



STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

Washington State Energy Code Development Standard Energy Code Proposal Form

May 2018

Log No. 19-WSEC-R22

Code being amended: Commercial Provisions Residential Provisions

Code Section # **TABLE R402.1.1**

Brief Description: Upgrade log wall standards to the national IRC requirements.

Proposed code change text

Chapter 2 Definitions

Log Structure. A type of construction whose primary structural elements are formed by a system of logs.

Log Wall. An assembly of individual structural logs for use as an exterior or interior load bearing wall, shear wall or non-load bearing wall.

TABLE R402.1.1

INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT^a

^a~~Log and solid timber walls with a minimum average thickness of 3.5 inches are exempt from this insulation requirement.~~

ⁿFor log structures developed in compliance with standard ICC 400, log walls shall meet the requirements for climate zone 5 of ICC 400.

Chapter 6 Referenced Standards

2017 – ICC 400 Standard on the Design and Construction of Log Structures

Appendix A

A103.3.4 Log wall. See Table A103.3.4. U-factors for log walls shall be determined using-ICC 400 Table 305.3.1.1, U-Factor of Log Wall (U_w) By Log Thickness (W_L) and Specific Gravity.

(Delete existing table A103.3.4)

**TABLE A103.3.4
LOG WALLS**

Average Log Diameter, Inches	U-factor
6	0.148
8	0.111
10	0.089
12	0.074
14	0.063
16	0.056

NOTE:

R-value of wood:
R-1.25 per inch
thickness

Average wall
thickness
90% average log
diameter

Purpose of code change: Upgrade log wall standards to the national IRC requirements. This will require a 5" to 7" inch wall depending on the wood species and specific gravity of the source wood.

Your amendment must meet one of the following criteria. Select at least one:

- | | |
|--|---|
| <input type="checkbox"/> Addresses a critical life/safety need. | <input type="checkbox"/> Consistency with state or federal regulations. |
| <input type="checkbox"/> The amendment clarifies the intent or application of the code. | <input type="checkbox"/> Addresses a unique character of the state. |
| <input checked="" type="checkbox"/> Addresses a specific state policy or statute.
(Note that energy conservation is a state policy) | <input type="checkbox"/> Corrects errors and omissions. |

Check the building types that would be impacted by your code change:

- | | |
|---|--|
| <input checked="" type="checkbox"/> Single family/duplex/townhome | <input type="checkbox"/> Commercial / Retail |
| <input checked="" type="checkbox"/> Multi-family 1 – 3 stories | <input type="checkbox"/> Institutional |
| <input type="checkbox"/> Multi-family 4 + stories | <input type="checkbox"/> Industrial |

Your name	Bill Kraus	Email address	bill.kraus@commerce.wa.gov
Your organization	Commerce, State Energy Office		chuck.murray@commerce.wa.gov
Other contact name	Chuck Murray	Phone number	360-725-5011 360-725-3113

Economic Impact Data Sheet

Briefly summarize your proposal's primary economic impacts and benefits to building owners, tenants and businesses.

See the assessment below.

Provide your best estimate of the construction cost (or cost savings) of your code change proposal? (See OFM Life Cycle Cost [Analysis tool](#) and [Instructions](#); use these [Inputs](#). **Webinars on the tool can be found [Here](#) and [Here](#)**)

\$5.55 /square foot (For residential projects, also provide \$ 5272 / dwelling unit)

Show calculations here, and list sources for costs/savings, or attach backup data pages

Provide your best estimate of the annual energy savings (or additional energy use) for your code change proposal?

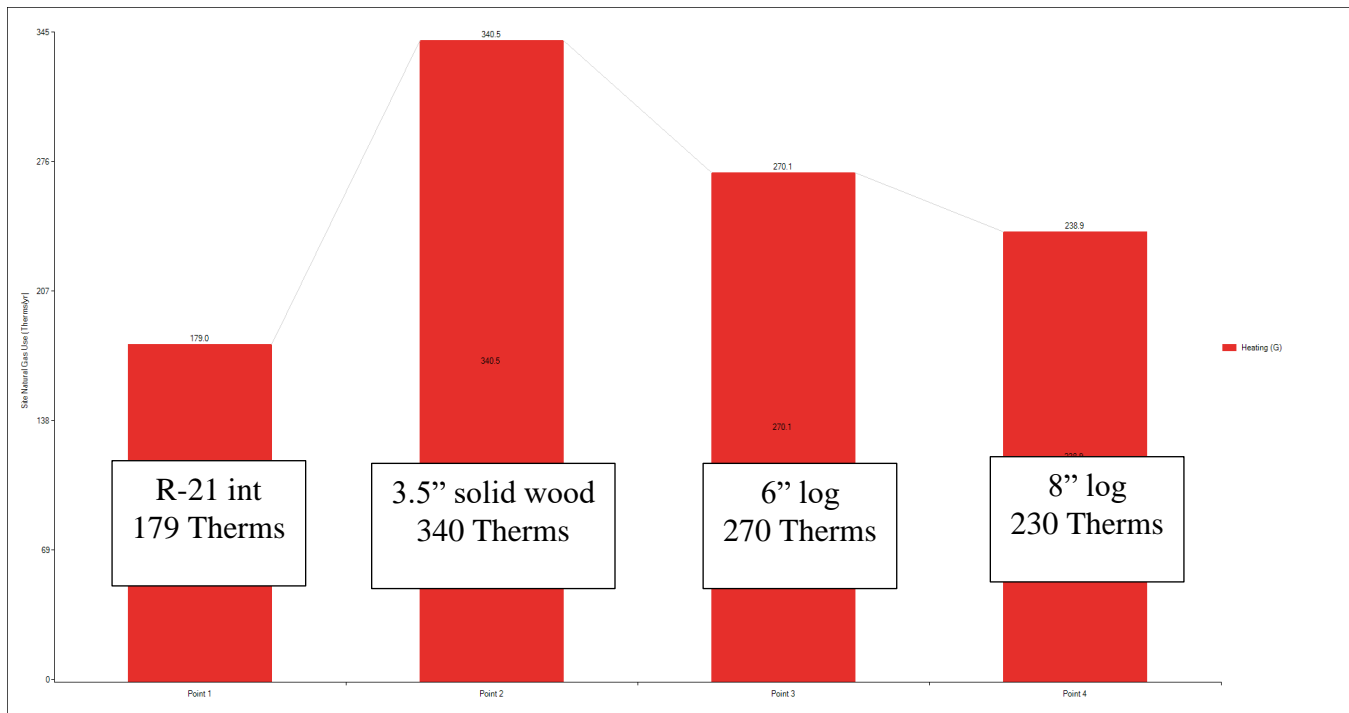
[Click here to enter text.](#)KWH/ square foot (or) 7.5 KBTU/ square foot

(For residential projects, also provide 107 therms KWH/KBTU / dwelling unit) per year.

Show calculations here, and list sources for energy savings estimates, or attach backup data pages

Energy Consumption:

The energy use of log walls was compared to the energy use of a R-21 int wall using Beopt energy simulation program. Beopt provides modeling using the energyplus engine and provides full hourly analysis, including the benefits of mass construction. Presented below is the space heating energy use only for a 1344 SF home meeting the 2015 WSEC.



First Cost:

For the life cycle cost model, we assumed the following first cost for construction.

- **Baseline** 3.5 inch solid wood - \$14.00 - Based on internet cost of kit home. Labor component added.
- **Alt 1.** 8 Inch log Wall - \$19.55 – Source RSmeans derived from whole building cost comparison.
- **Alt 2.** R-21 int. – \$11.50 SF – Source RSmeans.

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.

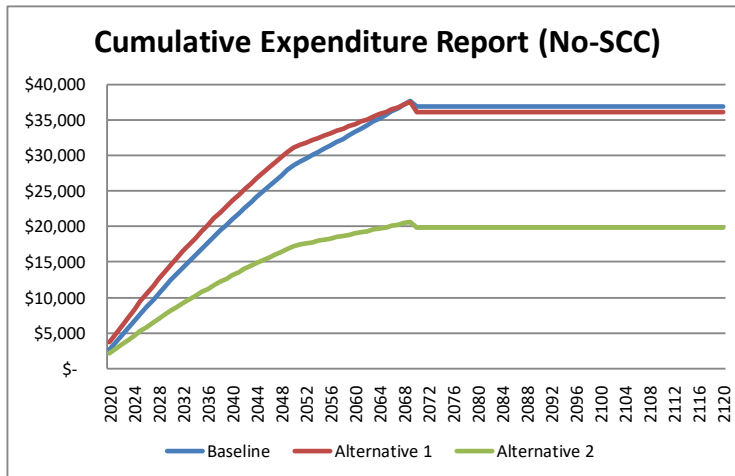
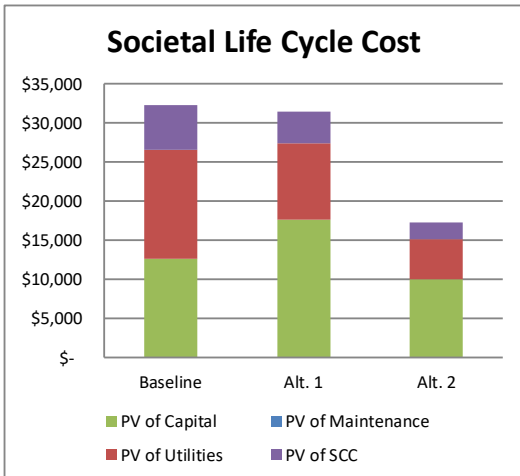
Key Analysis Variables		Building Characteristics	
Study Period (years)	50	Gross (Sq.Ft)	1,344
Nominal Discount Rate	5.00%	Useable (Sq.Ft)	1,344
Maintenance Escalation	1.00%	Space Efficiency	100.0%
Zero Year (Current Year)	2020	Project Phase	0
Construction Years	0	Building Type	0

Life Cycle Cost Analysis			BEST
Alternative	Baseline	Alt. 1	Alt. 2
Energy Use Intensity (kBtu/sq.ft)	25.3	17.7	9.4
1st Construction Costs	\$ 13,300	\$ 18,573	\$ 10,450
PV of Capital Costs	\$ 12,667	\$ 17,689	\$ 9,953
PV of Maintenance Costs	\$ -	\$ -	\$ -
PV of Utility Costs	\$ 13,858	\$ 9,700	\$ 5,157
Total Life Cycle Cost (LCC)	\$ 26,525	\$ 27,389	\$ 15,110
Net Present Savings (NPS)	N/A	\$ (864)	\$ 11,415

Societal LCC takes into consideration the social cost of carbon dioxide emissions caused by operational energy consumption

(GHG) Social Life Cycle Cost			BEST
	Baseline	Alt. 1	Alt. 2
GHG Impact from Utility Consumption			
Tons of CO2e over Study Period	90	63	34
% CO2e Reduction vs. Baseline	N/A	30%	63%
Present Social Cost of Carbon (SCC)	\$ 5,731	\$ 4,012	\$ 2,133
Total LCC with SCC	\$ 32,256	\$ 31,401	\$ 17,243
NPS with SCC	N/A	\$ 855	\$ 15,014

Warning: OFM Assigned Variables Not Used



All questions must be answered to be considered complete. Incomplete proposals will not be accepted.

< Primary Filter (Requires Level 1)

Office of Financial Management
 Olympia, Washington - Version: 2018-Residential
 Life Cycle Cost Analysis Tool
Baseline Input Page

Open Primary Filter and Click OK to Re-filter

Show All Entered Units (Requires Re-Filter)



Total Building Annual Utility Analysis	\$	361	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)
Annual Utility Bill [S]				\$ -	\$ 361
Annual Utility Consumption Not Entered Below					
Sum of Annual Utility Consumption Below				-	340
Total Annual Utility Consumption				-	340
Annual Utility Bill ÷ Total Utility Consumption	\$			\$ -	\$ 1.062

S H O W	Uniformat II Elemental Classification for Buildings (Building Component List)		REF	# of Units	Useful Life (Yrs.)	Installed Cost (\$/Unit)	1st Year Maintenance Cost (\$/Unit)	Total Component Installed Cost (\$'s)	Annual Water (CCF/Unit)	Annual Electricity (KWH/Unit)	Annual Natural Gas (Therm/Unit)	A
	Primary Entries Below: # of Units must be > 0 to be counted; Useful Life must be >= 2											
	A	Substructure						\$ 13,300				
x	A101098	Small Gas Home										
x	A101097	Log 3.5		950	55	\$14.00		\$ 13,300			0.357895	
x	A102097	Log 8			55	\$19.55					0.250526	
x	A103098	R-21 int			55	\$11.00					0.188421	
	B	Shell										
	C	Interiors										
	D	Services										
	E	Equipment & Furnishings										
	F	Special Construction & Demolition										
	G	Building Sitework										
	X904003			0.5								
	Z	Other Project Costs										
	Z10	One Time - Upfront Costs		1	50							
	Z30	Re-Occurring Annual Cost (Track Inflation)		1	1							

< Primary Filter (Requires Level 1)

Office of Financial Management
 Olympia, Washington - Version: 2018-Residential
 Life Cycle Cost Analysis Tool
Alternative 1 Input Page

Open Primary Filter and Click OK to Re-filter

Manual Special Selection Only (Requires Refilter)

Show Baseline Fields and Entered Units (Requires Refilter)

Show Differences Between Alternative and Baseline (Req. Refilter)



Total Building Annual Utility Analysis	\$	253	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)
Annual Utility Bill [S]				\$ -	\$ 253
Annual Utility Consumption Not Entered Below					
Sum of Annual Utility Consumption Below				-	238
Total Annual Utility Consumption				-	238
Annual Utility Bill ÷ Total Utility Consumption	\$			\$ -	\$ 1.062

Note: No Units Assigned to a Component with Entries

S H O W	Uniformat II Elemental Classification for Buildings (Building Component List)		REF	# of Units	Useful Life (Yrs.)	Installed Cost (\$/Unit)	1st Year Maintenance Cost (\$/Unit)	Total Component Installed Cost (\$'s)	Annual Water (CCF/Unit)	Annual Electricity (KWH/Unit)	Annual Natural Gas (Therm/Unit)	A
	Primary Entries Below: # of Units must be > 0 to be counted; Useful Life must be >= 2											
	Match Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14											
	A	Substructure						\$ 18,573				
	A101098	Small Gas Home										
	A101097	Log 3.5			55	\$14.00					0.357894737	
	A102097	Log 8		950	55	\$19.55		\$ 18,573			0.250526316	
	A103098	R-21 int			55	\$11.00					0.188421053	
	B	Shell										
	C	Interiors										
	D	Services										
	E	Equipment & Furnishings										
	F	Special Construction & Demolition										
	G	Building Sitework										
	Z	Other Project Costs										
	Z10	One Time - Upfront Costs		1	50							
	Z30	Re-Occurring Annual Cost (Track Inflation)		1	1							

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.

< Primary Filter (Requires Level 1)

**Office of Financial Management
 Olympia, Washington - Version: 2018-Residential
 Life Cycle Cost Analysis Tool
 Alternative 2 Input Page**

Open Primary Filter and Click OK to Re-filter

- Manual Special Selection Only (Requires Refilter)
- Show Baseline Fields and Entered Units (Requires Refilter)
- Show Differences Between Alternative and Baseline (Req. Refilter)

Total Building Annual Utility Analysis		Water (CCF)	Electricity (KWH)	Natural Gas (Therms)
Annual Utility Bill [\$]	\$ 134		\$ -	\$ 134
Annual Utility Consumption Not Entered Below		-	-	-
Sum of Annual Utility Consumption Below		-	-	127
Total Annual Utility Consumption		-	-	127
Annual Utility Bill + Total Utility Consumption	\$	-	\$ -	\$ 1,062

Note: No Units Assigned to a Component with Entries

S H O W	Uniformat II Elemental Classification for Buildings (Building Component List)		REF	# of Units	Useful Life (Yrs.)	Installed Cost (\$/Unit)	1st Year Maintenance Cost (\$/Unit)	Total Component Installed Cost (\$'s)	Annual Water (CCF/Unit)	Annual Electricity (KWH/Unit)	Annual Natural Gas (Therm/Unit)	Ar
	Primary Entries Below: # of Units must be > 0 to be counted; Useful Life must be >= 2								Entries Below for Component Specific Utility Analysis			
Match Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14												
A	Substructure							\$ 10,450				
A101098	Small Gas Home				55							
A101097	Log 3.5				55	\$14.00					0.25297619	
A102097	Log 8				55	\$19.55					0.177083333	
A103098	R-21 int			950	55	\$11.00		\$ 10,450			0.133184524	
B	Shell											
C	Interiors											
D	Services											
E	Equipment & Furnishings											
F	Special Construction & Demolition											
G	Building Sitework											
Z	Other Project Costs											
Z10	One Time - Upfront Costs			1	50							
Z30	Re-Occurring Annual Cost (Track Inflation)			1	1							

List any code enforcement time for additional plan review or inspections that your proposal will require, in hours per permit application:

Enforcement will be more consistent with national and state IRC requirements.

All questions must be answered to be considered complete. Incomplete proposals will not be accepted.