



**BSR/ASHRAE/IES Addendum aw
to ANSI/ASHRAE/IES Standard 90.1-2022**

Public Review Draft

Proposed Addendum aw to Standard 90.1-2022, Energy Standard for Sites and Buildings Except Low- Rise Residential Buildings

**First Public Review (July 2024)
(Draft Shows Proposed Changes to Current Standard)**

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FOREWORD

The current calculation methods for steel frame wall assembly U-factors are based on ideal or clear-field wall assemblies. For example, the current cavity correction factor method in Table A9.2-2 (effective R-values for framing/cavity insulation layer) includes only lay-out studs at specified spacing and top and bottom tracks. The AISI S250 calculation method includes just studs, without top and bottom tracks. These represent idealized “center-of-wall” U-factors that are not necessarily representative of many common construction and framing conditions. The pre-calculated U-factors in Table A3.3.3.1 have the same limitation because they are based on the approach in Table A9.2-2.

This proposal resolves the above inconsistency by evaluating the available hot-box test data to derive a consistent linear thermal bridge Psi-factor for steel framing members. The psi-factor approach is consistent with current Table A9.2-2 and AISI S250 for walls where the framing factor is about 10% (which is consistent with the “clear wall” framing factor of tested wall assemblies used to derive Table A9.2-2). The framing factor is based on the area of a typical steel framing flange (taken as 1.625 inches wide) to the gross opaque wall area which is consistent with the framing factor applied to wood framing. However, for U-factor calculation purposes, the framing factor is then associated with a length of steel framing per square foot of wall assembly to which the derived Psi-factor (linear thermal bridge transmittance) is applied to provide a correct U-factor for the assembly based on the amount of framing (framing factor) that includes lay-out studs, top and bottom tracks, and other framing elements as commonly included in wall assemblies (e.g., built-up stud columns, through cavity bridging, jamb/king studs at wall openings, and headers). Based on the hot box test data, this approach results in better than +/- 10% accuracy. More importantly, it properly accounts for the variation in framing factor which as currently ignored can have as much as a 35% non-conservative (under-prediction) bias relative to typical wall framing factors. The spreadsheet derivation of the Psi-factor for steel framing and its use in the calculation of the revised pre-calculated U-factors for steel frame wall assemblies is available upon request (which can be replicated by the calculation method included in this proposal).

Finally, the calculation approach in Section A9.2(b)(3)(ii) is updated to an equation format for improved clarity on how to calculate U-factors for steel framed wall assemblies whether using the Psi-factor approach or the AISI S250 standard to determine the U-factor for the base wall assembly. This equation format is the basis for updates to Table A3.3.3.1 and also follows more closely the equation form used for the same purpose in Section C402.1.4.2 of the 2021 IECC.

[Note to Reviewers: This addendum makes proposed changes to the current standard. These changes are indicated in the text by underlining (for additions) and ~~striketrough~~ (for deletions) except where the reviewer instructions specifically describe some other means of showing the changes. Only these changes to the current standard are open for review and comment at this time. Additional material is provided for context only and is not open for comment except as it relates to the proposed changes.]

Addendum aw to 90.1-2022

Delete Existing Table A3.3.3.1 (IP and SI)

Insert new Table A3.3.3.1(IP) (underline not shown for clarity)

Table A3.3.3.1 Assembly U-factors for Steel-Frame Walls by Stud Spacing and Framing Factor^{a,b}

Cavity Insulation Value	Base Wall U-Factor at Framing	Overall U-Factor for Assembly of Base Wall Plus Continuous Insulation (Uninterrupted by Framing or Furring)																			
		Rated R-value of Continuous Insulation																			
		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	20	25	30	35	40
Steel Framing at 12 in. on Center (25% Framing Factor) – includes framing for tracks, blocking, headers, & jamb and king studs																					
0.9	0.477	0.323	0.244	0.196	0.164	0.141	0.124	0.110	0.099	0.090	0.083	0.076	0.071	0.066	0.062	0.058	0.045	0.037	0.031	0.027	0.024
11	0.215	0.177	0.150	0.131	0.116	0.104	0.094	0.086	0.079	0.073	0.068	0.064	0.060	0.057	0.054	0.051	0.041	0.034	0.029	0.025	0.022
13	0.205	0.170	0.145	0.127	0.113	0.101	0.092	0.084	0.078	0.072	0.067	0.063	0.059	0.056	0.053	0.050	0.040	0.033	0.029	0.025	0.022
15	0.197	0.165	0.141	0.124	0.110	0.099	0.090	0.083	0.076	0.071	0.066	0.062	0.059	0.055	0.052	0.050	0.040	0.033	0.029	0.025	0.022
19	0.186	0.157	0.136	0.119	0.107	0.096	0.088	0.081	0.075	0.070	0.065	0.061	0.058	0.054	0.052	0.049	0.039	0.033	0.028	0.025	0.022
21	0.182	0.154	0.133	0.118	0.105	0.095	0.087	0.080	0.074	0.069	0.065	0.061	0.057	0.054	0.051	0.049	0.039	0.033	0.028	0.025	0.022
25	0.175	0.149	0.130	0.115	0.103	0.093	0.085	0.079	0.073	0.068	0.064	0.060	0.056	0.053	0.051	0.048	0.039	0.033	0.028	0.025	0.022
30	0.170	0.145	0.127	0.112	0.101	0.092	0.084	0.078	0.072	0.067	0.063	0.059	0.056	0.053	0.050	0.048	0.039	0.032	0.028	0.024	0.022
Steel Framing at 16 in. on Center (22% Framing Factor) – includes framing for tracks, blocking, headers, & jamb and king studs																					
0.9	0.461	0.315	0.240	0.193	0.162	0.139	0.122	0.109	0.098	0.090	0.082	0.076	0.071	0.066	0.062	0.058	0.045	0.037	0.031	0.027	0.024
11	0.198	0.166	0.142	0.124	0.111	0.100	0.091	0.083	0.077	0.071	0.066	0.062	0.059	0.055	0.053	0.050	0.040	0.033	0.029	0.025	0.022
13	0.188	0.158	0.137	0.120	0.107	0.097	0.088	0.081	0.075	0.070	0.065	0.061	0.058	0.055	0.052	0.049	0.040	0.033	0.028	0.025	0.022
15	0.180	0.153	0.133	0.117	0.105	0.095	0.087	0.080	0.074	0.069	0.064	0.060	0.057	0.054	0.051	0.049	0.039	0.033	0.028	0.025	0.022
19	0.169	0.145	0.127	0.112	0.101	0.092	0.084	0.077	0.072	0.067	0.063	0.059	0.056	0.053	0.050	0.048	0.039	0.032	0.028	0.024	0.022
21	0.165	0.142	0.124	0.110	0.099	0.090	0.083	0.077	0.071	0.066	0.062	0.059	0.055	0.052	0.050	0.048	0.038	0.032	0.028	0.024	0.022
25	0.159	0.137	0.121	0.108	0.097	0.089	0.081	0.075	0.070	0.065	0.061	0.058	0.055	0.052	0.049	0.047	0.038	0.032	0.028	0.024	0.022
30	0.153	0.133	0.117	0.105	0.095	0.087	0.080	0.074	0.069	0.064	0.060	0.057	0.054	0.051	0.049	0.046	0.038	0.032	0.027	0.024	0.021
Steel Framing at 24 in. on Center (18% Framing Factor) – includes framing for tracks, blocking, headers, & jamb and king studs																					
0.9	0.439	0.305	0.234	0.189	0.159	0.137	0.121	0.108	0.097	0.089	0.081	0.075	0.070	0.065	0.061	0.058	0.045	0.037	0.031	0.027	0.024
11	0.176	0.150	0.130	0.115	0.103	0.094	0.086	0.079	0.073	0.068	0.064	0.060	0.057	0.054	0.051	0.048	0.039	0.033	0.028	0.025	0.022
13	0.166	0.142	0.125	0.111	0.100	0.091	0.083	0.077	0.071	0.067	0.062	0.059	0.055	0.053	0.050	0.048	0.038	0.032	0.028	0.024	0.022
15	0.158	0.137	0.120	0.107	0.097	0.088	0.081	0.075	0.070	0.065	0.061	0.058	0.055	0.052	0.049	0.047	0.038	0.032	0.028	0.024	0.022
19	0.147	0.128	0.114	0.102	0.093	0.085	0.078	0.072	0.068	0.063	0.060	0.056	0.053	0.051	0.048	0.046	0.037	0.031	0.027	0.024	0.021
21	0.143	0.125	0.111	0.100	0.091	0.083	0.077	0.071	0.067	0.063	0.059	0.056	0.053	0.050	0.048	0.045	0.037	0.031	0.027	0.024	0.021

25	0.137	0.120	0.107	0.097	0.088	0.081	0.075	0.070	0.065	0.061	0.058	0.055	0.052	0.049	0.047	0.045	0.037	0.031	0.027	0.024	0.021
30	0.131	0.116	0.104	0.094	0.086	0.079	0.073	0.068	0.064	0.060	0.057	0.054	0.051	0.048	0.046	0.044	0.036	0.031	0.027	0.023	0.021
Steel Framing at 12 in. on Center (18% Framing Factor) – includes only studs at 12 in. on center and top and bottom tracks																					
0.9	0.439	0.305	0.234	0.189	0.159	0.137	0.121	0.108	0.097	0.089	0.081	0.075	0.070	0.065	0.061	0.058	0.045	0.037	0.031	0.027	0.024
11	0.176	0.150	0.130	0.115	0.103	0.094	0.086	0.079	0.073	0.068	0.064	0.060	0.057	0.054	0.051	0.048	0.039	0.033	0.028	0.025	0.022
13	0.166	0.142	0.125	0.111	0.100	0.091	0.083	0.077	0.071	0.067	0.062	0.059	0.055	0.053	0.050	0.048	0.038	0.032	0.028	0.024	0.022
15	0.158	0.137	0.120	0.107	0.097	0.088	0.081	0.075	0.070	0.065	0.061	0.058	0.055	0.052	0.049	0.047	0.038	0.032	0.028	0.024	0.022
19	0.147	0.128	0.114	0.102	0.093	0.085	0.078	0.072	0.068	0.063	0.060	0.056	0.053	0.051	0.048	0.046	0.037	0.031	0.027	0.024	0.021
21	0.143	0.125	0.111	0.100	0.091	0.083	0.077	0.071	0.067	0.063	0.059	0.056	0.053	0.050	0.048	0.045	0.037	0.031	0.027	0.024	0.021
25	0.137	0.120	0.107	0.097	0.088	0.081	0.075	0.070	0.065	0.061	0.058	0.055	0.052	0.049	0.047	0.045	0.037	0.031	0.027	0.024	0.021
30	0.131	0.116	0.104	0.094	0.086	0.079	0.073	0.068	0.064	0.060	0.057	0.054	0.051	0.048	0.046	0.044	0.036	0.031	0.027	0.023	0.021
Steel Framing at 16 in. on Center (14% Framing Factor) – includes only studs at 16 in. on center and top and bottom tracks																					
0.9	0.417	0.294	0.227	0.185	0.156	0.135	0.119	0.106	0.096	0.088	0.081	0.075	0.069	0.065	0.061	0.057	0.045	0.036	0.031	0.027	0.024
11	0.154	0.134	0.118	0.105	0.095	0.087	0.080	0.074	0.069	0.065	0.061	0.057	0.054	0.051	0.049	0.047	0.038	0.032	0.027	0.024	0.022
13	0.144	0.126	0.112	0.101	0.091	0.084	0.077	0.072	0.067	0.063	0.059	0.056	0.053	0.050	0.048	0.046	0.037	0.031	0.027	0.024	0.021
15	0.136	0.120	0.107	0.097	0.088	0.081	0.075	0.070	0.065	0.061	0.058	0.055	0.052	0.049	0.047	0.045	0.037	0.031	0.027	0.024	0.021
19	0.125	0.111	0.100	0.091	0.083	0.077	0.071	0.067	0.063	0.059	0.056	0.053	0.050	0.048	0.045	0.043	0.036	0.030	0.026	0.023	0.021
21	0.121	0.108	0.097	0.089	0.082	0.075	0.070	0.065	0.061	0.058	0.055	0.052	0.049	0.047	0.045	0.043	0.035	0.030	0.026	0.023	0.021
25	0.115	0.103	0.093	0.085	0.079	0.073	0.068	0.064	0.060	0.056	0.053	0.051	0.048	0.046	0.044	0.042	0.035	0.030	0.026	0.023	0.021
30	0.109	0.098	0.089	0.082	0.076	0.070	0.066	0.062	0.058	0.055	0.052	0.050	0.047	0.045	0.043	0.041	0.034	0.029	0.026	0.023	0.020
Steel Framing at 24 in. on Center (10% Framing Factor) – includes only studs at 24 in. on center and top and bottom tracks																					
0.9	0.394	0.283	0.220	0.181	0.153	0.133	0.117	0.105	0.095	0.087	0.080	0.074	0.069	0.064	0.060	0.057	0.044	0.036	0.031	0.027	0.024
11	0.132	0.117	0.104	0.095	0.086	0.080	0.074	0.069	0.064	0.060	0.057	0.054	0.051	0.049	0.046	0.044	0.036	0.031	0.027	0.023	0.021
13	0.122	0.109	0.098	0.089	0.082	0.076	0.070	0.066	0.062	0.058	0.055	0.052	0.049	0.047	0.045	0.043	0.035	0.030	0.026	0.023	0.021
15	0.114	0.102	0.093	0.085	0.078	0.073	0.068	0.063	0.060	0.056	0.053	0.051	0.048	0.046	0.044	0.042	0.035	0.030	0.026	0.023	0.021
19	0.103	0.093	0.085	0.079	0.073	0.068	0.064	0.060	0.056	0.053	0.051	0.048	0.046	0.044	0.042	0.040	0.034	0.029	0.025	0.022	0.020
21	0.099	0.090	0.082	0.076	0.071	0.066	0.062	0.058	0.055	0.052	0.050	0.047	0.045	0.043	0.041	0.040	0.033	0.028	0.025	0.022	0.020
25	0.092	0.085	0.078	0.072	0.067	0.063	0.059	0.056	0.053	0.050	0.048	0.046	0.044	0.042	0.040	0.039	0.032	0.028	0.024	0.022	0.020
30	0.087	0.080	0.074	0.069	0.064	0.060	0.057	0.054	0.051	0.049	0.046	0.044	0.042	0.041	0.039	0.038	0.032	0.027	0.024	0.021	0.019

a. Refer to Section A9.2(b)(3)(i) for calculation method used to generate table values.

b. The cavity insulation rated R-value of 0.9 corresponds to no cavity insulation.

Insert new Table A3.3.3.1(SI) (underline not shown for clarity)

Table A3.3.3.1 Assembly U-factors for Steel-Frame Walls by Stud Spacing and Framing Factor^{a,b}

Cavity Insulation Value	Base Wall U-Factor at Framing	Overall U-Factor for Assembly of Base Wall Plus Continuous Insulation (Uninterrupted by Framing or Furring)																			
		Rated R-value of Continuous Insulation																			
		0.18	0.35	0.53	0.70	0.88	1.06	1.23	1.41	1.59	1.76	1.94	2.11	2.29	2.47	2.64	3.52	4.40	5.28	6.16	7.04
Steel Framing at 300mm on Center (25% Framing Factor) – includes framing for tracks, blocking, headers, & jamb and king studs																					
0.16	2.71	1.83	1.39	1.11	0.93	0.80	0.70	0.62	0.56	0.51	0.47	0.43	0.40	0.38	0.35	0.33	0.26	0.21	0.18	0.15	0.13
1.94	1.22	1.01	0.85	0.74	0.66	0.59	0.53	0.49	0.45	0.42	0.39	0.36	0.34	0.32	0.30	0.29	0.23	0.19	0.16	0.14	0.13
2.29	1.16	0.97	0.83	0.72	0.64	0.57	0.52	0.48	0.44	0.41	0.38	0.36	0.34	0.32	0.30	0.29	0.23	0.19	0.16	0.14	0.13
2.64	1.12	0.93	0.80	0.70	0.63	0.56	0.51	0.47	0.43	0.40	0.38	0.35	0.33	0.31	0.30	0.28	0.23	0.19	0.16	0.14	0.13
3.35	1.06	0.89	0.77	0.68	0.61	0.55	0.50	0.46	0.42	0.39	0.37	0.35	0.33	0.31	0.29	0.28	0.22	0.19	0.16	0.14	0.13
3.70	1.03	0.87	0.76	0.67	0.60	0.54	0.49	0.45	0.42	0.39	0.37	0.34	0.32	0.31	0.29	0.28	0.22	0.19	0.16	0.14	0.12
4.40	1.00	0.85	0.74	0.65	0.59	0.53	0.49	0.45	0.41	0.39	0.36	0.34	0.32	0.30	0.29	0.27	0.22	0.18	0.16	0.14	0.12
5.28	0.96	0.82	0.72	0.64	0.57	0.52	0.48	0.44	0.41	0.38	0.36	0.34	0.32	0.30	0.29	0.27	0.22	0.18	0.16	0.14	0.12
Steel Framing at 400mm on Center (22% Framing Factor) – includes framing for tracks, blocking, headers, & jamb and king studs																					
0.16	2.62	1.79	1.36	1.10	0.92	0.79	0.69	0.62	0.56	0.51	0.47	0.43	0.40	0.37	0.35	0.33	0.26	0.21	0.18	0.15	0.13
1.94	1.13	0.94	0.81	0.71	0.63	0.57	0.51	0.47	0.44	0.40	0.38	0.35	0.33	0.31	0.30	0.28	0.23	0.19	0.16	0.14	0.13
2.29	1.07	0.90	0.78	0.68	0.61	0.55	0.50	0.46	0.43	0.40	0.37	0.35	0.33	0.31	0.29	0.28	0.22	0.19	0.16	0.14	0.13
2.64	1.02	0.87	0.75	0.66	0.60	0.54	0.49	0.45	0.42	0.39	0.37	0.34	0.32	0.31	0.29	0.28	0.22	0.19	0.16	0.14	0.12
3.35	0.96	0.82	0.72	0.64	0.57	0.52	0.48	0.44	0.41	0.38	0.36	0.34	0.32	0.30	0.29	0.27	0.22	0.18	0.16	0.14	0.12
3.70	0.94	0.81	0.71	0.63	0.56	0.51	0.47	0.44	0.40	0.38	0.35	0.33	0.31	0.30	0.28	0.27	0.22	0.18	0.16	0.14	0.12
4.40	0.90	0.78	0.68	0.61	0.55	0.50	0.46	0.43	0.40	0.37	0.35	0.33	0.31	0.29	0.28	0.27	0.22	0.18	0.16	0.14	0.12
5.28	0.87	0.75	0.67	0.60	0.54	0.49	0.45	0.42	0.39	0.37	0.34	0.32	0.31	0.29	0.28	0.26	0.21	0.18	0.16	0.14	0.12
Steel Framing at 600mm on Center (18% Framing Factor) – includes framing for tracks, blocking, headers, & jamb and king studs																					
0.16	2.49	1.73	1.33	1.08	0.90	0.78	0.69	0.61	0.55	0.50	0.46	0.43	0.40	0.37	0.35	0.33	0.25	0.21	0.18	0.15	0.13
1.94	1.00	0.85	0.74	0.65	0.59	0.53	0.49	0.45	0.42	0.39	0.36	0.34	0.32	0.30	0.29	0.27	0.22	0.19	0.16	0.14	0.12
2.29	0.94	0.81	0.71	0.63	0.57	0.52	0.47	0.44	0.41	0.38	0.35	0.33	0.32	0.30	0.28	0.27	0.22	0.18	0.16	0.14	0.12
2.64	0.90	0.78	0.68	0.61	0.55	0.50	0.46	0.43	0.40	0.37	0.35	0.33	0.31	0.29	0.28	0.27	0.22	0.18	0.16	0.14	0.12
3.35	0.84	0.73	0.65	0.58	0.53	0.48	0.44	0.41	0.38	0.36	0.34	0.32	0.30	0.29	0.27	0.26	0.21	0.18	0.15	0.14	0.12
3.70	0.81	0.71	0.63	0.57	0.52	0.47	0.44	0.41	0.38	0.36	0.33	0.32	0.30	0.28	0.27	0.26	0.21	0.18	0.15	0.14	0.12
4.40	0.78	0.68	0.61	0.55	0.50	0.46	0.43	0.40	0.37	0.35	0.33	0.31	0.29	0.28	0.27	0.25	0.21	0.18	0.15	0.13	0.12
5.28	0.74	0.66	0.59	0.53	0.49	0.45	0.42	0.39	0.36	0.34	0.32	0.30	0.29	0.28	0.26	0.25	0.21	0.17	0.15	0.13	0.12

Steel Framing at 300mm on Center (18% Framing Factor) – includes only studs at 300mm on center and top and bottom tracks

0.16	2.49	1.73	1.33	1.08	0.90	0.78	0.69	0.61	0.55	0.50	0.46	0.43	0.40	0.37	0.35	0.33	0.25	0.21	0.18	0.15	0.13
1.94	1.00	0.85	0.74	0.65	0.59	0.53	0.49	0.45	0.42	0.39	0.36	0.34	0.32	0.30	0.29	0.27	0.22	0.19	0.16	0.14	0.12
2.29	0.94	0.81	0.71	0.63	0.57	0.52	0.47	0.44	0.41	0.38	0.35	0.33	0.32	0.30	0.28	0.27	0.22	0.18	0.16	0.14	0.12
2.64	0.90	0.78	0.68	0.61	0.55	0.50	0.46	0.43	0.40	0.37	0.35	0.33	0.31	0.29	0.28	0.27	0.22	0.18	0.16	0.14	0.12
3.35	0.84	0.73	0.65	0.58	0.53	0.48	0.44	0.41	0.38	0.36	0.34	0.32	0.30	0.29	0.27	0.26	0.21	0.18	0.15	0.14	0.12
3.70	0.81	0.71	0.63	0.57	0.52	0.47	0.44	0.41	0.38	0.36	0.33	0.32	0.30	0.28	0.27	0.26	0.21	0.18	0.15	0.14	0.12
4.40	0.78	0.68	0.61	0.55	0.50	0.46	0.43	0.40	0.37	0.35	0.33	0.31	0.29	0.28	0.27	0.25	0.21	0.18	0.15	0.13	0.12
5.28	0.74	0.66	0.59	0.53	0.49	0.45	0.42	0.39	0.36	0.34	0.32	0.30	0.29	0.28	0.26	0.25	0.21	0.17	0.15	0.13	0.12

Steel Framing at 400mm on Center (14% Framing Factor) – includes only studs at 400mm on center and top and bottom tracks

0.16	2.37	1.67	1.29	1.05	0.89	0.77	0.68	0.60	0.55	0.50	0.46	0.42	0.39	0.37	0.35	0.33	0.25	0.21	0.18	0.15	0.13
1.94	0.88	0.76	0.67	0.60	0.54	0.49	0.45	0.42	0.39	0.37	0.34	0.32	0.31	0.29	0.28	0.26	0.21	0.18	0.16	0.14	0.12
2.29	0.82	0.71	0.63	0.57	0.52	0.48	0.44	0.41	0.38	0.36	0.34	0.32	0.30	0.28	0.27	0.26	0.21	0.18	0.15	0.14	0.12
2.64	0.77	0.68	0.61	0.55	0.50	0.46	0.43	0.40	0.37	0.35	0.33	0.31	0.29	0.28	0.27	0.25	0.21	0.18	0.15	0.13	0.12
3.35	0.71	0.63	0.57	0.52	0.47	0.44	0.41	0.38	0.35	0.33	0.32	0.30	0.28	0.27	0.26	0.25	0.20	0.17	0.15	0.13	0.12
3.70	0.69	0.61	0.55	0.50	0.46	0.43	0.40	0.37	0.35	0.33	0.31	0.29	0.28	0.27	0.25	0.24	0.20	0.17	0.15	0.13	0.12
4.40	0.65	0.58	0.53	0.48	0.45	0.41	0.39	0.36	0.34	0.32	0.30	0.29	0.27	0.26	0.25	0.24	0.20	0.17	0.15	0.13	0.12
5.28	0.62	0.56	0.51	0.47	0.43	0.40	0.37	0.35	0.33	0.31	0.30	0.28	0.27	0.26	0.24	0.23	0.19	0.17	0.14	0.13	0.12

Steel Framing at 600mm on Center (10% Framing Factor) – includes only studs at 600mm on center and top and bottom tracks

0.16	2.37	1.61	1.25	1.03	0.87	0.75	0.67	0.60	0.54	0.49	0.45	0.42	0.39	0.37	0.34	0.32	0.25	0.21	0.17	0.15	0.13
1.94	0.88	0.66	0.59	0.54	0.49	0.45	0.42	0.39	0.36	0.34	0.32	0.31	0.29	0.28	0.26	0.25	0.21	0.17	0.15	0.13	0.12
2.29	0.82	0.62	0.56	0.51	0.47	0.43	0.40	0.37	0.35	0.33	0.31	0.30	0.28	0.27	0.26	0.24	0.20	0.17	0.15	0.13	0.12
2.64	0.77	0.58	0.53	0.48	0.44	0.41	0.38	0.36	0.34	0.32	0.30	0.29	0.27	0.26	0.25	0.24	0.20	0.17	0.15	0.13	0.12
3.35	0.71	0.53	0.48	0.45	0.41	0.39	0.36	0.34	0.32	0.30	0.29	0.27	0.26	0.25	0.24	0.23	0.19	0.16	0.14	0.13	0.11
3.70	0.69	0.51	0.47	0.43	0.40	0.38	0.35	0.33	0.31	0.30	0.28	0.27	0.26	0.25	0.24	0.23	0.19	0.16	0.14	0.13	0.11
4.40	0.65	0.48	0.44	0.41	0.38	0.36	0.34	0.32	0.30	0.29	0.27	0.26	0.25	0.24	0.23	0.22	0.18	0.16	0.14	0.12	0.11
5.28	0.62	0.45	0.42	0.39	0.37	0.34	0.32	0.31	0.29	0.28	0.26	0.25	0.24	0.23	0.22	0.21	0.18	0.16	0.14	0.12	0.11

a. Refer to Section A9.2(b)(3)(i) for calculation method used to generate table values.

b. The cavity insulation rated RSI-value of 0.16 corresponds to no cavity insulation.

Revise as follows:

A9.2 Required Procedures. Two- or three-dimensional finite difference and finite volume computer models shall be an acceptable alternative method to calculating the thermal performance values for all assemblies and constructions listed below. The following procedures shall also be permitted to determine all alternative *U*-factors, *F*-factors, and *C*-factors:

a. Roofs (*no change*)

b. Above-Grade Walls

1. Mass walls: (*no change*)

2. Metal building walls: (*no change*)

3. Steel-framed walls: Determined by testing, or ~~series-path calculation method using the insulation/framing layer adjustment factors in Table A9.2-2, or in accordance with AISI S250 as modified herein;~~ one of the following calculation methods:

i. *Psi-factor* method:

$$R_{\text{eff,assembly}} = 1 / [(1/R_{\text{cav}}) + (\text{Psi})(L_f)] + R_s + R_{\text{af}} \quad \text{Eq A9.2(b)(3)-1}$$

$$U = 1 / R_{\text{eff,assembly}} \quad \text{Eq A9.2(b)(3)-2}$$

where,

$R_{\text{eff,assembly}}$ = the effective *R*-value for the overall *steel-framed wall* assembly

R_{cav} = the *rated R-value of insulation* for cavity insulation located between *wall framing members*

Psi = 0.075 Btu/ft-hr-F (0.130 W/m-K) linear *thermal transmittance* for cold-formed steel framing members

L_f = 12 x (FF / W_f), the length of steel framing per unit area of *opaque wall* assembly, ft/ft²
[SI: L_f = 1000 x (FF/ W_f), m/m²]

FF = framing fraction, which is the ratio of steel framing flange area to gross *opaque wall area*

W_f = steel framing flange width taken as a nominal 1.625 inches (41.3 mm)

R_s = the *R-value of continuous insulation* and all other continuous material layers on the interior and exterior surfaces of the *steel-framed wall* assembly.

R_{af} = the *R-value of interior and exterior air surface films*, taken as $R-0.17 + R-0.68 = R-0.85$ ($\text{RSI}-0.030 + \text{RSI}-0.120 = \text{R}-0.150$).

ii. Modified AISI S250 calculation method: Determine the *U-factor* of the base wall assembly, including only steel studs at a specified spacing and cavity insulation *R-value* between the studs in accordance with AISI S250, and excluding the *R-value* of all other material layers on the *steel-framed wall* assembly including air film *R-values*. The calculated *U-factor* shall be substituted for $1/R_{\text{cav}}$ in Eq. A9.2(b)(3)-1 to determine $R_{\text{eff,assembly}}$ of the overall *steel-framed wall* assembly including R_s and R_{af} . The term L_f in Eq. A9.2(b)(3)-1 shall include only the additional length of framing other than the studs that are spaced in accordance with the AISI S250 calculation procedure. The *U-factor* for the overall assembly shall be determined in accordance with Eq. A9.2(b)(3)-2.

i. ~~Where the *steel-framed wall* contains no cavity insulation and uses *continuous insulation* to satisfy the *U factor* maximum, the *steel-framed wall* member spacing is permitted to be installed at any on-center spacing.~~

ii. ~~Where the *steel-framed wall* contains framing at 24 in. on center with a 23% framing factor or framing at 16 in. on center with a 25% framing factor, the next lower framing member spacing input values shall be used when calculating using AISI S250.~~

iii. ~~Where the *steel-framed wall* contains less than 23% framing factors, AISI S250 shall be used without any modifications.~~

- ~~iv. Where the *steel framed wall* contains other than standard C shape framing members, the AISI S250 calculation option for other than standard C shape framing is permitted to be used.~~
- 4. Wood-framed walls: *(no change)*
- 5. Other walls: *(no change)*
- c. Below-Grade Walls *(no change)*
- d. Floors *(no change)*
- e. *Slab-on-Grade Floors* *(no change)*

Delete Table A9.2-2 as follows:

~~Table A9.2-2 Effective Insulation/Framing Layer R values for Wall Insulation Installed Between Steel Framing~~