



## Purpose

The purpose of this document is to provide guidance for permitting and construction compliance with the 2021 International Energy Conservation Code (IECC), as amended by the Kansas City Building and Rehabilitation Code (KCBRC), for residential projects defined by the IECC as IRC and IBC Group R-2, R-3, and R-4 up to 3 stories.

## Required Documentation - ECA Sheets

All required information in the 2021 International Energy Conservation Code and as listed below, must be on the **plan sheet(s) labeled as "ECA"** (Energy Code Analysis). This applies to plans for all new buildings, alterations, and additions to existing buildings.

This document is written primarily for new construction (including additions), however existing buildings undergoing renovations may have provisions and exceptions found in [Chapter 5](#) for alterations and additions- see Special Notes for Renovations and Alterations later in this document.

## General Standards for All Residential Plans

All Energy Code Analysis (ECA) sheets shall include, but are not limited to:

Yes No N/A

- State which of the following methods are being used to comply with the 2021 IECC [R401.2](#),
  - Prescriptive Compliance [R401.2.1](#) - include also the method specific standards below.
  - Total Building Performance [R401.2.2](#) - include also the method specific standards below.
  - Energy Rating Index Compliance (ERI) [R401.2.3](#) - include also the method specific standards below.
- State which Additional Efficiency Package Options is being used, [R401.2.5](#) and [R408](#).
- Plan View(s) marking the thermal envelope provided for all floors. Show insulation values, including continuous insulation if applicable.
- Elevation View depicting the thermal envelope.
- Section View(s) showing foundation, wall, and roof thermal envelope boundary and insulation R-values to be installed at each location. Show for each configuration type.
- Completed thermal envelope certificate - This is a copy of the certificate which is required to be posted permanently in the home [R401.3](#)
- List specific insulation requirements for all items mentioned in [R402](#).
- Note how penetrations of the Thermal Envelope will be addressed.

- Note compliance for lighting equipment, exterior lighting, & interior/exterior lighting controls per [R404](#).
- Note that a 2-inch conduit run up to the attic and a 2-inch conduit run into the garage area for future electric vehicle charging stations will be provided - KCBRC amendment. (new buildings only)
- Where software is used to calculate energy compliance, a nationally recognized software (i.e., [HERS/RESNET](#), [ekotrope](#), or [REScheck](#)) shall be submitted as a separate attachment to the plan case and referenced on the plans.
- For mechanical equipment sizing and efficiency ratings, ACCA Manual J, S, and D calculations shall be submitted as a separate document to the plan case. See Manual J Design Criteria on the following pages. *(When mechanical is not used as part of the total building energy code design, such as in the prescriptive method, these calculations may be deferred and submitted at the time of mechanical permit application - must identify deferral on plans)*

### Method Specific Standards

#### A. Prescriptive Compliance Method [R401](#) through [R404](#).

Yes No N/A

- Specify minimum R-values per R402.1.3, climate zone 4; a specific minimum value must be selected and shown on plans (choose only R-30 or R-20&5ci or R-13&10ci or R-20ci for walls).
- If using UA alternative, specify maximum U-factors per R402.1.2 and climate zone 4, provide calculations on plans and list maximum calculated U-factor per assembly.
- Note on plans that Testing [R402.4.1.2](#) will be performed and indicate either anticipated or target ACH (air changes per hour).

#### B. Total Building Performance Method [R405](#).

Yes No N/A

- Include table [R405.2](#) on the ECA sheets as a checklist for the design and construction of the structure.
- Note how the building thermal envelope is greater than or equal to levels of efficiency and solar heat gain coefficients in Table [R402.1.1](#) or [R402.1.3](#) of the [2009 IECC](#).
- Note how the energy cost is less than or equal to the annual energy cost of the standard design.
- Documentation per [R405.3](#) shall be referenced on ECA sheets and submitted as a separate document.

#### C. Energy Rating Index Compliance Method (ERI) [R406](#).

Yes No N/A

- Show how the building thermal envelope complies with [R406.3](#) for onsite renewables.
- Maximum ERI of table [R406.5](#). Our climate zone is 54 \* .95 % gives 51.3 required.
- Documentation per [R406.7](#) shall be referenced on ECA sheets and submitted as a separate document.
- Documentation per [R406.7.2.2](#) shall be provided prior to Certificate of Occupancy.
- The Renewable Energy Certificate (REC) where included in calculations shall be provided. [R406.7.3](#).

### Special Notes for Renovations/Alterations

Plans must have an ECA that details what areas in the thermal envelope must meet the Alteration requirements of [R503.1.1](#). The plans must list insulation values that will be used to meet this requirement. If not applicable, state as such in the ECA. Plans must denote a scope of work/description for anticipated mechanical, electrical, and plumbing work and how it will meet the 2021 IECC.

### Manual J Design Criteria

Elevation	Latitude	Winter heating	Summer cooling	Altitude correction factor	
740-1000 Depending on location	39° N	4° F	93° F	-----	
Indoor design temperature		Design temperature cooling		Heating temperature difference	
72° F		75°		68° F	
Cooling temperature difference		Wind velocity heating		Wind velocity cooling	Coincident wet bulb
18° F		15		7.5	75° F
Daily range		Winter humidity		Summer humidity	
High		30%		50%	

### General Standards for Residential Inspections

All outside or 3<sup>rd</sup> party inspections/reports must be received at least 5 business days prior to any Final Inspection or Final Inspection will not be scheduled.

#### *Prescriptive Compliance Method*

1. Insulation inspections by the City prior to concealment
  - a. Wall and floor insulation to be verified after framing is approved and before concealment, this includes attic baffles. Exterior insulation must be verified prior to concealment.
  - b. Attic insulation will be verified prior to final but after sheetrock is installed.
2. Duct Leakage Testing to be completed and submitted by third party inspector prior to occupancy.
3. Whole House Leakage test to be completed and submitted by Third Party Inspector prior to occupancy.
4. Energy Certificate to be installed per code and verified on final.

#### *Total Building Performance and ERI*

1. Insulation inspections by Third Party Inspector per the design documents (since these methods allows code compliance that does not meet the letter of the code, third party is required - must be RESNET or equivalent certified, as determined by this department, and provide certificate).
2. Duct Leakage Testing to be completed and submitted by third party inspector prior to occupancy.
3. Whole House Leakage test to be completed and submitted by third party inspector prior to occupancy.
4. Energy Certificate to be installed per code and verified on final.
5. Compliance report from Third Party Inspector verifying compliance with the design per 405.3.2.2.

### ECA Sample Drawings

Sample sheets (four) created by Central Energy Audits and Aspen Home in cooperation with KCMO-CPD can be found on the [CPD website](#) attached to this Information Bulletin.

# COVER SHEET

TABLE OF CONTENTS	
DRAWING NO.	CONTENT DESCRIPTION
CS1	TABLE OF CONTENTS, ARCHITECTURAL SQUARE FOOTAGE CHART
ECA 1	ENERGY CODE ANALYSIS-COMPLIANCE PATH, ADDITIONAL EFFICIENCY PACKAGE ITEM, SIGNED 2021 ENERGY LABEL, THERMAL ENVELOPE & PENETRATION REQUIREMENT TABLE, TOTAL BUILDING PERFORMANCE COMPLIANCE, ENERGY CALC. SQUARE FOOTAGE CHART, TYPICAL INSULATION WALL SECTION, FUTURE SOLAR & ELECTRIC VEHICLE CONDUIT INSTALLATION.
ECA 2	ENERGY CODE ANALYSIS INSULATION DETAILS, EXTERIOR WALL INTERSECTION INSULATION/FRAMING DETAIL, EXTERIOR CORNER WALL INSULATION/FRAMING DETAIL, VAULTED CEILING INSULATION/FRAMING DTL.
ECA 3	ENERGY CODE ANALYSIS- THERMAL ENVELOPE FLOOR PLANS, THERMAL ENVELOPE ELEVATIONS
5	CONSTRUCTION DRAWINGS-EXTERIOR ELEVATIONS
6	CONSTRUCTION DRAWINGS-FOUNDATION PLAN
7	CONSTRUCTION DRAWINGS-FIRST FLOOR PLAN
8	CONSTRUCTION DRAWINGS-SECOND FLOOR PLAN
9	CONSTRUCTION DRAWINGS-ROOF PLAN

PLAN NAME

SITE ADDRESS:

Sample Sheets created by Central Energy Audits and Aspen Homes in cooperation with KCMO City Planning

ARCHITECTURAL SQUARE FOOTAGE CHART
1924 S.F. FIRST FLOOR 1015 S.F. SECOND FLR 223 S.F. BASEMENT FIN. 3162 TOTAL AREA
1701 S.F. UNFIN. BSMNT. 167 S.F. COVERED DECK 190 S.F. DECK 972 S.F. GARAGE 129 S.F. FRONT PORCH 635 S.F. SUSPENDED GARAGE

DRAWING NO.:

CS1

Note: These ECA sheets and details were designed under the Total Building Performance method.

# THERMAL ENVELOPE & PENETRATION REQUIREMENTS

## R402.4.1.1 Installation.

The components of the *building thermal envelope* as indicated in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria indicated in Table R402.4.1.1, as applicable to the method of construction. Where required by the *code official*, an approved third party shall inspect all components and verify compliance.

**TABLE R402.4.1.1**  
**AIR BARRIER, AIR SEALING AND INSULATION INSTALLATION<sup>a</sup>**

COMPONENT	AIR BARRIER CRITERIA	INSULATION INSTALLATION CRITERIA
General requirements	A continuous air barrier shall be installed in the building envelope. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Ceiling/attic	The air barrier in any dropped ceiling or soffit shall be aligned with the insulation and any gaps in the air barrier shall be sealed. Access openings, drop down stairs or knee wall doors to unconditioned attic spaces shall be sealed.	The insulation in any dropped ceiling/soffit shall be aligned with the air barrier.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and the top of exterior walls shall be sealed. Knee walls shall be sealed.	Cavities within corners and headers of frame walls shall be insulated by completely filling the cavity with a material having a thermal resistance, R-value, of not less than R-3 per inch. Exterior thermal envelope insulation for framed walls shall be installed in substantial contact and continuous alignment with the air barrier.
Windows, skylights and doors	The space between framing and skylights, and the jambs of windows and doors, shall be sealed.	---
Rim joists	Rim joists shall include an exterior air barrier. <sup>b</sup> The junctions of the rim board to the sill plate and the rim board and the subfloor shall be air sealed.	Rim joists shall be insulated so that the insulation maintains permanent contact with the exterior rim board. <sup>b</sup>
Floors, including cantilevered floors and floors above garages	The air barrier shall be installed at any exposed edge of insulation.	Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of subfloor decking. Alternatively, floor framing cavity insulation shall be in contact with the top side of sheathing, or continuous insulation installed on the underside of floor framing and extending from the bottom to the top of all perimeter floor framing members.
Basement crawl space and slab foundations	Exposed earth in unvented crawl spaces shall be covered with a Class 1 vapor retarder/air barrier in accordance with Section R402.2.10. Penetrations through concrete foundation walls and slabs shall be air sealed. Class 1 vapor retarders shall not be used as an air barrier on below-grade walls and shall be installed in accordance with Section R702.7 of the <i>International Residential Code</i> .	Crawl space insulation, where provided instead of floor insulation, shall be installed in accordance with Section R402.2.10. Conditioned basement foundation wall insulation shall be installed in accordance with Section R402.2.8.1. Slab-on-grade floor insulation shall be installed in accordance with Section R402.2.10.
Shafts, penetrations	Duct and flue shafts to exterior or unconditioned space shall be sealed. Utility penetrations of the air barrier shall be caulked, gasketed or otherwise sealed and shall allow for expansion, contraction of materials and mechanical vibration.	Insulation shall be fitted tightly around utilities passing through shafts and penetrations in the building thermal envelope to maintain required R-value.
Narrow cavities	Narrow cavities of 1 inch or less that are not able to be insulated shall be air sealed.	Batts to be installed in narrow cavities shall be cut to fit or narrow cavities shall be filled with insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	Insulated portions of the garage separation assembly shall be installed in accordance with Sections R303 and R402.2.7.
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be air sealed in accordance with Section R402.4.5.	Recessed light fixtures installed in the building thermal envelope shall be airtight and IC rated, and shall be buried or surrounded with insulation.
Plumbing, wiring or other obstructions	All holes created by wiring, plumbing or other obstructions in the air barrier assembly shall be air sealed.	Insulation shall be installed to fill the available space and surround wiring, plumbing, or other obstructions, unless the required R-value can be met by installing insulation and air barrier systems completely to the exterior side of the obstructions.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate the wall from the shower or tub.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior walls	The air barrier shall be installed behind electrical and communication boxes. Alternatively, air-sealed boxes shall be installed.	---
HVAC register boots	HVAC supply and return register boots that penetrate building thermal envelope shall be sealed to the subfloor, wall covering or ceiling penetrated by the boot.	---
Concealed sprinklers	Where required to be sealed, concealed fire sprinklers shall only be sealed in a manner that is recommended by the manufacturer. Caulking or other adhesive sealants shall not be used to fill voids between fire sprinkler cover plates and walls or ceilings.	---

- a. Inspection of log walls shall be in accordance with the provisions of ICC 400.  
b. Air barrier and insulation full enclosure is not required in unconditioned/ventilated attic spaces and at rim joists.

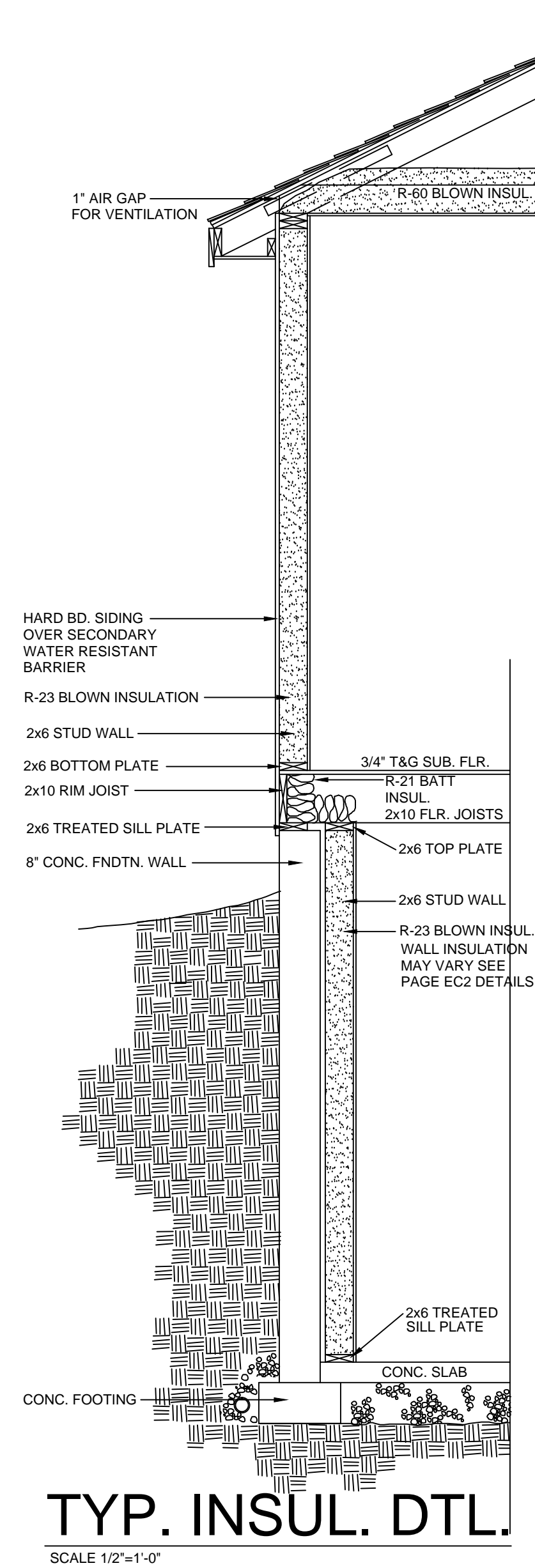
# TOTAL BUILDING PERFORMANCE TABLE R405.2 REQUIREMENTS

## CHAPTER 4 [RE] RESIDENTIAL ENERGY EFFICIENCY

**TABLE R405.2**  
**REQUIREMENTS FOR TOTAL BUILDING PERFORMANCE**  
ALL THESE REQUIREMENTS MUST BE MET FOR COMPLIANCE

SECTION <sup>a</sup>	TITLE
<b>General</b>	
R401.2.5	Additional energy efficiency
R401.3	Certificate
<b>Building Thermal Envelope</b>	
R402.1.1	Vapor retarder
R402.2.3	Eave baffle
R402.2.4.1	Access hatches and doors
R402.2.10.1	Crawl space wall insulation installations
R402.4.1.1	Installation
R402.4.1.2	Testing
R402.5	Maximum fenestration U-factor and SHGC
<b>Mechanical</b>	
R403.1	Controls
R403.3, including R403.3.1, except Sections R403.3.2, R403.3.3 and R403.3.6	Ducts
R403.4	Mechanical system piping insulation
R403.5.1	Heated water circulation and temperature maintenance systems
R403.5.3	Drain water heat recovery units
R403.6	Mechanical ventilation
R403.7	Equipment sizing and efficiency rating
R403.8	Systems serving multiple dwelling units
R403.9	Snow melt and ice systems
R403.10	Energy consumption of pools and spas
R403.11	Portable spas
R403.12	Residential pools and permanent residential spas
<b>Electrical Power and Lighting Systems</b>	
R404.1	Lighting equipment
R404.2	Interior lighting controls

- a. Reference to a code section includes all the relative subsections except as indicated in the table.



## ENERGY CALCULATIONS S.F. CHART

UNFINISHED BASEMENT	2335 S.F.
FINISHED BASEMENT	233 S.F.
TOTAL CONDITIONED BASEMENT AREA	2568 S.F.
MAIN FLOOR	1924 S.F.
SECOND FLOOR	980 S.F.
TOTAL CONDITIONED AREA	5472 S.F.

PLAN NAME

SITE ADDRESS:

## Energy Efficiency Certificate

**ADDRESS:** 2304 NE Shad Creek Pkwy, Pleasant Valley, MO, 64155  
**BUILDER:** Aspen Homebuilders  
**CODE EDITION:** IECC 2021  
**COMPLIANCE PATH:** Total Building Performance

**Central Energy Audits**  
Inspected by: Krissa Miller  
Certified Rater ID: 9501914  
Contact: 816-698-6051

INSULATION RATING		GLASS & DOOR	
Ceiling/Roof R	60	Window U	.25
Vaults R	38	Door U	.2
Wall R	23	Skylight U	.2
Foundation Wall R	21	Slab R	
Floors R	19	Other R	
Garage Wall R	21		

**HERS/ERI INDEX:** **49**

INFILTRATION TESTING		GLASS & DOOR	
Ducts	150	Window U	.25
Blower Door	CFM 25	Door U	.2
Air Changes	.3	Skylight U	.2

**HEATING & COOLING**  
Heating System TYPE Gas EFFICIENCY 96.7  
Cooling System TYPE Elec EFFICIENCY 14 SEER2  
Water Heater TYPE Gas EFFICIENCY 96

Average Mechanical Ventilation 70 CFM  
Additional Energy Efficiency Package Item R401.2.5.2.2

Indicate if the following have been installed:  
 Electric Furnace  
 Gas-Fire Unvented Room Heater  
 Baseboard Electric Heater

NOTES:  
 DESIGNER/BUILDER SIGNATURE: *Krissa Miller*  
 DATE: 03/27/2024

DRAWING NO.:

ECA1

**Note: These ECA sheets and details were designed under the Total Building Performance method.**

## COMPLIANCE PATH

THIS BUILDING WILL COMPLY WITH THE PERFORMANCE TABLE. TOTAL BUILDING PERFORMANCE PATH IS USED TO SHOW COMPLIANCE WITH THE 2021 IECC.

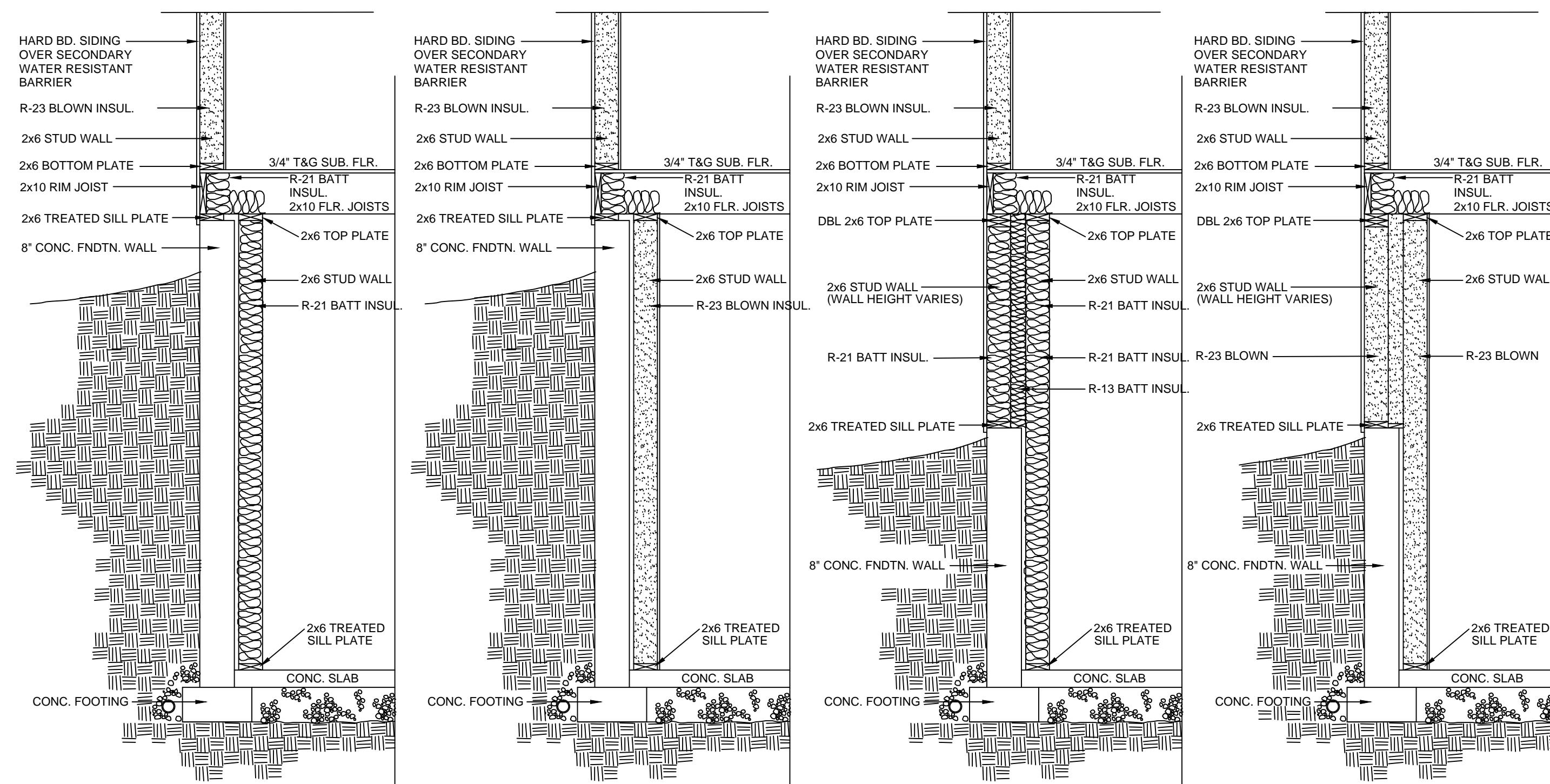
## ADDITIONAL EFFICIENCY PACKAGE ITEM

THE PROPOSED DESIGN OF THE BUILDING UNDER SECTION R405.3 SHALL HAVE AN ANNUAL ENERGY COST THAT IS LESS THAN OR EQUAL TO 95 PERCENT OF THE ANNUAL ENERGY COST OF THE STANDARD REFERENCE DESIGN.

## SOLAR PANEL & ELECTRIC VEHICLE CONDUIT

THE BUILDER SHALL INSTALL 2" CONDUIT TO THE ATTIC FOR FUTURE SOLAR PANEL WIRING AND TO THE GARAGE FOR ELECTRIC VEHICLE WIRING.

Note: These ECA sheets and details were designed under the Total Building Performance method.

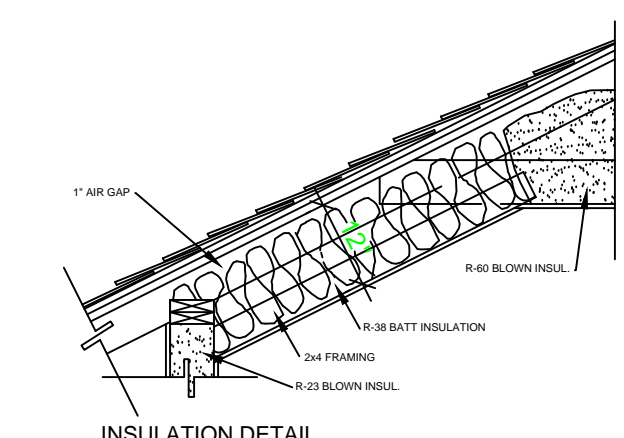


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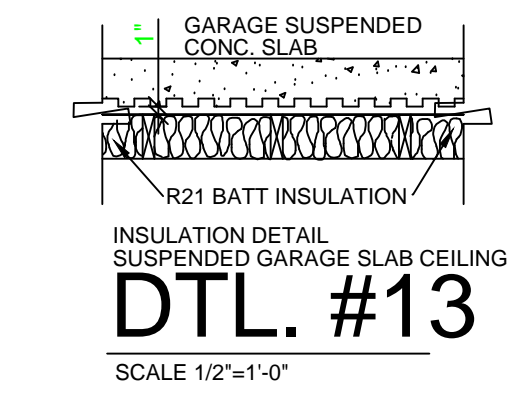
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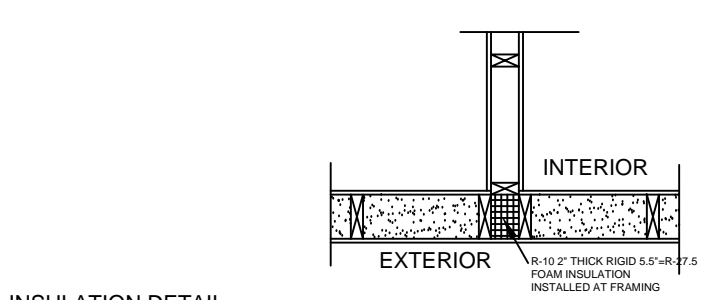
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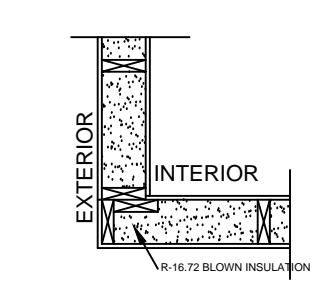
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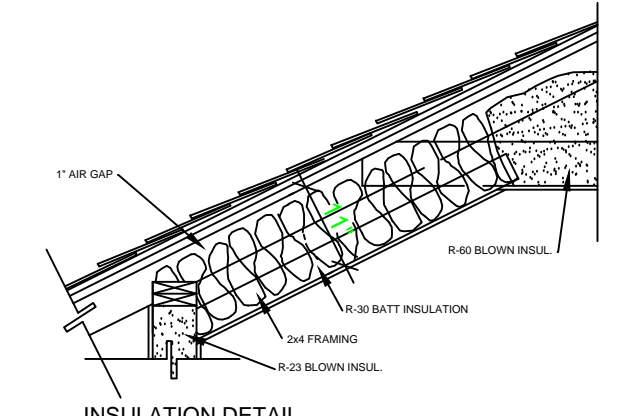
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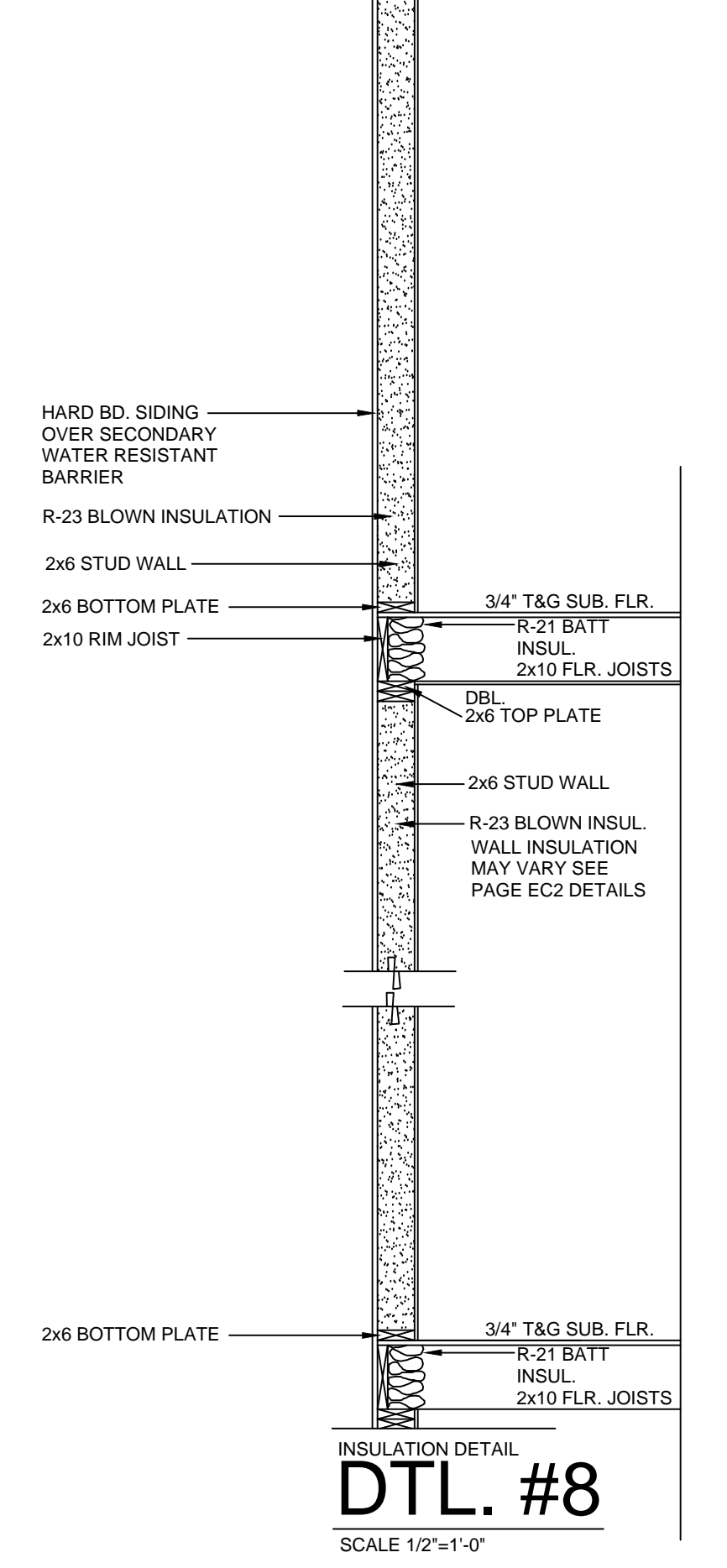
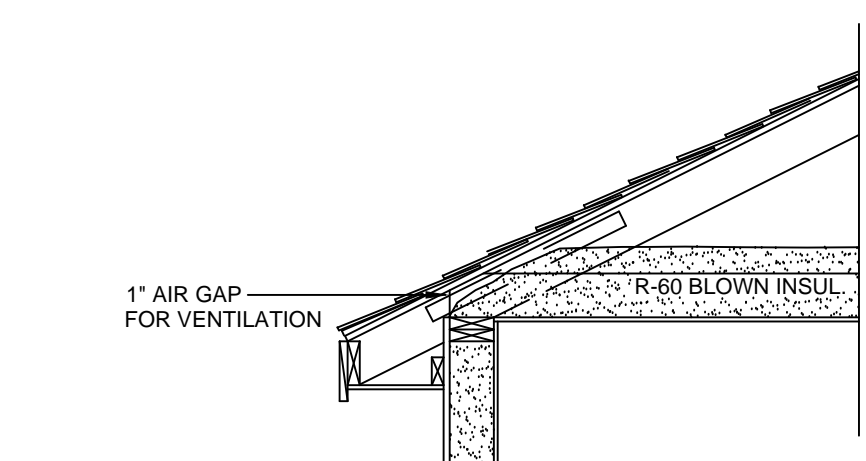
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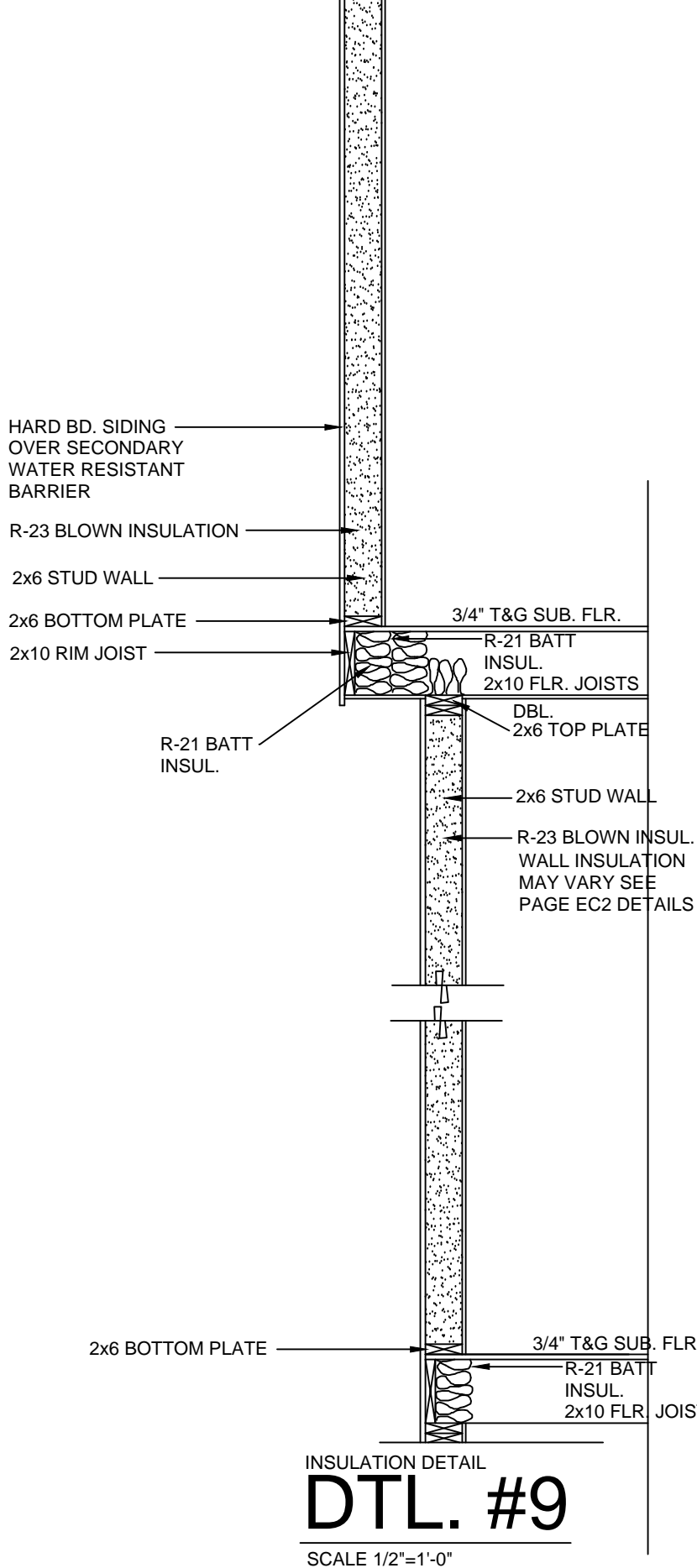
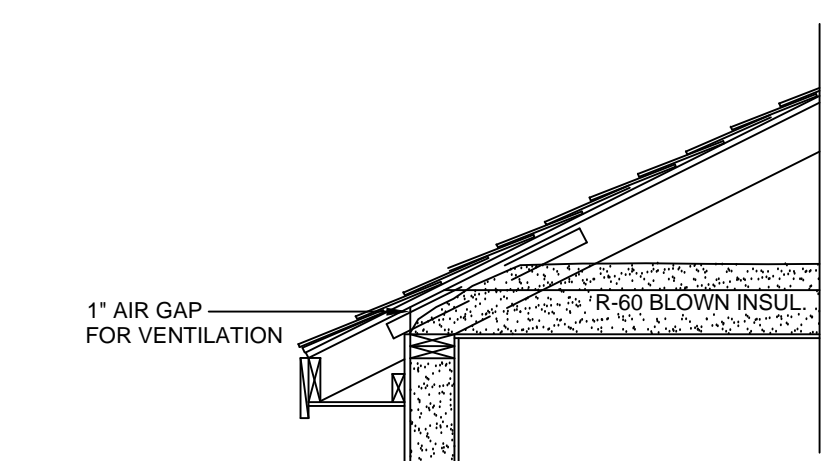
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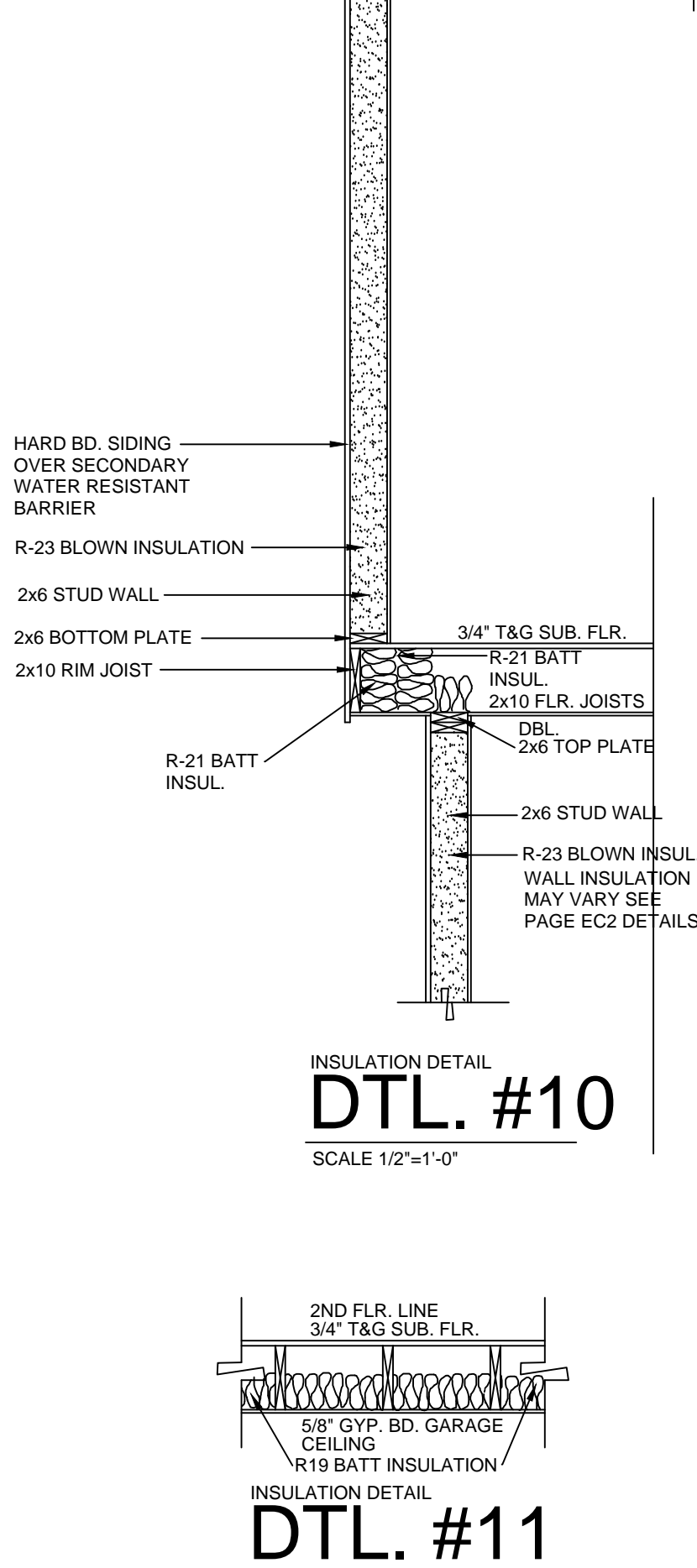
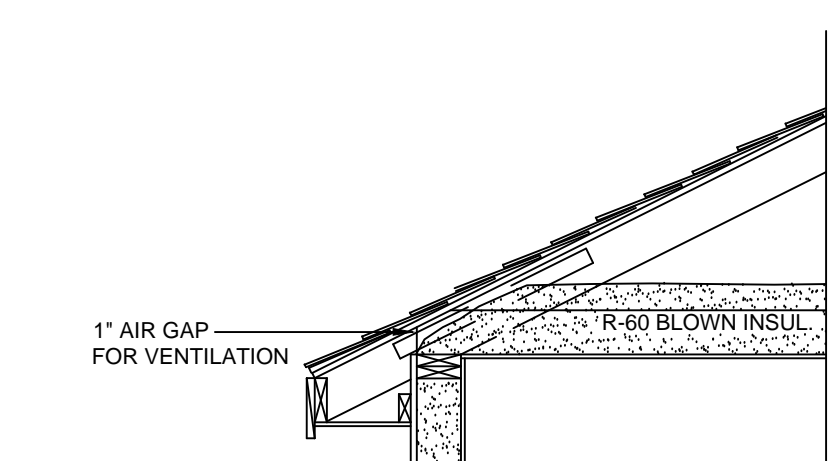
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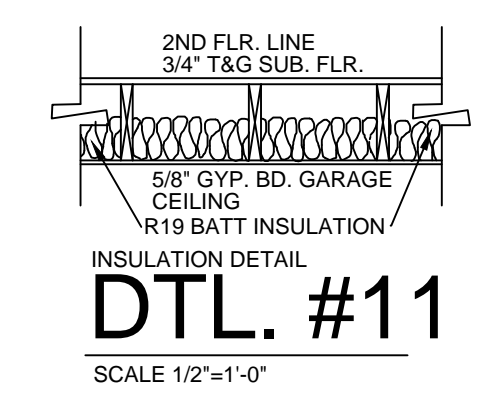
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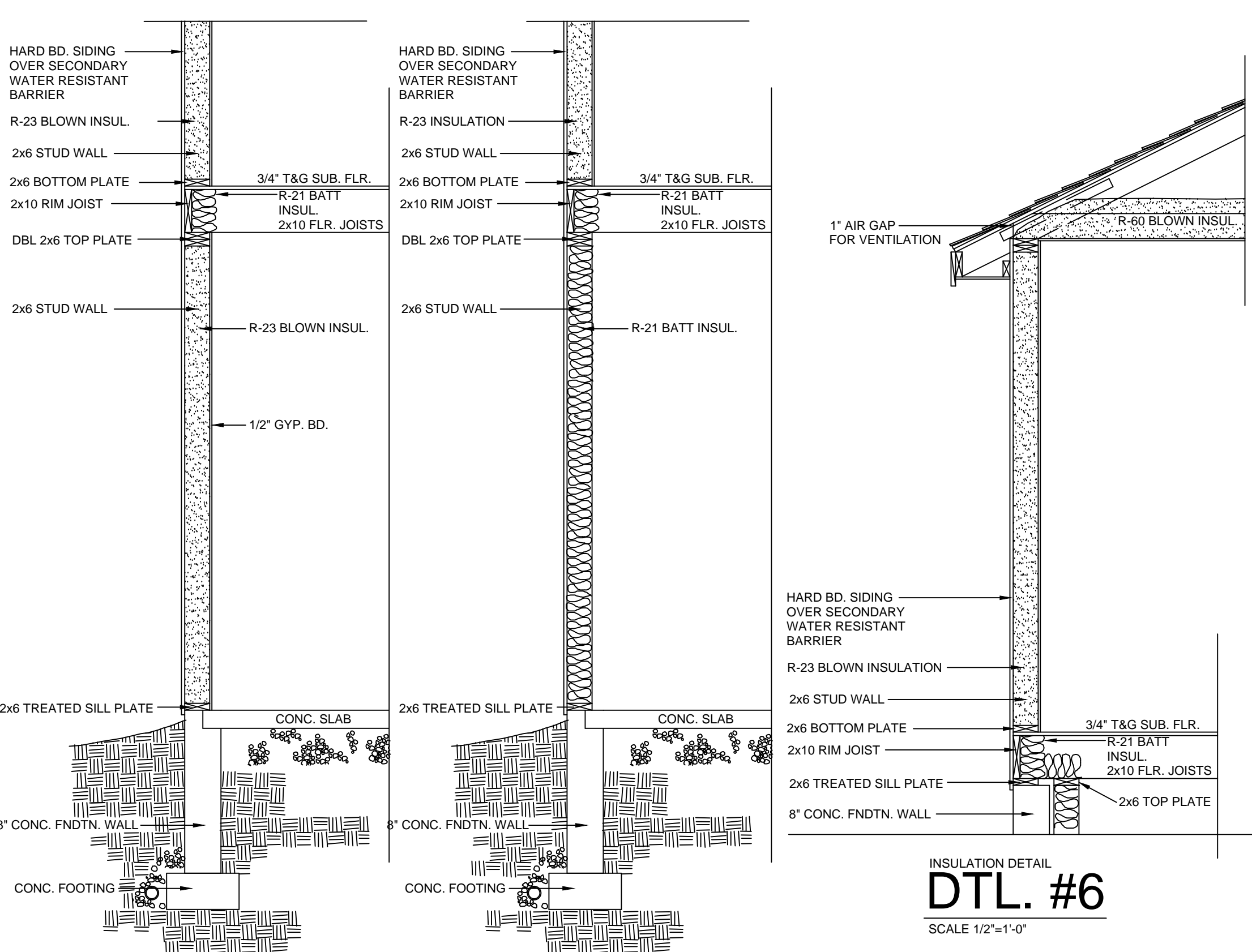
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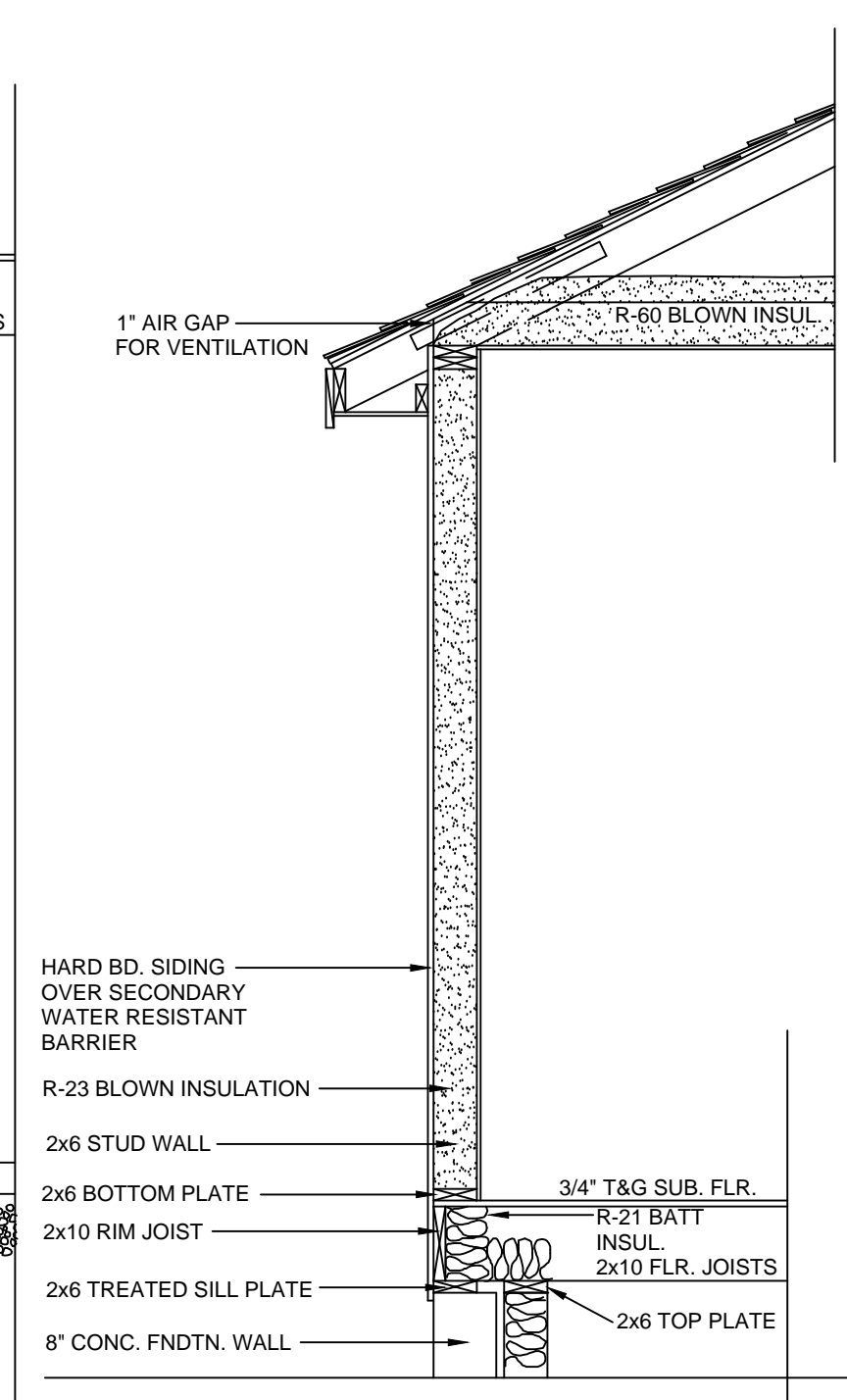


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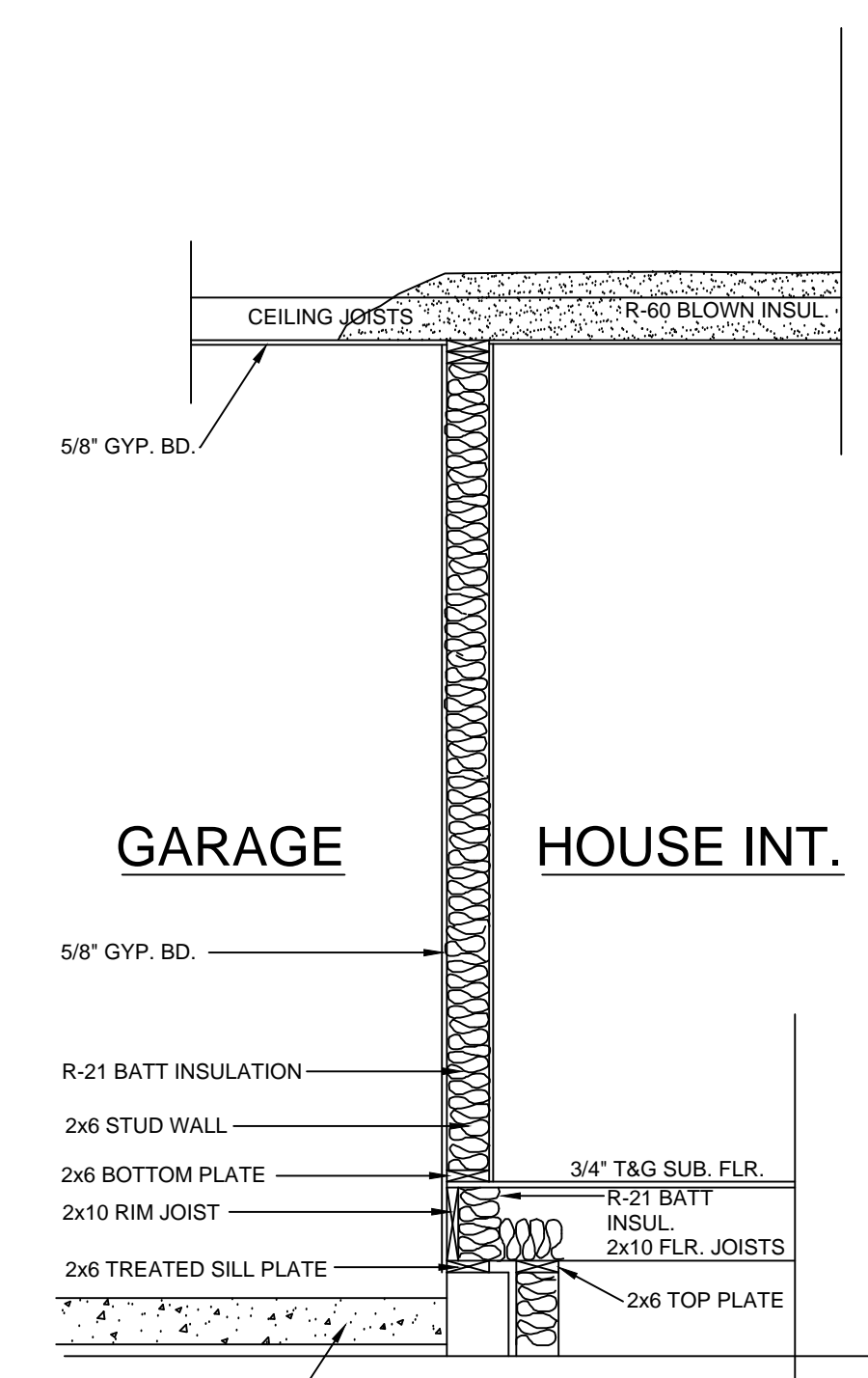


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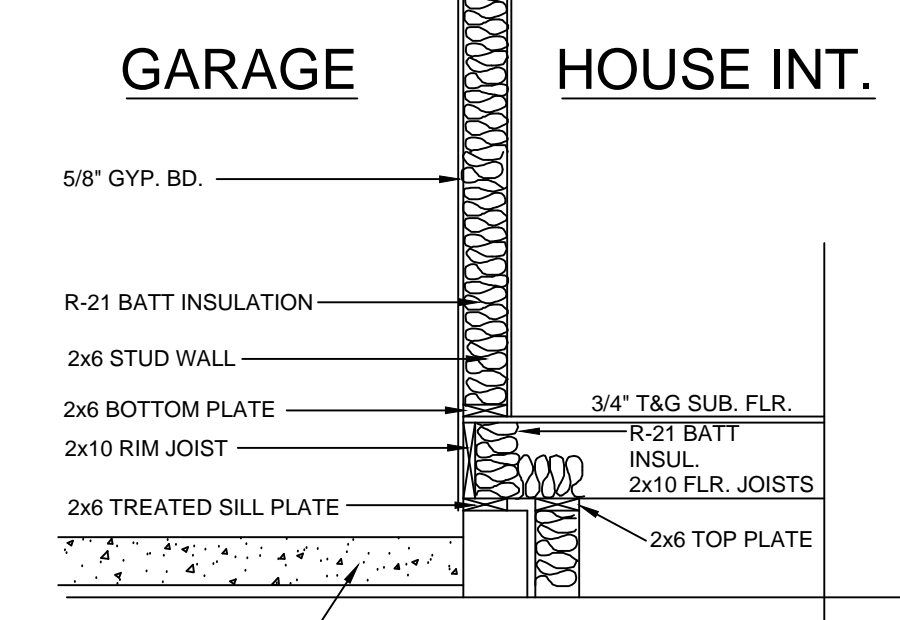
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INSULATION DETAIL  
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INSULATION DETAIL  
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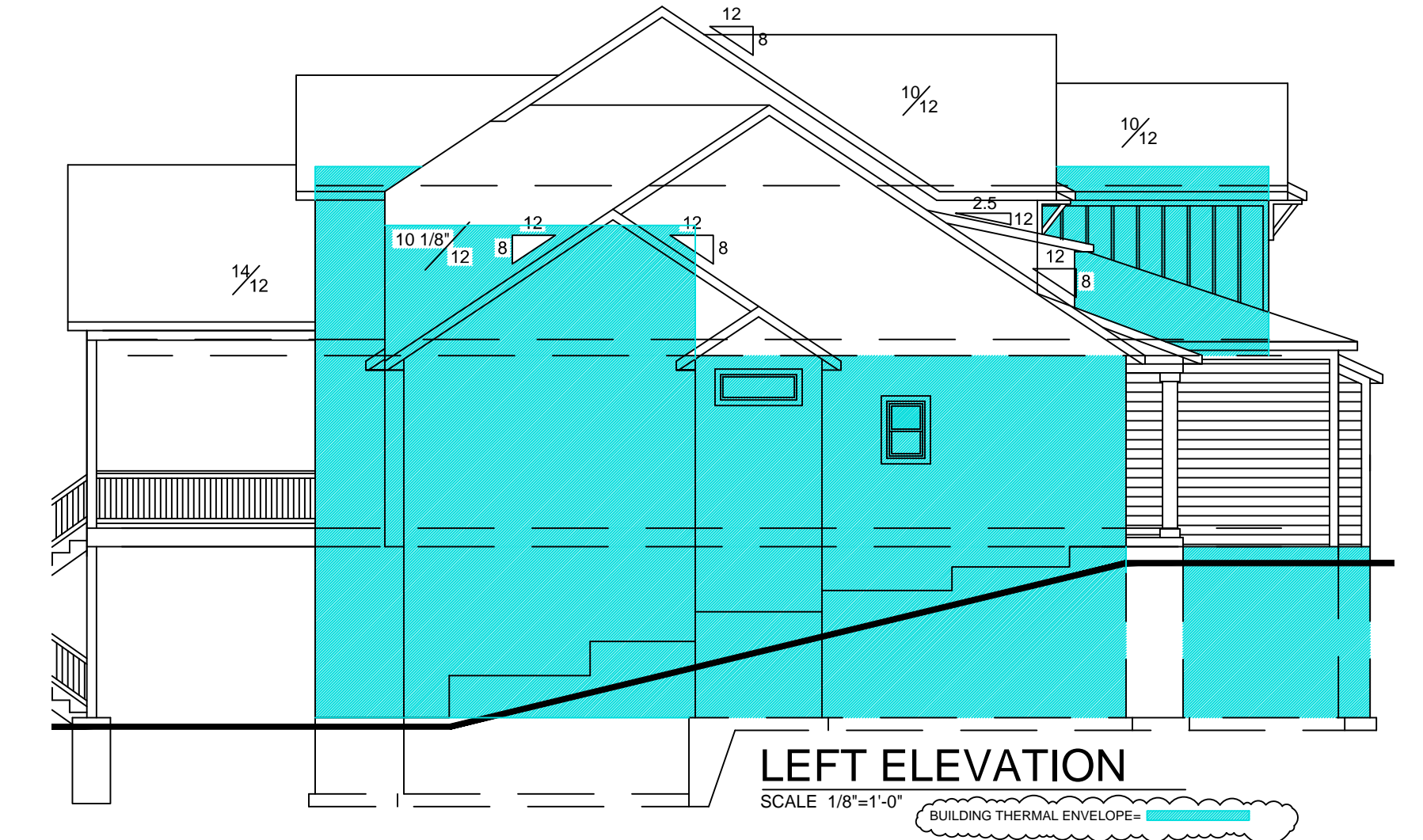
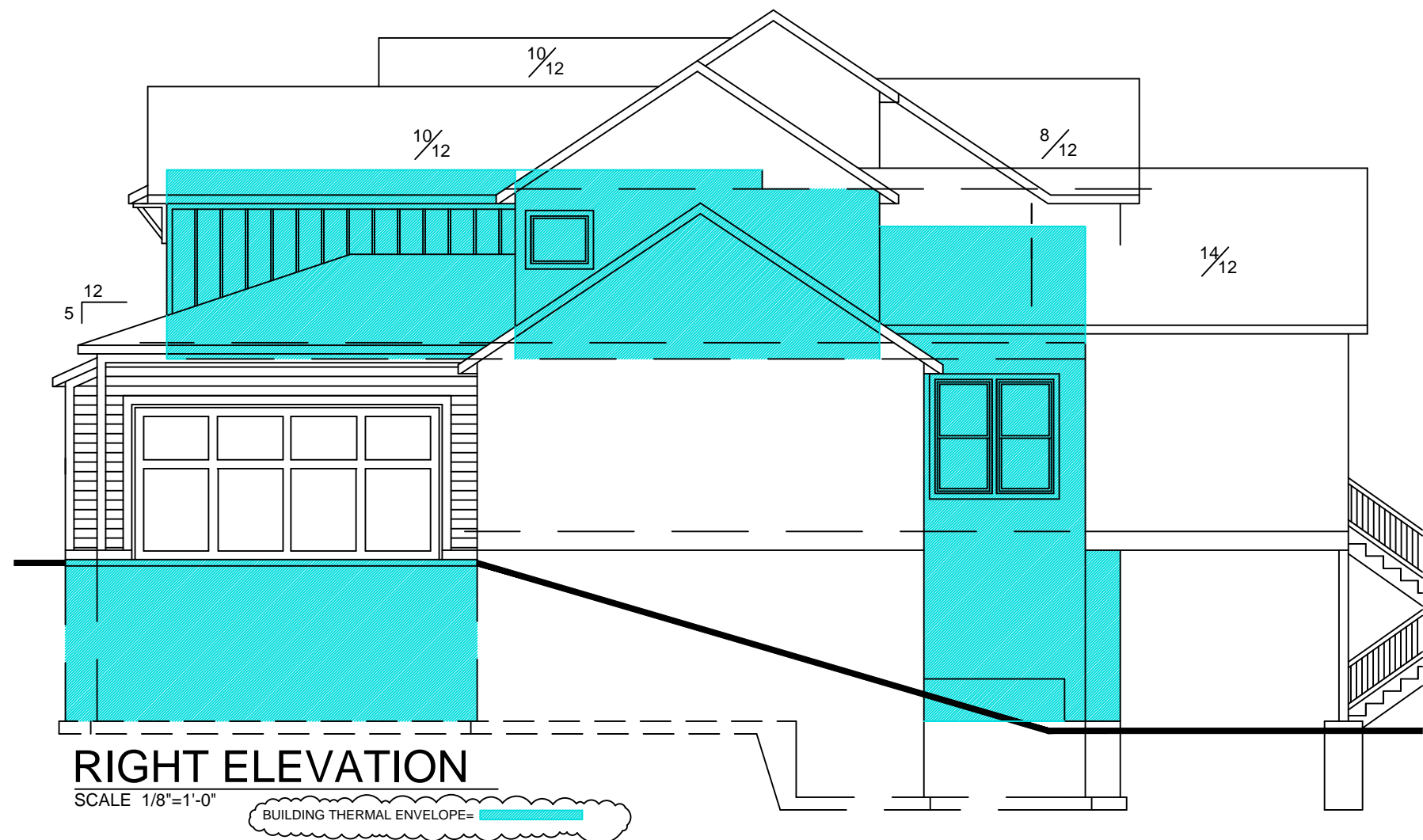
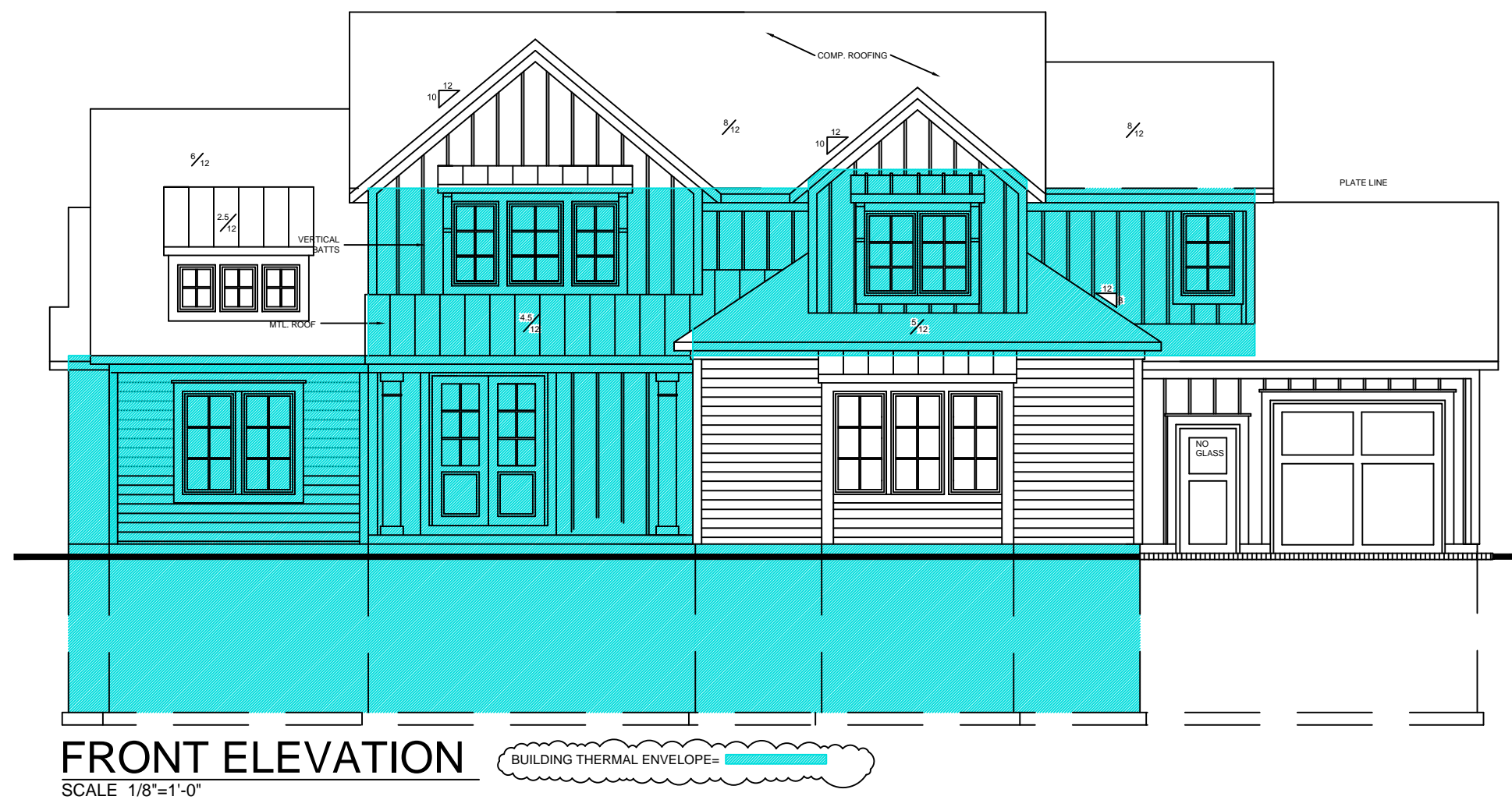
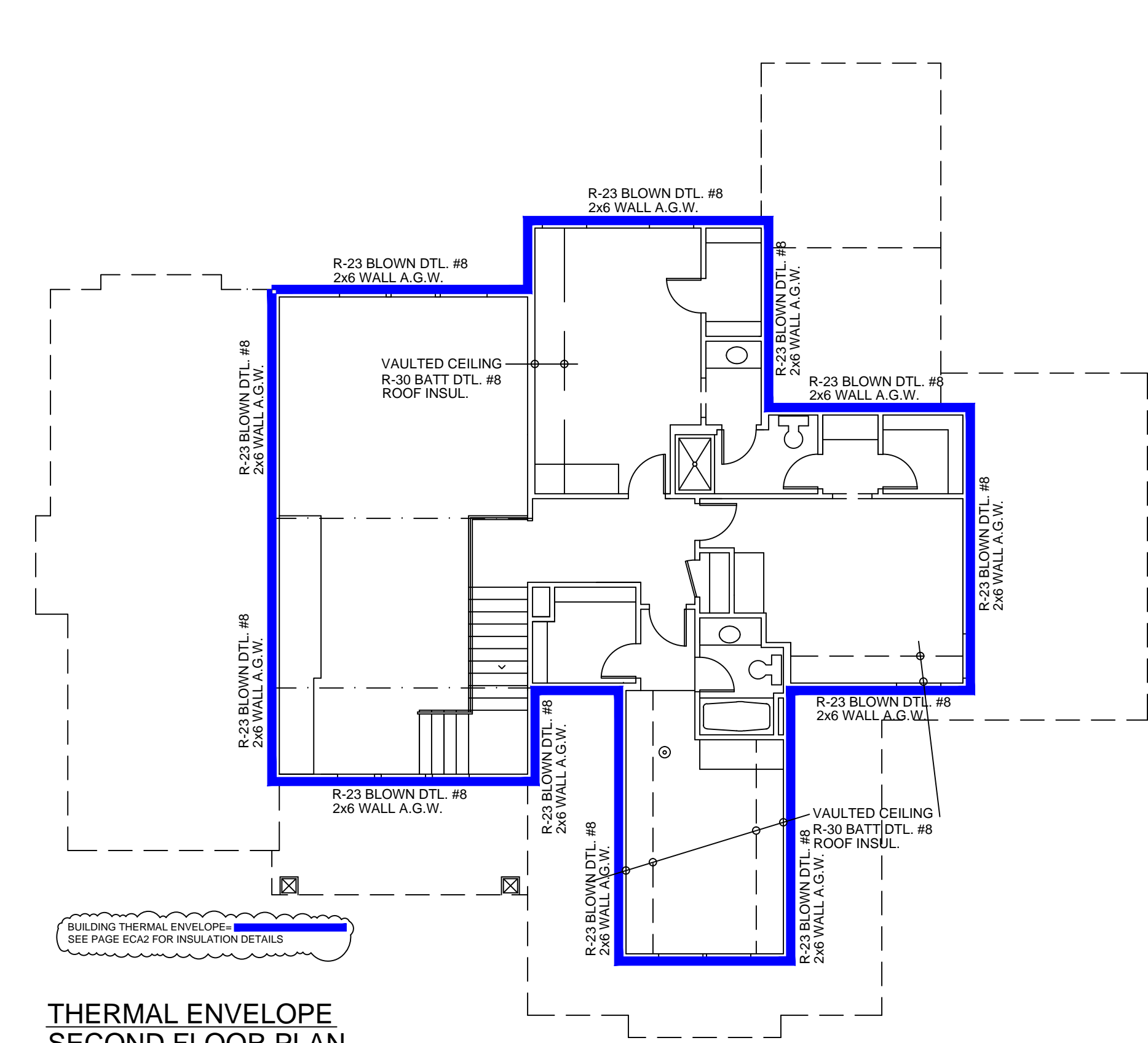
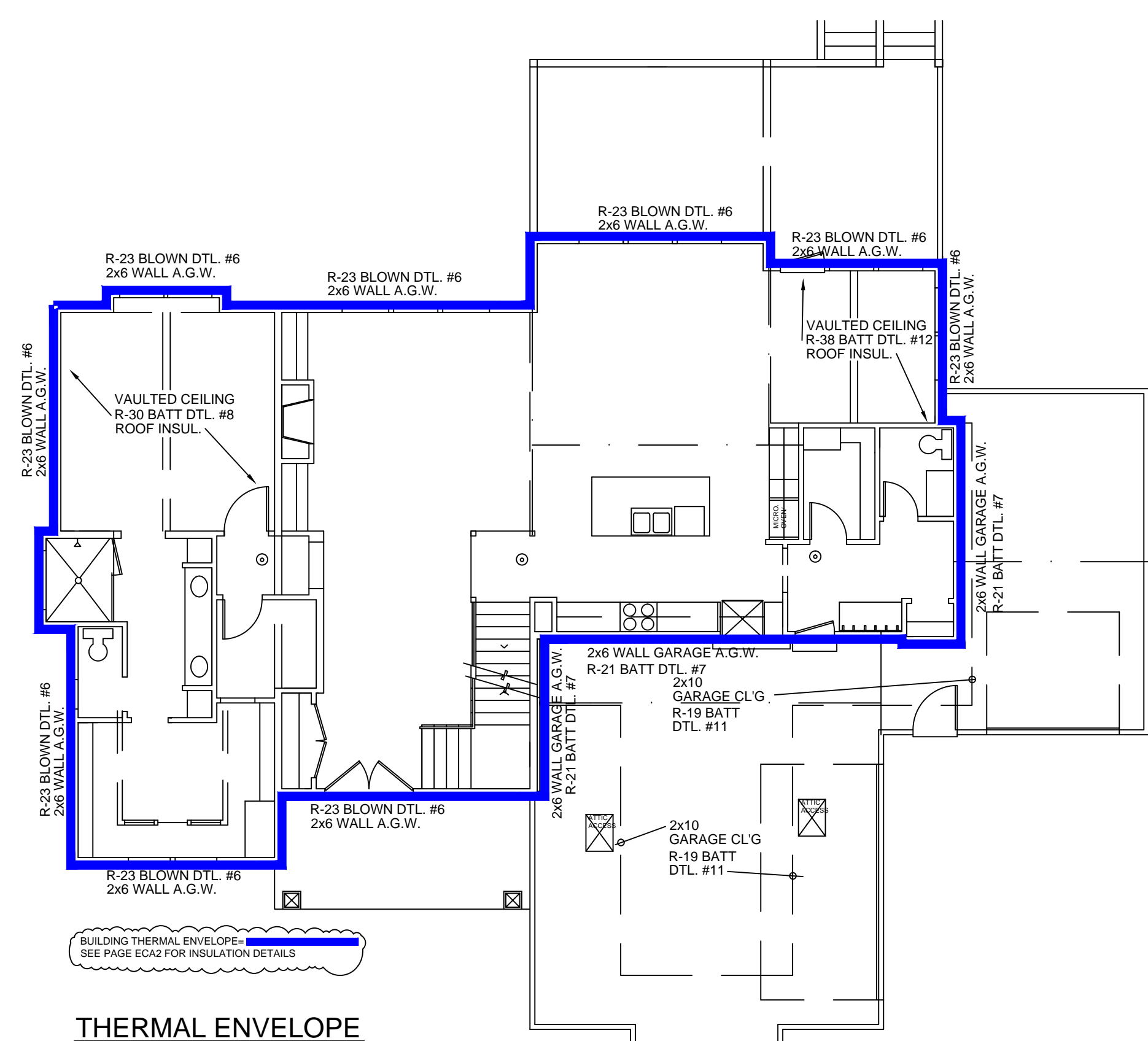
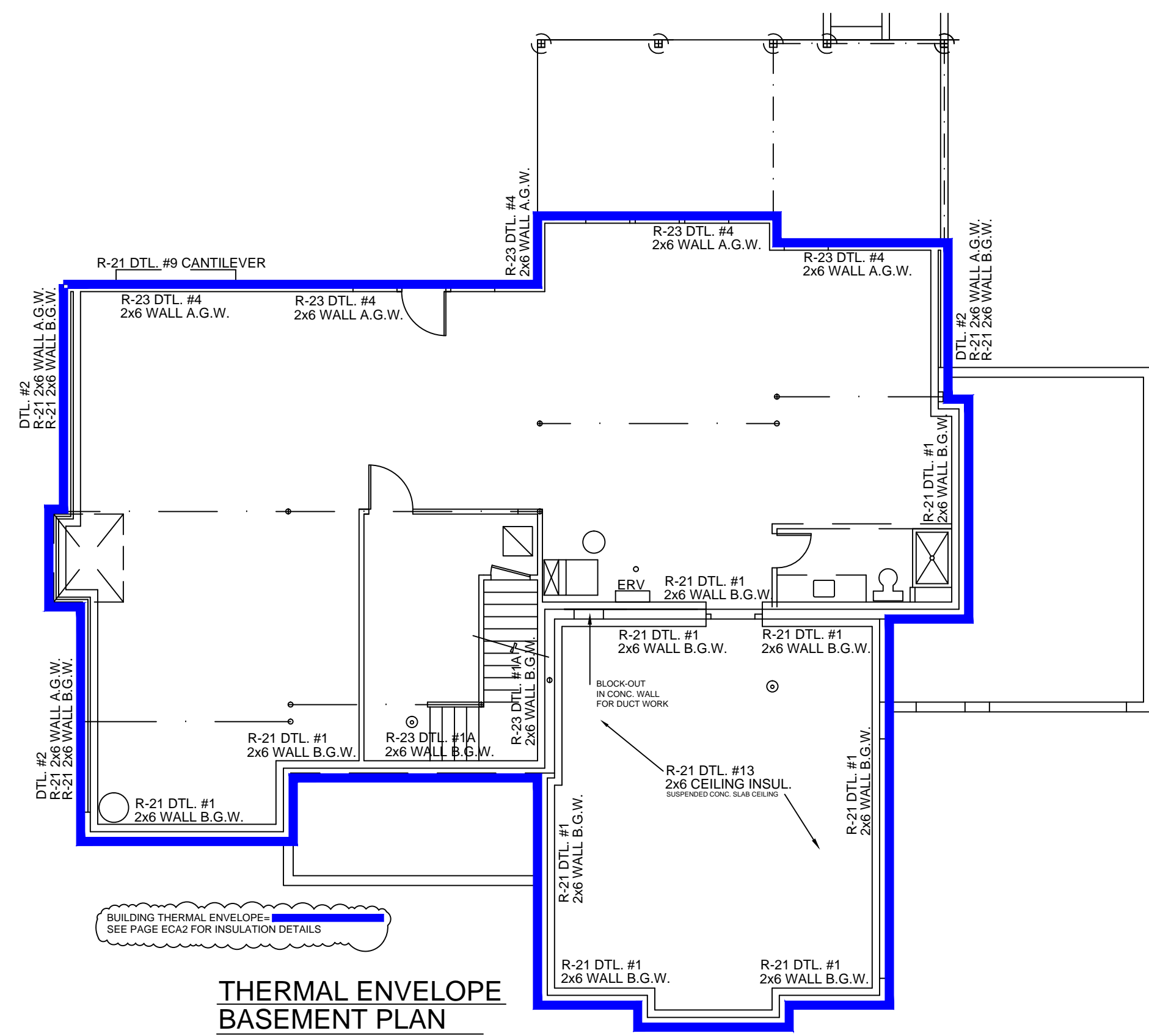
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PLAN NAME

SITE ADDRESS:

DRAWING NO.:

ECA2



PLAN NAME:  
SITE ADDRESS:

DRAWING NO.:  
**ECA3**

Note: These ECA sheets and details were designed under the Total Building Performance method.