PAREXUSA







California Energy Code and Parex USA Solutions

- EIFS
- Stucco Assemblies

What is "Title 24"?

Title 24 is the section of the California Code of Regulations which sets the Building Standards Code for the State of California. Cities and counties are required to enforce CCR Title 24 and may adopt more restrictive requirements as they deem necessary.

The code is divided into 12 parts. When people in the building industry speak of "Title 24", they are typically referring to Part 6, which applies to the Energy Efficiency Standards of the Building Standards Code.

Part 6 of Title 24 – Energy Efficiency Standards

The Energy Efficiency Standards apply to both residential and non-residential construction. These standards were established in 1978 as a response to a legislative mandate to reduce California's energy consumption.

The state is divided into 16 different climate zones. Each zone has a different energy efficiency requirement.

According to the California Energy Commission, these standards, along with those for energy efficient appliances, have saved the state more than $56 billion in electricity and natural gas costs since 1978. It is estimated that an additional $23 billion will be saved by 2013.

So What's New?

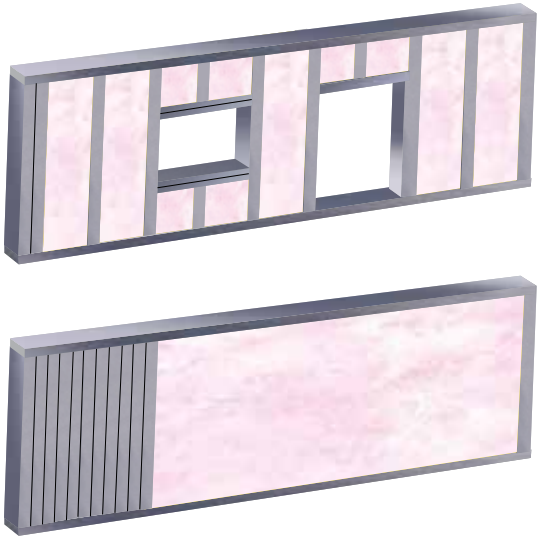
In 2008, new standards were created to significantly improve the energy efficiency of new residential and commercial buildings. As of January 1, 2010, these standards are now in effect. Any project that applies for a building permit on or after this date must comply with the new standards.

The 2008 standard is an aggressive increase in required energy efficiency. Construction professionals will need to rethink how they approach building design and construction to comply with this new standard. As a rule, everything contributes to energy efficiency-windows, wall assemblies, roof type, roof color, lighting, etc. Each element of a building needs to be evaluated for the impact it may have on a building's total energy consumption.

Thermal Performance of Walls

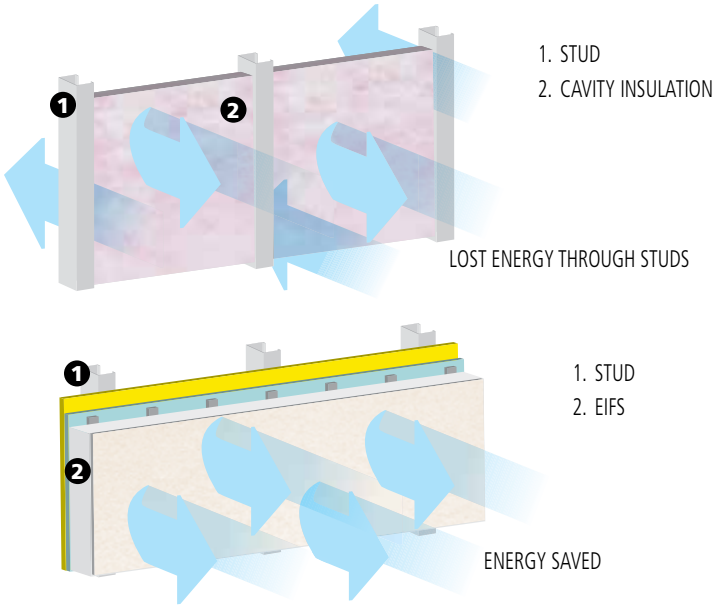
Wall energy performance criteria in Title 24 require meeting certain R-Values and U-Factors. "R-Value" is the resistance to heat conduction. The higher the R-Value the better a wall conserves energy. "U-Factor" is the heat conductivity of a wall. A larger U-Factor means worse energy conservation. U-Factor is the inverse of R-Value.

So how do "U-Factors" and "R-Values" impact building design and construction? U-Factors account for thermal "short circuits" in a wall assembly that R-Values do not. A thermal "short circuit" is also known as "thermal bridging". This thermal short circuiting occurs in areas of the wall assembly that are made up of materials that have low insulative value. This mainly occurs in the framing portion of the wall due to wood framing, and even more so metal framing, which have poor insulation qualities. Energy can infiltrate or escape a wall assembly with ease at each break in insulation where a framing member is present.



It is estimated that at least 25% of a typical wall area is made up of framing members. These thermal "short circuits" mean using R-Value of the stud cavity insulation without accounting for the losses through studs is not valid. To account for the loss through studs, only a fraction of the R-Value provided by insulation in the stud cavity is applied.

The one exception to this applies to continuous insulation. Title 24 allows for the full R-Value of continuous insulation to be used. By placing insulation on the exterior of the framing assembly, thermal "short circuits" are blocked because they are now fully covered by continuous insulation.



When continuous insulation is used on the outside of the building, studs don't break the continuity of the insulation. In essence, the building is covered by a blanket of insulation, which is an advantage of EIFS and insulated stucco assemblies over other types of cladding options. Thermal breaks caused by studs provide an opportunity for energy to flow in and out of the building. Parex USA air and water resistive barrier coatings provide a continuous air-blocking layer: climate controlled interior air stays in and uncontrolled air stays out of the building, reducing the building's HVAC system energy consumption to maintain the desired air temperature.

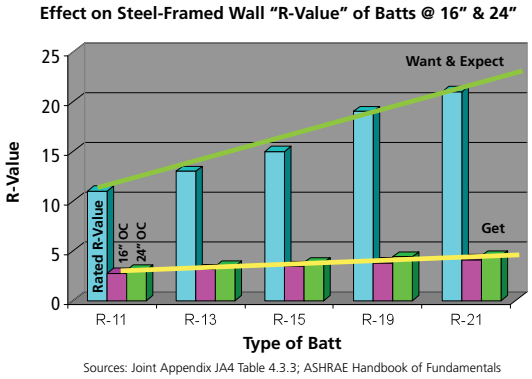
The Prescriptive Method and Continuous Insulation

The standards have both prescriptive requirement and performance requirement options. For the prescriptive aspect, Title 24 has several "Component Packages" in the standards that provide choices for the energy conservation properties of walls.

In terms of performance options, a building whose energy budget is at least as low as a prescriptive package is allowed when conformance is demonstrated by State approved software modeling.

As a rule, because metal is highly conductive and will pass thermal changes readily through the wall, metal framed walls will require continuous insulation in order not to exceed the maximum allowed U-Factor.

Continuous insulation is not only beneficial to framed construction. Mass wall designs (i.e. CMU, concrete, etc.) can also take advantage of adding continuous insulation to improve energy efficiency.



Sources: Joint Appendix JA4 Table 4.3.3; ASHRAE Handbook of Fundamentals

Continuous insulation provides the flexibility needed to meet demanding design requirements. By using exterior continuous insulation, batt insulation can be reduced and stud depth increases can be avoided. Other offsets can be allowed for options in windows, roof color, cavity insulation, etc.

Parex USA Offers Two Continuous Insulation Solutions to Meet Title 24 Requirements and Building Design Needs

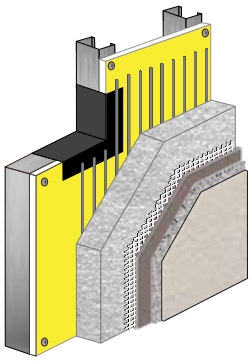
1 EIFS (Exterior Insulation and Finish Systems)

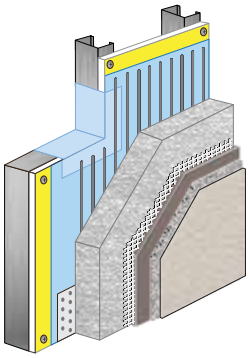
EIFS was an outgrowth of post war Europe where an economical, easy to install, and design friendly wall cladding was needed to rebuild the infrastructure. Today, EIFS still has the same properties that made it great back then but has seen accelerated growth due to its energy conserving properties. The typical insulation used in EIFS is EPS (expanded polystyrene) which provides an R-Value of 3.85 per inch. Most EIFS allow EPS to be installed up to 6 in. thick. EIFS has gained wide acceptance and acclaim as a proven method to deliver superior energy conservation and light weight wall assemblies while providing exceptional design versatility.

Parex USA EIFS offers a wide array of cladding options meet or exceed Title 24 energy efficiency requirements.

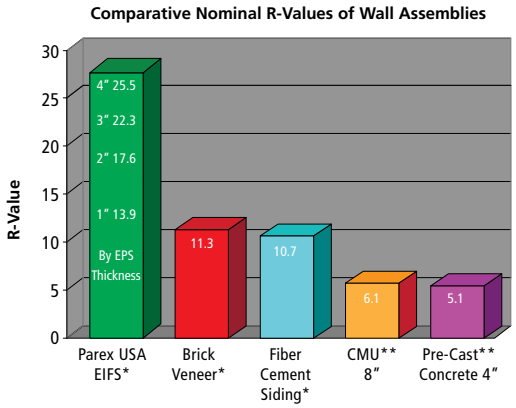
EIFS consists of:

- Optional air and water-resistive barriers with or without drainage capacity.
- An insulation board attached either adhesively or mechanically, or both, to the substrate.
- A polymer-based basecoat reinforced with an embedded fiberglass mesh.
- Decorative finish. Various forms of acrylic finish are available to achieve the aesthetic desired.


Non-Drainage EIFS


Drainage EIFS

Superior R-Value



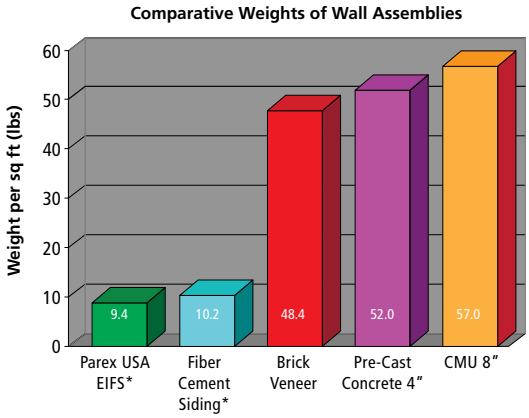
* Includes 16" o.c. wood studs, R-13 stud cavity batts, 1/2" sheathing and wallboard.
** Includes 3/4" XPS and 1/2" wallboard.

Sources: Joint Appendix JA4
ASHRAE Handbook of Fundamentals

The Department of Energy's Oak Ridge National Laboratory tests prove that EIFS has superior R-Value in relation to other leading cladding options. When it comes to considering how an exterior cladding depth can impact your building's operating cost, Parex USA EIFS is the smart choice!

Light Weight

Parex USA EIFS is a light weight exterior cladding system that reduces overall building costs by minimizing the investment required in structural components for heavier claddings.

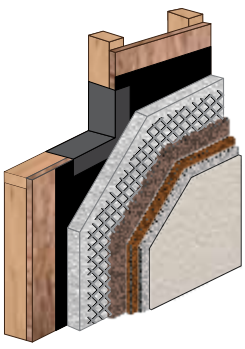


"Concrete Masonry Handbook for Architects, Engineers, Builders" PCA Portland Cement Assoc.
"Architect's Handbook of Formulas, Tables, and Mathematical Calculations" David Kent Ballast
"Architectural Graphics Standards" 8th Edition The American Institute of Architects
"2003 & 2009 ASHRAE Handbook Fundamentals" Inch-Pound Edition American Society of Heating and Air-Conditioning Engineers, Inc.

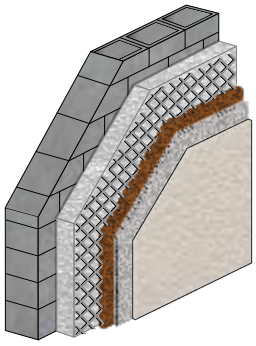
2 Insulated Stucco Assemblies

Stucco is an exterior cladding that has been used for generations. Stucco provides a highly desired aesthetic and a strong outer shell to act as the cladding for a structure.

Parex USA offers a wide range of stucco basecoats from 3/8 to 7/8 in. thick to address project specifications and aesthetic requirements. Like EIFS, stucco clad wall assemblies can be designed with continuous insulation of EPS or other insulative materials. Stucco assemblies by Parex USA can be continuously insulated up to 2 inches thick thus offering the most advanced energy efficient stucco assemblies available.



Stucco with EPS



Stucco with EPS on CMU

Parex USA Tables

The following tables are excerpts from the 2008 California Building Energy Efficiency Standards, associated compliance manuals and appendixes. They are intended to exemplify the provisions for the use of continuous insulation. Official published standards tables should be used for final insulated wall assembly designs.

If the Performance Method is used instead of a Prescriptive Method, the designer of the building must specify the type and thickness of continuous insulation board to use. Do not use these tables for the Performance Method.

For general reference:

Insulation Board R-Values	
Density lb/ cubic ft & Type	R-VALUE/INCH
0.9lb EPS (Type I)	3.85
1.35 EPS (Type II) 1.5 EPS ——	4.0 4.0
1.8** EPS (Type IX)	4.8
1.6 XPS (Type IV)	5.0
1.3 XPS (Type X)	5.0
1.0 Neopor EPS (Type I)	4.31
Nominal 2lb polyisocyanurate	6.5*

*R-Value varies among products. Consult manufacturer.

Wood-Framed Walls

RESIDENTIAL (Multi-family structures of three or fewer habitable stories; single family and duplex dwellings)
The building designer shall determine which component package is being used.
In Table A, select the U-Factor for the building's component package and climate zone, then refer to Table C.

Table A

Component Package	California Climate Zone															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
C	0.055	0.055	0.057	0.057	0.057	0.069	0.069	0.069	0.069	0.057	0.055	0.055	0.055	0.055	0.055	0.055
D	0.069	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.102	0.074	0.074	0.074	0.069	0.069	0.069
E	0.069	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.074	0.069	0.069	0.069
	Wall U-Factors															

Sources: Residential Compliance Manual: Section 3.3.4 and Prescriptive Component Packages, Standard Tables 151-B, 151-C, and 151-D; 2008 Building Energy Efficiency Standards Section 151(f) 1.A; Joint Appendix JA4 Table 4.3.1

Wood-Framed Walls

NON-RESIDENTIAL
In Table B select the U-Factor for the building's climate zone. Then refer to Table C.

Table B

California Climate Zone															
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
0.102	0.059	0.110	0.059	0.102	0.110	0.110	0.102	0.059	0.059	0.059	0.059	0.059	0.059	0.059	0.059
Wall U-Factors															

Sources: 2008 Building Energy Efficiency Standards Table 143A Prescriptive Envelope Criteria for Non-Residential Buildings

In Table C, identify the row indicating the framing and stud cavity insulation being considered. In that row, locate a cell with a U-Factor equal to or smaller than the U-Factor selected from Table A or B. Use the insulation board that provides the minimum required R-Value noted at the top of the column.

Table C

Wood-Framed Walls								
Nominal Framing Size and Spacing	Cavity Insulation R-Value	RATED R-VALUE OF CONTINUOUS INSULATION						
		R-2	R-4	R-6	R-7	R-8	R-10	R-14
2″x4″ 16″ O.C.	None	NA	NA	NA	0.102	0.093	0.078	0.059
	R-11 batt	0.090	0.076	0.066	0.062	0.059	0.052	0.043
	R-13 batt	0.085	0.072	0.063	0.060	0.056	0.050	0.042
	R-15 batt1	0.080	0.069	0.061	0.057	0.054	0.049	0.041
2″x6″ 16″ O.C.	None	NA	NA	NA	0.102	0.093	0.078	0.069
	R-19 batt	0.064	0.057	0.051	0.049	0.046	0.043	0.036
	R-21 batt1	0.061	0.054	0.049	0.047	0.044	0.041	0.035
2″x6″ 24″ O.C.	R-19 batt	0.062	0.055	0.50	0.47	0.45	0.42	0.036
	R-21 batt1	0.058	0.052	0.047	0.045	0.043	0.040	0.034
		U-Factors						

NA: Not Allowed
[1]Higher density fiberglass batt is required in these cases.
Source: Joint Appendix JA4 Table 4.3.1

Metal-Framed Walls

From Table D, select the U-Factor for the building type and climate zone. Then refer to Table E.

Table D

Building Type	California Climate Zone															
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
Non-residential	0.098	0.062	0.082	0.062	0.062	0.098	0.098	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062	0.062
High-rise Residential, Hotel and Motel	0.105 All Climate Zones															
	U-Factors															

Sources: Building Energy Efficiency Standards Tables 143-A and 143-B

In Table E, identify the row indicating the framing and stud cavity insulation being considered. In that row, locate a cell with a U-Factor equal to or smaller than the U-Factor selected from Table D. Then use the insulation board that provides the minimum required R-Value noted at the top of that column.

Table E

Metal-Framed Walls								
Nominal Framing Size and Spacing	Cavity Insulation R-Value	Rated R-Value of Continuous Insulation						
		R-2	R-4	R-6	R-7	R-8	R-10	R-14
4″ 16″ O.C.]	None	NA	NA	NA	NA	0.098	0.082	0.062
	R-11 batt	NA	NA	0.096	0.087	0.080	0.069	0.054
	R-13 batt	NA	NA	0.094	0.086	0.079	0.068	0.054
	R-15 batt1	NA	NA	0.093	0.085	0.078	0.068	0.053
6″ 16″ O.C.	None	NA	NA	NA	NA	0.098	0.082	0.062
	R-19 batt	NA	NA	0.087	0.080	0.074	0.065	0.051
	R-21 batt1	NA	0.104	0.086	0.079	0.073	0.064	0.051
		U-Factors						

NA: Not Allowed
[1]Higher density fiberglass batt is required in these cases.
Source: Joint Appendix JA4 Table 4.3.3

Example: How to Calculate Continuous Insulation Needs

Variables

1. Building location .....climate zone 3
2. Building type .....4 story office
3. Wall framing.....6" metal studs 16" O.C.
4. Stud cavity insulation.....R-19 batts

Using the Metal-Framed Walls Tables:

1. In Table D:
   Identify the row for non-residential construction. In that row, locate the cell in the column for Climate Zone 3.

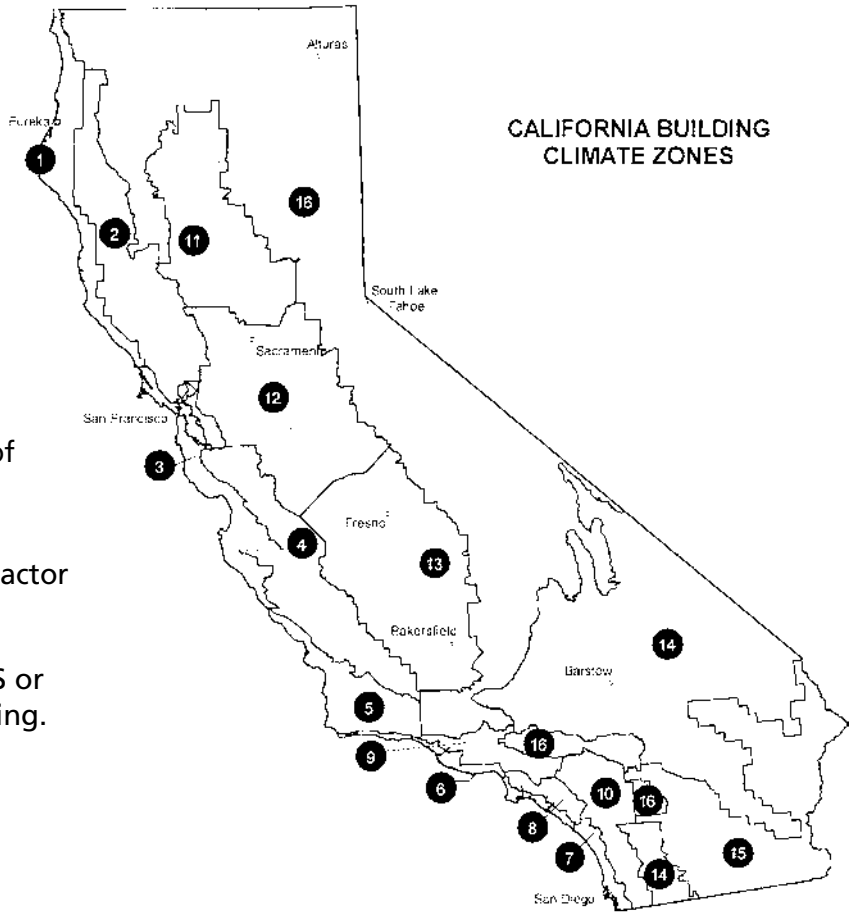
   The U-Factor in the cell is 0.082.

2. In Table E:
   Identify the row for 6" studs 16" O.C. with R-19 batts. In that row, locate a cell with a U-Factor of 0.082 or smaller.

   The cell in the R-7 column shows a U-Factor of 0.080, which is smaller than 0.082

   R-7 continuous insulation, in combination with the R-19 batts gives the required U-Factor of 0.082 or smaller for the building walls.

3. Use R-7 or higher insulation board in EIFS or insulated stucco assemblies for this building.



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