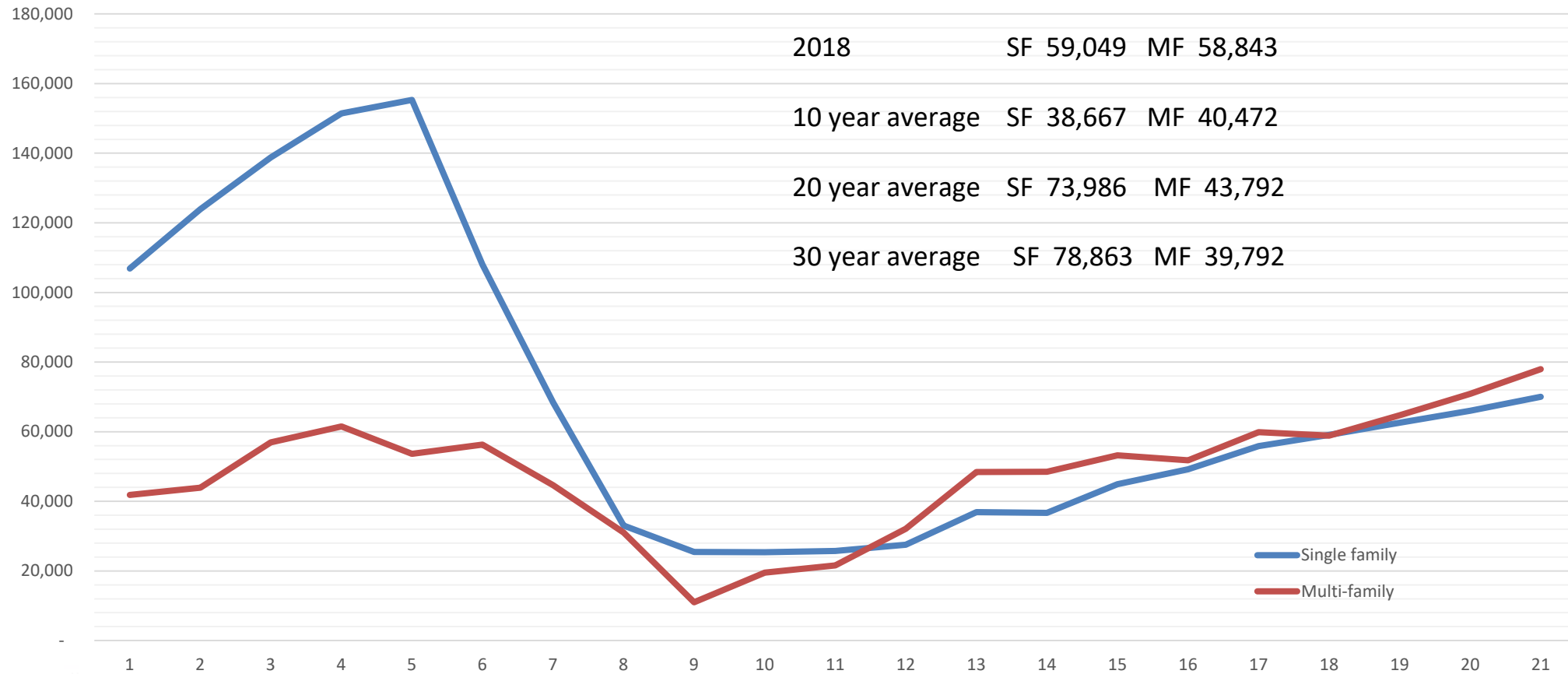
California Housing Market and Builder Interest

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Housing Production in California 2001 - 2021



2018 SF 59,049 MF 58,843

10 year average SF 38,667 MF 40,472

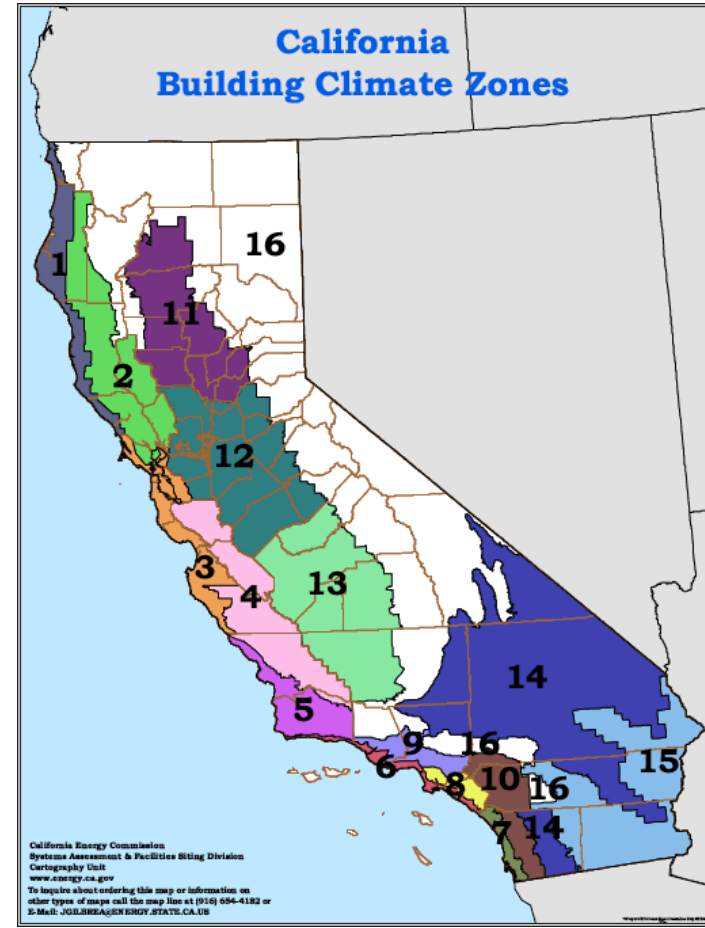
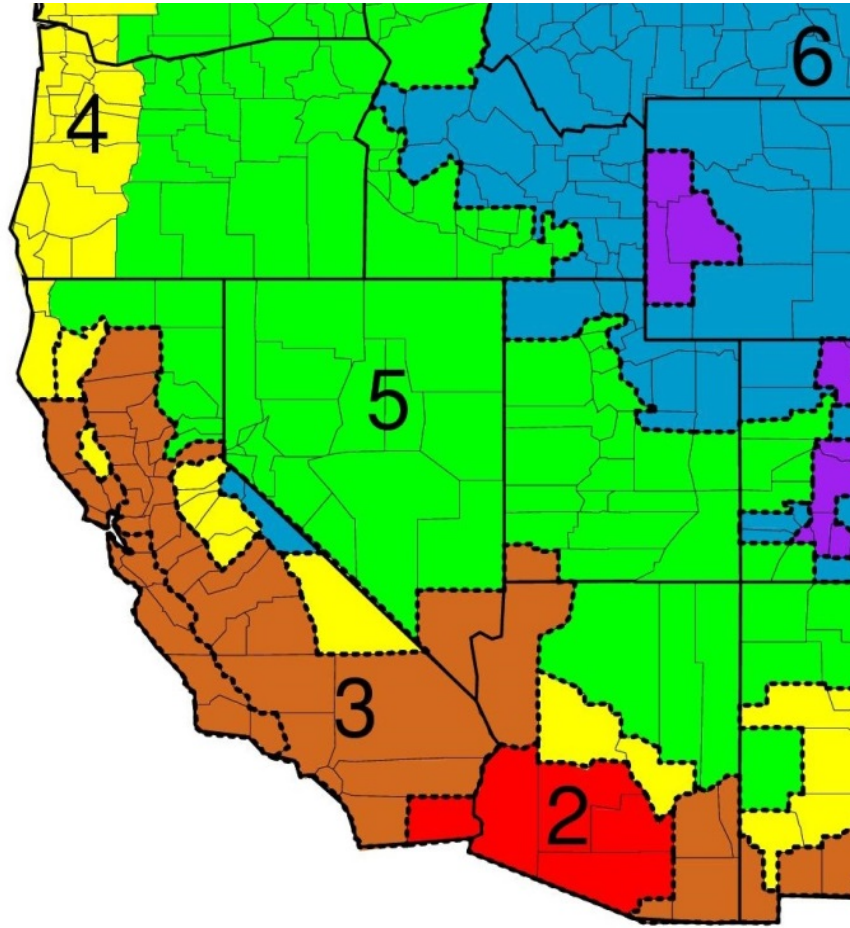
20 year average SF 73,986 MF 43,792

30 year average SF 78,863 MF 39,792

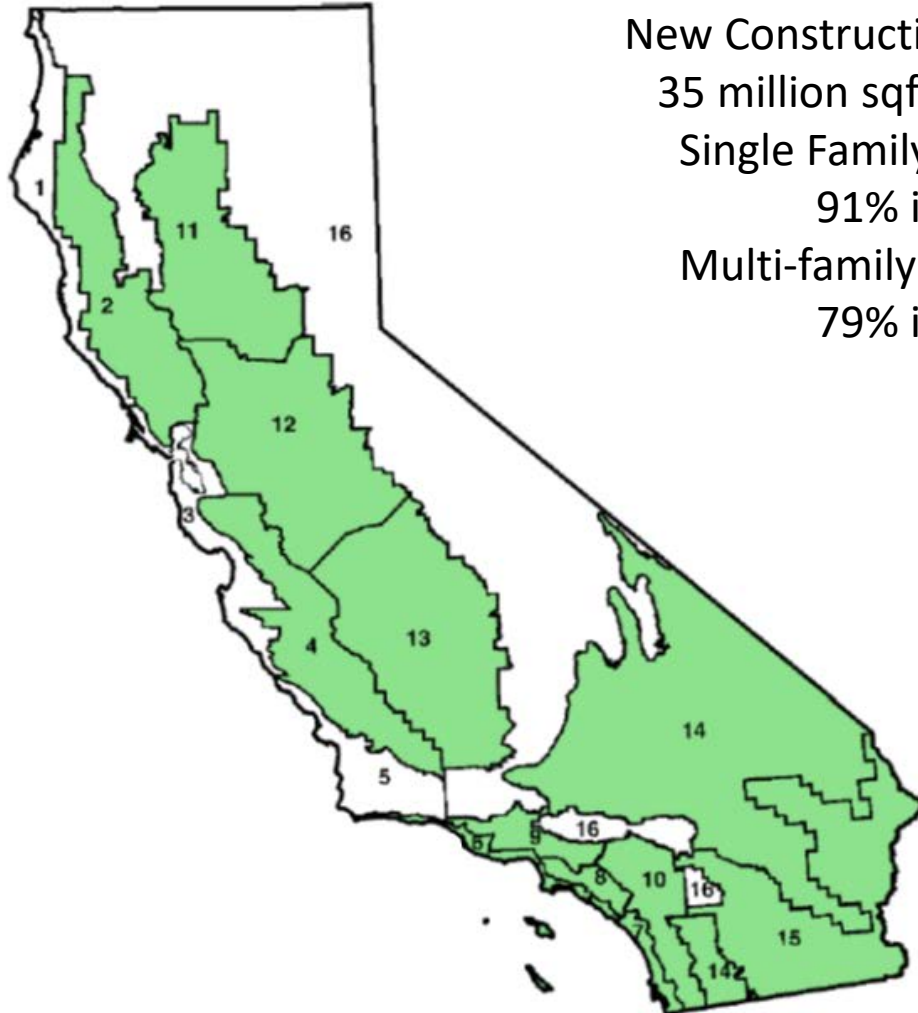
Source: Construction Industry Research Board



Climate Zones: IECC vs. CA



CA Residential Window Market



New Construction

35 million sqft windows installed in 2018

Single Family 28,000,000 (2,570 sf at 18% glazing)

91% in cooling dominated climate zones

Multi-family 7,000,000 (850 sf at 14% glazing)

79% in cooling dominated climate zones

Potential Retrofit Dual Pane Market

750 million square feet dual pane windows installed between 1980 and 2005 (84% in cooling dominated climate zones)

Source: California Energy Commission



CA Energy Code

Title 24, Part 6



- Regulated loads
 - Space heating
 - Space cooling
 - Water heating
- Triennial adoption cycle – in sync with national code adoption cycles
- 16 climate zones (unique to CA, not similar to IECC)
- Warren-Alquist requires all cost effective measures to be required by code
 - Cost effectiveness is over life of home (30 years)
- T-24, Part 6 has different parts
 - Mandatory minimum features (R-19 ceiling insulation; NAECA Standards for appliances, lighting efficacy)
 - Compliance approaches
 - Prescriptive packages (rarely used)
 - **Performance approach (95%+ use for building permit)**
 - CEC approved software: CBECC (engine for all T-24 software)
 - 2019 introduced requirement for energy efficiency and renewable energy
 - 2019 introduced a backstop for energy efficiency (minimum EE EDR)
- Unregulated loads – not controlled by T-24; majority of household energy use



T-24 Standards Compliance Comparison Beaumont, CZ 10

	Base	Heat Pump	All Electric	Battery	2x6	Unvented Attic	Skinny Triple-Pane Windows
Walls	2x4, R-4 Ext	2x4, R-4 Ext	2x4, R-4 Ext	2x4, R-4 Ext	2x6, R-6 Ext	2x4, R-5 Ext	2x4, R-4 Ext
Attic	R-49	R-49	R-49	R-38	R-49	R-49 Unvented	R-38
Cool Roof	Yes	Yes	Yes	No	Yes	Yes	Yes
Whole House Fan	Yes	No	No	No	No	No	No
IAQ – ERV/HRV	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Windows (U/SHGC)	0.31/0.22	0.31/0.22	0.31/0.22	0.31/0.22	0.31/0.22	0.31/0.22	0.20/0.20
HVAC	15 SEER/12.5 EER 0.92 AFUE	Heat Pump 16 SEER/13 EER/8.5 HSPF	Heat Pump 16 SEER/13 EER/8.5 HSPF	14 SEER/12.2 EER 0.80 AFUE	15 SEER/12.5 EER 0.92 AFUE	15 SEER/12.5 EER 0.92 AFUE	15 SEER/12.5 EER 0.80 AFUE
Water Heating	Tankless 0.95 UEF/0.96 EF	Tankless 0.95 UEF/0.96 EF	Heat Pump HPTU 50 120 DWHR 48.8% Eff	Tankless 0.82 EF	Tankless 0.82 EF	Tankless 0.95 UEF/0.96 EF	Tankless 0.82 EF
Solar/Battery	3.1 kW	3.1 kW	3.1 kW	3.1 kW/5 kWh	3.1 kW	3.1 kW	3.1 kW



Cost Impact

Triple Skinny Window Cost Impact by Code Year	2016		2019	
	Savings per House	Cost per sqft Glazing	Savings per House	Cost per sqft Glazing
Single family				
Cooling Climate Zones	\$2,757	\$5.02	\$2,967	\$5.50
Coastal Climate Zones	\$2,920	\$5.41	\$3,567	\$6.61
Multi-family	Savings per Unit		Savings per Unit	
Cooling Climate Zones	\$558	\$4.28	\$416	\$3.19
Coastal Climate Zones	\$522	\$4.00	\$412	\$3.16

Single family = 2700 sqft 2 story, 20% glazing; base window 0.31 u-value and 0.22 SHGC

Multi-family = 6960 sqft 2 story 8-plex, 15% glazing; base window 0.31 u-value and 0.22 SHGC

Cooling climate zone homes are modeled with 0.20 U-value, and 0.20 SHGC windows

Coastal climate zone homes are modeled with 0.20 U-value, and 0.48 SHGC windows



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Builder Concerns

- Availability
 - When
 - Multiple manufacturers – competitive pricing
 - Cooling and coastal climate zones – low and high SHGC
- Cost
 - Compliance trade-offs
 - Utility incentives available to assist to market maturation
- Weight
 - Impact on framing
 - Impact on labor – more labor needed to install
- Tempering - sliding glass doors
- Installation – water intrusion
- Visual impact – look any different than current dual pane windows





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