



PART 1:

**Code Seminar- The Architectural Headaches of Energy Codes and
Inspections issues for Contractor**

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Covering the Nation

12. Advanced Daylighting Design

- ☐ **Types of building impacted: Nonresidential**
- ☐ **Building system impacted: Lighting**
- ☐ **Anticipated type of change: Prescriptive**
- ☐ **Description of change- Consider requirements that encourage a comprehensive approach to daylighting with the focus on improved daylight distribution:**
 - o Provide PAF for shading devices (fixed louvers with calculated angle) o Introduce requirements for clerestories (prescriptive for selected building type(s))**
 - o Consider requirements for skylights (prescriptive for selected building type(s) to meet lower ceiling requirement than current requirement)**

Nonresidential HVAC

13. NR Proposals Based on ASHRAE 90.1-2016

- ☐ **Types of building impacted:** Nonresidential
- ☐ **Building system impacted:** HVAC
- ☐ **Anticipated type of change:** Prescriptive
- ☐ **Description of change-**This measure is comprised of four (4) sub-measures, which are described below.

1 of 4: Fan System Power: This measure will update fan system power requirements to align with ASHRAE 90.1 Table 6.5.3.1-1 Fan Power Limitation, and Table 6.5.3.1-2 Fan Power Limitation Pressure Drop Adjustment. The measure will also investigate strengthening the fan system power equation coefficients.

2 of 4: Exhaust Air Energy Recovery: This measure will evaluate the feasibility of incorporating the ASHRAE 90.1 Section 6.5.6.1 prescriptive exhaust air energy recovery requirements. Requirements will be presented in a similar method as Tables 6.5.6.1-1 and 6.5.6.1-2.

3 of 4: Equipment Efficiency: This measure will capture updates to mandatory equipment efficiencies in the ASHRAE 90.1 Section 6.8.1 tables.

4 of 4: Water Side Economizer: This measure will align with the language for integrated water-side economizers and maximum pressure drop for pre-heating coils in ASHRAE 90.1 Section 6.5.1.2. In addition, it will align with Addenda to ASHRAE 90.1-2010 by requiring water-side economizers for hydronic systems, and include heat rejection fan requirements.

14. Cooling Tower Minimum Efficiency

- ☐ Types of building impacted: Nonresidential
- ☐ Building system impacted: HVAC
- ☐ Anticipated type of change: Prescriptive
- ☐ Description of change- This measure proposes increasing the cooling tower minimum gpm/ton requirement.

15. NR Economizer Fault Detection Diagnostics (FDD) Requirements

- ☐ Types of building impacted: Nonresidential
- ☐ Building system impacted: HVAC
- ☐ Anticipated type of change: Mandatory
- ☐ Description of change- Economizer **fault detection and diagnostics** (FDD) enables automatic detection and diagnosis of economizer faults, such as a sensor failure, that can improve economizer operation.

The proposed code change would introduce FDD requirements for built-up air handlers greater than 54,000 kBtu/h in capacity.

FDD systems can be standalone, such as those on-board many packaged systems, or they can be integrated into a building direct digital control (DDC) system.

16. Induction Exhaust Fan Control (Laboratory Spaces)

☐ Types of building impacted: Nonresidential

☐ Building system impacted: HVAC

☐ Anticipated type of change: Mandatory

☐ Description of change- This measure will establish a mandatory requirement regulating how induction exhaust fans are specified.

A wind speed measuring station will be required to control discharge velocity of induction exhaust fans as cross winds vary.

Additionally this measure will establish a prescriptive baseline fan power allowance for pollutant exhaust systems.

17. Loading Dock Seals (Warehouses)

- ☐ **Types of building impacted: Nonresidential**
- ☐ **Building system impacted: HVAC**
- ☐ **Anticipated type of change: TBD**
- ☐ **Description of change- This measure seeks to reduce heat loss and heat gain through loading dock doors and seals, by limiting heat transmission through the closed door (U-factor) and limiting infiltration through the seal.**

18. High Efficiency Fume Hoods (Laboratory Spaces)

- ☐ Types of building impacted: Nonresidential
- ☐ Building system impacted: HVAC
- ☐ Anticipated type of change: TBD
- ☐ Description of change- Automatic Fume Hood Sash Closure Systems:

This measure would propose a prescriptive requirement that automated sash closure systems be installed in new laboratory exhaust systems that meet certain design criteria.

Automatic sash closure systems would likely be required on larger fume hoods in facilities in which hood operating hours are typically high.

Automated sash closure systems would be equipped with automatic controls that detect the presence of laboratory technicians in front of the fume hood.

The system would likely used an infrared sensor for technician proximity sensing, and there would likely be a manually override option that would enable users to override the automatic controls.

When the technician moves away from the hood, the sash will automatically lower, thereby reducing the airflow through the sash to minimum airflow levels; energy consumption will be reduced accordingly.

To provide a margin of safety, a built-in 30 second delay will ensure that the technician has not simply turned away for a brief moment. Since the savings associated with this measure depend on the controls being installed and calibrated correctly, the CASE Team will consider whether this

measure should include an acceptance test to verify the system is operating correctly at the time of permitting.

Glove Boxes/Iris Ports in Lieu of Fume Hoods: In cases where a fume hood is specified to store or manipulate nonhazardous chemicals, it may be possible to utilize a glove box in lieu of a fume hood.

The proposed measure would provide compliance credit for utilizing a glove box, which are smaller and require less ventilation and exhaust than a fume hood in certain situations.

The proposed standard would not apply to all fume hoods.

During the CASE effort, the Team will identify the most appropriate uses.

Cost of Compliance

	Other Options					
	R-4 CI walls	16 SEER	93 afue furnace	QII	Refrig Chg	Tankless .95
Climate Zone	Compliance % Improvement*	Compliance % Improvement*	Compliance % Improvement*	Compliance % Improvement*	Compliance % Improvement*	Compliance % Improvement*
3-Oakland	7.6%	0.1%	11.5%	9.7%	0.0%	4.5%
4-Paso Robles	6.0%	1.4%	7.9%	9.1%	1.0%	3.3%
7-San Diego	4.3%	1.3%	4.5%	5.9%	0.7%	6.3%
8-Irvine	4.5%	5.0%	3.8%	8.9%	3.7%	4.2%
9-L.A.	4.9%	4.5%	3.3%	9.5%	4.3%	2.7%
10-Riverside	5.0%	4.3%	3.6%	9.8%	3.8%	2.6%
11-Red Bluff	5.7%	3.7%	4.4%	9.3%	4.1%	1.4%
12-Sacramento	6.1%	2.8%	6.5%	10.2%	3.1%	2.2%
13-Fresno	5.3%	3.9%	3.9%	8.8%	4.7%	1.4%
Average	5.5%	3.0%	5.5%	9.0%	2.8%	3.2%
Estimated Cost	~\$1,100	~\$500	~\$500	~\$750	~\$250	~\$350

Shifted from commercial ventilation standard to residential ventilation standard =>30% lower airflow Balanced ventilation required or blower door test verifying low leakage between units MERV 13 air filtration Wall U-factor .051 (R-19+R-5)

Commercial Lighting allowance reduced to LED wattages (was easy credit) Wall U-factors remain same

2019 code cycle starts 1/1/2020 This is the “net-zero” code cycle Solar panels prescriptive standard QII prescriptive standard

Wall U-factor changes (minor) Window U/SHGC changes

Battery storage credit Hospitals now covered by Nonres

Commented [kn1]:

e Battery

Adding 7.5 kWh battery replaces R-19+R-4 wall upgrade, cool roof tile, whole house fan, 16 SEER A/C upgrade, and 1 solar panel

Battery subs for efficiency measures AND PV

Cost of Compliance

Other Options R-4 CI

Water is in checklist 1

DIVISION 4.3 WATER EFFICIENCY AND CONSERVATION

4.303 INDOOR WATER USE

4.303.1 WATER CONSERVING PLUMBING FIXTURES AND FITTINGS. Plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall comply with the following:

4.303.1.1 Water Closets. The effective flush volume of all water closets shall not exceed 1.28 gallons per flush. Tank-type water closets shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Tank-type Toilets.

Note: The effective flush volume of dual flush toilets is defined as the composite, average flush volume of two reduced flushes and one full flush.

4.303.1.2 Urinals. The effective flush volume of wall mounted urinals shall not exceed 0.125 gallons per flush. The effective flush volume of all other urinals shall not exceed 0.5 gallons per flush.

4.303.1.3 Showerheads.

4.303.1.3.1 Single Showerhead. Showerheads shall have a maximum flow rate of not more than 2.0 gallons per minute at 80 psi. Showerheads shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Showerheads.

4.303.1.3.2 Multiple showerheads serving one shower. When a shower is served by more than one showerhead, the combined flow rate of all the showerheads and/or other shower outlets controlled by a single valve shall not exceed 2.0 gallons per minute at 80 psi, or the shower shall be designed to only allow one shower outlet to be in operation at a time.

Note: A hand-held shower shall be considered a showerhead.

4.303.1.4 Faucets

4.303.1.3 Showerheads.

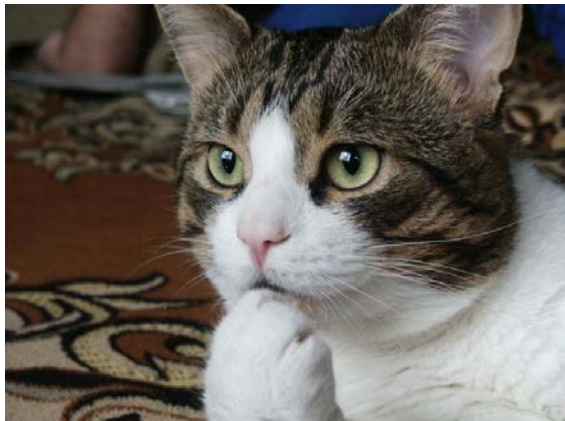
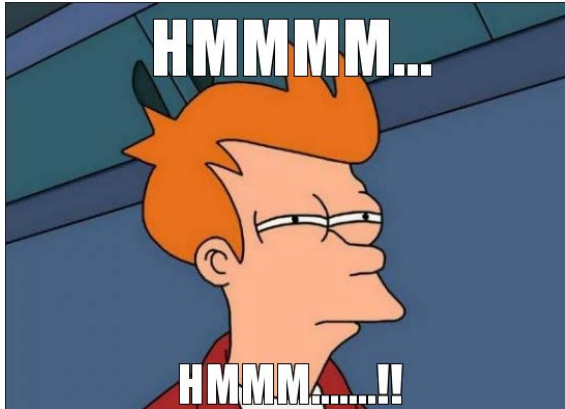
4.303.1.3.1 Single Showerhead. Showerheads shall have a maximum flow rate of not more than 2.0 gallons per minute at 80 psi. Showerheads shall be certified to the performance criteria of the U.S. EPA WaterSense Specification for Showerheads.

No more than 2 gpm at 80 psi?



hmmmmmm?





hmmmmmwew?

In a recent case, this issue became a legal case.

To begin with nearly most engineers did not knew

Key: U.S. WaterSense

Why should an Architect or Engineer Care?

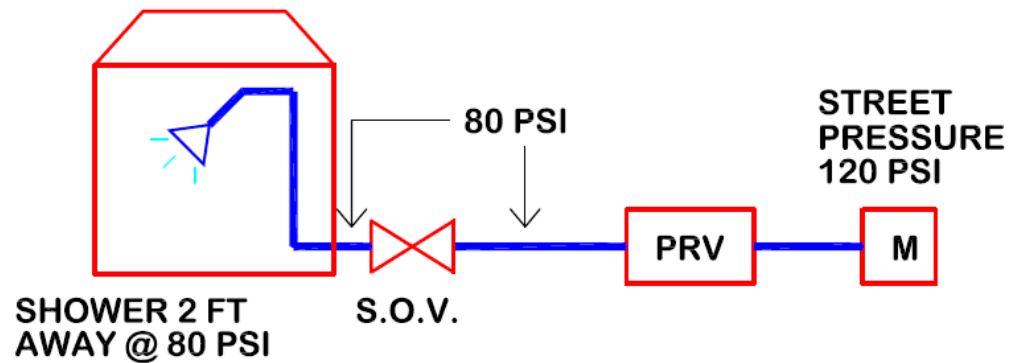
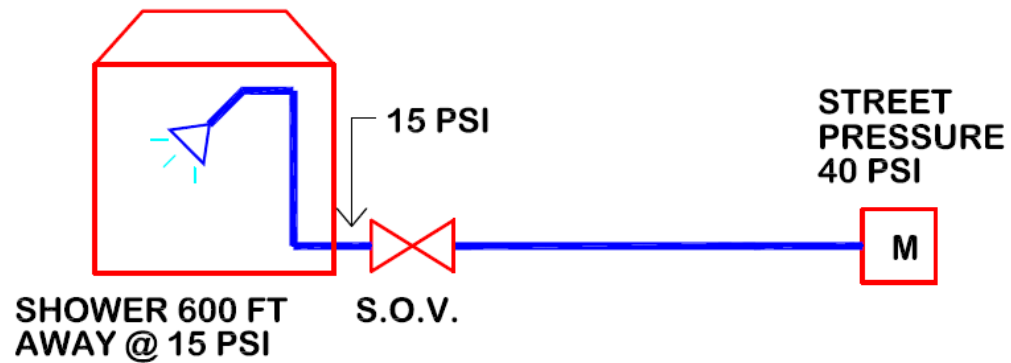
Simple: You Specify Therefore.. you are liable!

80 psi.....

Maximum plumbing fixture to
operate(Gaskets?)

15 psi

Minimum Pressure to operate
(with exceptions)



SAMPLE APPLICATION OF PRESSURE AND SHOWER HEAD

History:

EPA CFR 430 Subpart F, Appendix B

- Showering 17% of US in Residential
- 1,200,000,000,000, \$1.2t Gallons/yr
- WaterSense Shower standard 3/4/'10
- **No more than 2 gpm at 80 psi**

EPA CFR 430 Subpart F, Appendix B

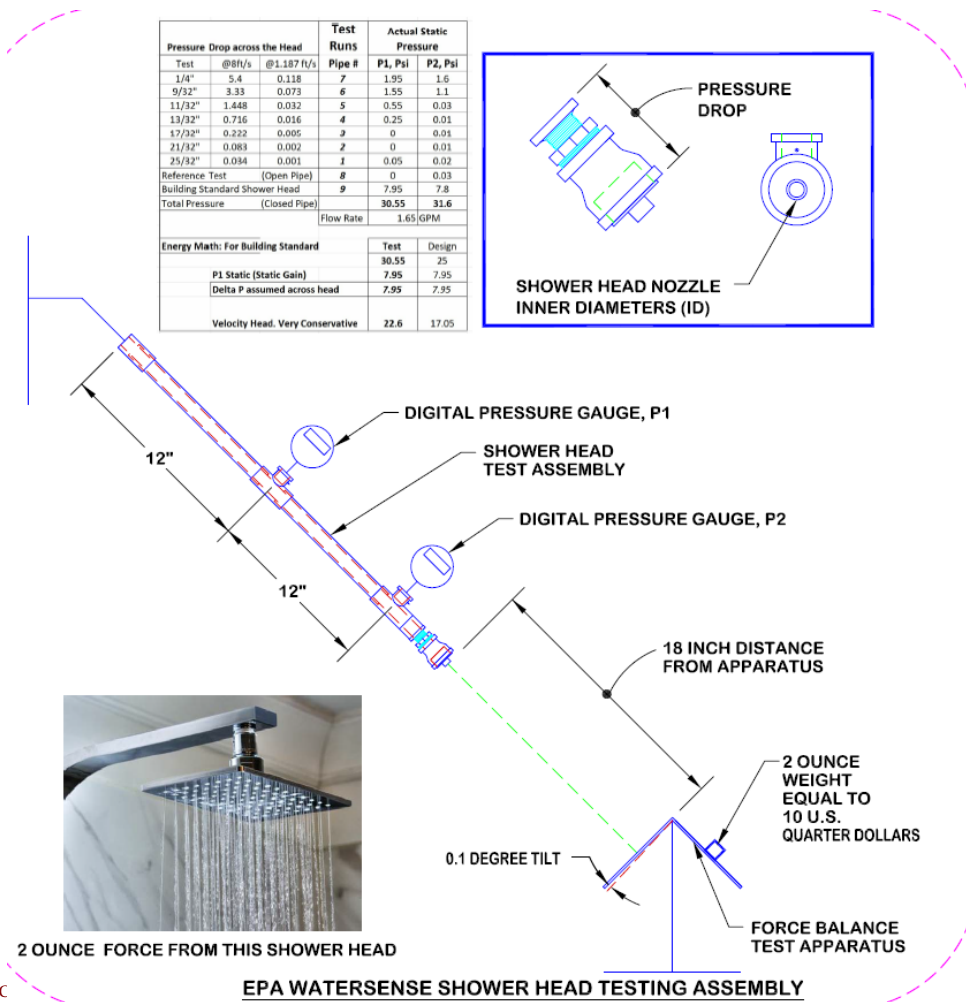
Table 1. Example Minimum Flow Rates

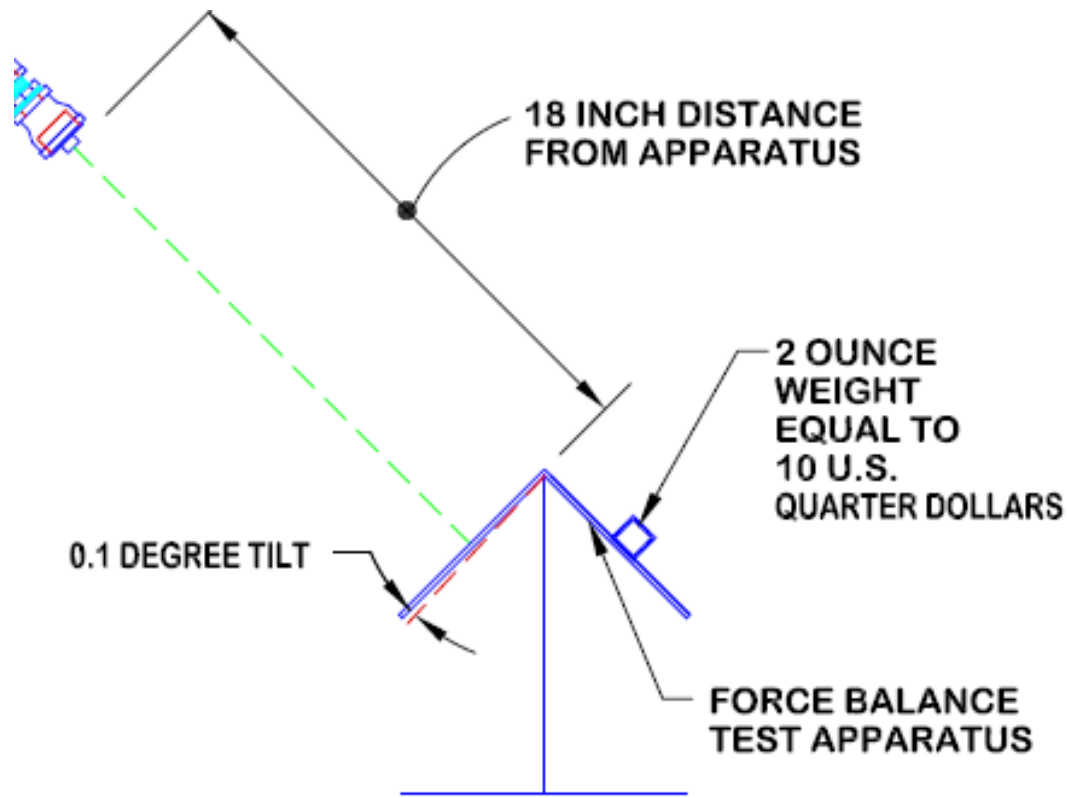
Showerhead Rated Flow Rate	Minimum Allowable Flow Rate		
	80 psi	45 psi	20 psi
2.0 gpm	1.5 gpm	1.5 gpm	1.2 gpm
1.75 gpm	1.3 gpm	1.3 gpm	1.1 gpm
1.5 gpm	1.1 gpm	1.1 gpm	0.9 gpm
1.0 gpm	0.8 gpm	0.8 gpm	0.6 gpm

How low is **0.6 gpm**?

Long hair, curly hair, ...

Q? How much **time**
do you spend in
understanding
shower heads based
on **Green Code?**





EPA ShowerHead Test Assembly

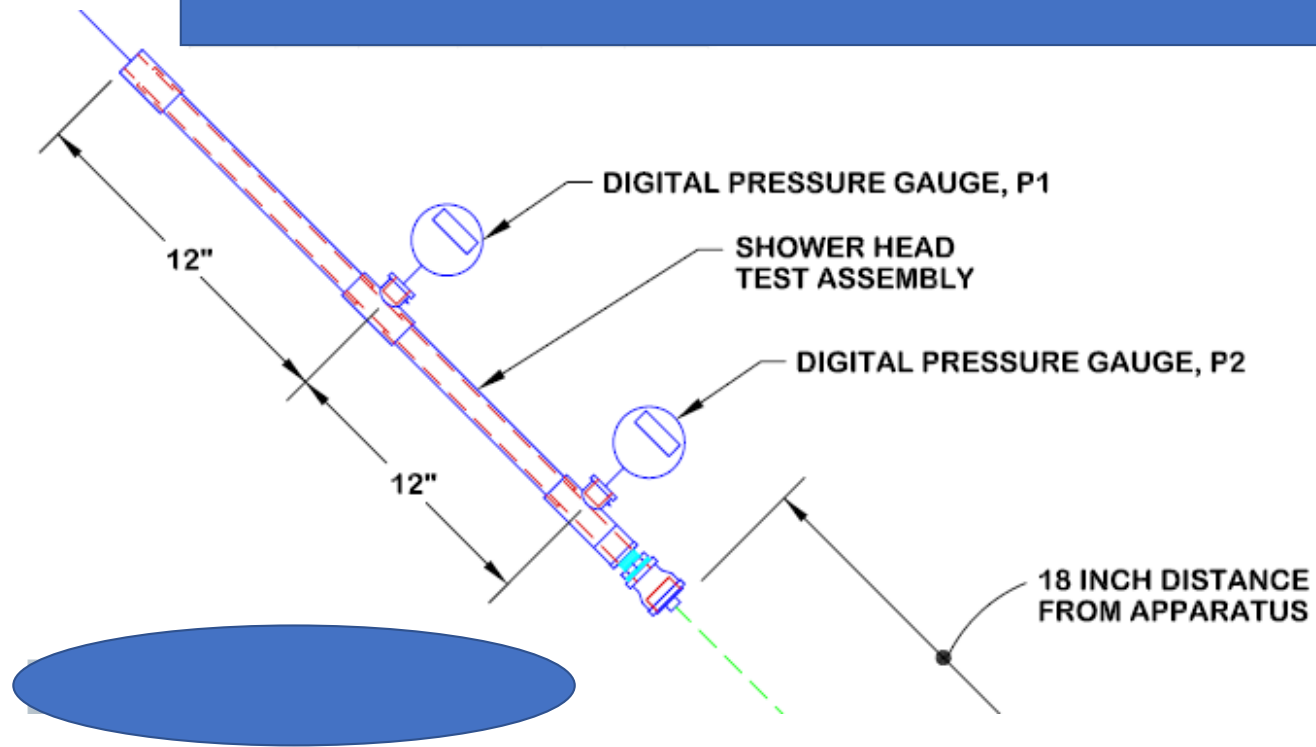


SHOWER HEAD FLOW TYPES





Shower Head Test Nozzles





2 OUNCE FORCE FROM THIS SHOWER HEAD

Other Consequences of Green Code/ Title-24?

Glazing

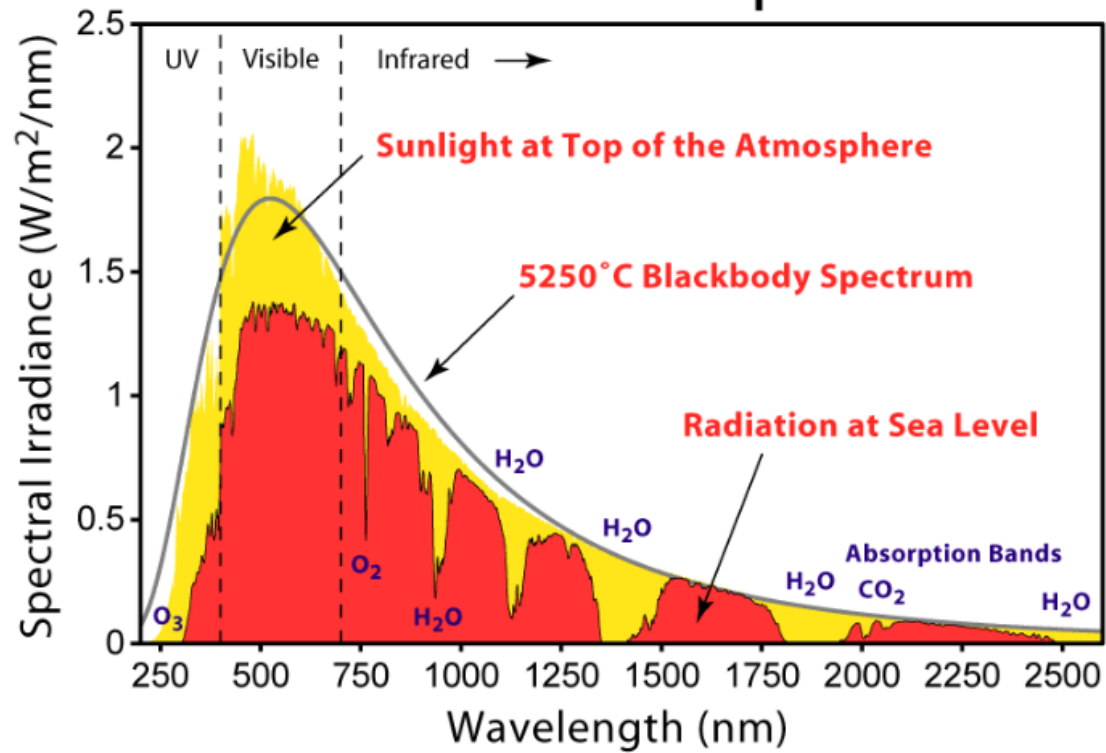
Sun passes glazing with 3 radiation

UV: 3% 300-380 nm changes colorings

Visible: 44% to 780 nm “visible”

Infrared: 53% from 780 nm “Heat”

Solar Radiation Spectrum

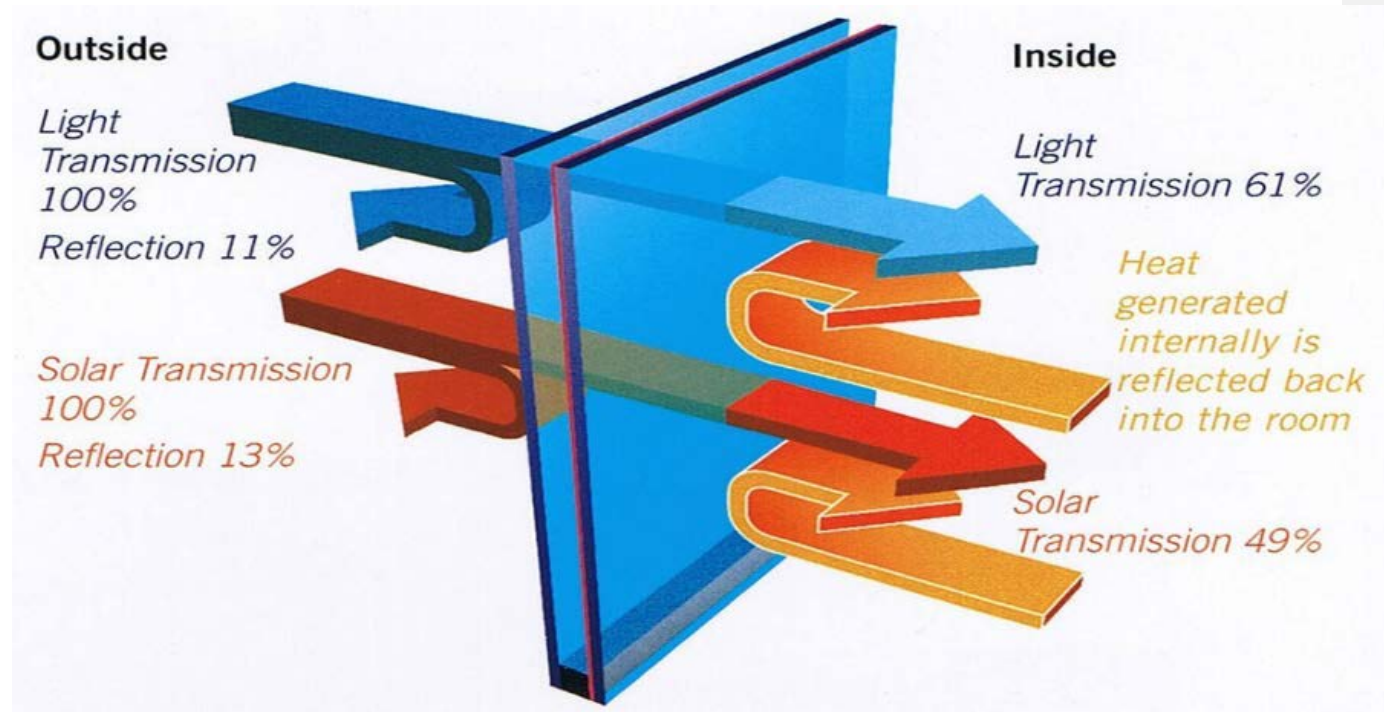


Emissivity

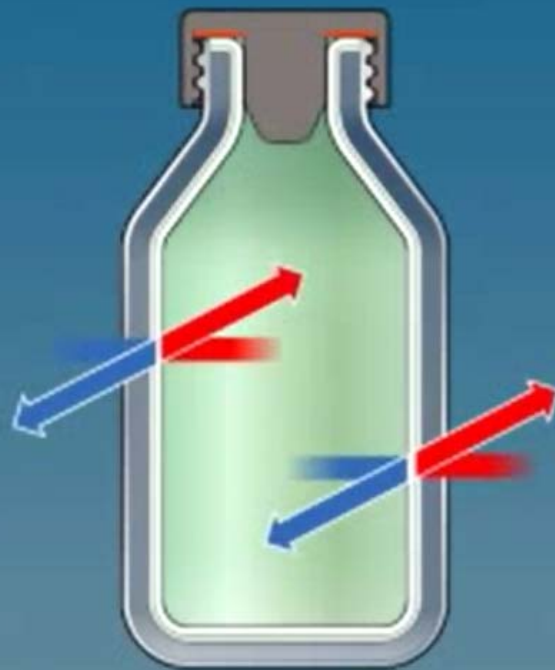
High reflective material: High Emissivity

Low Emissivity: Low E

Low-emissivity glass (or low-e glass as it is commonly referred to) is a type of energy-efficient glass designed to prevent heat escaping through your windows to the cold outdoors.



THERMOS PRINCIPLE COMPARISON



Two Types of Low E coating:

Solar Control Low E Coating: Solar Ban 70 Excel Glass

Passive Low E: Pyrolytic process. Very cold environment

Four potential surfaces.

- Never on the outside surface
- Generally, on the interior two surfaces between the air space

Low-E, ½" airspace, ¼" clear	U-Value	VLT	SHGC	LSG
Pyrolytic	0.33 – 0.37	54% – 74%	0.45 – 0.66	1.09 – 1.25
Double-Silver MSVD (High VLT/Low Reflectance)	0.29 – 0.29	53% – 70%	0.28 – 0.39	1.76 – 1.98
Triple-Silver MSVD (High VLT/Low Reflectance)	0.28 – 0.29	61%	0.27 – 0.30	2.17 – 2.37

3.5 Fenestration

Fenestration products such as windows, glazed doors, dynamic glazing, window films, and skylights have a significant impact on energy use and heating and cooling loads in a home. The size, orientation, and types of fenestration products can dramatically affect the overall energy performance of a house. Glazing type, orientation, shading and shading devices not only play a major role in the energy use of a building, but can affect the operation of the HVAC system and the

comfort of occupants. Fenestration Types 3.5.1 When choosing a window (new or replacement), it is always best to look for a National Fenestration Rating Council (NFRC) label on the window. The Energy Performance Ratings label is designed to help consumers identify the thermal resistance (U-factor) and solar heat gain (SHGC), which are factors that affect the energy performance of a window. This will help the consumer or designer compare the energy efficiency of window and glazed door products of different brands and manufacturers.

The following NFRC label provides information about the energy performance rating by listing identifiers such as:

- U factor,
- solar heat gain coefficient (SHGC),
- visible transmittance (VT), and
- air leakage (AL),

which helps provide accurate information for the consumer or designer:

A. U-factor measures the rate of heat loss through a product. The lower the U-factor, the lower the amount of heat loss. In cold climates where heating bills are a concern, choosing products with lower U-factors will reduce the amount of heat that escapes from inside the house.

B. The solar heat gain coefficient (SHGC) measures the percentage of radiant heat that passes through a fenestration product. The lower the SHGC, the lower the amount of solar heat gain through a window. In hot climates where air conditioning bills are a concern, choosing products with a lower SHGC will reduce the amount of heat that comes in from the outside.

C. Visible transmittance (VT) measures the percentage of light that comes through a fenestration product. The higher the VT rating, the more light is allowed through a window or glazed door. Skylights allow significantly more lighting and can be as efficient as vertical windows.

D. Air leakage (AL) is a measurement of heat loss and gain by infiltration through cracks in the window assembly, which can affect occupant comfort. The lower the AL, the lower the amount of air that will pass through cracks in the window assembly.

A. §10-111 (Administrative Standards) establishes the rules for rating and labeling fenestration products and establishes the **NFRC as the supervising authority.**

 National Fenestration Rating Council® CERTIFIED	World's Best Window Co. Millennium 2000+ Vinyl-Clad Wood Frame Double Glazing • Argon Fill • Low E Product Type: Vertical Slider
ENERGY PERFORMANCE RATINGS	
U-Factor (U.S./I-P) 0.30	Solar Heat Gain Coefficient 0.30
ADDITIONAL PERFORMANCE RATINGS	
Visible Transmittance 0.51	Air Leakage (U.S./I-P) 0.2
<p>Manufacturer stipulates that these ratings conform to applicable NFRC procedures for determining whole product performance. NFRC ratings are determined for a fixed set of environmental conditions and a specific product size. NFRC does not recommend any product and does not warrant the suitability of any product for any specific use. Consult manufacturer's literature for other product performance information.</p> <p>www.nfrc.org</p>	



Directory Search

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Detailed Product Ratings

GENERAL INFORMATION	
Manufacturer:	T.M. Cobb Millwork Division
Series Name:	Outswing Casement Window
Operator Type:	CSSV
Air Leakage:	≤ 0.3
Ventilation Rating (Standard Screen):	
Ventilation Rating (Enhanced Screen):	

Absoluteco.com

Greenerade.com

Endlesschool.com

3839 Birch Newport Beach, Ca 92660. 949 852 8700.

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AIA Orange County
2/24/2019

Detailed Product Ratings

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Series Name:	Outswing Casement Window
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Ventilation Rating (Standard Screen):	
Ventilation Rating (Enhanced Screen):	

RATINGS INFORMATION										(Found 148 Products)
Export to Excel										<< First < Previous Next > Last >>
CPD #	Manufacturer Product Code	U-factor	SHGC	VT	Condensation Resistance	Product Description				
TMC-N-9-00001-00001	"Douglas Fir: Gry / Air / SB70(3) - 11/16" (1/8"-1/8")"	0.33	0.19	0.27	52	Wood/Wood, Fill 1: AIR(100) , LowE, GY, No Grid				
TMC-N-9-00001-00002	"Douglas Fir: SB70 / Air / Clr - 11/16" (1/8"-1/8")"									
TMC-N-9-00002-00001	"Douglas Fir: Gry / Air / SB70(3) - 11/16" (1/8"-1/8")"									
TMC-N-9-00002-00002	"Douglas Fir: SB70 / Air / Clr - 11/16" (1/8"-1/8")"									
TMC-N-9-00003-00001	"Douglas Fir: Gry / Air / SB70(3) - 11/16" (1/8"-1/8")"									
TMC-N-9-00003-00002	"Douglas Fir: SB70 / Air / Clr - 11/16" (1/8"-1/8")"									
TMC-N-9-00004-00001	"Douglas Fir: Gry / Air / SB60(3) - 11/16" (1/8"-1/8")"									
TMC-N-9-00004-00002	"Douglas Fir: SB60 / Air / Clr - 11/16" (1/8"-1/8")"									
TMC-N-9-00005-00001	"Douglas Fir: Gry / Air / SB60(3) - 11/16" (1/8"-1/8")"	0.33	0.21	0.27	52	Wood/Wood, Fill 1: AIR(100) , LowE, GY, No Grid				
TMC-N-9-00005-00002	"Douglas Fir: SB60 / Air / Clr - 11/16" (1/8"-1/8")"	0.35	0.24	0.41	52	Wood/Wood, Fill 1: AIR(100) , LowE, CL, Grid				
TMC-N-9-00006-00001	"Douglas Fir: Gry / Air / SB60(3) - 11/16" (1/8"-1/8")"	0.40	0.19	0.24	46					
TMC-N-9-00006-00002	"Douglas Fir: SB60 / Air / Clr - 11/16" (1/8"-1/8")"	0.40	0.21	0.36	46					
TMC-N-9-00007-00001	"Douglas Fir: E366 / Air / Clr - 11/16" (1/8"-1/8")"	0.33	0.18	0.41	52	Wood/Wood, Fill 1: AIR(100) , LowE, CL, No Grid				
TMC-N-9-00008-00001	"Douglas Fir: E366 / Air / Clr - 11/16" (1/8"-1/8")"	0.35	0.17	0.36	52	Wood/Wood, Fill 1: AIR(100) , LowE, CL, Grid				

CPD #	U-factor	SHGC	VT	Condensation Resistance	Air Leakage	Ventilation Rating (Standard Screen)	Ventilation Rating (Enhanced Screen)	Close
TMC-N-9-00002-00001	0.35	0.17	0.24	52	≤ 0.3			

Group ID	Manufacturer Product Code	Frame/Sash Type	Glazing Layers	Low-E	Gap Widths	Spacer	Gap Fill	Grid	Divider	Tint
1	"Douglas Fir: Gry / Air / SB70(3) - 11/16" (1/8"-1/8")"	WD/WD	2	0.018(3)	0.438	A1-D	Fill 1: AIR(100)	S	0.75	GY

CPD #	U-factor	SHGC	VT	Condensation Resistance	Air Leakage	Ventilation Rating (Standard Screen)	Ventilation Rating (Enhanced Screen)	Close			
TMC-N-9-00002-00001	0.35	0.17	0.24	52	≤ 0.3						
Group ID	Manufacturer Product Code	Frame/Sash Type	Glazing Layers	Low-E	Gap Widths	Spacer	Gap Fill	Grid	Divider	Tint	
1	"Douglas Fir: Gry / Air / SB70(3) - 11/16"" (1/8""-1/8"")"	WD/WD	2	0.018(3)	0.438	A1-D	Fill 1: AIR(100)	S	0.75	GY	

RATINGS INFORMATION

Export to Excel

CPD #	Manufacturer Product Code	U-factor
TMC-N-9-00001-00001	"Douglas Fir: Gry / Air / SB70(3) - 11/16"" (1/8""-1/8"")"	0.3
TMC-N-9-00001-00002	"Douglas Fir: SB70 / Air / Clr - 11/16"" (1/8""-1/8"")"	0.3
TMC-N-9-00002-00001	"Douglas Fir: Gry / Air / SB70(3) - 11/16"" (1/8""-1/8"")"	0.3
TMC-N-9-00002-00002	"Douglas Fir: SB70 / Air / Clr - 11/16"" (1/8""-1/8"")"	0.3
TMC-N-9-00003-00001	"Douglas Fir: Gry / Air / SB70(3) - 11/16"" (1/8""-1/8"")"	0.4
TMC-N-9-00003-00002	"Douglas Fir: SB70 / Air / Clr - 11/16"" (1/8""-1/8"")"	0.4
TMC-N-9-00004-00001	"Douglas Fir: Gry / Air / SB60(3) - 11/16"" (1/8""-1/8"")"	0.3
TMC-N-9-00004-00002	"Douglas Fir: SB60 / Air / Clr - 11/16"" (1/8""-1/8"")"	0.3
TMC-N-9-00005-00001	"Douglas Fir: Gry / Air / SB60(3) - 11/16"" (1/8""-1/8"")"	0.3
TMC-N-9-00005-00002	"Douglas Fir: SB60 / Air / Clr - 11/16"" (1/8""-1/8"")"	0.3





LaCANTINA DOORS | TITLE 24 PRESCRIPTIVE PRODUCT OPTIONS

FOLDING DOOR OPTIONS

Type of Glass (1 lite)	Overall Glass Thickness	U-Factor	SHGC	VT
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ALUMINUM THERMALLY CONTROLLED

TRIPLE GLAZED (ARGON FILLED) *				
E366 - E180 - I89	1 1/4"	0.30	0.16	0.34
E366 - Clear - E366	1 1/4"	0.31	0.17	0.31

- *Maximum Panel Size: approx. 39" x 101"

ALUMINUM WOOD

TRIPLE GLAZED (ARGON FILLED) *				
E366 - E180 - I89	1 1/4"	0.31	0.15	0.32
E366 - Clear - E366	1 1/4"	0.32	0.16	0.29

- * Maximum Panel Size: approx. 39" x 101"

CLAD

ARGON FILLED WITH I89				
E272 - Argon - I89	3/4"	0.31	0.24	0.40
E270 - Argon - I89	3/4"	0.31	0.22	0.39
E240 - Argon - I89	3/4"	0.31	0.15	0.22
E366 - Argon - I89	3/4"	0.31	0.16	0.36

- Maximum Panel Size: approx. 39" x 120"

WOOD

ARGON FILLED WITH I89				
E272 - Argon - I89	3/4"	0.30	0.24	0.40
E270 - Argon - I89	3/4"	0.30	0.22	0.39
E240 - Argon - I89	3/4"	0.30	0.15	0.22
E366 - Argon - I89	3/4"	0.29	0.16	0.36

- Maximum Panel Size: approx. 39" x 120"

MULTI SLIDE DOOR OPTIONS

Type of Glass (1 lite)	Overall Glass Thickness	U-Factor	SHGC	VT
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ALUMINUM THERMALLY CONTROLLED

TRIPLE PANED (ARGON FILLED) *				
E366 - E180 - I89	1 1/16"	0.32	0.19	0.41

2. The permanent label must, at a minimum, identify the certifying organization and have an ID number or code to allow tracking back to the original information on file with the certifying organization, NFRC. The permanent label can also be inscribed on the spacer, etched on the glass, engraved on the frame, or otherwise located so as not to affect aesthetics.

No.	Size (w/h)	Type	Frame	Core	Glazing	Key Holes	U-Value	SGHC	Overhang				Left Fin				Right Fin				True North Azimuth	HPFC #	Notes
									Depth	Dist. Up	L. Extent	R. Extent	Depth	Top Up	Dist. Left	Bot. Up	Depth	Top Up	Dist. Right	Bot. Up			
001	4'-0" x 3'-6"	N	Alum	Alum	-		-	-															
002	4'-0" x 3'-6"	G	Alum	Alum	-		-	-															
003A	4'-0" x 6'-0"	N	Alum	Alum	-		-	-															
008B	25'-0" x 6'-0"	P	Alum	Alum	-		-	-															
009C	3'-0" x 6'-0"	N	Alum	Alum	-		-	-															
009D	3'-0" x 6'-0"	N	Alum	Alum	-		-	-															
008	3'-6" x 3'-6"	G	Alum	Alum	-		-	-															
100	6'-0" x 10'-0"	E	Alum	Gls	Dual/2		1.2	0.7													144	FLS-66-89-00020-00001	Freehood series 3400-1. Provide Freehood 1" mulion (thermal) between Door 100 & Window A21
101A	10'-11" x 10'-0"	G	Alum	Gls	Dual/2		0.82	0.31													54	FLS-66-79-00068-00001	Freehood series 3070. Mull to Window S1 with 2" Aluminum Tube. Match Depth to larger Freehood
101B	4'-0" x 6'-0"	C	Stone	SC	-		-	-															

No.	Size (wxh)	Type	Frame	Core	Glazing	Key Notes	U-Value	SGHC	Overhang		
									Depth	Dist. Up	L. Ext
001	4'-0" x 3'-6"	N	Alum	Alum	-		-	-			
002	4'-0" x 3'-6"	Q	Alum	Alum	-		-	-			
003A	4'-0" x 6'-0"	N	Alum	Alum	-		-	-			
003B	20'-0" x 6'-0"	P	Alum	Alum	-		-	-			
003C	3'-0" x 6'-0"	N	Alum	Alum	-		-	-			
003D	3'-0" x 6'-0"	N	Alum	Alum	-		-	-			
005	3'-8" x 3'-6"	Q	Alum	Alum	-		-	-			
100	6'-0" x 10'-0"	E	Alum	Gls	Dual/S		1.2	0.7			
101A	10'-11" x 10'-0"	G	Alum	Gls	Dual/S		0.52	0.31			

Overhang				Left Fin				Right Fin				True North Azimuth
Depth	Dist. Up	L. Extent	R. Extent	Depth	Top Up	Dist. Left	Bot. Up	Depth	Top Up	Dist. Right	Bot. Up	
												144
												54

Up	True North Azimuth	NFRC #	Notes
	144	FLE-M-89-00220-00001	Fleetwood series 3400-T. Provide Fleetwood 'i-mullion' (thermal) between Door 100 & Windows A2 & A3
	54	FLE-M-79-00068-00001	Fleetwood series 3070. Mull to Window B1 with 2" Aluminum Tube. Match Depth to larger Fleetwood jamb depth

E. §110.6(b) field-fabricated fenestration that do not have an NFRC rating shall use the Energy Commission default U-factors, SHGC, and optional VT values.

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Greenerade.com

*Endless*school.com

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AIA Orange County
2/24/2019



PART 2-

What Architects Need to Know for 2018 T24 and New Green Codes Possible Legal Cases

December 5 @ 6:00 am - 8:30 pm

"Dr. Saum K. Nour, Ph.D."

**PE Civil, PE Electrical, PE Mechanical, CPD, CFPE, LEED AP, AIA
LEED Administrator AT&T Building- Platinum**

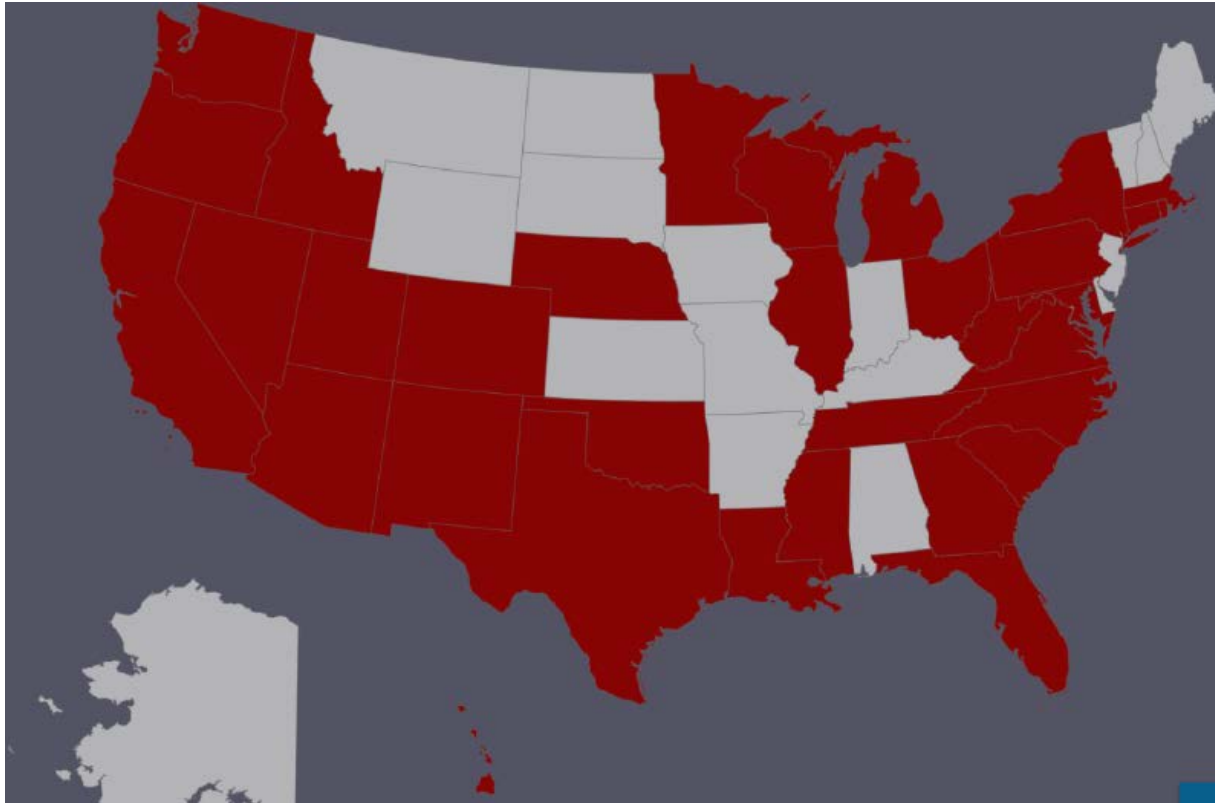
ASPE Fellow

snour@Absoluteco.com

+30 years old

3839 Birch, Newport Beach, Ca 92660. 949 852 8700. 949 852 1918 fax

Covering the Nation



STATE	LICENSE #
NCEES	22476
Arizona Mechanical	31808
Arizona Electrical	32191
California	M26221
Colorado	PE-32748
Connecticut	21298
Florida	63496
Georgia	PE029163
Hawaii	PE-11152
Idaho	P-11516
Illinois	062052335
Iowa	14734
Maryland	36200
Michigan	6201053815
Minnesota	43472
Missouri	2013013374

Nebraska	E-10985
Nevada	14475
New Jersey	
New Mexico	15623
New York	081715-1
North Carolina	32170
Ohio	E-61867
Oklahoma	119734
Oregon	60418PE
Pennsylvania	PE072571
South Carolina	23755
Texas	119734
Tennessee	111764
Utah	333030-2202
Virginia	... 0402041498
Washington	33677
Wisconsin	33870 - 006

Rhode Island

Louisiana

Part 2- Issues and Challenges of the Current Code

There are quite a number of challenges in the existing codes: glazing issues, minor architectural changes that will trigger major electrical work, lack of uniformity among plan checking, lack of training by installers, inspectors, and even architects. This session will review challenges with the current code including 2017 changes; and unravel headaches for the owners, architects, inspectors, and installers.

Part 1 is a precursor to Part 2 a review of the 2018 changes to the codes.

1. Identify current Green Code and Title-24 code issues
2. Review how 2017 changes impacted design
3. Identify the coordination issues with all other disciplines from the 2017 changes
4. Discuss what are the headaches, cost impacts, uniformity, and consistency in plan check and inspections due to the 2017 code changes



All ADA Approved.



No writing. No Wheels. No Mortar. No Metal. Stone Tools. Year 1400's. 2 Hectars. 50% work of foundation. 76" Annual Rain Fall. Seismic.



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Short Stories

Water Heater \$5k

Air Conditioning SEERx10⁵

U Values/SHGC

HERS Rating. Pressure Testing

Cool Roof....

Many More..

Time Value of Money

Who Pays for it ...

They Want to Move In.

I hired you to do your JOB!

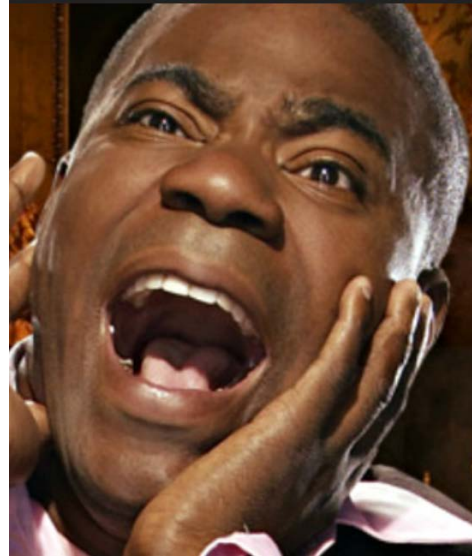
Am I to **Scare** you or **Teach** you?

Time is very short to teach you.

Need an entire Semester.

Time is an Unknown Property.

Therefore



Stay Safe Default Values

**In your drawings in Plain English
In “bold”: Speak to the builder
And Warn them.**



**Your Insurance Company will
Love you. To be BOLD.**

Stay Safe.

Or per

Nuclear Engineering:

Fail Safe

TABLE 110.6-A DEFAULT FENESTRATION PRODUCT U-FACTORS

FRAME	PRODUCT TYPE	SINGLE PANE ^{3,4} U-FACTOR	DOUBLE PANE ^{1,3,4} U-FACTOR	GLASS BLOCK ^{2,3} U-FACTOR
Metal	Operable	1.28	0.79	0.87
	Fixed	1.19	0.71	0.72
	Greenhouse/garden window	2.26	1.40	N.A.
	Doors	1.25	0.77	N.A.
	Skylight	1.98	1.30	N.A.
Metal, Thermal Break	Operable	N.A.	0.66	N.A.
	Fixed	N.A.	0.55	N.A.
	Greenhouse/garden window	N.A.	1.12	N.A.
	Doors	N.A.	0.59	N.A.
	Skylight	N.A.	1.11	N.A.
Nonmetal	Operable	0.99	0.58	0.60
	Fixed	1.04	0.55	0.57
	Doors	0.99	0.53	N.A.
	Greenhouse/garden windows	1.94	1.06	N.A.
	Skylight	1.47	0.84	N.A.
1. For all dual-glazed fenestration products, adjust the listed U-factors as follows: a. Add 0.05 for products with dividers between panes if spacer is less than 7/16 inch wide. b. Add 0.05 to any product with true divided lite (dividers through the panes). 2. Translucent or transparent panels shall use glass block values when not rated by NFRC 100. 3. Visible Transmittance (VT) shall be calculated by using Reference Nonresidential Appendix NA6. 4. Windows with window film applied that is not rated by NFRC 100 shall use the default values from this table.				

TABLE 110.6-B DEFAULT SOLAR HEAT GAIN COEFFICIENT (SHGC)


FRAME TYPE	PRODUCT	GLAZING	FENESTRATION PRODUCT SHGC		
			Single Pane ^{2,3} SHGC	Double Pane ^{2,3} SHGC	Glass Block ^{1,2} SHGC
Metal	Operable	Clear	0.80	0.70	0.70
	Fixed	Clear	0.83	0.73	0.73
	Operable	Tinted	0.67	0.59	N.A.
	Fixed	Tinted	0.68	0.60	N.A.
Metal, Thermal Break	Operable	Clear	N.A.	0.63	N.A.
	Fixed	Clear	N.A.	0.69	N.A.
	Operable	Tinted	N.A.	0.53	N.A.
	Fixed	Tinted	N.A.	0.57	N.A.
Nonmetal	Operable	Clear	0.74	0.65	0.70
	Fixed	Clear	0.76	0.67	0.67
	Operable	Tinted	0.60	0.53	N.A.
	Fixed	Tinted	0.63	0.55	N.A.
1 Translucent or transparent panels shall use glass block values when not rated by NFRC 200.					
2. Visible Transmittance (VT) shall be calculated by using Reference Nonresidential Appendix NA6.					
3. Windows with window film applied that is not rated by NFRC 200 shall use the default values from this table					

Custom Glass is out of business?

Maybe not?

Variance?!

Take these actions first....

T.M. COBB For 78 Years. Doors and Windows. Fully Engineered. Documentation.	 T.M. COBB	
Project Address:	Shadowlawn Residence 2833 Shadowlawn Ave, L.A. 90039	
Serial Number:	Shadowlawn9.04	
ENERGY PERFORMANCE RATINGS		
U factor (U.S./I-P)	Solar Heat Gain Coefficient	
0.33	0.24	
ADDITIONAL PERFORMANCE RATINGS		
Visible Transmittance	Air Leakage (U.S./I-P)	
0.72	0.2	
Manufacturer stipulates that these ratings comply with Manual J based on engineering practice and certified by licensed mechanical engineer of State of California. The window glazing (most critical to the calculation) has gone under rigorous laboratory testing with laboratory tested values for U-Factor and Solar Heat Gain Coefficient. The wood species value are from Manual J standards. All calculations are stamped by licensed engineer of State of California for only a specific window for a specific job address. www.tmcobb.com		

Manual J Calculations																			Solar B		60	or		Solar Ban 70									
Address: Shadowlawn Residence 2833 Shadowlawn Ave, L.A. 90039																																	
Item No.	Quantity	Dimension a	Dimension b	Area of One	Total	Wood trim	Wood area	Glass Type	Glazing Area	Wood %	Glazing %	Wood Thickness	U value	U Val Glass	Final U value	S.H.G.C.	Effective SH Coef	V.T.															
1.00	1	36	80	20.00	18.67	Bald	6.95	SB-60	13.05	0.3	0.65	1.75	0.371429	0.30	0.32	0.39	0.25	0.72															
2.00	2	30	80	16.67	90.00	Bald	6.41	SB-60	10.26	0.4	0.62	1.75	0.371429	0.30	0.33	0.39	0.24	0.72															
3.00	4	30.25	84	17.65	45.00	Bald	6.67	SB-60	10.98	0.4	0.62	1.75	0.371429	0.30	0.33	0.39	0.24	0.72															
4.00	2	32	90	20.00	5.25	Bald	7.15	SB-60	12.85	0.4	0.64	1.75	0.371429	0.30	0.33	0.39	0.25	0.72															
5.00	2	18	90	11.25	7.13	Bald	5.90	SB-60	5.35	0.5	0.48	1.75	0.371429	0.30	0.34	0.39	0.19	0.72															
6.00	2	32	90	20.00	7.13	Bald	7.15	SB-60	12.85	0.4	0.64	1.75	0.371429	0.30	0.33	0.39	0.25	0.72															
7.00	2	22.5	90	14.06	22.63	Bald	6.29	SB-60	7.77	0.4	0.55	1.75	0.371429	0.30	0.33	0.39	0.22	0.72															
8.00	4	30.25	80	16.81	28.59	Bald	6.44	SB-60	10.37	0.4	0.62	1.75	0.371429	0.30	0.33	0.39	0.24	0.72															
9.00	4	30.25	84	17.65	4.08	Bald	6.66	SB-60	10.99	0.4	0.62	1.75	0.371429	0.30	0.33	0.39	0.24	0.72															

Other Parameters?!

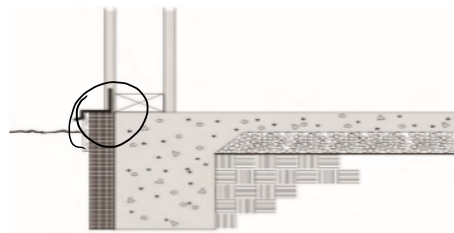
Shades

Table 3-3: Exterior Shades and Solar Heat Gain Coefficients

Exterior Shading Device	SHGC*
Standard Bug (insect) Screen (default for windows)	0.76
Exterior Sunscreens with Weave 53 x 16/inch	0.30
Louvered Sunscreens w/Louvers as wide as Window Openings	0.27
Low Sun Angle Louvered Sunscreen	0.13
Vertical Roller Shades or retractable/Drop Arm/ Combination/Marquisolette and Operable Awnings	0.13
Roll Down Blinds or Slats	0.13
None (for skylights only)	1.00
* Reference glass values assume single pane clear glass and metal framing 1/8 th inch double strength (DSS) glass. Use WS-3R Worksheet for calculation.	

Slab Edge Insulation

Figure 3-10: Perimeter Slab Insulation



Source: California Energy Commission

Table 3-4: Slab Insulation Requirements for Heated Slab Floors

Insulation Location	Insulation Orientation	Installation Requirements	Climate Zone	Insulation R-value
Outside edge of heated slab, either inside or outside the foundation wall	Vertical	From the level of the top of the slab, down 16 inches or to the frost line, whichever is greater. Insulation may stop at the top of the footing where this is less than the required depth. For below grade slabs, vertical insulation shall be extended from the top of the foundation wall to the bottom of the foundation (or the top of the footing) or to the frost line, whichever is greater.	1 – 15	5
			16	10
Between heated slab and outside foundation wall	Vertical and Horizontal	Vertical insulation from top of slab at inside edge of outside wall down to the top of the horizontal insulation. Horizontal insulation from the outside edge of the vertical insulation extending 4 feet toward the center of the slab in a direction normal to the outside of the building in plan view.	1 – 15	5
			16	10 vertical and 7 horizontal

Solar Panels

**2 kw minimum must be Solar Ready
Some Cities do and some do not....**

Do you want to risk?

**Owner asked you to design per Code!
Cities have no Liability.**





Absolute.co.com

Greenerade.com

Endless.school.com



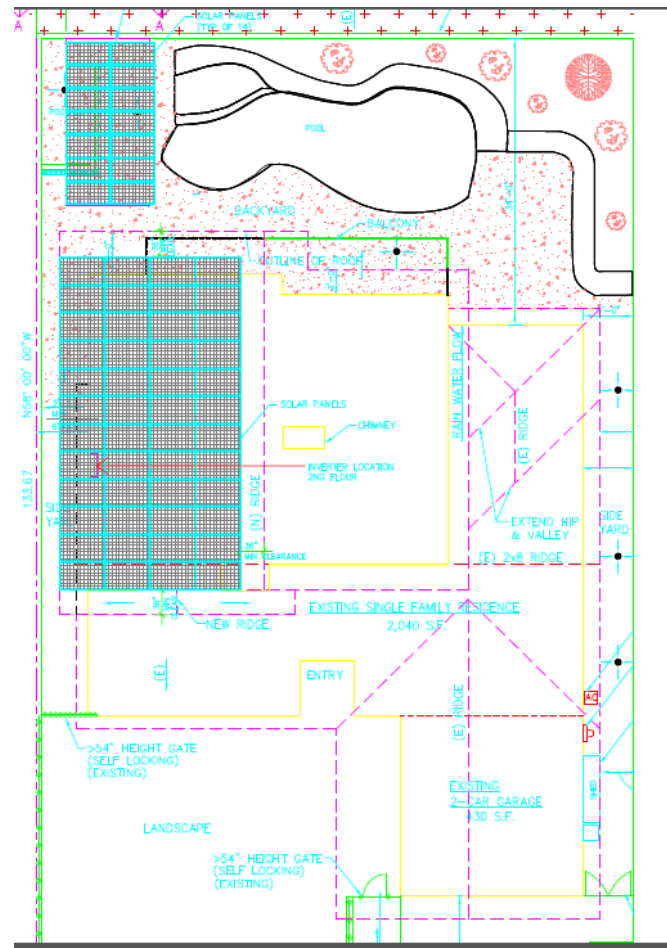
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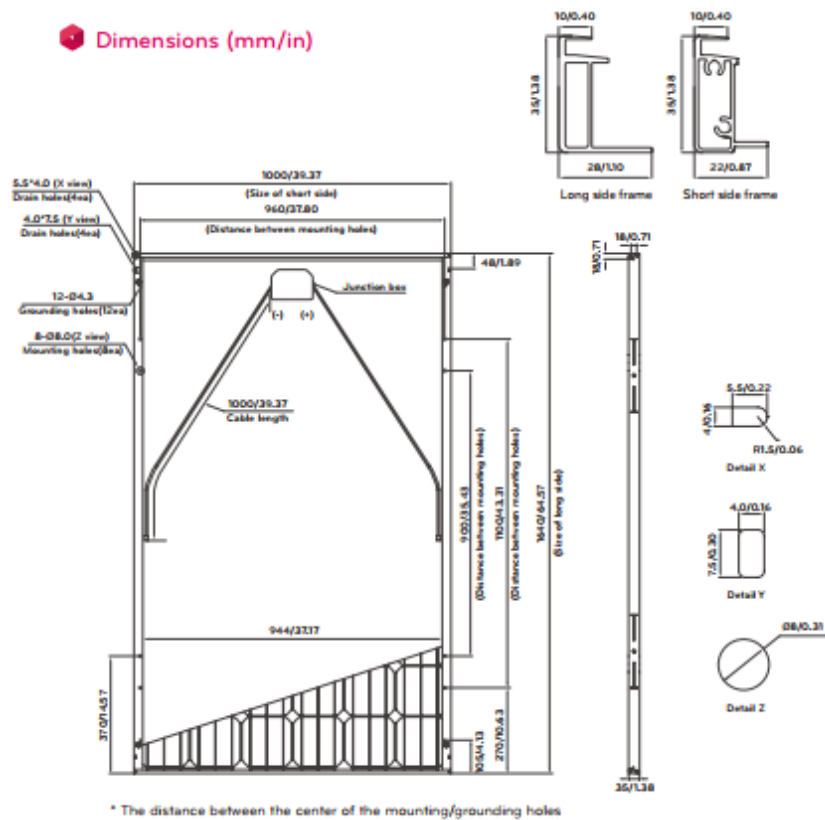
COMPLIANCE RESULTS	
01	Building Complies with Computer Performance
02	This building incorporates features that require field testing and/or verification by a certified HERS rater under the supervision of a CEC-approved HERS provider.
03	This building incorporates one or more Special Features shown below

This compliance analysis is valid only for permit applications through October 24, 2017

ENERGY USE SUMMARY				
04	05	06	07	08
Energy Use (kTODV/ft ² -yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	9.98	9.74	0.22	2.2%
Space Cooling	2.83	2.88	-0.23	-8.7%
IAQ Ventilation	0.82	0.82	0.00	0.0%
Water Heating	2.74	2.89	0.05	1.8%
Photovoltaic Offset	----	0.00	0.00	----
Compliance Energy Total	16.15	16.11	0.04	0.2%

PhotoVoltaic Beyond 2 kw

 Dimensions (mm/in)



* The distance between the center of the mounting/grounding holes

SOLAR PHOTOVOLTAIC

Assembly Bill (AB) 2188, which amends the California Solar Rights Act, requires that, on or before September 30, 2015, every city must adopt an ordinance that creates an expedited, streamlined permitting process for small residential rooftop solar energy systems. The purpose of the law is to further the State policy of promoting and encouraging the installation and use of solar energy systems by limiting obstacles to their use, and by minimizing the permitting costs of such systems.

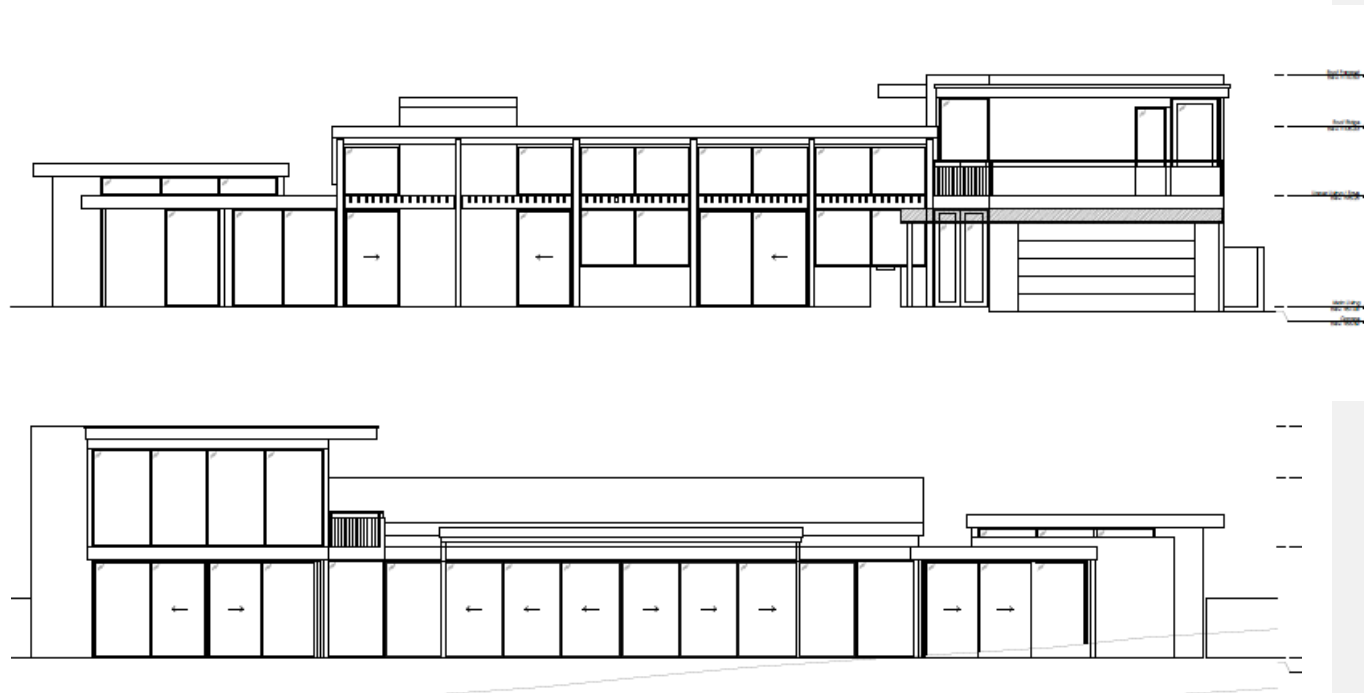
On July 28, 2015 the Newport Beach City Council adopted **Ordinance No 2015-23** amending Newport Beach Municipal Code Adding Chapter **15.18** regarding residential rooftop solar systems.

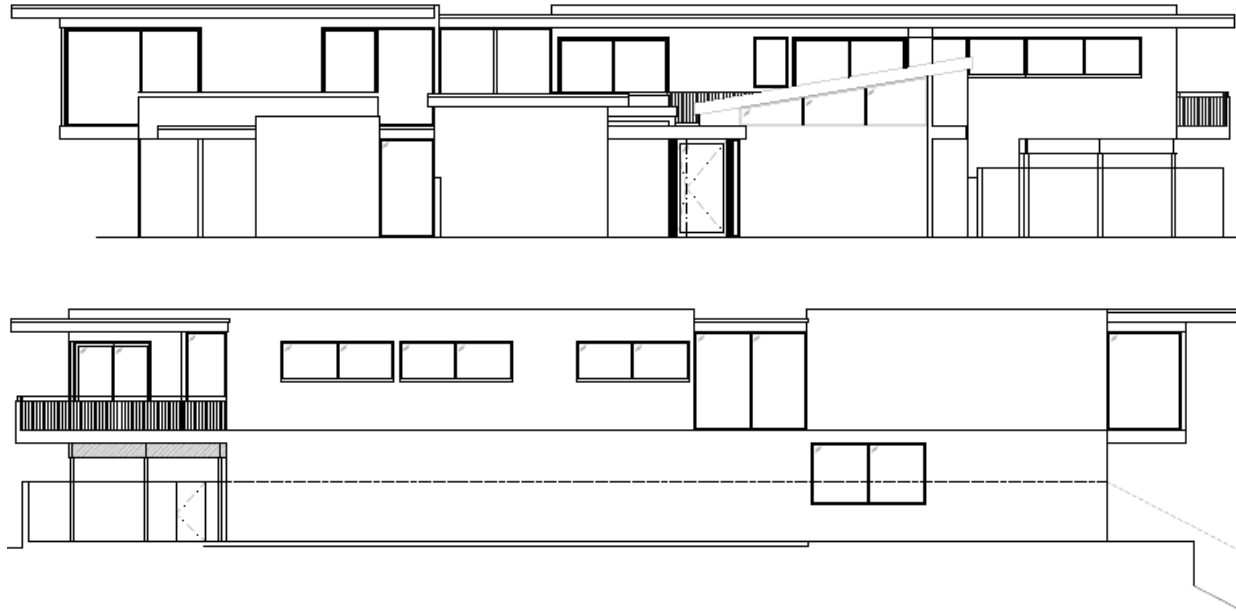
Below you will find all available documents to help you expedite the permitting of small residential rooftop solar systems:

- [Eligibility Checklist for Expedited Solar Photovoltaic Permitting for One- and Two-Family Dwellings](#)
- [Submittal Requirements Solar Photovoltaic Permitting for One- and Two-Family Dwellings](#)
- [Solar PV Standard Plan - Simplified: Central/String Inverter Systems for One- and Two-Family Dwellings](#)
- [Solar PV Standard Plan - Simplified: Micro Inverter and ACM Systems for One- and Two-Family Dwellings](#)
- [Structural Criteria for Residential Rooftop Solar Energy Installations](#)
- [Photovoltaic \(PV\) Systems Standard Inspection Checklist](#)
- [Solar Permit Application](#)
- [Solar Contractor Declaration](#)
- [Credit Card Authorization Form](#)

To apply for a [Solar Voltaic Permit](#) **click here**

Typical Example





Glass to Floor Ratio? 57.4%

GENERAL INFORMATION					
01	Project Name	Residence			
02	Calculation Description	Custom Home			
03	Project Location				
04	City		05	Standards Version	Compliance 2017
06	Zip Code	92663	07	Compliance Manager Version	BEMCmpMgr 2016.2.1 (885)
08	Climate Zone	CZ6	09	Software Version	CBEC-Res 2016.2.1 (888)
10	Building Type	Single Family	11	Front Orientation (deg/Cardinal)	135
12	Project Scope	Newly Constructed	13	Number of Dwelling Units	1
14	Total Cond. Floor Area (ft ²)	7294	15	Number of Zones	1
16	Slab Area (ft ²)	1000	17	Number of Stories	2
18	Addition Cond. Floor Area	n/a	19	Natural Gas Available	Yes
20	Addition Slab Area (ft ²)	n/a	21	Glazing Percentage (%)	57.4%

COMPLIANCE RESULTS	
01	Building Complies with Computer Performance
02	This building incorporates features that require field testing and/or verification by a certified HERS rater under the supervision of a CEC-approved HERS provider.
03	This building incorporates one or more Special Features shown below

This compliance analysis is valid only for permit applications through October 24, 2017

ENERGY USE SUMMARY				
04	05	06	07	08
Energy Use (kTOD/ft ² -yr)	Standard Design	Proposed Design	Compliance Margin	Percent Improvement
Space Heating	9.96	9.74	0.22	2.2%
Space Cooling	2.63	2.86	-0.23	-8.7%
IAQ Ventilation	0.82	0.82	0.00	0.0%
Water Heating	2.74	2.89	0.05	1.8%
Photovoltaic Offset	---	0.00	0.00	---
Compliance Energy Total	16.15	16.11	0.04	0.2%

Slab/Floor Electric Heat: Bathrooms generally

Plan Examiner Check List

CF1R Compliance Scope (Check all that apply and confirm required forms are included in permit application)			
Envelope	HVAC	Domestic Hot Water (DHW)	Solar Ready
<input type="checkbox"/> Performance	<input type="checkbox"/> Performance	<input type="checkbox"/> Performance	<input type="checkbox"/> Mandatory
<input type="checkbox"/> Prescriptive	<input type="checkbox"/> Prescriptive	<input type="checkbox"/> Prescriptive	<div>Lighting</div> <input type="checkbox"/> No forms for submittal Must be integrated into design
			<div>Form Key</div> <div>Mandatory requirements</div> <div>Prescriptive requirements</div> <div>Performance path</div> <div>Expand All Items</div> <div>Clear All</div>

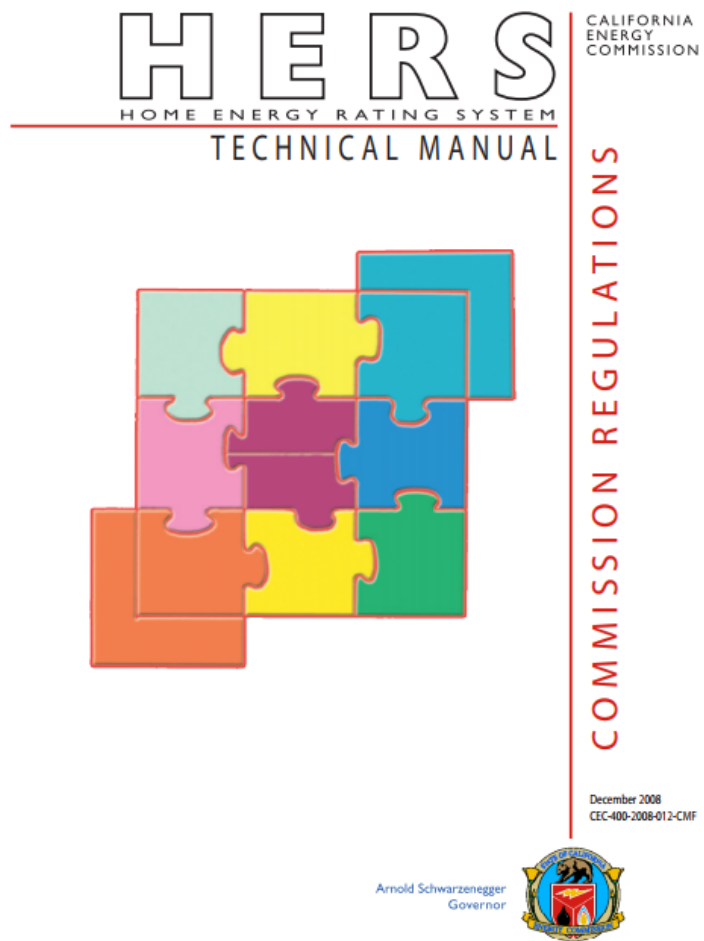
Certificate of Compliance (CF1R) General Information			YES	NO*
Are the following items confirmed on the plans? If "NO", items to be corrected per plan check comments				
G1. Has only one Certificate of Compliance (CF1R) been submitted as part of this permit FOR THE SAME FEATURE?		§10-103	<input type="checkbox"/>	<input type="checkbox"/>
G2. Do all pages of the CF1R have the same "Report Generated" date and time?	Performance method only		<input type="checkbox"/>	<input type="checkbox"/>
G3. Are all CF1R documents printed on the plans?		§10-103	<input type="checkbox"/>	<input type="checkbox"/>
G4. Are all CF1R documents signed and dated by the: Responsible building designers or owners? Documentation authors?	Electronic (HERS registered) or wet signature Electronic	§10-103	<input type="checkbox"/>	<input type="checkbox"/>
G5. If HERS verification required, has the CF1R been registered with a HERS provider?	If there are any HERS measures, registration required for ALL forms	§10-103	<input type="checkbox"/>	<input type="checkbox"/>
G6. Is the climate zone correct?	Based on zip code	§100.1(b)	<input type="checkbox"/>	<input type="checkbox"/>
G7. Is the site orientation correct?	Performance method: Azimuth (not plan north)		<input type="checkbox"/>	<input type="checkbox"/>
G8. Total conditioned floor area (ft ²)		§100.1(b)	<input type="checkbox"/>	<input type="checkbox"/>
G9. Number of bedrooms and number of dwelling units Bedrooms (per dwelling) Multifamily & hotel/motel units	Multifamily & hotel/motel	§100.1(b)	<input type="checkbox"/>	<input type="checkbox"/>
G10. Number of stories above grade	Not including mezzanine or lofts	§100(c)	<input type="checkbox"/>	<input type="checkbox"/>
G11. Is natural gas available on the site?	Yes / No		<input type="checkbox"/>	<input type="checkbox"/>

OVERALL REQUIREMENT					YES	NO
All compliance documents completed, signed and registered, if required (HERS verification triggers registration.)					<input type="checkbox"/>	<input type="checkbox"/>
CF1R (Certificate of Compliance - most current, if revised from plan review)					<input type="checkbox"/>	<input type="checkbox"/>
CF2R (Certificates of Installation)					<input type="checkbox"/>	<input type="checkbox"/>
CF3R (Certificates of Verification- HERS)					<input type="checkbox"/>	<input type="checkbox"/>
Define Fuel Type <input type="checkbox"/> natural gas <input type="checkbox"/> propane <input type="checkbox"/> electricity					<input type="checkbox"/>	<input type="checkbox"/>
A copy of the construction documents, or a comparable document confirming compliance, has been provided to the owner.					<input type="checkbox"/>	<input type="checkbox"/>
Does installed measure and/or HERS-verified data match CF1R and meet all mandatory requirements?						
Measure	Required Forms			Notes	YES	NO
	Form Name	CF2R	CF3R			
ADDITIONS & ALTERATIONS WITH NO HERS MEASURES						
Additions: All building features are in one report	ADD-02				<input type="checkbox"/>	<input type="checkbox"/>
Alterations: All building features are in one report	ALT-05				<input type="checkbox"/>	<input type="checkbox"/>
ENVELOPE						
Fenestration	ENV-01				<input type="checkbox"/>	<input type="checkbox"/>
Insulation	ENV-03				<input type="checkbox"/>	<input type="checkbox"/>
Roofing (cool roof, radiant barrier)	ENV-04				<input type="checkbox"/>	<input type="checkbox"/>
HERS Measures (if required)	ENV-20 & MCH-24				<input type="checkbox"/>	<input type="checkbox"/>
Envelope Air Leakage	ENV-21, 22, 23, 24				<input type="checkbox"/>	<input type="checkbox"/>
Quality Insulation Installation (QII)					<input type="checkbox"/>	<input type="checkbox"/>

HVAC						
Equipment	MCH-01				<input type="checkbox"/>	<input type="checkbox"/>
Whole House Fan (ventilation cooling)	MCH-02, MCH-30				<input type="checkbox"/>	<input type="checkbox"/>
Evaporative Coolers	MCH-04				<input type="checkbox"/>	<input type="checkbox"/>
HERS Measures						
Duct leakage	MCH-20				<input type="checkbox"/>	<input type="checkbox"/>
Duct location	MCH-21				<input type="checkbox"/>	<input type="checkbox"/>
Fan Efficacy	MCH-22				<input type="checkbox"/>	<input type="checkbox"/>
Airflow Rate	MCH-23				<input type="checkbox"/>	<input type="checkbox"/>
Refrigerant Charge	MCH-25				<input type="checkbox"/>	<input type="checkbox"/>
High SEER or EER	MCH-26				<input type="checkbox"/>	<input type="checkbox"/>
IAQ Ventilation	MCH-27				<input type="checkbox"/>	<input type="checkbox"/>
Return Duct and filter Grille	MCH-28				<input type="checkbox"/>	<input type="checkbox"/>
Buried Ducts	MCH-29				<input type="checkbox"/>	<input type="checkbox"/>
PLUMBING						
Distribution						
Non-HERS: Centralized system (multifamily)	PLB-01				<input type="checkbox"/>	<input type="checkbox"/>
Individual system	PLB-02				<input type="checkbox"/>	<input type="checkbox"/>
HERS: Centralized sytem (multifamily)	PLB-21				<input type="checkbox"/>	<input type="checkbox"/>
Individual system	PLB-22				<input type="checkbox"/>	<input type="checkbox"/>
Pools and Spas	PLB-03				<input type="checkbox"/>	<input type="checkbox"/>
Solar Hot Water	STH-01				<input type="checkbox"/>	<input type="checkbox"/>
ELECTRICAL						
PV Systems	SPV-01				<input type="checkbox"/>	<input type="checkbox"/>
Lighting: Single Family	LTG-01				<input type="checkbox"/>	<input type="checkbox"/>
Multifamily	LTG-02				<input type="checkbox"/>	<input type="checkbox"/>

HERS Rating

The Home Energy Rating System (HERS) Index is the industry standard by which a home's energy efficiency is measured. It's also the nationally recognized system for inspecting and calculating a home's energy performance.



4.2 Residential ACM Modeling Assumptions

For space conditioning (heating and cooling) and water heating energy, the modeling assumptions and procedures for the *HERS reference home* shall be the same as the *standard design home* as defined in the *2008 Residential ACM Approval Manual*, and the modeling assumptions and procedures for the *rated home* shall be the same as the *proposed design home* as defined in the *2008 Residential ACM Approval Manual*, except as stated in this section.

4.2.1 General Modeling Rules

ACM Section	Applicability
3.2.1 Weather Data	No changes from Residential ACM
3.2.2 Ground Reflectivity	No changes from Residential ACM
3.2.3 Building Physical Configuration	No changes from Residential ACM
3.2.4 Thermostats	No changes from Residential ACM
3.2.5 Internal Gains	Internal gains shall be determined based on the HERS lighting and appliances models described later in this chapter. See Section 4.7
3.2.6 Joint Appendix 4	No changes except that uninsulated walls and

- 4 pages of list

-
-

-
-
- **Duct Sealing**
 - **Supply Duct Location, Surface Area and R-Value**
 - **Low Leakage Ducts in Conditioned Space**
 - **Low Leakage Air Handlers**
 - **Verification of Return Duct Design**
 - **Verification of Air Filter Device Design**
 - **Verification of Bypass Duct Prohibition**

- . Refrigerant Charge in ducted Split System and ducted Packaged Unit Air Conditioners and Heat Pumps, and mini-split systems
- . Refrigerant Charge Indicator Display (CID)
- . Verified System Airflow
- . Air Handler Fan Efficacy
- . Verified Energy Efficiency Ratio (EER)

- . **Verified Seasonal Energy Efficiency Ratio (SEER)**
- . **Maximum Rated Total Cooling Capacity**
- . **Evaporatively Cooled Condensers**
- . **Ice Storage Air Conditioners**
- . **Continuous Whole-Building Mechanical Ventilation Airflow**
- . **Intermittent Whole-Building Mechanical Ventilation Airflow**
- . **Building Envelope Air Leakage**

- . **High Quality Insulation Installation (QII)**
- . **Quality Insulation Installation for Spray Polyurethane Foam**
- . **PV Field Verification Protocol**
- . **Verified Pipe Insulation Credit**
- . **Verified Parallel Piping**
- . **Verified Compact Hot Water Distribution System**
- . **Verified Point of Use**

- . Demand Recirculation: Manual Control
- . Demand Recirculation: Sensor Control
- . Multiple Recirculation Loop Design for DHW Systems Serving Multiple Dwelling Units

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Insulation Issues?

3839 Birch Newport Beach, Ca 92660. 949 852 8700.

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AIA Orange County

2/24/2019

What is an Opaque Envelope?

Opaque envelope assemblies are those that do not transmit solar radiation. The 2016 Building Energy Efficiency Standards (Energy Standards) include requirements for residential building envelope components, such as framing material, masonry or concrete, insulation, vapor retarders, and sheathing which make up opaque envelope assemblies for roof/ceilings, walls and floors.

Why? The envelope design drives the energy performance of a house and is a long-lasting feature because it is not often replaced like a furnace or water heater. Energy efficient envelopes reduce heating and cooling loads, which allow for smaller heaters and air conditioners. They also impact comfort of the occupants.

Relevant Code Sections

2016 California Building Energy Efficiency Standards, Title 24, Part 6:

- Section 110.6 – Mandatory Requirements for Fenestration Products and Exterior Doors
- Section 110.7 – Mandatory Requirements to Limit Air Leakage
- Section 110.8 – Mandatory Requirements for Insulation, Roofing Products, and Radiant Barriers
- Section 150.0 – Mandatory Features and Devices
 - 150.0(a-f) – Insulation
 - 150.0(g) – Vapor Retarder
 - 150.0(q) – Fenestration Products
- Section 150.1 – Performance and Prescriptive Compliance Approaches for Low-Rise Residential Buildings
- Section 150.2 – Energy Efficiency Standards for Additions and Alterations
- Residential Compliance Manual Section 3.6 – Envelope Features
- Joint Appendix JA4 – U-factor, C-factor, and Thermal Mass Data

Relevant Compliance Forms

- CF1R-ADD-01-E: Prescriptive Additions Compliance Form
- CF1R-ADD-02-E: Prescriptive Additions Non HERS Compliance Form
- CF1R-ALT-01-E: Prescriptive Alterations Compliance Form
- CF1R-ALT-05-E: Prescriptive Alterations Non HERS Compliance Form
- CF1R-ENV-02-E: Area Weighted Average Work Sheet
- CF1R-NCB-01-E: Prescriptive Newly Constructed Building Compliance Form
- CF2R-ADD-02-E: Prescriptive Additions Non HERS Installation Compliance Form
- CF2R-ALT-05-E: Prescriptive Alterations Non HERS Installation Compliance Form
- CF2R-ENV-03: Insulation Installation Compliance Form
- CF2R-ENV-20 (Tables a - e): Air Leakage Tests
- CF3R-ENV-20 (Tables a - e): Air Leakage HERS Verification
- CF3R-ENV (21 - 24): HERS QII Verification
- CF3R-EXC-20-H: HERS Verification of Existing Conditions for Alterations

Wall

Reichel - Two Story New Residence ? X

Construction Data

Currently Active Construction: **R19 R5 Stucco Wall**

Construction Name: **R19 R5 Stucco Wall**

Can Assign To: **Exterior Walls**

Construction Type: **Wood Framed Wall**

Construction Layers (inside to outside)

	Cavity Path	Frame Path
Inside Finish:	Gypsum Board	Gypsum Board
Sheathing / Insulation:	R5 Sheathing	R5 Sheathing
Cavity / Frame:	R 19	2x6 @ 16 in. O.C.
Sheathing / Insulation:	R1 Sheathing	R1 Sheathing
Exterior Finish:	R4 Synthetic Stucco	R4 Synthetic Stucco

☐ Non-Standard Spray Foam in Cavity

Winter Design U-value: **0.040** Btu/h-ft²-°F (meets max code 0.065 U-value (0.040))

Roof

Construction Data

Currently Active Construction: **Tile Roof**

Construction Name: **Tile Roof**

Can Assign To: **Attic Roofs**

Construction Type: **Wood Framed Ceiling** Roofing Type: **Steep Slope Roof tile, metal tile, c**

Construction Layers (topmost to bottom)

	Cavity Path	Frame Path
Roofing:	10 PSF (RoofTile)	10 PSF (RoofTile)
Above Deck Insulation:	R6 Sheathing	R6 Sheathing
Roof Deck:	Wood Siding/sheathing/decking	Wood Siding/sheathing/decking
Cavity / Frame:	R 30	2x4 @ 24 in. O.C.
Inside Finish:	Gypsum Board	Gypsum Board

☒ Non-Standard Spray Foam in Cavity

☒ Radiant Barrier Exposed on the Inside

Winter Design U-value: **0.030** Btu/h-ft²-°F

Floor

Construction Data

Currently Active Construction: **Ext R19 Floor**

Construction Name: **Ext R19 Floor**

Can Assign To: **Exterior Floors**

Construction Type: **Wood Framed Floor**

Construction Layers (topmost to bottom)

	Cavity Path	Frame Path
Floor Surface:	Carpeted	Carpeted
Concrete Fill:	Concrete fill	Concrete fill
Floor Deck:	Wood Siding/sheathing/decking	Wood Siding/sheathing/decking
Cavity / Frame:	R 19	2x6 @ 16 in. O.C.
Sheathing / Insulation:	- no sheathing/insul. -	- no sheathing/insul. -
Exterior Finish:	3 Coat Stucco	3 Coat Stucco

☐ Non-Standard Spray Foam in Cavity

Winter Design U-value: **0.049** Btu/h-ft²-°F

Sound

AHR 285

City of Newport Beach Example:

Mechanical Equipment Noise Various Heating Ventilating and Air Conditioning (HVAC) installations and occasional pool and spa pumps can be noise intrusions. Noise intrusions from HVAC equipment has been a problem in the past, especially in areas such as Balboa Island, Lido Island, and the Peninsula where the homes are very close together, and in commercial areas as well when abutting residential areas. However, the City's Municipal Code now requires a permit before installation of new HVAC equipment. Permits are only granted when a sound rating of the proposed equipment does not exceed standards, or is installed with a timing device that will deactivate the equipment during the

hours of 10:00 P.M. to 7:00 A.M. if the standards are exceeded. Just because HVAC equipment sound ratings are reviewed during plan check, as well as tested in the field after installation, it can still be problematic over time. As equipment ages and sometimes suffers from lack of maintenance, noise from the equipment can increase. Because of this, the City still deals with HVAC equipment noise on a complaint basis, in order insure ongoing compliance with the standards of the Code.

Table N2 Land Use Noise Compatibility Matrix		Community Noise Equivalent Level (CNEL)							
Land Use Categories									
Categories	Uses	<55	55-60	60-65	65-70	70-75	75-80	>80	
Residential	Single Family, Two Family, Multiple Family	A	A	B	C	C	D	D	
Residential	Mixed Use	A	A	A	C	C	C	D	
Residential	Mobile Home	A	A	B	C	C	D	D	
Commercial Regional, District	Hotel, Motel, Transient Lodging	A	A	B	B	C	C	D	
Commercial Regional, Village District, Special	Commercial Retail, Bank, Restaurant, Movie Theatre	A	A	A	A	B	B	C	
Commercial Industrial Institutional	Office Building, Research and Development, Professional Offices, City Office Building	A	A	A	B	B	C	D	
Commercial Recreational Institutional Civic Center	Amphitheatre, Concert Hall Auditorium, Meeting Hall	B	B	C	C	D	D	D	
Commercial Recreation	Children's Amusement Park, Miniature Golf Course, Go-cart Track, Equestrian Center, Sports Club	A	A	A	B	B	D	D	
Commercial General, Special Industrial, Institutional	Automobile Service Station, Auto Dealership, Manufacturing, Warehousing, Wholesale, Utilities	A	A	A	A	B	B	B	
Institutional	Hospital, Church, Library, Schools' Classroom	A	A	B	C	C	D	D	
Open Space	Parks	A	A	A	B	C	D	D	
Open Space	Golf Course, Cemeteries, Nature Centers Wildlife Reserves, Wildlife Habitat	A	A	A	A	B	C	C	
Agriculture	Agriculture	A	A	A	A	A	A	A	

SOURCE: Newport Beach, 2006

Zone A: Clearly Compatible—Specified land use is satisfactory, based upon the assumption that any buildings involved are of normal conventional construction without any special noise insulation requirements.

Zone B: Normally Compatible**—New construction or development should be undertaken only after detailed analysis of the noise reduction requirements and are made and needed noise insulation features in the design are determined. Conventional construction, with closed windows and fresh air supply systems or air conditioning, will normally suffice.

Zone C: Normally Incompatible—New construction or development should generally be discouraged. If new construction or development does proceed, a detailed analysis of noise reduction requirements must be made and needed noise insulation features included in the design.

Zone D: Clearly Incompatible—New construction or development should generally not be undertaken.

DAVID EGAN

Table N3 Noise Standards					
Land Use Categories		Allowable Noise Levels (dBA)			
Categories	Uses	Interior ^{a,b}		Exterior ^{a,b}	
		Interior Noise Level (Leq) 7am to 10pm	Interior Noise Level (Leq) 10 pm to 7 am	Exterior Noise Level (Leq) 7am to 10pm	Exterior Noise Level (Leq) 10 pm to 7 am
Residential	Single Family, Two Family, Multiple Family (Zone I)	45	40	55	50
	Residential Portions of Mixed Use Developments (Zone III)	45	40	60	50
Commercial Industrial	Commercial (Zone II)	N/A	N/A	65	60
	Industrial or Manufacturing (Zone IV)	N/A	N/A	70	70
Institutional	Schools, Day Care Centers, Churches, Libraries, Museums, Health Care Institutions (Zone I)	45	40	55	50

SOURCE: EIP Associates, 2006

^a If the ambient noise level exceeds the resulting standard, the ambient shall be the standard.

^b It shall be unlawful for any person at any location within the incorporated area of the City to create any noise or to allow the creation of any noise on property owned, leased, occupied or otherwise controlled by such a person which causes the noise level when measured on any other property, to exceed either of the following:

- The noise standard for the applicable zone for any fifteen-minute period;
- A maximum instantaneous noise level equal to the value of the noise standard plus twenty dBA for any period of time (measured using A-weighted slow response).
- In the event the ambient noise level exceeds the noise standard, the noise standard applicable to said category shall be increased to reflect the maximum ambient noise level.
- The noise standard for the residential portions of the residential property falling within one hundred feet of a commercial property, if the intruding noise originates from that commercial property.
- If the measurement location is on a boundary between two different noise zones, the lower noise level standard applicable to the noise zone shall apply.

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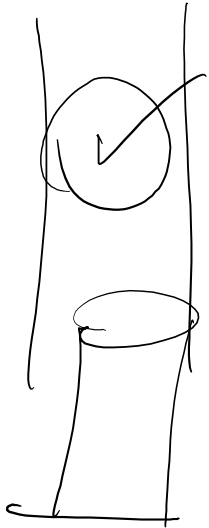
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2/24/2019



Heat Pump vs VFR vs FAU

Battle of Heating/Cooling 2018

Book type units vs Cylinder

Placing units on Right-A-Way... Easements

heat pump

SEER = 20



Commercial... All Similar issues.

Windows

Lighting...

Controls... Very Sophisticated for unsophisticated... CLLTG

HVAC

Insulations

Are you liable for lack of heating or cooling?

What is Comfort?

Smell/Odor

Rain/Humidity/Sprinklers

Rodent

2008 Non-residential Certificate of Acceptance



Certificate of Acceptance – Envelope (ENV)

[Fenestration Acceptance \(ENV-2A\)](#) — 2 pages



Certificate of Acceptance – Mechanical (MECH)

[Ventilation Systems – Variable Air and Constant Volume Systems \(MECH-2A\)](#) — 3 pages

[Constant-Volume, Single-Zone, Unitary A/C and Heat Pumps \(MECH-3A\)](#) — 3 pages

[Air Distribution Systems \(MECH-4A\)](#) — 3 pages

[Air Economizer Controls \(MECH-5A\)](#) — 3 pages

[Demand Control Ventilation \(DVC\) \(MECH-6A\)](#) — 3 pages

[Supply Fan Variable Flow Controls \(VFC\) \(MECH-7A\)](#) — 2 pages

[Valve Leakage Test \(MECH-8A\)](#) — 2 pages

[Supply Water Temperature Reset \(MECH-9A\)](#) — 2 pages

[Hydronic System Variable Flow Control \(MECH-10A\)](#) — 3 pages

[Automatic Demand Shed Control Acceptance \(MECH-11A\)](#) — 2 pages

[Fault Detection and Diagnostics for DX Units \(MECH-12A\)](#) — 3 pages

[Fault Detection and Diagnostics for Air Handling and Zone Terminal Units \(MECH-13A\)](#) — 3 pages

[Distributed Energy Storage DX AC Systems Test \(MECH-14A\)](#) — 3 pages

[Thermal Energy Storage \(TES\) Systems \(MECH-15A\)](#) — 3 pages



Certificate of Acceptance – Lighting (LTG)

[Lighting Controls and Automatic Daylighting \(LTG-2A\)](#) — 3 pages

[Automatic Daylighting Control Acceptance Document \(LTG-3A\)](#) — 10 pages



Certificate of Acceptance – Outdoor Lighting (OLTG)

[Outdoor Motion Sensor and Lighting Shut-off Controls \(OLTG-2A\)](#) — 3 pages

2016

Table 13-1: Acceptance Documents

Component	Document Name	Energy Standards Reference	Reference Nonresidential Appendix NA7
Envelope	NRCA-ENV-02-F – Fenestration Acceptance	§10-103(a)4 & §10-111 & §110.6	NA7.4.1
Mechanical	NRCA-MCH-02-A – Outdoor Air Acceptance	§10-103(b)4 & §120.1(b)2 & §120.5(a)1	NA7.5.1.1 NA7.5.1.2
	NRCA-MCH-03-A – Constant Volume, Single Zone, Unitary Air Conditioner and Heat Pump Systems	§120.1(c)2 & §120.2 & §120.5(a)2	NA7.5.2
	NRCA-MCH-04-A – Air Distribution Systems Acceptance	§120.5(a)3 & §140.4(l)	NA7.5.3
	NRCA-MCH-05-A – Air Economizer Controls Acceptance	§120.5(a)4 & §140.4(e)	NA7.5.4
	NRCA-MCH-06-A – Demand Control Ventilation Systems Acceptance	§120.1(c)4 & §120.5(a)5	NA7.5.5
	NRCA-MCH-07-A – Supply Fan VFD Acceptance	§120.5(a)6 & §140.4(c)2B & §140.4(c)2C	NA7.5.6
	NRCA-MCH-08-A – Valve Leakage Test	§120.5(a)8, §140.4(k)1 & §140.4(k)5, §140.4(k)6	NA7.5.7
	NRCA-MCH-09-A – Supply Water Temperature Reset Controls Acceptance	§120.5(a)9 & §140.4(k)4	NA7.5.8
	NRCA-MCH-10-A – Hydronic System Variable Flow Control Acceptance	§120.5(a)7, §140.4(k)1, §140.4(k)5, §140.4(k)6	NA7.5.9
	NRCA-MCH-11-A – Automatic Demand Shed Control Acceptance	§120.2(h), §120.5(a)10	NA7.5.10
	NRCA-MCH-12-A – Fault Detection & Diagnostics (FDD) for Packaged Direct Expansion Units	§120.2(i), §120.5(a)11	NA7.5.11
	NRCA-MCH-13-A – Automatic Fault Detection & Diagnostics (FDD) for Air Handling Units & Zone Terminal Units Acceptance	§120.5(a)12	NA7.5.12

Acceptance Test Requirements - Overview

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Mechanical	NRCA-MCH-14-A – Distributed Energy Storage DX AC Systems Acceptance	§120.5(a)13	NA7.5.13
	NRCA-MCH-15-A – Thermal Energy Storage (TES) System Acceptance	§120.5(a)14	NA7.5.14
	NRCA-MCH-16-A – Supply Air Temperature Reset Controls Acceptance	§140.4(f), 120.5(a)15	NA7.5.15
	NRCA-MCH-17-A – Condenser Water Supply Temperature Reset Controls Acceptance	Not required per Energy Standards. However, this test is required if this control strategy is implemented.	NA7.5.16
	NRCA-MCH-18-A – Energy Management Control System Acceptance	§110.2(e), §120.2(h), §120.5(a)17, §130.4(b), §130.5(f), §150.0(k)	-----
Indoor Lighting	NRCA-LTI-02-A Lighting Controls	§110.9(b), §130.1(c)	NA7.6.2
	NRCA-LTI-03-A Automatic Daylighting Controls	§130.1(d)	NA7.6.1
	NRCA-LTI-04-A Demand Responsive Lighting Controls	§130.1(e)	NA7.6.3
	NRCA-LTI-05-A Institutional Tuning Power Adjustment Factor	§140.6(a)2J	NA7.7.6.2
Outdoor Lighting	NRCA-LTO-02-A – Outdoor Lighting Acceptance Tests	§110.9(b), §130.2(a & c)	NA7.8
Process	NRCA-PRC-01-F – Compressed Air System Acceptance	§120.6(e)	NA7.13
	NRCA-PRC-02-F – Commercial Kitchen Exhaust	§140.9(b)	NA7.11
	NRCA-PRC-03-F – Parking Garage Exhaust	§120.6(c)	NA7.12
	NRCA-PRC-04-F – Refrigerated Warehouse – Evaporator Fan Motor Controls Acceptance	§120.6(a)3	NA7.10.2
	NRCA-PRC-05-F – Refrigerated Warehouse – Evaporative Condenser Controls Acceptance	§120.6(a)4	NA7.10.3.1
	NRCA-PRC-06-F – Refrigerated Warehouse – Air-Cooled Condenser Controls Acceptance	§120.6(a)4	NA7.10.3.2
	NRCA-PRC-07-F – Refrigerated Warehouse – Compressor Variable Speed Acceptance	§120.6(a)5	NA7.10.4
	NRCA-PRC-08-F – Refrigerated Warehouse – Electric Resistance Underslab Heating System Acceptance	§120.6(a)2	NA7.10.1
	NRCA-PRC-12-F – Elevator Lighting and Ventilation Controls	§120.6(f)5	NA7.14
	NRCA-PRC-13-F – Escalator and Moving Walkways Speed Control	§120.6(g)2	NA7.15

**These were only forms that Contractor has to Sign-Off.
Not the Engineer-Of-the Record.**



This is a dynamic document that creates a custom Part 6 checklist for a project scope. This checklist can also be used to create a set of example correction comments that may be used or modified by the plans examiner.

The dynamic version of this checklist is available on www.EnergyCodeAce.com under the Resources Ace.

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General—Are the following items confirmed on the plans? * If "NO", items to be corrected per plan check comments			YES	NO*
G1. Has only one Certificate of Compliance (NRCC) been submitted as part of this permit FOR THE SAME FEATURE?		§10-103	<input type="checkbox"/>	<input type="checkbox"/>
G2. Are all NRCC documents printed on the plans?		§10-103	<input type="checkbox"/>	<input type="checkbox"/>
G3. Are all NRCC documents signed and dated by the: Responsible building designers or owner? <i>Can be electronic or wet signature</i> Documentation author? <i>Can be electronic or wet signature</i>		§10-103	<input type="checkbox"/>	<input type="checkbox"/>
G4. Have commissioning design review forms been provided?	NEW NR building or any NR occupancy within NEW mixed-use building will require NRCC-CXR forms. If NR conditioned space is $\geq 10,000$ ft ² , OPR/BOD/Cx Specs are also required.	§120.8	<input type="checkbox"/>	<input type="checkbox"/>
G5. Is the climate zone correct?	Based on zip code	§100.1(b)	<input type="checkbox"/>	<input type="checkbox"/>
G6. Is the site orientation correct?	Azimuth (not plan north)	NR ACM 3.1	<input type="checkbox"/>	<input type="checkbox"/>
G7. Total conditioned floor area (ft ²) Total unconditioned area (ft ²)		§100.1(b)	<input type="checkbox"/>	<input type="checkbox"/>
G8. Number of dwelling units	Multifamily & hotel/motel	§100.1(b)	<input type="checkbox"/>	<input type="checkbox"/>
G9. Number of stories above grade	Not including mezzanine or lofts	§100(c)	<input type="checkbox"/>	<input type="checkbox"/>
G11. Is the correct version of the software being used (performance only)? http://www.energy.ca.gov/title24/2016standards/2016_computer_prog_list.html			<input type="checkbox"/>	<input type="checkbox"/>

2016 ENERGY CODE

Ace
ResourcesTitle 24, Part 6
Triggers

HVAC Simple Systems

Nonresidential
New HVAC: Simple and Complex Systems

	Mandatory Requirements								Prescriptive Requirements			
	Zone Thermostat ^f §120.2(a), (b) Setback Capable ^g	DCV ^h §120.1(c)	Heat Pump Controls ⁱ §120.2(d)	Shutoff and Reset ^j §120.2(e)	Ventilation Dampers Automatic close upon fan shutdown ^k §120.2(f)	Isolation Devices ^l §120.2(g)	Demand Shedding ^m §120.2(h)	Economizer FDD ^p §120.2(i)	Zone Control ^q §140.4(d)	Supply Temperature Reset ^r §140.4(f)	Economizer ^s §140.4(e)1-5	Variable Flow Control ^t §140.4(k)6 §140.4(m)
Package Terminal Air-Conditioner ^{u,c}	YES ^d	YES	no	YES ^k	YES	no	YES	YES	YES	YES	no	YES ^u
Unitary Air Conditioners and Condensing Units ^v	YES	YES	no	YES ^k	YES	no	no	YES	no	no	YES	YES ^u
Unitary Heat Pumps ^t	YES	YES	YES	YES ^k	YES	no	no	YES	no	no	YES	YES ^u
Applied Heat Pumps ^t	YES	YES	YES	YES ^k	YES	YES	YES	YES	YES	no	YES	YES ^u
Forced Air Furnace	YES	YES	no	YES ^k	YES ^m	no	YES	no	no	no	no	no
Unit Heater	YES	no	no	YES ^k	no	no	no	no	no	no	no	no

- A Central Energy Management Control System (EMCS) should be installed at building site for optimal equipment operation and coordination.
- B Configurations vary between availability of central plant in design or reliance on self-contained heating and cooling.
- C Special application requirements for Hotels, High-rise Residential, and Perimeter Zoning. Setback capable terminal devices should be used except where zone is not on EMCS. In that case, capability of four programmable control periods per 24 hours is required (§110.2(c)).
- D Stand-alone single room window units are exempt (See §110.2(c)).
- E Air or water source configuration.
- F An EMCS may perform the setback functions.
- G Set back the zone temperature setpoints to 55°F or lower for heating and 85°F or higher for cooling. Where used to control both heating and cooling, and where changeover between heating and cooling modes is automatic, the thermostatic controls shall be capable of providing a temperature dead band of at least 5°F, within which heating and cooling are both shut off or minimized.
- H Demand Control Ventilation. See §120.1(c) 3, 4 and 5 for additional CO2 concentration setpoint information and sensor location requirements.

- I Heat pumps with supplementary electric resistance heat have control requirements.
- J Must include automatic restart to maintain setback temperatures as necessary.
- K Must include automatic time switch OR occupancy sensor OR 4-hour timer, 7-day programmable local control exemption.
- L Assumes system has ventilation capacity at the terminal device. Damper is to reduce ventilation to zero during unoccupied periods. Exemptions for: gravity dampers, combustion air paths, 24-hour operation, or local law jurisdiction.
- M Reference to combustion air requirements.
- N For systems serving multiple zones totaling more than 25,000 ft². A zone need not be isolated if demonstrated that it must be heated or cooled continuously.
- O Include settings capable of disabling, manually controlling, or automatically operating equipment. Applies to HVAC systems with DDC to the zone level.

- P Fault detection and diagnostics (FDD) systems are commonly available for packaged HVAC units, and can be integrated directly by the manufacturer. These are required for all new air-cooled unitary direct-expansion systems with cooling capacity of 54 kBtu/h (4 ½ tons) or greater. Controls include economizer checks and refrigerant diagnostics. The systems can report failures or suboptimal conditions that impact efficiency. Required acceptance tests for these systems may be found in Reference Appendix NA7.5.11.
- Q Simultaneous heat and cool prevention except for variable-air-volume and other system types listed in this section. Ambient conditions also provide lockout for seasonal operation only per §140.4(n).
- R A reset strategy defined and applied to the supply air stream of the unit or terminal device.
- S Exemptions apply where: (1) outside air conditions are undesirable, (2) high-rise residential, (3) adverse effects of other systems, like dehumidification, (4) high cooling efficiency systems [Table 140.1-A] (5) computer rooms served per §140.9(a).
- T Air-side applications referred to in respective code language. Central EMCS necessary for remote system operation and ability to oversee all space-conditioning equipment and pumping needs.
- U Variable Frequency Drive necessary to operate supply fan speed control at the unit.

Acceptance Tests: HVAC Simple Systems

The measures below trigger these acceptance tests	NRCA-MCH-02-A Outdoor Air	NRCA-MCH-03-A Constant Volume, Single-zone, Unitary A/C and HP	NRCA-MCH04-A Air Distribution Duct Leakage	NRCA-MCH-05-A Air Economizer Controls	NRCA-MCH-06-A Demand Control Ventilation	NRCA-MCH-07-A Supply Fan VFD	NRCA-MCH-08-A Valve Leakage	NRCA-MCH-11-A Automatic Demand Shed	NRCA-MCH-12-A Fault Detection and Diagnostic for DX Systems	NRCA-MCH-13-A Fault Detection and Diagnostic for AHUs	NRCA-MCH-16-A Supply Air Temp Reset	NRCA-MCH-18-A ^A Energy Management Control System
Zone T-Stats	no	YES	no	no	no	no	no	no	no	no	no	YES
DCV	YES	YES	no	YES	YES	YES	no	no	no	no	no	YES
Heat Pump Controls	no	YES	no	no	no	no	no	no	no	no	no	no
Shutoff and Reset	no	YES	no	no	no	no	no	YES	no	no	no	YES
Ventilation Dampers	YES	YES	YES	YES	no	YES	no	no	no	no	no	YES
Isolation Devices	no	YES	YES	no	no	no	YES	no	no	no	no	YES
Demand Shedding	no	no	no	no	no	no	no	YES	no	no	no	YES
Economizer and/or FDD	YES	YES	no	YES	no	YES	no	no	YES	YES	no	YES
Zone Control	no	YES	no	no	no	no	YES	YES	no	no	no	YES
Supply Temp. Reset	no	no	no	no	no	no	no	no	no	no	YES	YES
Variable Flow Control	no	no	no	no	no	YES	YES	no	no	no	no	YES
Duct Systems	YES	no	YES	no	no	no	no	no	no	no	no	no

A Test is only applicable if an EMCS is present

OOPS Moment

HVAC Complex Systems

	Mandatory Requirements								Prescriptive Requirements				
Space Conditioning Equipment ^A	Zone Thermostat ^C §120.2(a), (b) Setback Capable ^D	DCV ^E §120.1(c)	Shutoff and Reset ^F §120.2(e)	Ventilation Dampers ^G §120.2(f) Automatic close upon fan shutdown ^H	Isolation Devices ^I §120.2(g)	Demand Shedding ^J §120.2(h)	DDC ^K §120.2(j)	Optimum Start Stop ^L §120.2(k) (new in 2016)	Zone Control ^M §140.4(d)	Supply Temperature Reset ^N §140.4(f) §140.4(k)4	Economizer ^O §140.4(e)1-5	Variable Flow Control ^P §140.4(k)6 §140.4(m)	Isolation ^Q §140.4(k)2 §140.4(k)3
Boiler	no	no	YES ^G	no	no	YES	YES	YES	YES	YES ^L	no	no	YES
Air-cooled Chiller	no	no	YES ^G	no	no	YES	YES	YES	YES	YES ^M	no	YES	YES
Water-cooled Chiller	no	no	YES ^G	no	no	YES	YES	YES	YES	YES ^M	no	YES	YES
Variable Refrigerant Flow (VRF)	YES	YES	YES ^G	no	YES	YES	no	no	YES	YES	YES	YES	no
Air Handling Systems & Zones ^B	YES	YES	YES ^G	YES	YES	YES	YES	YES	YES	YES	YES	YES	no
Zone Terminal Units or Fan Coils	YES	no	YES ^G	no	no	YES	YES	YES	YES	YES	no	YES	no

A Central Energy Management Control System (EMCS) should be installed at building site for optimal equipment operation and coordination.

B Applies to fan systems serving multiple thermostatically controlled zones, and to built-up air handler systems (non-unitary or nonpackaged HVAC equipment).

C An EMCS may perform the setback functions.

D Heating and cooling set point dead band of ±5°F should be implemented on all temperature set points. Applies only to equipment with heating AND cooling capability. Set back the zone temperature set points to 55°F or lower for heating and 85°F or higher for cooling.

E Demand Control Ventilation. See §120.1(c) 3, 4 and 5 for additional CO₂ concentration set point information and sensor location requirements.

F Must include automatic restart to maintain setback temperatures as

G Must include automatic time switch OR occupancy sensor OR 4-hour timer. 7-day programmable local control exemption.

H Reference to mechanical room ventilation fan where chillers are located.

I For systems serving multiple zones totaling more than 25,000 ft². A zone need not be isolated if demonstrated that it must be heated or cooled continuously.

J Include settings capable of disabling, manually controlling, or automatically operating equipment. Applies to HVAC systems with DDC to the zone level.

K Simultaneous heat and cool prevention except for variable-air-volume and other system types listed in this section. Ambient conditions also provide lockout for seasonal operation only.

L Referred to as "Hot Water Supply Temperature Reset".

M Referred to as "Chilled Water Supply Temperature Reset".

N Exemptions apply where: (1) outside air conditions are undesirable, (2) high-rise residential, (3) adverse effects of other systems, like dehumidification, (4) high cooling efficiency systems [Table 140.1-A] (5) computer rooms served per §140.9(a).

O Includes reference to both water and air-side applications referred to in respective code language. Central EMCS necessary for remote system operation and ability to oversee all space-conditioning equipment and pumping needs.

2016 ENERGY CODE



Title 24, Part 6

Nonresidential Interior Lighting – Alterations

Step 1: Applicable Lighting Alteration Sections ^A	Mandatory Requirements			Prescriptive Requirements	
Scope Classification ¹	Lighting Control Devices & Systems §110.9 ^B	Indoor Lighting Controls ^C §130.1	Acceptance Testing ^D §130.4	Calculated Lighting Power Density §140.6	Calculate Rated Power Reduction §141.0
Entire Luminaire Alteration ²	Using Area Category, Complete Building or Tailored Methods §141.0(b)2Ii				
	YES	YES	YES	YES	no
	Using Rated Power Reduction Method §141.0(b)2Iii				
Luminaire Component Modification ³	YES	YES	YES	no	YES ^E
	Using Area Category, Complete Building or Tailored Methods §141.0(b)2Ji				
	Using Rated Power Reduction Method §141.0(b)2Jii				
Lighting Wiring Alterations ⁴	YES	YES	YES	no	YES ^E

Terms and Definitions

- 1 Exceptions to the Energy Standards include: (a) luminaire alterations or component modifications of portable luminaires, or those affixed to movable partitions, or excluded by §140.6(a)3; and (b) where only 2 luminaires in an enclosed space are affected; (c) when disturbance of asbestos is directly caused by the modification or alteration (unless the luminaire modifications are made in conjunction with asbestos abatement).
- 2 Entire Luminaire Alteration includes: (a) removing and reinstalling a total of 10 percent or more of the existing luminaires; or (b) replacing or adding entire luminaires; or (c) adding, removing, or replacing walls or ceilings along with any redesign of the lighting system.
- 3 Luminaire Component Modification includes: (a) replacing the ballasts or drivers and the associated lamps in the luminaire; or (b) permanently changing the light source of the luminaire; or (c) changing the optical system of the luminaire, where 70 or more existing luminaires are modified either on any single floor of a building or, where multiple tenants inhabit the same floor, in any single tenant space, in any single year. Lamp replacements alone and ballast replacements alone shall not be considered a modification of the luminaire provided that the replacement lamps or ballasts are installed and powered without modifying the luminaire. Note: Lighting shall not prevent or disable the operation of emergency lighting.

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- 4 Lighting Wiring Alteration includes: (a) adding circuit feeding luminaires; or (b) replace, modify, or relocate wiring between a switch or panelboard and luminaires; or (c) replace lighting control panels, panelboards, or branch circuit wiring. Exception to requirements: lighting wiring alterations made only for the addition of lighting controls.

Notes

- A All sections listed in the table are applicable to the scope of work listed in the left hand column. Read over these sections carefully to determine what parts of each section pertain to the project. This Step 1 table is intended to be used in conjunction with the Step 2 table, below. Both should be read carefully.
- B For additional equipment requirements, see Title 20.
- C Controls requirements differ based on scope and lighting design. See the Step 2 table below for more information.
- D Acceptance testing is not required for alterations of ≤ 20 controlled luminaires per §141.0(b)2I, §141.0(b)2J, and §141.0(b)2K.
- E 50% reduction for office, retail and hotel occupancies. 35% reduction for all other occupancies.

AIA Orange County
2/24/2019

Step 2: Lighting Control Requirements		 Mandatory Requirements					
Scope Classification		Area Controls ⁶ §130.1(a)	Multi-Level Lighting Controls ⁷ §130.1(b)	Shut-OFF Controls ⁸ §130.1(c)	Automatic Daylighting Controls ⁹ §130.1(d)	Demand Responsive Controls ¹⁰ §130.1(e)	Secondary Daylit Zone Controls §140.6(d)
Entire Luminaire Alteration		Using Area Category, Complete Building or Tailored Methods §141.0(b)2li					
	≤ 85% of lighting power allowance	YES	YES	YES	no	no	no
	> 85% of lighting power allowance	YES	YES	YES	YES	YES	no
		Using Rated Power Reduction Method ^F §141.0(b)2lii					
Luminaire Component Modification		Using Area Category, Complete Building or Tailored Methods §141.0(b)2Ji					
	≤ 85% of lighting power allowance	YES	YES	YES	no	no	no
	> 85% of lighting power allowance	YES	YES	YES	YES	YES	no
		Using Rated Power Reduction Method ^F §141.0(b)2Jii					
Lighting Wiring Alterations		YES	YES	YES	YES	no	no

Terms and Definitions

- 6 §130.1(a) - Area Controls: All luminaires shall be functionally controlled with manually switched ON and OFF lighting controls. Each area enclosed by ceiling-height partitions shall be independently controlled.
- 7 §130.1(b) - Multi-Level Lighting Controls: The general lighting of any enclosed area 100 square feet or larger, with a connected lighting load that exceeds 0.5W per ft² shall meet the requirements of §130.1(b) or if lighting power is ≤ 85% of allowance, the enclosed space must have a minimum of one step of 30-70%.
- 8 §130.1(c) - Shut-OFF Controls: In addition to lighting controls installed to comply with §130.1(a) and (b), all installed indoor lighting shall be equipped with controls that meet the requirements of §130.1(c).

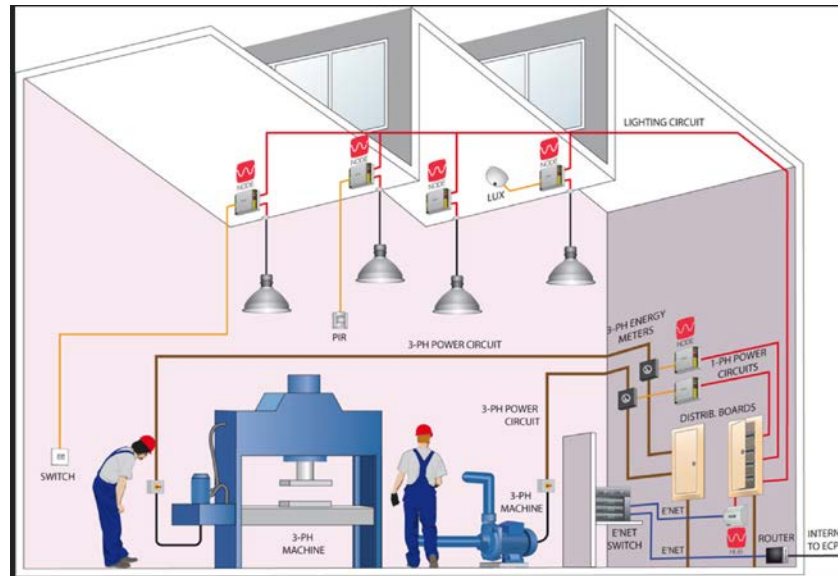
- 9 §130.1(d) - Automatic Daylighting Controls: Any altered luminaires providing general lighting that are in or are partially in daylit zones shall meet the requirements of §130.1(d)2.

- 10 §130.1(e) - Demand Responsive Controls: Only required in altered spaces > 10,000ft² where alteration changes area, occupancy types, or increases lighting power per Table 141.0-E.

Notes

- F Rated Power Reduction: Any multi-level, Shut-OFF or daylighting controls already in place must remain functional.

Number one issue currently is Controls



2016 Indoor Residential Lighting Requirements: Spaces & Lighting Controls

Residential Space	Manual ON/OFF Controls	Vacancy Sensor or Dimmer ¹	Separate Switching: Exhaust Fans	Separate Switching: Undercabinet Lighting
Hallways & Closets ²	Required for all spaces	Not required	Exhaust fans must be switched separate from lighting or utilize a device where lighting can be turned OFF while the fan is running. Excludes kitchen exhaust hoods.	Undercabinet lighting must be switched separate from all other lighting.
Kitchens		Based on installed luminaire or lamp type ³		
Bathrooms		At least one luminaire controlled by a vacancy sensor and all other based on installed lamp or luminaire type		
Laundry Rooms / Utility Rooms				
Garage				
All Other		Based on installed luminaire or lamp type ³		

¹ May be achieved with an EMCS or programmable scene controller with required functionality.

² Closets less than 70 ft². For all other closets, requirements based on installed lamp or luminaire type.

³ See page 3 for a list of requirements by lamp and luminaire type.

Got Questions?

