STATE OF WASHINGTON

STATE BUILDING CODE COUNCIL

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STATE BUILDING CODE COUNCIL
MEETING MINUTES

LOCATION: DES Building - First Floor
Presentation Room
1500 Jefferson St. SE
Olympia, Washington

DRAFT

MEETING DATE: Friday, February 8, 2019

Members in Attendance: Doug Orth, Chair; Diane Glenn; Traci Harvey; Kjell Anderson; Andrew Klein; Phil Lemley; Steve Simpson; Kevin Shutty; Eric Vander Mey

Members Absent: Jim Tinner, Vice Chair; Al French; Leanne Guier; Robert Graper; Barry Long

Staff In Attendance: Richard Brown, Managing Director; Krista Braaksma; Ray Shipman

Visitors in Attendance: Ken Brouillette; Earl Smith; Doug Scott; Billy Wallace; Al Audette; Micah Chappell; Jed Scheuermann; Chuck Murray

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Agenda Items	Council Actions/Discussion
1. Welcome and Introductions	Meeting called to order at 10:00 a.m. by Chair, Doug Orth. Everyone was welcomed and attendance noted.
2. Review & Approve Agenda	The agenda was approved as written.
3. Public Comment on Items not on the Agenda	There were no public comments on the agenda.
4. Review & Approve Minutes of January 11, 2019	The minutes were approved as written.
5. MVE Committee Report	The Committee report was accepted as submitted. See attached.
6. BFP Committee Report	The Committee report was accepted as submitted. See attached.

7. Legislative Update	The Legislative Report was accepted as submitted. See attached.
8. Set Two Month Window for Accepting Group 2 Codes Statewide Amendment Proposals	The window was set for between February 15th through April 15th.
9. Biennium Budget Proposal	The 2019 Biennium Budget was approved as submitted. See attached. The SBCC Chair asked staff to look into fee remittance compliance.
10. Staff Report	**Third Code Specialist:** There is a sound business justification for a third SBCC Staff Code Specialist. Richard has reviewed the budget impact of this additional staff person with DES Budget staff and the SBCC budget can support it. **Group 1 CR102 Status:** Staff is working with the Order Typing Service (OTS). Staff had to wait until the approved 2015 amendments were codified before submitting the CR 102 for the 2018 Group 1 Codes. **Report to House Local Government Committee:** Richard gave a SBCC overview to the House Local Government Committee January 25th at 10:00. The presentation is archived with TVW. **Long Term:** Update SBCC Web page: Underway. Council Process Modifications to the Review of Proposed Statewide Amendments and Review of Proposed or Enacted Local Amendments Required by HB1622: Underway. Base Line Economic Analysis Required by HB1622: Staff is ready to put this out on the street.
11. Other Business	None noted
12. Adjourn	The meeting was adjourned at 11:08 a.m.

Attachments: MVE Committee Report
BFP Committee Report
Legislative Report
Biennium Budget Proposal

Washington State Building Code Council • Code Change Cycle 2018 Group 2
2018 International Mechanical Code Review TAG Worksheet
TAG PROPOSED CHANGES - FINAL

International Mechanical Code (RCW 19.27.031(2))

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
WAC Administration Scope and Administration (SBCC Staff)						
---	---	WAC 51-52-003 International Mechanical Code	References code This WAC needs to be amended to reflect 2018 code.	N	Y	12/20/2018 TAG recommends an amendment 1/8/2019 TAG Approved amendment
---	---	WAC 51-52-008 Implementation	States adoption date. Needs amendment	N	Y	12/20/2018 TAG recommends an amendment 1/8/2019 TAG Approved amendment
Chapter 1 Scope and Administration (Al Spaulding)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	101.2	WAC 51-52-0101 Scope	This WAC needs an amendment to reference the 2017 version of NFPA 58	N	Y	12/20/2018 TAG recommends an amendment 1/8/2019 TAG Approved amendment
Chapter 2 Definitions. (Al Spaulding)						
Chapter 3 General Regulations (Al Spaulding)						
	301	WAC 51-52-0301 General	There is no text Change to “Reserved”	N	Y	12/20/2018 TAG recommends modifying the WAC 1/8/2019 TAG Approved amendment

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	306.6	WAC 51-52-0306 Appliances above ceilings	Our current amendment is not covered by the model code language. No changes are recommended	N	Y	12/20/2018 TAG recommends amending the amendment to reconcile accessible with ready access and access to. 1/8/2019 TAG Approved amendment
	Chapter 4 Ventilation (Vern Enns/Nancy Bernard)					
403.4	403.8	WAC 51-52-0403 Ventilation systems for Group R occupancies	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403.4.1	403.8.1	WAC 51-52-0403 Minimum ventilation performance	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403.4.2	403.8.2	WAC 51-52-0403 Control and operation	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403.4.3	403.8.3	WAC 51-52-0403 Outdoor air intake locations	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403.4.4	403.8.4	WAC 51-52-0403 Local exhaust ventilation requirements	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403.4.4.1	403.8.4.1	WAC 51-52-0403 Local exhaust systems	No changes are recommended	N	Y	12/20/2018 TAG recommends updating WAC references

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403.4.4.2	403.8.4.2	WAC 51-52-0403 Local exhaust fans	No changes are recommended	N	Y	12/20/2018 TAG recommends updating WAC references
403.4.5	403.8.5	WAC 51-52-0403 Whole house ventilation requirements	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403.4.5.1	403.8.5.1	WAC 51-52-0403 Outdoor air	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403..4.5.2	403.8.5.2	WAC 51-52-0403 Whole house supply system general requirements	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403..4.6	403.8.6	WAC 51-52-0403 Whole house ventilation with exhaust fan systems	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403.4.6.1	403.8.6.1	WAC 51-52-0403 Outdoor air	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403.4.6.2	403.8.6.2	WAC 51-52-0403 Outside air intake locations	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403.4.6.3	403.8.6.3	WAC 51-52-0403 Whole house exhaust system	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403.4.6.4	403.8.6.4	WAC 51-52-0403 Whole house exhaust and transfer fans	No changes are recommended	N	Y	12/20/2018 TAG recommends updating WAC references 403.3
403.4.6.5	403.8.6.5	WAC 51-52-0403 Fan noise	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403.4.7	403.8.7	WAC 51-52-0403 Whole house ventilation integrated with forced-air systems	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403.4.7.1	403.8.7.1	WAC 51-52-0403 Outdoor air	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403.4.7.2	403.8.7.2	WAC 51-52-0403 Whole house forced-air system	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403.4.8	403.8.8	WAC 51-52-0403 Whole house ventilation with supply fan systems	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403.4.8.1	403.8.8.1	WAC 51-52-0403 Outdoor air	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403.4.8.2	403.8.8.2	WAC 51-52-0403 Whole house supply system	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403.4.9	403.8.9	WAC 51-52-0403 Whole house ventilation with heat recovery or energy recovery ventilation systems	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403.4.9.1	403.8.9.1	WAC 51-52-0403 Outdoor air	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403.4.9.2	403.8.9.2	WAC 51-52-0403 Whole house heat recovery ventilator system	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
403.4.10	403.8.10	WAC 51-52-0403 Local exhaust ventilation and whole house ventilation alternate performance or design requirements.	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
403.4.11	403.8.11	WAC 51-52-0403 Alternate systems	No changes are recommended	N	Y	12/20/2018 TAG recommends keeping WAC unchanged 1/29/2019 TAG recommends modifying WAC numbering
404.1	404.2	Enclosed parking garages	Clarifies the intent with regard to "intermittent" operation. (Deemed significant by ICC) Change seems reasonable. Recommend no amendment	N	Y	12/20/2018 TAG recommends no amendment 1/29/2019 TAG recommends modifying WAC numbering
Chapter 5 Exhaust Systems (Vern Enns/Nancy Bernard) (Linked with IRC Chapter 15)						
Chapter 6 Duct Systems (Vern Enns/Nancy Bernard) (Linked with IRC Chapter 16)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Chapter 7 Combustion Air (Tom Jensen)(Linked with IRC Chapter 17)						
Chapter 8 Chimneys and Vents (Grant Middleton) (Linked with IRC Chapter 18)						
Chapter 9 Specific Appliances, Fireplaces and Solid Fuel-Burning Equipment (Ty Wasserman) (Linked with IRC Chapter 19)						
	Section 928	WAC 51-52-0928 Evaporative cooling equipment	Blank Change to “Reserved”	N	Y	12/20/2018 TAG recommends modifying the WAC 1/8/2019 TAG Approved amendment
Chapter 10 Boilers, Water Heaters and Pressure Vessels (Valerie Graber) (Linked with IRC Chapter 20)						
	1006.6	Safety and relief valve discharge	Address/coordinate reference to IPC		Y	1/8/2019 TAG recommends an amendment

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Chapter 11 Refrigeration (Valerie Graber/Grant Middleton)						
1105.6.3	None	Ventilation rate	Normal ventilation for ammonia not given. Add text to section. (and the room conditions shall be) in accordance with IIAR2.	N	Y	12/20/2018 TAG recommends an amendment 1/8/2019 TAG Approved amendment
Table 1106.5.2	None	Minimum Exhaust Rates	R143 not in table 1103.1. Change to (R143A).add the A	N	Y	12/20/2018 TAG recommends an amendment 1/8/2019 TAG Approved amendment
Same	1107.2	WAC 51-52-1107 Piping location	This section restricts all ref from exist access. Table 1104.3.2 allows A2 & B2 in exit access. Change WAC text to match changed language	N	Y	12/20/2018 TAG recommends deleting WAC 1/8/2019 TAG Approved amendment
Chapter 12 Hydronic Piping (Lawrence Palmer) (Linked with IRC Chapter 21)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Chapter 13 Fuel Oil Piping and Storage (Eric Vander Mey)						
Chapter 14 Solar Thermal Systems (Al Spaulding) (Linked with IRC Chapter 23)						
1402.8.3		Piping	Verify references to the IPC and WSEC	N	Y	1/8/2019 TAG recommends an amendment
Chapter 15 Referenced Standards (SBCC Staff)						
	Chapter 15	WAC 51-52-1500 Referenced standards	Added ASHRAE 62.2-~~2013~~ 2016? Not addressed in the 2018 Code Recommend keeping the amendment	N	Y	12/20/2018 TAG recommends an amendment to the WAC 1/8/2019 TAG Approved amendment

International Fuel Gas Code (WAC 51-51-007) (Linked with IRC Chapter 24)

Chapter 1 Scope and Administration (SBCC Staff)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	International Fuel Gas Code	WAC 51-52-21000	Blank Change to “Reserved”	N	Y	12/20/2018 TAG recommends modifying this WAC 1/8/2019 TAG Approved amendment
Chapter 2 Definitions (SBCC Staff)						
Chapter 3 General Regulations (SBCC Staff)						
Chapter 4 Gas Piping Installations (Vern Enns)						
	Chapter 4	WAC 51-52-21401 Gas piping installations	Blank Change to “Reserved”	N	Y	1/8/2019 TAG Approved amendment
Chapter 5 Chimneys and Vents (Vern Enns)						
Chapter 6 Specific Appliances (Vern Enns)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	Chapter 6	WAC 51-52-21601 Specific appliances	Blank Change to “Reserved”	N	Y	1/8/2019 TAG Approved amendment
	Chapter 7 Gaseous Hydrogen Systems (Vern Enns)					
	Chapter 8 Reference Standards (SBCC Staff)					

National Fuel Gas Code (ANSI Z223.1/NFPA 54) (RCW 19.27.031(2))

	Chapter 1 Administration (SBCC Staff)					
	National Fuel Gas Code	WAC 51-52-22000	Blank Change to “Reserved”	N	Y	12/20/2018 TAG recommends modifying this WAC 1/8/2019 TAG Approved amendment
	Chapter 2 Referenced Publications (SBCC Staff)					

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	Chapter 3 Definitions (SBCC Staff)					
	Chapter 4 General (SBCC Staff)					
	Chapter 5 Gas Piping System Design, Materials, and Components (SBCC Staff)					
	Chapter 6 Pipe Sizing (SBCC Staff)					
	Chapter 6	WAC 51-52-22006 Gas piping installation	Blank Change to “Reserved”	N	Y	12/20/2018 TAG recommends modifying this WAC 1/8/2019 TAG Approved amendment
	Chapter 7 Gas Piping Installation (SBCC Staff)					

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
		Chapter 8 Inspection, Testing, and Purging (SBCC Staff)				
		Chapter 9 Appliance, Equipment, and Accessory Installation (SBCC Staff)				
		Chapter 10 Installation of Specific Appliances (SBCC Staff)				
		Chapter 11 Procedures to Be Followed to Place Appliance in Operation (SBCC Staff)				
		Chapter 12 Venting of Appliances (SBCC Staff)				
		Chapter 13 Sizing of Category I Venting (SBCC Staff)				

NFPA 58 (Storage and Handling of Liquefied Petroleum Gases) (RCW 19.27.031(2))

		Chapter 1 Administration (Al Spaulding)				

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Chapter 2 Referenced Publications (Al Spaulding)						
Chapter 3 Definitions (Al Spaulding)						
Chapter 4 General Requirements (Al Spaulding)						
Chapter 5 LP-Gas Equipment and Appliances (Al Spaulding)						
Chapter 6 Installation of LP-Gas Systems (SBCC Staff)						
	Chapter 6	WAC 51-52-22006 Gas piping installation	Blank Change to “Reserved”		Y	12/20/2018 TAG recommends modifying this WAC 1/8/2019 TAG Approved amendment
Chapter 7 LP-Gas Liquid Transfer (SBCC Staff)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
		Chapter 8 Storage of Cylinders Awaiting Use, Resale, or Exchange (SBCC Staff)				
		Chapter 9 Vehicular Transportation of LP-Gas (SBCC Staff)				
		Chapter 10 Buildings or Structures Housing LP-Gas Distribution Facilities (SBCC Staff)				
		Chapter 11 Engine Fuel Systems (SBCC Staff)				
		Chapter 12 Refrigerated Containers (SBCC Staff)				
		Chapter 13 Marine Shipping and Receiving (SBCC Staff)				
		Chapter 14 Operations and Maintenance (SBCC Staff)				
		Chapter 15 Pipe and Tubing Sizing Tables (SBCC Staff)				

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation

International Residential Code

IRC Chapter 12 Mechanical Administration (Ty Wasserman)						
	M1201.1	WAC 51-51-1201 Scope		N	Y	1/8/2019 TAG recommends modifying this WAC
IRC Chapter 13 General Mechanical System Requirements (Ty Wasserman)						
IRC Chapter 14 Heating and Cooling Equipment and Appliances (Ty Wasserman)						
IRC Chapter 15 Exhaust Systems (Vern Enns/Nancy Bernard) (Linked with IMC Chapter 5)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1503.6	M1503.4	Makeup air required	Makeup air for domestic cooking exhaust systems is no longer required if all fuel-burning appliances in the dwelling unit have a direct vent or mechanical draft vent system (Considered a significant change by ICC) Requires makeup air with dampered openings for appliances NOT direct connected for combustion air and exhaust. Recommend accept as written	Y	Y	1/8/2019 TAG recommends an amendment. Vern will prepare an amendment proposal
	M1505.1	WAC 51-51-1505 General	The amendment calls out thickness and clearances. Renumber Look into mfg req	N	Y	1/8/2019 TAG recommends modifying this WAC
M1505.1	M1507.1	WAC 51-51-1507 General	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.2	M1507.2	WAC 51-51-1507 Recirculation of air	Recommend change amendment to require all hood exhausts to always discharge to out of doors, similar to toilet exhaust Note: 1/8/2019 TAG did not support this change at this time.	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3	M1507.3	WAC 51-51-1507 Whole-house mechanical ventilation system	Code change is to get better confirmation that the equipment installed will actually perform. By gaining a certification label, the fan equipment will have shown capable of meeting a standard of performance. Change amendment to include the new reference standard numbers	Y	Y	1/8/2019 TAG recommends modifying this WAC
M1505.3.1	M1507.3.1	WAC 51-51-1507 System design	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.2	M1507.3.2	WAC 51-51-1507 Control and operation	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3.2.1	M1507.3.2.1	WAC 51-51-1507 Operating instructions	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.3	M1507.3.3	WAC 51-51-1507 Mechanical ventilation rate	No problem with the code change to give more direction on quantity of air for the mechanical ventilation rate. The code change table values are same as 1507.3.3 (1) and are from ASHRAE 62.2-2010	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
Table M1505.3.3(1)	Table M1507.3.3 (1)	WAC 51-51-1507 Continuous Whole-House Mechanical Ventilation System Airflow Rate Requirements	No problem with the code change to give more direction on quantity of air for the mechanical ventilation rate. The code change table values are same as 1507.3.3 (1) and are from ASHRAE 62.2-2010	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
Table M1505.3.3(2)	Table M1507.3.3 (2)	WAC 51-51-1507 Intermittent Whole-House Mechanical Ventilation Rate Factors	No problem with the code change to give more direction on quantity of air for the mechanical ventilation rate. The code change table values are same as 1507.3.3 (1) and are from ASHRAE 62.2-2010	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3.4	M1507.3.4	WAC 51-51-1507 Whole-house ventilation using exhaust fans	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.4.1	M1507.3.4.1	WAC 51-51-1507 Whole-house ventilation fans	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.4.2	M1507.3.4.2	WAC 51-51-1507 Fan noise	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.4.3	M1507.3.4.3	WAC 51-51-1507 Fan controls	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3.4.4	M1507.3.4.4	WAC 51-51-1507 Ventilation openings	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.5	M1507.3.5	WAC 51-51-1507 Whole-house ventilation integrated with a forced-air system	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.5.1	M1507.3.5.1	WAC 51-51-1507 Integrated whole-house ventilation systems	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.5.2	M1507.3.5.2	WAC 51-51-1507 Ventilation duct insulation	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3.5.3	M1507.3.5.3	WAC 51-51-1507 Outdoor air inlets	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.6	M1507.3.6	WAC 51-51-1507 Whole-house ventilation using a supply fan	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.6.1	M1507.3.6.1	WAC 51-51-1507 Outdoor air	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.6.2	M1507.3.6.2	WAC 51-51-1507 Ducts	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Table M1505.3.6.2	Table M1507.3.6.2	WAC 51-51-1507 Prescriptive Supply Fan Duct Sizing	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.6.3	M1507.3.6.3	WAC 51-51-1507 Dampers	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.6.4	M1507.3.6.4	WAC 51-51-1507 Ventilation duct insulation	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.6.5	M1507.3.6.5	WAC 51-51-1507 Outdoor air inlets	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3.7	M1507.3.7	WAC 51-51-1507 Whole-house ventilation using a heat recovery ventilation system	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.7.1	M1507.3.7.1	WAC 51-51-1507 Heat recovery ventilation systems	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.7.2	M1507.3.7.2	WAC 51-51-1507 Ventilation duct insulation	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.7.3	M1507.3.7.3	WAC 51-51-1507 Outdoor air inlets	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.4	M1507.4	WAC 51-51-1507 Local exhaust	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
Table M1505.4	Table M1507.4	WAC 51-51-1507 Minimum Required Local Exhaust Rates For One- and Two-Family Dwellings	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.4.1	M1507.4.1	WAC 51-51-1507 Local exhaust fans	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.4.2	M1507.4.2	WAC 51-51-1507 Local exhaust controls	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
IRC Chapter 16 Duct Systems (Vern Enns/Nancy Bernard) (Linked with IMC Chapter 6)						
	M 1602.2	Return air opening locations for H, V, &AC systems	Adds item 7 Return air shall not be taken from natatorium enclosures UNLESS THE AIR IS DEHUMIDIED RM37-15 Strike Item 5 except --	Y IF ADDING DEHUMIDIFICATION TO BE ABLE TO RETURN AIR FROM NATATORIUM SPACE.	Y	1/8/2019 TAG recommends an amendment.
IRC Chapter 17 Combustion Air (Tom Jensen) (Linked with IMC Chapter 7)						
IRC Chapter 18 Chimneys and Vents (Grant Middleton)(Linked with IMC Chapter 8)						
IRC Chapter 19 Special Appliances, Equipment and Systems (Ty Wasserman) (Linked with IMC Chapter 9)						
IRC Chapter 20 Boilers and Water Heaters (Valerie Graber) (Linked with IMC Chapter 10)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
IRC Chapter 21 Hydronic Piping (Lawrence Palmer) (Linked with IMC Chapter 12)						
IRC Chapter 22 Special Piping and Storage Systems (Eric Vander Mey)						
IRC Chapter 23 Solar Thermal Energy Systems (Al Spaulding) (Linked with IMC Chapter 14)						
	M2301.2.3	WAC 51-51-2300 Pressure and temperature relief valves and system components	There is an added reference to the ICC 900. This amendment points to state adopted plumbing code (UPC). The base language this sub-section points to P2804 of the IRC which is consistent with IPC and not the state adopted UPC.	N	Y	1/8/2019 TAG recommends an amendment.
IRC Chapter 24 Fuel Gas (Vern Enns/SBCC Staff) (Linked with IFGC)						

Washington State Building Code Council
Code Change Cycle 2018 Group 2

2018 Washington State Energy Code Integrated Draft
TAG Review Summary of Significant Findings

The Energy Code TAG completed their review of the changes in the 2018 International Energy Conservation Code (IECC) and their integration into the 2015 Washington State Energy Code (WSEC). The majority of the changes were editorial in nature. The TAG did identify some of the integrated changes that would decrease the current stringency of the Washington State Energy Code and recommended they be removed.

The first such change is the elimination of the last sentence in **Section R402.4.2** in the 2018 IECC—"Where using tight-fitting doors on masonry fireplaces, the doors shall be listed and labeled in accordance with UL 907." The TAG determined the sentence should be retained in the WSEC.

The next item is a similar change in **Section R403.3.2** where the 2018 IECC deletes the two exceptions for duct sealing. The TAG felt the exceptions should be retained.

The biggest debate over requirements in the 2018 IECC occurred in regards to the added **Sections R403.3.6, R403.3.6.1 and R403.3.7.** These sections dealt with detailing when ducts are in conditioned spaces or partially conditioned space. The TAG ultimately decided the new Section R403.3.7 should not be included in the WSEC Integrated draft for two key reasons: there was a possible conflict with the language in R406 and the point value allowed for ducts within conditioned spaces, and members felt the requirement needed to be vetted to ensure the intended efficiency was achieved. Sections R403.3.6 and R403.3.6.1 were recommended to be retained in the WSEC after a failed motion to recommend removal. There was concern that the requirements were not necessarily applicable to both sides of the mountains and that there was no incentive to partially insulate ducts that would also be allowed to be hung in an unconditioned space.

The next item discussed was the Air exchange rate in **Table R405.5.2(1).** The 2018 IECC modified the language for the proposed design to be the measured air exchange rate. Kjell wondered how that would be possible to know when applying for a permit. After discussion, the TAG recommended modifying the language to "As proposed."

The final noted change was in both Section R502.1.1.2 and R503.1.2. Both of these sections go from a laundry list of sections for new heating and cooling systems compliance to a general "…shall comply with Section R403." This does broaden the scope somewhat as it would now include items such as system sizing, efficiency and pipe insulation.

The remainder of the changes were all found to be editorial or clarifying in nature.

CHAPTER 1 [RE]

SCOPE AND ADMINISTRATION

SECTION R101
SCOPE AND GENERAL REQUIREMENTS

R101.1 Title. This code shall be known as the *Washington State Energy Code*, and shall be cited as such. It is referred to herein as "this code."

R101.2 Scope. This code applies to *residential buildings* and the buildings sites and associated systems and equipment. This code shall be the maximum and minimum energy code for residential construction in each town, city and county. Residential *sleeping units*, Group I-1, Condition 2 assisted living facilities licensed by Washington state under chapter 388-78A WAC and Group I-1, Condition 2 residential treatment facilities licensed by Washington state under chapter 246-337 WAC shall utilize the commercial building sections of the energy code regardless of the number of stories of height above grade plane.

R101.3 Intent. This code shall regulate the design and construction of buildings for the effective use and conservation of energy over the useful life of each building. This code is intended to provide flexibility to permit the use of innovative approaches and techniques to achieve this objective. This code is not intended to abridge safety, health or environmental requirements contained in other applicable codes or ordinances.

R101.4 Applicability. Where, in any specific case, different sections of this code specify different materials, methods of construction or other requirements, the most restrictive shall govern. Where there is a conflict between a general requirement and a specific requirement, the specific requirement shall govern.

R101.4.1 Mixed ~~occupancy~~residential and commercial buildings. Where a building includes both *residential* building and *commercial* building ~~occupancies~~portions, each ~~occupancy~~ portion shall be separately considered and meet the applicable provisions of the WSEC - Commercial and Residential Provisions.

R101.5 Compliance. *Residential buildings* shall meet the provisions of WSEC - Residential Provisions. *Commercial buildings* shall meet the provisions of WSEC - Commercial Provisions.

R101.5.1 Compliance materials. The *code official* shall be permitted to approve specific computer software, worksheets, compliance manuals and other similar materials that meet the intent of this code.

SECTION R102
ALTERNATIVE MATERIALS, DESIGN AND METHODS OF CONSTRUCTION AND EQUIPMENT ~~APPLICABILITY—DUTIES AND POWERS OF THE CODE OFFICIAL~~

R102.1 Alternate materials, design and methods of construction and equipment. The provisions of this code are not intended to prevent the installation of any material or to prohibit any design or method of construction not specifically prescribed by this code~~, provided that any such alternative has been *approved*~~. ~~The code official shall be permitted to approve An~~ The code official shall have the authority to approve an alternate material, design or method of construction upon application of the owner or the owner's authorized agent. ~~where~~ The code official shall first find~~s~~ that the proposed design is satisfactory and complies with the intent of the provisions of this code, and that the material, method or work offered is, for the purpose intended, ~~at least~~ not less than the equivalent of that prescribed in this code for strength, effectiveness, fire resistance, durability and safety. Where the alternative material, design or method of construction is not *approved*, the code official shall respond in writing, stating the reasons why the alternative was not *approved*.

SECTION R103
CONSTRUCTION DOCUMENTS

R103.1 General. Construction documents, technical reports, and other supporting data shall be submitted in one or more sets with each application for a permit. The construction documents and technical reports shall be prepared by

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a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed. Where special conditions exist, the *code official* is authorized to require necessary construction documents to be prepared by a registered design professional.

Exception: The *code official* is authorized to waive the requirements for construction documents or other supporting data if the *code official* determines they are not necessary to confirm compliance with this code.

R103.2 Information on construction documents. Construction documents shall be drawn to scale upon suitable material. Electronic media documents are permitted to be submitted when *approved* by the *code official*. Construction documents shall be of sufficient clarity to indicate the location, nature and extent of the work proposed, and show in sufficient detail pertinent data and features of the building, systems and equipment as herein governed. Details shall include, but are not limited to, the following as applicable:

1. Insulation materials and their *R*-values.
2. Fenestration *U*-factors and SHGCs.
3. Area-weighted *U*-factor and SHGC calculations.
4. Mechanical system design criteria.
5. Mechanical and service water heating system and equipment types, sizes and efficiencies.
6. Equipment and systems controls
7. Duct sealing, duct and pipe insulation and location.
8. Air sealing details.

R103.2.1 Building thermal envelope depiction. The building's thermal envelope shall be represented on the construction documents.

R103.3 Examination of documents. The *code official* shall examine or cause to be examined the accompanying construction documents and shall ascertain whether the construction indicated and described is in accordance with the requirements of this code and other pertinent laws or ordinances. The code official is authorized to utilize a registered design professional or other approved entity not affiliated with the building design or construction in conducting the review of the plans and specifications for compliance with the code.

R103.3.1 Approval of construction documents. When the *code official* issues a permit where construction documents are required, the construction documents shall be endorsed in writing and stamped "Reviewed for Code Compliance." Such *approved* construction documents shall not be changed, modified or altered without authorization from the *code official*. Work shall be done in accordance with the *approved* construction documents. One set of construction documents so reviewed shall be retained by the *code official*. The other set shall be returned to the applicant, kept at the site of work and shall be open to inspection by the *code official* or a duly authorized representative.

R103.3.2 Previous approvals. This code shall not require changes in the construction documents, construction or designated occupancy of a structure for which a lawful permit has been heretofore issued or otherwise lawfully authorized, and the construction of which has been pursued in good faith within 180 days after the effective date of this code and has not been abandoned.

R103.3.3 Phased approval. The *code official* shall have the authority to issue a permit for the construction of part of an energy conservation system before the construction documents for the entire system have been submitted or *approved*, provided adequate information and detailed statements have been filed complying with all pertinent requirements of this code. The holders of such permit shall proceed at their own risk without assurance that the permit for the entire energy conservation system will be granted.

R103.4 Amended construction documents. Work shall be installed in accordance with the *approved* construction documents, and any changes made during construction that are not in compliance with the approved construction documents shall be resubmitted for approval as an amended set of construction documents.

R103.5 Retention of construction documents. One set of *approved* construction documents shall be retained by the *code official* for a period of not less than 180 days from date of completion of the permitted work, or as required by state or local laws.

SECTION R104
INSPECTIONS

R104.1 General. Construction or work for which a permit is required shall be subject to inspection by the *code official* or his or her designated agent, and such construction or work shall remain ~~accessible and exposed~~ visible and

able to be accessed for inspection purposes until *approved*. It shall be the duty of the permit applicant to cause the work to remain ~~accessible and exposed~~ visible and able to be accessed for inspection purposes. Neither the code official nor the jurisdiction shall be liable for expense entailed in the removal or replacement of any material, product, system or building component required to allow inspection to validate compliance with this code.

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R104.2 Required inspections. The *code official* or his or her designated agent, upon notification, shall make the inspections set forth in Sections R104.2.1 through R104.2.5.

R104.2.1 Footing and foundation inspection. Inspections associated with footings and foundations shall verify compliance with the code as to R-value, location, thickness, depth of burial and protection of insulation as required by the code and approved plans and specifications.

R104.2.2 Framing and rough-in inspection. Inspections at framing and rough-in shall be made before application of interior finish and shall verify compliance with the code as to types of insulation and corresponding R-values and their correct location and proper installation; fenestration properties (U-factor and SHCG) and proper installation; and air leakage controls as required by the code and approved plans and specifications.

R104.2.2.1 Wall insulation inspection. The building official, upon notification, shall make a wall insulation inspection in addition to those inspections required in Section R109 of the *International Residential Code*. This inspection shall be made after all wall and cavity insulation is in place and prior to cover.

C104.2.3 Plumbing rough-in inspection. Inspections at plumbing rough-in shall verify compliance as required by the code and approved plans and specifications as to types of insulation and corresponding R-values and protection, and required controls.

C104.2.4 Mechanical rough-in inspection. Inspections at mechanical rough-in shall verity compliance as required by the code and approved plans and specifications as to installed HVAC equipment type and size, required controls, system insulation and corresponding R-value, system air leakage control, programmable thermostats, dampers, whole-house ventilation and minimum fan efficiency.

Exception: Systems serving multiple dwelling units shall be inspected in accordance with Section C104.2.4.

R104.2.5 Final inspection. The building shall have a final inspection and not be occupied until *approved*.

R104.3 Reinspection. A building shall be reinspected when determined necessary by the *code official*.

R104.4 Approved inspection agencies. The *code official* is authorized to accept reports of third-party inspection agencies not affiliated with the building design or construction, provided such agencies are *approved* as to qualifications and reliability relevant to the building components and systems they are inspecting.

R104.5 Inspection requests. It shall be the duty of the holder of the permit or their duly authorized agent to notify the *code official* when work is ready for inspection. It shall be the duty of the permit holder to provide access to and means for inspections of such work that are required by this code.

R104.6 Reinspection and testing. Where any work or installation does not pass an initial test or inspection, the necessary corrections shall be made so as to achieve compliance with this code. The work or installation shall then be resubmitted to the *code official* for inspection and testing.

R104.7 Approval. After the prescribed tests and inspections indicate that the work complies in all respects with this code, a notice of approval shall be issued by the *code official*.

R104.7.1 Revocation. The *code official* is authorized to, in writing, suspend or revoke a notice of approval issued under the provisions of this code wherever the certificate is issued in error, or on the basis of incorrect information supplied, or where it is determined that the building or structure, premise, or portion thereof is in violation of any ordinance or regulation or any of the provisions of this code.

SECTION R105
VALIDITY

R105.1 General. If a portion of this code is held to be illegal or void, such a decision shall not affect the validity of the remainder of this code.

SECTION R106
REFERENCED STANDARDS

R106.1 Referenced codes and standards. The codes and standards referenced in this code shall be those listed in

Chapter 5, and such codes and standards shall be considered as part of the requirements of this code to the prescribed extent of each such reference and as further regulated in Sections R106.1.1 and R106.1.2.

R106.1.1 Conflicts. Where differences occur between provisions of this code and referenced codes and standards, the provisions of this code shall apply.

R106.1.2 Provisions in referenced codes and standards. Where the extent of the reference to a referenced code or standard includes subject matter that is within the scope of this code, the provisions of this code, as applicable, shall take precedence over the provisions in the referenced code or standard.

R106.2 Application of references. References to chapter or section numbers, or to provisions not specifically identified by number, shall be construed to refer to such chapter, section or provision of this code.

R106.3 Other laws. The provisions of this code shall not be deemed to nullify any provisions of local, state or federal law. In addition to the requirements of this code, all occupancies shall conform to the provisions included in the state building code (chapter 19.27 RCW). In case of conflicts among codes enumerated in RCW 19.27.031 (1) through (4) and this code, an earlier named code shall govern over those following. In the case of conflict between the duct sealing and insulation requirements of this code and the duct insulation requirements of Sections 603 and 604 of the *International Mechanical Code*, the duct insulation requirements of this code shall govern.

SECTION R107
FEES

R107.1 Fees. A permit shall not be issued until the fees prescribed in Section R107.2 have been paid, nor shall an amendment to a permit be released until the additional fee, if any, has been paid.

R107.2 Schedule of permit fees. A fee for each permit shall be paid as required, in accordance with the schedule as established by the applicable governing authority.

R107.3 Work commencing before permit issuance. Any person who commences any work before obtaining the necessary permits shall be subject to an additional fee established by the *code official*, which shall be in addition to the required permit fees.

R107.4 Related fees. The payment of the fee for the construction, *alteration*, removal or demolition of work done in connection to or concurrently with the work or activity authorized by a permit shall not relieve the applicant or holder of the permit from the payment of other fees that are prescribed by law.

R107.5 Refunds. The *code official* is authorized to establish a refund policy.

SECTION R108
STOP WORK ORDER

R108.1 Authority. Whenever the *code official* finds any work regulated by this code being performed in a manner either contrary to the provisions of this code or dangerous or unsafe, the *code official* is authorized to issue a stop work order.

R108.2 Issuance. The stop work order shall be in writing and shall be given to the owner of the property involved, or to the owner's authorized agent, or to the person doing the work. Upon issuance of a stop work order, the cited work shall immediately cease. The stop work order shall state the reason for the order, and the conditions under which the cited work will be permitted to resume.

R108.3 Emergencies. Where an emergency exists, the *code official* shall not be required to give a written notice prior to stopping the work.

R108.4 Failure to comply. Any person who shall continue any work after having been served with a stop work order, except such work as that person is directed to perform to remove a violation or unsafe condition, shall be subject to a fine as set by the applicable governing authority.

SECTION R109
BOARD OF APPEALS

R109.1 General. In order to hear and decide appeals of orders, decisions or determinations made by the *code official* relative to the application and interpretation of this code, there shall be and is hereby created a board of appeals. The *code official* shall be an ex officio member of said board but shall have no vote on any matter before

the board. The board of appeals shall be appointed by the governing body and shall hold office at its pleasure. The board shall adopt rules of procedure for conducting its business, and shall render all decisions and findings in writing to the appellant with a duplicate copy to the *code official*.

R109.2 Limitations on authority. An application for appeal shall be based on a claim that the true intent of this code or the rules legally adopted thereunder have been incorrectly interpreted, the provisions of this code do not fully apply or an equally good or better form of construction is proposed. The board shall have no authority to waive requirements of this code.

R109.3 Qualifications. The board of appeals shall consist of members who are qualified by experience and training and are not employees of the jurisdiction.

SECTION R110
VIOLATIONS

It shall be unlawful for any person, firm, or corporation to erect or construct any building, or remodel or rehabilitate any existing building or structure in the state, or allow the same to be done, contrary to or in violation of any of the provisions of this code.

SECTION R111
LIABILITY

Nothing contained in this code is intended to be nor shall be construed to create or form the basis for any liability on the part of any city or county or its officers, employees or agents for any injury or damage resulting from the failure of a building to conform to the provisions of this code.

CHAPTER 2 [RE]

DEFINITIONS

SECTION R201
GENERAL

R201.1 Scope. Unless stated otherwise, the following words and terms in this code shall have the meanings indicated in this chapter.

R201.2 Interchangeability. Words used in the present tense include the future; words in the masculine gender include the feminine and neuter; the singular number includes the plural and the plural includes the singular.

R201.3 Terms defined in other codes. Terms that are not defined in this code but are defined in the *International Building Code*, *International Fire Code*, *International Fuel Gas Code*, *International Mechanical Code*, *Uniform Plumbing Code* or the *International Residential Code* shall have the meanings ascribed to them in those codes.

R201.4 Terms not defined. Terms not defined by this chapter shall have ordinarily accepted meanings such as the context implies.

SECTION R202
GENERAL DEFINITIONS

ABOVE-GRADE WALL. A wall enclosing *conditioned space* that is not a below-grade wall. This includes between-floor spandrels, peripheral edges of floors, roof and basement knee walls, dormer walls, gable end walls, walls enclosing a mansard roof and skylight shafts.

ACCESSIBLE. Admitting close approach as a result of not being guarded by locked doors, elevation or other effective means (see "*Readily accessible*").

ADDITION. An extension or increase in the *conditioned space* floor area, number of stories, or height of a building or structure.

ADVANCED FRAMED WALLS. Studs framed on 24-inch centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and one stud is used to support each header. Headers consist of double 2x material with R-10 insulation between the header and exterior sheathing. Interior partition wall/exterior wall intersections are fully insulated in the exterior wall. (See **Standard Framing** and Appendix A, of this code.)

AIR BARRIER. ~~Material(s) assembled and~~ One or more materials joined together in a continuous manner to ~~provide a barrier to air leakage through the building envelope. An air barrier may be a single material or a combination of materials~~restrict or prevent the passage of air through the building thermal envelope and its assemblies.

AIR-IMPERMEABLE INSULATION. An insulation that functions as an air barrier material.

ALTERATION. Any construction, retrofit or renovation to an existing structure other than repair or addition ~~that requires a permit~~. Also, a change in a building, electrical, gas, mechanical or plumbing system that involves an extension, addition or change to the arrangement, type or purpose of the original installation ~~that requires a permit~~.

APPROVED. ~~Approval by the *code official* as a result of investigation and tests conducted by him or her, or by reason of accepted principles or tests by nationally recognized organizations.~~ Acceptable to the *code official*.

APPROVED AGENCY. An established and recognized agency that is regularly engaged in conducting tests or furnishing inspection services, ~~when~~ or furnishing product certification, where such agency has been approved by the code official.

AUTOMATIC. Self-acting, operating by its own mechanism when actuated by some impersonal influence, as, for example, a change in current strength, pressure, temperature or mechanical configuration (see "Manual").

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BASEMENT WALL. See *above-grade wall* and *below-grade wall*.

BELOW-GRADE WALL. That portion of a wall in the building envelope that is entirely below the finish grade and in contact with the ground.

BUILDING. Any structure used or intended for supporting or sheltering any use or occupancy, including any mechanical systems, service water heating systems and electric power and lighting systems located on the building site and supporting the building.

BUILDING SITE. A contiguous area of land that is under the ownership or control of one entity.

BUILDING THERMAL ENVELOPE. The below-grade walls, above-grade walls, floors, ceiling, roofs, and any other building element assemblies that enclose conditioned space or provide~~s~~ a boundary between *conditioned space* and exempt or unconditioned space.

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***C*-FACTOR (THERMAL CONDUCTANCE).** The coefficient of heat transmission (surface to surface) through a building component or assembly, equal to the time rate of heat flow per unit area and the unit temperature difference between the warm side and cold side surfaces (Btu/h ft^2 × °F) [W/(m^2 × K)].

CIRCULATING HOT WATER SYSTEM. A specifically designed water distribution system where one or more pumps are operated in the service hot water piping to circulate heated water from the water-heating equipment to the fixture supply and back to the water-heating equipment.

CLIMATE ZONE. A geographical region based on climatic criteria as specified in this code.

CODE OFFICIAL. The officer or other designated authority charged with the administration and enforcement of this code, or a duly authorized representative.

COMMERCIAL BUILDING. For this code, all buildings that are not included in the definition of "Residential buildings."

CONDITIONED FLOOR AREA. The horizontal projection of the floors associated with the *conditioned space*.

CONDITIONED SPACE. An area, room or space that is enclosed within the building thermal envelope and that is directly or indirectly heated or cooled. Spaces are indirectly heated or cooled where they communicate through openings with conditioned spaced, where they are separated from conditioned spaces by uninsulated walls, floors or ceilings, or where they contain uninsulated ducts, piping or other sources of heating or cooling.

CONTINUOUS AIR BARRIER. A combination of materials and assemblies that restrict or prevent the passage of air through the building thermal envelope.

CONTINUOUS INSULATION (c.i.). Insulating material that is continuous across all structural members without thermal bridges other than fasteners and service openings. It is installed on the interior or exterior or is integral to any opaque surface of the building envelope.

CURTAIN WALL. Fenestration products used to create an external nonload-bearing wall that is designed to separate the exterior and interior environments.

DEMAND RECIRCULATION WATER SYSTEM. ~~A water distribution system where pump(s) prime the service hot water piping with heated water upon demand for hot water~~ A water distribution system having one or more recirculation pumps that pump water from a heated water supply pipe back to the heated water source through a cold water supply pipe.

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DUCT. A tube or conduit utilized for conveying air. The air passages of self-contained systems are not to be construed as air ducts.

DUCT SYSTEM. A continuous passageway for the transmission of air that, in addition to ducts, includes duct fittings, dampers, plenums, fans and accessory air-handling equipment and appliances.

DWELLING UNIT. A single unit providing complete independent living facilities for one or more persons, including permanent provisions for living, sleeping, eating, cooking and sanitation.

ENERGY ANALYSIS. A method for estimating the annual energy use of the *proposed design* and *standard reference design* based on estimates of energy use.

ENERGY COST. The total estimated annual cost for purchased energy for the building functions regulated by this code, including applicable demand charges.

ENERGY SIMULATION TOOL. An *approved* software program or calculation-based methodology that projects the annual energy use of a building.

EXTERIOR WALL. Walls including both above-grade walls and below-grade walls.

FENESTRATION. Products classified as either vertical fenestration or skylights.

VERTICAL FENESTRATION. Windows (fixed or ~~moveable~~operable), glazed doors, glazed block and combination opaque/glazed doors composed of glass or other transparent or translucent glazing materials and installed at a slope of ~~at least~~ not less than 60 degrees from horizontal. Opaque areas such as spandrel panels are not considered vertical fenestration.

SKYLIGHT. Glass or other transparent or translucent glazing material installed at a slope of less than 60 degrees from horizontal.

FENESTRATION AREA. Total area of the fenestration measured using the rough opening, and including the glazing, sash and frame.

FENESTRATION PRODUCT, FIELD-FABRICATED. A fenestration product whose frame is made at the construction site of standard dimensional lumber or other materials that were not previously cut, or otherwise formed with the specific intention of being used to fabricate a fenestration product or exterior door. Field fabricated does not include site-built fenestration.

FENESTRATION PRODUCT, SITE-BUILT. A fenestration designed to be made up of field-glazed or field-assembled units using specific factory cut or otherwise factory-formed framing and glazing units. Examples of site-built fenestration include storefront systems, curtain walls, and atrium roof systems.

***F*-FACTOR.** The perimeter heat loss factor for slab-on-grade floors (Btu/h × ft × °F) [W/(m × K)].

HEATED SLAB-ON-GRADE FLOOR. Slab-on-grade floor construction in which the heating elements, hydronic tubing, or hot air distribution system is in contact with, or placed within or under, the slab.

HIGH-EFFICACY LAMPS. Compact fluorescent lamps, light emitting diode (LED) lamps, T-8 or smaller diameter linear fluorescent lamps, or other lamps with a minimum efficacy of:

1. 60 lumens per watt for lamps over 40 watts;
2. 50 lumens per watt for lamps over 15 watts to 40 watts; and
3. 40 lumens per watt for lamps 15 watts or less.

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HISTORIC BUILDINGS. Buildings that are listed in or eligible for listing in the *National Register of Historic Places*, or designated as historic under an appropriate state or local law.

INFILTRATION. The uncontrolled inward air leakage into a building caused by the pressure effects of wind or the effect of differences in the indoor and outdoor air density or both.

INSULATING SHEATHING. An insulating board with a core material having a minimum *R*-value of R-2.

INSULATING SIDING. A type of continuous insulation with manufacturer-installed insulating material as an integral part of the cladding product having a minimum *R*-value of R-2.

INTEGRATED ENERGY EFFICIENCY RATIO (IEER). A single-number figure of merit expressing cooling part-load EER efficiency for unitary air-conditioning and heat pump equipment on the basis of weighted operation at various load capacities for the equipment.

INTERMEDIATE FRAMED WALLS. Studs framed on 16-inch centers with double top plate and single bottom plate. Corners use two studs or other means of fully insulating corners, and each opening is framed by two studs. Headers shall be insulated to R-10.

LABELED. Equipment, materials or products to which have been affixed a label, seal, symbol or other identifying mark of a nationally recognized testing laboratory, ~~inspection~~ *approved* agency or other organization concerned with product evaluation that maintains periodic inspection of the production of the above-labeled items and whose labeling indicates either that the equipment, material or product meets identified standards or has been tested and found suitable for a specified purpose.

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LISTED. Equipment, materials, products or services included in a list published by an organization acceptable to the *code official* and concerned with evaluation of products or services that maintains periodic inspection of production of *listed* equipment or materials or periodic evaluation of services and whose

listing states either that the equipment, material, product or service meets identified standards or has been tested and found suitable for a specified purpose.

LOW-VOLTAGE LIGHTING. A lighting system consisting of an isolating power supply, the low voltage luminaires, and associated equipment that are all identified for the use. The output circuits of the power supply operate at 30 volts (42.4 volts peak) or less under all load conditions.

MANUAL. Capable of being operated by personal intervention (see "Automatic").

OPAQUE DOOR. A door that is not less than 50 percent opaque in surface area.

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PROPOSED DESIGN. A description of the proposed building used to estimate annual energy use for determining compliance based on total building performance.

READILY ACCESSIBLE. Capable of being reached quickly for operation, renewal or inspection without requiring those to whom ready access is requisite to climb over or remove obstacles or to resort to portable ladders or access equipment (see "*Accessible*").

REPAIR. The reconstruction or renewal of any part of an existing building for the purpose of its maintenance or to correct damage.

REROOFING. The process of recovering or replacing an existing roof covering. See "Roof recover" and "Roof replacement."

RESIDENTIAL BUILDING. For this code, includes detached one- and two-family dwellings and multiple single-family dwellings (townhouses) as well as Group R-2, R-3 and R-4 buildings three stories or less in height above grade plane.

ROOF ASSEMBLY. A system designed to provide weather protection and resistance to design loads. The system consists of a roof covering and roof deck or a single component serving as both the roof covering and the roof deck. A roof assembly includes the roof covering, underlayment~~,~~ and roof deck, and can also include a thermal barrier, and ignition barrier, insulation~~,~~ or a vapor retarder ~~and interior finish~~.

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ROOF RECOVER. The process of installing an additional roof covering over a prepared existing roof covering without removing the existing roof covering.

ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of its maintenance.

ROOF REPLACEMENT. The process of removing the existing roof covering, repairing any damaged substrate and installing a new roof covering.

***R*-VALUE (THERMAL RESISTANCE).** The inverse of the time rate of heat flow through a body from one of its bounding surfaces to the other surface for a unit temperature difference between the two surfaces, under steady state conditions, per unit area ($h \cdot ft^2 \cdot °F/Btu$) [$(m^2 \cdot K)/W$].

SERVICE WATER HEATING. Supply of hot water for purposes other than comfort heating.

SLAB-ON-GRADE FLOOR. That portion of a slab floor of the building envelope that is in contact with the ground and that is either above grade or is less than or equal to 24 inches below the final elevation of the nearest exterior grade.

SMALL BUSINESS. Any business entity (including a sole proprietorship, corporation, partnership or other legal entity) which is owned and operated independently from all other businesses, which has the purpose of making a profit, and which has fifty or fewer employees.

SOLAR HEAT GAIN COEFFICIENT (SHGC). The ratio of the solar heat gain entering the space through the fenestration assembly to the incident solar radiation. Solar heat gain includes directly transmitted solar heat and absorbed solar radiation which is then reradiated, conducted or convected into the space.

STANDARD FRAMING. All framing practices not defined as "intermediate" or "advanced" shall be considered standard. (See **Advanced Framed Wall, Intermediate Framed Wall**).

STANDARD REFERENCE DESIGN. A version of the *proposed design* that meets the minimum requirements of this code and is used to determine the maximum annual energy use requirement for compliance based on total building performance.

THERMAL ISOLATION. Physical and space conditioning separation from *conditioned space(s)*. The *conditioned space(s)* shall be controlled as separate zones for heating and cooling or conditioned by separate equipment.

THERMOSTAT. An automatic control device used to maintain temperature at a fixed or adjustable set point.

***U*-FACTOR (THERMAL TRANSMITTANCE).** The coefficient of heat transmission (air to air) through a building component or assembly, equal to the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films (Btu/h • ft^2 • °F) [W/(m^2 • K)].

UNHEATED SLAB-ON-GRADE FLOOR. A slab-on-grade floor that is not a heated slab-on-grade floor.

VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, any space.

VENTILATION AIR. That portion of supply air that comes from outside (outdoors) plus any recirculated air that has been treated to maintain the desired quality of air within a designated space.

VISIBLE TRANSMITTANCE [VT]. The ratio of visible light entering the space through the fenestration product assembly to the incident visible light, visible transmittance, includes the effects of glazing material and frame and is expressed as a number between 0
and 1.

WHOLE HOUSE MECHANICAL VENTILATION SYSTEM. An exhaust system, supply system, or combination thereof that is designed to mechanically exchange indoor air with outdoor air when operating continuously or through a programmed intermittent schedule to satisfy the whole house ventilation rates.

ZONE. A space or group of spaces within a building with heating or cooling requirements that are sufficiently similar so that desired conditions can be maintained throughout using a single controlling device.

CHAPTER 3 [RE]

GENERAL REQUIREMENTS

SECTION R301
CLIMATE ZONES

R301.1 General. Climate zones from Table R301.1 shall be used in determining the applicable requirements from Chapter 4.

TABLE R301.1
CLIMATE ZONES, MOISTURE REGIMES, AND WARM-HUMID DESIGNATIONS BY STATE AND COUNTY

Key: A - Moist, B - Dry, C - Marine. Absence of moisture designation indicates moisture regime is irrelevant.	
WASHINGTON	
5B Adams	4C Lewis
5B Asotin	5B Lincoln
5B Benton	4C Mason
5B Chelan	5B Okanogan
4C Clallam	4C Pacific
4C Clark	5B Pend Oreille
5B Columbia	4C Pierce
4C Cowlitz	4C San Juan
5B Douglas	4C Skagit
5B Ferry	5B Skamania
5B Franklin	4C Snohomish
5B Garfield	5B Spokane
5B Grant	5B Stevens
4C Grays Harbor	4C Thurston
4C Island	4C Wahkiakum
4C Jefferson	5B Walla Walla
4C King	4C Whatcom
4C Kitsap	5B Whitman
5B Kittitas	5B Yakima
5B Klickitat	

SECTION R302
DESIGN CONDITIONS

R302.1 Interior design conditions. The interior design temperatures used for heating and cooling load calculations shall be a maximum of 72°F (22°C) for heating and minimum of 75°F (24°C) for cooling.

R302.2 Exterior design conditions. The heating or cooling outdoor design temperatures shall be selected from Appendix C.

SECTION R303
MATERIALS, SYSTEMS AND EQUIPMENT

R303.1 Identification. Materials, systems and equipment shall be identified in a manner that will allow a determination of compliance with the applicable provisions of this code.

R303.1.1 Building thermal envelope insulation. An *R*-value identification mark shall be applied by the manufacturer to each piece of *building thermal envelope* insulation 12 inches (305 mm) or greater in width. Alternately, the insulation installers shall provide a certification listing the type, manufacturer and *R*-value of insulation installed in each element of the *building thermal envelope*. For blown or sprayed insulation (fiberglass and cellulose), the initial installed thickness, settled thickness, settled *R*-value, installed density, coverage area and number of bags installed shall be *listed* on the certification. For sprayed polyurethane foam (SPF) insulation, the installed thickness of the areas covered and *R*-value of installed thickness shall be *listed* on the certification. For insulated siding, the *R*-value shall be labeled on the product's package and shall be listed on the certification. The insulation installer shall sign, date and post the certification in a conspicuous location on the job site.

Exception: For roof insulation installed above the deck, the *R*-value shall be labeled as required by the material standards specified in Table 1508.2 of the *International Building Code* or Table R906.2 of the *International Residential Code*.

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R303.1.1.1 Blown or sprayed roof/ceiling insulation. The thickness of blown-in or sprayed roof/ceiling insulation (fiberglass or cellulose) shall be written in inches (mm) on markers that are installed at least one for every 300 square feet (28 m^2) throughout the attic space. The markers shall be affixed to the trusses or joists and marked with the minimum initial installed thickness with numbers a minimum of 1 inch (25 mm) in height.

Each marker shall face the attic access opening. Spray polyurethane foam thickness and installed *R*-value shall be *listed* on certification provided by the insulation installer.

R303.1.2 Insulation mark installation. Insulating materials shall be installed such that the manufacturer's *R*-value mark is readily observable upon inspection.

R303.1.3 Fenestration product rating. *U*-factors of fenestration products (windows, doors and skylights) shall be determined in accordance with NFRC 100.

Exception: Where required, garage door U-factors shall be determined in accordance with either NFRC 100 or ANSI/DASMA 105.

U-factors shall be determined by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled *U*-factor shall be assigned a default *U*-factor from Table R303.1.3(1), R303.1.3(2) or R303.1.3(4). The solar heat gain coefficient (SHGC) and visible transmittance (VT) of glazed fenestration products (windows, glazed doors and skylights) shall be determined in accordance with NFRC 200 by an accredited, independent laboratory, and labeled and certified by the manufacturer. Products lacking such a labeled SHGC or VT shall be assigned a default SHGC or VT from Table R303.1.3(3).

Exceptions: 1. Units without NFRC ratings produced by a *small business* may be assigned default *U*-factors from Table R303.1.3(5) for vertical fenestration.

2. Owner-built, nonoperable wood frame window consisting of a double pane unit with low-*e* (E=0.04 or less), ½-inch airspace with argon fill.

TABLE R303.1.3(1)
DEFAULT GLAZED ~~FENESTRATION~~ WINDOW, GLASS DOOR and SKYLIGHT *U*-FACTOR

Commented [KB19]: C E 30 Part II

FRAME TYPE	WINDOW AND GLASS DOOR		SKYLIGHT
	SINGLE PANE	DOUBLE PANE	
Metal	1.20	0.80	See Table R303.1.3(4)
Metal with Thermal Break[1]	1.10	0.65	
Nonmetal or Metal Clad	0.95	0.55	
Glazed Block	0.60		

[1] Metal Thermal Break A metal thermal break framed window shall incorporate the following minimum design characteristics:

a) The thermal conductivity of the thermal break material shall be not more than 3.6 Btu-in/h/ft^2/°F;

b) The thermal break material must produce a gap in the frame material of not less than 0.210 inches; and

c) All metal framing members of the products exposed to interior and exterior air shall incorporate a thermal break meeting the criteria in a) and b) above.

R303.1.4 Insulation product rating. The thermal resistance (*R*-value) of insulation shall be determined in accordance with the U.S. Federal Trade Commission *R*-value rule (C.F.R. Title 16, Part 460) in units of h × ft^2 × °F/Btu at a mean temperature of 75°F (24°C).

R303.1.4.1 Insulated siding. The thermal resistance (*R*-value) of insulated siding shall be determined in accordance with ASTM C1363. Installation for testing shall be in accordance with the manufacturer's installation instructions.

R303.2 Installation. All materials, systems and equipment shall be installed in accordance with the manufacturer's installation instructions and the *International Building Code* or *International Residential Code*, as applicable.

R303.2.1 Protection of exposed foundation insulation. Insulation applied to the exterior of basement walls, crawlspace walls and the perimeter of slab-on-grade floors shall have a rigid, opaque and weather-resistant protective covering to prevent the degradation of the insulation's thermal performance. The protective covering shall cover the exposed exterior insulation and extend a minimum of 6 inches (153 mm) below grade.

R303.3 Maintenance information. Maintenance instructions shall be furnished for equipment and systems that require preventive maintenance. Required regular maintenance actions shall be clearly stated and incorporated on a *readily accessible* label. The label shall include the title or publication number for the operation and maintenance manual for that particular model and type of product.

TABLE R303.1.3(2)
DEFAULT OPAQUE DOOR *U*-FACTORS

Commented [KB20]: C E30 Part II

Door Type	No Glazed Fenestration	Single Glazing	Double Glazing with ¼ in. Airspace	Double Glazing with ½ in. Airspace	Double Glazing with e=0.10, ½ in. Argon
SWINGING DOORS (Rough opening – 38 in. x 82 in.)					
Slab Doors					
Wood slab in wood frame[a]	0.46				
6% glazed fenestration (22 in. x 8 in. lite)	–	0.48	0.47	0.46	0.44
25% glazed fenestration (22 in.x36 in. lite)	–	0.58	0.48	0.46	0.42
45% glazed fenestration (22 in.x64 in. lite)	–	0.69	0.49	0.46	0.39
More than 50% glazed fenestration	Use Table R303.1.3(1)				
Insulated steel slab with wood edge in wood frame[a]	0.16				
6% glazed fenestration (22 in. x 8 in. lite)	–	0.21	0.20	0.19	0.18
25% glazed fenestration (22 in.x36 in. lite)	–	0.39	0.28	0.26	0.23
45% glazed fenestration (22 in.x64 in. lite)	–	0.58	0.38	0.35	0.26
More than 50% g glazed fenestration	Use Table R303.1.3(1)				
Foam insulated steel slab with metal edge in steel	0.37				

frame[b]					
6% glazed fenestration (22 in. x 8 in. lite)	–	0.44	0.42	0.41	0.39
25% glazed fenestration (22 in.x36 in. lite)	–	0.55	0.50	0.48	0.44
45% glazed fenestration (22 in.x64 in. lite)	–	0.71	0.59	0.56	0.48
More than 50% glazed fenestration	Use Table R303.1.3(1)				
Cardboard honeycomb slab with metal edge in steel frame[b]	0.61				
Style and Rail Doors					
Sliding glass doors/French doors	Use Table R303.1.3(1)				
Site-Assembled Style and Rail Doors					
Aluminum in aluminum frame	–	1.32	0.99	0.93	0.79
Aluminum in aluminum frame with thermal break	–	1.13	0.80	0.74	0.63

Note: Appendix A Tables A107.1(2) through A107.1(4) may also be used if applicable.

[a] Thermally broken sill (add 0.03 for nonthermally broken sill).

[b] Nonthermally broken sill.

TABLE R303.1.3(3)
DEFAULT GLAZED FENESTRATION SHGC AND VT

	SINGLE GLAZED		DOUBLE GLAZED		GLAZED
	Clear	Tinted	Clear	Tinted	BLOCK
SHGC	0.8	0.7	0.7	0.6	0.6
VT	0.6	0.3	0.6	0.3	0.6

TABLE R303.1.3(4)
DEFAULT *U*-FACTORS FOR SKYLIGHTS

Fenestration Type	Frame Type			
	Aluminum Without Thermal Break	Aluminum With Thermal Break	Reinforced Vinyl/ Aluminum-Clad Wood or Vinyl	Wood or Vinyl-Clad Wood/ Vinyl without Reinforcing
Single Glazing				
glass	U-1.58	U-1.51	U-1.40	U-1.18
acrylic/polycarb	U-1.52	U-1.45	U-1.34	U-1.11
Double Glazing				
air	U-1.05	U-0.89	U-0.84	U-0.67
argon	U-1.02	U-0.86	U-0.80	U-0.64
Double Glazing, *e*=0.20				
air	U-0.96	U-0.80	U-0.75	U-0.59
argon	U-0.91	U-0.75	U-0.70	U-0.54
Double Glazing, *e*=0.10				
air	U-0.94	U-0.79	U-0.74	U-0.58
argon	U-0.89	U-0.73	U-0.68	U-0.52
Double Glazing, *e*=0.05				
air	U-0.93	U-0.78	U-0.73	U-0.56
argon	U-0.87	U-0.71	U-0.66	U-0.50
Triple Glazing				
air	U-0.90	U-0.70	U-0.67	U-0.51
argon	U-0.87	U-0.69	U-0.64	U-0.48
Triple Glazing, *e*=0.20				
air	U-0.86	U-0.68	U-0.63	U-0.47
argon	U-0.82	U-0.63	U-0.59	U-0.43
Triple Glazing, *e*=0.20 on 2 surfaces				
air	U-0.82	U-0.64	U-0.60	U-0.44
argon	U-0.79	U-0.60	U-0.56	U-0.40

Triple Glazing, *e*=0.10 on 2 surfaces				
air	U-0.81	U-0.62	U-0.58	U-0.42
argon	U-0.77	U-0.58	U-0.54	U-0.38
Quadruple Glazing, *e*=0.10 on 2 surfaces				
air	U-0.78	U-0.59	U-0.55	U-0.39
argon	U-0.74	U-0.56	U-0.52	U-0.36
krypton	U-0.70	U-0.52	U-0.48	U-0.32

Notes for Table R303.1.3(4)

1. U-factors are applicable to both glass and plastic, flat and domed units, all spacers and gaps.
2. Emissivities shall be less than or equal to the value specified.
3. Gap fill shall be assumed to be air unless there is a minimum of 90% argon or krypton.
4. Aluminum frame with thermal break is as defined in footnote 1 to Table R303.1.3(1).

TABLE R303.1.3(5)
SMALL BUSINESS COMPLIANCE TABLE
DEFAULT *U*-FACTORS FOR VERTICAL FENESTRATION

Vertical Fenestration Description				Frame Type		
				Any Frame	Aluminum Thermal Break[2]	Wood/Vinyl/ Fiberglass
Panes	**Low-e[1]**	**Spacer**	**Fill**			
Double[3]	A	Any	Argon	0.48	0.41	0.32
	B	Any	Argon	0.46	0.39	0.30
	C	Any	Argon	0.44	0.37	0.28
	C	High Performance	Argon	0.42	0.35	Deemed to comply[5]
Triple[4]	A	Any	Air	0.50	0.44	0.26
	B	Any	Air	0.45	0.39	0.22
	C	Any	Air	0.41	0.34	0.20
	Any double low-e	Any	Air	0.35	0.32	0.18

[1] Low-eA (emissivity) shall be 0.24 to 0.16.
Low-eB (emissivity) shall be 0.15 to 0.08.
Low-eC (emissivity) shall be 0.07 or less.

[2] Aluminum Thermal Break = An aluminum thermal break framed window shall incorporate the following minimum design characteristics:

a) The thermal conductivity of the thermal break material shall be not more than 3.6 Btu-in/h/ft^2/°F;

b) The thermal break material must produce a gap in the frame material of not less than 0.210 inches; and

c) All metal framing members of the products exposed to interior and exterior air shall incorporate a thermal break meeting the criteria in a) and b) above.

[3] A minimum air space of 0.375 inches between panes of glass is required for double glazing.

[4] A minimum air space of 0.25 inches between panes of glass is required for triple glazing.

[5] Deemed to comply glazing shall not be used for performance compliance.

CHAPTER 4 [RE]

RESIDENTIAL ENERGY EFFICIENCY

SECTION R401
GENERAL

R401.1 Scope. This chapter applies to *residential buildings*.

R401.2 Compliance. Projects shall comply with one of the following:

1. Sections R401 through R404.
2. Section R405~~. and the provisions of Sections R401 through R404 labeled "Mandatory."~~

In addition, *dwelling units* and *sleeping units* in a *residential building* shall comply with Section R406.

R401.3 Certificate ~~(Mandatory)~~ . A permanent certificate shall be completed by the builder or ~~registered design professional~~ other approved party and posted on a wall in the space where the furnace is located, a utility room, or an approved location inside the building. When located on an electrical panel, the certificate shall not cover or obstruct the visibility of the circuit directory label, service disconnect label, or other required labels. The certificate shall list the predominant *R*-values of insulation installed in or on ceiling/roof, walls, foundation (slab, *below-grade wall*, and/or floor) and ducts outside conditioned spaces; *U*-factors for fenestration and the solar heat gain coefficient (SHGC) of fenestration, and the results from any required duct system and building envelope air leakage testing done on the building. Where there is more than one value for each component, the certificate shall list the value covering the largest area. The certificate shall list the types and efficiencies of heating, cooling and service water heating equipment. Where a gas-fired unvented room heater, electric furnace, or baseboard electric heater is installed in the residence, the certificate shall list "gas-fired unvented room heater," "electric furnace" or "baseboard electric heater," as appropriate. An efficiency shall not be *listed* for gas-fired unvented room heaters, electric furnaces or electric baseboard heaters.

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SECTION R402
BUILDING THERMAL ENVELOPE

R402.1 General (Prescriptive). The *building thermal envelope* shall meet the requirements of Sections R402.1.1 through R402.1.5.

Exception: The following buildings, or portions thereof, separated from the remainder of the building by building thermal envelope assemblies complying with this code shall be exempt from the building thermal envelope provisions of this code:

1. Those with a peak design rate of energy usage less than 3.4 Btu/h • ft^2 (10.7 W/m^2) or 1.0 watt/ft^2 of floor area for space conditioning purposes.
2. Those that do not contain conditioned space.
3. Greenhouses isolated from any conditioned space and not intended for occupancy.

R402.1.1 Insulation and fenestration criteria. The *building thermal envelope* shall meet the requirements of Table R402.1.1 based on the climate zone specified in Chapter 3.

R402.1.2 *R*-value computation. Insulation material used in layers, such as framing cavity insulation or continuous insulation, shall be summed to compute the corresponding component *R*-value. The manufacturer's settled *R*-value shall be used for blown insulation. Computed *R*-values shall not include an *R*-value for other building materials or air films. Where insulated siding is used for the purpose of complying with the continuous insulation requirements of Table R402.1.1, the manufacturer must supply an ICC Report that the R-factor has been certified, or use R-5 per inch for extruded polystyrene, and R-6 per inch for polyisocyanurate rigid insulation.

R402.1.3 *U*-factor alternative. An assembly with a *U*-factor equal to or less than that specified in Table R402.1.3 shall be permitted as an alternative to the *R*-value in Table R402.1.1.

R402.1.4 Total UA alternative. If the total *building thermal envelope* UA (sum of *U*-factor times assembly area) is less than or equal to the total UA resulting from using the *U*-factors in Table R402.1.3 (multiplied by the same assembly area as in the proposed building), the building shall be considered in compliance with Table R402.1.1. The *U*-factors for typical construction assemblies are included in Appendix A in chapter 51-11C WAC. These values shall be used for all calculations. Where proposed construction assemblies are not represented in Appendix A, values shall be calculated in accordance with the ASHRAE *Handbook of Fundamentals* using the framing factors listed in Appendix A where applicable and shall include the thermal bridging effects of framing materials. The SHGC requirements shall be met in addition to UA compliance. When using REScheck, the *U*-factors calculated by the software based on component *R*-value descriptions are acceptable. For the base building UA calculation, the maximum glazing area is 15% of the floor area.

R402.1.5 Vapor retarder. Wall assemblies in the *building thermal envelope* shall comply with the vapor retarder requirements of Section R702.7 of the *International Residential Code* or Section 1405.3 of the *International Building Code*, as applicable.

TABLE R402.1.1
INSULATION AND FENESTRATION REQUIREMENTS BY COMPONENT[a]

CLIMATE ZONE	5 AND MARINE 4
FENESTRATION U-FACTOR[b]	0.30
SKYLIGHT[b] U-FACTOR	0.50
GLAZED FENESTRATION SHGC[b, e]	NR
CEILING R-VALUE[k]	49
WOOD FRAME WALL[g, m,n] R-VALUE	21 int
Mass Wall R-Value[i]	21/21
FLOOR R-VALUE	30
BELOW-GRADE[c,m] WALL R-VALUE	10/15/21 int + TB
SLAB[d] R-VALUE & DEPTH	10, 2 ft

Commented [KB22]: F 31 brings IECC up to WSEC requirements for vertical fenestration

For SI: 1 foot = 304.8 mm, ci = continuous insulation, int = intermediate framing.

[a] *R*-values are minimums. *U*-factors and SHGC are maximums. When insulation is installed in a cavity which is less than the label or design thickness of the insulation, the compressed *R*-value of the insulation from Appendix Table A101.4 shall not be less than the *R*-value specified in the table.

[b] The fenestration *U*-factor column excludes skylights. The SHGC column applies to all glazed fenestration.

[c] "10/15/21 +TB" means R-10 continuous insulation on the exterior of the wall, or R-15 continuous insulation on the interior of the wall, or R-21 cavity insulation plus a thermal break between the slab and the basement wall at the interior of the basement wall. "10/15/21 +TB" shall be permitted to be met with R-13 cavity insulation on the interior of the basement wall plus R-5 continuous insulation on the interior or exterior of the wall. "TB" means thermal break between floor slab and basement wall.

[d] R-10 continuous insulation is required under heated slab on grade floors. See R402.2.9.1.

[e] There are no SHGC requirements in the Marine Zone.

[f] Reserved.

[g] Reserved.

[h] Reserved.

[i] Mass walls shall be in accordance with Section R402.2.5. The second *R*-value applies when more than half the insulation is on the interior of the mass wall.

Commented [BK(23]: E84

[j] Reserved.

[k] For single rafter- or joist-vaulted ceilings, the insulation may be reduced to R-38.

[l] Reserved.

[m] Int. (intermediate framing) denotes standard framing 16 inches on center with headers insulated with a minimum of R-10 insulation.

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

TABLE R402.1.3
EQUIVALENT U-FACTORS[a]

CLIMATE ZONE	5 AND MARINE 4
FENESTRATION U-FACTOR	0.30
SKYLIGHT U-FACTOR	0.50
CEILING U-FACTOR	0.026
WOOD FRAME WALL U-FACTOR	0.056
Mass Wall U-FACTOR[b]	0.056
FLOOR U-FACTOR	0.029
BELOW-GRADE WALL U-FACTOR	0.042

[a] Nonfenestration *U*-factors shall be obtained from measurement, calculation or an approved source or as specified in Section R402.1.3.

[b] ~~Reserved~~ Mass walls shall be in accordance with Section R402.2.5.

[c] Reserved.

R402.2 Specific insulation requirements (Prescriptive). In addition to the requirements of Section R402.1, insulation shall meet the specific requirements of Sections R402.2.1 through R402.2.11.

R402.2.1 Ceilings with attic spaces. Where Section R402.1.1 would require R-49 in the ceiling, installing R-38 over 100 percent of the ceiling area requiring insulation shall be deemed to satisfy the requirement for R-49 wherever the full height of uncompressed R-38 insulation extends over the wall top plate at the eaves. This reduction shall not apply to the *U*-factor alternative approach in Section R402.1.3 and the total UA alternative in Section R402.1.4.

R402.2.1.1 Loose insulation in attic spaces. Open-blown or poured loose fill insulation may be used in attic spaces where the slope of the ceiling is not more than 3 feet in 12 and there is at least 30 inches of clear distance from the top of the bottom chord of the truss or ceiling joist to the underside of the sheathing at the roof ridge.

R402.2.2 Reserved.

R402.2.3 Eave baffle. For air permeable insulations in vented attics, a baffle shall be installed adjacent to soffit and eave vents. Baffles shall maintain an opening equal or greater than the size of the vent. The baffle shall extend over the top of the attic insulation. The baffle shall be permitted to be any solid material.

R402.2.4 Access hatches and doors. Access doors from conditioned spaces to unconditioned spaces (e.g., attics and crawl spaces) shall be weatherstripped and insulated to a level equivalent to the insulation on the surrounding surfaces. Access shall be provided to all equipment that prevents damaging or compressing the insulation. A wood framed or equivalent baffle or retainer is required to be provided when loose fill insulation is installed, the purpose of which is to prevent the loose fill insulation from spilling into the living space when the attic access is opened, and to provide a permanent means of maintaining the installed *R*-value of the loose fill insulation.

Exception: Vertical doors that provide access from conditioned to unconditioned spaces shall be permitted to meet the fenestration requirements of Table R402.1.1.

R402.2.5 Mass walls. Mass walls, where used as a component of the thermal envelope of a building ~~for the purposes of this chapter~~ shall be one of the following:

1. ~~considered~~ Constructed of above-grade walls of concrete block, concrete, insulated concrete form ~~(ICF)~~, masonry cavity, brick ~~(other than~~ but not brick veneer~~)~~, ~~earth (~~adobe, compressed earth block, rammed earth,~~)~~ ~~and~~ mass timber, solid timber, or solid ~~/~~logs.

~~1.~~2. , ~~or~~ Any ~~other~~ wall~~s~~ having a heat capacity greater than or equal to ~~8~~ 6 Btu/ft^2 x °F (123 kJ/m^3 x K).

R402.2.6 Steel-frame ceilings, walls, and floors. Steel-frame ceilings, walls, and floors shall ~~meet~~ comply with the *U*-factor requirements of Table R402.1.3.

R402.2.7 Floors. Floor framing cavity insulation shall be installed to maintain permanent contact with the underside of the subfloor decking. Insulation supports shall be installed so spacing is no more than 24-inches on

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center. Foundation vents shall be placed so that the top of the vent is below the lower surface of the floor insulation.

Exceptions:

1. The floor framing cavity insulation shall be permitted to be in contact with the topside of sheathing or continuous insulation installed on the bottom side of floor framing where combined with insulation that meets or exceeds the minimum Wood Frame R-value in Table R402.1.1 and extends from the bottom to the top of all perimeter floor framing members.
2. When foundation vents are not placed so that the top of the vent is below the lower surface of the floor insulation, a permanently attached baffle shall be installed at an angle of 30° from horizontal, to divert air flow below the lower surface of the floor insulation.
3. Substantial contact with the surface being insulated is not required in enclosed floor/ceiling assemblies containing ducts where full R-value insulation is installed between the duct and the exterior surface.

R402.2.8 Below-grade walls. Below-grade exterior wall insulation used on the exterior (cold) side of the wall shall extend from the top of the below-grade wall to the top of the footing and shall be approved for below-grade use. Above-grade insulation shall be protected. Insulation used on the interior (warm) side of the wall shall extend from the top of the below-grade wall to the below-grade floor level and shall include R-5 rigid board providing a thermal break between the concrete wall and the slab.

R402.2.9 Slab-on-grade floors. The minimum thermal resistance (*R*-value) of the insulation around the perimeter of unheated or heated slab-on-grade floors shall be as specified in Table R402.1.1. The insulation shall be placed on the outside of the foundation or on the inside of the foundation wall. The insulation shall extend downward from the top of the slab for a minimum distance as shown in the table or to the top of the footing, whichever is less, or downward to at least the bottom of the slab and then horizontally to the interior or exterior for the total distance shown in the table. A two-inch by two-inch (maximum) pressure treated nailer may be placed at the finished floor elevation for attachment of interior finish materials. Insulation extending away from the building shall be protected by pavement or by a minimum of 10 inches (254 mm) of soil.

R402.2.9.1 Heated slab-on-grade floors ~~(Mandatory)~~ . The entire area of a heated slab-on-grade floor shall be thermally isolated from the soil with a minimum of R-10 insulation. The insulation shall be an approved product for its intended use. If a soil gas control system is present below the heated slab-on-grade floor, which results in increased convective flow below the heated slab-on-grade floor, the heated slab-on-grade floor shall be thermally isolated from the sub-slab gravel layer. R-10 heated slab-on-grade floor insulation is required for all compliance paths.

R402.2.10 Reserved.

R402.2.11 Masonry veneer. Insulation shall not be required on the horizontal portion of the foundation that supports a masonry veneer.

R402.3 Fenestration (Prescriptive). In addition to the requirements of Section R402, fenestration shall comply with Sections R402.3.1 through R402.3.5.

R402.3.1 *U*-factor. An area-weighted average of fenestration products shall be permitted to satisfy the *U*-factor requirements.

R402.3.2 Glazed fenestration SHGC. An area-weighted average of fenestration products more than 50 percent glazed shall be permitted to satisfy the SHGC requirements.

R402.3.3 Glazed fenestration exemption. Up to 15 square feet (1.4 m^2) of glazed fenestration per dwelling unit shall be permitted to be exempt from *U*-factor and SHGC requirements in Section R402.1.1. This exemption shall not apply to the *U*-factor alternative approach in Section R402.1.3 and the total UA alternative in Section R402.1.4.

R402.3.4 Opaque door exemption. One side-hinged opaque door assembly up to 24 square feet (2.22 m^2) in area is exempted from the *U*-factor requirement in Section R402.1.1. This exemption shall not apply to the *U*-factor alternative approach in Section R402.1.3 and the total UA alternative in Section R402.1.4.

R402.3.5 Reserved.

R402.4 Air leakage ~~(Mandatory)~~ . The building thermal envelope shall be constructed to limit air leakage in accordance with the requirements of Sections R402.4.1 through R402.4.4.

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R402.4.1 Building thermal envelope. The *building thermal envelope* shall comply with Sections R402.4.1.1 and R402.4.1.2. The sealing methods between dissimilar materials shall allow for differential expansion and contraction.

R402.4.1.1 Installation. The components of the *building thermal envelope* as listed in Table R402.4.1.1 shall be installed in accordance with the manufacturer's instructions and the criteria listed 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.

R402.4.1.2 Testing. The building or dwelling unit shall be tested and verified as having an air leakage rate of not exceeding 5 air changes per hour. Testing shall be conducted with a blower door at a pressure of 0.2 inches w.g. (50 Pascals). Where required by the *code official*, testing shall be conducted by an *approved* third party. A written report of the results of the test shall be signed by the party conducting the test and provided to the *code official*. Testing shall be performed at any time after creation of all penetrations of the *building thermal envelope*. Once visual inspection has confirmed sealing (see Table R402.4.1.1), operable windows and doors manufactured by *small business* shall be permitted to be sealed off at the frame prior to the test.

During testing:

1. Exterior windows and doors, fireplace and stove doors shall be closed, but not sealed, beyond the intended weatherstripping or other infiltration control measures;
2. Dampers including exhaust, intake, makeup air, backdraft and flue dampers shall be closed, but not sealed beyond intended infiltration control measures;
3. Interior doors, if installed at the time of the test, shall be open, access hatches to conditioned crawl spaces and conditioned attics shall be open;
4. Exterior or interior terminations ~~openings~~ for continuous ventilation systems and heat recovery ventilators shall be ~~closed and~~ sealed;
5. Heating and cooling systems, if installed at the time of the test, shall be turned off; and
6. Supply and return registers, if installed at the time of the test, shall be fully open.

Exceptions:

1. Additions less than 500 square feet of conditioned floor area.
2. Additions tested with the existing home having a combined maximum air leakage rate of 7 air changes per hour. To qualify for this exception, the date of construction of the existing house must be prior to the 2009 Washington State Energy Code.

R402.4.2 Fireplaces. New wood-burning fireplaces shall have tight-fitting flue dampers or doors and outdoor combustion air. When using tight-fitting doors on factory-built fireplaces listed and labeled in accordance with UL 127, the doors shall be tested and listed for the fireplace. Where using tight-fitting doors on masonry fireplaces, the doors shall be listed and labeled in accordance with UL 907.

R402.4.3 Air leakage of fenestration. Windows, skylights and sliding glass doors shall have an air infiltration rate of no more than 0.3 cfm per square foot (1.5 L/s/m^2), and swinging doors no more than 0.5 cfm per square foot (2.6 L/s/m^2), when tested according to NFRC 400 or AAMA/WDMA/CSA 101/I.S.2/A440 by an accredited, independent laboratory and *listed* and *labeled* by the manufacturer.

Exceptions:

1. Field-fabricated fenestration products (windows, skylights and doors).
2. Custom exterior fenestration products manufactured by a small business provided they meet the applicable provisions of Chapter 24 of the *International Building Code*. Once visual inspection has confirmed the presence of a gasket, operable windows and doors manufactured by *small business* shall be permitted to be sealed off at the frame prior to the test.

R402.4.4 Combustion air openings. Where open combustion air ducts provide combustion air to open combustion, space conditioning fuel burning appliances, the appliances and combustion air openings shall be located outside of the building thermal envelope, or enclosed in a room isolated from inside the thermal envelope. Such rooms shall be sealed and insulated in accordance with the envelope requirements of Table R402.1.1, where the walls, floors and ceilings shall meet the minimum of the below-grade wall R-value requirement. The door into the room shall be fully gasketed and any water lines and ducts in the room insulated in accordance with Section R403. The combustion air duct shall be insulated where it passes through conditioned space to a minimum of R-8.

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Exceptions:

1. Direct vent appliances with both intake and exhaust pipes installed continuous to the outside.
2. Fireplaces and stoves complying with Section R402.4.2 and Section R1006 of the International Residential Code.

R402.4.5 Recessed lighting. Recessed luminaires installed in the *building thermal envelope* shall be Type IC-rated and certified under ASTM E283 as having an air leakage rate not more than 2.0 cfm (0.944 L/s) when tested at a 1.57 psf (75 Pa) pressure differential and shall have a label attached showing compliance with this test method. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

R402.5 Maximum fenestration *U*-factor ~~(Mandatory)~~ . The area-weighted average maximum fenestration *U*-factor permitted using tradeoffs from Section R402.1.4 or R405 shall be 0.48 for vertical fenestration, and 0.75 for skylights.

TABLE R402.4.1.1
AIR BARRIER AND INSULATION INSTALLATION

COMPONENT	AIR BARRIER CRITERIA[a]	INSULATION CRITERIA[a]
General Requirements	A continuous air barrier shall be installed in the building envelope. Exterior thermal envelope contains a continuous air barrier. Breaks or joints in the air barrier shall be sealed.	Air-permeable insulation shall not be used as a sealing material.
Cavity insulation installation		All cavities in the thermal envelope shall be filled with insulation. The density of the insulation shall be at the manufacturers' product recommendation and said density shall be maintained for all volume of each cavity. Batt type insulation will show no voids or gaps and maintain an even density for the entire cavity. Batt insulation shall be installed in the recommended cavity depth. Where an obstruction in the cavity due to services, blocking, bracing or other obstruction exists, the batt product will be cut to fit the remaining depth of the cavity. Where the batt is cut around obstructions, loose fill insulation shall be placed to fill any surface or concealed voids, and at the manufacturers' specified density. Where faced batt is used, the installation tabs must be stapled to the face of the stud. There shall be no compression to the batt at the edges of the cavity due to inset stapling installation tabs. Insulation that upon installation readily conforms to available space shall be installed filling the entire cavity and within the manufacturers' density recommendation.
Ceiling/attic	The air barrier in any dropped ceiling/soffit shall be aligned with the insulation and any gaps in the air barrier sealed. Access openings, drop down stair 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 Batt insulation installed in attic roof assemblies may be compressed at exterior wall lines to allow for required attic ventilation.
Walls	The junction of the foundation and sill plate shall be sealed. The junction of the top plate and 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 of R-3 per inch minimum. 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 window/door jambs and framing and skylights and framing shall be sealed.	
Rim Joists	Rim joists shall include the air barrier.	Rim joists shall be insulated.
Floors (including above garage and cantilevered floors)	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 or floor framing cavity insulation shall be permitted to be in contact with the topside of sheathing or continuous insulation installed on the underside of floor framing and extend from the bottom to the top of all perimeter floor framing members.
Crawl space walls	Exposed earth in unvented crawl spaces shall be covered with a Class I, black vapor retarder with overlapping joints taped.	Where provided instead of floor insulation, insulation shall be permanently attached to the crawlspace walls.
Shafts, penetrations	Duct shafts, utility penetrations, and flue shafts opening to exterior or unconditioned space shall be sealed.	
Narrow cavities		Batts in narrow cavities shall be cut to fit and installed to the correct density without any voids or gaps or compression, or narrow cavities shall be filled by insulation that on installation readily conforms to the available cavity space.
Garage separation	Air sealing shall be provided between the garage and conditioned spaces.	
Recessed lighting	Recessed light fixtures installed in the building thermal envelope shall be sealed to the ~~drywall~~finished surface.	Recessed light fixtures installed in the building thermal envelope shall be air tight and IC rated.
Plumbing and wiring		Batt insulation shall be cut neatly to fit around wiring and plumbing in exterior walls. There shall be no voids or gaps or compression where cut to fit. Insulation that on installation readily conforms to available space shall extend behind piping and wiring.
Shower/tub on exterior wall	The air barrier installed at exterior walls adjacent to showers and tubs shall separate ~~them~~ the wall from the showers and tubs.	Exterior walls adjacent to showers and tubs shall be insulated.
Electrical/phone box on exterior wall	The air barrier shall be installed behind electrical or communication boxes or 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 ~~drywall~~ceiling penetrated by the boot.	
Concealed sprinklers	When 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.	

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IC = insulation contact

a. In addition, inspection of log walls shall be in accordance with the provisions of ICC-400.

SECTION R403
SYSTEMS

R403.1 Controls ~~(Mandatory)~~ . At least one thermostat shall be provided for each separate heating and cooling system.

R403.1.1 Programmable thermostat. Where the primary heating system is a forced-air furnace, at least one thermostat per dwelling unit shall be capable of controlling the heating and cooling system on a daily schedule to maintain different temperature set points at different times of the day. The thermostat shall allow for, at a minimum, a 5-2 programmable schedule (weekdays/weekends) and be capable of providing at least two programmable setback periods per day. This thermostat shall include the capability to set back or temporarily operate the system to maintain *zone* temperatures down to 55°F (13°C) or up to 85°F (29°C). The thermostat shall initially be programmed by the manufacturer with a heating temperature set point no higher than 70°F (21°C) and a cooling temperature set point no lower than 78°F (26°C). The thermostat and/or control system shall have an adjustable deadband of not less than 10°F.

Exceptions:

1. Systems controlled by an occupant sensor that is capable of shutting the system off when no occupant is sensed for a period of up to 30 minutes.
2. Systems controlled solely by a manually operated timer capable of operating the system for no more than two hours.

R403.1.2 Heat pump supplementary heat ~~(Mandatory)~~ . Unitary air cooled heat pumps shall include controls that minimize supplemental heat usage during start-up, set-up, and defrost conditions. These controls shall anticipate need for heat and use compression heating as the first stage of heat. Controls shall indicate when supplemental heating is being used through visual means (e.g., LED indicators). Heat pumps equipped with supplementary heaters shall be installed with controls that prevent supplemental heater operation above 40°F. At final inspection the auxiliary heat lock out control shall be set to 35°F or less.

R403.2 Hot water boiler outdoor temperature setback. Hot water boilers that supply heat to the building through one- or two-pipe heating systems shall have an outdoor temperature setback control that lowers the boiler water temperature based on the outdoor temperature.

R403.3 Ducts. Ducts and air handlers shall be installed in accordance with Sections R403.3.1 through R403.3.~~5~~7.

R403.3.1 Insulation (Prescriptive). Ducts outside the building thermal envelope shall be insulated to a minimum of R-8. Ducts within a concrete slab or in the ground shall be insulated to R-10 with insulation designed to be used below grade.

Exception: Ducts or portions thereof located completely inside the *building thermal envelope*. Ducts located in crawl spaces do not qualify for this exception.

R403.3.2 Sealing ~~(Mandatory)~~ . Ducts, air handlers, and filter boxes shall be sealed. Joints and seams shall comply with either the *International Mechanical Code* or *International Residential Code*, as applicable.

Exceptions:

1. Air-impermeable spray foam products shall be permitted to be applied without additional joint seals.
2. For ducts having a static pressure classification of less than 2 inched of water column (500 Pa), additional closure systems shall not be required for continuously welded joints and seams, and locking-type joints and seams of other than the snap-lock and button-lock types.

R403.3.2.1 Sealed air handler. Air handlers shall have a manufacturer's designation for an air leakage of no more than 2 percent of the design air flow rate when tested in accordance with ASHRAE 193.

R403.3.3 Duct testing ~~(Mandatory)~~ . Ducts shall be leak tested in accordance with WSU RS-33, using the maximum duct leakage rates specified.

Exceptions:

1. The total leakage test or leakage to the outdoors is not required for ducts and air handlers located entirely within the building thermal envelope. For forced air ducts, a maximum of 10 linear feet of return ducts and 5 linear feet of supply ducts may be located outside the conditioned space. All metallic ducts located outside the conditioned space must have both transverse and longitudinal joints sealed with mastic. If flex ducts are used, they cannot contain splices. Flex duct connections must be made with nylon straps and installed using a plastic

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strapping tensioning tool. Ducts located in crawl spaces do not qualify for this exception.

2. A duct air leakage test shall not be required for ducts serving heat or energy recovery ventilators that are not integrated with ducts serving heating or cooling systems.

A written report of the results shall be signed by the party conducting the test and provided to the code official.

R403.3.4 Duct leakage ~~(Mandatory)~~ . The total leakage of the ducts, where measured in accordance with Section R403.3.3, shall be as follows:

1. Rough-in test: Total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the system, including the manufacturer's air handler enclosure. All registers shall be taped or otherwise sealed during the test. If the air
handler is not installed at the time of the test, total leakage shall be less than or equal to 3 cfm (85 L/min) per 100 square feet (9.29 m^2) of conditioned floor area.
2. Postconstruction test: Leakage to outdoors shall be less than or equal to4 cfm (113.3 L/min) per 100 square feet (9.29 m^2) of conditioned floor area or total leakage shall be less than or equal to 4 cfm (113.3 L/min) per 100 square feet (9.29 m^2) of conditioned floor area when tested at a pressure differential of 0.1 inches w.g. (25 Pa) across the entire system, including the manufacturer's air handler enclosure. All register boots shall be taped or otherwise sealed during the test.

R403.3.5 Building cavities ~~(Mandatory)~~ . Building framing cavities shall not be used as ducts or plenums. Installation of ducts in exterior walls, floors or ceilings shall not displace required envelope insulation.

R403.3.6 Ducts buried within ceiling insulation. Where supply and return air ducts are partially or completely buried in ceiling insulation, such ducts shall comply with all of the following:

1. The supply and return ducts shall have an insulation *R*-value not less than R-8.
2. At all points along each duct, the sum of the ceiling insulation *R*-value against and above the top of the duct, and against and below the bottom of the duct, shall be not less than R-19, excluding the *R*-value of the duct insulation.

   Exception: Sections of the supply duct that are less than 3 feet (914 mm) from the supply outlet shall not be required to comply with these requirements.

R403.3.6.1 Effective *R*-value of deeply buried ducts. Where using a simulated energy performance analysis, sections of ducts that are: installed in accordance with Section R403.3.6; located directly on, or within 5.5 inches (140 mm) of the ceiling; surrounded with blown-in attic insulation having an *R*-value of R-30 or greater and located such that the top of the duct is not less than 3.5 inches (89 mm) below the top of the insulation, shall be considered as having an effective duct insulation *R*-value of R-25.

~~**R403.3.7 Ducts located in conditioned space.** For ducts to be considered as inside a conditioned space, such ducts shall comply with either of the following:~~

~~1. The duct system shall be located completely within the continuous air barrier and within the building thermal envelope.~~
~~2. The ducts shall be buried within ceiling insulation in accordance with Section R403.3.6 and all of the following conditions shall exist:~~
   ~~2.1. The air handler is located completely within the *continuous air barrier* and within the building thermal envelope.~~
   ~~2.2. The duct leakage, as measured either by a rough-in test of the ducts or a post-construction total system leakage test to outside the building thermal envelope in accordance with Section R403.3.4, is less than or equal to 1.5 cubic feet per minute (42.5 L/min) per 100 square feet (9.29 m^2) of conditioned floor area served by the duct system.~~
   ~~2.3. The ceiling insulation *R*-value installed against and above the insulated duct is greater than or equal to the proposed ceiling insulation *R*-value, less the *R*-value of the insulation on the duct.~~

R403.4 Mechanical system piping insulation ~~(Mandatory)~~ . Mechanical system piping capable of carrying fluids above 105°F (41°C) or below 55°F (13°C) shall be insulated to a minimum of R-6.

Exception: Up to 200 feet of hydronic system piping installed within the conditioned space may be insulated with a minimum of ½-inch insulation with a *k* value of 0.28.

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R403.4.1 Protection of piping insulation. Piping insulation exposed to weather shall be protected from damage, including that caused by sunlight, moisture, equipment maintenance, and wind, and shall provide shielding from solar radiation that can cause degradation of the material. Adhesive tape shall not be permitted.

R403.5 Service hot water systems. Energy conservation measures for service hot water systems shall be in accordance with Sections R403.5.1 through R403.5.5.

R403.5.1 Heated water circulation and temperature maintenance system ~~(Mandatory)~~ . Heated water circulation systems shall be in accordance with Section R403.5.1.1.

Heat trace temperature maintenance systems shall be in accordance with Section R403.5.1.2. Automatic controls, temperature sensors and pumps shall be *accessible*. Manual controls shall be *readily accessible*.

R403.5.1.1 Circulation systems. Heated water circulation systems shall be provided with a circulation pump. The system return pipe shall be a dedicated return pipe or a cold water supply pipe. Gravity and thermo-syphon circulation systems shall be prohibited. Controls for circulating hot water system pumps shall start the pump based on the identification of a demand for hot water within the occupancy. The controls shall automatically turn off the pump when the water in the circulation loop is at the desired temperature and when there is no demand for hot water.

R403.5.1.2 Heat trace systems. Electric heat trace systems shall comply with IEEE 515.1 or UL 515. Controls for such systems shall automatically adjust the energy input to the heat tracing to maintain the desired water temperature in the piping in accordance with the times when heated water is used in the occupancy.

R403.5.2 Demand recirculation water systems. ~~A water distribution system having one or more recirculation pumps that pump water from a heated water supply pipe back to the heated water source through a cold water supply pipe shall be a~~ *Demand recirculation water system*s. ~~Pumps~~ shall have controls that comply with both of the following:

1. The controls shall start the pump upon receiving a signal from the action of a user of a fixture or appliance, sensing the presence of a user of a fixture or sensing the flow of hot or tempered water to a fixture fitting or appliance.
2. The controls shall limit the temperature of the water entering the cold water piping to not greater than 104ºF (40 ºC).

R403.5.3 Hot water pipe insulation (Prescriptive). Insulation for hot water pipe, both within and outside the conditioned space, shall have a minimum thermal resistance (*R*-value) of R-3.

Exception: Pipe insulation is permitted to be discontinuous where it passes through studs, joists or other structural members and where the insulated pipes pass other piping, conduit or vents, provided the insulation is installed tight to each obstruction.

R403.5.4 Drain water heat recovery units. Drain water heat recovery units shall comply with CSA 55.2. Drain water heat recovery units shall be in accordance with CSA 55.1. Potable water-side pressure loss of drain water heat recovery units shall be less than 3 psi (20.7 kPa) for individual units connected to one or two showers. Potable water-side pressure loss of drain water heat recovery units shall be less than 2 psi (13.8 kPa) for individual units connected to three or more showers.

R403.5.5 Electric water heater insulation. All electric water heaters in unheated spaces or on concrete floors shall be placed on an incompressible, insulated surface with a minimum thermal resistance of R-10.

R403.6 Mechanical ventilation ~~(Mandatory)~~ . The building shall be provided with ventilation that meets the requirements of the *International Residential Code* or *International Mechanical Code*, as applicable, or with other approved means of ventilation. Outdoor air intakes and exhausts shall have automatic or gravity dampers that close when the ventilation system is not operating.

R403.6.1 Whole-house mechanical ventilation system fan efficacy. Mechanical ventilation system fans shall meet the efficacy requirements of Table R403.6.1.

Exception: ~~Where mechanical ventilation fans are integral to tested and listed HVAC equipment, they shall be powered by an electronically commutated motor.~~Where an air handler that is integral to the tested and listed HVAC equipment is used to provide whole-house ventilation, the air handler shall be powered by an electronically commutated motor.

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TABLE R403.6.1
MECHANICAL VENTILATION SYSTEM FAN EFFICACY

FAN LOCATION	AIR FLOW RATE MINIMUM (CFM)	MINIMUM EFFICACY (CFM/WATT)	AIR FLOW RATE MAXIMUM (CFM)
HRV or ERV	Any	1.2 cfm/watt	Any
Range hoods	Any	2.8 cfm/watt	Any
In-line fan	Any	2.8 cfm/watt	Any
Bathroom, utility room	10	1.4 cfm/watt	< 90
Bathroom, utility room	90	2.8 cfm/watt	Any

R403.7 Equipment sizing and efficiency rating ~~(Mandatory)~~ . Heating and cooling equipment shall be sized in accordance with ACCA Manual S based on building loads calculated in accordance with ACCA Manual J or other *approved* heating and cooling calculation methodologies. The output capacity of heating and cooling equipment shall not be greater than that of the smallest available equipment size that exceeds the loads calculated, including allowable oversizing limits. New or replacement heating and cooling equipment shall have an efficiency rating equal to or greater than the minimum required by federal law for the geographic location where the equipment is installed.

R403.7.1 Electric resistance zone heated units. All detached one- and two-family dwellings and multiple single-family dwellings (townhouses) up to three stories in height above grade plan using electric zonal heating as the primary heat source shall install an inverter-driven ductless mini-split heat pump in the largest zone in the dwelling. Building permit drawings shall specify the heating equipment type and location of the heating system.

Exception: Total installed heating capacity of 2Kw per dwelling or less.

R403.8 Systems serving multiple dwelling units ~~(Mandatory)~~ . Systems serving multiple dwelling units shall comply with Sections C403 and C404 of the WSEC--Commercial Provisions in lieu of Section R403.

R403.9 Snow melt system controls ~~(Mandatory)~~ . Snow and ice-melting systems, supplied through energy service to the building, shall include automatic controls capable of shutting off the system when the pavement temperature is above 50°F, and no precipitation is falling and an automatic or manual control that will allow shutoff when the outdoor temperature is above 40°F.

R403.10 Pool and permanent spa energy consumption ~~(Mandatory)~~ . Pools and permanent spas shall comply with Sections R403.10.1 through R403.10.4.2.

R403.10.1 Heaters. The electric power to heaters shall be controlled by a *readily accessible* on-off switch that is an integral part of the heater mounted on the exterior of the heater, or external to and within 3 feet (914 mm) of the heater. Operation of such switch shall not change the settings of the heater thermostat. Such switches shall be in addition to a circuit breaker for the power to the heater. Gas- fired heaters shall not be equipped with constant burning pilot lights.

R403.10.2 Time switches. Time switches or other control method that can automatically turn off and on according to a preset schedule shall be installed for heaters and pump motors. Heaters and pump motors that have built in time switches shall be deemed in compliance with this requirement.

Exceptions:

1. Where public health standards require 24-hour pump operation.
2. Pumps that operate solar- and waste-heat-recovery pool heating systems.

R403.10.3 Covers. Outdoor heated pools and outdoor permanent spas shall be provided with a vapor-retardant cover, or other *approved* vapor retardant means.

Exception: Where more than ~~70~~ 75 percent of the energy for heating, computed over an operating season of not less than three calendar months, is ~~from site-recovered energy, such as~~ from a heat pump or on-site renewable energy system~~solar energy source~~, covers or other vapor-retardant means shall not be required.

R403.10.4 Residential pool pumps. Pool pump motors may not be split-phase or capacitor start-induction run type.

R403.10.4.1 Two-speed capability.

1. Pump motors: Pool pump motors with a capacity of 1 hp or more shall have the capability of operating at two or more speeds with low speed having a rotation rate that is no more than one-half of the motor's maximum rotation

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rate.

2. Pump controls: Pool pump motor controls shall have the capability of operating the pool pump with at least two speeds. The default circulation speed shall be the lowest speed, with a high speed override capability being for a temporary period not to exceed one normal cycle.

R403.10.4.2 Pump operation. Circulating water systems shall be controlled so that the circulation pump(s) can be conveniently turned off, automatically or manually, when the water system is not in operation.

R403.11 Portable spas ~~(Mandatory)~~ . The energy consumption of electric-powered portable spas shall be controlled by the requirements of APSP-14.

R403.12 Residential pools and permanent residential spas. Residential swimming pools and permanent residential spas that are accessory to detached one- and two-family dwellings and townhouses three stories or less in height above grade plane and that are available only to the household and its guests shall be in accordance with APSP-15.

SECTION R404
ELECTRICAL POWER AND LIGHTING SYSTEMS

R404.1 Lighting equipment ~~(Mandatory)~~ . ~~A minimum of~~Not less than ~~75~~ 90 percent of lamps in permanently installed lighting fixtures shall be high-efficacy lamps.

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R404.1.1 Lighting equipment ~~(Mandatory)~~ . Fuel gas lighting systems shall not have continuously burning pilot lights.

SECTION R405
SIMULATED PERFORMANCE ALTERNATIVE (PERFORMANCE)

R405.1 Scope. This section establishes criteria for compliance using simulated energy performance analysis. Such analysis shall include heating, cooling, mechanical ventilation and service water heating energy only.

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R405.2 Mandatory requirements. ~~Compliance with this section requires that the mandatory provisions identified in Section R401.2 be met~~ Compliance with this section requires compliance with those sections shown in Table R405.2. All supply and return ducts not completely inside the *building thermal envelope* shall be insulated to a minimum of R-8.

TABLE R405.2
MANDATORY COMPLIANCE MEASURES FOR SIMULATED PERFORMANCE ALTERNATIVE

Section	Title	Comments
General		
R401.3	Certificate	
Envelope		
R402.4	Air leakage	
R402.5	Maximum fenestration U-factor	
Systems		
R403.1	Controls	
R403.1.2	Heat pump supplemental heat	
R403.3.2	Sealing	
R403.3.1	Equipment and system sizing	
R403.3.3	Duct testing	
R403.3.4	Duct leakage	
R403.3.5	Building cavities	
R403.4	Mechanical system piping insulation	

R403.5.1	Heated water circulation and temperature maintenance system	
R403.6	Mechanical ventilation	
R403.7	Equipment sizing and efficiency rating	
R403.8	Systems serving multiple dwelling units	
R403.9	Snow melt system controls	
R403.10	Pool and permanent spa energy consumption	
R403.11	Portable spas	
Electrical Power and Lighting		
R404.1	Lighting equipment	
R404.1.1	Lighting equipment	
Other Requirements		
R406	Additional energy efficiency requirements	

R405.3 Performance-based compliance. Compliance based on simulated energy performance requires that a proposed residence (*proposed design*) be shown to have an annual energy consumption based on site energy expressed in Btu and Btu per square foot of *conditioned floor area* as follows:

1. For structures less than 1,500 square feet of conditioned floor area, the annual energy consumption shall be less than or equal to 80 percent of the annual energy consumption of the *standard reference design*.
2. For structures 1,500 to 5,000 square feet of conditioned floor area, the annual energy consumption shall be no more than 72 percent of the *standard reference design*.
3. For structures over 5,000 square feet of conditioned floor area, the annual energy consumption shall be no more than 66 percent of the *standard reference design*.

Exception: For structures serving Group R-2 occupancies, the annual energy consumption shall be less than or equal to 85 percent of the annual energy consumption of the *standard reference design*.

R405.4 Documentation. Documentation of the software used for the performance design and the parameters for the building shall be in accordance with Sections R405.4.1 through R405.4.3.

R405.4.1 Compliance software tools. Documentation verifying that the methods and accuracy of the compliance software tools conform to the provisions of this section shall be provided to the *code official*.

R405.4.2 Compliance report. Compliance software tools shall generate a report that documents that the *proposed design* complies with Section R405.3. A compliance report on the *proposed design* shall be submitted with the application for the building permit. Upon completion of the building, a compliance report based on the as-built condition of the building shall be submitted to the code official before a certificate of occupancy is issued. Batch sampling of buildings to determine energy code compliance for all buildings in the batch shall be prohibited.

Compliance reports shall include information in accordance with Sections R405.4.2.1 and R405.4.2.2. Where the *proposed design* of a building could be built on different sites where the cardinal orientation of the building on each site is different, compliance of the *proposed design* for the purposes of the application for the building permit shall be based upon the worst-case orientation, worst-case configuration, worst-case building air leakage and worst-case duct leakage. Such worst-case parameters shall be used as inputs to the compliance software for energy analysis.

R405.4.2.1 Compliance report for permit application. A compliance report submitted with the application for building permit shall include all of the following:

1. Building street address, or other building site identification.
2. A statement indicating that the *proposed design* complies with Section R405.3.
3. An inspection checklist documenting the building component characteristics of the *proposed design* as indicated in Table R405.5.2(1). The inspection checklist shall show results for both the *standard reference design* and the *proposed design* with all user inputs to the compliance software to generate the results.

4. A site-specific energy analysis report that is in compliance with Section R405.3
5. Name of the individual performing the analysis and generating the report.
6. Name and version of the compliance software tool.

R405.4.2.2 Compliance report for certificate of occupancy. A compliance report submitted for obtaining the certificate of occupancy shall include all of the following:

1. Building street address, or other building site identification
2. A statement indicating that the as-built building complies with Section R405.3.
3. A certificate indicating that the building passes the performance matrix for code compliance and the energy saving features of the buildings.
4. A site-specific energy analysis report that is in compliance with Section R405.3.
5. Name of the individual performing the analysis and generating the report.
6. Name and version of the compliance software tool.

R405.4.3 Additional documentation. The *code official* shall be permitted to require the following documents:

1. Documentation of the building component characteristics of the *standard reference design*.
2. A certification signed by the builder providing the building component characteristics of the *proposed design* as given in Table R405.5.2(1).
3. Documentation of the actual values used in the software calculations for the *proposed design*.

R405.5 Calculation procedure. Calculations of the performance design shall be in accordance with Sections R405.5.1 and R405.5.2.

R405.5.1 General. Except as specified by this section, the *standard reference design* and *proposed design* shall be configured and analyzed using identical methods and techniques.

R405.5.2 Residence specifications. The *standard reference design* and *proposed design* shall be configured and analyzed as specified by Table R405.5.2(1). Table R405.5.2(1) shall include by reference all notes contained in Table R402.1.1.

TABLE R405.5.2(1)
SPECIFICATIONS FOR THE STANDARD REFERENCE AND PROPOSED DESIGNS

BUILDING COMPONENT	STANDARD REFERENCE DESIGN	PROPOSED DESIGN
Above-grade walls	Type: Mass wall if proposed wall is mass; otherwise wood frame. Gross area: Same as proposed *U*-factor: From Table R402.1.3 Solar absorptance = 0.75 Remittance = 0.90	As proposed As proposed As proposed As proposed As proposed
Below-grade walls	Type: Same as proposed Gross area: Same as proposed *U*-factor: From Table R402.1.3, with insulation layer on interior side of walls.	As proposed As proposed As proposed
Above-grade floors	Type: Wood frame Gross area: Same as proposed *U*-factor: From Table R402.1.3	As proposed As proposed As proposed
Ceilings	Type: Wood frame Gross area: Same as proposed *U*-factor: From Table R402.1.3	As proposed As proposed As proposed
Roofs	Type: Composition shingle on wood sheathing Gross area: Same as proposed Solar absorptance = 0.75 Emittance = 0.90	As proposed As proposed As proposed As proposed
Attics	Type: Vented with aperture = 1 ft^2 per 300 ft^2 ceiling area	As proposed
Foundations	Type: Same as proposed foundation wall area above and below-grade Soil characteristics: Same as proposed.	As proposed As proposed
Opaque Doors	Area: 40 ft^2 Orientation: North *U*-factor: Same as fenestration from Table R402.1.3.	As proposed As proposed As proposed
Vertical fenestration other than opaque doors[a]	Total area[h] = (a) The proposed glazing area; where proposed glazing area is less than 15% of the conditioned floor area. (b) 15% of the conditioned floor area; where the proposed glazing area is 15% or more of the conditioned floor area. Orientation: Equally distributed to four cardinal compass orientations (N, E, S & W). *U*-factor: From Table R402.1.3 SHGC: From Table R402.1.1 except that for climates with no requirement (NR) SHGC = 0.40 shall be used. Interior shade fraction: 0.92 - (0.21 × SHGC for the standard reference design) External shading: None	As proposed As proposed As proposed As proposed 0.92 - (0.21 × SHGC as proposed) As proposed
Skylights	None	As proposed
Air exchange rate	Air leakage rate of 5 air changes per hour at a pressure of 0.2 inches w.g. (50 Pa). The mechanical ventilation rate shall be in addition to the air leakage rate and the same as in the proposed design, but no greater than 0.01 × *CFA* +7.5 × (N_{br} + 1) where: *CFA* = conditioned floor area N_{br} = number of bedrooms -Energy recovery shall not be assumed for mechanical ventilation.	~~For residences that are not tested, the same air leakage rate as the standard reference design. For tested residences, The measured air exchange rate~~ As proposed[a]. -The mechanical ventilation rate[b] shall be in addition to the air leakage rate and shall be as proposed.

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Mechanical ventilation	None, except where mechanical ventilation is specified by the proposed design, in which case: Annual vent fan energy use: kWh/yr = ~~.03942 × *CFA* + 29.565~~ (1e$_f$) × (0.0876 x CFA + 65.7 × (N_{br} + 1) where: e$_f$ = the minimum exhaust fan efficacy from Table R403.6.1 corresponding to a flow rate of 0.01 × CFA + 7.5 × (N_{br}+1) *CFA* = conditioned floor area N_{br} = number of bedrooms	As proposed
Internal gains	IGain = 17,900 + 23.8 × *CFA* + 4104 × N_{br} (Btu/day per dwelling unit)	Same as standard reference design
Internal mass	An internal mass for furniture and contents of 8 pounds per square foot of floor area.	Same as standard reference design, plus any additional mass specifically designed as a thermal storage element[c] but not integral to the building envelope or structure.
Structural mass	For masonry floor slabs, 80% of floor area covered by R-2 carpet and pad, and 20% of floor directly exposed to room air. For masonry basement walls, as proposed, but with insulation required by Table R402.1.3 located on the interior side of the walls. For other walls, for ceilings, floors, and interior walls, wood frame construction.	As proposed As proposed As proposed
Heating systems[d, e]	Where the proposed design utilizes electric heating without a heat pump the standard reference design shall be an air source heat pump meeting the requirements of Section C403 of the WSEC—Commercial Provisions. For all other systems, the same system type as proposed, and the same system efficiency required by prevailing minimum federal standard. Capacity: Sized in accordance with Section R403.6	As proposed
Cooling systems[d, f]	Same system type as proposed. Same system efficiency as required by prevailing minimum federal standard. Capacity: Sized in accordance with Section R403.6.	As proposed
Service water heating[d, e, f, g]	Same system type as proposed. Same system efficiency as required by prevailing minimum federal standard. Use: Same as proposed design	As proposed gal/day = 30 + (10 × N_{br})
Thermal distribution systems	Duct insulation: From Section R403.3.3 A thermal distribution system efficiency (DSE) of 0.93 shall be applied to both the heating and cooling system efficiencies for all systems. **Exception**: For non-ducted heating and cooling systems that do not have a fan, the standard reference design distribution system efficiency (DES) shall be 1.	As specified in Table R405.5.2(2)
Thermostat	Type: Manual, cooling temperature setpoint = 75°F; Heating temperature setpoint = 72°F	Same as standard reference

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For SI: 1 square foot = 0.93 m^2, 1 British thermal unit = 1055 J, 1 pound per square foot = 4.88 kg/m^2, 1 gallon (U.S.) = 3.785 L, °C = (°F-3)/1.8, 1 degree = 0.79 rad

a. Where required by the *code official*, testing shall be conducted by an *approved* party. Hourly calculations as specified in the ASHRAE *Handbook of Fundamentals*, or the equivalent, shall be used to determine the energy loads resulting from infiltration.

b. The combined air exchange rate for infiltration and mechanical ventilation shall be determined in accordance with Equation 43 of 2001 ASHRAE *Handbook of Fundamentals*, page 26.24 and the "Whole-house Ventilation" provisions of 2001 ASHRAE *Handbook of Fundamentals*, page 26.19 for intermittent mechanical ventilation.

c. Thermal storage element shall mean a component not part of the floors, walls or ceilings that is part of a passive solar system, and that provides thermal storage such as enclosed water columns, rock beds, or

phase-change containers. A thermal storage element must be in the same room as fenestration that faces within 15 degrees (0.26 rad) of true south, or must be connected to such a room with pipes or ducts that allow the element to be actively charged.

d. For a proposed design with multiple heating, cooling or water heating systems using different fuel types, the applicable standard reference design system capacities and fuel types shall be weighted in accordance with their respective loads as calculated by accepted engineering practice for each equipment and fuel type present.

e. For a proposed design without a proposed heating system, a heating system with the prevailing federal minimum efficiency shall be assumed for both the standard reference design and proposed design.

f. For a proposed design home without a proposed cooling system, an electric air conditioner with the prevailing federal minimum efficiency shall be assumed for both the standard reference design and the proposed design.

g. For a proposed design with a nonstorage-type water heater, a 40-gallon storage-type water heater with the prevailing federal minimum energy factor for the same fuel as the predominant heating fuel type shall be assumed. For the case of a proposed design without a proposed water heater, a 40-gallon storage-type water heater with the prevailing federal minimum efficiency for the same fuel as the predominant heating fuel type shall be assumed for both the proposed design and standard reference design.

h For residences with conditioned basements, R-2 and R-4 residences and townhouses, the following formula shall be used to determine fenestration area:

$AF = A_s \times FA \times F$

Where:

AF = Total fenestration area.

A_S = Standard reference design total fenestration area.

FA = (Above-grade thermal boundary gross wall area)/(above-grade boundary wall area + 0.5 x below-grade boundary wall area).

F = (Above-grade thermal boundary wall area)/(above-grade thermal boundary wall area + common wall area) or 0.56, whichever is greater.

and where*:*

Thermal boundary wall is any wall that separates conditioned space from unconditioned space or ambient conditions.

Above-grade thermal boundary wall is any thermal boundary wall component not in contact with soil.

Below-grade boundary wall is any thermal boundary wall in soil contact.

Common wall area is the area of walls shared with an adjoining dwelling unit.

L and *CFA* are in the same units.

TABLE R405.5.2(2)
DEFAULT DISTRIBUTION SYSTEM EFFICIENCIES FOR PROPOSED DESIGNS[a]

DISTRIBUTION SYSTEM CONFIGURATION AND CONDITION	DISTRIBUTION SYSTEM EFFICIENCY
Distribution system components located in unconditioned space	0.88
Distribution systems entirely located in conditioned space[b]	0.93
Zonal systems[c]	1.00

For SI: 1 cubic foot per minute 0.47 L/s, 1 square foot 0.093m^2, 1 pound per square inch 6895 Pa, 1 inch water gauge 1250 Pa.

a. Values given by this table are for distribution systems, which must still meet all prescriptive requirements for duct and pipe system insulation and leakage.

b. Entire system in conditioned space shall mean that no component of the distribution system, including the air-handler unit, is located outside of the conditioned space. All components must be located on the interior side of the thermal envelope (inside the insulation) and also inside of the air barrier. Refrigerant compressors and piping are allowed to be located outside.

c. Zonal systems are systems where the heat source is located within each room. Systems shall be allowed to have forced airflow across

a coil but shall not have any ducted airflow external to the manufacturer's air-handler enclosure. Hydronic systems do not qualify.

R405.6 Calculation software tools. Calculation software, where used, shall be in accordance with Sections R405.6.1 through R405.6.3.

R405.6.1 Minimum capabilities. Calculation procedures used to comply with this section shall be software tools capable of calculating the annual energy consumption of all building elements that differ between the *standard reference design* and the *proposed design* and shall include the following capabilities:

1. Calculation of whole-building (as a single *zone*) sizing for the heating and cooling equipment in the *standard reference design* residence in accordance with Section R403.6.
2. Calculations that account for the effects of indoor and outdoor temperatures and part-load ratios on the performance of heating, ventilating and air-conditioning equipment based on climate and equipment sizing.
3. Printed *code official* inspection checklist listing each of the *proposed design* component characteristics from Table R405.5.2(1) determined by the analysis to provide compliance, along with their respective performance ratings (e.g., *R*-value, *U*-factor, SHGC, HSPF, AFUE, SEER, EF, etc.).

R405.6.2 Specific approval. Performance analysis tools meeting the applicable sections of Section R405 shall be permitted to be *approved*. Tools are permitted to be *approved* based on meeting a specified threshold for a jurisdiction. The *code official* shall be permitted to approve tools for a specified application or limited scope.

R405.6.3 Input values. When calculations require input values not specified by Sections R402, R403, R404 and R405, those input values shall be taken from an approved source.

SECTION R406
ADDITIONAL ENERGY EFFICIENCY REQUIREMENTS

R406.1 Scope. This section establishes options for additional criteria to be met for one- and two-family dwellings and townhouses, as defined in Section 101.2 of the *International Residential Code*, and dwelling units in *residential buildings*, to demonstrate compliance with this code.

R406.2 Additional energy efficiency requirements ~~(Mandatory)~~ . Each dwelling unit in a residential building shall comply with sufficient options from Table R406.2 so as to achieve the following minimum number of credits:

1. Small Dwelling Unit: .....1.5 credits
   Dwelling units less than 1500 square feet in conditioned floor area with less than 300 square feet of fenestration area. Additions to existing building greater than 500 square feet of heated floor area but less than 1500 square feet.

2. Medium Dwelling Unit: ..... 3.5 credits
   All dwelling units that are not included in #1 or #3.
   Exception: Dwelling units serving R-2 occupancies shall require 2.5 credits.

3. Large Dwelling Unit: ..... 4.5 credits
   Dwelling units exceeding 5000 square feet of conditioned floor area.
   Exception: Dwelling units serving R-2 occupancies shall require 2.5 credits.

4. Additions less than 500 square feet:.. 0.5 credits

The drawings included with the building permit application shall identify which options have been selected and the point value of each option, regardless of whether separate mechanical, plumbing, electrical, or other permits are utilized for the project

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TABLE 406.2
ENERGY CREDITS

OPTION	DESCRIPTION	CREDIT(S)
1a	EFFICIENT BUILDING ENVELOPE 1a: Prescriptive compliance is based on Table R402.1.1 with the following modifications: Vertical fenestration U = 0.28 Floor R-38 Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab **or** Compliance based on Section R402.1.4: Reduce the Total UA by 5%.	0.5
1b	EFFICIENT BUILDING ENVELOPE 1b: Prescriptive compliance is based on Table R402.1.1 with the following modifications: Vertical fenestration U = 0.25 Wall R-21 plus R-4 c.i. Floor R-38 Basement wall R-21 int plus R-5 ci Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab **or** Compliance based on Section R402.1.4: Reduce the Total UA by 15%.	1.0
1c	EFFICIENT BUILDING ENVELOPE 1c: Prescriptive compliance is based on Table R402.1.1 with the following modifications: Vertical fenestration U = 0.22 Ceiling and single-rafter or joist-vaulted R-49 advanced Wood frame wall R-21 int plus R-12 ci Floor R-38 Basement wall R-21 int plus R-12 ci Slab on grade R-10 perimeter and under entire slab Below grade slab R-10 perimeter and under entire slab **or** Compliance based on Section R402.1.4: Reduce the Total UA by 30%.	2.0
1d[a]	EFFICIENT BUILDING ENVELOPE 1d: Prescriptive compliance is based on Table R402.1.1 with the following modifications: Vertical fenestration U = 0.24	0.5
2a	AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION 2a: Compliance based on R402.4.1.2: Reduce the tested air leakage to 3.0 air changes per hour maximum **and** All whole house ventilation requirements as determined by Section M1507.3 of the *International Residential Code* shall be met with a high efficiency fan (maximum 0.35 watts/cfm), not interlocked with the furnace fan. Ventilation systems using a furnace including an ECM motor are allowed, provided that they are controlled to operate at low speed in ventilation only mode. To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the qualifying ventilation system.	0.5
2b	AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION 2b: Compliance based on Section R402.4.1.2: Reduce the tested air leakage to 2.0 air changes per hour maximum **and** All whole house ventilation requirements as determined by Section M1507.3 of the *International Residential Code* shall be met with a heat recovery ventilation system with minimum sensible heat recovery efficiency of 0.70. To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the heat recovery ventilation system.	1.0

OPTION	DESCRIPTION	CREDIT(S)
2c	AIR LEAKAGE CONTROL AND EFFICIENT VENTILATION 2c: Compliance based on Section R402.4.1.2: Reduce the tested air leakage to 1.5 air changes per hour maximum **and** All whole house ventilation requirements as determined by Section M1507.3 of the *International Residential Code* shall be met with a heat recovery ventilation system with minimum sensible heat recovery efficiency of 0.85. To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum tested building air leakage and shall show the heat recovery ventilation system.	1.5
3a[b]	HIGH EFFICIENCY HVAC EQUIPMENT 3a: Gas, propane or oil-fired furnace with minimum AFUE of 94%, or Gas, propane or oiled-fired boiler with minimum AFUE of 92% To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.	1.0
3b[b]	HIGH EFFICIENCY HVAC EQUIPMENT 3b: Air-source heat pump with minimum HSPF of 9.0 To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.	1.0
3c[b]	HIGH EFFICIENCY HVAC EQUIPMENT 3c: Closed-loop ground source heat pump; with a minimum COP of 3.3 **or** Open loop water source heat pump with a maximum pumping hydraulic head of 150 feet and minimum COP of 3.6 To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.	1.5
3d[b]	HIGH EFFICIENCY HVAC EQUIPMENT 3d: Ductless Split System Heat Pumps, Zonal Control: In homes where the primary space heating system is zonal electric heating, a ductless heat pump system shall be installed and provide heating to the largest zone of the housing unit. To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and the minimum equipment efficiency.	1.0
4	HIGH EFFICIENCY HVAC DISTRIBUTION SYSTEM: All heating and cooling system components installed inside the conditioned space. This includes all equipment and distribution system components such as forced air ducts, hydronic piping, hydronic floor heating loop, convectors and radiators. All combustion equipment shall be direct vent or sealed combustion. For forced air ducts: A maximum of 10 linear feet of return ducts and 5 linear feet of supply ducts may be located outside the conditioned space. All metallic ducts located outside the conditioned space must have both transverse and longitudinal joints sealed with mastic. If flex ducts are used, they cannot contain splices. Flex duct connections must be made with nylon straps and installed using a plastic strapping tensioning tool. Ducts located outside the conditioned space must be insulated to a minimum of R-8. Locating system components in conditioned crawl spaces is not permitted under this option. Electric resistance heat and ductless heat pumps are not permitted under this option. Direct combustion heating equipment with AFUE less than 80% is not permitted under this option. To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the heating equipment type and shall show the location of the heating and cooling equipment and all the ductwork.	1.0

OPTION	DESCRIPTION	CREDIT(S)
5a	EFFICIENT WATER HEATING 5a: All showerhead and kitchen sink faucets installed in the house shall be rated at 1.75 GPM or less. All other lavatory faucets shall be rated at 1.0 GPM or less.[c] To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the maximum flow rates for all showerheads, kitchen sink faucets, and other lavatory faucets.	0.5
5b	EFFICIENT WATER HEATING 5b: Water heating system shall include one of the following: Gas, propane or oil water heater with a minimum EF of 0.74 **or** Water heater heated by ground source heat pump meeting the requirements of Option 3c. **or** For R-2 occupancy, a central heat pump water heater with an EF greater than 2.0 that would supply DHW to all the units through a central water loop insulated with R-8 minimum pipe insulation. To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency.	1.0
5c	EFFICIENT WATER HEATING 5c: Water heating system shall include one of the following: Gas, propane or oil water heater with a minimum EF of 0.91 **or** Solar water heating supplementing a minimum standard water heater. Solar water heating will provide a rated minimum savings of 85 therms or 2000 kWh based on the Solar Rating and Certification Corporation (SRCC) Annual Performance of OG-300 Certified Solar Water Heating Systems. **or** Electric heat pump water heater with a minimum EF of 2.0 and meeting the standards of NEEA's Northern Climate Specifications for Heat Pump Water Heaters. To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall specify the water heater equipment type and the minimum equipment efficiency and, for solar water heating systems, the calculation of the minimum energy savings.	1.5
5d	EFFICIENT WATER HEATING 5d: A drain water heat recovery unit(s) shall be installed, which captures waste water heat from all the showers, and has a minimum efficiency of 40% if installed for equal flow or a minimum efficiency of 52% if installed for unequal flow. Such units shall be rated in accordance with CSA B55.1 and be so labeled. To qualify to claim this credit, the building permit drawings shall include a plumbing diagram that specifies the drain water heat recovery units and the plumbing layout needed to install it and labels or other documentation shall be provided that demonstrates that the unit complies with the standard.	0.5
6	RENEWABLE ELECTRIC ENERGY: For each 1200 kWh of electrical generation per housing unit provided annually by on-site wind or solar equipment a 0.5 credit shall be allowed, up to 3 credits. Generation shall be calculated as follows: For solar electric systems, the design shall be demonstrated to meet this requirement using the National Renewable Energy Laboratory calculator PVWATTs. Documentation noting solar access shall be included on the plans. For wind generation projects designs shall document annual power generation based on the following factors: The wind turbine power curve; average annual wind speed at the site; frequency distribution of the wind speed at the site and height of the tower. To qualify to claim this credit, the building permit drawings shall specify the option being selected and shall show the photovoltaic or wind turbine equipment type, provide documentation of solar and wind access, and include a calculation of the minimum annual energy power production.	0.5

a. Projects using this option may not use Option 1a, 1b or 1c.

b. Projects may only include credit from one space heating option, 3a, 3b, 3c or 3d. When a housing unit has two pieces of equipment (i.e., two furnaces) both must meet the standard to receive the credit.

c. **Plumbing Fixtures Flow Ratings.** Low flow plumbing fixtures (water closets and urinals) and fittings (faucets and showerheads) shall comply with the following requirements:

   1. Residential bathroom lavatory sink faucets: Maximum flow rate - 3.8 L/min (1.0 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.
   2. Residential kitchen faucets: Maximum flow rate - 6.6 L/min (1.75 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.
   3. Residential showerheads: Maximum flow rate - 6.6 L/min (1.75 gal/min) when tested in accordance with ASME A112.18.1/CSA B125.1.

CHAPTER 5

EXISTING BUILDINGS

SECTION R501
GENERAL

R501.1 Scope. The provisions of this chapter shall control the *alteration*, *repair*, *addition* and change of occupancy of existing buildings and structures.

R501.1.1 Additions, alterations, or repairs. Additions, alterations, or repairs to an existing building, building system or portion thereof shall comply with Sections R502, R503 or R504. Unaltered portions of the existing building or building supply system shall not be required to comply with this code.

R501.2 Existing buildings. Except as specified in this chapter, this code shall not be used to require the removal, *alteration* or abandonment of, nor prevent the continued use and maintenance of, an existing building or building system lawfully in existence at the time of adoption of this code.

R501.3 Maintenance. Buildings and structures, and parts thereof, shall be maintained in a safe and sanitary condition. Devices and systems that are required by this code shall be maintained in conformance with the code edition under which installed. The owner or the owner's authorized agent shall be responsible for the maintenance of buildings and structures. The requirements of this chapter shall not provide the basis for removal or abrogation of energy conservation, fire protection and safety systems and devices in existing structures.

R501.4 Compliance. *Alterations*, *repairs*, *additions* and changes of occupancy to, or relocation of, existing buildings and structures shall comply with the provisions for *alterations*, *repairs*, *additions* and changes of occupancy or relocation, respectively, in this code and the *International Residential Code, International Building Code*, *International Existing Building Code*, *International Fire Code, International Fuel Gas Code, International Mechanical Code, Uniform Plumbing Code, International Property Maintenance Code*, and NFPA 70.

Commented [KB52]: C E274 Part II

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R501.5 New and replacement materials. Except as otherwise required or permitted by this code, materials permitted by the applicable code for new construction shall be used. Like materials shall be permitted for repairs, provided hazards to life, health or property are not created. Hazardous materials shall not be used where the code for new construction would not permit their use in buildings of similar occupancy, purpose and location.

R501.6 Historic buildings. The building official may modify the specific requirements of this code for historic buildings and require alternate provisions which will result in a reasonable degree of energy efficiency. This modification may be allowed for those buildings or structures that are listed in the state or national register of historic places; designated as a historic property under local or state designation law or survey; certified as a contributing resource with a national register listed or locally designated historic district; or with an opinion or certification that the property is eligible to be listed on the national or state registers of historic places either individually or as a contributing building to a historic district by the state historic preservation officer or the keeper of the national register of historic places.

SECTION R502
ADDITIONS

R502.1 General. Additions to an existing building, building system or portion thereof shall conform to the provisions of this code as those provisions relate to new construction without requiring the unaltered portion of the existing building or building system to comply with this code. Additions shall not create an unsafe or hazardous condition or overload existing building systems. An addition shall be deemed to comply with this code where the addition alone complies, where the existing building and addition comply with this code as a single building, or where the building with the addition uses no more energy than the existing building. Additions shall be in accordance with Section R502.1.1 or R502.1.2.

R502.1.1 Prescriptive compliance. Additions shall comply with Sections R502.1.1.1 through R502.1.1.4.

R502.1.1.1 Building envelope. New building envelope assemblies that are part of the addition shall comply with Sections R402.1, R402.2, R402.3.1 through R402.3.5, and R402.4.

Exception: Where nonconditioned space is changed to conditioned space, the building envelope of the addition shall comply where the UA, as determined in Section R402.1.4, of the existing building and the addition, and any alterations that are part of the project, is less than or equal to the UA generated for the existing building.

R502.1.1.2 Heating and cooling systems. New heating, cooling and duct systems that are part of the addition shall comply with Section~~s~~ R403~~.1, R403.2, R403.3, R403.5 and R403.6~~.

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Exception: The following need not comply with the testing requirements of Section R403.3.3:

1. Additions of less than 750 square feet.
2. Duct systems that are documented to have been previously sealed as confirmed through field verification and diagnostic testing in accordance with procedures in WSU RS-33.
3. Ducts with less than 40 linear feet in unconditioned spaces.
4. Existing duct systems constructed, insulated or sealed with asbestos.

R502.1.1.3 Service hot water systems. New service hot water systems that are part of the addition shall comply with Section R403.5.

R502.1.1.4 Lighting. New lighting systems that are part of the addition shall comply with Section 404.1.

R502.1.2 Existing plus addition compliance (Simulated Performance Alternative). Where nonconditioned space is changed to conditioned space the addition shall comply where the annual energy use of the addition and the existing building, and any alterations that are part of the project, is less than or equal to the annual energy use of the existing building when modeled in accordance with Section R405. The addition and any alterations that are part of the project shall comply with Section R405 in its entirety.

SECTION R503
ALTERATIONS

R503.1 General. *Alterations* to any building or structure shall comply with the requirements of the code for new construction. *Alterations* shall be such that the existing building or structure is no less conforming to the provisions of this code than the existing building or structure was prior to the *alteration*.

Alterations to an existing building, building system or portion thereof shall conform to the provisions of this code as they relate to new construction without requiring the unaltered portions of the existing building or building system to comply with this code. Alterations shall not create an unsafe or hazardous condition or overload existing building systems.

Alterations shall be such that the existing building or structure uses no more energy than the existing building or structure prior to the *alteration*. Alterations to existing buildings shall comply with Section R503.1.1 through R503.2

The code official may approve designs of alterations which do not fully conform to all of the requirements of this code where in the opinion of the building official full compliance is physically impossible and/or economically impractical and:

1. The alteration improves the energy efficiency of the building; or
2. The alteration is energy efficient and is necessary for the health, safety, and welfare of the general public.

R503.1.1 Building envelope. Building envelope assemblies that are part of the alteration shall comply with Section R402.1.1 or R402.1.4, Sections R402.2.1 through R402.2.11, R402.3.1, R402.3.2, R402.4.3 and R402.4.4.

Exception: The following alterations need not comply with the requirements for new construction provided the energy use of the building is not increased:

1. Storm windows installed over existing fenestration.
2. Existing ceiling, wall or floor cavities exposed during construction provided that these cavities are filled with insulation. 2x4 framed walls shall be insulated to a minimum of R-15 and 2x6 framed walls shall be insulated to a minimum of R-21.
3. Construction where the existing roof, wall or floor cavity is not exposed.

4. Roof recover.
5. Roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above or below the sheathing.
6. Surface-applied window film installed on existing single pane fenestration assemblies to reduce solar heat gain provided the code does not require the glazing fenestration to be replaced.

R503.1.1.1 Replacement fenestration. Where some or all of an existing fenestration unit is replaced with a new fenestration product, including sash and glazing, the replacement fenestration unit shall meet the applicable requirements for *U*-factor and SHGC in Table R402.1.1. Where more than one replacement fenestration unit is being installed, an area-weighted average of the U-factor and SHGC of all replacement fenestration shall be permitted to be used to demonstrate compliance.

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R503.1.2 Heating and cooling systems. New heating, cooling and duct systems that are part of the alteration shall comply with Section~~s~~ R403.~~1, R403.2, R403.3 and R403.6.~~

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Exceptions:

1. Where ducts from an existing heating and cooling system are extended, duct systems with less than 40 linear feet in unconditioned spaces shall not be required to be tested in accordance with Section R403.2.2.
2. Existing duct systems constructed, insulated or sealed with asbestos.

R503.1.3 Service hot water systems. New service hot water systems that are part of the alteration shall comply with Section R403.5.

R503.1.4 Lighting. New lighting systems that are part of the alteration shall comply with Section R404.1.

Exception: Alterations that replace less than 50 percent of the luminaires in a space, provided that such alterations do not increase the installed interior lighting power.

R503.2 Change in space conditioning. Any nonconditioned or low-energy space that is altered to become *conditioned space* shall be required to be brought into full compliance with this code.

Exception: Where the simulated performance option in Section R405 is used to comply with this section, the annual energy use of the proposed design is permitted to be 110 percent of the annual energy use otherwise allowed by Section R405.3.

SECTION R504
REPAIRS

R504.1 General. Buildings, structures and parts thereof shall be repaired in compliance with Section R501.3 and this section. Work on nondamaged components that is necessary for the required *repair* of damaged components shall be considered part of the *repair* and shall not be subject to the requirements for *alterations* in this chapter. Routine maintenance required by Section R501.3, ordinary repairs exempt from *permit*, and abatement of wear due to normal service conditions shall not be subject to the requirements for *repairs* in this section.

The code official may approve designs of repairs which do not fully conform with all of the requirements of this code where in the opinion of the building official full compliance is physically impossible and/or economically impractical and:

1. The repair improves the energy efficiency of the building; or
2. The repair is energy efficient and is necessary for the health, safety, and welfare of the general public.

R504.2 Application. For the purposes of this code, the following shall be considered repairs.

1. Glass only replacements in an existing sash and frame.
2. Roof repairs.
3. Repairs where only the bulb and/or ballast within the existing luminaires in a space are replaced provided that the replacement does not increase the installed interior lighting power.

SECTION R505
CHANGE OF OCCUPANCY OR USE

R505.1 Change in occupancy or use. Any space not within the scope of Section R101.2 which is converted to space that is within the scope of Section R101.2 shall be brought into full compliance with this code.

Spaces undergoing a change in occupancy that would result in an increase in demand for either fossil fuel or electrical energy shall comply with this code.

Any space that is converted to a dwelling unit or portion thereof from another use or occupancy shall comply with this code.

Exception: Where the simulated performance option in Section R405 is used to comply with this section, the annual energy use of the proposed design is permitted to be 110 percent of the annual energy use otherwise allowed by Section R405.3.

	Residential	Commercial (including multi-family)	Source
Study Life	50 years	50 years	OFM
Period of Analysis	2020 - 2070	2020 - 2070	OFM (2021 occupancy)
First Cost			Proposal, TAG, other (2019 $)
Useful life			Proposal, TAG, other (BOMA)
Replacement Cost			Same as first cost unless otherwise documented
O&M Cost (non-energy)			Proposal, TAG, other
Energy Price, Electric	0.0966	0.0856	EIA Electricity Annual, weighted average for WA (2018) https://www.eia.gov/electricity/sales_revenue_price/xls/table6.xlsx
Energy Price, Gas	$1.062	0.8180	EIA Natural Gas Database, WA (2017) https://www.eia.gov/dnav/ng/hist/n3010wa3a.htm
Energy Escalation Rates	As published	As published	NIST Handbook 135 Supplement (2018) https://www.nist.gov/publications/energy-price-indices-and-discount-factors-life-cycle-cost-analysis-150-2018-annual
Inflation	3.01%	3.01%	OFM
Discount Rate (Nominal)	5%	5%	Same as loan rate
Discount Rate (real)	1.93%	1.93%	Calculated (automated by LCCT)
Loan Term	30		
Loan To Value	80%		
Loan Rate	5%		
Income Tax Rate	25%		
Depreciation	NA		

Underlined elements indicate changes to this document since 2018.

Primary User Inputs	Secondary User Inputs	Labels/Formulas (Locked)	OFM Inputs (Locked)	Locked Cells

1. Open the WA LCCT.xlsx file and fill in the project and user information on the General Info Page
2. Set the Base Year to current calendar, and Construction Years to 0 if occupied Jan. of next year
3. Click on the Baseline Input tab at the bottom of the workbook and use the Primary Filter (Upper left hand corner) to find and/or create descriptions for all the building components that will be examined in the Life Cycle Cost Analysis (LCCA)

   Primary Filter Key:
   1 = Should Always be Turned ON – Also displays Fixed Uniformat Level 1 Detail
   2 = Fixed Uniformat Level 2 Detail
   3 = Fixed Uniformat Level 3 Detail
   4 = Fixed Uniformat Level 4 Detail
   Other 1 = Adds One Customizable "Other" Description Field to all Level 3 Categories
   Other 2 = Adds a 2nd Customizable "Other" Description Field to all Level 3 Categories

4. Place an X in the "SHOW" box for all building components examined by the LCCA to force them to display, and then set the primary filter to filter to Level 1 only.

   

5. Fill in the custom Component List you created making sure to include each component's: # of Units, Useful Life, Installed Cost/Unit, and 1st Year Maintenance Cost/Unit. A reference number can be placed in the REF box to assist with describing that component within a Narrative report.
   Note: The baseline case should represent the minimum cost code qualifying option or an existing building with no modifications. "Other" description fields are only customizable on the Baseline Input Page
6. In the Total Building Annual Utility Analysis Box (Top of Page) input the annual bill $ amount, and the annual consumption for each utility. Make sure to match the physical units specified.

Total Building Annual Utility Analysis	$ -	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)	Diesel/#2 (Gallons)	#5/#6 Oil (Gallons)	Gas (Gall
Annual Utility Bill [$]							
Annual Utility Consumption Not Entered Below		-	-	-	-	-	

7. Click on Alt. 1 tab, Select the "Show Baseline Fields and Entered Units" option (Top of Page) and re-filter by clicking the Primary Filter, selecting only Level 1, and clicking OK.

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

   Note: All rows manually selected on the Baseline field will now be displayed on the Alternative page. If it is an unmodified Alternative page it will also show all the individual component data entered on the Baseline Input page.
8. Modify the component data to match the new modeled scenario, and enter the new scenario's annual utility bill and consumption data in the Total Building Annual Utility Analysis box.
   Note: A modified Alternative Input Page can be reset to match the baseline by setting the filter to "Select All" and drag copying the formulas found in O14:T14 and U14:AE14 to the start of the Z category. Cells in the Z category and Total building Annual Utility Box need to be matched to the baseline individually, or an original version of the WA LCCT can be re-opened.
9. Repeat Steps 7 & 8 for Alternative #2 and Alternative #3
10. View the Executive Report
    Note: If there are any data entry errors they will be displayed underneath the Net Present Savings values on the Executive report. More details on the error are displayed in the upper left hand corner of the Input page where the error is present.

Description of the Different Worksheet Tabs

General Info Page - On this page the user should enter all of the project and company information as well as the Timing Variables regarding when the study begins and the number of construction years. Also displayed on this page are the Key Variables assigned by OFM and the ability to turn on and modify basic financing assumptions.

Baseline Input Page - The values inputted on this page establish the total life cycle cost of the baseline scenario. For a new construction project the baseline should be set to match the lowest cost building that satisfies all Washington State building Codes. For a proposed remodel project the baseline should represent operating the existing building in its current form for the entire study period, including required identical part replacements.

Alt. 1, Alt. 2 & Alt. 3 Input Pages – The values inputted on these pages establishes the total life cycle costs of each corresponding alternative scenario. If these pages have not been modified in the past they will automatically populate with all of the data entries made on the Baseline Input Page.

Executive Report Page– This is a high level summary report page which can used to quickly identify which scenario has the lowest Total Life Cycle Cost or generates the greatest Net Present Saving compared to the baseline. This page also displays prominent flags if any data entry errors exist within the WA LCCT or if custom analysis has been completed.

Expenditure Report Page– This page displays cumulative and annual expenditure reports for the baseline and all the alternative scenarios.

Baseline, Alt. 1, Alt. 2 & Alt. 3 Report Pages – These pages displays detailed Present Value reports for each different scenario analyzed. Unlike the input page, where data can be entered at every different level of Uniformat II detail, on a report page all values sum to the lower level of detail. A value reported for a Level 2 category will include any entries made on the Input Page for that row plus the sum of all Level 3 data which by the nature of summing will also include all level 4 data. The Detailed Report Pages show the Savings to Investment Ratio created by and individual or group of components if component by component analysis has been completed.

Fuel Escalation – This page displays the assumptions OFM wants LCCA studies to conform to regarding fuel price escalation over the study period. The first 30 years of these estimates are currently set by the annually released NIST Energy Price Indices and Discount Factors as a supplement to NIST Handbook-135 – Life Cycle Costing Manual.

If your Computer is Calculating to Slow – If the program is operating super slow you can turn off Auto Calculations in Excel by clicking File->Options-> Formulas and selecting "Manual" under workbook calculations. Now entries will be quick, but you will need to tap F9 to calculate and filter.

Note to User – This quick start guide designed to assist with very basic analysis using the WA LCCT. It is highly recommended that you read the full instructions so you can utilize the full capabilities of the tool

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

General Information Page

Project Information	
Project Name	
Address	
City	
Zip Code	
Building Square Feet (Gross)	
Useable Square Feet	
Building Type (i.e. Office, School)	
Construction Type (i.e. New, Retrofit)	
Project Phase	
Report Version/Revision	
Date of Report	

User Information	
Company Name	
User First Name	
User Last Name	
Contact Number	
Contact Email	

All Fields Above Must Be Completed

Key Variables	○ OFM	◉ User	Value
Building Life	50	50	50
Real Discount Rate	0.53%	5.00%	5.00%
Standard Maintenance Escalation	1.00%	1.00%	1.00%
General Inflation	3.12%	3.01%	3.01%
Study Period (years)	51	51	51
Fuel Escalation Assumptions Located on Fuel Escalation Page			

User Inputs are for sensitivity analysis only, final submissions must be made using OFM inputs

Timing Variables	Year(s)	
Base Year (Generally Current Year)	2019	
Additional Construction Years beyond 2019	1	1st Operation Year = 2021

Finance 1st Purchases for ->	☑ Baseline	☑ Alt. 1	☑ Alt. 2
Down Payment (%)	20%	20%	20%
Term (Years)	30	30	30
Nominal Interest Rate	5.00%	5.00%	5.00%
Real Interest Rate	1.82%	1.82%	1.82%

Unlocked Cells for Notes and Calculations

<- Primary Filter (Requires Level 1)

Open Primary Filter and Click OK to Re-filter

☑ Show All Entered Units (Requires Re-Filter)

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

Baseline Input Page

ERROR: Useful Life < 2 or Units < 0

Total Building Annual Utility Analysis	$ 9,000	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)	Diesel/#2 (Gallons)	Gasoline (Gallons)	LPG (Gallons)	District Heat (mmBTU)	Other Annual Building Maint.
Annual Utility Bill [$]			$ 9,000						
Annual Utility Consumption Not Entered Below									Sum of Below
Sum of Annual Utility Consumption Below		-	100,000	-	-	-	-	-	$ -
Total Annual Utility Consumption		-	100,000	-	-	-	-	-	Total Maint.
Annual Utility Bill ÷ Total Utility Consumption		$ -	$ 0.09	$ -	$ -	$ -	$ -	$ -	$ -

SHOW	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)	Annual Diesel/#2 (Gal/Unit)	Annual Gasoline (Gal/Unit	Annual LPG Gal/Unit)	Annual Dist. Heat (KBTU/Unit)	Remaining Life (Years) of Existing Component
	Primary Entries Below: # of Units must be > 0 to be counted; Useful Life must be >= 2						$ 50,000	Entries Below for Component Specific Utility Analysis (Consumption per Unit) - Total Building Utility Analysis Above							
	A Substructure														
	A10 **Foundations**														
	A1010 Standard Foundations		1		$50,000.00		$ 50,000		100,000						
	A101001 Wall Foundations														
	A101002 Column Foundations And Pile Caps														
	A101003 Dewatering														
	A101099 Other Standard Foundations														
	A101098 Other														
	A101097 Other														
	A1020 Special Foundations														
	A102001 Pile Foundations														
	A102002 Caissons														
	A102003 Underpinning														
	A102004 Dewatering														
	A102005 Raft Foundations														
	A102006 Pressure Injected Grouting														
	A102099 Other Special Foundations														
	A102098 Other														
	A102097 Other														
	A1030 Slab on Grade														
	A103001 Standard Slab On Grade														
	A103002 Structural Slab On Grade														
	A103003 Inclined Slab On Grade														
	A103004 Trenches														
	A103005 Pits And Bases														
	A103006 Foundation Drainage														
	A103099 Other Slab On Grade														
	A103098 Other														
	A103097 Other														
	A20 **Basement Construction**														
	A2010 Basement Excavation														
	A201001 Excavation For Basements														
	A201002 Structure Backfill And Compaction														
	A201003 Shoring														
	A201099 Other Basement Excavation														
	A201098 Other														
	A201097 Other														
	A2020 Basement Walls														
	A202001 Basement Wall Construction														
	A202002 Moisture Protection														
	A202003 Basement Wall Insulation														
	A202099 Other Basement Walls														
	A202098 Other														
	A202097 Other														
	B Shell														
	B10 **Superstructure**														
	B1010 Floor Construction														
	B101001 Structural Frame														
	B101002 Structural Interior Walls														
	B101003 Floor Decks And Slabs														
	B101004 Balcony Construction														
	B101005 Ramps														
	B101006 Floor Raceway Systems														
	B101007 Inclined And Stepped Floors														
	B101099 Other Floor Construction														

	B101098	Other																
	B101097	Other																
	B1020	Roof Construction																
	B102011	Structural Frame																
	B102002	Structural Interior Walls																
	B102003	Roof Decks And Slabs																
	B102004	Canopies																
	B102099	Other Roof Construction																
	B102098	Other																
	B102097	Other																
	B20	**Exterior Enclosure**																
	B2010	Exterior Walls																
	B201001	Exterior Closure																
	B201002	Exterior Wall Backup Construction																
	B201003	Insulation And Vapor Retarder																
	B201004	Parapets																
	B201005	Exterior Louvers And Screens																
	B201006	Sun Control Devices (Exterior)																
	B201007	Balcony Walls And Railings																
	B201008	Exterior Soffits																
	B201009	Screen Wall																
	B201010	Exterior Coatings																
	B201011	Joint Sealant																
	B201099	Other Exterior Walls																
	B201098	Other																
	B201097	Other																
	B2020	Exterior Windows																
	B202001	Windows																
	B202002	Storefronts																
	B202003	Curtain Walls																
	B202004	Exterior Glazing																
	B202099	Other Exterior Windows																
	B202098	Other																
	B202097	Other																
	B2030	Exterior Doors																
	B203001	Solid Doors																
	B203002	Glazed Doors																
	B203003	Revolving Doors																
	B203004	Overhead And Roll-Up Doors																
	B203005	Hangar Doors																
	B203006	Blast Resistant Doors																
	B203007	Gates																
	B203008	Exterior Door Hardware																
	B203098	Other Exterior Specialty Doors																
	B203099	Other Exterior Personnel Doors																
	B203098	Other																
	B203097	Other																
	B30	**Roofing**																
	B3010	Roof Covering																
	B301001	High Slope Roof Coverings																
	B301002	Low Slope Membrane Systems																
	B301003	Roof Insulation And Fill																
	B301004	Flashings And Trim																
	B301005	Gutters And Downspouts																
	B301006	Roof Openings And Supports																
	B301099	Other Roofing																
	B301098	Other																
	B301097	Other																
	B3020	Roof Openings																
	B302099	Other Roof Openings																
	B302098	Other																
	B302097	Other																
	C	**Interiors**																
	C10	**Interior Construction**																
	C1010	Partitions																
	C101001	Fixed Partitions																
	C101002	Demountable Partitions																
	C101003	Retractable Partitions																
	C101004	Interior Guardrails And Screens																
	C101005	Interior Windows																
	C101006	Glazed Partitions And Storefronts																
	C101007	Interior Glazing																
	C101008	Joint Sealant																

	C101099	Other Partitions																
	C101098	Other																
	C101097	Other																
	C1020	Interior Doors																
	C102001	Standard Interior Doors																
	C102002	Glazed Interior Doors																
	C102003	Fire Doors																
	C102004	Sliding And Folding Doors																
	C102005	Interior Overhead Doors																
	C102006	Interior Gates																
	C102007	Interior Door Hardware																
	C102098	Other Interior Specialty Doors																
	C102099	Other Interior Personnel Doors																
	C102098	Other																
	C102097	Other																
	C1030	Fittings																
	C103001	Compartments, Cubicles & Toilet Partitions																
	C103002	Toilet And Bath Accessories																
	C103003	Marker Boards And Tack Boards																
	C103004	Identifying Devices																
	C103005	Lockers																
	C103006	Shelving																
	C103007	Fire Extinguisher Cabinets																
	C103008	Counters																
	C103009	Cabinets																
	C103010	Closets																
	C103011	Fire stopping Penetrations																
	C103012	Sprayed Fire-Resistive Materials																
	C103013	Raised Access Flooring																
	C103014	Casework																
	C103099	Other Interior Specialties																
	C103098	Other																
	C103097	Other																
	C20	**Stairs**																
	C2010	Stair Construction																
	C201001	Interior Stair Construction																
	C201002	Exterior Stair Construction																
	C201099	Other Stair Construction																
	C201098	Other																
	C201097	Other																
	C2020	Stair Finishes																
	C202001	Interior Stair Finish																
	C202099	Other Stair Finish																
	C202098	Other																
	C202097	Other																
	C30	**Interior Finishes**																
	C3010	Wall Finishes																
	C301001	Concrete Wall Finishes																
	C301002	Plaster Wall Finishes																
	C301003	Gypsum Wallboard Finishes																
	C301004	Tile And Terrazzo Wall Finishes																
	C301005	Painting To Walls																
	C301006	Wall Coverings																
	C301007	Acoustical Panels Adhered To Walls																
	C301008	Special Coatings To Walls																
	C301099	Other Wall Finishes																
	C301098	Other																
	C301097	Other																
	C3020	Floor Finishes																
	C302001	Tile Floor Finishes																
	C302002	Terrazzo Floor Finishes																
	C302003	Wood Flooring																
	C302004	Resilient Floor Finishes																
	C302005	Carpeting																
	C302006	Masonry And Stone Flooring																
	C302007	Painting And Staining Floors																
	C302008	Wall Base Finishes																
	C302009	Floor Toppings And Traffic Membranes																
	C302010	Hardeners And Sealers																
	C302099	Other Flooring And Floor Finishes																
	C302098	Other																
	C302097	Other																
	C3030	Ceiling Finishes																

	C303001	Exposed Concrete Finishes																
	C303002	Plaster Ceiling Finishes																
	C303003	Gypsum Wallboard Ceiling Finishes																
	C303004	Acoustical Ceiling Tiles And Panels																
	C303005	Wood Ceilings																
	C303006	Painting And Staining Ceilings																
	C303007	Suspensions Systems																
	C303008	Metal Strip Ceilings																
	C303099	Other Ceiling And Ceiling Finishes																
	C303098	Other																
	C303097	Other																
	D	**Services**																
	D10	**Conveying Systems**																
	D1010	Elevators & Lifts																
	D101001	General Construction Items																
	D101002	Passenger Elevators																
	D101003	Freight Elevators																
	D101004	Wheelchair Lift																
	D101099	Other Elevators																
	D101098	Other																
	D101097	Other																
	D1020	Escalators & Moving Walks																
	D102001	Moving Stairs																
	D102002	Moving Walks																
	D102099	Other Moving Stairs And Walks																
	D102098	Other																
	D102097	Other																
	D1090	Other Conveying Systems																
	D109001	Pneumatic Tube Systems																
	D109002	Conveyors																
	D109003	Linen, Trash, And Mail Chutes																
	D109004	Turntables																
	D109005	Operable Scaffolding																
	D109006	Transportation Systems																
	D109007	Overhead Cranes																
	D109099	Other Material Handling Systems																
	D109098	Other																
	D109097	Other																
	D20	**Plumbing**																
	D2010	Plumbing Fixtures																
	D201001	Waterclosets																
	D201002	Urinals																
	D201003	Lavatories																
	D201004	Sinks																
	D201005	Showers/Tubs																
	D201006	Drinking Fountains And Coolers																
	D201007	Bidets																
	D201099	Emergency Fixtures																
	D201098	Other																
	D201097	Other																
	D2020	Domestic Water Distribution																
	D202001	Pipes And Fittings																
	D202002	Valves And Hydrants																
	D202003	Domestic Water Equipment																
	D202004	Insulation And Identification																
	D202005	Specialties																
	D202099	Other Domestic Water Supply																
	D202098	Other																
	D202097	Other																
	D2030	Sanitary Waste																
	D203001	Waste Pipe And Fittings																
	D203002	Vent Pipe And Fittings																
	D203003	Floor Drains																
	D203004	Sanitary And Vent Equipment																
	D203005	Insulation And Identification																
	D203099	Other Sanitary Waste																
	D203098	Other																
	D203097	Other																
	D2040	Rain Water Drainage																
	D204001	Pipe And Fittings																
	D204002	Roof Drains																
	D204003	Rainwater Drainage Equipment																
	D204004	Insulation And Identification																

	D204099	Other Rain Water Drainage System																
	D204098	Other																
	D204097	Other																
	D2090	Other Plumbing Systems																
	D209001	Special Piping Systems																
	D209002	Acid Waste Systems																
	D209003	Interceptors																
	D209004	Pool Piping And Equipment																
	D209005	Compressed Air System (Non-Breathing)																
	D209099	Other Special Plumbing Systems																
	D209098	Other																
	D209097	Other																
	D30	**HVAC**																
	D3010	Energy Supply																
	D301001	Oil Supply System																
	D301002	Gas Supply System																
	D301003	Coal Supply System																
	D301004	Steam Supply System (From Central Plant)																
	D301005	Hot Water Supply System (From Central Plant)																
	D301006	Solar Energy Supply Systems																
	D301007	Wind Energy Supply System																
	D301099	Other Energy Supply																
	D300198	Other																
	D300197	Other																
	D3020	Heat Generating Systems																
	D302001	Steam Boilers																
	D302002	Hot Water Boilers																
	D302003	Furnaces																
	D302004	Fuel-Fired Unit Heaters																
	D302005	Auxiliary Equipment																
	D302006	Equipment Thermal Insulation																
	D302099	Other Heat Generating Systems																
	D302098	Other																
	D302097	Other																
	D3030	Cooling Generating Systems																
	D303001	Chilled Water Systems																
	D303002	Direct Expansion Systems																
	D303099	Other Cooling Generating Systems																
	D303098	Other																
	D303097	Other																
	D3040	Distribution Systems																
	D304001	Air Distribution, Heating, And Cooling																
	D304002	Steam Distribution Systems																
	D304003	Hot Water Distribution Systems																
	D304004	Change Over Distribution Systems																
	D304005	Glycol Distribution Systems																
	D304006	Chilled Water Distribution Systems																
	D304007	Exhaust Systems																
	D304008	Air Handling Units																
	D304099	Other Distribution Systems																
	D304098	Other																
	D304097	Other																
	D3050	Terminal & Package Units																
	D305001	Unit Ventilators																
	D305002	Unit Heaters																
	D305003	Fan Coil Units																
	D305004	Fin Tube Radiation																
	D305005	Electric Heating																
	D305006	Package Units																
	D305099	Other Terminal And Package Units																
	D305098	Other																
	D305097	Other																
	D3060	Controls & Instrumentation																
	D306001	HVAC Controls																
	D306002	Electronic Controls																
	D306003	Pneumatic Controls																
	D306004	Instrument Air Compressors																
	D306005	Gas Purging Systems																
	D306099	Other Controls Instrumentation																
	D306098	Other																
	D306097	Other																
	D3070	Systems Testing & Balancing																
	D307001	Water Side Testing And Balancing—H & C																

	D307002	Air Side Testing And Balancing—H, C & E															
	D307003	HVAC Commissioning															
	D307099	Other Systems Testing And Balancing															
	D307098	Other															
	D307097	Other															
	D3090	Other HVAC Systems & Equipment															
	D309001	General Construction Items															
	D309002	Refrigeration Systems															
	D309099	Other Special Mechanical Systems															
	D309098	Other															
	D309097	Other															
	D40	**Fire Protection**															
	D4010	Sprinklers															
	D401001	Sprinklers And Releasing Devices															
	D401002	Sprinkler Water Supply Equipment & Piping															
	D409099	Other Sprinklers															
	D409098	Other															
	D409097	Other															
	D4020	Standpipes															
	D402001	Standpipe Equipment And Piping															
	D402099	Other Standpipes															
	D402097	Other															
	D4030	Fire Protection Specialties															
	D403001	Fire Extinguishing Devices															
	D403099	Other Fire Protection Specialties															
	D403098	Other															
	D403097	Other															
	D4040	Other Fire Protection Systems															
	D409001	Carbon Dioxide Systems															
	D409002	Foam Generating Equipment															
	D409003	Clean Agent Systems															
	D409005	Hood And Duct Fire Protection															
	D409099	Other Special Fire Protection Systems															
	D409098	Other															
	D409097	Other															
	D50	**Electrical**															
	D5010	Electrical Service & Distribution															
	D501001	Main Transformers															
	D501002	Secondary															
	D501003	Main Switchboards															
	D501004	Interior Distribution Transformers															
	D501005	Panels															
	D501006	Enclosed Circuit Breakers															
	D501007	Motor Control Centers															
	D501099	Other Service And Distribution															
	D501098	Other															
	D501097	Other															
	D5020	Lighting & Branch Wiring															
	D502001	Branch Wiring															
	D502002	Lighting Equipment															
	D502099	Other Lighting And Branch Wiring															
	D502098	Other															
	D502097	Other															
	D5030	Communication & Security Systems															
	D503001	Fire Alarm Systems															
	D503002	Telecommunications Systems															
	D503003	Nurse Call Systems															
	D503004	Public Address Systems															
	D503005	Intercommunications Systems															
	D503006	Clock And Program Systems															
	D503007	Television Systems															
	D503008	Security Systems															
	D503099	Other Communications And Alarm Systems															
	D503098	Other															
	D503097	Other															
	D5090	Other Electrical Systems															
	D509001	General Construction Items (Electrical)															
	D509002	Emergency Lighting And Power															
	D509003	Grounding Systems															
	D509004	Lightning Protection															
	D509005	Electric Heating															
	D509006	Energy Management Control System															
	D509099	Other Special Systems And Devices															

	D509098	Other																
	D509097	Other																
	E	**Equipment & Furnishings**																
	E10	**Equipment**																
	E1010	Commercial Equipment																
	E101001	Checkroom Equipment																
	E101002	Registration Equipment																
	E101003	Vending Equipment																
	E101004	Laundry Equipment																
	E101005	Security And Vault Equipment																
	E101006	Teller And Service Equipment																
	E101007	Mercantile Equipment																
	E101008	Office Equipment																
	E101099	Other Commercial Equipment																
	E101098	Other																
	E101097	Other																
	E1020	Institutional Equipment																
	E102001	Miscellaneous Fixed & Moveable Equipment																
	E102002	Medical Equipment																
	E102003	Laboratory Equipment																
	E102004	Mortuary Equipment																
	E102005	Auditorium And Stage Equipment																
	E102006	Library Equipment																
	E102007	Ecclesiastical Equipment																
	E102008	Instrumental Equipment																
	E102009	Audio-Visual Equipment																
	E102010	Detention Equipment																
	E102099	Other Institutional Equipment																
	E102098	Other																
	E102097	Other																
	E1030	Vehicular Equipment																
	E103001	Parking Control Equipment																
	E103002	Loading Dock Equipment																
	E103003	Warehouse Equipment																
	E103099	Other Vehicular Equipment																
	E103098	Other																
	E103097	Other																
	E1090	Other Equipment																
	E109001	Built-In Maintenance Equipment																
	E109002	Food Service Equipment																
	E109003	Waste Handling Equipment																
	E109004	Residential Equipment																
	E109005	Unit Kitchens																
	E109006	Darkroom Equipment																
	E109007	Athletic, Recreational, And Therapeutic Equipment																
	E109008	Planetarium Equipment																
	E109009	Observatory Equipment																
	E109010	Agricultural Equipment																
	E109099	Other Specialized Fixed And Moveable Equipment																
	E109098	Other																
	E109097	Other																
	E20	**Fixed Furnishings**																
	E2010	Fixed Furnishings																
	E201001	Fixed Artwork																
	E201002	Window Treatments																
	E201003	Seating (Fixed)																
	E201004	Fixed Floor Grilles And Mats																
	E201005	Fixed Interior Landscaping																
	E201099	Other Fixed Interior Furnishings																
	E201098	Other																
	E201097	Other																
	E2020	Movable Furnishings																
	E202001	Moveable Art Work																
	E202002	Modular Prefabricated Furniture																
	E202003	Freestanding Furniture																
	E202004	Rugs And Accessories																
	E202005	Moveable Multiple Seating																
	E202006	Moveable Interior Landscaping																
	E202099	Other Moveable Furnishings																
	E202098	Other																
	E202097	Other																
	F	**Special Construction & Demolition**																
	F10	**Special Construction**																

	F1010	Special Structures																
	F101001	Metal Building Systems																
	F101002	Exterior Utility Buildings																
	F101003	Air-Supported Structures																
	F101099	Other Special Construction																
	F101098	Other																
	F101097	Other																
	F1020	Integrated Construction																
	F102001	Special Purpose Rooms																
	F102002	Integrated Assemblies																
	F102099	Other Integrated Construction																
	F102098	Other																
	F102097	Other																
	F1030	Special Construction Systems																
	F103001	Vaults																
	F103002	Sound, Vibration, & Seismic Construction																
	F103003	Radiation Protection																
	F103099	Other Special Construction Systems																
	F103098	Other																
	F103097	Other																
	F1040	Special Facilities																
	F104001	Interior Swimming Pools																
	F104002	Liquid And Gas Storage Tanks																
	F104003	Kennels And Animal Shelters																
	F104004	Site Constructed Incinerators																
	F104005	Ice Rinks																
	F104099	Other Special Facilities																
	F104098	Other																
	F104097	Other																
	F1050	Special Controls and Instrumentation																
	F105001	Recording Instrumentation																
	F105002	Building Automation Systems																
	F105099	Other Special Controls And Instrumentation																
	F105098	Other																
	F105097	Other																
	F20	**Selective Building Demolition**																
	F2010	Building Elements Demolition																
	F201001	Substructure And Superstructure																
	F201002	Exterior Closure																
	F201003	Roofing																
	F201004	Interior Construction And Finishes																
	F201005	Conveying Systems																
	F201006	Mechanical Systems																
	F201007	Electrical Systems																
	F201008	Equipment And Furnishings																
	F201099	Other Non-Hazardous Selective Building Demolition																
	F201098	Other																
	F201097	Other																
	F2020	Hazardous Components Abatement																
	F202001	Substructure And Superstructure																
	F202002	Exterior Closure																
	F202003	Roofing																
	F202004	Interior Construction And Finishes																
	F202005	Conveying Systems																
	F202006	Mechanical Systems																
	F202007	Electrical Systems																
	F202008	Equipment And Furnishings																
	F202099	Other Hazardous Selective Building Demolition																
	F202098	Other																
	F202097	Other																
	G	**Building Sitework**																
	G10	**Site Preparation**																
	G1010	Site Clearing																
	G101001	Clearing																
	G101002	Tree Removal																
	G101003	Stump Removal																
	G101004	Chipping																
	G101005	Grubbing																
	G101006	Selective Thinning																
	G101007	Debris Disposal																
	G101099	Other Site Clearing																
	G101098	Other																
	G101097	Other																

	G1020	Site Demolition & Relocation															
	G102001	Building Mass Demolition															
	G102002	Above Ground Site Demolition															
	G102003	Underground Site Demolition															
	G102004	Building Relocation															
	G102005	Utility Relocation															
	G102006	Fencing Relocation															
	G102007	Site Cleanup															
	G102099	Other Site Demolition And Relocations															
	G102098	Other															
	G102097	Other															
	G1030	Site Earthwork															
	G103001	Grading															
	G103002	Common Excavation															
	G103003	Rock Excavation															
	G103004	Fill And Borrow															
	G103005	Compaction															
	G103006	Soil Stabilization															
	G103007	Slope Stabilization															
	G103008	Soil Treatment															
	G103009	Shoring															
	G103010	Temporary Dewatering															
	G103011	Temporary Erosion And Sediment Control															
	G103099	Other Site Earthwork															
	G103098	Other															
	G103097	Other															
	G1040	Hazardous Waste Remediation															
	G104001	Removal Of Contaminated Soil															
	G104002	Soil Restoration And Treatment															
	G104099	Other Hazardous Waste Remediation															
	G104098	Other															
	G104097	Other															
	G20	**Site Improvements**															
	G2010	Roadways															
	G201001	Bases And Subbases															
	G201002	Curbs And Gutters															
	G201003	Paved Surfaces															
	G201004	Marking And Signage															
	G201005	Guardrails And Barriers															
	G201006	Resurfacing															
	G201099	Other Roadways															
	G201098	Other															
	G201097	Other															
	G2020	Parking Lots															
	G202001	Bases And Subbases															
	G202002	Curbs And Gutters															
	G202003	Paved Surfaces															
	G202004	Marking And Signage															
	G202005	Guardrails And Barriers															
	G202006	Resurfacing															
	G202007	Miscellaneous Structures And Equipment															
	G202099	Other Parking Lots															
	G202098	Other															
	G202097	Other															
	G2030	Pedestrian Paving															
	G203001	Bases And Subbases															
	G203002	Curbs And Gutters															
	G203003	Paved Surfaces															
	G203004	Guardrails And Barriers															
	G203005	Resurfacing															
	G203099	Other Walks, Steps, And Terraces															
	G203098	Other															
	G203097	Other															
	G2040	Site Development															
	G204001	Fencing And Gates															
	G204002	Retaining Walls															
	G204003	Exterior Furnishings															
	G204004	Security Structures															
	G204005	Signage															
	G204006	Fountains And Pools															
	G204007	Playing Fields															
	G204008	Terrace And Perimeter Walls															
	G204009	Flagpoles															

	G204099	Other Site Improvements																
	G204098	Other																
	G204097	Other																
	G2050	Landscaping																
	G205001	Fine Grading And Soil Preparation																
	G205002	Erosion Control Measures																
	G205003	Topsoil And Planting Beds																
	G205004	Seeding, Sprigging, And Sodding																
	G205005	Plantings																
	G205006	Planters																
	G205007	Irrigation Systems																
	G205099	Other Landscaping																
	G205098	Other																
	G205097	Other																
	G30	**Site Civil/Mechanical Utilities**																
	G3010	G3010 Water Supply																
	G301001	Well Systems																
	G301002	Potable Water Distribution																
	G301003	Potable Water Storage																
	G301004	Fire Protection Water Distribution																
	G301005	Fire Protection Water Storage																
	G301006	Non-Potable Water Distribution																
	G301007	Pumping Stations																
	G301008	Packaged Water Treatment Plants																
	G301099	Other Water Supply																
	G301098	Other																
	G301097	Other																
	G3020	Sanitary Sewer																
	G302001	Sanitary Sewer Piping																
	G302002	Sanitary Sewer Manholes And Cleanouts																
	G302003	Lift Stations And Pumping Stations																
	G302004	Packaged Sanitary Sewer Treatment Plants																
	G302005	Septic Tanks																
	G302006	Drain Fields																
	G302099	Other Sanitary Sewer																
	G302098	Other																
	G302097	Other																
	G3030	Storm Sewer																
	G303001	Storm Sewer Piping																
	G303002	Storm Sewer Structures																
	G303003	Lift Stations																
	G303004	Culverts																
	G303005	Headwalls																
	G303006	Erosion And Sediment Control Measures																
	G303007	Stormwater Management																
	G303099	Other Storm Sewer																
	G303098	Other																
	G303097	Other																
	G3040	Heating Distribution																
	G304001	Overhead Hot Water Systems																
	G304002	Overhead Steam Systems																
	G304003	Underground Hot Water Systems																
	G304004	Underground Steam Distribution Systems																
	G304005	Reinforced Concrete Manholes & Valve Boxes																
	G304006	Pumping Stations																
	G304099	Other Heating Distribution																
	G304098	Other																
	G304097	Other																
	G3050	Cooling Distribution																
	G305001	Overhead Cooling Systems																
	G305002	Underground Cooling Systems																
	G305003	Trenchboxes																
	G305004	Wells For Cooling																
	G305005	Pumping Stations																
	G305006	On-Site Cooling Towers																
	G305099	Other Cooling Distribution																
	G305098	Other																
	G305097	Other																
	G3060	Fuel Distribution																
	G306001	Liquid Fuel Distribution Piping																
	G306002	Aviation Fuel Distribution Piping System																
	G306003	Liquid Fuel Dispensing Equipment																
	G306004	Liquid Fuel Storage Tanks																

	G306005	Liquid Fuel System Trenchboxes																
	G306006	Gas Distribution Piping (Natural And Propane)																
	G306007	Gas Storage Tanks																
	G306008	Gas System Trenchboxes																
	G306098	Other Gas Distribution																
	G306099	Other Fuel Distribution																
	G306098	Other																
	G306097	Other																
	G3090	Other Site Mechanical Utilities																
	G309001	Industrial Waste Pipe																
	G309002	Industrial Waste Manholes And Cleanouts																
	G309003	Industrial Waste Lift Stations																
	G309004	Industrial Waste Holding Tanks & Separators																
	G309005	Industrial Waste Trenchboxes																
	G309099	Other Industrial Waste																
	G309098	Other																
	G309097	Other																
	G40	**Site Electrical Utilities**																
	G4010	Electrical Distribution																
	G401001	Substations																
	G401002	Transformers																
	G401003	Switches, Controls And Devices																
	G401004	Overhead Electric Conductors																
	G401005	Towers, Poles, Crossarms And Insulators																
	G401006	Underground Electric Conductors																
	G401007	Ductbanks, Manholes, Handholes, & Raceways																
	G401008	Grounding Systems																
	G401009	Metering																
	G401099	Other Electric Transmission And Distribution																
	G401098	Other																
	G401097	Other																
	G4020	Site Lighting																
	G402001	Transformers																
	G402002	Overhead Electric Conductors																
	G402003	Towers, Poles, Crossarms, And Insulators																
	G402004	Underground Electric Conductors																
	G402005	Ductbanks, Manholes And Handholes																
	G402006	Exterior Lighting Fixtures And Controls																
	G402007	Grounding Systems																
	G402008	Special Security Lighting Systems																
	G402099	Other Area Lighting																
	G402098	Other																
	G402097	Other																
	G4030	Site Communications & Security																
	G403001	Telecommunications Systems																
	G403002	Sound Systems																
	G403003	Fire Alarm Systems																
	G403004	Cable TV Systems (Catv)																
	G403005	Cables And Wiring																
	G403006	Ductbanks, Manholes And Handholes																
	G403007	Towers, Poles, And Stands																
	G403008	TV Cameras And Monitors																
	G403009	Grounding Systems																
	G403098	Other Communication And Alarm																
	G403099	Other Security Systems																
	G403098	Other																
	G403097	Other																
	G4040	Other Site Electrical Utilities																
	G409001	Sacrificial Anode Cathodic Protection System																
	G409002	Induced Current Cathodic Protection System																
	G409003	Emergency Power Generation																
	G409099	Other Cathodic Protection																
	G409098	Other																
	G409097	Other																
	G90	**Other Site Construction**																
	G9010	Service and Pedestrian Tunnels																
	G901001	Construction Of Service & Pedestrian Tunnels																
	G901002	Prefabricated Service And Pedestrian Tunnels																
	G909099	Other Service and Pedestrian Tunnels																
	G901098	Other																
	G901097	Other																
	G9090	Other Site Systems & Equipment																
	G909001	Bridges																

	G909002	Railroad Spurs																
	G909003	Snow Melting Systems																
	G909099	Other Special Construction																
	G909098	Other																
	G909097	Other																
	X	**Other Categories**																
	X90	**Other Categories**																
	X9010	Other																
	X901001	Other																
	X901002	Other																
	X901003	Other																
	X901004	Other																
	X901005	Other																
	X901006	Other																
	X901007	Other																
	X901008	Other																
	X901009	Other																
	X901010	Other																
	X9020	Other																
	X902001	Other																
	X902002	Other																
	X902003	Other																
	X902004	Other																
	X902005	Other																
	X902006	Other																
	X902007	Other																
	X902008	Other																
	X902009	Other																
	X902010	Other																
	X9030	Other																
	X903001	Other																
	X903002	Other																
	X903003	Other																
	X903004	Other																
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	X910008	Other																
	X910009	Other																
	X910010	Other																
	Y	**Other Categories**																
	Y90	**Other Categories**																
	Y9010	Other																
	Y901001	Other																
	Y901002	Other																
	Y901003	Other																
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	Y910005	Other																
	Y910006	Other																
	Y910007	Other																
	Y910008	Other																
	Y910009	Other																
	Y910010	Other																
	Z	**Other Project Costs**																
	Z10	**One Time - Upfront Costs**		1	50													
	Z1010	Agency Project Management		1	50													
	Z1010	Consultant Services		1	50													
	Z1030	Project Contingency		1	50													
	Z1030	GC/CM or D/B Management Costs		1	50													
	Z1030	DES Management Fees		1	50													
	Z1040	Higher/Lower 1st Costs vs. Replacement Costs		1	50													
	Z1050	Other One Time - Upfront Cost		1	50													
	Z1060	Other One Time - Upfront Cost		1	50													
	Z1070	Other One Time - Upfront Cost		1	50													
	Z1080	Other One Time - Upfront Cost		1	50													
	Z1090	Other One Time - Upfront Cost		1	50													
	Z109099	Other		1	50													
	Z108098	Other		1	50													
	Z107097	Other		1	50													
	Z106096	Other		1	50													
	Z105095	Other		1	50													
	Z104094	Other		1	50													
	Z103093	Other		1	50													
	Z102092	Other		1	50													
	Z101091	Other		1	50													
	Z100090	Other		1	50													
	Z20	**Other One Time - Upfront Costs**		1	50													
	Z2010	Other One Time - Upfront Cost		1	50													
	Z2020	Other One Time - Upfront Cost		1	50													
	Z3020	Other One Time - Upfront Cost		1	50													
	Z2030	Other One Time - Upfront Cost		1	50													
	Z2040	Other One Time - Upfront Cost		1	50													
	Z2050	Other One Time - Upfront Cost		1	50													
	Z205099	Other		1	50													
	Z205098	Other		1	50													
	Z205097	Other		1	50													
	Z205096	Other		1	50													
	Z205095	Other		1	50													
	Z205094	Other		1	50													
	Z205093	Other		1	50													
	Z205092	Other		1	50													
	Z205091	Other		1	50													
	Z30	**Re-Occurring Annual Cost (Track Inflation)**		1	1													
	Z3010	Other Re-Occurring Annual Cost		1	1													
	Z3020	Other Re-Occurring Annual Cost		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

ERROR: Useful Life < 2 or Units < 0

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	$ 9,000	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)	Diesel/#2 (Gallons)	Gasoline (Gallons)	LPG (Gallons)	District Heat (mmBTU)	Other Annual Building Maint.
Annual Utility Bill [$]			$ 9,000						$ -
Annual Utility Consumption Not Entered Below			-	-	-	-	-	-	Sum of Below
Sum of Annual Utility Consumption Below		-	100,000	-	-	-	-	-	$ -
Total Annual Utility Consumption		-	100,000	-	-	-	-	-	Total Maint.
Annual Utility Bill ÷ Total Utility Consumption		$ -	$ 0.09	$ -	$ -	$ -	$ -	$ -	$ -

SHOW	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)	Annual Diesel/#2 (Gal/Unit)	Annual Gasoline (Gal/Unit	Annual LPG Gal/Unit)	Annual Dist. Heat (KBTU/Unit)	Remaining Life (Years) of Existing Component
	Primary Entries Below: # of Units must be > 0 to be counted; Useful Life must be >= 2							Entries Below for Component Specific Utility Analysis (Consumption per Unit) - Total Building Utility Analysis Above							
	Match Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14						$ 50,000								
.	**A Substructure**														
	A1010 Standard Foundations		1		$50,000.00		$ 50,000		100000						
	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											

<- Primary Filter (Requires Level 1)

Office of Financial Management
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Life Cycle Cost Analysis Tool

Alternative 2 Input Page

ERROR: Useful Life < 2 or Units < 0

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	$ 9,000	Water (CCF)	Electricity (KWH)	Natural Gas (Therms)	Diesel/#2 (Gallons)	Gasoline (Gallons)	LPG (Gallons)	District Heat (mmBTU)	Other Annual Building Maint.
Annual Utility Bill [$]			$ 9,000						$ -
Annual Utility Consumption Not Entered Below		-	-	-	-	-	-	-	Sum of Below
Sum of Annual Utility Consumption Below		-	100,000	-	-	-	-	-	$ -
Total Annual Utility Consumption		-	100,000	-	-	-	-	-	Total Maint.
Annual Utility Bill ÷ Total Utility Consumption		$ -	$ 0.09	$ -	$ -	$ -	$ -	$ -	$ -

SHOW	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)	Annual Diesel/#2 (Gal/Unit)	Annual Gasoline (Gal/Unit	Annual LPG Gal/Unit)	Annual Dist. Heat (KBTU/Unit)	Remaining Life (Years) of Existing Component
	Primary Entries Below: # of Units must be > 0 to be counted; Useful Life must be >= 2								Entries Below for Component Specific Utility Analysis (Consumption per Unit) - Total Building Utility Analysis Above							
	Match Baseline: Filter to Select All & Drag Copy O14:S14 & U14:AG14							$ 50,000								
.	A	**Substructure**														
	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											

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

Executive Report

Project Information	
Project:	
Address:	
Company:	
Contact:	
Contact Phone:	
Contact Email:	

Key Analysis Variables		Building Characteristics	
Study Period (years)	51	Gross (Sq.Ft)	0
Nominal Discount Rate	3.67%	Useable (Sq.Ft)	0
Maintenance Escalation	1.00%	Space Efficiency	
Zero Year (Current Year)	2019	Project Phase	0
Construction Years	1	Building Type	0

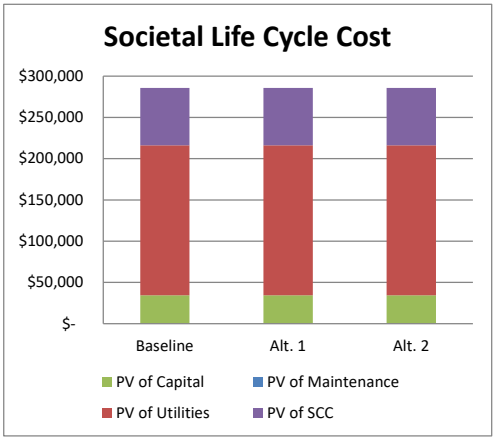
Life Cycle Cost Analysis	BEST		
Alternative	Baseline	Alt. 1	Alt. 2
Energy Use Intenstity (kBtu/sq.ft)	#DIV/0!	#DIV/0!	#DIV/0!
1st Construction Costs	$ 47,619	$ 47,619	$ 47,619
PV of Capital Costs	$ 34,545	$ 34,545	$ 34,545
PV of Maintenance Costs	$ -	$ -	$ -
PV of Utility Costs	$ 181,759	$ 181,759	$ 181,759
Total Life Cycle Cost (LCC)	**$ 216,304**	**$ 216,304**	**$ 216,304**
Net Present Savings (NPS)	**N/A**	**$ -**	**$ -**

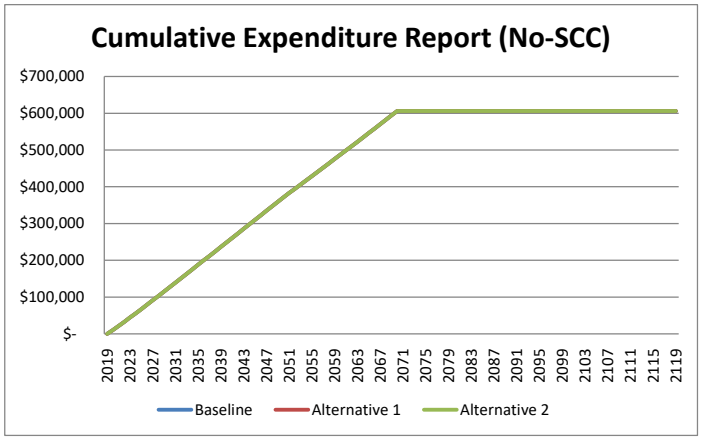
Societal LCC takes into consideration the social cost of carbon dioxide emissions caused by operational energy consumption

(GHG) Social Life Cycle Cost	BEST		
GHG Impact from Utility Consumption	Baseline	Alt. 1	Alt. 2
Tons of CO2e over Study Period	2,100	2,100	2,100
% CO2e Reduction vs. Baseline	N/A	0%	0%
Present Social Cost of Carbon (SCC)	$ 69,378	$ 69,378	$ 69,378
Total LCC with SCC	**$ 285,681**	**$ 285,681**	**$ 285,681**
NPS with SCC	**N/A**	**$ -**	**$ -**

Warning: OFM Assigned Variables Not Used

MAJOR ERROR ON: Base Alt. 1 Alt. 2





Baseline Short Description
Alternative 1 Short Description
Alternative 2 Short Description

	Cumulative Expenditure Summary			Annual Expenditure Summary		
Year	Baseline	Alt. 1	Alt. 2	Baseline	Alt. 1	Alt. 2
2019	$ -	$ -	$ -	$ -	$ -	$ -
2020	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000	$ 10,000
2021	$ 21,228	$ 21,228	$ 21,228	$ 11,228	$ 11,228	$ 11,228
2022	$ 32,568	$ 32,568	$ 32,568	$ 11,340	$ 11,340	$ 11,340
2023	$ 44,022	$ 44,022	$ 44,022	$ 11,454	$ 11,454	$ 11,454
2024	$ 55,592	$ 55,592	$ 55,592	$ 11,570	$ 11,570	$ 11,570
2025	$ 67,281	$ 67,281	$ 67,281	$ 11,688	$ 11,688	$ 11,688
2026	$ 79,089	$ 79,089	$ 79,089	$ 11,808	$ 11,808	$ 11,808
2027	$ 91,019	$ 91,019	$ 91,019	$ 11,930	$ 11,930	$ 11,930
2028	$ 102,983	$ 102,983	$ 102,983	$ 11,963	$ 11,963	$ 11,963
2029	$ 114,980	$ 114,980	$ 114,980	$ 11,998	$ 11,998	$ 11,998
2030	$ 127,014	$ 127,014	$ 127,014	$ 12,034	$ 12,034	$ 12,034
2031	$ 139,086	$ 139,086	$ 139,086	$ 12,072	$ 12,072	$ 12,072
2032	$ 151,197	$ 151,197	$ 151,197	$ 12,111	$ 12,111	$ 12,111
2033	$ 163,350	$ 163,350	$ 163,350	$ 12,152	$ 12,152	$ 12,152
2034	$ 175,545	$ 175,545	$ 175,545	$ 12,195	$ 12,195	$ 12,195
2035	$ 187,784	$ 187,784	$ 187,784	$ 12,239	$ 12,239	$ 12,239
2036	$ 199,977	$ 199,977	$ 199,977	$ 12,193	$ 12,193	$ 12,193
2037	$ 212,126	$ 212,126	$ 212,126	$ 12,149	$ 12,149	$ 12,149
2038	$ 224,324	$ 224,324	$ 224,324	$ 12,197	$ 12,197	$ 12,197
2039	$ 236,571	$ 236,571	$ 236,571	$ 12,247	$ 12,247	$ 12,247
2040	$ 248,777	$ 248,777	$ 248,777	$ 12,207	$ 12,207	$ 12,207
2041	$ 261,036	$ 261,036	$ 261,036	$ 12,258	$ 12,258	$ 12,258
2042	$ 273,256	$ 273,256	$ 273,256	$ 12,221	$ 12,221	$ 12,221
2043	$ 285,531	$ 285,531	$ 285,531	$ 12,275	$ 12,275	$ 12,275
2044	$ 297,770	$ 297,770	$ 297,770	$ 12,239	$ 12,239	$ 12,239
2045	$ 310,065	$ 310,065	$ 310,065	$ 12,295	$ 12,295	$ 12,295
2046	$ 322,327	$ 322,327	$ 322,327	$ 12,262	$ 12,262	$ 12,262
2047	$ 334,647	$ 334,647	$ 334,647	$ 12,320	$ 12,320	$ 12,320
2048	$ 346,936	$ 346,936	$ 346,936	$ 12,289	$ 12,289	$ 12,289
2049	$ 359,231	$ 359,231	$ 359,231	$ 12,295	$ 12,295	$ 12,295
2050	$ 371,532	$ 371,532	$ 371,532	$ 12,301	$ 12,301	$ 12,301
2051	$ 382,914	$ 382,914	$ 382,914	$ 11,382	$ 11,382	$ 11,382
2052	$ 394,332	$ 394,332	$ 394,332	$ 11,418	$ 11,418	$ 11,418
2053	$ 405,786	$ 405,786	$ 405,786	$ 11,455	$ 11,455	$ 11,455
2054	$ 417,277	$ 417,277	$ 417,277	$ 11,491	$ 11,491	$ 11,491
2055	$ 428,805	$ 428,805	$ 428,805	$ 11,527	$ 11,527	$ 11,527
2056	$ 440,368	$ 440,368	$ 440,368	$ 11,564	$ 11,564	$ 11,564
2057	$ 451,968	$ 451,968	$ 451,968	$ 11,600	$ 11,600	$ 11,600
2058	$ 463,605	$ 463,605	$ 463,605	$ 11,636	$ 11,636	$ 11,636
2059	$ 475,277	$ 475,277	$ 475,277	$ 11,673	$ 11,673	$ 11,673
2060	$ 486,986	$ 486,986	$ 486,986	$ 11,709	$ 11,709	$ 11,709
2061	$ 498,732	$ 498,732	$ 498,732	$ 11,745	$ 11,745	$ 11,745
2062	$ 510,514	$ 510,514	$ 510,514	$ 11,782	$ 11,782	$ 11,782
2063	$ 522,332	$ 522,332	$ 522,332	$ 11,818	$ 11,818	$ 11,818
2064	$ 534,186	$ 534,186	$ 534,186	$ 11,855	$ 11,855	$ 11,855
2065	$ 546,077	$ 546,077	$ 546,077	$ 11,891	$ 11,891	$ 11,891
2066	$ 558,005	$ 558,005	$ 558,005	$ 11,927	$ 11,927	$ 11,927
2067	$ 569,968	$ 569,968	$ 569,968	$ 11,964	$ 11,964	$ 11,964
2068	$ 581,968	$ 581,968	$ 581,968	$ 12,000	$ 12,000	$ 12,000
2069	$ 594,005	$ 594,005	$ 594,005	$ 12,036	$ 12,036	$ 12,036
2070	$ 606,077	$ 606,077	$ 606,077	$ 12,073	$ 12,073	$ 12,073
2071	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2072	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2073	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2074	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2075	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2076	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2077	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2078	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2079	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2080	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2081	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2082	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2083	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2084	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2085	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2086	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -

	Cumulative Expenditure Summary			Annual Expenditure Summary		
Year	Baseline	Alt. 1	Alt. 2	Baseline	Alt. 1	Alt. 2
2087	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2088	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2089	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2090	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2091	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2092	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2093	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2094	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2095	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2096	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2097	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2098	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2099	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2100	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2101	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2102	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2103	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2104	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2105	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2106	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2107	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2108	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2109	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2110	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2111	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2112	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2113	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2114	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2115	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2116	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2117	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2118	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -
2119	$ 606,077	$ 606,077	$ 606,077	$ -	$ -	$ -

	Baseline Expenditure Report					Cumulative Expenditures
Year	Capital	Maintenance	Utilities	Financing	**Total**	Baseline
2019	$ -	$ -	$ -	$ -	**$ -**	$ -
2020	$ 50,000	$ -	$ -	$ (40,000)	**$ 10,000**	$ 10,000
2021	$ -	$ -	$ 8,909	$ 2,319	**$ 11,228**	$ 21,228
2022	$ -	$ -	$ 9,091	$ 2,249	**$ 11,340**	$ 32,568
2023	$ -	$ -	$ 9,273	$ 2,181	**$ 11,454**	$ 44,022
2024	$ -	$ -	$ 9,455	$ 2,116	**$ 11,570**	$ 55,592
2025	$ -	$ -	$ 9,636	$ 2,052	**$ 11,688**	$ 67,281
2026	$ -	$ -	$ 9,818	$ 1,990	**$ 11,808**	$ 79,089
2027	$ -	$ -	$ 10,000	$ 1,930	**$ 11,930**	$ 91,019
2028	$ -	$ -	$ 10,091	$ 1,872	**$ 11,963**	$ 102,983
2029	$ -	$ -	$ 10,182	$ 1,816	**$ 11,998**	$ 114,980
2030	$ -	$ -	$ 10,273	$ 1,761	**$ 12,034**	$ 127,014
2031	$ -	$ -	$ 10,364	$ 1,708	**$ 12,072**	$ 139,086
2032	$ -	$ -	$ 10,455	$ 1,657	**$ 12,111**	$ 151,197
2033	$ -	$ -	$ 10,545	$ 1,607	**$ 12,152**	$ 163,350
2034	$ -	$ -	$ 10,636	$ 1,559	**$ 12,195**	$ 175,545
2035	$ -	$ -	$ 10,727	$ 1,512	**$ 12,239**	$ 187,784
2036	$ -	$ -	$ 10,727	$ 1,466	**$ 12,193**	$ 199,977
2037	$ -	$ -	$ 10,727	$ 1,422	**$ 12,149**	$ 212,126
2038	$ -	$ -	$ 10,818	$ 1,379	**$ 12,197**	$ 224,324
2039	$ -	$ -	$ 10,909	$ 1,338	**$ 12,247**	$ 236,571
2040	$ -	$ -	$ 10,909	$ 1,297	**$ 12,207**	$ 248,777
2041	$ -	$ -	$ 11,000	$ 1,258	**$ 12,258**	$ 261,036
2042	$ -	$ -	$ 11,000	$ 1,221	**$ 12,221**	$ 273,256
2043	$ -	$ -	$ 11,091	$ 1,184	**$ 12,275**	$ 285,531
2044	$ -	$ -	$ 11,091	$ 1,148	**$ 12,239**	$ 297,770
2045	$ -	$ -	$ 11,182	$ 1,114	**$ 12,295**	$ 310,065
2046	$ -	$ -	$ 11,182	$ 1,080	**$ 12,262**	$ 322,327
2047	$ -	$ -	$ 11,273	$ 1,048	**$ 12,320**	$ 334,647
2048	$ -	$ -	$ 11,273	$ 1,016	**$ 12,289**	$ 346,936
2049	$ -	$ -	$ 11,309	$ 985	**$ 12,295**	$ 359,231
2050	$ -	$ -	$ 11,345	$ 956	**$ 12,301**	$ 371,532
2051	$ -	$ -	$ 11,382	$ -	**$ 11,382**	$ 382,914
2052	$ -	$ -	$ 11,418	$ -	**$ 11,418**	$ 394,332
2053	$ -	$ -	$ 11,455	$ -	**$ 11,455**	$ 405,786
2054	$ -	$ -	$ 11,491	$ -	**$ 11,491**	$ 417,277
2055	$ -	$ -	$ 11,527	$ -	**$ 11,527**	$ 428,805
2056	$ -	$ -	$ 11,564	$ -	**$ 11,564**	$ 440,368
2057	$ -	$ -	$ 11,600	$ -	**$ 11,600**	$ 451,968
2058	$ -	$ -	$ 11,636	$ -	**$ 11,636**	$ 463,605
2059	$ -	$ -	$ 11,673	$ -	**$ 11,673**	$ 475,277
2060	$ -	$ -	$ 11,709	$ -	**$ 11,709**	$ 486,986
2061	$ -	$ -	$ 11,745	$ -	**$ 11,745**	$ 498,732
2062	$ -	$ -	$ 11,782	$ -	**$ 11,782**	$ 510,514
2063	$ -	$ -	$ 11,818	$ -	**$ 11,818**	$ 522,332
2064	$ -	$ -	$ 11,855	$ -	**$ 11,855**	$ 534,186
2065	$ -	$ -	$ 11,891	$ -	**$ 11,891**	$ 546,077
2066	$ -	$ -	$ 11,927	$ -	**$ 11,927**	$ 558,005
2067	$ -	$ -	$ 11,964	$ -	**$ 11,964**	$ 569,968
2068	$ -	$ -	$ 12,000	$ -	**$ 12,000**	$ 581,968
2069	$ -	$ -	$ 12,036	$ -	**$ 12,036**	$ 594,005
2070	$ -	$ -	$ 12,073	$ -	**$ 12,073**	$ 606,077
2071	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2072	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2073	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2074	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2075	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2076	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2077	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2078	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2079	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2080	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2081	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2082	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2083	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2084	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2085	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2086	$ -	$ -	$ -	$ -	**$ -**	$ 606,077

	Baseline Expenditure Report					Cumulative Expenditures
Year	Capital	Maintenance	Utilities	Financing	**Total**	Baseline
2087	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2088	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2089	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2090	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2091	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2092	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2093	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2094	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2095	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2096	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2097	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2098	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2099	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2100	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2101	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2102	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2103	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2104	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2105	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2106	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2107	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2108	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2109	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2110	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2111	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2112	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2113	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2114	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2115	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2116	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2117	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2118	$ -	$ -	$ -	$ -	**$ -**	$ 606,077
2119	$ -	$ -	$ -	$ -	**$ -**	$ 606,077

	Alternative 1 Expenditure Report					Cumulative Expenditures	Expenditures over Baseline	Expenditures over Baseline
Year	Capital	Maintenance	Utilities	Financing	Total	Alt. 1	Annual	Cumulative
2019	$ -	$ -	$ -	$ -	**$ -**	$ -	$ -	$ -
2020	$ 50,000	$ -	$ -	$ (40,000)	**$ 10,000**	$ 10,000	$ -	$ -
2021	$ -	$ -	$ 8,909	$ 2,319	**$ 11,228**	$ 21,228	$ -	$ -
2022	$ -	$ -	$ 9,091	$ 2,249	**$ 11,340**	$ 32,568	$ -	$ -
2023	$ -	$ -	$ 9,273	$ 2,181	**$ 11,454**	$ 44,022	$ -	$ -
2024	$ -	$ -	$ 9,455	$ 2,116	**$ 11,570**	$ 55,592	$ -	$ -
2025	$ -	$ -	$ 9,636	$ 2,052	**$ 11,688**	$ 67,281	$ -	$ -
2026	$ -	$ -	$ 9,818	$ 1,990	**$ 11,808**	$ 79,089	$ -	$ -
2027	$ -	$ -	$ 10,000	$ 1,930	**$ 11,930**	$ 91,019	$ -	$ -
2028	$ -	$ -	$ 10,091	$ 1,872	**$ 11,963**	$ 102,983	$ -	$ -
2029	$ -	$ -	$ 10,182	$ 1,816	**$ 11,998**	$ 114,980	$ -	$ -
2030	$ -	$ -	$ 10,273	$ 1,761	**$ 12,034**	$ 127,014	$ -	$ -
2031	$ -	$ -	$ 10,364	$ 1,708	**$ 12,072**	$ 139,086	$ -	$ -
2032	$ -	$ -	$ 10,455	$ 1,657	**$ 12,111**	$ 151,197	$ -	$ -
2033	$ -	$ -	$ 10,545	$ 1,607	**$ 12,152**	$ 163,350	$ -	$ -
2034	$ -	$ -	$ 10,636	$ 1,559	**$ 12,195**	$ 175,545	$ -	$ -
2035	$ -	$ -	$ 10,727	$ 1,512	**$ 12,239**	$ 187,784	$ -	$ -
2036	$ -	$ -	$ 10,727	$ 1,466	**$ 12,193**	$ 199,977	$ -	$ -
2037	$ -	$ -	$ 10,727	$ 1,422	**$ 12,149**	$ 212,126	$ -	$ -
2038	$ -	$ -	$ 10,818	$ 1,379	**$ 12,197**	$ 224,324	$ -	$ -
2039	$ -	$ -	$ 10,909	$ 1,338	**$ 12,247**	$ 236,571	$ -	$ -
2040	$ -	$ -	$ 10,909	$ 1,297	**$ 12,207**	$ 248,777	$ -	$ -
2041	$ -	$ -	$ 11,000	$ 1,258	**$ 12,258**	$ 261,036	$ -	$ -
2042	$ -	$ -	$ 11,000	$ 1,221	**$ 12,221**	$ 273,256	$ -	$ -
2043	$ -	$ -	$ 11,091	$ 1,184	**$ 12,275**	$ 285,531	$ -	$ -
2044	$ -	$ -	$ 11,091	$ 1,148	**$ 12,239**	$ 297,770	$ -	$ -
2045	$ -	$ -	$ 11,182	$ 1,114	**$ 12,295**	$ 310,065	$ -	$ -
2046	$ -	$ -	$ 11,182	$ 1,080	**$ 12,262**	$ 322,327	$ -	$ -
2047	$ -	$ -	$ 11,273	$ 1,048	**$ 12,320**	$ 334,647	$ -	$ -
2048	$ -	$ -	$ 11,273	$ 1,016	**$ 12,289**	$ 346,936	$ -	$ -
2049	$ -	$ -	$ 11,309	$ 985	**$ 12,295**	$ 359,231	$ -	$ -
2050	$ -	$ -	$ 11,345	$ 956	**$ 12,301**	$ 371,532	$ -	$ -
2051	$ -	$ -	$ 11,382	$ -	**$ 11,382**	$ 382,914	$ -	$ -
2052	$ -	$ -	$ 11,418	$ -	**$ 11,418**	$ 394,332	$ -	$ -
2053	$ -	$ -	$ 11,455	$ -	**$ 11,455**	$ 405,786	$ -	$ -
2054	$ -	$ -	$ 11,491	$ -	**$ 11,491**	$ 417,277	$ -	$ -
2055	$ -	$ -	$ 11,527	$ -	**$ 11,527**	$ 428,805	$ -	$ -
2056	$ -	$ -	$ 11,564	$ -	**$ 11,564**	$ 440,368	$ -	$ -
2057	$ -	$ -	$ 11,600	$ -	**$ 11,600**	$ 451,968	$ -	$ -
2058	$ -	$ -	$ 11,636	$ -	**$ 11,636**	$ 463,605	$ -	$ -
2059	$ -	$ -	$ 11,673	$ -	**$ 11,673**	$ 475,277	$ -	$ -
2060	$ -	$ -	$ 11,709	$ -	**$ 11,709**	$ 486,986	$ -	$ -
2061	$ -	$ -	$ 11,745	$ -	**$ 11,745**	$ 498,732	$ -	$ -
2062	$ -	$ -	$ 11,782	$ -	**$ 11,782**	$ 510,514	$ -	$ -
2063	$ -	$ -	$ 11,818	$ -	**$ 11,818**	$ 522,332	$ -	$ -
2064	$ -	$ -	$ 11,855	$ -	**$ 11,855**	$ 534,186	$ -	$ -
2065	$ -	$ -	$ 11,891	$ -	**$ 11,891**	$ 546,077	$ -	$ -
2066	$ -	$ -	$ 11,927	$ -	**$ 11,927**	$ 558,005	$ -	$ -
2067	$ -	$ -	$ 11,964	$ -	**$ 11,964**	$ 569,968	$ -	$ -
2068	$ -	$ -	$ 12,000	$ -	**$ 12,000**	$ 581,968	$ -	$ -
2069	$ -	$ -	$ 12,036	$ -	**$ 12,036**	$ 594,005	$ -	$ -
2070	$ -	$ -	$ 12,073	$ -	**$ 12,073**	$ 606,077	$ -	$ -
2071	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2072	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2073	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2074	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2075	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2076	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2077	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2078	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2079	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2080	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2081	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2082	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2083	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2084	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2085	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2086	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -

	Alternative 1 Expenditure Report					Cumulative Expenditures	Expenditures over Baseline	Expenditures over Baseline
Year	Capital	Maintenance	Utilities	Financing	Total	Alt. 1	Annual	Cumulative
2087	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2088	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2089	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2090	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2091	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2092	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2093	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2094	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2095	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2096	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2097	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2098	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2099	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2100	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2101	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2102	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2103	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2104	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2105	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2106	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2107	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2108	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2109	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2110	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2111	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2112	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2113	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2114	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2115	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2116	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2117	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2118	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2119	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -

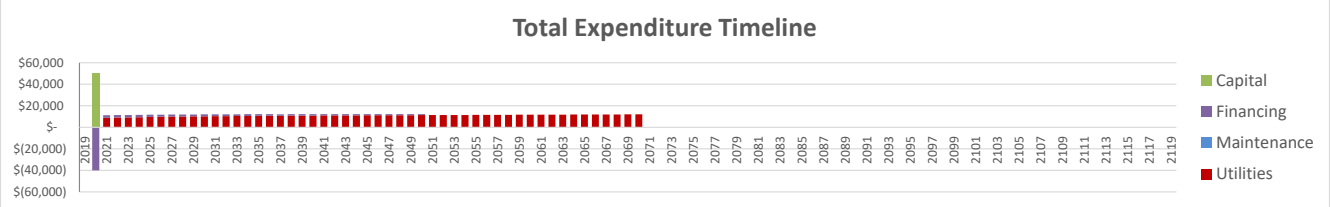
	Alternative 2 Expenditure Report					Cumulative Expenditures	Expenditures over Baseline	Expenditures over Baseline
Year	Capital	Maintenance	Utilities	Financing	Total	Alt. 2	Cumulative	Annual
2019	$ -	$ -	$ -	$ -	**$ -**	$ -	$ -	$ -
2020	$ 50,000	$ -	$ -	$ (40,000)	**$ 10,000**	$ 10,000	$ -	$ -
2021	$ -	$ -	$ 8,909	$ 2,319	**$ 11,228**	$ 21,228	$ -	$ -
2022	$ -	$ -	$ 9,091	$ 2,249	**$ 11,340**	$ 32,568	$ -	$ -
2023	$ -	$ -	$ 9,273	$ 2,181	**$ 11,454**	$ 44,022	$ -	$ -
2024	$ -	$ -	$ 9,455	$ 2,116	**$ 11,570**	$ 55,592	$ -	$ -
2025	$ -	$ -	$ 9,636	$ 2,052	**$ 11,688**	$ 67,281	$ -	$ -
2026	$ -	$ -	$ 9,818	$ 1,990	**$ 11,808**	$ 79,089	$ -	$ -
2027	$ -	$ -	$ 10,000	$ 1,930	**$ 11,930**	$ 91,019	$ -	$ -
2028	$ -	$ -	$ 10,091	$ 1,872	**$ 11,963**	$ 102,983	$ -	$ -
2029	$ -	$ -	$ 10,182	$ 1,816	**$ 11,998**	$ 114,980	$ -	$ -
2030	$ -	$ -	$ 10,273	$ 1,761	**$ 12,034**	$ 127,014	$ -	$ -
2031	$ -	$ -	$ 10,364	$ 1,708	**$ 12,072**	$ 139,086	$ -	$ -
2032	$ -	$ -	$ 10,455	$ 1,657	**$ 12,111**	$ 151,197	$ -	$ -
2033	$ -	$ -	$ 10,545	$ 1,607	**$ 12,152**	$ 163,350	$ -	$ -
2034	$ -	$ -	$ 10,636	$ 1,559	**$ 12,195**	$ 175,545	$ -	$ -
2035	$ -	$ -	$ 10,727	$ 1,512	**$ 12,239**	$ 187,784	$ -	$ -
2036	$ -	$ -	$ 10,727	$ 1,466	**$ 12,193**	$ 199,977	$ -	$ -
2037	$ -	$ -	$ 10,727	$ 1,422	**$ 12,149**	$ 212,126	$ -	$ -
2038	$ -	$ -	$ 10,818	$ 1,379	**$ 12,197**	$ 224,324	$ -	$ -
2039	$ -	$ -	$ 10,909	$ 1,338	**$ 12,247**	$ 236,571	$ -	$ -
2040	$ -	$ -	$ 10,909	$ 1,297	**$ 12,207**	$ 248,777	$ -	$ -
2041	$ -	$ -	$ 11,000	$ 1,258	**$ 12,258**	$ 261,036	$ -	$ -
2042	$ -	$ -	$ 11,000	$ 1,221	**$ 12,221**	$ 273,256	$ -	$ -
2043	$ -	$ -	$ 11,091	$ 1,184	**$ 12,275**	$ 285,531	$ -	$ -
2044	$ -	$ -	$ 11,091	$ 1,148	**$ 12,239**	$ 297,770	$ -	$ -
2045	$ -	$ -	$ 11,182	$ 1,114	**$ 12,295**	$ 310,065	$ -	$ -
2046	$ -	$ -	$ 11,182	$ 1,080	**$ 12,262**	$ 322,327	$ -	$ -
2047	$ -	$ -	$ 11,273	$ 1,048	**$ 12,320**	$ 334,647	$ -	$ -
2048	$ -	$ -	$ 11,273	$ 1,016	**$ 12,289**	$ 346,936	$ -	$ -
2049	$ -	$ -	$ 11,309	$ 985	**$ 12,295**	$ 359,231	$ -	$ -
2050	$ -	$ -	$ 11,345	$ 956	**$ 12,301**	$ 371,532	$ -	$ -
2051	$ -	$ -	$ 11,382	$ -	**$ 11,382**	$ 382,914	$ -	$ -
2052	$ -	$ -	$ 11,418	$ -	**$ 11,418**	$ 394,332	$ -	$ -
2053	$ -	$ -	$ 11,455	$ -	**$ 11,455**	$ 405,786	$ -	$ -
2054	$ -	$ -	$ 11,491	$ -	**$ 11,491**	$ 417,277	$ -	$ -
2055	$ -	$ -	$ 11,527	$ -	**$ 11,527**	$ 428,805	$ -	$ -
2056	$ -	$ -	$ 11,564	$ -	**$ 11,564**	$ 440,368	$ -	$ -
2057	$ -	$ -	$ 11,600	$ -	**$ 11,600**	$ 451,968	$ -	$ -
2058	$ -	$ -	$ 11,636	$ -	**$ 11,636**	$ 463,605	$ -	$ -
2059	$ -	$ -	$ 11,673	$ -	**$ 11,673**	$ 475,277	$ -	$ -
2060	$ -	$ -	$ 11,709	$ -	**$ 11,709**	$ 486,986	$ -	$ -
2061	$ -	$ -	$ 11,745	$ -	**$ 11,745**	$ 498,732	$ -	$ -
2062	$ -	$ -	$ 11,782	$ -	**$ 11,782**	$ 510,514	$ -	$ -
2063	$ -	$ -	$ 11,818	$ -	**$ 11,818**	$ 522,332	$ -	$ -
2064	$ -	$ -	$ 11,855	$ -	**$ 11,855**	$ 534,186	$ -	$ -
2065	$ -	$ -	$ 11,891	$ -	**$ 11,891**	$ 546,077	$ -	$ -
2066	$ -	$ -	$ 11,927	$ -	**$ 11,927**	$ 558,005	$ -	$ -
2067	$ -	$ -	$ 11,964	$ -	**$ 11,964**	$ 569,968	$ -	$ -
2068	$ -	$ -	$ 12,000	$ -	**$ 12,000**	$ 581,968	$ -	$ -
2069	$ -	$ -	$ 12,036	$ -	**$ 12,036**	$ 594,005	$ -	$ -
2070	$ -	$ -	$ 12,073	$ -	**$ 12,073**	$ 606,077	$ -	$ -
2071	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2072	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2073	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2074	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2075	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2076	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2077	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2078	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2079	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2080	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2081	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2082	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2083	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2084	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2085	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -
2086	$ -	$ -	$ -	$ -	**$ -**	$ 606,077	$ -	$ -

	Alternative 2 Expenditure Report					Cumulative Expenditures	Expenditures over Baseline	Expenditures over Baseline
Year	Capital	Maintenance	Utilities	Financing	Total	Alt. 2	Cumulative	Annual
2087	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2088	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2089	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2090	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2091	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2092	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2093	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2094	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2095	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2096	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2097	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2098	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2099	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2100	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2101	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2102	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2103	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2104	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2105	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2106	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2107	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2108	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2109	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2110	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2111	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2112	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2113	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2114	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2115	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2116	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2117	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2118	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -
2119	$ -	$ -	$ -	$ -	$ -	$ 606,077	$ -	$ -

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

☑ Show Values and Parent Categories Only (Requires Refilter)

Baseline Detailed Report

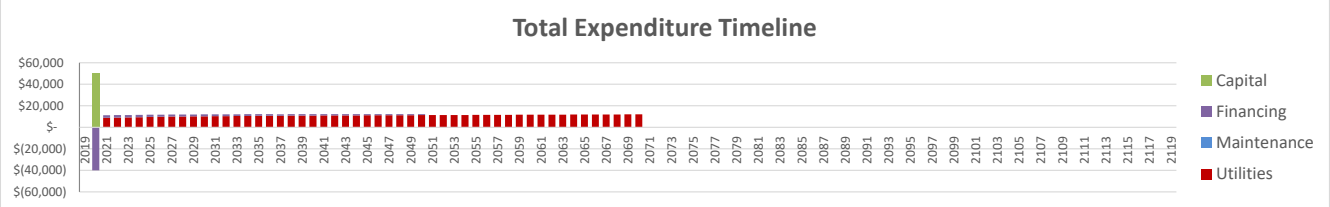


Building Component List All Values Sum To Their Parent Category		Present Value of Capital Costs	Present Value of Maintenance Costs	Present Value of Utility Costs	Total Present Value of Component or Group
Total Building Life Cycle Cost		**$ 34,545**	**$ -**	**$ 181,759**	**$ 216,304**
W	**Whole Building Entries (Capital = Financing)**	**$ (13,074)**	$ -	$ -	**$ (13,074)**
A	**Substructure**	**$ 47,619**	$ -	**$ 181,759**	**$ 229,378**
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**	$ -	$ -	$ -	$ -
Z30	**Re-Occurring Annual Cost (Track Inflation)**	$ -	$ -	$ -	$ -
C.E.	**Custom Entries**	$ -	$ -	$ -	$ -

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

○	Manual Special Selection Only (Requires Refilter)
◉	Show Values and Parent Categories Only (Requires Refilter)
○	Show Differences Between Alternative and Baseline (Req. Refilter)

Alternative 1 Detailed Report

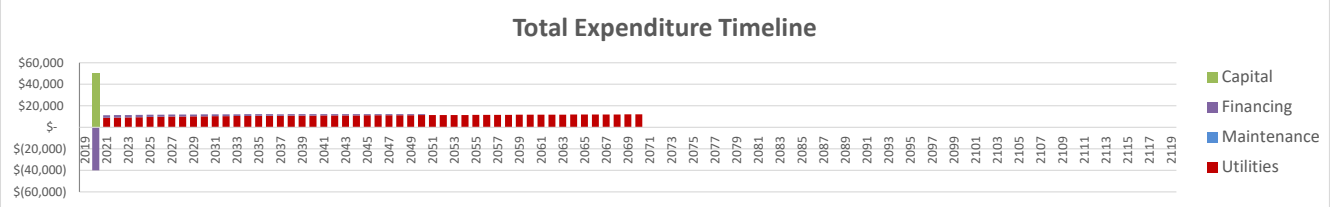


Building Component List All Values Sum To Their Parent Category		Present Value of Capital Costs	Present Value of Maintenance Costs	Present Value of Utility Costs	Total Present Value of Component or Group
Total Building Life Cycle Cost		**$ 34,545**	**$ -**	**$ 181,759**	**$ 216,304**
W	**Whole Building Entries (Capital = Financing)**	**$ (13,074)**	$ -	$ -	**$ (13,074)**
A	**Substructure**	**$ 47,619**	$ -	**$ 181,759**	**$ 229,378**
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**	$ -	$ -	$ -	$ -
Z30	**Re-Occurring Annual Cost (Track Inflation)**	$ -	$ -	$ -	$ -
C.E.	**Custom Entries**	$ -	$ -	$ -	$ -

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

○	Manual Special Selection Only (Requires Refilter)
◉	Show Values and Parent Categories Only (Requires Refilter)
○	Show Differences Between Alternative and Baseline (Req. Refilter)

Alternative 2 Detailed Report



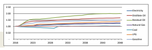
Building Component List All Values Sum To Their Parent Category		Present Value of Capital Costs	Present Value of Maintenance Costs	Present Value of Utility Costs	Total Present Value of Component or Group
	Total Building Life Cycle Cost	**$ 34,545**	**$ -**	**$ 181,759**	**$ 216,304**
W	**Whole Building Entries (Capital = Financing)**	**$ (13,074)**	$ -	$ -	**$ (13,074)**
A	**Substructure**	**$ 47,619**	$ -	**$ 181,759**	**$ 229,378**
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**	$ -	$ -	$ -	$ -
Z30	**Re-Occurring Annual Cost (Track Inflation)**	$ -	$ -	$ -	$ -
C.E.	**Custom Entries**	$ -	$ -	$ -	$ -

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

Fuel Escalation Page

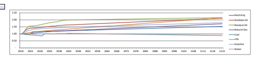
Input Method	OFM	User

Unlocked Cells for Notes and Calculation



Projection Future Beyond NIST Data (Linear Default)

Period	Linear Last 5 Years	5 Year % Growth
Electricity	0.004	0.33%
Distillate Oil	0.006	0.36%
Residual Oil	0.002	0.10%
Natural Gas	0.006	0.48%
Coal	(0.002)	-0.18%
LPG	0.010	0.79%
Gasoline	0.004	0.27%
Water	0.000	0.00%
Biomass	0.000	0.00%
District Heat	0.006	0.48%



Version Yr	2018
Version #	Residential

OFM Input

$ Escalation	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027
Electricity	1.00	0.99	0.97	0.98	1.00	1.02	1.04	1.06	1.08	1.10
Distillate Oil	1.00	1.05	1.20	1.31	1.37	1.40	1.42	1.42	1.43	1.44
Residual Oil	1.00	1.02	1.21	1.40	1.52	1.56	1.57	1.57	1.60	1.62
Natural Gas	1.00	1.01	1.02	1.02	1.01	1.01	1.10	1.15	1.15	1.16
Coal	1.00	0.98	0.96	0.95	0.94	0.93	0.91	0.91	0.89	0.88
Water*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Biomass*	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
District Heat*	1.00	1.01	1.02	1.02	1.01	1.01	1.10	1.15	1.15	1.16

Annual Supplement to NIST Handbook 135, Table Ca-4 Commercial Projected Fuel Price Indicies (excluding general inflation), LPG from Residential Section, Gasoline from Transportation Section, Water ... from NIST. Beyond 30 years projected based on NIST trends

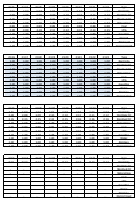
* Note: District Heat Escalates at the same rate as Natural Gas, H20 and Biomass prices assumed to keep pace with inflation

User Input

$ Escalation
Electricity
Distillate Oil
Residual Oil
Natural Gas
Coal
LPG
Gasoline
Water
Biomass
District Heat

Value Used

$ Escalation



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

Carbon Externality

Non Electricity Emission Factors are based on the site emissions and do not take into account any CO2 production or absorbtion that occurred during the production, refining, or distribution of the energy source.

Electricity Emission Factors are based on the site emissions of the power plant that produced the electricity

Source

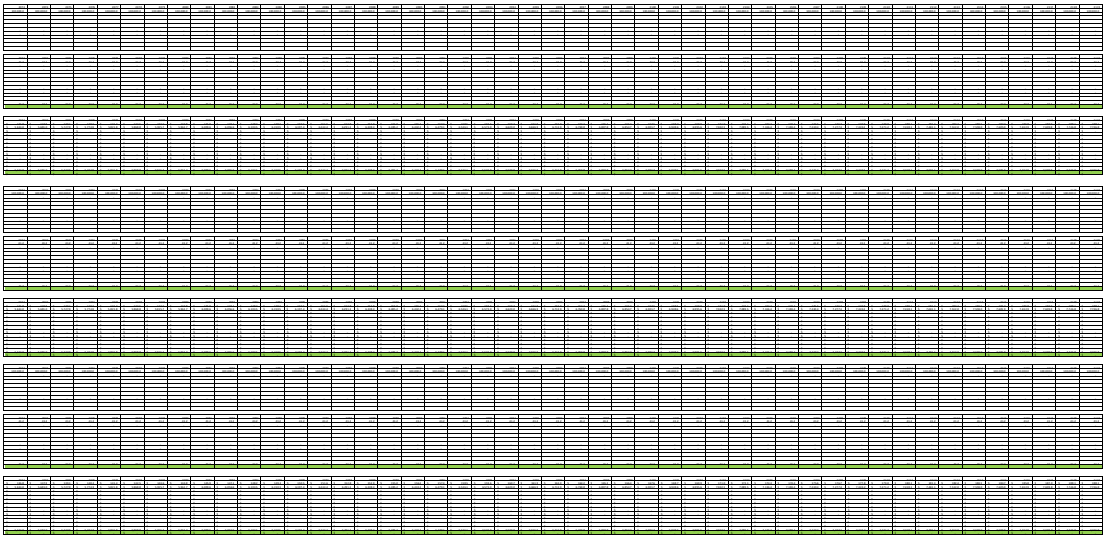
eCFR	e-CFR - Title 40 - Chapter I - Subchapter C - Part 98 - Subpart C - Tables C1 & C2
Marginal Electricity from Nat. Gas	NWPP 6th Plan lists Natural Gas as the Marginal Electricity Supply. The emission factor for electricity from natural gas power plants serving washington was calculated as an average of the reported emission factors from WA plants from 2009->2011 as used within Commerce Rule Making
Calculated	* District Heat assumes an 80% efficient Natural Gas Fired Boiler is used to produce deliverd thermal energy with no transmission losses
eCFR biofuels combustion emissions	Biofuels CO2e impact needs to be analyzed using a full Life Cycle Analysis not integrated into this version of the LCCT.

http://www.ecfr.gov/cgi-bin/text-idx?SID=42886e482db3011d05ac69b010cd4091&node=ap40.21.98_138.1&rgn=div9

% Biofuel	
Biodiesel	0%
Ethanol	0%

Average Annual kBTU/year	Baseline Consumption	2019	2020	2021	2022	2023	2024	2025	2026	2027
341214.148	Electricity (KWh)	-	100,000.0	100,000.0	100,000.0	100,000.0	100,000.0	100,000.0	100,000.0	100,000.0
0	Natural Gas (Therms)	-	-	-	-	-	-	-	-	-
-	Diesel#2 (Gallons)	-	-	-	-	-	-	-	-	-
-	#5/#6 Oil (Gallons)	-	-	-	-	-	-	-	-	-
-	Gasoline (Gallons)	-	-	-	-	-	-	-	-	-
-	LPG (Gallons)	-	-	-	-	-	-	-	-	-
-	District Heat (mmBTU)	-	-	-	-	-	-	-	-	-
0	Coal (mmBTU)	-	-	-	-	-	-	-	-	-
-	Biomass (mmBTU)	-	-	-	-	-	-	-	-	-
-	Biodiesel (Gallons)	-	-	-	-	-	-	-	-	-
-	Ethanol (Gallons)	-	-	-	-	-	-	-	-	-
341,214										

Baseline CO2e Emission (Tons)	2019	2020	2021	2022	2023	2024	2025	2026	2027
Electricity	-	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2
Natural Gas	-	-	-	-	-	-	-	-	-
Diesel#2	-	-	-	-	-	-	-	-	-
#5/#6 Oil	-	-	-	-	-	-	-	-	-
Gasoline	-	-	-	-	-	-	-	-	-
LPG	-	-	-	-	-	-	-	-	-
District Heat	-	-	-	-	-	-	-	-	-
Coal	-	-	-	-	-	-	-	-	-
Biomass	-	-	-	-	-	-	-	-	-
Biodiesel	-	-	-	-	-	-	-	-	-
Ethanol	-	-	-	-	-	-	-	-	-
Total Emissions CO2e (Tons)	-	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2
Emissions for Study Period	-	41.2	41.2	41.2	41.2	41.2	41.2	41.2	41.2
Life Cycle Emissions CO2e (Tons)	2,100.4								



Washington State Building Code Council • Code Change Cycle 2018 Group 2
2018 International Residential Code Review TAG Worksheet
TAG PROPOSED CHANGES - FINAL

International Residential Code (RCW 19.27.031(1)(b))

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
WAC Administration Scope and Administration (SBCC Staff)						
---	---	WAC 51-51-008 Implementation	States adoption date. Needs amendment	N	Y	11/14/2018 TAG recommends an amendment
Chapter 1 Scope and Administration (Kim Flanary, Willie Hill)						
Same	R101	WAC 51-51-01010 Scope	Need to reconcile changes with 2018 Code with WAC. On 11/14/2018 the TAG recommended keeping the WAC unchanged, however, SBCC staff is asking for another look.	N	Y	12/12/2018 TAG recommends an amendment
Chapter 2 Definitions. (Kim Flanary, Willie Hill)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Same	R202	WAC 51-51-0202 Definitions	ADULT FAMILY HOME ~~AIR-IMPERMEABLE INSULATION~~. (Omit This is addressed in the 2018 Code) ATTIC, HABITABLE. CHILD CARE, FAMILY HOME. CHILD DAY CARE, CONDITIONED SPACE. DWELLING UNIT. FIRE SEPARATION DISTANCE. MEZZANINE, LOFT. SALT WATER COASTAL AREA. SMALL BUSINESS. WHOLE HOUSE VENTILATION SYSTEM.	N	Y	11/14/2018 TAG recommends no amendment but asked staff to verify. An amendment is needed to omit one definition. 12/12/2018 TAG recommends amendment

Chapter 3 Building Planning (Jim Tinner, Al Audette)

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	R301	WAC 51-51-0301 Design Criteria	R301.2 Climatic and geographic design criteria. R301.2.2.3.1 Height limitations. R301.5 Live load. Need to maintain the state amendment regarding 60 PSF deck live loads	N	Y	11/14/2018 TAG Requested that the Residential Energy Code TAG review R301.2, Strike the amendment regarding R301.2.2.3.1 because it is addressed in the 2018 Code and retain the amendment for R301.5 12/12/2018 TAG recommends acceptance of amendment changes

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	R302	WAC 51-51-0302 Fire-resistant construction	R302.1 Exterior walls (Addressed in 2018 IRC) R302.2 Townhouses. (Addressed in 2018 IRC) R302.2.1 Continuity. R302.2.4 Structural independence R302.3.1 Supporting construction R302.13 Fire protection of floors	N	Y	11/14/2018 TAG recommends keeping the RCW but eliminating R302.1 and R302.2 12/12/2018 TAG tabled review of this section 1/18/2019 TAG approved amendment
	R308	WAC 51-51-0308 Glazing	R308.4.4 Glazing in guards and railings. R308.4.4.1 Structural glass baluster panels. Addressed in 2018 Code	N	Y	11/14/2018 TAG recommends eliminating the RCW 12/12/2018 TAG recommends amendment

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	R324	WAC 51-51-03240 Solar energy systems	R324.1 General. (Addressed in 2018) R324.2 Solar thermal systems. (Addressed in 2018) R324.3.1 Equipment listing (Addressed in 2018) R324.4 Rooftop-mounted photovoltaic systems (Retain Amendment) R324.4.1 Roof load. (Addressed in 2018) R324.4.2 Wind resistance (Addressed in 2018) R324.5 Building-integrated photovoltaic systems (Addressed in 2018) R324.5.1 Photovoltaic shingles. (Retain Amendment) R324.6 Ground-mounted photovoltaic systems. (Addressed in 2018) R324.7 Access and Pathways (Retain amendment but renumber to R324.6	N	Y	11/14/2018 TAG recommends modifying the RCW as noted to the left 12/12/2018 TAG recommends amendment

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	R325	WAC 51-51-0325 Adult family homes	R325.1 General. R325.3 Sleeping room classification. R325.4 Types of locking devices and door activation. R325.5 Smoke and carbon monoxide alarm requirements. R325.6 Escape windows and doors. R325.7 Fire apparatus access roads and water supply for fire protection. R325.8 Grab bar general requirements. R325.8.1 Grab bar cross section. R325.8.2 Grab bar installation. R325.8.3 Grab bars at water closets. R325.8.3.1 Fixed position grab bars. R325.8.3.2 Swing-up grab bars. R325.8.4 Grab bars at bathtubs. R325.8.4.1 Vertical grab bars. R325.8.4.2 Horizontal grab bars. R325.8.5 Grab bars at shower stalls. R325.8.5.1 Vertical grab bars. R325.8.5.2 Horizontal grab bars. R325.9 Ramps. R325.9.1 Handrails for ramps. R325.10 Stair treads and risers.	N	Y	11/14/2018 TAG recommends keeping the RCW but modifying it to match the revised numbering 12/12/2018 TAG tabled review of this section 1/18/2019 TAG recommends amendment

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
			R325.10.1 Handrails for treads and risers. R325.11 Shower stalls. Recommend retaining state amendment and renumbering to R330			
R329	R326	WAC 51-50-0326 Family home child care	R326 Family home child care.	N	Y	11/14/2018 TAG recommends keeping the RCW but modifying it to match the revised numbering 12/12/2018 TAG tabled review of this section 1/18/2019 TAG recommends amendment

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
R330	R327	WAC 51-51-0327 Protection against radon	R327.1 Protection Against Radon.	N	Y	11/14/2018 TAG recommends keeping the RCW unchanged Staff noticed the need for number changes. 1/18/2019 TAG recommends amendment
	R328	WAC 51-51-0328 Mezzanines	R328.1 General. R328.2 Mezzanines. R328.3 Area limitation R328.4 Means of egress. R328.5 Openness This changed last code cycle and got missed. Recommend delete amendment. Also note that habitable attics are now included in mezzanine portion of the IRC	N	Y	11/14/2018 TAG recommends eliminating the RCW
	R329	WAC 51-51-0329 Swimming pools, spas, and hot tubs	R329.1 General. Only adopt the barrier portions - Renumber state amendment. Defer to Plumbing TAG	N	Y	11/14/2018 TAG recommends modifying the RCW as noted to the left.

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Chapter 4 Foundations (Willie Hill)						
Chapter 5 Floors (Michelle Yee, Tim Woodard)						
R507.9.2	R507.2.4	WAC 51-51-0507 Deck lateral load connections	State amendment needed to section 507.9.2 of 2018 for exemption for decks under 30 inches. Recommend only carrying forward the exception. State amendment needed for foot note “e” to Table R507.9.1.3(2). Recommend carrying forward all of existing R507.2.1 of State Amendment and replacing the new table R507.9.1.3(2) TW Other impacts noted during 12/12/2018 meeting. Look at charging language.	N	Y	12/5/2018 TAG recommends an amendment to the amendment 12/12/2018 TAG tabled review of this section 1/18/2019 TAG recommends eliminating amendment
Chapter 6 Wall Construction (Kim Flanary)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Same	R602.7.5	WAC 51-51-0602 Supports for headers	This section is not adopted Recommend omitting the amendment and adopting the 2018 changes. See directly below.	N	Y	12/5/2018 TAG asked staff to prepare a position statement 12/12/2018 TAG recommends acceptance of amendment changes
R602.10.10	R602.10.11	WAC 51-51-0602 Cripple wall bracing	Change not addressed in 2018 code. Modify amendment to reflect renumbering in 2018	N	Y	12/5/2018 TAG recommends modifying the amendment 12/12/2018 TAG recommends acceptance of amendment changes
Chapter 7 Wall Covering (Jim Tinner)						
Chapter 8 Roof-ceiling Construction (Michelle Yee)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Chapter 9 Roof Assemblies (Tim Woodard)						
Chapter 10 Chimneys and Fireplaces (SBCC Staff)						
	R1006	WAC 51-51-1006 Exterior air supply	Amendment was not addressed by the 2018 IRC. Recommend addressing numbering conflict by renumbering amendment R1006.2 to R1006 .6	N	Y	11/14/2018 TAG recommends keeping WAC but revising numbering
Chapter 11 Not adopted per WAC 51-51-003)						
Chapter 12 Mechanical Administration (IMC TAG)						
	M1201.1	WAC 51-51-1201 Scope		N	Y	1/8/2019 TAG recommends modifying this WAC
Chapter 13 General Mechanical System Requirements (IMC TAG)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Chapter 14 Heating and Cooling Equipment and Appliances (IMC TAG)						
Chapter 15 Exhaust Systems (IMC TAG)						
	M1505.1	WAC 51-51-1505 General	The amendment calls out thickness and clearances. Renumber Look into mfg req	N	Y	1/8/2019 TAG recommends modifying this WAC
M1505.1	M1507.1	WAC 51-51-1507 General	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.2	M1507.2	WAC 51-51-1507 Recirculation of air	Recommend change amendment to require all hood exhausts to always discharge to out of doors, similar to toilet exhaust Note: 1/8/2019 TAG did not support this change at this time.	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3	M1507.3	WAC 51-51-1507 Whole-house mechanical ventilation system	Code change is to get better confirmation that the equipment installed will actually perform. By gaining a certification label, the fan equipment will have shown capable of meeting a standard of performance. Change amendment to include the new reference standard numbers	Y	Y	1/8/2019 TAG recommends modifying this WAC
M1505.3.1	M1507.3.1	WAC 51-51-1507 System design	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.2	M1507.3.2	WAC 51-51-1507 Control and operation	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.2.1	M1507.3.2.1	WAC 51-51-1507 Operating instructions	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3.3	M1507.3.3	WAC 51-51-1507 Mechanical ventilation rate	No problem with the code change to give more direction on quantity of air for the mechanical ventilation rate. The code change table values are same as 1507.3.3 (1) and are from ASHRAE 62.2-2010	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
Table M1505.3.3(1)	Table M1507.3.3 (1)	WAC 51-51-1507 Continuous Whole-House Mechanical Ventilation System Airflow Rate Requirements	No problem with the code change to give more direction on quantity of air for the mechanical ventilation rate. The code change table values are same as 1507.3.3 (1) and are from ASHRAE 62.2-2010	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
Table M1505.3.3(2)	Table M1507.3.3 (2)	WAC 51-51-1507 Intermittent Whole-House Mechanical Ventilation Rate Factors	No problem with the code change to give more direction on quantity of air for the mechanical ventilation rate. The code change table values are same as 1507.3.3 (1) and are from ASHRAE 62.2-2010	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.4	M1507.3.4	WAC 51-51-1507 Whole-house ventilation using exhaust fans	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3.4.1	M1507.3.4.1	WAC 51-51-1507 Whole-house ventilation fans	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.4.2	M1507.3.4.2	WAC 51-51-1507 Fan noise	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.4.3	M1507.3.4.3	WAC 51-51-1507 Fan controls	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.4.4	M1507.3.4.4	WAC 51-51-1507 Ventilation openings	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3.5	M1507.3.5	WAC 51-51-1507 Whole-house ventilation integrated with a forced-air system	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.5.1	M1507.3.5.1	WAC 51-51-1507 Integrated whole-house ventilation systems	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.5.2	M1507.3.5.2	WAC 51-51-1507 Ventilation duct insulation	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.5.3	M1507.3.5.3	WAC 51-51-1507 Outdoor air inlets	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3.6	M1507.3.6	WAC 51-51-1507 Whole-house ventilation using a supply fan	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.6.1	M1507.3.6.1	WAC 51-51-1507 Outdoor air	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.6.2	M1507.3.6.2	WAC 51-51-1507 Ducts	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
Table M1505.3.6.2	Table M1507.3.6.2	WAC 51-51-1507 Prescriptive Supply Fan Duct Sizing	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3.6.3	M1507.3.6.3	WAC 51-51-1507 Dampers	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.6.4	M1507.3.6.4	WAC 51-51-1507 Ventilation duct insulation	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.6.5	M1507.3.6.5	WAC 51-51-1507 Outdoor air inlets	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.7	M1507.3.7	WAC 51-51-1507 Whole-house ventilation using a heat recovery ventilation system	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
M1505.3.7.1	M1507.3.7.1	WAC 51-51-1507 Heat recovery ventilation systems	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.7.2	M1507.3.7.2	WAC 51-51-1507 Ventilation duct insulation	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.3.7.3	M1507.3.7.3	WAC 51-51-1507 Outdoor air inlets	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.4	M1507.4	WAC 51-51-1507 Local exhaust	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Table M1505.4	Table M1507.4	WAC 51-51-1507 Minimum Required Local Exhaust Rates For One- and Two-Family Dwellings	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.4.1	M1507.4.1	WAC 51-51-1507 Local exhaust fans	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
M1505.4.2	M1507.4.2	WAC 51-51-1507 Local exhaust controls	No changes are recommended	N	Y	1/8/2019 TAG recommends modifying this WAC to match model code numbering
Chapter 16 Duct Systems (IMC TAG)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	M 1602.2	Return air opening locations for H, V, &AC systems	Adds item 7 Return air shall not be taken from natatorium enclosures UNLESS THE AIR IS DEHUMIDIED RM37-15 Strike Item 5 except --	Y IF ADDING DEHUMIDIFICATION TO BE ABLE TO RETURN AIR FROM NATATORIUM SPACE.	Y	1/8/2019 TAG recommends an amendment.
Chapter 17 Combustion Air (IMC TAG)						
Chapter 18 Chimneys and Vents (IMC TAG)						
Chapter 19 Special Appliances, Equipment and Systems (IMC TAG)						
Chapter 20 Boilers and Water Heaters (IMC TAG)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Chapter 21 Hydronic Piping (IMC TAG)						
Chapter 22 Special Piping and Storage Systems (IMC TAG)						
Chapter 23 Solar Thermal Energy Systems (IMC TAG)						
	M2301.2.3	WAC 51-51-2300 Pressure and temperature relief valves and system components	There is an added reference to the ICC 900. This amendment points to state adopted plumbing code (UPC). The base language this sub-section points to P2804 of the IRC which is consistent with IPC and not the state adopted UPC.	N	Y	1/8/2019 TAG recommends an amendment.
Chapter 24 Fuel Gas (IMC TAG)						
Chapters 25 – 43 Not adopted per WAC 51-51-003						
Chapter 44 Referenced Standards (SBCC Staff)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Appendix F Radon Gas Methods (Adopted per WAC 51-51-003) (Willie Hill)						
	Appendix F	WAC 51-51-60101 Radon control methods				
Same	AF103	WAC 51-51-60103 Requirements	**AF103.1 General**. The following construction techniques are intended to resist radon entry and prepare the building for post-construction radon mitigation, if necessary (see Figure AF102). These techniques are required in high radon potential counties designated in Table AF101(1).	N	Y	12/5/2018 TAG recommends revisiting this amendment 12/12/2018 TAG recommends acceptance of amendment changes
Appendix Q (2015 IRC) Dwelling unit fire sprinkler systems (Adopted per WAC 51-51-003) (Todd Short)						
Appendix U	Appendix Q	WAC 51-51-60105 Dwelling unit fire sprinkler systems	The design and installation of residential fire sprinkler systems shall be in accordance with the 2015 International Residential Code Section P2904 Dwelling Unit Fire Sprinkler Systems. Q is now Tiny Houses	N	Y	12/12/2018 TAG recommends acceptance of amendment changes

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Appendix T Solar-ready Provisions—Detached One- and Two-family Dwellings and Townhouses (SBCC Staff)						
Appendix T	Appendix U	WAC 51-51-60106 Solar-ready provisions-detached one- and two-family dwellings, multiple single-family dwellings (townhouses)	Some but not all of the amendment have been addressed by the 2018 IRC. An amendment is recommended. Note: adoption without SBCC approval is addressed in RCW 50-50-0102.	N	Y	11/14/2018 TAG recommend an amendment which includes local adoption without SBCC approval or notification 12/12/2018 TAG recommends acceptance of amendment changes
Appendix V (2015 IRC) Fire Sprinklers (Todd Short)						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	Appendix V	WAC 51-51-60107 Fire sprinklers	Fire sprinklers. The provisions contained in this appendix are not mandatory unless specifically referenced in the adopting ordinance. AV107.1 Fire sprinklers. An approved automatic fire sprinkler system shall be installed in new one-family and two-family dwellings and townhouses in accordance with Appendix Q.	N	Y	12/12/2018 TAG recommends acceptance of amendment changes.

Washington State Building Code Council • Code Change Cycle 2018 Group 2
2018 Uniform Plumbing Code Review Worksheet
Tag Proposed Changes - Final

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	Chapter 1 Scope and Administration					
	Chapter 2 Definitions.					
	Chapter 3 General Regulations					
309.5		Sound Transmission			Y	Amendment needed Strike 309.5 Sound Transmission
	Chapter 4 Plumbing Fixtures and Fixture Fittings					
	414.3	WAC 51-56-0400 Drain Connection			Y	Keep Amendment Edit reference to 807.3

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	Chapter 5 Water Heaters					
	501.1	WAC 51-56-0500 Applicability	The minimum capacity for water heaters shall be in accordance with the first hour rating listed in Table 501.1(2) to match model code Table 501.1(1) has been moved to this location and renumbered. Table 501.1(2) has been updated by a TIA and renumbered. This table was changed by a WA State Amendment which needs to be reviewed to see if it is still needed.	N	Y	Re-number "2" to match model code. Editorial Change
	Chapter 6 Water Supply and Distribution					
	603.5.12	WAC 51-56-0600 Beverage Dispensers	Editorial – changed 'in accordance' to 'that complies'		Y	Keep Amendment (change to complies with)
	603.5.21	Chemical Dispensers	New Section, check compatibility with DOH reg		Y	Amendment Needed Referencing DOH see section 603.1

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	604.1	Table 604.1	Standards updated, added table note		Y	Editorial change needed. To match model code
	604.13	Water Heater Connectors	Editorial – changed 'be in accordance' to 'comply'		Y	Editorial change needed. To match model code
	605.1.3.3 **605.1.4** **605.1.5** **605.2.2** **605.3.1** **605.5.2** **605.6.1.1** **605.6.1.3** **605.8** **605.9.1** **605.10.1** **605.12.2**	Joints	Editorial – changed 'be in accordance' to 'comply'		Y	Editorial change needed. To match model code. comply

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	606.1	Valves	Added full-port, changed 'be in accordance' to 'comply', updated standards		Y	Editorial change needed. To match model code. comply
	607.2 **608.2** **608.5** **608.7** **609.10**	Various	Editorial changed 'be in accordance' to 'comply'		Y	Editorial change needed. To match model code. comply
	608.3	WAC 51-56-0600 Expansion Tanks, and Combination Temperature and Pressure-Relief Valves	Same		Y	Keep Amendment Add exception from 608.3.1
	608.3.1	WAC 51-56-0600	Same		Y	Delete 608.3.1
	608.5	WAC 51-56-0600 Discharge Piping	Same		Y	Keep Amendment Editorial change needed. To match model code. comply
	Chapter 7 Sanitary Drainage					

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
Chapter 9 Vents						
	903.1	WAC 51-56-0900 Applicable Standards	Code change deletes reference to Table 701.1 (which is what the state amendment does) and adds specific requirements for testing plastic pipe and tubing to ASTM E84 or UL 723. Recommend accepting the code change. No need for state amendment. No economic impact.	N	Y	Delete Amendment
Chapter 10 Traps and Interceptors						
Chapter 11 Storm Drainage						
1101.13	WAC 51-56-1100 Cleanouts	No changes here	NOTE: the only other change in this section was in 1104.2 Conductors: 2015 code stated be in accordance: 2018 code states "Shall Comply Keep amendment		Y	Keep Amendment Edit shall Comply
Chapter 12 Fuel Gas Piping NOT ADOPTED						
Chapter 13 Health Care Facilities Med Gas & Vacuum Syst.						
Chapter 14 Firestop Protection						

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	Chapter 15 Alt. Water Sources for Nonpotable App.					
	1501.1.1	WAC 51-56-1500 Allowable use of Alternative Water			Y	Amendment Needed. To say: The provisions of this chapter and the Washington state department of health shall apply to the construction, alteration and repair of alternate water source systems for non – potable applications. Delete all other amendments in chapter 15

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	1501.2	WAC 51-56-1500 System Design	Alternate water source systems shall be designed in accordance with this chapter, and applicable department of health rules by a registered design professional		Y	Delete Amendment
	1501.11.2.3	WAC 51-56-1500 Discovery of Cross-Connection	In the event that an unauthorized cross-connection with the potable water system is discovered, the following procedure, , in the presence of the AHJ, shall be activated immediately		Y	Delete Amendment
	1501.13.1	WAC 51-56-1500 General			Y	Delete Amendment
	1502.0	WAC 51-56-1500 Gray Water Systems	**NOT ADOPTED**		Y	Delete Amendment
	1503.4	WAC 51-56-1500 Connection to Potable or Reclaimed (Recycled) Water Systems			Y	Delete Amendment
	1504.1	WAC 51-56-1500 General	1501.1.1 Allowable use of Alternative Water. Where approved or required by the authority having jurisdiction, alternate water sources (reclaimed (recycled) water, gray water and on-site treated nonpotable water) shall be permitted		Y	Delete Amendment

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	1504.7	WAC 51-56-1500 On-Site Treated Nonpotable Water Devices and Systems	Devices or equipment used to treat nonpotable water for on-site use in order to maintain the minimum water quality requirements determined by the authority having jurisdiction shall be approved by the department of health.		Y	Delete Amendment
	1504.10.2	WAC 51-56-1500 Reserved	**RESERVED NO TEXT**		Y	Delete Amendment

Chapter 16 Nonpotable Rainwater Catchment Syst.

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
	1601.11.1	WAC 51-56-1600 General			Y	New amendment To say: The provisions of this chapter and the Washington state department of health shall apply to the construction alteration and repair of non-potable rainwater catch systems. Delete all other amendments in chapter 16
	1602.0	WAC 51-56-1600 Nonpotable Rainwater Catchment Systems	**NO TEXT**		Y	Delete Amendment
	1602.1	WAC 51-56-1600 General	The installation, construction, alteration, and repair of rainwater catchments systems shall be approved by the authority having jurisdiction		Y	Delete Amendment
	1602.11.2.3	WAC 51-56-1600 Discovery of Cross-Connection			Y	Delete Amendment

2018 Code Section	2015 Code Section	Title or Subject	Reviewer Comments	Economic Impact (Y/N)	Amend Needed (Y/N)	TAG Comments/ Recommendation
		Chapter 17 Reference Standards				
		Appendices A,B,I				

2019 Legislative Session Bill Tracking Log
State Building Code Council
Bills of Interest

Bill Number	Title	Sponsor	Description	Position	Committee/ Action
HB 1023 **SB 5396**	Allowing certain adult family homes to increase capacity to eight beds.	Macri Keiser	This bill allows certain adult family homes to increase capacity from six to eight beds and imposes specific criteria for licensing for 7 or 8 beds Added required sprinklers to last year's bill	For a similar bill in 2018: Concern – Monitor Neutral - Monitor	H Rules Health & Long Term Care 2/1/2019: 8:00
HB 1040 SHB 1040 **SB 5106**	Concerning the creation of a work group to study and make recommendations on natural disaster mitigation and resiliency activities	Reeves Das	AN ACT Relating to the creation of a work group to study and make recommendations on natural disaster mitigation and resiliency activities	Neutral – Monitor	H Appropriations **S Rules**
HB 1103 **SB 5284**	Concerning smoke detection devices	Eslick Liias	AN ACT Relating to smoke detection devices; and prescribing penalties. This bill addresses smoke detection devices but does not impact the SBCC as currently written. As the bill works its way through the adoption process it is possible it might be linked to "RCW 19.27.530 Carbon monoxide alarms—Requirements—Exemptions—Adoption of rules". RCW 19.27 is the SBCC RCW.	Neutral – Monitor	Consumer Protection & Business Financial Inst., Econ. Dev. & Trade

Bill Number	Title	Sponsor	Description	Position	Committee/ Action
HB 1112	Concerning reducing greenhouse gas emissions from hydrofluorocarbons	Fitzgibbon	AN ACT Relating to reducing greenhouse gas emissions from 2 hydrofluorocarbons and prescribing penalties. Calls for SBCC to adopt rules allowing appropriate substitutions.	Neutral – Monitor	**H Appropriations** 2/11/19, 3:30 Exec 2/13, 3:30
SB 5426		Mullet			Energy, Env & Tech 2/05/2019: 10:00 Exec 2/7 10:00
HB 1134	Concerning standardizing fire safety codes for mobile food establish-ments	Peterson	AN ACT Relating to standardizing fire safety codes for mobile 2 food establishments	Neutral – Monitor	Local Gov 2/01/2019: 10:00 Exec 2/15 10:00
HB 1257	Concerning Energy conservation	Doglio	This act modifies the Energy Code and Building Code., The act authorizes local governments to voluntarily adopt energy codes for residential structures that achieve even greater energy savings and greenhouse gas reductions than the minimum state energy code; The act also requires electrical vehicle charging capability at all new buildings where parking is provided	Neutral – Monitor	Environ & Energy Exec 2/07 8:00
SB 5293		Carlyle			Environ, Energy & Technology Exec 2/7 10:00

Key:

Rules 2G 3C	Bill eligible to placed on Floor Calendar
Rules R, C or 2	In Rules Committee
2nd Read	Bill on House Suspension Calendar (scheduled for floor debate and will likely not be amended)
~~Struck through text~~	Bill did not pass cutoff date

Bill Number	Title	Sponsor	Description	Position	Committee/ Action
HB 1353	Concerning accessory dwelling units zoning	Vick	This act allows local governments to allow accessory apartments outside the urban growth area. While the act as written does not impact the SBCC, amendments might.	Neutral – Monitor	Environ & Energy 02/11/19, 1:30
HB 1402 **SB 5587**	Concerning product certification agencies	Blake Salomon	This act authorizes product certification agencies to certify building products and methods of construction, design, and systems for alternate code compliance.	Neutral – Monitor	Local Gov 1/30/2019: 8:00 Local Gov 02/12/19, 8:00
HB 1444 **SB 5115** SSB 5115	Appliance efficiency	Morris Caryle	This bill modifies provisions regarding efficiency standards for some appliances and building fixtures. Coordination between RCW 19.27 and RCW 19.260 has been problematic. This bill repeals RCW 19.27.170	Neutral – Monitor May lock in obsolete standards Neutral – Monitor May lock in obsolete standards	Env & Energy Exec 2/07 8:00 **S Ways & Means** 2/12/19 3:30
HB 1567 **SB 5697**	Concerning the sale and installation of solid fuel burning devices.	Doglio Cleveland	This bill calls for the SBCC to revisit the approved method for testing factory-built fireplaces (Sec 2 ((c))	Neutral – Monitor Neutral – Monitor	Env. & Energy 02/12/19, 3:30 Env., Energy & Technology 2/13/19 8:00

Key:

Rules 2G 3C	Bill eligible to placed on Floor Calendar
Rules R, C or 2	In Rules Committee
2nd Read	Bill on House Suspension Calendar (scheduled for floor debate and will likely not be amended)
~~Struck through text~~	Bill did not pass cutoff date

Bill Number	Title	Sponsor	Description	Position	Committee/ Action
HB 1747	Concerning risk-based water standards	Doglio	The bill calls for the Department of Health in consultation with the SBCC to adopt rules for risk based water quality standards for the on-site treatment and reuse of nonpotable alternative water sources for nonpotable end uses	Neutral – Monitor	**Local Gov** 02/12/19
HB 1797	Accessory dwelling units	Gregerson	Requires local governments to allow ADUs and sets criteria for regulation. Requires the SBCC to adopt rules.	Neutral – Monitor	**Local Government**
SB 5812		Palumbo		Neutral – Monitor	**Housing Stability & Affordability**
HB 1862	Net metering	Mead	This bill increases the net-metering availability obligation for utilities. DES Impact: The SBCC, in consultation with the department of commerce and local governments, shall conduct a study of the state building codes and adopt changes necessary to encourage greater use of renewable energy systems. (Sec.4)	Neutral – Monitor	**Environ & Energy**
SB 5223 SSB 5223	Net metering	Palumbo		Neutral – Monitor	**S Ways & Means** 2/05/19, 3:30
~~**SB 5235**~~	~~Concerning plumbing~~	~~Keiser~~	~~This bill does not impact the SBCC~~	~~Neutral – Monitor~~	
SB 5382	Concerns Tiny Home Accessory Dwelling	Zeiger	This act addresses tiny houses serving as accessory dwelling units. The act defines "tiny houses" as structures in accordance with the International Residential Code (IRC) Appendix Q. (Sec.1(1)) As written, the SBCC would have to adopt IRC Appendix Q	Neutral – Monitor	**Housing Stability & Affordability** 2/06/19, 1:30

Key:

Rules 2G 3C	Bill eligible to placed on Floor Calendar
Rules R, C or 2	In Rules Committee
2nd Read	Bill on House Suspension Calendar (scheduled for floor debate and will likely not be amended)
~~Struck through text~~	Bill did not pass cutoff date

Bill Number	Title	Sponsor	Description	Position	Committee/ Action
SB 5383	Concerns tiny house zoning	Zeiger	This act addresses the relationship between tiny houses and land subdivision as well as with Labor and Industries. The act defines "tiny houses" as structures in accordance with the International Residential Code (IRC) Appendix Q (Sec.4). The act requires the SBCC to adopt IRC Appendix Q (Sec5(1)(b)) which can be addressed during the normal course of SBCC business.	Neutral – Monitor	**Housing Stability & Affordability** 2/06/19, 1:30
SB 5384	Concerns tiny house communities	Zeiger	This act addresses the relationship between tiny houses and growth management. The act defines "tiny houses" as structures in accordance with the International Residential Code (IRC) Appendix Q. As written, the SBCC would have to adopt IRC Appendix Q	Neutral – Monitor	**Local Government** 2/05/19, 8:00
SB 5557	Concerning seismic hazard risk reduction	Liias	This bill addresses seismic hazard risk reduction. It calls for a member of the SBCC to serve on a task force. It also requires the Department of Commerce to work with the SBCC to determine criteria for the types and quality of construction that meet a functional recovery standard. The bill calls for the SBCC to adopt Appendix A of the International Existing Building Code	Neutral – Monitor	**Local Government** 2/07/19, 8:00
SB 5634	Concerning SBCC	Brown	Allowing code modifications only once every five years	Neutral – Monitor	**Local Government** 2/12/19, 8:00

Key:
Rules 2G 3C Bill eligible to placed on Floor Calendar
Rules R, C or 2 In Rules Committee
2nd Read Bill on House Suspension Calendar (scheduled for floor debate and will likely not be amended)
~~Struck through text~~ Bill did not pass cutoff date

State Building Code Council Summary

Operating Revenue	Biennium 17/19 Projection*	Biennium 17/19 Planned	Variance from Plan	Biennium 19/21 Planned	Variance from planned 19/21 to planned 17/19
04/99/000110 P-Card Incentive Rebate	26	0	26	0	0
04/99/006000 Misc Recovery of Expenditures	10,682	0	10,682	0	0
Total Revenue	**10,708**	**0**	**10,708**	**0**	**0**

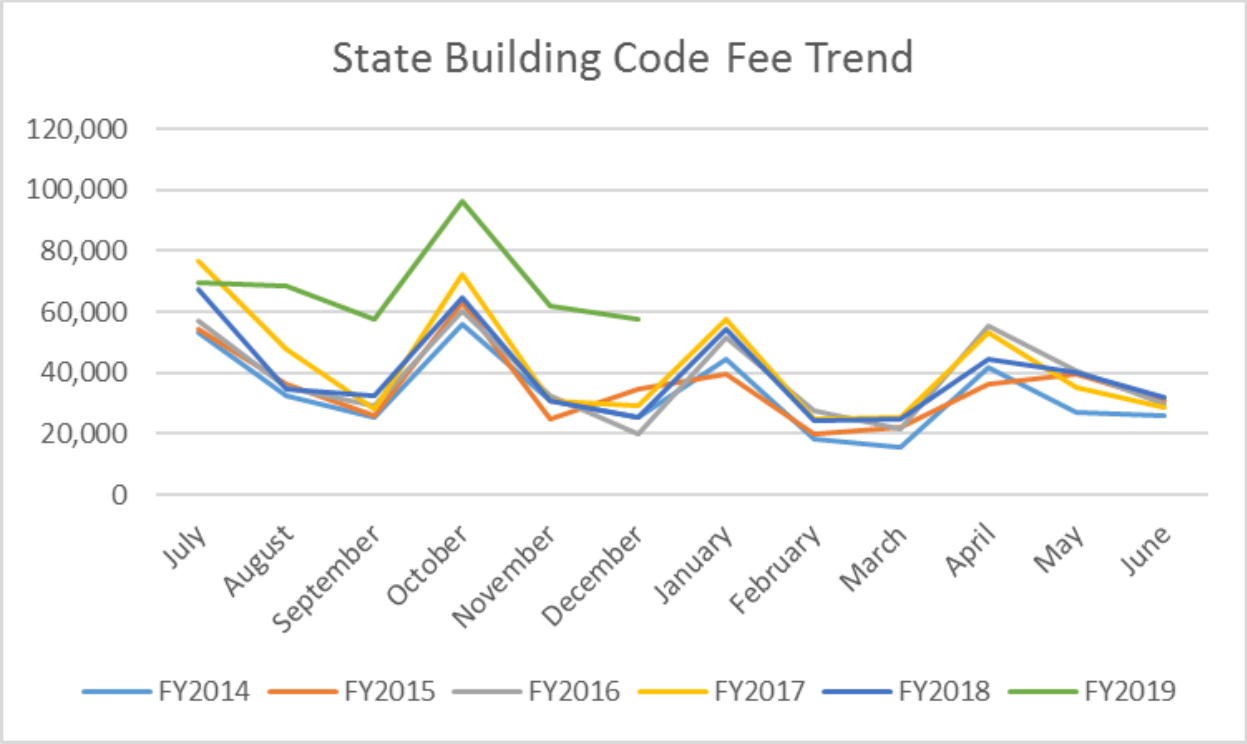
Operating Expenses	Biennium 17/19 Projection*	Biennium 17/19 Planned	Variance from Plan	Biennium 19/21 Planned	Variance from planned 19/21 to planned 17/19
A / Salaries and Wages	493,683	524,274	30,591	726,984	202,710
B / Employee Benefits	172,360	178,058	5,698	262,245	84,187
C / Professional Service Contracts	240,000	240,000	0	0	(240,000)
E / Goods and Services	226,637	243,799	17,162	304,749	60,950
G / Travel	56,088	72,000	15,912	90,000	18,000
JA,JB - Non Capitalized Equip	2,983	900	(2,083)	1,125	225
TE / Internal Allocations	194,662	197,079	2,417	246,349	49,270
Total Expenses	**1,386,413**	**1,456,110**	**69,697**	**1,631,452**	**175,342**

Net Income	Biennium 17/19 Projection*	Biennium 17/19 Planned	Variance from Plan	Biennium 19/21 Planned	Variance from planned 19/21 to planned 17/19
Net Income (Loss) Operating	**(1,375,705)**	**(1,456,110)**	**80,405**	**(1,631,452)**	**175,342**
Non-Operating Revenue/Transfers					
02/99/000001 State Building Code Fee	1,529,285	1,653,600	(124,315)	2,203,200	549,600
02/99/000004 Architect License Fee	20,734	10,700	10,034	41,468	30,768
Total Non-Operating Revenue/Transfers	**1,550,019**	**1,664,300**	**(114,281)**	**2,244,668**	**580,368**
TOTAL Net Income	**174,314**	**208,190**	**(33,876)**	**613,217**	**755,710**

Staffing	Biennium 17/19 Projection*	Biennium 17/19 Planned	Variance from Plan	Biennium 19/21 Planned	Variance from planned 19/21 to planned 17/19
Total FTEs	3.53	3.42	(0.11)	5.00	1.58

Balance Sheet Summary	Cash and Cash Equivalents	Current Assets	Current Liabilities	Working Capital	Current Ratio	Unrestricted Net Position	Total Net Position
Through Fiscal Month 18, December 2018	233,796	233,796	16,630	217,166	14.06	217,166	217,166

* Biennium 17/19 Projection includes 18 months of actuals plus 6 months of remaining allotments.


State Building Code Fee Trend
120,000
100,000
80,000
60,000
40,000
20,000
0
July
August
September
October
November
December
January
February
March
April
May
June
FY2014
FY2015
FY2016
FY2017
FY2018
FY2019