

# Title 51 WAC

## BUILDING CODE COUNCIL

**Chapters**

<p><b>51-04</b> Policies and procedures for consideration of state-wide and local amendments to the State Building Code.</p> <p><b>51-06</b> Public records.</p> <p><b>51-08</b> Uniform procedural rules.</p> <p><b>51-10</b> Barrier-free facilities.</p> <p><b>51-11</b> Washington State Energy Code.</p> <p><b>51-13</b> Ventilation and indoor air quality.</p> <p><b>51-16</b> State Building Code update and amendment—Adoption of the 1988 editions of the Uniform Codes.</p> <p><b>51-18</b> Washington state water conservation performance standards.</p> <p><b>51-19</b> Washington State Historic Building Code.</p>	<p>51-12-107</p> <p>51-12-108</p> <p>51-12-109</p> <p>51-12-110</p> <p>51-12-200</p>	<p>filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 107. Inspections and Enforcement. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-107, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 108. Severability. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-108, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 109. Violations. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-109, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 110. Liability. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-110, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 200. General. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-200, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p>
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**DISPOSITION OF CHAPTERS FORMERLY CODIFIED IN THIS TITLE**

**Chapter 51-12  
WASHINGTON STATE ENERGY CODE**

<p>51-12-100</p> <p>51-12-101</p> <p>51-12-102</p> <p>51-12-103</p> <p>51-12-104</p> <p>51-12-105</p> <p>51-12-106</p>	<p>51-12-201</p> <p>51-12-202</p> <p>51-12-203</p> <p>51-12-204</p> <p>51-12-205</p> <p>51-12-206</p> <p>51-12-207</p>	<p>Section 100. Title. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-100, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 101. Intent. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-101, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 102. Scope. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-102, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-102, filed 9/23/86; 86-11-013 (Order 86-04), § 51-12-102, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-102, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 103. Conflicts with Other Codes. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-103, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 104. Materials and Equipment. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-104, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 105. Alternate Materials—Method of Construction, Design or Insulating Systems. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-105, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 106. Plans and Specifications. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-106, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 201. A. [Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-201, filed 9/23/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-201, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 202. B. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-202, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 203. C. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-203, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 204. D. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-204, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 205. E. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-205, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 206. F. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-206, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-206, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p> <p>Section 207. G. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-207, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.</p>
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- 51-12-208 Section 208. H. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-208, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-209 Section 209. I. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-209, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-210 Section 210. J. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-210, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-211 Section 211. K. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-211, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-212 Section 212. L. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-212, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-213 Section 213. M. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-213, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-214 Section 214. N. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-214, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-215 Section 215. O. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-215, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-216 Section 216. P. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-216, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-217 Section 217. Q. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-217, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-218 Section 218. R. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-218, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-219 Section 219. S. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-219, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-219, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-220 Section 220. T. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-220, filed 1/3/90, effective 7/1/90. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-220, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-221 Section 221. U. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-221, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-222 Section 222. V. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-222, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-223 Section 223. W X Y Z. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-223, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-223, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-300 Section 300. General. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-300, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-301 Section 301. Heated and Cooled Buildings. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-301, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-302 Section 302. Climatic Zones. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-302, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-303 Section 303. Departures. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-303, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-304 Section 304. Design Parameters. [Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-304, filed 9/23/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-304, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-305 Section 305. Ventilation. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-305, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-305, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-400 Section 400. General. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-400, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-401 Section 401. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-401, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-402 Section 402. Overall Thermal Performance and Building Envelope Requirements. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-402, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-402, filed 9/23/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-402, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-403 Section 403. Thermal Performance Criteria and Envelope Requirements for Low-rise Residential Buildings. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-403, filed 1/3/90, effective 7/1/90.

	Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-403, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-416	effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-404	Section 404. Thermal Performance Criteria for All Other Occupancies. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-404, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-11-013 (Order 86-04), § 51-12-404, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-404, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-417	Section 416. Air Handling Duct System Insulation. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-416, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-405	Section 405. Air Leakage for All Buildings. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-405, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-418	Section 417. Duct Construction. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-417, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-406	Section 406. Building Mechanical Systems. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-406, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-419	Section 418. Piping Insulation. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-418, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-407	Section 407. Calculations of Heating and Cooling Loads and System Sizing Limits. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-407, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-420	Section 419. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-419, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-408	Section 408. (Reserved). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-408, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-421	Section 420. Water Heaters, Storage Tanks, Boilers, and Piping. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-420, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-409	Section 409. Simultaneous Heating and Cooling. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-409, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-422	Section 421. Pump Operation. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-421, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-410	Section 410. Energy Recovery. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-410, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-423	Section 422. Pipe Insulation. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-422, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-411	Section 411. HVAC Equipment Performance Requirements. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-411, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-11-013 (Order 86-04), § 51-12-411, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-411, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-424	Section 423. Conservation of Hot Water. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-423, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-412	Section 412. Energy for Air Delivery. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-412, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-425	Section 424. Electrical Power and Lighting. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-424, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-413	Section 413. Balancing. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-413, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-426	Section 425. Lighting Switching. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-425, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-414	Section 414. Cooling with Outdoor Air (Economizer Cycle). [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-414, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.	51-12-500	Section 426. Lighting Power Budget. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-426, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-426, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-426, filed 9/23/86; 86-11-013 (Order 86-04), § 51-12-426, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-426, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
51-12-415	Section 415. Controls. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-415, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90,	51-12-501	Section 500. General. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-500, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

- 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-502 Section 502. Design. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-502, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-503 Section 503. Analysis procedure. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-503, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-503, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-504 Section 504. Calculation Procedure. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-504, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-505 Section 505. Documentation. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-505, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-506 Section 506. Buildings Utilizing Nondepletable Energy. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-506, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-507 Section 507. Documentation—Buildings Using Nondepletable Energy Sources. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-507, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-600 Section 600. General. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-600, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-601 Section 601. Low-rise Residential Building Envelope Requirements. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-601, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-601, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-20-024 (Resolution No. 86-17), § 51-12-601, filed 9/23/86; 86-11-013 (Order 86-04), § 51-12-601, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-601, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-602 Section 602. Low-rise Residential Building Mechanical Systems. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-602, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-11-013 (Order 86-04), § 51-12-602, filed 5/13/86; 85-24-028 (Order 85-14), § 51-12-602, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-603 Section 603. Low-rise Residential Building Service Water Heating. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-603, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-604 Section 604. Low-rise Residential Building Electrical Power and Lighting. [Statutory Authority: 1985 c

144. 85-24-028 (Order 85-14), § 51-12-604, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-605 Section 605. Building Envelope Requirements for Other than Low-rise Residential Buildings. [Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-605, filed 1/31/89, effective 7/1/89. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-605, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-606 Section 606. Building Mechanical Systems Requirements for Other than Low-rise Residential Buildings. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-606, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-607 Section 607. Service Water Heating Requirement for Other than Low-rise Residential Buildings. [Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-607, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.
- 51-12-608 Section 608. Electrical Power and Lighting Requirements for Other than Low-rise Residential Buildings. [Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-12-608, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27.074, 19.27A.010 and 19.27A.020. 89-04-043 (Order 88-10), § 51-12-608, filed 1/31/89, effective 7/1/89. Statutory Authority: RCW 19.27A.020 and chapter 19.27A RCW. 86-11-013 (Order 86-04), § 51-12-608, filed 5/13/86. Statutory Authority: 1985 c 144. 85-24-028 (Order 85-14), § 51-12-608, filed 11/26/85.] Repealed by 91-01-112, filed 12/19/90, effective 7/1/91. Statutory Authority: RCW 19.27A.020 and 1990 c 2.

### Chapter 51-04 WAC

#### POLICIES AND PROCEDURES FOR CONSIDERATION OF STATE-WIDE AND LOCAL AMENDMENTS TO THE STATE BUILDING CODE

##### WAC

- 51-04-010 Declaration of purpose.
- 51-04-015 Definitions.
- 51-04-018 Preproposal petition.
- 51-04-020 Policies for the consideration of proposed state-wide amendments.
- 51-04-025 Procedure for submittal or proposed state-wide amendments.
- 51-04-030 Policies for consideration of proposed local government residential amendments.
- 51-04-035 Procedure for submittal of proposed local government residential amendments.
- 51-04-037 Preapproved local government residential amendments.
- 51-04-040 Reconsideration.
- 51-04-050 Ex parte communications.
- 51-04-060 Opinions and interpretations.
- 51-04-070 Council mailing address.

**WAC 51-04-010 Declaration of purpose.** The Washington state building code council, hereinafter called the council, is required by chapter 266, Laws of 1988, to adopt and maintain the state building code, hereinafter referred to as the building code, as provided

in chapters 19.27, 19.27A, and 70.92 RCW, and the state legislature.

The primary objective of the council is to encourage consistency in the building code throughout the state of Washington and to maintain the building code consistent with the state's interest as provided in RCW 19.27.020.

The building code shall be as defined in WAC 51-04-015(6).

The council is also required by RCW 19.27.074 to approve or deny all city and county amendments to the building code that apply to single family or multifamily buildings as defined in RCW 19.27.015.

The purpose of this chapter is to establish policies and procedures for submittal and council review and consideration of proposed state-wide and city and county amendments respectively, to the building code.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348, 90-02-108, § 51-04-010, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-04-010, filed 9/1/76.]

**WAC 51-04-015 Definitions.** (1) "Supplements and accumulative supplements" mean the publications between editions of the uniform codes and standards which include changes to the current edition of the uniform codes and standards.

(2) "Council" means the Washington state building code council.

(3) "Emergency state-wide amendment" means any proposed state-wide amendment, the adoption of which is necessary immediately in order to protect life, safety or health of building occupants, preserve the structural integrity of buildings built to the state building code or to comply with enacted state or federal legislation. Emergency state-wide amendments to the state building code must be adopted in accordance with the Administrative Procedure Act, chapter 34.05 RCW.

(4) "Local government amendment" means any amendment to the state building code, as adopted by cities or counties for implementation and enforcement in their respective jurisdictions.

(5) "Local government residential amendment" means any amendment to the state building code, as adopted by cities or counties for implementation and enforcement in their respective jurisdictions, that applies to single and multifamily buildings as defined by RCW 19.27.015.

(6) "State building code" means the Uniform Building Code and Standards; the Uniform Mechanical Code including Appendix B, Chapter 22 Fuel Gas Piping; the Uniform Fire Code and Standards; the Uniform Plumbing Code and Standards, excluding Chapters 11 and 12; the state regulations for barrier-free facilities; the state energy code; and any other codes so designated by the Washington state legislature as adopted and amended by the council.

(7) "State-wide amendment" means any amendment to the building code, initiated through council action or by petition to the council from any agency, city or county, or interested individual or organization, that would have the effect of amending the building code for the entire state of Washington. State-wide amendments to the state building code must be adopted in accordance

with the Administrative Procedure Act, chapter 34.05 RCW.

(8) "State building code update cycle" means that period during which the uniform code and standards referenced in chapter 19.27 RCW are updated and amended by the council in accordance with the Administrative Procedure Act, chapter 34.05 RCW. During the code update cycle, the entire building code is updated by the council. The code update cycle commences upon availability of the publication of the current edition of the Uniform Codes by the International Conference of Building Officials, and concludes with formal adoption of the revised building code by the council and final review by the state legislature.

Within sixty days of the receipt of the new current editions of the uniform codes as published by the International Conference of Building Officials, International Association of Plumbing and Mechanical Officials, and Western Fire Chiefs respectively, the council shall enter rulemaking to update the building code.

(9) "Uniform codes" means the Uniform Building, Mechanical, Plumbing, and Fire Codes as published by the International Conference of Building Officials, International Association of Plumbing and Mechanical Officials, and Western Fire Chiefs respectively.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348, 90-02-108, § 51-04-015, filed 1/3/90, effective 2/3/90.]

**WAC 51-04-018 Preproposal petition.** An agency, city or county, or other interested individual or organization wishing to submit state-wide or local government residential amendments to the building code for council consideration, may file with the council a preproposal petition in order to solicit comments from council members and interested parties, prior to council action.

The council may refer a preproposal petition to one of the council standing committees for review and comment.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348, 90-02-108, § 51-04-018, filed 1/3/90, effective 2/3/90.]

**WAC 51-04-020 Policies for the consideration of proposed state-wide amendments.** The council will accept and consider petitions for emergency state-wide amendments to the building code at any time, in accordance with RCW 19.27.074 and chapter 34.05 RCW.

The council will accept and consider all other petitions for state-wide amendments in conjunction with the state building code update cycle, in accordance with RCW 19.27.074 and chapter 34.05 RCW, and WAC 51-04-015 and 51-04-020.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348, 90-02-108, § 51-04-020, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-04-020, filed 9/1/76.]

**WAC 51-04-025 Procedure for submittal or proposed state-wide amendments.** All proposed state-wide amendments shall be submitted in writing to the council, on the form provided by the council.

Petitions for state-wide amendments to the building code should be submitted to the council within thirty

days of publication of the new current editions of the uniform codes as revised by the International Conference of Building Officials, International Association of Plumbing and Mechanical Officials, and Western Fire Chiefs respectively.

Petitions for emergency state-wide amendments to the building code may be submitted at any time, in accordance with RCW 19.27.074 and chapter 34.05 RCW, and WAC 51-04-015 and 51-04-020.

The council may refer a proposed state-wide amendment to one of the council standing committees for review and comment prior to council action in accordance with chapter 34.05 RCW.

The council shall deal with all proposed state-wide amendments within the time frames required by chapter 19.27 RCW, RCW 34.05.330, and all other deadlines established by statute.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348, 90-02-108, § 51-04-025, filed 1/3/90, effective 2/3/90.]

**WAC 51-04-030 Policies for consideration of proposed local government residential amendments.** All amendments to the building code, as adopted by cities and counties for implementation and enforcement in their respective jurisdictions, that apply to single and multifamily buildings as defined by RCW 19.27.015, shall be submitted to the council for approval.

The council shall consider and approve or deny all proposed local government residential amendments to the building code within ninety days of receipt of a proposal, unless alternative scheduling is agreed to by the council and the proposing entity.

All local government residential amendments to the building code that require council approval shall be submitted in writing to the council, after the city or county legislative body has adopted the amendment and prior to implementation and enforcement of the amendment by the local jurisdiction.

It is the policy of the council to encourage joint proposals for local government residential amendments from more than one jurisdiction. Local government residential amendments submitted to the council for approval should be based on:

- (1) Climatic conditions that are unique to the jurisdiction.
- (2) Geologic or seismic conditions that are unique to the jurisdiction.
- (3) Environmental impacts such as noise, dust, etc., that are unique to the jurisdiction.
- (4) Life, health, or safety conditions that are unique to the local jurisdiction.
- (5) Other special conditions that are unique to the jurisdiction.

**EXCEPTIONS:** Appendices or portions thereof that have the effect of amending the uniform codes, that do not conflict with the building code for single and multifamily residential buildings as defined by RCW 19.27.015, may be adopted by local jurisdictions without council review or approval.

Local government residential amendments to Chapters 1, 2, or 3 of the uniform building code need not be

submitted to the council for review and approval provided that such amendments do not diminish the construction requirements of those chapters.

Those portions of the supplement or accumulative supplements that affect single and multifamily residential buildings as defined by RCW 19.27.015 that are not adopted by the council shall be submitted to the council for consideration as local government residential amendments to the building code.

Local government residential amendments shall conform to the limitations provided in RCW 19.27.040.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348, 90-02-108, § 51-04-030, filed 1/3/90, effective 2/3/90.]

**WAC 51-04-035 Procedure for submittal of proposed local government residential amendments.** All proposed local government residential amendments to the state building code shall be submitted in writing to the council, on a form provided by the council, along with a statement of need for the proposed amendment.

The council shall accept and consider all applications for review of local government residential amendments submitted to the council in a proper manner.

The council may refer a proposed local government residential amendment to one of the council standing committees for review and comment prior to council action in accordance with RCW 19.27.074.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348, 90-02-108, § 51-04-035, filed 1/3/90, effective 2/3/90.]

**WAC 51-04-037 Preapproved local government residential amendments.** Any local government residential amendment, that the council determines to be appropriate for adoption by other local governments, may be designated as a preapproved local government residential amendment.

A preapproved local government residential amendment may be adopted by any local government upon notification of the council.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348, 90-02-108, § 51-04-037, filed 1/3/90, effective 2/3/90.]

**WAC 51-04-040 Reconsideration.** Any party proposing a state-wide or local government amendment to the building code may, upon denial of the amendment by the council, file a petition for reconsideration in accordance with RCW 34.05.470.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348, 90-02-108, § 51-04-040, filed 1/3/90, effective 2/3/90.]

**WAC 51-04-050 Ex parte communications.** All written communications received by council members during council rule-making proceedings, shall be forwarded to staff for inclusion in the public record.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348, 90-02-108, § 51-04-050, filed 1/3/90, effective 2/3/90.]

**WAC 51-04-060 Opinions and interpretations.** RCW 19.27.031 grants the council authority to render opinions relating to the building code at the request of a local building official.

Council building code related opinions and interpretations shall be limited to the state regulations for barrier-free facilities, the state energy code, and council amendments to the uniform codes.

The Washington state energy office shall provide opinions and interpretations related to the state energy code.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-060, filed 1/3/90, effective 2/3/90.]

**WAC 51-04-070 Council mailing address.** All requests for information, documentation, etc., should be submitted to:

Washington State Building Code Council  
Ninth and Columbia Building  
Mailstop: GH-51  
Olympia, Washington 98504-4151  
(206) 753-2222

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-04-070, filed 1/3/90, effective 2/3/90.]

**Chapter 51-06 WAC  
PUBLIC RECORDS**

**WAC**

- 51-06-010 Purpose of chapter.
- 51-06-020 Public records available.
- 51-06-070 Copying.
- 51-06-120 Address for communications.

**DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER**

- 51-06-030 Definitions. [Order 76-02, § 51-06-030, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.
- 51-06-040 Public records officer. [Order 76-02, § 51-06-040, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.
- 51-06-050 Office hours. [Order 76-02, § 51-06-050, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.
- 51-06-060 Requests for public records. [Order 76-02, § 51-06-060, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.
- 51-06-080 Exemptions. [Order 76-02, § 51-06-080, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.
- 51-06-090 Review of denials of public records requests. [Order 76-02, § 51-06-090, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.
- 51-06-100 Protection of public records. [Order 76-02, § 51-06-100, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.
- 51-06-110 Records index. [Order 76-02, § 51-06-110, filed 9/1/76.] Repealed by 90-02-108, filed 1/3/90, effective 2/3/90. Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348.

**WAC 51-06-010 Purpose of chapter.** The purpose of this chapter shall be to ensure compliance by the state building code council (hereinafter referred to as the "council"), including its members and staff, with the provisions of chapter 42.17 RCW (Initiative 276), and in particular with RCW 42.17.250 - 42.17.320 dealing with public records.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-06-010, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-06-010, filed 9/1/76.]

**WAC 51-06-020 Public records available.** All public records of the council as defined in WAC 51-06-030 are available for public inspection and copying at the Department of Community Development, Ninth and Columbia Building, Olympia, Washington 98504, pursuant to these rules, except as otherwise provided by RCW 42.17.310.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-06-020, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-06-020, filed 9/1/76.]

**WAC 51-06-070 Copying.** The department of community development may charge a fee of twenty-five cents per page for providing copies of public records and for use of the office's copy equipment.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-06-070, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-06-070, filed 9/1/76.]

**WAC 51-06-120 Address for communications.** All requests for information, documentation, etc., should be submitted to the:

Washington State Building Code Council  
Ninth and Columbia Building  
Mailstop: GH-51  
Olympia, Washington 98504-4151  
(206) 753-2222

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-06-120, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-06-120, filed 9/1/76.]

**Chapter 51-08 WAC  
UNIFORM PROCEDURAL RULES**

**WAC**

- 51-08-010 Uniform procedural rules.

**WAC 51-08-010 Uniform procedural rules.** The state building code council, hereinafter referred to as the council, adopts as its own rules of practice all those uniform procedural rules promulgated by the code reviser now codified in the Washington Administrative Code, as WAC 1-08-005 through 1-08-590, as now or hereinafter amended, subject to any additional rules the council may add from time to time. The council reserves the right to make whatever determination is fair and equitable should any question not covered by its rules come before the council, said determination to be in accordance with the spirit and intent of the law.

[Statutory Authority: Chapters 19.27 and 34.05 RCW and 1989 c 348. 90-02-108, § 51-08-010, filed 1/3/90, effective 2/3/90; Order 76-02, § 51-08-010, filed 9/1/76.]

### Chapter 51-10 WAC BARRIER-FREE FACILITIES

#### WAC

**Reviser's note:** This chapter has been exempted from the publication, style, and format requirements of the Washington Administrative Code.

Copies of chapter 51-10 WAC (Barrier-free facilities) may be obtained from the State Building Code Council, Department of Community Development, Local Government Assistance Division, Ninth and Columbia Building, Mailstop GH-51, Olympia, Washington 98504-4151, telephone (206) 753-0738.

The Department of Community Development provides staff support to the State Building Code Council.

[Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW and 1989 c 266. 90-02-110, filed 1/3/90, effective 7/1/90. Statutory Authority: Chapters 19.27 and 70.92 RCW. 88-24-021 (Order 88-09), filed 12/2/88, effective 7/1/89; 86-24-040 (Order 86-18), filed 11/26/86, effective 4/27/87; 85-07-036 (Order 85-02), filed 3/18/85; 85-03-095 (Order 85-01), filed 1/22/85; 83-15-033 (Order 83-4), filed 7/18/83; Order 77-02, filed 8/3/77; Order 76-02, filed 9/1/76; Order 76-01, filed 6/28/76.]

### Chapter 51-11 WAC WASHINGTON STATE ENERGY CODE

#### WAC

51-11-0100	Chapter 1—Administration and enforcement.
51-11-0101	Section 101. Scope and general requirements.
51-11-0102	Materials and equipment.
51-11-0103	Alternate materials—Method of construction, design or insulating systems.
51-11-0104	Plans and specifications.
51-11-0105	Inspections and enforcement.
51-11-0106	Violations.
51-11-0107	Liability.
51-11-0108	Conflicts with other codes.
51-11-0109	Severability.
51-11-0200	Chapter 2—Definitions.
51-11-0201	General definitions.
51-11-0300	Chapter 3—Design conditions.
51-11-0301	Design criteria.
51-11-0302	Thermal design parameters.
51-11-0303	Mechanical ventilation.
51-11-0400	Chapter 4—Building design by systems analysis.
51-11-0401	Scope.
51-11-0402	Systems analysis.
51-11-0500	Chapter 5—Building design by component performance approach.
51-11-0501	Scope.
51-11-0502	Building envelope requirements.
51-11-0503	Building mechanical systems.
51-11-0504	Service water heating.
51-11-0505	Electrical power and lighting.
51-11-0601	Scope.
51-11-0602	Building envelope requirements for group R occupancy.
51-11-0603	Building mechanical systems for group R occupancy.
51-11-0604	Electric power and lighting for group R occupancy.
51-11-0605	Building envelope requirements for Other than Group R Occupancies.
51-11-0606	Building mechanical systems requirements for other than Group R occupancies.
51-11-0607	Service water heating requirement for other than Group R occupancies.

51-11-0608	Electrical power and lighting requirements for other than Group R occupancies.
51-11-0700	Chapter 7—Standards.
51-11-0701	Standards.
51-11-0800	Section 0800—Suggested software for chapter 4 systems analysis approach for Group R occupancy.
51-11-0900	Section 0900—Prescriptive heating system sizing.
51-11-1000	Chapter 10.
51-11-1001	Section 1001 General.
51-11-1002	Section 1002: Below grade walls and slabs.
51-11-1003	Section 1003: On-grade slab floors.
51-11-1004	Section 1004: Crawlspace floors.
51-11-1005	Section 1005: Above-grade walls.
51-11-1006	Section 1006 Default u-values for glazing and doors.
51-11-1007	(Reserved.)
51-11-1008	Section 1007 Ceilings.
51-11-1009	Section 1008 Air infiltration.
51-11-1010	Section 1009 Mass.

### WAC 51-11-0100 Chapter 1—Administration and enforcement.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0100, filed 12/19/90, effective 7/1/91.]

### WAC 51-11-0101 Section 101. Scope and general requirements.

101.1 Title: This Code shall be known as the "Washington State Energy Code" and may be cited as such; and will be referred to herein as "this Code."

101.2 Purpose and Intent: The purpose of this Code is to provide minimum standards for new or altered buildings and structures or portions thereof to achieve efficient use and conservation of energy.

The purpose of this Code is not to create or otherwise establish or designate any particular class or group of persons who will or should be especially protected or benefitted by the terms of this Code.

It is intended that these provisions provide flexibility to permit the use of innovative approaches and techniques to achieve efficient use and conservation of energy. These provisions are structured to permit compliance with the intent of this Code by any one of the following three paths of design:

1. A systems analysis approach for the entire building and its energy-using sub-systems which may utilize renewable energy sources, Chapter 4.

2. A component performance approach for various building elements and mechanical systems and components, Chapter 5.

3. A prescriptive requirements approach, Chapter 6.

Compliance with any one of these approaches meets the intent of this Code. This Code is not intended to abridge any safety or health requirements required under any other applicable codes or ordinances.

The provisions of this Code do not consider the efficiency of various energy forms as they are delivered to the building envelope. A determination of delivered energy efficiencies in conjunction with this Code will provide the most efficient use of available energy in new building construction.



101.3 Scope: This Code sets forth minimum requirements for the design of new buildings and structures that provide facilities or shelter for public assembly, educational, business, mercantile, institutional, storage and residential occupancies, as well as those portions of factory and industrial occupancies designed primarily for human occupancy by regulating their exterior envelopes and the selection of their HVAC, service water heating, electrical distribution and illuminating systems and equipment for efficient use and conservation of energy.

Buildings shall be designed to comply with the requirements of either Chapter 4, 5, or 6 of this Code.

101.3.1 Exempt Buildings: Buildings and structures or portions thereof meeting any of the following criteria shall be exempt from the building envelope requirements of sections 502 and sections 602 and 605, but shall comply with all other requirements for building mechanical systems, service water heating and lighting systems.

101.3.1.1: Buildings and structures or portions thereof whose peak design rate of energy usage is less than three and four tenths (3.4) Btu/h per square foot or one point zero (1.0) watt per square foot of floor area for space conditioning requirements.

101.3.1.2: Buildings and structures or portions thereof which are neither heated according to the definition of heated space in Chapter 2, nor cooled by a non-renewable energy source, provided that the non-renewable energy use for space conditioning complies with requirements of section 101.3.1.1.

101.3.1.3: Greenhouses isolated from any conditioned space and not intended for occupancy.

101.3.2 Application to Existing Buildings: Additions, historic buildings, changes of occupancy or use, and alterations or repairs shall comply with the requirements in the subsections below.

EXCEPTION: The building official may approve designs of alterations or 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 alteration or repair improves the energy efficiency of the building; or

2. The alteration or repair is energy efficient and is necessary for the health, safety, and welfare of the general public.

In no case, shall building envelope requirements or mechanical system requirements be less than those requirements in effect at the time of the initial construction of the building.

101.3.2.1 Additions to Existing Buildings: Additions to existing buildings or structures may be made to such buildings or structures without making the entire building or structure comply, provided that the new additions shall conform to the provisions of this Code.

EXCEPTION: New additions which do not fully comply with the requirements of this Code and which have a

floor area which is less than seven hundred fifty square feet shall be approved provided that improvements are made to the existing occupancy to compensate for any deficiencies in the new addition. Compliance shall be demonstrated by either systems analysis or component performance calculations. The nonconforming addition and upgraded, existing occupancy shall have an energy budget or heat loss which is less than or equal to the unimproved existing building, with the addition designed to comply with this Code.

101.3.2.2 Historic Buildings: The building official may modify the specific requirements of this Code for historic buildings and require in lieu thereof alternate requirements which will result in a reasonable degree of energy efficiency. This modification may be allowed for those buildings which have been specifically designated as historically significant by the state or local governing body, or listed in The National Register of Historic Places or which have been determined to be eligible for listing.

101.3.2.3 Change of Occupancy or Use:

1. Any Other than Group R Occupancy which is presently unconditioned where the occupancy or use is changed to require conditioning shall be required to be brought into full compliance with this Code.

2. The use or occupancy of any Other than Group R Occupancies which are presently conditioned may be changed without complying with this code, provided additional heat or cooling is not added.

3. Any Other than Group R Occupancy which is converted to Group R Occupancy shall be brought into full compliance with this Code.

4. Any Group R Occupancy which is converted to Other than Group R Occupancy shall be required to comply with all of the provisions of this code if either new or increased heating or cooling is provided.

5. All Occupancies, which are converted from a Group R Occupancy or an Other than Group R Occupancy or use, to a new Other than Group R Occupancy or use shall comply with the lighting standards set forth in this code unless the existing lighting is not altered.

101.3.2.4 Alterations and Repairs: All alterations and repairs to buildings or portions thereof originally constructed subject to the requirements of this Code shall conform to the provisions of this Code without exception. For all other existing buildings, initial tenant alterations shall comply with the new construction requirements of this Code. Other alterations and repairs may be made to existing buildings and moved buildings without making the entire building comply with all of the requirements of this Code for new buildings, provided the following requirements are met:

101.3.2.5 Building Envelope: The result of the alterations or repairs both:

1. Improves the energy efficiency of the building, and

2. Complies with the overall average thermal transmittance values of the elements of the exterior building envelope in Table 5-1 or 5-2 of Chapter 5 or the nominal R-values and glazing requirements of the reference case in Tables 6-1 to 6-6 or 6-7.

**EXCEPTIONS:**

1. Untested storm windows may be installed over existing glazing for an assumed U-value of 0.90, however, where glass and sash are being replaced in Group R Occupancy, glazing with a maximum area weighted average U-value of 0.40 shall be installed where there is an electric resistance space heating system and glazing with a maximum U-value of 0.65 (Climate Zone I) and 0.60 (Climate Zone II) shall be installed where there is any other space heating system.

2. Where the structural elements of the altered portions of roof/ceiling, wall or floor are not being replaced, these elements shall be deemed to comply with this Code if all existing framing cavities which are exposed during construction are filled to the full depth with batt insulation or insulation having an equivalent nominal R-value while, for roof/ceilings, maintaining the required space for ventilation. Existing walls and floors without framing cavities need not be insulated. Existing roofs shall be insulated to the requirements of this Code if

a. The roof is uninsulated or insulation is removed to the level of the sheathing, or

b. All insulation in the roof/ceiling was previously installed exterior to the sheathing or non-existent.

101.3.2.6 Building Mechanical Systems: Those parts of systems which are altered or replaced shall comply with section 503 of this Code.

101.3.2.7 Service Water Heating: Those parts of systems which are altered or replaced shall comply with section 504.

101.3.2.8 Lighting: Those parts of systems which are altered or replaced in buildings initially constructed subject to the requirements of this Code shall comply with section 505. Other remodels or replacements of lighting systems which are part of a substantial remodel shall comply with sections 505. In addition, remodeling of any size area with or without putting a new ceiling grid or suspension system when reusing existing fixtures and/or adding new ones shall not require compliance with the lighting power budget as long as the installed wattage is maintained or reduced. Remodeling of an entire floor or an entire tenant space that includes a new lighting system with or without a new ceiling grid or suspension system shall require compliance of a lighting power budget of section 505. Compliance with switching requirements of section 505.2 is only required when new wiring is being run related to adding fixtures and/or fixtures are being relocated to a new circuit.

101.3.3 Mixed Occupancy: When a building houses more than one occupancy, each portion of the building shall conform to the requirements for the occupancy housed therein. Where approved by the building official,

where minor accessory uses do not occupy more than ten percent of the area of any floor of a building, the major use may be considered the building occupancy.

101.4 Amendments by Local Government: Except as provided in RCW 19.27A.020(7), this Code shall be the maximum and minimum energy code for Group R Occupancy in each town, city and county, no later than July 1, 1991. This Code shall be the minimum energy code for all other than Group R Occupancies in each town, city and county.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0101, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0102 Materials and equipment.**

102.1 Identification: All materials and equipment shall be identified in order to show compliance with this Code.

102.2 Maintenance Information: Required regular maintenance actions shall be clearly stated and incorporated on a readily accessible label. Such label may be limited to identifying, by title or publication number, the operation and maintenance manual for that particular model and type of product. Maintenance instructions shall be furnished for any equipment which requires preventive maintenance for efficient operation.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0102, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0103 Alternate materials—Method of construction, design or insulating systems.** The provisions of this Code are not intended to prevent the use of any material, method of construction, design or insulating system not specifically prescribed herein, provided that such construction, design or insulating system has been approved by the building official as meeting the intent of this Code. The building official may approve any such alternate provided he finds the proposed alternate meets or exceeds the provisions of this Code and that the material, method, design or work offered is for the purpose intended, at least the equivalent of that prescribed in this Code, in quality, strength, effectiveness, fire-resistance, durability, safety, and efficient use and conservation of energy. The building official may require that sufficient evidence of proof be submitted to substantiate any claims that may be made regarding performance capabilities.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0103, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0104 Plans and specifications.**

104.1 General: If required by the building official, plans and specifications shall be submitted in support of an application for a building permit. If required by the building official, plans and specifications shall be stamped and authenticated by a registered design professional currently licensed in the state of Washington. If required by the building official, all energy calculations submitted under the provisions of Chapter 4 for Other than Group R Occupancy shall be stamped and

authenticated by an engineer or architect licensed to practice by the state. All plans and specifications, together with supporting data, shall be submitted to the building official prior to issuance of a building permit.

**104.2 Details:** The plans and specifications shall show in sufficient detail all pertinent data and features of the building and the equipment and systems as herein governed including, but not limited to: design criteria, exterior envelope component materials, U-values of the envelope systems, R-values of insulating materials, size and type of apparatus and equipment, equipment and systems controls and other pertinent data to indicate compliance with the requirements of this Code.

The building official may accept the professional stamp of an architect or engineer licensed to do business by the state in lieu of a plan and specification check if the engineer or architect stipulates to the best of his knowledge, understanding and belief, the design meets the requirements of this Code.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0104, filed 12/19/90, effective 7/1/91.]

#### **WAC 51-11-0105 Inspections and enforcement.**

**105.1 General:** All construction or work for which a permit is required shall be subject to inspection by the building official and all such construction or work shall remain accessible and exposed for inspection purposes until approved by the building official.

**105.2 Approvals Required:** No work shall be done on any part of the building or structure beyond the point indicated in each successive inspection without first obtaining the approval of the building official.

**105.2.1 Required Inspections:** The building official, upon notification, shall make the following inspection in addition to those inspections required in section 305(e) of the Washington State Uniform Building Code:

1. **Wall insulation inspection:** To be made after all wall insulation and air vapor retarder sheet or film materials are in place, but before any wall covering is placed.

**105.3 Reinspection:** The building official may require a structure to be reinspected.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0105, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0106 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.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0106, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0107 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.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0107, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0108 Conflicts with other codes.** 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) and Uniform Building Code and Standards Adoption and Amendment rules and (chapter 51-16 WAC). In case of conflicts among codes enumerated in RCW 19.27.031 (1), (2), (3), and (4) and this Code, the first named code shall govern over the following. Provided, in the case of conflict between the duct insulation requirements of this Code and the duct insulation requirements of section 1005 of the Uniform Mechanical Code, the duct insulation requirements of this Code, or where applicable, a local jurisdiction's energy code shall govern.

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 be applicable. Wherever in this Code reference is made to the appendix, the provisions in the appendix shall not apply unless specifically adopted.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0108, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0109 Severability.** If any provision of this Code or its application to any person or circumstance is held invalid, the remainder of this Code or the application of the provision to other persons or circumstances is not affected.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0109, filed 12/19/90, effective 7/1/91.]

#### **WAC 51-11-0200 Chapter 2--Definitions.**

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0200, filed 12/19/90, effective 7/1/91.]

#### **WAC 51-11-0201 General definitions.**

**201.1 Application of Terms:** For the purposes of this Code, certain abbreviations, terms, phrases, words and their derivatives, shall be as set forth in this chapter. Where terms are not defined, they shall have their ordinary accepted meanings within the context with which they are used. In the event there is a question about the definition of a term, the definitions for terms in the codes enumerated in RCW 19.27.031 and the edition of Webster's dictionary referenced therein shall be considered as the sources for providing ordinarily accepted meanings.

**AAMA:** American Architectural Manufacturers Association

**Accepted analysis methods:** Heating/cooling and lighting load calculations performed in accordance with the most current procedures developed by a nationally recognized professional organization and approved by the Building Official.

**Addition:** See the Washington State Building Code.

**Advanced framed ceiling:** Advanced framing assumes full and even depth of insulation extending to the outside edge of exterior walls. (See Standard Framing.)

**Advanced framed walls:** Studs framed on twenty-four 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.

**AFUE. Annual fuel utilization efficiency:** Unlike steady state conditions, this rating is based on average usage including on and off cycling as set out in the standardized Department of Energy Test Procedures.

**Air conditioning, comfort:** The process of treating air to control simultaneously its temperature, humidity, cleanliness and distribution to meet requirements of the conditioned space.

**Air transport factor:** The ratio of the rate of useful sensible heat removal from the conditioned space to the energy input to the supply and return fan motor(s), expressed in consistent units and under the designated operating conditions.

**ASHRAE:** American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc.

**ASTM:** American Society for Testing and Materials

**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*.)

**Basement Wall:** The opaque portion of a wall which encloses a basement and is partially or totally below grade.

**Below grade walls:** Walls or the portion of walls which are entirely below the finish grade or which extend two feet or less above the finish grade.

**Building, existing:** See the Washington State Building Code.

**Boiler capacity:** The rate of heat output in Btu/h measured at the boiler outlet, at the design inlet and outlet conditions and rated fuel/energy input.

**Building envelope:** The elements of a building which enclose conditioned spaces through which thermal energy may be transferred to or from the exterior or to or from spaces exempted by the provisions of Section 101.3.1.

**Building official:** The official authorized to act in behalf of a jurisdiction code enforcement agency or its authorized representative.

**Building project:** A building or group of buildings, including on-site energy conversion or electric-generating facilities, which utilize a single submittal for a construction permit or are within the boundary of a contiguous area under one ownership.

**Clerestory:** A window placed in a wall projecting from a roof plane at sixty degrees or more from the horizontal to admit daylight into the interior of a building. (See *Skylight*.)

**Comfort Envelope:** The area on a psychrometric chart enclosing all those conditions described in Standard RS-4, Figure No. 1, as being comfortable.

**Conditioned space:** All spaces which are provided with heated and/or cooled air or which are capable of being maintained at temperatures over fifty degrees F during the heating season, including adjacent connected spaces separated by an uninsulated component (e.g., basements, utility rooms, garages, corridors).

**Continuous air barrier:** A system of materials installed during construction that is designed to effectively minimize the transfer of air to or from the conditioned space through unintentional openings in the building envelope.

**Cooled space:** Space within a building which is provided with a positive cooling supply.

**COP - Coefficient of performance:** The ratio of the rate of net heat output (heating mode) or heat removal (cooling mode) to the rate of total on-site energy input to the heat pump, expressed in consistent units and under designated rating conditions. (See *Net Heat Output*, *Net Heat Removal*, *Total On-Site Energy Input*.)

**Deadband:** The temperature range in which no heating or cooling is used.

**Degree day, heating:** A unit, based upon temperature difference and time, used in estimating fuel consumption and specifying nominal heating load of a building in winter. For any one day when the mean temperature is less than sixty-five degrees F there exist as many degree days as there are Fahrenheit degrees difference in temperature between the mean temperature for the day and sixty-five degrees F.

**Door area:** Total area of door measured using the rough opening and including the door and frame.

**Dwelling unit:** See the Washington State Building Code.

**EER. Energy efficiency ratio:** The ratio of net equipment cooling capacity in Btu/h to total rate of electric input in watts under designated operating conditions.

**Efficiency, HVAC system:** The ratio of useful energy (at the point of use) to the energy input for a designated time period, expressed in percent.

**Emissivity:** The ability to absorb infrared radiation. A low emissivity implies a higher reflectance of infrared radiation.

**Energy:** The capacity for doing work; taking a number of forms which may be transformed from one into another, such as thermal (heat), mechanical (work), electrical and chemical; in customary units, measured in kilowatt-hours (kWh) or British thermal units (Btu). (See *New energy*.)

**Energy, recovered:** (See *Recovered energy*.)

**Exterior envelope:** (See *Building envelope*.)

**Floor over unconditioned space:** A floor which separates a conditioned space from an unconditioned space which is buffered from exterior ambient conditions including vented crawlspaces and unconditioned basements or other similar spaces, or exposed to exterior ambient conditions including open parking garages and enclosed garages which are mechanically ventilated.

**F-Value:** The perimeter heat loss factor expressed in Btu/hr•ft•°F.

**Glazing:** All areas, including the frames, in the shell of a conditioned space that let in natural light including windows, clerestories, skylights, sliding or swinging glass doors and glass block walls.

**Glazing area:** Total area of the glazing measured using the rough opening, and including the glazing, sash, and frame. For doors where the daylight opening area is less than fifty percent of the door area, the glazing area is the daylight opening area. For all other doors, the glazing area is the door area.

**Gross conditioned floor area:** The horizontal projection of that portion of interior space which is contained within exterior walls and which is conditioned directly or indirectly by an energy-using system, and which has an average height of five feet or greater, measured from the exterior faces.

**Gross exterior wall area:** The normal projection of the building envelope wall area bounding interior space which is conditioned by an energy-using system; includes opaque wall, window and door areas. The gross area of walls consists of all opaque wall areas, including foundation walls, between floor spandrels, peripheral edges of floors, window areas including sash, and door areas, where such surfaces are exposed to exterior ambient conditions and enclose a conditioned space including interstitial areas between two such spaces.

**Gross floor area:** The sum of the areas of the several floors of the building, including basements, cellars, mezzanine and intermediate floored tiers and penthouses of headroom height, measured from the exterior faces of exterior walls or from the center line of walls separating buildings, but excluding: Covered walkways, open roofed-over areas, porches and similar spaces. Pipe trenches, exterior terraces or steps, chimneys, roof overhangs and similar features.

**Gross roof/ceiling area:** The sum of the areas of the roof/ceiling assembly, consisting of the total interior surface area of all elements, including skylights, which enclose a conditioned space.

**Guest room:** See the Washington State Building Code.

**Heat:** The form of energy that is transferred by virtue of a temperature difference.

**Heat storage capacity:** The physical property of materials (mass) located inside the building envelope to absorb, store, and release heat.

**Heated space:** Space within a building which is provided with a positive heating supply. Finished living space within a basement or registers or heating devices designed to supply heat to a basement space shall automatically define that space as heated space. (See Positive Heating Supply.)

**HSPF. Heating season performance factor:** The total heating output (in Btu) of a heat pump during its normal annual usage period for heating divided by the total (watt hour) electric power input during the same period, as determined by test procedures consistent with the U.S. Department of Energy "Test Procedure for Central Air Conditioners, Including Heat Pumps" published in the December 27, 1979, Federal Register, Vol 44, No. 24, IOCFR. 430. When specified in Btu per watt hour an HSPF of 6.826 is equivalent to a COP of 2.0.

**Humidistat:** A regulatory device, actuated by changes in humidity, used for automatic control of relative humidity.

**HVAC:** Heating, ventilating and air conditioning.

**HVAC system components:** HVAC system components provide, in one or more factory-assembled packages, means for chilling and/or heating water with controlled temperature for delivery to terminal units serving the conditioned spaces of the buildings. Types of HVAC system components include, but are not limited to, water chiller packages, reciprocating condensing units and water source (hydronic) heat pumps. (See HVAC system equipment.)

**HVAC system efficiency:** (See Efficiency, HVAC system.)

**HVAC system equipment:** HVAC system equipment provides, in one (single package) or more (split system) factory-assembled packages, means for air circulation, air cleaning, air cooling with controlled temperature and dehumidification; and optionally, either alone or in combination with a heating plant, the functions of heating and humidifying. The cooling function may be either electrically or heat operated and the refrigerant condenser may be air, water or evaporatively cooled. Where the equipment is provided in more than one package, the separate packages shall be designed by the manufacturer to be used together. The equipment may provide the heating function as a heat pump or by the use of electric elements. (The word "equipment" used without modifying adjective may, in accordance with common industry usage, apply either to HVAC system equipment or HVAC system components.)

**Illumination:** The density of the luminous flux incident on a surface; it is the quotient of the luminous flux by the area of the surface when the latter is uniformly illuminated.

**Infiltration:** The uncontrolled inward air leakage through cracks and interstices in any building element and around windows and doors of a building caused by the pressure effects of wind and/or the effect of differences in the indoor and outdoor air density.

**Insulation baffle:** A rigid material, resistant to wind driven moisture, the purpose of which is to allow air to flow freely into the attic or crawl space and to prevent insulation from blocking the ventilation of these spaces, or the loss of insulation. Example materials for this purpose are sheet metal, or wax impregnated cardboard.

**Luminaire:** A complete lighting unit consisting of a lamp or lamps together with the parts designed to distribute the light, to position and protect the lamps and to connect the lamps to the electric power supply.

**Manual:** Capable of being operated by personal intervention. (See Automatic.)

**Net heat output:** The change in the total heat content of the air entering and leaving the equipment (not including supplementary heat and heat from boilers).

**Net heat removal:** The total heat content of the air entering and leaving the equipment (without heat) or the difference in total heat content of the water or refrigerant entering and leaving the component.

**New energy:** Energy, other than recovered energy, utilized for the purpose of heating or cooling. (See energy.)

**Nominal R-value:** The thermal resistance of insulation as specified by the manufacturer according to recognized trade and engineering standards.

**Nonrenewable energy sources:** All energy sources that are not renewable energy sources including natural gas, oil, coal, wood, liquified petroleum gas, steam, and any utility-supplied electricity.

**Occupancy:** See the Washington State Building Code.

**Opaque envelope areas:** All exposed areas of a building envelope which enclose conditioned space, except openings for windows, skylights, doors, glazing and building service systems.

**Open blown:** Loose fill insulation pneumatically installed in an unconfined attic space.

**Outdoor air:** Air taken from the outdoors and, therefore, not previously circulated through the system.

**Packaged terminal air conditioner:** A factory-selected combination of heating and cooling components, assemblies or sections intended to serve a room or zone. (For the complete technical definition, see Standard RS-10.)

**Packaged terminal heat pump:** A factory-selected combination of heating and cooling components, assemblies or sections intended for application in an individual room or zone. (For the complete technical definition, see Standard RS-21.)

**Permeance (perm):** The ability of a material of specified thickness to transmit moisture in terms of amount of moisture transmitted per unit time for a specified area and differential pressure (grains per hour•ft<sup>2</sup>•inches of HG). Permeance may be measured using ASTM E-96-72 or other approved dry cup method as specified in RS-1.

**Pool cover:** A vapor-retardant cover which lies on or at the surface of the pool.

**Positive cooling supply:** Mechanical cooling deliberately supplied to a space, such as through a supply register. Also, mechanical cooling indirectly supplied to a space through uninsulated surfaces of space cooling components, such as evaporator coil cases and cooling distribution systems which are capable of maintaining air temperatures within the space of eighty-five degrees F, or lower, at the exterior design conditions specified in Section 302.1. To be considered exempt from inclusion in this definition, such surfaces shall comply with the insulation requirements of this Code.

**Positive heating supply:** Heat deliberately supplied to a space by design, such as a supply register, radiator or heating element. Also, heat indirectly supplied to a space through uninsulated surfaces of service water heaters and space heating components, such as furnaces, boilers and heating and cooling distributions systems which are capable of maintaining air temperature within the space of fifty degrees F, or higher, at the exterior design conditions specified in Section 302.1. To be considered exempt from inclusion in this definition, such surfaces shall comply with the insulation requirements of this Code.

**Power:** In connection with machines, the time rate of doing work. In connection with the transmission of energy of all types, the rate at which energy is transmitted; in customary units, it is measured in watts (W) or British Thermal Units per hour (Btu/h).

**Public facility rest room:** A rest room used by the transient public on a regular (rather than casual) basis. Examples include rest rooms in service stations, airports, train terminals and convention halls. Rest rooms incorporated with private guest rooms in hotels, motels or dormitories and rest room facilities intended for the use of employees and not usually used by the general public are not considered public facility rest rooms.

**Radiant slab:** A slab on grade containing heated pipes, ducts, or electric heating cables that constitute a radiant slab or portion thereof for a complete or partial heating of the structure.

**Readily accessible:** See the Washington State Mechanical Code.

**Recooling:** The removal of heat by sensible cooling of the supply air (directly or indirectly) that has been previously heated above the temperature to which the air is to be supplied to the conditioned space for proper control of the temperature of that space.

**Recovered energy:** Energy utilized which would otherwise be wasted (i.e. not contribute to a desired end use) from an energy utilization system.

**Reheat:** The application of sensible heat to supply air that has been previously cooled below the temperature of the conditioned space by either mechanical refrigeration or the introduction of outdoor air to provide cooling.

**Renewable energy sources:** Renewable energy sources of energy (excluding minerals) are derived from: (1) incoming solar radiation, including but not limited to, natural daylighting and photosynthetic processes; (2) energy sources resulting from wind, waves and tides, lake or pond thermal differences; and (3) energy derived from the internal heat of the earth, including nocturnal thermal exchanges.

**Reset:** Adjustment of the set point of a control instrument to a higher or lower value automatically or manually to conserve energy.

**Roof/ceiling assembly:** A roof/ceiling assembly shall be considered as all components of the roof/ceiling envelope through which heat flows, thus creating a building transmission heat loss or gain, where such assembly is exposed exterior ambient conditions to and encloses a conditioned space. The gross area of a roof/ceiling assembly consists of the total interior surface of such assembly, including skylights.

**Room air conditioner:** A packaged assembly designed as a unit primarily for mounting in a window or through a wall, or as a console, and designed to provide free delivery of conditioned air to an enclosed space, room or zone. It includes a prime source of refrigeration for cooling and dehumidification and means for circulating and cleaning air, and may also include means for ventilating and heating.

**Sequence:** A consecutive series of operations.

**Service systems:** All energy-using systems in a building that are operated to provide services for the occupants or processes housed therein, including HVAC, service water heating, illumination, transportation, cooking or food preparation, laundering or similar functions.

**Service water heating:** Supply of hot water for domestic or commercial purposes other than comfort heating.

**Service water heating demand:** The maximum design rate of energy withdrawal from a service water heating system in a designated period of time (usually an hour or a day).

**Shaded:** Glazed area which is externally protected from direct solar radiation by use of devices permanently affixed to the structure or by an adjacent building, topographical feature, or vegetation.

**Shall:** Denotes a mandatory code requirement.

**Single family:** One and two family residential dwelling units with no more than two units in a single building.

**Skylight:** A glazing surface that has a slope of less than sixty degrees from the horizontal plane.

**Slab-on-grade, exterior:** Any portion of a slab floor in contact with the ground which is less than or equal to twenty-four inches below the final elevation of the nearest exterior grade.

**Slab-below-grade:** Any portion of a slab floor in contact with the ground which is more than twenty-four inches below the final elevation of the nearest exterior grade.

**Solar energy source:** Source of natural daylighting and of thermal, chemical or electrical energy derived directly from conversion of incident solar radiation.

**Standard framing:** All framing practices not defined as "intermediate" or "advanced" shall be considered standard. (See Advanced framed ceiling, Advanced framed walls, Intermediate framed wall.)

**Substantial contact:** A condition where adjacent building materials are placed in a manner that proximal surfaces are contiguous, being installed and supported as to eliminate voids between materials, without compressing or degrading the thermal performance of either product.

**Substantially remodeled or rehabilitated:** Any alteration or restoration of a building or structure within any twelve-month period, the cost of which exceeds sixty percent of the current replacement value of the particular building or structure.

**System:** A combination of central or terminal equipment or components and/or controls, accessories, interconnecting means, and terminal devices by which energy is transformed so as to perform a specific function, such as HVAC, service water heating or illumination.

**Tapering:** Installation of a reduced level of ceiling insulation at the eaves, due to reduced clearance.

**Terminal element:** The means by which the transformed energy from a system is finally delivered; i.e. registers, diffusers, lighting fixtures, faucets and similar elements.

**Thermal by-pass:** An area where the envelope surrounding the conditioned space is breached, or where an ineffective application compromises the performance of

a thermal or infiltration barrier, increasing the structure's energy consumption by exposing finished surfaces to ambient conditions and additional heat transfer.

**Thermal conductance (C):** Time rate of heat flow through a body (frequently per unit area) from one of its bounding surfaces to the other for a unit temperature difference between the two surfaces, under steady conditions ( $\text{Btu/hr}\cdot\text{ft}^2\cdot\text{°F}$ ).

**Thermal resistance (R):** The reciprocal of thermal conductance ( $\text{hr}\cdot\text{ft}^2\cdot\text{°F/Btu}$ ).

**Thermal transmittance (U):** The coefficient of heat transmission (air to air). It is the time rate of heat flow per unit area and unit temperature difference between the warm side and cold side air films ( $\text{Btu/hr}\cdot\text{ft}^2\cdot\text{°F}$ ). The U-value applies to the fractional combinations of different materials used in series along the heat flow path.

**Thermal transmittance, overall (U<sup>o</sup>):** The overall (average) heat transmission of a gross area of the exterior building envelope ( $\text{Btu/hr}\cdot\text{ft}^2\cdot\text{°F}$ ). The U<sup>o</sup>-value applies to the combined effect of the time rate of heat flows through the various parallel paths, such as windows, doors and opaque construction areas, comprising the gross area of one or more exterior building components, such as walls, floors or roof/ceiling.

**Thermostat:** An automatic control device actuated by temperature and designed to be responsive to temperature.

**Total on-site energy input:** The combination of all the energy inputs to all elements and accessories as included in the equipment components, including but not limited to, compressor(s), compressor sump heater(s), circulating pump(s), purge devices, fan(s), and the HVAC system component control circuit.

**Transmission coefficient:** The ratio of the solar heat gain through a glazing system to that of an unshaded single pane of double strength window glass under the same set of conditions.

**U-Value:** See thermal transmittance.

**Uniform building code:** The Washington State Uniform Building Code as modified by the Washington State Building Code Council.

**Uniform mechanical code:** The Washington State Uniform Mechanical Code as modified by the Washington State Building Code Council.

**Unitary cooling and heating equipment:** One or more factory-made assemblies which include an evaporator or cooling coil, a compressor and condenser combination, and may include a heating function as well. Where such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together.

**Unitary heat pump:** One or more factory-made assemblies which include an indoor conditioning coil, compressor(s) and outdoor coil or refrigerant-to-water heat exchanger, including means to provide both heating and cooling functions. When such equipment is provided in more than one assembly, the separate assemblies shall be designed to be used together.

**Vapor retarder:** A layer of low moisture transmissivity material (not more than 1.0 perm dry cup) placed over

the warm side (in winter) of insulation, over the exterior of below grade walls, and under floors as ground cover to limit the transport of water and water vapor through exterior walls, ceilings, and floors. Vapor retarding paint, listed for this application, also complies with this Code.

**Vaulted ceilings:** All ceilings where enclosed joist or rafter space is formed by ceilings applied directly to the underside of roof joists or rafters.

**Ventilation:** The process of supplying or removing air by natural or mechanical means to or from any space. Such air may or may not have been conditioned.

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

**Walls (exterior):** Any member or group of members which defines the exterior boundaries or courts of a building and which have a slope of sixty degrees or greater with the horizontal plane, and separates conditioned from unconditioned space. Band joists between floors are to be considered a part of exterior walls.

**Water-chilling package of absorption:** A factory-designed and prefabricated assembly (not necessarily shipped as a single package) of one or more condensers, evaporators (water coolers), absorbers and generators with interconnections and accessories used for chilling water.

**Water-chilling package, centrifugal or rotary:** A factory-designed and prefabricated assembly (not necessarily shipped as one package) or one or more centrifugal or rotary compressors, condensers and water coolers (evaporators) with interconnections and accessories used for chilling water.

**Water-chilling package, reciprocating:** A factory-designed and prefabricated assembly, self-contained or condenserless, of one or more reciprocating compressors, condenser (self-contained only), water coolers (evaporator) and interconnections and accessories used for chilling water. The condenser may be air, evaporatively or water cooled.

**Zone:** A space or group of spaces within a building with heating and/or cooling requirements sufficiently similar so that comfort conditions can be maintained throughout by a single controlling device. Each dwelling unit in residential buildings shall be considered a single zone.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0201, filed 12/19/90, effective 7/1/91.]

### **WAC 51-11-0300 Chapter 3--Design conditions.**

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0300, filed 12/19/90, effective 7/1/91.]

#### **WAC 51-11-0301 Design criteria.**

##### **301.1 General:**

The criteria of this chapter establish the design conditions upon which the minimum thermal design requirements of the building envelope and the design of the HVAC system are to be based.

[Title 51 WAC—p 16]

**301.2 Heating and Cooling:** A building that is designed to be both heated and cooled shall meet the more stringent of the heating or cooling requirements as required in this code when requirements of the exterior envelope differ.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0301, filed 12/19/90, effective 7/1/91.]

### **WAC 51-11-0302 Thermal design parameters.**

**302.1 Exterior Design Conditions:** The heating or cooling outdoor design temperatures shall be selected from 0.6 percent column for winter and 0.5 percent column for summer from the Puget Sound Chapter of ASHRAE publication "Recommended Outdoor Design Temperatures, Washington State, ASHRAE." (See also Washington State Energy Code Manual.)

#### **302.2 Interior Design Conditions:**

**302.2.1 Indoor Design Temperature:** Indoor design temperature shall be seventy degrees F for heating and seventy-eight degrees F for cooling.

**EXCEPTION:** Other design temperatures may be used for equipment selection if it results in a lower energy usage.

**302.2.2 Humidification:** If humidification is provided during heating, it shall be designed for a maximum relative humidity of thirty percent. When comfort air conditioning is provided, the actual design relative humidity within the comfort envelope as defined in Standard RS-4, listed in Chapter 7, shall be selected for minimum total HVAC system energy use.

**302.3 Climate Zones:** All buildings shall comply with the requirements of the appropriate climate zone as defined herein.

**ZONE 1:** Climate Zone 1 shall include all counties not included in Climate Zone 2.

**ZONE 2:** Climate Zone 2 shall include: Adams, Chelan, Douglas, Ferry, Grant, Kittitas, Lincoln, Okanogan, Pend Oreille, Spokane, Stevens, and Whitman counties.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0302, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0303 Mechanical ventilation.** For all Occupancies, the minimum requirements for ventilation shall comply with the Washington State Ventilation Code and Indoor Air Quality Code. (WAC 51-13)

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0303, filed 12/19/90, effective 7/1/91.]

### **WAC 51-11-0400 Chapter 4--Building design by systems analysis.**

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0400, filed 12/19/90, effective 7/1/91.]

#### **WAC 51-11-0401 Scope.**

**401.1 General:** This chapter establishes design criteria in terms of total energy use by a building, including all

(1990 Ed.)



of its systems. Analysis of design for all Group R Occupancy shall comply with section 402.1 to 402.6. Analysis of design for other buildings shall comply with sections 402.2 to 402.6.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0401, filed 12/19/90, effective 7/1/91.]

### WAC 51-11-0402 Systems analysis.

#### 402.1 Special Requirements for All Group R Occupancy:

402.1.1 Energy Budgets: Proposed buildings designed in accordance with this section shall be designed to use no more energy from non-renewable sources for space heating, and domestic hot water heating than a standard building whose enclosure elements and energy consuming systems are designed in accordance with section 502.2 of this Code for the appropriate climate zone, and heating system type. Energy derived from renewable sources may be excluded from the total annual energy consumption attributed to the alternative building.

402.1.2 Calculation of Energy Consumption: The application for a building permit shall include documentation which demonstrates, using a calculation procedure as listed in Chapter 8, or an approved alternate, that the proposed building's annual space heating energy use does not exceed the annual space heating and water heating energy use of a standard building conforming to Chapter 5 of this Code for the appropriate climate zone. The total calculated annual energy consumption shall be shown in units of kWh/ft<sup>2</sup>/year or Btu/ft<sup>2</sup>/year of conditioned area.

402.1.3 Input Values: The following standardized input values shall be used in calculating annual space heating budgets:

PARAMETER	VALUE
Thermostat set point, heating	65° F
Thermostat set point, cooling	78° F
Thermostat night set back	65° F
Thermostat night set back period	0 hours
Internal gain	
R-3 units	3000 Btu/hr
R-1 units	1500 Btu/hr
Domestic Hot Water Heater Setpoint	120° F
Domestic Hot Water Consumption	20 gallons/person/day.
Minimum heat storage	Calculated using standard engineering practice for the actual building or as approved.
Site weather data	Typical meteorological year (TMY) or ersatz TMY data for the closest appropriate TMY site or other site as approved.
Heating equipment efficiency	
Electric resistance heat	1.00
Heat Pumps	6.80 HSPF.
Other Fuels	0.78 AFUE.

The standard building shall be modeled with glazing area distributed equally among the four cardinal directions. Parameter values that may be varied by the building designer to model energy saving options include, but are not limited to, the following:

1. Overall thermal transmittance,  $U^{\circ}$ , of building envelope or individual building components;
2. Heat storage capacity of building;
3. Glazing orientation; area; and shading coefficients;
4. Heating system efficiency.

402.1.4 Solar Shading and Access: Building designs using passive solar features with eight percent or more south facing equivalent glazing to qualify shall provide to the building official a sun chart or other approved documentation depicting actual site shading for use in calculating compliance under this section. The building shall contain at least forty-five Btu/°F for each square foot of south facing glass.

402.1.5 Infiltration: Infiltration levels used shall be set at 0.35 air changes per hour for thermal calculation purposes only.

402.1.6 Heat Pumps: The heating season performance factor (HSPF) for heat pumps shall be calculated using procedures consistent with section 5.2 of the U.S. Department of Energy Test Procedure for Central Air Conditioners, including heat pumps published in the December 27, 1979 Federal Register Vol. 44, No. 24.10 CFR 430. Climate data as specified above, the proposed buildings overall thermal performance value (Btu/°F) and the standardized input assumptions specified above shall be used to model the heat pumps HSPF.

402.2 Energy Analysis: Compliance with this chapter will require an analysis of the annual energy usage, hereinafter called an annual energy analysis.

EXCEPTION: Chapters 5, and 6 of this Code establish criteria for different energy-consuming and enclosure elements of the building which, will eliminate the requirement for an annual systems energy analysis while meeting the intent of this Code.

A building designed in accordance with this chapter will be deemed as complying with this Code if the calculated annual energy consumption is not greater than a similar building (defined as a "standard design") whose enclosure elements and energy-consuming systems are designed in accordance with Chapter 5.

For an alternate building design to be considered similar to a "standard design," it shall utilize the same energy source(s) for the same functions and have equal floor area and the same ratio of envelope area to floor area, environmental requirements, occupancy, climate data and usage operational schedule.

402.3 Design: The standard design, conforming to the criteria of Chapter 5 and the proposed alternative design shall be designed on a common basis as specified herein:

The comparison shall be expressed as kBtu or kWh input per square foot of conditioned floor area per year at the building site.

402.4 Analysis Procedure: The analysis of the annual energy usage of the standard and the proposed alternative building and system design shall meet the following criteria:

a. The building heating/cooling load calculation procedure used for annual energy consumption analysis shall be detailed to permit the evaluation of effect of factors specified in section 402.5.

b. The calculation procedure used to simulate the operation of the building and its service systems through a full-year operating period shall be detailed to permit the evaluation of the effect of system design, climatic factors, operational characteristics, and mechanical equipment on annual energy usage. Manufacturer's data or comparable field test data shall be used when available in the simulation of systems and equipment. The calculation procedure shall be based upon eight thousand seven hundred sixty hours of operation of the building and its service systems.

402.5 Calculation Procedure: The calculation procedure shall cover the following items:

a. Design requirements—Environmental requirements as required in Chapter 3.

b. Climatic data—Coincident hourly data for temperatures, solar radiation, wind and humidity of typical days in the year representing seasonal variation.

c. Building data—Orientation, size, shape, mass, air, moisture and heat transfer characteristics.

d. Operational characteristics—Temperature, humidity, ventilation, illumination, control mode for occupied and unoccupied hours.

e. Mechanical equipment—Design capacity, part load profile.

f. Building loads—Internal heat generation, lighting, equipment, number of people during occupied and unoccupied periods.

EXCEPTION: Group R Occupancy shall comply with calculation procedures in Chapter 8, or an approved alternate.

402.6 Documentation: Proposed alternative designs, submitted as requests for exception to the standard design criteria, shall be accompanied by an energy analysis comparison report. The report shall provide technical detail on the two building and system designs and on the data used in and resulting from the comparative analysis to verify that both the analysis and the designs meet the criteria of Chapter 4 of this Code.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0402, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0500 Chapter 5--Building design by component performance approach.**

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0500, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0501 Scope.**

501.1 General: Buildings that are heated or mechanically cooled shall be constructed so as to provide the required thermal performance of the various components. A building that is designed to be both heated and cooled shall meet the more stringent of the heating or cooling requirements as provided in this Code when requirements of the exterior envelope differ.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0501, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0502 Building envelope requirements.**

502.1 General:

502.1.1: The stated U- or F-value of any component assembly, listed in Table 5-1 or 5-2, such as roof/ceiling, opaque wall or opaque floor may be increased and the U-value for other components decreased, provided that the total heat gain or loss for the entire building envelope does not exceed the total resulting from compliance to the U-values specified in this Section.

The U-values for typical construction assemblies are included in Chapter 10. These values shall be used for all calculations. Where proposed construction assemblies are not represented in Chapter 10, values shall be calculated in accordance with Chapters 19-27 in RS-1 listed in Chapter 7, using the framing factors listed in Chapter 10.

For envelope assemblies containing metal framing, the U-value shall be determined by one of the following methods:

1. Results of laboratory or field measurements.
2. Standard RS-25, listed in Chapter 7, where the metal framing is bonded on one or both sides to a metal skin or covering.
3. The zone method as provided in Chapter 22 of RS-1, listed in Chapter 7.
4. Effective framing/cavity R-values as provided from the following table for metal stud walls:

WALL FRAMING	CAVITY INSULATION	
	R-11	R-19
2 x 4 @ 16" o.c.	5.50	—
2 x 4 @ 24" o.c.	6.60	—
2 x 6 @ 16" o.c.	—	7.6 0
2 x 6 @ 24" o.c.	—	8.5 5

502.1.2: For consideration of thermal mass effects, see section 402.4.

502.1.3: When return air ceiling plenums are employed, the roof/ceiling assembly shall:

- a. For thermal transmittance purposes, not include the ceiling proper nor the plenum space as part of the assembly; and

b. For gross area purposes, be based upon the interior face of the upper plenum surface.

#### 502.1.4 Insulation:

502.1.4.1 General: All insulating materials shall comply with sections 1712 and/or 1713 of the Uniform Building Code. Substantial contact of the insulation with the surface being insulated is required. All insulation materials shall be installed according to the manufacturer's instructions to achieve proper densities, and maintain uniform R-values. To the maximum extent possible, insulation shall extend over the full component area to the intended R-value.

502.1.4.2 Insulation Materials: All insulation materials including facings such as vapor barriers or breather papers installed within floor/ceiling assemblies, roof/ceiling assemblies, walls, crawl spaces, or attics shall have a flame spread rating of less than twenty-five and a smoke density not to exceed four hundred fifty when tested in accordance with UBC Standard 42-1.

#### EXCEPTIONS:

1. Foam plastic insulation shall comply with section 1712 of the Uniform Building Code.

2. When such materials are installed in concealed spaces of Types III, IV, and V construction, the flame spread and smoke developed limitations do not apply to facing, provided that the facing is installed in substantial contact with the unexposed surface of the ceiling, floor, or wall finish.

3. Cellulose insulation shall comply with section 1713 of the Uniform Building Code.

502.1.4.3 Clearances: Where required, insulation shall be installed with clearances according to manufacturers specifications. Insulation shall be installed so that required ventilation is unobstructed. For blown or poured loose fill insulation clearances shall be maintained through installation of a permanent retainer.

502.1.4.4 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 which prevents damaging or compressing the insulation. A wood framed or equivalent baffle or retainer must 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.

502.1.4.5 Roof/Ceiling Insulation: Open-blown or poured loose-fill insulation may be used in attic spaces where the slope of the ceiling is not more than three feet in twelve and there is at least thirty 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. When eave vents are installed, baffling of the vent

openings shall be provided so as to deflect the incoming air above the surface of the insulation. Baffles shall be, rigid material, resistant to wind driven moisture. Requirements for baffles for ceiling insulation shall meet the Uniform Building Code section 3205(c) for minimum ventilation requirements. When feasible, the baffles shall be installed from the top of the outside of the exterior wall, extending inward, to a point six inches vertically above the height of noncompressed insulation, and twelve inches vertically above loose fill insulation.

502.1.4.6 Wall Insulation: Insulation installed in exterior walls shall comply with the provisions of this section. All wall insulation shall fill the entire cavity. Exterior wall cavities isolated during framing shall be fully insulated to the levels of the surrounding walls. All faced insulation shall be face stapled to avoid compression.

502.1.4.7 Floor Insulation: Floor insulation shall be installed in a permanent manner in substantial contact with the surface being insulated. Insulation supports shall be installed so spacing is no more than twenty-four inches on center. Foundation vents shall be placed so that the top of the vent is below the lower surface of the floor insulation.

Exception: Insulation may be omitted from floor areas over heated basements, heated garages, or underfloor areas used as HVAC supply plenums. See Uniform Mechanical Code section 1008 for underfloor supply plenum requirements. When foundation walls are insulated, the insulation shall be attached in a permanent manner. The insulation shall not block the airflow through foundation vents when installed. 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 thirty degrees from horizontal, to divert air flow below the lower surface of the floor insulation.

502.1.4.8 Slab-On-Grade: Slab-on-grade insulation, installed inside the foundation wall, shall extend downward from the top of the slab for a minimum distance of twenty-four inches or downward and then horizontally beneath the slab for a minimum combined distance of twenty-four inches. Insulation installed outside the foundation shall extend downward to a minimum of twenty-four inches or to the frostline. Above grade insulation shall be protected.

EXCEPTION: For monolithic slabs, the insulation shall extend downward from the top of the slab to the bottom of the footing.

502.1.4.9 Radiant Slabs: The entire area of a radiant slab 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 radiant slab, which results in increased convective flow below the radiant slab, the radiant slab shall be thermally isolated from the sub-slab gravel layer.

#### 502.1.4.10 Below-Grade Walls:

a. 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.

b. 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.

502.1.5 Glazing and Door U-Values: For Group R Occupancy, glazing and door U-values shall be determined in accordance with section 502.1.5.1. For other occupancies, glazing and door U-values shall be determined in accordance with either section 502.1.5.1 or 502.1.5.2.

502.1.5.1 Standard Procedure for Determination of Glazing and Door U-Values: U-values for glazing and doors, including all fire doors, shall be the tested U-values for thermal transmittance due to conduction resulting from either the AAMA 1503.1-88 test procedure or the ASTM C236-87 or C976-82 test procedures, provided that testing shall be conducted under established winter horizontal heat flow test conditions using fifteen mile per hour wind speed directed perpendicular to the exterior surface of the glazing as specified under AAMA 1503.1-88.

AAMA 1503.1-88 testing, shall be conducted by a laboratory accredited by AAMA to perform that test. ASTM C236-87 or C976-82 testing shall be conducted by an independent laboratory accredited by a nationally recognized accreditation program, independent of that laboratory. All tested U-values reported for listing by the state building code council after January 1, 1991, shall include certification by the manufacturer of gas content in the sealed insulated glass unit used for testing and in the production unit.

Product samples tested shall be production line units or representative of units as purchased by the consumer or contractor. Product sample sizes tested shall be in accordance with AAMA 1503.1-88, except that skylights shall be tested with a nominal two foot by four foot size, or a nominal four foot by four foot size. The installation of the test sample shall be in accordance with AAMA 1503.1-88, section 8.4. All testing performed after January 1, 1991, shall not include screens. All glazing and doors shall be identified with a label that states an overall product U-value that is no less than the actual tested U-value. The labeled U-value shall be used in all calculations to determine compliance with this Code. Sealed insulating glass shall conform to, or be in test for, ASTM E-774-81 level A.

**EXCEPTIONS:**

1. The exterior frame dimensions of the product sample size tested shall not deviate by more than three inches from the height and width specified, except that skylights are allowed to be tested in the closest production line size to that specified above.

2. Passive air inlets are not required to be part of the tested assembly.

3. Products tested prior to December 31, 1990, to AAMA 1503.1-80, ASTM C236-80 or C976-82 which are not in compliance with the test size requirement above, and which are in compliance with the product sample sizes in AAMA 1503.1-80, shall be acceptable until December 31, 1994.

4. Untested glazing and doors shall be assigned the default U-values listed in Chapter 10. The default values for the opaque portions of doors shall be those listed in Chapter 10, provided that the U-value listed for a door with a thermal break shall only be allowed if both the door and the frame have a thermal break.

5. The U-value of an insulated glazing product which has a 'grille pattern' installed between the glazing layers shall be deemed equal to the U-value of an insulated glazing product which is tested without a 'grille pattern' in between glazing layers, provided a minimum one-eighth inch air space exists between the 'grille pattern' and both glass lites.

6. For a glazing product which is manufactured with an alternative 'low-e coating' than the 'low-e coating' of the tested glazing product, the U-value shall be deemed equal provided that the alternative 'low-e coating' material has an equal or lower rated emissivity.

502.1.5.2 Alternate Glazing and Door U-Values for Other Than Group R Occupancy: Glazing U-values for other than Group R Occupancy are also allowed to be taken from Table 13 of Chapter 27 of RS-1 listed in Chapter 7 or calculated in accordance with the procedures of Chapter 27 of RS-1 listed in Chapter 7 and door U-values are also allowed to be taken from Table 6 in Chapter 22 of RS-1 listed in Chapter 7.

**502.1.6 Moisture Control:**

502.1.6.1: Vapor retarders shall be installed on the warm side (in winter) of insulation as specified in the following cases.

EXCEPTION: Vapor retarder installed with not more than one-third of the nominal R-value between it and the conditioned space.

502.1.6.2 Floors: Floors separating conditioned space from unconditioned space shall have a vapor retarder installed. The vapor retarder shall have a one perm dry cup rating or less (i.e., four mil. polyethylene or kraft faced material).

502.1.6.3: Roof/ceiling assemblies where the ventilation space above the insulation is less than an average of twelve inches shall be provided with a vapor retarder. Faced batt insulation where used as a vapor retarder shall be face stapled. Single rafter joist vaulted ceiling cavities shall be of sufficient depth to allow a minimum one inch vented air space above the insulation.

502.1.6.4: Vapor retarders shall not be required in roof/ceiling assemblies where the ventilation space above the insulation averages twelve inches or greater.

502.1.6.5: Vapor retarders shall not be required where all of the insulation is installed between the roof membrane and the structural roof deck.

502.1.6.6 Wall Insulation: Walls separating conditioned space from unconditioned space shall have a vapor retarder installed. Faced batt insulation shall be face stapled.

502.1.6.7 Ground Cover: A ground cover of six mil (0.006 inch thick) black polyethylene or approved equal shall be laid over the ground within crawl spaces. The ground cover shall be overlapped twelve inches minimum at the joints and shall extend to the foundation wall.

EXCEPTION: The ground cover may be omitted in crawl spaces if the crawl space has a concrete slab floor with a minimum thickness of three and one-half inches.

#### 502.2 Thermal Criteria for Group R Occupancy:

502.2.1: The proposed UA as calculated using Equations 2 and 3 shall not exceed the Target UA as calculated using Equation 1. For the purpose of determining equivalent thermal performance, the glazing area for the target UA shall be calculated using figures in Table 5-1, and all the glazing shall be located in the wall area. The opaque door area shall be the same in the target UA and the proposed UA.

502.2.2 Space Heat Type: The following two categories comprise all space heating types:

1. Electric Resistance: Space heating systems which include baseboard units, radiant units, and forced air units as either the primary or secondary heating system.

EXCEPTION: Electric resistance systems for which the total electric heat capacity in each individual dwelling unit does not exceed the greater of: 1) One thousand watts per dwelling unit, or; 2) One watt per square foot of the gross floor area.

2. Other: All gas, wood, oil, and propane space heating systems, unless electric resistance is used as a secondary heating system, and all heat pump space heating systems. (See EXCEPTIONS, Electric Resistance, section 502.2.2 above.)

#### 502.3 Thermal Performance Criteria For Other Than Group R Occupancies.

502.3.1: The overall thermal transmittance value ( $U^o$ ) of the gross area of elements of the exterior building envelope of all buildings other than low-rise residential buildings shall not exceed the values given in Tables 5-2. Equations 2, 4 and 5 shall be used to determine acceptable combinations of building components and thermal properties to meet this requirement for heating.  $U^o$  and  $U^w$  are specified in units of:

$$\frac{\text{Btu}}{\text{hr.} \cdot \text{ft}^2 \cdot \text{°F}}$$

502.3.2 Slab on Grade Floors: For slab on grade floors the thermal resistance of the insulation around the perimeter of the floor shall not be less than the value given in Table 5-2.

502.3.3 Alternative Wall Allowance for Other Than Group R Occupancies: For other than Group R Occupancies, three stories or less, the maximum allowed value for average thermal transmittance ( $U_o$ ) of the exterior walls may be increased to the values given in Table 5-2 BUILDINGS OVER THREE CONDITIONED STORIES provided that at least one of the following criteria is also met:

1. Mechanical supply of outside air and mechanical exhaust of building air shall be automatically shut off and the duct closed for at least eight hours per day during hours of nonoccupancy, or

2. The primary source of heating for the building shall be one or more heat pumps meeting the provisions of section 503.4.2 or gas or oil combustion heating equipment with a minimum combustion efficiency of eighty-five percent for central heating plants and eighty percent for room and space heaters. This efficiency shall be determined in accordance with the provisions of section 503.4.3.

*Provided further:* That if both criteria are met, the maximum allowed value for thermal transmittance ( $U^o$ ) of the exterior walls used in Table 5-2 may be increased by 0.05 in determining compliance with the provisions of the Code.

For walls with a wall weight of at least thirty lbs. per  $\text{ft}^2$  (provided that walls constructed of hollow masonry units have cores filled with either grout, concrete, or with an insulating material with resistance per inch (R) of at least  $2.25 \text{ ft}^2/\text{hr.} \cdot \text{°F}/\text{Btu}$ ) the calculated thermal resistance of the wall sections measured face to face on wall units which are exposed to inside air temperatures, not including the thermal resistance of air films or additional exterior wall elements may be increased by twenty-five percent in determining compliance with the provisions of the code provided that:

Heating and cooling set-point temperatures in the conditioned spaces or zones of the building shall be separated by at least five degrees F. The temperature control shall be designed to prevent new energy from being used to heat the space above the heating set-point temperature or cool the space below the cooling set-point temperature.

#### 502.4 Air Leakage for All Occupancies:

502.4.1: The requirements of this section shall apply to all buildings and structures, or portions thereof, and only to those locations separating outdoor ambient conditions from interior spaces that are heated or mechanically cooled.

502.4.2: Exterior doors and windows shall be designed to limit air leakage into or from the building envelope. Site-constructed doors and windows shall be sealed in accordance with Section 502.4.3.

#### 502.4.3:

a. Exterior joints around windows and door frames, openings between walls and foundation, between walls and roof and wall panels; openings at penetrations of

utility services through walls, floors, and roofs; and all other openings in the building envelope for all occupancies and all other openings in between units in R-1 occupancy shall be sealed, caulked, gasketed, or weatherstripped to limit air leakage.

b. All exterior doors or doors serving as access to an enclosed unheated area shall be weatherstripped to limit leakage around their perimeter when in a closed position.

c. Site built windows are exempt from testing but shall be made tight fitting. Fixed lights shall have glass retained by stops with sealant or caulking all around. Operating sash shall have weatherstripping working against overlapping trim, and a closer/latch which will hold the sash closed. The window frame to framing crack shall be made tight with caulking, overlapping membrane, or other approved technique.

d. Openings that are required to be fire resistive are exempt from this section.

502.4.4 Recessed Lighting Fixtures: When installed in the building envelope, recessed lighting fixtures shall meet one of the following requirements:

1. Type IC rated, manufactured with no penetrations between the inside of the recessed fixture and ceiling cavity and sealed or gasketed to prevent air leakage into the unconditioned space.

2. Type IC or non-IC rated, installed inside a sealed box constructed from a minimum one-half inch thick gypsum wall board, or constructed from a preformed polymeric vapor barrier, or other air tight assembly manufactured for this purpose, while maintaining required clearances of not less than one-half inch from combustible material and not less than three inches from insulation material.

3. Type IC rated, certified under ASTM E283 to have no more than 2.0 cfm air movement from the conditioned space to the ceiling cavity. The lighting fixture shall be tested at seventy-five Pascals or 1.57 lbs/ft<sup>2</sup> pressure difference and have a label attached, showing compliance.

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## EQUATION 1 -- GROUP R OCCUPANCY

## TARGET UA

$$UA_T = U_W A_W + U_{BGW} A_{BGW} + U_G A_G + U_F A_F + U_{RC} A_{RC} + U_{CC} A_{CC} + U_D A_D + F_S P_S$$

## Where:

- $UA_T$  = the target combined thermal transmittance of the gross exterior wall, floor, and roof/ceiling assembly area .
- $U_W$  = the thermal transmittance value of the opaque above grade wall area found in Table 5-1.
- $A_W$  = opaque above grade wall area.
- $U_{BGW}$  = the thermal transmittance value of the below grade opaque wall area found in Table 5-1.
- $A_{BGW}$  = opaque below grade wall area.
- $U_G$  = the thermal transmittance value of the glazing area found in Table 5-1.
- $A_G$  = .15 (total floor area of the conditioned space).
- $U_F$  = the thermal transmittance value of the floor area found in Table 5-1.
- $A_F$  = floor area over unconditioned space.
- $U_{RC}$  = the thermal transmittance value of the roof/ceiling area found in Table 5-1.
- $A_{RC}$  = roof/ceiling area.
- $U_{CC}$  = the thermal transmittance value of the cathedral ceiling area found in Table 5-1.
- $A_{CC}$  = cathedral ceiling area.
- $U_D$  = the thermal transmittance value of the opaque door area found in table 5-1.
- $A_D$  = opaque door area.
- $F_S$  = concrete slab component F-value found in Table 5-1.
- $P_S$  = Lineal ft. of concrete slab perimeter.

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## EQUATION 2 -- ALL OCCUPANCIES

$$U = \frac{1}{r_o + R_1 + R_2 \dots r_i}$$

## Where:

U = the thermal transmittance of the assembly.

$r_o$  = outside air film resistance.

$r_o$  = .17 for all exterior surfaces.

$r_i$  = inside air film resistance.

$r_i$  = 0.61 for interior horizontal surfaces, heat flow up.

$r_i$  = 0.92 for interior horizontal surfaces, heat flow down.

$r_i$  = 0.68 for interior vertical surfaces.

$R = \frac{1}{C} = \frac{X}{K}$  = measure of the resistance to the passage of heat for each element.

C = conductance, the heat flow through a specific material of specific thickness.

K = insulation value of a material per inch.

X = the thickness of the material in inches.



THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

## EQUATION 3 -- GROUP R OCCUPANCY

## PROPOSED UA

$$UA = U_W A_W + U_{BGW} A_{BGW} + U_G A_G + U_F A_F + U_{RC} A_{RC} + U_{CC} A_{CC} + U_D A_D + F_S P_S$$

Where:

- UA = the combined thermal transmittance of the gross exterior wall, floor, and roof/ceiling assembly area
- $U_W$  = the thermal transmittance of the opaque wall area.
- $U_{BGW}$  = the thermal transmittance value of the below grade opaque wall area.
- $A_{BGW}$  = opaque below grade wall area.
- $A_W$  = opaque wall area.
- $U_G$  = the thermal transmittance of the glazing (window or skylight) area.
- $A_G$  = glazing area, including windows in exterior doors.
- $U_F$  = the thermal transmittance of the floor area.
- $A_F$  = floor area over unconditioned space.
- $U_{RC}$  = the thermal transmittance of the roof/ceiling area.
- $A_{RC}$  = roof/ceiling area.
- $U_{CC}$  = the thermal transmittance of the cathedral ceiling area.
- $A_{CC}$  = cathedral ceiling area.
- $U_D$  = The thermal transmittance value of the opaque door area.
- $A_D$  = opaque door area.
- $F_S$  = concrete slab component f-factor.
- $P_S$  = Lineal ft. of concrete slab perimeter.

NOTE: Where more than one type of wall, window, roof/ceiling, door, and skylight is used, the U and A terms for those items shall be expanded into sub-elements as:

$$U_{W1} A_{W1} + U_{W2} A_{W2} + U_{W3} A_{W3} + \dots \text{etc.}$$

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## EQUATION 4 -- OTHER THAN GROUP R OCCUPANCY

TARGET  $U_o$ 

$$U_o = \frac{U_w A_w + U_f A_f + U_c A_c + F_s P_s}{A_w + A_f + A_c + P_s}$$

Where:

- $U_o$  = the target combined thermal transmittance of the gross exterior wall, floor, and roof/ceiling assembly area .
- $U_w$  = the thermal transmittance value of the opaque above grade wall area found in Table 5-2.
- $A_w$  = opaque above grade wall area.
- $U_f$  = the thermal transmittance value of the floor area found in Table 5-2.
- $A_f$  = floor area over unconditioned space.
- $U_c$  = the thermal transmittance value of the ceiling area found in Table 5-2.
- $A_c$  = ceiling area.
- $F_s$  = concrete slab component F-value found in Table 5-2.
- $P_s$  = Lineal ft. of concrete slab perimeter

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## EQUATION 5 -- OTHER THAN GROUP R OCCUPANCY

PROPOSED  $U_o$ 

$$U_o = \frac{U_W A_W + U_{BGW} A_{BGW} + U_G A_G + U_F A_F + U_{RC} A_{RC} + U_{CC} A_{CC} + U_D A_D + F_S P_S}{A_W + A_{BGW} + A_G + A_F + A_{RC} + A_{CC} + A_D + P_S}$$

Where:

- $U_o$  = the combined thermal transmittance of the gross exterior wall, floor, and roof/ceiling assembly area.
- $U_W$  = the thermal transmittance of the opaque wall area.
- $U_{BGW}$  = the thermal transmittance value of the below grade opaque wall area.
- $A_{BGW}$  = opaque below grade wall area.
- $A_W$  = opaque wall area.
- $U_G$  = the thermal transmittance of the glazing (window or skylight) area.
- $A_G$  = glazing area, including windows in exterior doors.
- $U_F$  = the thermal transmittance of the floor area.
- $A_F$  = floor area over unconditioned space.
- $U_{RC}$  = the thermal transmittance of the roof/ceiling area.
- $A_{RC}$  = roof/ceiling area.
- $U_{CC}$  = the thermal transmittance of the cathedral ceiling area.
- $A_{CC}$  = cathedral ceiling area.
- $U_D$  = Thermal transmittance value of opaque door area.
- $A_D$  = opaque door area.
- $F_S$  = concrete slab component F-factor.
- $P_S$  = Lineal ft. of concrete slab perimeter.

NOTE: Where more than one type of wall, window, roof/ceiling, door, and skylight is used, the U and A terms for those items shall be expanded into sub-elements as:

$$U_{W1} A_{W1} + U_{W2} A_{W2} + U_{W3} A_{W3} + \dots \text{etc.}$$

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0502, filed 12/19/90, effective 7/1/91.]

### WAC 51-11-0503 Building mechanical systems.

503.1 General: This section covers the determination of design requirements, system and component performance, control requirements, insulating systems and duct construction.

EXCEPTION: Special applications, including but not limited to hospitals, laboratories, thermally sensitive equipment, and computer rooms may be exempted from the requirements of this section when approved by the building official.

503.2 Calculations of Heating and Cooling Loads, and System Sizing Limits: The design parameters specified in Chapter 3 shall apply for all computations.

503.2.1 Calculation Procedures: Heating and cooling design loads for the purpose of sizing HVAC systems are required and shall be calculated in accordance with accepted engineering practice, including infiltration and ventilation.

503.2.2 Space Heating and Space Cooling System Sizing Limits: Building mechanical systems for all buildings which provide space heating and/or space cooling shall be sized no greater than one hundred fifty percent of the heating and cooling design loads as calculated above.

EXCEPTIONS: The following limited exemptions from the sizing limit shall be allowed, however, in all cases heating and/or cooling design load calculations shall be submitted.

1. For equipment which provides both heating and cooling in one package unit, including heat pumps with electric heating and cooling and gas-pack units with gas heating and electric cooling, compliance need only be demonstrated for either the space heating or space cooling system size.

2. Natural gas- or oil-fired space heating equipment whose total rated space heating output in any one dwelling unit is fifty-six thousand Btu/h or less may exceed the one hundred fifty percent sizing limit provided that the installed equipment has an annual fuel utilization efficiency (AFUE) of not less than the sum of seventy-eight percent plus one percent for every five thousand Btu/h that the space heating equipment output exceeds the design heating load of the dwelling unit.

3. Stand-by equipment may be installed if controls and other devices are provided which allow redundant equipment to operate only when the primary equipment is not operating.

503.3 Simultaneous Heating and Cooling: Each temperature control zone shall include thermostatic controls installed and operated to sequence the use of heating and cooling energy to satisfy the thermal and/or humidity requirement of the zone. Controls shall prevent reheating (heating air that is cooler than system mixed

air), recooling (cooling air that is warmer than the system mixed air), mixing or simultaneous supply of warm air (warmer than system return air mixed air) and cold air (cooler than system mixed air), or other simultaneous operation of heating and cooling systems to one zone. For the purposes of this section, system mixed air is defined as system return air mixed with the minimum ventilation air requirement by section 303.

#### EXCEPTIONS:

1. Variable air volume systems designed to reduce the air supply to each zone during periods of occupancy to the larger of the following:

a. Thirty percent or less of the peak supply volume.

b. The minimum allowed to meet ventilation requirements of section 303.

c. 0.5 cfm/ft<sup>2</sup> of zone conditioned area before reheating, recooling or mixing takes place. Consideration shall be given to supply air temperature reset control.

2. The energy for reheating, or providing warm air in mixing systems, is provided entirely from recovered energy that would otherwise be wasted, or from renewable energy sources. In addition, the system shall comply with section 503.7 without exception.

3. Areas where specific humidity levels are required to satisfy process needs.

4. Where special pressurization relationships or cross-contamination requirements are such that variable air volume systems are impractical, supply air temperatures shall be reset by representative building load or outside air temperature.

### 503.4 HVAC Equipment Performance Requirements:

#### 503.4.1 Equipment Components:

503.4.1.1: The requirements of this section apply to equipment and mechanical component performance for heating, ventilating and air-conditioning systems. Equipment efficiency levels are specified. Data furnished by the equipment supplier or certified under a nationally recognized certification program or rating procedure shall be used to satisfy these requirements. Equipment efficiencies shall be based on the standard rating conditions in Tables 5-4, 5-5 or 5-6 as appropriate.

503.4.1.2: Where components from more than one manufacturer are assembled into systems regulated under this section, compliance for each component shall be as specified in sections 503.4.2 through 503.4.6 of this Code.

503.4.2: HVAC System Heating Equipment Heat Pump-heating Mode. Heat pumps whose energy input is entirely electric shall have a coefficient of performance (COP) heating, not less than the values in Table 5-7. Heat Pumps with supplementary backup heat other than electricity shall meet the requirements of Table 5-7.

503.4.2.1: These requirements apply to, but are not limited to, unitary (central) heat pumps (air source and

water source) in the heating mode, water source (hydronic) heat pumps as used in multiple-unit hydronic HVAC systems, and heat pumps in the packaged terminal air-conditioner in the heating mode.

503.4.2.3 Supplementary Heater: The heat pump shall be installed with a control to prevent supplementary backup heater operation when the operating load can be met by the heat pump compression cycle alone.

503.4.2.4 Heat Pump Controls: Requirements for heat pump controls are listed in section 503.8.3.5 of this Code.

503.4.3 HVAC System Combustion Equipment: For Group R Occupancy, all gas, oil, and propane central heating systems shall have a minimum AFUE of 0.78\*. All other Group R Occupancy heating equipment fueled by gas, oil, or propane shall be equipped with an intermittent ignition device. For all Other Occupancies, all gas and oil-fired central heating plants shall have a minimum combustion efficiency of not less than that shown in Table 5-3.

\* HVAC Heating system efficiency trade-offs shall be made using Chapters 4 or 6 of this Code.

503.4.4 Packaged and Unitary HVAC System Equipment, Electrically Operated, Cooling Mode: HVAC system equipment as listed below, whose energy input in the cooling mode is entirely electric, shall have an energy efficiency ratio (EER) or a seasonal energy efficiency ratio (SEER) cooling not less than values in Table 5-8.

503.4.4.1: These requirements apply to, but are not limited to, unitary (central) and packaged terminal heat pumps (air source and water source); packaged terminal air conditioners.

EXCEPTION: These requirements do not apply to equipment used for refrigerated food or florists' and nurseries' coolers.

503.4.5 Applied HVAC System Components, Electrically Operated, Cooling Mode: HVAC System components, as listed in Table 5-9, whose energy input is entirely electric, shall have an energy efficiency ratio (EER) or a Coefficient of Performance (COP) cooling not less than the values in Table 5-9.

503.4.6 HVAC System Equipment - Heat Operated, Cooling Mode, Efficiency Limitation, Equipment: Heat-operated cooling equipment shall have a COP cooling not less than the values in Table 5-10.

### 503.5 Transport Energy:

503.5.1 All-air Systems: The air transport factor for each all-air system shall be not less than 5.5. The factor shall be based on design system air flow for constant volume systems. The factor for variable air volume systems may be based on average conditions of operation. Energy for transfer of air through heat recovery devices shall not be included in determining the factor; however, such energy shall be included in the evaluation of the effectiveness of the heat recovery system.

$$\text{Air Transport Factor} = \frac{\text{Space Sensible Heat Removal}^*}{\text{Supply} + \text{Return Fan(s) Power Input}^*}$$

\*Expressed in Btu/h or watts

503.5.2 Other Systems: Air and water, all-water and unitary systems employing chilled, hot, dual-temperature or condenser water transport systems to space terminals shall not require greater transport energy (including central and terminal fan power and pump power) than an equivalent all-air system providing the same space sensible heat removal and having an air transport factor not less than 5.5.

503.6 Balancing: The HVAC system design shall provide a means for balancing air and water systems. Balancing the system shall include, but not be limited to, dampers, temperature and pressure test connections and balancing valves.

503.7 Cooling with Outdoor Air (Economizer Cycle): Each fan system shall be designed to use up to and including one hundred percent of the fan system capacity for cooling with outdoor air automatically whenever its use will result in lower usage of new energy. Activation of economizer cycle shall be controlled by sensing outdoor air enthalpy or outdoor air dry-bulb temperature alone or alternate means approved by the building official.

EXCEPTIONS: Cooling with outdoor air is not required under any one or more of the following conditions:

1. The fan system capacity is less than three thousand five hundred cfm or total cooling capacity is less than ninety thousand Btu/h.

2. The quality of the outdoor air is so poor as to require extensive treatment of the air and approval by the building official.

3. The need for humidification or dehumidification requires the use of more energy than is conserved by the outdoor air cooling on an annual basis.

4. The use of outdoor air cooling may affect the operation of other systems so as to increase the overall energy consumption of the building.

5. When energy recovered from an internal/external zone heat recovery system exceeds the energy conserved by outdoor air cooling on an annual basis.

6. When all space cooling is accomplished by a circulating liquid which transfers space heat directly or indirectly to a heat rejection device such as a cooling tower without use of a refrigeration system.

7. When the use of one hundred percent outside air will cause coil frosting, controls may be added to reduce the quantity of outside air. However, the intent of this exception is to use one hundred percent air in lieu of mechanical cooling when less energy usage will result and this exception applies only to direct expansion systems when the compressor is running.

### 503.8 Controls:

503.8.1 Temperature Control: Each system shall be provided with at least one adjustable thermostat for the regulation of temperature. Each thermostat shall be capable of being set by adjustment or selection of sensors as follows:

503.8.1.1: When used to control heating only: Fifty-five degrees to seventy-five degrees F.

503.8.1.2: When used to control cooling only: Seventy degrees to eighty-five degrees F.

503.8.1.3: When used to control both heating and cooling, it shall be capable of being set from fifty-five degrees to eighty-five degrees F and shall be capable of operating the system heating and cooling in sequence. The thermostat and/or control system shall have an adjustable deadband of not less than ten degrees F.

503.8.2 Humidity Control: If a system is equipped with a means for adding moisture to maintain specific selected relative humidities in space or zones, a humidistat shall be provided. Humidistats shall be capable of being set to prevent new energy from being used to produce space-relative humidity above thirty percent.

EXCEPTION: Special occupancies requiring different relative humidities may be permitted when approved by the building official.

#### 503.8.3 Zoning for Temperature Control:

503.8.3.1 One- and Two-Family Dwellings: At least one thermostat for regulation of space temperature shall be provided for each separate system. In addition, a readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating and/or cooling input to each zone or floor.

503.8.3.2 Multifamily Dwellings: For multifamily dwellings, each individual dwelling unit shall have at least one thermostat for regulation of space temperature. A readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating and/or cooling input to each room. Spaces other than living units shall meet the requirements of 503.8.3.3.

503.8.3.3 Other Types of Buildings or Occupancies: At least one thermostat for regulation of space temperature shall be provided for:

1. Each separate system.

2. Each separate zone as defined in Chapter 2. As a minimum, each floor of a building shall be considered as a separate zone. In a multistory building where the perimeter system offsets only the transmission losses of the exterior wall, an entire side of uniform exposure may be zoned separately. A readily accessible manual or automatic means shall be provided to partially restrict or shut off the heating and/or cooling input to each floor.

#### 503.8.3.4 Control Setback and Shut-off:

1. Residential Occupancy Groups. One- and Two-Family and Multifamily dwellings—The thermostat required in section 503.8.3.1 or section 503.8.3.2, or an alternate means such as a switch or clock, shall provide a

readily accessible, manual or automatic means for reducing the energy required for heating and cooling during the periods of non-use or reduced need, such as, but not limited to unoccupied periods and sleeping hours. Lowering thermostat set points to reduce energy consumption of heating systems shall not cause energy to be expended to reach the reduced setting.

2. Other Buildings and Occupancies. Each HVAC system shall be equipped with a readily accessible, automatic means of shutting off or reducing the energy used for HVAC during periods of non-use or alternate uses of the building spaces or zones served by the system. The following are examples that meet this requirement:

- a. Manually adjustable automatic timing devices.
- b. Automatic control systems.

503.8.3.5 Heat Pump Controls: Programmable thermostats are required for all heat pump systems. The cut-on temperature for the compression heating shall be higher than the cut-on temperature for the supplementary heat, and the cut-off temperature for the compression heating shall be higher than the cut-off temperature for the supplementary heat. Heat pump thermostats will be capable of providing at least two programmable setback periods per day. The automatic setback thermostat shall have the capability of limiting the use of supplemental heat during the warm-up period.

503.9 Air Handling Duct System Insulation: Ducts, plenums and enclosures installed in or on buildings shall be thermally insulated per Table 5-11.

EXCEPTIONS: Duct insulation (except where required to prevent condensation) is not required in any of the following cases:

1. When the heat gain or loss of the ducts, without insulation, will not increase the energy requirements of the building.
2. Within the HVAC equipment.
3. Exhaust air ducts.
4. Supply or return air ducts installed in unvented crawl spaces with insulated walls, basements, or cellars in one- and two-family dwellings.

503.10 Duct Construction: All duct work shall be constructed in accordance with Standards RS-15, RS-16, RS-17, RS-18, RS-19 or RS-20, as applicable, and the Uniform Mechanical Code.

503.10.1: High-pressure and medium-pressure ducts shall be leak tested in accordance with the applicable standards in Chapter 7 of this Code with the rate of air leakage not to exceed the maximum rate specified in that standard.

503.10.2: When low-pressure supply air ducts are located outside of the conditioned space, all HVAC ductwork seams and joints, both longitudinal and transverse, shall be taped and sealed with products approved by the

building official only. Ductwork joints shall be mechanically fastened with a minimum of three fasteners per joint for a cylindrical duct. Use Table 5-11 for duct insulation requirements.

503.10.3: Requirements for Automatic or manual dampers are found in the Washington State Ventilation and Indoor Air Quality Code.

503.11 Piping Insulation: All piping installed to serve buildings (and within) shall be thermally insulated in accordance with Table 5-12. For service hot water systems see section 504.7. If water pipes are outside of conditioned space then the pipe insulation requirement shall be R-3 minimum for non-recirculating hot and cold water pipes. For recirculating service hot and cold water pipes use Table 5-12 for pipe sizes and temperatures.

EXCEPTIONS: Piping insulation is not required in any of the following cases:

1. Piping installed within unitary HVAC equipment.

2. When the heat loss and/or heat gain of the piping, without insulation, does not increase the energy requirements of the building or is used as a component of a designed heating system.

503.11.1 Other Insulation Thickness: Insulation thickness in Table 5-12 is based on insulation having thermal resistance in the range of 4.0 to 4.6 per inch of thickness on a flat surface at a mean temperature of seventy-five degrees F. Minimum insulation thickness shall be increased for materials having R-values less than 4.0 per inch, or may be reduced for materials having R-values greater than 4.6 per inch.

a. For materials with thermal resistance greater than  $R = 4.6$  per inch, the minimum insulation thickness may be reduced as follows:

$$\frac{4.6 \times (\text{Table 5-12 Thickness})}{\text{Actual Resistance}} = \text{New Minimum Thickness}$$

b. For materials with thermal resistance less than  $R = 4.0$  per inch, the minimum insulation thickness shall be increased as follows:

$$\frac{4.0 \times (\text{Table 5-10 Thickness})}{\text{Actual Resistance}} = \text{New Minimum Thickness}$$

c. Additional insulation with vapor barriers shall be provided to prevent condensation where required by the building official.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0503, filed 12/19/90, effective 7/1/91.]

#### WAC 51-11-0504 Service water heating.

504.1 Scope: The purpose of this section is to provide criteria for design and equipment selection that will produce energy savings when applied to service water heating.

#### 504.2 Water Heaters, Storage Tanks and Boilers:

504.2.1 Performance Efficiency: All Storage water heaters shall meet the requirements of the 1987 National Appliance Energy Conservation Act and be so labeled. 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.

504.2.2 Insulation: Heat loss from unfired hot-water storage tanks shall be limited to a maximum of 9.6 Btu/hr/ft<sup>2</sup> of external tank surface area. The design ambient temperature shall be no higher than sixty-five degrees F.

504.2.3 Combination Service Water Heating/Space Heating Boilers: Service water heating equipment shall not be dependent on year round operation of space heating boilers.

#### EXCEPTIONS:

1. Systems with service/space heating boilers having a standby loss Btu/h less than:

$$(13.3 \text{ pmd} + 400)/n$$

determined by the fixture count method where:

pmd = probably maximum demand in gallons/hour as determined in accordance with Chapter 37 of Standard RS-11.

n = fraction of year when outdoor daily mean temperature exceeds 64.9° F.

The standby loss is to be determined for a test period of twenty-four-hour duration while maintaining a boiler water temperature of ninety degrees F above an ambient of sixty degrees F and a five foot stack on appliance.

2. For systems where the use of a single heating unit will lead to energy savings, such unit shall be utilized.

504.3 Automatic Controls: Service water heating systems shall be equipped with automatic temperature controls capable of adjustment from the lowest to the highest acceptable temperature settings for the intended use. Temperature setting range shall be set to one hundred twenty degrees F or forty-nine degrees C.

504.4 Shutdown: A separate switch shall be provided to permit turning off the energy supplied to electric service water heating systems. A separate valve shall be provided to permit turning off the energy supplied to the main burner(s) of all other types of service water heater systems.

#### 504.5 Swimming Pools:

504.5.1: All pool heaters shall be equipped with readily accessible ON/OFF switch to allow shutting off the operation of the heater without adjusting the thermostat setting. Controls shall be provided to allow the water temperature to be regulated from the maximum design temperature down to sixty-five degrees F.

504.5.2 Pool Covers: Heated swimming pools shall be equipped with a pool cover, approved by the building official.

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

504.7 Pipe Insulation: For recirculating and non-recirculating systems, piping shall be thermally insulated in accordance with section 503.11 and Table 5-12.

#### 504.8 Conservation of Hot Water:

504.8.1 Showers and Lavatories: Showers and lavatories used for other than safety reasons shall be equipped with flow control devices or specially manufactured showerheads or aerators to limit the total water flow rate to a maximum of three gallons per minute per showerhead or faucet, as measured with both hot and cold faucets turned on to their maximum flow.

#### 504.8.2 Lavatories in Restrooms of Public Facilities:

504.8.2.1: Lavatories in restrooms of public facilities shall be equipped with a metering valve designed to close by spring or water pressure when left unattended (self-closing) and limit the flow of water to a maximum of 2.5 gallons per minute.

EXCEPTION: Separate lavatories for physically handicapped persons shall not be equipped with self-closing valves.

504.8.2.2: Lavatories in restrooms of public facilities shall be equipped with devices which limit the outlet temperature to a maximum of one hundred ten degrees F.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0504, filed 12/19/90, effective 7/1/91.]

### WAC 51-11-0505 Electrical power and lighting.

505.1 General: Electrical distribution and lighting systems shall be designed for efficient distribution and use of electrical energy from the service entrance to and at the points of use as provided herein.

505.2 Lighting Switching: Switching for building lighting systems shall be designed and installed to permit efficient use of energy and to permit maximum flexibility in the use of the installed lighting. The following mandatory requirements represent the minimum lighting controls to be installed in any building. Additional controls should be provided where deemed appropriate and where the installation of such controls can significantly reduce energy consumption.

a. All lighting controls, except automatic controls or those for special purpose applications which require trained operators or those which would pose a safety problem or a security hazard, shall be installed so as to be readily accessible to personnel occupying or using the lighting space.

b. The maximum lighting power that may be controlled from a single switch or automatic control shall

not exceed that provided by a twenty ampere circuit loaded to no more than eighty percent. A master control may be installed provided the individual switches retain their capability to function independently.

c. All lighted spaces enclosed by walls or ceiling height partitions and with floor area less than four hundred square feet shall be provided an individual lighting control or an occupant-sensing automatic control.

d. All lighted spaces with floor area greater than four hundred square feet shall be provided with controls to permit reducing the lighting by not more than one half or occupant-sensing automatic controls.

e. All building areas greater than two hundred square feet where natural lighting is available shall be provided with individual controls or daylight- or occupant-sensing automatic controls which permit control of lights independent of general area lighting. Either individual controls shall be provided for each row of luminaires parallel to a window wall or controls shall be provided to reduce the lighting in at least two steps to not more than one-half and to completely off in the natural lighting area. For office and school occupancies, at a minimum, lighting serving a zone within twelve feet of a window wall or the zone between an interior wall and the window wall of less than twelve feet shall comply with this provision. For retail occupancies, at least the row of luminaires nearest the window shall comply with this provision.

f. All display, exhibition, or specialty lighting shall be controlled independently of general area lighting.

g. All exterior building lighting including facade lighting, parking lots, driveways, walkways shall be furnished with automatic controls to reduce or turn off all lights during periods of non-use or daylight hours, except those required for safety and security. Sign lights shall be exempt from this provision.

505.3 Lighting Power Budget: A lighting power budget is the upper limit of the power to be available to provide the lighting needs in accordance with the criteria and calculation procedure specified herein.

The lighting power budget for a building shall be the sum of the power limits computed for all lighted interior and exterior spaces and shall be determined in accordance with the procedures specified in this section.

EXCEPTION: One- and two-family detached dwellings and the dwelling portion of multifamily buildings are exempt from the requirements of section 505.3.

505.3.1 Budget Development: The installed lighting wattage for the building project shall not exceed the budget level calculated in this section. The budget wattage level shall be the sum of the interior budget calculated and the exterior budget. Lighting wattage includes lamp and ballast wattage.

505.3.2 Building Interiors: The interior lighting budget shall be calculated by multiplying the gross conditioned floor area, in square feet, by the appropriate



unit power budget, in watts per square foot, specified in Table 5-13.

For special conditions when approved by the building official, calculation based on Illuminating Engineering Society Unit Power Density or similar nationally recognized standards may be used.

The lighting power budget shall be based on the primary occupancy for which the space within the building is intended. If multiple occupancies are intended, the lighting power budget for each type of occupancy shall be separately calculated and summed to obtain the lighting budget for the interior spaces of the building. If a common circulation area serves multiple occupancies or multiple retail spaces, the lighting power budget for the common circulation area shall be the weighted average of the lighting power budgets for all other areas on that floor. In cases where a lighting plan for only a portion of a building is submitted, the interior lighting budget shall be based on the gross floor area covered by the plan.

EXCEPTIONS:

1. Where the following automatic lighting controls are installed, for calculations used to determine code compliance, the installed lighting wattage may be reduced by the following percentages:

a. For occupant-sensing devices, energy savings of thirty percent shall be allowed for any single space up to four hundred ft<sup>2</sup> and enclosed by ceiling height partitions; classrooms, conference rooms, computer rooms, storage areas, corridors, or waiting rooms.

b. For daylighting controls, energy savings of thirty percent for continuous dimming and twenty percent for stepped controls shall be allowed for any daylit space.

c. For lumen maintenance controls, energy savings of ten percent shall be allowed for any space.

d. For daylighting controls with occupant-sensing devices, energy savings of forty-four percent shall be allowed for any single space up to four hundred ft<sup>2</sup> within daylit spaces, and enclosed by ceiling height partitions.

e. For occupant-sensing devices with lumen maintenance controls, energy savings of thirty-seven percent shall be allowed for any single space up to four hundred ft<sup>2</sup> and enclosed by ceiling height partitions.

505.3.2.1: Lighting for the following applications shall be exempted from inclusion in the calculation of lighting power budgets:

A. Stage lighting, entertainment, or audiovisual presentations where the lighting is an essential technical element for the function performed.

B. Lighting for medical and dental tasks.

C. Lighting in areas specifically designed for visually handicapped people.

D. For restaurant occupancies, lighting for kitchens and food preparation areas.

505.3.4 Building Exteriors: The exterior lighting budget shall be calculated by multiplying the building perimeter in feet by 7.5 watts per foot. Lighting for parking structures shall be calculated at 0.3 watts per gross square foot of parking area. An allowance for outdoor surface parking and circulation lighting may be added at 0.05 watts per ft<sup>2</sup> of area. Lighting for signs that are not an integral part of the building shall be exempted from inclusion in these calculations.

TABLE 5-1 TARGET COMPONENT VALUES FOR GROUP R OCCUPANCY

Climate Zone⇒	Electric Resistance		Other Fuels	
	1	2	1	2
<u>Component</u>				
Glazing % Floor Area	15%	15%	15%	15%
Glazing U-Factor	U = 0.400	U = 0.400	U = 0.650	U = 0.600
Doors	U = 0.200 (R = 5)	U = 0.200 (R = 5)	U = 0.400 (R = 2.5)	U = 0.400 (R = 2.5)
<b>Ceilings:</b>				
Attic	U = 0.031 (R = 38)	U = 0.031 (R = 38)	U = 0.036 (R = 30)	U = 0.031 (R = 38)
Single Rafter/ Joist Vaulted	U = 0.034 (R = 30)	U = 0.034 (R = 30)	U = 0.034 (R = 30)	U = 0.034 (R = 30)
Walls	U = 0.058 (R = 19A)	U = 0.044 (R = 19+5A)	U = 0.062 (R = 19)	U = 0.062 (R = 19+5)
Floors	U = 0.029 (R = 30)	U = 0.029 (R = 30)	U = 0.041 (R = 19)	U = 0.029 (R = 30)
Slab on Grade Slab R-Value	F = 0.54 (R = 10)	F = 0.54 (R = 10)	F = 0.54 (R = 10)	F = 0.54 (R = 10)
<u>Below Grade Interior</u>				
Wall R-Value	(R = 19)	(R = 19)	(R = 19)	(R = 19)
2' Depth: Walls Slab	U = 0.043 F = .69	U = 0.043 F = .69	U = 0.043 F = .69	U = 0.043 F = .69
3.5' Depth: Walls Slab	U = 0.041 F = 0.64	U = 0.041 F = 0.64	U = 0.041 F = 0.64	U = 0.041 F = 0.64
7' Depth: Walls Slab	U = 0.037 F = 0.57	U = 0.037 F = 0.57	U = 0.037 F = 0.57	U = 0.037 F = 0.57
<u>Below Grade Exterior</u>				
Wall R-Value	(R = 10)	(R = 12)	(R = 10)	(R = 12)
2' Depth: Walls Slab	U = 0.070 F = 0.60	U = 0.061 F = 0.60	U = 0.070 F = 0.60	U = 0.061 F = 0.60
3.5' Depth: Walls Slab	U = 0.064 F = 0.57	U = 0.057 F = 0.57	U = 0.064 F = 0.57	U = 0.057 F = 0.57
7' Depth: Walls Slab	U = 0.056 F = 0.42	U = 0.050 F = 0.42	U = 0.056 F = 0.42	U = 0.050 F = 0.42

TABLE 5-2 COMPONENT REQUIREMENTS FOR OTHER  
THAN GROUP R OCCUPANCIES

BUILDINGS OF THREE CONDITIONED STORIES OR LESS					
Zone	Ceilings	Walls (Includes Glazing)	Floors	Slab on Grade <sup>1</sup>	
F-Value	U <sub>o</sub>	Installed U <sub>o</sub>	U <sub>o</sub>	U <sub>o</sub>	R-Value
I.	0.035	0.25	0.05	7	0.56
II.	0.035	0.20	0.05	10	0.54

<sup>1</sup>Insulation shall be water-resistant material manufactured for this use.

BUILDINGS OVER THREE CONDITIONED STORIES					
Zone	Ceilings	Walls (Includes Glazing)	Floors	Slab on Grade <sup>1</sup>	
F-Value	U <sub>o</sub>	Installed U <sub>o</sub>	U <sub>o</sub>	U <sub>o</sub>	R-Value
I.	0.08	0.30	0.08	7	0.56
II.	0.06	0.25	0.08	10	0.54

<sup>1</sup>Insulation shall be water-resistant material manufactured for this use.

TABLE 5-3 OTHER THAN GROUP R OCCUPANCY HVAC SYSTEM  
HEATING EQUIPMENT - GAS- AND OIL-FIRED  
MINIMUM STEADY STATE COMBUSTION EFFICIENCY

Types of Equipment	Percent <sup>1</sup>	Percent <sup>2</sup>
Forced-air furnaces and low-pressure steam or hot-water boilers	74	75
Gravity central furnaces	69	-
All other vented heating equipment	69	-

<sup>1</sup>Combustion efficiency for furnaces of capacities of 225,000 Btu/h and less and boilers of capacities of 300,000 Btu/h and less shall be tested in accordance with the applicable U.S. Department of Energy furnace test procedures.

<sup>2</sup>Combustion efficiency of commercial/industrial furnaces and boilers is defined as 100 percent minus stack losses in percent of heat input.

Stack losses are:

Loss due to sensible heat in dry flue gas.

Loss due to incomplete combustion.

Loss due to sensible and latent heat in moisture formed by combustion of hydrogen in the fuel.

TABLE 5-4 HVAC SYSTEM HEATING EQUIPMENT (HEAT PUMPS)  
ELECTRICALLY OPERATED STANDARD RATING CONDITIONS

CONDITIONS	<u>TYPE</u>		
	AIR SOURCE		WATER SOURCE
Air entering equipment °F	70°F (dry bulb)	70°F (dry bulb)	70°F (dry bulb)
Outdoor unit ambient °F	47°F (dry bulb) /43°F (wet bulb)	17°F (dry bulb) /15°F (wet bulb)	-----
Entering water temp. °F	-----	-----	60°F
Water flow rate	-----	-----	As used in cooling

Standard ratings are at sea level.

TABLE 5-5 HVAC SYSTEM EQUIPMENT, ELECTRICALLY DRIVEN  
STANDARD RATING CONDITIONS--COOLING

		<u>TEMPERATURES</u>			
		DRY BULB	WET BULB	INLET	OUTLET
Air entering equipment	°F	80°	67°	-----	-----
Condenser ambient (air cooled)	°F	95°	75°	-----	-----
Condenser water (water cooled)	°F	---	---	85°	95°

Standard ratings are at sea level.

TABLE 5-6 APPLIED HVAC SYSTEM COMPONENTS ELECTRICALLY DRIVEN  
STANDARD RATING CONDITIONS--COOLING

ITEM	CENTRIFUGAL OR SELF-CONTAINED RECIPROCATING WATER CHILLER	CONDENSERLESS RECIPROCATING WATER-CHILLER
Leaving chilled water temperature, °F	44°	44°
Entering chilled water temperature, °F	54°	54°
Leaving condenser water temperature, °F	95°	--
Entering water temperature, °F	85°	--
Fouling factor, water		
Nonferrous tubes	0.0005*	0.0005
Steel tubes	0.0010*	0.0010
Fouling factor, refrigerant	0.0000*	0.0000
Condenser ambient (air/evap. cooled), °F	95°F(dry bulb) /75°F(wet bulb)	--
Compressor saturated discharge temperature	Water cooled (evap cooled) °F  Air cooled, °F	105°  120°

Standard ratings are at sea level.

\* hr·ft<sup>2</sup>·°F/Btu

TABLE 5-7 MINIMUM HEAT PUMP EFFICIENCIES, HEATING MODE<sup>1</sup>

SOURCE	MINIMUM COP	MINIMUM HSPF
<b>Air Source:</b>		
Split System	3.0 <sup>2</sup>	6.8
Single Package System	3.0 <sup>2</sup>	6.6
<b>Water Source</b>		
Ground Water Source	3.8 <sup>3</sup>	---
	3.0 <sup>4</sup>	---

<sup>1</sup> When tested at the standard rating specified in Table 5-4.

<sup>2</sup> When tested @ 47°F(dry bulb)/43°F(wet bulb)

<sup>3</sup> @ 70°F entering

<sup>4</sup> @ 50°F entering

TABLE 5-8 MINIMUM EFFICIENCY FOR ELECTRIC HVAC EQUIPMENT, COOLING

STANDARD RATING CAPACITY	AIR COOLED		EVAP/WATER COOLED
	SEER	EER	EER
<b>Under 65,000 Btu/hr. ( 19,050 watts )</b>			
A. Split System	10.0	---	---
B. Single Package	9.7	---	9.3 <sup>1</sup>
<b>65,000 Btu/hr. and over</b>	----	8.9 <sup>2</sup>	10.5 <sup>1</sup>

<sup>1</sup> @ 80°F dry bulb / 67°F wet bulb

<sup>2</sup> @ 95°F dry bulb

TABLE 5-9 MINIMUM EFFICIENCY FOR ELECTRIC HVAC COMPONENTS<sup>1, 2</sup>

		WATER CHILLING PACKAGES					
		CONDENSING MEANS					
TYPE OF COMPONENT	COMPRESSOR TYPE	AIR		WATER		EVAPORATIVE	
		EER	COP	EER	COP	EER	COP
Condenser Included	Centrifugal or rotary	8.00	2.34	13.80	4.04	--	--
	Reciprocating	8.40	2.36	12.00	3.51	--	--
Condenserless	Reciproc.	9.90	2.90	12.00	3.51	--	--
Compressor and condenser units 65,000 Btu/hr (19,000 watts) Positive and over <sup>2</sup> displacement		9.50	2.78	12.50	3.66	12.50	3.66
		HYDRONIC HEAT PUMPS					
Water source under 65,000 Btu/hr (19,000 watts)	Centrifugal or rotary			9.00	2.64		
Water source 65,000 Btu/hr (19,000 watts) and over	Centrifugal or rotary			9.40	2.75		

<sup>1</sup> When tested at the standard rating conditions specified in Table 5-6.

<sup>2</sup> Ratings in accordance with Standard RS-14 as applicable.



Table 5-10 HVAC-SYSTEM HEAT OPERATED COOLING EQUIPMENT

HEAT SOURCE	MINIMUM COP
Direct Fired ( gas, oil )	0.48
Indirect Fired ( steam, hot water )	0.68

Minimum COP =  $\frac{\text{Net Cooling Output}}{\text{Total heat input}^1}$

<sup>1</sup> electrical auxiliary inputs excluded

TABLE 5-11

## INSULATION OF DUCTS

DUCT LOCATION	CLIMATE ZONE	INSULATION TYPES MECHANICALLY COOLED	INSULATION TYPES HEATING ONLY	GROUP R OCCUPANCY HEATING OR COOLING DUCTS
On roof or on exterior of building	I	C, V <sup>2</sup> and W	C and W	E and W
	II	D, V <sup>2</sup> and W	D and W	D and W
Attic, garage, crawl space, in walls <sup>1</sup> , in floor/ceiling <sup>1</sup>	I	B and V <sup>2</sup>	B	E
	II	C and V <sup>2</sup>	C	E
Within the conditioned space or in heated basements		None Required	None Required	None Required
In cement slab or in ground		A	B	B

Note: Where ducts are used for both heating and cooling, the minimum insulation shall be as required for the most restrictive condition.

- <sup>1</sup> Insulation may be omitted on that portion of a duct which is located within a wall or floor-ceiling space where both sides of this space are exposed to conditioned air and where this space is not ventilated or otherwise exposed to unconditioned air.
- <sup>2</sup> Vapor barriers shall be installed on conditioned air supply ducts in geographic areas where the average of the July, August, and September mean dewpoint temperature exceeds 60°F.

**INSULATION TYPES:** Minimum densities and out-of-package thickness.

- A. 0.5-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket or equivalent to provide an installed total thermal resistance of at least R-2.
- B. 2-inch 0.60 lb/cu. ft. mineral or glass fiber blanket 1.5-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket. 1.5-inch 3 to 7 lb/cu. ft. mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-5.
- C. 3-inch 0.60 lb/cu. ft. mineral or glass fiber blanket 2-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket. 2-inch 3 to 7 lb/cu. ft. mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-7.
- D. 4-inch 0.60 lb/cu. ft. mineral or glass fiber blanket 3-inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber blanket. 3-inch 3 to 7 lb/cu. ft. mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-10.
- E. 3.5 inch 0.60 lb/cu.ft. mineral or glass fiber blanket, 2.5 inch 1.5 to 2 lb/cu. ft. duct liner, mineral or glass fiber board or equivalent to provide an installed total thermal resistance of at least R-8.
- V. Vapor barrier, with perm rating not greater than 0.5 perm, all joints sealed.
- W. Approved weatherproof barrier.

TABLE 5-12

## MINIMUM PIPE INSULATION REQUIREMENTS\*

PIPING SYSTEM	FLUID TEMP RANGE (°F)	INSULATION THICKNESS FOR GIVEN PIPE DIAMETERS <sup>1</sup>					
		LESS THAN 12 FOOT PIPE RUN <sup>2</sup> UP TO 2"	1" AND LESS	GREATER THAN 1" TO 2"	GREATER THAN 2" TO 4"	GREATER THAN 4" TO 6"	GREATER THAN 6" AND LARGER
<b>HEATING &amp; HOT WATER SYSTEMS</b>							
Steam & Hot Water Pressure/temperature							
High	306°F ⇌ 450°F	1.5"	2.5"	2.5"	3.0"	3.5"	3.5"
Medium	251°F ⇌ 305°F	1.5"	2.0"	2.5"	2.5"	3.0"	3.0"
Low	201°F ⇌ 250°F	1.0"	1.5"	1.5"	2.0"	2.0"	2.0"
All Other		0.5"	1.0"	1.0"	1.5"	1.5"	1.5"
Steam Condensate (for feed water)	Any	1.0"	1.0"	1.5"	2.0"	2.0"	2.0"
<b>COOLING SYSTEMS</b>							
Chilled Water	40°F ⇌ 55°F	0.5"	0.5"	.75"	1.0"	1.0"	1.0"
Refrigerant/brine	Below 40°F	1.0"	1.0"	1.5"	1.5"	1.5"	1.5"

<sup>1</sup>For piping exposed to ambient air, increase thickness by 0.5".

<sup>2</sup>Pipe runouts not exceeding 12 feet in length to individual units, with a pipe diameter of less than 2 inches.

\*Column headings for pipe diameters amended 5/30/90.

TABLE 5-13

LIGHTING POWER BUDGET<sup>1</sup>

GROUP OCCUPANCY DESCRIPTION		LIGHTING POWER BUDGET <sup>2</sup> (W/sq ft)
A	Assembly w/stage	1.1
	Stage lighting	Exempt
	Assembly w/o stage; other than B and E	1.1
B	Gasoline service station	1.7
	Storage garages	0.3
	Office buildings	1.7
	Wholesale stores	2.0
	Police and fire stations	1.7
	Retail Stores:	
	less than 6000 ft <sup>2</sup>	4.0
	6000 to 20,000 ft <sup>2</sup>	3.0
	over 20,000 ft <sup>2</sup>	2.0
	Drinking and dining establishments	1.85
	Food preparation task light	Exempt
	Aircraft hangars - storage	0.7
Process plants <sup>3</sup>	1.0	
Factories and work shops <sup>3</sup>	1.7	
Storage structures	0.7	
E	Schools and daycare centers	1.7
	Audio-visual presentation lighting	Exempt
H	Storage structures	0.7
	Handling areas	1.7
	Paint shops	2.5
	Auto repair shops	1.7
	Aircraft repair hangars	1.7
I	Institutions	1.7
	Administrative support areas	1.7
	Diagnostic, treatment, food service task lighting	Exempt
R	Dwelling units	Exempt
	Food preparation task lighting	Exempt

<sup>1</sup> Watts/ft<sup>2</sup> of room may be increased by two percent per foot of height above 20 feet.

<sup>2</sup> Emergency exit lighting is exempt from interior lighting budget.

<sup>3</sup> Lighting that is part of machines or equipment is exempt from this budget.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0505, filed 12/19/90, effective 7/1/91.]

#### WAC 51-11-0601 Scope.

601.1 General: This chapter establishes design criteria in terms of prescribed requirements for building construction.

The provisions of this chapter are applicable to all Occupancies. Occupancies shall comply with all the requirements of Chapter 5 except for the modifications herein specified.

The building envelope requirements of this chapter may be met by installing one of the prescriptive packages in Tables 6-1 to 6-6 for Group R Occupancy, or Table 6-7 for Other Occupancies. Installed components shall meet the requirements of section 602 and 605. Compliance with nominal R-Values shall be demonstrated for the thermal resistance of the added insulation in framing cavities and/or insulated sheathing only and shall not include the thermal transmittance of other building materials or air films, but shall permit interruption by occasional framing members.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0601, filed 12/19/90, effective 7/1/91.]

#### WAC 51-11-0602 Building envelope requirements for group R occupancy.

602.1 Roof/Ceiling: Ceilings below vented attics and single-rafter, joist-vaulted ceilings shall be insulated to not less than the nominal R-value specified for ceilings in Tables 6-1 to 6-6 as applicable.

602.2 Exterior Walls Both Above and Below Grade: Above grade exterior walls shall be insulated to not less than the nominal R-value specified in Tables 6-1 to 6-6 as applicable. The following walls should be considered to meet R-19 without additional documentation:

1. 2 x 6 framed and insulated with R-19 fiberglass batts.
2. 2 x 4 framed and insulated with R-13 fiberglass batts plus R-3.2 foam sheathing.
3. 2 x 4 framed and insulated with R-11 fiberglass batts plus R-5.0 foam sheathing.

602.3 Exterior Walls (Below Grade): Below grade exterior walls surrounding conditioned space shall be insulated to not less than the nominal R-value specified for below grade walls in Tables 6-1 to 6-6 as applicable.

602.4 Slab-on-Grade Floors: Slab-on-Grade floors shall be insulated along their perimeter to not less than the nominal R-values specified for slab-on-grade floors in Tables 6-1 to 6-6 as applicable. Slab insulation shall be installed in compliance with section 502.1.4.8. See Chapter 5, section 502.1.4.9, for additional requirements for radiant slab heating.

602.5 Floors Over Unconditioned Space: Floors over unconditioned spaces, such as vented crawl spaces, unconditioned basements, and parking garages shall be insulated to not less than the nominal R-value shown for floors over unconditioned spaces, in Tables 6-1 to 6-6.

602.6 Exterior Doors: For all doors which are less than fifty percent glazing, including fire doors, the opaque door area shall have a maximum area weighted average U-value not exceeding that shown in Tables 6-1 to 6-6 and the glazing shall comply with section 602.7. U-values for the opaque door area shall be determined in accordance with section 502.1.5.1. For all doors which are fifty percent or more glazing, the entire door area shall comply with the glazing requirements in section 602.7.

EXCEPTION: Doors whose area and U-value are included in the calculations for compliance with the requirements for glazing in section 602.7 shall be exempt from the U-value requirements stated above.

#### 602.7 Glazing:

602.7.1 Glazing Area: The total glazing area as defined in Chapter 2 shall not exceed the percentage of gross conditioned floor area specified in Tables 6-1 to 6-6. This area shall also include any doors using the exception of section 602.6.

602.7.2 Glazing U-Value: The total glazing area as defined in Chapter 2 shall have an area weighted average U-value not to exceed that specified in Tables 6-1 to 6-6. U-values for glazing shall be determined in accordance with section 502.1.5.1. These areas and U-values shall also include any doors using the exception of section 602.6.

If the U-values for all glazing products are below the U-value specified, then no calculations are required. If compliance is to be achieved through an area weighted calculation, then the areas and U-values shall be included in the plans submitted with a building permit application.

EXCEPTION: Single glazing for ornamental, security, or architectural purposes shall have its area doubled and shall be included in the percentage of the total glazing area as allowed for in Tables 6-1 to 6-6. The maximum area (before doubling) allowed for the total of all single glazing is one percent of the floor area.

602.8 Air Leakage For Group R Occupancy: The minimum air leakage control measures shall be as specified in section 502.4 as applicable.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0602, filed 12/19/90, effective 7/1/91.]

#### WAC 51-11-0603 Building mechanical systems for group R occupancy.

603.1: Group R Occupancies that are space heated by air-to-air, ground-to-air, or water-to-air heat pumps shall comply with Table 6-2 or 6-4 or 6-6 for other fuels. System sizing shall be determined by an analysis

consistent with section 503.2 of this Code, or, when approved by the building official, Chapter 9. All mechanical equipment efficiencies and service water heating system efficiencies shall comply with standards as stated in sections 503 and 504 of this Code.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0603, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0604 Electric power and lighting for group R occupancy.**

604.1: All electrical power and lighting systems shall comply with the requirements of section 505.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0604, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0605 Building envelope requirements for other than Group R occupancies.**

605.1 Opaque Envelope Criteria: Roof/ceilings, exterior walls, floors over unconditioned space, below grade walls, and slab on grade floors enclosing heated spaces shall be insulated to not less than the nominal R-value specified for roof/ceilings, exterior walls, floors over unconditioned space, below grade walls, and slab on grade floors, respectively, in Table 6-7. Roof/ceilings enclosing mechanically cooled spaces shall be insulated to not less than the nominal R-value specified for roof/ceilings in Table 6-7.

605.2 Glazing Criteria: All glazing shall be, at a minimum, double glazing. Insulating glass with at least one-half inch air space or approved storm sash will be considered as complying. The total glazing area shall not exceed the percentage of gross exterior wall area specified in Table 6-7.

EXCEPTION: Single glazing in doors may be installed provided that the glazing area is doubled for the purpose of demonstrating compliance with the glazing area requirements.

605.3 Air Leakage: All buildings shall comply with the air leakage requirement of section 502.4.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0605, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0606 Building mechanical systems requirements for other than Group R occupancies.** All building mechanical systems shall comply with the requirements of section 503.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0606, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0607 Service water heating requirement for other than Group R occupancies.** All service water heating systems shall comply with the requirements of section 504.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0607, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0608 Electrical power and lighting requirements for other than Group R occupancies.** All electrical power and lighting systems shall comply with the requirements of section 505.

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TABLE 6-1 • PRESCRIPTIVE REQUIREMENTS<sup>1</sup> FOR GROUP R OCCUPANCY  
CLIMATE ZONE 1 • HEATING BY ELECTRIC RESISTANCE

OPTION	GLAZING % FLOOR AREA	GLAZING U-VALUE	DOORS U-VALUE	CEILING <sup>2</sup>	VAULTED CEILING <sup>3</sup>	WALL ABOVE GRADE	WALL·int <sup>4</sup> BELOW GRADE	WALL·ext <sup>4</sup> BELOW GRADE	FLOOR <sup>5</sup>	SLAB <sup>6</sup> ON GRADE
I.	10%	0.46	0.40	R-38	R-30	R-21	R-21	R-10	R-30	R-10
II.	12%	0.43	0.20	R-38	R-30	R-19	R-19	R-10	R-30	R-10
III.	12%	0.40	0.40	R-38	R-30	R-21	R-21	R-10	R-30	R-10
IV.*	15%	0.40	0.20	R-38	R-30	R-19	R-19	R-10	R-30	R-10
V.	18%	0.39	0.20	R-38	R-30	R-21	R-21	R-10	R-30	R-10
VI.	21%	0.36	0.20	R-38	R-30	R-21	R-21	R-10	R-30	R-10
VII. <sup>7</sup>	25%	0.35	0.20	R-38	R-30	R-19+R-5 <sup>8</sup>	R-21	R-10	R-30	R-10
VIII. <sup>7</sup>	30%	0.32	0.20	R-38	R-30	R-19+R-5 <sup>8</sup>	R-21	R-10	R-30	R-10

\* Reference Case • (highlighted in redline)

<sup>1</sup> Minimum requirements for each option listed. For example, if a proposed design has a glazing ratio to the conditioned floor area of 19%, it shall comply with all of the requirements of the 21% glazing option (or higher). Proposed designs which cannot meet the specific requirements of a listed option above, may calculate compliance by Chapters 4 or 5 of this Code.

<sup>2</sup> Requirement applies to all ceilings except single rafter or joist vaulted ceilings. 'Adv' denotes Advanced Framed Ceiling.

<sup>3</sup> Requirement applicable only to single rafter or joist vaulted ceilings.

<sup>4</sup> Below grade walls shall be insulated either on the exterior to a minimum level of R-10, or on the interior to the same level as walls above grade. Exterior insulation installed on below grade walls shall be a water resistant material, manufactured for its intended use, and installed according to the manufacturer's specifications. See section 602.2.

<sup>5</sup> Floors over crawl spaces or exposed to ambient air conditions.

<sup>6</sup> Required slab perimeter insulation shall be a water resistant material, manufactured for its intended use, and installed according to manufacturer's specifications. See section 602.4.

<sup>7</sup> These options shall be applicable to buildings less than three stories.

<sup>8</sup> This wall insulation requirement denotes R-19 wall cavity insulation plus R-5 foam sheathing.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

**TABLE 6-2 • PRESCRIPTIVE REQUIREMENTS<sup>1</sup> FOR GROUP R OCCUPANCY  
CLIMATE ZONE 1 • HEATING BY OTHER FUELS**

OPTION	HVAC <sup>9</sup> EQUIP. EFFIC.	GLAZING % FLOOR AREA	GLAZING U-VALUE	DOORS U-VALUE	CEILING <sup>2</sup>	VAULTED CEILING <sup>3</sup>	WALL ABOVE GRADE	WALL·int <sup>4</sup> BELOW GRADE	WALL·ext <sup>4</sup> BELOW GRADE	FLOOR <sup>5</sup>	SLAB <sup>6</sup> ON GRADE
I.	Med.	10%	0.70	0.40	R-30	R-30	R-15	R-15	R-10	R-19	R-10
II.	Med.	12%	0.65	0.40	R-30	R-30	R-15	R-15	R-10	R-19	R-10
III.	High	21%	0.75	0.40	R-30	R-30	R-19	R-19	R-10	R-19	R-10
IV.*	Med.	21%	0.65	0.40	R-30	R-30	R-19	R-19	R-10	R-19	R-10
V.	Low	21%	0.60	0.40	R-30	R-30	R-19	R-19	R-10	R-19	R-10
VI. <sup>7</sup>	Med.	25%	0.50	0.40	R-38	R-30	R-19	R-19	R-10	R-25	R-10
VII. <sup>7</sup>	Med.	30%	0.45	0.40	R-30	R-30	R-19	R-19	R-10	R-25	R-10

\* Reference Case • (highlighted in redline)

<sup>1</sup> Minimum requirements for each option listed. For example, if a proposed design has a glazing ratio to the conditioned floor area of 19%, it shall comply with all of the requirements of the 21% glazing option (or higher). Proposed designs which cannot meet the specific requirements of a listed option above, may calculate compliance by Chapters 4 or 5 of this Code.

<sup>2</sup> Requirement applies to all ceilings except single rafter or joist vaulted ceilings. 'Adv' denotes Advanced Framed Ceiling.

<sup>3</sup> Requirement applicable only to single rafter or joist vaulted ceilings.

<sup>4</sup> Below grade walls shall be insulated either on the exterior to a minimum level of R-10, or on the interior to the same level as walls above grade. Exterior insulation installed on below grade walls shall be a water resistant material, manufactured for its intended use, and installed according to the manufacturer's specifications. See section 602.2.

<sup>5</sup> Floors over crawl spaces or exposed to ambient air conditions.

<sup>6</sup> Required slab perimeter insulation shall be a water resistant material, manufactured for its intended use, and installed according to manufacturer's specifications. See section 602.4.

<sup>7</sup> These options shall be applicable to buildings less than three stories.

<sup>8</sup> This wall insulation requirement denotes R-19 wall cavity insulation plus R-5 foam sheathing.

<sup>9</sup> Minimum HVAC Equipment efficiency requirement. 'Low' denotes an AFUE of 0.74. 'Med.' denotes an AFUE of 0.78. 'High' denotes an AFUE of 0.88.



THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

TABLE 6-3 • PRESCRIPTIVE REQUIREMENTS<sup>1</sup> FOR GROUP R OCCUPANCY  
CLIMATE ZONE 2 • HEATING BY ELECTRIC RESISTANCE

OPTION	GLAZING % FLOOR AREA	GLAZING U-VALUE	DOORS U-VALUE	CEILING <sup>2</sup>	VAULTED CEILING <sup>3</sup>	WALL ABOVE GRADE	WALL·int <sup>4</sup> BELOW GRADE	WALL·ext <sup>4</sup> BELOW GRADE	FLOOR <sup>5</sup>	SLAB <sup>6</sup> ON GRADE
I.	10%	0.38	0.20	R-38	R-30	R-21	R-21	R-12	R-30	R-10
II.	12%	0.40	0.20	R-38	R-30	R-19+R-5 <sup>8</sup>	R-21	R-12	R-25	R-10
III.*	15%	0.40	0.20	R-38	R-30	R-19+R-5 <sup>8</sup>	R-21	R-12	R-30	R-10
IV.	18%	0.38	0.20	R-38	R-30	R-19+R-5 <sup>8</sup>	R-21	R-12	R-30	R-10
V. <sup>7</sup>	21%	0.35	0.20	R-38Adv	R-38	R-19+R-5 <sup>8</sup>	R-21	R-12	R-30	R-10
VI. <sup>7</sup>	25%	0.33	0.20	R-49Adv	R-38	R-19+R-5 <sup>8</sup>	R-21	R-12	R-30	R-10
VII. <sup>7</sup>	30%	0.31	0.20	R-60Adv	R-38	R21+R7.5 <sup>9</sup>	R-21	R-12	R-30	R-10

\* Reference Case • (highlighted in redline)

<sup>1</sup> Minimum requirements for each option listed. For example, if a proposed design has a glazing ratio to the conditioned floor area of 19%, it shall comply with all of the requirements of the 21% glazing option (or higher). Proposed designs which cannot meet the specific requirements of a listed option above, may calculate compliance by Chapters 4 or 5 of this Code.

<sup>2</sup> Requirement applies to all ceilings except single rafter or joist vaulted ceilings. 'Adv' denotes Advanced Framed Ceiling.

<sup>3</sup> Requirement applicable only to single rafter or joist vaulted ceilings.

<sup>4</sup> Below grade walls shall be insulated either on the exterior to a minimum level of R-10, or on the interior to the same level as walls above grade. Exterior insulation installed on below grade walls shall be a water resistant material, manufactured for its intended use, and installed according to the manufacturer's specifications. See section 602.2.

<sup>5</sup> Floors over crawl spaces or exposed to ambient air conditions.

<sup>6</sup> Required slab perimeter insulation shall be a water resistant material, manufactured for its intended use, and installed according to manufacturer's specifications. See section 602.4.

<sup>7</sup> These options shall be applicable to buildings less than three stories.

<sup>8</sup> This wall insulation requirement denotes R-19 wall cavity insulation plus R-5 foam sheathing.

<sup>9</sup> This wall insulation requirement denotes R-21 wall cavity insulation plus R-7.5 foam sheathing.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

**TABLE 6-4 • PRESCRIPTIVE REQUIREMENTS<sup>1</sup> FOR GROUP R OCCUPANCY  
CLIMATE ZONE 2 • HEATING BY OTHER FUELS**

OPTION	HVAC <sup>9</sup> EQUIP. EFFIC.	GLAZING % FLOOR AREA	GLAZING U-VALUE	DOORS U-VALUE	CEILING <sup>2</sup>	VAULTED CEILING <sup>3</sup>	WALL ABOVE GRADE	WALL·int <sup>4</sup> BELOW GRADE	WALL·ext <sup>4</sup> BELOW GRADE	FLOOR <sup>5</sup>	SLAB <sup>6</sup> ON GRADE
I.	Med.	10%	0.70	0.40	R-38	R-30	R-19	R-19	R-12	R-25	R-10
II.	Med.	12%	0.65	0.40	R-38	R-30	R-19	R-19	R-12	R-25	R-10
III.	High	17%	0.65	0.40	R-38	R-30	R-19	R-19	R-12	R-25	R-10
IV.*	Med.	17%	0.60	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
V.	Low	17%	0.50	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
VI.	Med.	21%	0.50	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
VII. <sup>7</sup>	Med.	25%	0.45	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10
VIII. <sup>7</sup>	Med.	30%	0.40	0.40	R-38	R-30	R-19	R-19	R-12	R-30	R-10

\* Reference Case • (highlighted in redline)

<sup>1</sup> Minimum requirements for each option listed. For example, if a proposed design has a glazing ratio to the conditioned floor area of 19%, it shall comply with all of the requirements of the 21% glazing option (or higher). Proposed designs which cannot meet the specific requirements of a listed option above, may calculate compliance by Chapters 4 or 5 of this Code.

<sup>2</sup> Requirement applies to all ceilings except single rafter or joist vaulted ceilings. 'Adv' denotes Advanced Framed Ceiling.

<sup>3</sup> Requirement applicable only to single rafter or joist vaulted ceilings.

<sup>4</sup> Below grade walls shall be insulated either on the exterior to a minimum level of R-10, or on the interior to the same level as walls above grade. Exterior insulation installed on below grade walls shall be a water

resistant material, manufactured for its intended use, and installed according to the manufacturer's specifications. See section 602.2.

<sup>5</sup> Floors over crawl spaces or exposed to ambient air conditions.

<sup>6</sup> Required slab perimeter insulation shall be a water resistant material, manufactured for its intended use, and installed according to manufacturer's specifications. See section 602.4.

<sup>7</sup> These options shall be applicable to buildings less than three stories.

<sup>8</sup> This wall insulation requirement denotes R-19 wall cavity insulation plus R-5 foam sheathing.

<sup>9</sup> Minimum HVAC Equipment efficiency requirement. 'Low' denotes an AFUE of 0.74. 'Med.' denotes an AFUE of 0.78. 'High' denotes an AFUE of 0.88.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991TABLE 6-5 LOG HOMES PRESCRIPTIVE REQUIREMENTS<sup>1</sup>  
HEATING BY ELECTRIC RESISTANCE

OPTION	AVERAGE <sup>2</sup> LOG THICKNESS	GLAZING % FLOOR AREA	GLAZING U-VALUE	DOORS U-VALUE	CEILING <sup>3</sup>	VAULTED <sup>4</sup> CEILING	FLOOR <sup>5</sup>	SLAB <sup>6</sup> ON GRADE
<u>CLIMATE ZONE 1</u>								
I. <sup>7</sup>	5.5"	15%	0.31	0.14	R-60 Adv	R-38	R-38	R-10
II. <sup>7</sup>	7.5"	15%	0.40	0.20	R-60 Adv	R-38	R-30	R-10
III.*	9.6"	15%	0.40	0.20	R-38	R-30	R-30	R-10
<u>CLIMATE ZONE 2</u>								
IV. <sup>7</sup>	6.7"	15%	0.31	0.14	R-60 Adv	R-38	R-38	R-10
V. <sup>7</sup>	8.7"	15%	0.40	0.14	R-60 Adv	R-38	R-38	R-10
VI. <sup>7</sup>	9.8"	15%	0.40	0.20	R-60 Adv	R-38	R-30	R-10
VII. <sup>7</sup>	10.5"	15%	0.40	0.20	R-49 Adv	R-38	R-30	R-10
VIII.*	13.5"	15%	0.40	0.20	R-38	R-30	R-30	R-10

\* Reference Case • (highlighted in redline)

<sup>1</sup> For Group R Occupancy use Table 6-5 for only the portion of floor area using log/solid timber walls. Use Tables 6-1 to 6-4 for all other portions of the floor area. Minimum requirements are for each option listed. Interpolations between options is not permitted. Proposed designs which cannot meet the specific requirements of a listed option above, may calculate compliance by Chapters 4 or 5 of this Code.

<sup>2</sup> Required minimum average log thickness.

<sup>3</sup> 'Adv' denotes Advanced Framing. Requirement applies to all ceilings except single rafter joist vaulted ceilings.

<sup>4</sup> Requirement applicable only to single rafter joist vaulted ceilings.

<sup>5</sup> Floors over crawl spaces or exposed to ambient air conditions.

<sup>6</sup> Required slab perimeter insulation shall be water-resistant material, manufactured for its intended use, and installed according to manufacturer's specifications.

<sup>7</sup> These options shall be applicable to buildings less than three stories.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991TABLE 6-6 LOG HOMES PRESCRIPTIVE REQUIREMENTS<sup>1</sup>  
HEATING BY OTHER FUELS

OPTION	AVERAGE <sup>2</sup> LOG THICKNESS	GLAZING % FLOOR AREA	GLAZING U-VALUE	DOORS U-VALUE	CEILING <sup>3</sup>	VAULTED <sup>4</sup> CEILING	FLOOR <sup>5</sup>	SLAB <sup>6</sup> ON GRADE
<u>CLIMATE ZONE 1</u>								
I. <sup>7</sup>	3.5"	21%	0.40	0.39	R-49 Adv	R-38	R-30	R-10
II.	4.4"	21%	0.40	0.40	R-38	R-30	R-19	R-10
III.	5.2"	21%	0.50	0.40	R-38	R-30	R-19	R-10
IV.	6.5"	21%	0.60	0.40	R-38	R-30	R-19	R-10
V.	7.0"	21%	0.60	0.40	R-38	R-30	R-19	R-10
VI.*	8.2"	21%	0.65	0.40	R-38	R-30	R-19	R-10
<u>CLIMATE ZONE 2</u>								
VII. <sup>7</sup>	3.5"	17%	0.31	0.14	R-60 Adv	R-38	R-38	R-10
VIII <sup>7,8</sup>	3.5"	17%	0.40	0.40	R-60 Adv	R-38	R-30	R-10
IX. <sup>7</sup>	4.6"	17%	0.40	0.40	R-60 Adv	R-38	R-30	R-10
X.	5.4"	17%	0.40	0.40	R-38	R-30	R-30	R-10
XI.	6.8"	17%	0.50	0.40	R-38	R-30	R-30	R-10
XII.*	9.0"	17%	0.60	0.40	R-38	R-30	R-30	R-10

\* Reference Case • (highlighted in redline)

<sup>1</sup> For Group R Occupancy use Table 6-6 for only the portion of floor area using log/solid timber walls. Use Tables 6-1 to 6-4 for all other portions of the floor area. Minimum requirements are for each option listed. Interpolations between options is not permitted. Proposed designs which cannot meet the specific requirements of a listed option above, may calculate compliance by Chapters 4 or 5 of this Code.

<sup>2</sup> Required minimum average log thickness.

<sup>3</sup> 'Adv' denotes Advanced Framing. Requirement applies to all ceilings except single rafter joist vaulted ceilings.

<sup>4</sup> Requirement applicable only to single rafter joist vaulted ceilings.

<sup>5</sup> Floors over crawl spaces or exposed to ambient air conditions.

<sup>6</sup> Required slab perimeter insulation shall be water-resistant material, manufactured for its intended use, and installed according to manufacturer's specifications.

<sup>7</sup> These options shall be applicable to buildings less than three stories.

<sup>8</sup> For this option, minimum HVAC system efficiency is an AFUE of 0.88.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

TABLE 6-7 OTHER THAN GROUP R OCCUPANCIES PRESCRIPTIVE REQUIREMENTS

COMPONENT	ZONE I	ZONE II
SPACE CONDITIONING SYSTEM TYPE	ANY	ANY
ROOF/CEILINGS	R-30	R-30
EXTERIOR WALLS	R-11	R-11
FLOORS OVER UNCONDITIONED SPACE	R-11	R-11
BELOW GRADE WALLS	R-4	R-5
SLAB ON GRADE FLOORS <sup>1</sup>	R-7	R-10
GLAZING TYPE	Double <sup>2</sup>	Double <sup>2</sup>
MAXIMUM TOTAL GLAZING AREA (% of Gross Exterior Wall Area)	32%	22%

<sup>1</sup> Insulation shall be a water-resistant material, manufactured for its intended use, and installed to manufacturer's specifications.

<sup>2</sup> 'Double' denotes a minimum air space between glazings of 1/2 inch.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0608, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0700 Chapter 7--Standards.**

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0700, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0701 Standards.** The standards and portions thereof, which are referred to in various parts of this code shall be part of the Washington State Energy Code and are hereby declared to be a part of this Code.

CODE  
STANDARD  
NO.

TITLE AND SOURCE

RS-1 1989 ASHRAE Handbook of Fundamentals

RS-2 Standard Method of Test for Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors, Specification E283-84 of ASTM.

Specifications for Aluminum Windows, ANSI A134.1, 1972.

Specifications for Aluminum Sliding Glass Doors, ANSI A134.2, 1972.

CODE  
STANDARD  
NO.

TITLE AND SOURCE

Industry Standard for Wood Window Units, NWWDA IS-2-87, Industry Standard for Wood Sliding Patio Doors, NWWDA IS-3-88.

RS-2B

AAMA 1503.1-88, 1988 Voluntary Test Method for Thermal transmittance of windows, doors and glazed wall sections.

RS-2C

ASTM C236-87 test for thermal conductance and transmittance of built-up sections by means of a guarded hot box; and ASTM C976-82 thermal performance of building assemblies by means of the calibrated hot box.

RS-3

ASHRAE Standard 62-89 Ventilation for Acceptable Indoor Air Quality.

RS-4

ASHRAE Standard 55-81 Thermal Environmental Conditions for Human Occupancy.

CODE STANDARD NO.	TITLE AND SOURCE	CODE STANDARD NO.	TITLE AND SOURCE
RS-5	DOE Test Procedures for Water Heaters, 10 CFR Part 430 Appendix E to Subpart B.	RS-21	Standard for Package Terminal Heat Pumps, ARI Standard 380-90.
RS-6	Household Automatic Electric Storage-Type Water Heaters, ANSI C72.1-1972.	RS-22	ASTM E779-87 Standard practice for measuring air leakage by the fan pressurization method.
RS-7	Gas Water Heaters, Volume III, Circulating Tank, Instantaneous and Large Automatic Storage-Type Water Heaters, ANSI Z21.10.3, 1974.	RS-23	ASTM E741 Standard practice for measuring air leakage by the tracer dilution method.
RS-8	IES Lighting Handbook, Illuminating Engineering Society, 1984 Reference Volume, 1987 Application Volume.	RS-24	Standard 24 CFR Part 3280 HUD.
RS-9	ASHRAE Standard 90.1-1989, Efficient Design of New Buildings Except New Low-Rise Residential Buildings.	RS-25	Thermal Bridge in Sheet Metal Construction from Appendix E of RS-9.
RS-10	Standard for Packaged Terminal Air Conditioners, ARI Standard 310-90.	RS-26	Super Good Cents Technical Reference
RS-11	1987 ASHRAE HVAC Systems and Applications Handbook.		
RS-12	Energy Calculations I: Procedures for Determining Heating and Cooling Loads for Computerizing Energy Calculations—Algorithms for Building Heat Transfer Subsystems, ASHRAE 1975.		
RS-13	Energy Calculations II: Procedures for Simulating the Performance of Components and Systems for Energy Calculations, 3rd Edition, ASHRAE 1975.		
RS-14	Standard for Positive Displacement Refrigerant Compressor and Condensing Units, ARI Standard 520-74.		
RS-15	1988 ASHRAE Equipment Handbook.		
RS-16	Heating and Air Conditioning Systems—Installation Standards, SMACNA, February, 1977.		
RS-17	SMACNA Duct Metal and Flexible Construction Standards, 1st Edition, Washington, D.C., 1985.		
RS-18	Same as Standard RS-17.		
RS-19	SMACNA Fibrous Glass Duct Construction Standards, 6th Edition, Washington, D.C., 1990.		
RS-20	1990 ASHRAE Refrigeration Volume.		

## ACCREDITED AUTHORITATIVE AGENCIES

AAMA refers to the American Architectural Manufacturers Association, 35 East Wacker Drive, Chicago, IL 60601

ANSI refers to the American National Standards Institute, Inc., 1430 Broadway, New York, NY 10018

ARI refers to the Air conditioning and Refrigeration Institute, 1815 North Fort Myer Drive, Arlington, VA 22209

ASHRAE refers to the American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc., 1791 Tullie Circle, N.E., Atlanta, GA 30329

ASTM refers to the American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103

IES refers to Illuminating Engineering Society, 345 East 47th Street, New York, NY 10017

NESCA refers to the National Environmental System Contractors Association, 1501 Wilson Blvd., Arlington, VA 22209

NWWDA refers to the National Wood Window and Door Association, 1400 East Toughy Avenue, Suite G-54, Des Plaines, IL 60018

SMACNA refers to the Sheet Metal and Air Conditioning contractors National Association, Inc., 8224 Old Courthouse Rd., Tysons Corner, Vienna, VA 22180

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0701, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0800 Section 0800—Suggested software for chapter 4 systems analysis approach for Group R occupancy.**

Program Name: Source

CALPAS 3 BERKELEY SOLAR GROUP  
455 Santa Clara Ave.  
Oakland, CA 94610  
(415) 843-7600

Program Name:	Source
DATA CAL	SUNRISE ENERGY, INC. 5708 43rd Ave E. Tacoma, WA 98443 (206) 922-5218
DOE 2	ACROSOF T INTERNATIONAL, INC. 9745 E. Hampton Ave. Suite 230 Denver, CO 80231 (303) 368-9225
F-LOAD	F-CHART SOFTWARE 4406 Fox Bluff Rd. Middleton, WI 53562 (608) 836-8536
MICROPAS	ENERCOMP 123 C Street Davis, CA 95616 (916) 753-3400
SUNDAY	ECOTOPE 2812 East Madison St. Seattle, WA 98112 (206) 322-3753
WATTSUN	WSEO 809 Legion Way S.E. Olympia, WA 98504 Attn: Hank Date (206) 956-2031

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0800, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-0900 Section 0900--Prescriptive heating system sizing.** When using the prescriptive approach in Chapter 6, if approved by the building official, design heat load calculations are not required to show compliance to this Code if the heating system installed is equal to or less than the following:

Climate Zone I	
Electric Resistance	21 btu/hr•ft <sup>2</sup>
Electric Resistance (Forced Air)	24 btu/hr•ft <sup>2</sup>
Other Fuels (Forced Air)	27 btu/hr•ft <sup>2</sup>
Climate Zone II	
Electric Resistance	29 btu/hr•ft <sup>2</sup>
Electric Resistance (Forced Air)	32 btu/hr•ft <sup>2</sup>
Other Fuels (Forced Air)	39 btu/hr•ft <sup>2</sup>

Example: A 1500 ft<sup>2</sup> house in Zone I, heated with gas, would not have to submit a design heat load if the proposed furnace is 40,500 BTU or less.

$$1500 \times 27 = 40,500$$

Disclaimer: All heating systems shall be designed and installed in accordance with Uniform Building Code section 1211.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-0900, filed 12/19/90, effective 7/1/91.]

#### WAC 51-11-1000 Chapter 10.

Section 1000 Default heat-loss coefficients for site-built single and multifamily homes.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1000, filed 12/19/90, effective 7/1/91.]

#### WAC 51-11-1001 Section 1001 General.

(1990 Ed.)

1001.1 Scope: This chapter includes tables of seasonal average heat-loss coefficients for specified nominal insulation. The heat-loss coefficients may also be used for heating system sizing.

1001.2 Description: These coefficients were developed primarily from data and procedures from Standard RS-1, and taken specifically from Standard RS-26, listed in Chapter 7.

Coefficients not contained in this chapter may be computed using the procedures listed in these references if the assumptions in the following sections and Standard RS-26, listed in Chapter 7, are used, along with data from the sources referenced above.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1001, filed 12/19/90, effective 7/1/91.]

#### WAC 51-11-1002 Section 1002: Below grade walls and slabs.

1002.1 General: Table 10-1 lists heat-loss coefficients for below-grade walls and floors.

Coefficients for below-grade walls are given as U-values (Btu/°F•hr per square foot of wall area). Coefficients for below-grade slabs are listed as F-values (Btu/°F•hr per lineal foot of slab perimeter).

Below-grade wall U-values are only valid when used with the accompanying below-grade slab F-value, and vice versa.

1002.2 Component Description: All below-grade walls are assumed to be eight-inch concrete. The wall is assumed to extend from the slab upward to the top of the mud sill for the distance specified in Table 10-1, with six inches of concrete wall extending above grade.

Interior insulation is assumed to be fiberglass batts placed in the cavity formed by 2x4 framing on twenty-four inch centers with one-half inch of gypsum board as the interior finish material. Exterior insulation is assumed to be applied directly to the exterior of the below-grade wall from the top of the wall to the footing. The exterior case does not assume any interior framing or sheetrock.

In all cases, the entire wall surface is assumed to be insulated to the indicated nominal level with the appropriate framing and insulation application. Coefficients are listed for wall depths of two, three and one-half, and seven feet below grade. Basements shallower than two feet should use on-grade slab coefficients.

Heat-loss calculations for wall areas above grade should use above-grade wall U-values, beginning at the mudsill.

1002.3 Insulation Description: Coefficients are listed for the following four configurations:

1. Uninsulated: No insulation or interior finish.

2. Interior insulation: Interior 2x4 insulated wall without a thermal break between concrete wall and slab.

[Title 51 WAC—p 55]

3. Interior insulation w/thermal break: Interior 2x4 insulated wall with R-5 rigid board providing a thermal break between the concrete wall and the slab.

4. Exterior insulation: Insulation applied directly to the exterior surface of the concrete wall.



THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

TABLE 10-1 DEFAULT WALL U-VALUES AND SLAB F-VALUES FOR BASEMENTS

	Below Grade Wall U-value	Below Grade Slab F-value
<b>2-Foot Depth Below Grade</b>		
Uninsulated	0.350	0.59
R-11 Interior	0.066	0.68
R-11 Interior w/tb	0.070	0.60
R-19 Interior	0.043	0.69
R-19 Interior w/tb	0.045	0.61
R-10 Exterior	0.070	0.60
R-12 Exterior	0.061	0.60
<b>3.5-Foot Depth Below Grade</b>		
Uninsulated	0.278	0.53
R-11 Interior	0.062	0.63
R-11 Interior w/tb	0.064	0.57
R-19 Interior	0.041	0.64
R-19 Interior w/tb	0.042	0.57
R-10 Exterior	0.064	0.57
R-12 Exterior	0.057	0.57
<b>7-Foot Depth Below Grade</b>		
Uninsulated	0.193	0.46
R-11 Interior	0.054	0.56
R-11 Interior w/tb	0.056	0.42
R-19 Interior	0.037	0.57
R-19 Interior w/tb	0.038	0.43
R-10 Exterior	0.056	0.42
R-12 Exterior	0.050	0.42

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1002, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-1003 Section 1003: On-grade slab floors.**

1003.1 General: Table 10-2 lists heat-loss coefficients for heated on-grade slab floors, in units of Btu/°F●hr per lineal foot of perimeter.

1003.2 Component Description: All on-grade slab floors are assumed to be six-inch concrete poured directly onto the earth. The bottom of the slab is assumed to be at grade line. Monolithic and floating slabs are not differentiated.

Soil is assumed to have a conductivity of 0.75 Btu/hr●°F●ft<sup>2</sup>. Slabs two-feet or more below grade should use basement coefficients.

1003.3 Insulation Description: Coefficients are provided for the following three configurations:

Two-Foot (or four-foot) vertical: Insulation is applied directly to the slab exterior, extending downward from the top of the slab to a depth of two-feet (or four-feet) below grade.

Two-Foot (or four-foot) horizontal: Insulation is applied directly to the underside of the slab, and run horizontally from the perimeter inward for two-feet or four-feet. The slab edge is exposed in this configuration.

Note: A horizontal installation with a thermal break of at least R-5 at the slab edge should use the vertical-case F-values.

Fully insulated slab: Insulation extends from the top of the slab, along the entire perimeter, and completely covers the area under the slab.

TABLE 10-2 DEFAULT F-VALUES FOR ON-GRADE SLABS

Insulation type	R-0	R-5	R-10	R-15
Uninsulated slab	0.73	—	—	—
2-ft Horizontal (No thermal break)	—	0.70	0.70	0.69
4-ft Horizontal (No thermal break)	—	0.67	0.64	0.63
2-ft Vertical (or Horiz. w/T.B.)	—	0.58	0.54	0.52
4-ft Vertical (or Horiz. w/T.B.)	—	0.54	0.48	0.45
Fully insulated slab	—	—	0.36	—

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1003, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-1004 Section 1004: Crawlspace floors.**

1004.1 General: Tables 10-3 and 10-4 list heat-loss coefficients for floors over crawlspaces in units of Btu/°F●hr per square foot of floor.

They are derived from procedures listed in RS-1, listed in Chapter 7, assuming an average outdoor temperature of 45° F, an average indoor temperature of 65° F, and a crawlspace area of one thousand three hundred fifty ft<sup>2</sup> and one hundred fifty ft of perimeter. The crawlspace is assumed to be 2.5-feet high, with twenty-four inches below grade and six inches above grade.

1004.2 Crawlspace Description: Four crawlspace configurations are considered: vented, unvented, enclosed and heated plenum.

Vented crawlspaces: Assumed to have three air-changes per hour, with at least one ft<sup>2</sup> of net-free ventilation in the foundation for every three hundred ft<sup>2</sup> of crawlspace floor area. The crawlspace is not actively heated.

Floors over unheated areas, such as garages, may only use those values which have R-0 perimeter insulation.

Unvented crawlspaces: Assumed to have 1.5 air changes per hour, with less than one ft<sup>2</sup> of net-free ventilation in the foundation for every three hundred ft<sup>2</sup> of crawlspace floor area. The crawlspace is not actively heated. Floors over unheated basements may only use those values which have R-0 perimeter insulation.

Heated-plenum crawlspaces: Assumed to have 0.25 air-changes per hour, with no foundation vents. Heated supply air from central furnace is blown into a crawlspace and allowed to enter the living space unducted via holes cut into the floor.

Enclosed floors: Assumes no buffer space, and a covering of one-half inch of T1-11 on the exterior of the cavity exposed to the outside air.

1004.3 Construction Description: Floors are assumed to be either joisted floors framed on sixteen inch centers, or post and beam on four by eight foot squares. Insulation is assumed to be installed under the subflooring between the joists or beams with no space between the insulation and the subfloor. Insulation is assumed to be uncompressed.

Perimeter insulation is assumed to extend from the top of the rim joist to the crawlspace floor and then inward along the ground (on top of the ground cover) for at least twenty-four inches.

Floor coverings are assumed to be light carpet with rubber pad.

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 THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991
 

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 TABLE 10-3 DEFAULT U-VALUES FOR FLOORS OVER VENTED CRAWLSPACE  
 OR UNHEATED BASEMENT
 

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Floor	Nominal R-value		U-value	
	Perimeter		Post & Beam	Joists
0	0		0.112	0.134
	11		0.100	0.116
	19		0.098	0.114
	30		0.093	0.107
11	0		0.052	0.056
	11		0.048	0.052
19	0		0.038	0.041
	11		0.036	0.038
22	0		0.034	0.037
	11		0.033	0.035
25	0		0.032	0.034
	11		0.031	0.033
30	0		0.028	0.029
	11		0.027	0.028
38	0		0.024	0.025
	11		0.024	0.024

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 TABLE 10-4 DEFAULT U-VALUES FOR FLOORS OVER HEATED PLENUM CRAWLSPACES
 

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	Nominal R-value	U-value
	Perimeter	
	11	0.085
	19	0.075
	30	0.069

---

**Note:** Crawlspace used as heated plenums have approximately 30-percent higher heat-loss rate than unvented crawlspaces with the same assumed ACH. Default U-values in Table 10-4 reflect this higher rate of heat loss.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1004, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-1005 Section 1005: Above-grade walls.**

**Section 1005.1 General:** Table 10-5 lists heat-loss coefficients for the opaque portion of above-grade walls (Btu/°F·hr per square foot). They are derived from procedures listed in RS-1, listed in Chapter 7, assuming exterior air films at 7.5-mph wind speed.

Insulation is assumed to uniformly fill the entire cavity and to be installed as per manufacturer's directions. All walls are assumed to be finished on the inside with one-half inch gypsum wallboard, and on the outside with either beveled wood siding over one-half inch plywood sheathing or with five-eighths inch T1-11 siding. Insulated sheathing (either interior or exterior) is assumed to cover the entire opaque wall surface.

**1005.2 Framing Description:** Three framing types are considered, and defined as follows:

**Standard:** Studs framed on sixteen inch centers with double top plate and single bottom plate. Corners use three studs and each opening is framed using two studs. Headers consist of double 2X or single 4X material with an air space left between the header and the exterior sheathing. Interior partition wall/exterior wall intersections use two studs in the exterior wall.

Framing weighting factors: Studs and plates .19  
 Insulated cavity .77  
 Headers .04

**Intermediate:** Studs framed on sixteen 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 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.

Framing weighting factors: Studs and plates .18  
 Insulated cavity .78  
 Headers .04

**Advanced:** Studs framed on twenty-four 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.

Framing weighting factors: Studs and plates .13  
 Insulated cavity .83  
 Headers .04

**1005.3 Component Description:** Default coefficients for three types of walls are listed: single-stud walls, strap walls, and double-stud walls.

**Single-Stud Wall:** Assumes either 2x4 or 2x6 studs framed on sixteen or twenty-four inch centers. Headers are solid for 2x4 walls and double 2x for 2x6 walls, with either dead-air or rigid-board insulation in the remaining space.

**Strap Wall:** Assumes 2x6 studs framed on sixteen or twenty-four inch centers. 2x3 or 2x4 strapping is run horizontally along the interior surface of the wall to provide additional space for insulation.

**Double-Stud Wall:** Assumes an exterior structural wall and a separate interior, non-structural wall. Insulation is placed in both wall cavities and in the space between the two walls. Stud spacing is assumed to be on twenty-four inch centers for both walls.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

TABLE 10-5 DEFAULT U-VALUES FOR ABOVE-GRADE WALLS

2 x 4 Single Wood Stud: R-11 Batt

	<u>Siding Material/Framing Type</u>				
	R-value of Foam Board	Lapped Wood		T1-11	
		STD	ADV	STD	ADV
NOTE: Nominal Batt R-value: R-11 at 3.5-inch thickness	0	.088	.084	.094	.090
Installed Batt R-value: R-11 in 3.5-inch cavity	1	.080	.077	.085	.082
	2	.074	.071	.078	.075
	3	.069	.066	.072	.070
	4	.064	.062	.067	.065
	5	.060	.058	.063	.061
	6	.056	.055	.059	.057
	7	.053	.052	.055	.054
	8	.051	.049	.052	.051
	9	.048	.047	.050	.049
	10	.046	.045	.047	.046
	11	.044	.043	.045	.044
	12	.042	.041	.043	.042

2 x 4 Single Wood Stud: R-13 Batt

	<u>Siding Material/Framing Type</u>				
	R-value of Foam Board	Lapped Wood		T1-11	
		STD	ADV	STD	ADV
NOTE: Nominal Batt R-value: R-13 at 3.63-inch thickness	0	.082	.078	.088	.083
Installed Batt R-value: R-12.7 in 3.5-inch cavity	1	.075	.072	.080	.076
	2	.069	.066	.073	.070
	3	.065	.062	.068	.065
	4	.060	.058	.063	.061
	5	.057	.055	.059	.057
	6	.053	.052	.056	.054
	7	.051	.049	.052	.051
	8	.048	.047	.050	.048
	9	.046	.045	.047	.046
	10	.044	.043	.045	.044
	11	.042	.041	.043	.042
	12	.040	.039	.041	.040

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991**2 x 4 Single Wood Stud: R-15 Batt**

	<u>Siding Material/Framing Type</u>				
	R-value of Foam Board	Lapped Wood		T1-11	
		STD	ADV	STD	ADV
<b>NOTE:</b>					
Nominal Batt R-value: R-15 at 3.5-inch thickness	0	.076	.071	.081	.075
Installed Batt R-value: R-15 in 3.5-inch cavity	1	.069	.065	.073	.069
	2	.064	.061	.068	.069
	3	.060	.057	.063	.059
	4	.056	.053	.059	.056
	5	.053	.051	.055	.052
	6	.050	.048	.052	.050
	7	.047	.046	.049	.047
	8	.045	.044	.047	.045
	9	.043	.042	.044	.043
	10	.041	.040	.042	.041
	11	.039	.038	.041	.039
	12	.038	.037	.039	.038

**2 x 6 Single Wood Stud: R-19 Batt**

	<u>Siding Material/Framing Type</u>						
	R-value of Foam Board	Lapped Wood			T1-11		
		STD	INT	ADV	STD	INT	ADV
<b>NOTE:</b>							
Nominal Batt R-value R-19 at 6-inch thickness	0	.062	.058	.055	.065	.061	.058
Installed Batt R-Value R-18 in 5.5-inch cavity	1	.058	.055	.052	.060	.057	.055
	2	.054	.052	.050	.056	.054	.051
	3	.051	.049	.047	.053	.051	.049
	4	.048	.046	.045	.050	.048	.046
	5	.046	.044	.043	.048	.046	.044
	6	.044	.042	.041	.045	.044	.042
	7	.042	.040	.039	.043	.042	.040
	8	.040	.039	.038	.041	.040	.039
	9	.038	.037	.035	.039	.038	.037
	10	.037	.036	.035	.038	.037	.036
	11	.036	.035	.034	.036	.035	.035
	12	.034	.033	.033	.035	.034	.033

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991**2 x 6 Single Wood Stud: R-21 Batt**

	R-value of Foam Board	Siding Material/Framing Type					
		Lapped Wood			T1-11		
		STD	INT	ADV	STD	INT	ADV
<b>NOTE:</b>							
Nominal BATT R-value R-21 at 5.5-inch thickness	0	.057	.054	.051	.060	.056	.053
Installed Batt R-value R-21 in 5.5-inch cavity	1	.054	.051	.048	.056	.053	.050
	2	.050	.048	.045	.052	.050	.047
	3	.048	.045	.043	.049	.047	.045
	4	.045	.043	.041	.047	.045	.043
	5	.043	.041	.040	.044	.042	.041
	6	.041	.039	.038	.042	.041	.039
	7	.039	.038	.036	.040	.039	.037
	8	.038	.036	.035	.039	.037	.036
	9	.036	.035	.034	.037	.036	.035
	10	.035	.034	.033	.036	.035	.033
	11	.033	.033	.032	.034	.033	.032
	12	.032	.031	.031	.033	.032	.031

**2 x 6 Single Wood Stud: R-22 Batt**

	R-value of Foam Board	Siding Material/Framing Type					
		Lapped Wood			T1-11		
		STD	INT	ADV	STD	INT	ADV
<b>NOTE:</b>							
Nominal Batt R-value R-22 at 6.75-inch thickness	0	.059	.055	.052	.062	.058	.054
Installed Batt R-value R-20 in 5.5-inch cavity	1	.055	.052	.049	.057	.054	.051
	2	.052	.049	.047	.054	.051	.048
	3	.049	.046	.044	.050	.048	.046
	4	.046	.044	.042	.048	.046	.044
	5	.044	.042	.041	.045	.043	.042
	6	.042	.040	.039	.043	.042	.040
	7	.040	.039	.037	.041	.040	.038
	8	.038	.037	.036	.039	.038	.037
	9	.037	.036	.035	.038	.037	.035
	10	.035	.034	.033	.036	.035	.034
	11	.034	.033	.032	.035	.034	.033
	12	.033	.032	.031	.034	.033	.032

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

2 x 6 Single Wood Stud: Two R-11 Batts

	R-value of Foam Board	Siding Material/Framing Type					
		Lapped Wood			T1-11		
		STD	INT	ADV	STD	INT	ADV
<b>NOTE:</b>							
Nominal Batt R-value R-22 at 7-inch thickness	0	.060	.057	.054	.063	.059	.056
Installed Batt R-value R-18.9 in 5.5-inch cavity	1	.056	.053	.051	.059	.056	.053
	2	.053	.050	.048	.055	.052	.050
	3	.050	.048	.046	.052	.049	.047
	4	.047	.045	.044	.049	.047	.045
	5	.045	.043	.042	.046	.045	.043
	6	.043	.041	.040	.044	.043	.041
	7	.041	.040	.038	.042	.041	.039
	8	.039	.038	.037	.040	.039	.038
	9	.038	.037	.036	.039	.038	.036
	10	.036	.035	.034	.037	.036	.035
	11	.035	.034	.033	.036	.035	.034
	12	.034	.033	.032	.034	.034	.033

2 x 8 Single Stud: R-25 Batt

	R-value of Foam Board	Siding Material/Framing Type					
		Lapped Wood			T1-11		
		STD	INT	ADV	STD	INT	ADV
<b>NOTE:</b>							
Nominal Batt R-value R-25 at 8-inch thickness	0	.051	.047	.045	.053	.049	.046
Installed Batt R-value R-23.6 in 7.25-inch cavity	1	.048	.045	.043	.049	.046	.044
	2	.045	.043	.041	.047	.044	.042
	3	.043	.041	.039	.044	.042	.040
	4	.041	.039	.037	.042	.040	.038
	5	.039	.037	.036	.040	.038	.037
	6	.037	.036	.035	.038	.037	.036
	7	.036	.035	.033	.037	.035	.034
	8	.035	.033	.032	.035	.034	.033
	9	.033	.032	.031	.034	.033	.032
	10	.032	.031	.030	.033	.032	.031
	11	.031	.030	.029	.032	.031	.030
	12	.030	.029	.028	.031	.030	.029



THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

2 x 6: Strap Wall

	<u>Siding Material/Frame Type</u>			
	Lapped Wood		T1-11	
	STD	ADV	STD	ADV
R-19 + R-11 Batts	.036	.035	.038	.036
R-19 + R-8 Batts	.041	.039	.042	.040

2 x 6 + 2 x 4: Double Wood Stud

<u>Batt Configuration</u>			<u>Siding Material/Frame Type</u>			
			Lapped Wood		T1-11	
Exterior	Middle	Interior	STD	ADV	STD	ADV
R-19	-----	R-11	.040	.037	.041	.038
R-19	-----	R-19	.034	.031	.035	.032
R-19	R-8	R-11	.029	.028	.031	.029
R-19	R-11	R-11	.027	.026	.028	.027
R-19	R-11	R-19	.024	.023	.025	.023
R-19	R-19	R-19	.021	.020	.021	.020

2 x 4 + 2 x 4: Double Wood Stud

<u>Batt Configuration</u>			<u>Siding Material/Frame Type</u>			
			Lapped Wood		T1-11	
Exterior	Middle	Interior	STD	ADV	STD	ADV
R-11	-----	R-11	.050	.046	.052	.048
R-19	-----	R-11	.039	.037	.043	.039
R-11	R-8	R-11	.037	.035	.036	.036
R-11	R-11	R-11	.032	.031	.033	.032
R-13	R-13	R-13	.029	.028	.029	.028
R-11	R-19	R-11	.026	.026	.027	.026

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

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**Log Walls**

	<u>Average Log Diameter</u>	<u>U-value</u>
<b>NOTE:</b>		
R-value of wood:	6-inch	0.148
R-1.25 per inch thickness	8-inch	0.111
Average wall thickness	10-inch	0.089
90% average log diameter	12-inch	0.074
	14-inch	0.063
	16-inch	0.056

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**Stress Skin Panel**

	<u>Panel Thickness</u>	<u>U-value</u>
<b>NOTE:</b>		
R-value of expanded polystyrene:	3 1/2-inch	.071
R-3.85/inch	5 1/2-inch	.048
	7 1/4-inch	.037
	9 1/4-inch	.030
Framing: 6%	11 1/4-inch	.025
Spline: 8%		
No thermal bridging between interior and exterior splines		

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**Single Metal Stud**

<u>Nominal Wall Thickness</u>	<u>Nominal Insulation R-Value</u>	<u>Effective Insulation R-Value</u>	<u>Stud Spacing</u>	
			<u>16" O.C.</u>	<u>24" O.C.</u>
4 inch	R-11	R-11	.14	.13
4 inch	R-13	R-12.7	.13	.12
6 inch	R-19	R-18	.11	.10

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[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1005, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-1006 Section 1006 Default u-values for glazing and doors.**

1006.1 Untested Glazing and Doors: Untested glazing and doors shall be assigned the following U-values:

a. Manufactured glazing products:

single glazing (all):	U = 1.20;
double glazing:	
aluminum or steel framed:	U = 0.90;
wood or vinyl framed:	U = 0.75;

b. Nonmanufactured site built fixed lite glazing products with a minimum of one-half inch airspace in a wood frame only. All products supplied by manufacturers, such as kits for solariums, shall use the default U-values for manufactured glazing products cited above.

air-filled:	U = 0.60;
argon-filled:	U = 0.55;
low-e, air-filled:	U = 0.50;
low-e, argon-filled:	U = 0.40;

Products which do not comply with all of these criteria shall use the default U-values listed under manufactured glazing products.

c. For Doors, see Table 10-6 on the next page.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

**TABLE 10-6 TRANSMISSION COEFFICIENTS (U) FOR WOOD AND STEEL DOORS**  
Btu/hr·ft<sup>2</sup>·°F

Nominal Door Thickness, Inches	Description	No Storm Door	Wood Storm Door <sup>c</sup>	Metal Storm Door <sup>d</sup>
<b>Wood Doors<sup>b</sup></b>				
1-3/8	Panel door with 7/16 inch panels <sup>e</sup>	0.57	0.33	0.37
1-3/8	Hollow core flush door	0.47	0.30	0.32
1-3/8	Solid core flush door	0.39	0.26	0.28
1-3/4	Panel door with 7/16 inch panels <sup>e</sup>	0.57	0.33	0.36
1-3/4	Hollow core flush door	0.46	0.29	0.32
1-3/4	Panel door with 1-1/8 inch panels <sup>e</sup>	0.39	0.26	0.28
1-3/4	Solid core flush door	0.33	0.28	0.25
2-1/4	Solid core flush door	0.27	0.20	0.21
<b>Steel Doors<sup>b</sup></b>				
1-3/4	Fiberglass or mineral wool core w/ steel stiffeners, no thermal break <sup>f</sup>	0.60	----	----
1-3/4	Paper honeycomb core without thermal break <sup>f</sup>	0.56	----	----
1-3/4	Solid urethane foam core without thermal break <sup>a</sup>	0.40	----	----
1-3/4	Solid fire rated mineral fiberboard core without thermal break <sup>f</sup>	0.38	----	----
1-3/4	Polystyrene core without thermal break(18 gage commercial steel) <sup>f</sup>	0.35	----	----
1-3/4	Polyurethane core without thermal break(18 gage commercial steel) <sup>f</sup>	0.29	----	----
1-3/4	Polyurethane core without thermal break(24 gage commercial steel) <sup>f</sup>	0.29	----	----
1-3/4	Polyurethane core w/ thermal break & wood perimeter(24 gage commercial steel) <sup>f</sup>	0.20	----	----
1-3/4	Solid urethane foam core with thermal break	0.19	0.16	0.17

Note: All U-factors for exterior doors in this table are for doors with no glazing, except for the storm doors which are in addition to the main exterior door. Any glazing area in exterior doors should be included with the appropriate glass type and analyzed. Interpolation and moderate extrapolation are permitted for door thicknesses other than those specified.

<sup>a</sup> Values are based on a nominal 32 by 80 in. door size with no glazing.

<sup>b</sup> Outside air conditions: 15 mph wind speed, 0°F air temperature; inside air conditions: natural convection, 70°F air temperature.

<sup>c</sup> Values for wood storm door are for approximately 50 percent glass area.

<sup>d</sup> Values for metal storm door are for any percent glass area.

<sup>e</sup> 55 percent panel area

<sup>f</sup> ASTM C 236 hotbox data on a nominal 3 by 7 ft door size with no glazing.

The U-factors in Table 6 are for exterior wood and steel doors. The values given for wood doors were calculated, and those for steel doors were taken from hot box tests (Sabine et al. 1975; Yellot 1965) or from manufacturer's test reports. An outdoor surface conductance of 6.0 Btu/h·ft<sup>2</sup>·°F was used, and the indoor surface conductance was taken as 1.4 Btu/h·ft<sup>2</sup>·°F for vertical surfaces with horizontal heat flow. All values given are for exterior doors without glazing. If an exterior door contains glazing, the glazing should be analyzed as a window.

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1006, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-1007 (Reserved.)**

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1007, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-1008 Section 1007 Ceilings.**

1007.1 General: Table 10-7 lists heat-loss coefficients for the opaque portion of exterior ceilings below vented attics, vaulted ceilings, and roof decks in units of Btu/°F●hr per square foot of ceiling.

They are derived from procedures listed in RS-1, listed in Chapter 7. Ceiling U-values are modified for the buffering effect of the attic, assuming an indoor temperature of 65° F and an outdoor temperature of 45° F.

1007.2 Component Description: The three types of ceilings are characterized as follows:

**Ceilings Below a Vented Attic:** Attic insulation is assumed to be blown-in, loose-fill fiberglass with a K-value of 2.6 hr●°F●ft<sup>2</sup>/Btu per inch. Full bag count for specified R-value is assumed in all cases. Ceiling dimensions for flat ceiling calculations are forty-five by thirty feet, with a gabled roof having a 4/12 pitch. The attic is assumed to vent naturally at the rate of three air changes per hour through soffit and ridge vents. A void fraction of 0.002 is assumed for all attics with insulation baffles. Standard-framed, unbaffled attics assume a void fraction of 0.008.

Attic framing is either standard or advanced. Standard framing assumes tapering of insulation depth around the perimeter with resultant decrease in thermal resistance. An increased R-value is assumed in the center of the ceiling due to the effect of piling leftover insulation. Advanced framing assumes full and even depth of insulation extending to the outside edge of exterior walls. Advanced framing does not change from the default value.

U-Values for flat ceilings below vented attics with standard framing may be modified with the following table:

Roof Pitch	U-Value for Standard Framing	
	R-30	R-38
4/12	.036	.031
5/12	.035	.030
6/12	.034	.029
7/12	.034	.029
8/12	.034	.028
9/12	.034	.028
10/12	.033	.028
11/12	.033	.027
12/12	.033	.027

Vented scissors truss attics assume a ceiling pitch of 2/12 with a roof pitch of either 4/12 or 5/12. Unbaffled

standard framed scissors truss attics are assumed to have a void fraction of .016.

**Vaulted Ceilings:** Insulation is assumed to be fiberglass batts installed in roof joist cavities. In the vented case, at least 1.5-inches between the top of the batts and the underside of the roof sheathing is left open for ventilation in each cavity. A ventilation rate of three air changes per hour is assumed. In the unvented or dense pack case, the ceiling cavity is assumed to be fully packed with insulation, leaving no space for ventilation.

**Roof Decks:** Rigid insulation is applied to the top of roof decking with no space left for ventilation. Roofing materials are attached directly on top of the insulation. Framing members are often left exposed on the interior side.

THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

TABLE 10-7                      DEFAULT U-VALUES FOR CEILINGS

## Ceilings Below Vented Attics

	<u>Standard Frame</u>	<u>Advanced Frame</u>
<b>Flat Ceiling</b>	<b>Baffled</b>	
R-19	0.049	0.047
R-30	0.036	0.032
R-38	0.031	0.026
R-49	0.027	0.020
R-60	0.025	0.017
<b>Scissors Truss</b>		
R-30 (4/12 roof pitch)	0.043	0.031
R-38 (4/12 roof pitch)	0.040	0.025
R-49 (4/12 roof pitch)	0.038	0.020
R-30 (5/12 roof pitch)	0.039	0.032
R-38 (5/12 roof pitch)	0.035	0.026
R-49 (5/12 roof pitch)	0.032	0.020

## Vaulted Ceilings

	<u>16" O.C.</u>	<u>24" O.C.</u>
<b>Vented</b>		
R-19 2x10 joist	0.049	0.048
R-30 2x12 joist	0.034	0.033
R-38 2x14 joist	0.027	0.027
<b>Unvented</b>		
R-30 2x10 joist	0.034	0.033
R-38 2x12 joist	0.029	0.027
R-21 + R-21 2x12 joist	0.026	0.025

## Roof Deck

	<u>4x Beams, 48" O.C.</u>
R-12.5 2" Rigid insulation	0.064
R-21.9 3.5" Rigid insulation	0.040
R-37.5 6" Rigid insulation	0.025
R-50 8" Rigid insulation	0.019

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1008, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-1009 Section 1008 Air infiltration.**

1008.1 General: Tables 10-8 and 10-9 list effective air-change rates and heat capacities for heat loss due to infiltration.

Estimated seasonal average infiltration rate in air changes per hour (ACH) is given for standard air-leakage control (see section 502.4 Air Leakage for All Occupancies). The effective air-change rate shall be used in calculations for compliance under either the Component Performance or Systems Analysis approaches.

Heat loss due to infiltration shall be computed using the following equation:

$$Q_{infil} = ACH_{eff} * HCP$$

where:  $Q_{infil}$  = Heat loss due to air infiltration

$ACH_{eff}$  = the effective infiltration rate in Table 10-8

HCP = the Heat Capacity Density Product for the appropriate elevation or climate zone as given below.

**TABLE 10-8 ASSUMED EFFECTIVE AIR-CHANGES PER HOUR**

Air-Leakage Control Package	Air-Changes per Hour	
	Natural	Effective
Standard	0.35	0.35

**TABLE 10-9 DEFAULT HEAT CAPACITY/DENSITY PRODUCT FOR AIR**

Zone	Average Elevation	Heat Capacity/Density
1	Mean Sea Level	0.0180 Btu/hr·°F
2	2000	0.0168 Btu/hr·°F
3	3000	0.0162 Btu/hr·°F

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1009, filed 12/19/90, effective 7/1/91.]

**WAC 51-11-1010 Section 1009 Mass.**

1009.1 General: Table 10-10 lists default mass-values for residential construction types. All calculations are based on standard ASHRAE values for heat-storage capacity as listed in RS-1 Chapter 22.

Thermal capacity of furniture is ignored, as is heat storage beyond the first four inches of mass thickness. All mass is assumed to be in direct contact with the conditioned space. Concrete separated from the heated volume by other materials must multiply the listed concrete mass value by the result of the following formula:

$$\ln(R\text{-value}) \times (-.221) + 0.5$$

Where:

Ln = Natural log

R-value = R-value of material covering concrete

Note: All default values for covered concrete slabs have been adjusted according to this procedure.

1009.2 Mass Description: Mass is divided into two types: Structural and additional.

Structural Mass: Includes heat-storage capacity of all standard building components of a typical residential structure, including floors, ceilings, and interior and exterior walls in Btu/°F·ft<sup>2</sup> of floor area. It also assumes exterior wall, interior wall and ceiling surface area approximately equals three times the floor area.

Additional Mass: Includes any additional building material not part of the normal structure, which is added specifically to increase the building's thermal-storage capability. This category includes masonry fireplaces, water or trombe walls, and extra layers of sheetrock.

Coefficients are in  $\text{Btu}/^\circ\text{F}\cdot\text{ft}^2$  of surface area of material exposed to conditioned space. The coefficient for water is  $\text{Btu}/^\circ\text{F}\cdot\text{gallon}$ .

1009.3 Component Description: Light frame assumes one inch thick wood flooring with five-eighths inch sheetrock on ceilings and interior walls, and walls consisting of either five-eighths inch sheetrock or solid logs. Slab assumes a four-inch concrete slab on or below grade, with five-eighths inch sheetrock on exterior and interior walls and ceiling, and with separate values for interior or exterior wall insulation. Adjustments for slab covering is based on R-value of material. Additional mass values are based on the density multiplied by the specific heat of the material adjusted for listed thickness.



THE WASHINGTON STATE ENERGY CODE • WAC 51-11 • EFFECTIVE JULY 1, 1991

TABLE 10-10

## DEFAULT MASS VALUES

Structural Mass M-value	Btu/°F·Ft <sup>2</sup> floor area
<b>Light frame:</b>	
Joisted/post & beam floor, sheetrock walls and ceilings	3.0
Joisted/post & beam floor, log walls, sheetrock ceilings	4.0
<b>Slab with interior wall insulation:</b>	
Slab, no covering or tile, sheetrock walls and ceilings	10.0
Slab, hardwood floor covering, sheetrock walls and ceilings	7.0
Slab, carpet and pad, sheetrock walls and ceilings	5.0
<b>Slab with exterior wall insulation:</b>	
Slab, no covering or tile, sheetrock walls and ceilings	12.0
Slab, hardwood floor covering, sheetrock walls and ceilings	9.0
Slab, carpet and pad, sheetrock walls and ceilings	7.0
<b>Additional Mass M-Value:</b>	
	<b>BTU/°F·Ft<sup>2</sup> surface area</b>
Gypsum wallboard, 1/2-inch thickness	0.54
Gypsum wallboard, 5/8-inch thickness	0.68
Hardwood floor	1.40
Concrete/Brick, 4 inch-thickness	10.30
Concrete/Brick, 6 inch-thickness	15.40
	<b>BTU/°F·gallon</b>
Water, 1 gallon	8.0

[Statutory Authority: RCW 19.27A.020 and 1990 c 2. 91-01-112, § 51-11-1010, filed 12/19/90, effective 7/1/91.]

### Chapter 51-13 WAC

#### VENTILATION AND INDOOR AIR QUALITY

##### WAC

51-13-100	Chapter 1—Administration and enforcement.
51-13-101	Scope and general requirements.
51-13-102	Alternate systems and materials method of design, construction and installation.
51-13-103	Plans and specifications.
51-13-104	Enforcement and inspections.
51-13-105	Validity.
51-13-106	Conflicts with other codes.
51-13-107	Violations.
51-13-108	Liability.
51-13-200	Definitions.
51-13-201	General.
51-13-202	Definitions.
51-13-300	Chapter 3—Design conditions.
51-13-301	Design criteria.
51-13-302	Minimum ventilation criteria for all Group R occupancies.
51-13-303	Mechanical ventilation criteria and minimum ventilation prescriptive requirements for all Group R occupancies.
51-13-304	Mechanical ventilation criteria and minimum ventilation performance for all other occupancies.
51-13-400	Chapter 4—Indoor air quality.
51-13-401	Pollutant source control.
51-13-402	Solid fuel burning appliances and fireplaces.
51-13-500	Chapter 5—Radon resistive construction standards.
51-13-501	Scope.
51-13-502	State-wide radon requirements.
51-13-503	Radon prescriptive requirements.

##### WAC 51-13-100 Chapter 1—Administration and enforcement.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-100, filed 12/18/90, effective 7/1/91.]

##### WAC 51-13-101 Scope and general requirements.

101.1 Title: This Code shall be known as the Washington State Ventilation and Indoor Air Quality Code. It is herein referred to as "this Code".

101.2 Intent: The purpose of this Code is to provide minimum standards for the design and installation of mechanical ventilation systems, the selection of structural materials used within the conditioned space, and the construction of radon mitigation systems for new construction.

It is intended that these provisions provide flexibility to permit the use of innovative approaches and techniques. These provisions are structured to permit compliance with the intent of this Code by demonstration of performance through on site testing or through engineered design. This Code is not intended to abridge any safety or health requirements required under any other applicable codes or ordinances.

101.3 Scope: This Code sets forth minimum requirements for ventilation in all occupancies, including the design of new construction.

##### 101.3.1 Application to Existing Buildings

[Title 51 WAC—p 74]

101.3.1.1 Additions to Existing Buildings: Additions to existing buildings or structures may be made without making the entire building comply, provided that the new addition shall conform to the provisions of this Code.

##### Exceptions

1. Additions that do not include kitchens, bathrooms, water closets, indoor swimming pools, spas, and other areas where excess water vapors are produced and are less than five hundred square feet are exempt from Chapter 3.

2. Additions or alterations to existing buildings which do not require the construction of foundations, crawlspaces, slabs, or basements shall not be required to meet the requirements for radon protection.

101.3.1.2 Alterations and Repairs: All alterations and repairs may be made to existing or moved buildings built or permitted prior to the enforcement of this Code without making the entire building comply with the provisions of this Code, provided the alterations or repairs comply with this Code.

101.3.1.3 Historic Buildings: Historic buildings are exempt from this Code only to the extent necessary to preserve those features essential to their historical appearance or function.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-101, filed 12/18/90, effective 7/1/91.]

##### WAC 51-13-102 Alternate systems and materials method of design, construction and installation.

102.1 Alternate Materials and Methods of Construction: The provisions of this Code are not intended to prevent the use of any material, method of construction, design or ventilation system not specifically prescribed herein, provided that such construction, design, or ventilation system has been approved by the building official.

The building official may approve any such alternate, provided that the proposed design is satisfactory and complies with the provisions of this Code and that the material, method, or work offered is, for the purpose intended, at least the equivalent of that prescribed in this Code in suitability, effectiveness, safety, and indoor air quality.

The building official may require plans and specifications to be submitted in support of an application for a building permit. Plans and specifications may be required by the building official to be stamped and authenticated by an engineer or architect licensed by the state to practice as such.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-102, filed 12/18/90, effective 7/1/91.]

##### WAC 51-13-103 Plans and specifications.

103.1 General: With each application for a building permit, and when required by the building official, plans and specifications demonstrating compliance with this

Code shall be submitted. The building official may require that plans and specifications be stamped and authenticated by an engineer, architect, or other qualified professional licensed to practice in the state.

103.2 Details: The plans and specifications shall show in sufficient detail pertinent data and features of the materials, equipment and systems as herein governed, including, but not limited to: design criteria, structural panel materials, size and type of apparatus and equipment, systems and equipment controls, provisions for combustion air to fuel burning appliances, and other pertinent data to indicate conformance with the requirements of this Code.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-103, filed 12/18/90, effective 7/1/91.]

#### **WAC 51-13-104 Enforcement and inspections.**

104.1 General: Pertinent data and features of the building and the materials, equipment and/or systems as herein governed shall be subject to inspection by the building official.

104.2 Approvals Required: No materials, equipment, systems, or portions thereof, shall be concealed without first obtaining approval from the building official.

104.3 Tests: Whenever there is insufficient evidence of compliance with any of the provisions in this Code or evidence that any material or construction does not conform to the requirements of this Code, the building official may require tests as proof of compliance to be made at no expense to the local jurisdiction.

Test methods shall be as specified by this Code or by other recognized test standards. If there are no recognized or accepted test methods for the proposed alternate, the building official shall determine test procedures.

104.4 Final Inspection: All materials, equipment, and systems herein governed shall be inspected and approved before the building shall be deemed ready for occupancy.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-104, filed 12/18/90, effective 7/1/91.]

#### **WAC 51-13-105 Validity.**

105.1 Validity: If a section, subsection, sentence, clause, or phrase of this Code is, for any reason, held to be unconstitutional, such decision shall not affect the validity of the remaining portion of this Code.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-105, filed 12/18/90, effective 7/1/91.]

#### **WAC 51-13-106 Conflicts with other codes.**

106.1 Conflicts with Other Codes: In addition to the requirements of this Code, buildings must conform to the provisions of the State Building Code (Chapter 19.27 RCW and Chapter 51-16 WAC). In case of conflicts between the Uniform Building, Uniform Plumbing, Uniform Mechanical, and Uniform Fire Codes as

adopted and amended in Chapter 51-16 Washington Administrative Code, the provisions of Chapter 51-13 shall govern. This Code is not intended to abridge any safety or health requirements under any other applicable codes or ordinances.

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 be applicable.

Wherever in this Code reference is made to the appendix, the provisions of the appendix shall not apply unless specifically adopted.

106.2 Authority: Local legislative authorities are authorized and directed to enforce this Code. Local legislative authorities are authorized to promulgate, adopt, and issue those rules and regulations necessary for the effective and efficient administration of this Code.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-106, filed 12/18/90, effective 7/1/91.]

#### **WAC 51-13-107 Violations.**

107.1 Violations: It shall be unlawful for any persons, 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 in violation of any of the provisions of this Code.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-107, filed 12/18/90, effective 7/1/91.]

#### **WAC 51-13-108 Liability.**

108.1 Liability: Nothing contained in this Code is intended to be nor shall be construed to create nor 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.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-108, filed 12/18/90, effective 7/1/91.]

#### **WAC 51-13-200 Definitions.**

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-200, filed 12/18/90, effective 7/1/91.]

#### **WAC 51-13-201 General.**

201.1 General: For the purposes of this Code, certain terms, phrases, words, and their derivatives shall be construed as specified in this section. Words used is the singular include the plural and the plural, the singular. Words used in the masculine gender include the feminine and feminine, the masculine.

Where terms are not defined in this section, the definitions shall be taken from Chapter 4 of the Uniform Building Code.

Where terms are not defined in either this section or Chapter 4 of the Uniform Building Code, they shall

have their ordinary accepted meanings within the context with which they are used. Webster's Third International Dictionary of the English Language, Unabridged, copyrighted 1981, shall be considered as providing ordinarily accepted meanings.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-201, filed 12/18/90, effective 7/1/91.]

#### WAC 51-13-202 Definitions.

**Addition:** An extension or increase in floor area or height of a building or structure.

**Aggregate:** Crushed stone, stone, or other inert material, or combinations thereof having hard, strong, durable pieces.

**Air barrier:** A continuous material or system of materials utilized for the purpose of minimizing the movement of air across a defined boundary, and capable of withstanding the maximum pressure developed across it, without failing by becoming significantly more leaky.

**Air, exhaust:** Air removed from a space and not re-used therein.

**Air, outdoor:** Air taken from the external atmosphere and, therefore, not previously circulated through the HVAC system or the conditioned space.

**Air, supply:** That air delivered to the conditioned space and used for ventilation, heating, cooling, humidification, or dehumidification.

**Air, transfer:** The movement of indoor air from one space to another.

**Air, ventilation:** That portion of supply air that is outdoor air plus any recirculated air that has been treated for the purpose of maintaining acceptable indoor air quality.

**AMCA:** Air Movement and Control Association, Inc.

**Approved:** As to material and types of construction, refers to approved by the building official as the result of investigation and tests conducted by him, or by reason of accepted principles or tests by recognized authorities, technical or scientific organizations.

**ASHRAE:** American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc.

**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.

**Back-draft damper:** A damper installed to restrict introduction of unconditioned air from an unconditioned space to a conditioned space.

**Barometric damper:** Shall be any listed non-manual device that freely allows the flow of air in one direction, but does not allow conditioned air to escape. Any installed combustion air damper shall meet the installation requirements of the manufacturer.

**Building official:** The officer or other designated authority charged with the administration and enforcement of this Code, or his duly authorized representative.

**Certified local government:** The local government has been certified by the state historical preservation officer as having established its own historic preservation commission and a program meeting federal and state standards.

**CFM:** Cubic feet per minute.

**Conditioned floor area:** The floor area within the conditioned space.

**Conditioned space:** That part of a building that is heated or cooled or both for the comfort of occupants.

**Dehumidistat:** An automatic control device which measures changes in humidity and controls a device(s) for maintaining a maximum specified humidity range or level.

**Exfiltration:** The uncontrolled outward air leakage through cracks and concealed spaces in any building element and around sole plates, wall outlets, duct systems, windows, and doors of a building, caused by the pressure effect of wind and/or the effect of differences in the indoor and outdoor air density.

**Gravel:** A type of aggregate.

**Habitable space (room):** Space in a structure for living, sleeping, eating, or cooking. Bathrooms, toilet compartments, closets, halls, storage, or utility space and similar areas, are not considered habitable space. For the purpose of this Code, a single habitable space may consist of adjoining rooms when one half of the area of the common wall is open and unobstructed and provides an opening of not less than one-tenth of the floor area of the interior room or twenty five square feet, whichever is greater.

**Heat recovery ventilation system:** A device or combination of devices applied to provide the outdoor air for ventilation in which energy is transferred between the intake and exhaust airstream.

**Historic buildings:** Any structure, collection of structures, and their associated sites, deemed of importance to the history, architecture, or culture of an area by an appropriate local, state, or federal government jurisdiction. Including shall be structures on official national, state, or local listings such as the National Register of Historic Places, the State Register of Historic Places, state points of historical interest, and registers or listings of historical or architecturally significant sites, places, historic districts, or landmarks as adopted by a certified local government.

**Humidistat:** An automatic control device which measures changes in humidity and controls a device(s) for maintaining a minimum specified humidity range or level.

**HVAC:** Heating, ventilating, and air conditioning.

**HVI:** Home Ventilating Institute of America, Inc.

**Infiltration:** The uncontrolled inward air leakage through cracks and concealed spaces in any building element and around sole plates, wall outlets, duct systems, windows, and doors of a building, caused by the pressure effect of wind and/or the effect of differences in the indoor and outdoor air density.

**"J" Definitions:** (Reserved)

**"K" Definitions:** (Reserved)

**"L" Definitions:** (Reserved)

**Manual:** Capable of being operated by human intervention.

**Mitigate:** To design, select, apply, and install systems, materials, and processes that reduce radon concentrations in the indoor air of a building, and/or prevent entry of radon into the indoor air of a building, so that the average indoor radon concentration is reduced to an acceptable level.

**New construction:** Any building, addition or change in occupancy permitted on or after the effective date of this Code.

**"O" Definitions:** (Reserved)

**Picocurie, pCi:** A measure of radioactive activity equal to one trillion of a curie. A curie is the amount of any radionuclide that undergoes thirty seven billion nuclear disintegrations per second, hence a picocurie is .037 nuclear disintegrations per second.

**Picocurie per liter, pCi/L:** A common unit of measurement of the concentration of radioactivity in a gas. One pCi/L corresponds to 2.22 radioactive disintegrations per minute per liter of air.

**"Q" Definitions:** (Reserved)

**R value:** (See Thermal resistance (R) )

**Readily accessible:** Readily accessible means capable of being reached safely and quickly for operation, repair, or inspections, without requiring those to whom ready access is requisite to climb over or remove obstacles, or to resort to the use of portable access equipment.

**Soil depressurization system (SDS):** A radon control technique that depressurizes the space below a concrete slab or other soil gas retarder relative to the space above it. The purpose of SDS is to maintain a slightly lower pressure in the soil gas under the slab or other soil gas retarder, compared to the indoor pressure above it, to ensure that flows are from the indoors to the soil, thus preventing mass transport of radon contaminated soil gas to the indoor air.

**Soil gas retarder membrane:** A flexible sheet material placed between the soil and the indoor air for the purpose of reducing the flow of soil gas into the building.

**Solid fuel burning appliance:** Any factory-built or site built appliance designed to provide heat for a structure by burning solid fuels.

**Source specific ventilation system:** A mechanical ventilation system including all fans, controls, and ducting,

which is dedicated to exhausting contaminant-laden air to the exterior of the building from the room or space in which the contaminant is generated.

**System:** A combination of equipment and/or controls, accessories, interconnecting means, and terminal elements by which air is transferred.

**Terminal element:** The means by which the transferred air from a system is finally delivered; i.e., registers, diffusers, through-the-wall vents, roof caps, etc.

**Thermal resistance (R):** The resistance of a material to heat flow, measured as the inverse of heat flow per unit area, per unit time, per unit temperature difference across the thickness of material considered. In this Code, R has units of sq.ft./hr./°F/Btu.

**Thermostat:** An instrument which measures changes in temperature and control device(s) for maintaining a desired temperature.

**Unconditioned space:** (See Conditioned space )

**Ventilation:** The process of supplying and removing air by natural or mechanical means to and from any space. Such air may or may not be conditioned.

**Ventilation, mechanical:** The introduction and distribution of outdoor air and the removal of indoor air by mechanical means.

**Ventilation, natural:** Ventilation other than by mechanical means.

**Whole house ventilation system:** A mechanical ventilation system, including fans, controls, and ducts, which replaces, by direct or indirect means, air from the habitable rooms with outdoor air.

**Wood stove:** (See Solid fuel burning appliance )

**"X" Definitions:** (Reserved)

**"Y" Definitions:** (Reserved)

**Zone:** A space or group of spaces within a building with heating and/or cooling requirements sufficiently similar so that comfort conditions can be maintained throughout by a single controlling device.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-202, filed 12/18/90, effective 7/1/91.]

#### WAC 51-13-300 Chapter 3--Design conditions.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-300, filed 12/18/90, effective 7/1/91.]

#### WAC 51-13-301 Design criteria.

301.1 General: The criteria of this chapter establish the design conditions upon which the minimum ventilation systems are to be based for all occupancies.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-301, filed 12/18/90, effective 7/1/91.]

**WAC 51-13-302 Minimum ventilation criteria for all Group R occupancies.**

**302.1 General:** This section shall apply to all Group R occupancies as defined by the Washington State Building Code. Compliance with this section shall be demonstrated through engineering calculations or performance testing. Documentation of calculations shall be submitted to the building official where required. Performance testing shall be conducted in accordance with recognized test methods.

**302.2 Minimum Ventilation Performance:** Each dwelling unit or guest room shall be equipped with source specific and whole house ventilation systems designed and installed to satisfy the ventilation requirements of this chapter.

**Exception:** All public corridors shall meet the ventilation requirements in section 1205 (c) of the Uniform Building Code.

**302.2.1 Source Specific Ventilation:** Source specific exhaust ventilation shall be required in each kitchen, bathroom, water closet, laundry facility, indoor swimming pool, spa, and other rooms where excess water vapor or cooking odor is produced.

The minimum source specific ventilation effective exhaust capacity shall be not less than levels specified in Table 3-1.

**302.2.2 Whole House Ventilation Systems:** Each dwelling unit shall be equipped with a whole house ventilation system which shall be capable of providing at least 0.35 air changes per hour, but not less than fifteen cubic feet per minute per bedroom plus an additional fifteen cubic feet per minute. Whole house ventilation systems shall be designed to limit ventilation to a level no greater than 0.5 air changes per hour under normal operation conditions. Whole house ventilation systems shall supply outdoor air to all habitable rooms through individual outdoor air inlets, forced-air heating system, ducting or equivalent means. Doors and operable lites in windows are deemed not to meet the outdoor air supply intake requirements.

**302.3 Controls:** All ventilation system controls shall be readily accessible. Controls for whole house ventilation systems shall be capable of operating the ventilation system without energizing other energy-consuming appliances.

**Exception:** Continuously operated whole house ventilation systems switch shall not be readily accessible by the occupant.

**302.3.1 Source Specific Ventilation Systems:** Source specific ventilation systems shall be controlled by manual switches, dehumidistats, timers, or other approved means.

**302.3.2 Intermittently Operated Whole House Ventilation Systems:** The intermittently operated whole house ventilation systems shall be constructed to have the capability for continuous operation, and shall have a manual control and an automatic control, such as a clock timer.

**302.4 Noise:** Whole house fans located four feet or less from the interior grille shall have a sone rating of 1.5 or less measured at 0.1 inches water gauge. Remotely mounted fans shall be acoustically isolated from the structural elements of the building and from attached duct work using insulated flexible duct or other approved material.

**Exception:** Whole house ventilation systems which are integrated with forced-air heating systems or heat-recovery ventilation systems are exempt from the sone rating requirements of this section.

**302.5 Ventilation Ducts:** All ducts shall terminate outside the building. Exhaust ducts in systems which are designed to operate intermittently shall be equipped with back-draft dampers. All exhaust ducts in unconditioned spaces shall be insulated to a minimum of R-4. All supply ducts in the conditioned space shall be insulated to a minimum of R-4.

**302.6 Outdoor Air:** A mechanical system shall supply outdoor air as required in section 302.2.2. The mechanical system may consist of exhaust fans, supply fans, or both.

**302.6.1 Outdoor Air Inlets:** Inlets shall be screened or otherwise protected from entry by insects, leaves, or other material. Outdoor air inlets shall be located so as not to take air from the following areas:

- Closer than ten feet from an appliance vent outlet, unless such vent outlet is three feet above the outdoor air inlet.
- Where it will pick up objectionable odors, fumes, or flammable vapors.
- A hazardous or unsanitary location.
- A room or space having any fuel-burning appliances therein.
- Closer than ten feet from a vent opening of a plumbing drainage system unless the vent opening is at least three feet above the air inlet.
- Attic, crawl spaces, or garages.

**302.6.2 Individual Room Outdoor Air Inlets:** Individual room outdoor air inlets shall have a controllable and secure opening and be capable of a total opening area of not less than four square inches and tested by a nationally recognized standard or approved agency and located to avoid drafts.

**302.6.3 Ventilation Integrated with Forced-Air Systems:** The outdoor air connection to the return air stream shall be located to prevent thermal shock to the heat exchanger.

**302.6.4 Distribution:** Outdoor air shall be distributed to each habitable room by individual inlets, separate duct systems, or a forced-air system. Where outdoor air supplies are separated from exhaust points by doors, provisions shall be made to ensure air flow by undercutting doors, installation of grilles, transoms, or similar means where permitted by the Uniform Building Code.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-302, filed 12/18/90, effective 7/1/91.]

**WAC 51-13-303 Mechanical ventilation criteria and minimum ventilation prescriptive requirements for all Group R occupancies.**

303.1 General: This section establishes minimum prescriptive design requirements for intermittently operated systems. Continuously operated systems shall comply with section 302. System characteristics not addressed in the following sections shall comply with section 302. A system which meets the requirements of this section shall be deemed to satisfy the requirements of this chapter.

303.1.1 Source Specific: Exhaust fans providing source specific ventilation shall have a minimum fan flow rating not less than fifty cfm at 0.25 inches water gauge for bathrooms, laundries, or similar rooms and one hundred cfm at 0.25 inches water gauge for kitchens. Manufacturers' fan flow ratings shall be determined as per HVI 916 (July 1989) or AMCA 210.

303.1.2 Whole House: Whole house ventilation systems may consist of whole house exhaust, integration with forced-air systems or dedicated heat recovery ventilation systems. Whole house exhaust systems shall meet the following requirements:

a) Exhaust fans providing whole house ventilation shall have a flow rating at 0.25 inches water gauge as specified in Table 3-2. Manufacturer's fan flow ratings shall be determined as per HVI 916 (July 1989) or AMCA 210. Table 3-2 shall not be used for dwelling units with more than four bedrooms.

b) Integrated forced-air ventilation systems shall have a six inch diameter or equivalent outdoor air inlet duct connecting a terminal element on the outside of the building to the return plenum of the forced-air system. The outdoor air inlet duct shall be equipped with a damper, or other device that regulates air flow to a minimum of 0.35 air changes per hour but not greater than the 0.50 air changes per hour under normal operating conditions.

c) Heat recovery ventilation systems: All duct work in heat recovery ventilation systems shall be not less than six inch diameter. Balancing dampers shall be installed on the inlet and exhaust side. Flow measurement grids shall be installed on the supply and return. System minimum flow rating shall be not less than that specified in Table 3-2. Maximum flow rates in Table 3-2 do not apply to heat recovery ventilation systems.

303.2 Source Specific and Whole House Exhaust Ducts: Exhaust ducts shall meet all requirements of section 302.5. Duct diameter length and number of elbows shall not be less than four inches and duct length shall not exceed levels specified in Table 3-3. Terminal elements shall have at least the equivalent net free area of the duct work.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-303, filed 12/18/90, effective 7/1/91.]

**WAC 51-13-304 Mechanical ventilation criteria and minimum ventilation performance for all other occupancies.**

304.1 Ventilation: The outdoor air quantities specified in Table 3-4 for each type of occupancy shall be used as the minimum for design. In no case shall the outdoor air quantities be less than five cfm per person.

The minimum requirements for operable area to provide natural ventilation are specified in the Uniform Building Code (UBC) as adopted by the state of Washington.

Where a mechanical ventilation system is installed, the mechanical ventilation system shall be capable of supplying ventilation air to each zone with the minimum outdoor air quantities specified in Table 3-4 based upon the greater of the occupant densities in Table 3-4 or the design occupant density. The outdoor air shall be ducted directly to every air handling unit in each zone not provided with sufficient operable area for natural ventilation. The maximum outdoor air quantities used as the basis for calculating the heating and cooling design loads shall not exceed three times the quantities specified in Table 3-4.

In all parking garages, other than open parking garages as defined in UBC 709 (b), used for storing or handling of automobiles operating under their own power and on all loading platforms in bus terminals, ventilation shall be provided at 1.5 cfm per square foot of gross floor area. The building official may approve an alternate ventilation system designed to exhaust a minimum fourteen thousand cfm for each operating vehicle. Such system shall be based on the anticipated instantaneous movement rate of vehicles but not less than 2.5 percent (or one vehicle) of the garage capacity. Automatic carbon monoxide sensing systems may be submitted for approval.

In all buildings used for the repair of automobiles, each repair stall shall be equipped with an exhaust extension duct, extending to the outside of the building, which if over ten feet in length, shall mechanically exhaust three hundred cfm. Connecting offices and waiting rooms shall be supplied with conditioned air under positive pressure.

Combustion air requirements shall conform to the requirements of Chapter 6 of the UMC.

Mechanical refrigerating equipment and rooms storing refrigerates shall conform to the requirements of Chapter 15 of the UMC.

Exception: If outdoor air quantities other than those specified in Table 3-4 are used or required because of special occupancy or process requirements, source control of air contamination, health, and safety or other standards, the required outdoor air quantities shall be used as the basis for calculating the heating and cooling design loads.

MINIMUM SOURCE SPECIFIC VENTILATION CAPACITY  
REQUIREMENTS  
TABLE 3-1

	Bathrooms	Kitchens
Intermittently operating	50 cfm	100 cfm
Continuous operation	20 cfm	25 cfm

WHOLE HOUSE EXHAUST FAN PRESCRIPTIVE  
REQUIREMENTS  
TABLE 3-2

<u>Bedrooms</u>	CFM <u>Minimum</u>	CFM <u>Maximum</u>
2 or less	50	75
3	80	120
4	100	150

PRESCRIPTIVE EXHAUST DUCT SIZING  
TABLE 3-3

Fan Tested CFM @0.25 W.G.	Maximum Flex Diameter	Maximum Length Feet	Maximum Smooth Diameter	Maximum Length Feet	Maximum Elbows*
50	4 inch	25	4 inch	70	3
50	5 inch	90	5 inch	100	3
50	6 inch	Over 100	6 inch	Over 100	3
80	4 inch	Not Allowed	4 inch	20	3
80	5 inch	15	5 inch	100	3
80	6 inch	90	6 inch	Over 100	3
100	5 inch	Not Allowed	5 inch	50	3
100	6 inch	45	6 inch	Over 100	3
125	6 inch	15	6 inch	Over 100	3
125	7 inch	70	7 inch	Over 100	3

\*For each additional elbow subtract 10 feet from length.



VENTILATION REQUIREMENTS IN OTHER THAN GROUP R OCCUPANCY TABLE NO. 3-4

TABLE 3-4  
 OUTDOOR AIR REQUIREMENTS FOR VENTILATION<sup>1</sup>  
 COMMERCIAL FACILITIES

Application	Estimated Maximum <sup>2</sup>	Outdoor Air
	Occupancy P/1000 ft <sup>2</sup> or 100 m <sup>2</sup>	Requirements cfm/person
<b>Dry Cleaners, Laundries<sup>3</sup></b>		
Commercial laundry	10	25
Commercial dry cleaner	30	30
Storage, pick up	30	35
Coin-operated laundries	20	15
Coin-operated dry cleaner	20	15
<b>Food and Beverage Service</b>		
Dinning rooms	70	20
Cafeteria, fast food	100	20
Bars, cocktail lounges <sup>4</sup>	100	30
Kitchens (cooking) <sup>23</sup>	20	15
<b>Garages, Repair, Service Stations</b>		
Enclosed parking garage <sup>5</sup>		1.50 cfm/ft.sq.
Auto repair rooms		1.50 cfm/ft.sq.
<b>Hotels, Motels, Resorts, Domitories<sup>6</sup></b>		
Bedrooms		30 cfm/ft.sq.
Living Rooms		30 cfm/ft.sq.
Bath <sup>7</sup>		35
cfm/ft.sq.		
Lobbies	30	15
Conference rooms	50	20
Assembly rooms	120	15
Dormitory sleeping area <sup>8</sup>	20	15
Gambling casinos <sup>4</sup>	120	30
<b>Offices</b>		
Office space <sup>9</sup>	7	20
Reception area	60	15
Telecommunication centers and data entry areas	60	20
Conference rooms	50	20
<b>Public Spaces</b>		
Corridors and utilities		0.005 cfm/ft.sq.
Public restroom, cfm/wc or urinal <sup>10</sup>		50
Lockers and dressing rooms		.05 cfm/ft.sq.
Smoking lounge <sup>11</sup>	70	60
Elevators <sup>12</sup>		1.0 cfm/ft.sq.

TABLE 3-4 Cont.  
 OUTDOOR AIR REQUIREMENTS FOR VENTILATION<sup>1</sup>  
 COMMERCIAL FACILITIES

Application	Estimated Maximum <sup>2</sup> Occupancy P/1000 ft <sup>2</sup> or 100 m <sup>2</sup>	Outdoor Air Requirements cfm/person
<b>Retail Stores, Sales Floors, and Show Room Floors</b>		
Basement and street	30	0.3 cfm/ft.sq.
Upper floors	20	0.2 cfm/ft.sq.
Storage rooms	15	0.15 cfm/ft.sq.
Dressing rooms		0.20 cfm/ft.sq.
Malls and arcades	20	0.20 cfm/ft.sq.
Shipping and receiving	10	0.15 cfm/ft.sq.
Warehouses	5	0.05 cfm/ft.sq.
Smoking lounge <sup>11</sup>	70	60
<b>Specialty Shops</b>		
Barber	25	15
Beauty	25	25
Reducing salons	20	15
Florists <sup>13</sup>	8	15
Clothiers, furniture		.30 cfm/ft.sq.
Hardware, drugs, fabric	8	15
Supermarkets	8	15
Pet shops		1.00 cfm/ft.sq.
<b>Sports and Amusement<sup>14</sup></b>		
Spectator areas	150	15
Game rooms	70	25
Ice arenas(playing areas)		0.50 cfm/ft.sq
Swimming Pools(pool and deck area) <sup>15</sup>		0.50 cfm/ft.sq.
Playing floor(gymnasium)	30	20
Ballrooms and discos	100	25
Bowling alleys(seating areas)	70	25
<b>Theaters<sup>16</sup></b>		
Ticket booths	60	20
Lobbies	150	20
Auditorium	150	20
Stages, studios	70	15
<b>Transportation<sup>17</sup></b>		
Waiting rooms	100	15
Platforms	100	15
Vehicles	150	15
<b>Workrooms</b>		
Meat processing <sup>18</sup>	10	15

TABLE 3-4 Cont.  
 OUTDOOR AIR REQUIREMENTS FOR VENTILATION<sup>1</sup>  
 COMMERCIAL FACILITIES

Application	Estimated Maximum <sup>2</sup> Occupancy P/1000 ft <sup>2</sup> or 100 m <sup>2</sup>	Outdoor Air Requirements cfm/person
Photo studios	10	15
Darkrooms	10	0.50 cfm/ft.sq.
Pharmacy	20	15
Bank vaults	5	15
Duplicating, printing <sup>19</sup>		0.50 cfm/ft.sq.
<b>INSTITUTIONAL FACILITIES</b>		
<b>Education</b>		
Classroom	50	15
Laboratories <sup>20</sup>	30	20
Training shop	30	20
Music rooms	50	15
Libraries	20	15
Locker rooms		0.50 cfm/ft.sq.
Corridors		0.10 cfm/ft.sq.
Auditoriums	150	15
Smoking lounges <sup>11</sup>	70	60
<b>Hospitals, Nursing and Convalescent Homes</b>		
Patient rooms <sup>21</sup>	10	25
Medical procedure	20	15
Operating rooms	20	30
Recovery and ICU	20	15
Autopsy rooms <sup>22</sup>		0.50
cfm/ft.sq.		
Physical Therapy	20	15
<b>Correctional Facilities</b>		
Cells	20	20
Dining halls	100	15
Guard station	40	15

1. Derived from ASHRAE Standard 62-1989.
2. Net occupiable space
3. Dry-cleaning process may require more air.
4. Supplementary smoke-removal equipment may be required.
5. Distribution among people must consider worker location and concentration of running engine; stands where engine are run must incorporate systems for positive engine exhaust withdrawal. Contaminant sensors may be used to control ventilation.
6. Independent of room size.

7. Installed capacity for intermittent use.
8. See also food and beverage service, merchandising, barber and beauty shops, garages.
9. Some office equipment may require local exhaust.
10. Mechanical exhaust with no recirculation is recommended.
11. Normally supplied by transfer air, local mechanical exhaust; with no recirculation recommended.
12. Normally supplied by transfer air.
13. Ventilation to optimize plant growth may dictate requirements.
14. When internal combustion engines are operated for maintenance of playing surfaces, increased ventilation rates may be required.
15. Higher values may be required for humidity control.
16. Special ventilation will be needed to eliminate special stage effects.
17. Ventilation within vehicles may require special considerations.
18. Spaces maintained at low temperatures (-10°F. to +50°F.) are not covered by these requirements unless the occupancy is continuous. Ventilation from adjoining spaces is permissible. When the occupancy is intermittent, infiltration will normally exceed the ventilation requirements.
19. Installed equipment must incorporate positive exhaust and control of undesirable contaminants.
20. Special contamination control systems may be required for processes or functions including laboratory animal occupancy.
21. Special requirements or codes and pressure relationships may determine minimum ventilation rates and filter efficiency. Procedures generating contaminants may require higher rates.
22. Air shall not be recirculated into other spaces.
23. Makeup air for hood exhaust may require more ventilating air.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-304, filed 12/18/90, effective 7/1/91.]

**WAC 51-13-400 Chapter 4--Indoor air quality.**

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-400, filed 12/18/90, effective 7/1/91.]

**WAC 51-13-401 Pollutant source control.**

401.1 Formaldehyde Reduction Measures: All structural panel components of the house such as softwood plywood, particle board, wafer board, and oriented strand board shall be identified as "EXPOSURE 1", "EXTERIOR" or "HUD-APPROVED."

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-401, filed 12/18/90, effective 7/1/91.]

**WAC 51-13-402 Solid fuel burning appliances and fireplaces.**

402.1 General: Solid fuel burning appliances and fireplaces shall satisfy one of the following criteria.

402.2 Solid Fuel Burning Appliances: Solid fuel burning appliances shall be provided with the following:

- a) Tight fitting glass or metal doors.
- b) An outside source of combustion air directly connected to the fire box, or tested and listed to the performance requirements of the carbon monoxide test required by the Department of Housing and Urban Development Mobile Home Construction and Safety Standards.

Exception: If existing construction prohibits the introduction of outside combustion air directly to the appliance or the solid fuel burning appliance is part of the central heating system and is installed in an unconditioned space, combustion air may be supplied to the room in which the solid fuel burning appliance is located in lieu of direct ducting. The combustion air terminus shall be located as close to the solid fuel burning appliance as possible and shall be provided with a barometric damper or equivalent. The combustion air source shall be no less than four inches in diameter or the equivalent in area or as approved.

402.3 Fireplaces: Fireplaces shall be provided with each of the following:

- a) Tightly fitting flue dampers, operated by a readily accessible manual or approved automatic control.
- b) An outside source for combustion air ducted into the firebox. The duct shall be at least six square inches, and shall be provided with an operable outside air duct damper.
- c) Tightly fitting glass or metal doors, or flue draft induction fan, or as approved for minimizing back-drafting.

Exception: Fireplaces with gas logs shall be installed in accordance with the Uniform Mechanical Code Chapter 803.

(1990 Ed.)

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-402, filed 12/18/90, effective 7/1/91.]

**WAC 51-13-500 Chapter 5--Radon resistive construction standards.**

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-500, filed 12/18/90, effective 7/1/91.]

**WAC 51-13-501 Scope.**

501.1 General: The criteria of this chapter establishes minimum radon resistive construction requirements for all Group R Occupancies. These requirements are adopted pursuant to the ventilation requirements of Section 7, of Chapter 2 of the Session Laws of 1990.

501.2 Application: The requirements of this chapter shall be adopted and enforced by all jurisdictions of the state according to the following subsections:

501.2.1: All jurisdictions of the state shall comply with section 502.

501.2.2: Ferry, Grant, Okanogan, Pend Oreille, Skamania, Spokane, Stevens, and Wahkiakum counties shall also comply with section 503.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-501, filed 12/18/90, effective 7/1/91.]

**WAC 51-13-502 State-wide radon requirements.**

**502.1: Crawlspace**

502.1.1 General: All crawlspaces shall comply with the requirements of this section.

502.1.2 Ventilation: All crawlspaces shall be ventilated as specified in section 2516 (c) of the Washington State Uniform Building Code (chapter 51-16 WAC).

If the installed ventilation in a crawlspace is less than one square foot for each three hundred square feet of crawlspace area, or if the crawlspace vents are equipped with operable louvers, a radon vent shall be installed from a point between the ground cover and soil. The radon vent shall be installed in accordance with sections 503.2.6 and 503.2.7.

502.1.3 Crawlspace plenum systems: In crawlspace plenum systems used for providing supply or return air for an HVAC system, aggregate, a soil gas retarder membrane and a radon vent pipe shall be installed in accordance with section 503.2.

In addition, a radon vent fan shall be installed and activated. The fan shall be located as specified in section 503.2.7. The fan shall be capable of providing at least one hundred cfm at one inch water column static pressure.

**502.2 Radon monitoring**

502.2.1 Three month etched track radon monitoring: A three month etched track radon monitor, installation instructions, and radon information sheets shall be provided by the builder at the final inspection to all single family residences and to all first floor dwelling units in

multi-unit structures. It is not the responsibility of the builder to administer the radon test.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-502, filed 12/18/90, effective 7/1/91.]

#### WAC 51-13-503 Radon prescriptive requirements.

503.1 Scope: This section establishes prescriptive construction requirements for reducing the potential for radon entry into all Group R occupancies, and for preparing the building for future mitigation if desired.

##### 503.2 Floors in Contact with the Earth

503.2.1 General: Concrete slabs that are in direct contact with the building envelope shall comply with the requirements of this section.

Exception: Concrete slabs located under garages or other than Group R occupancies need not comply with this chapter.

503.2.2 Aggregate: A layer of aggregate of four inch minimum thickness shall be placed beneath concrete slabs. The aggregate shall be continuous to the extent practical.

##### 503.2.3 Gradation: Aggregate shall:

a) Comply with Uniform Building Standard 26-2 and shall be No. 67 or larger size aggregate as listed in Table 26-2-A, Grading Requirements for Concrete Aggregates; or

b) Meet the 1988 Washington State Department of Transportation specification 9-03.1 (3) "Coarse Aggregate for Portland Cement Concrete", or any equivalent successor standards. Aggregate size shall be of Grade 5 or larger as listed in section 9-03.1 (3) C, "Grading"; or

c) Be screened, washed, and free of deleterious substances in a manner consistent with UBC Standard 26-2 with one hundred percent of the gravel passing a one inch sieve and less than two percent passing a four-inch sieve. Sieve characteristics shall conform to those acceptable under UBC Standard 26-2.

Exception: Aggregate shall not be required if a substitute material or system, with sufficient load bearing characteristics, and having approved capability to provide equal or superior air flow, is installed.

503.2.4 Soil-Gas Retarder Membrane: A soil-gas retarder membrane, consisting of at least one layer of virgin polyethylene with a thickness of at least six mil, or equivalent flexible sheet material, shall be placed directly under all concrete slabs. The flexible sheet shall extend to the foundation wall or to the outside edge of the monolithic slab. Seams shall overlap at least twelve inches.

503.2.5 Sealing of Penetrations and Joints: All penetrations and joints in concrete slabs or other floor systems and walls below grade, that will not be accessible at the time the certificate of occupancy is granted, shall be sealed by an approved sealant to create an air barrier to limit the movement of soil-gas into the indoor air.

Sealants shall be approved by the manufacturer for the intended purpose. Sealant joints shall conform to manufacturer's specifications. The sealant shall be placed and tooled in accordance with manufacturer's specifications. There shall be no gaps or voids after the sealant has cured.

503.2.6 Radon Vent: One continuous sealed pipe shall run from a point within the aggregate under each concrete slab to a point outside the building. Joints and connections shall be gas tight.

The continuous sealed pipe shall terminate no less than twelve inches above the eave, and more than ten horizontal feet from a woodstove or fireplace chimney, or operable window. The continuous sealed pipe shall be labeled "radon vent." The label shall be placed so as to remain visible to an occupant.

The minimum pipe diameter shall be three inches unless otherwise approved. Acceptable sealed plastic pipe shall be smooth walled, and may include either PVC schedule 40 or ABS schedule of equivalent wall thickness.

The entire sealed pipe system shall be sloped to drain. The exterior pipe opening shall be protected from blockage by snow accumulation.

The sealed pipe system may pass through an unconditioned attic before exiting the building; but to the extent practicable, the sealed pipe shall be located inside the thermal envelope of the building in order to enhance passive stack venting.

Exception: A fan forced sub-slab depressurization system includes:

1) Soil-gas retarder membrane as specified in section 503.2.4;

2) Sealing of penetrations and joints as specified in section 503.2.5;

3) A three-inch continuous sealed radon pipe shall run from a point within the aggregate under each concrete slab to a point outside the building;

4) Joints and connection shall be gas tight, and may be of either PVC schedule 40 or ABS schedule of equivalent in wall thickness;

5) A label of "radon vent" shall be placed on the pipe so as to remain visible to the occupant;

6) Fan circuit and wiring as specified in section 503.2.7 and a fan.

If the sub-slab depressurization system is exhausted through the concrete foundation wall or rim joist, the exhaust terminus shall be a minimum of six feet from operable windows or outdoor air intake vents and shall be directed away from operable windows and outdoor air intake vents to prevent radon re-entrainment.

503.2.7 Fan Circuit and Wiring and Location: An area for location of an in-line fan shall be provided. The location shall be as close as practicable to the radon vent pipe's point of exit from the building, or shall be outside

the building shell; and shall be located so that the fan and all downstream piping is isolated from the indoor air.

Provisions shall be made to allow future activation of an in-line fan on the radon vent pipe without the need to place new wiring. A one hundred ten volt power supply shall be provided at a junction box near the fan location.

503.2.8 Separate Aggregate Areas: If the four-inch aggregate area underneath the concrete slab is not continuous, but is separated into distinct isolated aggregate areas by a footing or other barrier, a minimum of one radon vent pipe shall be installed into each separate aggregate area.

Exception: Separate aggregate areas may be considered a single area if a minimum three-inch diameter connection joining the separate areas is provided for every thirty feet of barrier separating those areas.

503.2.9 Concrete Block Walls: Concrete block walls connected to below grade areas shall be considered unsealed surfaces. All openings in concrete block walls that will not remain accessible upon completion of the building shall be sealed at both vertical and horizontal surfaces, in order to create a continuous air barrier to limit the transport of soil-gas into the indoor air.

[Statutory Authority: RCW 19.27.190. 91-01-102, § 51-13-503, filed 12/18/90, effective 7/1/91.]

**Chapter 51-16 WAC  
STATE BUILDING CODE UPDATE AND  
AMENDMENT--ADOPTION OF THE 1988  
EDITIONS OF THE UNIFORM CODES**

WAC	
51-16-010	Authority.
51-16-020	Purpose.
51-16-030	Uniform Building Code and Uniform Building Code Standards.
51-16-040	Uniform Mechanical Code.
51-16-050	Uniform Fire Code and Uniform Fire Code Standards.
51-16-060	Uniform Plumbing Code and Uniform Plumbing Code Standards.
51-16-070	Exceptions.
51-16-080	Permit exemptions guideline.
51-16-100	Review of city and county amendments previously approved by the council.

Reviser's note: Underscoring and ~~strike-through~~ is used by the Building Code Council in this chapter to show changes from the applicable Uniform Code.

**DISPOSITION OF SECTIONS FORMERLY CODIFIED IN THIS CHAPTER**

51-16-090	Submittal of proposed city or county amendments. [Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-090, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-090, filed 11/26/85, effective 6/11/86.] Repealed by 90-13-033, filed 6/13/90, effective 7/23/90. Statutory Authority: RCW 19.27.060 (7)(b).
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**WAC 51-16-010 Authority.** These rules are adopted under the authority of chapter 19.27 RCW.

[Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-010, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-010, filed 11/26/85, effective 6/11/86.]

**WAC 51-16-020 Purpose.** The purpose of these rules is to implement the provisions of chapter 19.27 RCW, which provides that the state building code council shall maintain the State Building Code in a status which is consistent with the purpose as set forth in RCW 19.27.020. In maintaining the codes the council shall regularly review updated versions of the codes adopted under the act, and other pertinent information, and shall amend the codes as deemed appropriate by the council.

[Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-020, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-020, filed 11/26/85, effective 6/11/86.]

**WAC 51-16-030 Uniform Building Code and Uniform Building Code Standards.** The 1988 edition of the *Uniform Building Code*, and the 1988 edition of the *Uniform Building Code Standards* as published by the International Conference of Building Officials and available from the International Conference of Building Officials, 5360 South Workman Mill Road, Whittier, California 90601 are hereby adopted by reference with the following additions, deletions and exceptions:

400. The following amendments are adopted to UBC chapter 4.

Sec. 404. Add the following definitions:

**CHILD DAY CARE**, shall, for the purposes of these regulations, mean the care of children during any period of a 24 hour day.

**CHILD DAY CARE HOME, FAMILY** is a child day care facility, licensed by the state, located in the family abode of the person or persons under whose direct care and supervision the child is placed, for the care of twelve or fewer children, including children who reside at the home.

Sec. 407. Add the following definition:

**FAMILY ABODE** means a single dwelling unit and accessory buildings occupied for living purposes by a family which provides permanent provisions for living, sleeping, eating, cooking, and sanitation.

Sec. 409. Revise the definition of health hazard as follows:

Health hazard is a classification of a chemical for which there is statistically significant evidence based on at least one reproducible study conducted in accordance with established scientific principles that acute health effects may occur in exposed persons. The term "health hazard" includes chemicals which are toxic or highly toxic agents, irritants, corrosives, hepatotoxins, nephrotoxins, neurotoxins, agents which can have an acute effect on the hematopoietic system, and agents that have acute effects on the lungs, skin, eyes or mucous membrane.

Sec. 414. Add the following definition:

**MULTIFAMILY RESIDENTIAL BUILDING** is a common wall dwelling or apartment house that consists of four or fewer dwelling units that do not exceed two stories in height and that are less than five thousand square feet in total area.

Sec. 420. Add the following definition:

**SINGLE FAMILY RESIDENTIAL BUILDING** is a dwelling containing only one dwelling unit.

800. The following amendments are adopted to UBC chapter 8.

Sec. 801. Revise the definition of "Division 3" and add an exception as follows:

Division 3. Any building or portion thereof used for day-care purposes for more than six children.

Exception: Family child day-care homes shall be considered Group R Division 3 Occupancies.

For occupancy separation see Table No. 5-B.

Sec. 802 (c). Revise as follows:

(c) Special provisions. Rooms in Division 1 and 2 Occupancies used for kindergarten, first or second grade pupils and Division 3 Occupancies shall not be located above or below the first story.

EXCEPTION: 1. Rooms on floors which have exits to the exterior of the building which require no more than 4 feet of vertical travel from the floor level to the level of the exterior finished surface of the ground, paving or sidewalk.

2. In buildings equipped with an automatic sprinkler system throughout, rooms used for kindergarten, first- and second-grade children or for day-care purposes may be located on the second story, provided there are at least two exits directly into separate exiting systems as defined in Section 3319(a).

3. Division 3 Occupancies located above the second story, shall be in buildings equipped with an automatic sprinkler system throughout and of Type I or Type II fire-resistive construction when:

A. Division 3 Occupancies above the fourth floor shall not have more than 12 children per floor; and,

B. The entire story on which the day-care facility is located is equipped with an approved fire alarm and smoke detection system as set forth in the Fire Code. Actuation of the system shall sound an alarm audible throughout the entire story; and,

C. The day-care facility is divided into not less than two areas of approximately the same size, separated from each other by not less than one-hour fire-resistive construction. Openings between the two areas shall be protected by an automatic-closing smoke and draft control assembly, having a fire-protection rating of not less than 20 minutes, which will close automatically upon actuation of the fire alarm or detection systems; and,

D. Each separated area is provided with air-moving equipment independent of that serving the other; and,

E. Each separated area has not less than two exits, one of which is permitted to be through the adjoining separated area; and,

F. The exits from the Division 3 Occupancy shall be into separate exiting systems as defined in Section 3319.

Balance of section to remain unchanged.

900. The following amendments are adopted to UBC chapter 9.

Sec. 901 (a). Revise as follows:

Sec. 901. (a) General. For definitions, identification and control of hazardous materials, display of nonflammable solid and nonflammable or noncombustible liquid hazardous materials in Group B, Division 2 Occupancies used for retail sales, and storage and use of Class 3 solid and liquid oxidizers in Groups I, M and R Occupancies, see the Fire Code. For application and use of control areas, see Footnote 1 of Tables Nos. 9-A and 9-B. The primary use of a building will be considered as a Group H, Division 1, 2, or 3 or 7 Occupancy when its primary use is for storage, and the aggregate quantity of hazardous materials in the building is in excess of Tables Nos. 9-A or 9-B. Group H Occupancies shall be:

Sec. 901(a). Division 2.6. Revise Exception as follows:

EXCEPTIONS: 1. Rooms or areas used for woodworking where no more than three fixed in-place woodworking appliances are utilized may be classified as a Group B, Division 2 Occupancy, provided the appliances are equipped with dust collectors sufficient to remove dust generated by the appliance.

Sec. 901(a). Division 7. Revise as follows:

Occupancies having quantities of materials in excess of those listed in Table No. 9-B that are health hazards, including but not limited to:

1. Corrosives.
2. Highly toxic materials.
3. Irritants.

Sec. 901(f). Revise as follows:

EXCEPTION: When an HMMP is required, the applicant may submit the report(s) used for compliance with requirements of 40 CFR "Hazardous Chemical Reporting and Community Right-to-Know Regulations" under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA).

Sec. 902(g). Revise as follows:

(g) Standby power. A standby power system shall be provided for required mechanical exhaust ventilation, treatment, temperature control, liquid-level limit control, pressure control, alarm, and detection or other required electrically operated systems in Group H, Divisions 1, 2 and 3 Occupancies, and in Group H, Division 7 Occupancies in which there is use or storage of corrosives, highly toxic solids and liquids, irritants, sensitizers or other health hazard materials. For required



systems, see the Fire Code. The standby power system shall be designed and installed in accordance with the Electrical Code to automatically supply power to all electrical equipment required by the Fire Code when the normal electrical supply system is interrupted.

Sec. 902(h). Revise as follows:

(h) Emergency power. An emergency power system shall be provided for required mechanical exhaust ventilation, treatment, temperature control, liquid-level limit control, pressure control, alarm and detection or other required electrically operated systems in Group H, Division 6 Occupancies, and in Group H, Division 7 Occupancies in which highly toxic or toxic gases are stored or used. For required systems, see the Fire Code. The emergency power system shall be designed and installed in accordance with the Electrical Code to automatically supply power to the exhaust ventilation system when the normal electrical supply system is interrupted.

Sec. 902(k). Delete exception.

Sec. 903. Revise first paragraph as follows:

Group H Occupancies shall be located on property in accordance with Section 504, Tables Nos. 9-C and 9-D and other provisions of this chapter. In Group H, Division 2 or Division 3 Occupancies, not less than 25 percent of the perimeter wall of the occupancy shall be an exterior wall.

Sec. 904(b). Revise first paragraph as follows:

(b) Ventilation in Hazardous Locations. Areas or spaces in which explosive, corrosive, combustible, flammable or highly toxic dusts, mists, fumes, vapors or gases are or may be emitted due to the processing, use, handling or storage of materials shall be mechanically ventilated as required by the Fire Code and the Mechanical Code.

Sec. 906. Revise title as follows:

Shaft and exit enclosures

Sec. 906. Add a new paragraph as follows:

In buildings with Group H, Division 6 Occupancies, a fabrication area may have mechanical, duct and piping penetrations which extend through not more than two floors within that fabrication area. The annular space around penetrations for cables, cable trays, tubing, piping, conduit or ducts shall be sealed at the floor level to restrict the movement of air. The fabrication area, including the areas through which the ductwork and piping extend, shall be considered a single conditioned environment.

Sec. 908. Revise paragraph 5 as follows:

Combustible fiber storage rooms with a fiber storage capacity not exceeding 500 cubic feet, shall be separated from the remainder of the building by a one-hour fire-resistive occupancy separation. Combustible fiber storage vaults having a fiber storage capacity of more than 500 cubic feet, shall be separated from the remainder of

the building by a two-hour fire-resistive occupancy separation.

Sec. 909. Revise as follows:

Sec. 909. An approved fire alarm system shall be installed in Group H Occupancies as specified in the Fire Code.

Sec. 910. Revise first paragraph as follows:

Explosion control

Sec. 910. Explosion control; equivalent protective devices, suppression systems or barricades shall be provided to control or vent the gases resulting from deflagrations of dusts, gases or mists in rooms, buildings or other enclosures as required by the Fire Code so as to minimize structural or mechanical damage. If detonation rather than deflagration is considered likely, protective devices or systems such as fully contained barricades shall be provided, except that explosion venting to minimize damage from less than 2.0 grams of TNT (equivalence) is permitted. Walls, floors and roofs separating a use from an explosion exposure shall be designed to resist a minimum internal pressure of 100 pounds per square foot in addition to the loads required by Chapter 23.

Sec. 911(f) 1. Revise as follows:

(f) Piping and tubing. 1. General. HPM piping and tubing shall comply with this subsection and shall be installed in accordance with nationally recognized standards. Piping and tubing systems shall be metallic unless the material being transported is incompatible with such system. Systems supplying gaseous HPM having a health hazard ranking of 3 or 4 shall be welded throughout, except for connections, valves and fittings, to the systems which are within a ventilated enclosure. HPM supply piping or tubing in service corridors shall be exposed to view.

Table No. 9-A. Revise as follows:

Delete all—(dash marks) in the columns and replace with N.A.

Add a reference at the end of the table before "N.L." as follows:

N.A. = Not Applicable.

Table No. 9-A. Revise Footnote No. 5 as follows:

5 Quantities may be increased 100 percent when stored in approved storage cabinets, gas cabinets, fume hoods, exhausted enclosures or safety cans as specified in the Fire Code. When Footnote No. 4 also applies, the increase for both footnotes may be applied.

Table No. 9-A. Add new Footnotes Nos. 11 and 12 as follows:

Solid	Liquid
Lbs. <sup>11</sup>	and Gallons <sup>11</sup>

<sup>11</sup> The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials within a single control area of a Group B, Division 2 Occupancies used for retail sales may exceed the exempt amounts when such areas are in compliance with the Fire Code.

Oxidizer, Class 3<sup>12</sup>

<sup>12</sup> A maximum quantity of 200 pounds of solid or 20 gallons of liquid Class 3 oxidizers may be permitted in Groups I, M and R Occupancies when such materials are necessary for maintenance purposes or operation of equipment. See the Fire Code.

Table No. 9-B. Revise as follows:

Delete all—(dash marks) in the right hand column and replace with 0 (zeros).

Table No. 9-B. Revise Footnote No. 6 as follows:

<sup>6</sup> Quantities may be increased 100 percent when stored in approved storage cabinets, gas cabinets, fume hoods, exhausted enclosures or safety cans as specified in the Fire Code. When Footnote No. 5 also applies, the increase for both footnotes may be applied.

Under USE<sup>3</sup>—CLOSED SYSTEMS—Gas, add Footnote No. 6 to all items, except for Highly Toxic.

Table No. 9-B. Add a new Footnote No. 9 as follows:

Solid Liquid  
(Lbs.)<sup>4,5,9</sup> and Gallons<sup>4,5,9</sup>

<sup>9</sup> The aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid health hazard materials within a single control area of a Group B, Division 2 Occupancies used for retail sales may exceed the exempt amounts when such areas are in compliance with the Fire Code.

Table No. 9-C. Revise as follows:

OCCUPANCY GROUP	MINIMUM DISTANCE FROM PROPERTY LINE <sup>1</sup>	FIRE RESISTANCE OF EXTERIOR WALLS	OPENINGS IN EXTERIOR WALLS <sup>2</sup>
H-2-3 Not in a detached building	When area does not exceed 1,000 sq. ft.	4 hours less than 5 feet, 2 hours less than 10 feet, 1 hour less than 20 feet	Not permitted less than 5 feet, protected less than 20 feet
H-2-3 Not in a detached building	30 feet when the area exceeds 1,000 sq. ft. <sup>3</sup>	No requirement based on location <sup>4</sup>	No requirement based on location <sup>5</sup>

Sec. 913. Add the following section.

Sec. 913. The amendments, revisions and changes to Chapter 9 of the Uniform Building Code which are contained in the 1989 Supplement to the Uniform Building Code are hereby adopted.

1200. The following amendments are adopted to UBC chapter 12.

Sec. 1201. Amend Division 3 as follows:

Division 3 Dwellings, family child day care homes and lodging houses.

Sec. 1204. Revise as follows:

Sec. 1204. Stairs, exits and smokeproof enclosures shall be as specified in Chapter 33.

Exception: Only one exit door from a family child day care home need comply with the requirements of Section 3304(b).

For family child day care homes with more than six children, each floor level used for family child day care purposes shall be served by two remote exits. Outside exit doors shall be operable from the inside without the use of keys or any special knowledge or effort.

Basements located more than four feet below grade level shall not be used for family child day care homes unless one of the following conditions exist:

(a) Exit stairways from the basement open directly to the exterior of the building without entering the first floor; or

(b) One of the two required exits discharges directly to the exterior from the basement level, and a self closing door is installed at the top or bottom of the interior stair leading to the floor above; or

(c) One of the two required exits is an operable window or door, approved for emergency escape or rescue, that opens directly to a public street, public alley, yard or exit court is provided; or

(d) A residential sprinkler system is provided throughout the entire building in accordance with National Fire Protection Association Standard 13d.

Floors located more than four feet above grade level shall not be occupied by children in family child day care homes.

Exceptions: 1. Use of toilet facilities while under supervision of an adult staff person.

2. Family child day care homes may be allowed on the second story if one of the following conditions exist:

(a) Exit stairways from the second story open directly to the exterior of the building without entering the first floor; or

(b) One of the two required exits discharges directly to the exterior from the second story level, and a self closing door is installed at the top or bottom of the interior stair leading to the floor below; or

(c) A residential sprinkler system is provided throughout the entire building in accordance with National Fire Protection Association Standard 13d.

Every sleeping or napping room in a family child day care home shall have at least one operable window for emergency rescue.

Exception: Sleeping or napping rooms having doors leading to two separate exits ways, or a door leading directly to the exterior of the building.

Basements in dwelling units and every sleeping room below the fourth story shall have at least one operable window or door approved for emergency escape or rescue which shall open directly into a public street, public alley, yard or exit court. The units shall be operable from the inside to provide a full clear opening without the use of separate tools.

All escape or rescue windows shall have a minimum net clear openable area of 5.7 square feet. The minimum net clear openable height dimension shall be 24 inches. The minimum net clear openable width dimension shall be 20 inches. When windows are provided as a means of escape or rescue they shall have a finished sill height not more than 44 inches above the floor.

Bars, grilles, grates or similar devices may be installed on an emergency escape or rescue windows or doors, provided:

1. Such devices are equipped with approved release mechanisms which are operable from the inside without the use of a key or special knowledge or effort; and

2. The building is equipped with smoke detectors installed in accordance with Section 1210.

Sec. 1210. Revise as follows:

Sec. 1210. (a) Smoke detectors. 1. General. Dwelling units and hotel or lodging house guest rooms that are used for sleeping purposes shall be provided with operable smoke detectors. Detectors shall be installed in accordance with the approved manufacturer's instructions.

2. Additions, alterations or repairs to Group R Occupancies. When the valuation of an addition, alteration or repair to a Group R Occupancy exceeds \$1,000.00 and a permit is required, or when one or more sleeping rooms are added or created in existing Group R Occupancies, smoke detectors shall be installed in accordance with Subsections 3, 4 and 5 of this section.

3. Power source. In new construction, required smoke detectors shall receive their primary power from the building wiring when such wiring is served from a commercial source. Wiring shall be permanent and without a disconnecting switch other than those required for over-current protection. Smoke detectors may be battery operated when installed in existing buildings or in buildings without commercial power, or in buildings which undergo alterations, repairs or additions regulated by Subsection 2 of this section.

4. Location within dwelling units. In dwelling units detectors shall be mounted on the ceiling or wall at a point centrally located in the corridor or area giving access to each separate sleeping area. When the dwelling unit has more than one story and in dwellings with basements, a detector shall be installed on each story and in the basement. In dwelling units where a story or basement is split into two or more levels, the smoke detector shall be installed in the upper level, except that when the lower level contains a sleeping area, a detector shall be located on each level. When sleeping rooms are on an upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. In dwelling units where the ceiling height of a room open to the hallway serving the bedrooms exceeds that of the hallway by 24 inches or more, smoke detectors shall be installed in the hallway and the adjacent room. Detectors shall sound an alarm audible in all sleeping areas of the dwelling unit, in which they are located.

5. Location in efficiency dwelling units and hotels. In efficiency dwelling units, hotel suites and in hotel sleeping rooms, detectors shall be located on the ceiling or wall of the main room or hotel sleeping room. When sleeping rooms within an efficiency dwelling unit or hotel suite are on an upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. When actuated, the detector shall sound an alarm audible within the sleeping area of the dwelling unit, hotel suite or sleeping room in which it is located.

6. Location within family child day care homes. In family child day care homes operable detectors shall be located in all sleeping and napping areas. When the family child day care home has more than one story, and in family child day care homes with basements, an operable detector shall be installed on each story and in the basement. In family child day care homes where a story or basement is split into two or more levels, the smoke detector shall be installed in the upper level, except that when the lower level contains a sleeping or napping area, an operable detector shall be located on each level. When sleeping rooms are on an upper level, the detector shall be placed at the ceiling of the upper level in close proximity to the stairway. In family child day care homes where the ceiling height of a room open to the hallway serving the bedrooms exceeds that of the hallway by 24 inches or more, smoke detectors shall be installed in the hallway and the adjacent room. Detectors shall sound an alarm audible in all areas of the building.

Balance of section to remain unchanged.

Sec. 1213. Add the following paragraph and exception:

Rooms or spaces containing a commercial-type cooking kitchen, boiler, maintenance shop, janitor closet, laundry, woodworking shop, flammable or combustible storage, or painting operation shall be separated from the family child day care area by at least one hour fire-resistive construction.

EXCEPTION: A fire-resistive separation shall not be required where the food preparation kitchen contains only a domestic cooking range, and the preparation of food does not result in the production of smoke or grease laden vapors.

2300. The following amendments are adopted to UBC chapter 23.

Section 2312(h) 2. I. Diaphragms. Revise subsection (iv) as follows:

(iv) Where wood diaphragms are used to laterally support concrete or masonry walls, the anchorage shall conform to Section 2312(h) 2. H above. In Seismic Zones Nos. , 3 and 4 anchorage shall not be accomplished by use of toe nails or nails subject to withdrawal, nor shall wood ledgers or framing be used in cross-grain bending or cross-grain tension, and the continuous ties required by paragraph (iii) above shall be in addition to the diaphragm sheathing.

2700. The following amendments are adopted to UBC chapter 27.

Sec. 2722(f) 6. Revise item 1 of the exception as follows:

EXCEPTION: This requirement need not apply in any of the following cases, provided the compactness limitations for beams given in Section 2722 (f) 4 shall apply to columns as well:

1. For columns with  $f_a$  less than  $0.4F_y$  for all load combinations, except for loads specified in Section 2722(d) 1. Such columns shall have allowable stresses reduced 25 percent when one end frames into a joint not complying with Formula 22-3, and 50 percent when both ends frame into joints not complying with Formula 22-3.

Sec. 2722(f) 7. Revise as follows:

7. Trusses in SMRSF. Trusses may be used as horizontal members in SMRSF if the sum of the truss seismic force flexural strength exceeds the sum of the column seismic force flexural strength immediately above and below the truss by a factor of at least 1.25. For this determination the strengths of the members shall be reduced by the gravity load effects. In buildings of more than one story, the column axial stress shall not exceed  $0.4F_y$  and the ratio of the unbraced column height to the least radius of gyration shall not exceed 60. Columns shall have allowable stresses reduced 25 percent when one end frames into a truss, and 50 percent when both ends frame into trusses. The connection of the truss chords to the column shall develop the lesser of the following:

- A. The strength of the truss chord.
- B. The chord force necessary to develop 125 percent of the flexural strength of the column.

3800. The following amendments are adopted to UBC chapter 38.

Sec. 3801. Add the following subsection (e):

(e) When sprinklers are installed in an insulated ceiling cavity not meeting exceptions of UBC Standard 38-1 or where blocked by ducts or other similar obstructions, a space 6 inches or greater in depth with not less than 12 inches clearance from ducts or other similar obstructions shall be provided under all sprinklers.

Section 3802(h). Revise as follows:

(h) Group R Division 1 Occupancies. An automatic sprinkler system shall be installed throughout every apartment house three or more stories in height or containing more than 15 dwelling units and every hotel three or more stories in height or containing 20 or more guest rooms. Residential or quick response standard sprinkler heads shall be used in the dwelling unit and guest room portions of the building. The sprinkler system shall comply with the requirements of Washington State Building Code Standard No. 38-3W.

5100. The following amendments are adopted to UBC chapter 51.

Sec. 5103. Delete entire section.

Sec. 5105. Revise as follows:

Elevator Machine Room Floors

Section 5105. Elevator hoistways shall not be vented through an elevator machine room unless such venting is accomplished by an approved duct system installed through the elevator machine room. Cable slots entering the machine room shall be sleeved beneath the machine room floor and extend to not less than 12 inches below the shaft vent to must be installed in a manner that inhibits the passage of smoke into the machine room.

3800. The following amendments are adopted to chapter 38 of the UBC Standards:

Sec. 38-3W. Add the following new standard No. 38-3W.

WASHINGTON STATE BUILDING CODE STANDARD  
NO. 38-3W

INSTALLATION OF SPRINKLER SYSTEMS IN  
RESIDENTIAL OCCUPANCIES

Sec. 38.301W. Except for the limitations, deletions, modifications or amendments set forth in Section 38.302W of this standard, the installation of sprinkler systems in residential occupancies of four stories or less when required by the Uniform Building Code shall be in accordance with the "Standard for the Installation of Sprinkler Systems in Residential Occupancies, NFPA 13R-1988", published by the National Fire Protection Association, copyright 1988, Batterymarch Park, Quincy, Massachusetts 02269, as if set out at length herein.

Sec. 38.302W. The National Fire Protection Association standard adopted by section 38.301W applies to the selection, installation, inspection, maintenance and testing of residential sprinkler systems, except as follows:

1. Table 1-5.1 is amended to read as follows:

Table 1-5.1

Materials and Dimensions	Standard
Spec. for Black and Hot-Dipped Zinc Coated (Galvanized) Welded and Seamless Steel Pipe for Fire Protection Use	ASTM A795
Specification for Welded and Seamless Steel Pipe	ASTM A53
Wrought-Steel Pipe	ANSI B36.10
Specification for Electric-Resistance Welded Steel Pipe	ASTM A135
Copper Tube (Drawn, Seamless) Specification for Seamless Copper Tube	ASTM B88
Specification for General Requirements for Wrought Seamless Copper and Copper-Alloy Tube	ASTM B251
Brazing Filler Metal (Classification BCuP-3 or BCuP-4)	AWS A5.8
Specification for Solder Metal, 9-5 (Tin-Antimony-Grade 95TA)	ASTM B32

Table 1-5.1

Materials and Dimensions	Standard
Specifications for CPVC Pipe	ASTM F437 ASTM F438 ASTM F439 ASTM F442
Specification for Polybutylene Tube	ASTM D 3309

2. Table 1-5.5 is amended to read as follows:

Table 1-5.5

Materials and Dimensions	Standard
Cast Iron	
Cast Iron Threaded Fittings Class 125 and 250	ANSI B16.4
Cast Iron Pipe Flanges and Flanged Fittings	ANSI B16.1
Malleable Iron	
Malleable Iron Threaded Fittings Class 150 and 300	ANSI B16.3
Steel	
Factory-made Threaded Fittings Class 150 and 300	ANSI B16.9
Buttwelding ends for Pipe, Valves Flanges and Fittings	ANSI B16.25
Spec. for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and Elevated Temperatures	ASTM A234
Pipe Flanges and Flanged Fittings, Steel Nickel Alloy and Other Special Alloys	ANSI B16.5
Forged Steel Fittings, Socket Welded and Threaded	ANSI B16.11
Copper	
Wrought Copper and Copper Alloy- Solder-Joint Pressure Fittings	ANSI B16.22
Cast Copper Alloy Solder-joint Pressure fittings	ANSI B16.18
Plastic Fittings for CPVC Pipe	ASTM F437 ASTM F438 ASTM F439 ASTM F442
Plastic Fittings for Polybutylene tube	ASTM D 3309

[Statutory Authority: RCW 19.27.020 and 19.27.074. 91-01-117, § 51-16-030, filed 12/19/90, effective 7/1/91. Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-16-030, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27.074. 88-24-018 and 89-11-081 (Orders 88-11 and 88-11A), § 51-16-030, filed 12/1/88 and 5/23/89, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-030, filed 11/26/85, effective 6/11/86.]

**WAC 51-16-040 Uniform Mechanical Code.** The 1988 edition of the *Uniform Mechanical Code*, including chapter 22, Fuel Gas Piping, Appendix B, published by the International Conference of Building Officials and

the International Association of Plumbing and Mechanical Officials is hereby adopted by reference with the following exception:

In the case of conflict between the duct insulation requirements of section 1005 of this code and the duct insulation requirements of chapter 51-12 WAC the Washington State Energy Code, or where applicable, a local jurisdiction's energy code, the provisions of such energy codes shall govern.

[Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-040, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-040, filed 11/26/85, effective 6/11/86.]

**WAC 51-16-050 Uniform Fire Code and Uniform Fire Code Standards.** The 1988 edition of the *Uniform Fire Code* and the 1988 edition of the *Uniform Fire Code Standards* published by the International Conference of Building Officials, and the Western Fire Chiefs Association is hereby adopted by reference with the following additions, deletions and exceptions:

(1) Section 10.306(h) of the Uniform Fire Code is hereby amended to read as follows:

(h) Group R Division 1 Occupancies. An automatic sprinkler system shall be installed throughout every apartment house three or more stories in height or containing more than 15 dwelling units and every hotel three or more stories in height or containing 20 or more guest rooms. Residential or quick response standard sprinkler heads shall be used in the dwelling unit and guest room portions of the building. The sprinkler system shall comply with the requirements of Washington State Building Code Standard No. 38-3W.

(2) Article 80 of the 1988 edition of the Uniform Fire Code is hereby amended as follows:

(a) Revise Sec. 80.101 as follows:

The purpose of this article is to provide requirements for the prevention, control and mitigation of physical hazards and health hazards related to hazardous materials and to provide information needed by emergency response personnel. Hazardous materials are those chemicals or substances defined as such in Article 9. See Appendix VI-A for the classification of hazard categories and hazard evaluations.

The general provisions and requirements in Division I shall apply to all hazardous materials, including those materials regulated elsewhere in this code, except that when specific requirements are provided in other articles, those specific requirements shall apply. When a material has multiple hazards, all hazards shall be addressed.

The provisions of this article are waived when such provisions are preempted by other codes, statutes or ordinances. Notwithstanding any other provision of this article the chief or other enforcing official charged with enforcement of this code, shall waive the requirements of this article when: 1) there exist other federal, state or local laws or regulations which regulate the same hazard

or conditions as this article, and 2) such other laws or regulations address those physical hazards or health hazards for which the fire service is charged with prevention or response. The details of any action granting any such waiver shall be recorded and entered in the files of the code enforcement agency.

The classification system referenced in Division II shall apply to all hazardous materials, including those materials regulated elsewhere in this code.

**EXCEPTIONS:**

1. The off-site transportation of hazardous materials when in conformance with the Department of Transportation (DOT) regulations.

2. The quantities of alcoholic beverages, medicines, foodstuffs and cosmetics, containing not more than 50 percent by volume of water-miscible liquids and with the remainder of the solutions not being flammable, in retail sales occupancies are unlimited when packaged in individual containers not exceeding 4 liters.

For retail display of nonflammable solid and nonflammable or noncombustible liquid hazardous materials in Group B, Division 2 retail sales occupancies, see Section 80.108.

Notwithstanding any other language to the contrary, Article 80 is adopted in the State of Washington for the purpose to provide requirements for the prevention, control and mitigation of physical hazards and health hazards only.

(b) Revise Sec. 80.102(b) paragraph six as follows:

CONTROL AREA is space within a building where the exempt amounts specified in Division III may be stored or the exempt amounts specified in Division IV may be dispensed, used or handled. Storage or use of quantities in excess of those listed in the tables are required by UBC 901 to be rated as the appropriate Group H occupancy.

(c) Revise the paragraph in Sec. 80.102(b) defining health hazard as follows:

Health Hazard is a classification of a chemical for which there is statistically significant evidence based on at least one reproducible study conducted in accordance with established scientific principles that acute health effects may occur in exposed persons. The term "health hazard" includes chemicals which are toxic or highly toxic agents, irritants, corrosives, hepatotoxins, nephrotoxins, neurotoxins, agents which can have an acute effect on the hematopoietic system, and agents that have acute effects on the lungs, skin, eyes or mucous membranes.

(d) Revise Sec. 80.103(a) paragraphs one, two and three as follows:

Sec. 80.103. (a) General. In those jurisdictions which require permits under this article:

1. No person, firm or corporation shall store, dispense, use or handle hazardous material in excess of quantities specified in Section 4.108 unless and until a valid permit has been issued pursuant to this article.

2. A permit shall be obtained when a material is classified as having more than one hazard category if the quantity limits are exceeded in any category.

3. No person, firm or corporation shall install, abandon, remove, close or substantially modify a storage facility or other area regulated by this article until a permit has been issued. (See also Sections 80.107 and 80.108.)

EXCEPTIONS: 1. Routine maintenance.

2. For work performed on an emergency basis, application for permit shall be made within two working days of commencement of work.

(e) Revise Sec. 80.103(c) as follows:

(c) Hazardous Materials Management Plan. When required by the chief, each application for a permit pursuant to this article shall include a Hazardous Materials Management Plan (HMMP) in accordance with Appendix II-E.

EXCEPTION: Compliance with requirements of 40 CFR "Hazardous Chemical Reporting and Community Right-To-Know Regulations" under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) will satisfy the requirement of this subsection.

(f) Revise Sec. 80.103(d) as follows:

(d) Hazardous Materials Inventory Statement. When required by the chief, each application for a permit pursuant to this article shall include a Hazardous Materials Inventory Statement (HMIS) in accordance with Appendix II-E.

EXCEPTION: Compliance with requirements of 40 CFR "Hazardous Chemical Reporting and Community Right-To-Know Regulations" under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) will satisfy the requirement of this subsection.

(g) Revise 80.104(b) Exception 1. as follows:

1. Materials intended for use in weed abatement, erosion control, soil amendment or similar applications, when applied in accordance with the manufacturer's instructions or nationally recognized practices, including: a) pesticides used according to registered label directions, and b) fertilizers and soil amendments used according to manufacturers directions.

(h) Revise 80.104(e) as follows:

(e) Identification. Visible hazard identification signs as specified in U.F.C. Standard No. 79-3 shall be placed at entrances to locations where hazardous materials are stored, dispensed, used or handled in quantities requiring a permit.

EXCEPTION: The chief may waive this requirement in special cases when consistent with safety, if the owner or operator has submitted a hazardous materials management plan and a hazardous materials inventory statement. See Appendix II-E.

Individual containers, cartons or packages shall be conspicuously marked or labeled in accordance with nationally recognized standards or other approved equivalent systems. See also Section 80.301(d).

(i) Revise 80.105 paragraph one as follows:

Sec. 80.105. Buildings or portions thereof in which hazardous materials are stored, handled or used shall be constructed in accordance with the Building Code, as specified in U.B.C. Chapter 9.

(j) Add an exception to Sec. 80.106 as follows:

EXCEPTION: Compliance with requirements of 40 CFR "Hazardous Chemical Reporting and Community Right-To-Know Regulations" under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) will satisfy the requirements of this section.

(k) Revise 80.107 as follows:

Facility Closure or Placement out of Service Notification.

Sec. 80.107. The permit holder or applicant shall notify the fire department of its intent to terminate storage, dispensing, handling or use of hazardous materials at least 30 days prior to facility closure or placing facility out of service.

(l) Delete Sec. 80.108 entirely.

(m) Add a new section 80.108 as follows:

Retail Display

Sec. 80.108. When in accordance with this section, the aggregate quantity of nonflammable solid and nonflammable or noncombustible liquid hazardous materials permitted within a single control area of a Group B, Division 2 retail sales occupancy may exceed the exempt amounts specified in Division III, Tables Nos. 80.306-A, 80.309-A, 80.310-A, 80.312-A, 80.314-A and 80.315-A. The maximum allowable quantity in pounds or gallons permitted within a single control area of a retail sales occupancy shall be the amount derived from the formula:

$$E_R = E \times p \times A$$

WHERE:

E<sub>R</sub> = exempt amount permitted in a single control area of a retail sales occupancy.

E = exempt amount specified in Division III exempt amount tables.

p = density factor from Table No. 80.109.

A = square footage area of the hazardous material retail display or storage.

The maximum aggregate floor area for hazardous material retail display or storage over which the density factor may be applied shall not exceed 1500 square feet per control area.

The area of storage or display shall also comply with the following requirements:

1. Display of solids shall not exceed 200 pounds per square foot of floor area actually occupied by the solid merchandise.

2. Display of liquids shall not exceed 20 gallons per square foot of floor area actually occupied by the liquid merchandise.

3. Display height shall not exceed 6 feet.

4. Individual containers less than 5 gallons or less than 25 pounds shall be stored on pallets, racks or shelves.

5. Storage racks and shelves shall be in accordance with the provisions of Section 80.301(i).

6. Containers shall be approved for the use intended.

7. Individual containers shall not exceed 100 pounds or 5-gallon capacity.

8. Incompatible materials shall be separated in accordance with the provisions of Section 80.301(n).

9. Floors shall be in accordance with the provisions of Section 80.301(z).

10. Aisles 4 feet in width shall be maintained on three sides of the display area.

11. Hazard identification signs shall be provided in accordance with the provisions of Section 80.104(e).

Table No. 80.108. Add a table as follows:

TABLE NO. 80.108  
DENSITY FACTORS FOR EXEMPT AMOUNTS IN RETAIL SALES

HAZARD CATEGORIES <sup>1</sup>	CLASS	DENSITY FACTOR p
Physical Hazards: Oxidizers; unstable (reactive) materials; water-reactive materials	Class 4	N.P.
	Class 3	0.075
	Class 2	0.006
	Class 1	0.003
Health Hazards: Highly toxic solids and liquids; corrosives; other health hazard solids, liquids and gases	All	0.0013

NP = Not permitted

<sup>1</sup>Hazard categories are as specified in Division II. Density factors shall not apply to categories other than those listed.

(n) Add a new section as follows:

Sec. 80.109. Notwithstanding Section 1.103(b) conditions in existence at the time of the adoption of this article may continue if such condition was legal at the time of the adoption of this code, provided such condition is not dangerous to life or does not present a distinct and substantial hazard to property.

(o) Add a new section as follows:

Sec. 80.110. The intent of this article is to promote compliance with nationally recognized standards, including those identified in Appendix V-A and any guidance or directives from nationally recognized standards development organizations. Compliance with such standards shall be considered by the chief in judging compliance with the intent of this article.

(p) Delete Sec 80.202(b) 4. entirely.

(q) Add a new exception to Sec. 80.301(a) as follows:

3. Underground Storage Tanks regulated by 40 CFR 280 or state law.

(r) Amend Sec. 80.301(a) by adding a new second paragraph as follows:

The provisions for toxic compressed gases shall apply only after consideration of the hazard potential, alternatives for controlling the hazard, and the cost and benefits of the alternatives.

(s) Revise Sec 80.301(b) 1. as follows:

(b) Containers and Tanks. 1. Design and construction. Containers and tanks shall be designed and constructed in accordance with nationally recognized standards. See Section 2.304(b).

(t) Revise Sec. 80.301(b) 2. to read as follows:

2. Tanks out-of-service 90 days. Any stationary tank not used for a period of 90 days shall be properly maintained or removed in a manner approved by the chief. Such tanks shall have the fill line, gauge opening and pump connection secured against tampering. Vent lines shall be properly maintained.

Tanks which are to be placed back in service shall be tested in a manner approved by the chief.

(u) Revise Sec. 80.301(b) 3. to read as follows:

3. Defective containers and tanks. Defective containers and tanks shall be removed from service, repaired, or disposed of in accordance with nationally recognized standards of good practice such as the American Petroleum Institute (API) or American Society of Mechanical Engineers (ASME). See Section 2.304(b).

(v) Revise Sec. 80.301(b) 5. to read as follows:

5. Underground tanks. Underground tanks not otherwise excepted by this section used for the storage of hazardous materials shall be located and protected in accordance with Sections 79.601 and 79.603 of this code. Secondary containment shall be provided for all new installations of underground tanks.

(w) Revise the second paragraph of Sec 80.301(d) to read as follows:

Signs prohibiting smoking shall be provided in accordance with the provisions of Article 13.

(x) Revise Sec. 80.301(e) to read as follows:

(e) Security. The storage of hazardous materials shall be protected against tampering or trespassers by fencing or other control measures.

(y) Revise Sec. 80.301(f) to read as follows:

(f) Ignition Sources.

Smoking, use of open flames or high-temperature devices in a manner which creates a hazardous condition shall not be permitted.

EXCEPTION: Energy-consuming equipment listed for use with the hazardous material stored.

(z) Amend Sec. 80.301(k) by adding a third sentence as follows:

Compliance with requirements of 40 CFR "Hazardous Chemical Reporting and Community Right-To-Know Regulations" under Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA) will satisfy the requirements of this subsection.

(aa) Amend Sec. 80.301(m) by adding a second sentence as follows:

Threshold Limit Values (TLV) as established by the American Conference of Governmental & Industrial Hygienists (ACGIH), OSHA or Washington Industrial Safety and Health Act - chapter 296-62 WAC will be utilized for establishing minimum standards where ventilation is required.

(bb) Amend Sec. 80.301(o) 2. by deleting the first complete sentence.

(cc) Revise the second sentence of Sec. 80.301(q) to read as follows:

The design shall be engineered and recognize the nature of the stored material and its likely behavior in an explosion.

(dd) Revise Sec. 80.301(r) to read as follows:

(r) Electrical Wiring and Equipment. Electrical wiring and equipment shall be installed in accordance with the Washington State Electrical Code chapter 296-46 WAC.

(ee) Revise Sec. 80.301(s) to read as follows:

(s) Standby Power. When mechanical ventilation, treatment systems, temperature control, alarm, detection or other electrically operated systems are required, such systems shall be connected to a secondary source of power to automatically supply electrical power in the event of loss of power from the primary source. See the Washington State Electrical Code chapter 296-46 WAC.

(ff) Revise Sec. 80.301(u) to read as follows:

(u) Manual Alarm. A local fire alarm manual pull station or approved emergency signal device shall be installed outside of each interior exit door of approved storage buildings, rooms or areas. Activation of the manual alarm shall sound a local alarm.

(gg) Revise Sec. 80.301(y) 1. to read as follows:

1. Fire access roadways. See The Building Code Act, RCW 19.27.060(5).

(hh) Amend Sec. 80.303(a) 3. by adding an exception as follows:

Exception: Where water is incompatible with the hazardous material stored, the Chief may approve alternate fire suppression methods to an automatic sprinkler system.

(ii) Revise Sec. 80.303(a) 4. to read as follows:

4. Explosion venting or suppression. When flammable gases which are toxic or highly toxic are stored in rooms outside of gas cabinets or exhausted enclosures, the storage rooms shall be provided with explosion venting or suppression in accordance with the provisions of Section 80.301(q).

(jj) Amend Sec. 80.303(b) 3. adding two exceptions as follows:



Exceptions: 1. Anhydrous ammonia (fertilizer grade) portable tanks and cylinders.

2. Where water is incompatible with the hazardous material stored, the Chief may approve alternate fire suppression methods to an automatic sprinkler system.

(kk) Revise the exception in Sec. 80.303(c) 3. B. as follows:

EXCEPTIONS:

1. A cabinet or exhausted enclosure need not be provided for leaking cylinders if all cylinders are stored within gas cabinets or exhausted enclosures.

2. A cabinet or exhausted enclosure need not be provided for leaking cylinders if a U.S. DOT approved cylinder containment vessel is provided.

(ll) Amend the title before Sec. 80.305 to read as follows:

Flammable Solids and Combustible Dusts

(mm) Revise Sec. 80.305(a) 4. to read as follows:

4. Explosion venting or suppression. Rooms, buildings or equipment used for the storage of combustible dusts shall be provided with explosion venting, equivalent protective devices or suppression in accordance with the provisions of Section 80.301(q).

(nn) Amend Sec. 80.306(a) 1. by adding the following exception:

EXCEPTION: For retail display of nonflammable solid and nonflammable or noncombustible liquid Class 1, Class 2 and Class 3 oxidizers, see Section 80.108.

(oo) Revise the footnotes following Table No. 80.306-A as follows:

<sup>1</sup> For liquid oxidizers, a conversion of 10 pounds per gallon shall be used.

<sup>2</sup> No exempt amounts of Class 4 oxidizers are permitted in Group R Occupancies, offices or retail sales portions of Group B Occupancies.

<sup>3</sup> No exempt amounts of Class 4 oxidizers are permitted in Group A, E, I, or M Occupancies, or in classrooms of Group B Occupancies unless storage is within a hazardous material storage cabinet containing no other storage.

<sup>4</sup> A maximum quantity of 200 pounds of solid or 20 gallons of liquid Class 3 oxidizers may be permitted in Groups I, M and R Occupancies when such materials are necessary for maintenance purposes or operation of equipment. The oxidizers shall be stored in approved containers and in a manner approved by the chief.

(pp) Revise Sec 80.306(a) 8. as follows:

8. Explosion venting or suppression. Explosion venting or suppression shall not be required in storage areas for Class 1, 2, and 3 oxidizers.

(qq) Revise the footnotes following Table No. 80.307-A as follows:

<sup>1</sup> For organic peroxide liquids, a conversion of 10 pounds per gallon shall be used.

<sup>2</sup> No exempt amounts of unclassified detonatable or Class I organic peroxides are permitted in Group R Occupancies or offices or retail sales portions of Group B Occupancies.

<sup>3</sup> No exempt amounts of unclassified detonatable or Class I organic peroxides are permitted in Group A, E, I or M Occupancies or in classrooms of Group B Occupancies unless storage is within a hazardous material storage cabinet containing no other storage.

(rr) Revise the exception in Sec. 80.309(a) 1. as follows:

EXCEPTIONS:

1. Detonatable, unstable (reactive) materials shall be stored in accordance with Article 77.

2. For retail display of nonflammable solid and nonflammable or noncombustible liquid unstable (reactive) materials, see Section 80.108.

(ss) Amend Sec 80.310(a) by adding an exception as follows:

EXCEPTION: For retail display of nonflammable solid and nonflammable or noncombustible liquid water-reactive materials, see Section 80.108.

(tt) Amend the title of Table No. 80.310-A to read as follows:

WATER-REACTIVES EXEMPT AMOUNTS POUNDS<sup>1</sup>

(uu) Revise Sec 80.312(a) 1. and 2. and the section title to read as follows:

Highly Toxic or Toxic Solids and Liquids

Sec. 80.312. (a) Indoor Storage. 1. General. Indoor storage of highly toxic or toxic solids and liquids shall be in accordance with the provisions specified in Subsections 80.312(a) and (c) and Section 80.301.

EXCEPTION: For retail display of nonflammable solid and nonflammable or noncombustible liquid highly toxic materials, see Section 80.108.

2. Exempt amounts. When the amount of highly toxic or toxic solids or liquids stored in one control area exceeds that specified in Table No. 80.312-A, such storage shall be within a room or building conforming to the Building Code requirements for a Group H, Division 7 Occupancy.

(vv) Revise the title of Table No. 80.312-A as follows:

HIGHLY TOXIC OR TOXIC SOLIDS AND LIQUIDS EXEMPT AMOUNTS<sup>1</sup>

(ww) Revise the footnote of Table No. 80.312-A as follows:

<sup>1</sup>For highly toxic or toxic liquids, a conversion of 10 pounds per gallon shall be used.

(xx) Add a second footnote to Table No. 80.312-A as follows:

<sup>2</sup> Toxic liquids with vapor pressure greater than one psia shall be treated as highly toxic liquids.

(yy) Delete Sec. 80.312(c) entirely.

(zz) Delete Sec. 80.313(c) entirely.

(aaa) Amend Sec. 80.314(a) 1. adding an exception as follows:

EXCEPTION: For retail display of nonflammable solid and nonflammable or noncombustible liquid corrosive materials, see Section 80.108.

(bbb) Delete Sec. 80.315 Other Health Hazard Solids, Liquids and Gases entirely.

(ccc) Amend Sec 80.401(a) revising the exception as follows:

EXCEPTIONS: 1. Hazardous materials regulated by other articles in this code.

2. Underground Storage Tanks regulated by 40 CFR 280 or state law.

(ddd) Amend Sec. 80.401(a) by adding a new second paragraph as follows:

The provisions for toxic compressed gases shall apply only after consideration of the hazard potential, alternatives for controlling the hazard, and the cost and benefits of the alternatives.

(eee) Revise Sec. 80.401(b) 3. as follows:

3. Tanks out of service 90 days. Any stationary tank not used for a period of 90 days shall be properly maintained or removed in accordance with nationally recognized standards of good practice. Such tanks shall have the fill line, gauge opening and pump connection secured against tampering. Vent lines shall be properly maintained.

(fff) Revise Sec. 80.401(b) 4. as follows:

4. Defective containers, cylinders and tanks. Defective containers, cylinders and tanks shall be removed from service, repaired or disposed of in accordance with nationally recognized standards of good practice.

(ggg) Revise Sec. 80.401(b) 6. as follows:

6. Underground tanks. Underground tanks not otherwise excepted by this section containing hazardous materials shall be located and protected in accordance with Sections 79.601 and 79.603 of this code. Secondary containment shall be provided for all new underground tanks.

(hhh) Amend Sec. 80.401(c) 3. A. revising the exception as follows:

EXCEPTIONS: 1. Nonmetallic piping with approved connections.

2. Nationally recognized standards shall be deemed to be in compliance with this section.

(iii) Amend Sec. 80.401(c) 3. C. by adding an exception as follows:

EXCEPTION: Where excess flow control is not appropriate according to nationally recognized standards of good practice.

(jjj) Revise Sec. 80.401(j) as follows:

(j) Electrical Equipment and Wiring. Electrical equipment and wiring in dispensing and use areas shall be installed in accordance with the provisions of the Washington State Electrical Code chapter 296-46 WAC.

(kkk) Revise Sec. 80.401(l) as follows:

(l) Standby power. When mechanical ventilation, treatment systems, temperature control, manual alarm, detection or other electrically operated systems are required by other provisions of this division, such systems shall be connected to a standby source of power to automatically supply electrical power in the event of loss of power from the primary source. (See the Washington State Electrical Code chapter 296-46 WAC.)

(lll) Revise Sec. 80.401(n) 1. as follows:

1. Signs prohibiting smoking shall be provided in accordance with the provisions of Article 13.

(mmm) Revise Sec. 80.401(o) as follows:

(o) Security. Dispensing, use and handling areas shall be protected against tampering or trespassing by fencing or other control measures.

(nnn) Revise Sec. 80.402(b) 2. A. as follows:

A. Dispensing. When liquids having a hazard ranking of 3 or 4 in accordance with U.F.C. Standard No. 79-3 are dispensed from tanks or drums, dispensing shall be only by approved pumps taking suction from the top or by other methods in accordance with nationally recognized standards of good practice.

(ooo) Revise Sec. 80.402(b) 2. B. as follows:

B. Ventilation. When gases, liquids or solids having a hazard ranking of 3 or 4 in accordance with U.F.C. Standard No. 79-3 are dispensed or used, approved ventilation shall be provided to control fumes, mists or vapors at the point of generation.

EXCEPTION: Gases, liquids or solids which can be demonstrated not to create harmful fumes, mists or vapors based on applicable recognized standards.

(ppp) Revise Sec. 80.402(b) 2. D. as follows:

D. Explosion venting or suppression. Explosion venting or suppression shall be provided in accordance with the provisions of Section 80.301(q) when an explosion hazard can occur because of the characteristics or nature of the hazardous materials dispensed or used, or as a result of the dispensing or use process.

(qqq) Revise Sec. 80.402(b) 3. D. as follows:

D. Explosion venting or suppression. Explosion venting or suppression shall be provided in accordance with the provisions of Section 80.301(q) when an explosion hazard can occur because of the hazardous materials dispensed or used, or as a result of the dispensing or use process.

(rrr) Amend Sec. 80.402(b) 3. F. (v) by adding the following exception:

EXCEPTION: Automatic shutdown need not be provided for reactors utilized for the production of toxic or highly toxic gas when such reactors are:

1. Operated at pressure less than 15 psig.

2. Constantly attended.

3. Provided with readily accessible emergency shutoff valves.

(sss) Delete Sec. 80.402(b) 3. F. (viii) Process equipment entirely.

(ttt) Revise Sec. 80.402(c) 2. as follows:

2. Dispensing. When liquids having a hazard ranking of 3 or 4 in accordance with U.F.C. Standard No. 79-3 are dispensed from tanks or drums, dispensing shall be by approved pumps taking suction from the top or by other methods in accordance with nationally recognized standards of good practice.

(uuu) Revise Sec. 80.402(c) 6. A. as follows:

A. Fire access roadways. See the Building Code Act, RCW 19.27.060(5).

(vvv) Amend Sec. 80.402(c) 8. C. by adding an exception as follows:

EXCEPTION: Automatic shutdown need not be provided for reactors utilized for the production of toxic or highly toxic gas is when such reactors are:

1. Operated at pressure less than 15 psig.
2. Constantly attended.
3. Provided with readily accessible emergency shutoff valves.

(www) Revise Table No. 80.402-A by adding a new Item 1.3 as follows, renumbering current Section 1 materials and revising Item 5.1 as follows:

TABLE NO. 80.402-A—EXEMPT AMOUNTS OF HAZARDOUS MATERIALS PRESENTING A PHYSICAL HAZARD—MAXIMUM QUANTITIES PER CONTROL AREA  
Values within parentheses are in cubic feet (cu. ft.) or pounds (lbs.)

MATERIAL	CLASS	CLOSED SYSTEMS			OPEN SYSTEMS		
		Solid lbs. (cu. ft.)	Liquid gallons (lbs.)	Gas cu. ft.	Solid lbs. (cu. ft.)	Liquid gallons (lbs.)	Gas cu. ft.
1.3 Combustible Fiber	Loose Baled	(100) (1,000)	NA NA	NA NA	(20) (200)	NA NA	NA NA
5.1 Pyrophoric		1 <sup>a</sup>	(1) <sup>a</sup>	10 <sup>a,3</sup>	0	0	0

(xxx) Revise Table No. 80.402-A revising footnote 5 to read as follows:

<sup>5</sup>The amount may be doubled when dispensed or used inside approved exhausted gas cabinets, exhausted enclosures or fume hoods. When Footnote 1 also applies, the increase for both footnotes may be applied.

(yyy) Revise Table No. 80.402-A by adding a new footnote 7 after the word AREA in Table title. Insert new footnote 7 language as follows:

<sup>7</sup>The aggregate quantity in use and storage shall not exceed the quantity listed for storage. See Division III.

(zzz) Revise Table No. 80.402-A by replacing all references to footnote 2 with footnote 7.

(aaaa) Revise Table No. 80.402-A by adding a footnote 8 to 1.1, 1.2, 1.3 "Combustible Fiber", 1.4, 2.1, 3.1, 3.2, 3.3, and 4.3. Also insert footnote 8 language after existing footnotes as follows:

<sup>8</sup>For use of any amount, see Articles 28, 30, 45, 46, 48, 50, 74, 75, 76, 77, 78, and 79 as applicable for the hazard category of the material in use.

(bbbb) Revise Table No. 80.402-B by adding a footnote 6 after AREA in Table title. Also insert new footnote 6 language after existing footnotes as follows:

<sup>6</sup>The aggregate quantity in use and storage shall not exceed the quantity listed for storage. See Division III.

(cccc) Amend Uniform Fire Code Appendix V-A by adding the following:

The Chlorine Institute, Inc. 2001 L Street, NW, Washington, D.C. 20036

- The Chlorine Manual
- Instruction Booklet Chlorine Institute Emergency Kit "A" for 100-pound and 150-pound Chlorine cylinders
- Instruction Booklet Chlorine Institute Emergency Kit "B" for Chlorine Ton Containers
- Instruction Booklet Chlorine Institute Emergency Kit "C" for Chlorine Tank Cars/Tank Trucks
- Chlorine Institute Drawing 188, Chlorine Cylinder Recovery Vessel

[Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-16-050, filed 1/3/90, effective 7/1/90. Statutory Authority: RCW 19.27.074. 88-24-018 and 89-11-081 (Orders 88-11 and 88-11A), § 51-16-050, filed 12/1/88 and 5/23/89, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-050, filed 11/26/85, effective 6/11/86.]

**WAC 51-16-060 Uniform Plumbing Code and Uniform Plumbing Code standards.** The 1988 edition of the *Uniform Plumbing Code* and the 1988 *Uniform Plumbing Code Standards*, published by the International Association of Plumbing and Mechanical Officials is hereby adopted by reference: *Provided* That chapters 11 and 12 of this code are not adopted; *Provided further*, That those requirements of the Uniform Plumbing Code relating to venting of appliances as found in Chapter 13 are not adopted.

[Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-060, filed 12/1/88, effective 7/1/89; 86-24-041 (Order 86-19), § 51-16-060, filed 11/26/86, effective 4/27/87. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-060, filed 11/26/85, effective 6/11/86.]

**WAC 51-16-070 Exceptions.** The exceptions and amendments to the uniform codes contained in the provisions of chapter 19.27 RCW shall apply in case of conflict with any of the provisions of these rules.

In case of conflict between the codes adopted under these rules and the provisions of chapter 51-10 WAC, the Washington state regulations for barrier-free facilities, the provisions of chapter 51-10 WAC shall govern.

[Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-070, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-070, filed 11/26/85, effective 6/11/86.]

**WAC 51-16-080 Permit exemptions guideline.** Cities and counties are permitted the option of adopting a one thousand five hundred dollar building permit exemption for certain construction and alteration activities for Group R, Division 3 and Group M, Division 1 occupancies. To adopt the permit exemption guideline, the following section of the 1988 Uniform Building Code shall be amended as follows:

(1) Section 301 (b) of the Uniform Building Code shall be amended to read as follows:

(b) Exempted work. A building permit shall not be required for the following:

1. One-story detached accessory buildings used as tool and storage sheds, playhouses and similar uses, provided the projected roof area does not exceed one hundred twenty square feet.

2. Fences not over six feet high.

3. Oil derricks.

4. Movable cases, counters, and partitions not over five feet nine inches high.

5. Retaining walls which are not over four feet in height measured from the bottom of the footing to the top of the wall, unless supporting a surcharge or impounding Class I, II, or III-A liquids.

6. Water tanks supported directly upon grade if the capacity does not exceed five thousand gallons and the ratio of height to diameter or width does not exceed two to one.

7. Platforms, walks, and driveways not more than thirty inches above grade and not over any basement or story below.

8. Painting, papering, and similar finish work.

9. Temporary motion picture, television, and theater stage sets and scenery.

10. Window awnings supported by an exterior wall of Group R, Division 3, and Group M Occupancies when projecting not more than fifty-four inches.

11. Prefabricated swimming pools accessory to a Group R, Division 3 Occupancy in which the pool walls are entirely above the adjacent grade and if the capacity does not exceed five thousand gallons.

12. Minor construction and alteration activities to Group R, Division 3 and Group M, Division 1 occupancies, as determined by the building official, which the total valuation, as determined in Section 304 (b) or as documented by the applicant to the satisfaction of the building official, does not exceed one thousand five hundred dollars in any twelve-month period: *Provided*, That the construction and/or alteration activity does not affect any structural components, or reduce existing egress, light, air, and ventilation conditions. This exemption does not include electrical, plumbing, or mechanical activities. The permit exemption shall not otherwise exempt the construction or alteration from the substantive standards of the codes enumerated in RCW 19.27.031, as amended and maintained by the state building code council under RCW 19.27.070.

Unless otherwise exempted, separate plumbing, electrical, and mechanical permits will be required for the above exempted items.

Exemption from the permit requirements of this code shall not be deemed to grant authorization for any work to be done in any manner in violation of the provisions of this code or any other laws or ordinances of this jurisdiction.

The adoption of an ordinance or resolution by cities and counties for the purpose to provide for a permit exemption as outlined in this section, shall not be considered a local government residential amendment requiring approval by the state building code council.

[Statutory Authority: RCW 19.27.060 (7)(b). 90-13-033, § 51-16-080, filed 6/13/90, effective 7/23/90. Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-080, filed 12/1/88, effective 7/1/89. Statutory Authority: 1985 c 360. 85-24-029 (Order 85-13), § 51-16-080, filed 11/26/85, effective 6/11/86.]

**WAC 51-16-100 Review of city and county amendments previously approved by the council.** The council will review all amendments to the 1985 editions of the codes approved by the council pursuant to RCW 19.27.074 and 19.27.060. The council will declare null and void any amendments which have become obsolete, unnecessary, or in conflict due to changes in the language of the 1988 editions of the codes as adopted under these rules.

[Statutory Authority: RCW 19.27.074. 88-24-018 (Order 88-11), § 51-16-100, filed 12/1/88, effective 7/1/89.]

**Chapter 51-18 WAC**

**WASHINGTON STATE WATER CONSERVATION PERFORMANCE STANDARDS**

**WAC**

51-18-010	Declaration of purpose.
51-18-020	Application.
51-18-030	Water efficiency standards.
51-18-040	Exceptions.
51-18-050	Implementation.

**WAC 51-18-010 Declaration of purpose.** The purpose of this chapter shall be to implement water conservation performance standards in accordance with section 8, chapter 348, Laws of 1989.

[Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-18-010, filed 1/3/90, effective 7/1/90.]

**WAC 51-18-020 Application.** This chapter shall apply to all new construction and all remodeling involving replacement of plumbing fixtures in all residential, hotel, motel, school, industrial, commercial use, or other occupancies determined by the council to use significant quantities of water.

[Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-18-020, filed 1/3/90, effective 7/1/90.]

**WAC 51-18-030 Water efficiency standards.** (1) Standards for waterclosets. The guideline for maximum water use allowed in gallons per flush (gpf) for any of the following waterclosets is the following:

Tank-type toilets . . . . .	3.5 gpf
Flushometer-valve toilets . . . . .	3.5 gpf
Flushometer-tank toilets . . . . .	3.5 gpf
Electromechanical hydraulic toilets . . . . .	3.5 gpf

(2) Standard for urinals. The guideline for maximum water use allowed for any urinal is 3.0 gallons per flush.

(3) Standard for showerheads. The guideline for maximum water use allowed for any showerhead is 3.0 gallons per minute.

(4) Standards for faucets. The guideline for maximum water use allowed in gallons per minute (gpm) for any of the following faucets and replacement aerators is the following:

- Bathroom faucets . . . . . 3.0 gpm
- Lavatory faucets . . . . . 3.0 gpm
- Kitchen faucets . . . . . 3.0 gpm
- Replacement aerators . . . . . 3.0 gpm

(5) No urinal or watercloset that operates on a continuous flow or continuous flush basis shall be permitted.

[Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-18-030, filed 1/3/90, effective 7/1/90.]

**WAC 51-18-040 Exceptions.** Except where designed and installed for use by the physically handicapped, lavatory faucets located in restrooms intended for use by the general public must be equipped with a metering valve designed to close by spring or water pressure when left unattended (self-closing).

[Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-18-040, filed 1/3/90, effective 7/1/90.]

**WAC 51-18-050 Implementation.** The standards for water efficiency contained in WAC 51-18-030 shall be in effect as of July 1, 1990, as provided in section 8, chapter 348, Laws of 1989.

[Statutory Authority: Chapters 19.27, 19.27A and 70.92 RCW, and 1989 c 266. 90-02-110, § 51-18-050, filed 1/3/90, effective 7/1/90.]

**Chapter 51-19 WAC**

**WASHINGTON STATE HISTORIC BUILDING CODE**

WAC

**PART I  
TITLE AND SCOPE**

- 51-19-100 Title.
- 51-19-110 Purpose.
- 51-19-120 Scope.
- 51-19-130 Existing uses.
- 51-19-140 Additions, alterations, and repairs.
- 51-19-150 Change of occupancy.
- 51-19-160 Maintenance.
- 51-19-170 Alternative materials, designs, and methods.
- 51-19-180 Modifications.
- 51-19-190 Tests.

**PART II  
ADMINISTRATION**

- 51-19-200 Enforcement.
- 51-19-210 Permits.
- 51-19-220 Inspection.
- 51-19-230 Repairs.
- 51-19-240 Relocated buildings.
- 51-19-250 Right of entry.
- 51-19-260 Liability.
- 51-19-270 Unsafe buildings or structures.
- 51-19-280 Appeals.

**PART III  
DEFINITIONS**

- 51-19-300 Definitions.

(1990 Ed.)

**PART IV  
FIRE AND LIFE SAFETY STANDARDS**

- 51-19-400 General.
- 51-19-410 Exit systems.
- 51-19-420 Structural safety.
- 51-19-430 Weather protection.
- 51-19-440 Other safety features.
- 51-19-450 Light, ventilation, sanitation, smoke detectors, and heating.
- 51-19-460 Plumbing.

**PART V  
EARTHQUAKE HAZARD REDUCTION**

- 51-19-500 Survey or evaluation.
- 51-19-510 Alternatives.

**PART VI  
CHANGE OF OCCUPANCY STANDARDS**

- 51-19-600 General.
- 51-19-610 Heights and area.
- 51-19-620 Fire safety.
- 51-19-630 Property protection.
- 51-19-640 Structural safety.
- 51-19-650 Light and ventilation.
- 51-19-660 Flame spread reduction.
- 51-19-670 Roof coverings.

**PART VII  
ACCESSIBILITY TO PERSONS WITH DISABILITIES**

- 51-19-700 General.
- 51-19-710 Building access and use.

**PART VIII  
ENERGY CONSERVATION**

- 51-19-800 General.
- 51-19-810 Alternative energy conservation provisions.

**PART IX APPENDICES**

- 51-19-900 Appendix A.
- 51-19-901 Appendix B—Bibliography.

**PART I  
TITLE AND SCOPE**

**WAC 51-19-100 Title.** This code shall be known as the Washington State Historic Building Code, hereinafter referred to as the HBC.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-100, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-110 Purpose.** It is the purpose of the HBC to provide regulations, as prescribed in RCW 19.27.120(2), providing alternatives, when authorized by the appropriate building official, to conformance to all the requirements of the codes adopted under RCW 19.27.031, for repairs, alterations, and additions necessary for the preservation, restoration and related reconstruction, rehabilitation, strengthening, or relocation of buildings or structures designated as historic buildings, in accordance with RCW 19.27.120(1). Such regulations are intended to preserve original, or restored architectural elements and features, to encourage energy conservation, barrier-free access and a cost-effective approach to preservation, and to provide a historic building or structure that will be less hazardous, based on accepted life and fire safety practices, than the existing building. These regulations, when authorized by the appropriate building official, control and allow alternatives to any and all codes enumerated in RCW 19.27.031 when dealing with historic buildings or sites.

The purpose of this code is not to create or otherwise establish or designate any particular class or group of persons who will or should be especially protected or benefited by the terms of this code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-110, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-120 Scope.** The provisions of the HBC shall constitute the minimum standards for the preservation, restoration and related reconstruction, rehabilitation, strengthening, or relocation of buildings or structures, changes of occupancy and alteration or repair of historic buildings. Whenever reference is made to an appendix in this code, the provisions of the appendix shall not apply unless specifically adopted.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-120, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-130 Existing uses.** Historic buildings may have their existing use or occupancy continued if such use or occupancy was legal at the time of the adoption of the HBC, provided such continued use is not dangerous to life and that subsequently adopted regulations specifically applicable to historic buildings or structures are satisfied.

Nothing in the HBC shall be construed to allow the degradation of those systems, devices and equipment required by the prevailing codes under which the building was constructed.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-130, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-140 Additions, alterations, and repairs.** Buildings and structures to which additions, alterations, or repairs are made shall comply with all the requirements of the Building Code for new construction except as specifically provided in the HBC. Additions, alterations, or repairs may be made to any building or structure without requiring the historic building or structure to comply with all the requirements of the Building Code, provided:

(1) Additions shall conform to the requirements for a new building or structure.

(2) Additions, alterations, or repairs shall not cause a historic building or structure to become unsafe or overloaded.

(3) New additions shall not add to or cause a historic building to exceed the height, number of stories, or area specified for new buildings.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-140, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-150 Change of occupancy.** Any change in the use or occupancy of a historic building or structure shall comply with the provisions of the HBC. Any building which involves a change in use or occupancy shall not exceed the height, number of stories, and area permitted for new buildings, except as permitted in the HBC and local ordinances.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-150, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-160 Maintenance.** All buildings and structures and all parts thereof shall be maintained in a safe and sanitary condition. All systems, devices, or safeguards which were required by the prevailing codes under which the building was constructed shall be maintained in conformance with the requirements of the HBC. The owner or the owner's designated agent shall be responsible for the maintenance of buildings and structures. To determine compliance with this section, the building official may cause any structure to be inspected.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-160, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-170 Alternative materials, designs, and methods.** The provisions of this code are not intended to prevent the use of any material, design, or method of construction not specifically prescribed by the HBC, provided any alternate has been approved and its use authorized by the building official.

The building official may approve any such alternate, provided the building official finds that the proposed design is satisfactory and complies with the provisions of the HBC and that the material and method of work offered is, for the purpose intended, at least the equivalent of that prescribed in this code in suitability, strength, effectiveness, fire resistance, durability, safety, and sanitation.

The building official shall require that sufficient evidence or proof be submitted to substantiate any claims that may be made regarding use of an alternate. The details of any action granting approval of an alternate shall be recorded and entered in the files of the code enforcement agency.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-170, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-180 Modifications.** Whenever there are practical difficulties involved in carrying out the provisions of the HBC, the building official may accept compliance alternatives or grant modifications for individual cases, provided the building official shall first find that a significant reason makes the strict letter of the HBC impractical and that the compliance alternative or modification is in conformity with the intent and purpose of the HBC and that such compliance alternative or modification does not lessen health, life-safety, and the intent of any fire-safety requirements or any degree of structural integrity. The details of any action granting modifications or the acceptance of a compliance alternative shall be recorded and entered in the files of the code enforcement agency.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-180, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-190 Tests.** Whenever there is insufficient evidence of compliance with any of the provisions of the HBC or evidence that any material or construction does not conform to the requirements of the HBC, the building official may require tests as proof of compliance to be made at no expense to the jurisdiction.

Test methods shall be as specified by the HBC, the Building Code, or by other recognized test standards. If there are no recognized and accepted test methods for the proposed alternate, the building official shall determine test procedures.

All tests shall be made by an approved agency. Reports of such tests shall be retained by the building official for the period required for the retention of public records.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-190, filed 12/18/90, effective 7/1/91.]

## PART II ADMINISTRATION

**WAC 51-19-200 Enforcement.** The building official is hereby authorized to enforce the provisions of the HBC. The building official shall have the power to render interpretations of the HBC and to adopt and enforce rules and regulations supplemental to this code as may be deemed necessary in order to clarify the application of the provisions of the HBC. Such interpretations, rules, and regulations shall be in conformity with the intent and purpose of the HBC.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-200, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-210 Permits.** Buildings or structures regulated by the HBC shall not be enlarged, altered, repaired, improved, or converted unless a separate permit for each building or structure has been obtained from the building official in accordance with and in the manner prescribed in the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-210, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-220 Inspection.** All buildings or structures within the scope of this code and all construction or work for which a permit is required shall be subject to inspection by the building official in accordance with and in the manner prescribed in the HBC and the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-220, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-230 Repairs.** Repairs to any portion of a historic building or structure may be made with original materials and original methods of construction, subject to provisions of the HBC.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-230, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-240 Relocated buildings.** Relocated historic buildings shall be considered a historic building for the purposes of the HBC. Relocated residential buildings in or within a county or city are not required to meet the full requirements of the Building Code, as prescribed in RCW 19.27.180, provided the occupancy classification of the building or structure is not changed as a result of the move. If an occupancy classification change occurs as a result of the move, the building or

structure shall be reviewed under Part VI, Change of occupancy standards. Relocated historic buildings and structures shall be so sited that exterior wall and opening requirements comply with the Building Code or the compliance alternatives of the HBC. Foundations of relocated historic buildings and structures shall comply with the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-240, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-250 Right of entry.** Whenever necessary to make an inspection to enforce any of the provisions of the HBC, or whenever the building official or an authorized representative has reasonable cause to believe that there exists in any building or upon any premises any condition or code violation which makes such building or premises unsafe, dangerous or hazardous, the building official or an authorized representative may enter such building or premises at all reasonable times to inspect the same or to perform any duty imposed upon the building official by the HBC, provided that if such building or premises be occupied, proper credentials shall first be presented and entry requested; and if such building or premises be unoccupied, the official shall first make a reasonable effort to locate the owner or other persons having charge or control of the building or premises and request entry. If such entry is refused, the building official or an authorized representative shall have recourse to every remedy provided by law to secure entry.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-250, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-260 Liability.** The building official or an authorized representative charged with the enforcement of the HBC, acting in good faith and without malice in the discharge of the prescribed duties, shall not thereby render themselves liable for any damage that may accrue to persons or property as a result of any act or by reason of any act or omission in the discharge of those duties. Any suit brought against the building official or employee because of such act or omission performed in the enforcement of any provision of the HBC shall be defended by the jurisdiction until final termination of such proceedings and any judgment resulting therefrom shall be assumed by the jurisdiction.

The HBC shall not be construed to relieve from or lessen the responsibility of any person owning, operating, or controlling any building or structure for any damages to persons or property caused by defects, nor shall the code enforcement agency or its parent jurisdiction be held as assuming any such liability by reason of the inspections authorized by the HBC or any permits or certificates issued under the HBC.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-260, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-270 Unsafe buildings or structures.** All buildings or structures regulated by the HBC which are structurally unsafe or not provided with adequate egress,

or which constitute a fire hazard or are otherwise dangerous to human life are, for the purpose of this section, unsafe. Unsafe buildings shall comply with section 203 of the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-270, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-280 Appeals.** The board of appeals established under the Building Code shall have authority to provide for final interpretation of the provision of the HBC and to hear appeals.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-280, filed 12/18/90, effective 7/1/91.]

### PART III DEFINITIONS

**WAC 51-19-300 Definitions.** For the purpose of the HBC, certain terms, phrases, words, and their derivatives shall be construed as specified in this chapter. Words used in the singular include the plural and the plural the singular. Words used in the masculine gender include the feminine and the feminine the masculine.

Where terms are not defined, they shall have their ordinary accepted meanings within the context in which they are used. In the event there is a question about the definition of a term, the definitions for terms in the codes enumerated in RCW 19.27.031 and the edition of *Webster's Dictionary*, referenced therein shall be considered as the sources for providing ordinarily accepted meanings.

"Adaptive use" is the process of adapting a building to accomplish a use other than that for which it was designed; i.e., a piano factory being converted into housing, or a mansion into an office or apartments.

"Addition" is an extension or increase in floor area or height of a building or structure.

"Alter or alteration" is any change, addition, or modification in construction or occupancy.

"Approved agency" is an established and recognized agency regularly engaged in conducting tests or furnishing inspection services, when such agency has been approved by the building official.

"Building" is any structure used or intended for supporting or sheltering any use or occupancy. (See structure.)

"Building Code" is the Uniform Building Code, promulgated by the International Conference of Building Officials as adopted by the state building code council.

"Building official" is the officer or other designated authority charged with the administration and enforcement of the HBC, or a duly authorized representative.

"Building service equipment" refers to the plumbing, mechanical, electrical, and elevator equipment including piping, wiring, fixtures, and other accessories which provide sanitation, lighting, heating, ventilation, cooling, refrigeration, firefighting, and transportation facilities essential for the habitable occupancy of the building or structure for its designated use and occupancy.

"Certified local government" or "CLG" means the local government has been certified by the state historic

preservation officer as having established its own historic preservation commission and a program meeting federal and state standards.

"Dangerous Building Code" is the code, adopted by this jurisdiction, which outlines the processes and procedures for the determination and abatement of dangerous buildings.

"Electrical Code" is the National Electrical Code, promulgated by the National Fire Protection Association, as adopted by the Washington state department of labor and industries, electrical section.

"Equivalency" is meeting the intent of the HBC by means other than those detailed in specific code provisions.

"Fire hazard" is any thing or act which increases or may cause an increase of the hazard or menace of fire to a greater degree than that customarily recognized as normal by persons in the public service regularly engaged in preventing, suppressing, or extinguishing fire; or which may obstruct, delay, hinder, or interfere with the operations of the fire department or the egress of occupants in the event of fire.

"Historic building" is any structure, collection of structures, and their associated sites, deemed of importance to the history, architecture, or culture of an area by an appropriate local, state, or federal governmental jurisdiction. Included shall be structures on official national, state, or local historic registers or official listings such as the National Register of Historic Places, the state register of historic places, state points of historical interest, and registers or listings of historical or architecturally significant sites, places, historic districts, or landmarks as adopted by a certified local government.

"Historic fabric" consists of the original materials and portions of the building intact when exposed or as they appeared and were used in the past.

"Historical aspects" are the particular features of the historic site, building, or structure that gives it its historic significance. Features may include but are not limited to one or more of the following: Historical background, noteworthy architecture, unique design, works of art, memorabilia, and artifacts.

"Imminent hazard" is a condition which could cause serious or life threatening injury or death at any time.

"Occupancy" is the purpose for which a building, or part thereof, is used or intended to be used.

"Original materials" are those portions of the structure's fabric that existed during the period deemed to be most architecturally and/or historically significant.

"Preservation" is the maintenance of the structure in its present condition or as originally constructed. Preservation aims at halting further deterioration and providing structural safety, but does not contemplate significant rebuilding. Preservation includes techniques of arresting or slowing the deterioration of a structure; improvement of structural conditions to make a structure safe, habitable, or otherwise useful; normal maintenance and minor repairs that do not change or adversely affect the fabric or appearance of a structure.

"Prevailing code" is the "regular building regulations" which governed the design and construction or alteration



of historical buildings within the jurisdiction of the enforcing agency at the time of their construction.

"Reconstruction" is the process of rebuilding a nonextant structure or portion of a structure to its original appearance through archival and archeological investigation. Although parts of the original structure are sometimes included in the reconstruction, the process usually involves new construction materials.

"Rehabilitation" involves equipping the building or facility for an extended useful life with a minimum alteration of original construction or the process of returning a structure to a state of usefulness by repairs, alterations, or additions.

"Relocation" involves any structure or a portion of a structure that may be moved to a new location.

"Renovation" is to make sound again any structure involved under the various definitions hereunder by cleanup, repair, and replacement of deteriorated detail or structure.

"Repair" is the reconstruction, renovation, or renewal of any portion of a historic building for the purpose of its maintenance.

"Reproduction" is a duplication, copy, or close imitation of the original.

"Restoration" is the process of accurately recovering, by the removal of later work and the replacement of missing earlier work, the form and details of a structure, together with its setting, as it appeared at a particular period of time.

"Structure" is that which is built or constructed, an edifice or building of any kind, or any piece of work artificially built up or composed of parts joined together in some definite manner.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-300, filed 12/18/90, effective 7/1/91.]

#### PART IV FIRE AND LIFE SAFETY STANDARDS

**WAC 51-19-400 General.** Safety to life in historic buildings and structures shall meet the intent of the Building Code. The provisions of this section shall be deemed as meeting the intent of the Historic Building Code, provided that none of the fire and life-safety features required by the prevailing codes under which the building was constructed will be reduced below the level established by either the HBC or the equivalent provisions of the currently adopted Building Code, whichever is least stringent. Alterations or repairs to a historic building or structure which are nonstructural and do not adversely affect any structural member or any part of the building or structure having required fire resistance may be made with the same materials of which the building or structure is constructed. Fire resistive ratings of archaic materials may be evaluated based upon the Guideline on Fire Ratings of Archaic Materials and Assemblies from Guideline 2 of the Uniform Code for Building Conservation.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-400, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-410 Exit systems.** (1) Exit system capacity and the arrangement of exits shall comply with the requirements of the Building Code. Exit systems shall comply with the provisions of subsections (1) through (5) of this section, or the provisions of the prevailing code under which the building was constructed, whichever is more stringent. If any provision of the HBC or the prevailing code under which a building was constructed is more stringent than the currently adopted Building Code, the exit system shall comply with the provision of the currently adopted Building Code.

(2) All elements of the exit system shall be of sufficient size, width, and arrangement to provide safe and adequate means of egress. Every required exit shall have access to a public way, directly or through yards, courts or similar spaces, and such access shall be permanently maintained clear of any obstruction which would impede exiting.

(3) Occupants of every floor above the first story and in basements shall have access to at least two separate exits. A fire escape shall not be substituted for a stairway which was required by the prevailing codes under which the building was constructed.

#### Exceptions:

(a) In all occupancies, second stories with an occupant load of less than ten may have one exit.

(b) Only one exit need be provided from the second story within an individual dwelling unit which has an occupant load of less than ten.

(c) Two or more dwelling units on the second story may have access to only one common exit when the total occupant load does not exceed ten.

(d) Floors and basements used exclusively for service of the building may have one exit. For the purposes of this exception, storage rooms, laundry rooms, maintenance offices, and similar uses shall not be considered as providing service to the building.

(e) Basements within an individual dwelling unit having an occupant load of less than ten may have one exit.

(f) Occupied roofs of Group R, Division 3 occupancies may have one exit if such occupied areas are less than five hundred square feet and located no higher than immediately above the second story.

(4) Corridors serving as a part of the exit system which have an occupant load of thirty or more in a Group A, B, E, or H occupancy or an occupant load of ten or more in a Group R, Division 1 or Group I occupancy shall have walls and ceilings of not less than one hour fire resistive construction. Existing walls and ceilings surfaced with wood lath and plaster or one-half inch thick gypsum wallboard may be permitted in lieu of one hour fire resistive construction, provided the surfaces are in good condition.

Door openings into such corridors shall be protected by a tight fitting smoke and draft control assembly having a fire protection rating of not less than twenty minutes when such opening protection was required by the prevailing codes under which the building was constructed. Door closing devices, door gaskets, and other requirements imposed by the prevailing codes under

which the building was constructed shall be maintained. When the building was constructed under a code which did not require twenty minute smoke and draft control assemblies, doorway openings shall be protected by doors having a fire protection rating of not less than twenty minutes or by a minimum one and three-eighths inch thick, solid bonded, wood core door or an equivalent insulated steel door. In such case, the frames need not have a fire resistive time period. Doors shall be maintained self-closing or shall be automatic closing, self-latching by activation of a smoke detector.

Transoms and openings other than doors from corridors to rooms shall be protected as required by the Building Code. Existing transoms may be maintained if fixed in the closed position. When the code under which the building was constructed permitted unprotected transoms or other unprotected openings, other than doors, such transoms or openings shall be covered with a minimum of three-fourths-inch-thick plywood, one-half-inch-thick gypsum wallboard, fixed glazing listed and labeled for a fire protection rating of at least three-fourths hour or equivalent material on the room side. Openings with fixed wired glass set in steel frames are permitted in corridor walls and ceilings.

Exception: Existing corridor walls, ceilings, and opening protection not in compliance with the above may be continued when the building is protected with an approved automatic sprinkler system throughout: *Provided*, That a draft gasket assembly on sound, solid, self-closing, self-latching doors at door openings is installed and that sealing, caulking, and duct penetrations shall have dampers in all one-hour rated exit corridors. Such sprinkler system may be supplied from the domestic water supply system, provided the system is of adequate pressure, capacity, and sizing for the combined domestic and sprinkler requirements.

(5) Every dwelling unit, guest room, or sleeping rooms shall have access directly to the outside or to a public corridor or exit balcony.

(6) Existing fire escapes complying with this section may be accepted by the building official as one of the required exits. The fire escape shall not be the primary or the only exit. Fire escapes shall not take the place of stairways required by the codes under which the building was constructed.

Fire escapes shall comply with the following:

(a) Access from a corridor shall not be through an intervening room.

Exception: Access through an intervening room may be permitted if the intervening door is not lockable and an exit sign is installed above the door which will direct occupants to the fire escape.

(b) All openings in an exterior wall below or within ten feet, measured horizontally, of an existing fire escape serving a building over two stories in height shall be protected by fire assembly having a minimum three-fourths hour fire protection rating, and where operable be self-closing. When openings are located within a recess or vestibule, adjacent enclosure walls shall be of not less than one hour fire resistive construction.

(c) Egress from the building shall be by an opening having a minimum clear width and height of not less than twenty-nine inches. Such openings shall be openable from the inside without the use of a key or special knowledge or effort. The sill of an opening giving access to the fire escape shall be not more than thirty inches above the floor of the building or balcony.

(d) Fire escape stairways and their balconies shall support their dead load plus a live load of not less than one hundred pounds per square foot or concentrated load of three hundred pounds placed anywhere on the balcony or stairway so as to produce the maximum stress conditions. The stairway shall have a pitch not to exceed sixty degrees from the horizontal and shall have a minimum width of eighteen inches. The stairway shall be provided with a top and intermediate railing on each side. Treads shall be not less than four inches in width and the rise between treads shall not exceed ten inches. All stairway and balcony railings shall support a horizontally applied force of not less than fifty pounds per lineal foot of railing or a concentrated load of two hundred pounds placed anywhere on the railing so as to produce the maximum stress conditions.

(e) Fire escape balconies shall be not less than forty-four inches in width with no floor opening greater than five-eighths inch in width except the stairway opening. Stairway openings in such balconies shall be not less than twenty-two inches by forty-four inches. The guardrail of each balcony shall be not less than thirty-six inches high with not more than nine inches between intermediate rails.

(f) Fire escapes shall extend to the roof or provide an approved gooseneck ladder between the top floor landing and the roof when serving buildings four or more stories in height having roofs with a slope not exceeding four in twelve. Such ladders shall be designed and connected to the building to withstand a horizontal force of one hundred pounds per lineal foot; each rung shall support a concentrated load of five hundred pounds placed anywhere on the rung so as to produce the maximum stress conditions. All ladders shall be at least fifteen inches in clear width, be located within twelve inches of the building, and shall be placed flatwise relative to the face of the building. Ladder rungs shall be three-quarters inch in diameter and shall be located ten inches to twelve inches on center. Openings for roof access ladders through cornices and similar projections shall have minimum dimensions of thirty inches by thirty-three inches.

(g) The lowest balcony shall be not more than eight-feet from the ground. Fire escapes shall extend to the ground or be provided with counterbalanced stairs reaching to the ground.

(h) Fire escapes shall be kept clear and unobstructed at all times and maintained in good working order.

(i) The fire escape shall have a clearance from electrical service conductors as required by the Electrical Code.

(7) Existing winding or spiral stairways may serve as one exit from a building, provided that a complying handrail is located at the stair's outside perimeter. (See WAC 51-19-440.) A winding or spiral stairway may

not be the principal exit when used in conjunction with a fire escape as a second exit. The width of a spiral or winding stair may be used in the calculation of provided exit width when in compliance with this section. Circular stairways complying with the Building Code shall be acceptable as an exit.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-410, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-420 Structural safety.** A building or structure or its individual structural members that exceed the limits established by the Dangerous Buildings Code shall be replaced or strengthened in order that the building, structure, or individual structural members will comply with the requirements of the Building Code for new construction. Roofs, floors, walls, foundations, and all structural components of buildings or structures shall be capable of resisting the forces and loads for the occupancies intended, as specified in the prevailing codes under which the building was constructed or in chapter 23 of the Building Code, except for earthquake forces and loads. See Part V of this chapter for earthquake hazard reduction requirements.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-420, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-430 Weather protection.** (1) Every building shall provide weather protected shelter for the occupants against the elements and exclude dampness.

(2) The roof of every building or structure shall provide weather protection for the building. All devices which were provided or are required to prevent ponding or flooding or to convey the roof water shall be capable of fulfilling that purpose.

(3) All weather exposed surfaces of historic buildings or structures shall provide weather protection.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-430, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-440 Other safety features.** (1)(a) The largest tread run within any flight of stairs shall not exceed the smallest by more than three-eighths inch. The greatest riser height within any flight of stairs shall not exceed the smallest by more than three-eighths inch.

Exception: Existing spiral and circular stairs shall be exempt from the variance in tread size requirement.

(b) Every stairway shall have at least one handrail.

Exception: A handrail is not required for existing stairs having less than four risers.

Spiral and winding stairways shall have a handrail on the outside perimeter.

(2) All unenclosed floor and roof openings, open and glazed sides of stairways, landings and ramps, balconies or porches which are more than thirty inches above grade or floor below, and roofs used for other than service of the building shall be protected by a guardrail.

Exception: Guardrails need not be provided at the following locations:

(a) On the loading side of loading docks.

(b) On the auditorium side of a stage or enclosed platform.

(1990 Ed.)

(c) On private stairways thirty inches or less in height.

Existing guardrails, other than guardrails located on the open side of a stairway, which are at least thirty-six inches in height shall be permitted to remain. Guardrails lower than thirty-six inches in height shall be augmented or corrected to raise their effective height to thirty-six inches. Guardrails for stairways, exclusive of their landings, may have a height which is not less than thirty inches measured above the nosing of treads.

The spacing between existing intermediate railings or openings in existing ornamental patterns in significant historical staircases may be accepted; otherwise the Building Code shall apply. Missing elements or members of a guardrail may be replaced in a manner which will preserve the historic appearance of the building or structure.

(3) The installation or replacement of glass shall be as required for new construction by the Building Code and the requirements for energy conservation in Part VIII of this code.

(4) All wires and equipment, and installations thereof, that convey electric current, in, on, or about buildings or structures shall be in strict conformity with chapter 19.28 RCW, the statutes of the state of Washington, and the rules issued by the Washington state department of labor and industries.

(5) Leaking drain or supply lines shall be repaired or replaced. All unsafe conditions shall be corrected. Any cross connections or siphonage between fixtures shall be corrected.

(6) Mechanical systems shall have any unsafe conditions corrected.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-440, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-450 Light, ventilation, sanitation, smoke detectors, and heating.** (1) For Group R occupancies, light, ventilation, sanitation, smoke detectors, and heating shall meet the requirements of the Building Code.

(2) Skylights set at an angle of less than forty-five degrees from the horizontal plane shall be mounted at least four inches above the plane of the roof on a curb constructed of materials as required for the frame. Skylights may be installed in the plane of the roof when the roof slope is greater than forty-five degrees from horizontal.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-450, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-460 Plumbing.** All plumbing fixtures shall be connected to a sanitary sewer or to an approved private sewage disposal system. All plumbing fixtures shall be connected to an approved system of water supply and provided with hot and cold running water necessary for its normal operation. All plumbing fixtures shall be of an approved glazed earthenware type or of a similarly nonabsorbent material.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-460, filed 12/18/90, effective 7/1/91.]

## PART V EARTHQUAKE HAZARD REDUCTION

**WAC 51-19-500 Survey or evaluation.** When required by the building official a survey or evaluation shall be made by an architect or structural engineer licensed by the state to practice as such, who is knowledgeable in the earthquake resistant design of structures, regarding the structure's ability to resist the seismic loads prescribed by the Building Code requirements or by established alternate evaluation methodologies. Broad judgment may be exercised concerning the strength and performance of materials not recognized by the Building Code. Past historic records of the structure or similar structures may be used in the evaluation, including the effects of subsequent alterations. The capability of the structure to carry vertical and horizontal loads shall be evaluated. A complete, continuous and adequate stress path, including connections, from every part or portion of the structure to the ground shall be provided for the required vertical and horizontal forces.

Parapets and exterior decoration shall be investigated for conformance with the Building Code or evaluation methodologies and anchorage with the ability to resist seismic forces shall be required, except in the case where those parapets or decoration are judged to present no hazard to life safety.

A report shall be made of the findings of the survey and evaluation noting all deterioration of the existing structure and making recommendations for the repair of deterioration and for any reconstruction or strengthening which should be undertaken. Plans and specifications for the work done pursuant to the survey and evaluation prepared under this section shall be prepared under the responsible charge of an architect or structural engineer.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-500, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-510 Alternatives.** Alternative materials and methods of construction may be substituted for those otherwise required by the HBC or by the recommendations of the earthquake survey and evaluation provided the alternative methods are necessary to preserve historic materials or features and that such alternative methods provide satisfactorily for the purposes intended, or are reasonably equivalent to the prescribed methods in quality, strength, effectiveness, fire resistance, durability, and safety.

The building official may request that sufficient evidence be submitted to substantiate any claims made regarding such alternative materials, evaluation methodologies, and alternative methods of construction.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-510, filed 12/18/90, effective 7/1/91.]

## PART VI CHANGE OF OCCUPANCY STANDARDS

**WAC 51-19-600 General.** The character of the occupancy of historic buildings and structures may be changed, provided the requirements of this chapter are

met. Where no specific requirements are included herein, the building or structure shall comply with the Building Code.

Every change of occupancy to a classification in a different group or different division of the same group shall require a new certificate of occupancy regardless of whether any alterations are required by the HBC.

If the building or portion thereof does not conform to the requirements of the HBC for the proposed occupancy group or division, the building or portion thereof shall be made to conform to the Building Code except as specified in the HBC. The building official may issue a new certificate of occupancy stating that the building complies with the HBC.

The relative degree of hazard between different occupancy groups or between divisions of the same group shall be as set forth in the hazard category classifications, Tables Nos. VI-1 through VI-5. A historic building may have its occupancy changed to an occupancy within the same hazard group or to an occupancy in a lesser hazard group without complying with all of the provisions of this chapter. A historic building shall comply with the requirements of the Building Code, except as specified in this chapter, when a change in occupancy will place it in a higher hazard group or when the occupancy is changed to Group A, Division 1 or 2, Group E, H, or I.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-600, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-610 Heights and area.** Heights and areas of buildings and structures shall meet the requirements of the Building Code for the new occupancy.

Exception: Historic buildings exceeding the maximum allowable heights and areas permitted for new buildings may undergo a change of occupancy if the hazard level of the new occupancy is equal to or less than the existing hazard group as shown in Table No. VI-1.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-610, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-620 Fire safety.** (1) When a change of occupancy is made to a higher hazard group as shown in Table No. VI-1, all elements of the exit system shall comply with the requirements of the Building Code.

Exceptions: (a) Existing exit corridors and stairways meeting the requirements of Part IV of this chapter may be used.

(b) Exit system elements may meet alternative compliance requirements as approved by the building official.

(2) Existing exit systems complying with Part IV shall be accepted if the occupancy change is to an equal or lesser hazard group when evaluated in accordance with Table No. VI-2.

(3) When a change of occupancy is made to a higher hazard group as shown in Table No. VI-3, occupancy separations shall be provided as specified in the Building Code. When approved by the building official, existing wood lath and plaster in good condition or one-half inch

gypsum wall board may be accepted where a one hour occupancy separation is required.

(4)(a) Vertical shafts may be designed to meet the requirements of atriums as required by the Building Code or the requirements of this chapter.

(b) Interior stairways shall be enclosed as required by the Building Code when a change of occupancy is made to a higher hazard group as shown in Table No. VI-4.

Exceptions:

(i) In other than Group I occupancies, an enclosure will not be required for openings serving only one adjacent floor and not connected with corridors or stairways serving other floors.

(ii) Existing stairways not enclosed need not be enclosed in a continuous vertical shaft if each story is separated from other stories by one hour fire resistive construction or approved wired glass set in steel frames and all exit corridors are sprinklered. The openings between the corridor and occupant space shall have at least one quick response sprinkler head above the openings on the tenant side, with a draft gasket assembly on sound, solid, self-closing doors. The sprinkler system may be supplied from the domestic water supply system, provided the system is of adequate pressure, capacity, and sizing for the combined domestic and sprinkler requirements.

(c) Interior shafts, including, but not limited to, elevator hoistways, service and utility shafts, shall be enclosed with a minimum of one-hour fire-resistive construction.

Exceptions:

(i) Vertical openings, other than stairways, need not be enclosed if the entire building is provided with an approved automatic sprinkler system. The sprinkler system may be supplied from the domestic water supply system, provided the system is of adequate pressure, capacity, and sizing for the combined domestic and sprinkler requirements.

(ii) Where one-hour fire-resistive floor construction is required, vertical shafts need not be enclosed when such shafts are blocked at every floor level by the installation of not less than two full inches of solid wood or equivalent construction.

(d) All openings into such shafts shall be protected by fire assemblies having a fire protection rating of not less than one hour and shall be maintained self-closing or shall be automatic closing by actuation of a smoke detector. All other openings shall be fire protected in an approved manner. Existing fusible link-type automatic door-closing devices may be permitted if the fusible link rating does not exceed one hundred thirty-five degrees.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-620, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-630 Property protection.** (1) Exterior walls shall have fire resistance and opening protection as set forth in the Building Code. This provision shall not apply to walls at right angles to the property line.

Exceptions:

(1990 Ed.)

(a) Where a fire-resistive rating greater than two hours is required for a building of any type of construction, existing noncombustible exterior walls having a fire resistive rating equivalent to two hours as determined by the building official may be accepted, provided:

(i) The building is classified as a Group A, Division 3; Group B, Division 1 or Group B, Division 2 occupancy; and

(ii) The building does not exceed three stories in height; or

(iii) The building shall be of heavy timber construction, and does not exceed five stories in height. (The state Building Code council recommends the use of Guideline 2 of the Uniform Code for Building Conservation as reference in determining fire resistive rating equivalency.)

(b) Existing exterior walls shall be accepted if the occupancy is changed to a hazard group which is equal to or less than the existing occupancy as defined in Table No. VI-4.

(2) New openings in exterior walls shall be protected as required by the Building Code. Existing, nonconforming openings shall be protected by fire assembly having a minimum three-fourth hour fire protection rating, and where operable be self-closing. When openings in the exterior walls are required to be protected due to distance from the property line, the sum of the area of such openings shall not exceed fifty percent of the total wall area in each story.

Exceptions:

(a) Protected openings shall not be required for Group R, Division 1 occupancies which do not exceed three stories in height and which are located not less than three feet from the property line.

(b) Where opening protection is required, an automatic fire extinguishing system throughout may be substituted for opening protection.

(c) Opening protection may be omitted when the change of occupancy is to an equal or lower hazard classification in accordance with Table No. VI-2.

(d) The building shall be of heavy timber construction, and does not exceed five stories in height.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-630, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-640 Structural safety.** Buildings and structures shall meet the minimum level of performance for structural safety as specified in Parts IV and V of this chapter.

Historic buildings may undergo a change of occupancy if the hazard group is equal to or less than the existing occupancy as shown in Table No. VI-5. Buildings undergoing a change of occupancy to a more hazardous group shall meet the earthquake hazard reduction requirements of Part V of this chapter for the new occupancy.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-640, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-650 Light and ventilation.** When deemed necessary by the building official, light and ventilation shall comply with the requirements of the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-650, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-660 Flame spread reduction.** Where finish materials are required to have a flame-spread classification of Class III or better, existing nonconforming materials shall be surfaced with an approved fire retardant paint or finish.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-660, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-670 Roof coverings.** Regardless of occupancy group, roof covering materials not less than Class C shall be permitted where a fire retardant roof covering is required. Nonrated materials may be acceptable only where approved by the building official.

TABLE NO. VI-1  
HEIGHTS AND AREAS  
HAZARD CATEGORIES AND CLASSIFICATIONS

Relative Hazzard	Occupancy Classification*
1	A-1, H, I-3 (highest hazard group)
2	A-2, A-2.1, I-1, I-2
3	A-3, A-4, B, E, R-1
4	R-3, M (lowest hazard group)

\* See Table 5-A of the Building Code.

TABLE NO. VI-2  
LIFE SAFETY AND EXITS  
HAZARD CATEGORIES AND CLASSIFICATIONS

Relative Hazzard	Occupancy Classification*
1	A-1, A-2, A-2.1, E, I, H-1, H-2, H-3 and H-7 (highest hazard group)
2	A-3
3	R-1, R-3, B-2 dining and drinking establishments
4	B-2 all others, B-4, H other than H-1, H-2, H-3 and H-7
5	B-1, B-3
6	M (lowest hazard group)

\* See Table 5-A of the Building Code.

TABLE NO. VI-3  
OCCUPANCY SEPARATIONS  
HAZARD CATEGORIES AND CLASSIFICATIONS

Relative Hazzard	Occupancy Classification*
1	B-1, H, I (highest hazard group)
2	A, B-2, B-3, B-4

Relative Hazzard	Occupancy Classification*
3	E
4	R-1, M
5	R-3 (lowest hazard group)

\* See Table 5-A of the Building Code.

TABLE NO. VI-4  
EXPOSURE OF EXTERIOR WALLS  
AND STAIRWAY ENCLOSURES  
HAZARD CATEGORIES AND CLASSIFICATIONS

Relative Hazzard	Occupancy Classification*
1	H (highest hazard group)
2	B-2 mercantile and warehouses
3	A, E, I
4	B-1, B-2 all others, R
5	B-4, M (lowest hazard group)

\* See Table 5-A of the Building Code.

TABLE NO. VI-5  
EARTHQUAKE SAFETY  
HAZARD CATEGORIES AND CLASSIFICATIONS

Relative Hazzard	Occupancy Classification*
1	A, E, I (highest hazard group)
2	R-1
3	B-3, B-4, H
4	B-1, B-2
5	R-3, M (lowest hazard group)

\* See Table 5-A of the Building Code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-670, filed 12/18/90, effective 7/1/91.]

**PART VII  
ACCESSIBILITY TO PERSONS WITH  
DISABILITIES**

**WAC 51-19-700 General.** The HBC shall provide the standards for accessibility of historic buildings to persons with disabilities. The value of access to buildings, structures, and sites of historic and cultural significance can be best obtained by providing the greatest degree of access while preserving the historic or architectural features of a building. Where accessibility is required by chapter 51-10 WAC, such standards shall be incorporated as practical.

Code users may consult the appendix bibliography concerning accessibility designs in historic buildings. Appendix Table A-901 is also provided to assist in application of the code.

Where additions are undertaken they shall incorporate useful accessible design features.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-700, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-710 Building access and use.** (1) Entry. At least one primary entrance to a historic building shall be usable by persons with disabilities. When the building official, building designer, and local or state preservation officer concur that adaptation of a primary entrance will have a detrimental impact on the aesthetic or historic context of the entrance, then the building official may accept a reasonable alternate public entrance. When access is provided by other than a primary entrance, the entrance access shall be clearly indicated by directional signs. Accessible parking shall be located so as to provide the closest practical distance to the accessible entrance.

(2) Ramps.

(a) General. The building official shall accept alternate ramp designs which comply with the HBC when it is determined that installation of a ramp having a slope which complies with chapter 51-10 WAC cannot be achieved.

(b) Slope. The slope of the ramp shall be not steeper than one vertical to nine horizontal for a horizontal length not to exceed twelve feet. Ramps which have a horizontal length which does not exceed two feet may have a slope not to exceed one vertical to six horizontal. Adequate warnings shall be posted indicating steepness where slopes exceed the requirements provided in the regulations for barrier-free facilities.

(3) Doors. Existing doorways which provide a net clear opening of not less than twenty-nine and one-half inches shall be deemed to meet the access requirements of this chapter.

(4) Changes in elevation. Changes in elevation of portions of buildings on accessible routes of travel shall be accessible by ramps or lifts consistent with the intent of the HBC.

(5) Toilet rooms. Where toilet facilities are provided, at least one such facility designed for use by persons with disabilities, shall be provided for each sex, or a separate facility usable by either sex located along an accessible route of travel. Alternate provisions providing substantially equivalent facilities shall comply with this code.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-710, filed 12/18/90, effective 7/1/91.]

## PART VIII ENERGY CONSERVATION

**WAC 51-19-800 General.** Historic buildings shall comply with the energy conservation and ventilation and indoor air quality requirements of the Washington State Energy Code chapter 51-11 WAC and the Washington State Ventilation and Indoor Air Quality Code chapter 51-13 WAC. The building official may modify the specific requirements of the Energy Code for Historic Buildings and require in lieu thereof alternate requirements which will result in a reasonable degree of energy efficiency.

(1990 Ed.)

Exceptions: The historic elements of the following buildings and structures are exempt from the State Energy Code:

- Totally preserved buildings used as historical exhibits.
- Seasonal use buildings.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-800, filed 12/18/90, effective 7/1/91.]

**WAC 51-19-810 Alternative energy conservation provisions.** (1) General. The alternative energy conservation requirements as specified in this part may be applied to a historic building if approved by the building official. The building official may approve other alternatives designed to improve energy efficiency without loss of the historic fabric of the building.

(2) Building envelope requirements. Historic buildings shall meet the minimum thermal performance values specified in the energy code, or the alternative measures specified in this subsection.

(a) Attics. Where accessible, insulation shall be installed in the attic to the requirements of the Energy Code, or lesser levels to maintain adequate ventilation, to reduce condensation problems or to provide safety clearances around electrical wiring or utility systems.

Additional insulation with an integral vapor barrier shall not be installed on top of existing insulation. A vapor barrier shall not be installed between layers of insulation.

(b) Exterior walls. Accessible wall cavities where finishes are being disturbed by alteration or renovation work shall be insulated to the extent practical. If accessible, a vapor retarder shall be installed on the winter warm side of the insulation (facing the conditioned space). An approved vapor retarding paint or clear finish is an acceptable vapor retarder. Permeable materials on the exterior side of the cavity (or unheated side) or an air space or means of venting framing cavities to the exterior are required if insulation is added to the cavities in wood frame construction.

(c) Doors. Doors which are not of the original material or which are not replicas designed to be compatible with the historic aspects of the structure shall conform to the requirements of the Energy Code.

(d) Floors over crawl spaces. If accessible, adequately ventilated, and with ground clearance in conformance with Building Code requirements, insulation with an R-value of eleven or greater shall be installed in floors of unheated crawl spaces.

(e) Moisture control in crawl spaces. Minimum foundation ventilation shall be provided in unheated crawl spaces. The net-free area of ventilation shall be at least 1/300th of the floor area. The vents shall be distributed around the perimeter of the foundation as equally as practical to provide adequate cross-ventilation. If accessible, a black polyethylene vapor barrier shall be applied to cover the exposed earth as prescribed in the Building Code.

(f) Air leakage. Windows and doors.

(i) All exterior windows and doors shall be gasketed or weatherstripped.

[Title 51 WAC—p 111]

(ii) If the existing windows and doors are replaced with factory manufactured windows, the windows shall be double glazed units or shall be equipped with interior or exterior storm windows.

(iii) Single glazed windows which are part of the historic features of the building may be retained, repaired, or restored with or without the addition of storm windows.

(g) Chimney flues. Chimney flues which are no longer in use shall be closed off and sealed against air leakage.

(h) Exterior openings. The following openings in the exterior building envelope shall be caulked, gasketed, or otherwise sealed:

(i) Exterior joints around window and door frames;

(ii) Penetrations of utility services through walls, floors, and roofs.

(iii) Any other penetrations as required by the building official.

(i) Insulation materials. New insulation materials shall conform to the applicable provisions of the building, mechanical, plumbing, and energy codes for fire-resistance, flame-spread, smoke-density ratings and Building Code provisions for roof and exposed deck ceiling insulation.

(3) Building mechanical systems. Existing heating, ventilation, and cooling systems which are part of the significant historic features of the building or structure, and which in the opinion of the building official do not constitute a safety hazard, may remain in use, be repaired or be replaced in kind. Replacement, alteration, or addition of other heating, ventilation, and cooling equipment shall comply with the provisions of the energy, ventilation and indoor air quality, mechanical, and plumbing codes.

(4) Water heating. Replacement or addition of water heating equipment shall comply with the provisions of the Energy Code.

(5) Lighting. Existing lighting may be retained, repaired, and replaced in kind or with replica fixtures. Areas of buildings or structures in which lighting is being replaced shall conform to the requirements of the Energy Code where practical. Appropriate clearances of insulation material from sources of heat; i.e., light fixtures, shall be as required by the Building Code requirements.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-810, filed 12/18/90, effective 7/1/91.]



PART IX  
APPENDICES

WAC 51-19-900 Appendix A.

Table A - 901

	BUILDING FEATURES			
	ENTRY	DOORS	TOILET ROOMS	FLOORS & LEVELS
<b>Instructions:</b>	Prevailing Codes:	Prevailing Codes:	Prevailing Codes:	Prevailing Codes:
1. Determine Building Category; i.e., II.D. under Building Type and Historical Aspects.	Primary public entrance with access to elevators available	-31 1/2" clear openings	5'-0" x 4'-8" stall clear length 32" min. clear entry in front of compartment door 32" clear turn 60" diameter circle	-Access to all floors, except in offices, retail shops
2. Go to box in category under Building Features.		-5' level perpendicular to closed door	Lavy. 29" clear under for newly designed space. See WAC 51-10 Sec. 511.1.	-floor on given story level or ramped.
3. Numbers in box refer to the Alternatives List.		-18" clear at strike side		
<b>Category (Building Type and Historical Aspects)</b>	<b>ENTRY</b> See Alternatives List	<b>DOORS</b> See Alternatives List	<b>TOILET ROOMS</b> See Alternatives List	<b>FLOORS &amp; LEVELS</b> See Alternatives List
<b>I. Publicly owned or leased building providing governmental services to general public; i.e., City Hall, Courthouse, etc., adaptive use, restoration, or reconstruction.</b>				
A. Exterior (shell) historical all or part, Interior nonhistorical.	2, 4	1, Exterior only None interior	None	N.A.
B. Interior historical-all or part, Exterior nonhistorical.		1,2 Interior only None exterior	1, 2	1, 2
C. All historical-major change in use, change in occupancy.	2, 4	1, Exterior 1, 2 Interior only	1, 2	1, 2
D. All historical-minor change in use to equal or less intensive occupancy. Limited services.	2, 4	1, Exterior 1, 2, Interior only	1, 2	1, 2
<b>II. Privately owned buildings offering services to consumers; i.e., taverns, restaurants, general shops, etc., or buildings owned by government and leased or consigned to private operator.</b>				
A. Adaptive use restoration, reconstructions, Interior nonhistoric, Exterior historical (all or part).	1, 2, 3, 4	1, Exterior, and 1 Interior.	None	N.A.
B. Interior historical-(all or part), Exterior		None exterior,	1, 2, 3	N.A.
C. All historical-major change in use, change in occupancy, or mixed occupancy. Minor change of use to equal or less intensive occupancy.	1, 2, 3, 4	1, 2, 3	1, 2, 3	1, 2, 3
D. Reconstruction, or restoration. No change in use except to museum. (Minor mixed occupancy with administration space would be allowed.)	1, 2, 3, 4	1, 2, 3	1, 2, 3	1, 2, 3
E. Museum quality restoration and/or reconstruction including museum use. (Minor mixed occupancy compatible with that use would be allowed.) Also includes renovation of historical building or site.	1, 2, 3, 4	1, 2, 3	1, 2, 3	1, 2, 3
<b>III. Privately or publicly owned buildings used as museums or as site for display of the building itself; i.e., museum, schoolhouse, garden centers, galleries, etc.</b>				
A. Reconstruction, or restoration. No change in use except to museum. (Minor mixed occupancy such as administrative would be allowed.)	1, 2, 3, 4	1, 2, 3	1, 2, 3	1, 2, 3
B. Museum quality restoration and/or reconstruction museum use (Minor mixed occupancy compatible with that would be allowed). Also includes renovation of historical building or site.	1, 2, 3, 4	1, 2, 3	1, 2, 3	1, 2, 3
<b>IV. Privately owned buildings not open to general public but employing 3 or more persons; i.e., business offices.</b>				
A. Adaptive use-Interior nonhistorical, Exterior historical (all or part).	1, 2, 3, 4	1, 2, 3, Exterior, None Interior	1, 2	1, 2, 3, Exterior Access, None Interior access
B. Adaptive use-Interior historical, Exterior nonhistorical.	1, 2, 3, 4	None exterior, 1, 2, 3, Interior	1, 2	None Exterior access, 1, 2, 3, Interior access
C. All historical-major change in use, change in occupancy or mixed occupancy. Minor change of use to equal or less intensive occupancy.	1, 2, 3, 4	1 through 3	1, 2	1, 2, 3
D. Reconstruction, or restoration. No change in use-except to museum. (Minor mixed occupancy such as administrative would be allowed.)	1, 2, 3, 4	1 through 3	1, 2	1, 2, 3
<b>V. Buildings employing less than 3 people.</b>	All alternatives 4, 2, 3, 4	All alternatives 1- 3	All alternatives 1- 3	All alternatives 1- 3

ALTERNATIVES LIST

These alternatives are listed in order of priority and are to be used with Table A-901.

## ENTRY:

1. Ramp at greater than standard slope, but no greater than 1:9 for a horizontal distance not to exceed 12 feet at main, side, or rear entrance.
2. Access, listed in the order of priority, at grade or by ramp or lift to any entrance used by general public.
3. Ramp no greater than 1:6 slope for a distance not to exceed a horizontal distance of 2 feet at main, side, or rear entrance.
4. Access, listed in the order of priority, at grade, or by ramp, or lift at any entrance not used by general public but open (unlocked), with directional signs.

DOORS: (One means of entry into spaces requiring access)

1. 30-inch width of clear opening operable by single motion.
2. Usable 29 1/2 inches clear opening with door(s) operable by single motion.
3. Single or double door to provide a usable 29 1/2 inches clear opening.

## TOILET ROOMS:

1. Toilet facility of dimensions no less than those provided in the prevailing provisions in chapter 51-10 WAC designated as a unisex toilet for disabled persons.
2. Provide unisex toilet for disabled persons and general public.
3. No toilet for anyone.

## FLOORS AND LEVELS:

1. Access to experiences, services, functions and materials and resources; i.e., maps, plans, courtroom, council chambers, etc., at accessible levels.
2. Access provided to levels and floors by ramps of greater than standard slope and no greater than 1:9 for horizontal distances not to exceed 12 feet. Lifts may be provided.
3. Access provided to levels and floors by ramps of 1:6 slope for horizontal distance not to exceed 2 feet. Adequate warnings shall be provided to indicate steepness of the slope.

## USE NOTES:

1. Listed alternatives only apply to building requiring construction permits.
2. These alternatives should be used only where it is not possible to meet prevailing code.
3. Alternatives should be used only in those portions of the building that are historical.
4. Alternatives apply to access for physically disabled persons.
5. Alternatives apply to historic buildings only.
6. For other accessibility standards, see chapter 51-10 WAC.
7. Alternatives are listed in priority order.
8. No alternatives are allowed for simulations.

[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-900, filed 12/18/90, effective 7/1/91.]

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[Statutory Authority: RCW 19.27.120 and 19.27.074. 91-01-103, § 51-19-901, filed 12/18/90, effective 7/1/91.]