

MODEL ENERGY CODE COMPLIANCE GUIDE



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CITY OF

NORTH LAS VEGAS
Your Community of Choice

**CITY OF NORTH LAS VEGAS
2003 MODEL ENERGY CODE ENFORCEMENT**

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CITY OF NORTH LAS VEGAS 2003 MODEL ENERGY CODE ENFORCEMENT

Effective May 18, 1998, the City of North Las Vegas Building Safety Division now requires all single family residential, commercial, industrial and multi-family buildings to submit data providing compliance with the 2003 International Energy Conservation Code. Effective August 1, 2005, all standard tracts will be required to update their plans to meet compliance with the newly adopted codes, including model energy. All windows will be required to bear an NFRC label, indicating the tested "U" Values.

The average heating degree days for the City of North Las Vegas has been established at 2,499. This information must be contained and used in your calculation.

In order to assist you, the following information will provide you with guidelines for various methods used in preparing energy calculations. Regardless of which method utilized, the 2003 International Energy Conservation Code has basic requirements that must be complied with. (See attached)

I. SINGLE FAMILY RESIDENTIAL

There are three (3) methods by which you may do energy calculations.

A. Building Design by System Analysis -Chapter 4 CABO MEC-

A system analysis is a complex design method in which the total energy use per square foot per year is compared to an identical building designed by the Component Performance Method. The system analysis can only be accomplished by a computer simulation package and requires a stamp and signature by a Nevada Registered Engineer or Architect. Duct insulation requirements depend on results of the system analysis. A "statement of compliance" must accompany each system analysis.

B. Component Performance Approach -Chapter 5 CABO MEC-

The component performance approach is a simplified design method where each part of the building envelope is analyzed to determine if it meets the minimum standards, and utilizes the City of North Las Vegas Trade-Off Worksheet for the building envelope. The minimum insulation required for heating and cooling ducts is R-6. This method may be performed by a professional designer, contractor, or homeowner.

C. Design by Acceptable Practice

-Chapter 6 CABO MEC-

A design by acceptable practice is otherwise known as the “prescriptive standard”. Compliance with the prescriptive standard is achieved by following the standard requirements as published by the Building Safety Division. In addition, the minimum insulation required for heating and cooling ducts is R-6. A complete door and window schedule will be required, to include, all square footages. This method may be performed by a design professional, contractor, or homeowner.

NOTE: An “Energy Schedule” sheet is required to be on the building plans for each residential plan (form and sample attached). This sheet compiles all the information from the Energy Code and calculations into one concise document which is utilized by the Builder, Plans Examiner, and Inspector.

II. PRESCRIPTIVE STANDARDS FOR NEW RESIDENTIAL CONSTRUCTION (CHAPTER 6)

Building components as shown on the plans must comply with the following minimum requirements:

A. Exterior wall assemblies include:

1. Gypsum board interior finish
2. Framing
3. Insulation
4. Exterior weather barrier
 - a). 2 x 4 studs @ 16" o.c. with R-13 insulation

B. Windows and Doors

1. Window and door area not to exceed 15% of the floor living area
2. Skylights are not to exceed 1% of the roof area
3. Ornamental (non-insulated) glazing shall not exceed 1% of the allowable glazing area
4. Windows must be any of the following types or have a U-Value not exceeding 0.54:
 - a). Double pane with wood or vinyl frame
 - b). Double pane with wood or vinyl frame and low-e rating
 - c). Double pane with wood or vinyl frame, low-e rating and argon gas
 - d). Double pane aluminum with a thermal break (*may only be used with 2 x 6 @ 24" o.c. construction, R-21 wall insulation, and a minimum ½" foam sheathing*)

C. Roof/Ceiling Assemblies include:

1. Gypsum board interior finish
2. Framing

3. Insulation
4. Roof Sheathing
5. Exterior weather barrier

- a). All trusses @ 24" o.c. with attic air space and R-26 insulation covering the bottom chord; OR
- b). Low slope (less than 3:12) and flat ceiling joists @ 16" o.c. with attic air space and R-26 insulation: OR
- c). Cathedral (slope 3:12 or greater) ceiling joist, 2x10 or 2x12 @ 16" o.c. with R-26 insulation.

D. Floor Assemblies include:

1. Sub-flooring
2. Framing
3. Insulation over unheated basements or garages

- a). Floor joists @ 16" o.c. with R-19 insulation

NOTE: *Floors over exterior areas use required roof/ceiling insulation*

E. Crawl Space Wall Assemblies include foundation wall system:

1. Interior side of wall with R-10 batt or blanket insulation
2. Exterior insulative sheathing with a minimum of R-10

F. Basement Wall Assemblies include:

1. Poured in place concrete or 8" CMU
2. Interior framing and finish materials
 - a). Interior side of the wall with studs @ 14" o.c. and R-6 insulation
OR
 - b). Exterior insulative sheathing with a minimum of R-5.71

III. COMMERCIAL, INDUSTRIAL AND MULTI-FAMILY BUILDINGS

There are two (2) methods by which you may do energy calculations.

1. Building Design by System Analysis -Chapter 4 CABO MEC-

A system analysis is a complex design method that can only be accomplished by a computer simulation package and requires a stamp and signature by a Nevada Registered Engineer or Architect. Duct insulation requirements depend on results of the system analysis. A "statement of compliance" must accompany each system analysis.

2. Component Performance Approach

-Chapter 5 CABO MEC-

- a. An analysis of the building envelope.
- b. Minimum R-6 insulation for heating and cooling ducts.

Computer design software utilized and applied within its scope and intent may be used in performing energy calculations.

NOTE: *An “Energy Schedule” sheet is required to be on the building plans for each commercial, industrial or multi-family plan (see attached). This sheet compiles all the information from the Energy Code and calculations into one concise document which is utilized by the Builder, Plans Examiner, and Inspector.*

IV. EXEMPT BUILDINGS

Buildings that do not need to comply with the Model Energy Code include:

- Buildings that are neither heated nor cooled.
- Buildings or portions of buildings which are heated or cooled solely by non-depletable energy sources, including direct solar energy, wind energy, ground or geothermal energy.
- Manufactured housing, including mobile homes and modular and factory-built housing which is covered by other state or federal regulation.
- Buildings or portions of buildings where the amount of energy used for all purposes is less than 3.4 BTU's per hour or 1.0 watt per square foot of gross floor area.

City of North Las Vegas
Summary of Basic Requirements

Air Leakage	Joints, penetration, and all other such openings in the building envelope that are sources of air leakage must be caulked, gasketed, weatherstripped, or otherwise sealed. The maximum leakage rate for manufactured windows is 0.34 cfm/ft of operable sash crack. The maximum leakage rate for manufactured doors is 0.5 cfm/ft ² of door area.						
Vapor Retarder	<p>Vapor retarders must be installed on the warm-in-winter side of all non-vented framed ceilings, walls and floors. This requirement does not apply to the following locations nor where moisture or its freezing will not damage the materials.</p> <ul style="list-style-type: none"> • Texas Zones 2-5 • Alabama, Georgia, N. Carolina Zones 4-6 • Oklahoma, S. Carolina Zones 6-7 • Arkansas, Tennessee Zones 6-7 • Florida, Hawaii, Louisiana, Mississippi All Zones 						
Materials and Insulation Information	Materials and equipment must be identified so that compliance can be determined. Manufacturer manuals for all installed heating and cooling equipment and service water heating equipment must be provided. Insulation R-values, glazing and door U-values, and heating and cooling equipment efficiency (if high-efficiency credit is taken) must be clearly marked on the building plans or specifications.						
Duct Insulation	<p>Supply and return ducts for heating and cooling systems located in unconditioned spaces must be insulated to the levels shown on the reverse side of this sheet.</p> <p>Exceptions: Insulation is not required for exhaust air ducts, ducts within HVAC equipment, and when the design temperature difference between the air in the duct and the surrounding air is 25° F or less.</p>						
Duct Construction	All transverse joints must be sealed with mastic, tape, or mastic plus tape. The HVAC system must provide a means for balancing air and water systems.						
Temperature Controls	<p>Thermostats are required for each separate HVAC system in single-family buildings and each dwelling unit in multifamily buildings (non-dwelling portions of multifamily buildings must have one thermostat for each system or zone). Thermostats must have the following ranges:</p> <table style="margin-left: 40px; border: none;"> <tr> <td>Heating Only</td> <td style="text-align: right;">55 ° F - 75°F</td> </tr> <tr> <td>Cooling Only</td> <td style="text-align: right;">70 ° F - 85°F</td> </tr> <tr> <td>Heating and Cooling</td> <td style="text-align: right;">55 ° F - 85°F</td> </tr> </table> <p>A manual or automatic means to partially restrict or shut off the heating and/or cooling input to each zone or floor shall be provided for single-family homes and to each room for multifamily buildings.</p>	Heating Only	55 ° F - 75°F	Cooling Only	70 ° F - 85°F	Heating and Cooling	55 ° F - 85°F
Heating Only	55 ° F - 75°F						
Cooling Only	70 ° F - 85°F						
Heating and Cooling	55 ° F - 85°F						
HVAC Piping Insulation	HVAC piping in unconditioned spaces conveying fluids at temperatures above 120°F or chilled fluids at less than 55°F must be insulated to the levels shown on the reverse side of this sheet.						
Swimming Pools	All heated swimming pools must have an on/off pool heater switch. Heated pools require a pool cover unless over 20% of the heating energy is from non-depletable sources. All swimming pool pumps must be equipped with a time clock.						
Circulating Hot Water	Circulating hot water systems must have automatic or manual controls and pipes must be insulated to the levels shown on the reverse side of this sheet.						
Electric Systems	Each multifamily dwelling unit must be equipped with separate electric meters.						

**CITY OF NORTH LAS VEGAS
Residential Energy Schedule**

Builder:	_____	Contact:	_____
Plan:	_____	Permit #:	_____
Project:	_____	Date:	_____

Total Conditioned Floor Area: 1636 sq. ft.
 Construction Type: Single Family
 Foundation Type: Slab on Grade

INSULATION

	<u>Type</u>	<u>R-Value</u>	<u>Location</u>
Roof/Ceiling:	<u>2x4 @ 24" o.c.</u>	<u>R-30</u>	<u>Attic Portions</u>
Roof/Ceiling:	<u>2x12 @ 24" o.c.</u>	<u>R-30</u>	<u>Rafter Portions</u>
Wall:	<u>2x4 @ 16" o.c.</u>	<u>R-13 & 1" EPS</u>	<u>Exterior Wall</u>
Wall:	<u>2x6 @ 16" o.c.</u>	<u>N/A</u>	<u>Exterior Wall</u>
Wall:	<u>2x6 @ 16" o.c.</u>	<u>N/A</u>	<u>Skylite Wall</u>
Wall:	<u>2x6 @ 16" o.c.</u>	<u>R-13</u>	<u>Garage Wall</u>
Wall:	<u>2x6 @ 16" o.c.</u>	<u>R-13</u>	<u>Knee Wall</u>
Floor:	<u>2x12 @ 24" o.c.</u>	<u>N/A</u>	<u>Above Garage</u>
Other:	<u>1-3/4" Solid Core</u>	<u>3</u>	<u>Solid Core Doors</u>
Other:	<u>2x12 @ 24" o.c.</u>	<u>N/A</u>	<u>Subfloor</u>

FENESTRATION

	<u>Type</u>	<u>Frame</u>	<u>Area (ft²)</u>	<u>U-Value</u>
Window:	<u>Sliding</u>	<u>Metal</u>	<u>158.7</u>	<u>0.87</u>
Window:	<u>Single hung</u>	<u>Metal</u>	<u>N/A</u>	<u>0.87</u>
Window:	<u>Fixed</u>	<u>Metal</u>	<u>24.5</u>	<u>0.72</u>
Window:	<u>Fx.Butt Glazed</u>	<u>Metal</u>	<u>66.6</u>	<u>0.72</u>
Door (Patio):	<u>Sliding</u>	<u>Metal</u>	<u>N/A</u>	<u>0.77</u>
Door (French):	<u>Hinged</u>	<u>Wood</u>	<u>N/A</u>	<u>0.55</u>
Glass Block:	<u>Fixed</u>	<u>None</u>	<u>N/A</u>	<u>0.57</u>
Skylight:	<u>Fixed</u>	<u>Metal</u>	<u>N/A</u>	<u>0.80</u>
Other:	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>	<u>N/A</u>

EQUIPMENT

Furnace AFUE:	<u>78%</u>	Water Heater(s):	Size: <u>40</u>
A/C SEER:	<u>10.0</u>		EF: <u>0.53</u>
HVAC Duct Ins:	<u>4.2 or R-6</u>	External R-12 Wrap:	<u>No</u>
		Pipe Ins:	<u>No</u>
		Recirc:	<u>No</u>

**CITY OF NORTH LAS VEGAS
Residential Energy Schedule**

Builder:	_____	Contact:	_____
Plan:	_____	Permit #:	_____
Project:	_____	Date:	_____

Total Conditioned Floor Area: _____
 Construction Type: _____
 Foundation Type: _____

INSULATION

	<u>Type</u>	<u>R-Value</u>	<u>Location</u>
Roof/Ceiling:	_____	_____	_____
Roof/Ceiling:	_____	_____	_____
Wall:	_____	_____	_____
Wall:	_____	_____	_____
Wall:	_____	_____	_____
Wall:	_____	_____	_____
Wall:	_____	_____	_____
Floor:	_____	_____	_____
Other:	_____	_____	_____
Other:	_____	_____	_____

FENESTRATION

	<u>Type</u>	<u>Frame</u>	<u>Area (ft²)</u>	<u>U-Value</u>
Window:	_____	_____	_____	_____
Window:	_____	_____	_____	_____
Window:	_____	_____	_____	_____
Window:	_____	_____	_____	_____
Door (Patio):	_____	_____	_____	_____
Door (French):	_____	_____	_____	_____
Glass Block:	_____	_____	_____	_____
Skylight:	_____	_____	_____	_____
Other:	_____	_____	_____	_____

EQUIPMENT

Furnace AFUE:	_____	Water Heater(s):	Size: _____
A/C SEER:	_____		EF: _____
HVAC Duct Ins:	_____	External R-12 Wrap:	_____
		Pipe Ins:	_____
		Recirc:	_____

TRADE-OFF WORKSHEET

Contractors Name _____ Date _____
 Contractors Address _____
 Construction Address _____ Zone # _____
 Submitted By _____ Phone # _____

THERMAL ENVELOPE

**YOUR
HOUSE**

**CODE
HOUSE**

ROOF/CEILING AREA (SQ. FT.)

- | | | | | |
|-------------------------------|-----------------------|-------------|----|---------|
| 1. | Flat or Vaulted _____ | ÷ R _____ | = | _____ |
| 2. | Cathedral _____ | ÷ R _____ | = | _____ |
| 3. | Skylight _____ | ÷ R _____ | = | _____ |
| 4. | Other _____ | ÷ R/O _____ | = | _____ |
| Add totals of lines (1+2+3+4) | | | 5. | = _____ |

A. Total Room Area _____ x U (0.0428) B. _____

WALLS (Sq. Ft. excluding window area)

- | | | | | |
|----|--------------------|-----------|---|-------|
| 6. | Exterior _____ | ÷ R _____ | = | _____ |
| 7. | Garage/House _____ | ÷ R _____ | = | _____ |
| 8. | Solid Doors _____ | ÷ R _____ | = | _____ |
| 9. | Other _____ | ÷ R _____ | = | _____ |

WINDOWS (Sq. Ft.)

- | | | | | |
|-----|--------------------|-----------|---|-------|
| 10. | Fixed _____ | x U _____ | = | _____ |
| 11. | Operable _____ | x U _____ | = | _____ |
| 12. | Glass Block _____ | x U _____ | = | _____ |
| 13. | Glazed Doors _____ | x U _____ | = | _____ |
| 14. | Other _____ | x U _____ | = | _____ |

Add totals of lines (6+7+8+9+10+11+12+13+14) 15. = _____

C. Total Wall & Window Area _____ x U (0.180) = D. _____

STATEMENT OF COMPLIANCE

The proposed building design represented in these documents is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the requirements of the 1992 CABO Model Energy Code.

Contractor/Designer Signature

Company Name

Date

TYPICAL R-VALUES FOR FRAMED ASSEMBLIES

ROOF/CEILING

Flat & Vaulted Ceilings

R-Value of Insulation	Trusses at 24"	Joists at 16"
19	20.1	20.0
22	23.0	22.2
26	27.1	26.4
30	31.1	30.5
38	39.1	38.5

Cathedral Ceilings

R-Value of Insulation	Framing @ 16"o.c		
	2x8	2x10	2x12
19	20.0	20.0	20.0
22	22.3	22.9	22.0
26	-----	22.9	22.9
30	-----	29.9	30.0
38	-----	-----	37.5

Walls (Wood framed @ 16" o.c., Stucco exterior, Gypboard interior)

R-Value of Insulation	Stud	3/4" Stucco	1/2" Foam	1" Foam
13	2x4	12.00	13.85	15.85
15	2x4	13.17	15.02	17.02
19	2x6	16.25	18.05	20.05
21	2x6	18.13	19.98	21.98
*11	2x4	11.20	(Garage/House Common Wall)	

FLOOR (Over unheated area)

R-Value of Insulation	Assembly R-Value
11	12.5
13	14.1
19	20.1
30	29.4
38	36.6

DOORS

	Wood 1-3/8	Wood 1-3/4	Metal 1-3/4
7/16 panel	1.75	1.75	-----
1-1/8 panel	-----	2.56	-----
Flush hollow	2.13	2.17	-----
Flush solid	2.56	3.03	-----
Mineral fiber w/o thermal break			1.67
Foam core w/thermal break			5.00

GLAZING INFORMATION

LABELS

All fenestration products used in construction projects in the City of North Las Vegas must have a label identifying the thermal conductive characteristics of the product expressed in U-Value. Only the official National Fenestration Rating Council (NFRC) label or a City of North Las Vegas default label will be acceptable. Default labels may not be smaller than 15 square inches with a minimum of two inches in any dimension. Information on all labels must include the manufacturers name, complete description, U-Value, and the statement "the manufacturer certifies this product complies with the City of North Las Vegas Model Energy Code".

DEFAULT VALUES:

Values of fenestration products not certified by the NFRC shall be determined from the fenestration default table:

Manufactured Fenestration Product Default U-Values

	<u>Framing Materials</u>						
	<u>Single</u>	<u>Any Metal</u>		<u>Thermal¹ Break</u>		<u>Non-Metal^{2,3}</u>	
			<u>Double⁴</u>	<u>Double⁴</u>	<u>Double⁴</u>	<u>Single</u>	<u>Double⁴</u>
Operable Windows	1.28	0.87	0.71	0.93	0.60		
Fixed Windows	1.19	0.72	0.60	1.04	0.57		
Patio Doors	1.25	0.77	0.68	0.99	0.55		
Skylights	1.26	0.80	0.70	0.91	0.55		
Greenhouse Windows	2.26	1.4	1.12	2.94	1.06		

- ¹ The minimum design characteristics to qualify as a Thermal Break Product are:
- The material used as the thermal break must have a thermal conductivity of not more than 3.6 BTU-inch/hr/ft²/°F, and;
 - The thermal break must produce a gap of not less than 0.210", and;
 - All metal members of the product exposed to interior and exterior air must incorporate a thermal break meeting the criteria in (a) and (b) above.

In addition, the product must be clearly labeled by the manufacturer that it qualifies as a thermally broken product in accordance with Commission requirements.

- ² Non-metal products can include metal fasteners, hardware and door thresholds.

- ³ Add 0.04 to the listed U-Value for any products that have metal cladding in any configuration.

- ⁴ For all dual glazed fenestration products, adjust the listed U-Values as follows:

- Subtract 0.05 for spacers of 7/16" or wider.
- Subtract 0.05 for Low-E glazing.
- Add 0.05 for products with dividers between the panes if the spacer is less than 6/16" wide.
- Add 0.05 to any product with true dividend lites (dividers through the panes).

PRESCRIPTIVE PACKAGES

Summary of Basic Requirements
Prescriptive Package Worksheet
R-Value/U-Value Weighted Average Worksheet
Glazing Area/ U-Value Trade-Off Worksheet
Prescriptive Packages for Single-Family Buildings
Prescriptive Packages for Multi-Family Buildings

Summary of Basic Requirements

Air Leakage	Joints, penetration, and all other such openings in the building envelope that are sources of air leakage must be caulked, gasketed, weatherstripped, or otherwise sealed. The maximum leakage rate for manufactured windows is 0.34 cfm/ft of operable sash crack. The maximum leakage rate for manufactured doors is 0.5 cfm/ft ² of door area.												
Vapor Retarder	<p>Vapor retarders must be installed on the warm-in-winter side of all non-vented framed ceilings, walls and floors. This requirement does not apply to the following locations nor where moisture or its freezing will not damage the materials.</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 5%;">d.</td> <td style="width: 60%;">Texas</td> <td style="width: 35%; text-align: right;">Zones 2-5</td> </tr> <tr> <td>e.</td> <td>Alabama, Georgia, N. Carolina Oklahoma, S. Carolina</td> <td style="text-align: right;">Zones 4-6</td> </tr> <tr> <td>f.</td> <td>Arkansas, Tennessee</td> <td style="text-align: right;">Zones 6-7</td> </tr> <tr> <td>g.</td> <td>Florida, Hawaii, Louisiana, Mississippi</td> <td style="text-align: right;">All Zones</td> </tr> </table>	d.	Texas	Zones 2-5	e.	Alabama, Georgia, N. Carolina Oklahoma, S. Carolina	Zones 4-6	f.	Arkansas, Tennessee	Zones 6-7	g.	Florida, Hawaii, Louisiana, Mississippi	All Zones
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e.	Alabama, Georgia, N. Carolina Oklahoma, S. Carolina	Zones 4-6											
f.	Arkansas, Tennessee	Zones 6-7											
g.	Florida, Hawaii, Louisiana, Mississippi	All Zones											
Materials and Insulation Information	Materials and equipment must be identified so that compliance can be determined. Manufacturer manuals for all installed heating and cooling equipment and service water heating equipment must be provided. Insulation R-values, glazing and door U-values, and heating and cooling equipment efficiency (if high-efficiency credit is taken) must be clearly marked on the building plans or specifications.												
Duct Insulation	<p>Supply and return ducts for heating and cooling systems located in unconditioned spaces must be insulated to the levels shown on the reverse side of this sheet.</p> <p>Exceptions: Insulation is not required for exhaust air ducts, ducts within HVAC equipment, and when the design temperature difference between the air in the duct and the surrounding air is 25° F or less.</p>												
Duct Construction	All transverse joints must be sealed with mastic, tape, or mastic plus tape. The HVAC system must provide a means for balancing air and water systems.												
Temperature Controls	<p>Thermostats are required for each separate HVAC system in single-family buildings and each dwelling unit in multifamily buildings (non-dwelling portions of multifamily buildings must have one thermostat for each system or zone). Thermostats must have the following ranges:</p> <table style="width: 100%; border: none;"> <tr> <td style="width: 50%;">Heating Only</td> <td style="text-align: right;">55 ° F - 75°F</td> </tr> <tr> <td>Cooling Only</td> <td style="text-align: right;">70 ° F - 85°F</td> </tr> <tr> <td>Heating and Cooling</td> <td style="text-align: right;">55 ° F - 85°F</td> </tr> </table> <p>A manual or automatic means to partially restrict or shut off the heating and/or cooling input to each zone or floor shall be provided for single-family homes and to each room for multifamily buildings.</p>	Heating Only	55 ° F - 75°F	Cooling Only	70 ° F - 85°F	Heating and Cooling	55 ° F - 85°F						
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Heating and Cooling	55 ° F - 85°F												
HVAC Piping Insulation	HVAC piping in unconditioned spaces conveying fluids at temperatures above 120°F or chilled fluids at less than 55°F must be insulated to the levels shown on the reverse side of this sheet.												
Swimming Pools	All heated swimming pools must have an on/off pool heater switch. Heated pools require a pool cover unless over 20% of the heating energy is from non-depletable sources. All swimming pool pumps must be equipped with a time clock.												
Circulating Hot Water	Circulating hot water systems must have automatic or manual controls and pipes must be insulated to the levels shown on the reverse side of this sheet.												
Electric Systems	Each multifamily dwelling unit must be equipped with separate electric meters.												

Duct Insulation R-Value Requirements

Zone Number	Duct Insulation R-Value Requirements	
	Ducts Located In: Attics, Crawl Spaces, Exterior Cavities, Outside	Ducts Located In: Unheated Basements
Zones 1-8	R-6	R-6
Zones 9-16	R-8	R-6
Zone 17	R-9	R-6
Zone 18	R-9	R-8
Zone 19	R-11	R-8

Minimum Insulation Thickness for HVAC Pipes ^(a)

Piping System Types	Fluid Temp. Range (°F)	Insulation Thickness in Inches by Pipe Size ^(b)			
		Runouts 2 in ^(c)	1 in. and Less	1.25 in. to 2 in.	2.5 in. to 4 in.
Heating Systems					
Low Pressure/temp	201-250	1.0	1.5	1.5	2.0
Low Temperature	120-200	0.5	1.0	1.0	1.5
Steam Condensate	Any	1.0	1.0	1.5	2.0
Cooling Systems					
Chilled Water	40-55	1.5	1.5	0.75	1.0

(a) The pipe insulation thickness specified in this table are based on insulation R-values ranging from R-4 to R-4.6 per inch of thickness. For materials with an R-value greater than R-4.6, the insulation thickness specified in this table may be reduced as follows:

$$\text{New minimum thickness} = \frac{4.6 \times \text{Table 2-2 thickness}}{\text{Actual R-value}}$$

For materials with an R-value less than R-4, the minimum insulation thickness must be increased as follows:

$$\text{New minimum thickness} = \frac{4.0 \times \text{Table 2-2 thickness}}{\text{Actual R-value}}$$

(b) For piping exposed to outdoor air, increase thickness by 0.5 in.

(c) Applies to runouts not exceeding 12 ft. in length to individual terminal units.

Minimum Insulation Thickness for Circulating Hot Water Pipes

Heated Water Temperature (°F)	Insulation Thickness in Inches by Pipe Sizes ^(a)			
	Non-Circulating Runouts		Circulating Mains and Runouts	
	Up to 1 in.	Up to 1.25 in.	1.5 - 2.0 in.	Over 2 in.
170-180	0.5	1.0	1.5	2.0
140-160	0.5	0.5	1.0	1.5
100-130	0.5	0.5	0.5	1.0

(a) nominal pipe size and insulation thickness.

Prescriptive Package Worksheet

Builder Name _____ Date _____
 Builder Address _____
 Construction Address _____
 Zone Number _____ Package Number _____
 Submitted By _____ Phone Number _____

PROPOSED	REQUIRED
-----------------	-----------------

Glazing Area

$$100 \times \frac{\text{Glazing Area}}{\text{Gross Wall Area}} = \text{Proposed Glazing Area} \%$$

_____ %
Max. Glazing Area

R-Value

Description	Comments	Proposed R-Value
Ceiling		R-
Wall		R-
Floor over unconditioned space		R-
Floor over outside Air		R-
Basement Wall		R-
Slab Floor		R-
Crawl Space Wall		R-

Minimum R-Value

R-
R-
R-
R-
R-
R-
R-
R-

U-Value

Description	Comments	Proposed U-Value
Glazing		U-
Opaque Door		U-

Maximum U-Value

U-
U-

Equipment Efficiency (This section may be left blank if Normal is selected on the right)

Heating _____ AFUE/HSPF _____

Cooling _____ SEER _____
 Efficiency Make & Model Number

Check One

- Normal
- High Heating
- High Cooling
- High Heating & Cooling

Statement of Compliance: The proposed building design in these documents is consistent with the building plans, specifications, and other calculations submitted with the permit application. The proposed building has been designed to meet the requirements of the 1992 CABO Model Energy Code.

Builder/Designer

Company Name

**R-VALUE / U-VALUE
WEIGHTED AVERAGE WORKSHEET
(optional)**

Assembly:

Component Description	R-Value	U-Value (1 ÷ R-Value)	Area	U-Value x Area (UA)

Total Area=	Total UA=
-------------	-----------

$$\frac{\text{Total Area}}{\text{Total UA}} = \text{Weighted Average R-Value}$$

$$\frac{\text{Total Area}}{\text{Total Area}} = \text{Weighted Average U-Value}$$

Assembly:

Component Description	R-Value	U-Value (1 ÷ R-Value)	Area	U-Value x Area (UA)

Total Area=	Total UA=
-------------	-----------

$$\frac{\text{Total Area}}{\text{Total UA}} = \text{Weighted Average R-Value}$$

$$\frac{\text{Total Area}}{\text{Total Area}} = \text{Weighted Average U-Value}$$

GLAZING AREA / U-VALUE TRADE-OFF WORKSHEET
(optional)

The glazing area and U-Value requirements for any prescriptive package can be altered to better meet your building design. Any combination of area and U-Value that satisfies the following relationship can be used.

$$\text{New Area} \times \text{New U-Value} \leq \text{Package Area} \times \text{Package U-Value}$$

Where Package Area and Package U-Value are the area and U-Value in the prescriptive package you have selected and New Area and New U-Value are your altered window and U-Value combination.

Fill in the following blanks and attach this worksheet to the Prescriptive Package Worksheet. See the following page for examples.

Zone Number _____ Package Number _____

Package Glazing Requirements:

$$\frac{\text{_____}}{\text{Glazing Area \%}} \times \frac{\text{_____}}{\text{Glazing U-Value}} = \frac{\text{_____}}{\text{Package Glazing Total}}$$

New Glazing Requirements:

$$\frac{\text{_____}}{\text{Glazing Area \%}} \times \frac{\text{_____}}{\text{Glazing U-Value}} = \frac{\text{_____}}{\text{New Glazing Total}}$$

NOTE: New Glazing Total must be less than or equal to Package Glazing Total

Example 1:

Refer to the single family prescriptive packages for Zone 8. Package 3 lists a maximum window area percentage of 15% and a maximum U-Value of 0.65. The Package Window Total (area x U-Value) for this package is 9.8. Assume, however, that your building design calls for a window area of 17%. To determine the maximum allowable U-Value for a 17% window area, divide the Package Window Total by 17%.

$$\text{New Window U-Value} = (15 \times 0.65) \div 17 = 0.57$$

The new window requirements are a window area percentage of 17% and a U-Value of 0.57.

Zone Number 8 Package Number 5

Package Glazing Requirements:

$$\frac{15}{\text{Glazing Area \%}} \times \frac{0.65}{\text{Glazing U-Value}} = \frac{9.8}{\text{Package Glazing Total}}$$

New Glazing Requirements:

$$\frac{17}{\text{Glazing Area \%}} \times \frac{0.57}{\text{Glazing U-Value}} = \frac{9.7}{\text{New Glazing Total}}$$

EXAMPLE
New Glazing must be \leq Package Glazing

Example 2:

The Window Area/U-Value Trade-Off Worksheet is also useful if you prefer to install windows with a U-Value that is different from the package requirement. As in the previous example, assume that you have selected Package 3 from Zone 8, but prefer to use windows with a U-Value of 0.72. To determine the maximum allowable area for windows with a U-Value of 0.72, divide the Package Window Total by 0.72:

$$\text{New Window Area} = (15 \times 0.65) \div 0.72 = 13.5$$

The new window requirements are a window area percentage of 13.5% and a U-Value of 0.72.

Zone Number 8 Package Number 5

Package Glazing Requirements:

$$\frac{15}{\text{Glazing Area \%}} \times \frac{0.65}{\text{Glazing U-Value}} = \frac{9.8}{\text{Package Glazing Total}}$$

New Glazing Requirements:

$$\frac{13.5}{\text{Glazing Area \%}} \times \frac{0.72}{\text{Glazing U-Value}} = \frac{9.7}{\text{New Glazing Total}}$$

New Glazing must be \leq Package Glazing

Table 4-1. Ceiling U-Values ^(a)

Insulation R-Value	Standard Truss U-Value	Raised Truss ^(b) U-Value	Insulation R-Value	Standard Truss U-Value	Raised Truss ^(b) U-Value
R-0	0.568	0.568	R-33	0.033	0.029
R-7	0.119	0.119	R-34	0.032	0.028
R-8	0.108	0.108	R-35	0.032	0.028
R-9	0.098	0.098	R-36	0.031	0.027
R-10	0.089	0.089	R-37	0.031	0.026
R-11	0.082	0.082	R-38	0.030	0.025
R-12	0.076	0.076	R-39	0.030	0.025
R-13	0.070	0.070	R-40	0.029	0.024
R-14	0.066	0.066	R-41	0.029	0.024
R-15	0.062	0.061	R-42	0.028	0.023
R-16	0.059	0.058	R-43	0.028	0.023
R-17	0.056	0.055	R-44	0.027	0.022
R-18	0.053	0.052	R-45	0.027	0.022
R-19	0.051	0.049	R-46	0.027	0.021
R-20	0.048	0.047	R-47	0.026	0.021
R-21	0.047	0.045	R-48	0.026	0.020
R-22	0.045	0.043	R-49	0.026	0.020
R-23	0.043	0.041	R-50	0.026	0.020
R-24	0.042	0.040	R-51	0.025	0.019
R-25	0.040	0.038	R-52	0.025	0.019
R-26	0.039	0.037	R-53	0.025	0.019
R-27	0.038	0.035	R-54	0.025	0.018
R-28	0.037	0.034	R-55	0.024	0.018
R-29	0.036	0.033	R-56	0.024	0.018
R-30	0.035	0.032	R-57	0.024	0.018
R-31	0.034	0.031	R-58	0.024	0.017
R-32	0.034	0.030	R-59	0.024	0.017

(a) R-value represents the sum of the ceiling cavity insulation plus the R-value of insulating sheathing (if used). For example, R-19 cavity insulation plus R-2 sheathing is reported as R-21 ceiling insulation. For ventilated ceilings, insulating sheathing must be placed between the conditioned space and the ventilated portion of the roof (typically applied to the trusses or rafters immediately behind the drywall or other ceiling finish material).

(b) To receive credit for a raised truss, the insulation must achieve its full insulation thickness over the exterior walls.

Table 4-2. Wood-Frame Wall U-Values ^(a,b)

Insulation R-Value ^(c)	16-in. o.c. Wall U-Value	24-in. o.c. Wall U-Value
R-0	0.251	0.255
R-7	0.100	0.099
R-8	0.094	0.092
R-9	0.088	0.086
R-10	0.083	0.081
R-11	0.082	0.080
R-12	0.078	0.076
R-13	0.075	0.072
R-14	0.071	0.069
R-15	0.069	0.066
R-16	0.061	0.059
R-17	0.058	0.057
R-18	0.056	0.055
R-19	0.054	0.053
R-20	0.053	0.051
R-21	0.051	0.049
R-22	0.050	0.048
R-23	0.048	0.047
R-24	0.047	0.045
R-25	0.046	0.044
R-26	0.045	0.043
R-27	0.044	0.042
R-28	0.043	0.041

(a) U-Value are for uncompressed insulation.

(b) U-Values in this table were developed for wood-frame walls, but the 16-in o.c. Wall U-Value column can also be used for above-grade concrete, masonry, and log walls. Mass wall R-Value to U-Value conversion tables are planned for future versions of the MECcheck Manual.

(c) Wall R-Values are the sum of the cavity insulation plus insulating sheathing (if used).

Table 4-3. 16-in o.c. Metal-Frame Wall U-Values

Cavity R-Value	Insulating Sheathing R-Value										
	R-0	R-1	R-2	R-3	R-4	R-5	R-6	R-7	R-8	R-9	R-10
R-0	0.270	0.258	0.205	0.170	0.146	0.127	0.113	0.101	0.092	0.084	0.078
R-11	0.120	0.118	0.106	0.096	0.087	0.080	0.074	0.069	0.065	0.061	0.057
R-13	0.114	0.111	0.100	0.091	0.084	0.077	0.072	0.067	0.063	0.059	0.056
R-15	0.109	0.107	0.096	0.088	0.081	0.075	0.070	0.065	0.061	0.058	0.054
R-19	0.101	0.099	0.090	0.083	0.077	0.071	0.066	0.062	0.059	0.055	0.052
R-21	0.098	0.096	0.088	0.081	0.075	0.070	0.065	0.061	0.058	0.054	0.052
R-25	0.094	0.093	0.085	0.078	0.073	0.068	0.063	0.060	0.056	0.053	0.051

Table 4-4. 24-in. o.c. Metal-Frame Wall U-Values

Cavity R-Value	Insulating Sheathing R-Value										
	R-0	R-1	R-2	R-3	R-4	R-5	R-6	R-7	R-8	R-9	R-10
R-0	0.270	0.258	0.205	0.170	0.146	0.127	0.113	0.101	0.092	0.084	0.078
R-11	0.106	0.104	0.095	0.086	0.080	0.074	0.069	0.064	0.060	0.057	0.054
R-13	0.100	0.098	0.090	0.082	0.076	0.071	0.066	0.062	0.058	0.055	0.052
R-15	0.094	0.093	0.085	0.078	0.073	0.068	0.063	0.060	0.056	0.053	0.051
R-19	0.088	0.086	0.080	0.074	0.069	0.064	0.060	0.057	0.054	0.051	0.049
R-21	0.085	0.084	0.077	0.072	0.067	0.063	0.059	0.056	0.053	0.050	0.048
R-25	0.081	0.080	0.074	0.069	0.064	0.060	0.057	0.054	0.051	0.049	0.046

Table 4-5. Floor U-Values

Insulation R-Value	Floor U-Value
R-0	0.249
R-7	0.096
R-11	0.072
R-13	0.064
R-15	0.057
R-19	0.047
R-21	0.044
R-26	0.037
R-30	0.033

Table 4-6. Basement U-Values ^(a)

Insulation R-Value	Basement Wall U-Value	Insulation R-Value	Basement Wall U-Value
R-0	0.360	R-10	0.072
R-1	0.244	R-11	0.067
R-2	0.188	R-12	0.062
R-3	0.155	R-13	0.059
R-4	0.132	R-14	0.055
R-5	0.115	R-15	0.052
R-6	0.102	R-16	0.050
R-7	0.092	R-17	0.047
R-8	0.084	R-18	0.045
R-9	0.077	R-19	0.043
		R-20	0.041

(a) Insulation R-values represent the sum of exterior and/or interior insulation. Basement walls must be insulated from the top of the basement wall to 10 ft. below ground level or to the floor of the basement, whichever is less.

Table 4-7. Slab F-Values

Perimeter Insulation R-Value	Slab F-Value	
	24-in. Insulation Depth	48-in. Insulation Depth
R-0	1.04	1.04
R-1	0.91	0.89
R-2	0.86	0.83
R-3	0.83	0.79
R-4	0.82	0.76
R-5	0.80	0.74
R-6	0.79	0.73
R-7	0.79	0.71
R-8	0.78	0.70
R-9	0.77	0.69
R-10	0.77	0.68
R-11		0.68
R-12		0.67
R-13		0.66
R-14		0.66
R-15		0.65
R-16		0.65
R-17		0.65
R-18		0.64
R-19		0.64
R-20		0.64

Table 4-8. Crawl Space Wall U-Values

Insulation R-Value	Crawl Space Wall U-Value
R-0	0.477
R-1	0.313
R-2	0.235
R-3	0.189
R-4	0.158
R-5	0.136
R-6	0.120
R-7	0.107
R-8	0.096
R-9	0.088
R-10	0.081
R-11	0.075
R-12	0.069
R-13	0.065
R-14	0.061
R-15	0.057
R-16	0.054
R-17	0.051
R-18	0.049
R-19	0.047
R-20	0.045

Table 4-9. U-Values for Windows, Glazed Doors, and Skylights ^(a)

Frame/Glazing Features	Single Pane	Double Pane
Metal Without Thermal Break		
Operable	1.30	0.87
Fixed	1.17	0.69
Door	1.26	0.80
Skylight	1.92	1.30
Metal With Thermal Break		
Operable	1.07	0.67
Fixed	1.11	0.63
Door	1.10	0.66
Skylight	1.93	1.13
Metal-Clad Wood		
Operable	0.98	0.60
Fixed	1.05	0.58
Door	0.99	0.57
Skylight	1.50	0.88
Wood/Vinyl		
Operable	0.94	0.56
Fixed	1.04	0.57
Door	0.98	0.56
Skylight	1.47	0.85
Glass Block Assemblies	0.60	

Table 4-10. U-Value Table for Non-Glazed Doors ^(a)

Steel Doors		
Without Foam Core	0.60	
With Foam Core	0.35	
Wood Doors	Without Storm	With Storm
Panel With 7/16-in. Panels	0.54	0.36
Hollow Core Flush	0.46	0.32
Panel With 1-1/8-in. Panels	0.39	0.28
Solid Core Flush	0.40	0.26
(a) The U-Values in these tables can be used in the absence of test U-Values. The product cannot receive credit for a feature that cannot be clearly detected. Where a composite of materials from two different product types is used, the product must be assigned the higher U-Value.		

Table 4-11. U-Value and F-Value Requirements by Climate Zone

Climate Zone	Ceiling U-Value	Single-Family Wall U-Value	Multi-Family Wall U-Value	Floor U-Value	Basement Wall U-Value	Unheated Slab F-Value	Heated Slab F-Value	Crawl Space Wall U-Value
1	0.050	0.26	0.38	0.08	0.360	1.04	1.04	0.477
2	0.050	0.24	0.37	0.08	0.360	1.04	0.79	0.137
3	0.048	0.22	0.36	0.07	0.360	1.04	0.79	0.137
4	0.045	0.20	0.35	0.07	0.121	1.04	0.79	0.137
5	0.043	0.18	0.34	0.07	0.113	1.04	0.79	0.124
6	0.040	0.17	0.33	0.05	0.106	0.82	0.79	0.111
7	0.038	0.16	0.32	0.05	0.098	0.82	0.79	0.098
8	0.036	0.16	0.31	0.05	0.090	0.82	0.79	0.085
9	0.033	0.15	0.30	0.05	0.082	0.82	0.79	0.071
10	0.031	0.14	0.29	0.05	0.081	0.81	0.79	0.058
11	0.028	0.13	0.29	0.05	0.080	0.81	0.79	0.058
12	0.026	0.13	0.28	0.05	0.079	0.80	0.79	0.058
13	0.026	0.12	0.27	0.05	0.078	0.74	0.71	0.058
14	0.026	0.11	0.26	0.05	0.077	0.73	0.70	0.058
15	0.026	0.11	0.23	0.05	0.075	0.72	0.69	0.058
16	0.026	0.11	0.22	0.05	0.052	0.71	0.69	0.058
17	0.026	0.11	0.18	0.05	0.052	0.69	0.67	0.058
18	0.026	0.10	0.17	0.05	0.052	0.68	0.66	0.058
19	0.025	0.10	0.13	0.04	0.052	0.66	0.65	0.058

Package	MAXIMUM		MINIMUM						Heating/Cooling Equipment Efficiency ⁽⁹⁾
	Glazing Area Percent ¹	Glazing U-Value ²	Ceiling R-Value ³ Wall	Wall R-Value ⁴	Floor R-Value ⁵	Basement Wall R-Value ⁶	Slab Perimeter R-Value ⁷	Crawl Space R-Value ⁸	
1	12%	0.75	R-19	R-13	R-11	R-5	R-0	R-5	Normal
2	12%	0.75	R-26	R-13	R-11	R-4	R-0	R-4	Normal
3	15%	0.65	R-19	R-13	R-13	R-6	R-0	R-6	Normal
4	15%	0.65	R-30	R-13	R-11	R-4	R-0	R-4	Normal
5	18%	0.65	R-30	R-13	R-13	R-6	R-2	R-7	Normal
6	18%	0.50	R-19	R-11	R-11	R-5	R-0	R-6	Normal
7	25%	0.55	R-38	R-13	R-19	R-8	R-2	R-10	Normal
8	25%	0.45	R-26	R-13	R-11	R-5	R-0	R-6	Normal
9	12%	Any	R-19	R-13	R-11	R-4	R-0	R-5	High Heating
10	15%	0.90	R-19	R-13	R-11	R-5	R-0	R-6	High Heating
11	18%	0.90	R-30	R-13	R-15	R-7	R-2	R-9	High Heating
12	18%	0.75	R-19	R-13	R-11	R-5	R-0	R-5	High Heating
13	25%	0.70	R-30	R-13	R-19	R-7	R-2	R-11	High Heating
14	12%	0.90	R-19	R-13	R-13	R-5	R-0	R-6	High Cooling
15	12%	Any	R-30	R-13	R-13	R-6	R-2	R-7	High Cooling
16	15%	0.90	R-30	R-13	R-19	R-7	R-2	R-9	High Cooling
17	18%	0.70	R-30	R-13	R-11	R-5	R-0	R-6	High Cooling
18	25%	0.60	R-30	R-13	R-19	R-8	R-2	R-11	High Cooling
19	25%	0.50	R-19	R-13	R-13	R-6	R-2	R-7	High Cooling
20	12%	Any	R-19	R-13	R-11	R-3	R-0	R-3	High Heat/Cool
21	15%	Any	R-19	R-13	R-13	R-5	R-0	R-6	High Heat/Cool
22	18%	Any	R-30	R-13	R-19	R-7	R-2	R-12	High Heat/Cool
23	18%	0.90	R-19	R-13	R-13	R-5	R-0	R-7	High Heat/Cool
24	25%	0.75	R-30	R-13	R-15	R-6	R-0	R-8	High Heat/Cool

FOOTNOTES:

- 1 Glazing area is the ratio of the area of the glazing assemblies (including sliding-glass doors, skylights, and basement windows but excluding opaque doors) to the gross wall area, expressed, as a percentage. Up to 1% of the total glazing area may be excluded from the U-value requirement. For example, 3 ft² of decorative glass may be excluded from a building design with 300 ft² of glazing area.
- 2 Glazing U-values should be tested and documented by the manufacturer in accordance with the National Fenestration Rating Council (NFRC) test procedure, taken from the glazing U-value table in Appendix B, or derived from an alternate test procedure or table accepted by your local jurisdiction. Center-of-glass U-values cannot be used.
- 3 The ceiling R-values do not assume a raised or oversized truss construction. If the insulation achieves the full insulation thickness over the exterior walls, R-30 insulation may be substituted for R-38 insulation and R-38 insulation may be substituted for R-49 insulation. Ceiling R-values represent the sum of cavity insulation plus insulating sheathing (if used). For ventilated ceilings, insulating sheathing must be placed between the conditioned space and the ventilated portion of the roof.
- 4 Wall R-values represent the sum of the wall cavity insulation plus insulating sheathing (is used). Do not include exterior siding, structural sheathing, and interior drywall. For example, an R-19 requirement could be met EITHER by R-19 cavity insulation OR R-13 cavity insulation plus R-6 insulating sheathing. Wall requirements apply to wood-frame or mass (concrete, masonry, log) wall constructions, but do not apply to metal-frame construction. Metal-frame wall equivalent R-values can be found in Appendix C.
- 5 The floor requirements apply to floors over unconditioned spaces (such as unconditioned crawlspaces, basements, or garages). Floors over outside air must meet the ceiling requirements.
- 6 Walls of conditioned basements below uninsulated floors must be insulated from the top of the basement wall to a depth of 10 ft

below ground level or to the level of the basement floor, whichever is less. The entire opaque portion of the basement walls with an average depth less than 50% below grade must meet the same R-value requirement as above-grade walls. Conditioned basement windows and sliding doors must be included with the other glazing. Basement doors must meet the door U-value requirement described in Note b.

- 7 The R-value requirements are for unheated slabs. Add an additional R-2 for heated slabs, except in Zone 1 which does not require slab insulation. For packages with a slab insulation requirement, the insulation must extend a total linear distance of at least 24 in. in Zones 2-12 and 48 in. in Zones 13-17. The insulation must extend 1) down from the top of the slab, or 2) down from the top of the slab to the bottom of the slab and then horizontally underneath the slab, or 3) down from the top of the slab to the bottom of the slab and then horizontally away from the slab, with pavement or at least 10 in. of soil covering the horizontal insulation.
- 8 The crawl space wall R-value requirements are for walls of unventilated crawl spaces. The crawl space wall insulation must extend from the top of the wall (including the sill plate) to at least 12 in. below the outside finished grade. If the distance from the outside finished grade to the top of the footing is less than 12 in., the insulation must extend a total vertical plus horizontal distance of 24 in. from the outside finished grade.
- 9 High Heating means a furnace AFUE of 90% or more, or a heat pump HSPF of 7.8 or more. High Cooling means a SEER of 12 or more. High Heat/Cool means both heating and cooling equipment must meet the minimum efficiencies. If you plan to install more than one piece of heating equipment or more than one piece of cooling equipment, the equipment with the lowest efficiency must meet or exceed the efficiency required by the selected package. The following California counties do not qualify for the cooling equipment credit: Alameda, Contra Costa, Los Angeles, Marin, Monterey, Napa, Orange, San Benito, San Diego, San Francisco, San Luis Obispo, San Mateo, Santa Barbara, Santa Clara, Santa Cruz, Solano, Sonoma, and Ventura.

NOTES:

1. Glazing Areas and U-values are maximum acceptable levels. Insulation R-values are minimum acceptable levels. R-value requirements are for insulation only and do not include structural components.
2. Opaque doors in the building envelope must have a U-value no greater than 0.35. Door U-values must be based on manufacturer data, taken from the door U-value table in Appendix B, or derived from an alternate test procedure or table accepted by your jurisdiction. If a door contains glass and an aggregate U-value rating for that door is not available, include the glass area of the door with your windows and use the opaque door U-value to determine compliance of the door. One door may be excluded from this requirement (i.e., may have a U-value greater than 0.35).
3. If a ceiling, wall, floor, basement wall, slab-edge, or crawl space wall component includes two or more areas with different insulation levels, the component complies if the area-weighted average R-value is greater than or equal to the R-value requirement for that component. Glazing or door components comply if the area-weighted average U-value of all windows or doors is less than or equal to the U-value requirement (0.35 for doors). Use the R-value/U-value Weighted Average Worksheet for these computations.

1992 MODEL ENERGY CODE
SINGLE FAMILY DWELLING ROOM ADDITION
QUICK COMPLIANCE ASSEMBLY PERFORMANCE WORKSHEET

Owner: _____ Application Number: _____

Address: _____

Heated / Cooled Floor Area _____ Sq. Ft. A. _____
 Base Value from Table I

DESIGN CREDITS

Roof
 Insulation R- _____
 Radiant Barrier (Y/N) _____
 Roof Credit from Table II 1. _____

Walls
 Insulation R- _____
 1" Polystyrene Foam (Y/N) _____
 Wall Credit from Table II 2. _____

Multi Level
 More than 1 story (Y/N)
 Multi Level Credit from Table II 3. _____

Ceiling
 Average Ceiling Height _____ Ft.
 Ceiling Height Credit from Table II 4. _____

Mechanical Efficiency
 High Efficiency HVAC (Y/N) _____
 HVAC Credit from Table II 5. _____

Building Shape
 Width to Depth Ratio _____
 Width / Depth Credit from Table II 6. _____

Windows
 Highest Window U-Value _____
 Window Credit from Table III 7. _____

Total Design Credits (add lines 1+2+3+4+5+6+7) B. _____

Maximum Allowable Sq. Ft. Area of Openings (multiply line AxB)
 Including Exterior Doors, House/Garage Door, Skylights & Windows C. _____

- NOTE:
1. All floors over unconditioned space Use R-19 insulation.
 2. Basement and crawl space walls Use R-4 insulation.
 3. Mechanical ducts in unconditioned areas Use R-6 insulation.
 4. Seal all cracks at exterior framing connections to the foundation, doors and windows.

WOOD FRAME ASSEMBLY PERFORMANCE TABLES

Table I. Base Values for Heated / Cooled Areas

Area (sq.ft.)	Base Value	Area (sq.ft.)	Base Value	Area (sq.ft.)	Base Value	Area (sq.ft.)	Base Value	Area (sq.ft.)	Base Value
50	28	375	77	700	105	1025	127	1400	148
75	35	400	79	725	107	1050	128	1500	153
100	40	425	82	750	109	1075	130	1600	158
125	45	450	84	775	110	1100	131	1700	163
150	49	475	87	800	112	1125	133	1800	167
175	53	500	89	825	114	1150	134	1900	172
200	56	525	91	850	115	1175	135	2000	176
225	60	550	93	875	117	1200	136	2100	181
250	63	575	95	900	119	1225	138	2200	185
275	66	600	97	925	120	1250	140	2300	189
300	69	625	99	950	122	1275	141	2400	193
325	72	650	101	975	124	1300	142	2500	197
350	74	675	103	1000	125	1325	144	2600	501

Table II. Design Credits

Roof					Walls			
				With Radiant Barrier		With 1" Polystyrene Foam		
	16"o.c.	24"o.c.	16"o.c.	24"o.c.	R-11	****	.322	
R-19	****	.005	.014	.019	R-13	.109	.378	
R-30	.020	.026	.034	.040	R-15	.185	.422	
R-38	.029	.034	.043	.048	R-19	.348	.504	
Ceiling Average Height at Exterior Walls					Multi Level Heated / Cooled Area (Sq. Ft.)			
9 Ft.		.126	11Ft.	.378	Equal to or Less than 4,000		.007	
10Ft.		.252	12Ft.	.504	Greater than 4,000		.012	
HVAC Efficiency					Width to Depth Ratio			
Furnace AFUE of 90% or greater and Air Conditioning SEER of 12 or greater Heat Pump HSPF of 7.8 or greater				Credit	Greater Than		Credit	
				.10	2 to 1		.048	
					3 to 1		.144	
					4 to 1		.240	
					5 to 1		.333	

Table III. Window Efficiency Credits

U-Value	Credit	U-Value	Credit	U-Value	Credit	U-Value	Credit
.87	1.014	.77	1.18	.67	1.410	.57	1.752
.86	1.028	.76	1.199	.66	1.438	.56	1.796
.85	1.043	.75	1.220	.65	1.467	.55	1.842
.84	1.059	.74	1.241	.64	1.499	.54	1.890
.83	1.074	.73	1.262	.63	1.530	.53	1.941
.82	1.091	.72	1.285	.62	1.563	.52	1.995
.81	1.107	.71	1.308	.61	1.597	.51	2.051
.80	1.124	.70	1.332	.60	1.633	.50	2.111
.79	1.142	.69	1.357	.59	1.671	.49	2.175
.78	1.161	.68	1.383	.58	1.711	.48	2.243

**CITY OF NORTH LAS VEGAS BUILDING SAFETY
COMMERCIAL BUILDING
ENERGY SCHEDULE**

Project Name _____ PAC # _____
 Address _____ Date _____
 Total Conditioned Floor Area in Square Feet _____
 Construction Type (wood studs, metal studs, masonry, etc.) _____
 Foundation Type (slab on grade, raised wood floor, etc.) _____

BUILDING SHELL

Insulation

Component	Type	R-Value	Location
Roof/Ceiling			
Roof/Ceiling			
Wall			
Wall			
Wall			
Floor			
Floor			
Other			

Fenestration

Component	Type	Frame	Area	U-Value	Shading Coefficient
Window					
Window					
Glass Block					
Skylight					
Door					
Door					
Other					

FURNACE: _____
 A/C SEER: _____
 HVAC
 Duct Insul.: _____

WATER HEATER SIZE: _____
 EFFICIENCY: _____
 R-12 Wrap: _____

**CITY OF NORTH LAS VEGAS BUILDING SAFETY
BUILDING DESIGN BY
COMPONENT PERFORMANCE APPROACH**

Constant Values:
None for Uo calculations

PROJECT: _____

ADDRESS: _____

PREPARED BY: _____

WALL
(Equation 1)

ROOF
(Equation 2)

$$U_o = \frac{U_w A_w + U_g A_g + U_d A_d}{A}$$

U_w= _____
 A_w= _____
 U_g= _____
 A_g= _____
 U_d= _____
 A_d= _____
 A= _____
 U_o= Less Than .34

$$U_o = \frac{U_r A_r + U_g A_g + U_d A_d}{A}$$

U_r= _____
 A_r= _____
 U_g= _____
 A_g= _____
 U_d= _____
 A_d= _____
 A= _____
 U_o= Less Than .10

U_w OR U_r=
 A_w OR A_r=
 U_d=
 U_g=
 A_g=
 A_d=
 U_o=
 A=

The transmittance of the components of the opaque wall, floor or roof and ceiling assembly area
 Opaque wall, floor or roof and ceiling assembly area (sq. ft.)
 The thermal transmittance of door or similar opening
 The thermal transmittance of the glazed area (window or skylight)
 Glazed area (sq. ft.)
 Door area (sq. ft.)
 The average or combined transmittance of the gross exterior wall, floor or ceiling assembly area
 The gross exterior wall, floor or roof assembly area where more than one type of wall, window and/or door is used, the respective terms for those are (U_{w1}A_{w1}) + (U_{w2}A_{w2}) + (U_{w3}A_{w3}) + ...etc.

**CITY OF NORTH LAS VEGAS BUILDING SAFETY
BUILDING DESIGN BY
COMPONENT PERFORMANCE APPROACH**

WALL

(Equation 3)

$$OTTV_w = \frac{(U_w A_w T_{D_{EQ}}) + (A_f S F S C) + (U_f A_f \Delta T)}{A_o}$$

ROOF

(Equation 4)

$$OTTV_r = \frac{(U_r A_r T_{D_{EQR}}) + (138 A_s S C_s) + (U_s A_s \Delta T)}{A_o}$$

U_w= _____
 A_w= _____
 T_{D_{EQ}}= _____
 A_f= _____
 S F = 124
 S C = _____
 U_f= _____
 A_f= _____
 Δ T = _____
 A_o= _____
 OTTV = _____
 OTTV = Less Than 32

U_r= _____
 A_r= _____
 T_{D_{EQ}}= _____
 A_s= _____
 S F = 138
 S C = _____
 U_s= _____
 A_s= _____
 Δ T = _____
 A_o= _____
 OTTV = _____
 OTTV = Less Than 8

OTTV_w OR OTTV_r=

The overall thermal transfer value walls or roof/ceiling

A_o=

Gross wall area or roof area

U_w OR U_r=

The thermal transmittance of all elements of the opaque wall or roof area

A_w OR A_r=

Opaque wall or roof area (sq. ft.)

U_f OR U_s=

Thermal transmittance of the fenestration area or skylight area

A_f OR A_s=

Fenestration area or skylight area (sq. ft.)

S F =

Solar factor = 124 windows

S F =

Solar factor = 138 skylights

S C OR S C_s =

Shade coefficient of the fenestration or skylight

Δ T =

Temperature difference between exterior and interior design conditions

T_{D_{EQ}}=

See sheet 3 of 4

T_{D_{EQR}}=

See sheet 4 of 4

Where more than one type of wall, the respective terms for those elements are (U_{w1}A_{w1}T_{D_{EQ}}1)
 + (U_{w2}A_{w2}T_{D_{EQ}}2) +....etc.

**CITY OF NORTH LAS VEGAS BUILDING SAFETY
EXTERIOR DESIGN CONDITIONS**

EXTERIOR DESIGN CONDITIONS

WINTER Design Dry-Bulb.....	28°F
SUMMER Design Dry-Bulb.....	106°F
SUMMER Design Wet-Bulb.....	70°F
Degree Days Heating.....	2,499
Degrees North Latitude.....	36°5'

EXAMPLE

**CITY OF NORTH LAS VEGAS BUILDING SAFETY
COMMERCIAL BUILDING
ENERGY SCHEDULE**

Project Name _____ PAC # _____
 Address _____ Date _____
 Total Conditioned Floor Area in Square Feet _____
 Construction Type (wood studs, metal studs, masonry, etc.) _____
 Foundation Type (slab on grade, raised wood floor, etc.) _____

BUILDING SHELL

Insulation

Component	Type	R-Value	Location
Roof/Ceiling	2x6- 16" o.c.	30	Attic Portions
Roof/Ceiling			
Wall	2x4 - 24" o.c.	13	Ext. wall - R13
Wall			
Wall			
Floor			
Floor			
Other	1 3/4" SC	3.03	Solid Core Doors

Fenestration

Component	Type	Frame	Area	U-Value	Shading Coefficient
Window	Fixed	Aluminum	660	0.72	
Window					
Glass Block					
Skylight					
Door	Storefront	Aluminum	60	0.87	
Door	French	Wood, Dual Pane	126	0.55	
Other					

FURNACE: 78%
 A/C SEER: 10
 HVAC
 Duct Insul.: R-6

WATER HEATER SIZE: N/A
 EFFICIENCY: N/A
 R-12 Wrap: No