



Decoding QII

*Let's Talk About HERS Quality
Insulation Installation*



HELPING YOU PLAY YOUR CARDS RIGHT



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Last Decoding Talk...

 **Decoding** * **Residential Compliance**™
Let's Talk About Design to Construction



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This program is funded by California utility customers under the auspices of the California Public Utilities Commission and in support of the California Energy Commission.



Who Are We?



Gina Rodda, Gabel Energy
gina@gabelenergy.com



BUILDING ENERGY ANALYSIS +
ENERGY CODE COMPLIANCE

Host: Gina Rodda

Gina Rodda, our host for the Decoding Talk series, is a Certified Energy Analyst (CEA), and LEED Accredited Professional (AP).

She is involved in providing residential and non-residential energy calculations for a variety of building types throughout California; an instructor of full day trainings; and host of various webinars specific to Title 24 (Part 6) Building Energy Efficiency Standards.

Gina has been in the energy modeling field since 1991, starting the *ninth* California building energy code cycle of her career.



Who Are We?



Rob Starr, CHEERS
rstarr@cheers.org

Co-Host: Rob Starr

Rob Starr has been a HERS Rater since 2002. He has since risen through the ranks to become the regional supervisor for home inspectors throughout Southern California and Nevada.

As a BPI Building Analyst and Envelope Professional, he provided valuable contributions to the development of ConSol's BPI training protocols. In addition to his management role, he is a highly-regarded instructor for BECT, BPI and CHEERS training.

His extensive field experience and training acuity make him one of California's top journeyman experts in building science, design and operations, and advanced building methods.





How can the energy code be:



How can the design documents support a project being successful when pursuing QII verification;



Knowing *when* the HERS rater must be integrated into the project schedule and construction verification process;



Being aware of the multiple inspections required by the HERS rater for QII, and how to be prepared for them.



Agenda

Agenda for Today Approx. Length

✦ Welcome..... 10 minutes

✦ Why?!..... 15 minutes

✦ Let's Talk

✧ *Challenge A: Design 20 minutes*

✧ *Challenge B: A-Typical Scenarios .. 15 minutes*

✧ *Challenge C: Scheduling..... 40 minutes*

✧ *Challenge D: Inspections 15 minutes*

✦ Next Steps..... 5 minutes

✦ Wrap Up



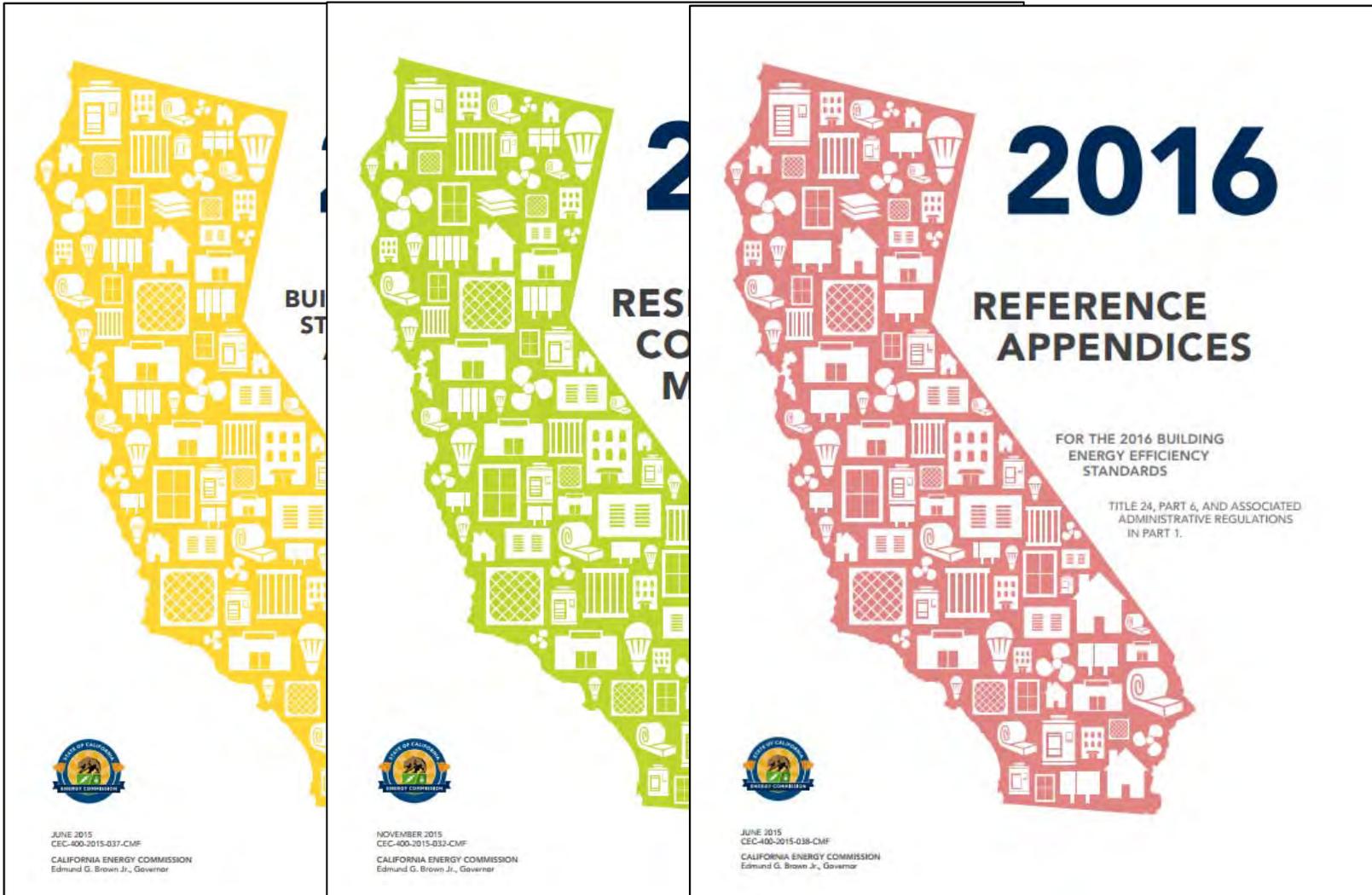
Why?



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What? Title 24 Part 6: Energy Code



<http://www.energy.ca.gov/title24/2016standards/index.html>



Mandatory Measures



*Cannot be traded via the Performance Approach.
Not typically documented within Certificate of
Compliance (CF1R)*

Two Ways to Comply with the Standards



Prescriptive Approach



*Each building feature to show
compliance independently*



Performance Approach



*Proposed TDV equal or better
than baseline TDV*

Compliance Documentation



2019 CASE Reports

QII

Would move from a performance credit to a prescriptive requirements.



CEC: Future Code

<http://www.energy.ca.gov/title24/2019standards/>



Have a voice!

2019 STANDARDS UPDATE SCHEDULE	
DATE	MILESTONES
February 2016-July 2016	Measures Identified and approval
August 2016 to June 2017	Stakeholder meeting/workshop & final staff workshop
June 1, 2017	CASE Reports submitted to the CEC
December 1, 2017	45-day Language Hearings
March 1, 2018	Adoption of 2019 Standards at Business Meeting
June 1, 2018 to November 2018	Staff work on Software, Compliance Manuals, Electronic Documents Available to Industry
November 1, 2018	Approval of the Manuals
January 1, 2019	Software, Compliance Manuals, Electronic Documents Available to Industry
January 1, 2020	Effective Date



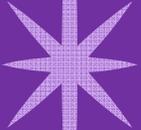
HERS Raters

Who is the HERS Rater and why are they in charge?

- ✦ Special Inspectors to the AHJ (building departments)
- ✦ Trained and maintained by their HERS provider
 - ✧ CHEERS (www.cheers.org)
 - ✧ CalCERTS (www.calcerts.com)
- ✦ Hired by the building owner or contractor
 - ✧ MUST be 3rd party (not under the employment of the contractor or related to them)
- ✦ Inspection features determined by Energy Commission per Reference Appendices



Our Question To You

- 
1. *What is your biggest challenge regarding HERS verified Quality Insulation Installation (QII)?*
 2. *What are your top 3 wishes for improving the QII process?*
 3. *If you could wave your magic wand, the QII process would include _____ to make your job easier in understanding and implementing QII?*

Condensed list of requirements to put on construction documents.

Timing coordination with trades and finding a general contractor who "gets it". Also just need more experience doing it.

1. *Condensed list of requirements to put on construction documents.*
2. *Mandatory QII training for insulation contractors.*
3. *Shouldn't any job be of good ""quality"" without premium prices?"*

Getting Gen. Contr. to fully understand and monitor QII



Let's Talk



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Challenges



- ✦ Challenge A:
 - ✦ Design Documents



- ✦ Challenge B:
 - ✦ A-Typical Scenarios



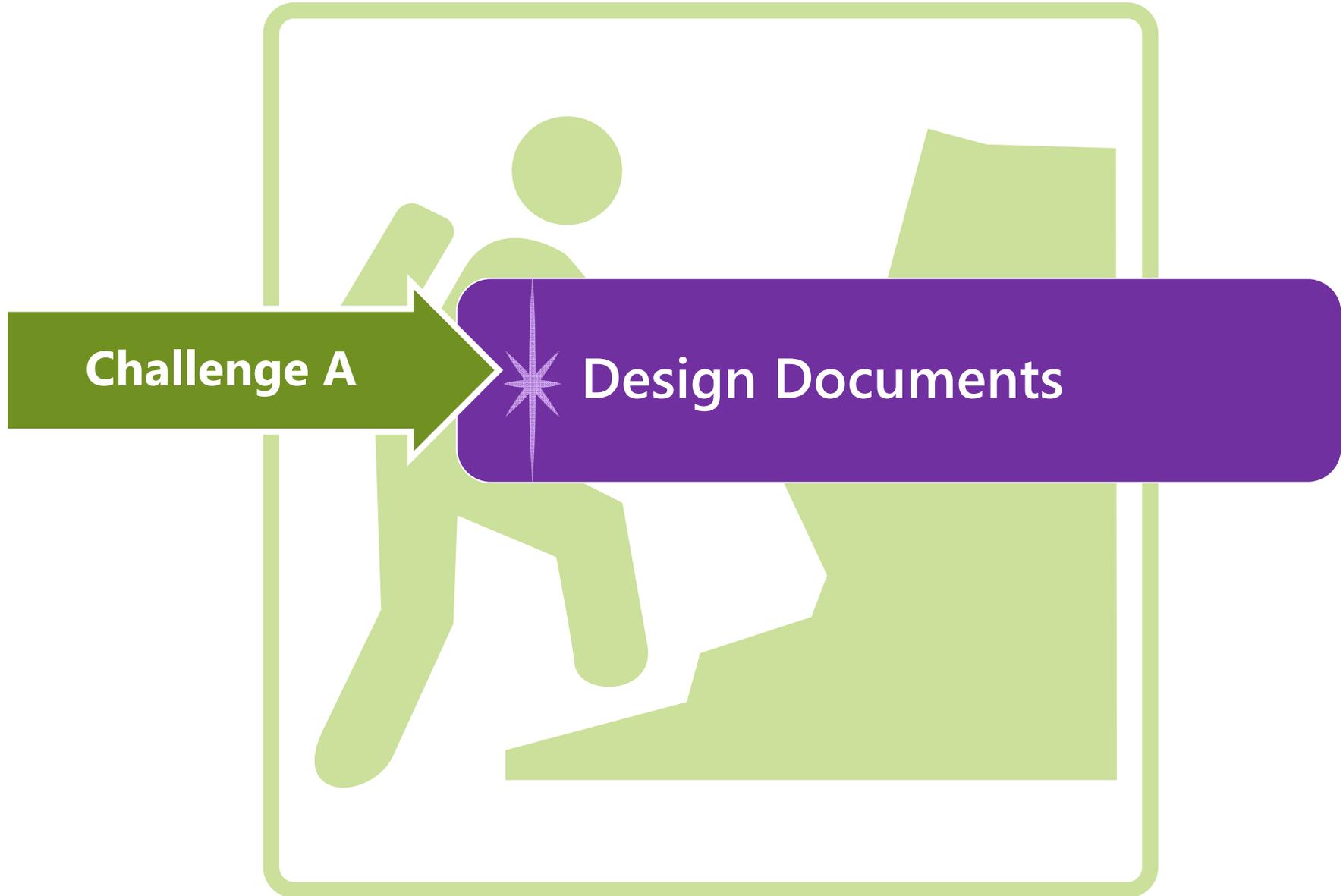
- ✦ Challenge C:
 - ✦ Project Scheduling



- ✦ Challenge D:
 - ✦ Inspection Process



Challenge A





Why Does it Exist?



Photo courtesy of Douglas Beaman Associates LLC

What *IS* QII?

- ✦ Quality Insulation Installation:
 - ✧ A HERS rater makes sure that insulation is installed right to realize the FULL R-value of the assembly and the air infiltration rate.
 - **No HERS verification:**
 - *The U-factor of the assembly is NOT the inverse of the R-value of the assembly.*
 - **QII HERS verification:**
 - *U-factor IS the inverse of R-value of the assembly.*

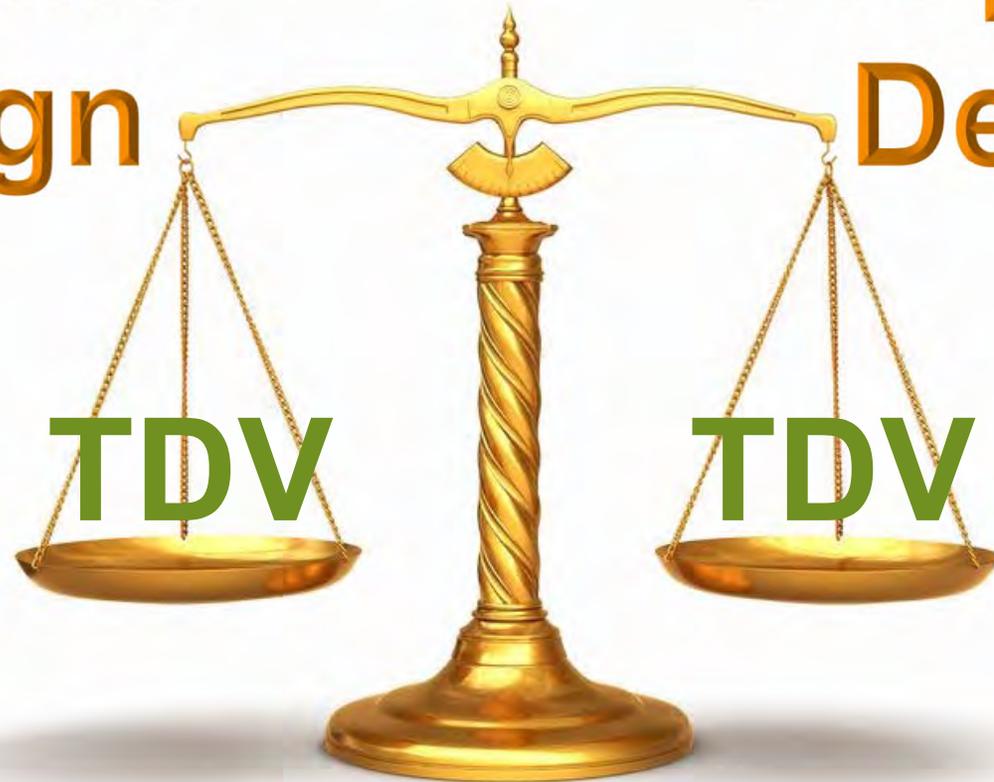


Why Would it be Used?

Trade-Offs!

**Baseline
Design**

**Proposed
Design**





Design Decisions



- ✦ Typically QII is desired to offset design features that do not meet Title 24 Part 6 minimum requirements:
 - ✧ Coordination with Energy Consultant so that design can pass with minimal changes:
 - Design should support the QII features so that construction of project is *successful!*



Example Project (Stockton CZ 12)

No HERS QII

★ Compliance Margin

✧ -8.8% TDV

- Walls: meeting prescriptive
- Windows: meeting prescriptive
- **Roof: R-38**
 - *No high performance roof (that would require insulation at roof AND at ceiling)*
- HVAC: meeting prescriptive
 - Ducts in crawlspace
- DHW: meeting prescriptive

Hers QII

★ Compliance Margin

✧ +1.5% TDV (+10.3 TDV)

HERS Measures

Date of Rating:

Quality Insulation Installation

Envelope Leakage Testing

Leakage Type:

Existing Leakage: ACH50

New Leakage: ACH50



Show CF1R with HERS QII

CERTIFICATE OF COMPLIANCE - RESIDENTIAL PERFORMANCE COMPLIANCE METHOD

CF1R-PRF-01

Project Name: Sample House

Calculation Date/Time: 19:00, Sun, Mar 19, 2017

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Calculation Description: Title 24 Analysis

Input File Name: Sample T24 v7 QII.rbd16x

BUILDING ENVELOPE - HERS VERIFICATION			
01	02	03	04
Quality Insulation Installation (QII)	Quality Installation of Spray Foam Insulation	Building Envelope Air Leakage	CFM50
Required	Not Required	Not Required	---

WATER HEATING SYSTEMS					
01	02	03	04	05	06
Name	System Type	Distribution Type	Water Heater	Number of Heaters	Solar Fraction (%)
DHW Sys 1	DHW	Standard	DHW Heater 1 (1)	1	.0%

WATER HEATERS										
01	02	03	04	05	06	07	08	09	10	11
Name	Heater Element Type	Tank Type	Number of Units	Tank Volume (gal)	Energy Factor or Efficiency	Input Rating/Pilot	Tank Insulation R-value (Int/Ext)	Standby Loss / Recovery Eff	NEEA Heat Pump Type	Tank Location or Ambient Condition
DHW Heater 1	Gas	Small Instantaneous	1	n/a	0.8 EF	199000 Btu/hr	n/a	n/a	n/a	n/a

SPACE CONDITIONING SYSTEMS					
01	02	03	04	05	06
SC Sys Name	System Type	Heating Unit Name	Cooling Unit Name	Fan Name	Distribution Name
HVAC System1	Other Heating and Cooling System	Heating Component 1	Cooling Component 1	HVAC Fan 1	Air Distribution System 1

HVAC - HEATING UNIT TYPES			
01	02	03	04
Name	System Type	Number of Units	Efficiency
Heating Component 1	CntrlFurnace	1	80 AFUE

HVAC - COOLING UNIT TYPES							
01	02	03	04	05	06	07	08
Name	System Type	Number of Units	Efficiency		Zonally Controlled	Compressor Type	HERS Verification
			EER	SEER			
Cooling Component 1	SplitAirCond	1	12.2	14	Not Zonal	Single Speed	Cooling Component 1-hers-cool

Registration Number:
CA Building Energy Efficiency Standards - 2016 Residential Compliance

Registration Date/Time:
Report Version - CF1R-03032017-695

HERS Provider:
Report Generated at: 2017-03-19 19:01:04



Provide Guidance

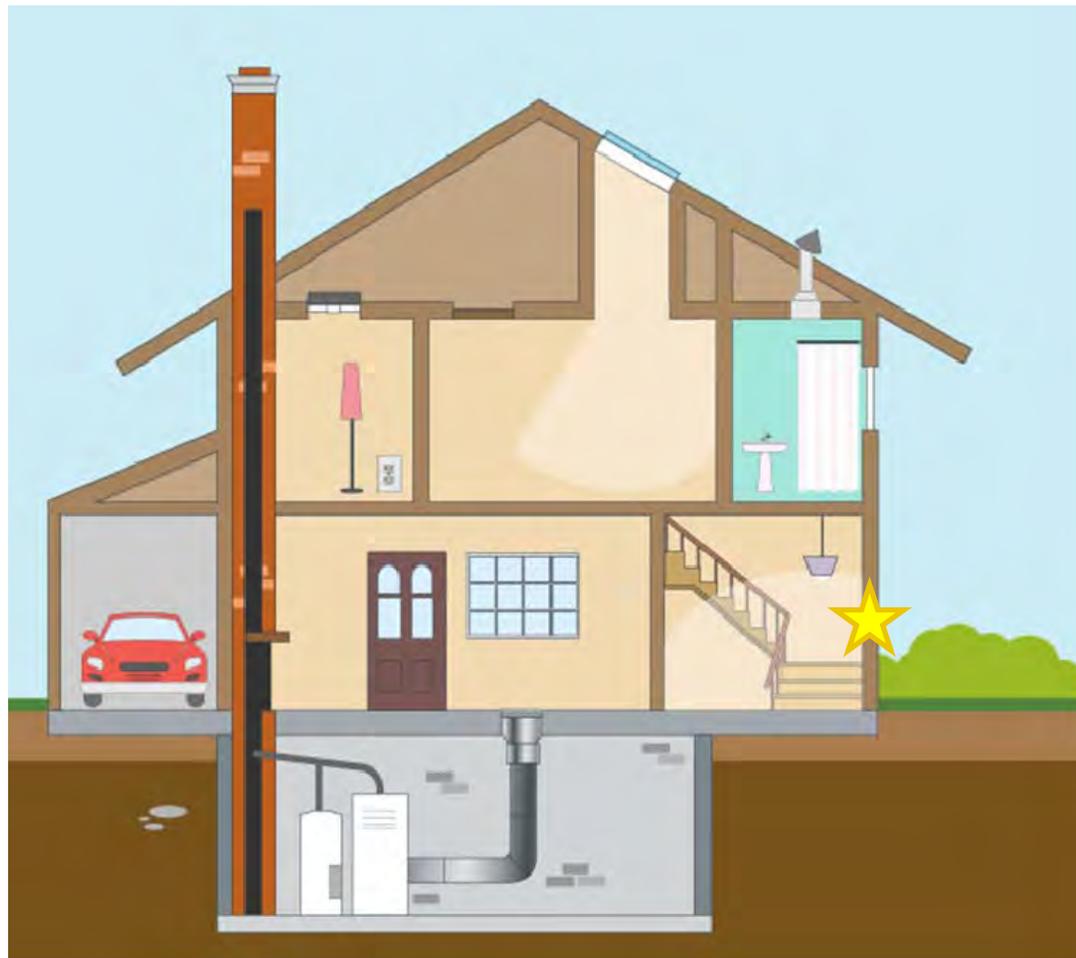


- ★ Be aware of the design changes that need to happen for HERS QII.
 - ✧ Incorporate those design features into the design set
- ★ Help the project be successful, on time AND on budget.
 - ✧ The more guidance the design set provides, the more likely the entire team will be on the same page.



What Can Be Supported in Design?

Problem Features



★ Framed Corners



Framed Corners (CF2R/3R-ENV-21-H C10)



★ Cavities in corner channels or wall intersections that will become inaccessible shall be completely filled with insulation and verified **before the exterior sheathing is installed.**

- ✧ Alternative framing can be used to eliminate this problem:
 - When batt insulation is used, it must be cut to fit around framing.



What Can Be Supported in Design?

Problem Features



- ★ Framed Corners
- ★ Insulated Headers



Insulated Headers (CF2R/3R-ENV-21-H C13)



★ All single-member window and door headers shall be insulated to a minimum of:

- ✧ **R-3 for a 2x4 framing, or equivalent width,**
- ✧ **R-5 for all other assemblies.**

Insulation is to be placed between the interior face of the header and inside surface of the interior wall finish.



What Can Be Supported in Design?

Problem Features



- ★ Framed Corners
- ★ Insulated Headers
- ★ Porch/Attic Knee Walls



Porch/Attic Knee Walls (CF2R/3R-ENV-21-H F2)



If rigid insulation is installed on the walls it must also be installed in these areas.

★ Insure all wall insulation is in contact with the air barrier on all six sides. Exterior air barrier is often missed when an attic is attached to an exterior wall.

- ✧ Insulation values for these areas **shall be insulated to meet or exceed the wall R-value specified on the Certificate of Compliance, and all other required compliance documentation.**



QII Checklist

Based on QII
Instructions from CEC



Brings in CF2R and
CF3R guidance for each
inspection point



QII Schedule and
Design Document Note
block included

2016 Title 24 Part 6 Quality Insulation Installation Checklist

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4.1.2017

Why Does this HERS Verification Credit Exist?

Many insulation installations have flaws that degrade thermal performance. Four problems are generally responsible for this degradation:

1. There is an inadequate air barrier in the building envelope, or holes and gaps within the air barrier system inhibit the ability to limit air leakage.
2. Insulation is not in contact with the air barrier, creating air spaces that short-circuits the thermal barrier of the insulation when the air barrier is not limiting air leakage properly.
3. The insulation has voids or gaps, resulting in portions of the construction assembly that are not insulated and, therefore, has less thermal resistance than other portions of the assembly.
4. The insulation is compressed, creating a gap near the air barrier and/or reducing the thickness of the insulation.

A performance energy credit for correctly installing an air barrier and insulation to eliminate or reduce common problems associated with poor installation is provided in the RA3.5 for new residential homes and additions including single family and low-rise multi family. See the CF1R-PRF-01-E for the project to see if "HERS QII" is required for the project.

There is no claim, promise, or guarantee of any kind about the accuracy, completeness, or adequacy of the content of this resource.

QII Schedule on Site

Timing for QII Tasks	Task
Establishing Sub's for project	Engage HERS rater <i>early</i> to have them review plans and schedule inspections
Framing Stage	Air barrier inspection (before ANY INSULATION installed)
Insulation Installation	Roof, walls and floors insulation installation must be inspected before <u>closing up</u> building feature (BEFORE finishing)
Final for Occupancy Permit	Final paperwork (CF2R and CF3R's) coordinated for final inspection by Building Inspector.

QII Note Block

Common Thermal Specifications

- Materials shall comply with, and be installed in conformance with, all applicable building codes for building. California Building Code (including, but not limited to, California Electric Code Section 719) and installed to meet all applicable fire codes.
- Materials shall meet California Quality Standards for Insulating Material, Title 24, Part 12, Chapter 4, Article 3, listed in the California Department of Consumer Affairs Consumer Guide and Directory of Certified Insulating Materials.
- Materials shall comply with flame spread rating and smoke density requirements of Chapter 26 and Section 706 of the Title 24, Part 2: all installations with exposed facings must use fire retardant facings which have been tested and certified not to exceed a flame spread of 25 and a smoke development rating of 450. Insulation facings that do not touch a ceiling, wall, or floor surface, and faced batts on the undersides of roofs with an air space between the ceiling and facing are considered exposed applications.
- Materials shall be installed according to manufacturer specifications and instructions.
- Hard covers or draft stops shall be placed over all drop ceiling areas and interior wall cavities to keep insulation in place and stop air movement. If hard covers or draft stops are missing or incomplete, they shall be completed before insulation is installed.
- Required eave ventilation shall not be obstructed - the net free-ventilation area of the eave vent shall be maintained.



Schedule QII for Success

QII Schedule on Site	
Timing for QII Tasks	Task
Establishing Sub's for project	Engage HERS rater <i>early</i> to have them review plans and schedule inspections
Framing Stage	Air barrier inspection (before ANY INSULATION installed)
Insulation Installation	Roof, walls and floors insulation installation must be inspected before closing up building feature (BEFORE finishing)
Final for Occupancy Permit	Final paperwork (CF2R and CF3R's) coordinated for final inspection by Building Inspector.

- ★ HERS QII doesn't happen the same way all the other HERS measures happen:
 - ✧ HERS rater has to be out EARLIER
 - ✧ HERS rater has to be there more than once for the same measure
 - ✧ HERS rater becomes the educator



Set Up QII for Success

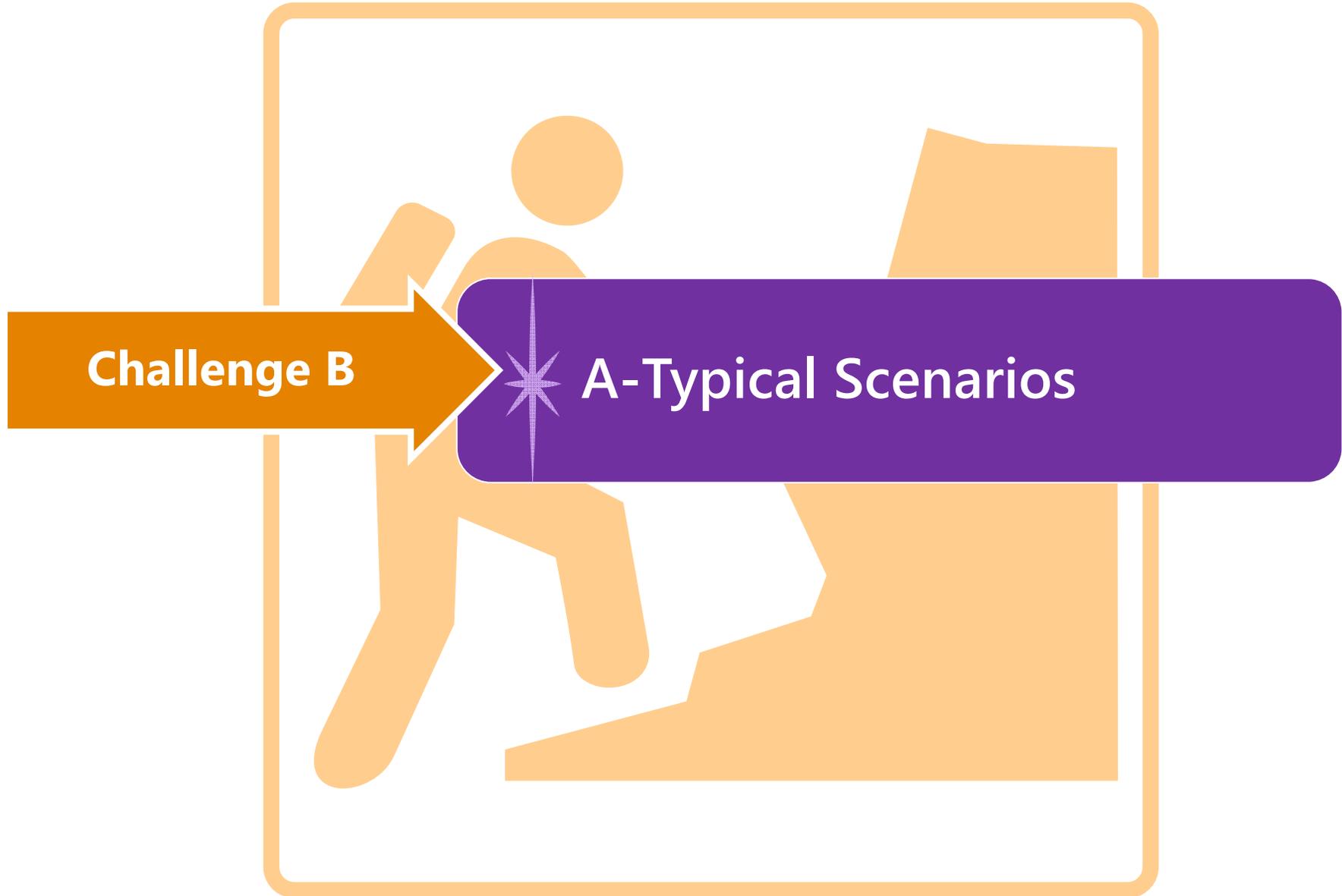
✦ Provide a note block that give an overview of what will be expected.

✧ *The resource provided with this Decoding Talk is available for your use with the intent to get the process started, and to be customized to match the needs of the specific project.*

QII Note Block	
Common Thermal Specifications	
<input type="checkbox"/>	Materials shall comply with, and be installed in conformance with, all applicable building codes for building, California Building Code (including, but not limited to, California Electric Code Section 719) and installed to meet all applicable fire codes.
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<input type="checkbox"/>	Materials shall be installed according to manufacturer specifications and instructions.
<input type="checkbox"/>	Hard covers or draft stops shall be placed over all drop ceiling areas and interior wall cavities to keep insulation in place and stop air movement. If hard covers or draft stops are missing or incomplete, they shall be completed before insulation is installed.
<input type="checkbox"/>	Required eave ventilation shall not be obstructed - the net free-ventilation area of the eave vent shall be maintained.
<input type="checkbox"/>	Eave vent baffles shall be installed to prevent air movement under or into the batt.
<input type="checkbox"/>	Insulation shall cover all recessed lighting fixtures. If the fixtures are not rated for insulation cover (IC) and air tight, the fixtures shall be replaced. All recessed light fixtures that penetrate the ceiling shall be listed for zero clearance insulation contact (IC), have a label that certifies it as airtight with leakage less than 2.0 cfm @ 75 Pa when tested to ASTM E283, and shall be sealed with a gasket or caulk between the light's housing and the ceiling.
<input type="checkbox"/>	Insulation shall be installed so that they will be in contact with the air barrier.
<input type="checkbox"/>	Insulation shall fill the cavity. Sized to fit, no compression, fill voids etc.
R-Value Measurement	
<input type="checkbox"/>	The HERS rater shall verify the installed thickness of insulation in all assemblies and locations on walls, roof/ceilings, and floors, and to ensure that insulation levels and installation integrity meet the R-value specified on the Certificate of Compliance, and all other required compliance documentation.
Walls	
<input type="checkbox"/>	Bottom plates of framed and non-framed and other wall type assemblies shall be sealed to the ground subfloor or slab, and above ground subfloor.
<input type="checkbox"/>	Wall stud cavities shall be caulked or foamed to provide a substantially air-tight envelope to the outdoors, attic, garage and crawl space. All plumbing and wiring penetrations through the top and bottom plates and electrical boxes that penetrate the sheathing shall be sealed. All gaps in the air barrier shall be caulked, taped, or sealed with minimally expansive foam.
Rim-Joists	
<input type="checkbox"/>	All rim-joists shall be insulated to the same R-Value as the adjacent walls.
Kneewalls, Skylight Shafts, and Gable Ends	
<input type="checkbox"/>	Framing for kneewalls, skylight shafts and gable ends that separate conditioned from unconditioned space shall be insulated to meet or exceed the wall R-value specified on the Certificate of Compliance, and all other required compliance documentation.
<input type="checkbox"/>	The insulation shall be installed without gaps and with minimal compression.
<input type="checkbox"/>	For steel-framed kneewalls, skylight shafts, and gable ends, external surfaces of steel studs shall be covered with insulation unless otherwise specified on the CF1R Certificate of Compliance .
<input type="checkbox"/>	The house side of the insulation shall be in contact with the drywall or other wall finish.
<input type="checkbox"/>	The insulation shall be supported so that it will not fall down by either friction fitting to the framing, inset or face stapling of flanges, or using other support such as netting.
<input type="checkbox"/>	Insulation for all kneewall and skylight shafts shall be completely enclosed by vertical and horizontal framing, including horizontal plates at top and bottom of the insulation.
<input type="checkbox"/>	In unvented attics, where insulation is applied directly to the underside of the roof deck, kneewalls, skylight shafts, and gable ends shall be insulated to meet or exceed the wall R-value specified on the Certificate of Compliance, and all other required compliance documentation.
CF2R Certificate of Installations Forms	
<input type="checkbox"/>	The CF2R-ENV forms (Insulation Certificate of Installation) shall be signed by the SPF applicator stating that the installation is consistent with the plans and specifications for which the building permit was issued shall be provided. The certificate shall also state the installing company name, insulation manufacturer's name and material identification, and that the labeled installed nominal thickness, and installed R-value for SPF insulation meets those specified in Section 3, Thermal Specification. The SPF applicator shall also attach an R-value chart or an ICC ESR showing compliance with AC377 for each SPF insulation material used.
<input type="checkbox"/>	It is the installer's responsibility to ensure the products are installed properly, and it is the HERS rater's responsibility to verify proper installation.



Challenge B





A-Typical Scenarios

Dropped Ceiling

- ✦ Prepare them early

Double /Staggered Stud Walls

- ✦ Tricks for success

Difficult Building Features

- ✦ Atriums
- ✦ Knee Walls
- ✦ Wall Intersections/Framed corners

Multi-Family

- ✦ No metal framing (not eligible for QII)
- ✦ Air barrier between units and common areas



Dropped Ceilings (CF2R/3R-ENV-21-H D4)



Photo courtesy of DOE

Dropped ceilings are covered with hard covers and sealed to framing.

- ✦ The 2008 RA allowed the entire drop area to be filled with insulation level with the rest of the attic.
 - ✧ This is no longer allowed under the 2013/2016 Standards; hard covers are required.
- ✦ Framing of soffits or drop ceilings should be done inside the Air Barrier.
 - ✧ **This means the drywall has been installed and sealed as required before the soffit or drop ceiling is framed out.**



Ceiling (CF2R/3R-ENV-21&22-H)

Reliance on fire stops and fire blocking for air barrier.

- ✦ Continuous and air tight ceiling air barrier (usually the drywall)
- ✦ Insulation stuffed in openings for fire stops does not count as an air barrier



Photo courtesy of Rick Chitwood

Photo courtesy of Rob Starr





Double /Staggered Stud Walls (CF2R/3R-ENV-21-H D9)



Be Prepared!

- ✦ Builder needs to determine the best location for the installation of an additional air barrier to create a standard size cavity so the insulation can be in contact with all six sides
- ✦ Staggered studs provide a great thermal break, but can be more difficult to install insulation due to the unusual shape of the cavity



Photo courtesy of Bright Green Strategies



Difficult Building Features

Photo courtesy of Rick Chitwood



Photo courtesy of Bright Green Strategies

How will this work?

- ◆ Atriums:
 - ◇ This picture is the perfect example of a unique architectural feature that can be quite difficult to bring into compliance with QII Standards
- ◆ Attic Knee Walls
 - ◇ Are hard
- ◆ Wall Intersections
 - ◇ Can you insulated them easily?



Multi Family (CF2R/3R-ENV-21-H H1-8)



How Is It Different?

- ✦ Multi Family is not much different from Single Family
- ✦ It does have some features that are unique, but the overall goal is the same

Multifamily Air Barrier	
<input type="checkbox"/> See A – F Above	1. <i>Multifamily buildings require all the above plus each unit. When fire rating is required, fire barrier putty pads should be used per the manufacturer’s instructions.</i>
<input type="checkbox"/> Between Units	2. <i>Floor AND Ceiling of each Dwelling Unit – All penetrations through the floor and ceiling of each unit must be sealed including, electric and gas utilities, water pipes, drain pipes, fire protection service pipes, communication wiring etc.</i>
<input type="checkbox"/> Multi-Level Spaces	3. <i>Elevator penthouse, mechanical penthouse, stairwell doors, roof access hatch, plumbing stacks, etc. sealed to reduce air transfer from attached spaces.</i>
<input type="checkbox"/> Common Walls	4. <i>Common Walls – Bottom plate between units must be sealed to the subfloor. All penetration in the common walls is sealed. Interior walls that open into the common walls must be sealed.</i>
<input type="checkbox"/> Chases at Units	5. <i>Vertical Chases – All vertical chases are sealed at the floor and ceiling of each unit so air cannot transfer from first floor to second floor around chase.</i>
<input type="checkbox"/> Vertical Chases	6. <i>Vertical Chases –The chases such as garbage chutes, elevator shafts, and HVAC ducting are sealed to stop air movement through the chase to surrounding spaces.</i>
<input type="checkbox"/> Hallways	7. <i>Common Hallways – Penetrations between dwelling unit and common hallways are sealed, including doors to the dwelling unit, are gasketed or made substantially airtight.</i>



Multi Family (CF2R/3R-ENV-21-H H1-8)

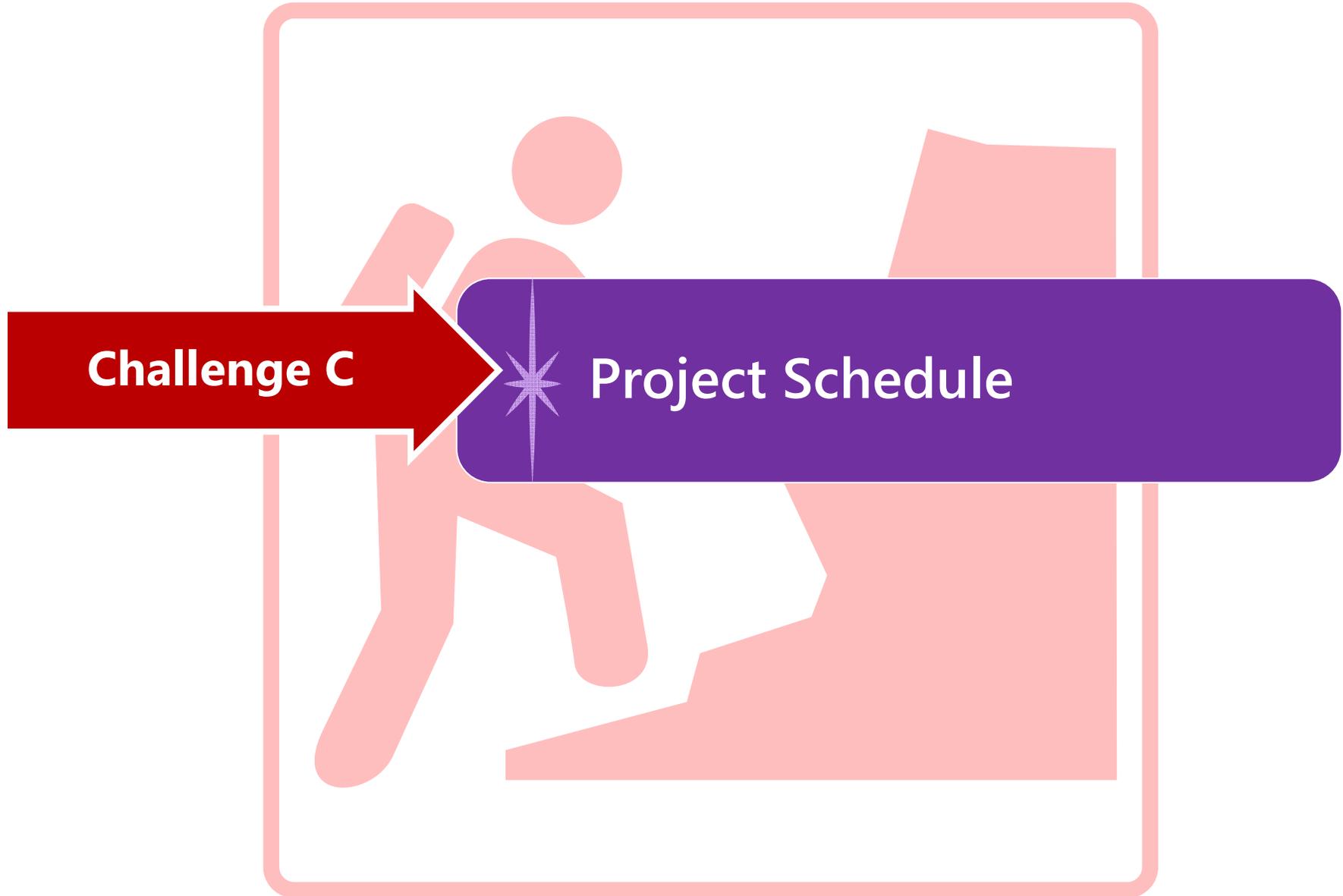
Air Barrier Layout – Be Prepared!

- ✦ Unconditioned corridors
- ✦ Cross Hatch: Conditioned units above 1st floor
unconditioned spaces



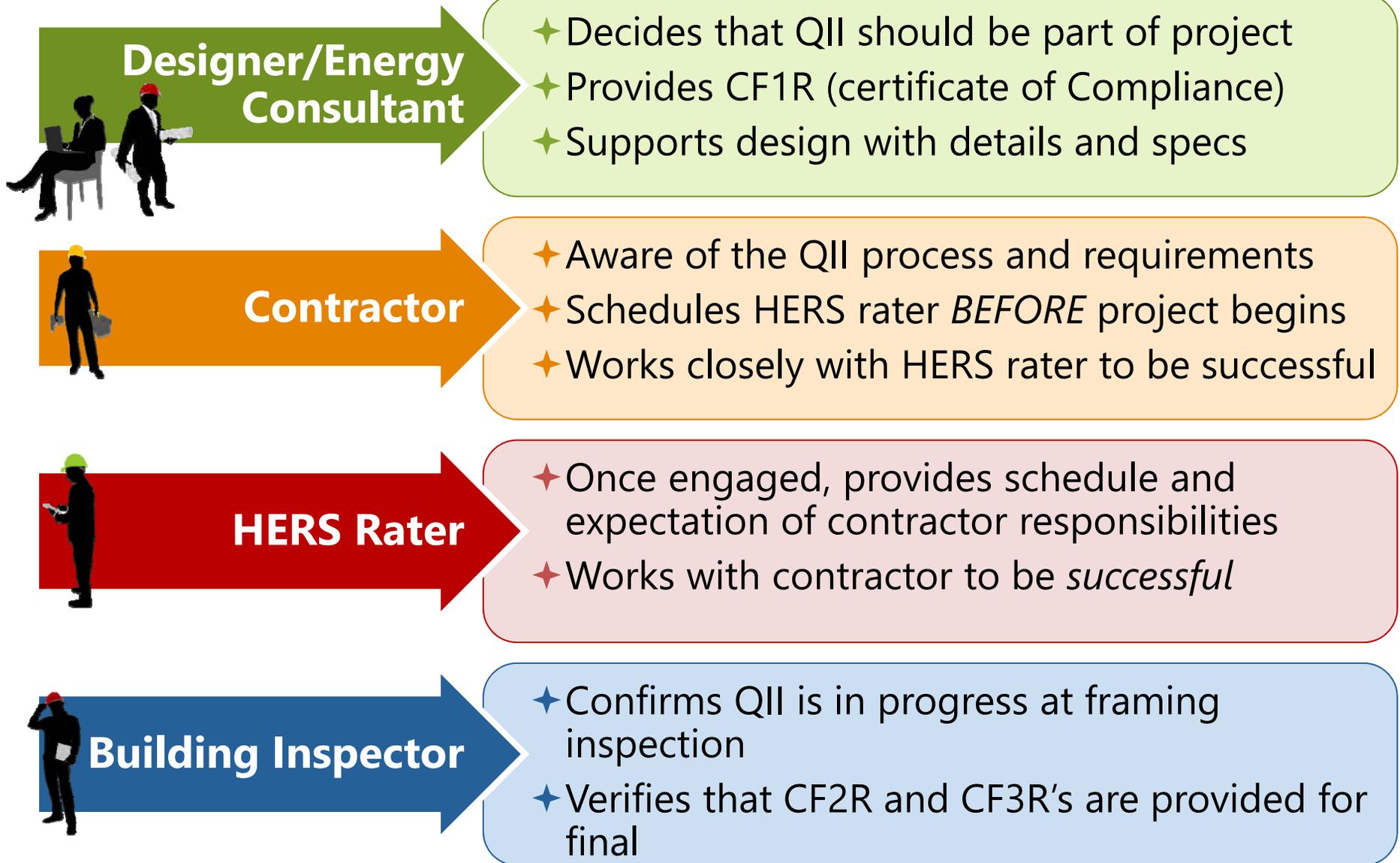


Challenge C



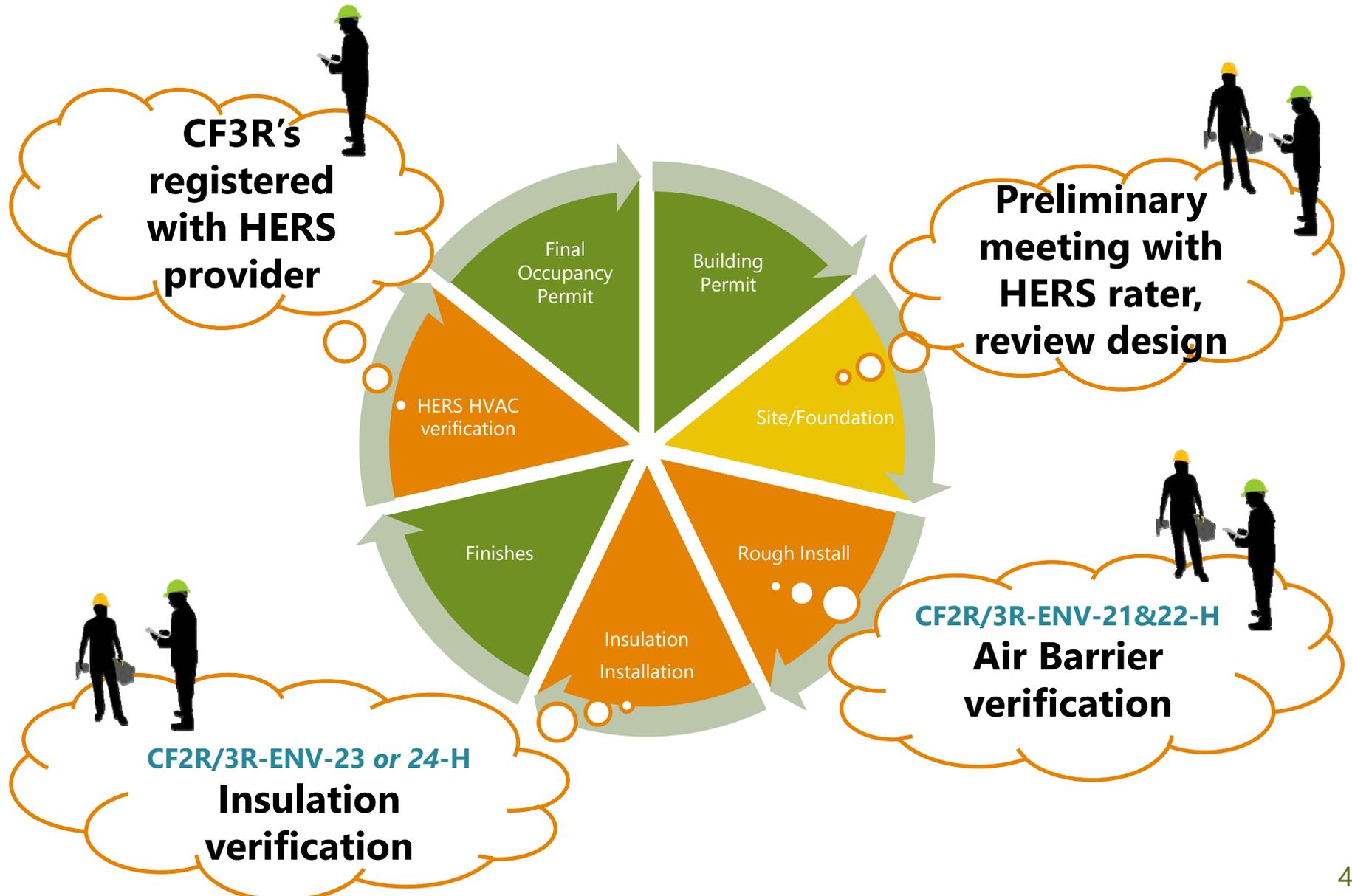


Players



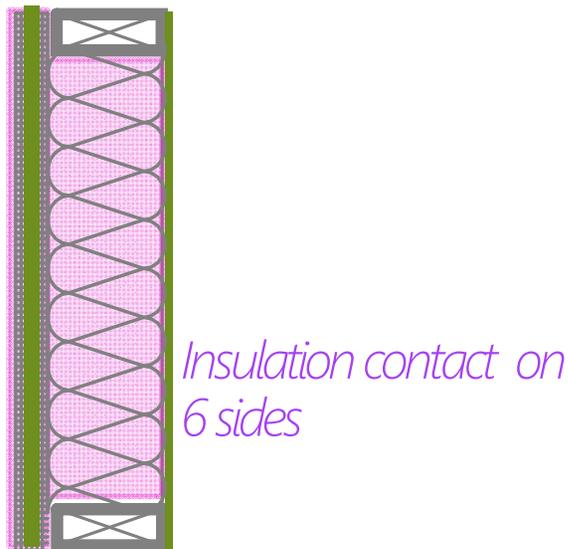
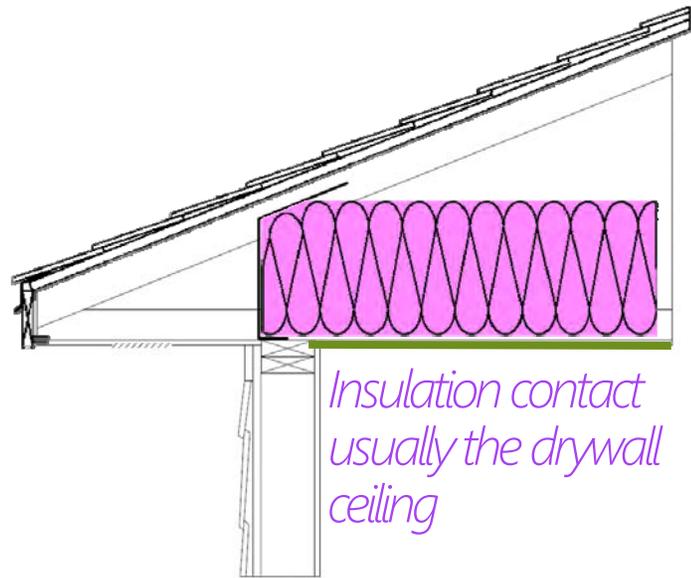


Building Process





Insulation Performance Factors



Air Barrier and Insulation

1. Continuous air barrier
 - ✧ CF2R/3R-ENV-21&22-H
2. Insulation in contact with the air barrier(s)
 - ✧ CF2R/3R-ENV-23 or 24-H



Air Barrier

1st Inspection





Penetrations (CF2R/3R-ENV-21/22-H)



Wall/Roof/Floor

- ✦ *All electrical boxes including knockouts that penetrate the air barrier to unconditioned space are sealed*
- ✦ *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*



Photos courtesy of Rob Starr

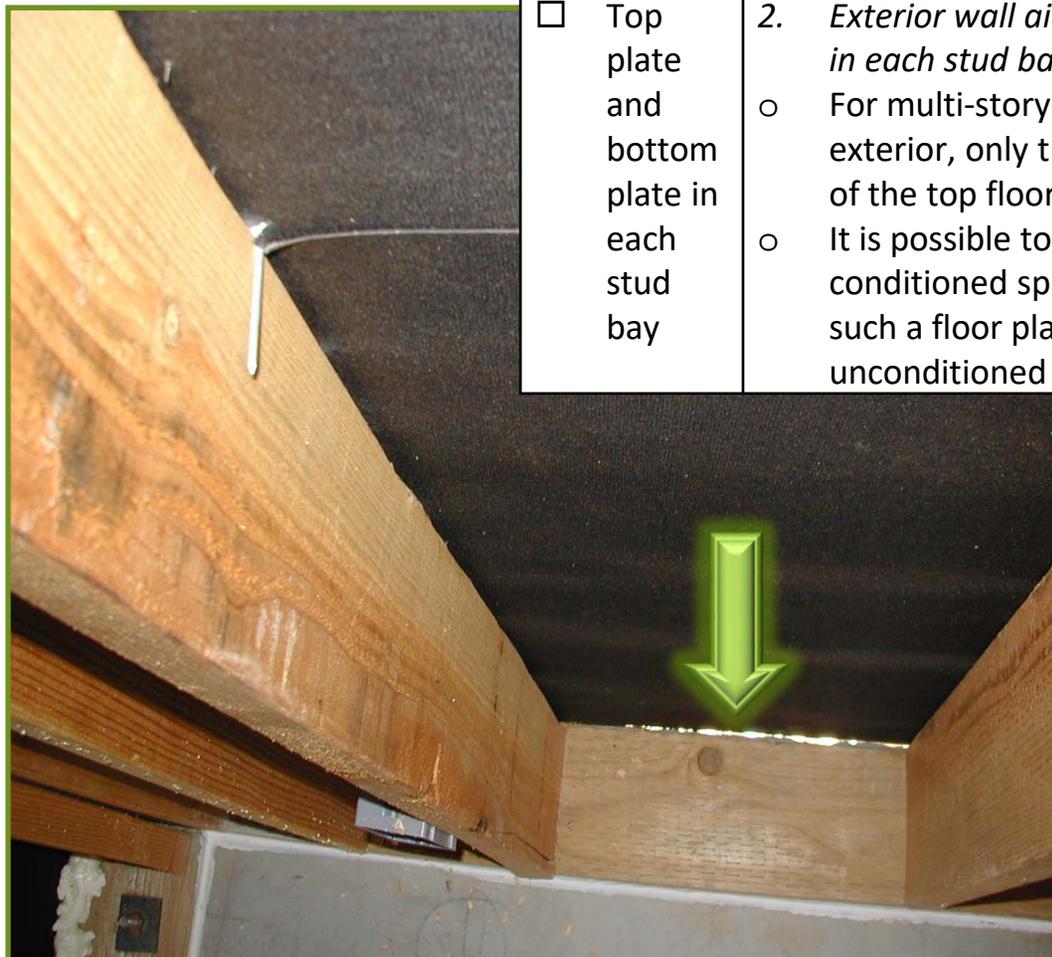


Photo courtesy of Bright Green Strategies



Wall (CF2R/3R-ENV-21-H C2)

Sealed to the top and bottom plate in *each* stud bay



- Top plate and bottom plate in each stud bay

2. *Exterior wall air barrier is sealed to the top plate and bottom plate in each stud bay.*
 - For multi-story buildings that have a continuous air barrier on the exterior, only the bottom plate of the first floor and the top plate of the top floor need to be sealed to the exterior air barrier.
 - It is possible to have a two-story house where the upstairs conditioned space has a smaller footprint than the first story. In such a floor plan, top plates of a first story wall exposed to an unconditioned attic would be sealed to the exterior air barrier.

Photo courtesy of Rick Chitwood



Wall (CF2R/3R-ENV-21-H C6)



Photo courtesy of Rob Starr

Windows and Doors

- ✦ Coordinate between trades who is responsible.
 - ✦ Window installer *or*
 - ✦ Framer *or*
 - ✦ Insulation installer.

Windows and doors

6. *All gaps around windows and doors are sealed. The sealant used follows window manufacturer specifications.*



Ceiling (CF2R/3R-ENV-21-H D4-5)

Hard covers for drop ceilings and chases



Photos courtesy of Rob Starr

<input type="checkbox"/> Dropped Ceilings	<p>4. All dropped ceilings are covered with hard covers and sealed to framing.</p> <ul style="list-style-type: none">○ The 2008 RA allowed the entire drop area to be filled with insulation level with the rest of the attic. This is no longer allowed under the 2013/2016 Standards; hard covers are required.○ Framing of soffits or drop ceilings should be done inside the Air Barrier. This means the drywall has been installed and sealed as required before the soffit or drop ceiling is framed out.
<input type="checkbox"/> Chases	<p>5. All chases are covered with hard covers and sealed to framing.</p> <ul style="list-style-type: none">○ All vertical chases shall have hard covers sealed to the framing at each plate level.○ See notes for #4 above.



Roof (CF2R/3R-ENV-22-H B2)

Chimney/Flue



Photos courtesy of DOE

Chimney/
Flue

2. *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.*



Floor (CF2R/3R-ENV-21-H B3/4)

Reliance on sub-floor as the air barrier.

Photo courtesy of Rob Starr



Penetrations

3. *All plumbing and electrical wires that penetrate the floor are sealed.*

Photo courtesy of Rick Chitwood



Subfloor

4. *Subfloor sheathing is glued or sealed at all exterior panel edges to create a continuous air tight subfloor.*



Floor (CF2R/3R-ENV-21-H C7 and G1-2)



Rim Joists and Blocking

<input type="checkbox"/> Rim joists	7. <i>Rim joists gaps/openings are fully sealed</i>
<input type="checkbox"/> Blocking	1. <i>Airtight blocking is installed between joists where the wall rim joist would have been located in the absence of a cantilever.</i> o Blocking must be installed any time joists goes over an exterior wall or opens into an unconditioned space.
<input type="checkbox"/> Cantilever	2. <i>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</i>



Photos courtesy of Rob Starr





Floor (CF2R/3R-ENV-21-H C5)



Photos courtesy of Rob Starr



Exterior Bottom Plates

- | | |
|---|---|
| <input type="checkbox"/> Exterior bottom plates | <p>5. <i>Exterior bottom plates (all stories) are sealed to the floor using the appropriate sealing method.</i></p> <ul style="list-style-type: none">○ If the exterior air barrier is continuous (from the bottom story to the top story), then the bottom plate of first floor only needs to be sealed.○ In order to verify that the bottom plate is sealed, the following are allowed:<ul style="list-style-type: none">● Use a gasket material that is 3.5 inches wide on 2x4, 5.5 inches wide on 2x6; or● Seal the bottom plate on the inside at junction of concrete and plate with caulk or foam; or● Watch sealing of the bottom plate to foundation during framing. |
|---|---|



Insulation

Next Inspection(s)





Ceiling (CF2R/3R-ENV-22-H A13)

Photo courtesy of Rick Chitwood



All top plates are sealed to drywall.

Top Plates

13. *All top plates of interior and exterior walls are sealed to drywall.*

Interior Walls

- Top plates do not need to be sealed unless there is an unconditioned space above.
- Sealing of the top plate can be done from the attic after all the drywall is installed, or from below before drywall is installed.
- If sealing from the attic after drywall is installed, use caulk or foam to seal all top plates to the drywall.
- If sealing from below when the drywall is installed at a later date, a gasket type material must be used. The gasket must be thick enough to fill any irregularities (approximately 1/4 inch thick) between the two surfaces and the gasket must remain flexible so that it can expand/compress and still seal the two materials together when they meet.



Ceiling (CF2R/3R-ENV-23-H C1/15/16)

Insulation is in direct contact with ceiling so there are no gaps between the ceiling and the insulation.



Photo courtesy of Rick Chitwood



Photo courtesy of Rob Starr

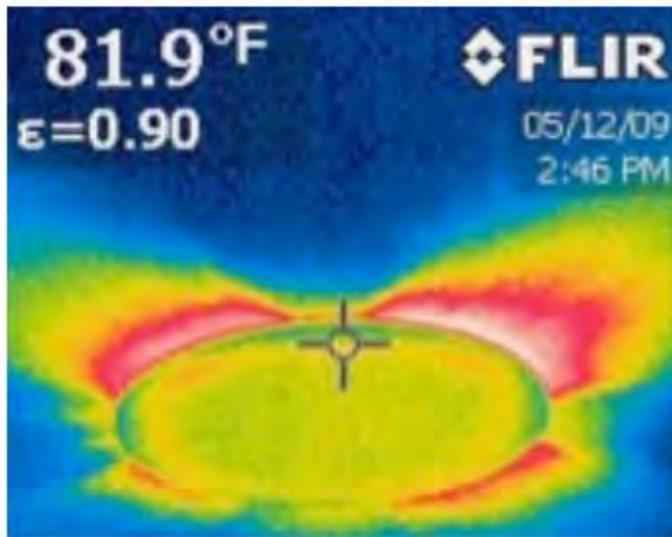
<input type="checkbox"/> Attic Rulers	<i>15. Attic rulers appropriate to the material are installed and evenly distributed throughout the attic to verify Depth (one ruler for every 250 ft²) The rulers are clearly readable from the attic access and scaled to read inches of insulation and the R-value installed.</i>
<input type="checkbox"/> Loose-fill and SPF	<i>16. Loose-fill and SPF insulation - a HERS rater shall measure the installed thickness (include low and high areas) and density of insulation in at least 6 random locations on walls, roof/ceilings and floors to ensure minimum thickness levels and the installed density meets the R-value specified on the CF1R, and are consistent with the manufacturer's coverage chart.</i>



Ceiling (CF2R/3R-ENV-22-H A5)

Can lights

Photos courtesy of DOE



Air leakage around recessed light.

As shown in this image taken with an infrared camera, hot attic air can leak into a home around a recessed can light in summer. In winter, warm, conditioned air can be pulled out of the house and into the attic.



<input type="checkbox"/> Can Lights	5. <i>All installed recessed light fixtures that penetrate the ceiling to unconditioned space are rated to be Insulation Contact and Airtight (IC and AT) which allows direct contact with insulation. The housing is sealed to the drywall.</i>
-------------------------------------	--



Wall (CF2R/3R-ENV-23-H D1-3)



Photo courtesy of Bright Green Strategies

The bad...

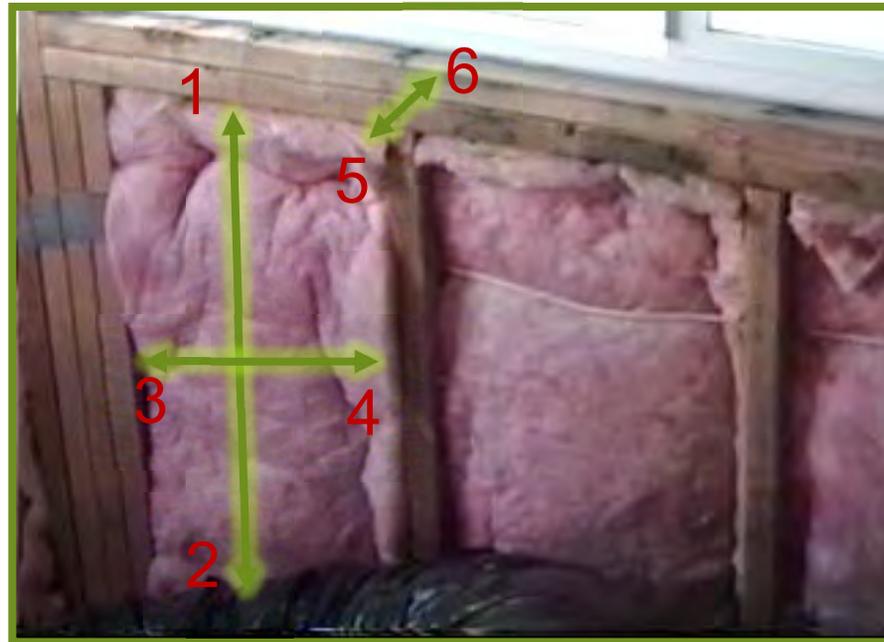
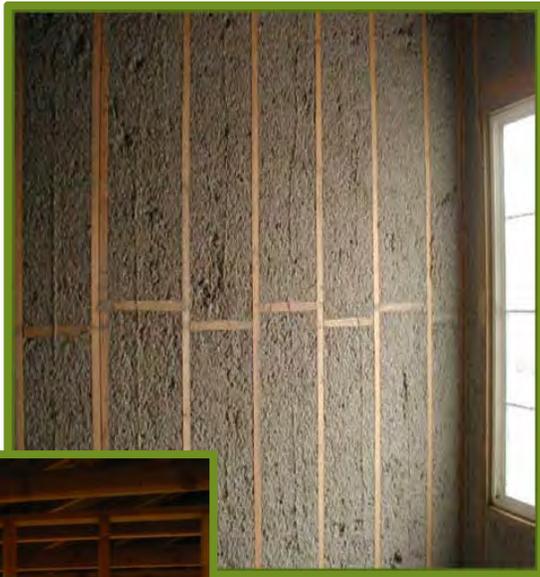


Photo courtesy of Rick Chitwood

<input type="checkbox"/> Filled Cavity	1. <i>Batts, loose fill mineral fiber, mineral and natural wool, and cellulose: fills cavity and is in contact with air barrier on six sides.</i>
<input type="checkbox"/> ocSPF: 2x4	2. <i>ocSPF: completely fill cavities of 2x4 inch framing or less. Not required to fill cavities greater than 2x4 inch framing unless required to meet R-value.</i>
<input type="checkbox"/> ccSPF: R-value	3. <i>ccSPF: insulation is not required to fill the cavities of framed assemblies unless required to meet R-value.</i>



Wall (CF2R/3R-ENV-23-H D1-3)



The good..

Photos courtesy of Rick Chitwood



<input type="checkbox"/> Filled Cavity	1. <i>Batts, loose fill mineral fiber, mineral and natural wool, and cellulose: fills cavity and is in contact with air barrier on six sides.</i>
<input type="checkbox"/> ocSPF: 2x4	2. <i>ocSPF: completely fill cavities of 2x4 inch framing or less. Not required to fill cavities greater than 2x4 inch framing unless required to meet R-value.</i>
<input type="checkbox"/> ccSPF: R-value	3. <i>ccSPF: insulation is not required to fill the cavities of framed assemblies unless required to meet R-value.</i>



Wall (CF2R/3R-ENV-23-H B7)



Photos courtesy of Rob Starr

Batt insulation is delaminated around all plumbing and electrical lines in ceilings, walls and floors.



Batt:
Delaminated

7. *Batt insulation is delaminated around all plumbing and electrical lines in ceilings, walls and floors.*

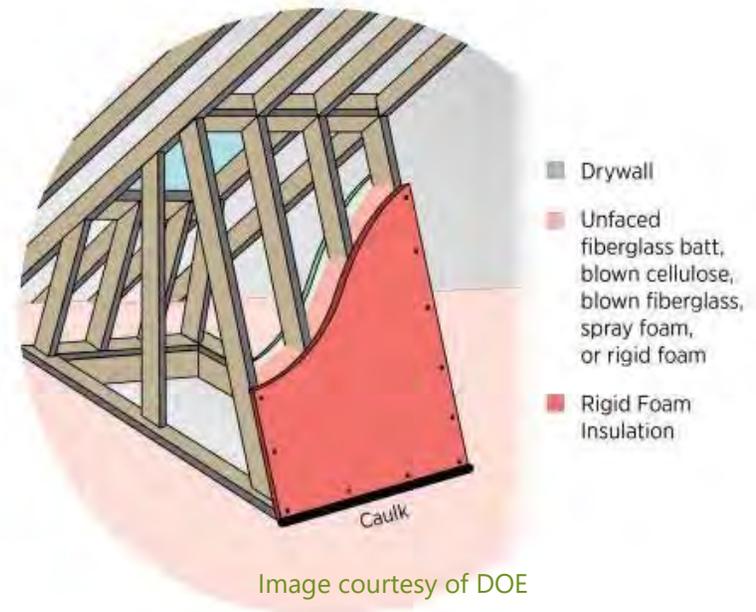


Wall (CF2R/3R-ENV-23-H D7-9)

Photo courtesy of Rick Chitwood



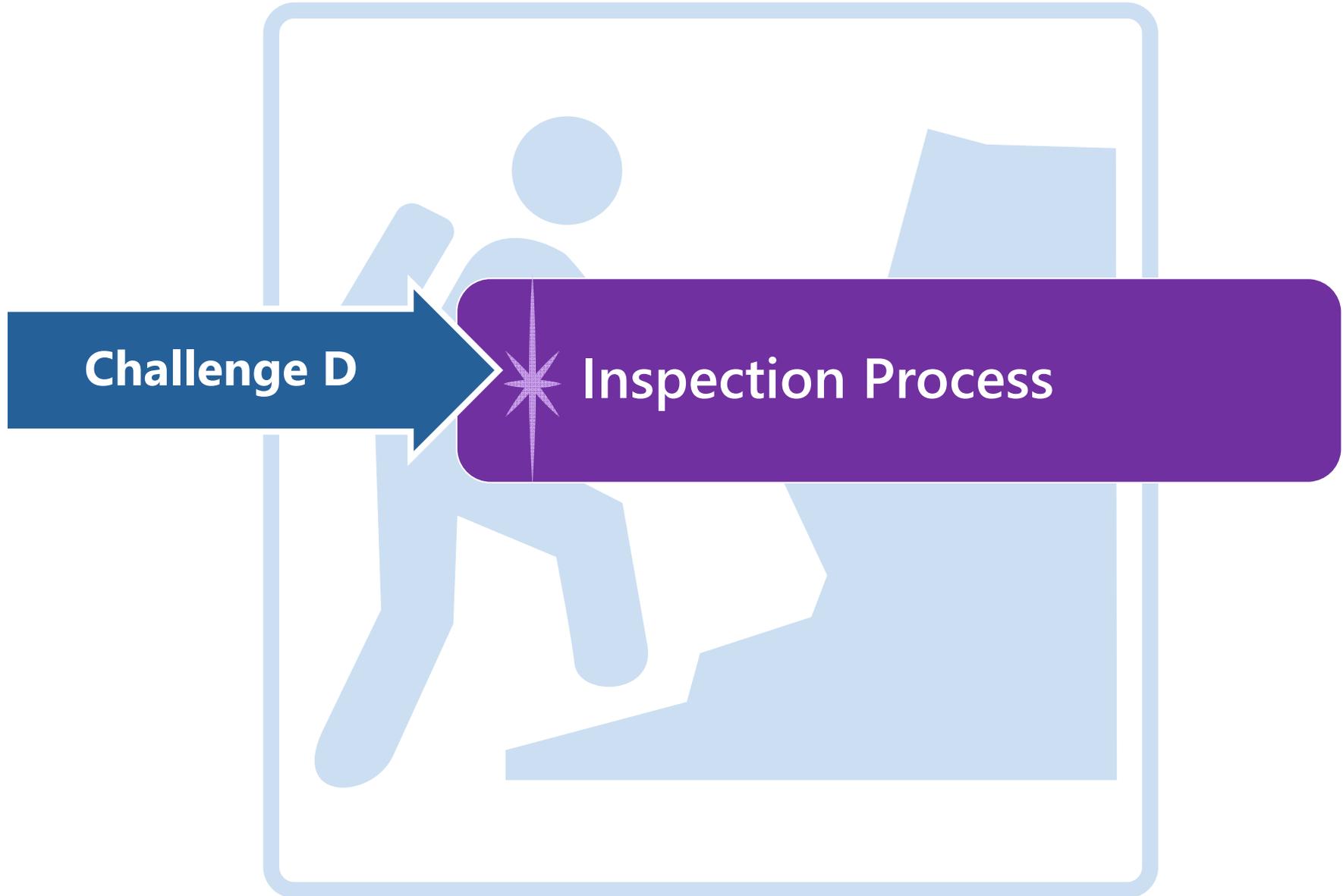
Skylights



<input type="checkbox"/> Skylights and Knee Walls	7. Skylight shafts and attic knee wall insulation must meet all the requirements for walls and is in contact with the air barrier on six sides unless SPF is used.
<input type="checkbox"/> Skylights and Knee Walls	8. Skylight shafts and attic kneewalls insulation shall be in full contact with the drywall or other interior wall finish. Batt insulation must be cut to fit around 2x4's that are laid flat.
<input type="checkbox"/> Skylights and Knee Walls	9. Skylight shafts and attic kneewalls shall be completely enclosed by vertical and horizontal framing, including horizontal plates at top and bottom of the insulation.

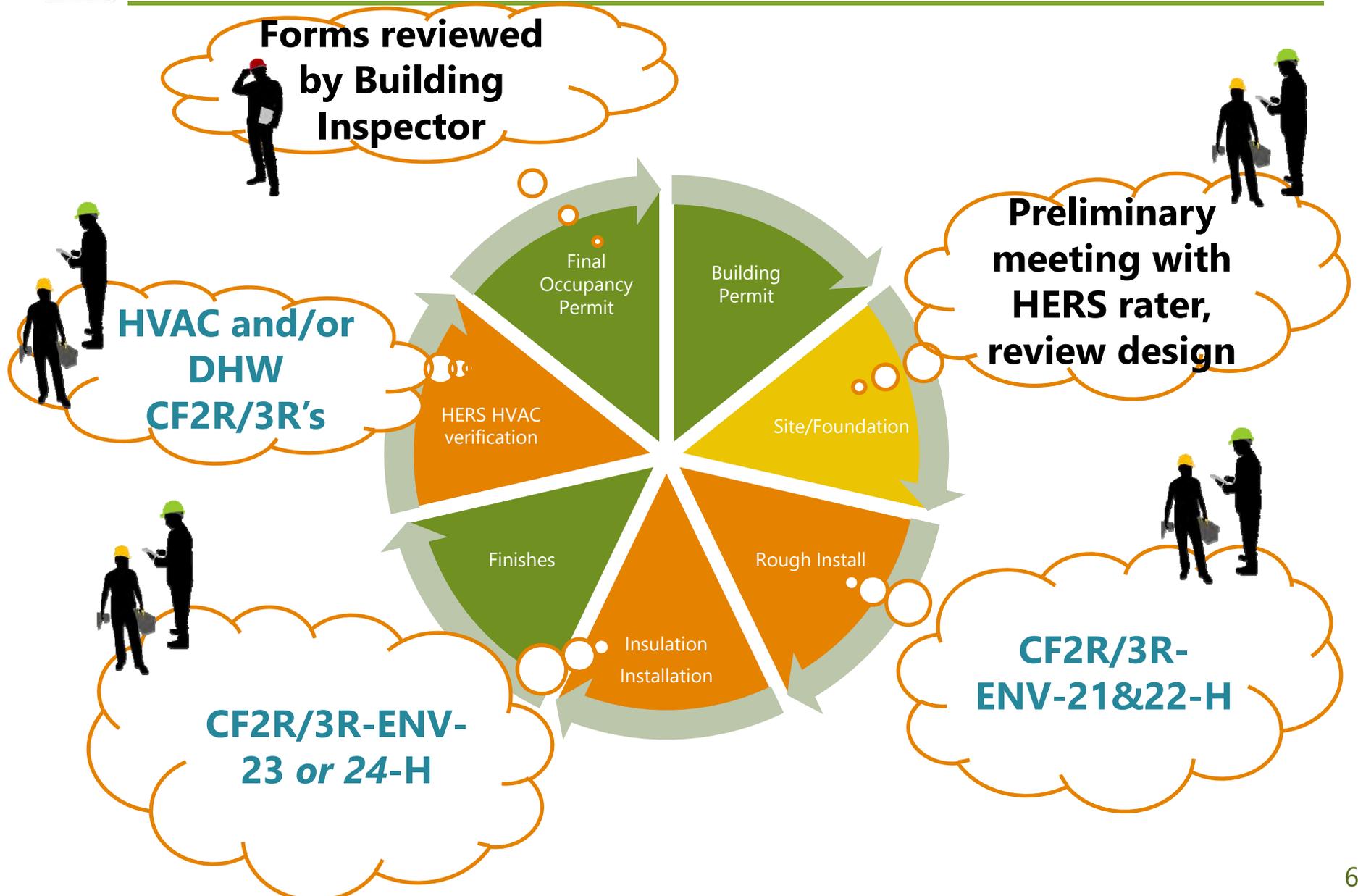


Challenge D



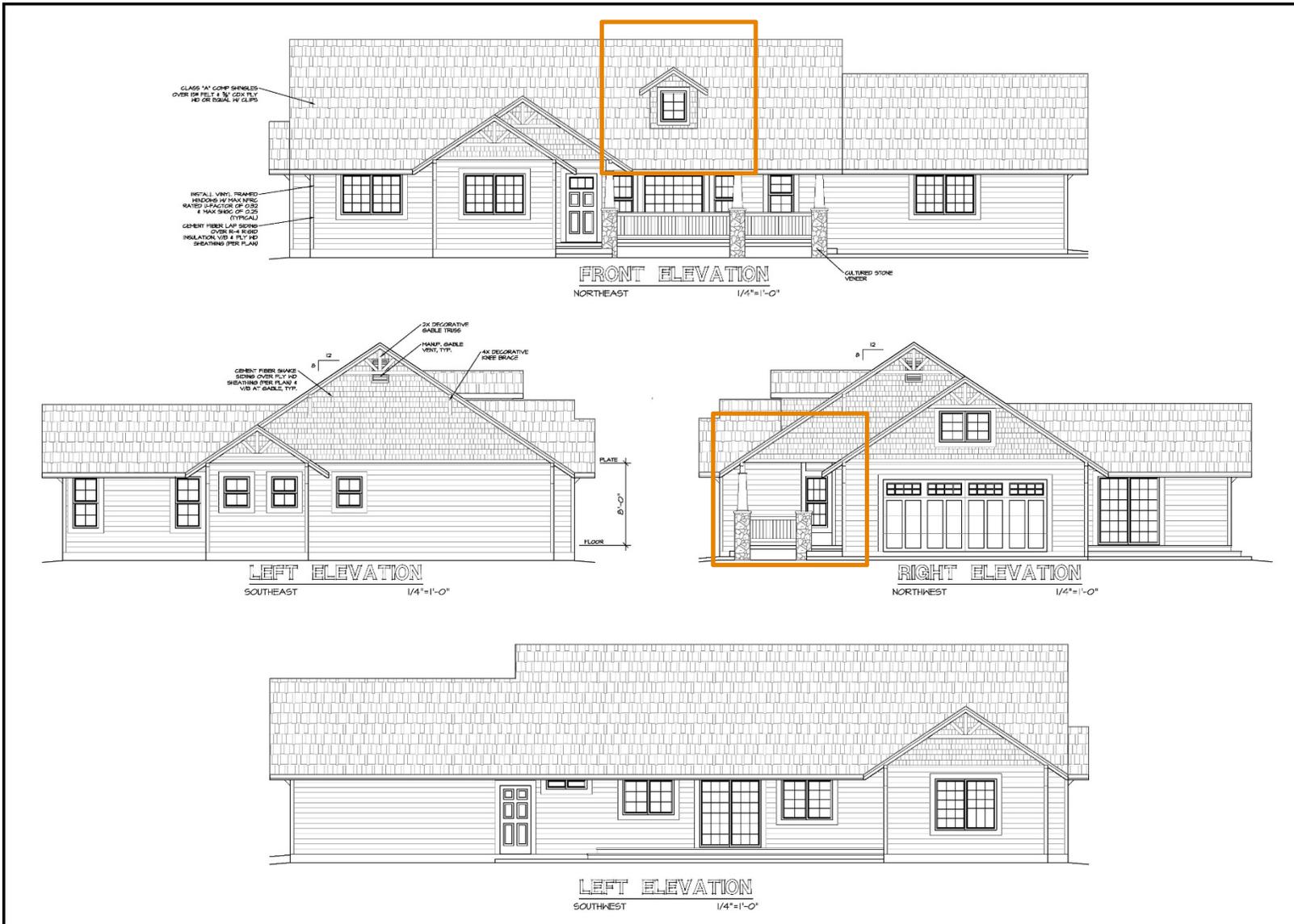


Certificate of Installation/Verification





Sample House = QII Review



DESIGN+RIGHT ARCHITECTS
400 BROWN STREET SAN FRANCISCO, CA 94102
TEL: (415) 398-8055

SITE INFORMATION:
19555 JACKSON RD.
STOCKTON, CA

PROPOSED PROJECT FOR:
JOSEPH SAMPLE
DRAWING DESCRIPTION
ELEVATIONS

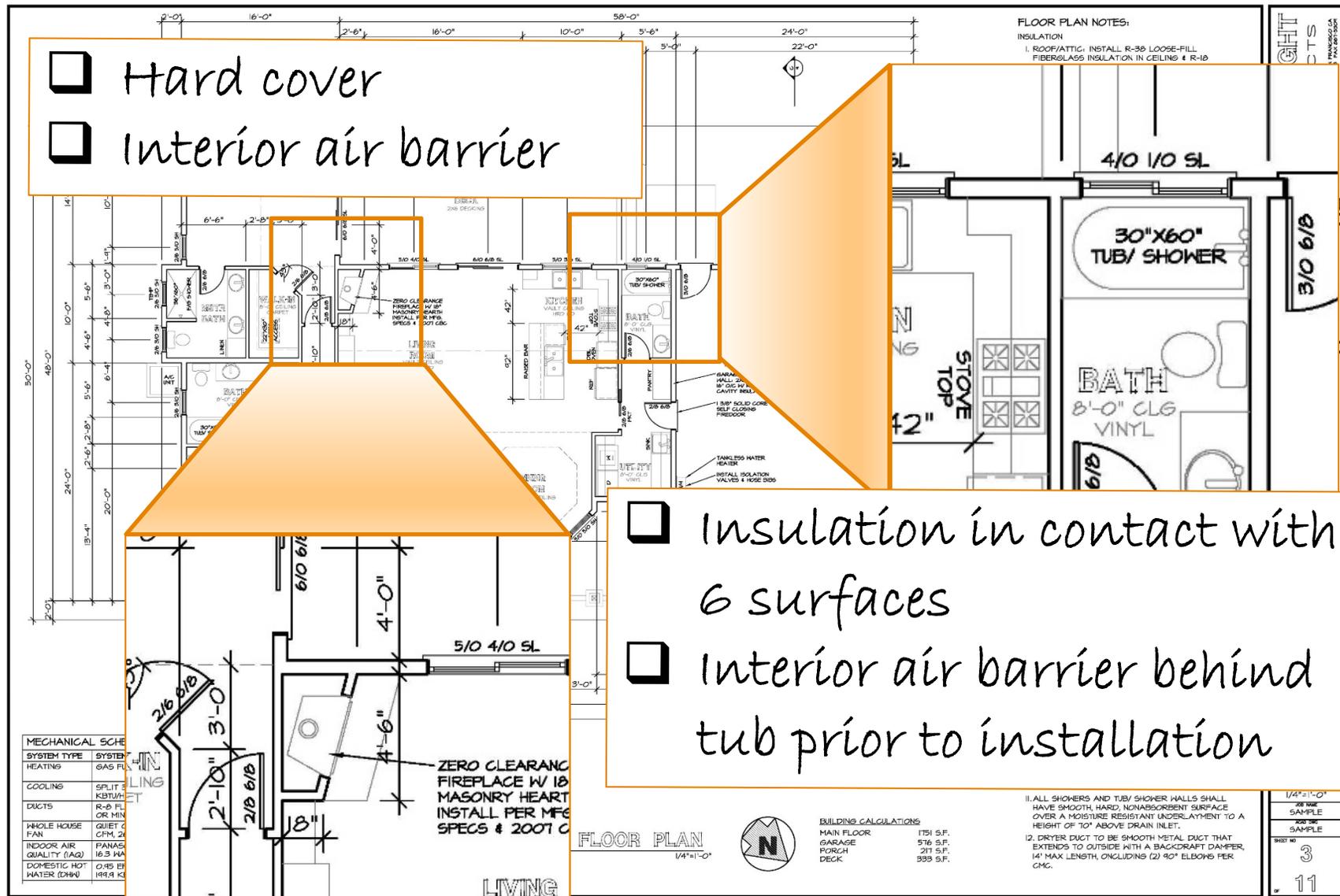
REVISION	DATE	BY

DESIGNED BY
R. BRIAN SELBY
DATE
JAN 2017
SCALE
1/4"=1'-0"
SHEET SIZE
SAMPLE
SHEET NO.
SAMPLE

SHEET NO.
2
OF
11



Sample House = QII Review





Sample House = QII Review

- Insulation end at porch
- Attic knee wall at coffered ceiling

- Attic knee wall at vaulted ceiling

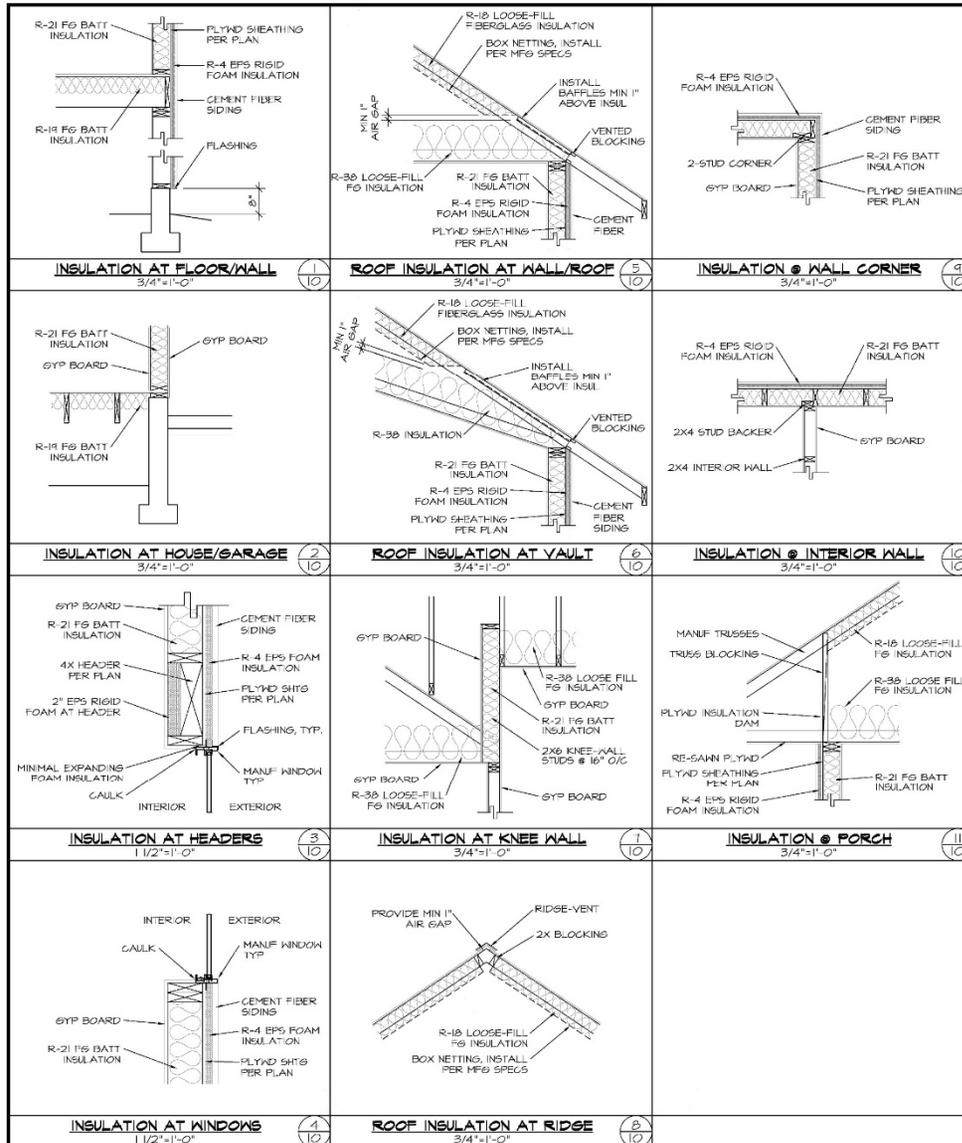
Architectural drawings showing roof and attic details. The drawings include sections A-A, B-B, and C-C, and a detail of the porch area. Annotations include 'R-18 DECORATIVE INSULATION', 'CLASS 'A' CORP SHINGLES OVER 5/8" FELT & 5/8" CORP PLY W/ 1/2" FIBERGLASS INSULATION', 'HAND TRUSSES @ 24" OC', '2X6 FASCIA W/ GUTTER', '1/2" DRYWALL', and '2X4 STUDS @ 24" OC'. A detail of the porch area shows 'BELOW ROOF ROCK INSULATION & BOX NETTING' and '1/2" DRYWALL' and '2X4 STUDS @ 24" OC'. The drawings also include a revision table and a title block.

REVISION	DATE	BY

DESIGNED BY	BRIAN SELBY
DATE	JAN 2017
SCALE	1/4"=1'-0"
JOB NAME	SAMPLE
DATE PLOT	SAMPLE
SHEET NO	9
OF	11



Sample House = QII Review



QII Schedule on Site	
Timing for QII Tasks	Task
Establishing Sub's for project	Engage HERS rater <i>early</i> to have them review plans and schedule inspections
Framing Stage	Air barrier inspection (before ANY INSULATION installed)
Insulation Installation	Roof, walls and floors insulation installation must be inspected before closing up building feature (BEFORE finishing)
Final for Occupancy Permit	Final paperwork (CF2R and CF3R's) coordinated for final inspection by Building Inspector.

QII Note Block	
Common Thermal Specifications	
<input type="checkbox"/>	Materials shall comply with, and be installed in conformance with, all applicable building codes for building California Building Code (including, but not limited to, California Electric Code Section 719) and installed to meet all applicable fire codes.
<input type="checkbox"/>	Materials shall meet California Quality Standards for Insulating Material, Title 24, Part 12, Chapter 4, Article 3, listed in the California Department of Consumer Affairs Consumer Guide and Directory of Certified Insulating Materials.
<input type="checkbox"/>	Materials shall comply with flame spread rating and smoke density requirements of Chapter 26 and Section 706 of the Title 24, Part 2. All installations with exposed facings must use fire retardant facings which have been tested and certified not to exceed a flame spread of 25 and a smoke development rating of 450. Insulation facings that do not touch a ceiling, wall, or floor surface, and face batts on the undersides of roofs with an air space between the ceiling and facing are considered exposed applications.
<input type="checkbox"/>	Materials shall be installed according to manufacturer specifications and instructions.
<input type="checkbox"/>	Hard covers or draft stops shall be placed over all drop ceiling areas and interior wall cavities to keep insulation in place and stop air movement. If hard covers or draft stops are missing or incomplete, they shall be completed before insulation is installed.
<input type="checkbox"/>	Required eave ventilation shall not be obstructed - the net free ventilation area of the eave vent shall be maintained.
<input type="checkbox"/>	Eave vent baffles shall be installed to prevent air movement under or into the batt.
<input type="checkbox"/>	Insulation shall cover all recessed lighting fixtures. If the fixtures are not rated for insulation cover (IC) and air tight, the fixtures shall be replaced. All recessed light fixtures that penetrate the ceiling shall be listed for zero clearance insulation contact (IC), have a label that certifies it as air-tight with leakage less than 2.0 cfm @ 75 Pa when tested to ASTM E283, and shall be sealed with a gasket or caulk between the light's housing and the ceiling.
<input type="checkbox"/>	Insulation shall be installed so that they will be in contact with the air barrier.
<input type="checkbox"/>	Insulation shall fill the cavity. Sized to fit, no compression, fill voids etc.
R-Value Measurement	
<input type="checkbox"/>	The HERS rater shall verify the installed thickness of insulation in all assemblies and locations on walls, roof/ceilings, and floors, and to ensure that insulation levels and installation in-egally meet the R-value specified on the Certificate of Compliance, and all other required compliance documentation.
Walls	
<input type="checkbox"/>	Bottom plates of framed and non-framed and other wall type assemblies shall be sealed to the ground subfloor or slab, and above ground subfloor.
<input type="checkbox"/>	Wall stud cavities shall be caulked or foamed to provide a substantially air-tight envelope to the outdoors, attic, garage and crawlspace. All plumbing and wiring penetrations through the top and bottom plates and electrical boxes that penetrate the sheathing shall be sealed. All gaps in the air barrier shall be caulked, taped, or sealed with minimally expansive foam.
Windows	
<input type="checkbox"/>	All gaps around windows and doors are sealed. The sealant used follows window manufacturer specifications. Coordinate between trades who is responsible.
Rim-joists	
<input type="checkbox"/>	All rim joints shall be insulated to the same R-Value as the adjacent walls.
Kneewalls, Skylight Shafts, and Gable Ends	
<input type="checkbox"/>	Framing for kneewalls, skylight shafts and gable ends that separate conditioned from unconditioned space shall be insulated to meet or exceed the wall R-value specified on the Certificate of Compliance, and all other required compliance documentation.

DESIGN-T-RIGHT ARCHITECTS
400 BROADWAY, SUITE 1000, STOCKTON, CA 95210
TEL: 209.477.1100 FAX: 209.477.1101

SITE INFORMATION:
5555 JACKSON RD,
STOCKTON, CA

PROPOSED PROJECT FOR:
JOSEPH SAMPLE

ISSUANCE DESCRIPTION:
SECTIONS

REVISION	DATE	BY

DRAWN BY:	MR. BRIAN SELBY
DATE:	JAN 2017
SCALE:	1/4"=1'-0"
TITLE:	2017 QII SAMPLE
PROJECT:	2017 QII SAMPLE
SHEET NO.:	10
TOTAL SHEETS:	12



Next Steps



HELPING YOU PLAY YOUR CARDS RIGHT



Coming Soon!

July 2017

Residential and Nonresidential HERS
w/Russ King

August 2017

Details Behind Continuous Insulation
w/Building Science Corp.



EnergyCodeAce.com/training



DOE Building America Solutions Center

<https://basc.pnnl.gov/>

Building Components

The Building Components tool will help you find new and existing homes guides. Click the images below for a list of subcategories corresponding to each of the primary categories. Select one category to display a list of related guides.





A new website developed by the Statewide Codes & Standards Program to help you meet the requirements of Title 24, Part 6

We offer **FREE**



A variety of tools to help you identify the forms, installation techniques, and building energy standards relevant to building projects in California



Classroom and online trainings on Title 24, Part 6.



Fact Sheets, Trigger Sheets, Checklists, and FAQs to help you understand when Title 24, Part 6 is "triggered" and how to correctly comply when it is



visit us at
www.EnergyCodeAce.com



Wrap Up



HELPING YOU PLAY YOUR CARDS RIGHT