

ASHRAE Standard 140-2011

Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests

Results for Autodesk Green Building Studio 2/13/2014

vs.

Informative Annex B8, Section B8.1 Example Results

Prepared By
Autodesk

Results Developed
13-Feb-2014

ASHRAE Standard 140-2011
Computer Programs, Program Authors, and Producers of Example Results for
Section 5.2 - Building Thermal Envelope and Fabric Load Tests

The programs used to generate the example results are described in Table B11-1. Under the computer program column, the first entry in each cell is the proper program name and version number. The entries in parentheses are the abbreviations for the programs generally used in the tables and charts which follow.

The second column ("Authoring Organization") indicates the national research facility, university, or industry organization with expertise in building science that wrote the simulation software.

The third column ("Implemented By") indicates the national research facility, university, or industry organization with expertise in building science that performed the simulations. The majority of organizations that performed simulations either ran software written by their organization or otherwise ran other building energy simulation software in addition to that written by their organization.

See Standard 140, Annex B11 for further details.

TABLE B11-1
Computer Programs, Program Authors, and Producers of Example Results

Computer Program (Abbrev.)	Authoring Organization	Example Results Produced by
BLAST-3.0 level 193 v.1 (BLAST-US/IT)	CERL, ^a United States (U.S.)	NREL, ^b U.S. Politecnico Torino, Italy
DOE-2.1D 14 (DOE21D)	LANL/LBNL, ^c U.S.	NREL, U.S.
ESP-RV8 (ESP-DMU)	Strathclyde University, United Kingdom (U.K.)	De Montfort University, U.K.
SERIRES/SUNCODE 5.7 (SRES/SUN)	NREL/Ecotope, U.S.	NREL, U.S.
SERIRES 1.2 (SRES-BRE)	NREL/BRE, ^d U.S./U.K.	BRE, U.K.
S3PAS	University of Sevilla, Spain	University of Sevilla, Spain
TASE	Tampere University, Finland	Tampere University, Finland
TRNSYS 13.1 (TSYS-BEL/BRE)	University of Wisconsin, U.S.	BRE, U.K. Vrije Universiteit (VUB) Brussels, Belgium

^aCERL-U.S. Army Construction Engineering Research Laboratories

^bNREL-National Renewable Energy Laboratory

^cLANL/LBNL-Los Alamos National Laboratory/Lawrence Berkeley National Laboratory

^dBRE-Building Research Establishment

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Note: The statistics in the tables below are based on the Standard 140 informative example results.
 These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-1. Annual Heating Loads (MWh)

Simulation Model: Organization or Country: Case	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES* BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
									Min	Max	Mean	(Max-Min)/ Mean** (%)		
600 Base Case, South Windows	4.296	4.773	5.709	5.226	5.596	4.882	4.872	5.362	4.296	5.709	5.090	27.8%	4.530	451.7%
610 S. Windows + Overhang	4.355	4.806	5.786	5.280	5.620	4.971	4.970	5.383	4.355	5.786	5.146	27.8%	4.607	459.3%
620 East & West Windows	4.613	5.049	5.944	5.554	5.734	5.564	5.073	5.728	4.613	5.944	5.407	24.6%	5.514	5.504
630 E&W Windows + Overhang & Fins	5.050	5.359	6.469	5.883	6.001	6.095	5.624	5.050	5.050	6.469	5.783	24.5%	5.357	5.335
640 Case 600 with Htg Temp. Setback	2.751	2.888	3.543	3.255	3.803	3.065	3.043	3.309	2.751	3.803	3.207	32.8%	2.660	2.781
650 Case 600 with Night Ventilation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	0.000
900 South Windows	1.170	1.610	1.872	1.897	1.988	1.730	1.655	2.041	1.170	2.041	1.745	49.9%	1.660	1.648
910 S. Windows + Overhang	1.575	1.862	2.254	2.174	2.282	2.063	2.097	2.220	1.575	2.282	2.066	34.2%	1.543	1.526
920 East & West Windows	3.313	3.752	4.255	4.093	4.058	4.235	3.776	4.300	3.313	4.300	3.973	24.8%	3.902	3.884
930 E&W Windows + Overhang & Fins	4.143	4.347	5.335	4.755	4.728	5.168	4.740	4.740	4.143	5.335	4.745	25.1%	4.332	4.303
940 Case 900 with Htg Temp. Setback	0.793	1.021	1.239	1.231	1.411	1.179	1.080	1.323	0.793	1.411	1.160	53.3%	1.130	1.136
950 Case 900 with Night Ventilation	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	---	---	0.000
960 Sunspace	2.311	2.664	2.928	2.884	2.851	2.943	3.373	2.816	2.311	3.373	2.846	37.3%	2.487	2.584
195 Solid Conduction	4.167								4.167	4.167	4.167	0.0%	4.649	4.632
200 Surface Convection (Int & Ext IR="off")	5.252								5.252	5.252	5.252	0.0%		
210 Infrared Radiation (Int IR="off", Ext IR="on")	6.456	6.559					6.554	6.967	6.456	6.967	6.634	7.7%		
215 Infrared Radiation (Int IR="on", Ext IR="off")	5.547								5.547	5.547	5.547	0.0%	7.290	726.8%
220 In-Depth Base Case	6.944	7.215	8.787	8.102	8.127	7.422	7.297	7.437	6.944	8.787	7.666	24.0%	8.362	836.5%
230 Infiltration	10.376	10.740	12.243	11.633	11.649	11.037	10.840	10.964	10.376	12.243	11.185	16.7%	11	1092.3%
240 Internal Gains	5.649	6.009	7.448	6.769	6.786	6.194	6.076	6.234	5.649	7.448	6.396	28.1%	7	7.041
250 Exterior Shortwave Absorptance	4.751	5.739	7.024	6.608	6.653	5.974	5.764	5.738	4.751	7.024	6.031	37.7%	6	5.913
270 South Solar Windows	4.510	4.930		5.341	5.920		5.047	5.489	4.510	5.920	5.206	27.1%	5	5.006
280 Cavity Albedo	4.675	5.125		5.937	6.148		5.279	5.841	4.675	6.148	5.501	26.8%	5	5.281
290 South Shading	4.577	4.959		5.406	5.942		5.132	5.509	4.577	5.942	5.254	26.0%	5.658	5.646
300 East/West Window	4.761	5.077		5.587	5.964		5.124	5.786	4.761	5.964	5.383	22.3%	5.835	5.826
310 East/West Shading	5.221	5.327		5.850	6.165		5.610		5.221	6.165	5.635	16.8%	5.795	5.787
320 Thermostat	3.859	4.209		4.627	5.141		4.348	4.840	3.859	5.141	4.504	28.5%	4.230	4.230
395 Low Mass Solid Conduction	4.984	4.799	5.835	5.199	5.201	4.967	4.855	4.839	4.799	5.835	5.085	20.4%	5.772	5.783
400 Low Mass Opaque Windows	6.900	7.075	8.770	7.966	7.973	7.287	7.166	7.326	6.900	8.770	7.558	24.7%	8.329	8.334
410 Low Mass Infiltration	8.596	8.873	10.506	9.726	9.734	9.019	8.936	9.085	8.596	10.506	9.309	20.5%	9	9.268
420 Low Mass Internal Gains	7.298	7.610	9.151	8.365	8.373	7.774	7.697	7.863	7.298	9.151	8.016	23.1%	8	7.923
430 Low Mass Ext. Shortwave Absorptance	5.429	6.488	7.827	7.178	7.186	6.662	6.500	6.510	5.429	7.827	6.723	35.7%	6.412	638.5%
440 Low Mass Cavity Albedo	4.449	4.987		5.652	5.811		5.098	5.642	4.449	5.811	5.273	25.8%	4.815	480.1%
800 High Mass Opaque Windows	4.868	5.953	7.228	6.611	6.600	6.161	5.940	5.861	4.868	7.228	6.153	38.4%	6.351	632.5%
810 High Mass Cavity Albedo	1.839	2.446		3.004	2.828		2.567	2.962	1.839	3.004	2.608	44.7%	2.152	213.0%

* SRES-BRE (SERIRES 1.2) simulations for cases with interior solar absorptance = 0.9 have an input error that likely affects annual heating and cooling loads by <0.2 MWh/y (2-3%); see Section B7.2.

** ABS[(Max-Min) / (Mean of Example Simulation Results)]

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Simulation Model: Organization or Country: Case	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES* BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
									Min	Max	Mean	(Max-Min)/ Mean** (%)		
600 Base Case, South Windows	6.137	6.433	7.079	7.278	7.964	6.492	6.492	6.778	6.137	7.964	6.832	26.7%	7.669	7.697
610 S. Windows + Overhang	3.915	4.851	4.852	5.448	5.778	4.764	4.601	5.506	3.915	5.778	4.964	37.5%	5.623	5.650
620 East & West Windows	3.417	4.092	4.334	4.633	5.004	4.011	3.901	4.351	3.417	5.004	4.218	37.6%	4.894	4.915
630 E&W Windows + Overhang & Fins	2.129	3.108	2.489	3.493	3.701	2.489	2.416	2.416	2.129	3.701	2.832	55.5%	2.924	2.942
640 Case 600 with Htg Temp. Setback	5.952	6.183	6.759	7.026	7.811	6.247	6.246	6.508	5.952	7.811	6.592	28.2%	7.259	7.351
650 Case 600 with Night Ventilation	4.816	5.140	5.795	5.894	6.545	5.088	5.119	5.456	4.816	6.545	5.482	31.5%	5.911	5.726
900 South Windows	2.132	2.600	2.455	3.165	3.415	2.572	2.485	2.599	2.132	3.415	2.678	47.9%	3.219	3.237
910 S. Windows + Overhang	0.821	1.533	0.976	1.872	1.854	1.428	1.326	1.767	0.821	1.872	1.447	72.6%	1.748	1.764
920 East & West Windows	1.840	2.616	2.440	2.943	3.092	2.457	2.418	2.613	1.840	3.092	2.552	49.1%	3.081	3.093
930 E&W Windows + Overhang & Fins	1.039	1.934	1.266	2.173	2.238	1.439	1.416	1.439	1.039	2.238	1.644	73.0%	1.770	1.781
940 Case 900 with Htg. Temp. Setback	2.079	2.536	2.340	3.036	3.241	2.489	2.383	2.516	2.079	3.241	2.578	45.1%	3.087	3.108
950 Case 900 with Night Ventilation	0.387	0.526	0.538	0.921	0.589	0.551	0.561	0.771	0.387	0.921	0.605	88.2%	0.768	0.746
960 Sunspace	0.488	0.666	0.428	0.803	0.718	0.643	0.411	0.786	0.411	0.803	0.618	63.4%	0.768	0.752
195 Solid Conduction	0.414								0.414	0.414	0.414	0.0%	0.617	0.621
200 Surface Convection (Int & Ext IR="off")	0.570								0.570	0.570	0.570	0.0%		
210 Infrared Radiation (Int IR="off", Ext IR="on")	0.162	0.613					0.668	0.641	0.162	0.668	0.521	97.1%		
215 Infrared Radiation (Int IR="on", Ext IR="off")	0.639								0.639	0.639	0.639	0.0%	0.644	0.644
220 In-Depth Base Case	0.186	0.701	0.399	0.827	0.835	0.734	0.737	0.683	0.186	0.835	0.638	101.8%	0.386	0.380
230 Infiltration	0.454	0.976	0.692	1.131	1.139	1.020	1.040	0.985	0.454	1.139	0.930	73.7%	0.621	0.613
240 Internal Gains	0.415	1.072	0.660	1.239	1.246	1.108	1.114	1.045	0.415	1.246	0.987	84.2%	0.643	0.636
250 Exterior Shortwave Absorptance	3.213	2.545	2.177	2.924	2.931	2.486	2.684	3.380	2.177	3.380	2.793	43.1%	3.327	3.342
270 South Solar Windows	7.528	8.670		9.828	10.350		8.764	8.714	7.528	10.350	8.976	31.4%	9.293	9.287
280 Cavity Albedo	4.873	5.895		6.511	7.114		5.761	6.257	4.873	7.114	6.069	36.9%	6.136	6.130
290 South Shading	5.204	7.011		7.871	8.089		6.699	7.431	5.204	8.089	7.051	40.9%	6.775	6.771
300 East/West Window	4.302	5.836		6.665	7.100		5.721	5.781	4.302	7.100	5.901	47.4%	6.032	6.020
310 East/West Shading	2.732	4.570		5.245	5.471		3.727	3.727	2.732	5.471	4.349	63.0%	3.647	3.639
320 Thermostat	5.061	5.906		6.725	7.304		5.956	5.663	5.061	7.304	6.103	36.8%	5.988	5.986
395 Low Mass Solid Conduction	0.000	0.011	0.000	0.016	0.014	0.010	0.010	0.011	0.000	0.016	0.009	177.1%		0.000
400 Low Mass Opaque Windows	0.000	0.040	0.002	0.061	0.058	0.042	0.045	0.044	0.000	0.061	0.036	167.3%	0.001	0.001
410 Low Mass Infiltration	0.000	0.059	0.010	0.084	0.084	0.063	0.067	0.065	0.000	0.084	0.054	155.5%	0.004	0.004
420 Low Mass Internal Gains	0.011	0.147	0.051	0.189	0.188	0.154	0.158	0.143	0.011	0.189	0.130	136.9%	0.034	0.034
430 Low Mass Ext. Shortwave Absorptance	0.542	0.617	0.422	0.704	0.684	0.563	0.617	0.875	0.422	0.875	0.628	72.1%	0.922	0.943
440 Low Mass Cavity Albedo	3.967	4.172		4.674	5.204		3.975	4.684	3.967	5.204	4.446	27.8%	4.698	4.729
800 High Mass Opaque Windows	0.113	0.224	0.055	0.272	0.222	0.195	0.207	0.325	0.055	0.325	0.202	133.9%	0.090	0.091
810 High Mass Cavity Albedo	1.052	1.405		1.711	1.708		1.191	1.624	1.052	1.711	1.449	45.5%	1.640	1.656

* SRES-BRE (SERIRES 1.2) simulations for cases with interior solar absorptance = 0.9 have an input error that likely affects annual heating and cooling loads by <0.2 MWh/y (2-3%); see Section B7.2.

Affected results for Cases 270 and 290 through 320 are indicated by italics

** ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio 2/13/2014 vs. Annex B8, Section B8.1 Example Results

By Autodesk, 13-Feb-2014
Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-4. Annual Hourly Integrated Peak Sensible Cooling Loads

Case	Simulation Model: Organization or Country:	ESP DMU		BLAST US-IT		DOE21D NREL		SRES-SUN NREL		SRES BRE*	S3PAS SPAIN		TSYS BEL-BRE		TASE FINLAND		Example Result Statistics				GBS 2/13/2014		GBS v3.4	
		kW	Date Hr	kW	Date Hr	kW	Date Hr	kW	Date Hr		kW	Date Hr	kW	Date Hr	kW	Date Hr	Min kW	Max kW	Mean kW	(Max-Min)/Mean** (%)	kW	Date Hr	kW	Date Hr
600 Base Case, South Windows		6.194	17-Oct 13	5.965	16-Oct 14	6.656	16-Oct 13	6.827	16-Oct 14		6.286	25-Nov 14	6.486	16-Oct 14	6.812	17-Oct 14	5.965	6.827	6.461	13.3%	6.615	17-Oct 15	6.620	17-Oct 15
610 S. Windows + Overhang		5.669	25-Nov 13	5.824	25-Nov 14	6.064	13-Jan 14	6.371	25-Nov 14		6.170	25-Nov 14	5.675	25-Nov 14	6.146	17-Oct 14	5.669	6.371	5.988	11.7%	6.009	13-Jan 14	6.018	13-Jan 14
620 East & West Windows		3.634	26-Jul 16	4.075	26-Jul 17	4.430	26-Jul 17	4.593	26-Jul 17		4.297	26-Jul 17	4.275	26-Jul 17	5.096	26-Jul 16	3.634	5.096	4.343	33.7%	4.515	26-Jul 18	4.518	26-Jul 18
630 E&W Windows + Overhang & Fins		3.072	26-Jul 16	3.704	26-Jul 17	3.588	26-Jul 17	4.116	26-Jul 17		3.665	26-Jul 17	3.608	26-Jul 17			3.072	4.116	3.626	28.8%	3.608	26-Jul 18	3.610	26-Jul 18
640 Case 600 with Htg. Temp. Setback		6.161	17-Oct 13	5.892	16-Oct 14	6.576	16-Oct 14	6.776	16-Oct 14		6.250	25-Nov 14	6.442	16-Oct 14	6.771	17-Oct 14	5.892	6.776	6.410	13.8%	6.531	17-Oct 15	6.571	17-Oct 15
650 Case 600 with Night Ventilation		6.031	17-Oct 13	5.831	16-Oct 14	6.516	16-Oct 14	6.671	16-Oct 14		6.143	25-Nov 14	6.378	17-Oct 14	6.679	17-Oct 14	5.831	6.679	6.321	13.4%	6.412	17-Oct 15	6.413	17-Oct 15
900 South Windows		2.888	17-Oct 14	3.155	06-Oct 15	3.458	17-Oct 14	3.871	17-Oct 14		3.334	17-Oct 15	3.567	17-Oct 15	3.457	17-Oct 15	2.888	3.871	3.390	29.0%	3.650	17-Oct 16	3.650	17-Oct 16
910 S. Windows + Overhang		1.896	17-Oct 15	2.500	21-Oct 15	2.336	17-Oct 15	3.277	17-Oct 15		2.786	17-Oct 15	2.792	17-Oct 15	3.147	17-Oct 15	1.896	3.277	2.676	51.6%	2.911	17-Oct 16	2.911	17-Oct 16
920 East & West Windows		2.385	26-Jul 16	2.933	26-Jul 17	3.109	26-Jul 17	3.487	26-Jul 17		3.071	26-Jul 17	3.050	26-Jul 17	3.505	26-Jul 17	2.385	3.505	3.077	36.4%	3.360	26-Jul 18	3.359	26-Jul 18
930 E&W Windows + Overhang & Fins		1.873	26-Jul 17	2.546	26-Jul 17	2.388	26-Jul 18	3.080	26-Jul 17		2.486	26-Jul 17	2.498	26-Jul 17			1.873	3.080	2.479	48.7%	2.552	26-Jul 18	2.550	26-Jul 18
940 Case 900 with Htg. Temp. Setback		2.888	17-Oct 14	3.155	06-Oct 15	3.458	17-Oct 14	3.871	17-Oct 14		3.334	17-Oct 15	3.567	17-Oct 15	3.457	17-Oct 15	2.888	3.871	3.390	29.0%	3.657	17-Oct 16	3.657	17-Oct 16
950 Case 900 with Night Ventilation		2.033	02-Sep 14	2.621	02-Sep 15	2.664	02-Sep 15	3.170	02-Sep 14		2.677	02-Sep 15	2.696	02-Sep 15	2.867	02-Sep 14	2.033	3.170	2.674	42.5%	3.026	02-Sep 16	3.103	02-Sep 16
960 Sunspace		0.953	16-Aug 16	1.144	26-Jul 16	1.057	26-Jul 16	1.370	26-Jul 16		1.179	26-Jul 16	1.378	26-Jul 16	1.403	26-Jul 16	0.953	1.403	1.212	37.1%	1.320	26-Jul 17	1.319	26-Jul 17
195 Solid Conduction		0.651	26-Jul 15														0.651	0.651	0.651	0.0%	0.911	26-Jul 19	0.807	26-Jul 18
200 Surface Convection (Int & Ext IR="off")		0.863	16-Aug 14														0.863	0.863	0.863	0.0%		26-Jul 18		
210 Infrared Radiation (Int IR="off", Ext IR="on")		0.476	16-Aug 16	1.017	26-Jul 15								1.068	26-Jul 16	1.142	26-Jul 15	0.476	1.142	0.926	71.9%		26-Jul 17		
215 Infrared Radiation (Int IR="on", Ext IR="off")		1.007	11-Aug 14														1.007	1.007	1.007	0.0%	1.122	26-Jul 18	1.109	26-Jul 17
220 In-Depth Base Case		0.560	27-Jul 15	1.166	26-Jul 15	0.937	27-Jul 14	1.340	26-Jul 15		1.215	26-Jul 16	1.179	26-Jul 16	1.213	26-Jul 15	0.560	1.340	1.087	71.7%	0.890	26-Jul 17	0.882	26-Jul 17
230 Infiltration		1.059	27-Jul 15	1.646	26-Jul 15	1.455	27-Jul 14	1.875	26-Jul 15		1.700	26-Jul 15	1.708	26-Jul 16	1.749	26-Jul 15	1.059	1.875	1.599	51.0%	1.652	16-Aug 18	1.633	16-Aug 18
240 Internal Gains		0.739	27-Jul 15	1.347	26-Jul 15	1.119	27-Jul 14	1.540	26-Jul 15		1.398	26-Jul 16	1.361	26-Jul 16	1.397	26-Jul 15	0.739	1.540	1.272	63.0%	1.067	26-Jul 18	1.059	26-Jul 17
250 Exterior Shortwave Absorptance		3.360	05-Sep 12	3.036	05-Sep 12	2.605	05-Sep 11	2.590	26-Aug 14		2.258	26-Aug 14	3.228	05-Sep 13	4.912	05-Sep 12	2.258	4.912	3.141	84.5%	2.514	26-Aug 16	2.376	26-Aug 16
270 South Windows		6.356	25-Nov 13	6.641	25-Nov 14			7.234	16-Oct 14				6.764	17-Oct 14	6.867	16-Oct 14	6.356	7.234	6.772	13.0%	6.635	17-Oct 15	6.631	17-Oct 15
280 Cavity Albedo		4.444	17-Oct 13	4.631	25-Nov 13			5.220	16-Oct 14				4.786	16-Oct 14	5.236	16-Oct 14	4.444	5.236	4.863	16.3%	4.744	16-Oct 15	4.740	16-Oct 15
290 South Shading		6.269	13-Jan 13	6.505	25-Nov 14			6.976	25-Nov 14				6.203	25-Nov 14	6.621	25-Nov 14	6.203	6.976	6.525	11.9%	6.392	13-Jan 14	6.390	13-Jan 14
300 East/West Window		3.404	26-Jul 16	4.093	26-Jul 17			4.657	26-Jul 17				4.278	26-Jul 17	4.929	26-Jul 17	3.404	4.929	4.272	35.7%	4.304	26-Jul 18	4.295	26-Jul 18
310 East/West Shading		2.848	26-Jul 16	3.749	30-Jun 17			4.164	26-Jul 17				3.589	26-Jul 17			2.848	4.164	3.587	36.7%	3.369	26-Jul 19	3.361	26-Jul 18
320 Thermostat		5.701	25-Nov 13	5.946	25-Nov 14			6.553	16-Oct 14				6.178	17-Oct 14	6.141	16-Oct 14	5.701	6.553	6.104	14.0%	5.762	17-Oct 15	5.759	17-Oct 15
395 Low Mass Solid Conduction		0.000		0.362	26-Jul 18	0.000		0.394	26-Jul 17		0.356	26-Jul 18	0.363	26-Jul 18	0.345	26-Jul 18	0.000	0.394	0.260	151.6%				0.000
400 Low Mass Opaque Windows		0.000		0.581	26-Jul 17	0.265	27-Jul 17	0.666	26-Jul 16		0.612	26-Jul 17	0.613	26-Jul 17	0.572	26-Jul 17	0.000	0.666	0.473	140.9%	0.198	26-Jul 19	0.193	26-Jul 19
410 Low Mass Infiltration		0.035	27-Jul 16	0.699	26-Jul 17	0.413	27-Jul 17	0.814	26-Jul 15		0.724	26-Jul 16	0.743	26-Jul 17	0.710	26-Jul 17	0.035	0.814	0.591	131.8%	0.323	27-Jul 18	0.317	27-Jul 18
420 Low Mass Internal Gains		0.258	27-Jul 15	0.923	26-Jul 15	0.631	27-Jul 15	1.047	26-Jul 15		0.938	26-Jul 15	0.938	26-Jul 16	0.921	26-Jul 15	0.258	1.047	0.808	97.7%	0.622	16-Aug 18	0.614	16-Aug 18
430 Low Mass Ext. Shortwave Absorptance		1.493	16-Aug 14	1.772	26-Aug 14	1.427	16-Aug 14	1.762	26-Jul 15		1.575	26-Jul 15	1.798	05-Sep 13	2.578	05-Sep 12	1.427	2.578	1.772	64.9%	2.042	15-Aug 15	2.056	15-Aug 15
440 Low Mass Cavity Albedo		4.546	17-Oct 13	4.424	16-Oct 14			5.053	16-Oct 14				4.686	16-Oct 14	5.278	17-Oct 14	4.424	5.278	4.797	17.8%	4.809	17-Oct 15	4.816	17-Oct 15
800 High Mass Opaque Windows		0.585	27-Jul 14	0.967	16-Aug 14	0.743	28-Jul 14	1.352	27-Jul 14		1.028	27-Jul 15	0.983	16-Aug 14	1.358	05-Sep 12	0.585	1.358	1.002	77.1%	0.744	28-Jul 16	0.745	28-Jul 16
810 High Mass Cavity Albedo		1.852	02-Sep 14	2.357	26-Aug 14			2.991	02-Sep 14				2.344	02-Sep 14	2.862	02-Sep 14	1.852	2.991	2.481	45.9%	2.534	02-Sep 16	2.534	02-Sep 16

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.

** ABS((Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio 2/13/2014 vs. Annex B8, Section B8.1 Example Results

By Autodesk, 13-Feb-2014
 Note: The statistics in the tables below are based on the Standard 140 Informative example results.
 These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-5. Free-Float Temperature Output

MAXIMUM ANNUAL HOURLY INTEGRATED ZONE TEMPERATURE														Example Result Statistics				GBS 2/13/2014			GBS v3.4										
Case	Simulation Model:		ESP		BLAST		DOE21D		SRES-SUN		SRES		S3PAS		TSYS		TASE		Min	Max	Mean	(Max-Min)	Autodesk			Autodesk					
	Organization or Country:	DMU	US-IT	US-IT	NREL	NREL	NREL	NREL	BRE*	SPAIN	BEL-BRE	FINLAND	T (°C)	Date	Hr	T (°C)	Date	Hr					T (°C)	Date	Hr	T (°C)	Date	Hr			
600FF - Low Mass with S. Windows	64.9	17-Oct	15	65.1	16-Oct	15	69.5	17-Oct	15	68.6	16-Oct	15	64.9	16-Oct	16	65.3	17-Oct	16	65.3	15-Oct	16	64.9	69.5	66.2	6.9%	67.0	17-Oct	16	67.1	17-Oct	16
900FF - High Mass with S. Windows	41.8	17-Oct	15	43.4	02-Sep	16	42.7	02-Sep	15	44.8	02-Sep	15	43.0	02-Sep	15	42.5	17-Oct	15	43.2	15-Sep	15	41.8	44.8	43.1	6.9%	44.7	17-Oct	16	44.8	17-Oct	16
650FF Case 600FF with Night Ventilation	63.2	17-Oct	15	63.5	16-Oct	15	68.2	17-Oct	15	67.0	16-Oct	15	63.3	16-Oct	16	63.7	17-Oct	16	63.8	16-Oct	16	63.2	68.2	64.7	7.7%	64.1	17-Oct	16	64.1	17-Oct	16
950FF Case 900FF with Night Ventilation	35.5	02-Sep	16	36.2	02-Sep	16	35.9	02-Sep	16	38.5	02-Sep	15	36.1	02-Sep	16	35.7	02-Sep	15	37.6	15-Sep	16	35.5	38.5	36.5	8.1%	36.9	17-Oct	16	37.1	17-Oct	16
960 Sunspace	48.9	17-Oct	15	48.9	06-Oct	15	49.0	17-Oct	15	51.0	17-Oct	15	50.2	17-Oct	15	55.3	17-Oct	15	48.9	15-Oct	15	48.9	55.3	50.3	12.8%	51.2	17-Oct	16	50.4	17-Oct	15

MINIMUM ANNUAL HOURLY INTEGRATED ZONE TEMPERATURE														Example Result Statistics				GBS 2/13/2014			GBS v3.4										
Case	Simulation Model:		ESP		BLAST		DOE21D		SRES-SUN		SRES		S3PAS		TSYS		TASE		Min	Max	Mean	(Max-Min)	Autodesk			Autodesk					
	Organization or Country:	DMU	US-IT	US-IT	NREL	NREL	NREL	NREL	BRE*	SPAIN	BEL-BRE	FINLAND	T (°C)	Date	Hr	T (°C)	Date	Hr					T (°C)	Date	Hr	T (°C)	Date	Hr			
600FF - Low Mass with S. Windows	-15.6	04-Jan	7	-17.1	04-Jan	8	-18.8	04-Jan	8	-19.0	04-Jan	7	-17.9	04-Jan	8	-17.9	04-Jan	7	-18.5	08-Jan	9	-18.8	-15.6	-17.6	18.3%	-16.1	03-Jan	8	-16.1	03-Jan	8
900FF - High Mass with S. Windows	-1.6	04-Jan	8	-3.2	04-Jan	8	-4.3	04-Jan	8	-4.5	04-Jan	8	-4.0	04-Jan	8	-6.4	04-Jan	8	-5.6	08-Jan	9	-6.4	-1.6	-4.2	111.9%	-2.0	04-Jan	8	-1.9	04-Jan	8
650FF Case 600FF with Night Ventilation	-22.6	04-Jan	6	-23.0	04-Jan	7	-21.6	04-Jan	2	-23.0	04-Jan	2	-22.9	04-Jan	2	-22.8	04-Jan	7	-22.9	02-Jan	23	-23.0	-21.6	-22.7	6.2%	-17.3	04-Jan	8	-17.3	04-Jan	8
950FF Case 900FF with Night Ventilation	-19.5	04-Jan	6	-20.0	04-Jan	7	-18.6	04-Jan	7	-19.7	04-Jan	7	-20.2	04-Jan	7	-19.3	04-Jan	8	-20.0	07-Jan	22	-20.2	-18.6	-19.6	8.2%	-14.5	04-Jan	7	-14.5	04-Jan	7
960 Sunspace	2.7	06-Feb	6	1.6	06-Feb	7	3.9	06-Feb	7	3.1	06-Feb	7	1.4	06-Feb	6	-2.8	04-Jan	8	-0.4	05-Feb	7	-2.8	3.9	1.4	492.6%	6.6	06-Feb	7	5.8	06-Feb	7

AVERAGE ANNUAL HOURLY INTEGRATED ZONE TEMPERATURE														Example Result Statistics				GBS 2/13/2014			GBS v3.4								
Case	Simulation Model:		ESP		BLAST		DOE21D		SRES-SUN		SRES		S3PAS		TSYS		TASE		Min	Max	Mean	(Max-Min)	Autodesk			Autodesk			
	Organization or Country:	DMU	US-IT	US-IT	NREL	NREL	NREL	NREL	BRE*	SPAIN	BEL-BRE	FINLAND	T (°C)	Date	Hr	T (°C)	Date	Hr					T (°C)	Date	Hr	T (°C)	Date	Hr	
600FF - Low Mass with S. Windows	25.1			25.4			24.6			25.5			25.9			24.5			24.2		25.9	25.1	6.8%	27.0			27.1		
900FF - High Mass with S. Windows	25.5			25.9			24.7			25.5			25.7			24.5			24.5		25.9	25.2	5.9%	27.1			27.1		
650FF Case 600FF with Night Ventilation	18.2			18.7			19.1			19.0			19.6			18.0			18.0		19.6	18.7	8.7%	20.2			19.9		
950FF Case 900FF with Night Ventilation	14.1			14.3			14.3			15.0			14.3			14.0			14.0		15.0	14.4	6.7%	15.8			15.9		
960 Sunspace	27.5			27.7			28.0			28.7			28.5			28.0			28.4		29.0	28.0	9.0%	30.2			29.7		

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.
 ** ABS (Max-Min) / (Mean of Example Simulation Results)

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio 2/13/2014 vs. Annex B8, Section B8.1 Example Results
By Autodesk , 13-Feb-2014

Note: The statistics in the tables below are based on the Standard 140 informative example results.
 These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-6. Low Mass Basic Sensitivity Tests

ANNUAL HEATING [MWh]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
Case	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
610-600 Heat, S. Shade	0.059	0.033	0.077	0.054	0.024	0.089	0.098	0.021	0.021	0.098	0.057	135.4%	0.077	0.075	
620-600 Heat, E&W Orient.	0.317	0.276	0.235	0.328	0.138	0.682	0.201	0.366	0.138	0.682	0.318	171.1%	0.984	0.987	
630-620 Heat, E&W Shade	0.437	0.310	0.525	0.329	0.267	0.531	0.551		0.267	0.551	0.421	67.4%	-0.158	-0.169	
640-600 Heat, Htg. Setback	-1.545	-1.885	-2.166	-1.971	-1.793	-1.817	-1.829		-2.166	-1.545	-1.882	33.0%	-1.870	-1.736	

ANNUAL SENSIBLE COOLING [MWh]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
Case	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
610-600 Cool, S. Shade	-2.222	-1.582	-2.227	-1.830	-2.186	-1.728	-1.891	-1.272	-2.227	-1.272	-1.867	51.1%	-2.046	-2.048	
620-600 Cool, E&W Orient.	-2.720	-2.341	-2.745	-2.645	-2.960	-2.481	-2.591	-2.427	-2.960	-2.341	-2.614	23.7%	-2.775	-2.782	
630-620 Cool, E&W Shade	-1.288	-0.984	-1.845	-1.140	-1.303	-1.522	-1.485		-1.845	-0.984	-1.367	63.0%	-1.970	-1.973	
640-600 Cool, Htg. Setback	-0.185	-0.250	-0.320	-0.252	-0.153	-0.245	-0.246	-0.270	-0.320	-0.153	-0.240	69.5%	-0.410	-0.346	
650-600 Cool, Night Vent	-1.321	-1.293	-1.284	-1.384	-1.419	-1.404	-1.373		-1.419	-1.284	-1.350	10.0%	-1.757	-1.971	

PEAK HEATING [kW]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
Case	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
610-600 Heat, S. Shade	0.000	0.001	-0.011	0.000		0.000	-0.008	0.000	-0.011	0.001	-0.003	458.2%	-0.010	-0.011	
620-600 Heat, E&W Orient.	0.154	0.001	0.001	0.019		0.240	-0.008	0.025	-0.008	0.240	0.062	402.7%	0.262	0.266	
630-620 Heat, E&W Shade	0.001	0.000	-0.021	0.003		0.001	0.000		-0.021	0.003	-0.003	900.0%	-0.267	-0.271	
640-600 Heat, Htg. Setback	1.795	1.546	1.898	2.272		2.310	1.792	2.600	1.546	2.600	2.030	51.9%	2	1.774	

PEAK SENSIBLE COOLING [kW]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
Case	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
610-600 Cool, S. Shade	-0.525	-0.141	-0.592	-0.456		-0.116	-0.811	-0.666	-0.811	-0.116	-0.472	147.1%	-1	-0.602	
620-600 Cool, E&W Orient.	-2.560	-1.890	-2.226	-2.234		-1.989	-2.211	-1.716	-2.560	-1.716	-2.118	39.8%	-2.100	-1.500	
630-620 Cool, E&W Shade	-0.562	-0.371	-0.842	-0.477		-0.632	-0.667		-0.842	-0.371	-0.592	79.6%	-0.907	-0.908	
640-600 Cool, Htg. Setback	-0.033	-0.073	-0.080	-0.051		-0.036	-0.044	-0.041	-0.080	-0.033	-0.051	91.8%	-0.084	-0.049	
650-600 Cool, Night Vent	-0.163	-0.134	-0.140	-0.156		-0.143	-0.108	-0.133	-0.163	-0.108	-0.140	39.2%	-0.203	-0.207	

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.

** ABS (Max-Min) / (Mean of Example Simulation Results)]

Table B8-7. High Mass Basic Sensitivity Tests

ANNUAL HEATING [MWh]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
900-600 Mass, Heat	-3.126	-3.163	-3.837	-3.329	-3.608	-3.152	-3.217	-3.321	-3.837	-3.126	-3.344	21.3%	-2.870	-2.869	
910-900 Heat, S. Shade	0.405	0.252	0.382	0.277	0.294	0.333	0.442	0.179	0.179	0.442	0.321	82.1%	-0.116	-0.122	
920-900 Heat, E&W Orient.	2.143	2.142	2.383	2.196	2.070	2.505	2.121	2.259	2.070	2.505	2.227	19.5%	2.242	2.236	
930-920 Heat, E&W Shade	0.830	0.595	1.080	0.662	0.670	0.933	0.964		0.595	1.080	0.819	59.2%	0.430	0.420	
940-900 Heat, Htg. Setback	-0.377	-0.589	-0.633	-0.666	-0.577	-0.551	-0.575	-0.718	-0.718	-0.377	-0.586	58.2%	-0.530	-0.512	
960-900 Heat, Sunspace	1.141	1.054	1.056	0.987	0.863	1.213	1.718	0.775	0.775	1.718	1.101	85.7%	0.827	0.936	

ANNUAL SENSIBLE COOLING [MWh]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
900-600 Mass, Cool	-4.005	-3.833	-4.624	-4.113	-4.549	-3.920	-4.007	-4.179	-4.624	-3.833	-4.154	19.0%	-4.450	-4.461	
910-900 Cool, S. Shade	-1.311	-1.067	-1.479	-1.293	-1.561	-1.144	-1.159	-0.832	-1.561	-0.832	-1.231	59.2%	-1.471	-1.472	
920-900 Cool, E&W Orient.	-0.292	0.016	-0.015	-0.222	-0.323	-0.115	-0.067	0.014	-0.323	0.016	-0.126	270.1%	-0.138	-0.143	
930-920 Cool, E&W Shade	-0.801	-0.682	-1.174	-0.770	-0.854	-1.018	-1.002		-1.174	-0.682	-0.900	54.7%	-1.312		
940-900 Cool, Htg. Setback	-0.053	-0.064	-0.115	-0.129	-0.174	-0.083	-0.102	-0.083	-0.174	-0.053	-0.100	120.5%	-0.132	-0.128	
950-900 Cool, Night Vent	-1.745	-2.074	-1.917	-2.244	-2.826	-2.021	-1.924	-1.828	-2.826	-1.745	-2.072	52.2%	-2.451	-2.491	
960-900 Cool, Sunspace	-1.644	-1.934	-2.027	-2.362	-2.697	-1.929	-2.074	-1.813	-2.697	-1.644	-2.060	51.1%	-2.451	-2.485	

PEAK HEATING [kW]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
900-600 Mass, Heat	-0.587	-0.487	-0.488	-0.498		-0.429	-0.414	-0.557	-0.587	-0.414	-0.494	35.0%	-0.290	-0.288	
910-900 Heat, S. Shade	0.008	0.003	0.007	0.004		0.010	0.019	0.004	0.003	0.019	0.008	207.6%	-0.103	-0.105	
920-900 Heat, E&W Orient.	0.458	0.250	0.248	0.253		0.421	0.192	0.264	0.192	0.458	0.298	89.4%	0.273	0.275	
930-920 Heat, E&W Shade	0.047	0.029	0.027	0.029		0.035	0.036		0.027	0.047	0.034	59.1%	-0.237	-0.242	
940-900 Heat, Htg. Setback	1.130	1.575	2.108	2.356		2.509	1.606	2.631	1.130	2.631	1.988	75.5%	2.133	2.136	
960-900 Heat, Sunspace	-0.440	-0.702	-0.830	-0.897		-0.756	-0.995	-1.018	-1.018	-0.440	-0.805	71.8%	-1.039		

PEAK SENSIBLE COOLING [kW]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
900-600 Mass, Cool	-3.306	-2.810	-3.198	-2.956		-2.952	-2.919	-3.355	-3.355	-2.810	-3.071	17.7%	-2.965	-2.970	
910-900 Cool, S. Shade	-0.992	-0.655	-1.122	-0.594		-0.548	-0.775	-0.310	-1.122	-0.310	-0.714	113.8%	-0.739	-0.739	
920-900 Cool, E&W Orient.	-0.503	-0.222	-0.349	-0.384		-0.263	-0.517	0.048	-0.517	0.048	-0.313	180.5%	-0.290	-0.291	
930-920 Cool, E&W Shade	-0.512	-0.387	-0.721	-0.407		-0.585	-0.552		-0.721	-0.387	-0.527	63.3%	-0.808	-0.809	
940-900 Cool, Htg. Setback	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	0.000	0.000	----	0.007	0.007	
950-900 Cool, Night Vent	-0.855	-0.534	-0.794	-0.701		-0.657	-0.881	-0.590	-0.881	-0.534	-0.716	48.4%	-0.624	-0.547	
960-900 Cool, Sunspace	-1.935	-2.011	-2.401	-2.501		-2.155	-2.189	-2.054	-2.501	-1.935	-2.178	26.0%	-2.330	-2.332	

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.

** ABS (Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio 2/13/2014 vs. Annex B8, Section B8.1 Example Results
 By Autodesk , 13-Feb-2014

Note: The statistics in the tables below are based on the Standard 140 informative example results.
 These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-8. Low Mass In-Depth (Cases 195 thru 320) Sensitivity Tests

ANNUAL HEATING [MWh]									Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES* BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)		
200-195 Surface Convection	1.085								1.085	1.085	1.085	0.0%		
210-200 Ext IR (Int IR "off")	1.204								1.204	1.204	1.204	0.0%		
220-215 Ext IR (Int IR "on")	1.397								1.397	1.397	1.397	0.0%	1.072	1.097
215-200 Int IR (Ext IR "off")	0.295								0.295	0.295	0.295	0.0%		
220-210 Int IR (Ext IR "on")	0.488	0.656					0.743	0.470	0.470	0.743	0.589	46.3%		
230-220 Infiltration	3.432	3.525	3.456	3.531	3.522	3.615	3.543	3.527	3.432	3.615	3.519	5.2%	2.577	2.558
240-220 Internal Gains	-1.295	-1.206	-1.339	-1.333	-1.341	-1.228	-1.221	-1.203	-1.341	-1.203	-1.271	10.9%	-1.322	-1.324
250-220 Ext Solar Abs.	-2.193	-1.476	-1.763	-1.494	-1.474	-1.448	-1.533	-1.699	-2.193	-1.448	-1.635	45.6%	-2.425	-2.452
270-220 South Windows	-2.434	-2.285		-2.761	-2.207		-2.250	-1.948	-2.761	-1.948	-2.314	35.1%	-3.353	-3.359
280-270 Cavity Albedo	0.165	0.195		0.596	0.228		0.232	0.352	0.165	0.596	0.295	146.3%	0.275	0.275
320-270 Thermostat	-0.651	-0.721		-0.714	-0.779		-0.699	-0.649	-0.779	-0.649	-0.702	18.5%	-0.779	-0.777
290-270 South Shading	0.067	0.029		0.065	0.022		0.085	0.020	0.067	0.085	0.048	135.4%	0.649	0.640
300-270 E&W Windows	0.251	0.147		0.246	0.044		0.077	0.297	0.044	0.297	0.177	142.9%	0.827	0.820
310-300 E&W Shading	0.460	0.250		0.263	0.201		0.486		0.201	0.486	0.332	85.8%	-0.040	-0.039
ANNUAL SENSIBLE COOLING [MWh]									Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES* BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)		
200-195 Surface Convection	0.156								0.156	0.156	0.156	0.0%		
210-200 Ext IR (Int IR "off")	-0.408								-0.408	-0.408	-0.408	0.0%		
220-215 Ext IR (Int IR "on")	-0.453								-0.453	-0.453	-0.453	0.0%	0	-0.263
215-200 Int IR (Ext IR "off")	0.069								0.069	0.069	0.069	0.0%		
220-210 Int IR (Ext IR "on")	0.024	0.088					0.069	0.042	0.024	0.088	0.056	114.8%		
230-220 Infiltration	0.268	0.275	0.293	0.304	0.304	0.286	0.303	0.302	0.268	0.304	0.292	12.3%	0	0.233
240-220 Internal Gains	0.229	0.371	0.261	0.412	0.411	0.374	0.377	0.362	0.229	0.412	0.350	52.3%	0.258	0.255
250-220 Ext Solar Abs.	3.027	1.844	1.778	2.097	2.096	1.752	1.947	2.697	1.752	3.027	2.155	59.2%	2.941	2.962
270-220 South Windows	7.342	7.969		9.001	9.515		8.027	8.031	7.342	9.515	8.314	26.1%	8.908	8.907
280-270 Cavity Albedo	-2.655	-2.775		-3.317	-3.236		-3.003	-2.457	-3.317	-2.457	-2.907	29.6%	-3.158	-3.157
320-270 Thermostat	-2.467	-2.764		-3.103	-3.046		-2.808	-3.051	-3.103	-2.467	-2.873	22.1%	-3.305	-3.301
290-270 South Shading	-2.324	-1.659		-1.957	-2.261		-2.065	-1.283	-2.324	-1.283	-1.925	54.1%	-2.518	-2.517
300-270 E&W Windows	-3.226	-2.834		-3.163	-3.250		-3.043	-2.933	-3.250	-2.834	-3.075	13.5%	-3	-3.267
310-300 E&W Shading	-1.570	-1.266		-1.420	-1.629		-1.994		-1.994	-1.266	-1.576	46.2%	-2	-2.381
PEAK HEATING [kW]									Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES* BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)		
200-195 Surface Convection	0.647								0.647	0.647	0.647	0.0%		
210-200 Ext IR (Int IR "off")	0.050								0.050	0.050	0.050	0.0%		
220-215 Ext IR (Int IR "on")	0.080								0.080	0.080	0.080	0.0%	0.155	0.160
215-200 Int IR (Ext IR "off")	0.136								0.136	0.136	0.136	0.0%		
220-210 Int IR (Ext IR "on")	0.166	0.307					0.356	0.195	0.166	0.356	0.256	74.1%		
230-220 Infiltration	1.519	1.704	1.529	1.584		1.811	1.556	1.587	1.519	1.811	1.613	18.1%	1.389	1.378
240-220 Internal Gains	-0.182	-0.180	-0.183	-0.200		-0.189	-0.183	-0.187	-0.200	-0.180	-0.186	10.7%	-0.181	-0.182
250-220 Ext Solar Abs.	-0.001	-0.001	0.000	0.000		-0.007	0.000	0.005	-0.007	0.005	-0.001	2100.0%	-0.009	-0.009
270-220 South Windows	-0.004	-0.003		-0.034			0.000	0.218	-0.034	0.218	0.035	711.9%	-0.023	-0.024
280-270 Cavity Albedo	0.001	0.001		0.024			0.000	0.021	0.000	0.024	0.009	255.3%	-0.010	-0.010
320-270 Thermostat	-0.002	-0.002		-0.010			0.000	-0.003	-0.010	0.000	-0.003	294.1%	-0.001	0.000
290-270 South Shading	0.000	0.000		0.000			-0.008	0.000	-0.008	0.000	-0.002	500.0%	0.276	0.273
300-270 E&W Windows	0.151	-0.001		0.020			-0.008	0.032	-0.008	0.151	0.039	411.4%	0.296	0.294
310-300 E&W Shading	0.001	0.001		-0.012			0.000		-0.012	0.001	-0.002	520.0%	-0.307	-0.304
PEAK SENSIBLE COOLING [kW]									Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES* BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)		
200-195 Surface Convection	0.212								0.212	0.212	0.212	0.0%		
210-200 Ext IR (Int IR "off")	-0.387								-0.387	-0.387	-0.387	0.0%		
220-215 Ext IR (Int IR "on")	-0.447								-0.447	-0.447	-0.447	0.0%	-0.232	-0.227
215-200 Int IR (Ext IR "off")	0.144								0.144	0.144	0.144	0.0%		
220-210 Int IR (Ext IR "on")	0.084	0.149					0.111	0.071	0.071	0.149	0.104	75.2%		
230-220 Infiltration	0.499	0.480	0.518	0.535		0.485	0.529	0.536	0.480	0.536	0.512	10.9%	0.762	0.751
240-220 Internal Gains	0.179	0.181	0.182	0.200		0.183	0.183	0.184	0.179	0.200	0.185	11.4%	0.177	0.177
250-220 Ext Solar Abs.	2.800	1.870	1.668	1.250		1.043	2.049	3.699	1.043	3.699	2.054	129.3%	1.624	1.494
270-220 South Windows	5.796	5.475		5.894			5.585	5.654	5.475	5.894	5.681	7.4%	5.745	5.749
280-270 Cavity Albedo	-1.912	-2.010		-2.014			-1.978	-1.631	-2.014	-1.631	-1.909	20.1%	-1.891	-1.891
320-270 Thermostat	-0.655	-0.695		-0.681			-0.586	-0.726	-0.655	-0.695	-0.669	20.9%	-0.873	-0.872
290-270 South Shading	-0.087	-0.086		-0.258			-0.561	-0.246	-0.087	-0.086	-0.248	191.9%	-0.243	-0.241
300-270 E&W Windows	-2.952	-2.548		-2.577			-2.486	-1.938	-2.952	-1.938	-2.500	40.6%	-2.331	-2.336
310-300 E&W Shading	-0.556	-0.344		-0.493			-0.689		-0.689	-0.344	-0.520	66.3%	-0.935	-0.934

* SRES-BRE (SERIRES 1.2) simulations for cases with interior solar absorptance = 0.9 have an input error that likely affects annual heating and cooling load sensitivities by <0.2 MWh/y. (<6% for heating, <3% for cooling); see Section B7.2. Affected results involving Cases 270 and 290 through 320 are indicated with italics.
 ** ABS[(Max-Min) / (Mean of Example Simulation Results)]

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio 2/13/2014 vs. Annex B8, Section B8.1 Example Results
By Autodesk , 13-Feb-2014**

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-9. Low Mass In-Depth (Cases 395 thru 440) Sensitivity Tests

ANNUAL HEATING [MWh]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
400-395 Surf. Conv. & IR	1.916	2.276	2.935	2.767	2.772	2.320	2.311	2.487	1.916	2.935	2.473	41.2%	2.558	255.1%	
410-400 Infiltration	1.696	1.798	1.736	1.760	1.761	1.732	1.770	1.759	1.696	1.798	1.752	5.8%	0.941	93.4%	
420-410 Internal Gains	-1.298	-1.263	-1.355	-1.361	-1.361	-1.245	-1.239	-1.222	-1.361	-1.222	-1.293	10.8%	-1.343	-1.345	
430-420 Ext Solar Abs.	-1.869	-1.122	-1.324	-1.187	-1.187	-1.112	-1.197	-1.353	-1.869	-1.112	-1.294	58.5%	-1.515	-1.538	
600-430 South Windows	-1.133	-1.715	-2.118	-1.952	-1.590	-1.780	-1.628	-1.148	-2.118	-1.133	-1.633	60.3%	-1.882	-1.868	
440-600 Cavity Albedo	0.153	0.214		0.426	0.215		0.226	0.280	0.153	0.426	0.252	108.2%	0.285	0.284	
ANNUAL SENSIBLE COOLING [MWh]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
400-395 Surf. Conv. & IR	0.000	0.029	0.002	0.045	0.044	0.032	0.034	0.033	0.000	0.045	0.027	164.1%	0.001	0.001	
410-400 Infiltration	0.000	0.019	0.008	0.023	0.026	0.021	0.022	0.021	0.000	0.026	0.018	148.2%	0.003	0.003	
420-410 Internal Gains	0.011	0.088	0.041	0.105	0.104	0.091	0.090	0.078	0.011	0.105	0.076	123.6%	0.031	0.030	
430-420 Ext Solar Abs.	0.531	0.470	0.371	0.515	0.496	0.409	0.460	0.732	0.371	0.732	0.498	72.5%	0.887	0.910	
600-430 South Windows	5.595	5.816	6.657	6.574	7.280	5.929	5.875	5.903	5.595	7.280	6.204	27.2%	6.747	6.754	
440-600 Cavity Albedo	-2.170	-2.261		-2.604	-2.760		-2.517	-2.094	-2.760	-2.094	-2.401	27.7%	-2.970	-296.9%	
PEAK HEATING [kW]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
400-395 Surf. Conv. & IR	0.805	1.071	1.148	1.310		1.079	1.115	1.250	0.805	1.310	1.111	45.4%	1	99.0%	
410-400 Infiltration	0.758	0.844	0.757	0.792		0.885	0.778	0.794	0.757	0.885	0.801	16.0%	0	0.492	
420-410 Internal Gains	-0.182	-0.180	-0.183	-0.200		-0.183	-0.183	-0.188	-0.200	-0.180	-0.186	10.8%	0	-0.182	
430-420 Ext Solar Abs.	-0.001	0.000	0.000	0.000		0.000	0.000	0.011	-0.001	0.011	0.001	840.0%	0	0.282	
600-430 South Windows	-0.005	-0.004	-0.005	-0.029		-0.007	0.000	0.217	-0.029	0.217	0.024	1031.1%	0	-0.039	
440-600 Cavity Albedo	0.002	0.002		0.019			0.000	0.022	0.000	0.022	0.009	244.4%	0.001	0.000	
PEAK SENSIBLE COOLING [kW]										Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/ Mean** (%)			
400-395 Surf. Conv. & IR	0.000	0.219	0.265	0.272		0.256	0.251	0.227	0.000	0.272	0.213	127.8%		0.193	
410-400 Infiltration	0.035	0.118	0.148	0.148		0.112	0.130	0.138	0.035	0.148	0.118	95.4%	0.125	0.124	
420-410 Internal Gains	0.223	0.224	0.218	0.233		0.214	0.195	0.211	0.195	0.233	0.217	17.7%	0	0.297	
430-420 Ext Solar Abs.	1.235	0.849	0.796	0.715		0.637	0.861	1.657	0.637	1.657	0.964	105.8%	1	1.442	
600-430 South Windows	4.701	4.193	5.229	5.065		4.711	4.688	4.234	4.193	5.229	4.689	22.1%	4.573	456.4%	
440-600 Cavity Albedo	-1.648	-1.541		-1.774			-1.800	-1.534	-1.800	-1.534	-1.659	16.0%	-1.806	-180.4%	

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.

** ABS[(Max-Min) / (Mean of Example Simulation Results)]

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio 2/13/2014 vs. Annex B8, Section B8.1 Example Results
By Autodesk , 13-Feb-2014**

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-10. High Mass Basic and In-Depth Sensitivity Tests

														GBS 2/13/2014	GBS v3.4
ANNUAL HEATING [MWh]										Statistics for Example Results				GBS 2/13/2014	GBS v3.4
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/Mean** (%)	Autodesk	Autodesk	
800-430 Mass, w/ Op. Win.	-0.561	-0.535	-0.599	-0.567	-0.586	-0.501	-0.560	-0.649	-0.649	-0.501	-0.570	26.0%	-0.061	-0.060	
900-800 Himass, S. Win.	-3.698	-4.343	-5.356	-4.714	-4.612	-4.431	-4.285	-3.820	-5.356	-3.698	-4.407	37.6%	-4.691	-4.677	
900-810 Himass, Int. Sol. Abs.	-0.669	-0.836		-1.107	-0.840		-0.912	-0.921	-1.107	-0.669	-0.881	49.7%	-0.493	-0.482	
910-610 Mass, w/ S. Shade	-2.780	-2.944	-3.532	-3.106	-3.338	-2.908	-2.873	-3.163	-3.532	-2.780	-3.081	24.4%	-3.063	-3.067	
920-620 Mass, w/ E&W Win.	-1.300	-1.297	-1.689	-1.461	-1.676	-1.329	-1.297	-1.428	-1.689	-1.297	-1.435	27.3%	-1.612	-1.620	
930-630 Mass w/ E&W Shade	-0.907	-1.012	-1.134	-1.128	-1.273	-0.927	-0.884		-1.273	-0.884	-1.038	37.5%	-1.025	-1.031	
940-640 Mass, w/ Htg. Setback	-1.958	-1.867	-2.304	-2.024	-2.392	-1.886	-1.963	-1.986	-2.392	-1.867	-2.048	25.6%	-1.530	-1.645	
ANNUAL SENSIBLE COOLING [MWh]										Statistics for Example Results				GBS 2/13/2014	GBS v3.4
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/Mean** (%)	Autodesk	Autodesk	
800-430 Mass, w/ Op. Win.	-0.429	-0.393	-0.367	-0.432	-0.462	-0.368	-0.410	-0.550	-0.550	-0.367	-0.426	42.9%	-0.832	-0.852	
900-800 Himass, S. Win.	2.019	2.376	2.400	2.893	3.193	2.377	2.278	2.274	2.019	3.193	2.476	47.4%	3.129	3.145	
900-810 Himass, Int. Sol. Abs.	1.080	1.195		1.454	1.707		1.294	0.975	1.075	1.707	1.284	57.0%	1.579	1.581	
910-610 Mass, w/ S. Shade	-3.094	-3.318	-3.876	-3.576	-3.924	-3.336	-3.275	-3.739	-3.924	-3.094	-3.517	23.6%	-3.875	-3.886	
920-620 Mass, w/ E&W Win.	-1.577	-1.476	-1.894	-1.690	-1.912	-1.554	-1.483	-1.738	-1.912	-1.476	-1.666	26.2%	-1.813	-1.822	
930-630 Mass w/ E&W Shade	-1.090	-1.174	-1.223	-1.320	-1.463	-1.050	-1.000		-1.463	-1.000	-1.189	39.0%	-1.154	-1.162	
940-640 Mass, w/ Htg. Setback	-3.873	-3.647	-4.419	-3.990	-4.570	-3.758	-3.863	-3.992	-4.570	-3.647	-4.014	23.0%	-4.172	-4.243	
950-650 Mass, w/ Night Vent	-4.429	-4.614	-5.257	-4.973	-5.956	-4.537	-4.558	-4.685	-5.956	-4.429	-4.876	31.3%	-5.143	-4.981	
PEAK HEATING [kW]										Statistics for Example Results				GBS 2/13/2014	GBS v3.4
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/Mean** (%)	Autodesk	Autodesk	
800-430 Mass, w/ Op. Win.	-0.215	-0.151	-0.141	-0.149		-0.142	-0.144	-0.198	-0.215	-0.141	-0.163	45.4%	-0.461	-0.465	
900-800 Himass, S. Win.	-0.377	-0.340	-0.352	-0.378		-0.294	-0.269	-0.142	-0.378	-0.142	-0.307	76.7%	0.138	0.138	
900-810 Himass, Int. Sol. Abs.	-0.129	-0.113		-0.155			-0.089	-0.166	-0.166	-0.089	-0.130	59.1%	0.050	0.052	
910-610 Mass, w/ S. Shade	-0.579	-0.485	-0.470	-0.494		-0.419	-0.386	-0.553	-0.579	-0.386	-0.484	39.9%	-0.383	-0.382	
920-620 Mass, w/ E&W Win.	-0.283	-0.238	-0.241	-0.264		-0.248	-0.214	-0.318	-0.318	-0.214	-0.258	40.4%	-0.279	-0.279	
930-630 Mass w/ E&W Shade	-0.237	-0.209	-0.193	-0.238		-0.214	-0.178		-0.238	-0.178	-0.211	28.5%	-0.249	-0.250	
940-640 Mass, w/ Htg. Setback	-1.252	-0.458	-0.278	-0.414		-0.230	-0.600	-0.526	-1.252	-0.230	-0.537	190.4%	0.073	0.074	
PEAK SENSIBLE COOLING [kW]										Statistics for Example Results				GBS 2/13/2014	GBS v3.4
CASES	ESP DMU	BLAST US-IT	DOE21D NREL	SRES-SUN NREL	SRES BRE*	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Min	Max	Mean	(Max-Min)/Mean** (%)	Autodesk	Autodesk	
800-430 Mass, w/ Op. Win.	-0.908	-0.805	-0.684	-0.410		-0.547	-0.816	-1.220	-1.220	-0.410	-0.770	105.2%	-1.298	-1.311	
900-800 Himass, S. Win.	2.303	2.188	2.715	2.519		2.306	2.584	2.099	2.099	2.715	2.388	25.8%	2.906	2.905	
900-810 Himass, Int. Sol. Abs.	1.036	0.798		0.880			1.223	0.595	0.595	1.223	0.906	69.3%	1.116	1.116	
910-610 Mass, w/ S. Shade	-3.773	-3.324	-3.728	-3.094		-3.384	-2.883	-2.999	-3.773	-2.883	-3.312	26.9%	-3.098	-3.107	
920-620 Mass, w/ E&W Win.	-1.249	-1.142	-1.321	-1.106		-1.226	-1.225	-1.591	-1.591	-1.106	-1.266	38.3%	-1.155	-1.159	
930-630 Mass w/ E&W Shade	-1.199	-1.158	-1.200	-1.036		-1.179	-1.110		-1.200	-1.036	-1.147	14.3%	-1.056	-1.060	
940-640 Mass, w/ Htg. Setback	-3.273	-2.737	-3.118	-2.905		-2.916	-2.875	-3.314	-3.314	-2.737	-3.020	19.1%	-2.874	-2.914	
950-650 Mass, w/ Night Vent	-3.998	-3.210	-3.852	-3.501		-3.466	-3.692	-3.812	-3.998	-3.210	-3.647	21.6%	-3.386	-3.310	

* SRES-BRE (SERIRES 1.2) simulations did not produce output for this variable.

** ABS[(Max-Min) / (Mean of Example Simulation Results)]

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio 2/13/2014 vs. Annex B8, Section B8.1 Example Results
By Autodesk , 13-Feb-2014**

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-11. Annual Transmissivity Coefficient of Windows

(ANNUAL UNSHADED TRANSMITTED SOLAR RADIATION)/(ANNUAL UNSHADED INCIDENT SOLAR RADIATION)

Simulation Model: Organization or Country: Case	ESP DMU	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
								Min	Max	Mean	(Max-Min)/ Mean* (%)		
620 West	0.674	0.681	0.687	0.657	0.641	0.654	0.648	0.641	0.687	0.663	7.0%	0.799	0.799
600 South	0.650	0.671	0.652	0.650	0.628	0.647	0.623	0.623	0.671	0.646	7.5%	0.791	0.791

* ABS[(Max-Min) / (Mean of Example Simulation Results)]

Table B8-12. Annual Shading Coefficient of Window Shading Devices: Overhangs & Fins

(1-(ANNUAL SHADED TRANSMITTED SOLAR RADIATION))/(ANNUAL UNSHADED TRANSMITTED SOLAR RADIATION)

Simulation Model: Organization or Country: Case	ESP DMU	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
								Min	Max	Mean	(Max-Min)/ Mean* (%)		
630/620 West	0.182	0.346	0.196	0.216	0.329	0.339		0.182	0.346	0.268	61.2%	0.377	0.377
610/600 South	0.170	0.209	0.165	0.188	0.183	0.205	0.115	0.115	0.209	0.177	53.5%	0.209	0.209

* ABS[(Max-Min) / (Mean of Example Simulation Results)]

Table B8-13. Case 600 Annual Incident Solar Radiation (kWh/m²)

Simulation Model: Organization or Country: Case	ESP DMU	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
								Min	Max	Mean	(Max-Min)/ Mean* (%)		
North	427	434	456	407	457	367	453	367	457	429	20.9%	450	450
East	959	1155	1083	1217	1082	1101	962	959	1217	1080	23.9%	1167	1167
West	1086	1079	1003	857	1002	1012	1090	857	1090	1018	22.9%	1092	1092
South	1456	1566	1476	1468	1474	1522	1468	1456	1566	1490	7.4%	1577	1577
Horizontal	1797	1831	1832	1832	1832	1832	1832	1797	1832	1827	1.9%	1832	1832

* ABS[(Max-Min) / (Mean of Example Simulation Results)]

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.2 - Building Thermal Envelope and Fabric Load Tests
Autodesk Green Building Studio 2/13/2014 vs. Annex B8, Section B8.1 Example Results
By Autodesk , 13-Feb-2014**

Note: The statistics in the tables below are based on the Standard 140 informative example results.
These statistics do not have any substantial importance and are not to be interpreted as acceptance criteria.

Table B8-14. Case 600 Annual Transmitted Solar Radiation - Unshaded (kWh/m²)

Simulation Model: Organization or Country:	ESP DMU	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
								Min	Max	Mean	(Max-Min)/ Mean* (%)		
Case													
West	732	735	689	563	642	662	706	563	735	676	25.5%	872	872
South	946	1051	962	954	926	984	914	914	1051	962	14.2%	1247	1247

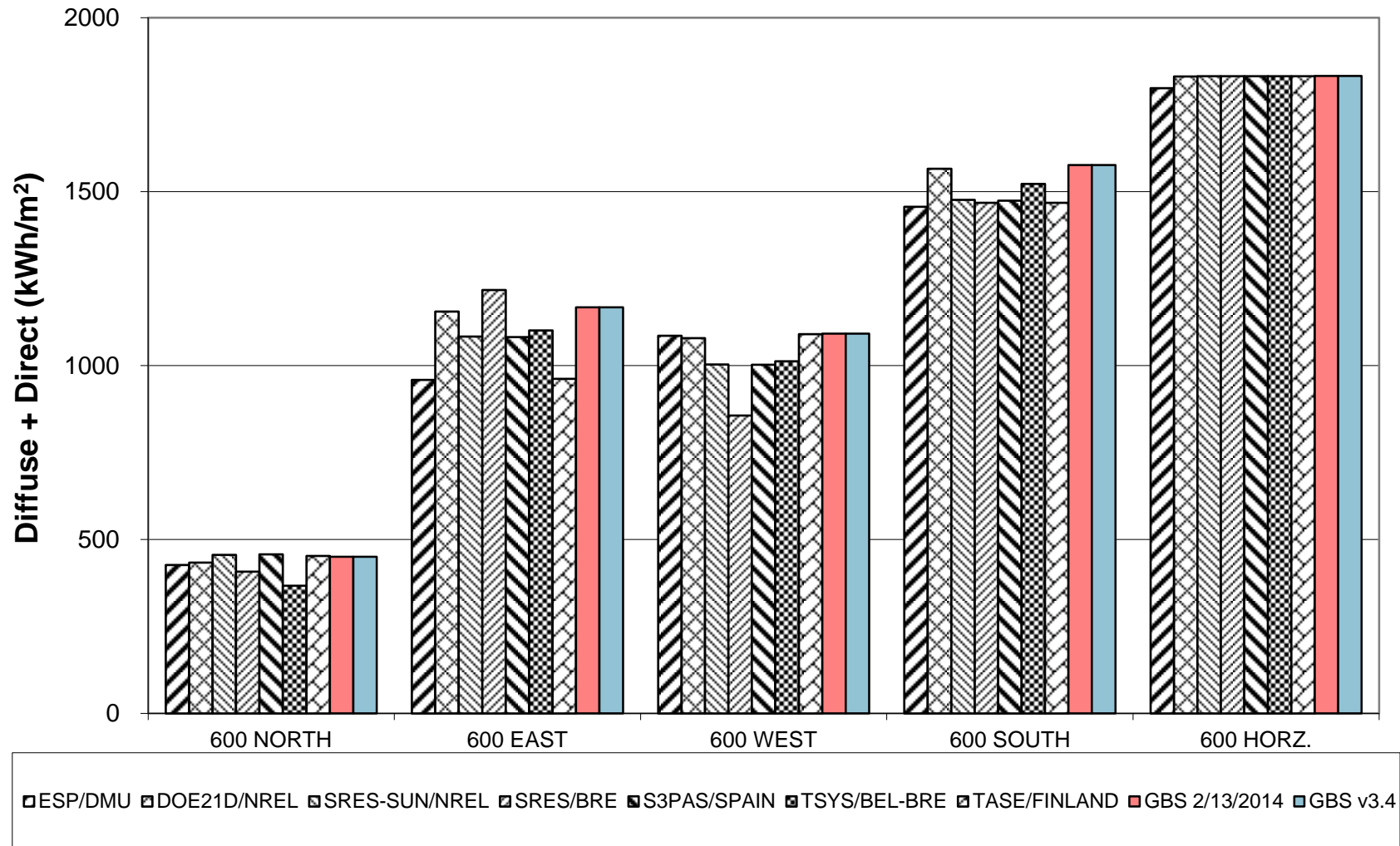
* ABS[(Max-Min) / (Mean of Example Simulation Results)]

Table B8-15. Case 600 Annual Transmitted Solar Radiation - Shaded (kWh/m²)

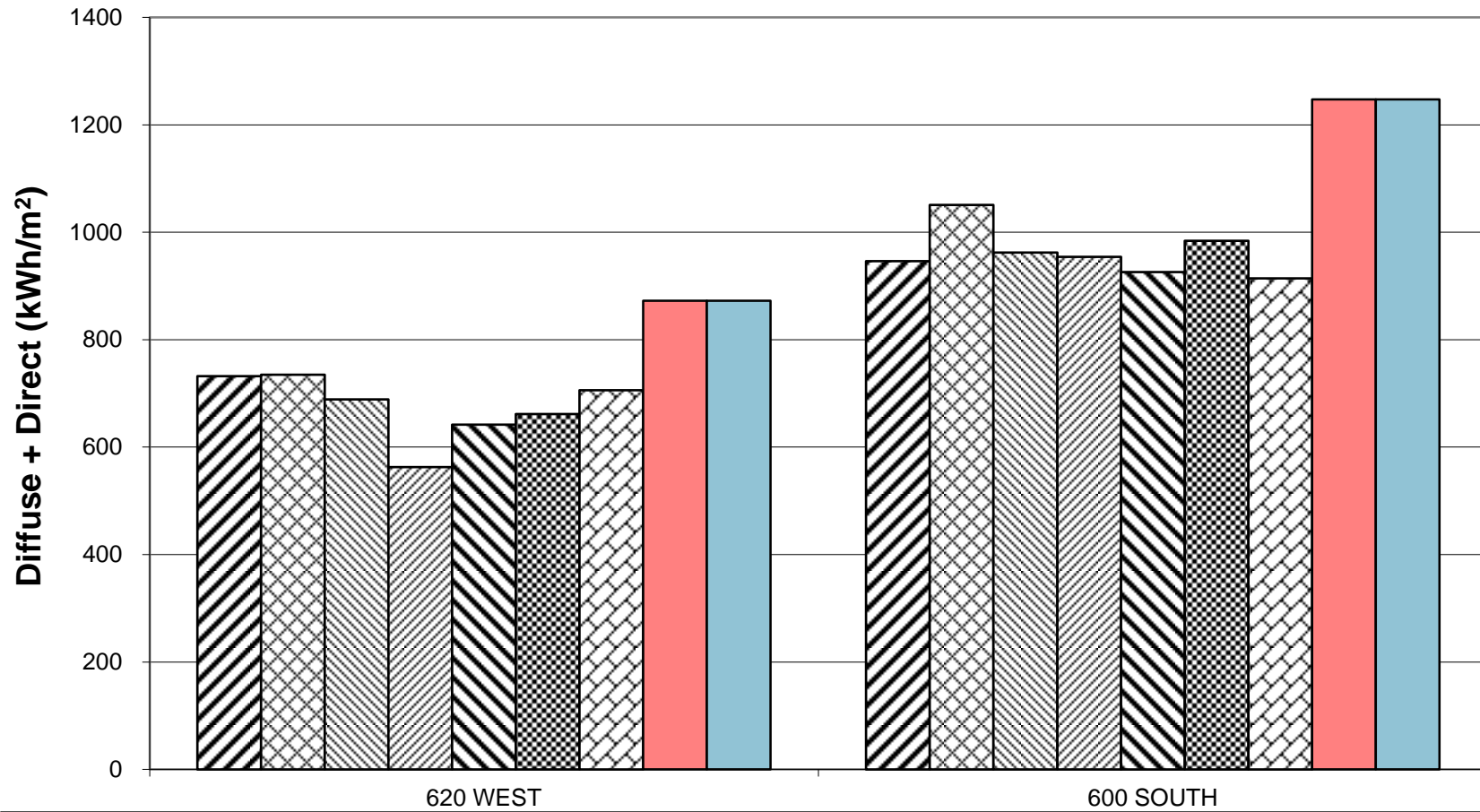
Simulation Model: Organization or Country:	ESP DMU	DOE21D NREL	SRES-SUN NREL	SRES BRE	S3PAS SPAIN	TSYS BEL-BRE	TASE FINLAND	Statistics for Example Results				GBS 2/13/2014 Autodesk	GBS v3.4 Autodesk
								Min	Max	Mean	(Max-Min)/ Mean* (%)		
Case													
West	599	481	554	441	431	438		431	599	491	34.2%	543	543
South	785	831	803	775	757	782	809	757	831	792	9.3%	986	986

* ABS[(Max-Min) / (Mean of Example Simulation Results)]

**Figure B8-1. BESTEST BASIC
 Annual Incident Solar Radiation**

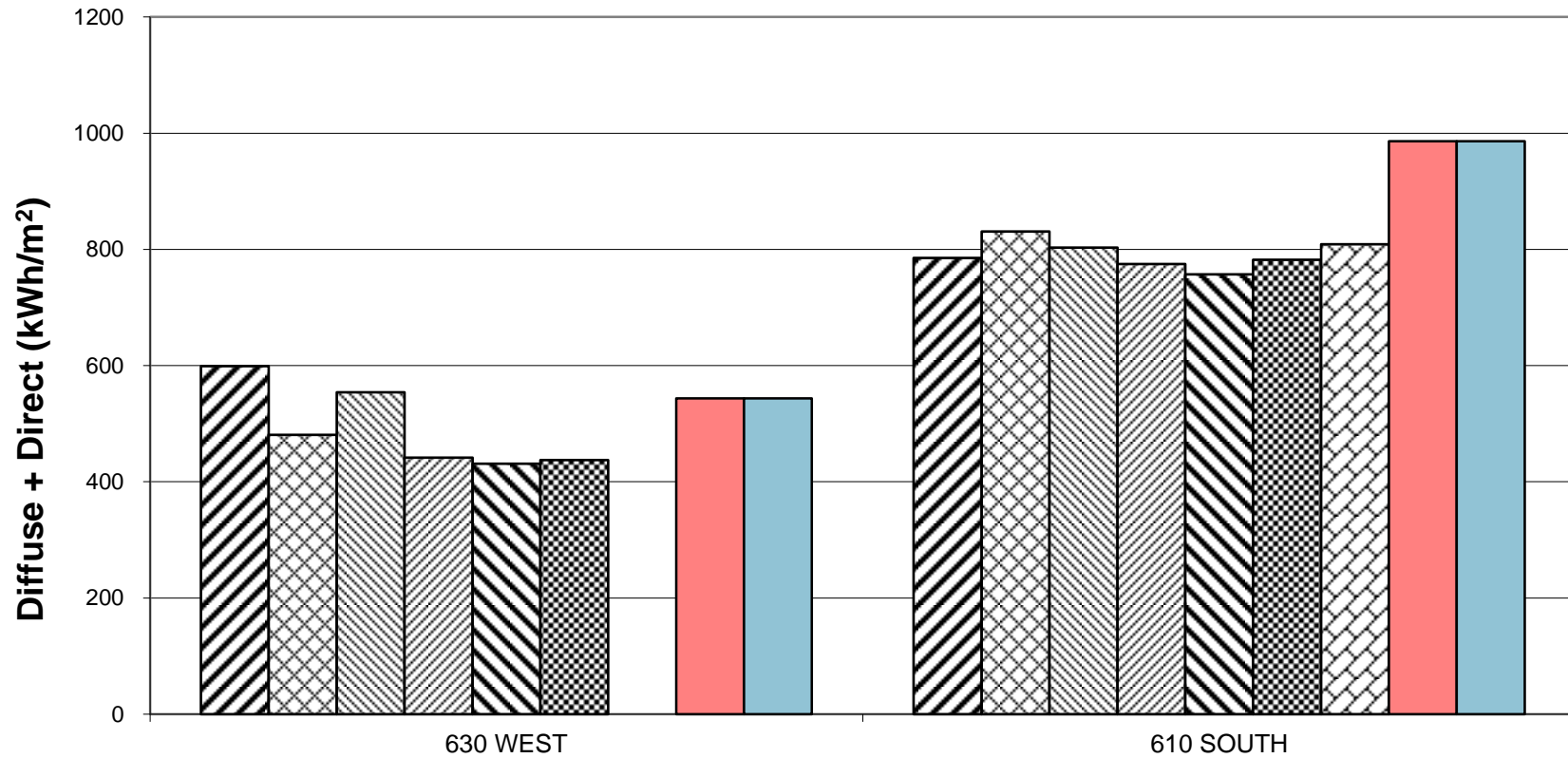


**Figure B8-2. BESTEST BASIC
 Annual Transmitted Solar Radiation - Unshaded**



ESP/DMU
 DOE21D/NREL
 SRES-SUN/NREL
 SRES/BRE
 S3PAS/SPAIN
 TSYS/BEL-BRE
 TASE/FINLAND
 GBS 2/13/2014
 GBS v3.4

**Figure B8-3. BESTEST BASIC
 Annual Transmitted Solar Radiation - Shaded**



ESP/DMU
 DOE21D/NREL
 SRES-SUN/NREL
 SRES/BRE
 S3PAS/SPAIN
 TSYS/BEL-BRE
 TASE/FINLAND
 GBS 2/13/2014
 GBS v3.4

Figure B8-4. BESTEST BASIC
Annual Transmissivity Coefficient of Windows
(Unshaded Transmitted)/(Incident Solar Radiation)

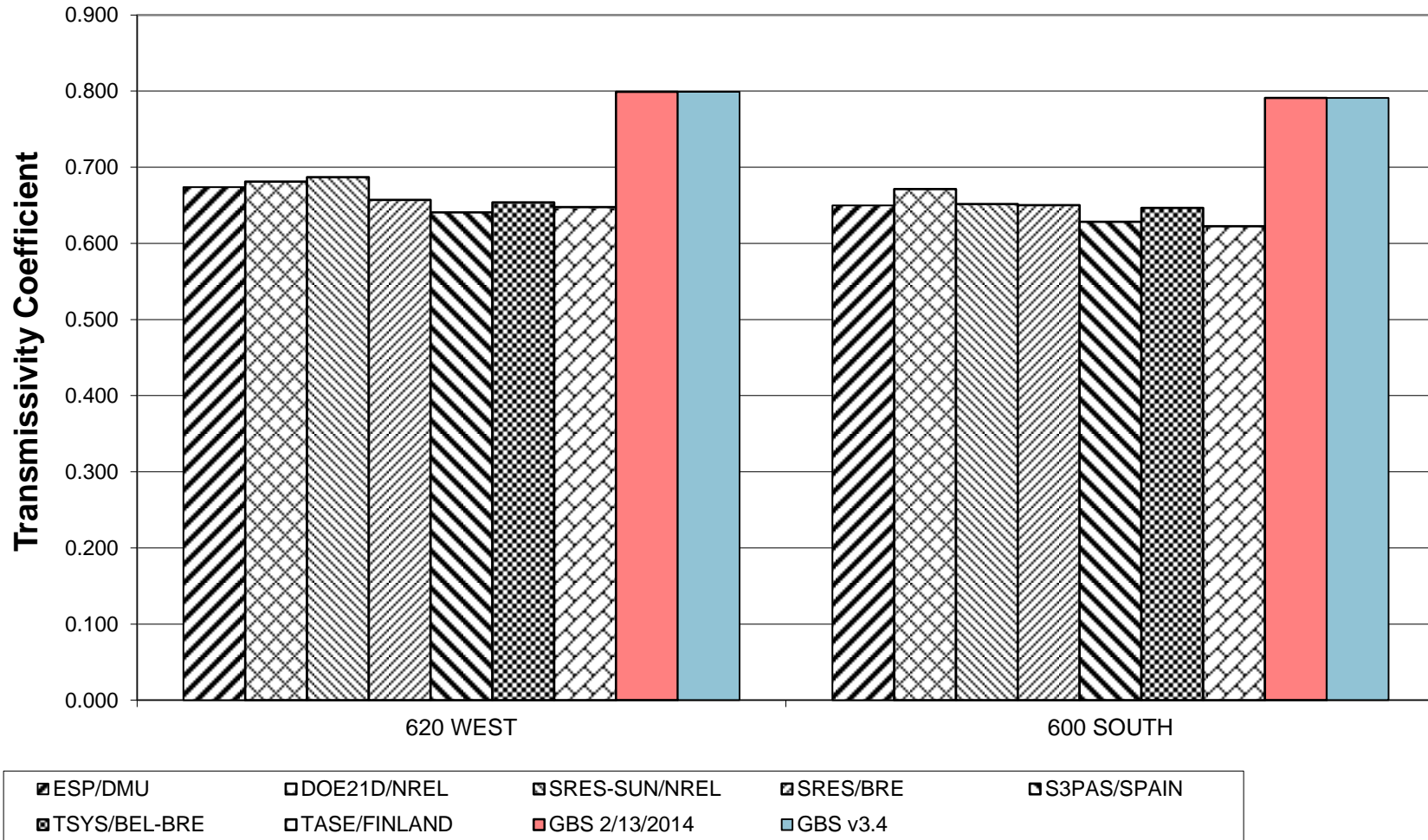
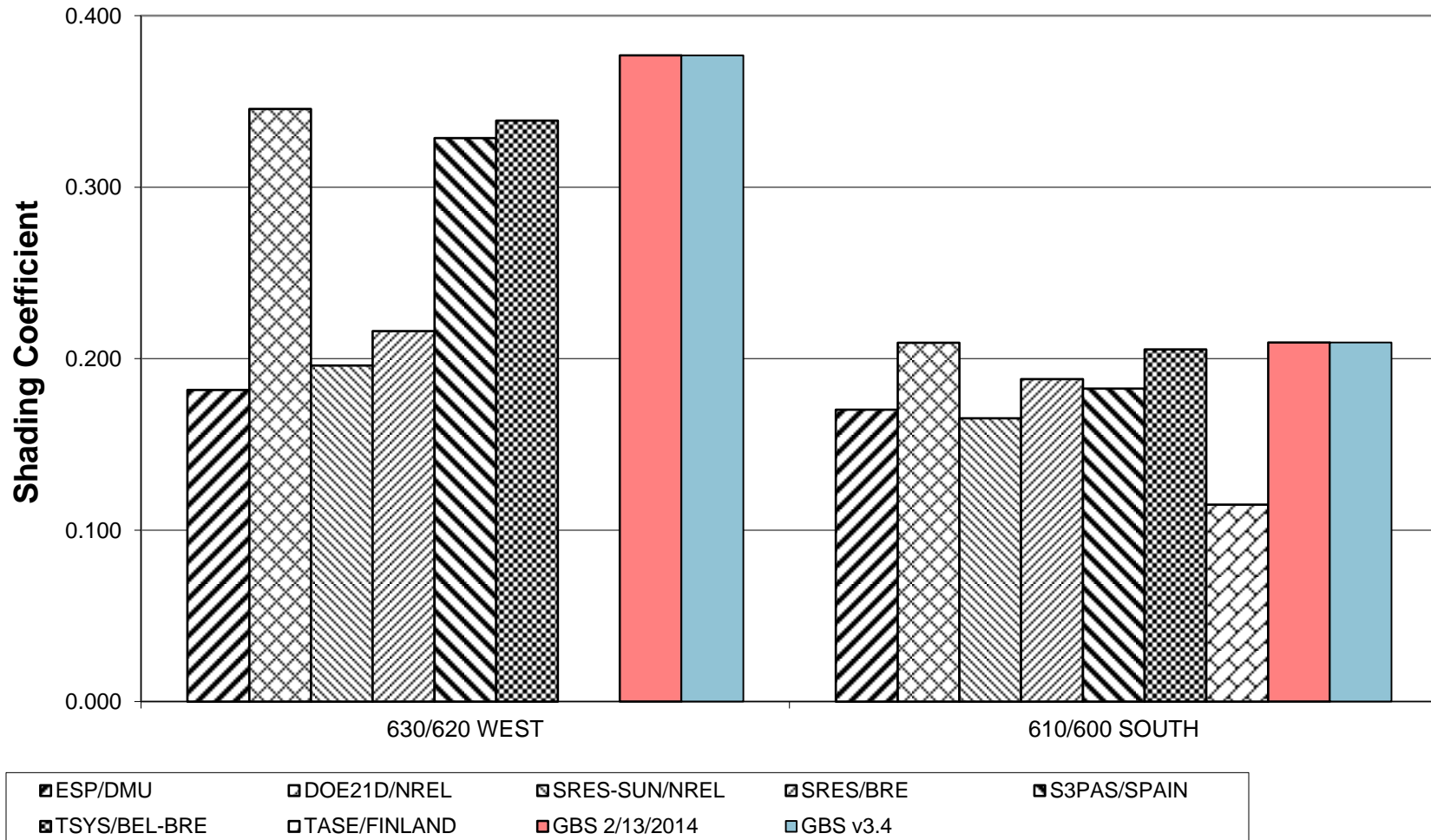
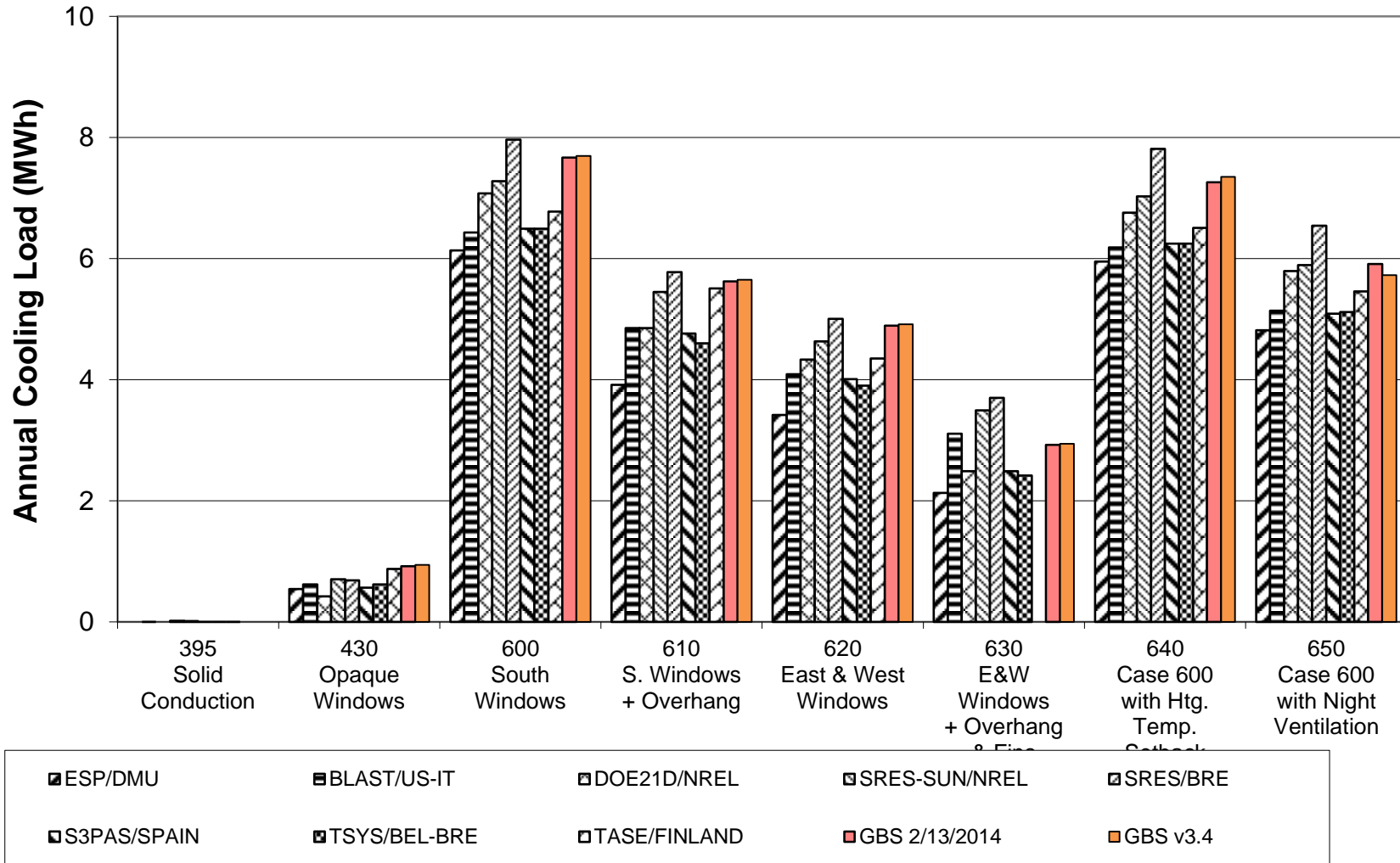


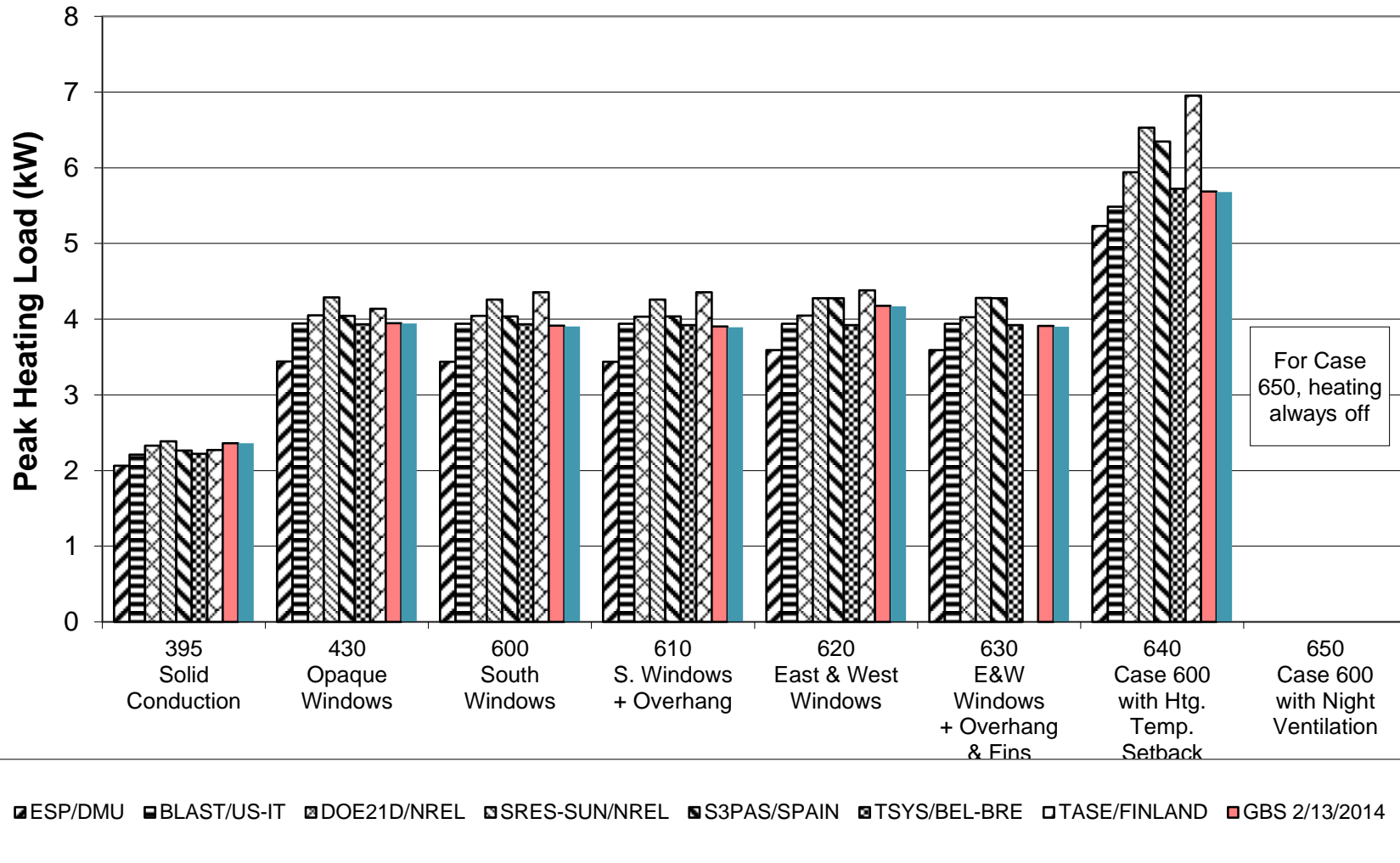
Figure B8-5. BESTEST BASIC
Annual Overhang and Fin Shading Coefficients
(1-(Shaded)/(Unshaded)) Transmitted Solar Radiation



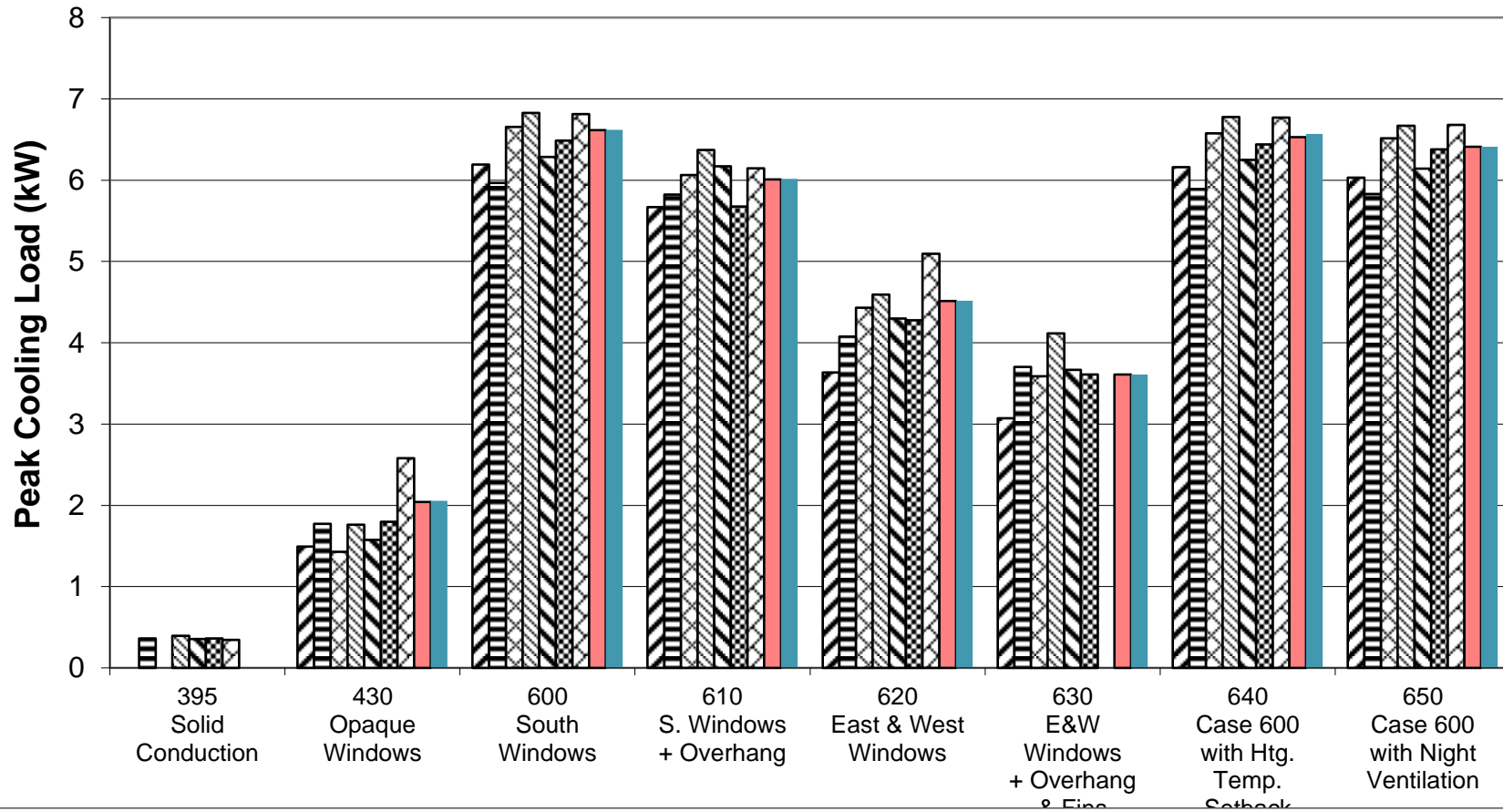
**Figure B8-7. BESTEST BASIC
 Low Mass Annual Sensible Cooling**



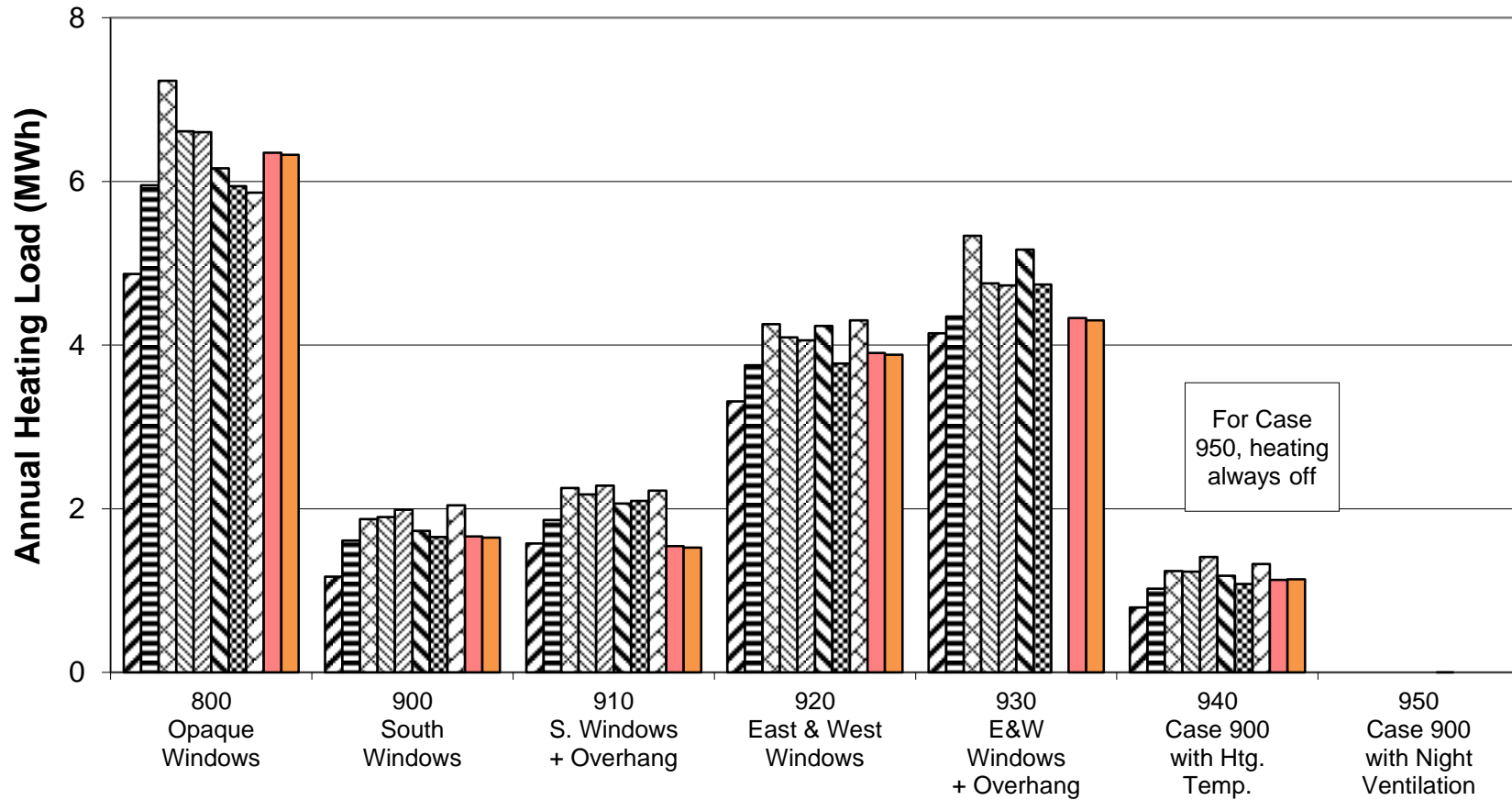
**Figure B8-8. BESTEST BASIC
 Low Mass Peak Heating**



**Figure B8-9. BESTEST BASIC
 Low Mass Peak Sensible Cooling**

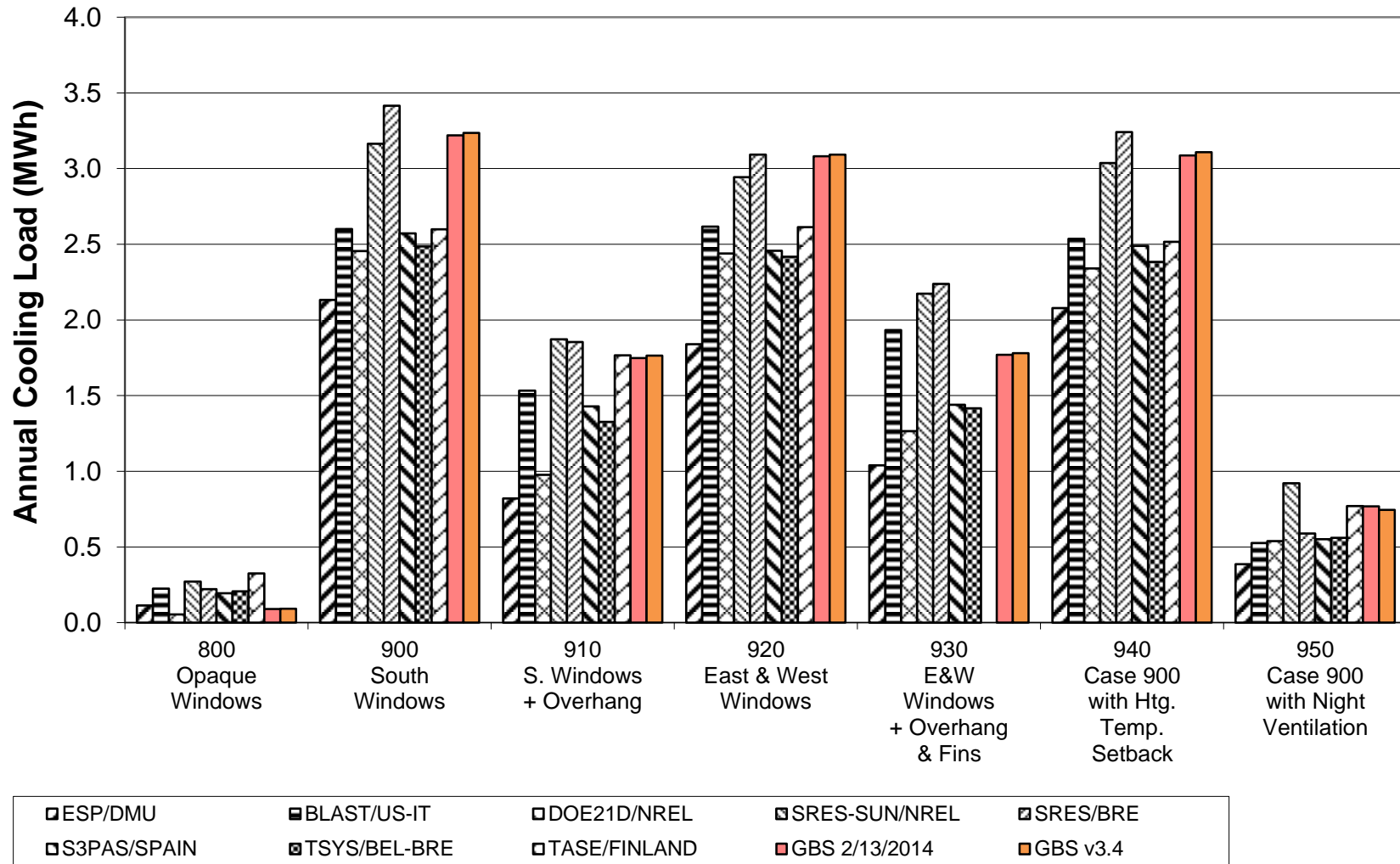


**Figure B8-10. BESTEST BASIC
High Mass Annual Heating**

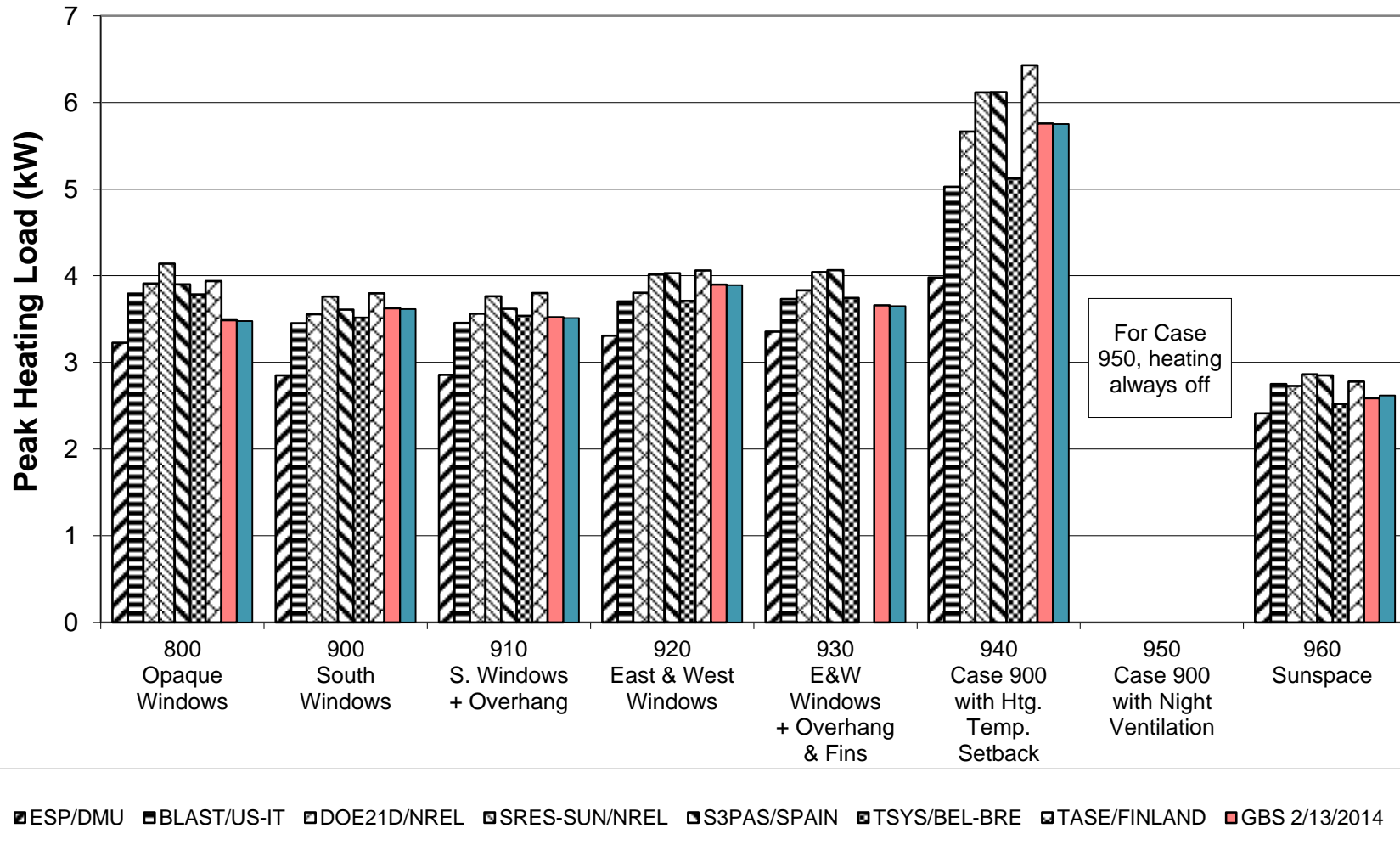


ESP/DMU	BLAST/US-IT	DOE21D/NREL	SRES-SUN/NREL	SRES/BRE
S3PAS/SPAIN	TSYS/BEL-BRE	TASE/FINLAND	GBS 2/13/2014	GBS v3.4

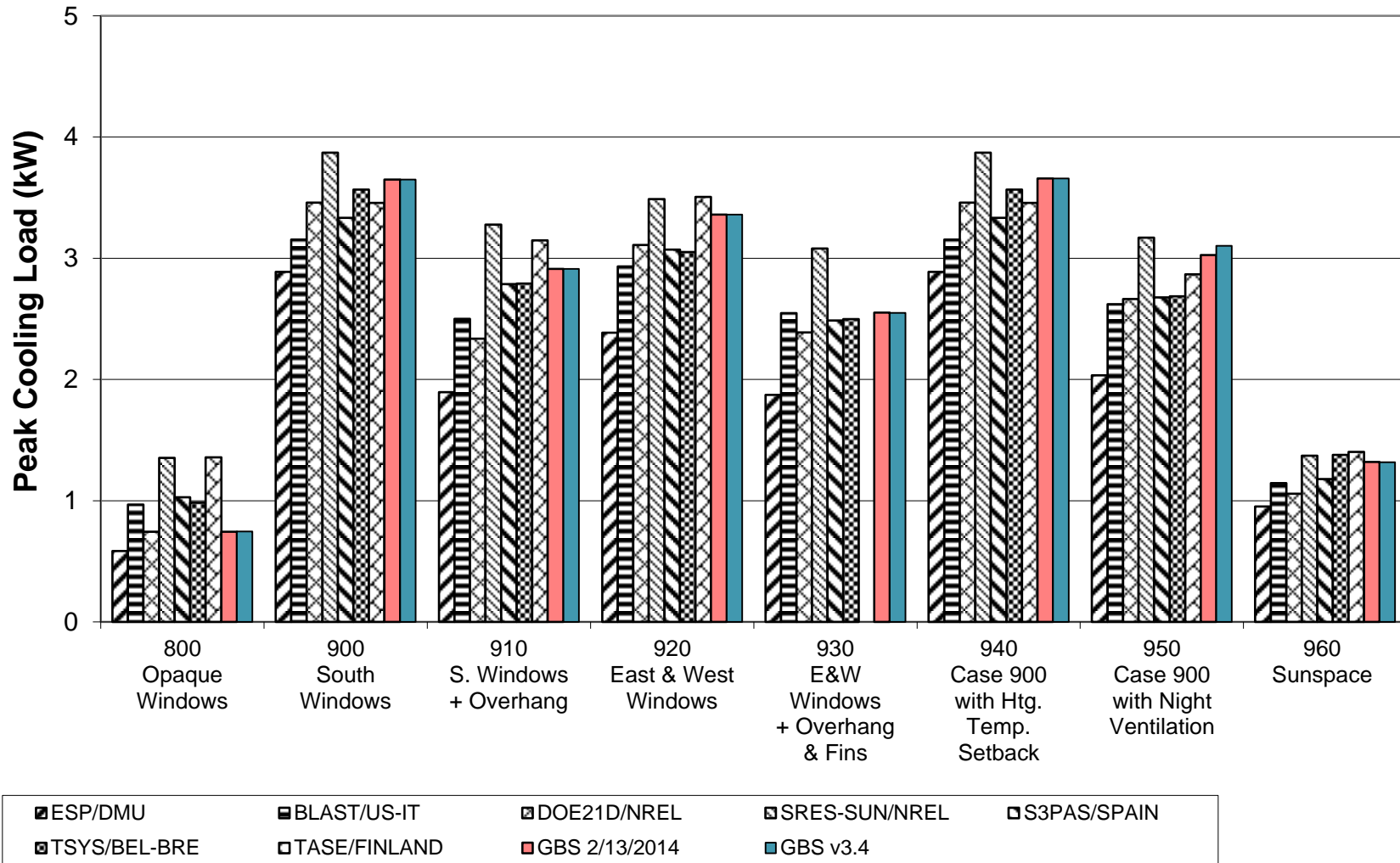
**Figure B8-11. BESTEST BASIC
 High Mass Annual Sensible Cooling**



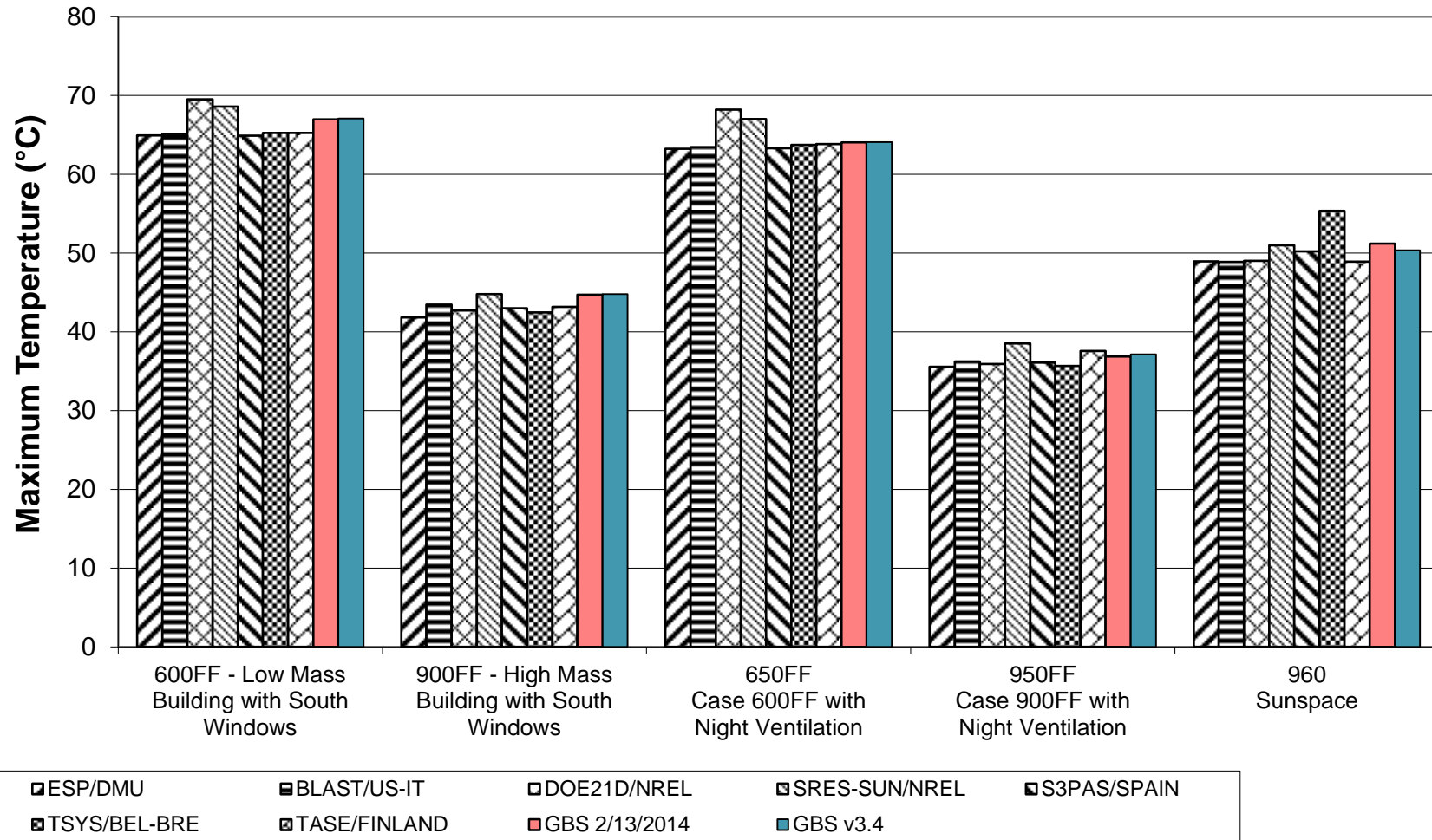
**Figure B8-12. BESTEST BASIC
 High Mass Peak Heating**



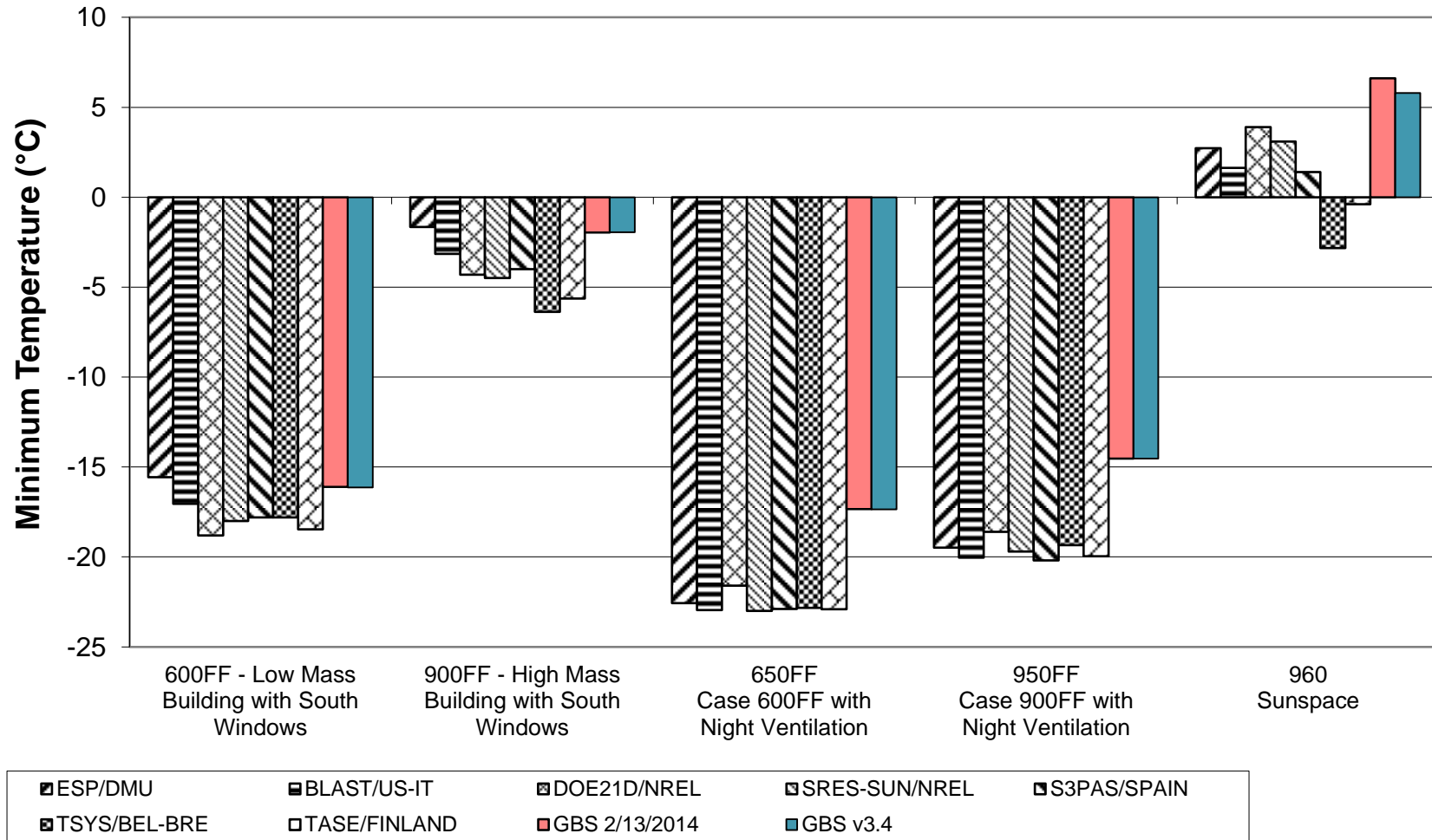
**Figure B8-13. BESTEST BASIC
 High Mass Peak Sensible Cooling**



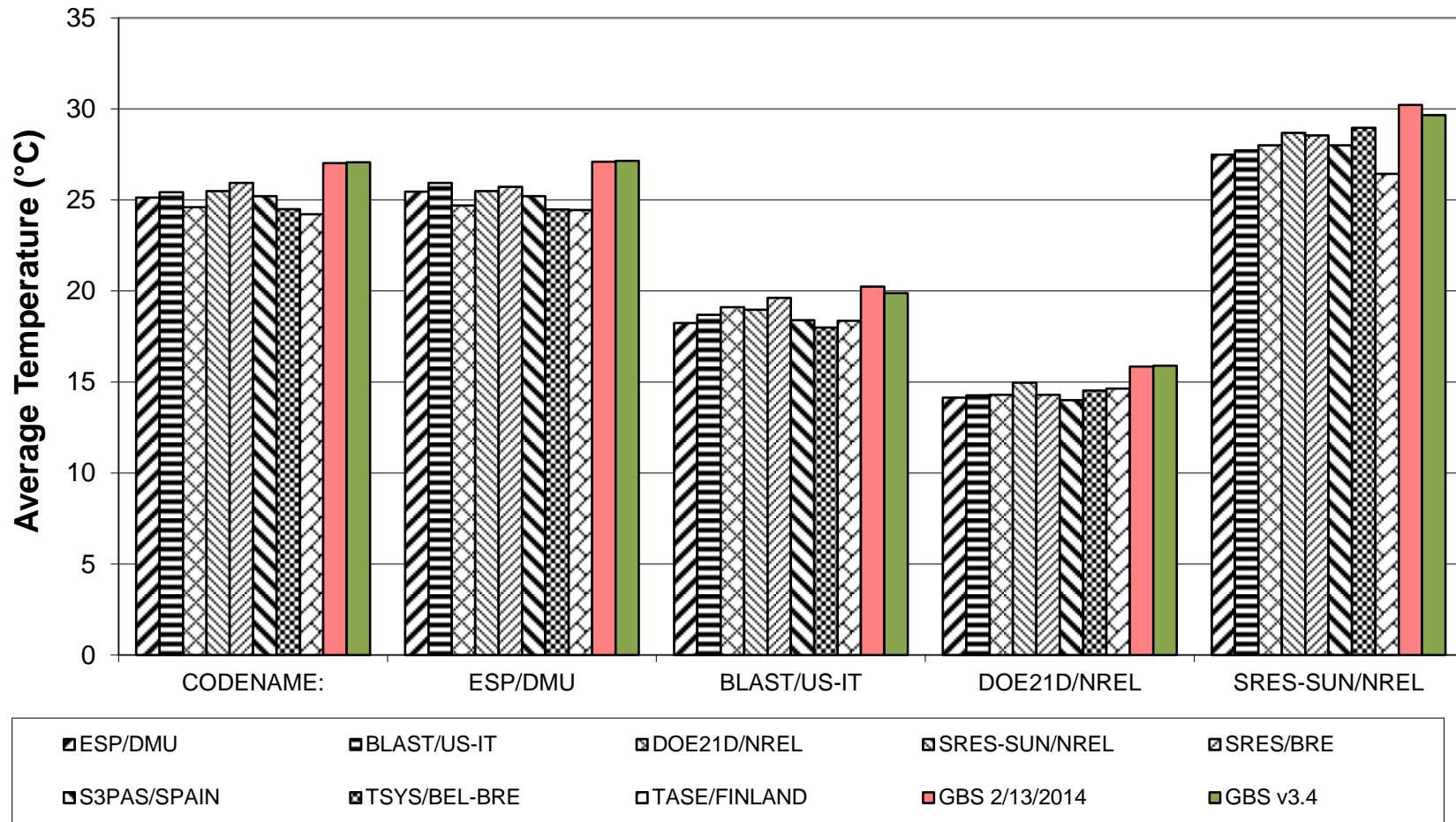
**Figure B8-14. BESTEST BASIC
 Maximum Hourly Annual Temperature
 Free-Float Cases**



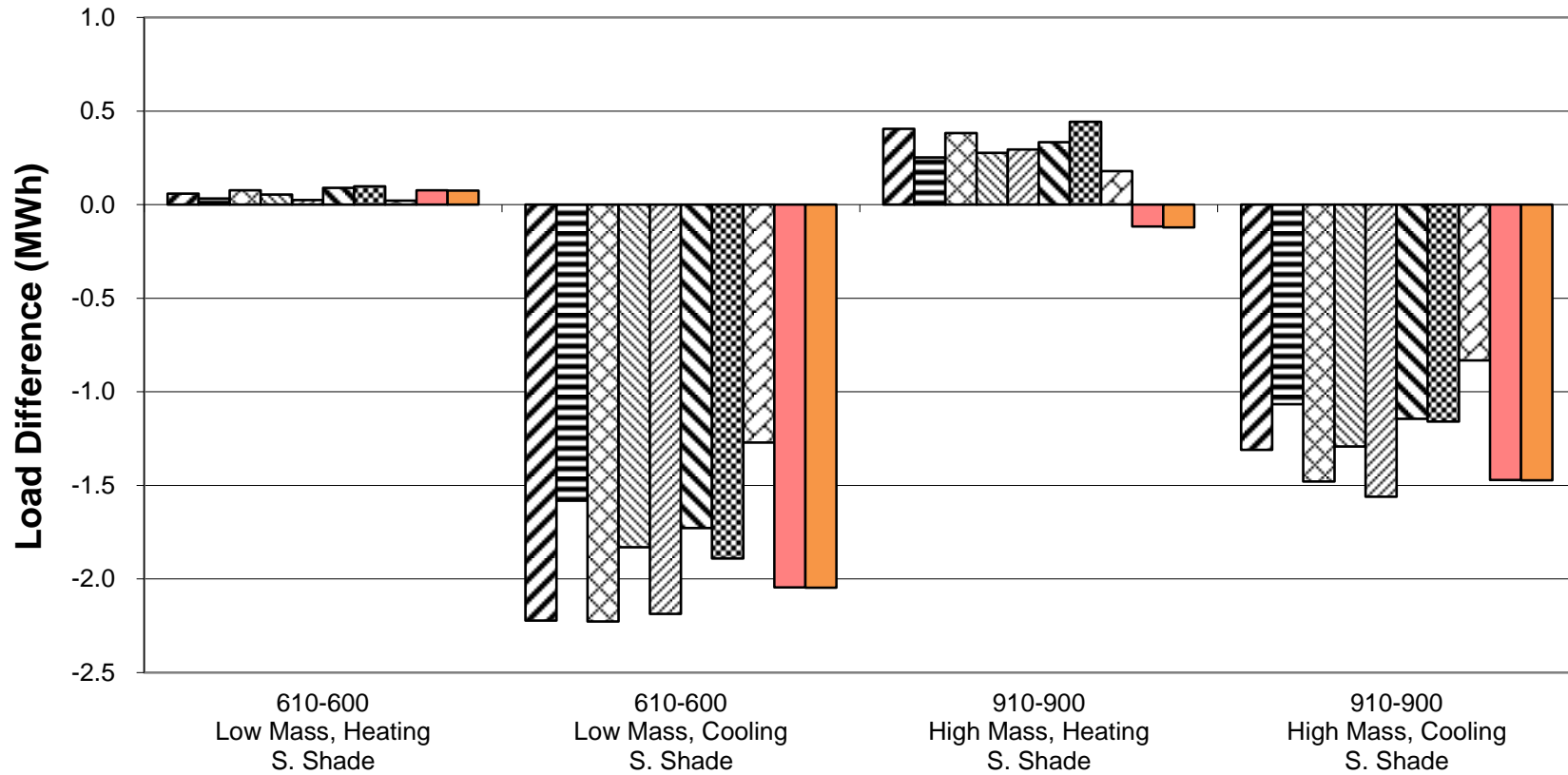
**Figure B8-15. BESTEST BASIC
 Minimum Hourly Annual Temperature
 Free-Float Cases**



**Figure B8-16. BESTEST BASIC
 Average Hourly Annual Temperature
 Free-Float Cases**

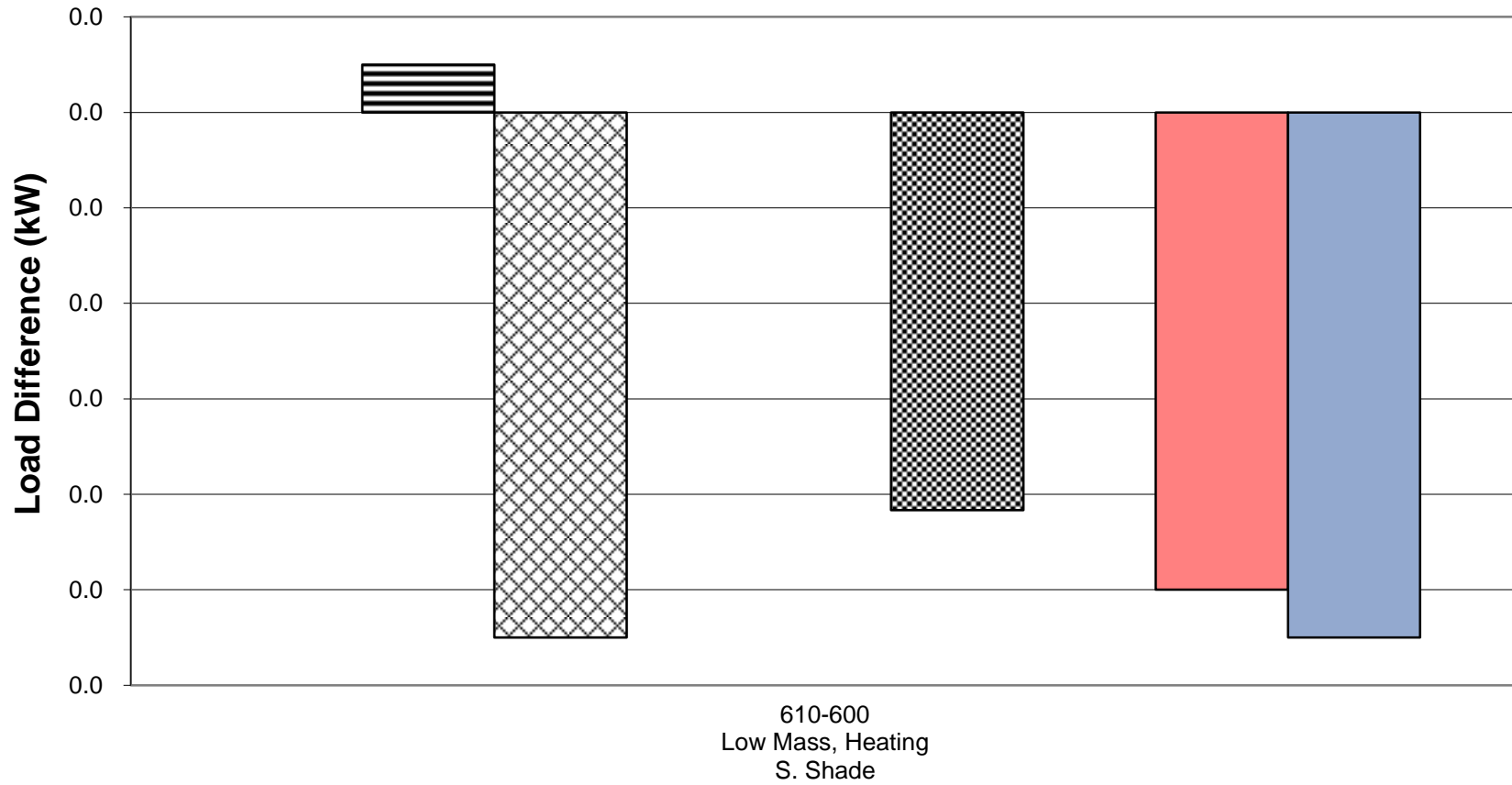


**Figure B8-17. BESTEST BASIC
 South Window Shading (Delta)
 Annual Heating and Sensible Cooling**



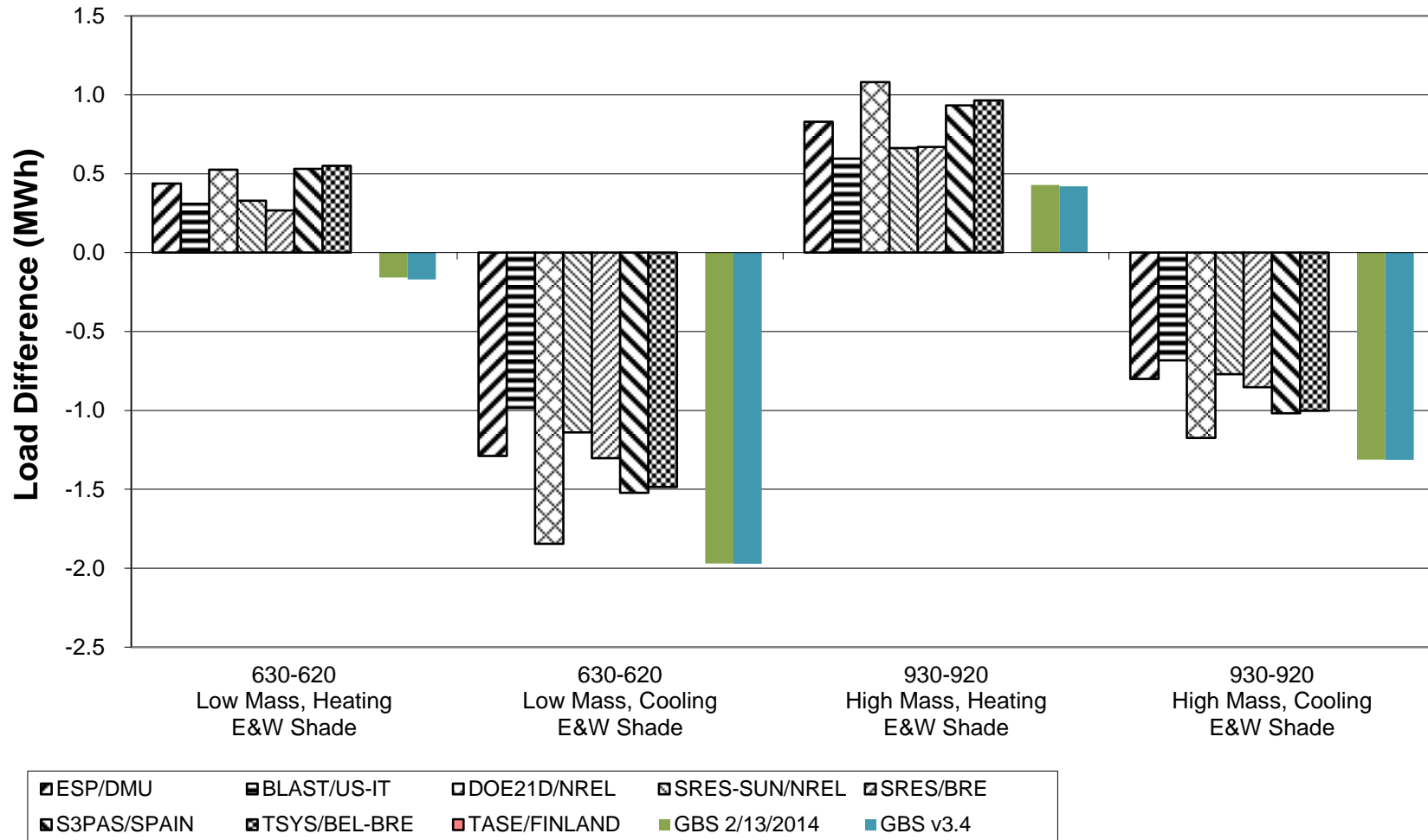
ESP/DMU	BLAST/US-IT	DOE21D/NREL	SRES-SUN/NREL	SRES/BRE
S3PAS/SPAIN	TSYS/BEL-BRE	TASE/FINLAND	GBS 2/13/2014	GBS v3.4

**Figure B8-18. BESTEST BASIC
 South Window Shading (Delta)
 Peak Heating and Sensible Cooling**

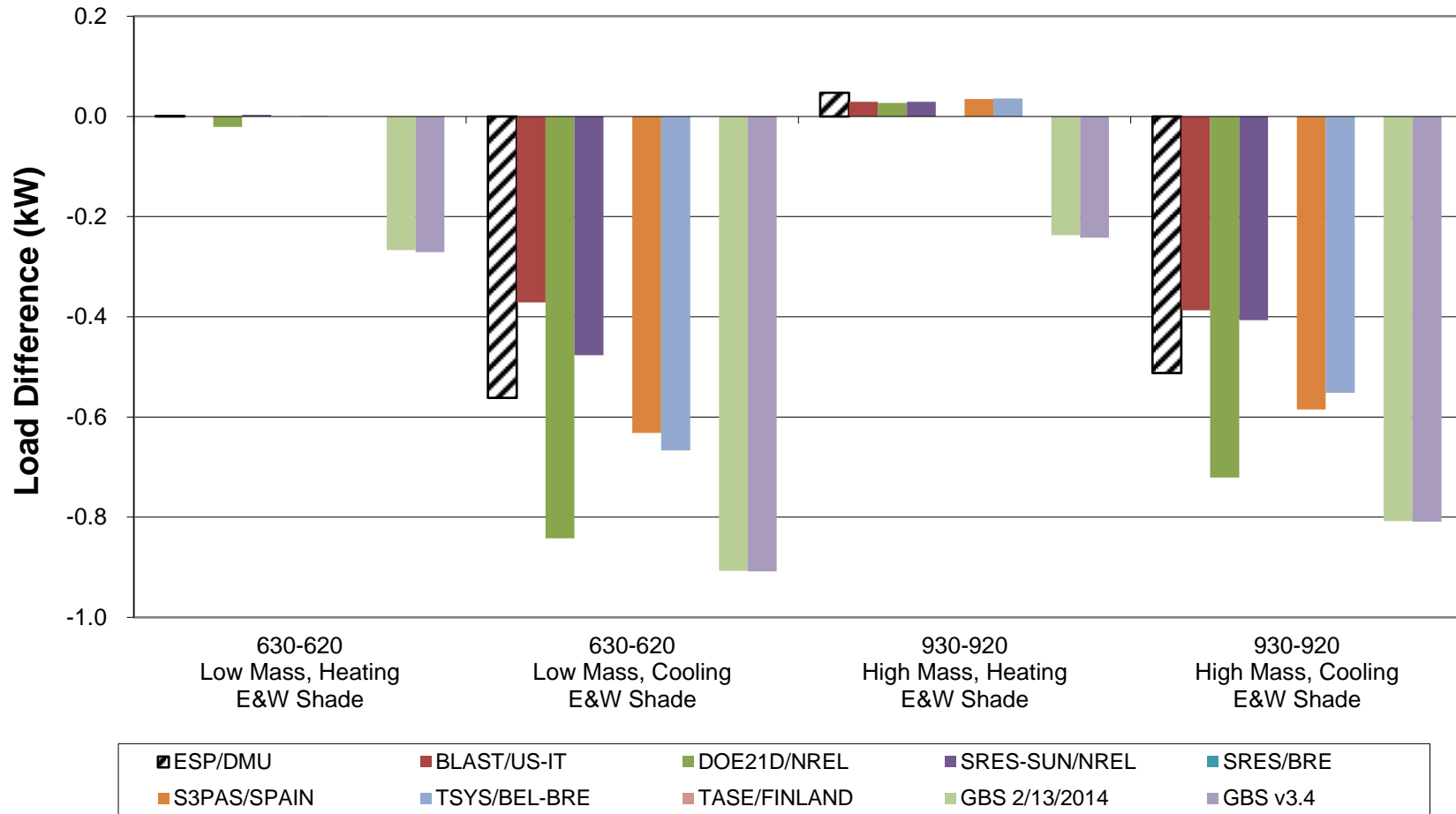


ESP/DMU	BLAST/US-IT	DOE21D/NREL	SRES-SUN/NREL	S3PAS/SPAIN
TSYS/BEL-BRE	TASE/FINLAND	GBS 2/13/2014	GBS v3.4	

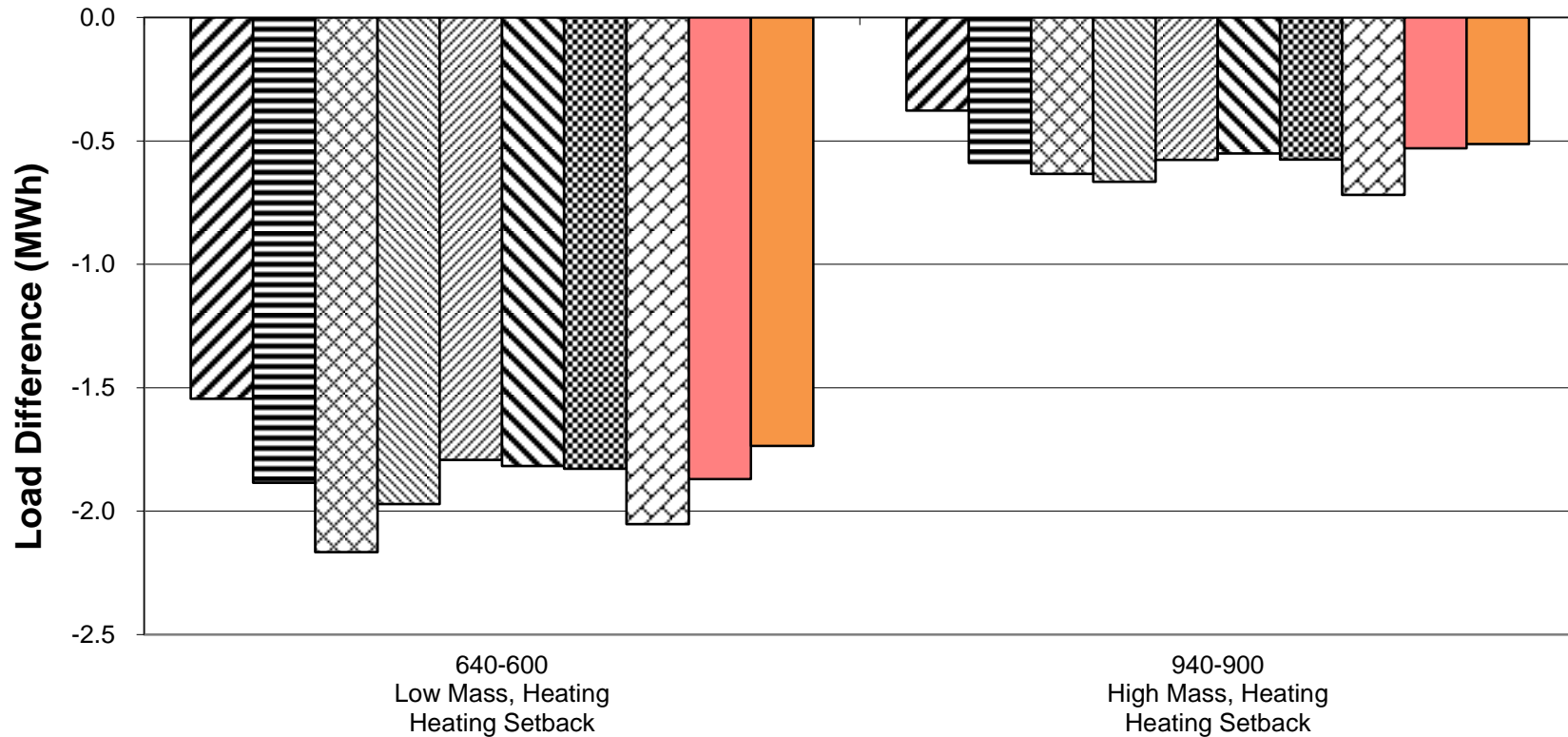
**Figure B8-21. BESTEST BASIC
 East & West Shaded Window (Delta)
 Annual Heating and Sensible Cooling**



**Figure B8-22. BESTEST BASIC
 East & West Shaded Window (Delta)
 Peak Heating and Sensible Cooling**

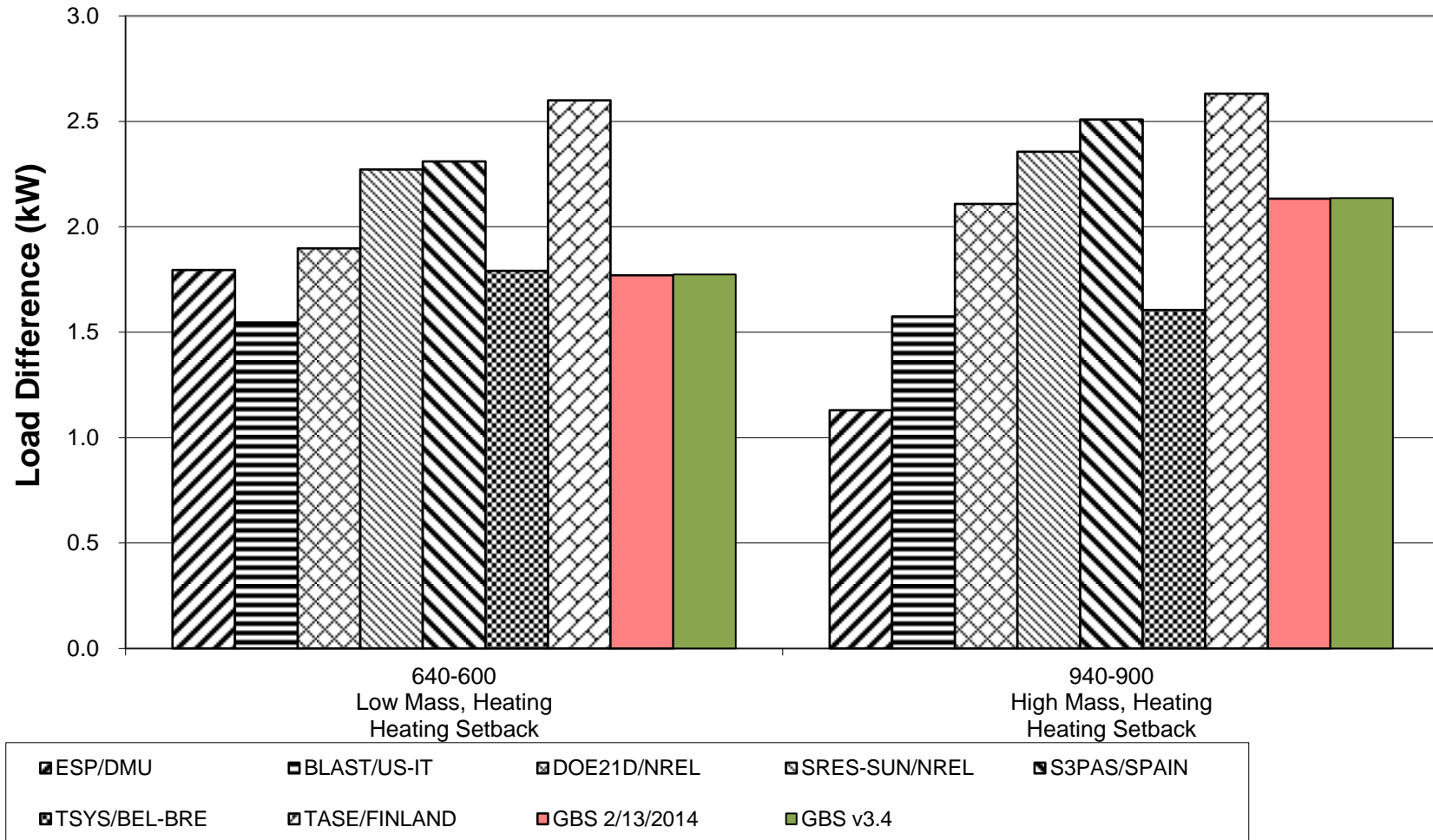


**Figure B8-23. BESTEST BASIC
 Thermostat Setback (Delta)
 Annual Heating**

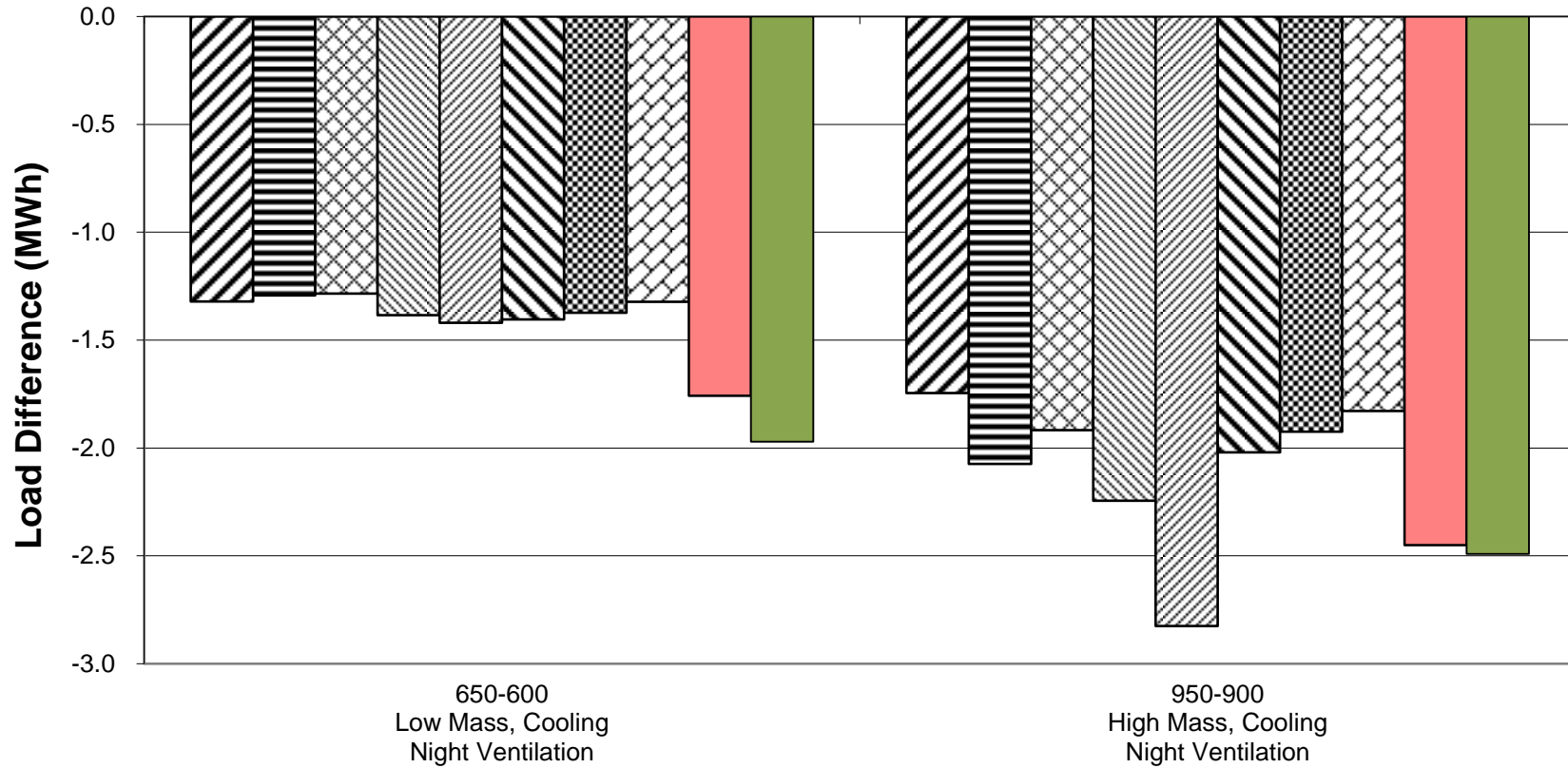


□ ESP/DMU	▣ BLAST/US-IT	▣ DOE21D/NREL	▣ SRES-SUN/NREL	▣ SRES/BRE
▣ S3PAS/SPAIN	▣ TSYS/BEL-BRE	▣ TASE/FINLAND	▣ GBS 2/13/2014	▣ GBS v3.4

**Figure B8-24. BESTEST BASIC
 Thermostat Setback (Delta)
 Peak Heating**

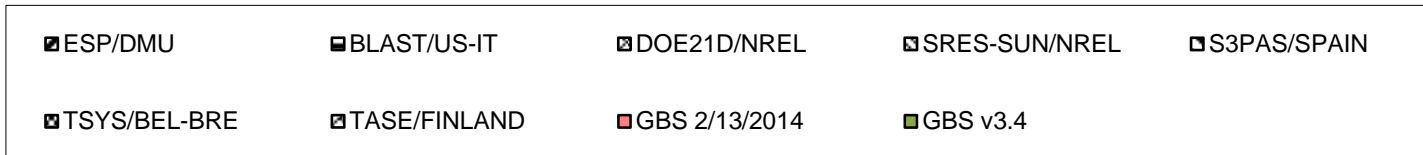
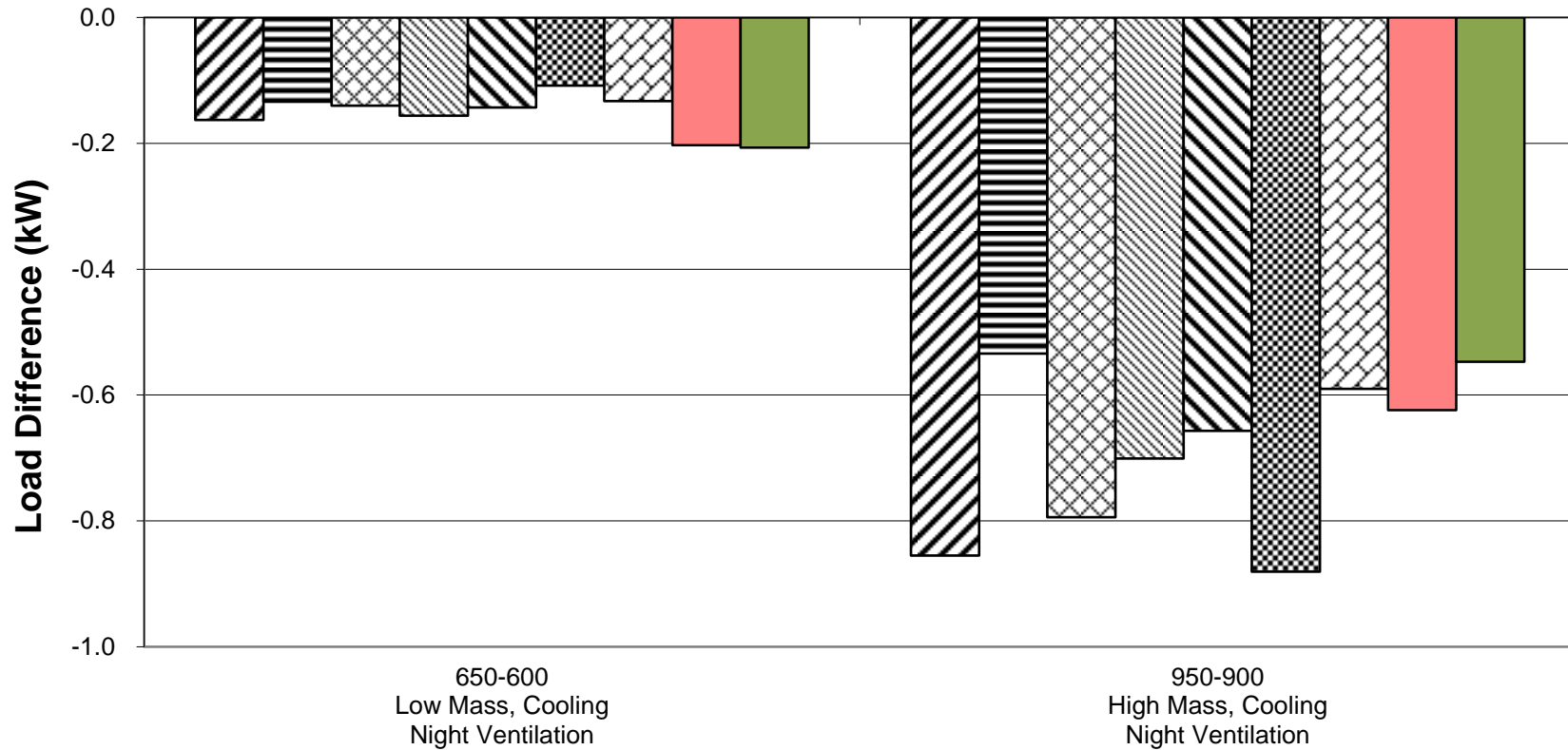


**Figure B8-25. BESTEST BASIC
 Vent Cooling (Delta)
 Annual Sensible Cooling**

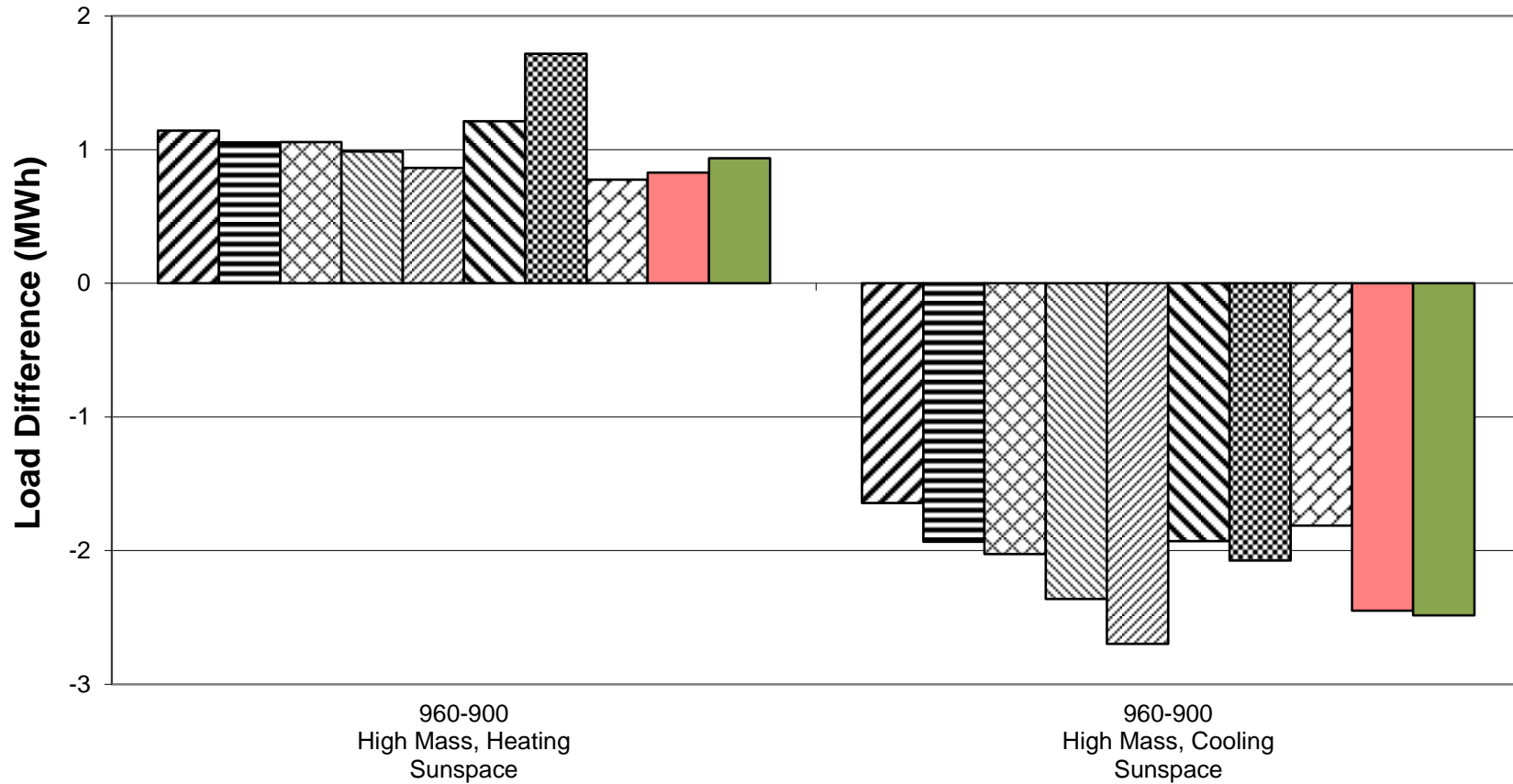


ESP/DMU	BLAST/US-IT	DOE21D/NREL	SRES-SUN/NREL	SRES/BRE
S3PAS/SPAIN	TSYS/BEL-BRE	TASE/FINLAND	GBS 2/13/2014	GBS v3.4

**Figure B8-26. BESTEST BASIC
 Vent Cooling (Delta)
 Peak Sensible Cooling**

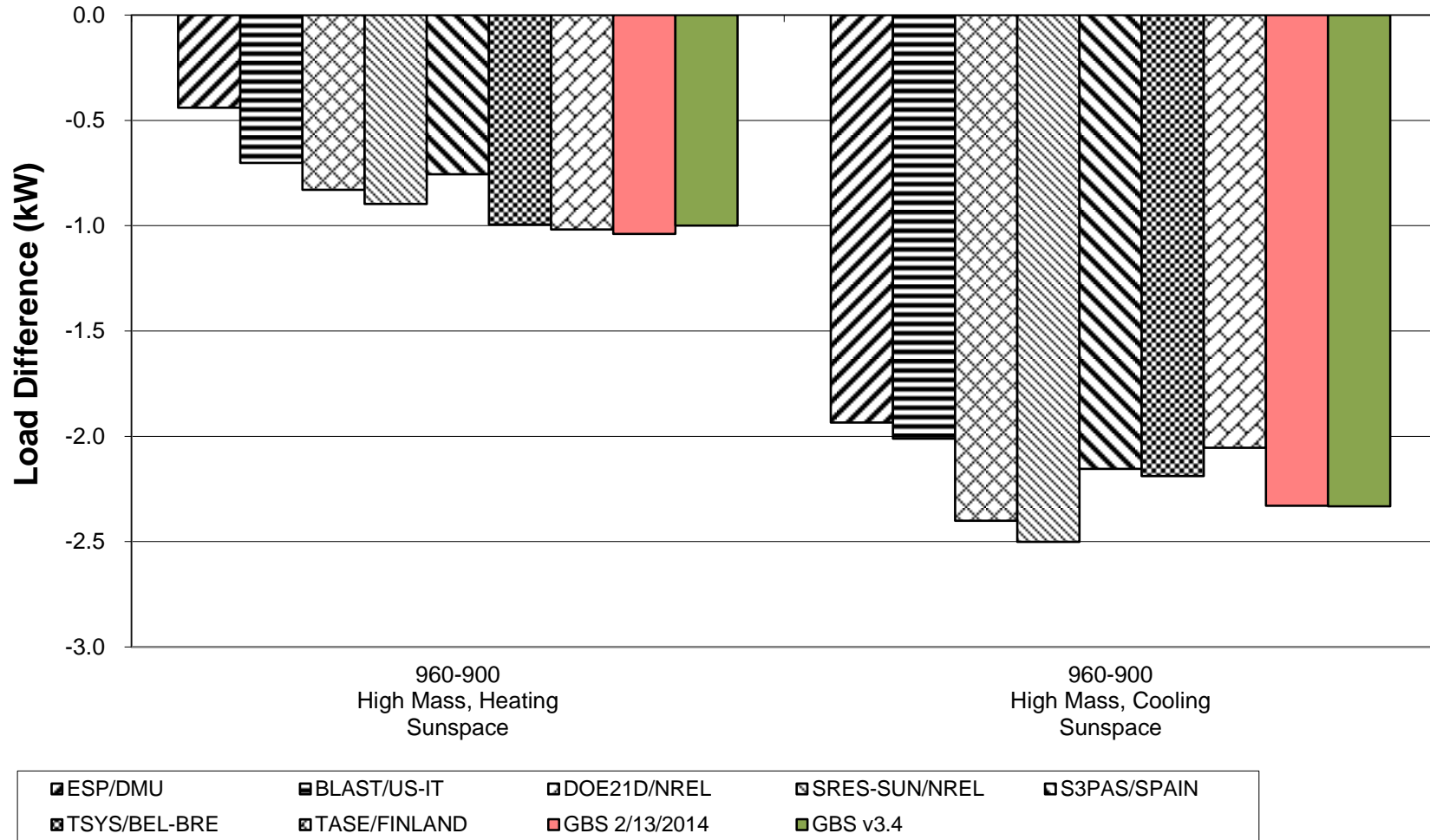


**Figure B8-27. BESTEST BASIC
 Sunspace (Delta)
 Annual Heating and Sensible Cooling**

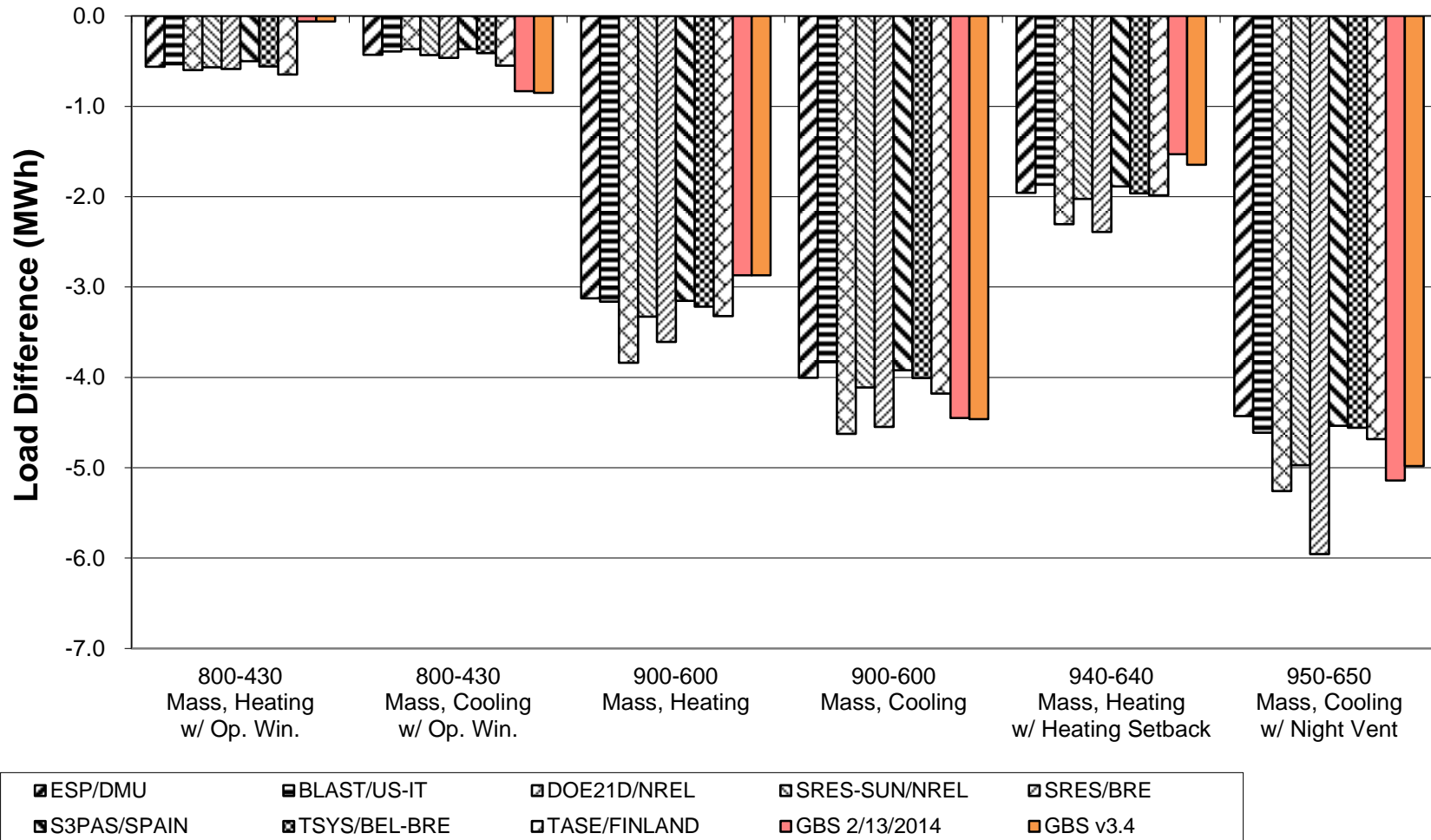


ESP/DMU	BLAST/US-IT	DOE21D/NREL	SRES-SUN/NREL	SRES/BRE
S3PAS/SPAIN	TSYS/BEL-BRE	TASE/FINLAND	GBS 2/13/2014	GBS v3.4

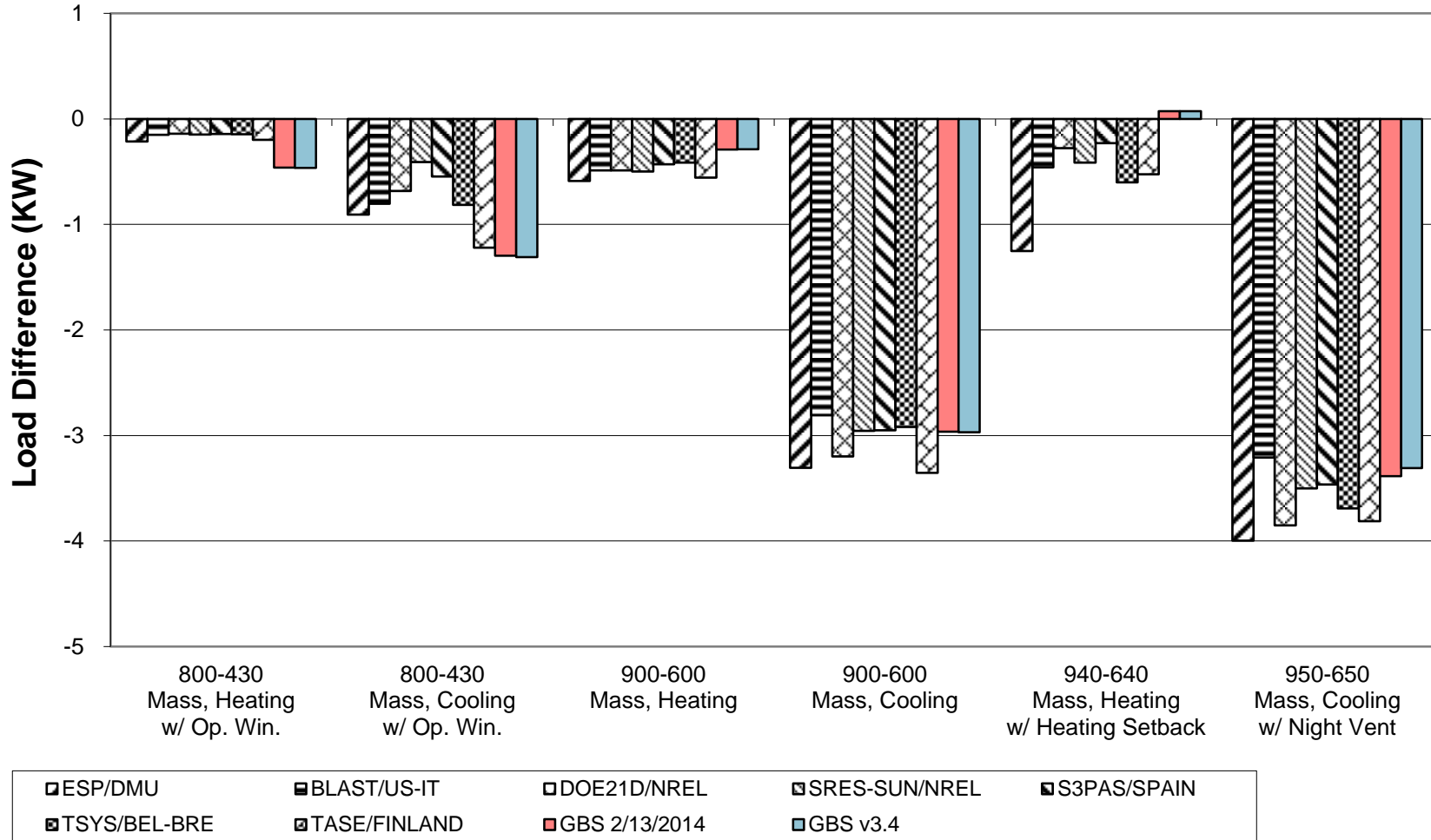
**Figure B8-28. BESTEST BASIC
 Sunspace (Delta)
 Peak Heating and Sensible Cooling**



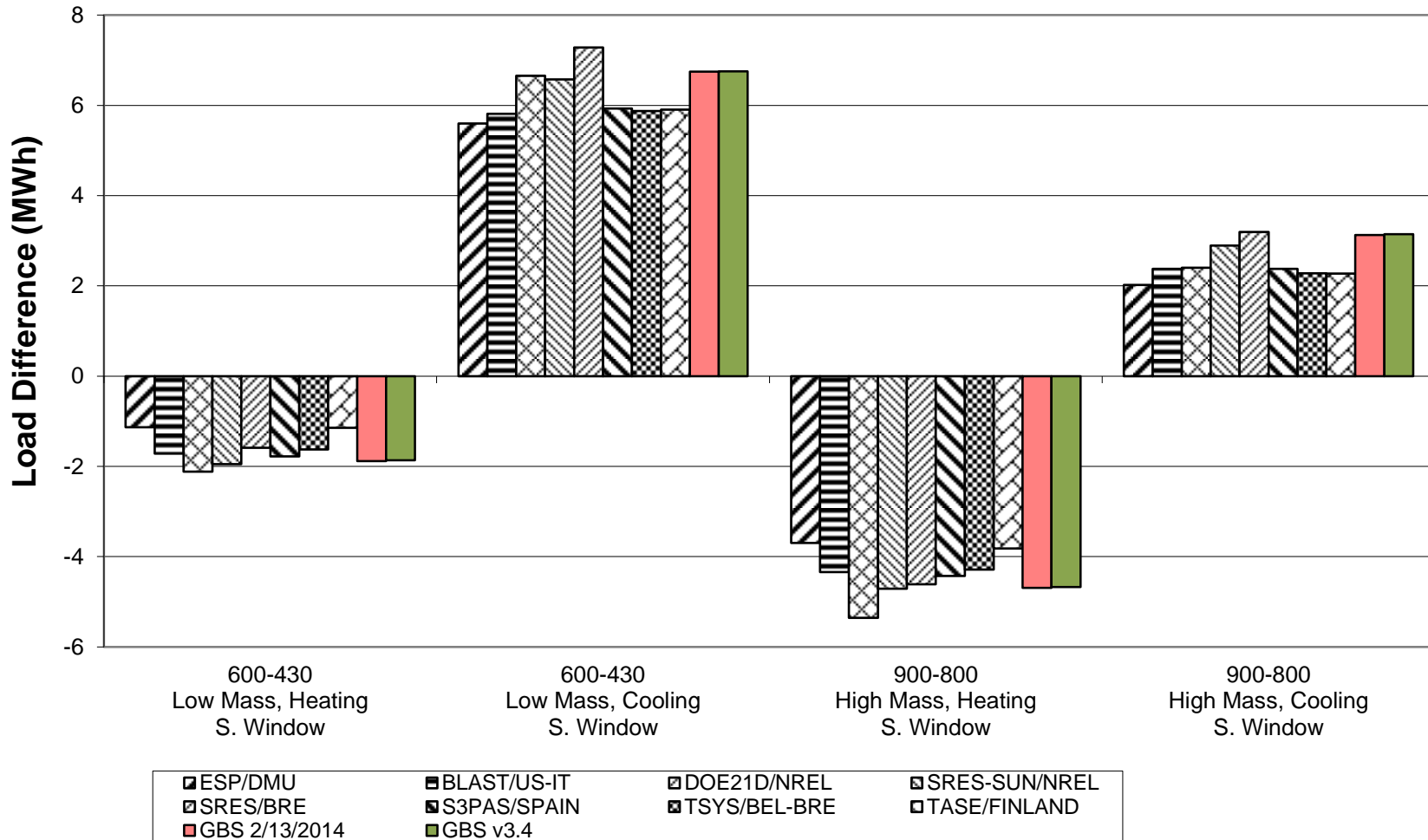
**Figure B8-29. BESTEST BASIC AND IN-DEPTH
 Mass Effect (Delta)
 Annual Heating and Sensible Cooling**



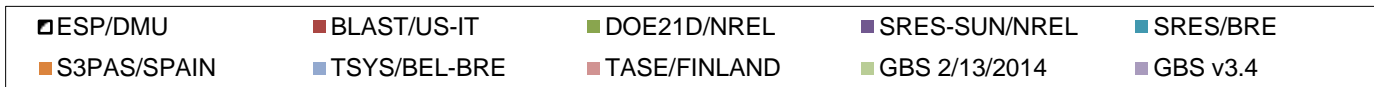
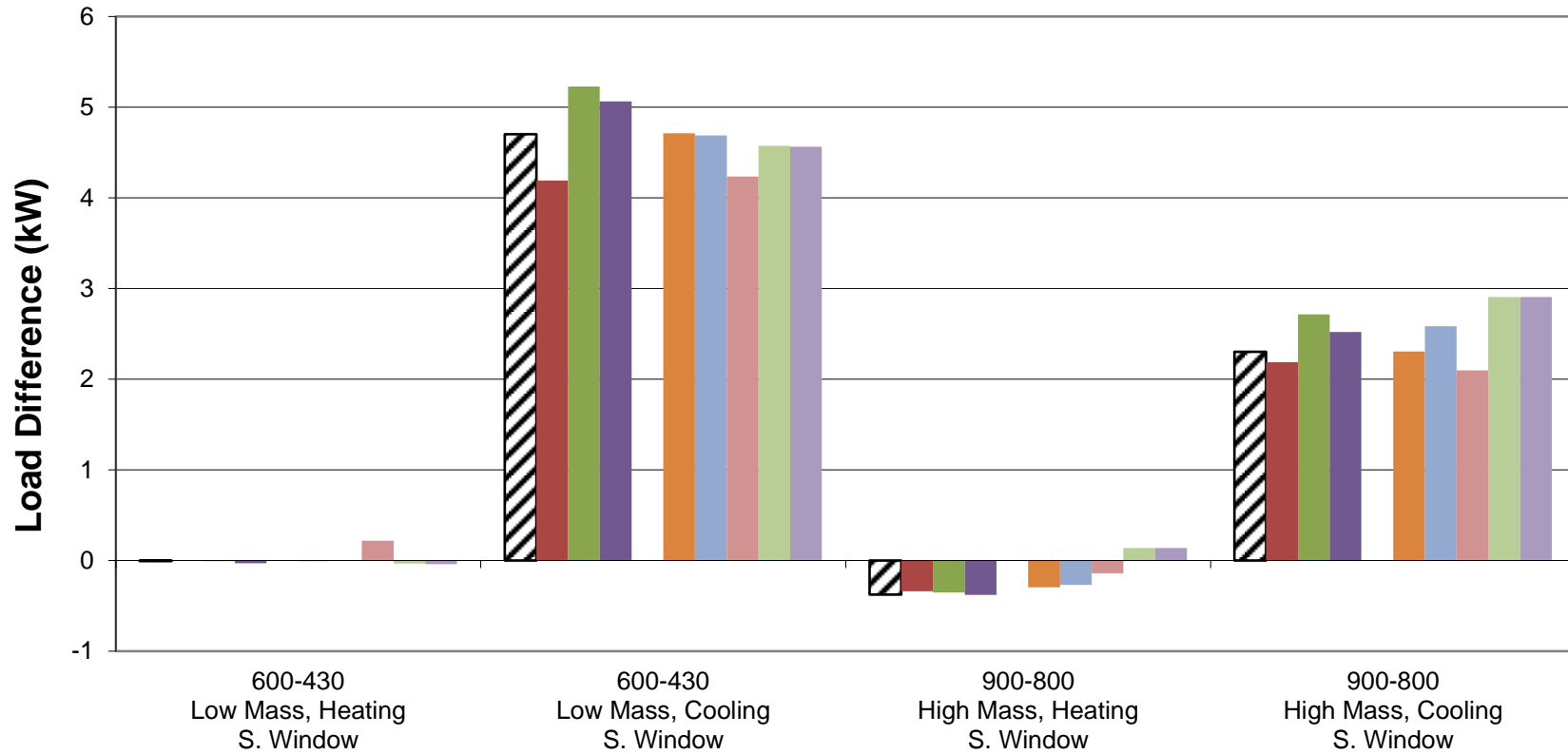
**Figure B8-30. BESTEST BASIC AND IN-DEPTH
 Mass Effect (Delta)
 Peak Heating and Sensible Cooling**



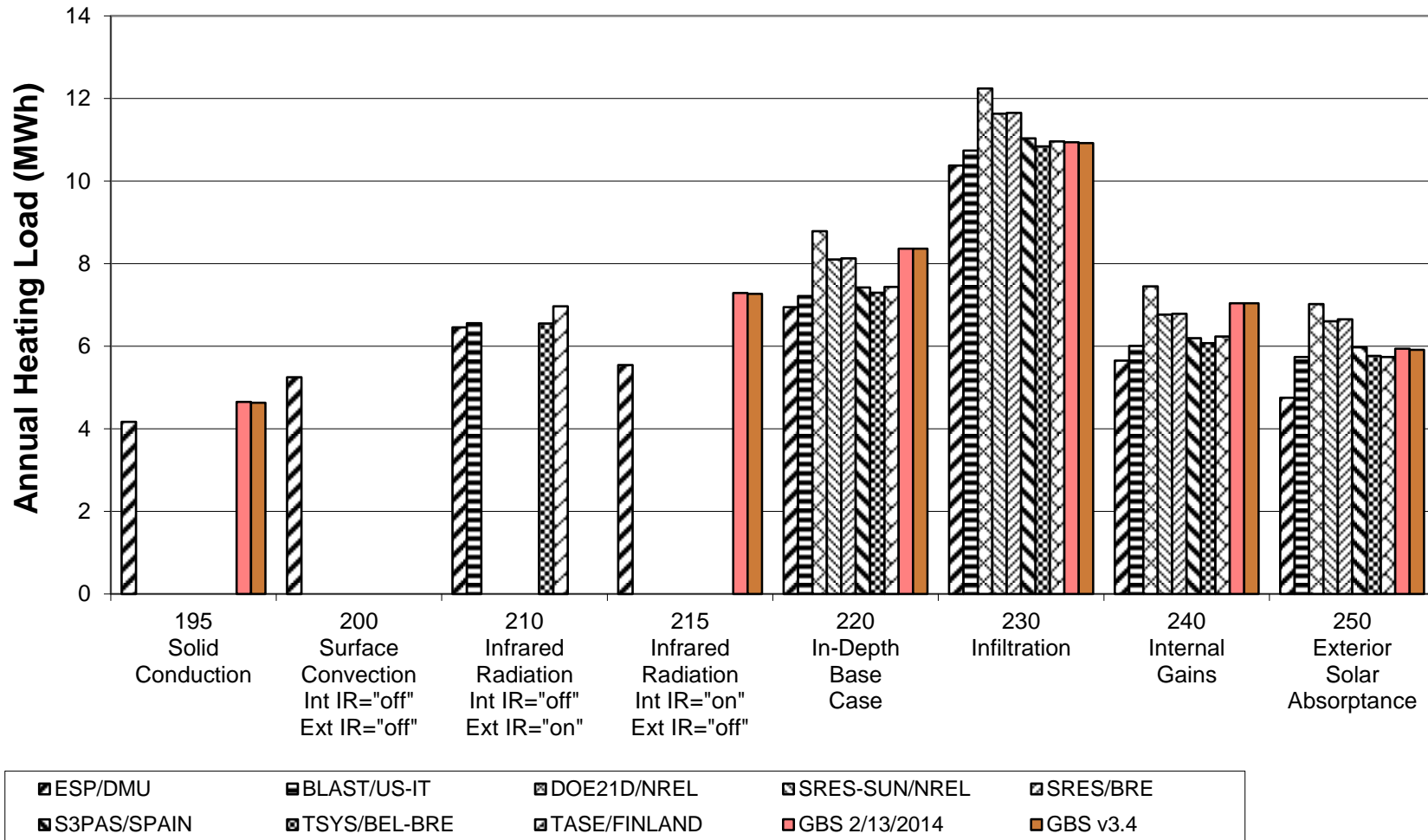
**Figure B8-31. BESTEST IN-DEPTH
 South Window (Delta)
 Annual Heating and Sensible Cooling**



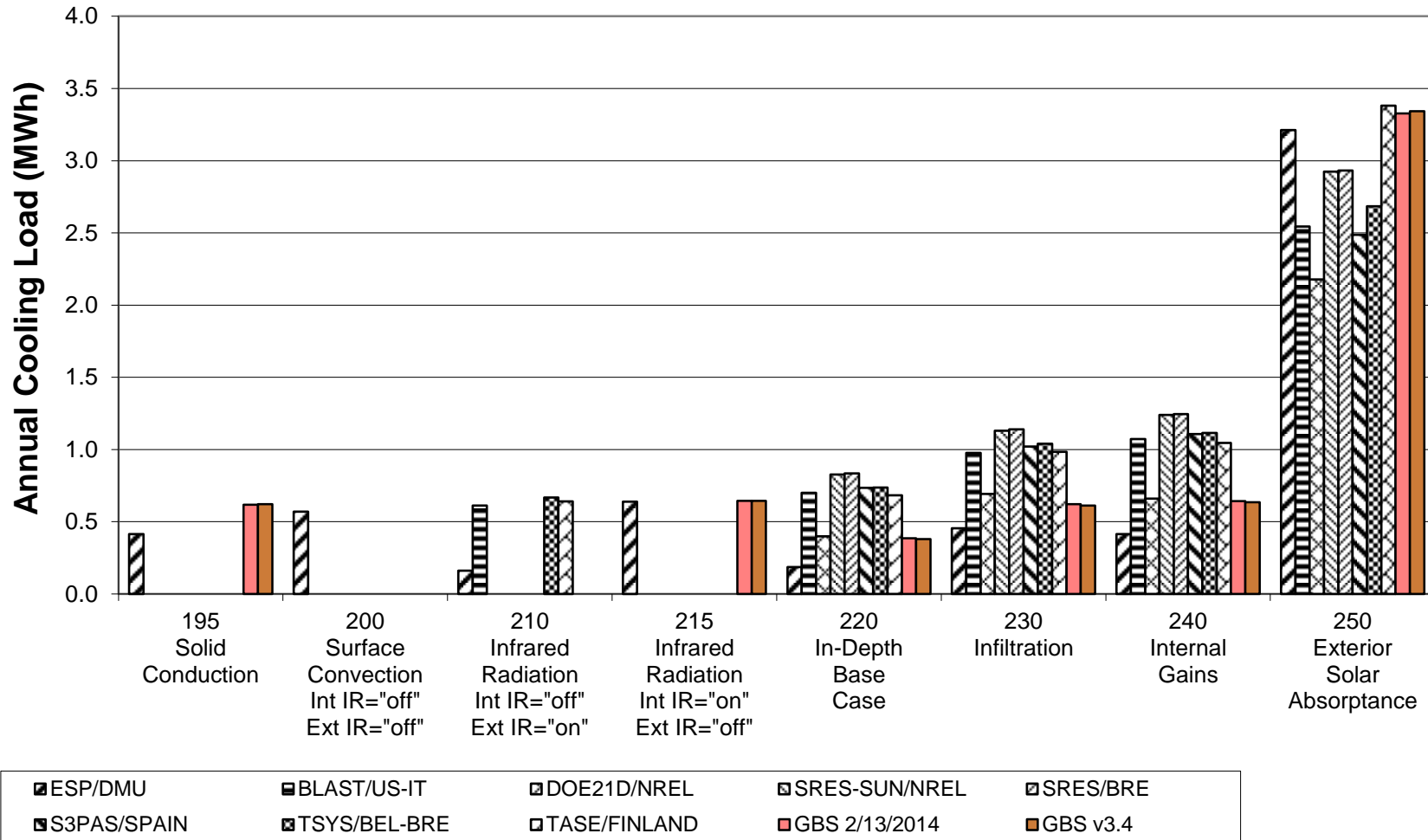
**Figure B8-32. BESTEST IN-DEPTH
 South Window (Delta)
 Peak Heating and Sensible Cooling**



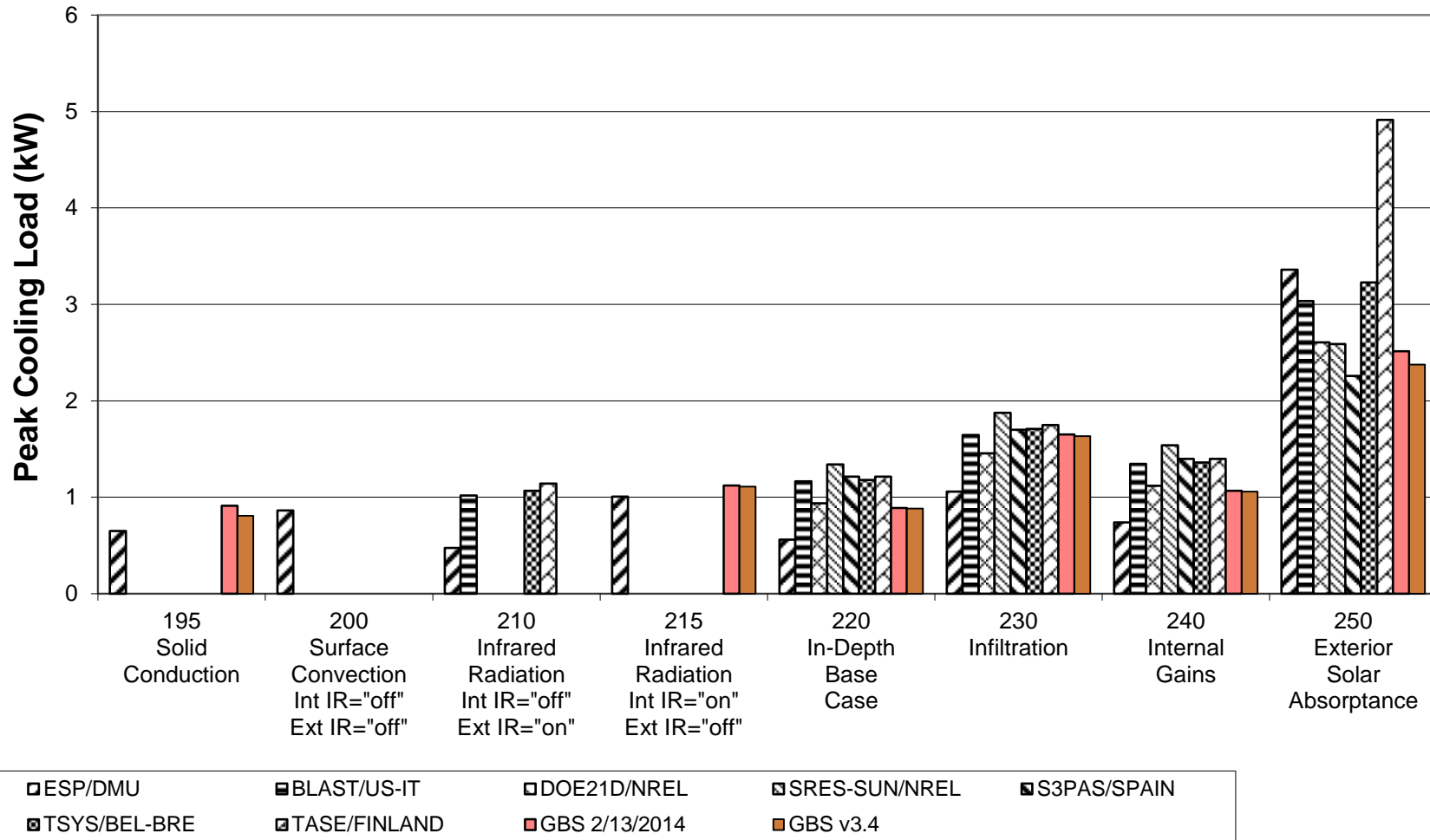
**Figure B8-33. BESTEST IN-DEPTH
 Low Mass Annual Heating
 Cases 195 to 250**



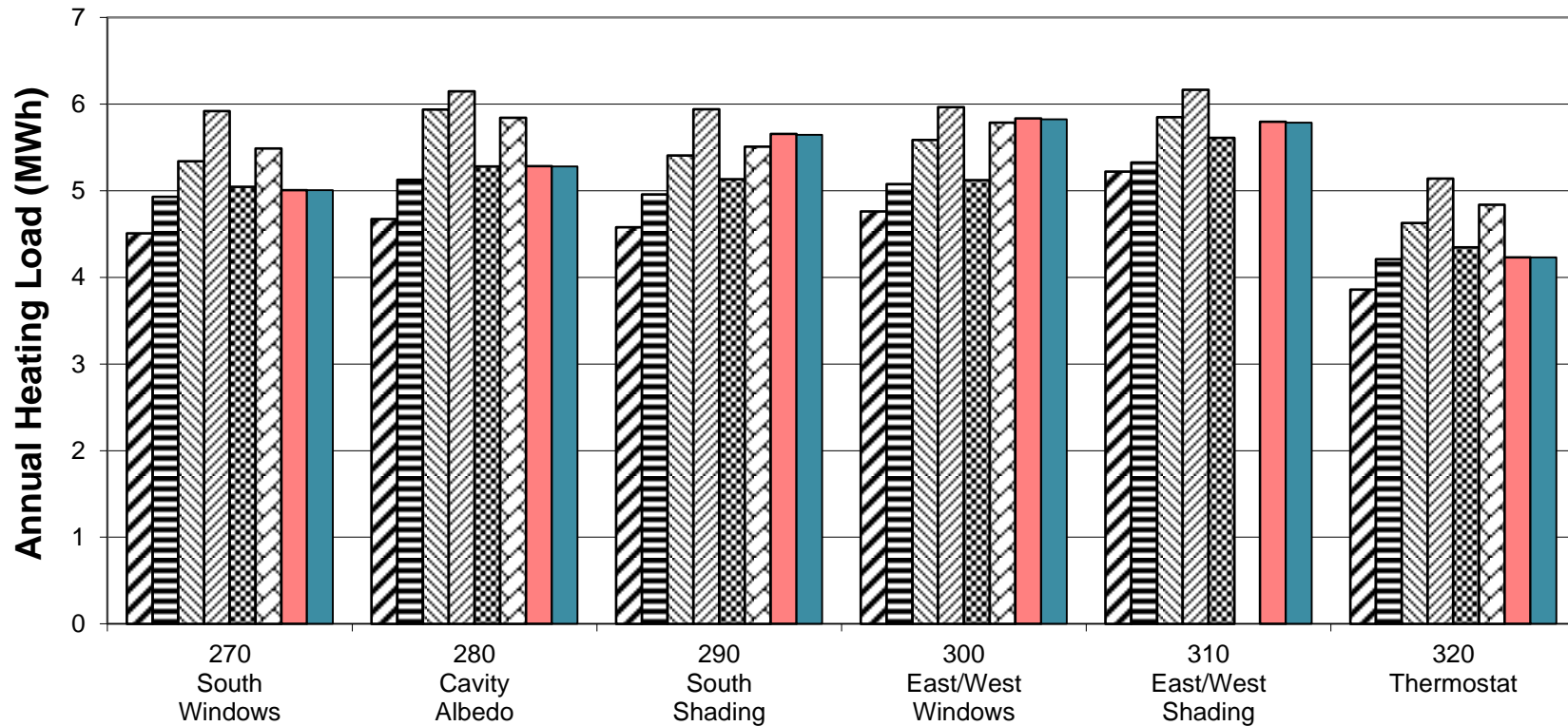
**Figure B8-34. BESTEST IN-DEPTH
 Low Mass Annual Sensible Cooling
 Cases 195 to 250**



**Figure B8-36. BESTEST IN-DEPTH
 Low Mass Peak Sensible Cooling
 Cases 195 to 250**



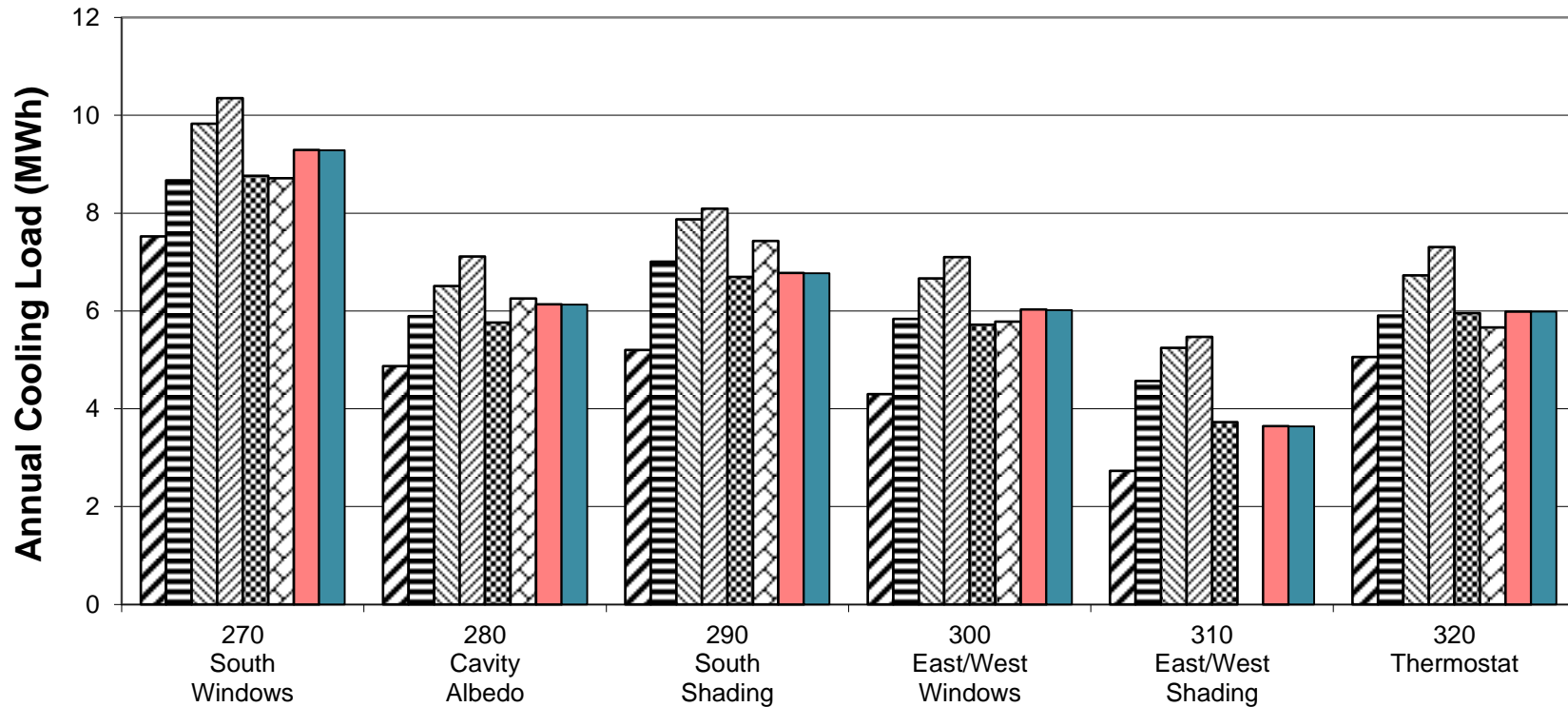
**Figure B8-37. BESTEST IN-DEPTH
 Low Mass Annual Heating
 Cases 270 to 320**



ESP/DMU
 BLAST/US-IT
 SRES-SUN/NREL
 SRES/BRE
 TSYS/BEL-BRE
 TASE/FINLAND
 GBS 2/13/2014
 GBS v3.4

* SRES/BRE Cases 270, 290-320 have input error likely affecting results by <0.2 MWh/y (<3%)

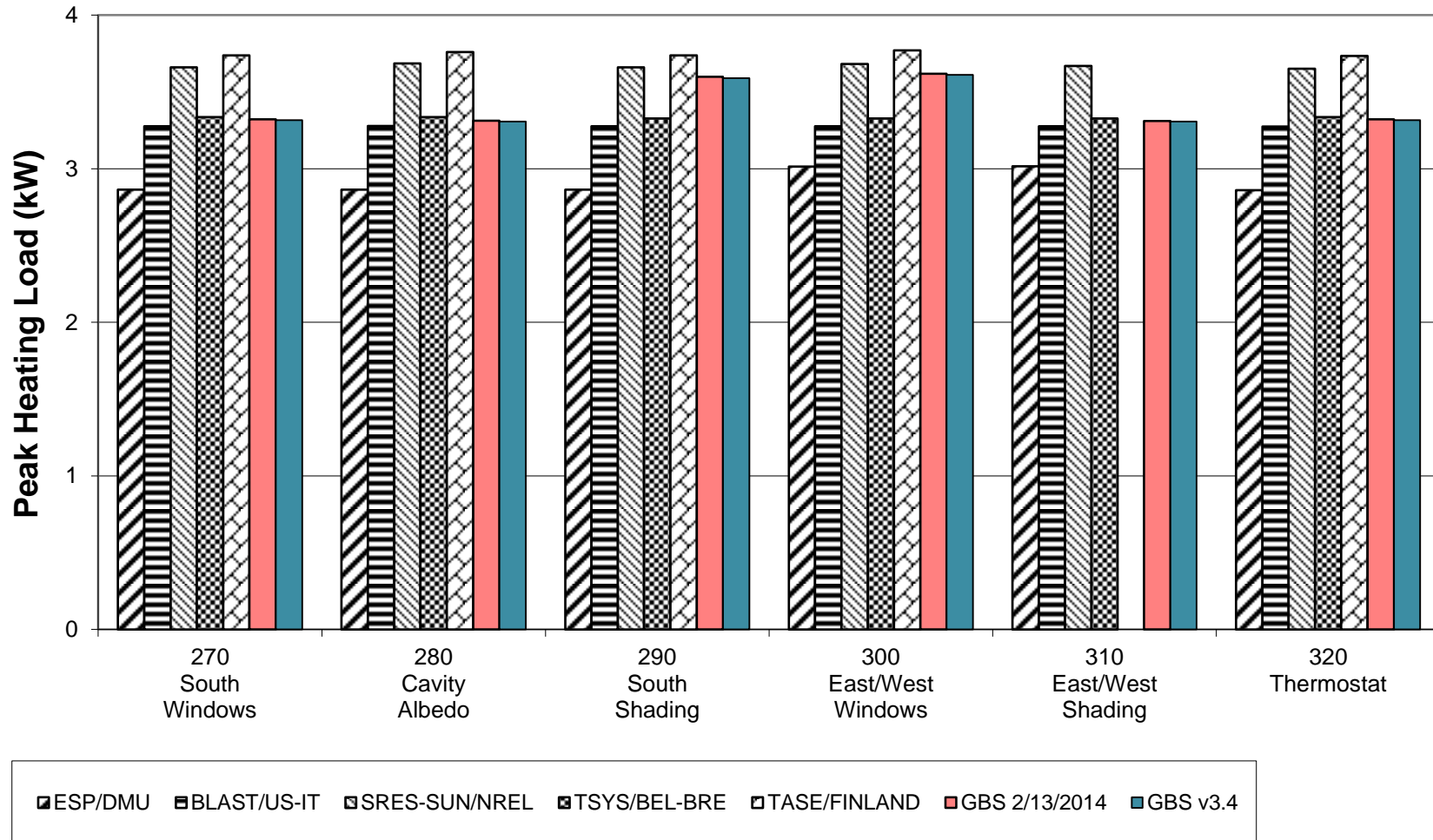
**Figure B8-38. BESTEST IN-DEPTH
 Low Mass Annual Sensible Cooling
 Cases 270 to 320**



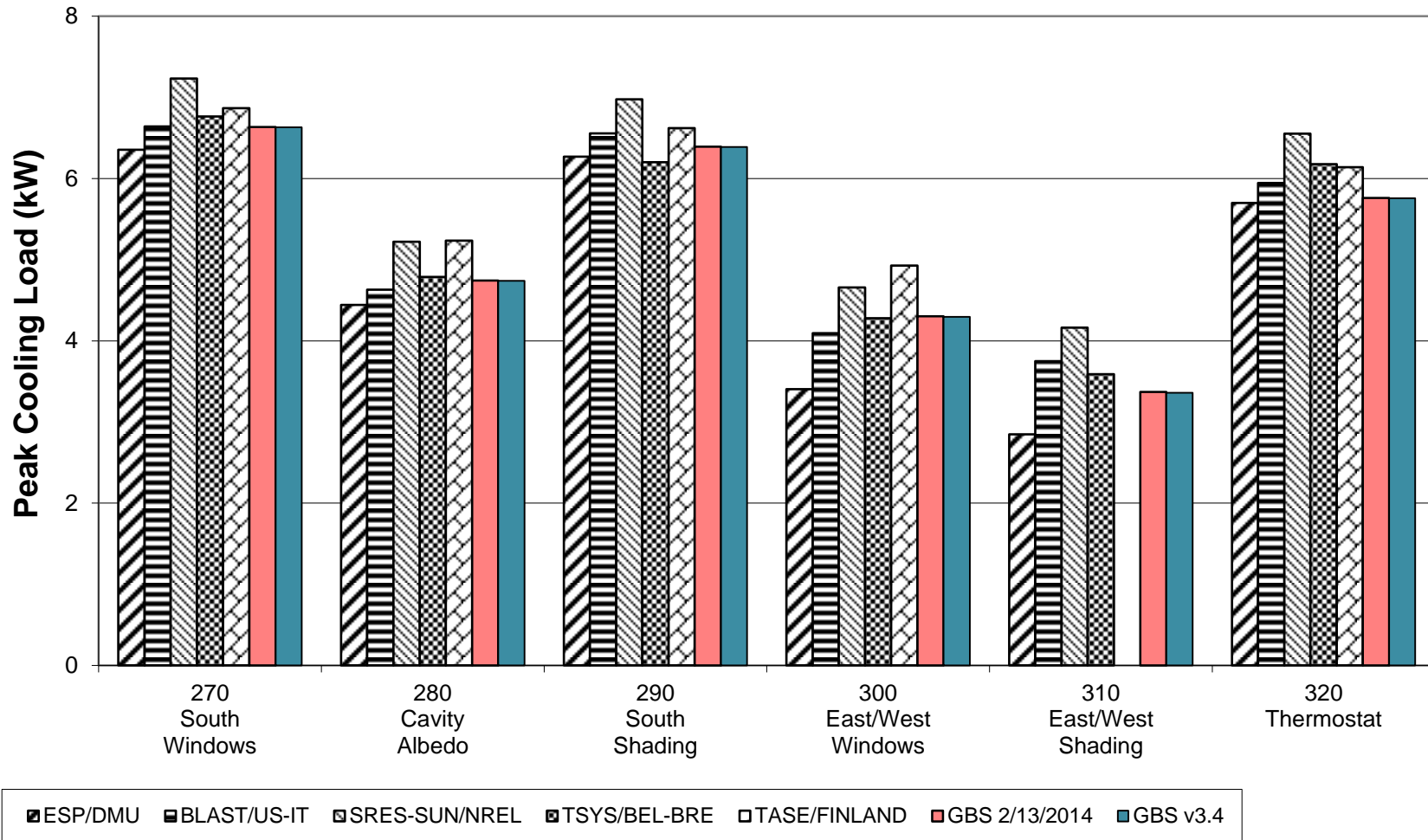
ESP/DMU
 BLAST/US-IT
 SRES-SUN/NREL
 SRES/BRE
 TSYS/BEL-BRE
 TASE/FINLAND
 GBS 2/13/2014
 GBS v3.4

* SRES/BRE Cases 270, 290-320 have input error likely affecting results by <0.2 MWh/y (<3%)

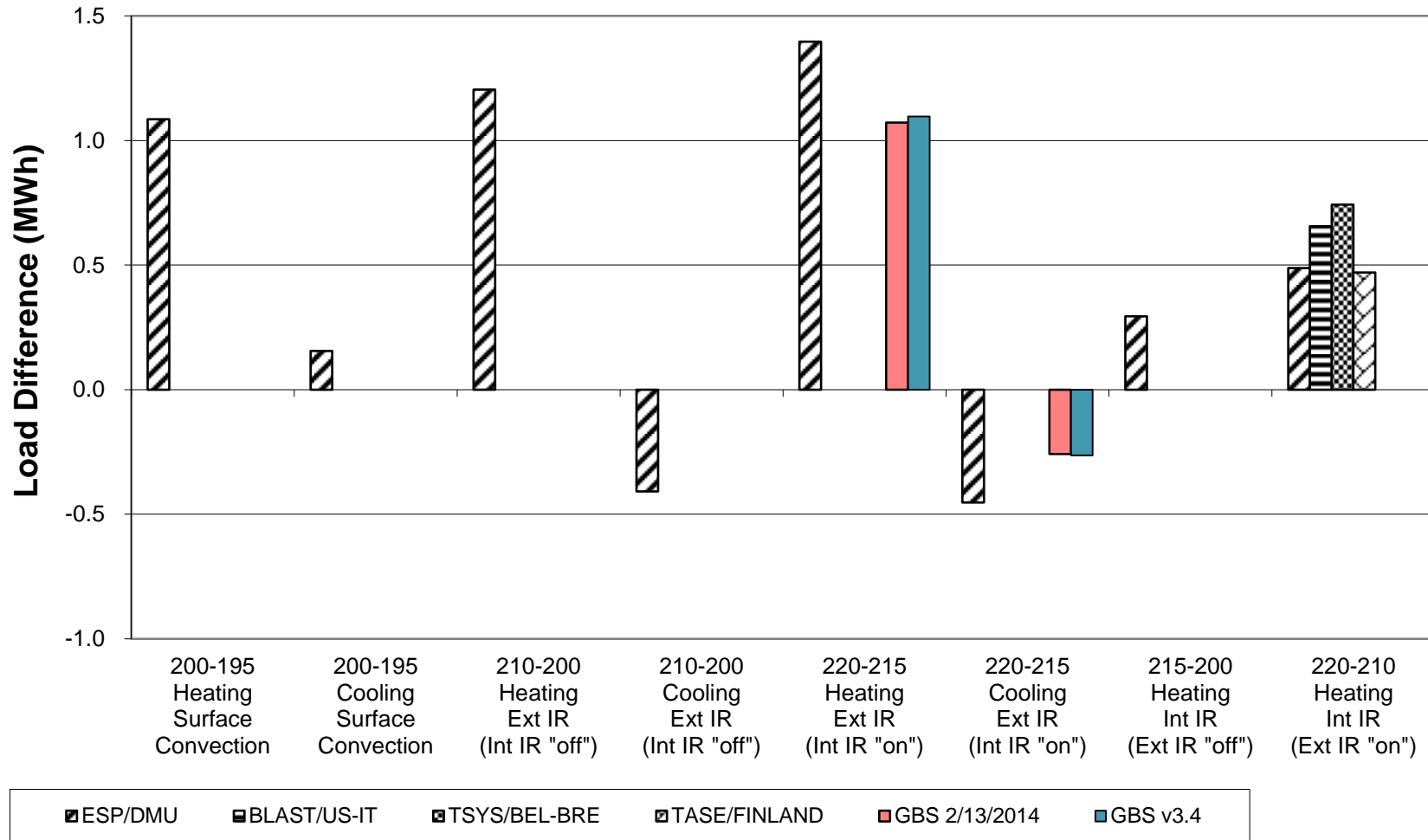
**Figure B8-39. BESTEST IN-DEPTH
 Low Mass Peak Heating
 Cases 270 to 320**



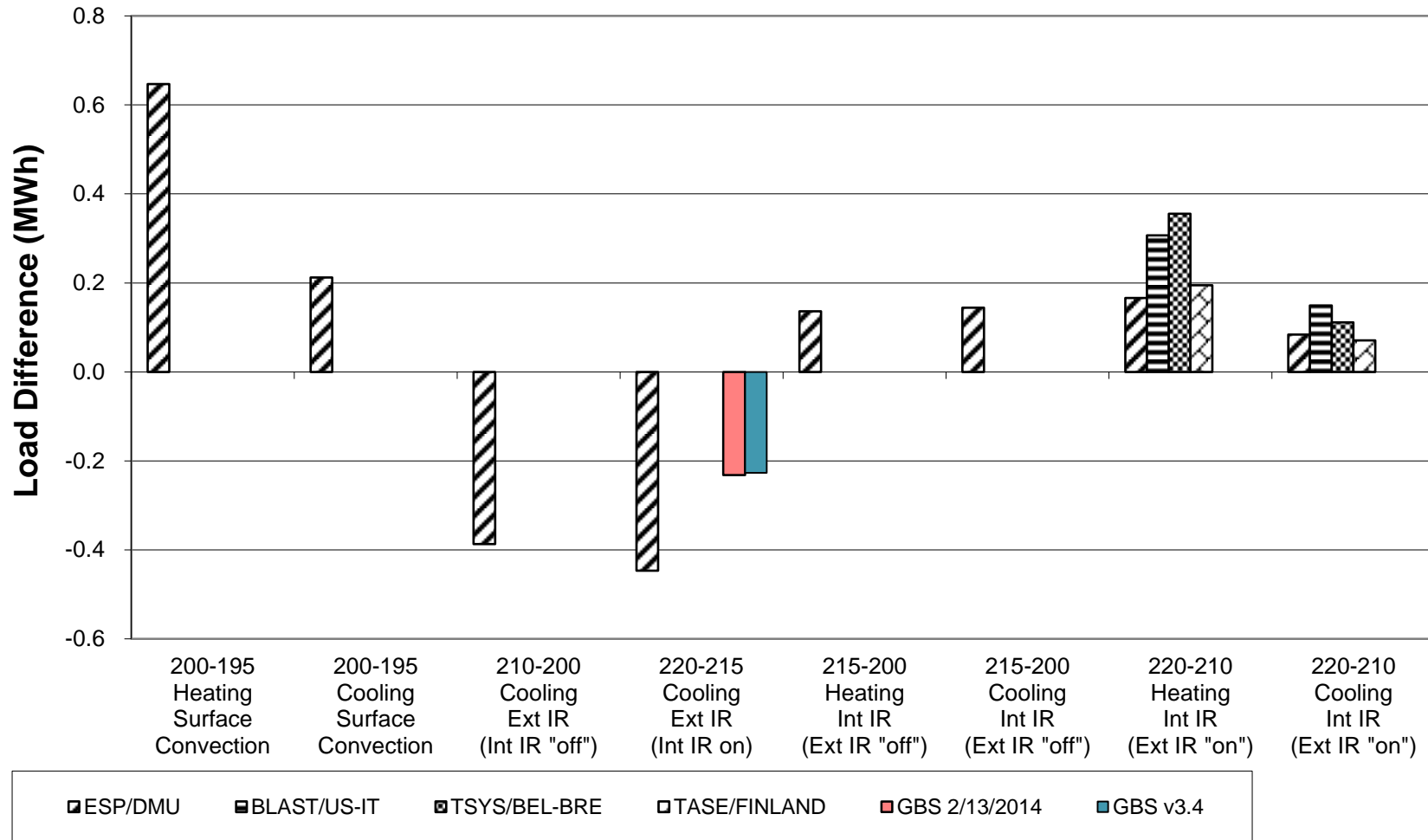
**Figure B8-40. BESTEST IN-DEPTH
 Low Mass Peak Sensible Cooling
 Cases 270 to 320**



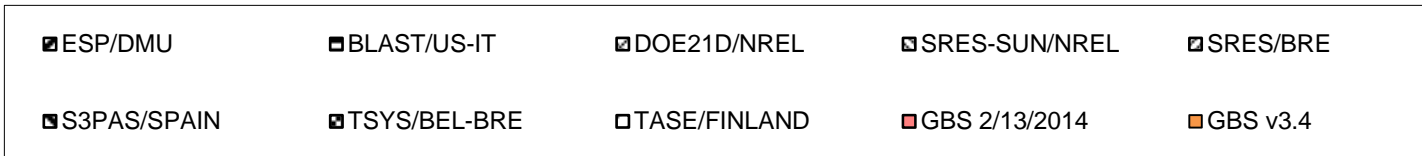
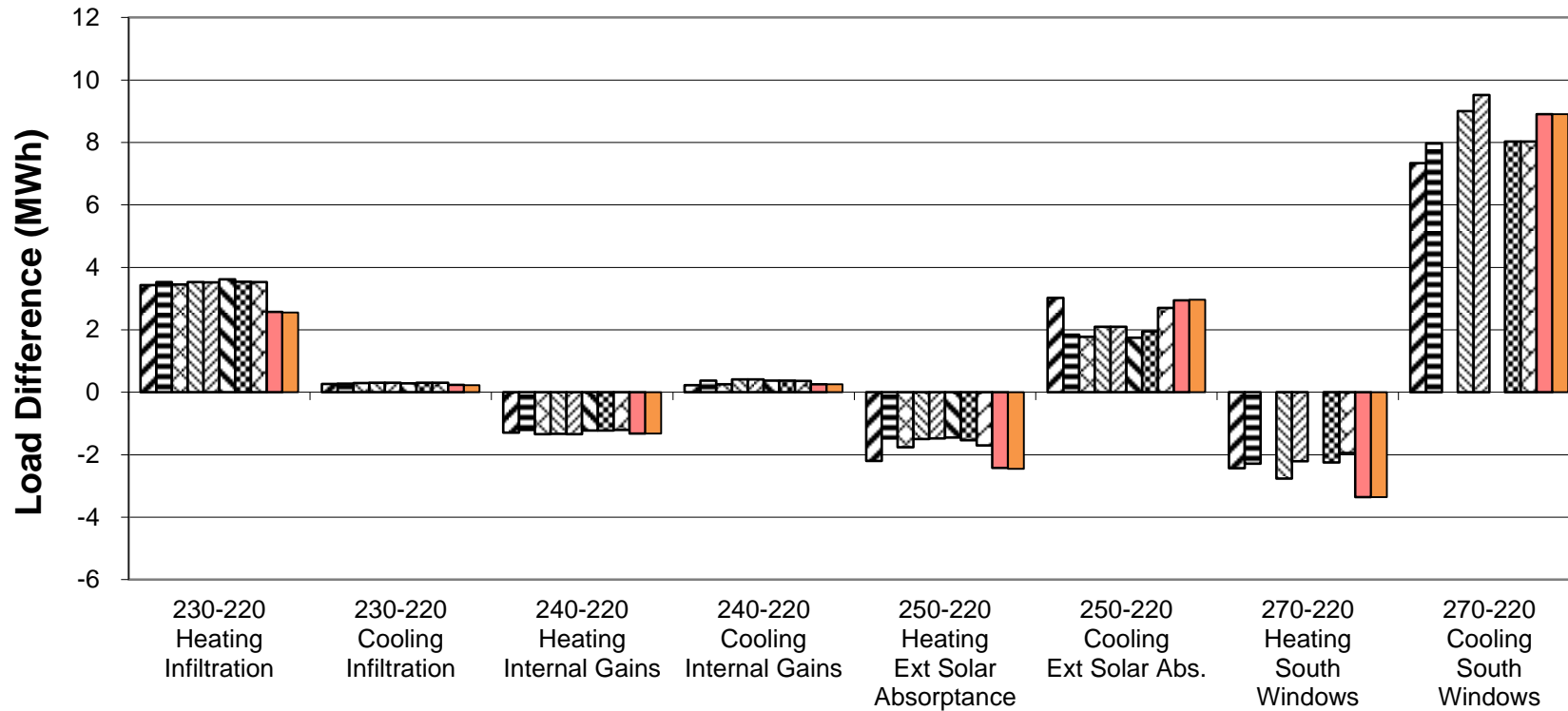
**Figure B8-41. BESTEST IN-DEPTH
 Cases 195 to 220 (Delta)
 Annual Heating and Sensible Cooling**



**Figure B8-42. BESTEST IN-DEPTH
 Cases 195 to 220 (Delta)
 Peak Heating and Sensible Cooling**

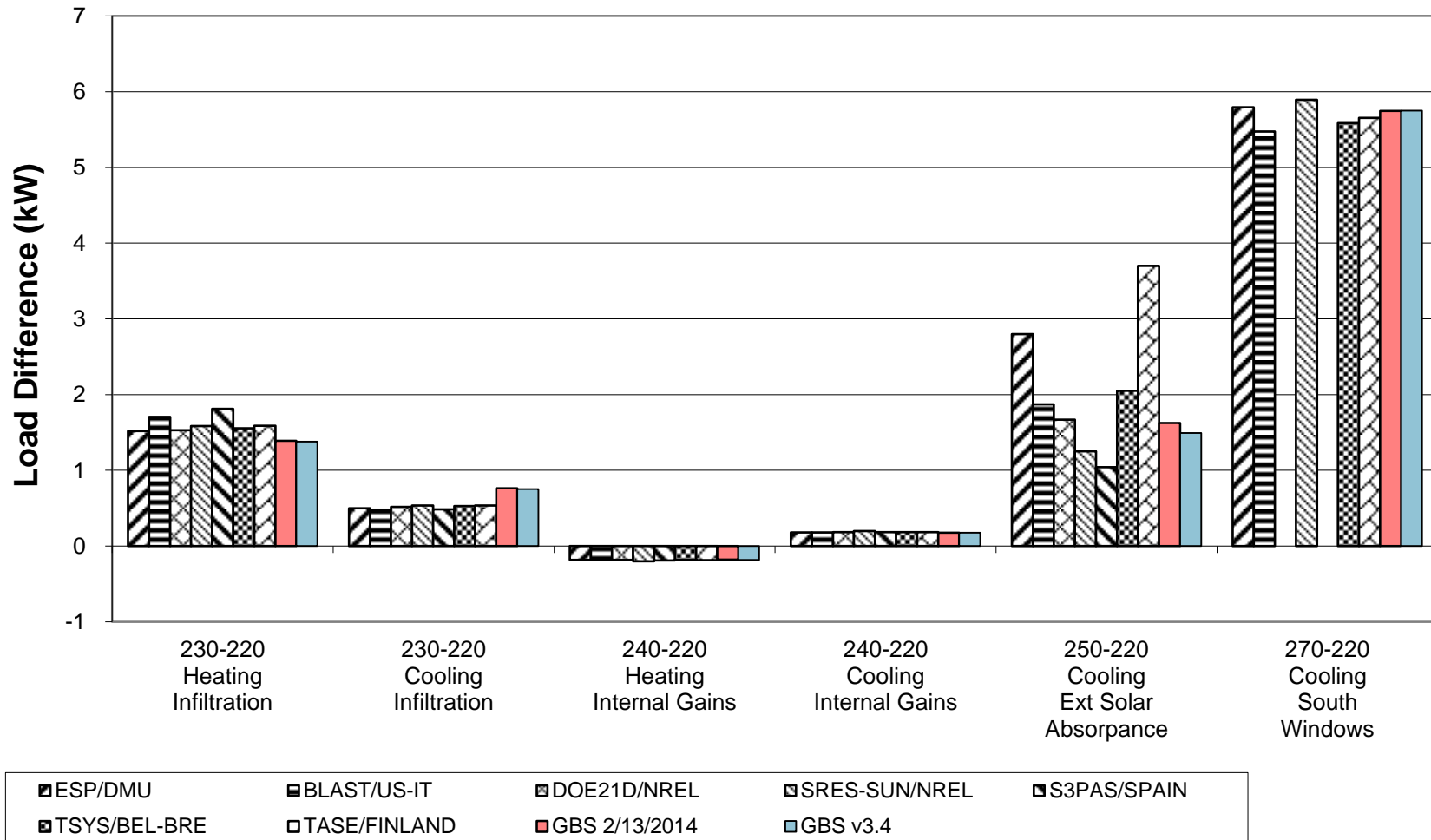


**Figure B8-43. BESTEST IN-DEPTH
 Cases 220 to 270 (Delta)
 Annual Heating and Sensible Cooling**

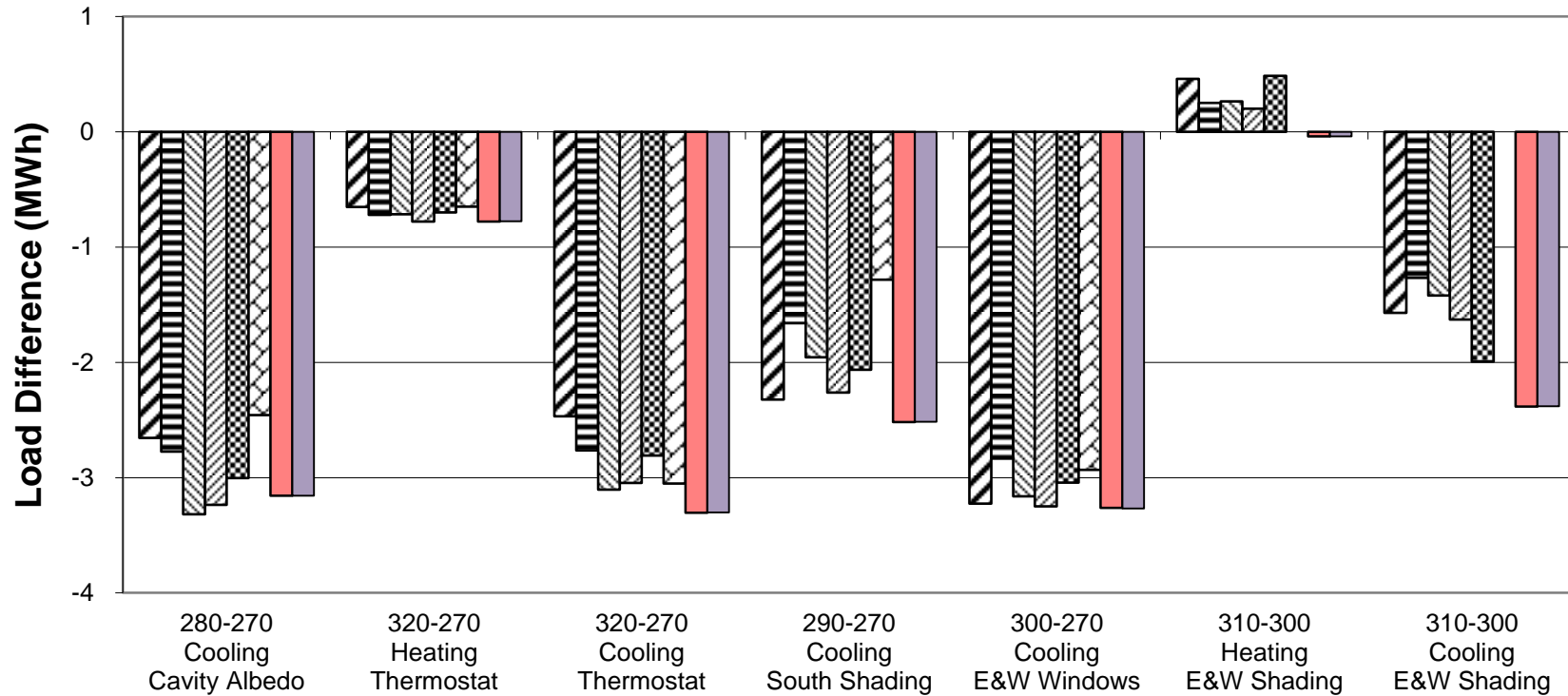


* SRES/BRE Case 270 has input error likely affecting 270-220 sensitivity results for heating by <0.2 MWh/y (<6%), and for cooling by <0.2 MWh/y (<3%)

**Figure B8-44. BESTEST IN-DEPTH
 Cases 220 to 270 (Delta)
 Peak Heating and Sensible Cooling**



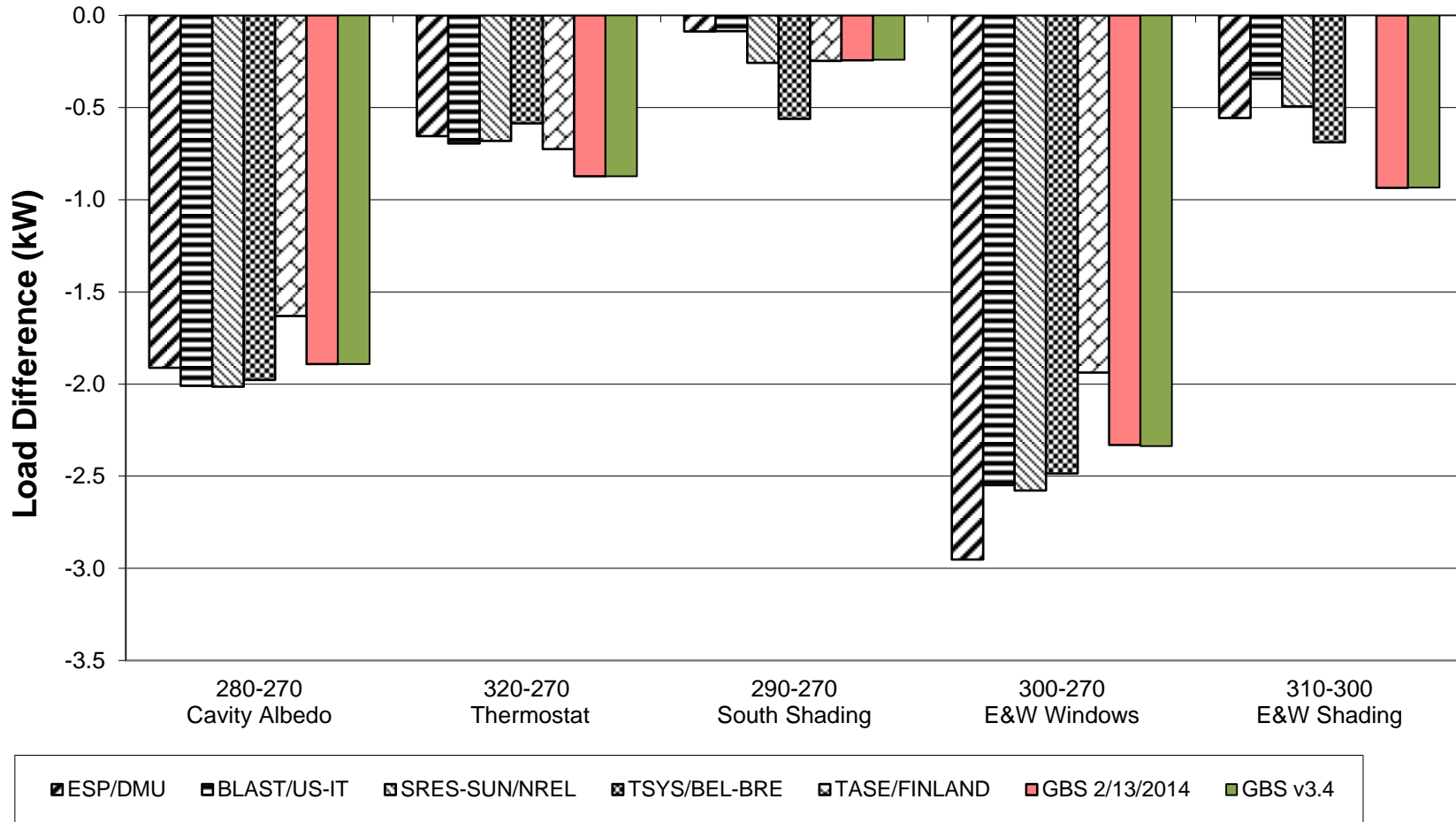
**Figure B8-45. BESTEST IN-DEPTH
 Cases 270 to 320 (Delta)
 Annual Heating and Sensible Cooling**



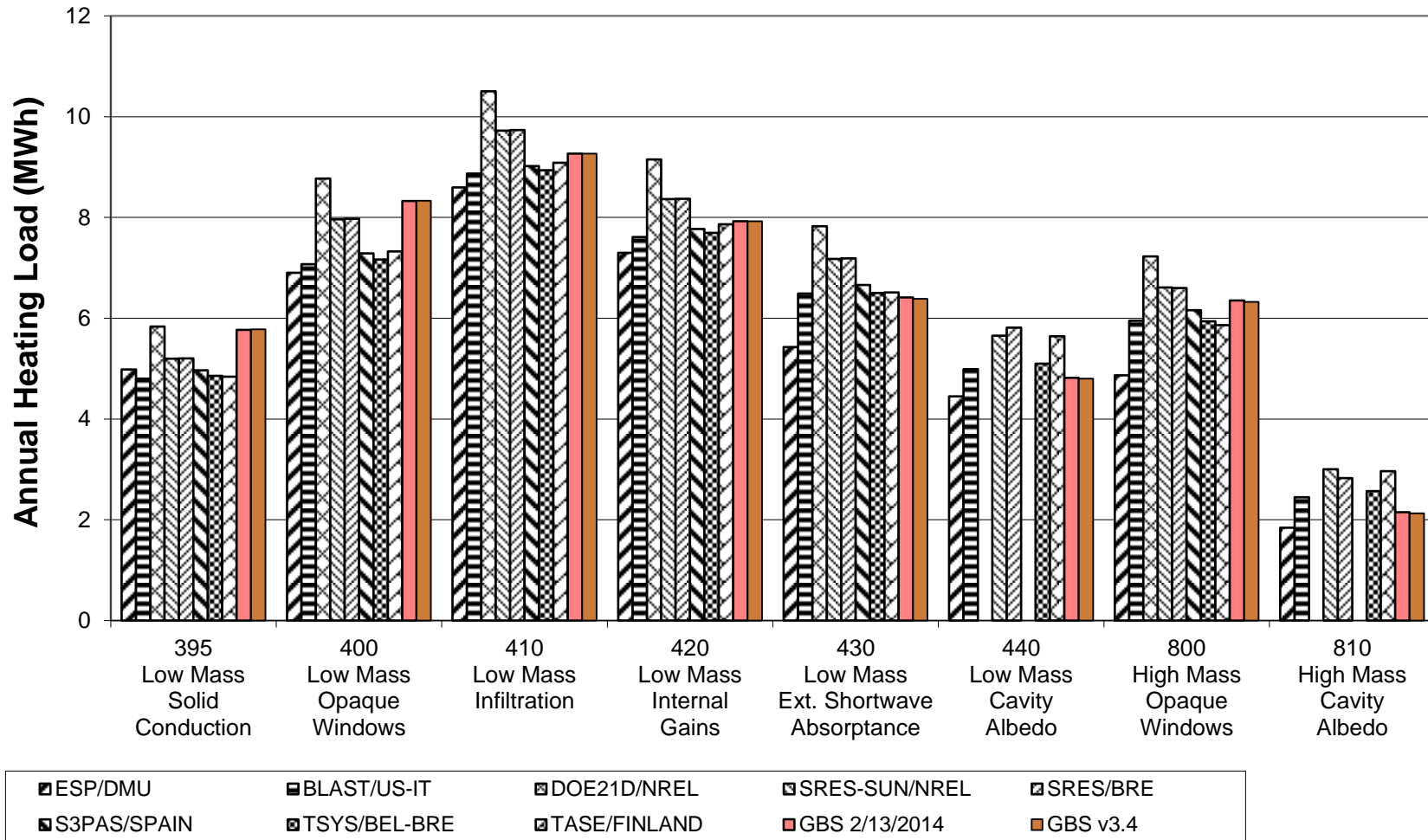
■ ESP/DMU
 ■ BLAST/US-IT
 ■ SRES-SUN/NREL
 ■ SRES/BRE
 ■ TSYS/BEL-BRE
 ■ TASE/FINLAND
 ■ GBS 2/13/2014
 ■ GBS v3.4

* SRES-BRE Cases 270, 290-320 have input error likely affecting sensitivity results for heating by <math><0.2 \text{ MWh/y}</math> (<math><6\%</math>), and for cooling by <math><0.2 \text{ MWh/y}</math> (<math><3\%</math>)

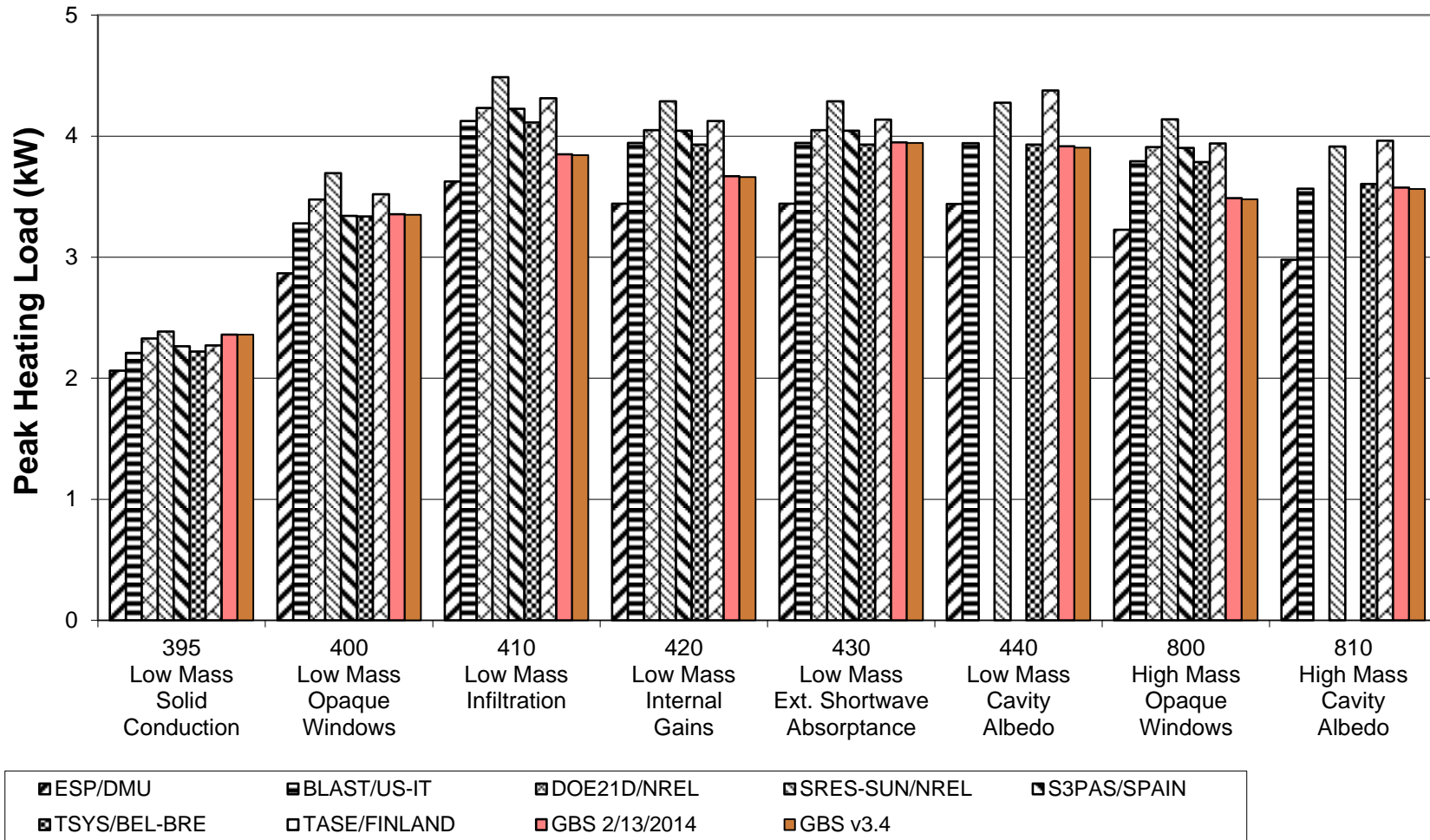
**Figure B8-46. BESTEST IN-DEPTH
 Cases 270 to 320 (Delta)
 Peak Sensible Cooling**



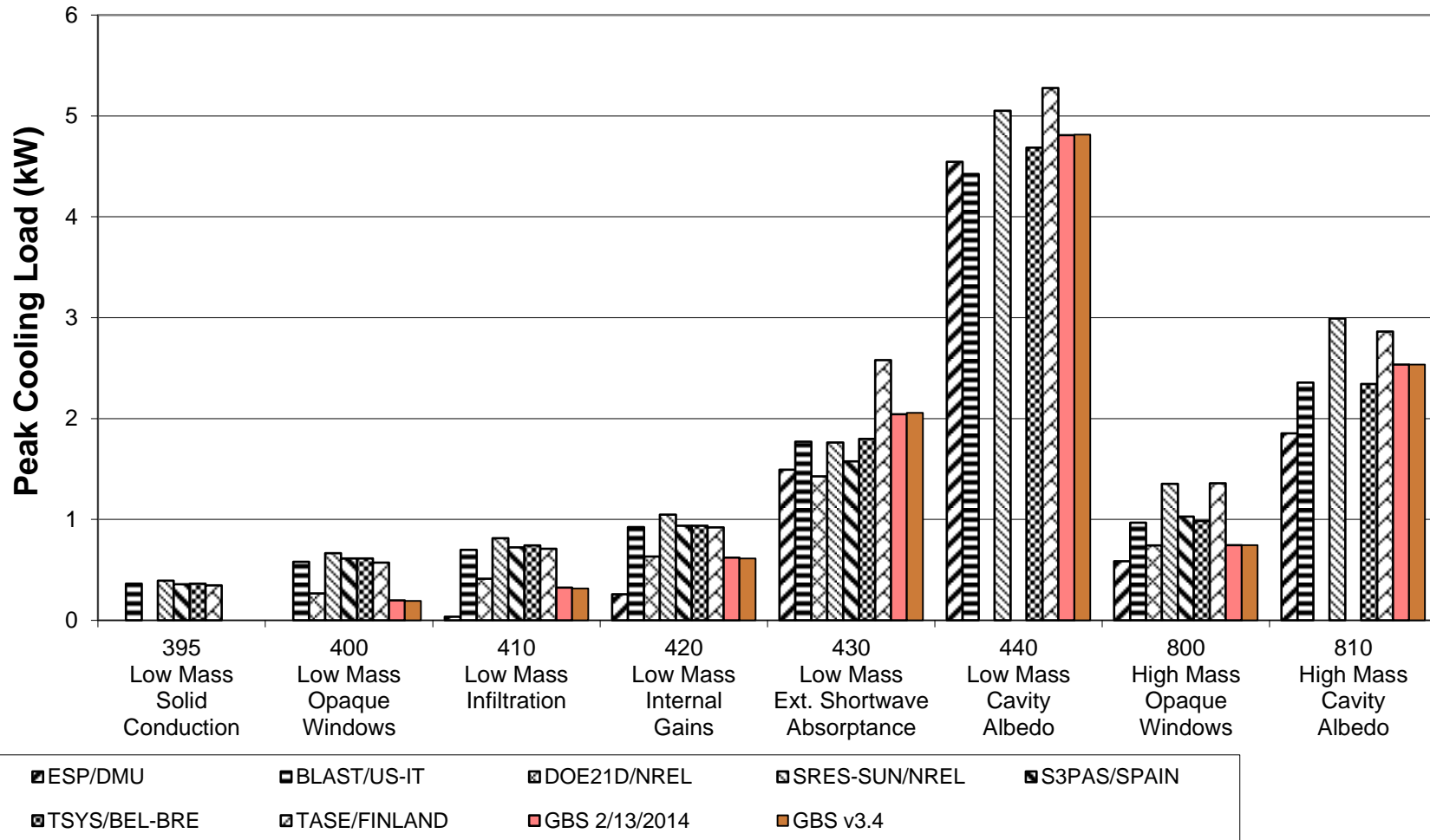
**Figure B8-47. BESTEST IN-DEPTH
Annual Heating
Cases 395 to 440, 800, 810**



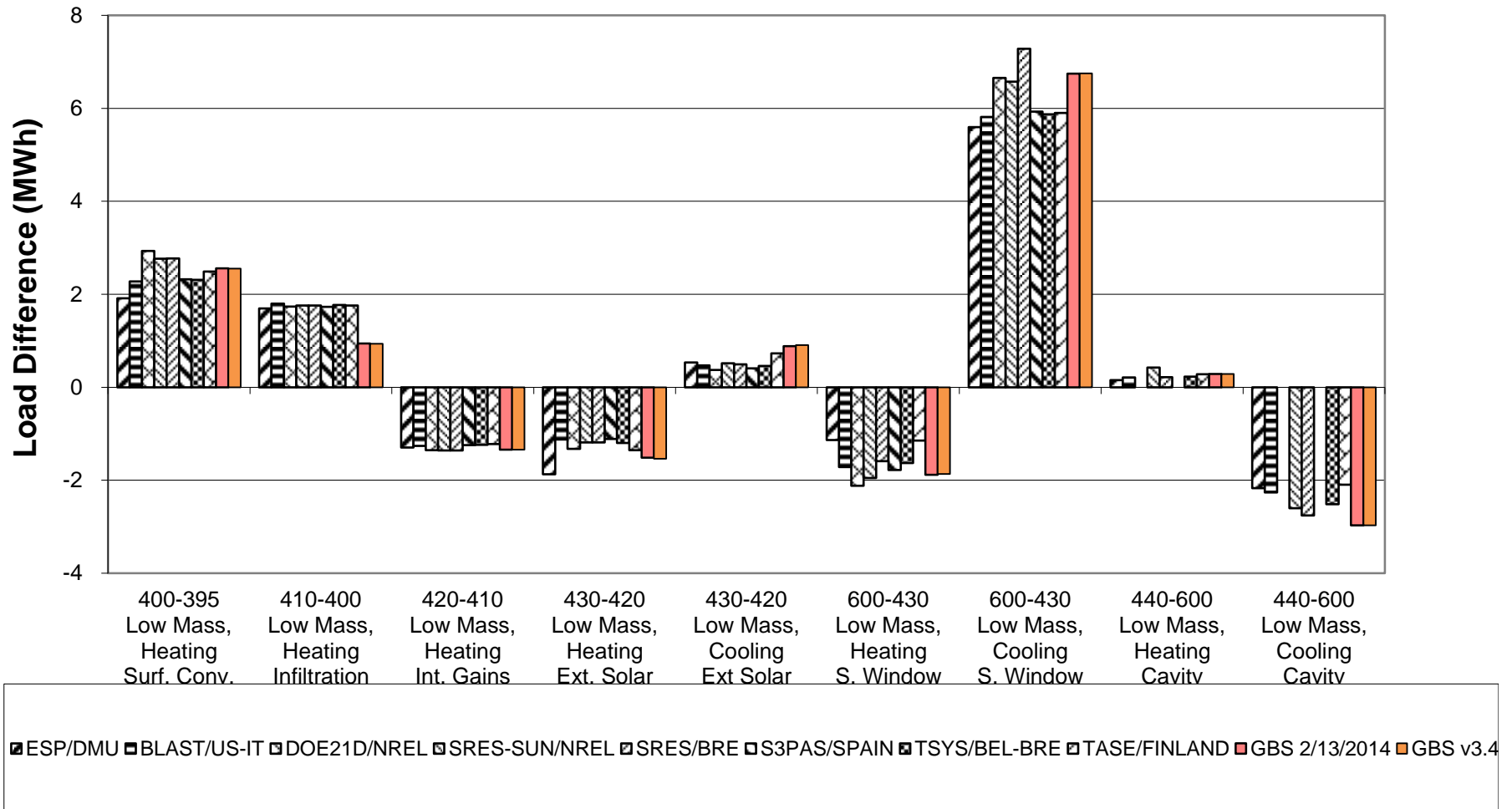
**Figure B8-49. BESTEST IN-DEPTH
 Peak Heating
 Cases 395 to 440, 800, 810**



**Figure B8-50. BESTEST IN-DEPTH
 Peak Sensible Cooling
 Cases 395 to 440, 800, 810**



**Figure B8-51. BESTEST IN-DEPTH
 Cases 395 to 600 (Delta)
 Annual Heating and Sensible Cooling**



**Figure B8-53. BESTEST Case 900FF
Annual Hourly Temperature Frequency**

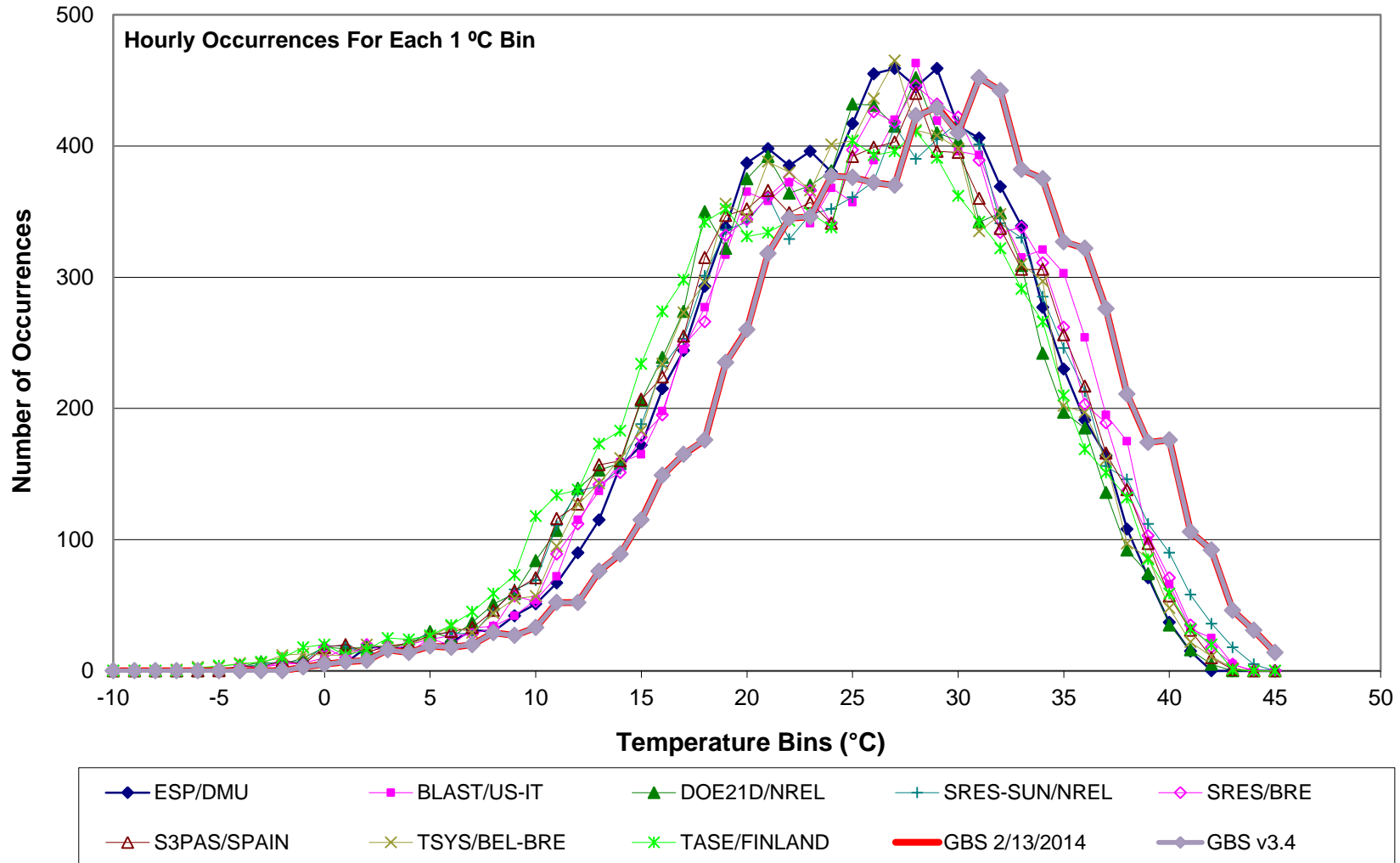


Figure B8-54. BESTEST Case 600
Cloudy & Clear Day Hourly Incident Solar
South Facing Surface

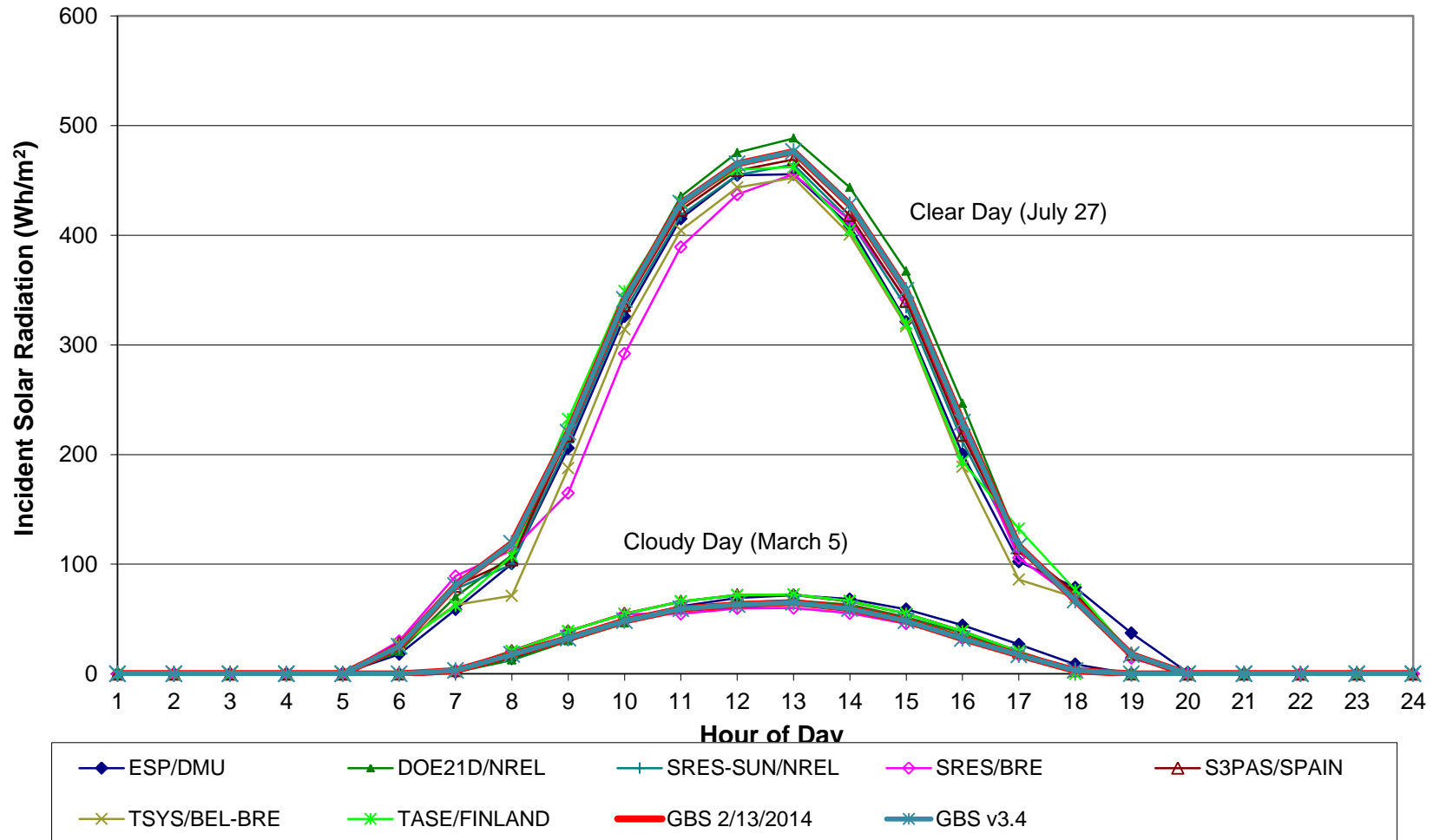
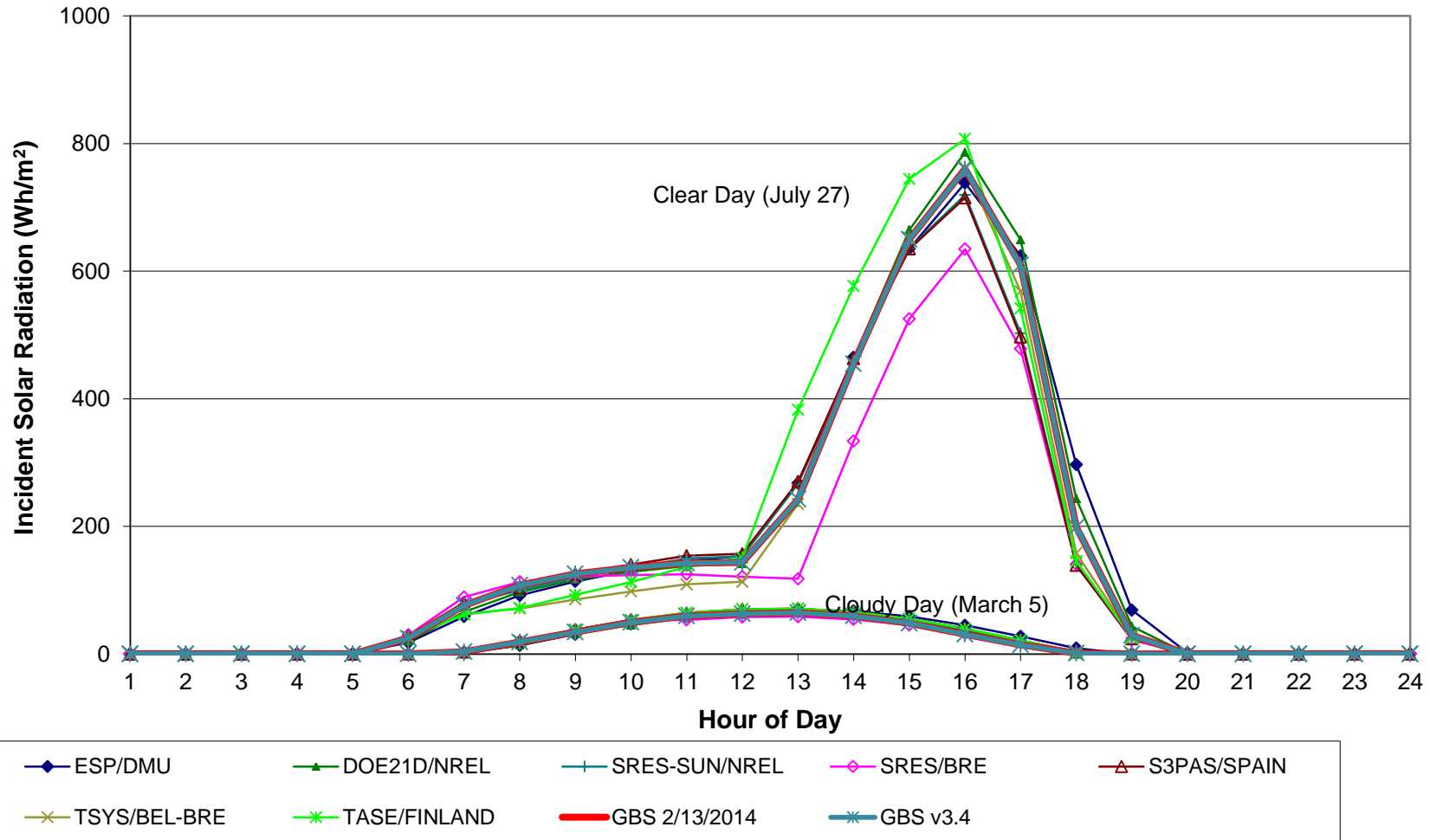
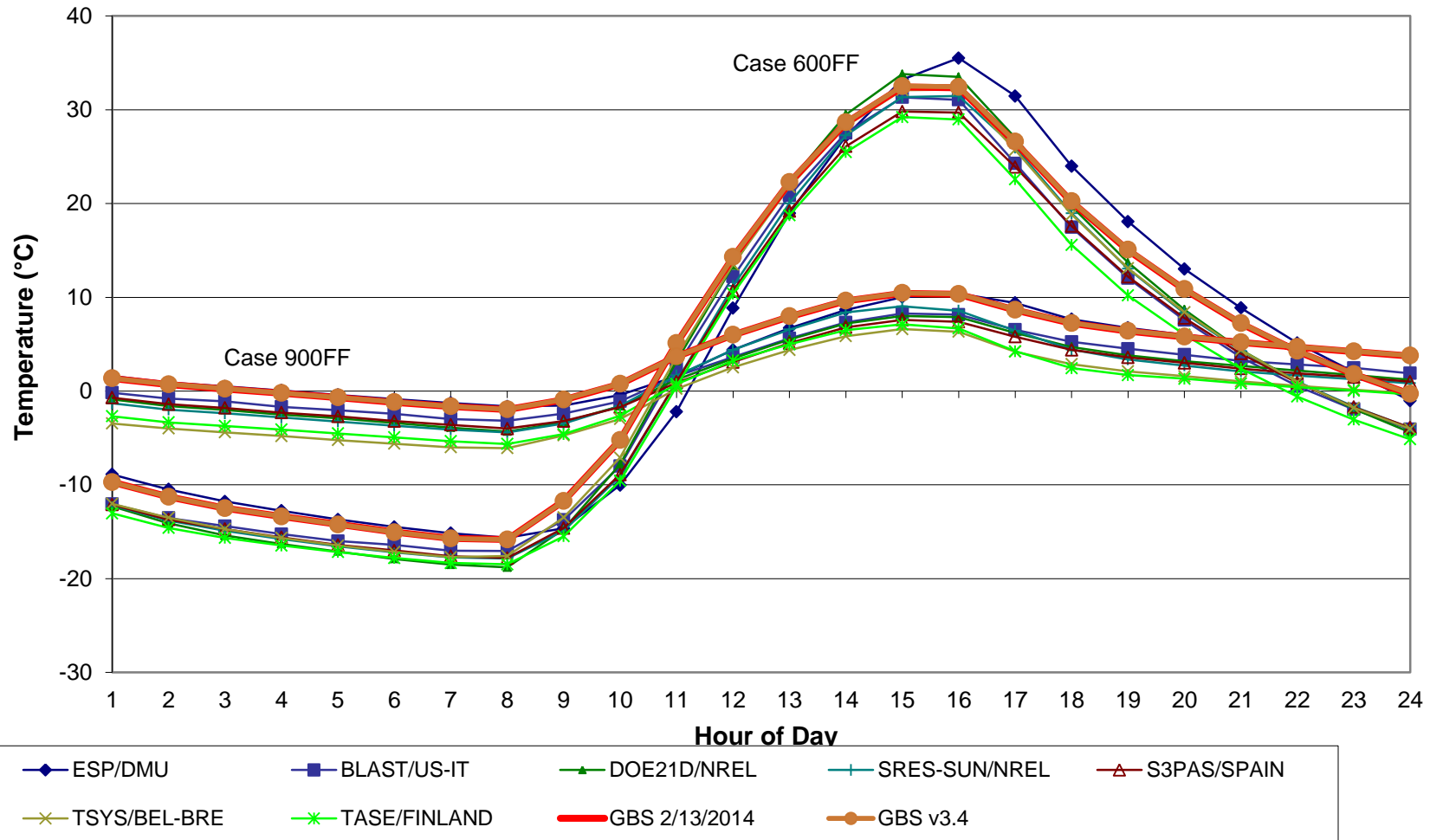


Figure B8-55. BESTEST Case 600
Cloudy & Clear Day Hourly Incident Solar
West Facing Surface



**Figure B8-56. BESTEST
HOURLY FREE FLOAT TEMPERATURES
Clear Cold Day - Cases 600FF and 900FF**



**Figure B8-57. BESTEST
HOURLY FREE FLOAT TEMPERATURES
Clear Hot Day - Cases 650FF and 950FF**

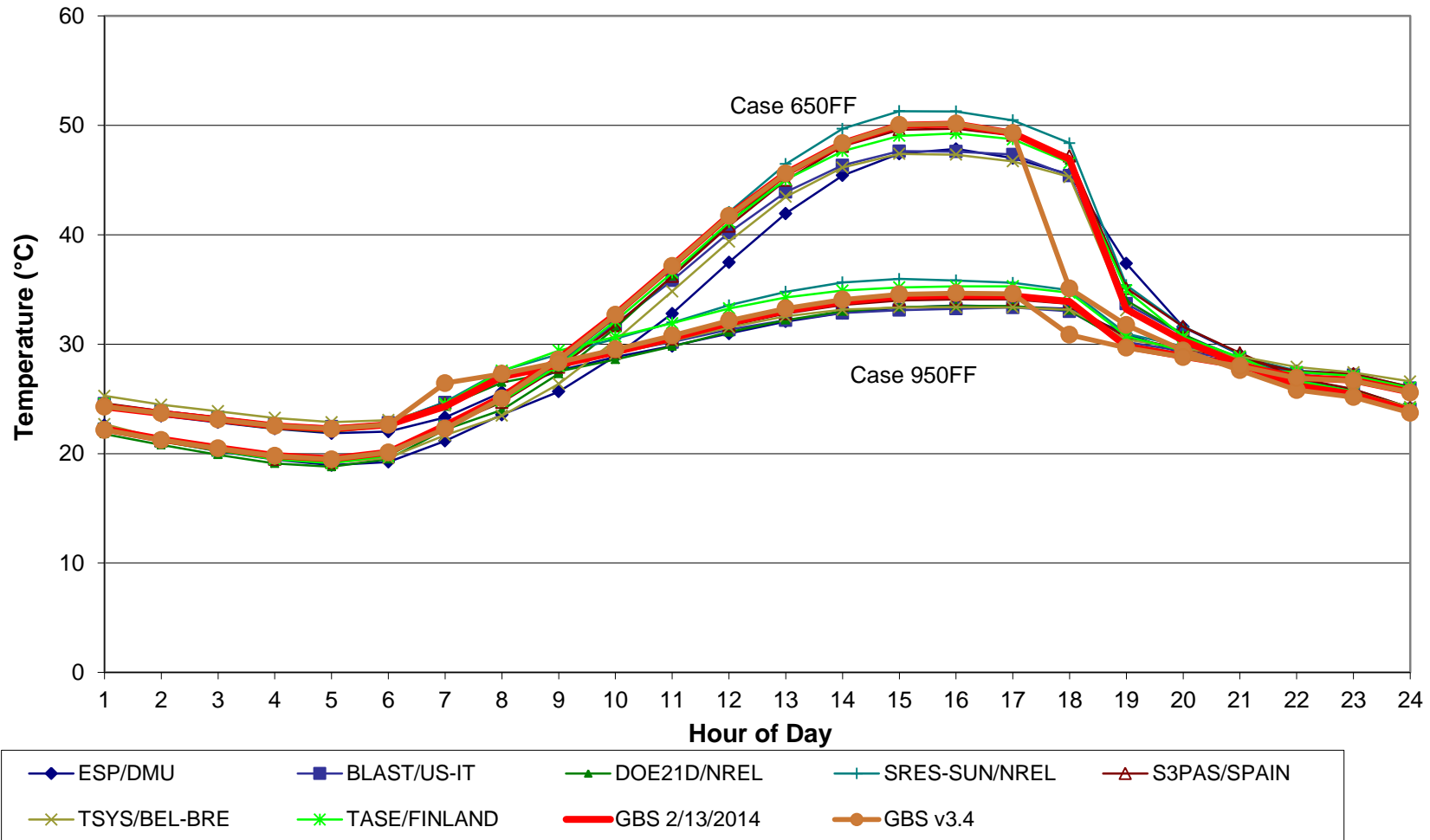


Figure B8-59. BESTEST HOURLY LOADS
Clear Cold Day, Case 900
Heating (+), Sensible Cooling (-)

