2019 Energy Code

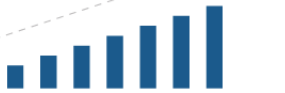
Insulation and QII Requirements

California Energy Commission

August 2020

PRIMARY FUNCTIONS OF THE

CALIFORNIA ENERGY COMMISSION



Advancing State Energy Policy

Investing in Energy Innovation

Developing Renewable Energy

Preparing for Energy Emergencies

Achieving Energy Efficiency

Transforming Transportation

Overseeing Energy Infrastructure

Intergovernmental Collaboration

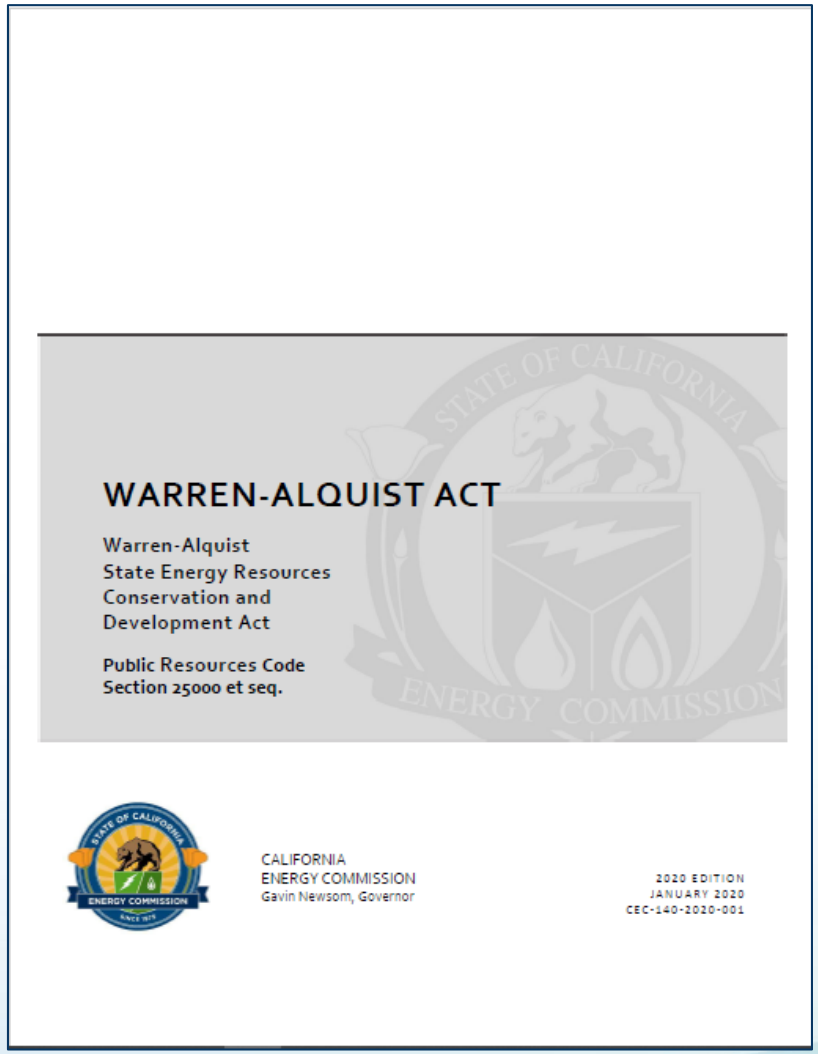
Agenda

2019 Building Energy Efficiency Standards (Energy Code)

- Energy Code Basics
- Navigating Title 24, Part 1 and Part 6
- 2019 Nonresidential Insulation Requirements
- 2019 Residential Insulation Requirements
- 2019 Quality Insulation Installation (QII)
- Resources

Energy Code Basics

Energy Code History



The Warren-Alquist Act established the California Energy Commission (CEC) in 1974

- Develop and adopt energy efficiency standards for buildings in California (under Title 24)
- Requires periodic updates, usually every three years
- Requires the Energy Code to be cost effective over the economic life of the building

2019 Energy Code

2019 Building Energy Efficiency Standards

The 2019 Building Energy Efficiency Standards take effect January 1, 2020. Find compliance manuals, forms, software, and supporting content.

LEARN MORE ABOUT THE 2019 STANDARDS ›

2019 Energy Code

Effective January 1, 2020

- Building permit applications submitted on or after effective date
- Must use 2019 software and forms

2019 Documents Online

- Energy Code
- Reference Appendices
- Compliance Manuals
- Forms

Energy Code Requirements

Mandatory measures

- Minimum efficiency requirements must always be met
- Can never trade off

Prescriptive measures

- Predefined efficiency requirements
- May supersede mandatory measures
- Different requirements for newly constructed buildings, additions, and alterations

Compliance Approaches

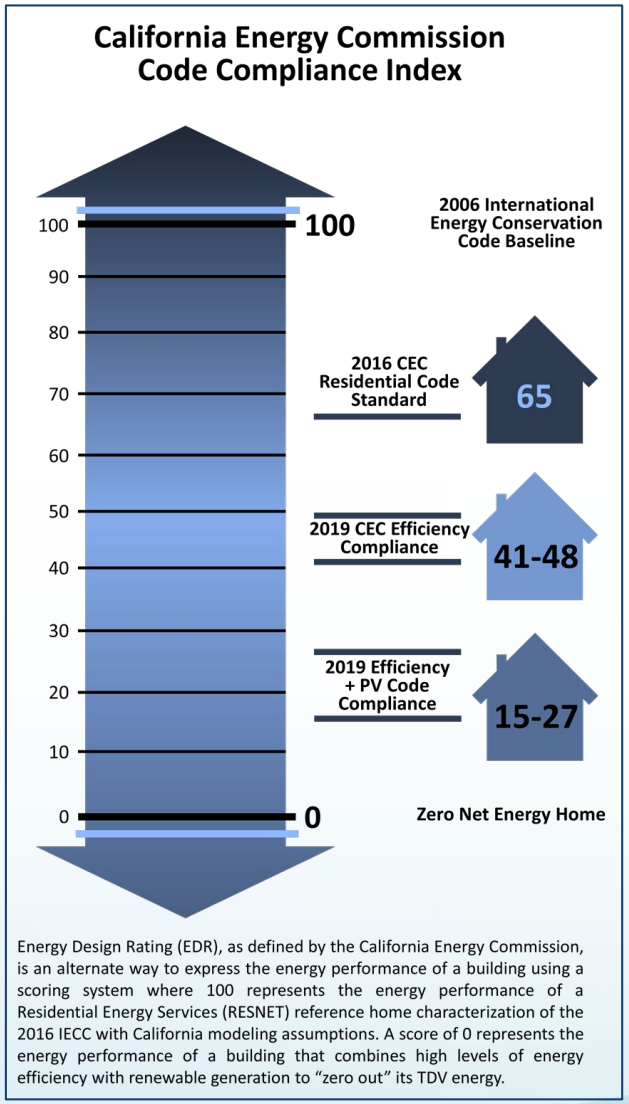
Prescriptive Approach

- Simple approach, no trade-offs
- Match the standard building baseline
- More common for alterations and nonresidential

Performance Approach

- Most flexible approach, allows for trade-offs
- Must meet all mandatory requirements
- Requires the use of CEC approved software
- Residential: proposed efficiency EDR ≤ standard building design and total EDR (including PV) ≤ standard building design
- Nonresidential: proposed TDV ≤ standard building design

Energy Design Rating (EDR)



Energy Design Rating (EDR), as defined by the California Energy Commission, is an alternate way to express the energy performance of a building using a scoring system where 100 represents the energy performance of a Residential Energy Services (RESNET) reference home characterization of the 2016 IECC with California modeling assumptions. A score of 0 represents the energy performance of a building that combines high levels of energy efficiency with renewable generation to "zero out" its TDV energy.

Low-rise residential EDR score based on total estimated energy use

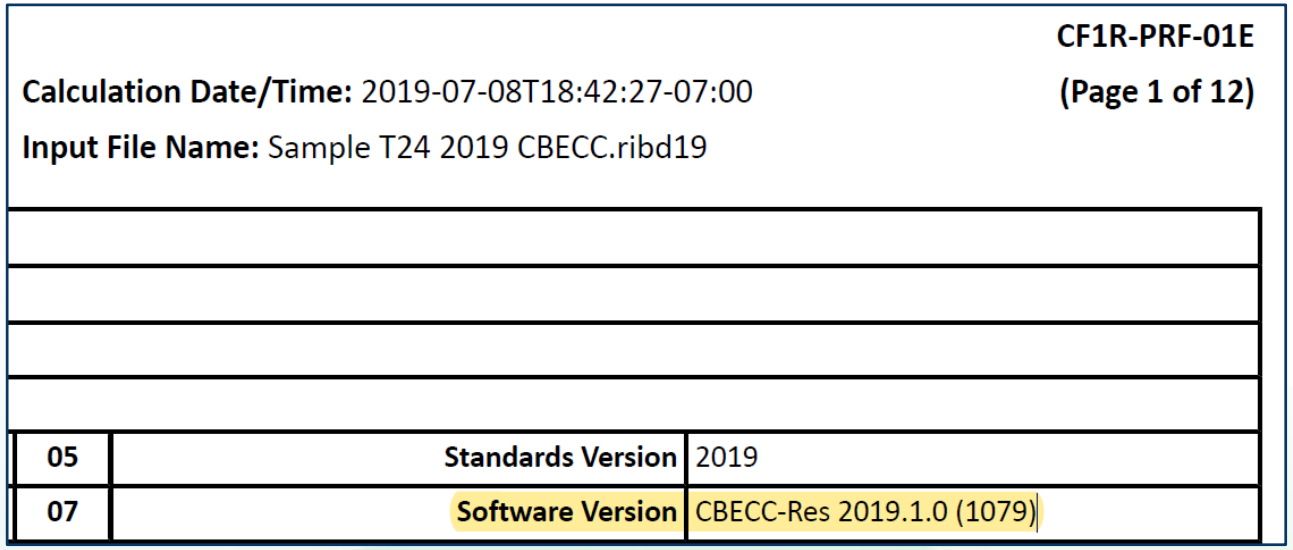
- 100 represents a home built to 2006 IECC
- 0 represents a zero net energy home
- Two types of EDR must be met individually
  - **Efficiency EDR**: Includes energy savings for space heating, cooling, ventilation, water heating measures, plus limited credit for battery
  - **Total EDR**: Includes efficiency EDR minus compliance credit for PV, battery, and other demand flexibility measures

2019 Compliance Software

To demonstrate Energy Code compliance with the performance approach

Must use most recently approved versions

- Residential
  - CBECC-Res 2019.1.2
  - EnergyPro 8.1 Residential
  - Right-Energy 2019.1.1
- Nonresidential
  - CBECC-Com 2019.1.2
  - EnergyPro 8.1 Commercial



CF1R-PRF-01E

Calculation Date/Time: 2019-07-08T18:42:27-07:00 **(Page 1 of 12)**

Input File Name: Sample T24 2019 CBECC.ribd19

05	**Standards Version**	2019
07	**Software Version**	CBECC-Res 2019.1.0 (1079)

Demonstrating Compliance

Compliance forms confirm Energy Code is met

- Completed by designers, consultants, builders, contractors, technicians, HERS raters, etc.
- Submitted to enforcement agencies for verification
  - Certificate of Compliance
  - Certificate of Installation
  - Certificate of Acceptance
  - Certificate of Verification

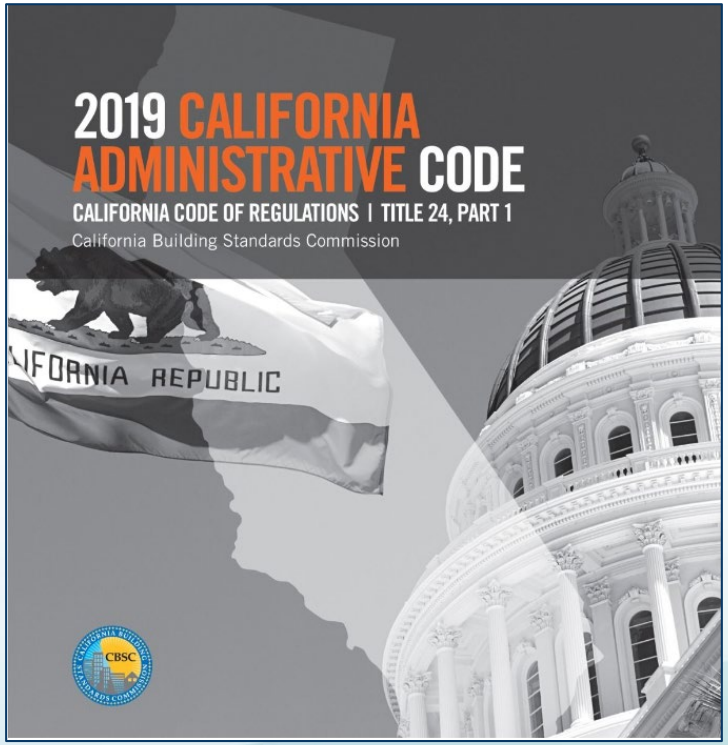
2019 Energy Code

Navigating Title 24 - Part 1 and Part 6

Title 24 – California Building Code

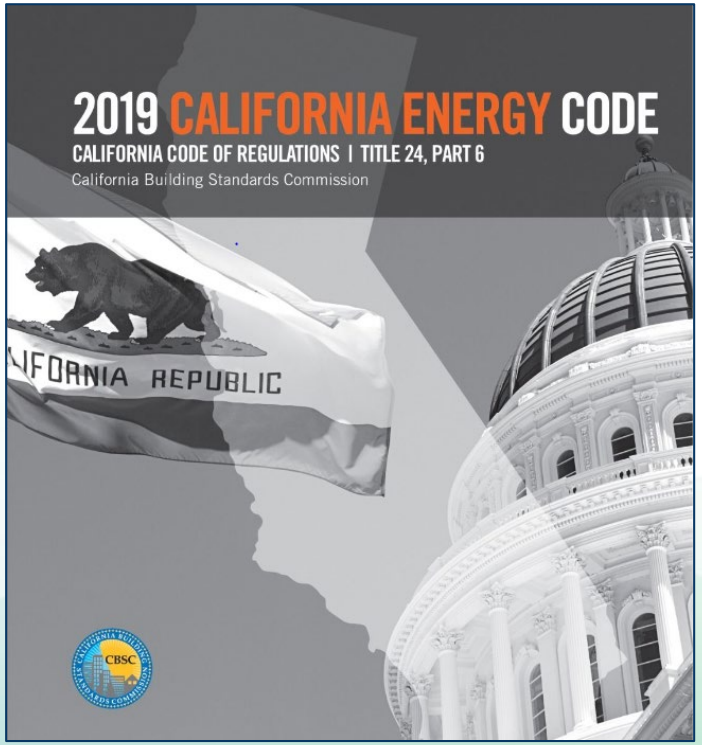
Part 1 - Administrative Code

- Chapter 10
- Sections 10-101 – 10-115
- Administrative requirements



Part 6 - Energy Code

- Subchapters 1 - 9
- Sections 100.0 - 150.2
- Technical requirements



Part 6 Energy Code

All Buildings § 100.0 - Table 100.0-A

Occupancies	Application	Mandatory	Prescriptive	Performance	Additions/Alterations
General Provisions for All Buildings		100.0, 100.1, 100.2, 110.0			
Nonresidential, High-Rise Residential, And Hotels/Motels	General				
	Envelope (conditioned)	110 11	Envelope (conditioned)	110.6, 110.7, 110.8,120.7	140.3
	Envelope (unconditioned process spaces)	N.A.	140.3(c)		
	HVAC (conditioned)	110.2, 110.5, 120.1, 120.2, 120.3, 120.4, 120.5, 120.8	140.4	140.0, 1	140.0, 140.1
	Water Heating	110.3, 120.3, 120.8, 120.9	140.5		
	Indoor Lighting (conditioned, process spaces)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6		141.0
	Indoor Lighting (unconditioned and parking garages)	110.9, 120.8, 130.0, 130.1, 130.4	140.3(c), 140.6		
	Outdoor Lighting	110.9, 130.0, 130.2, 130.4	140.7		
	Electrical Power Distribution	110.11, 130.5	N.A.	N.A.	
	Pool and Spa Systems	110.4, 110.5, 150.0(p)	N. A.		141.0
	Solar Ready Buildings	110.10	N.A.		141.0(a)
Covered Processes[1]	Envelope, Ventilation, Process Loads	110.2, 120.6	140.9	140.1	120.6, 140.9, 141.1
Signs	Indoor and Outdoor	110.9, 130.0, 130.3	140.8	N.A.	141.0, 141.0(b)2H

Nonresidential relevant sections

§ 110.7 - § 110.8 All buildings

§ 120.7 Mandatory measures

§ 140.3 Prescriptive requirements

§ 141.0 Additions and alterations

Part 6 Energy Code

All Buildings § 100.0 - Table 100.0-A

General Provisions for All Buildings		100.0, 100.1, 100.2, 110.0			
Occupancies	**Application**	**Mandatory**	**Prescriptive**	**Performance**	**Additions/Alterations**
General Provisions for All Buildings					
Low-Rise Residential	General	150.0			
	Envelope (conditioned)	110.6, 110.7, 110.8, 150(a), 150.0(b), 150.0(c), 150.0(d), 150.0(e), 150.0(g), 150.0(q)	Envelope (conditioned)	110.6, 110.7, 110.8, 150(a), 150.0(b), 150.0(c), 150.0(d), 150.0(e), 150.0(g), 150.0(q)	
	HVAC (conditioned)	110.2, 110.5, 150.0(h), 150.0(i), 150.0(j), 150.0(m), 150.0(o)	150.1(a, c)	150.1(a), 150.1(b)	150.2(a), 150.2(b)
	Water Heating	110.3, 150.0(j, n)			
	Indoor Lighting (conditioned, unconditioned and parking garages)	110.9, 130.0, 150.0(k)	150.1(a, c)	150.1(a), 150.1(b)	150.2(a), 150.2(b)
	Outdoor Lighting	110.9, 130.0,150.0(k)			
	Pool and Spa Systems	110.4, 150.0(p)	N. A.	N.A.	150.2(a), 150.2(b)
	Solar Ready Buildings	110.10	N. A.	N.A.	N.A.

Residential relevant sections

§ 110.7 - § 110.8 All buildings

§ 150.0 Mandatory measures

§ 150.1 Prescriptive requirements

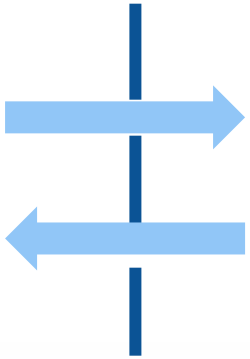
§ 150.2 Additions and alterations

Air Leakage Requirements

All Buildings

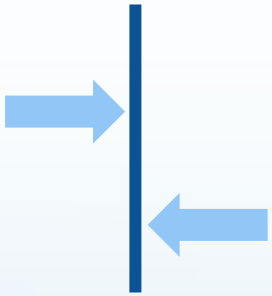
Mandatory § 110.7

Air Leakage Definitions



Infiltration - uncontrolled air leakage from outside to inside, through cracks, joints, windows, doors, partitions or penetrations

Exfiltration - uncontrolled air leakage from inside to outside, through cracks, joints, windows, doors, partitions or penetrations



Air Barrier – a system of materials joined and sealed together to control air flow through the building envelope that separates conditioned from unconditioned space, or that separates adjoining conditioned spaces of different occupancies or uses

Air Leakage Mandatory Requirements

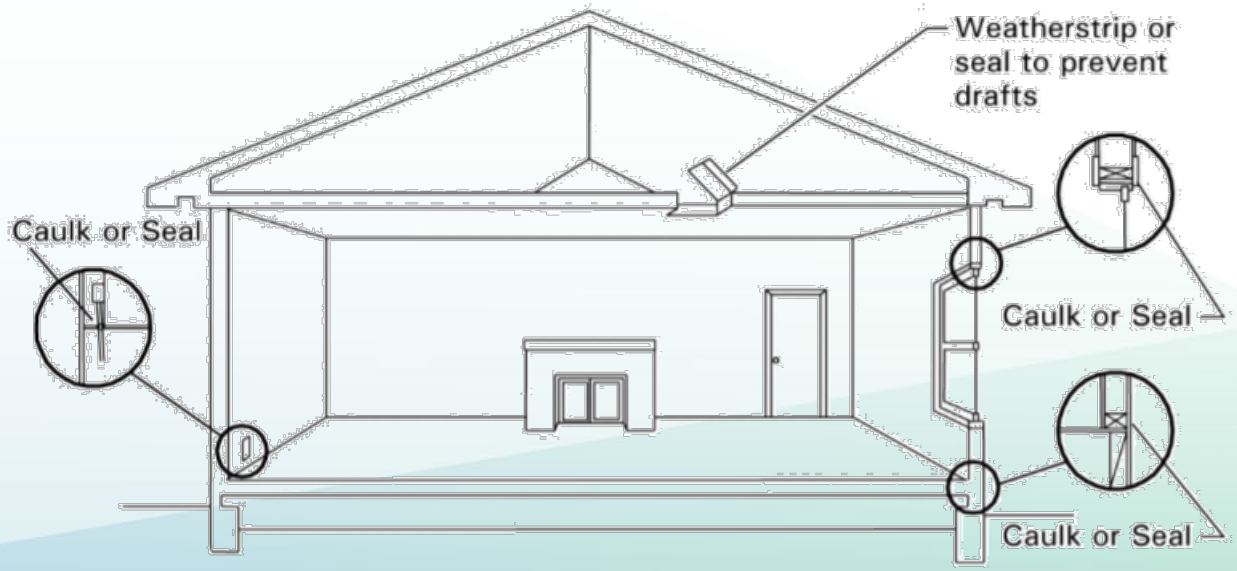
All Buildings § 110.7

Most overlooked **MANDATORY** requirement. Major impacts on energy use.

Limit infiltration and exfiltration

- Must caulk, gasket, weather-strip, or seal all joints, penetrations, openings
- New air sealing fact sheet

Figure 3-11: Caulking and Weatherstripping



Insulation and Radiant Barrier Requirements

All Buildings

Mandatory § 110.8

Energy Code Definitions

Exterior wall - separates conditioned space from outdoor space

Demising wall - separates conditioned space from enclosed unconditioned space

Roof - outside cover of a building, including the structural supports, decking, and top layer that is exposed to the outside

Ceiling - demising partition over conditioned space and under unconditioned space

Floor - exterior partition under conditioned space and above outdoor space

Soffit - demising partition under conditioned space and above unconditioned space

Insulation Definitions

U-factor - a measure of the heat transmission through a wall, roof, floor (all materials in assembly), or a given thickness of a material (insulation)

R-value - capacity of an insulating material to resist heat flow

Lower U-factor is better

Higher R-value is better

Insulation Mandatory Requirements

All Buildings § 110.8(a-c)

All Materials

- Certified to California Quality Standards for Insulation Materials by the California Department of Consumer Affairs
- Restricts use of formaldehyde foam
- Must have fire-retardant on exposed surfaces and be installed according to California Building Code

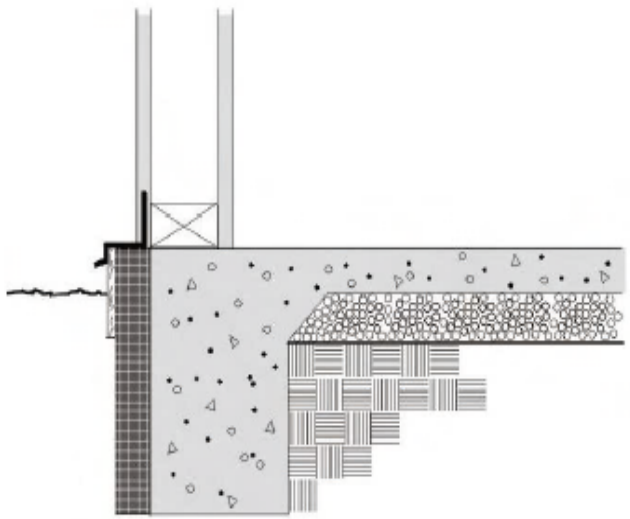
Alterations in Existing Buildings

- Attics in low-rise residential R-value of new insulation and existing insulation are combined
  - If space is too small to meet required R-value must fill entire space (compliant with Part 2, Section 1203.2)

Insulation Mandatory Requirements

All Buildings § 110.8(g-h)

Figure 3-6: Perimeter Slab Insulation



Heated slab floors

- Meet requirements in Table 110.8-A for R-value and climate zone
- Must be certified per § 110.8(a)
- Protect exposed material to wind, equipment, moisture and UV
- Rigid plate to prevent intrusion of insects into foundation
- Requirements for direct contact with slab and grade (water absorption and vapor permeable)

Wet insulation systems above roofs waterproof membrane

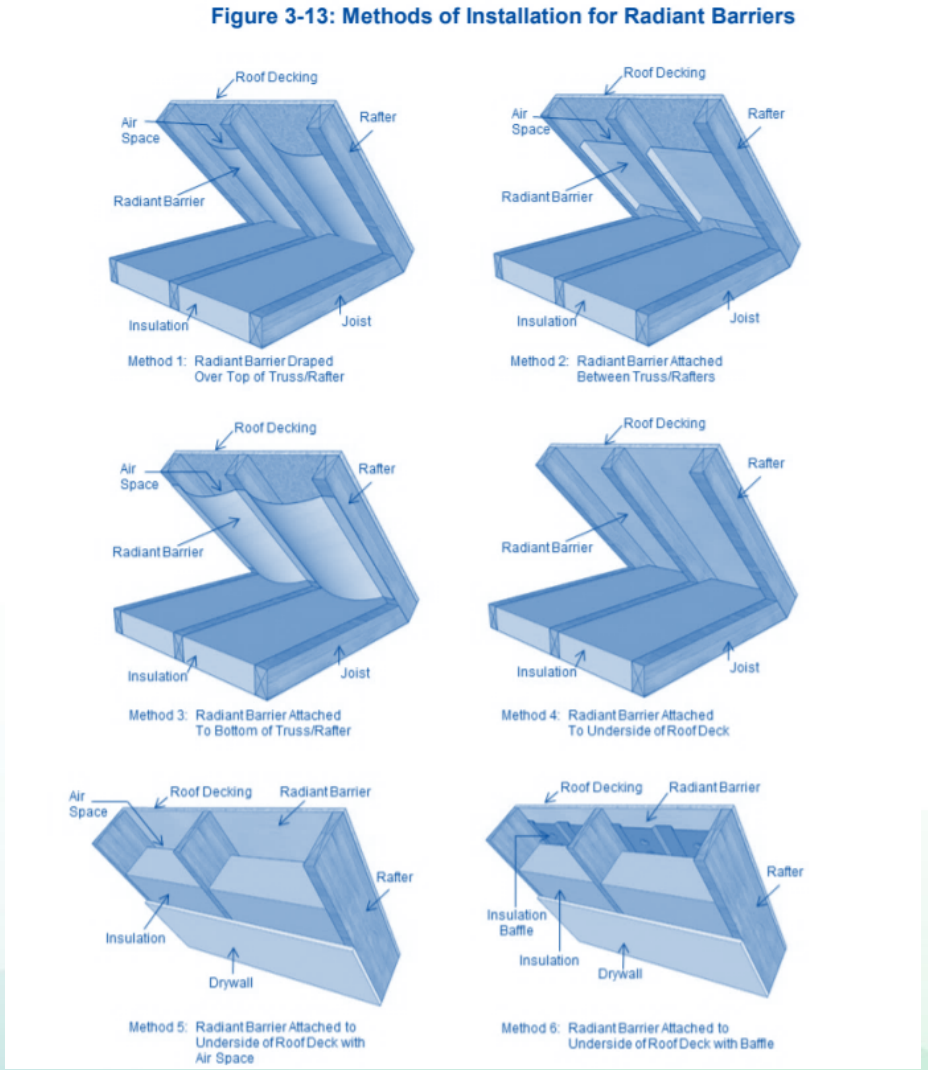
- Meet effective R-value in Reference Joint Appendix JA4.2

Radiant Barrier Mandatory Requirements

All Buildings § 110.8(j)

Radiant barriers - where required

- Emittance of 0.05 or less
- Tested per ASTM
- Certified to CA Department of Consumer Affairs



Insulation Requirements
Nonresidential

Mandatory § 120.7

Prescriptive § 140.3(a)

Alterations § 140.1(b)

Insulation Mandatory Requirements

Nonresidential § 120.7(a)

Roof and ceilings

- Mandatory weighted U-factor of assembly

	Assembly Type	Maximum U-factor
Roof and Ceiling	Metal building	0.098
	Wood framed and other	0.075

- Placement of insulation
  - Direct contact with continuous ceiling or roof, above or below roof deck
  - When insulation at roof, cannot have openings or vents into unconditioned space between ceiling and roof
  - No insulation on removable panels of suspended ceiling

Insulation Mandatory Requirements

Nonresidential § 120.7(b, c)

Walls, floors and soffits

	Assembly Type	Maximum U-factor
Walls	Metal buildings	0.113
	Metal-framed walls (includes demising)	0.151
	Heavy mass walls	0.690
	Light mass walls	0.440
	Wood-framed walls and other	0.110
	Wood-framed demising walls	0.099
	Spandrel panel and opaque curtain walls	0.280
Floor and Soffit	Raised mass	0.269
	Other	0.071

Insulation Prescriptive Requirements

Nonresidential § 140.3(a)1-4

Meet assembly U-factors in Tables 140.3-B, 140.3-C, or 140.3-D

TABLE 140.3-C – PRESCRIPTIVE ENVELOPE CRITERIA FOR HIGH-RISE RESIDENTIAL BUILDINGS AND GUEST ROOMS OF HOTEL/MOTEL BUILDINGS

				Climate Zone															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Envelope	**Maximum U-factor**	**Roofs/ Ceilings**	Metal Building	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041	0.041
			Wood Framed and Other	0.028	0.028	0.034	0.028	0.034	0.034	0.039	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028	0.028
		Walls	Metal Building	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.061	0.057	0.057	0.057	0.057	0.057	0.057
			Metal-framed	0.069	0.069	0.069	0.069	0.069	0.069	0.105	0.069	0.069	0.069	0.069	0.069	0.069	0.069	0.048	0.069
			Mass, Light[1]	0.170	0.170	0.170	0.170	0.170	0.227	0.227	0.227	0.196	0.170	0.170	0.170	0.170	0.170	0.170	0.170
			Mass, Heavy[1]	0.160	0.160	0.160	0.184	0.211	0.690	0.690	0.690	0.690	0.690	0.184	0.253	0.211	0.184	0.184	0.160
			Wood-framed and Other	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.042	0.059	0.059	0.042	0.042	0.042
		Floors/ Soffits	Raised Mass[1]	0.045	0.045	0.058	0.058	0.058	0.069	0.092	0.092	0.092	0.069	0.058	0.058	0.058	0.045	0.058	0.037
			Other	0.034	0.034	0.039	0.039	0.039	0.039	0.071	0.039	0.039	0.039	0.039	0.039	0.039	0.034	0.039	0.034

Insulation Mandatory Requirements

Nonresidential Alterations § 141.0(b)1A

Roofs

- Meet requirements of 141.0(b)2Biii when roof is stripped to the deck or recover boards
- R-value or assembly U-factor per Table 141.0-C

TABLE 141.0-C INSULATION REQUIREMENTS FOR ROOF ALTERATIONS

	Nonresidential		High-Rise Residential and Guest Rooms of Hotel/Motel Buildings	
Climate Zone	Continuous Insulation R-value	U-factor	Continuous Insulation R-value	U-factor
1	R-8	0.082	R-14	0.055
2	R-14	0.055	R-14	0.055
3-9	R-8	0.082	R-14	0.055
10-16	R-14	0.055	R-14	0.055

Insulation Mandatory Requirements

Nonresidential Alterations § 141.0(b)1B, C

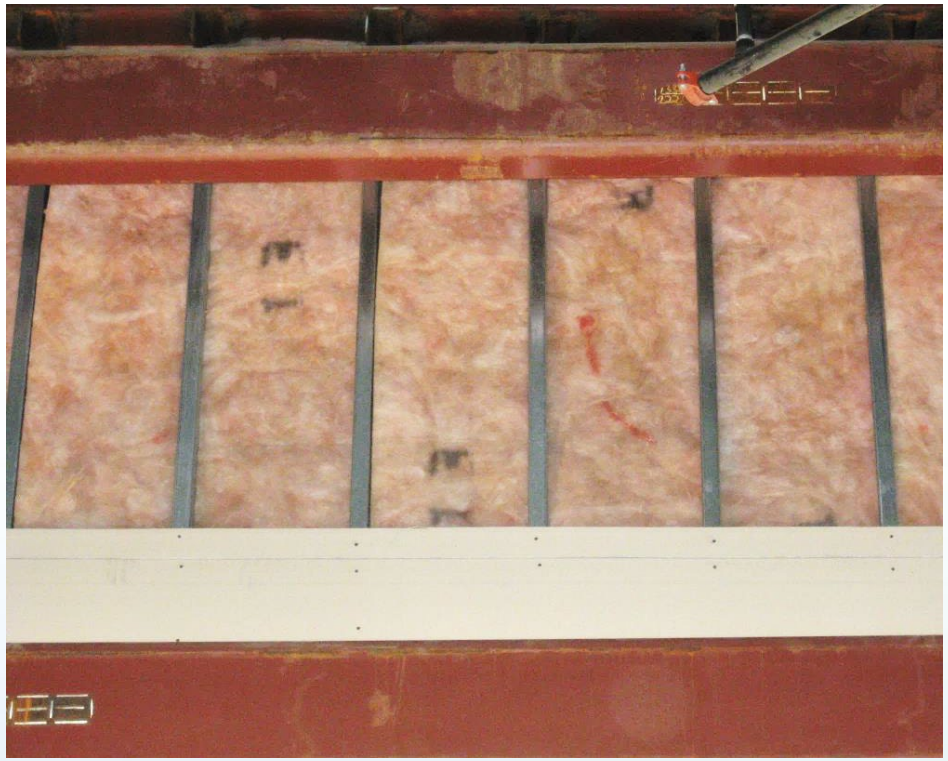
Walls, floors and soffits

- Altered components meet cavity R-value or assembly U-factor

	Assembly Type	Minimum R-value	Maximum U-factor
Walls	Metal buildings	R-13	0.113
	Metal-framed walls	R-13	0.217
	Wood-framed walls and others	R-11	0.110
	Spandrel panel and curtain walls	R-4	0.280
Floors and Soffits	Raised framed floors	R-11	0.071
	Raised mass floors in high-rise residential, hotel and motel	R-6	0.111

Test Your Knowledge

Nonresidential



Do metal-framed demising walls need insulation?

Yes, they need to meet mandatory requirements in § 120.7

- Metal-framed demising walls require the same U-factor as metal-framed exterior walls

Insulation and Radiant Barrier Requirements

Residential

Mandatory § 150.0(a-d,f)

Prescriptive § 150.1(c)1-2

Alterations § 150.2(a)1

Insulation Mandatory Requirements

Residential § 150.0(a, b)

Ceiling and roof assemblies

- Maximum U-factor of 0.043
- Minimum R-22 insulation in wood frame
- Vented attic: installed at ceiling
- Unvented attic: installed at ceiling or roof
- Attic access door: insulation permanently attached
- Insulation in direct contact with air barrier

Loose-fill insulation

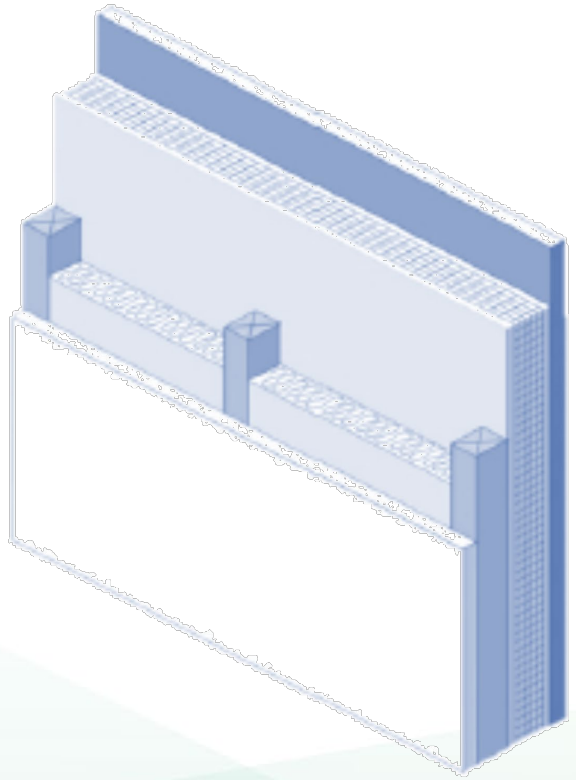
- Minimum installed weight per square foot to meet manufacturer's requirements

Insulation Mandatory Requirements

Residential § 150.0(c)

Wall insulation

- 2x4 walls assembly U-factor 0.102
- 2x6 walls assembly U-factor of 0.071
- Opaque non-framed assembly U-factor 0.102
- Masonry walls must meet prescriptive requirements (no trade-offs)
  - Climate zones 1-15, above grade
    - Interior insulation – U-factor 0.77
    - Exterior insulation – U-factor 0.125
  - Climate zone 16, above grade
    - Interior insulation – U-factor 0.59
    - Exterior insulation – U-factor 0.77



Insulation Mandatory Requirements

Residential § 150.0(d, f, g)

Raised floors

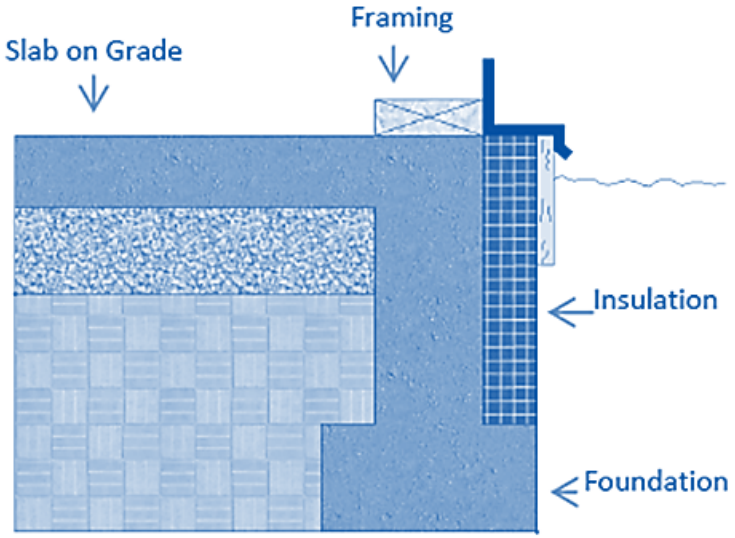
- Maximum assembly U-factor of 0.037
- Minimum R-19 insulation in wood frame

Slab edge insulation

- When required (heated slab and climate zone 16)
  - Water absorption
  - Water vapor permeance
  - Protection from UV & physical damage

Vapor barrier

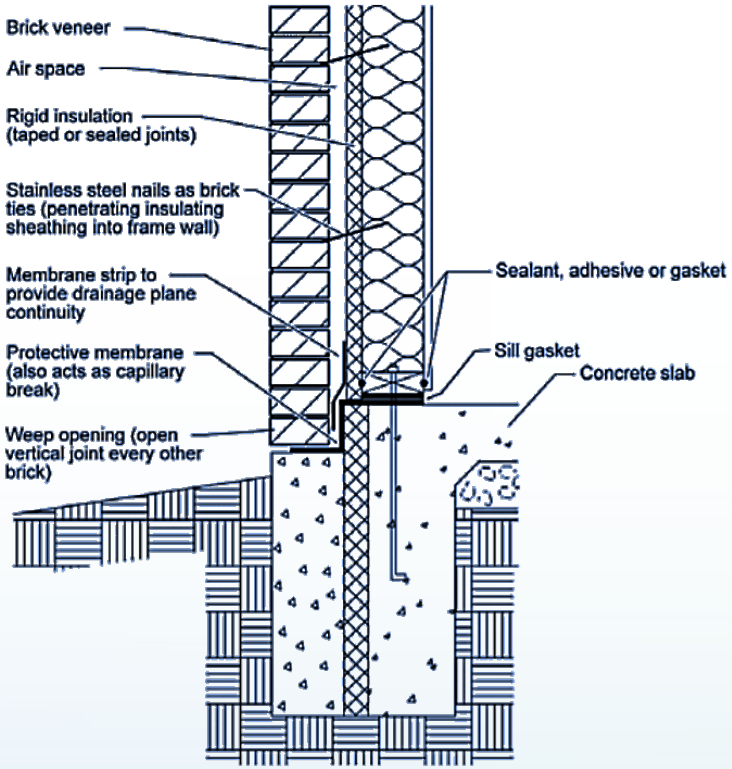
- Unvented crawl spaces
- Climate zones 14, 16
  - conditioned side of insulation in exterior walls and attics



Insulation Prescriptive Requirements

Residential § 150.1(c)1B

Figure 28: Wood-Framed Wall With Brick Veneer



Wall insulation per Tables 150.1-A and 150.1-B

- Climate zones 1-5, 8-16 framed
  - Single family U-factor 0.048
    - 2x6 wood frame R-21 plus R-5
  - Multifamily U-factor 0.051
- Climate zones 6-7 framed
  - U-factor 0.065
- Mass walls above and below grade must be insulated
- All other unframed walls meet framed U-factors

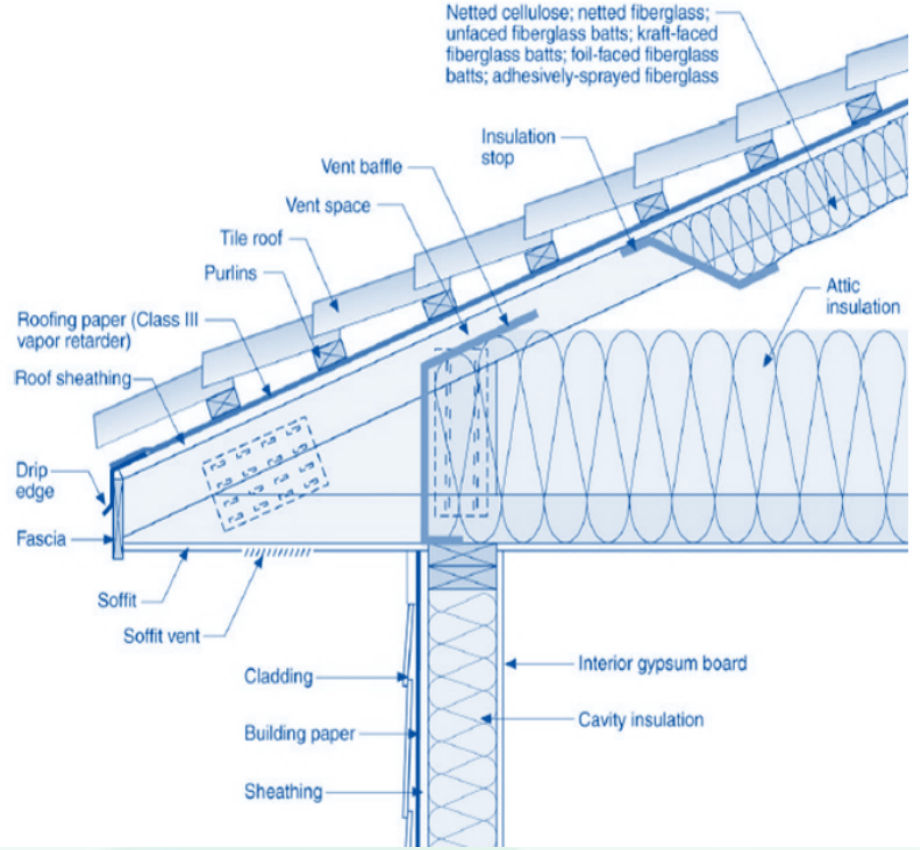
Insulation and Radiant Barrier Prescriptive Requirements

Residential § 150.1(c)1A, 2

Roof and ceiling insulation

Option B - Tables 150.1-A and 150.1-B

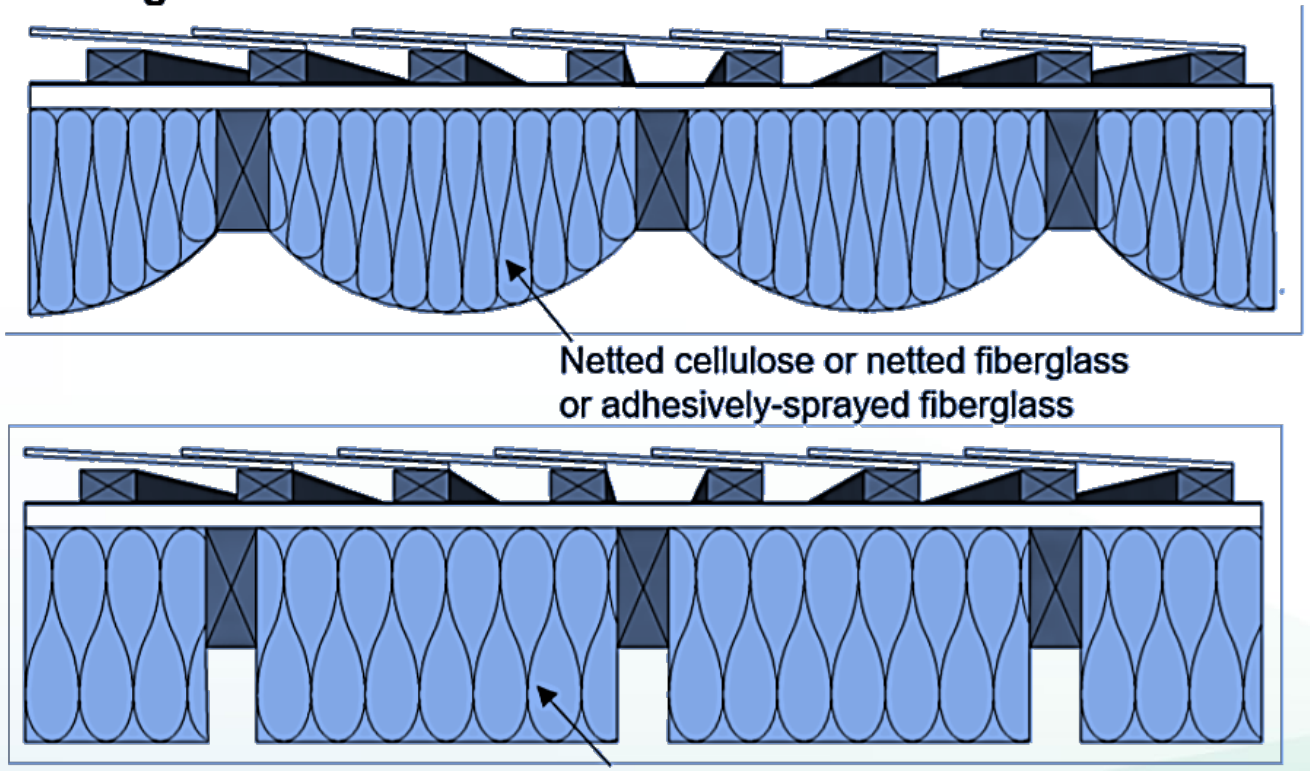
- Vented attic
- Below roof deck insulation
  - Single family R-19 in climate zones 4, 8-16
  - Multifamily R-19 in climate zones 4, 8, 9, 11-15
  - Multifamily R-13 in climate zones 10, 16
  - Roof assembly air space required
- Ceiling insulation R-30 or R-38 per Tables
- Radiant barrier in climate zones 2-3, 5-7
- Ducts insulated to R-6 or R-8 per Tables



Insulation and Radiant Barrier Prescriptive Requirements

Residential § 150.1(c)1A,2

Figure 3-25: Placement of Insulation Below the Roof Deck



Insulation and Radiant Barrier Prescriptive Requirements

Residential § 150.1(c)1A,2

Roof and ceiling insulation

Option C - Tables 150.1-A and 150.1-B

- Ducts located in conditioned space with R-6 insulation
- Meet 150.1(c)9B with HERS verification
- Ceiling insulation
  - R-38 in climate zones 1, 11-16
  - R-30 in climate zones 2-10
- Radiant barrier in climate zones 2-15

Insulation Prescriptive Requirements

Residential § 150.1(c)1C,D

R-value or assembly U-factors in Tables 150.1-A and 150.1-B

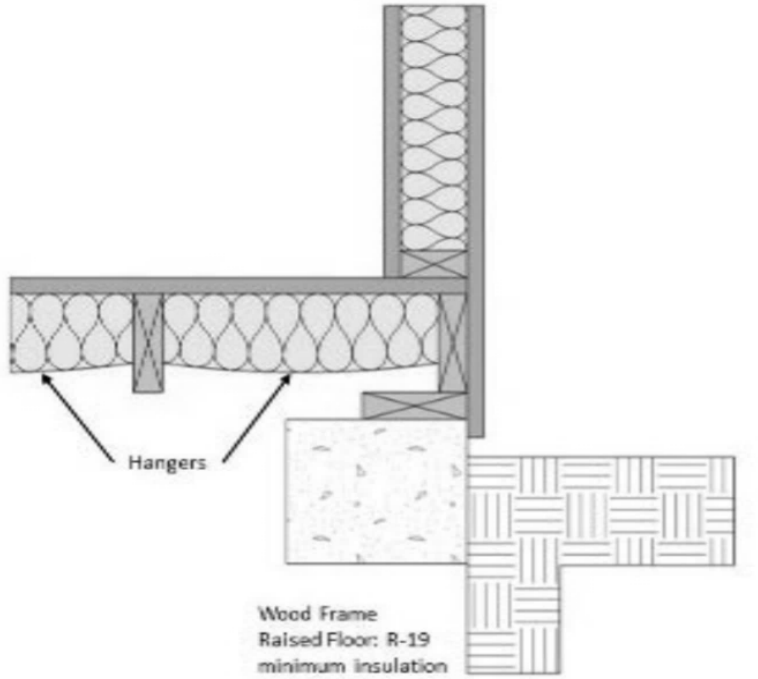
Raised floors

- Framed raised
  - Assembly U-factor 0.037
  - Minimum R-19 wood framed
- Concrete raised
  - Climate zones 1-2, 11, 13-14, 16 U-factor 0.092
  - Climate zones 3-10 U-factor 0.269
  - Climate zones 12, 15 U-factor 0.138

Slab perimeter

- Climate zone 16
  - Maximum assembly U-factor of 0.58
  - Minimum R-7 continuous insulation

Figure 3-30: Raised Floor Insulation



Insulation and Radiant Barrier Prescriptive Requirements

Table 150.1-A Single Family vs. Table 150.1-B Multifamily

				Climate Zone															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope Insulation	Roofs/Ceilings	Option B (§150.1(c)9A)	Below Roof Deck Insulation[1,2] (With Air Space)	NR	NR	NR	R 19	NR	NR	NR	R 19	R 19	R 19	R 19	R 19	R 19	R 19	R 19	R 19
			Ceiling Insulation	R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant Barrier	NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
		Option C (§150.1(c)9B)	Ceiling Insulation	R 38	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant Barrier	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR

Building Envelope Insulation	Roofs/Ceilings	Option B (§150.1(c)9A)	Below Roof Deck Insulation [1,2] (With Air Space)	NR	NR	NR	R19	NR	NR	NR	R19	R19	R13	R19	R19	R19	R19	R19	R13
			Ceiling Insulation	R 38	R 38	R 30	R 38	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant Barrier	NR	REQ	REQ	NR	REQ	REQ	REQ	NR	NR	NR	NR	NR	NR	NR	NR	NR
		Option C (§150.1(c)9B)	Ceiling Insulation	R38	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 30	R 38	R 38	R 38	R 38	R 38	R 38
			Radiant Barrier	NR	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	REQ	NR

Insulation Prescriptive Requirements

Table 150.1-A Single Family vs. Table 150.1-B Multifamily

				Climate Zone															
				1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Building Envelope Insulation	Walls	Above Grade	Framed[3]	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.065	U 0.065	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048	U 0.048
			Mass Wall Interior[4,5]	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.059 R 17
			Mass Wall Exterior[4,5]	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.077 R 13
		Below Grade	Below Grade Interior[6]	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.067 R 15
			Below Grade Exterior 8	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.100 R 10	U 0.100 R 10	U 0.053 R 19

Building Envelope Insulation	Walls	Above Grade	Framed [3]	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.065	U 0.065	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051	U 0.051
			Mass Wall Interior [4,5]	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.059 R 17
			Mass Wall Exterior [5]	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.125 R 8.0	U 0.077 R 13
		Below Grade	Below Grade Interior	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.077 R 13	U 0.067 R 15
			Below Grade Exterior	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.200 R 5.0	U 0.100 R 10	U 0.100 R 10	U 0.053 R 19

Insulation and QII Prescriptive Requirements

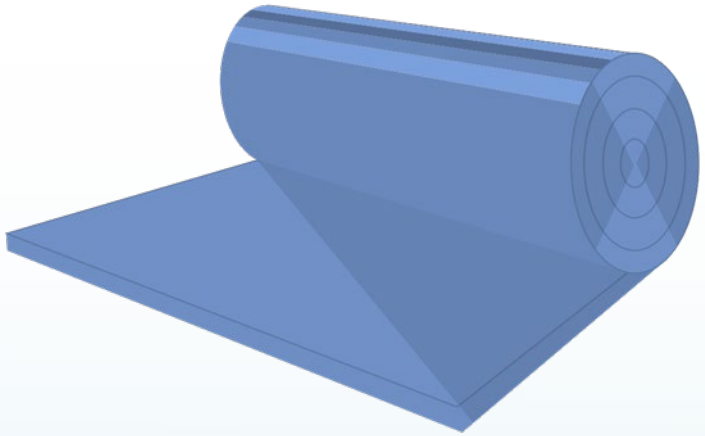
Table 150.1-A Single Family vs. Table 150.1-B Multifamily

			Climate Zone														
			1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**
Building Envelope	**Floors**	Slab Perimeter	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	U 0.58 R 7.0
		Raised	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19
		Concrete Raised	U 0.092 R 8.0	U 0.092 R 8.0	U 0.269 R 0	U 0.269 R 0	U0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0
	Quality Insulation Installation (QII)		Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Building Envelope	**Floors**	Slab Perimeter	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	NR	U 0.58 R 7.0
		Raised	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19	U 0.037 R 19
		Concrete Raised	U 0.092 R 8.0	U 0.092 R 8.0	U 0.269 R 0	U 0.269 R 0	U0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.269 R 0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0	U 0.092 R 8.0	U 0.138 R 4.0	U 0.092 R 8.0
	Quality Insulation Installation (QII)		Yes	Yes	Yes	Yes	Yes	Yes	NR	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Insulation Prescriptive Requirements

Additions § 150.2(a)1



All additions

- Existing siding not altered and wall extensions
  - R-21 in 2x6 wood-framed, no continuous
  - R-15 in 2x4 wood-framed, no continuous
  - QII exceptions
    - No insulated headers for existing doors and windows
    - No air sealing if existing air barrier not altered

Additions ≤ 700 square feet

- Ceiling insulation
  - R-38 in climate zones 1,11-16
  - R-30 in climate zones 2-10
  - Radiant barrier in climate zones 2-15
  - Exception: R-22 allowed in rafter roofs
- QII not required

Test Your Knowledge

Residential

Should insulation be installed against the radiant barrier?

No, radiant barriers need an airspace to work properly and provide maximum benefits.

- Tables 150.1-A, B only require radiant barrier when there is no insulation under the roof deck

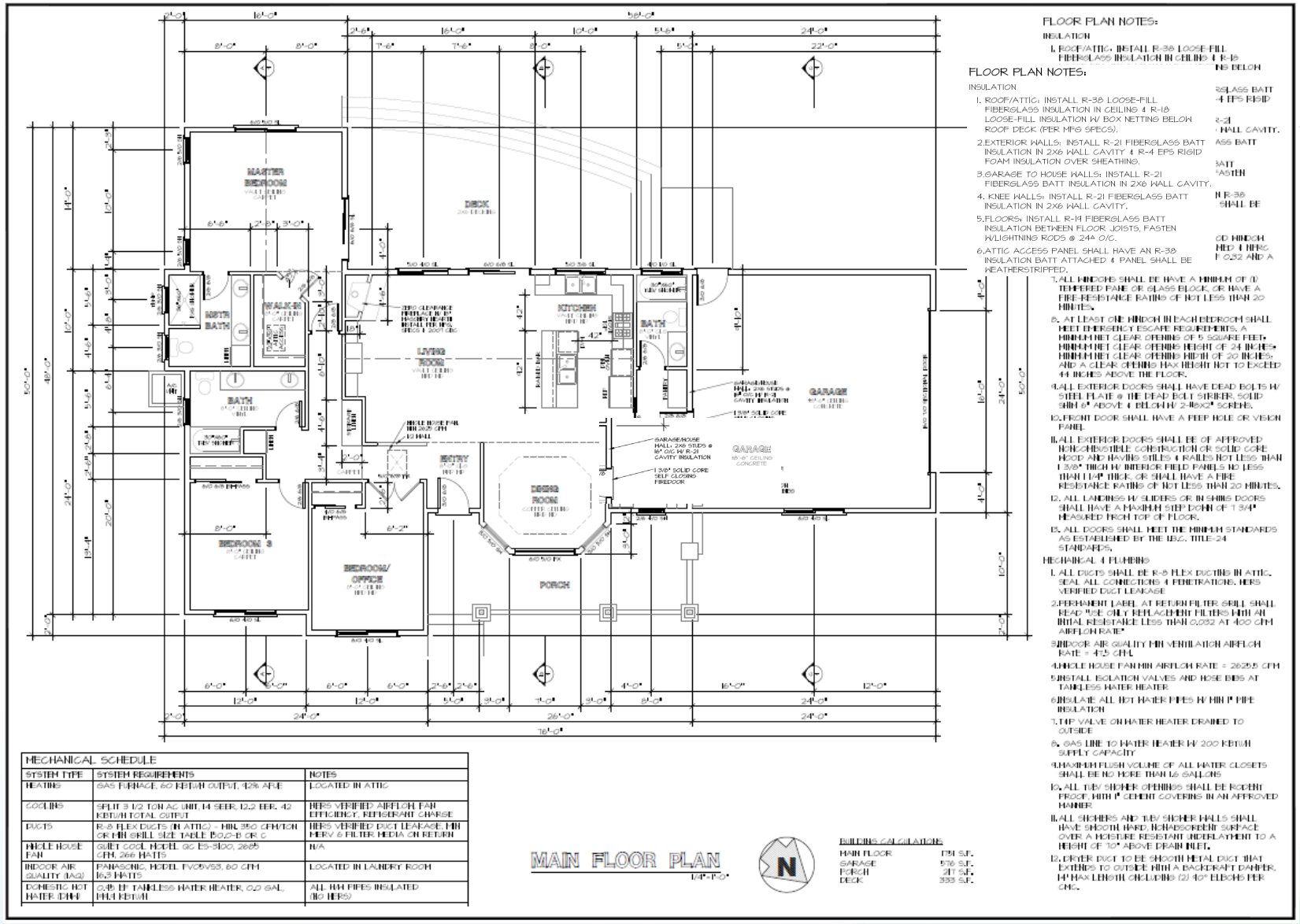
CF1R-PRF-01

SLAB FLOORS

01	02	03	04	05	06	07
Name	Zone	Area (ft2)	Perimeter (ft)	Edge Insul. R-value & Depth	Carpeted Fraction	Heated
Slab-on-Grade	__Garage__	576	72	None	0%	No

OPAQUE SURFACE CONSTRUCTIONS

01	02	03	04	05	06	07	08
Construction Name	**Surface Type**	**Construction Type**	**Framing**	**Total Cavity R-value**	**Interior / Exterior Continuous R-value**	**U-factor**	**Assembly Layers**
Garage Wall	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O. C.	No insulation	n/a	0.361	Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4 Exterior Finish: 3 Coat Stucco
Exterior Wall: R-21+R-4	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.051	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Sheathing / Insulation: R4 Sheathing Exterior Finish: 3 Coat Stucco
Demising Wall: R-21	Interior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.064	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Other Side Finish: Gypsum Board
Attic Garage Roof Cons	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O. C.	No insulation	n/a	0.644	Cavity / Frame: no insul. / 2x4 Top Chrd Roof Deck: Wood Siding/sheathing/decking Roofing: Light Roof (Asphalt Shingle)
Attic RoofHouse	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O. C.	R 18	n/a	0.055	Under Roof Joists: R-5.0 insul. Cavity / Frame: R-13.0 / 2x4 Top Chrd Roof Deck: Wood Siding/sheathing/decking Roofing: Light Roof (Asphalt Shingle)



FLOOR PLAN NOTES:

INSULATION

1. ROOF/ATTIC: INSTALL R-38 LOOSE-FILL FIBERGLASS INSULATION IN CEILING & R-18 LOOSE-FILL INSULATION W/ BOX NETTING BELOW ROOF DECK (PER MFG SPECS).
2. EXTERIOR WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY & R-4 EPS RIGID FOAM INSULATION OVER SHEATHING.
3. GARAGE TO HOUSE WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY.
4. KNEE WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY.
5. FLOORS: INSTALL R-19 FIBERGLASS BATT INSULATION BETWEEN FLOOR JOISTS, FASTEN W/LIGHTNING RODS @ 24" O/C.
6. ATTIC ACCESS PANEL SHALL HAVE AN R-38 INSULATION BATT ATTACHED & PANEL SHALL BE WEATHERSTRIPPED.

FLOOR PLAN NOTES:

INSULATION

1. ROOF/ATTIC: INSTALL R-38 LOOSE-FILL FIBERGLASS INSULATION IN CEILING & R-18 LOOSE-FILL INSULATION W/ BOX NETTING BELOW ROOF DECK (PER MFG SPECS).
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6. ATTIC ACCESS PANEL SHALL HAVE AN R-38 INSULATION BATT ATTACHED & PANEL SHALL BE WEATHERSTRIPPED.

7. ALL WINDOWS SHALL BE HAVE A MINIMUM OF (1) TEMPERED PANE OF GLASS BLOCK, OR HAVE A FIRE-RESISTANCE RATING OF NOT LESS THAN 20 MINUTES.
8. AT LEAST ONE WINDOW IN EACH BEDROOM SHALL MEET EMERGENCY ESCAPE REQUIREMENTS. A MINIMUM NET CLEAR OPENING OF 5 SQUARE FEET. MINIMUM NET CLEAR OPENING HEIGHT OF 24 INCHES. MINIMUM NET CLEAR OPENING WIDTH OF 20 INCHES. AND A CLEAR OPENING MAX HEIGHT NOT TO EXCEED 44 INCHES ABOVE THE FLOOR.
9. ALL EXTERIOR DOORS SHALL HAVE DEAD BOLTS W/ STEEL PLATE @ THE DEAD BOLT STRIKER, SOLID SHIM 6" ABOVE & BELOW W/ 2-#8X2" SCREWS.
10. FRONT DOOR SHALL HAVE A PEEP HOLE OR VISION PANEL
11. ALL EXTERIOR DOORS SHALL BE OF APPROVED NONCOMBUSTIBLE CONSTRUCTION OR SOLID CORE WOOD AND HAVING STILES & RAILS NOT LESS THAN 1 3/8" THICK W/ INTERIOR FIELD PANELS NO LESS THAN 1 1/4" THICK, OR SHALL HAVE A FIRE RESISTANCE RATING OF NOT LESS THAN 20 MINUTES.
12. ALL LANDINGS W/ SLIDERS OR IN SWING DOORS SHALL HAVE A MAXIMUM STEP DOWN OF 7 3/4" MEASURED FROM TOP OF FLOOR.
13. ALL DOORS SHALL MEET THE MINIMUM STANDARDS AS ESTABLISHED BY THE U.B.C. TITLE-24 STANDARDS.

MECHANICAL & PLUMBING

1. ALL DUCTS SHALL BE R-8 FLEX DUCTING IN ATTIC. SEAL ALL CONNECTIONS & PENETRATIONS. HERS VERIFIED DUCT LEAKAGE
2. PERMANENT LABEL AT RETURN FILTER GRILL SHALL READ "USE ONLY REPLACEMENT FILTERS WITH AN INITIAL RESISTANCE LESS THAN 0.032 AT 400 CFM AIRFLOW RATE"
3. INDOOR AIR QUALITY MIN VENTILATION AIRFLOW RATE = 47.5 CFM.
4. WHOLE HOUSE FAN MIN AIRFLOW RATE = 2825.5 CFM
5. INSTALL ISOLATION VALVES AND HOSE BIBS AT TANKLESS WATER HEATER
6. INSULATE ALL HOT WATER PIPES W/ MIN 1" PIPE INSULATION
7. T&P VALVE ON WATER HEATER DRAINED TO OUTSIDE
8. GAS LINE TO WATER HEATER W/ 200 KBTUH SUPPLY CAPACITY
9. MAXIMUM FLUSH VOLUME OF ALL WATER CLOSETS SHALL BE NO MORE THAN 1.6 GALLONS
10. ALL TUB/ SHOWER OPENINGS SHALL BE RODENT PROOF, WITH 1" CEMENT COVERING IN AN APPROVED MANNER
11. ALL SHOWERS AND TUB/ SHOWER WALLS SHALL HAVE SMOOTH, HARD, NONABSORBENT SURFACE OVER A MOISTURE RESISTANT UNDERLAYMENT TO A HEIGHT OF 70" ABOVE DRAIN INLET.
12. DRYER DUCT TO BE SMOOTH METAL DUCT THAT EXTENDS TO OUTSIDE WITH A BACKDRAFT DAMPER, 14' MAX LENGTH, INCLUDING (2) 90° ELBOWS PER CMC.

MECHANICAL SCHEDULE

SYSTEM TYPE	SYSTEM REQUIREMENTS	NOTES
HEATING	GAS FURNACE, 60 KBTUH OUTPUT, 92% AFUE	LOCATED IN ATTIC
COOLING	SPLIT 3 1/2 TON AC UNIT, 14 SEER, 12.2 EER, 42 KBTUH TOTAL OUTPUT	HERS VERIFIED AIRFLOW, FAN EFFICIENCY, REFRIGERANT CHARGE
DUCTS	R-8 FLEX DUCTS (IN ATTIC) - MIN 350 CFM/TON OR MIN GRILL SIZE TABLE 150.0-B OR C	HERS VERIFIED DUCT LEAKAGE; MIN MERV 6 FILTER MEDIA ON RETURN
WHOLE HOUSE FAN	QUIET COOL MODEL QC ES-3100, 2685 CFM, 266 WATTS	N/A
INDOOR AIR QUALITY (IAQ)	PANASONIC, MODEL FV05VS3, 80 CFM 16.5 WATTS	LOCATED IN LAUNDRY ROOM
DOMESTIC HOT WATER (DHW)	0.96 EF TANKLESS WATER HEATER, 0.0 GAL, 199.9 KBTUH	ALL DHW PIPES INSULATED (NO HERS)

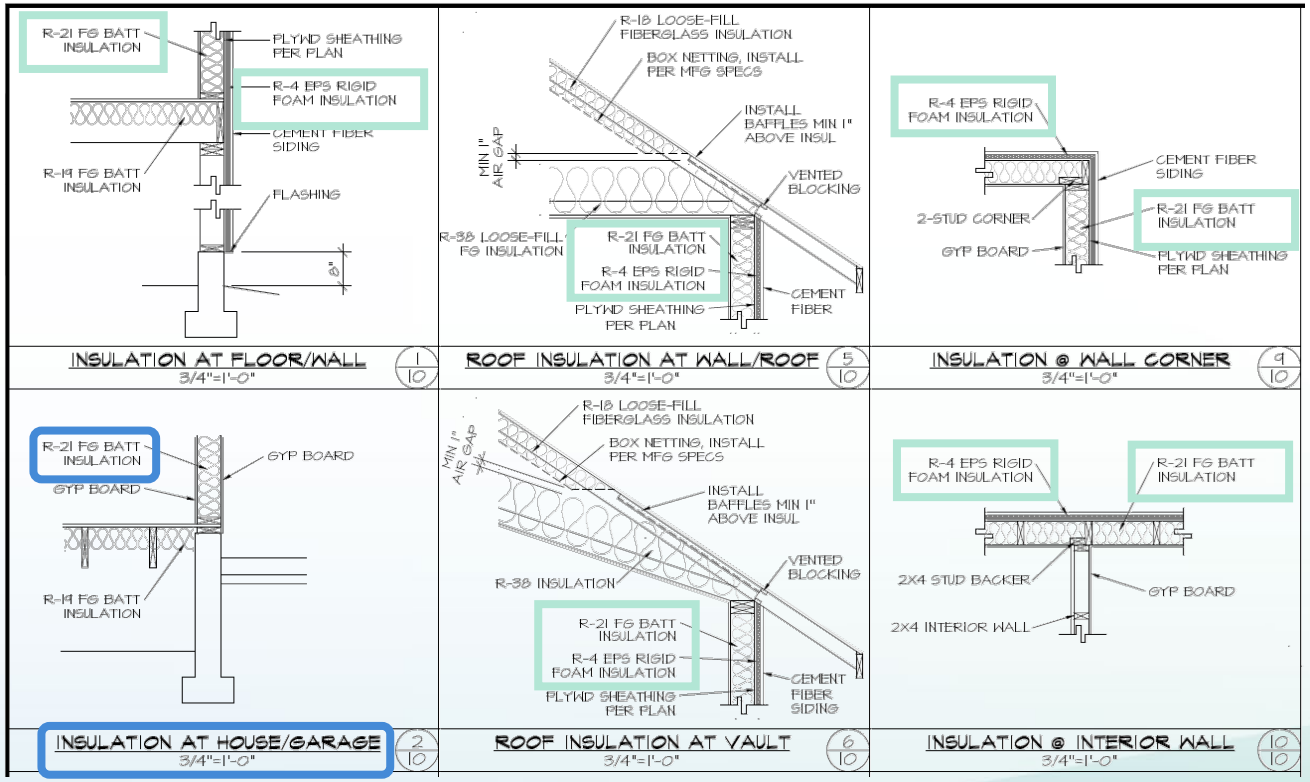
MAIN FLOOR PLAN

1/4"=1'-0"

BUILDING CALCULATIONS

MAIN FLOOR	1751 S.F.
GARAGE	576 S.F.
PORCH	217 S.F.
DECK	333 S.F.

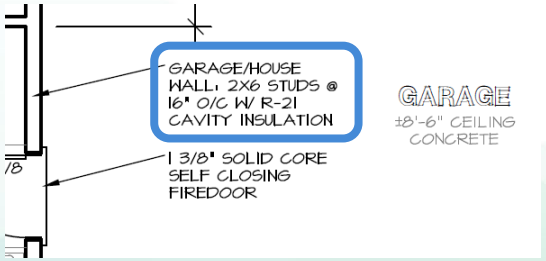
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
Garage Wall	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O. C.	No insulation	n/a	0.361	Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4 Exterior Finish: 3 Coat Stucco
Exterior Wall: R-21+R-4	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.051	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Sheathing / Insulation: R4 Sheathing Exterior Finish: 3 Coat Stucco
Demising Wall: R-21	Interior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.064	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Other Side Finish: Gypsum Board



FLOOR PLAN NOTES:

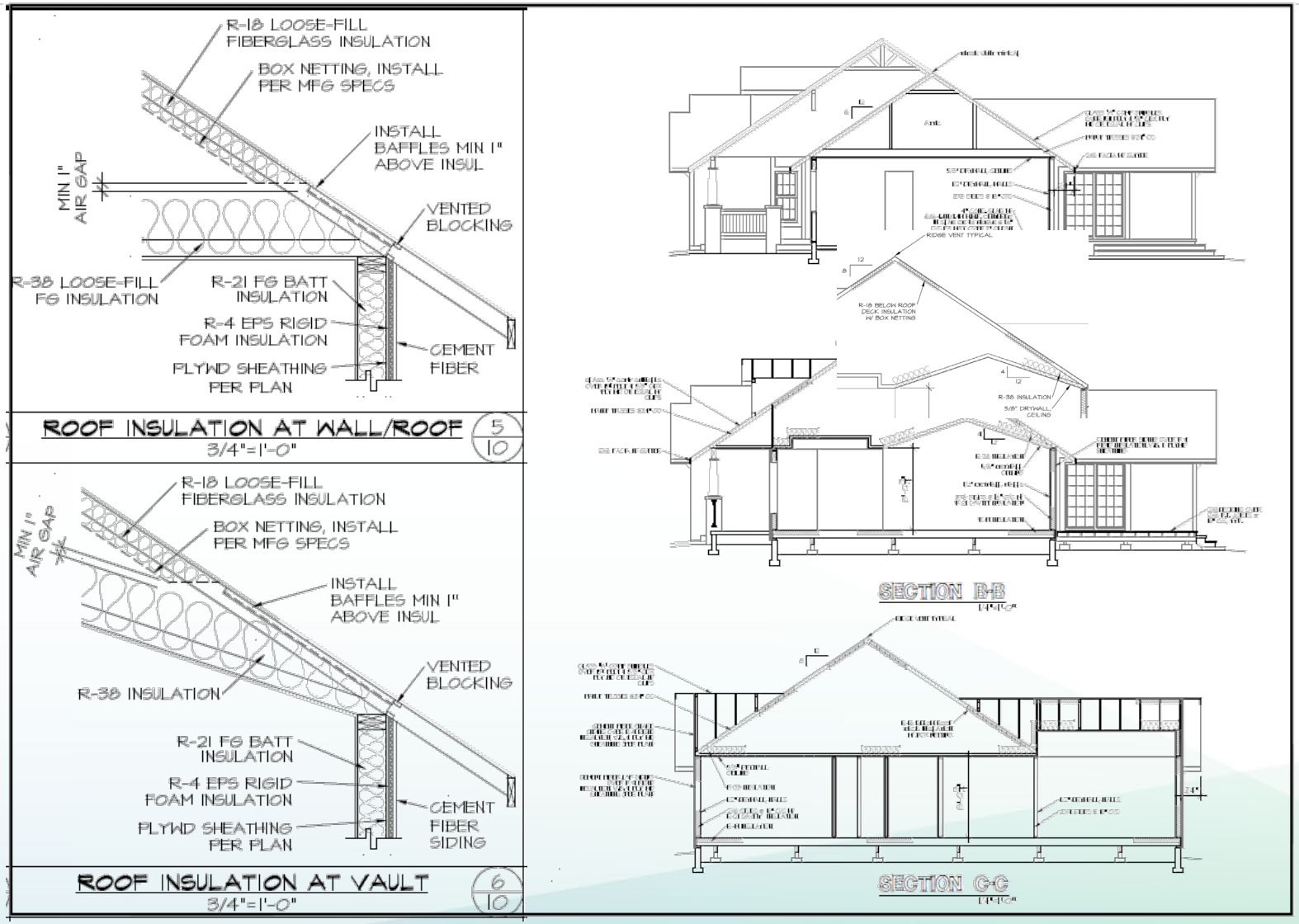
INSULATION

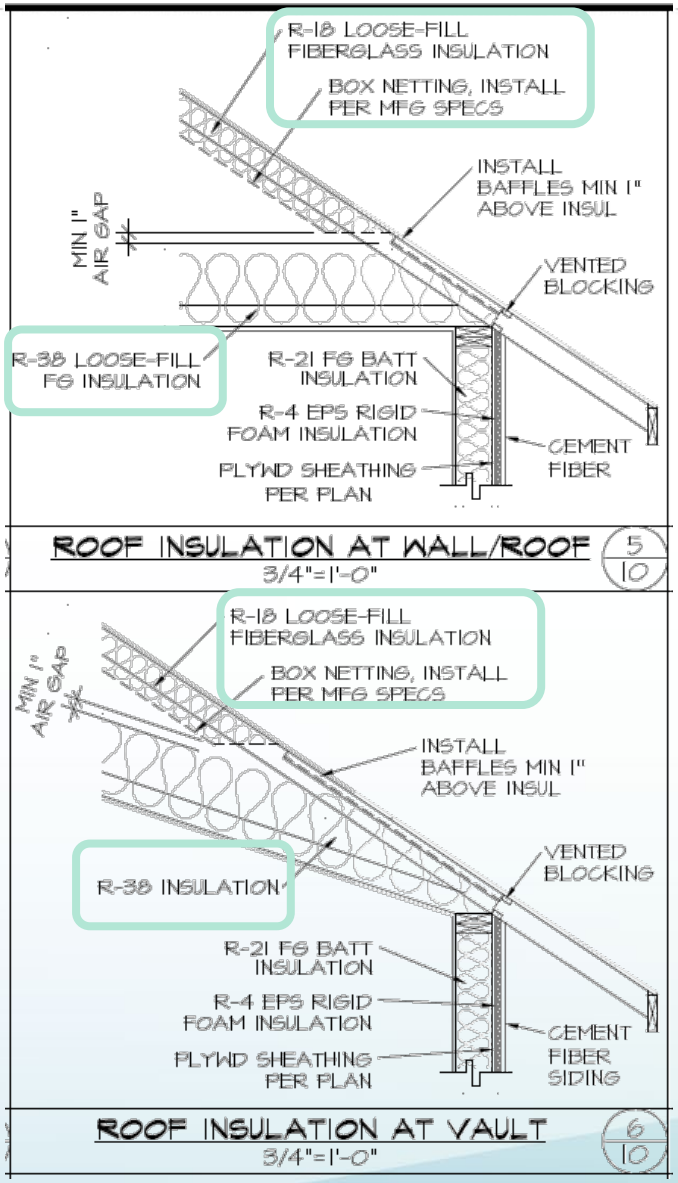
1. ROOF/ATTIC: INSTALL R-38 LOOSE-FILL FIBERGLASS INSULATION IN CEILING & R-18 LOOSE-FILL INSULATION W/ BOX NETTING BELOW ROOF DECK (PER MFG SPECS).
2. EXTERIOR WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY & R-4 EPS RIGID FOAM INSULATION OVER SHEATHING.
3. GARAGE TO HOUSE WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY.
4. KNEE WALLS: INSTALL R-21 FIBERGLASS BATT INSULATION IN 2X6 WALL CAVITY.
5. FLOORS: INSTALL R-19 FIBERGLASS BATT INSULATION BETWEEN FLOOR JOISTS, FASTEN W/LIGHTNING RODS @ 24^ O/C.
6. ATTIC ACCESS PANEL SHALL HAVE AN R-38 INSULATION BATT ATTACHED & PANEL SHALL BE WEATHERSTRIPPED.

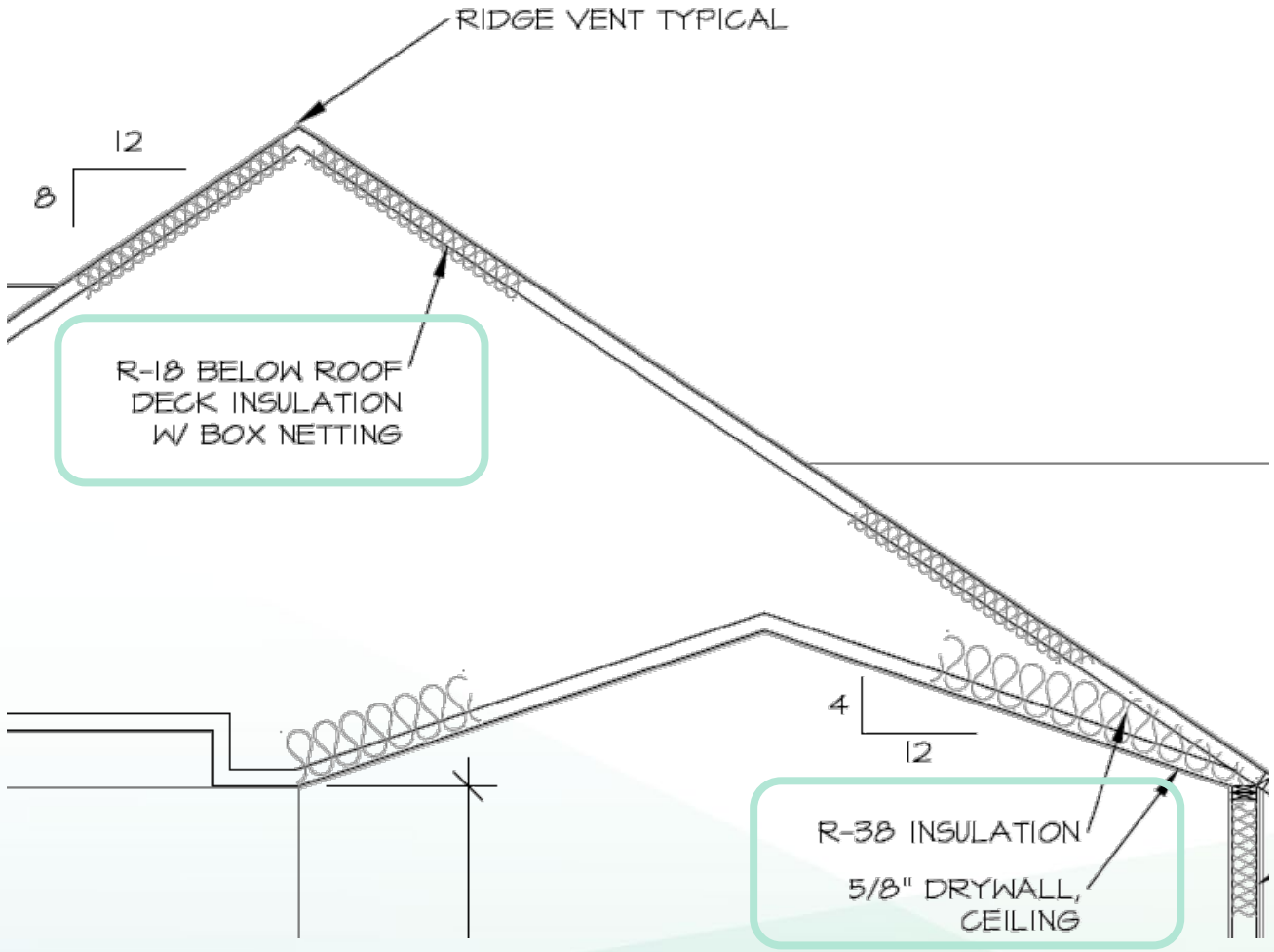


CF1R-PRF-01

OPAQUE SURFACE CONSTRUCTIONS							
01	02	03	04	05	06	07	08
Construction Name	Surface Type	Construction Type	Framing	Total Cavity R-value	Interior / Exterior Continuous R-value	U-factor	Assembly Layers
Garage Wall	Exterior Walls	Wood Framed Wall	2x4 @ 16 in. O. C.	No insulation	n/a	0.361	Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4 Exterior Finish: 3 Coat Stucco
Exterior Wall: R-21+R-4	Exterior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.051	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Sheathing / Insulation: R4 Sheathing Exterior Finish: 3 Coat Stucco
Demising Wall: R-21	Interior Walls	Wood Framed Wall	2x6 @ 16 in. O. C.	R-21	n/a	0.064	Inside Finish: Gypsum Board Cavity / Frame: R-21 / 2x6 Other Side Finish: Gypsum Board
Attic Garage Roof Cons	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O. C.	No insulation	n/a	0.644	Cavity / Frame: no insul. / 2x4 Top Chrd Roof Deck: Wood Siding/sheathing/decking Roofing: Light Roof (Asphalt Shingle)
Attic RoofHouse	Attic Roofs	Wood Framed Ceiling	2x4 Top Chord of Roof Truss @ 24 in. O. C.	R 18	n/a	0.055	Under Roof Joists: R-5.0 insul. Cavity / Frame: R-13.0 / 2x4 Top Chrd Roof Deck: Wood Siding/sheathing/decking Roofing: Light Roof (Asphalt Shingle)
R-19 Floor Crawlspace	Floors Over Crawlspace	Wood Framed Floor	2x6 @ 16 in. O. C.	R 18	n/a	0.05	Floor Surface: Carpeted Floor Deck: Wood Siding/sheathing/decking Cavity / Frame: R-19 in 5-1/2 in. (R-18) / 2x6
Garage Roof Attic	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 16 in. O. C.	No insulation	n/a	0.472	Inside Finish: Gypsum Board Cavity / Frame: no insul. / 2x4
High Performance	Ceilings (below attic)	Wood Framed Ceiling	2x4 @ 16 in. O. C.	R-38	n/a	0.025	Inside Finish: Gypsum Board Cavity / Frame: R-9.1 / 2x4 Over Ceiling Joists: R-28.9 insul.


R-18 LOOSE-FILL FIBERGLASS INSULATION
BOX NETTING, INSTALL PER MFG SPECS
INSTALL BAFFLES MIN 1" ABOVE INSUL
MIN 1" AIR GAP
VENTED BLOCKING
R-38 LOOSE-FILL FG INSULATION
R-21 FG BATT INSULATION
R-4 EPS RIGID FOAM INSULATION
CEMENT FIBER
PLYWD SHEATHING PER PLAN
ROOF INSULATION AT WALL/ROOF
3/4"=1'-0"
5
10
R-18 LOOSE-FILL FIBERGLASS INSULATION
BOX NETTING, INSTALL PER MFG SPECS
MIN 1" AIR GAP
INSTALL BAFFLES MIN 1" ABOVE INSUL
VENTED BLOCKING
R-38 INSULATION
R-21 FG BATT INSULATION
R-4 EPS RIGID FOAM INSULATION
CEMENT FIBER SIDING
PLYWD SHEATHING PER PLAN
ROOF INSULATION AT VAULT
3/4"=1'-0"
6
10
SECTION B-B
SECTION C-C


R-18 LOOSE-FILL FIBERGLASS INSULATION
BOX NETTING, INSTALL PER MFG SPECS
INSTALL BAFFLES MIN 1" ABOVE INSUL
MIN 1" AIR GAP
VENTED BLOCKING
R-38 LOOSE-FILL FG INSULATION
R-21 FG BATT INSULATION
R-4 EPS RIGID FOAM INSULATION
CEMENT FIBER
PLYWD SHEATHING PER PLAN
ROOF INSULATION AT WALL/ROOF
3/4"=1'-0"
5
10
R-18 LOOSE-FILL FIBERGLASS INSULATION
BOX NETTING, INSTALL PER MFG SPECS
MIN 1" AIR GAP
INSTALL BAFFLES MIN 1" ABOVE INSUL
R-38 INSULATION
VENTED BLOCKING
R-21 FG BATT INSULATION
R-4 EPS RIGID FOAM INSULATION
CEMENT FIBER SIDING
PLYWD SHEATHING PER PLAN
ROOF INSULATION AT VAULT
3/4"=1'-0"
6
10


RIDGE VENT TYPICAL
12
8
R-18 BELOW ROOF DECK INSULATION W/ BOX NETTING
4
12
R-38 INSULATION
5/8" DRYWALL, CEILING

Quality Insulation Installation Requirements

Residential

Prescriptive § 150.1(c)1E

Quality Insulation Installation

Residential

What is quality insulation installation (QII)?

- A certified HERS rater verifies the quality of installed insulation and exterior air barrier in order to ensure full U-factor of the assembly
- Without the HERS verification the assembly U-factor is de-rated by about 13% in the energy compliance calculations

Quality Insulation Installation Prescriptive Requirements

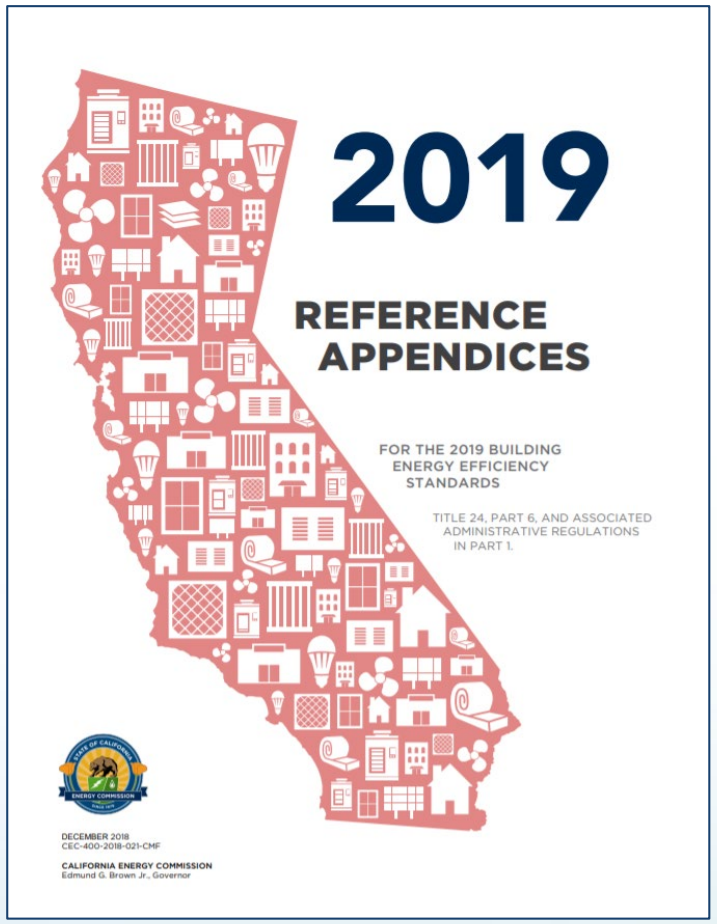
Residential § 150.1(c)1E

Quality insulation installation (QII)

- Requires HERS verification of installed insulation and exterior air barrier
- Meet criteria in Reference Residential Appendix RA3.5
- Not mandatory, but difficult to offset
- Modeling without can have 7-11% penalty
- Climate zone 7 not required for multifamily

Quality Insulation Installation

Residential RA3.5



QII Resources

- Reference Residential Appendix RA3.5
- Energy Code Ace – QII fact sheet
- CalCERTS - QII booklet
- Cheers - QII YouTube video
- Wise Warehouse – QII presentation (also in Spanish)
- NAIMA - 25 Checkpoints
- Manufacturers installation guides

CF1R-PRF-01

REQUIRED SPECIAL FEATURES

The following are features that must be installed as condition for meeting the modeled energy performance for this computer analysis.

- PV System: 2.68 kWdc
- Whole house fan
- Cool roof
- Insulation below roof deck
- Window overhangs and/or fins

HERS FEATURE SUMMARY

The following is a summary of the features that must be field-verified by a certified HERS Rater as a condition for meeting the modeled energy performance for this computer analysis. Additional detail is provided in the buildng tables below. Registered CF2Rs and CF3Rs are required to be completed in the HERS Registry

Building-level Verifications:
- Quality insulation installation (QII)
- IAQ mechanical ventilation
- Kitchen range hood
- Whole House Fan Airflow and Fan Efficacy

Cooling System Verifications:
- Minimum Airflow
- Verified EER
- Verified Refrigerant Charge
- Fan Efficacy Watts/CFM

Heating System Verifications:
- -- None --

HVAC Distribution System Verifications:
- Duct Sealing

Domestic Hot Water System Verifications:
- -- None --

BUILDING - FEATURES INFORMATION

01	02	03	04	05	06	07
Project Name	Conditioned Floor Area (ft^2)	Number of Dwelling Units	Number of Bedrooms	Number of Zones	Number of Ventilation Cooling Systems	Number of Water Heating Systems
Sample House	1751	1	3	1	1	1

Quality Insulation Installation

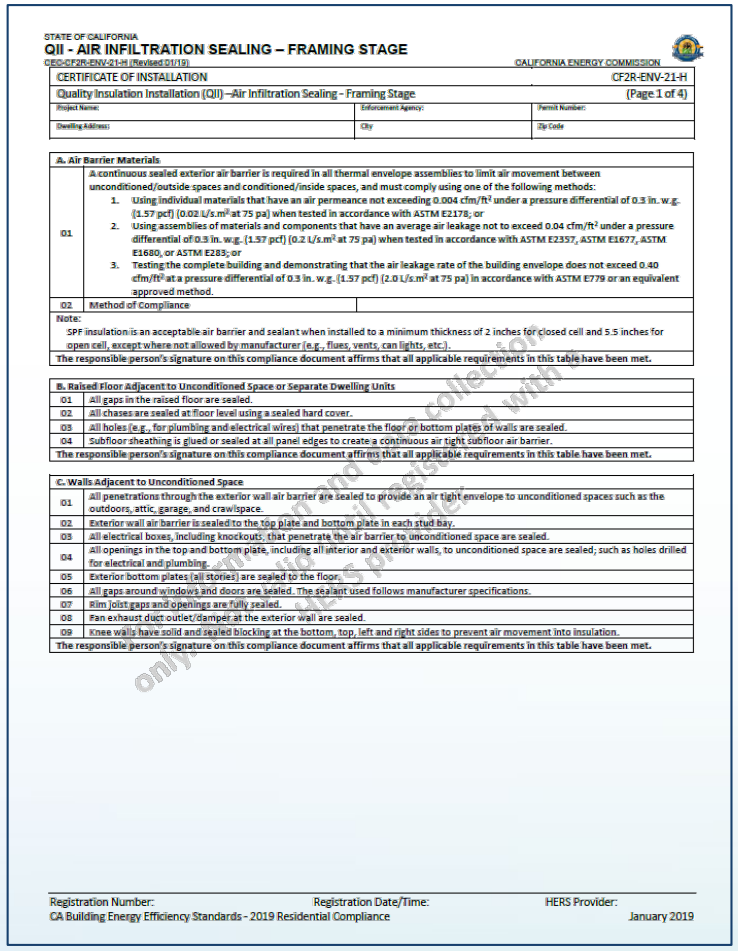
Residential

Design stage meeting

- QII Checklist
- Who is responsible for what
  - Framing
  - Electrical
  - Plumbing
  - HVAC
  - Insulation
- When will HERS rater verify different stages

Quality Insulation Installation HERS Requirements

Residential CF2R-ENV-21-H



STATE OF CALIFORNIA
QII - AIR INFILTRATION SEALING – FRAMING STAGE
CEC-CF2R-ENV-21-H (Revised 01/19) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF INSTALLATION CF2R-ENV-21-H
Quality Insulation Installation (QII) –Air Infiltration Sealing - Framing Stage (Page 1 of 4)

Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City	Zip Code

A. Air Barrier Materials		
01	A continuous sealed exterior air barrier is required in all thermal envelope assemblies to limit air movement between unconditioned/outside spaces and conditioned/inside spaces, and must comply using one of the following methods: 1. Using individual materials that have an air permeance not exceeding 0.004 cfm/ft² under a pressure differential of 0.3 in. w.g. (1.57 psf) (0.02 L/s.m² at 75 pa) when tested in accordance with ASTM E2178; or 2. Using assemblies of materials and components that have an average air leakage not to exceed 0.04 cfm/ft² under a pressure differential of 0.3 in. w.g. (1.57 psf) (0.2 L/s.m² at 75 pa) when tested in accordance with ASTM E2357, ASTM E1677, ASTM E1680, or ASTM E283; or 3. Testing the complete building and demonstrating that the air leakage rate of the building envelope does not exceed 0.40 cfm/ft² at a pressure differential of 0.3 in. w.g. (1.57 psf) (2.0 L/s.m² at 75 pa) in accordance with ASTM E779 or an equivalent approved method.	
02	Method of Compliance	
Note: SPF insulation is an acceptable air barrier and sealant when installed to a minimum thickness of 2 inches for closed cell and 5.5 inches for open cell, except where not allowed by manufacturer (e.g., flues, vents, can lights, etc.).		
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.		

B. Raised Floor Adjacent to Unconditioned Space or Separate Dwelling Units	
01	All gaps in the raised floor are sealed.
02	All chases are sealed at floor level using a sealed hard cover.
03	All holes (e.g., for plumbing and electrical wires) that penetrate the floor or bottom plates of walls are sealed.
04	Subfloor sheathing is glued or sealed at all panel edges to create a continuous air tight subfloor air barrier.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

C. Walls Adjacent to Unconditioned Space	
01	All penetrations through the exterior wall air barrier are sealed to provide an air tight envelope to unconditioned spaces such as the outdoors, attic, garage, and crawlspace.
02	Exterior wall air barrier is sealed to the top plate and bottom plate in each stud bay.
03	All electrical boxes, including knockouts, that penetrate the air barrier to unconditioned space are sealed.
04	All openings in the top and bottom plate, including all interior and exterior walls, to unconditioned space are sealed; such as holes drilled for electrical and plumbing.
05	Exterior bottom plates (all stories) are sealed to the floor.
06	All gaps around windows and doors are sealed. The sealant used follows manufacturer specifications.
07	Rim joist gaps and openings are fully sealed.
08	Fan exhaust duct outlet/damper at the exterior wall are sealed.
09	Knee walls have solid and sealed blocking at the bottom, top, left and right sides to prevent air movement into insulation.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

Registration Number: Registration Date/Time: HERS Provider:
CA Building Energy Efficiency Standards - 2019 Residential Compliance January 2019

QII Checklist – Framing Stage

A. Air barrier materials
B. Raised floor
C. Walls and knee walls
D. Ceiling air barrier
E. Roof air barrier – unvented attic
F. Conditioned space above or adjacent to garage
G. Cantilevered floor air barrier
H. Walls for attached porch, attic, double wall
I. Air barriers in multifamily dwellings
J. Special requirements for SIPs
K. Special requirements for ICF

A. Air Barrier Materials		
01	A continuous sealed exterior air barrier is required in all thermal envelope assemblies to limit air movement between unconditioned/outside spaces and conditioned/inside spaces, and must comply using one of the following methods: 1. Using individual materials that have an air permeance not exceeding 0.004 cfm/ft² under a pressure differential of 0.3 in. w.g. (1.57 pcf) (0.02 L/s.m² at 75 pa) when tested in accordance with ASTM E2178; or 2. Using assemblies of materials and components that have an average air leakage not to exceed 0.04 cfm/ft² under a pressure differential of 0.3 in. w.g. (1.57 pcf) (0.2 L/s.m² at 75 pa) when tested in accordance with ASTM E2357, ASTM E1677, ASTM E1680, or ASTM E283; or 3. Testing the complete building and demonstrating that the air leakage rate of the building envelope does not exceed 0.40 cfm/ft² at a pressure differential of 0.3 in. w.g. (1.57 pcf) (2.0 L/s.m² at 75 pa) in accordance with ASTM E779 or an equivalent approved method.	
02	Method of Compliance	
Note: SPF insulation is an acceptable air barrier and sealant when installed to a minimum thickness of 2 inches for closed cell and 5.5 inches for open cell, except where not allowed by manufacturer (e.g., flues, vents, can lights, etc.).		
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.		

B. Raised Floor Adjacent to Unconditioned Space or Separate Dwelling Units	
01	All gaps in the raised floor are sealed.
02	All chases are sealed at floor level using a sealed hard cover.
03	All holes (e.g., for plumbing and electrical wires) that penetrate the floor or bottom plates of walls are sealed.
04	Subfloor sheathing is glued or sealed at all panel edges to create a continuous air tight subfloor air barrier.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

C. Walls Adjacent to Unconditioned Space	
01	All penetrations through the exterior wall air barrier are sealed to provide an air tight envelope to unconditioned spaces such as the outdoors, attic, garage, and crawlspace.
02	Exterior wall air barrier is sealed to the top plate and bottom plate in each stud bay.
03	All electrical boxes, including knockouts, that penetrate the air barrier to unconditioned space are sealed.
04	All openings in the top and bottom plate, including all interior and exterior walls, to unconditioned space are sealed; such as holes drilled for electrical and plumbing.
05	Exterior bottom plates (all stories) are sealed to the floor.
06	All gaps around windows and doors are sealed. The sealant used follows manufacturer specifications.
07	Rim joist gaps and openings are fully sealed.
08	Fan exhaust duct outlet/damper at the exterior wall are sealed.
09	Knee walls have solid and sealed blocking at the bottom, top, left and right sides to prevent air movement into insulation.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

D. Ceiling Air Barrier Adjacent to Unconditioned Space	
01	There is a continuous air barrier at the ceiling level. All openings into walls, drops, chases or double walls are sealed.
02	All penetrations through the top plate of interior and exterior walls are sealed.
03	Fire sprinklers penetrating a ceiling air barrier shall be sealed to prevent air movement according to the manufacturer's instructions.
04	All fixtures cut into ceiling air barrier (e.g., HVAC registers, electrical boxes, fire alarm boxes, exhaust fan housing, and recessed lighting fixtures) are sealed to the surrounding dry wall. If it is not possible to seal the fixture directly, a secondary air barrier shall be created around the fixture.
05	All installed recessed lighting fixtures that penetrate the ceiling to unconditioned space are rated to be Insulation Contact and Airtight (IC and AT) which allow direct contact with insulation.
06	All dropped ceiling areas are covered with hard covers that are sealed to the framing, or else the bottom and sides of dropped ceiling areas are all insulated and sealed as ceilings and walls as required on the Certificate of Compliance.
07	All vertical chases (e.g., HVAC ducts and plumbing) and soffits are sealed at the ceiling level.
08	Chimneys and flues require sheet metal flashing at the ceiling level. The flashing shall be sealed to the chimney/flue with fire rated caulk. The flashing shall be sealed to the surrounding framing.
09	Framing locations where air may move down into the walls from the attic (e.g., double walls, pocket doors, architectural bump-outs, etc.) have a sealed hard cover to prevent air movement.
10	Attic access forms an airtight seal between the conditioned space and unconditioned space. Vertical attic access requires mechanical compression using screws or latches.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

E. Roof Air Barrier – Unvented Attics Adjacent to Unconditioned Space	
01	There is a continuous air barrier at the roof deck and gable ends.
02	Chimneys and flues require sheet metal flashing at the roof deck. The flashing is sealed to the chimney/flue with fire rated caulk. The flashing is sealed to the surrounding framing.
03	All penetrations in the roof deck and gable ends for plumbing, electrical, etc. are sealed.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

F. Conditioned Space Above or Adjacent to Garage Air Barrier	
01	All penetrations in the subfloor above the garage into conditioned space must follow the raised floor air barrier requirements.
02	Infiltration between the space above the garage and the subfloor is prevented by one of the following methods: • Seal all edges of the garage ceiling (typically drywall) at the perimeter of the garage to create a continuous air tight surface between the garage and adjacent conditioned envelope. Seal all plumbing, electrical, and mechanical penetrations between the garage and adjacent conditioned space. For an open-web truss, airtight blocking is added on all four sides of the garage perimeter. Insulation can be placed on the garage ceiling. • Seal the band joist above the wall at the garage to conditioned space transition. Seal all subfloor seams and penetrations between the garage and adjacent conditioned space. Insulation must be placed in contact with the subfloor below the conditioned space.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

G. Cantilevered Floor Air Barrier	
01	Airtight blocking is installed between joists where the wall rim joist would have been located in the absence of a cantilever.
02	Exterior sheathing is installed to the bottom of the cantilever so that there is a continuous air and weather barrier for the cantilever. The cantilevered joist must be insulated to the same R-value as would be required for the subfloor prior to closing.
03	Any gaps, cracks or penetrations in the air barrier of the cantilever are sealed. Recessed can lights in the cantilever are IC and AT and properly sealed to the sheathing.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

H. Walls for Attached Porch, Attic, Double Wall Air Barrier	
01	An exterior wall air barrier is required at the intersection of the porch and exterior wall when there is conditioned space on the other side. The exterior wall includes an air barrier where the attic attaches to the conditioned space.
02	Truss framing blocking is used at the top and bottom of each wall/roof section.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

I. Air Barriers in Multifamily Dwellings	
01	Each dwelling unit must be sealed to stop air movement between dwelling units. Treat adjacent dwelling units as unconditioned space for air sealing.
02	All penetrations through the floor and ceiling of each dwelling unit are sealed, including electric and gas utilities, water pipes, drain pipes, fire protection service pipes, and communication wiring.
03	Elevator penthouse, mechanical penthouse, stairwell doors, roof access hatches, and plumbing stacks that separate conditioned and unconditioned space are all sealed.
04	Vertical chases for garbage chutes, elevator shafts, HVAC ducting and plumbing shall be treated as unconditioned space for sealing.
05	Common hallways shall be treated as unconditioned space for sealing.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

J. Special Requirements for SIPs	
01	SIPs are considered an air barrier when properly sealed at top, bottom, sides and all penetrations.
02	Air barrier is continuous across all surfaces, including between SIPs and non-SIP sections.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

K. Special Requirements for ICF	
01	ICF sections are considered an air barrier when properly sealed at top, bottom, sides and all penetrations.
02	Air barrier is continuous across all surfaces, including between ICF and non-ICF sections.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Installation documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Documentation Author Company Name:	Date Signed:
Address:	CEA/HERS Certification Identification (If applicable):
City/State/Zip:	Phone:

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Installation is true and correct.
2. I am either: a) a responsible person eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation and attest to the declarations in this statement, or b) I am an authorized representative of the responsible person and attest to the declarations in this statement on the responsible person's behalf.
3. The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations and the installation conforms to the requirements given on the Certificate of Compliance, plans, and specifications approved by the enforcement agency.
4. I understand that a HERS rater will check the installation to verify compliance and if such checking determines the installation fails to comply, I am required to offer any necessary corrective action at no charge to the building owner.
5. I will ensure that a registered copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.

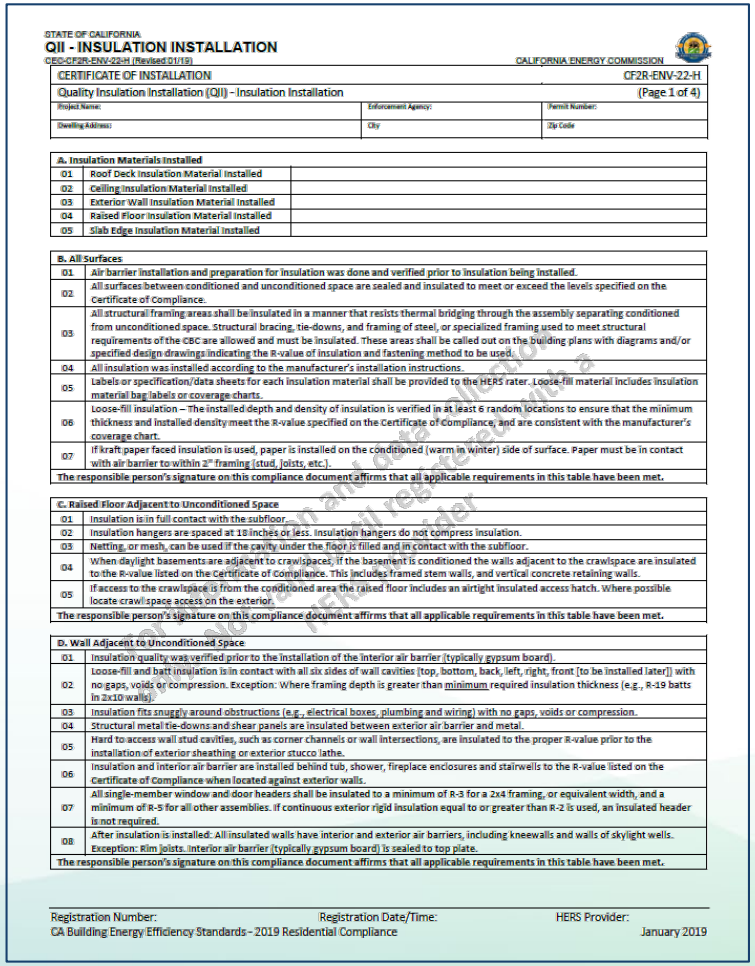
Responsible Builder/Installer Name:	Responsible Builder/Installer Signature:	
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner)	Position With Company (Title):	
Address:	CSLB License:	
City/State/Zip:	Phone	Date Signed:
Third Party Quality Control Program (TPQCP) Status:	Name of TPQCP (if applicable):	

Quality Insulation Installation HERS Requirements

Residential CF2R-ENV-22-H

QII Checklist – Insulation Stage

A. Insulation materials installed
B. All surfaces
C. Raised floor
D. Wall
E. Ceiling
F. Ceiling insulation in vented attics
G. Insulation in unvented attics
H. Insulation in vented attic
I. Skylights and knee walls
J. Floors above garages
K. Cantilevered floors
L. Attached porches
M. Spray foam insulation



STATE OF CALIFORNIA
QII - INSULATION INSTALLATION
CEC-CF2R-ENV-22-H (Revised 01/19) CALIFORNIA ENERGY COMMISSION

CERTIFICATE OF INSTALLATION CF2R-ENV-22-H
Quality Insulation Installation (QII) - Insulation Installation (Page 1 of 4)

Project Name:	Enforcement Agency:	Permit Number:
Dwelling Address:	City	Zip Code

A. Insulation Materials Installed		
01	Roof Deck Insulation Material Installed	
02	Ceiling Insulation Material Installed	
03	Exterior Wall Insulation Material Installed	
04	Raised Floor Insulation Material Installed	
05	Slab Edge Insulation Material Installed	

B. All Surfaces	
01	Air barrier installation and preparation for insulation was done and verified prior to insulation being installed.
02	All surfaces between conditioned and unconditioned space are sealed and insulated to meet or exceed the levels specified on the Certificate of Compliance.
03	All structural framing areas shall be insulated in a manner that resists thermal bridging through the assembly separating conditioned from unconditioned space. Structural bracing, tie-downs, and framing of steel, or specialized framing used to meet structural requirements of the CBC are allowed and must be insulated. These areas shall be called out on the building plans with diagrams and/or specified design drawings indicating the R-value of insulation and fastening method to be used.
04	All insulation was installed according to the manufacturer's installation instructions.
05	Labels or specification/data sheets for each insulation material shall be provided to the HERS rater. Loose-fill material includes insulation material bag labels or coverage charts.
06	Loose-fill insulation – The installed depth and density of insulation is verified in at least 6 random locations to ensure that the minimum thickness and installed density meet the R-value specified on the Certificate of Compliance, and are consistent with the manufacturer's coverage chart.
07	If kraft paper faced insulation is used, paper is installed on the conditioned (warm in winter) side of surface. Paper must be in contact with air barrier to within 2" framing (stud, joists, etc.).
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

C. Raised Floor Adjacent to Unconditioned Space	
01	Insulation is in full contact with the subfloor.
02	Insulation hangers are spaced at 18 inches or less. Insulation hangers do not compress insulation.
03	Netting, or mesh, can be used if the cavity under the floor is filled and in contact with the subfloor.
04	When daylight basements are adjacent to crawlspaces, if the basement is conditioned the walls adjacent to the crawlspace are insulated to the R-value listed on the Certificate of Compliance. This includes framed stem walls, and vertical concrete retaining walls.
05	If access to the crawlspace is from the conditioned area the raised floor includes an airtight insulated access hatch. Where possible locate crawl space access on the exterior.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

D. Wall Adjacent to Unconditioned Space	
01	Insulation quality was verified prior to the installation of the interior air barrier (typically gypsum board).
02	Loose-fill and batt insulation is in contact with all six sides of wall cavities (top, bottom, back, left, right, front [to be installed later]) with no gaps, voids or compression. Exception: Where framing depth is greater than minimum required insulation thickness (e.g., R-19 batts in 2x10 walls).
03	Insulation fits snuggly around obstructions (e.g., electrical boxes, plumbing and wiring) with no gaps, voids or compression.
04	Structural metal tie-downs and shear panels are insulated between exterior air barrier and metal.
05	Hard to access wall stud cavities, such as corner channels or wall intersections, are insulated to the proper R-value prior to the installation of exterior sheathing or exterior stucco lathe.
06	Insulation and interior air barrier are installed behind tub, shower, fireplace enclosures and stairwells to the R-value listed on the Certificate of Compliance when located against exterior walls.
07	All single-member window and door headers shall be insulated to a minimum of R-3 for a 2x4 framing, or equivalent width, and a minimum of R-5 for all other assemblies. If continuous exterior rigid insulation equal to or greater than R-2 is used, an insulated header is not required.
08	After insulation is installed: All insulated walls have interior and exterior air barriers, including kneewalls and walls of skylight wells. Exception: Rim joists. Interior air barrier (typically gypsum board) is sealed to top plate.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

Registration Number: Registration Date/Time: HERS Provider:
CA Building Energy Efficiency Standards - 2019 Residential Compliance January 2019

A. Insulation Materials Installed		
01	Roof Deck Insulation Material Installed	
02	Ceiling Insulation Material Installed	
03	Exterior Wall Insulation Material Installed	
04	Raised Floor Insulation Material Installed	
05	Slab Edge Insulation Material Installed	

B. All Surfaces	
01	Air barrier installation and preparation for insulation was done and verified prior to insulation being installed.
02	All surfaces between conditioned and unconditioned space are sealed and insulated to meet or exceed the levels specified on the Certificate of Compliance.
03	All structural framing areas shall be insulated in a manner that resists thermal bridging through the assembly separating conditioned from unconditioned space. Structural bracing, tie-downs, and framing of steel, or specialized framing used to meet structural requirements of the CBC are allowed and must be insulated. These areas shall be called out on the building plans with diagrams and/or specified design drawings indicating the R-value of insulation and fastening method to be used.
04	All insulation was installed according to the manufacturer's installation instructions.
05	Labels or specification/data sheets for each insulation material shall be provided to the HERS rater. Loose-fill material includes insulation material bag labels or coverage charts.
06	Loose-fill insulation – The installed depth and density of insulation is verified in at least 6 random locations to ensure that the minimum thickness and installed density meet the R-value specified on the Certificate of Compliance and are consistent with the manufacturer's coverage chart.
07	If kraft paper faced insulation is used, paper is installed on the conditioned (warm in winter) side of surface. Paper must be in contact with air barrier to within 2" framing (stud, joists, etc.).
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

C. Raised Floor Adjacent to Unconditioned Space	
01	Insulation is in full contact with the subfloor.
02	Insulation hangers are spaced at 18 inches or less. Insulation hangers do not compress insulation.
03	Netting, or mesh, can be used if the cavity under the floor is filled and in contact with the subfloor.
04	When daylight basements are adjacent to crawlspaces, if the basement is conditioned the walls adjacent to the crawlspace are insulated to the R-value listed on the Certificate of Compliance. This includes framed stem walls, and vertical concrete retaining walls.
05	If access to the crawlspace is from the conditioned area the raised floor includes an airtight insulated access hatch. Where possible locate crawl space access on the exterior.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

D. Wall Adjacent to Unconditioned Space	
01	Insulation quality was verified prior to the installation of the interior air barrier (typically gypsum board).
02	Loose-fill and batt insulation is in contact with all six sides of wall cavities (top, bottom, back, left, right, front [to be installed later]) with no gaps, voids or compression. Exception: Where framing depth is greater than minimum required insulation thickness (e.g., R-19 batts in 2x10 walls).
03	Insulation fits snuggly around obstructions (e.g., electrical boxes, plumbing and wiring) with no gaps, voids or compression.
04	Structural metal tie-downs and shear panels are insulated between exterior air barrier and metal.
05	Hard to access wall stud cavities, such as corner channels or wall intersections, are insulated to the proper R-value prior to the installation of exterior sheathing or exterior stucco lathe.
06	Insulation and interior air barrier are installed behind tub, shower, fireplace enclosures and stairwells to the R-value listed on the Certificate of Compliance when located against exterior walls.
07	All single-member window and door headers shall be insulated to a minimum of R-3 for a 2x4 framing, or equivalent width, and a minimum of R-5 for all other assemblies. If continuous exterior rigid insulation equal to or greater than R-2 is used, an insulated header is not required.
08	After insulation is installed: All insulated walls have interior and exterior air barriers, including kneewalls and walls of skylight wells. Exception: Rim joists. Interior air barrier (typically gypsum board) is sealed to top plate.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

E. Ceiling Adjacent to Unconditioned Space	
01	Insulation extends to the outside surface of the exterior wall.
02	Insulation is in direct contact with the ceiling air barrier so there are no gaps, voids or compression.
03	Chimneys and flues (except zero clearance) have a sheet metal collar at the ceiling level to prevent contact with the insulation. The collar is at least as tall as the depth of the insulation. There is a minimum 1" clearance between the collar and the chimney/flue for double wall vent, and 6" for single wall vent, unless manufacturer's instructions require otherwise. The collar is sealed to the ceiling with high temperature sealant to prevent air leakage. The insulation is in contact with the sheet metal collar.
04	Recessed can lights penetrating the ceiling air barrier are covered with insulation to the depth needed to meet the ceiling R-value specified on the Certificate of Compliance.
05	External surfaces of steel studs, steel-framed kneewalls, skylight shafts, and gable ends are covered with insulation.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

F. Ceiling Insulation in Vented Attics	
01	Required eave ventilation shall not be obstructed. The net-free ventilation area of the eave vent is maintained.
02	Eave vent baffles and dams are installed to prevent air movement under or into the ceiling insulation.
03	Attic access is insulated to the same R-value required by the Certificate of Compliance for ceiling insulation and the insulation is permanently attached using adhesive or mechanical fasteners.
04	Attic access must have a dam around the access to at least the same depth as the insulation.
05	Attic rulers specified to the installed loose-fill material (brand and type) are installed and evenly distributed throughout the attic to verify depth (one ruler for every 250 ft^2). The rulers are clearly readable and scaled to read inches of insulation and the R-value installed.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

G. Insulation in Unvented Attics	
01	The roof sheathing is the air barrier and is sealed to prevent air movement to the outside.
02	Insulation is in full contact with the air barrier (roof sheathing).
03	If insulated using air permeable insulation, gable end walls are sealed and insulated the same as exterior walls, including interior air barrier.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

H. Insulation in Vented Attics (High Performance Vented Attics)	
01	Insulation is in full contact with roof sheathing and firmly supported to prevent sagging.
02	Batt insulation between roof trusses is acceptable with minimal gaps and voids caused by roof truss members.
03	Insulation is not required on gable end walls.
04	Required roof deck insulation over any conditioned space, or HVAC ducts, is installed on the entire attic roof deck; even over unconditioned spaces (e.g., garage, covered porch). Roof deck of attic over unconditioned space without HVAC ducts and separated from other attics by a sealed air barrier do not need to be insulated.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

I. Special Requirements for Skylight Shafts and Attic Knee Walls	
01	Insulation must meet all the requirements for walls and insulation is in contact with the air barrier on all six sides unless SPF is used.
02	Insulation shall be in full contact with the interior wall finish. Batt insulation must be cut to fit around 2x4's that are laid flat.
03	Skylight shafts and attic knee walls shall be completely enclosed by vertical and horizontal framing, including horizontal plates at the top and bottom of the insulation.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

J. Special Requirements for Floors Above Garages	
01	If the air barrier is at the perimeter of the garage below the conditioned subfloor, then the insulation may be placed on the garage ceiling. The perimeter of the subfloor must also be insulated.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

K. Special Requirements for Cantilevered Floors	
01	Sealed blocking shall be installed between joists where the wall rim joist would have been located in the absence of a cantilever. Insulation shall be placed on both sides of the block.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

L. Special Requirements for Attached Porches	
01	Exterior wall at the intersection of the porch roof is fully insulated above, below and behind the roof line.
02	Where truss framing is used, airtight blocking is used at the top and bottom of each wall/roof section and is insulated.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

M. Special Requirements for SPF Insulation	
01	Installed product meets the claimed R-value per inch. Non-standard values are supported by an ICC Evaluation Service Report (ESR) number (e.g., ESR-xxxx) and documented on the CF2R-ENV-03. Non-standard values are anything greater than R-5.8/inch for closed cell and R-3.6/inch for open cell.
02	Installed thickness meets the required R-value from the Certificate of Compliance. Verified in at least 6 random places for each surface type: floors, walls, and ceilings.
03	Insulation is spray applied to fully adhere to structural assembly framing, floor and ceiling joists, and other framing surfaces within the construction cavity.
04	If multiple layers are applied, each foam lift (e.g., spray application) adheres to the substrate and foam interfaces.
05	Closed cell SPF: In areas where an air barrier is required the foam is at least 2" thick.
06	Open cell SPF: In areas where an air barrier is required the foam is at least 5.5" thick.
07	Open cell SPF: Depressions in the foam insulation surface are not greater than 1/2" of the required thickness provided these depressions do not exceed 10% of the surface area being insulated.
08	Open cell SPF: Insulation completely fills cavities of 2x4 framing.
09	SPF insulation is not applied directly to recessed lighting fixtures unless specifically allowed by manufacturer's instructions. When not allowed, can lights are: A. Covered with a minimum of 1.5" of mineral fiber insulation; or B. Enclosed in a manufacturer's approved box fabricated from an approved material, such as 18 gauge sheet metal or ½" gypsum board.
The responsible person's signature on this compliance document affirms that all applicable requirements in this table have been met.	

DOCUMENTATION AUTHOR'S DECLARATION STATEMENT	
1. I certify that this Certificate of Installation documentation is accurate and complete.	
Documentation Author Name:	Documentation Author Signature:
Documentation Author Company Name:	Date Signed:
Address:	CEA/HERS Certification Identification (If applicable):
City/State/Zip:	Phone:

RESPONSIBLE PERSON'S DECLARATION STATEMENT

I certify the following under penalty of perjury, under the laws of the State of California:

1. The information provided on this Certificate of Installation is true and correct.
2. I am either: a) a responsible person eligible under Division 3 of the Business and Professions Code in the applicable classification to accept responsibility for the system design, construction, or installation of features, materials, components, or manufactured devices for the scope of work identified on this Certificate of Installation and attest to the declarations in this statement, or b) I am an authorized representative of the responsible person and attest to the declarations in this statement on the responsible person's behalf.
3. The constructed or installed features, materials, components or manufactured devices (the installation) identified on this Certificate of Installation conforms to all applicable codes and regulations and the installation conforms to the requirements given on the Certificate of Compliance, plans, and specifications approved by the enforcement agency.
4. I understand that a HERS rater will check the installation to verify compliance and if such checking determines the installation fails to comply, I am required to offer any necessary corrective action at no charge to the building owner.
5. I will ensure that a registered copy of this Certificate of Installation shall be posted, or made available with the building permit(s) issued for the building, and made available to the enforcement agency for all applicable inspections. I understand that a registered copy of this Certificate of Installation is required to be included with the documentation the builder provides to the building owner at occupancy.

Responsible Builder/Installer Name:	Responsible Builder/Installer Signature:	
Company Name: (Installing Subcontractor or General Contractor or Builder/Owner)	Position With Company (Title):	
Address:	CSLB License:	
City/State/Zip:	Phone	Date Signed:
Third Party Quality Control Program (TPQCP) Status:	Name of TPQCP (if applicable):	

Quality Insulation Installation HERS Requirements

Residential RA3.5

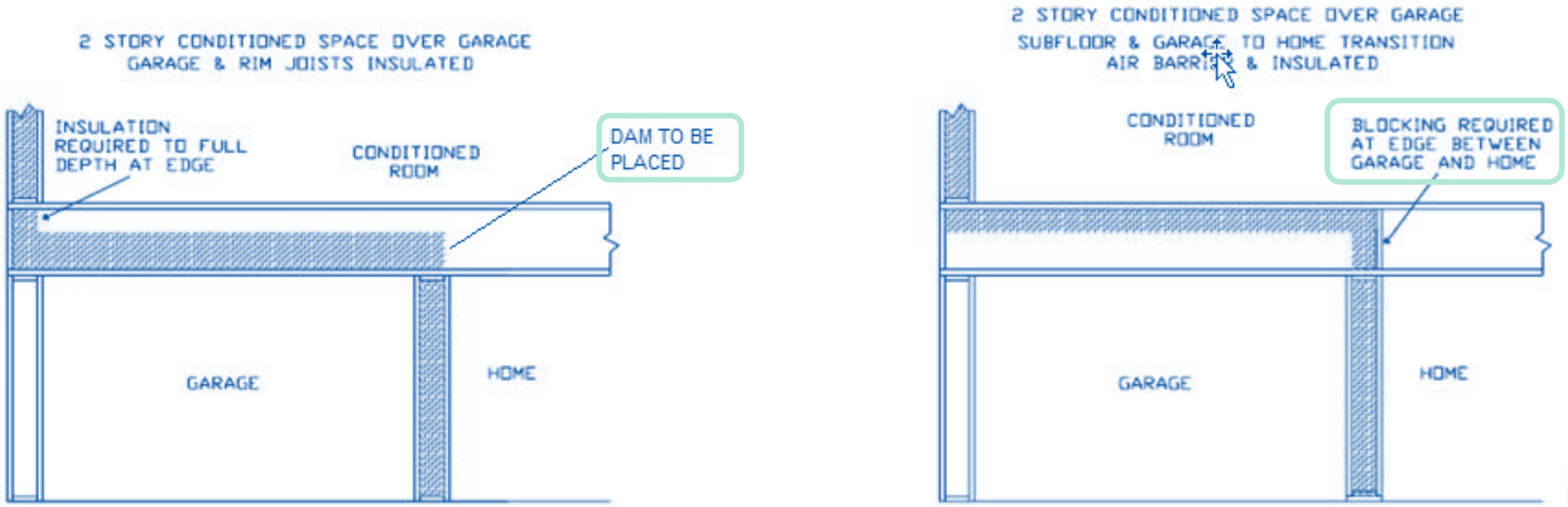


Figure RA3.5-1 Homes with Conditioned Space Over Garage – Batt and Blanket Insulation

Quality Insulation Installation HERS Requirements

Residential RA3.5

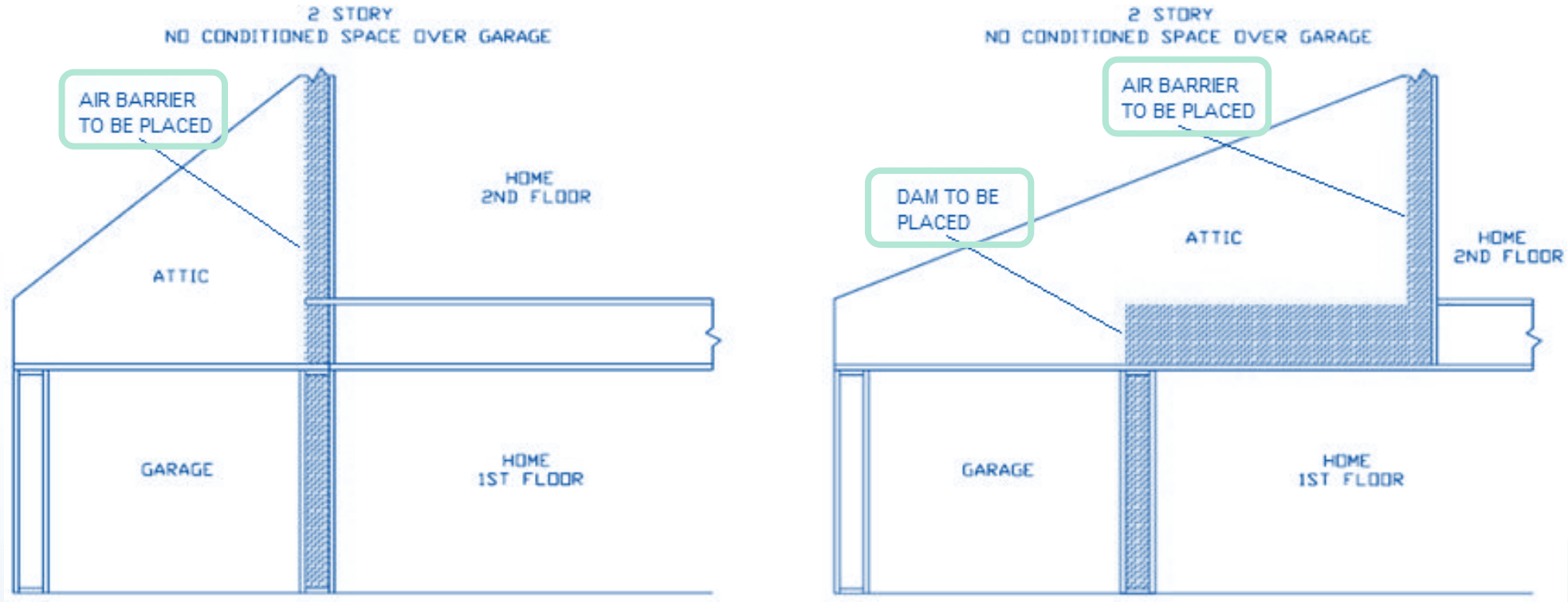
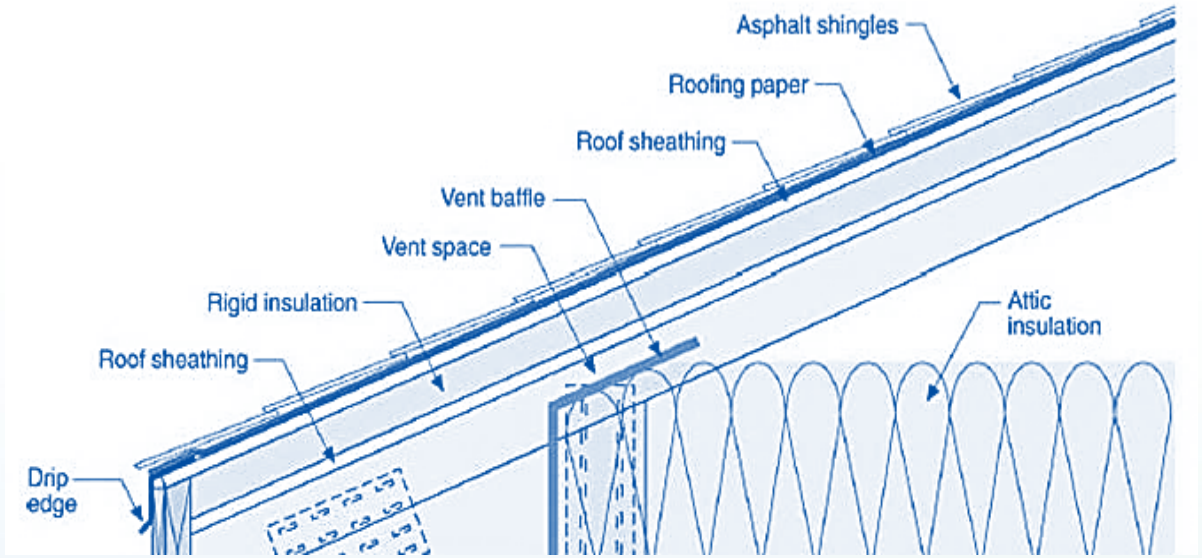
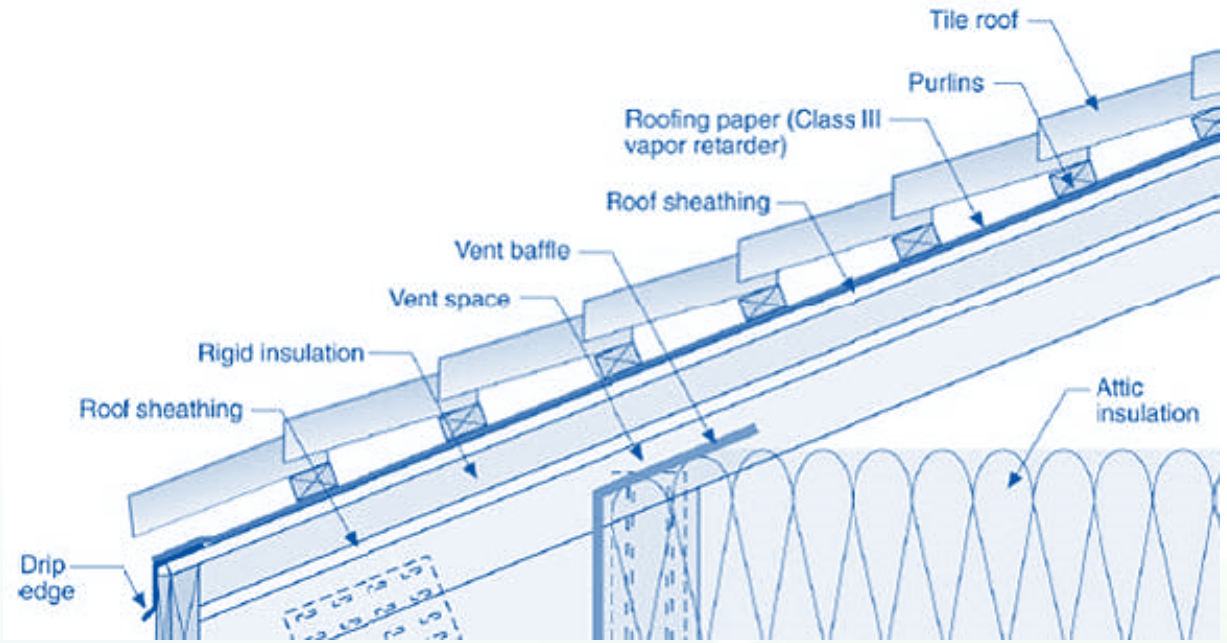


Figure RA3.5-2 Homes with No Conditioned Space Over Garage – Batt and Blanket Insulation

Quality Insulation Installation HERS Requirements

Residential Compliance Manual





Quality Insulation Installation HERS Requirements

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Figure 3-44: Standard Truss vs. Raised Heel Energy Truss

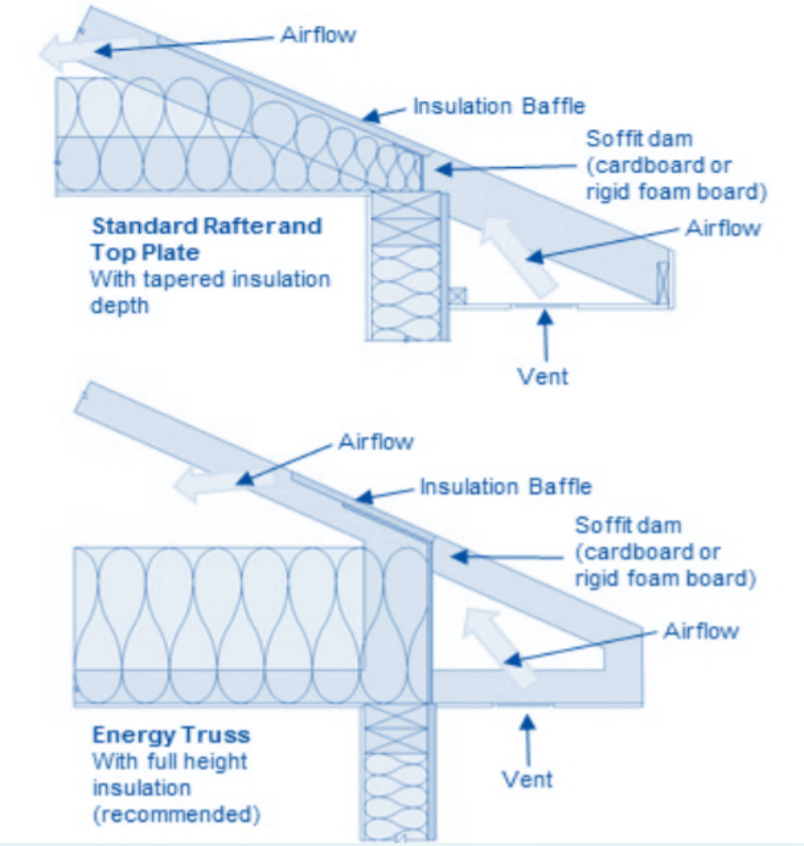
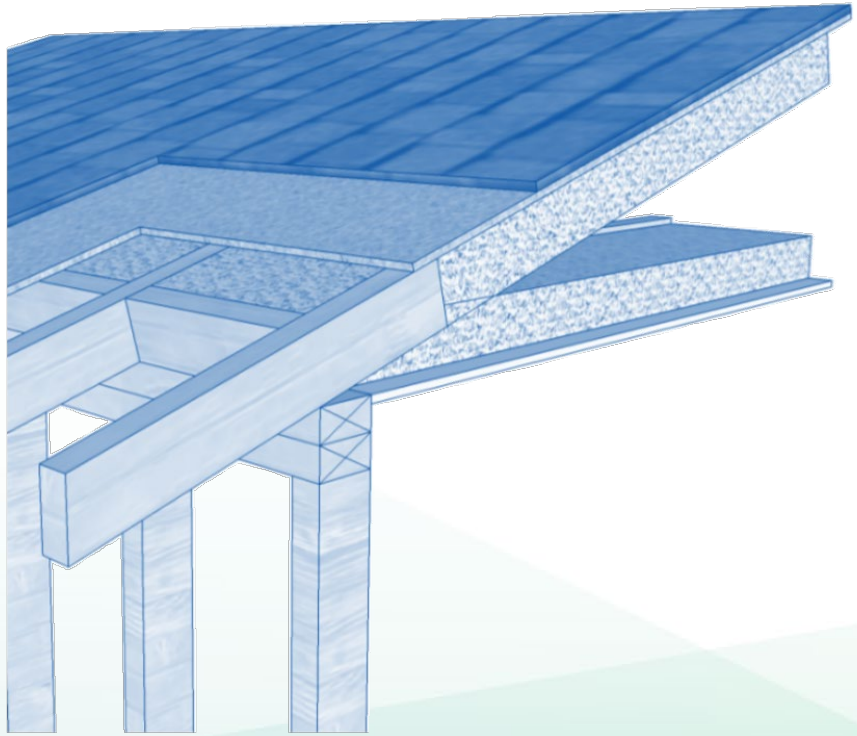


Figure 3-35: Unvented Attic Assembly With Insulation at the Ceiling and Between the Roof Rafters



Quality Insulation Installation HERS Requirements

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Figure 3-46: Wood-Framed Wall, 2x6 @ 24” oc, AWF With Three-Stud corners

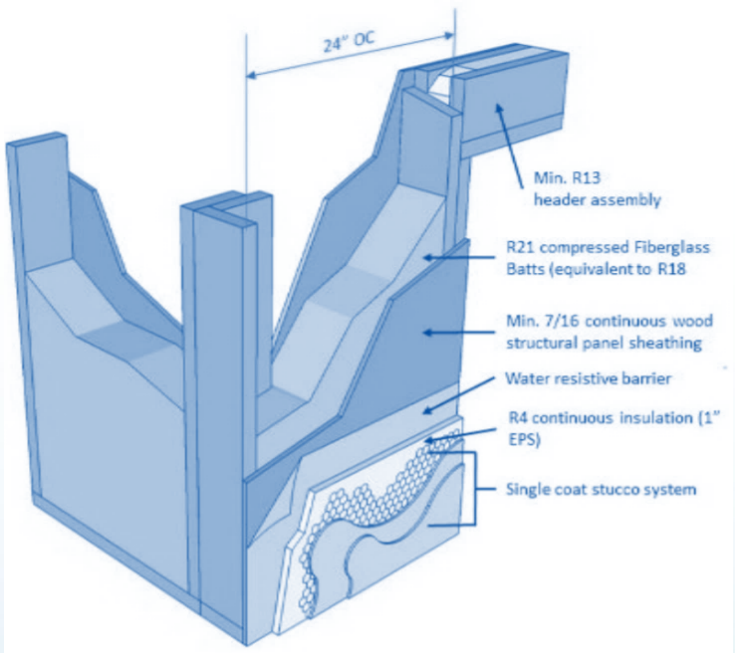
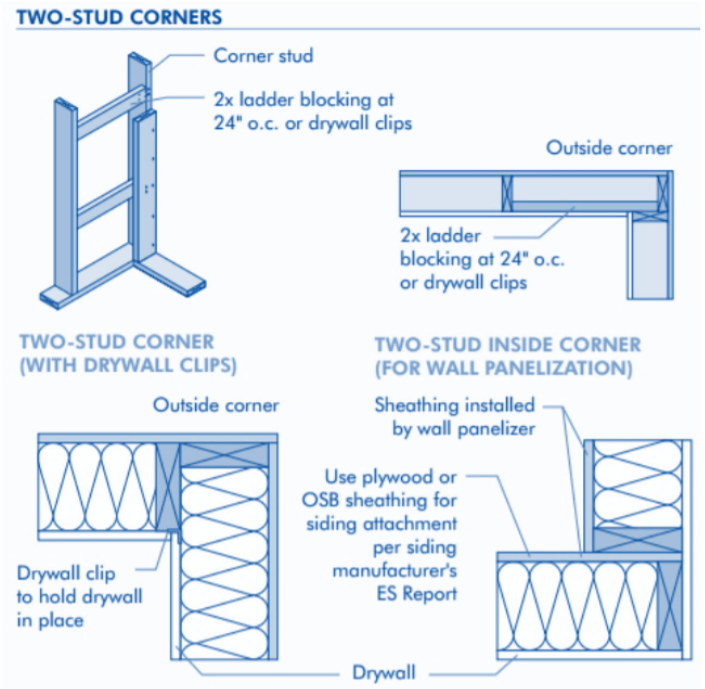
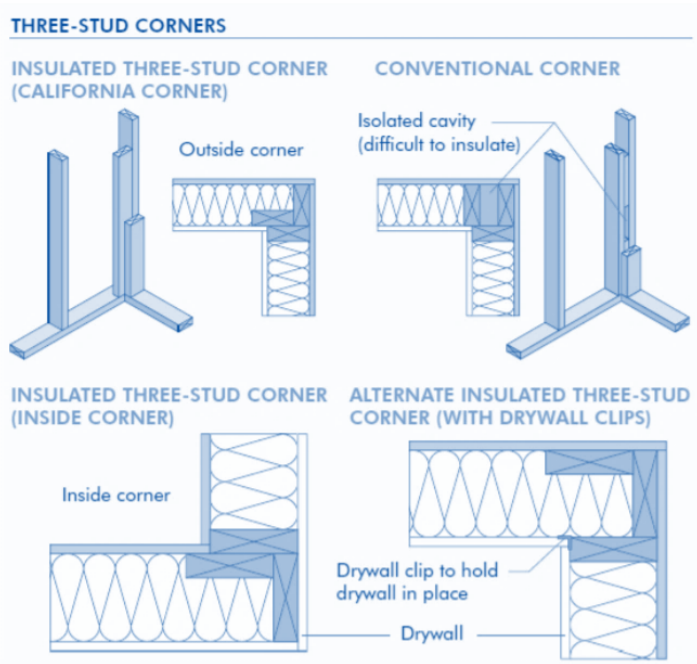


Figure 3-47: Advanced Framing Corners





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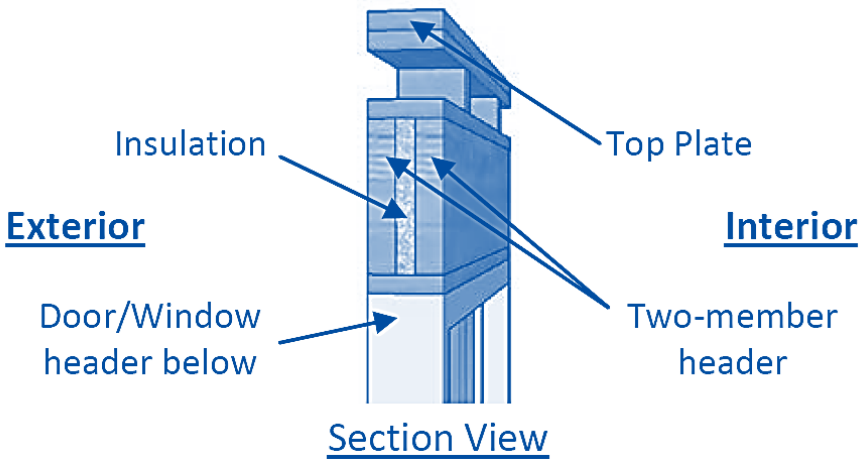
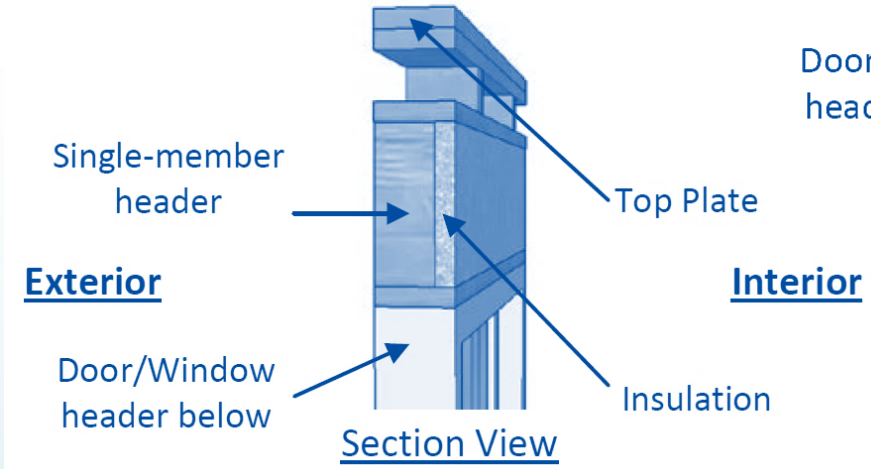
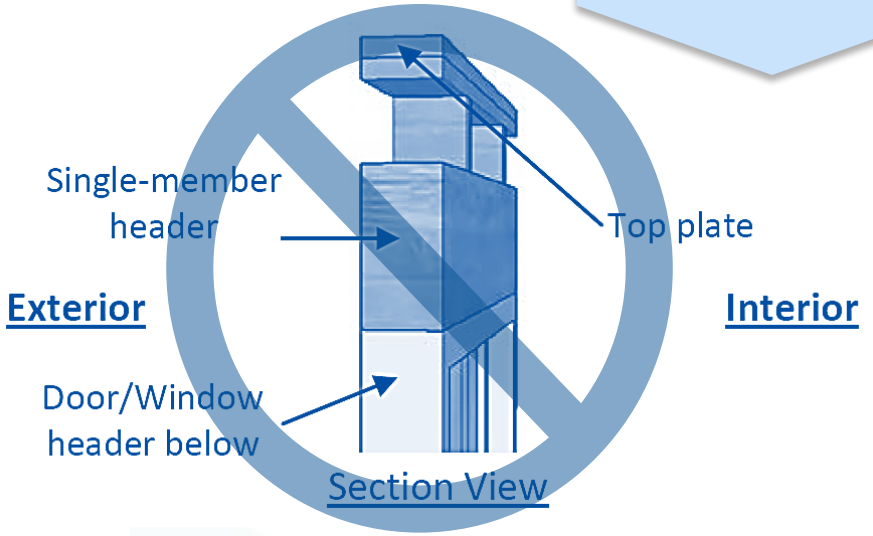




Full width headers must have continuous insulation



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Fail

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Fail

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Pass

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Fail

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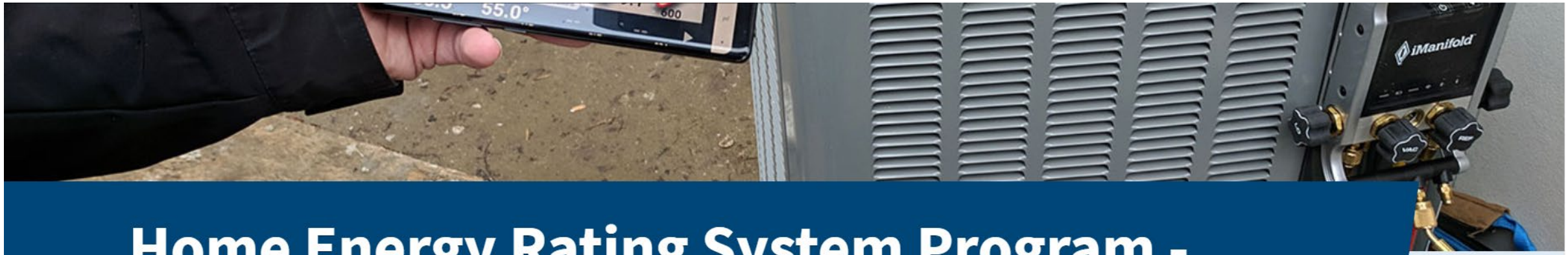

Home Energy Rating System Program - HERS

The Home Energy Rating System (HERS) Program tests and rates the energy performance of a home. The California Energy Commission's HERS Program addresses construction defects and poor equipment installation, including HVAC systems and insulation. The Energy Commission has a list of approved HERS providers who train and certify raters.

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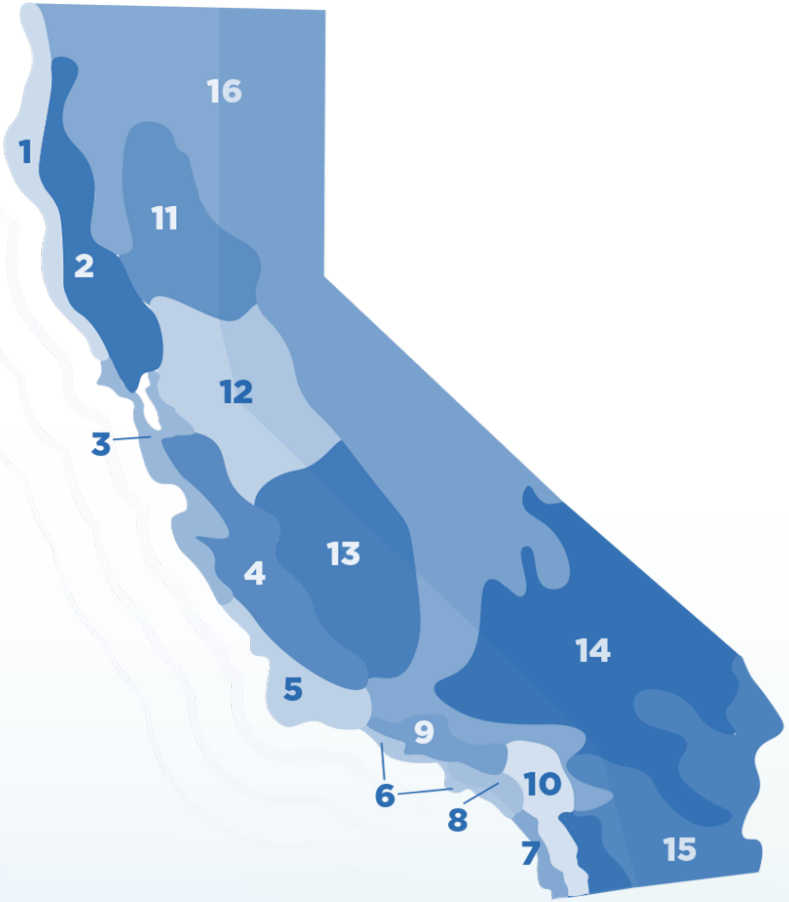

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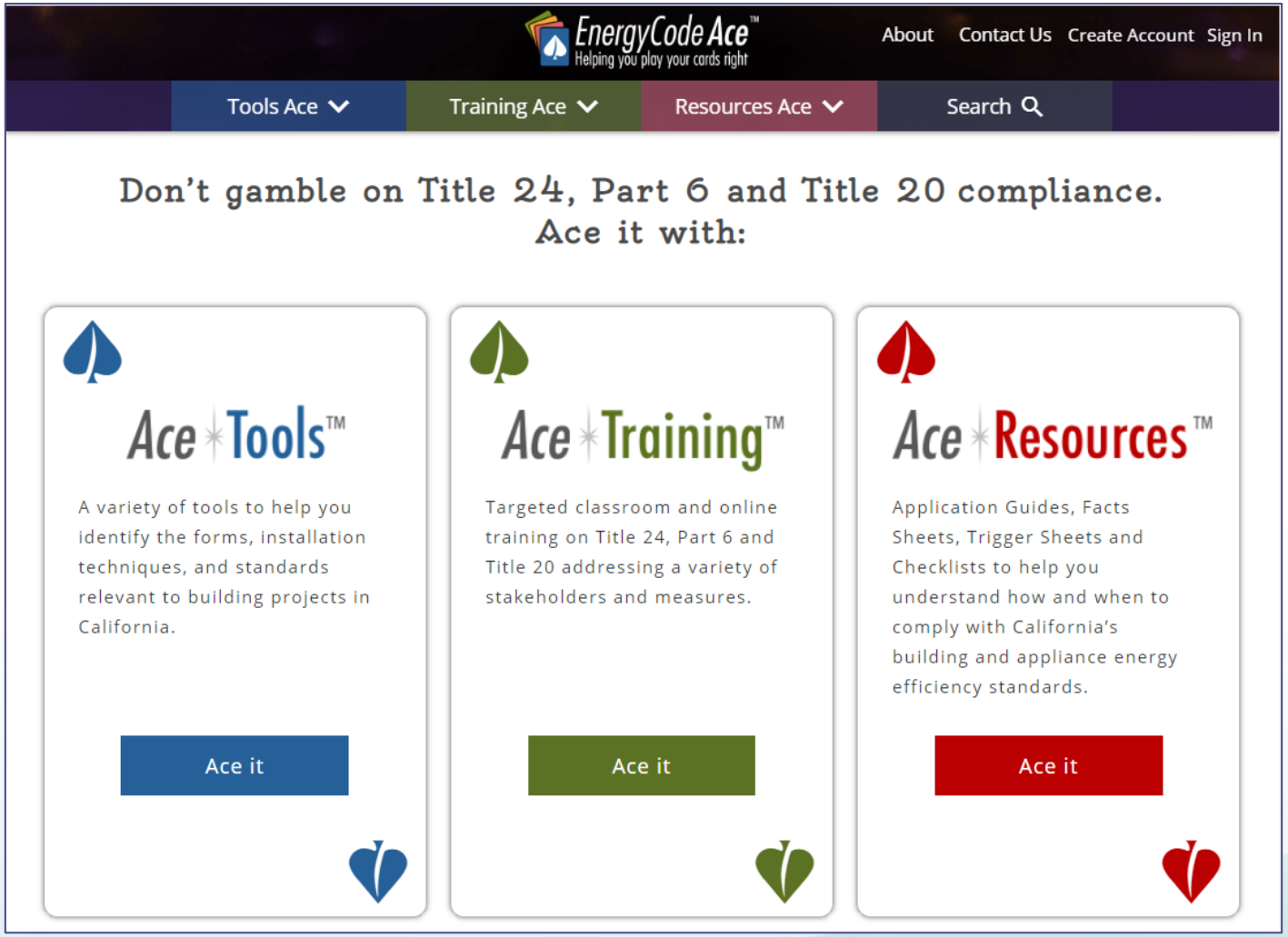

- Forms and resource tools
- Free training in person and online
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Thank you