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Subject: TRACE® 3D Plus v3.01.25 Compliance with ANSI/ASHRAE Standard 140-2014

Dear TRACE® 3D Plus User:

We are pleased to inform you that TRACE® 3D Plus v3.01.25 was tested in compliance with ANSI/ASHRAE Standard 140-2014, Standard Method of Test for the Evaluation of Building Energy Analysis Computer Programs. Test results, supplemented by graphs and explanatory notes, accompany this letter.

As you may know, ANSI/ASHRAE/IESNA Standard 90.1, Energy Standard for Buildings, Except Low-Rise Residential Buildings, stipulates that any computer program that is used to demonstrate code compliance via the performance path's Energy Cost Budget Method must be tested in accordance with Standard 140. TRACE® 3D Plus v3.01.25 has completed the BESTEST validation for calculation and comparison with similar analysis programs as required by ASHRAE Standard 140.

Standard 90.1 defines minimum requirements for the design of energy-efficient buildings and is used by many state and local code-writing bodies as the "standard of care" in their jurisdictions. Building-energy simulation programs such as TRACE® 3D Plus, are used to estimate the difference in energy costs between the design- and budget-building models specified in Section 11 of Standards 90.1.

If you have any questions about the testing documentation that accompanies this letter, or about any of Trane's design and analysis tools, please contact our C.D.S. Support Center by phoning (608)787-3926 or emailing cdshelp@trane.com .

Best regards,

Delia Estrada
Product Development Manager
Trane C.D.S.

Attachments: Results and modeling notes from Standard 140 testing of TRACE® 3D Plus

ASHRAE Standard 140-2014

Computer Programs, Program Authors, and Producers of Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1

Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

List of Tables

<i>Table</i>	<i>Description</i>	<i>Sheet Tab</i>	<i>Cell Range</i>
B8-1	Annual Heating Loads	Tables 1	B7 - P47
B8-2	Annual Sensible Cooling Loads		B48 - P89
B8-3	Annual Hourly Integrated Peak Heating Loads	Tables 2	B7 - AH47
B8-4	Annual Hourly Integrated Peak Sensible Cooling Loads		B48 - AH88
B8-5	Free-Float Temperature Output		B89 - AH118
B8-6	Low Mass Basic Sensitivity Tests	Tables 3	B7 - P39
B8-7	High Mass Basic Sensitivity Tests		B41 - P81
B8-8	Low Mass In-Depth (Cases 195 thru 320) Sensitivity Tests	Tables 4	B7 - P78
B8-9	Low Mass In-Depth (Cases 395 thru 440) Sensitivity Tests	Tables 5	B7 - P45
B8-10	High Mass Basic and In-Depth Sensitivity Tests		B47 - P91
B8-11	Annual Transmissivity Coefficient of Windows	Tables 6	B7 - O14
B8-12	Annual Shading Coefficient of Window Shading Devices: Overhangs & Fins		B16 - O23
B8-13	Case 600 Annual Incident Solar Radiation (kWh/m ²)		B25 - O34
B8-14	Case 600 Annual Transmitted Solar Radiation – Unshaded (kWh/m ²)		B36 - O42
B8-15	Case 600 Annual Transmitted Solar Radiation –Shaded (kWh/m ²)		B44 - O50

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1

Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

List of Figures

Figure	Title	Sheet Tab
B8-1	BESTEST BASIC Annual Incident Solar Radiation	Fig B8-1 Ann Incident Solar
B8-2	BESTEST BASIC Annual Transmitted Solar Radiation Unshaded	Fig B8-2 Ann SolRad Unshaded
B8-3	BESTEST BASIC Annual Transmitted Solar Radiation Shaded	Fig B8-3 Ann SolRad Shaded
B8-4	BESTEST BASIC Annual Transmissivity Coefficient of Windows (Unshaded Transmitted)/(Incident Solar Radiation)	Fig B8-4 Trans Coeff
B8-5	BESTEST BASIC Annual Overhang and Fin Shading Coefficients (1-(Shaded)/(Unshaded)) Transmitted Solar Radiation	Fig B8-5 OH&Fin Shade Coeff
B8-6	BESTEST BASIC Low Mass Annual Heating	Fig B8-6 Lomass Ann Heat
B8-7	BESTEST BASIC Low Mass Annual Sensible Cooling	Fig B8-7 Lomass Ann Cool
B8-8	BESTEST BASIC Low Mass Peak Heating	Fig B8-8 Lomass Peak Heat
B8-9	BESTEST BASIC Low Mass Peak Sensible Cooling	Fig B8-9 Lomass Peak Cool
B8-10	BESTEST BASIC High Mass Annual Heating	Fig B8-10 Himass Ann Heat
B8-11	BESTEST BASIC High Mass Annual Sensible Cooling	Fig B8-11 Himass Ann Cool
B8-12	BESTEST BASIC High Mass Peak Heating	Fig B8-12 Himass Peak Heat
B8-13	BESTEST BASIC High Mass Peak Sensible Cooling	Fig B8-13 Himass Peak Cool
B8-14	BESTEST BASIC Maximum Hourly Annual Temperature Free-Float Cases	Fig B8-14 FF Maximum Temp
B8-15	BESTEST BASIC Minimum Hourly Annual Temperature Free-Float Cases	Fig B8-15 FF Minimum Temp
B8-16	BESTEST BASIC Average Hourly Annual Temperature Free-Float Cases	Fig B8-16 FF Average Temp
B8-17	BESTEST BASIC South Window Shading (Delta) Annual Heating and Sensible Cooling	Fig B8-17 Delta-S Shade-Load
B8-18	BESTEST BASIC South Window Shading (Delta) Peak Heating and Sensible Cooling	Fig B8-18 Delta-S Shade-Peak
B8-19	BESTEST BASIC East & West Window (Delta) Annual Heating and Sensible Cooling	Fig B8-19 Delta-E&W-Load
B8-20	BESTEST BASIC East & West Window (Delta) Peak Heating and Sensible Cooling	Fig B8-20 Delta-E&W-Peak
B8-21	BESTEST BASIC East & West Shaded Window (Delta) Annual Heating and Sensible Cooling	Fig B8-21 Delta-E&WShade-Load
B8-22	BESTEST BASIC East & West Shaded Window (Delta) Peak Heating and Sensible Cooling	Fig B8-22 Delta-E&WShade-Peak
B8-23	BESTEST BASIC Thermostat Setback (Delta) Annual Heating	Fig B8-23 Delta-TSetback-Heat
B8-24	BESTEST BASIC Thermostat Setback (Delta) Peak Heating	Fig B8-24 Delta-TSetback-Peak
B8-25	BESTEST BASIC Vent Cooling (Delta) Annual Sensible Cooling	Fig B8-25 Delta-VentCool-Load
B8-26	BESTEST BASIC Vent Cooling (Delta) Peak Sensible Cooling	Fig B8-26 Delta-VentCool-Peak
B8-27	BESTEST BASIC Sunspace (Delta) Annual Heating and Sensible Cooling	Fig B8-27 Delta-Sunspace-Load
B8-28	BESTEST BASIC Sunspace (Delta) Peak Heating and Sensible Cooling	Fig B8-28 Delta-Sunspace-Peak
B8-29	BESTEST BASIC AND IN-DEPTH Mass Effect (Delta) Annual Heating and Sensible Cooling	Fig B8-29 Delta-Mass Effect-Ann
B8-30	BESTEST BASIC AND IN-DEPTH Mass Effect (Delta) Peak Heating and Sensible Cooling	Fig B8-30 Delta-Mass Effect-Pk
B8-31	BESTEST IN-DEPTH South Window (Delta) Annual Heating and Sensible Cooling	Fig B8-31 Delta-S Win-Ann
B8-32	BESTEST IN-DEPTH South Window (Delta) Peak Heating and Sensible Cooling	Fig B8-32 Delta-S Win-Peak
B8-33	BESTEST IN-DEPTH Low Mass Annual Heating Cases 195 to 250	Fig B8-33 Indepth 1
B8-34	BESTEST IN-DEPTH Low Mass Annual Sensible Cooling Cases 195 to 250	Fig B8-34 Indepth 2
B8-35	BESTEST IN-DEPTH Low Mass Peak Heating Cases 195 to 250	Fig B8-35 Indepth 3

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1

Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

List of Figures

Figure	Title	Sheet Tab
B8-36	BESTEST IN-DEPTH Low Mass Peak Sensible Cooling Cases 195 to 250	Fig B8-36 Indepth 4
B8-37	BESTEST IN-DEPTH Low Mass Annual Heating Cases 270 to 320	Fig B8-37 Indepth 5
B8-38	BESTEST IN-DEPTH Low Mass Annual Sensible Cooling Cases 270 to 320	Fig B8-38 Indepth 6
B8-39	BESTEST IN-DEPTH Low Mass Peak Heating Cases 270 to 320	Fig B8-39 Indepth 7
B8-40	BESTEST IN-DEPTH Low Mass Peak Sensible Cooling Cases 270 to 320	Fig B8-40 Indepth 8
B8-41	BESTEST IN-DEPTH Cases 195 to 220 (Delta) Annual Heating and Sensible Cooling	Fig B8-41 Indepth Delta 1
B8-42	BESTEST IN-DEPTH Cases 195 to 220 (Delta) Peak Heating and Sensible Cooling	Fig B8-42 Indepth Delta 2
B8-43	BESTEST IN-DEPTH Cases 220 to 270 (Delta) Annual Heating and Sensible Cooling	Fig B8-43 Indepth Delta 3
B8-44	BESTEST IN-DEPTH Cases 220 to 270 (Delta) Peak Heating and Sensible Cooling	Fig B8-44 Indepth Delta 4
B8-45	BESTEST IN-DEPTH Cases 270 to 320 (Delta) Annual Heating and Sensible Cooling	Fig B8-45 Indepth Delta 5
B8-46	BESTEST IN-DEPTH Cases 270 to 320 (Delta) Peak Sensible Cooling	Fig B8-46 Indepth Delta 6
B8-47	BESTEST IN-DEPTH Annual Heating Cases 395 to 440, 800, 810	Fig B8-47 Indepth 9
B8-48	BESTEST IN-DEPTH Annual Sensible Cooling Cases 395 to 440, 800, 810	Fig B8-48 Indepth 10
B8-49	BESTEST IN-DEPTH Peak Heating Cases 395 to 440, 800, 810	Fig B8-49 Indepth 11
B8-50	BESTEST IN-DEPTH Peak Sensible Cooling Cases 395 to 440, 800, 810	Fig B8-50 Indepth 12
B8-51	BESTEST IN-DEPTH Cases 395 to 600 (Delta) Annual Heating and Sensible Cooling	Fig B8-51 Indepth Delta 7
B8-52	BESTEST IN-DEPTH Cases 395 to 600 (Delta) Peak Heating and Sensible Cooling	Fig B8-52 Indepth Delta 8
B8-53	BESTEST Case 900FF Annual Hourly Temperature Frequency	Fig B8-53 Hrly-Temp Freq
B8-54	BESTEST Case 600 Cloudy & Clear Day Hourly Incident Solar South Facing Surface	Fig B8-54 Hrly-IncidentSol-S
B8-55	BESTEST Case 600 Cloudy & Clear Day Hourly Incident Solar West Facing Surface	Fig B8-55 Hrly-IncidentSol-W
B8-56	BESTEST HOURLY FREE FLOAT TEMPERATURES Clear Cold Day - Cases 600FF and 900FF	Fig B8-56 Hrly-FF Temp-ColdDay
B8-57	BESTEST HOURLY FREE FLOAT TEMPERATURES Clear Hot Day - Cases 650FF and 950FF	Fig B8-57 Hrly-FF Temp-HotDay
B8-58	BESTEST HOURLY LOADS Clear Cold Day, Case 600 Heating (+), Sensible Cooling (-)	Fig B8-58 Hrly-Loads-Case600
B8-59	BESTEST HOURLY LOADS Clear Cold Day, Case 900 Heating (+), Sensible Cooling (-)	Fig B8-59 Hrly-Loads-Case900

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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)

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	Statistics for Example Results				TRACE 3DP® Trane®
										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%	4.361
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%	4.406
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%	4.536
630 E&W Windows + Overhang & Fins		5.050	5.359	6.469	5.883	6.001	6.095	5.624		5.050	6.469	5.783	24.5%	4.867
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%	2.683
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%	1.217
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%	1.497
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%	3.181
930 E&W Windows + Overhang & Fins		4.143	4.347	5.335	4.755	4.728	5.168	4.740		4.143	5.335	4.745	25.1%	3.892
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%	0.767
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%	2.417
195 Solid Conduction		4.167								4.167	4.167	4.167	0.0%	4.358
200 Surface Convection (Int & Ext IR="off")		5.252								5.252	5.252	5.252	0.0%	5.569
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%	6.625
215 Infrared Radiation (Int IR="on", Ext IR="off")		5.547								5.547	5.547	5.547	0.0%	5.936
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%	7.108
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%	10.875
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%	5.867
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%	5.183
270 South Solar Windows		4.510	4.930		5.341	5.920		5.047	5.489	4.510	5.920	5.206	27.1%	4.456
280 Cavity Albedo		4.675	5.125		5.937	6.148		5.279	5.841	4.675	6.148	5.501	26.8%	4.656
290 South Shading		4.577	4.959		5.406	5.942		5.132	5.509	4.577	5.942	5.254	26.0%	4.492
300 East/West Window		4.761	5.077		5.587	5.964		5.124	5.786	4.761	5.964	5.383	22.3%	4.503
310 East/West Shading		5.221	5.327		5.850	6.165		5.610		5.221	6.165	5.635	16.8%	4.778
320 Thermostat		3.859	4.209		4.627	5.141		4.348	4.840	3.859	5.141	4.504	28.5%	3.750
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%	4.983
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%	7.022
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%	8.897
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%	7.639
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%	6.000
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%	4.553
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%	5.336
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%	1.961

* SRES-BRE 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 Annex B7, Section B7.1.1.

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

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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 B8-2. Annual Sensible Cooling Loads (MWh)

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	Statistics for Example Results				TRACE 3DP® Trane®
										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%	6.739
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%	4.742
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%	4.167
630 E&W Windows + Overhang & Fins		2.129	3.108	2.489	3.493	3.701	2.489	2.416		2.129	3.701	2.832	55.5%	2.767
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%	6.442
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%	5.761
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%	2.517
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%	1.239
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%	2.556
930 E&W Windows + Overhang & Fins		1.039	1.934	1.266	2.173	2.238	1.439	1.416		1.039	2.238	1.644	73.0%	1.644
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%	2.442
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%	0.547
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%	0.633
195 Solid Conduction		0.414								0.414	0.414	0.414	0.0%	0.414
200 Surface Convection (Int & Ext IR="off")		0.570								0.570	0.570	0.570	0.0%	0.589
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%	0.364
215 Infrared Radiation (Int IR="on", Ext IR="off")		0.639								0.639	0.639	0.639	0.0%	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%	0.406
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%	0.694
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%	0.703
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%	3.203
270 South Solar Windows		7.528	8.670		9.828	<i>10.350</i>		8.764	8.714	7.528	<i>10.350</i>	<i>8.976</i>	31.4%	8.497
280 Cavity Albedo		4.873	5.895		6.511	7.114		5.761	6.257	4.873	7.114	6.069	36.9%	5.506
290 South Shading		5.204	7.011		7.871	<i>8.089</i>		6.699	7.431	5.204	<i>8.089</i>	<i>7.051</i>	40.9%	6.400
300 East/West Window		4.302	5.836		6.665	<i>7.100</i>		5.721	5.781	4.302	<i>7.100</i>	<i>5.901</i>	47.4%	5.475
310 East/West Shading		2.732	4.570		5.245	<i>5.471</i>		3.727		2.732	<i>5.471</i>	<i>4.349</i>	63.0%	3.744
320 Thermostat		5.061	5.906		6.725	<i>7.304</i>		5.956	5.663	5.061	<i>7.304</i>	<i>6.103</i>	36.8%	5.797
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%	0.006
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%	0.017
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%	0.067
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%	0.653
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%	4.242
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%	0.208
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%	1.208

* 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 Annex B7,

Section B7.1.1. Affected results for Cases 270 and 290 through 320 are indicated by italics

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

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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 B8-3. Annual Hourly Integrated Peak Heating 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				TRACE 3DP® Trane®		
	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		
600 Base Case, South Windows	3.437	04-Jan	5	3.940	04-Jan	5	4.045	04-Jan	5	4.258	04-Jan	2		4.037	04-Jan	2	3.931	04-Jan	6	4.354	04-Jan	2	3.437	4.354	4.000	22.9%	3.747	04-Jan	5		
610 S. Windows + Overhang	3.437	04-Jan	5	3.941	04-Jan	5	4.034	04-Jan	5	4.258	04-Jan	2		4.037	04-Jan	2	3.922	04-Jan	6	4.354	04-Jan	2	3.437	4.354	3.998	22.9%	3.736	04-Jan	5		
620 East & West Windows	3.591	04-Jan	6	3.941	04-Jan	5	4.046	04-Jan	5	4.277	04-Jan	2		4.277	04-Jan	2	3.922	04-Jan	6	4.379	04-Jan	2	3.591	4.379	4.062	19.4%	3.736	04-Jan	7		
630 E&W Windows + Overhang & Fins	3.592	04-Jan	7	3.941	04-Jan	5	4.025	04-Jan	5	4.280	04-Jan	2		4.278	04-Jan	2	3.922	04-Jan	6				3.592	4.280	4.006	17.2%	3.715	04-Jan	7		
640 Case 600 with Htg. Temp. Setback	5.232	04-Jan	7	5.486	04-Jan	8	5.943	04-Jan	8	6.530	04-Jan	8		6.347	04-Jan	8	5.722	04-Jan	8	6.954	04-Jan	8	5.232	6.954	6.031	28.6%	6.371	04-Jan	8		
650 Case 600 with Night Ventilation	0.000			0.000	04-Jan		0.000			0.000				0.000			0.000			0.000			0.000	0.000	0.000	----	0.000	01-Jan	1		
900 South Windows	2.850	04-Jan	7	3.453	04-Jan	7	3.557	04-Jan	7	3.760	04-Jan	7		3.608	04-Jan	8	3.517	04-Jan	7	3.797	04-Jan	7	2.850	3.797	3.506	27.0%	3.169	04-Jan	7		
910 S. Windows + Overhang	2.858	04-Jan	7	3.456	04-Jan	7	3.564	04-Jan	7	3.764	04-Jan	7		3.618	04-Jan	8	3.536	04-Jan	7	3.801	04-Jan	7	2.858	3.801	3.514	26.8%	3.168	04-Jan	7		
920 East & West Windows	3.308	04-Jan	7	3.703	04-Jan	7	3.805	04-Jan	7	4.013	04-Jan	7		4.029	04-Jan	7	3.708	04-Jan	7	4.061	04-Jan	7	3.308	4.061	3.804	19.8%	3.479	04-Jan	7		
930 E&W Windows + Overhang & Fins	3.355	04-Jan	7	3.732	04-Jan	7	3.832	04-Jan	7	4.042	04-Jan	7		4.064	04-Jan	7	3.744	04-Jan	7				3.355	4.064	3.795	18.7%	3.502	04-Jan	7		
940 Case 900 with Htg. Temp. Setback	3.980	04-Jan	7	5.028	04-Jan	8	5.665	04-Jan	8	6.116	04-Jan	8		6.117	04-Jan	8	5.122	03-Jan	9	6.428	04-Jan	8	3.980	6.428	5.494	44.6%	4.904	04-Jan	8		
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	01-Jan	1		
960 Sunspace	2.410	04-Jan	7	2.751	04-Jan	8	2.727	04-Jan	8	2.863	04-Jan	8		2.852	04-Jan	8	2.522	04-Jan	8	2.779	04-Jan	8	2.410	2.863	2.701	16.8%	2.692	04-Jan	8		
195 Solid Conduction	2.004	04-Jan	2																			2.004	2.004	2.004	0.0%	2.091	04-Jan	6			
200 Surface Convection (Int & Ext IR="off")	2.651	04-Jan	5																			2.651	2.651	2.651	0.0%	2.851	04-Jan	6			
210 Infrared Radiation (Int IR="off", Ext IR="on")	2.701	04-Jan	5	2.973	04-Jan	5										2.981	04-Jan	5	3.325	04-Jan	2	2.701	3.325	2.995	20.8%	3.054	04-Jan	5			
215 Infrared Radiation (Int IR="on", Ext IR="off")	2.787	04-Jan	5																			2.787	2.787	2.787	0.0%	3.028	04-Jan	6			
220 In-Depth Base Case	2.867	04-Jan	5	3.280	04-Jan	5	3.465	04-Jan	5	3.695	04-Jan	2		3.348	04-Jan	8	3.336	04-Jan	6	3.520	04-Jan	2	2.867	3.695	3.359	24.7%	3.243	04-Jan	6		
230 Infiltration	4.386	04-Jan	5	4.984	04-Jan	2	4.994	04-Jan	2	5.279	04-Jan	2		5.159	04-Jan	2	4.892	04-Jan	6	5.107	04-Jan	2	4.386	5.279	4.972	18.0%	5.053	04-Jan	6		
240 Internal Gains	2.685	04-Jan	5	3.100	04-Jan	5	3.282	04-Jan	5	3.495	04-Jan	2		3.159	04-Jan	8	3.153	04-Jan	6	3.333	04-Jan	8	2.685	3.495	3.172	25.5%	3.059	04-Jan	6		
250 Exterior Shortwave Absorptance	2.866	04-Jan	5	3.279	04-Jan	5	3.465	04-Jan	5	3.695	04-Jan	2		3.341	04-Jan	6	3.336	04-Jan	6	3.525	04-Jan	2	2.866	3.695	3.358	24.7%	3.243	04-Jan	6		
270 South Windows	2.863	04-Jan	5	3.277	04-Jan	5				3.661	04-Jan	2								3.336	04-Jan	6	2.863	3.738	3.375	25.9%	3.025	04-Jan	5		
280 Cavity Albedo	2.864	04-Jan	5	3.278	04-Jan	5				3.685	04-Jan	2								3.336	04-Jan	6	2.864	3.759	3.384	26.4%	3.026	04-Jan	5		
290 South Shading	2.863	04-Jan	5	3.277	04-Jan	5				3.661	04-Jan	2								3.328	04-Jan	6	2.863	3.738	3.373	25.9%	3.015	04-Jan	5		
300 East/West Window	3.014	04-Jan	6	3.276	04-Jan	5				3.681	04-Jan	2								3.328	04-Jan	6	3.014	3.770	3.414	22.1%	3.014	04-Jan	5		
310 East/West Shading	3.015	04-Jan	6	3.277	04-Jan	5				3.669	04-Jan	2								3.328	04-Jan	6	3.015	3.669	3.322	19.7%	2.993	04-Jan	7		
320 Thermostat	2.861	04-Jan	5	3.275	04-Jan	5				3.651	04-Jan	2								3.336	04-Jan	6	2.861	3.735	3.372	25.9%	3.024	04-Jan	5		
395 Low Mass Solid Conduction	2.062	04-Jan	7	2.209	04-Jan	8	2.328	04-Jan	3	2.385	04-Jan	3		2.263	04-Jan	4	2.221	04-Jan	8	2.270	04-Jan	3	2.062	2.385	2.248	14.4%	2.233	04-Jan	4		
400 Low Mass Opaque Windows	2.867	04-Jan	5	3.280	04-Jan	5	3.476	04-Jan	5	3.695	04-Jan	2		3.342	04-Jan	8	3.336	04-Jan	6	3.520	04-Jan	2	2.867	3.695	3.359	24.6%	3.243	04-Jan	6		
410 Low Mass Infiltration	3.625	04-Jan	5	4.124	04-Jan	5	4.233	04-Jan	5	4.487	04-Jan	2		4.227	04-Jan	2	4.114	04-Jan	6	4.314	04-Jan	2	3.625	4.487	4.161	20.7%	4.148	04-Jan	6		
420 Low Mass Internal Gains	3.443	04-Jan	5	3.944	04-Jan	5	4.050	04-Jan	5	4.287	04-Jan	2		4.044	04-Jan	2	3.931	04-Jan	6	4.126	04-Jan	2	3.443	4.287	3.975	21.2%	3.964	04-Jan	6		
430 Low Mass Ext. Shortwave Absorptance	3.442	04-Jan	5	3.944	04-Jan	5	4.050	04-Jan	5	4.287	04-Jan	2		4.044	04-Jan	2	3.931	04-Jan	6	4.137	04-Jan	2	3.442	4.287	3.976	21.3%	3.964	04-Jan	6		
440 Low Mass Cavity Albedo	3.439	04-Jan	5	3.942	04-Jan	5				4.277	04-Jan	2								3.931	04-Jan	6	3.439	4.376	3.993	23.5%	3.747	04-Jan	5		
800 High Mass Opaque Windows	3.227	04-Jan	5	3.793	04-Jan	7	3.909	04-Jan	7	4.138	04-Jan	2		3.902	04-Jan	8	3.786	04-Jan	7	3.939	04-Jan	7	3.227	4.138	3.813	23.9%	3.780	04-Jan	7		
810 High Mass Cavity Albedo	2.979	04-Jan	7	3.566	04-Jan	7				3.915	04-Jan	7								3.606	04-Jan	7	2.979	3.963	3.606	27.3%	3.317	04-Jan	7		

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

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

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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:		ESP			BLAST			DOE21D			SRES-SUN			SRES BRE*	S3PAS			TSYS			TASE			Example Result Statistics				TRACE 3DP®		
	Organization or Country:		DMU			US-IT			NREL			NREL				SPAIN			BEL-BRE			FINLAND			Min	Max	Mean	(Max-Min)/	Trane®		
	kW	Date	Hr	kW	Date	Hr	kW	Date	Hr	kW	Date	Hr	kW	Date		Hr	kW	Date	Hr	kW	Date	Hr	kW	Date	Hr	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%	6.567	17-Oct	13		
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%	6.164	23-Dec	13		
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%	3.921	31-Jul	10		
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%	3.397	26-Jul	17		
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%	6.499	17-Oct	13		
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%	6.417	17-Oct	13		
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%	3.254	17-Oct	15		
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%	2.577	17-Oct	15		
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%	2.782	26-Jul	17		
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%	2.279	26-Jul	17		
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%	3.254	17-Oct	15		
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	2.686	02-Sep	15	2.867	02-Sep	14	2.033	3.170	2.674	42.5%	2.301	02-Sep	15		
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%	1.141	16-Aug	15		
195 Solid Conduction	0.651	26-Jul	15																			0.651	0.651	0.651	0.0%	0.730	26-Jul	16			
200 Surface Convection (Int & Ext IR="off")	0.863	16-Aug	14																			0.863	0.863	0.863	0.0%	0.974	26-Jul	16			
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%	0.820	27-Jul	15			
215 Infrared Radiation (Int IR="on", Ext IR="off")	1.007	11-Aug	14																			1.007	1.007	1.007	0.0%	1.074	26-Jul	16			
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%	0.910	27-Jul	15		
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%	1.403	27-Jul	15		
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%	1.092	27-Jul	15		
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%	3.041	05-Sep	13		
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%	6.856	25-Nov	13			
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%	4.715	17-Oct	13			
290 South Shading	6.269	13-Jan	13	6.555	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%	6.714	23-Dec	13			
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%	3.900	02-Jul	10			
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%	3.267	26-Jul	17			
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%	6.176	25-Nov	13			
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%	0.074	27-Jul	18		
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%	0.254	27-Jul	17		
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%	0.393	26-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%	0.630	27-Jul	16		
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%	1.731	16-Aug	14		
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%	4.719	17-Oct	14			
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%	0.853	28-Jul	14		
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%	2.114	02-Sep	14			

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

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

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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																															
Simulation Model:		ESP			BLAST			DOE21D			SRES-SUN			SRES		S3PAS			TSYS			TASE			Example Result Statistics				TRACE 3DP®		
Organization or Country:		DMU			US-IT			NREL			NREL			BRE*		SPAIN			BEL-BRE			FINLAND			Min	Max	Mean	(Max-Min)/	Trane®		
Case	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	T (°C)	T (°C)	Mean** (%)	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%	64.7	17-Oct	15		
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%	43.2	02-Sep	14		
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%	68.2	17-Oct	15		
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%	37.1	02-Sep	15		
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%	51.4	17-Oct	14		
MINIMUM ANNUAL HOURLY INTEGRATED ZONE TEMPERATURE																															
Simulation Model:		ESP			BLAST			DOE21D			SRES-SUN			SRES		S3PAS			TSYS			TASE			Example Result Statistics				TRACE 3DP®		
Organization or Country:		DMU			US-IT			NREL			NREL			BRE*		SPAIN			BEL-BRE			FINLAND			Min	Max	Mean	(Max-Min)/	Trane®		
Case	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	Date	Hr	T (°C)	T (°C)	T (°C)	Mean** (%)	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	-18.0	04-Jan	7		-17.8	04-Jan	8	-17.8	04-Jan	7	-18.5	08-Jan	9	-18.8	-15.6	-17.6	18.3%	-17.3	04-Jan	7		
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%	-2.6	04-Jan	7		
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%	-23.0	04-Jan	6		
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	7	-20.0	07-Jan	22	-20.2	-18.6	-19.6	8.2%	-20.2	04-Jan	6		
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%	2.2	06-Feb	6		
AVERAGE ANNUAL HOURLY INTEGRATED ZONE TEMPERATURE																															
Simulation Model:		ESP			BLAST			DOE21D			SRES-SUN			SRES		S3PAS			TSYS			TASE			Example Result Statistics				TRACE 3DP®		
Organization or Country:		DMU			US-IT			NREL			NREL			BRE*		SPAIN			BEL-BRE			FINLAND			Min	Max	Mean	(Max-Min)/	Trane®		
Case	T (°C)			T (°C)			T (°C)			T (°C)			T (°C)			T (°C)			T (°C)			T (°C)	T (°C)	T (°C)	Mean** (%)	T (°C)					
600FF - Low Mass with S. Windows	25.1			25.4			24.6			25.5			25.9			25.2			24.5			24.2	24.2	25.9	25.1	6.8%	25.8				
900FF - High Mass with S. Windows	25.5			25.9			24.7			25.5			25.7			25.2			24.5			24.5	24.5	25.9	25.2	5.9%	26.0				
650FF Case 600FF with Night Ventilation	18.2			18.7			19.1			19.0			19.6			18.4			18.0			18.0	18.0	19.6	18.7	8.7%	19.8				
950FF Case 900FF with Night Ventilation	14.1			14.3			14.3			15.0			14.3			14.0			14.5			14.6	14.0	15.0	14.4	6.7%	14.9				
960 Sunspace	27.5			27.7			28.0			28.7			28.5			28.0			29.0			26.4	26.4	29.0	28.0	9.0%	28.8				

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

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

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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				TRACE 3DP® Trane®
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%	0.044	
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%	0.175	
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%	0.331	
640-600 Heat, Htg. Setback	-1.545	-1.885	-2.166	-1.971	-1.793	-1.817	-1.829	-2.053	-2.166	-1.545	-1.882	33.0%	-1.678	
ANNUAL SENSIBLE COOLING [MWh]										Statistics for Example Results				TRACE 3DP® Trane®
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%	-1.997	
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%	-2.572	
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%	-1.400	
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%	-0.297	
650-600 Cool, Night Vent	-1.321	-1.293	-1.284	-1.384	-1.419	-1.404	-1.373	-1.322	-1.419	-1.284	-1.350	10.0%	-0.978	
PEAK HEATING [kW]										Statistics for Example Results				TRACE 3DP® Trane®
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	
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%	-0.010	
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%	-0.021	
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%	2.624	
PEAK SENSIBLE COOLING [kW]										Statistics for Example Results				TRACE 3DP® Trane®
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%	-0.403	
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%	-2.646	
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%	-0.523	
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%	-0.068	
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%	-0.149	

* 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				TRACE 3DP® Trane®
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%	-3.144	
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%	0.281	
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%	1.964	
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%	0.711	
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%	-0.450	
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%	1.200	
ANNUAL SENSIBLE COOLING [MWh]										Statistics for Example Results				TRACE 3DP® Trane®
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%	-4.222	
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%	-1.278	
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%	0.039	
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%	-0.911	
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%	-0.075	
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%	-1.969	
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%	-1.883	
PEAK HEATING [kW]										Statistics for Example Results				TRACE 3DP® Trane®
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%	-0.578	
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%	0.000	
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%	0.310	
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%	0.023	
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%	1.735	
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%	-0.477	
PEAK SENSIBLE COOLING [kW]										Statistics for Example Results				TRACE 3DP® Trane®
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%	-3.313	
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%	-0.677	
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%	-0.472	
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%	-0.503	
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	-----	0.000	
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%	-0.953	
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%	-2.113	

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

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

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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				TRACE 3DP® Trane®
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%	1.211
210-200 Ext IR (Int IR "off")	1.204								1.204	1.204	1.204	0.0%	1.056
220-215 Ext IR (Int IR "on")	1.397								1.397	1.397	1.397	0.0%	1.172
215-200 Int IR (Ext IR "off")	0.295								0.295	0.295	0.295	0.0%	0.367
220-210 Int IR (Ext IR "on")	0.488	0.656					0.743	0.470	0.470	0.743	0.589	46.3%	0.483
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%	3.767
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%	-1.242
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%	-1.925
270-220 South Windows	-2.434	-2.285		-2.761	-2.207		-2.250	-1.948	-2.761	-1.948	-2.314	35.1%	-2.653
280-270 Cavity Albedo	0.165	0.195		0.596	0.228		0.232	0.352	0.165	0.596	0.295	146.3%	0.200
320-270 Thermostat	-0.651	-0.721		-0.714	-0.779		-0.699	-0.649	-0.779	-0.649	-0.702	18.5%	-0.706
290-270 South Shading	0.067	0.029		0.065	0.022		0.085	0.020	0.020	0.085	0.048	135.4%	0.036
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%	0.047
310-300 E&W Shading	0.460	0.250		0.263	0.201		0.486		0.201	0.486	0.332	85.8%	0.275
ANNUAL SENSIBLE COOLING [MWh]									Statistics for Example Results				TRACE 3DP® Trane®
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%	0.175
210-200 Ext IR (Int IR "off")	-0.408								-0.408	-0.408	-0.408	0.0%	-0.225
220-215 Ext IR (Int IR "on")	-0.453								-0.453	-0.453	-0.453	0.0%	-0.239
215-200 Int IR (Ext IR "off")	0.069								0.069	0.069	0.069	0.0%	0.056
220-210 Int IR (Ext IR "on")	0.024	0.088					0.069	0.042	0.024	0.088	0.056	114.8%	0.042
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%	0.289
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%	0.297
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%	2.797
270-220 South Windows	7.342	7.969		9.001	9.515		8.027	8.031	7.342	9.515	8.314	26.1%	8.092
280-270 Cavity Albedo	-2.655	-2.775		-3.317	-3.236		-3.003	-2.457	-3.317	-2.457	-2.907	29.6%	-2.992
320-270 Thermostat	-2.467	-2.764		-3.103	-3.046		-2.808	-3.051	-3.103	-2.467	-2.873	22.1%	-2.700
290-270 South Shading	-2.324	-1.659		-1.957	-2.261		-2.065	-1.283	-2.324	-1.283	-1.925	54.1%	-2.097
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%	-3.022
310-300 E&W Shading	-1.570	-1.266		-1.420	-1.629		-1.994		-1.994	-1.266	-1.576	46.2%	-1.731
PEAK HEATING [kW]									Statistics for Example Results				TRACE 3DP® Trane®
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%	0.760
210-200 Ext IR (Int IR "off")	0.050								0.050	0.050	0.050	0.0%	0.203
220-215 Ext IR (Int IR "on")	0.080								0.080	0.080	0.080	0.0%	0.215
215-200 Int IR (Ext IR "off")	0.136								0.136	0.136	0.136	0.0%	0.177
220-210 Int IR (Ext IR "on")	0.166	0.307					0.356	0.195	0.166	0.356	0.256	74.1%	0.189
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%	1.810
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%	-0.184
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%	0.000
270-220 South Windows	-0.004	-0.003		-0.034			0.000	0.218	-0.034	0.218	0.035	711.9%	-0.218
280-270 Cavity Albedo	0.001	0.001		0.024			0.000	0.021	0.000	0.024	0.009	255.3%	0.000
320-270 Thermostat	-0.002	-0.002		-0.010			0.000	-0.003	-0.010	0.000	-0.003	294.1%	-0.001
290-270 South Shading	0.000	0.000		0.000			-0.008	0.000	-0.008	0.000	-0.002	500.0%	-0.010
300-270 E&W Windows	0.151	-0.001		0.020			-0.008	0.032	-0.008	0.151	0.039	411.4%	-0.012
310-300 E&W Shading	0.001	0.001		-0.012			0.000		-0.012	0.001	-0.002	520.0%	-0.020
PEAK SENSIBLE COOLING [kW]									Statistics for Example Results				TRACE 3DP® Trane®
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%	0.244
210-200 Ext IR (Int IR "off")	-0.387								-0.387	-0.387	-0.387	0.0%	-0.155
220-215 Ext IR (Int IR "on")	-0.447								-0.447	-0.447	-0.447	0.0%	-0.164
215-200 Int IR (Ext IR "off")	0.144								0.144	0.144	0.144	0.0%	0.099
220-210 Int IR (Ext IR "on")	0.084	0.149					0.111	0.071	0.071	0.149	0.104	75.2%	0.090
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%	0.494
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%	0.183
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%	2.131
270-220 South Windows	5.796	5.475		5.894			5.585	5.654	5.475	5.894	5.681	7.4%	5.946
280-270 Cavity Albedo	-1.912	-2.010		-2.014			-1.978	-1.631	-2.014	-1.631	-1.909	20.1%	-2.140
320-270 Thermostat	-0.655	-0.695		-0.681			-0.586	-0.726	-0.726	-0.586	-0.669	20.9%	-0.679
290-270 South Shading	-0.087	-0.086		-0.258			-0.561	-0.246	-0.561	-0.086	-0.248	191.9%	-0.141
300-270 E&W Windows	-2.952	-2.548		-2.577			-2.486	-1.938	-2.952	-1.938	-2.500	40.6%	-2.955
310-300 E&W Shading	-0.556	-0.344		-0.493			-0.689		-0.689	-0.344	-0.520	66.3%	-0.633

* 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 Annex B7, Section B7.1.1. Affected results involving Cases 270 and 290 through 320 are indicated with italics.

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

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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				TRACE 3DP® Trane®
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%	2.039
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%	1.875
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%	-1.258
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%	-1.639
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%	-1.639
440-600 Cavity Albedo	0.153	0.214		0.426	0.215		0.226	0.280	0.153	0.426	0.252	108.2%	0.192
ANNUAL SENSIBLE COOLING [MWh]									Statistics for Example Results				TRACE 3DP® Trane®
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%	0.006
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%	0.011
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%	0.050
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%	0.586
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%	6.086
440-600 Cavity Albedo	-2.170	-2.261		-2.604	-2.760		-2.517	-2.094	-2.760	-2.094	-2.401	27.7%	-2.497
PEAK HEATING [kW]									Statistics for Example Results				TRACE 3DP® Trane®
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%	1.010
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%	0.905
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%	-0.184
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%	0.000
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%	-0.218
440-600 Cavity Albedo	0.002	0.002		0.019			0.000	0.022	0.000	0.022	0.009	244.4%	0.001
PEAK SENSIBLE COOLING [kW]									Statistics for Example Results				TRACE 3DP® Trane®
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%	0.181
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%	0.139
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%	0.237
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%	1.101
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%	4.836
440-600 Cavity Albedo	-1.648	-1.541		-1.774			-1.800	-1.534	-1.800	-1.534	-1.659	16.0%	-1.848

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

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

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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

ANNUAL HEATING [MWh]									Statistics for Example Results				TRACE 3DP® Trane®
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** (%)	
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%	-0.664
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%	-4.119
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%	-0.744
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%	-2.908
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%	-1.356
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%	-0.975
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%	-1.917
ANNUAL SENSIBLE COOLING [MWh]									Statistics for Example Results				TRACE 3DP® Trane®
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** (%)	
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%	-0.444
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%	2.308
900-810 Himass, Int. Sol. Abs.	1.080	1.195		1.454	1.707		1.294	0.975	0.975	1.707	1.284	57.0%	1.308
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%	-3.503
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%	-1.611
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%	-1.122
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%	-4.000
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%	-5.214
PEAK HEATING [kW]									Statistics for Example Results				TRACE 3DP® Trane®
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** (%)	
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%	-0.185
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%	-0.611
900-810 Himass, Int. Sol. Abs.	-0.129	-0.113		-0.155			-0.089	-0.166	-0.166	-0.089	-0.130	59.1%	-0.148
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%	-0.568
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%	-0.257
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%	-0.213
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%	-1.467
PEAK SENSIBLE COOLING [kW]									Statistics for Example Results				TRACE 3DP® Trane®
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** (%)	
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%	-0.878
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%	2.400
900-810 Himass, Int. Sol. Abs.	1.036	0.798		0.880			1.223	0.595	0.595	1.223	0.906	69.3%	1.140
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%	-3.587
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%	-1.139
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%	-1.119
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%	-3.245
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%	-4.117

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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.

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

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

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1

Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Statistics for Example Results				TRACE 3DP® Trane®
	DMU	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND	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%	0.695
600 South	0.650	0.671	0.652	0.650	0.628	0.647	0.623	0.623	0.671	0.646	7.5%	0.634

* 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	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Statistics for Example Results				TRACE 3DP® Trane®
	DMU	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND	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%	0.273
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%	0.196

* 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	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Statistics for Example Results				TRACE 3DP® Trane®
	DMU	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND	Min	Max	Mean	(Max-Min)/ Mean* (%)	
North	427	434	456	407	457	367	453	367	457	429	20.9%	433
East	959	1155	1083	1217	1082	1101	962	959	1217	1080	23.9%	1186
West	1086	1079	1003	857	1002	1012	1090	857	1090	1018	22.9%	1041
South	1456	1566	1476	1468	1474	1522	1468	1456	1566	1490	7.4%	1548
Horizontal	1797	1831	1832	1832	1832	1832	1832	1797	1832	1827	1.9%	1841

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

ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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)

Case	Simulation Model:	ESP	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Statistics for Example Results				TRACE 3DP® Trane®
	Organization or Country:	DMU	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND	Min	Max	Mean	(Max-Min)/ Mean* (%)	
West		732	735	689	563	642	662	706	563	735	676	25.5%	724
South		946	1051	962	954	926	984	914	914	1051	962	14.2%	982

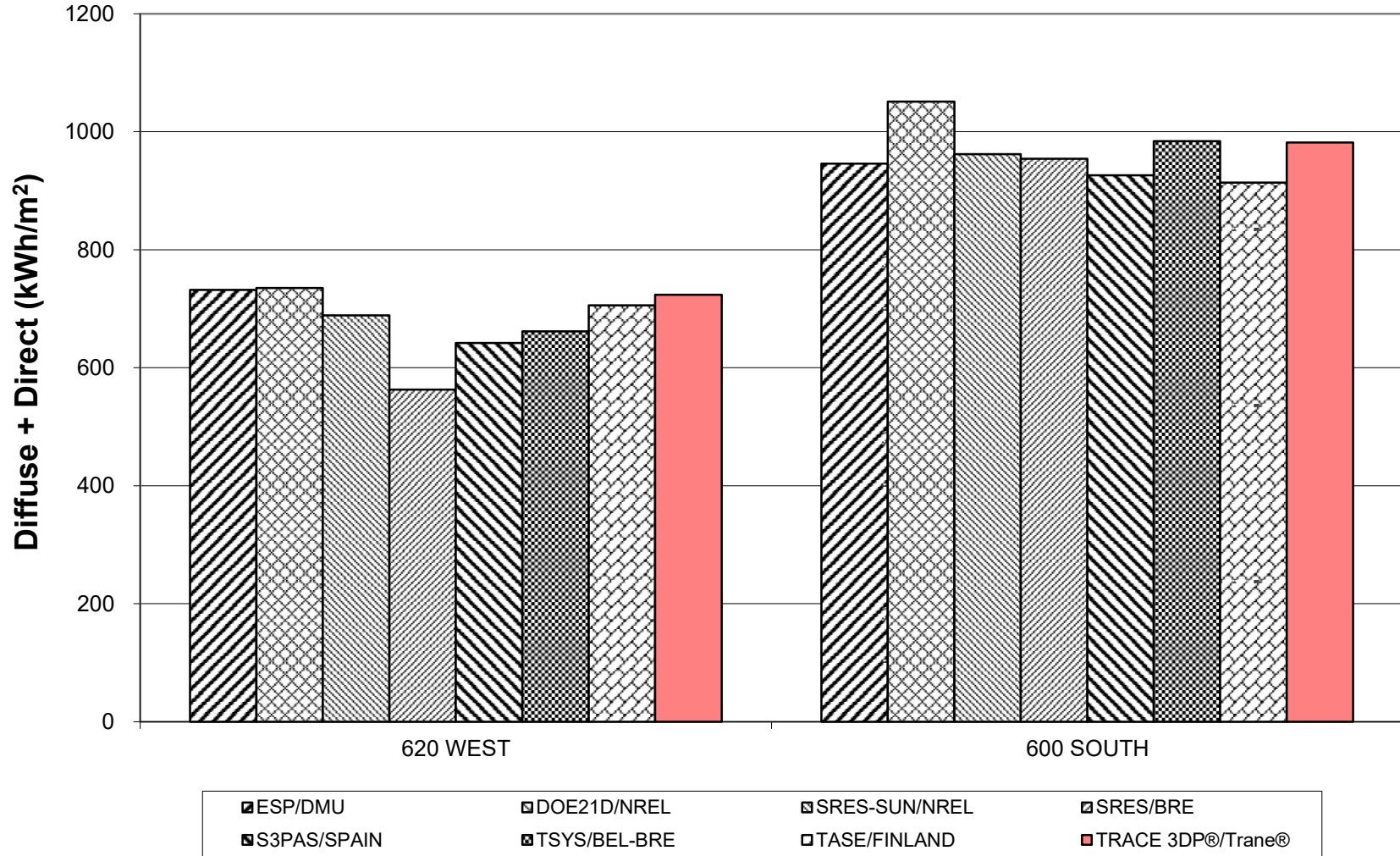
* ABS[(Max-Min) / (Mean of Example Simulation Results)]

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

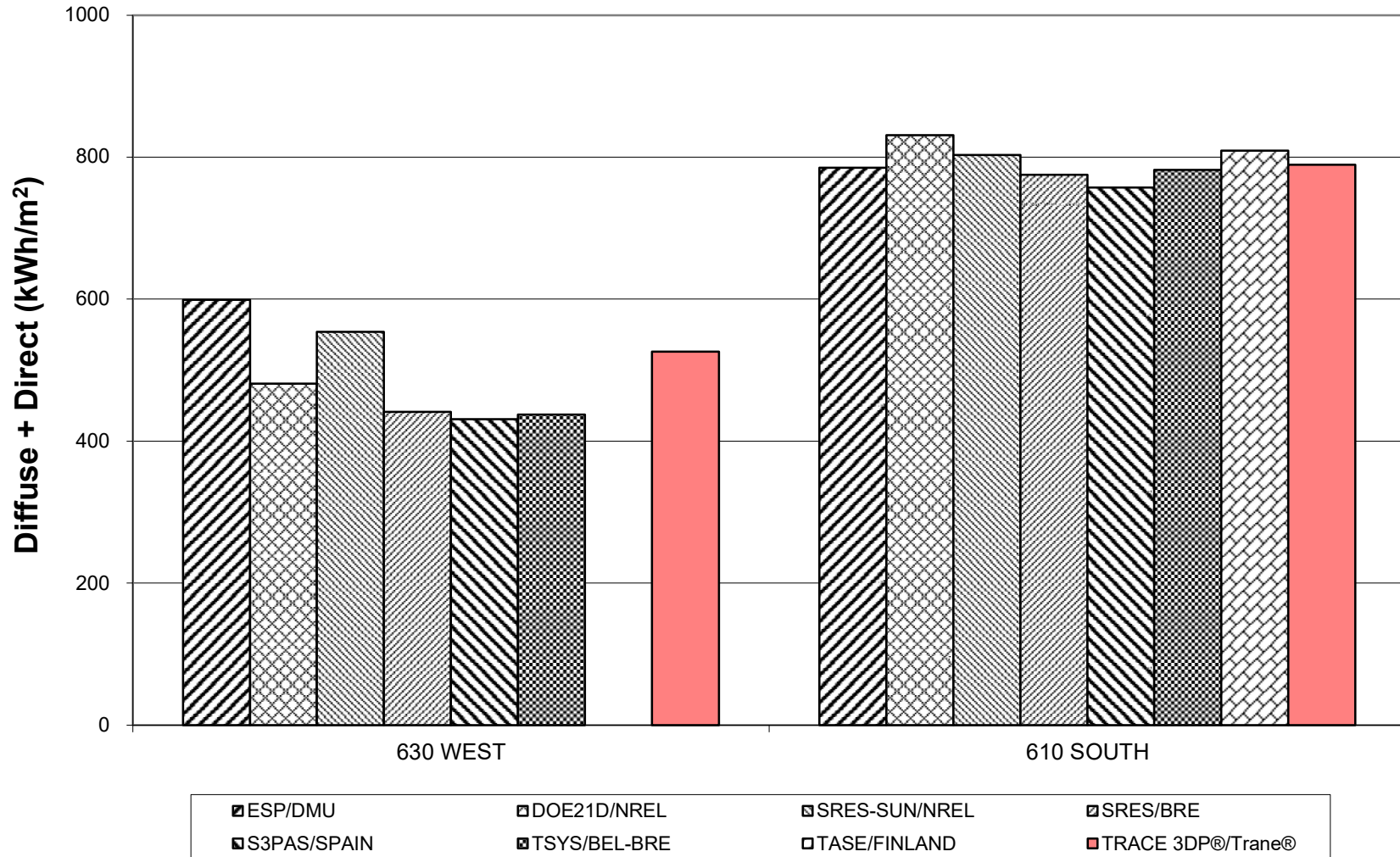
Case	Simulation Model:	ESP	DOE21D	SRES-SUN	SRES	S3PAS	TSYS	TASE	Statistics for Example Results				TRACE 3DP® Trane®
	Organization or Country:	DMU	NREL	NREL	BRE	SPAIN	BEL-BRE	FINLAND	Min	Max	Mean	(Max-Min)/ Mean* (%)	
West		599	481	554	441	431	438		431	599	491	34.2%	526
South		785	831	803	775	757	782	809	757	831	792	9.3%	789

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

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



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



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

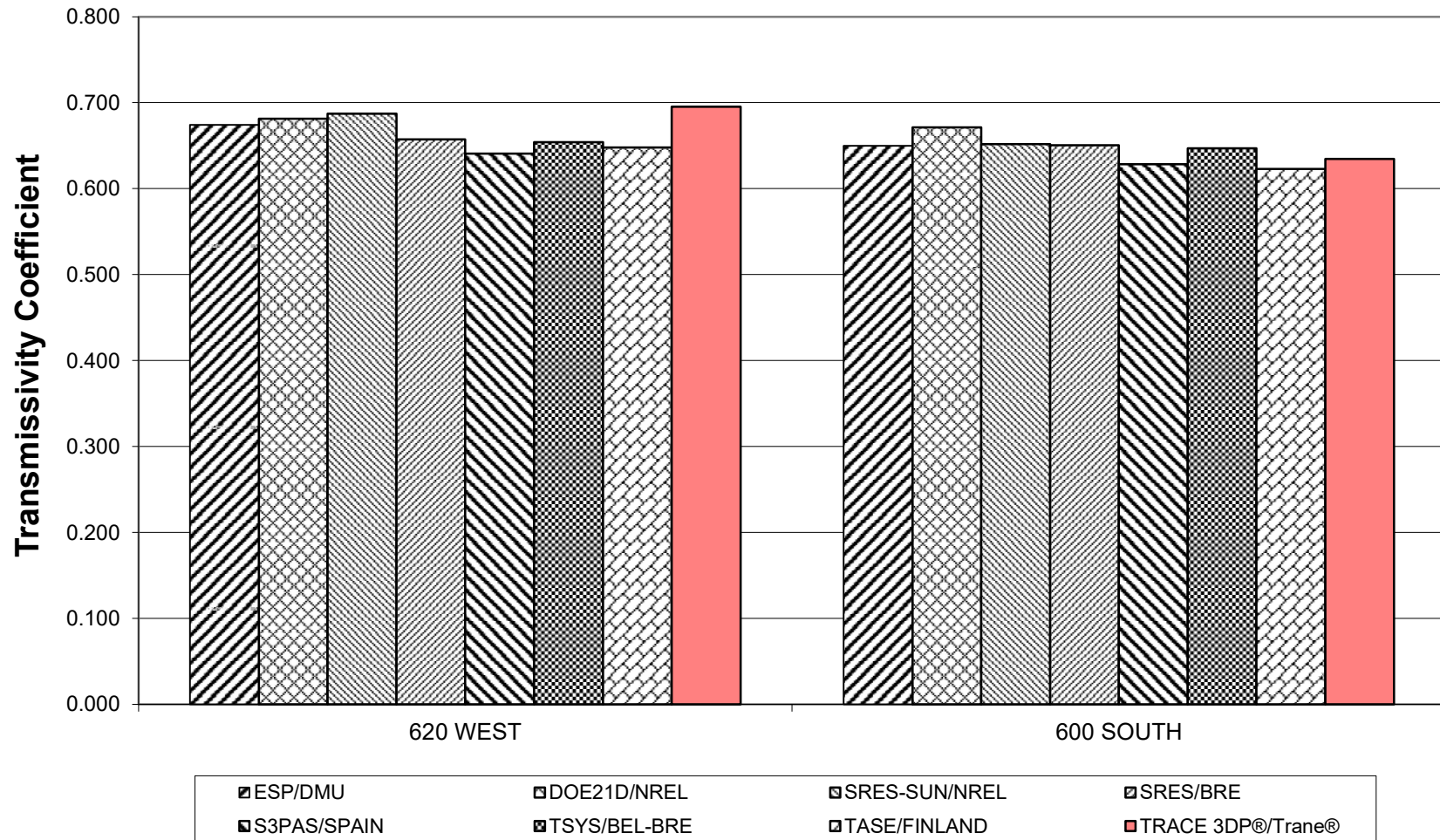
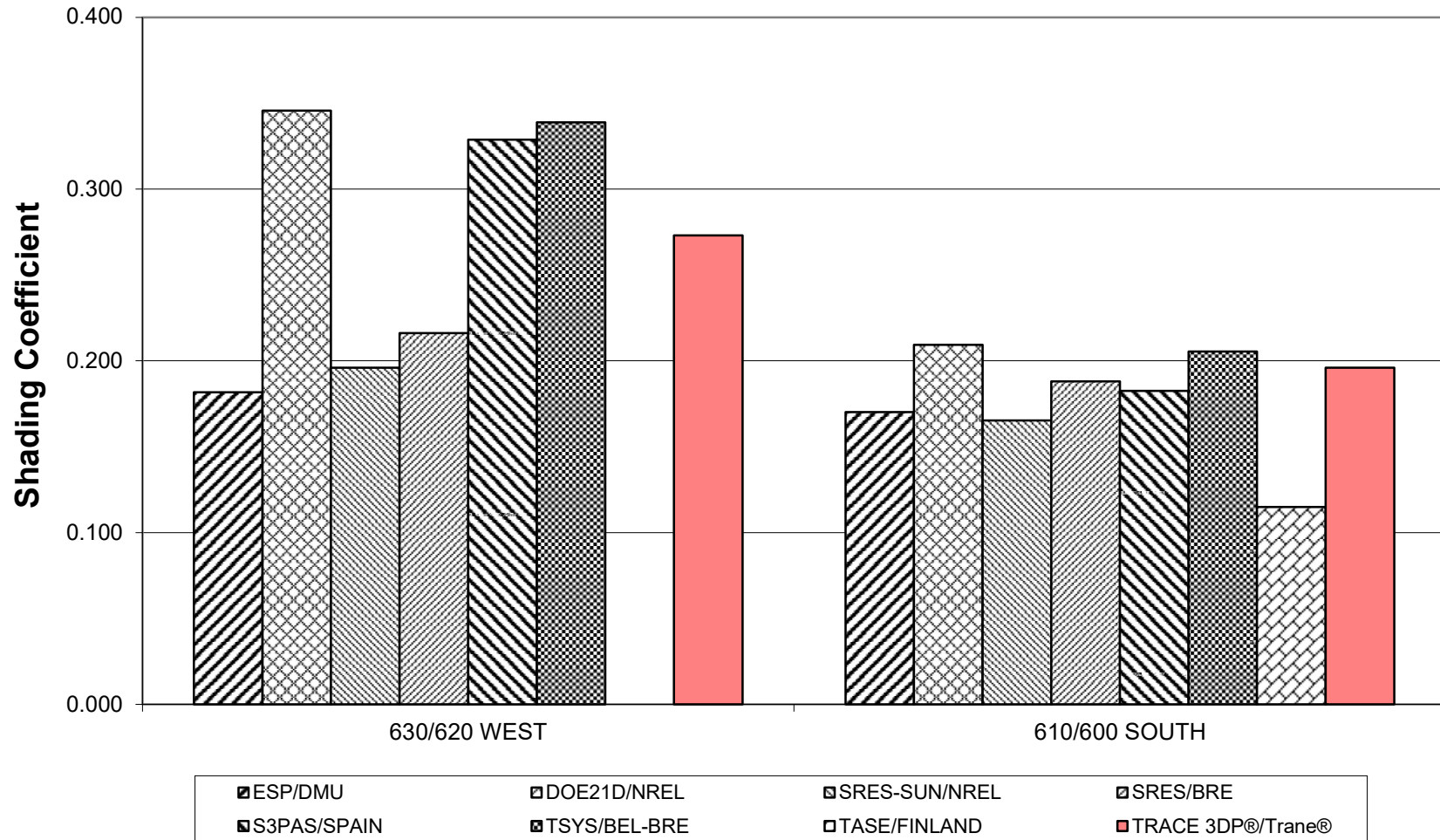
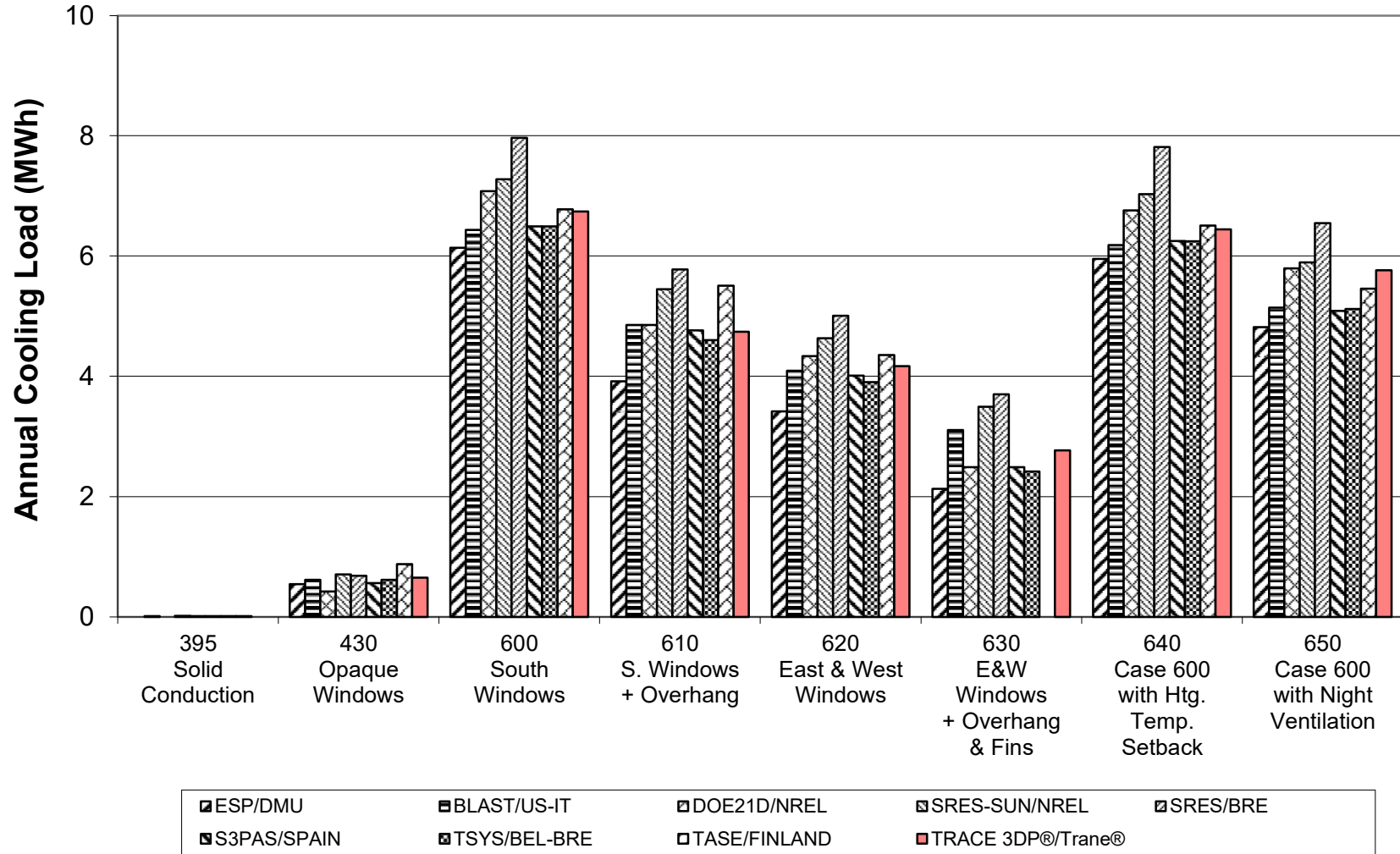


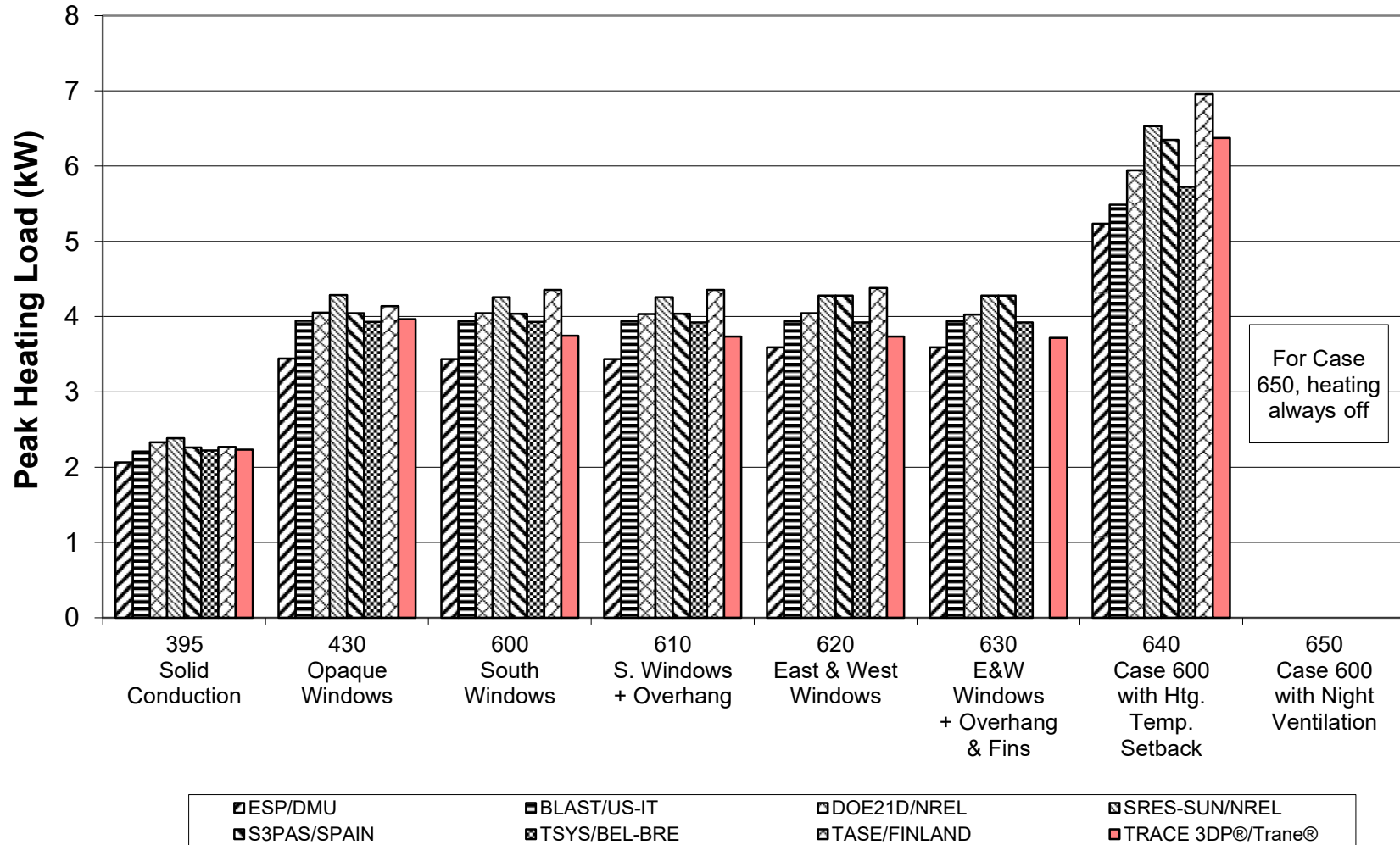
Figure B8-5. BESTEST BASIC
Annual Overhang and Fin Shading Coefficients
(1-(Shaded)/(Unshaded)) Transmitted Solar Radiation



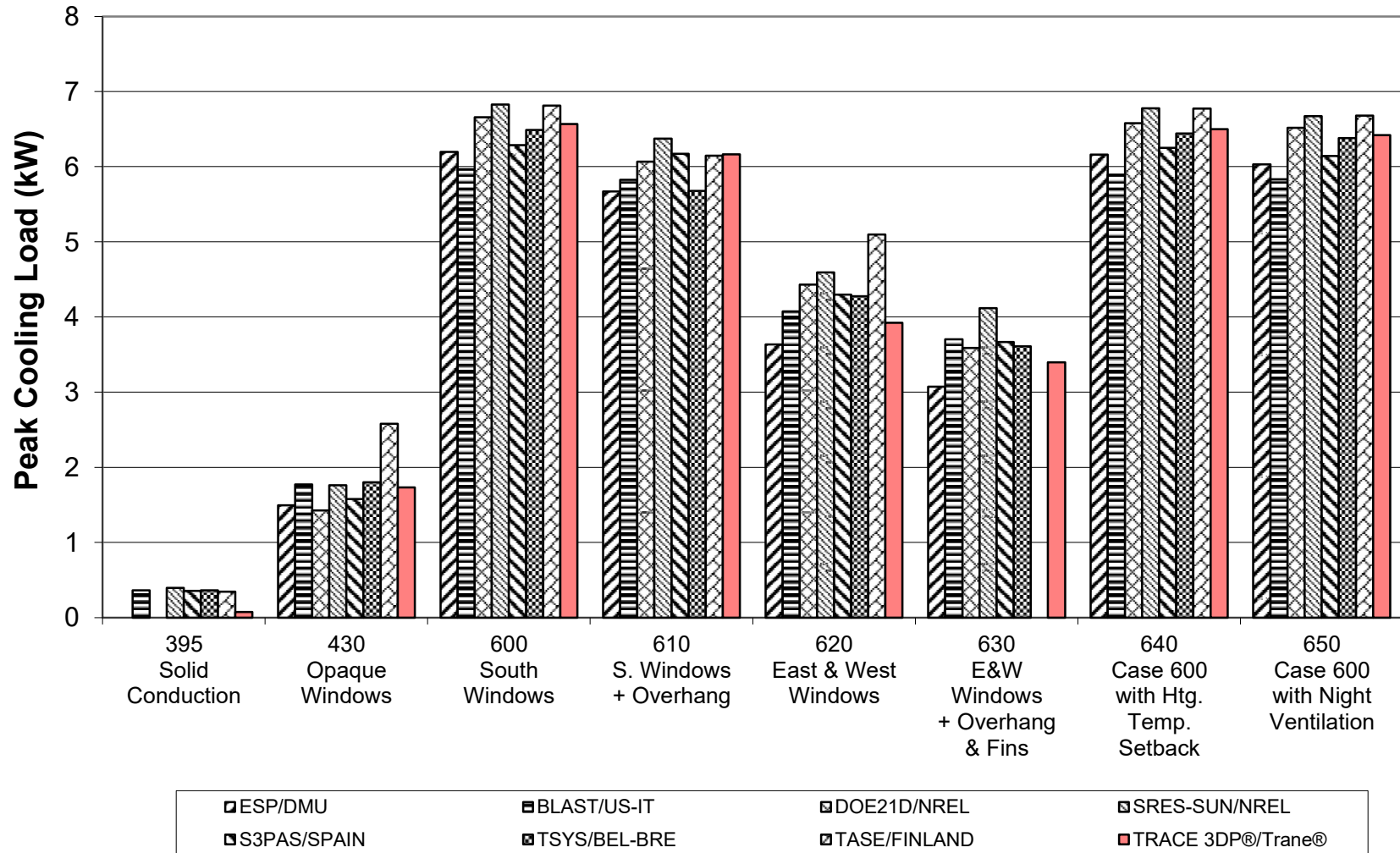
**Figure B8-7. BESTEST BASIC
 Low Mass Annual Sensible Cooling**



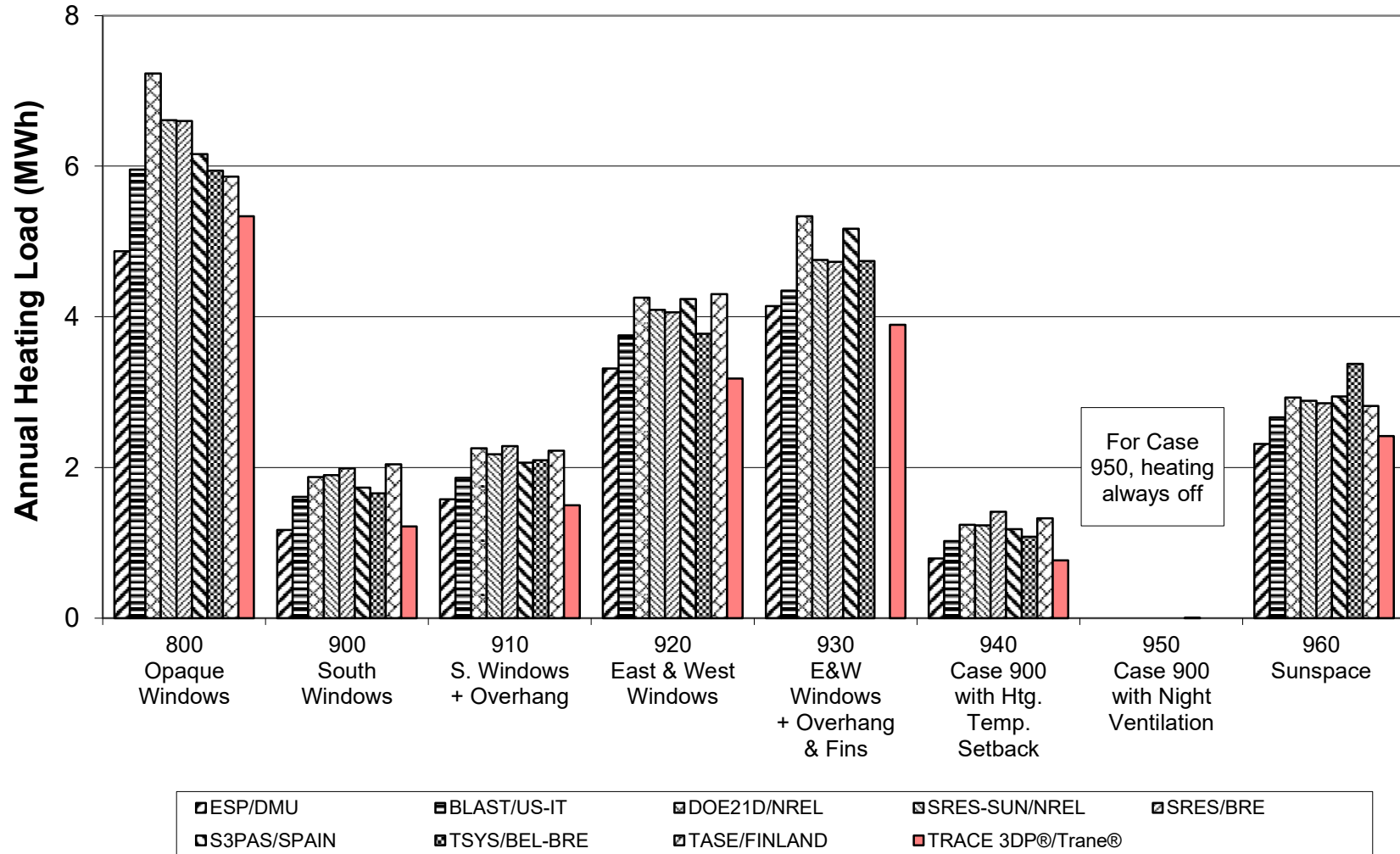
**Figure B8-8. BESTEST BASIC
 Low Mass Peak Heating**



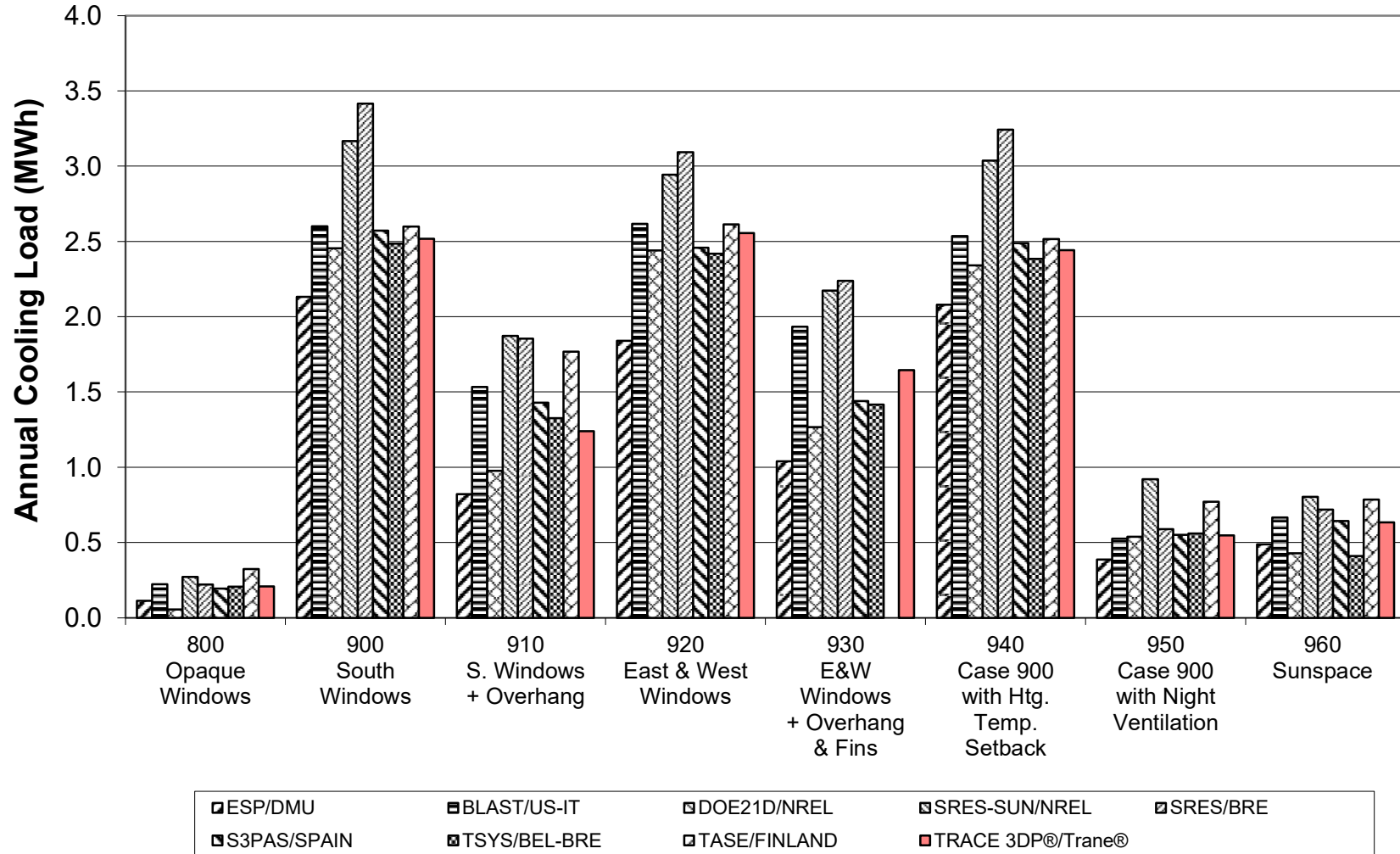
**Figure B8-9. BESTEST BASIC
 Low Mass Peak Sensible Cooling**



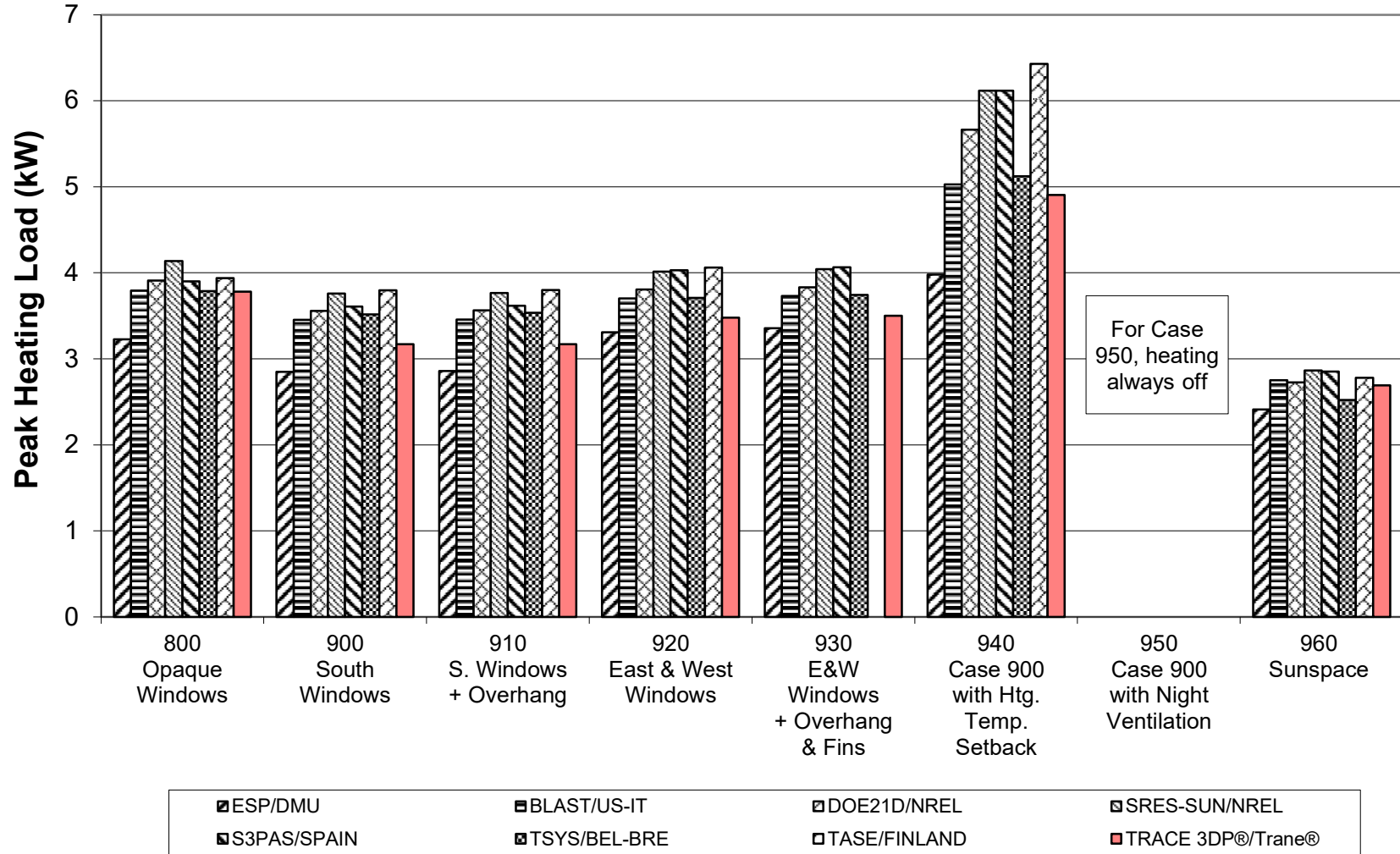
**Figure B8-10. BESTEST BASIC
 High Mass Annual Heating**



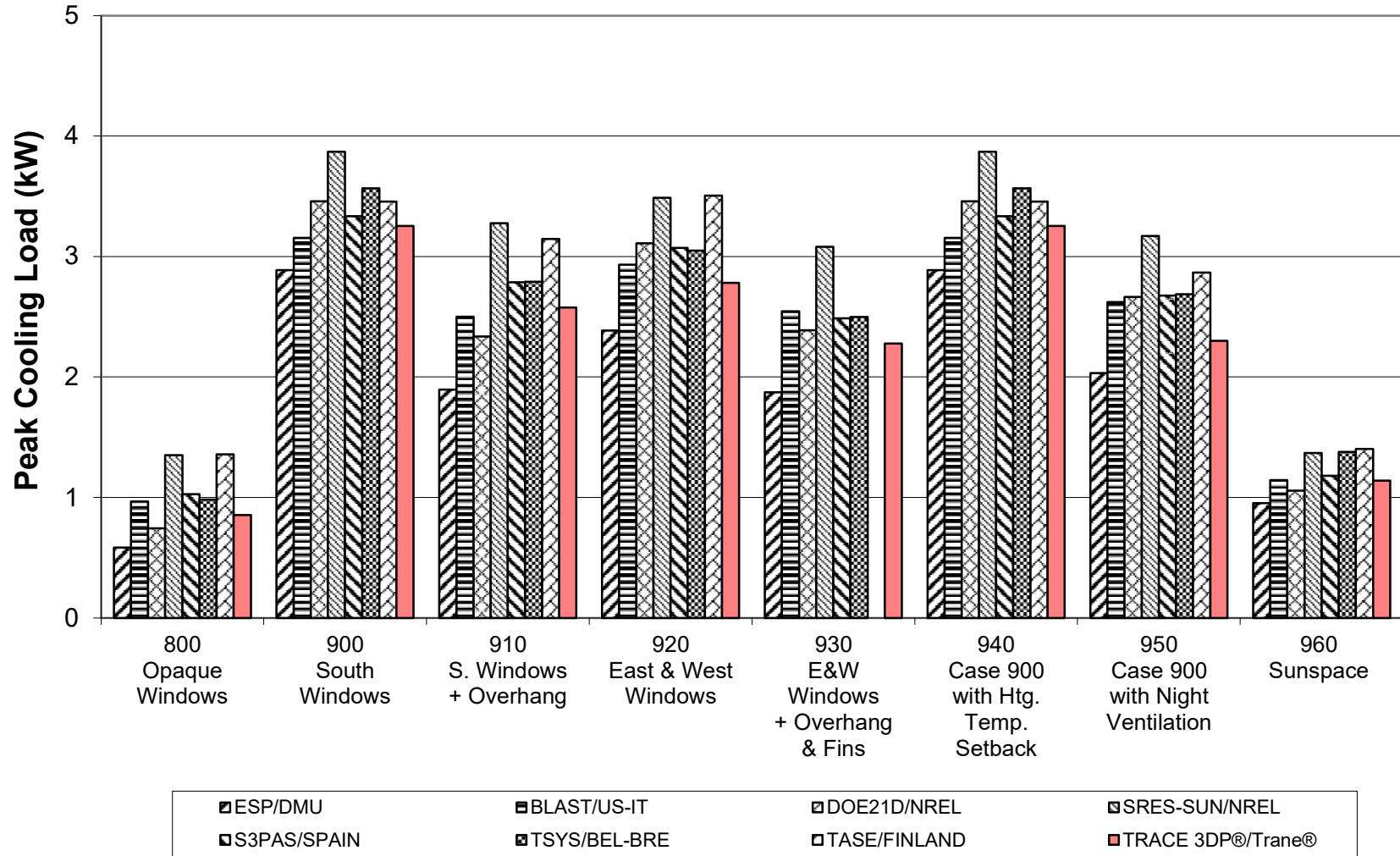
**Figure B8-11. BESTEST BASIC
 High Mass Annual Sensible Cooling**



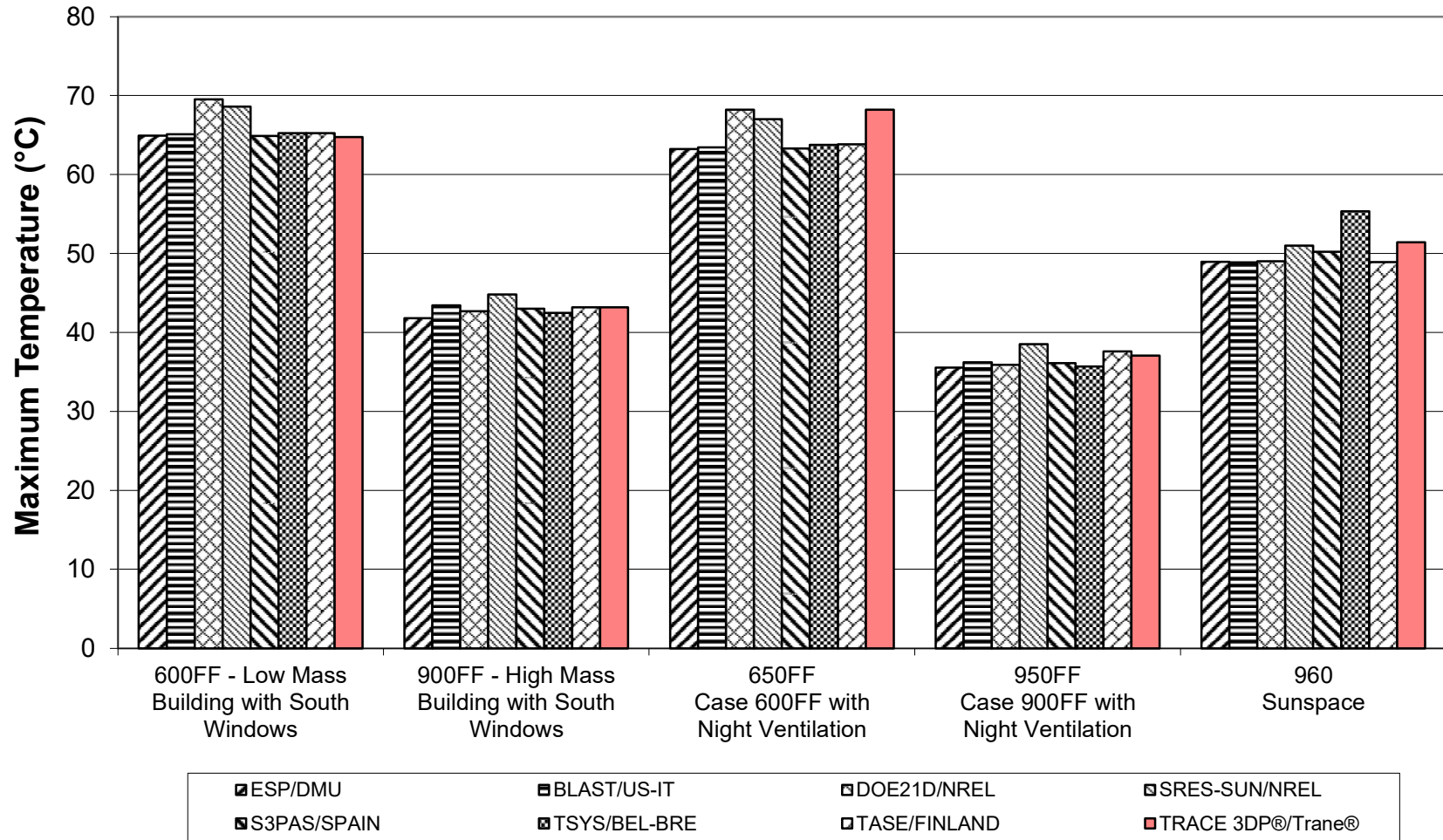
**Figure B8-12. BESTEST BASIC
 High Mass Peak Heating**



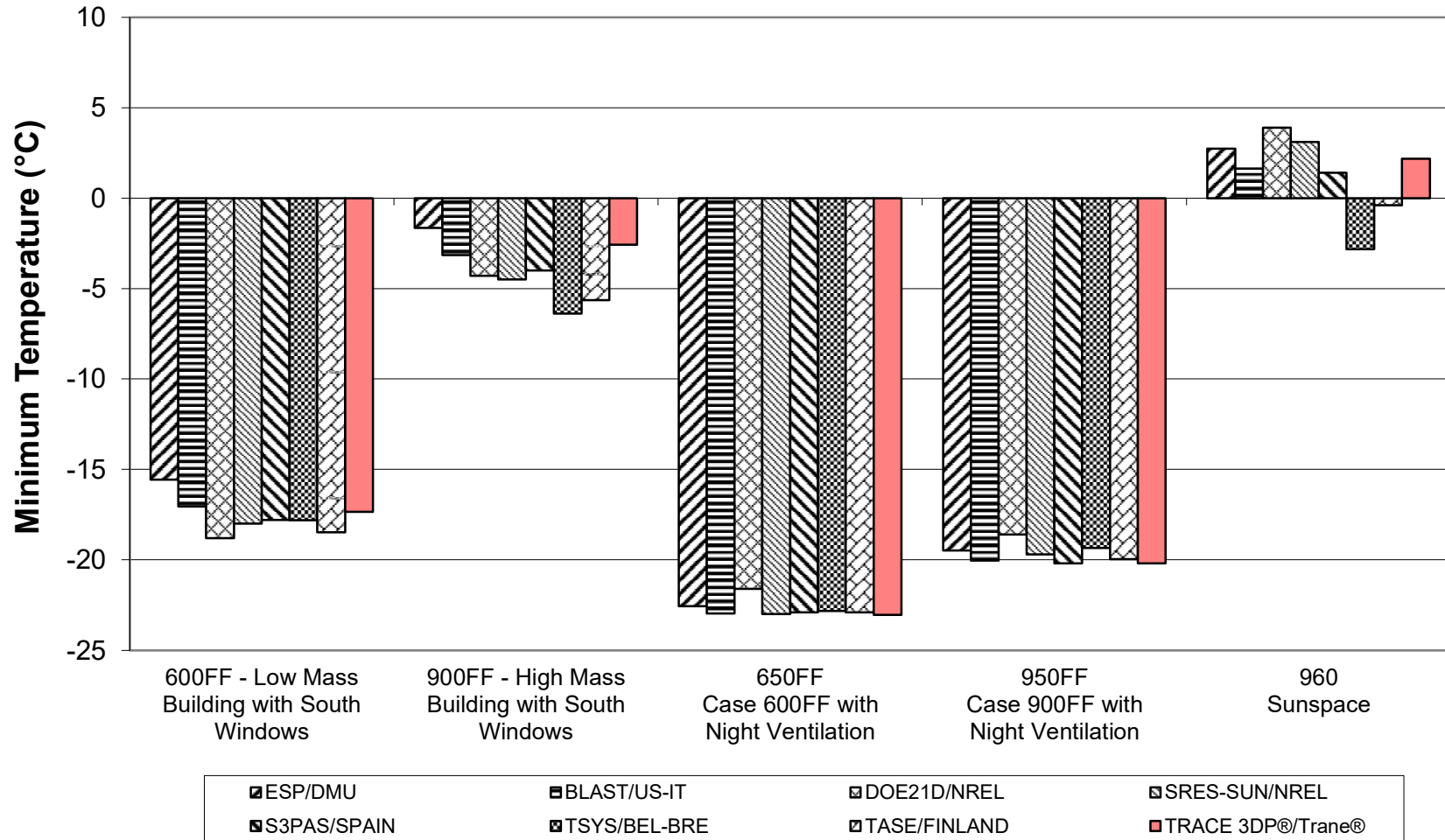
**Figure B8-13. BESTEST BASIC
 High Mass Peak Sensible Cooling**



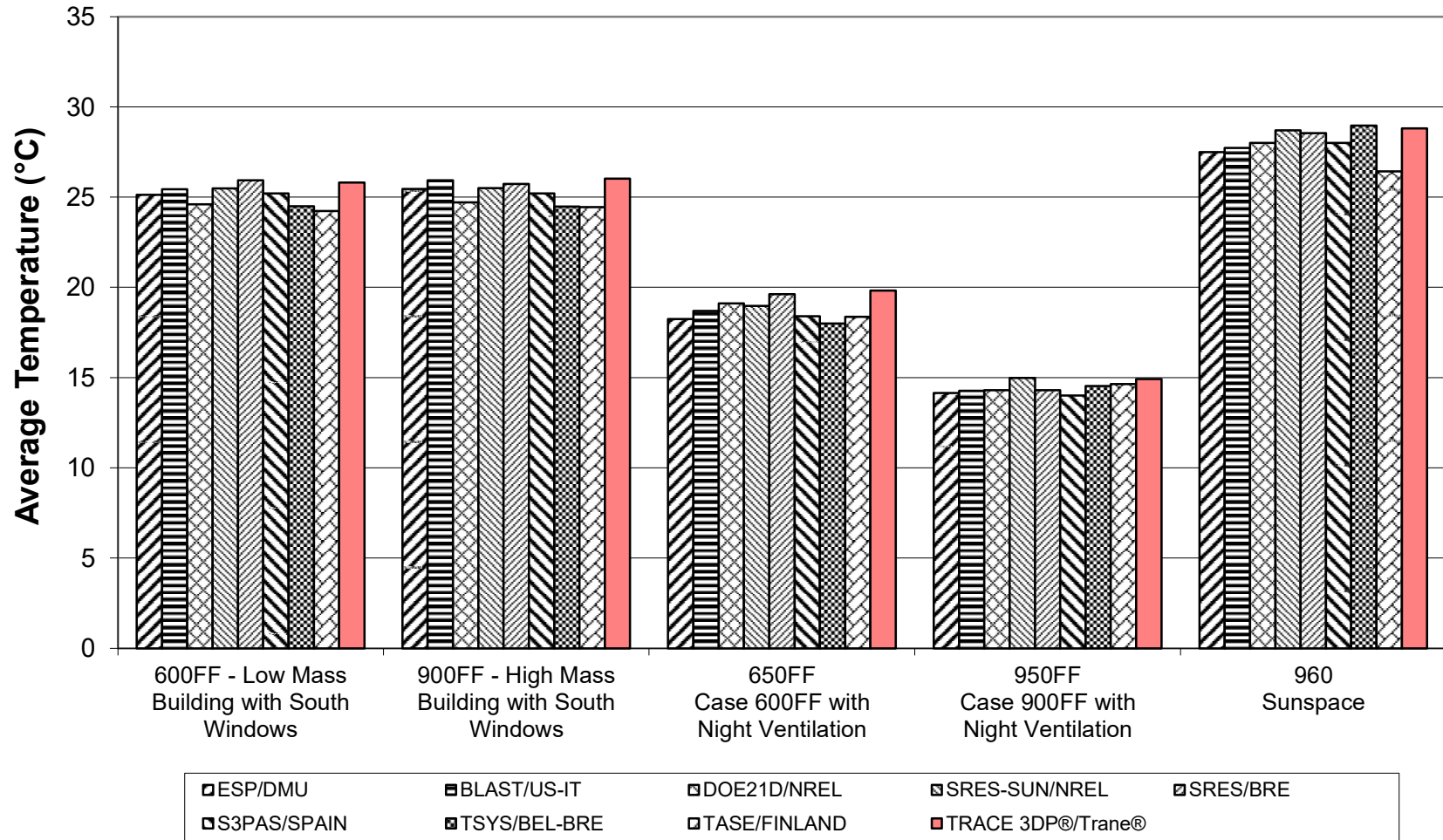
**Figure B8-14. BESTEST BASIC
 Maximum Hourly Annual Temperature
 Free-Float Cases**



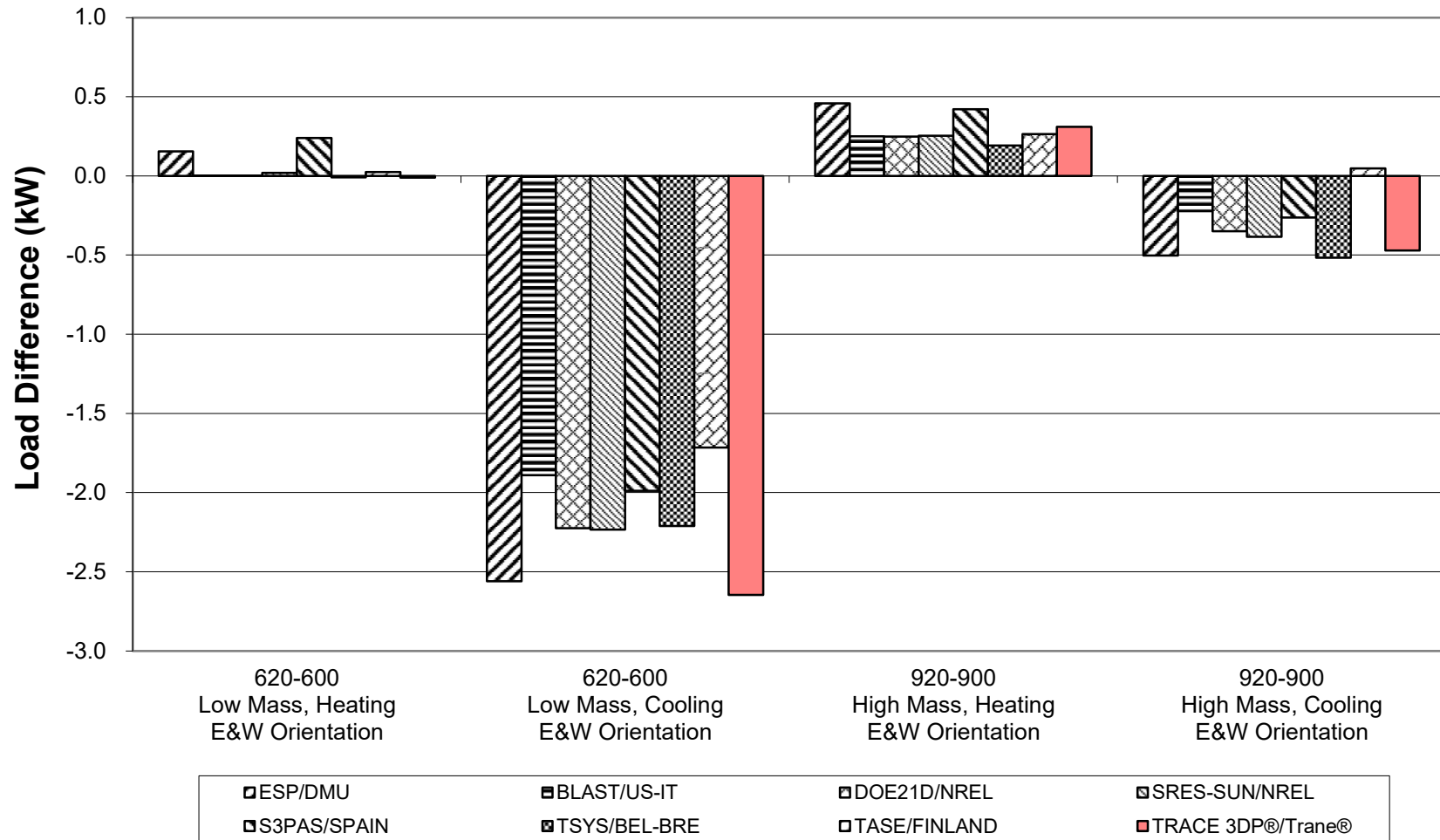
**Figure B8-15. BESTEST BASIC
 Minimum Hourly Annual Temperature
 Free-Float Cases**



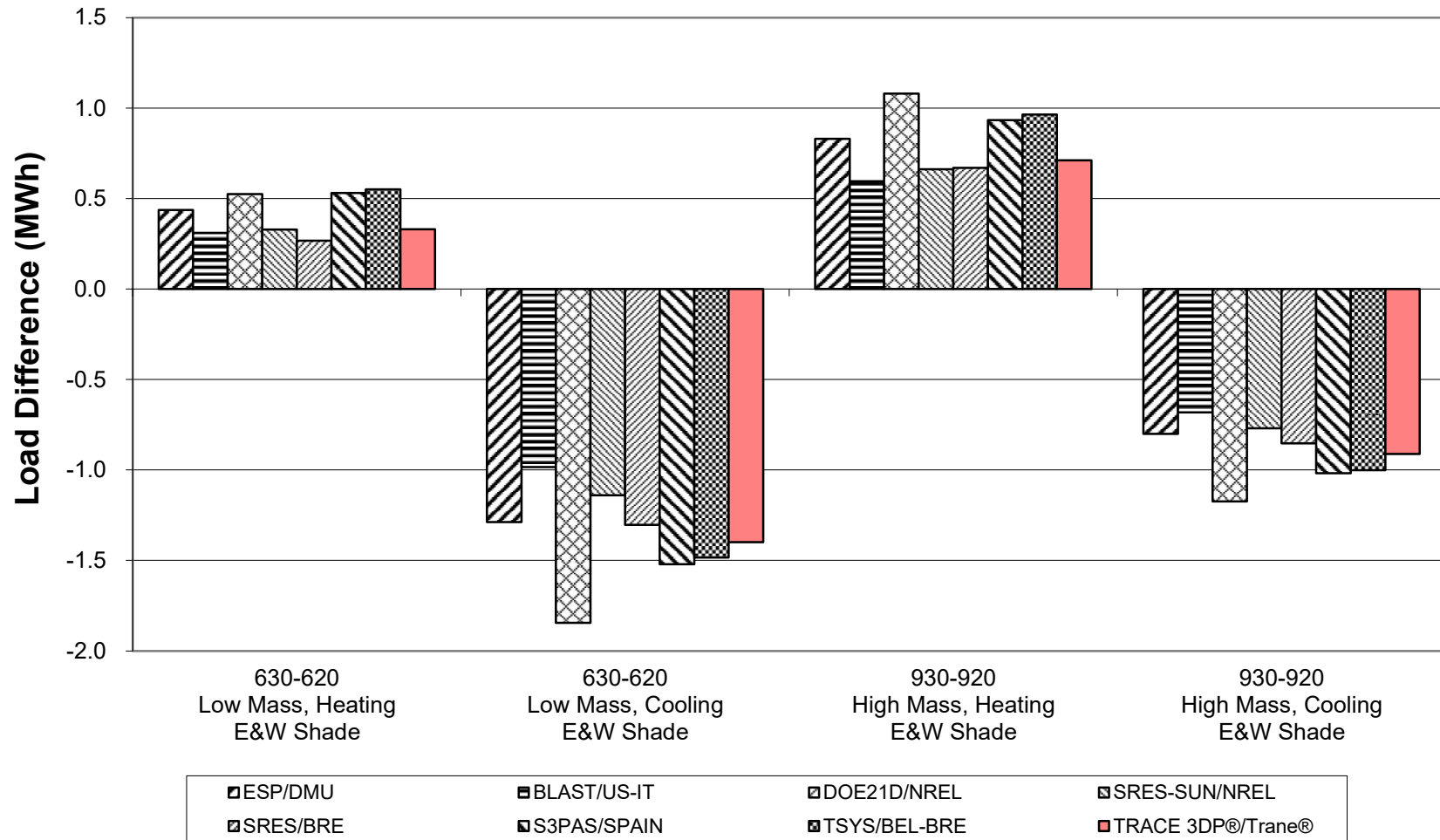
**Figure B8-16. BESTEST BASIC
 Average Hourly Annual Temperature
 Free-Float Cases**



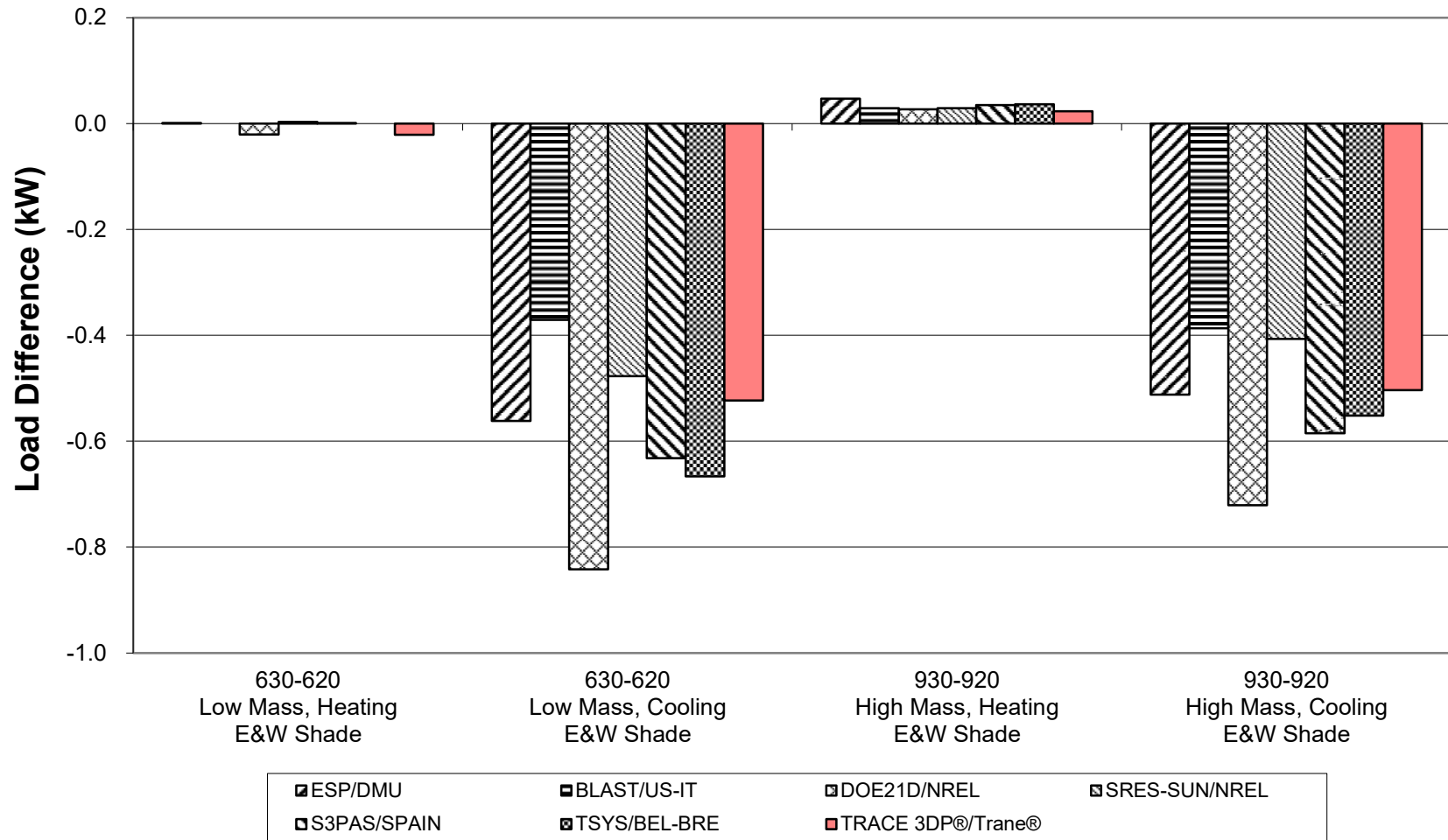
**Figure B8-20. BESTEST BASIC
 East & West Window (Delta)
 Peak Heating and Sensible Cooling**



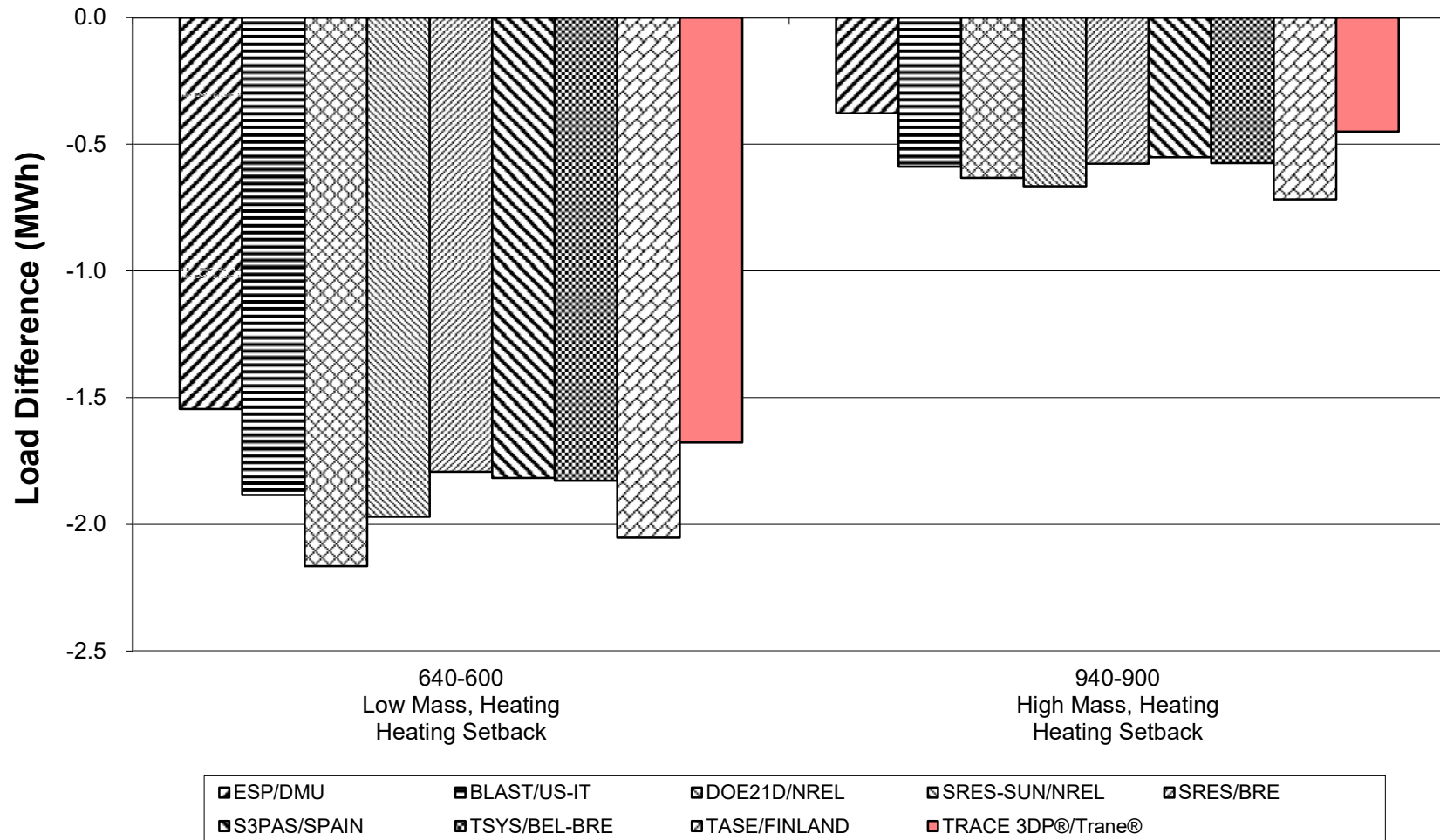
**Figure B8-21. BESTEST BASIC
 East & West Shaded Window (Delta)
 Annual Heating and Sensible Cooling**



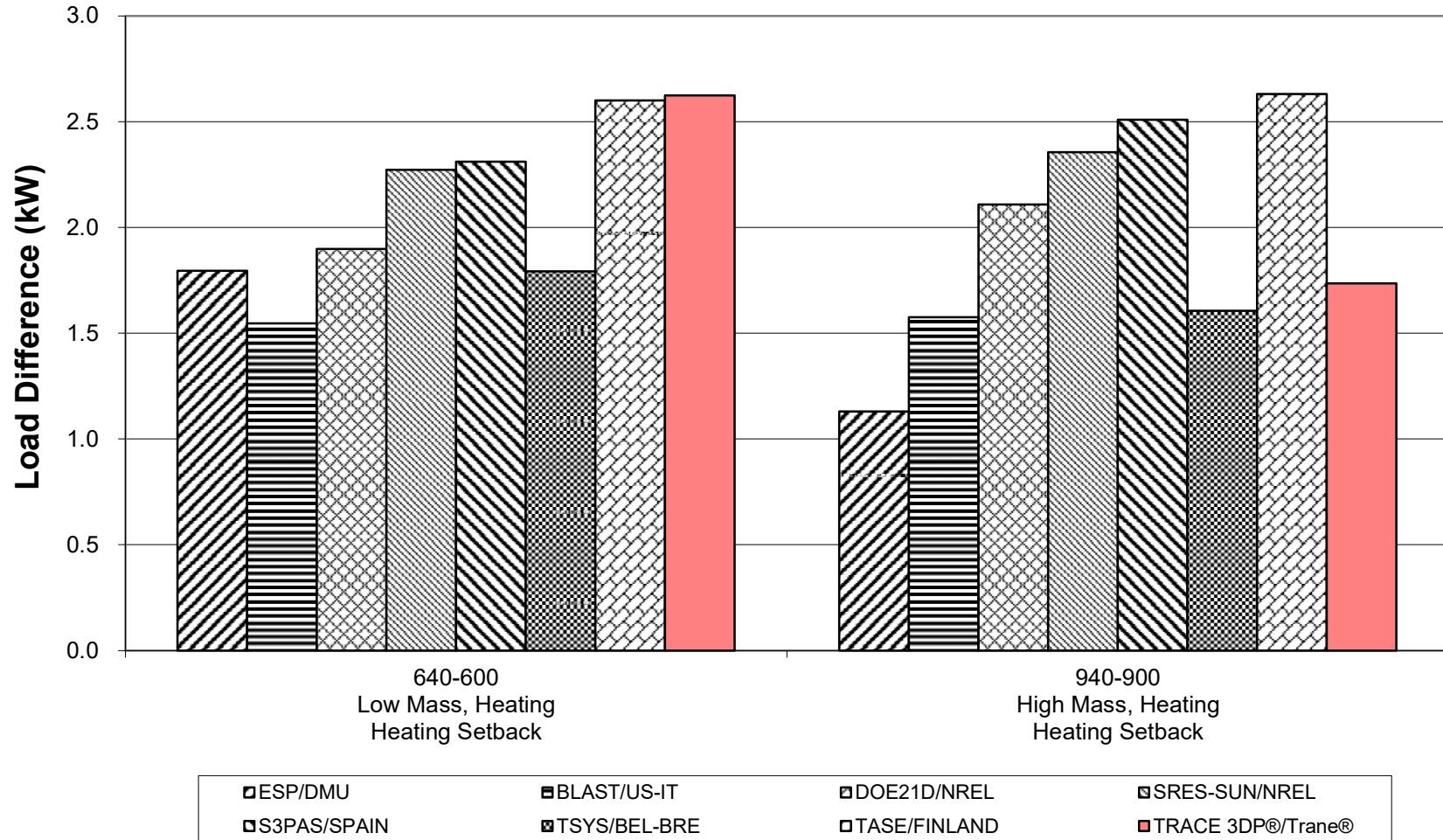
**Figure B8-22. BESTEST BASIC
 East & West Shaded Window (Delta)
 Peak Heating and Sensible Cooling**



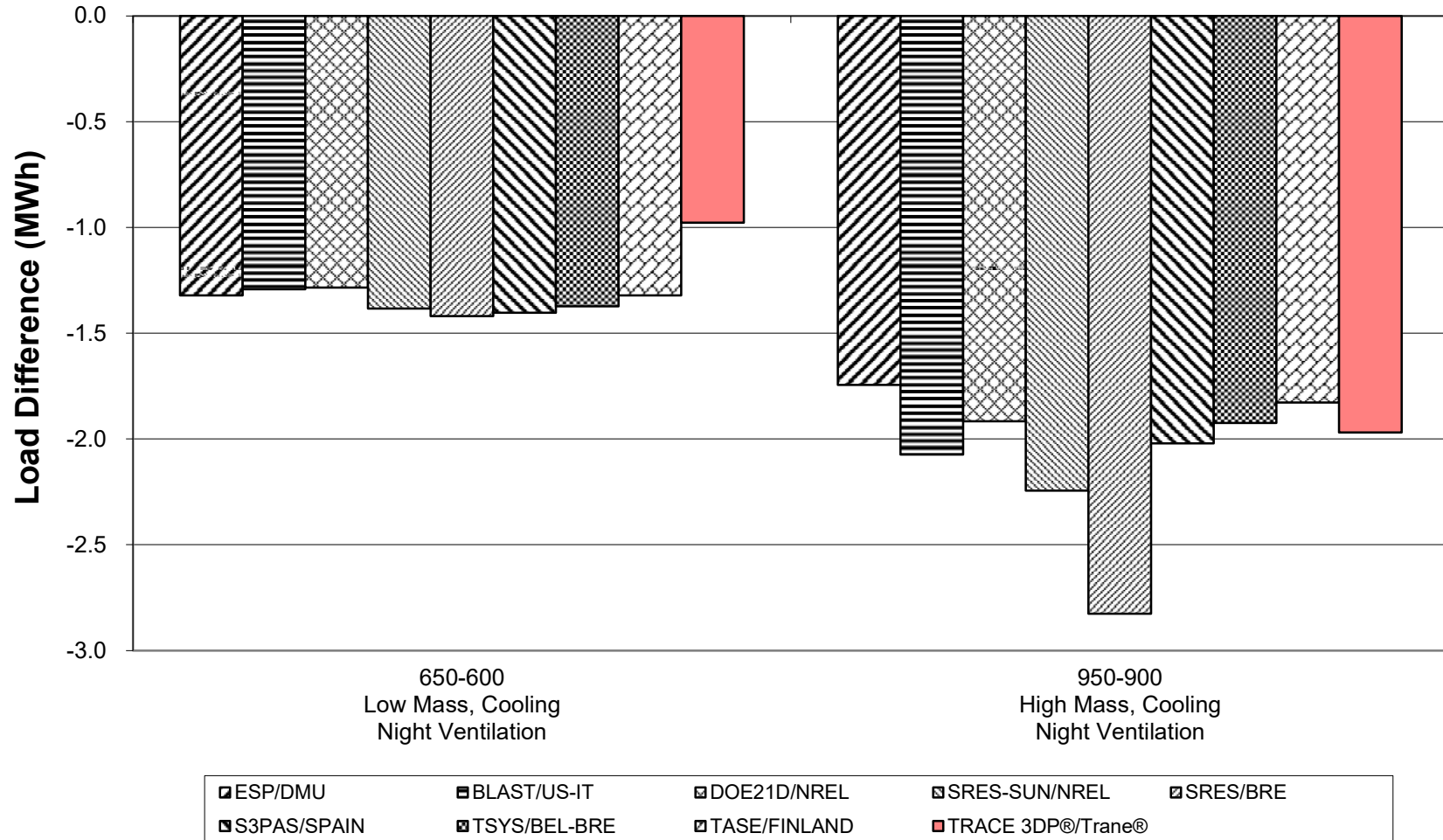
**Figure B8-23. BESTEST BASIC
 Thermostat Setback (Delta)
 Annual Heating**



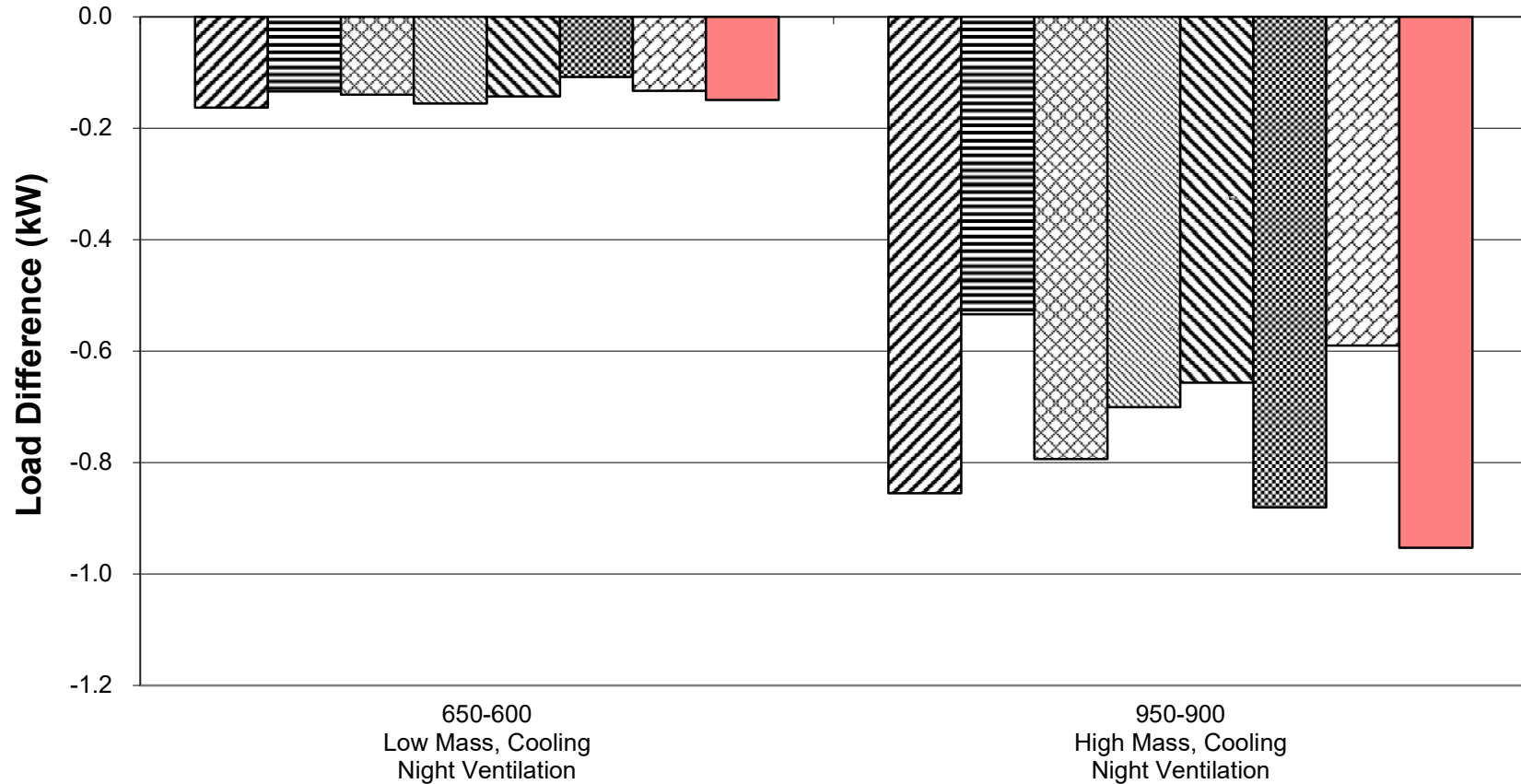
**Figure B8-24. BESTEST BASIC
Thermostat Setback (Delta)
Peak Heating**



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

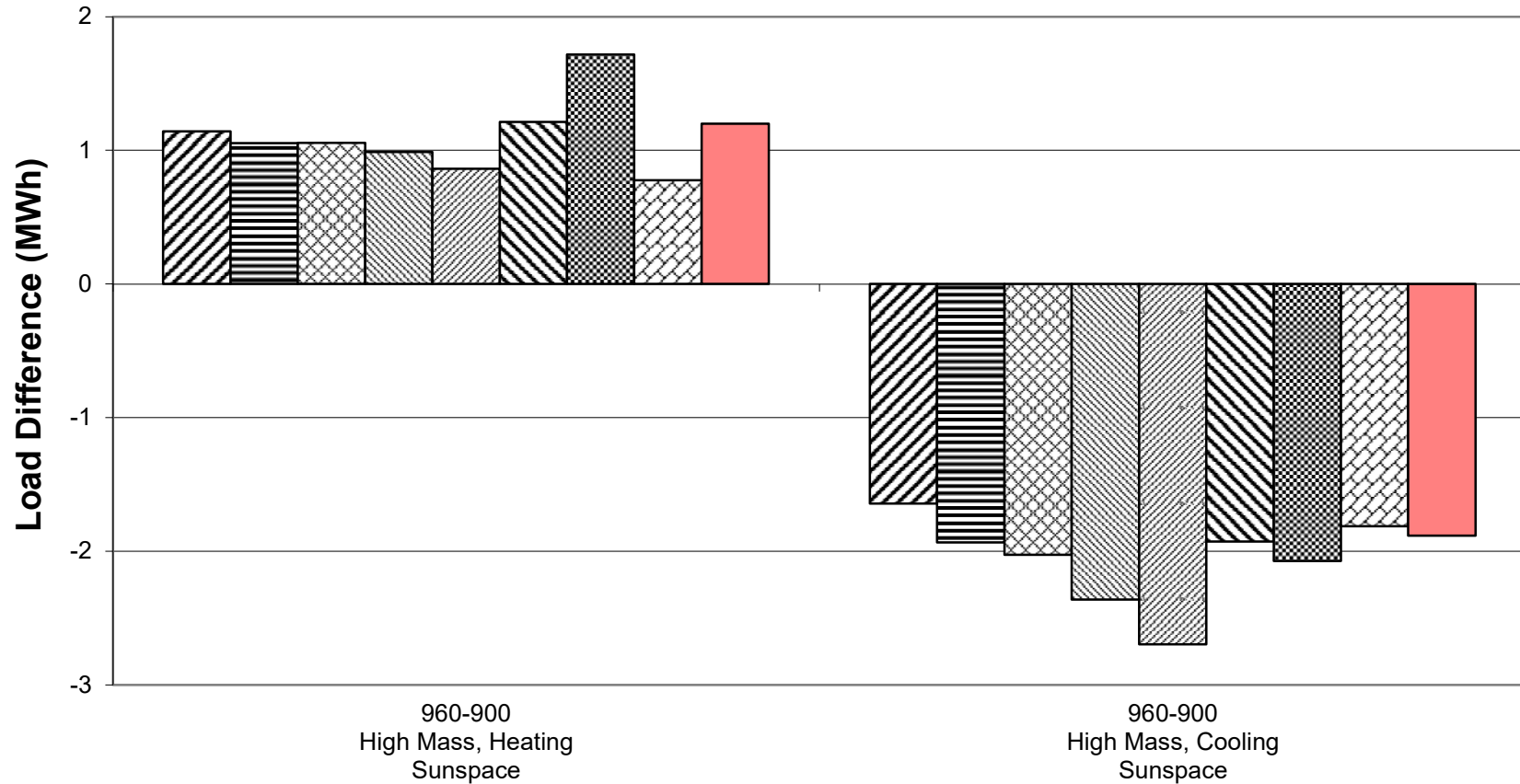


**Figure B8-26. BESTEST BASIC
 Vent Cooling (Delta)
 Peak Sensible Cooling**



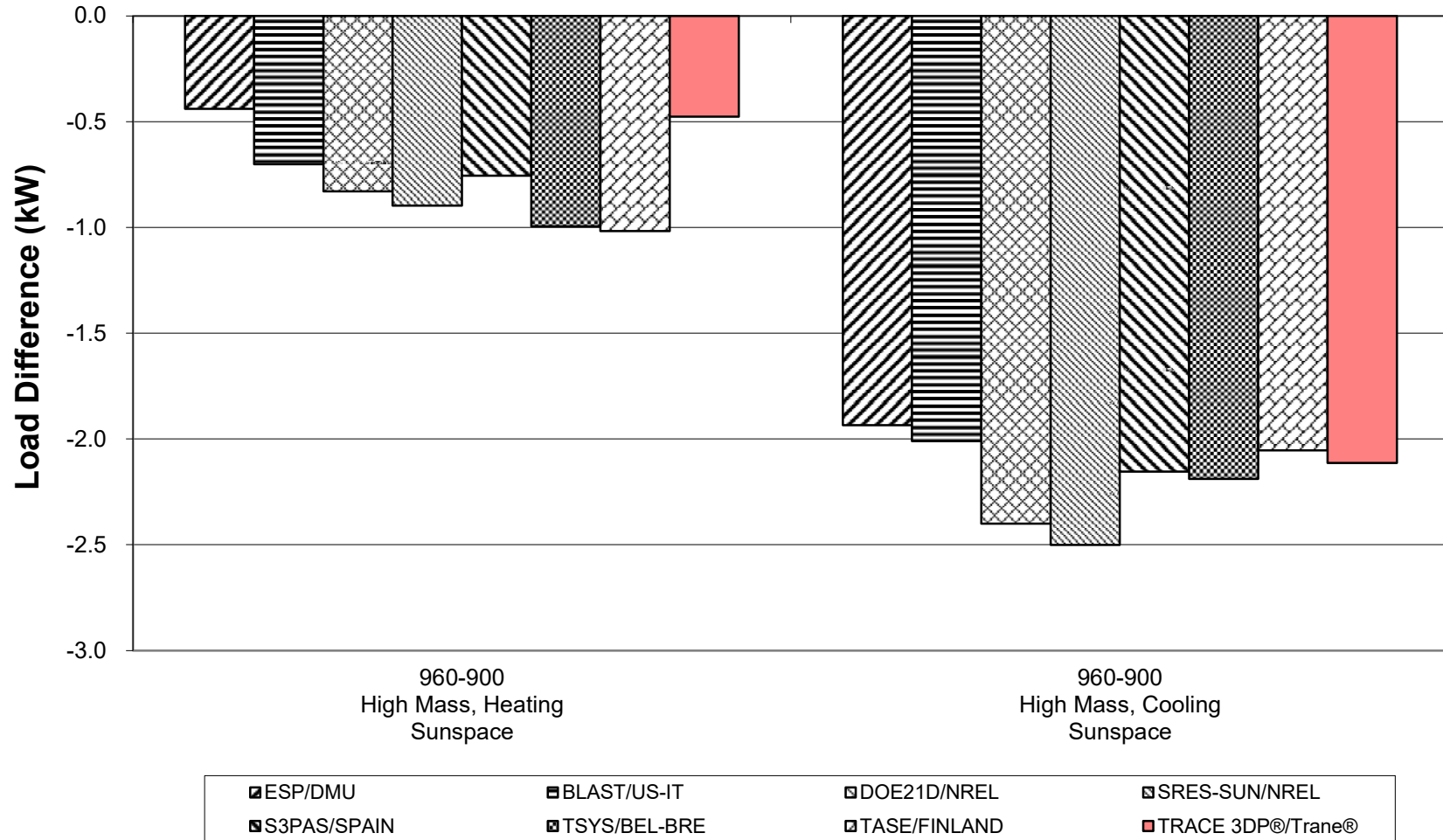
ESP/DMU	BLAST/US-IT	DOE21D/NREL	SRES-SUN/NREL
S3PAS/SPAIN	TSYS/BEL-BRE	TASE/FINLAND	TRACE 3DP®/Trane®

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

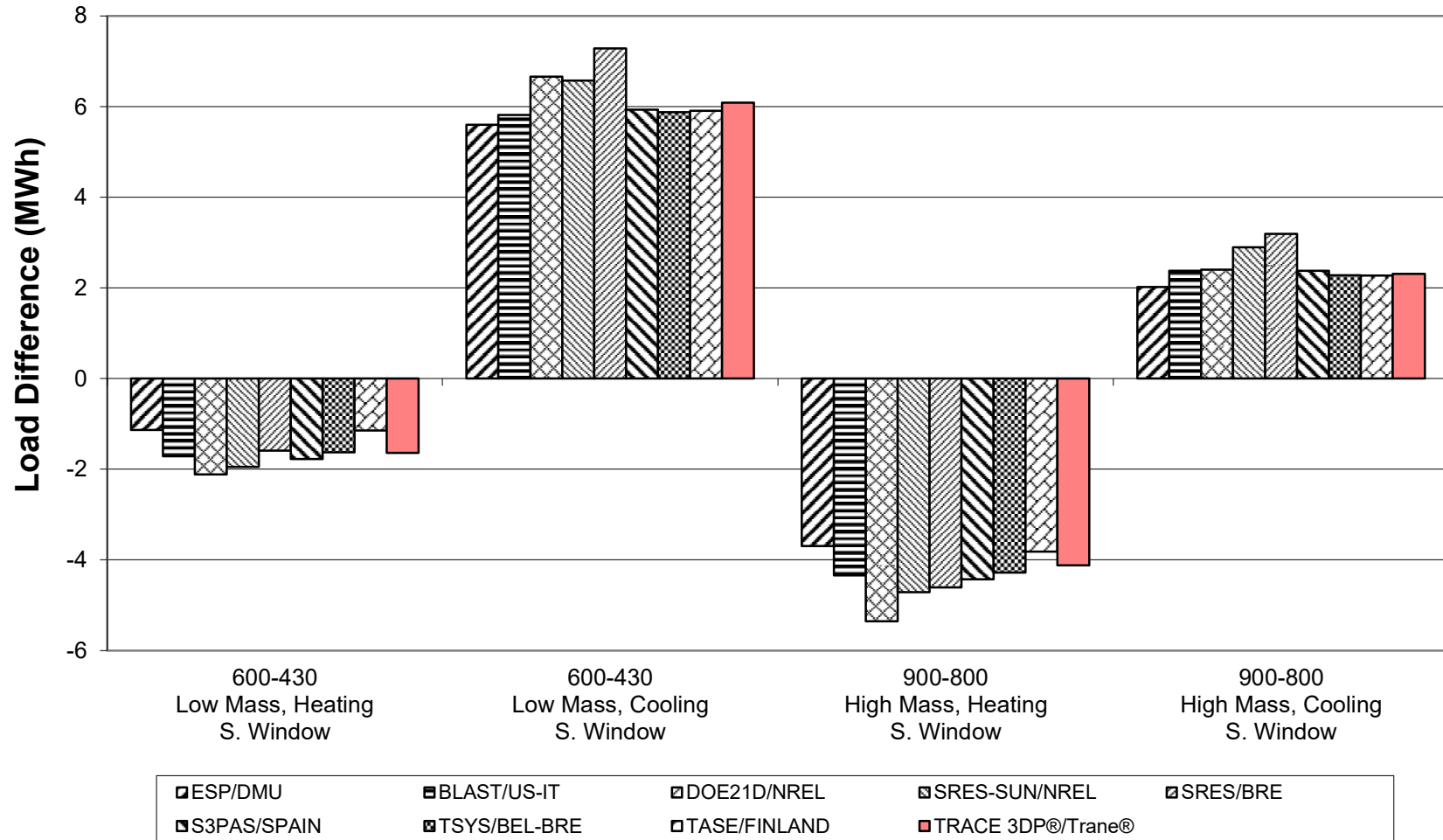


ESP/DMU	BLAST/US-IT	DOE21D/NREL	SRES-SUN/NREL	SRES/BRE
S3PAS/SPAIN	TSYS/BEL-BRE	TASE/FINLAND	TRACE 3DP®/Trane®	

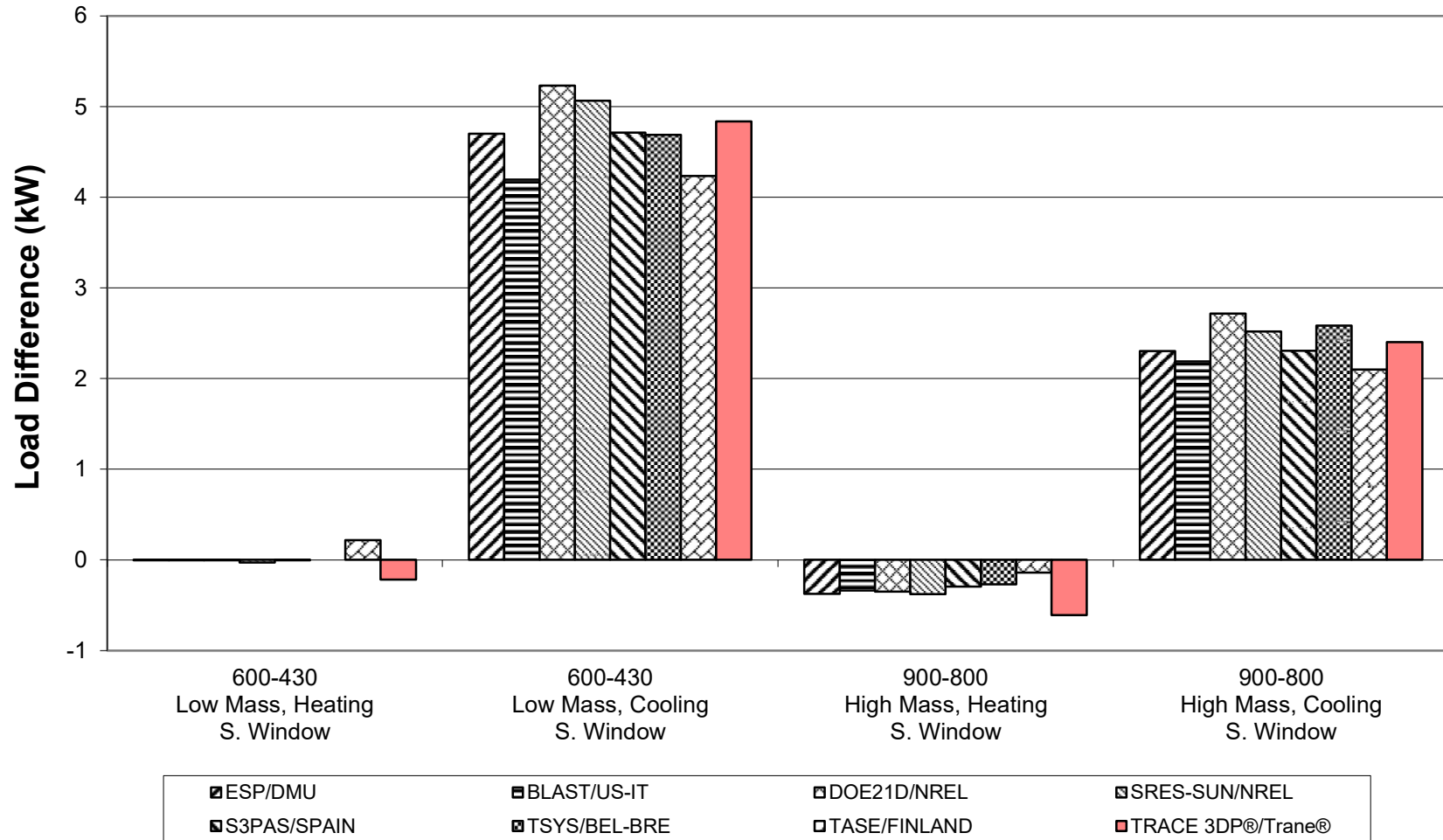
**Figure B8-28. BESTEST BASIC
 Sunspace (Delta)
 Peak Heating and Sensible Cooling**



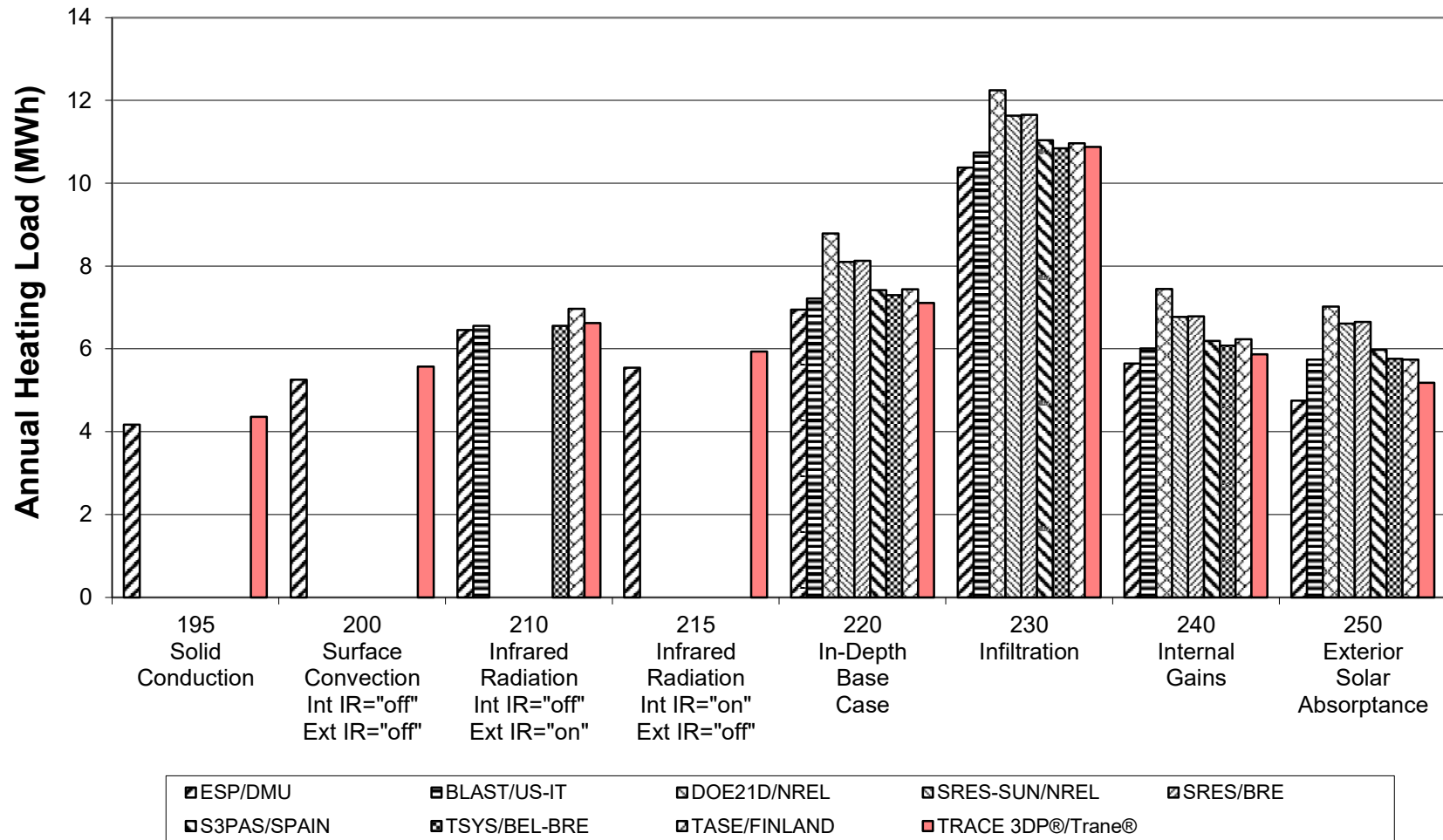
**Figure B8-31. BESTEST IN-DEPTH
 South Window (Delta)
 Annual Heating and Sensible Cooling**



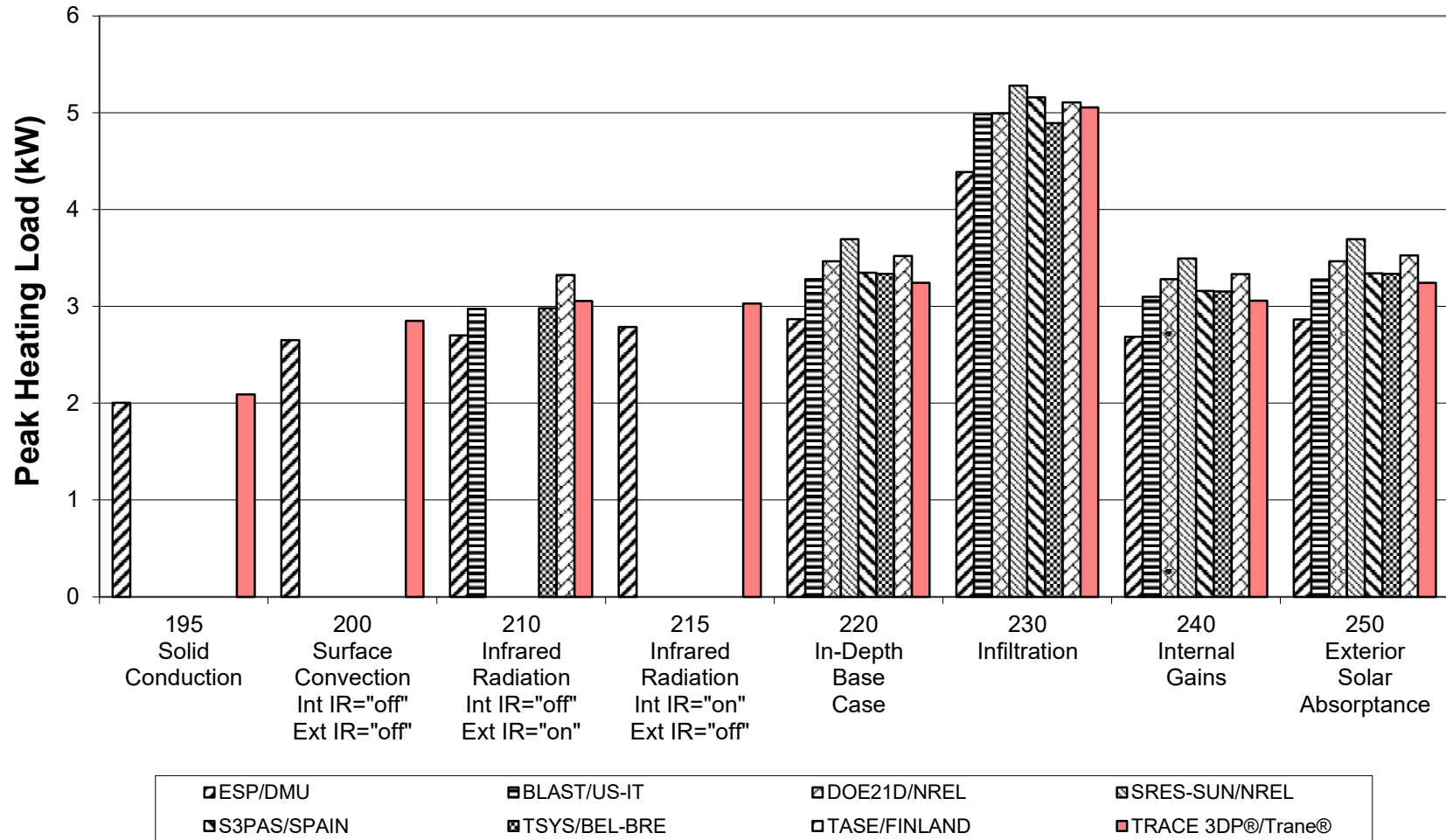
**Figure B8-32. BESTEST IN-DEPTH
 South Window (Delta)
 Peak Heating and Sensible Cooling**



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

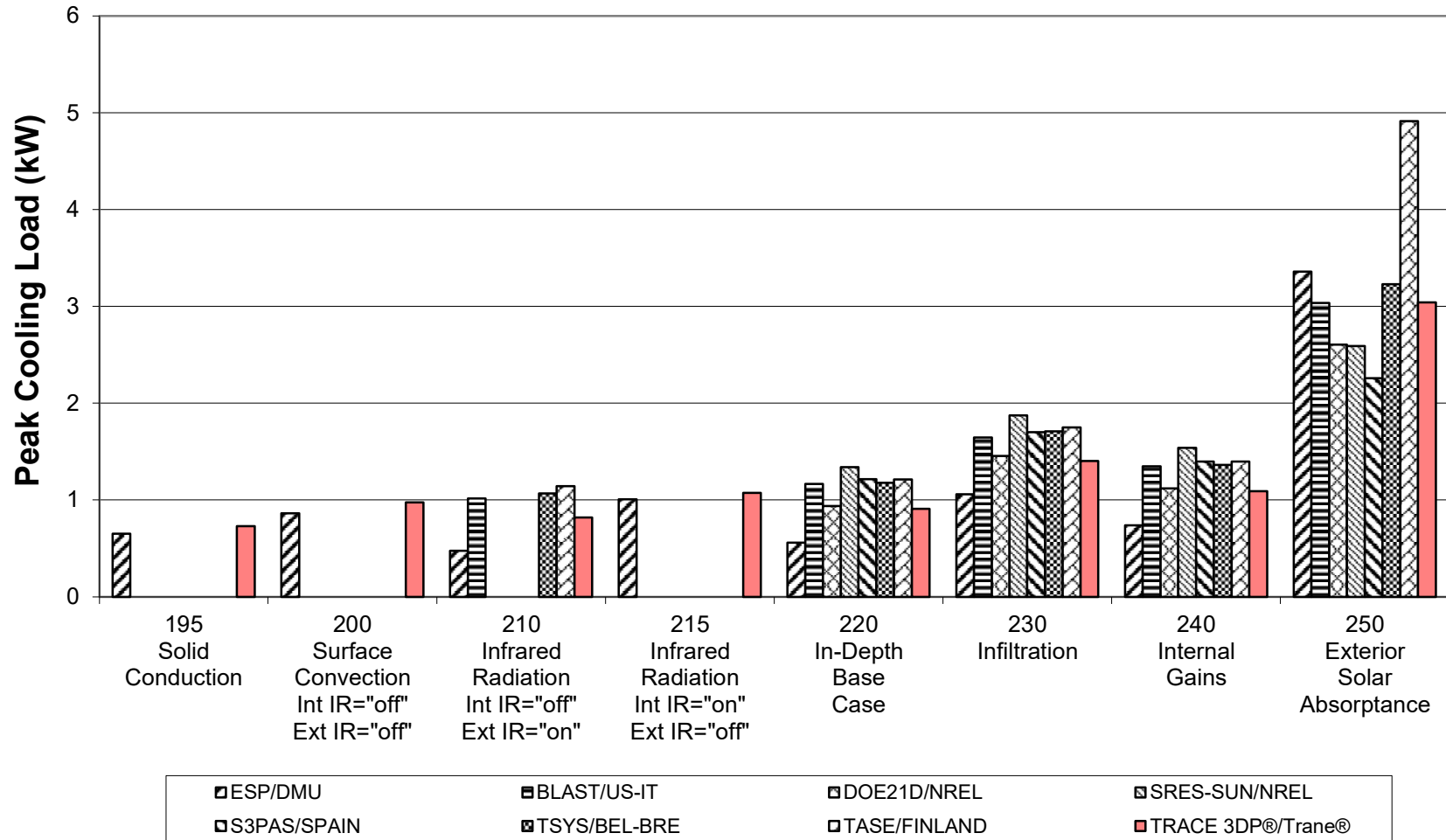


**Figure B8-35. BESTEST IN-DEPTH
 Low Mass Peak Heating
 Cases 195 to 250**

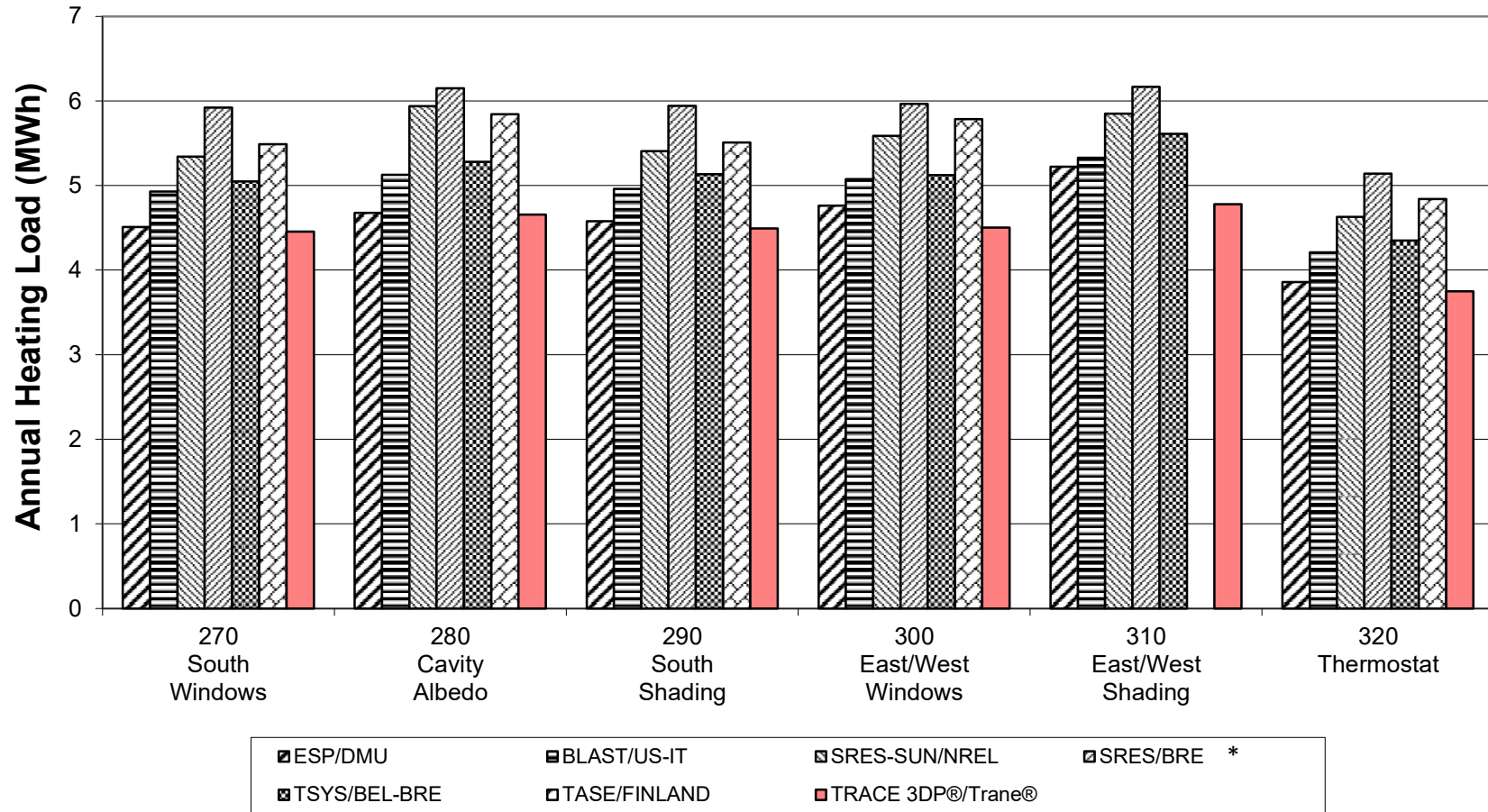


ASHRAE Standard 140-2014, Informative Annex B8, Section B8.1
 Example Results for Section 5.2 - Building Thermal Envelope and Fabric Load Cases 195-960 & 600FF-950FF

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

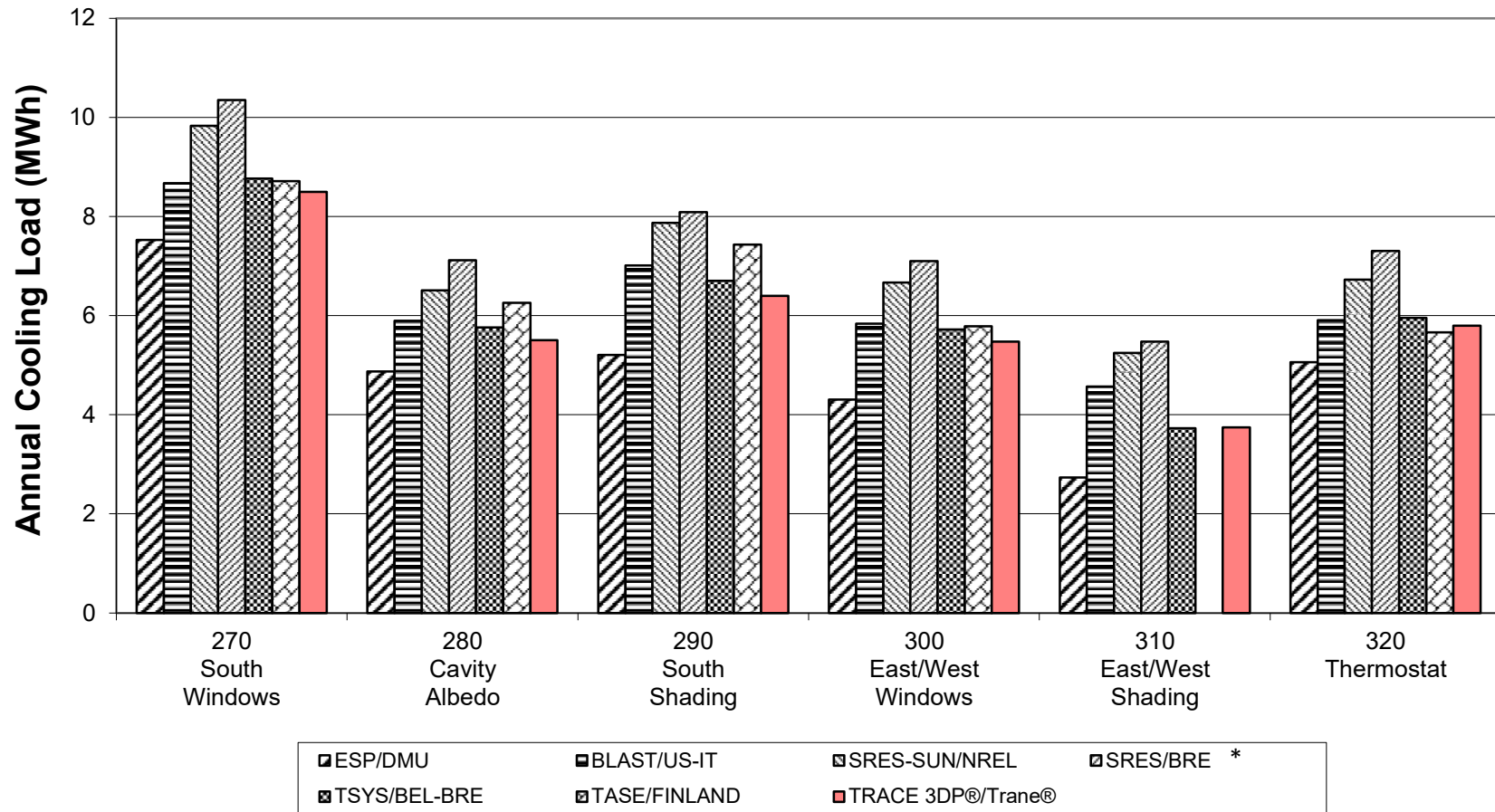


**Figure B8-37. BESTEST IN-DEPTH
 Low Mass Annual Heating
 Cases 270 to 320**



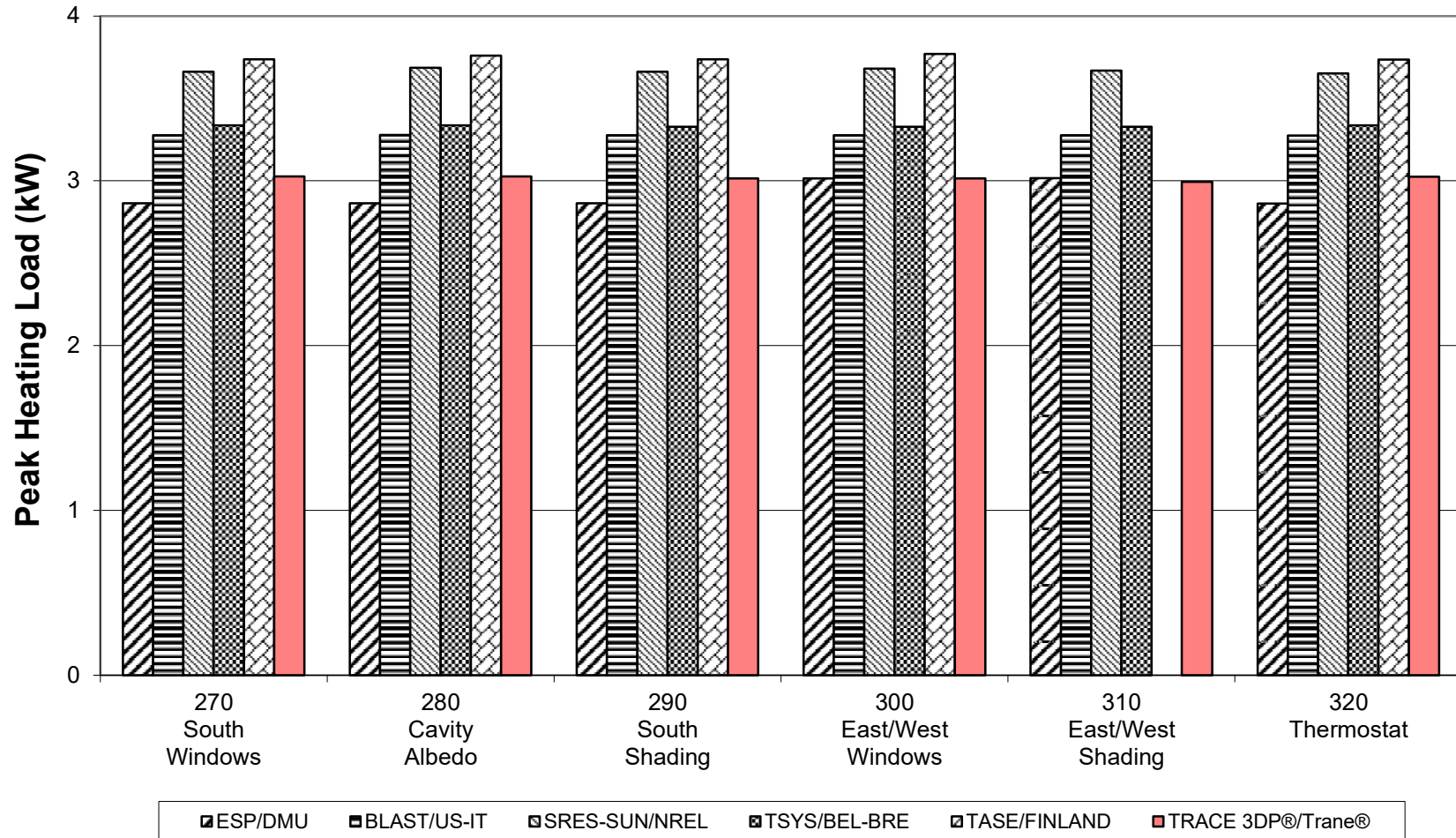
* SRES/BRE Cases 270, 290-320 have input error likely affecting results by <0.2 MWh/y (<3%)

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

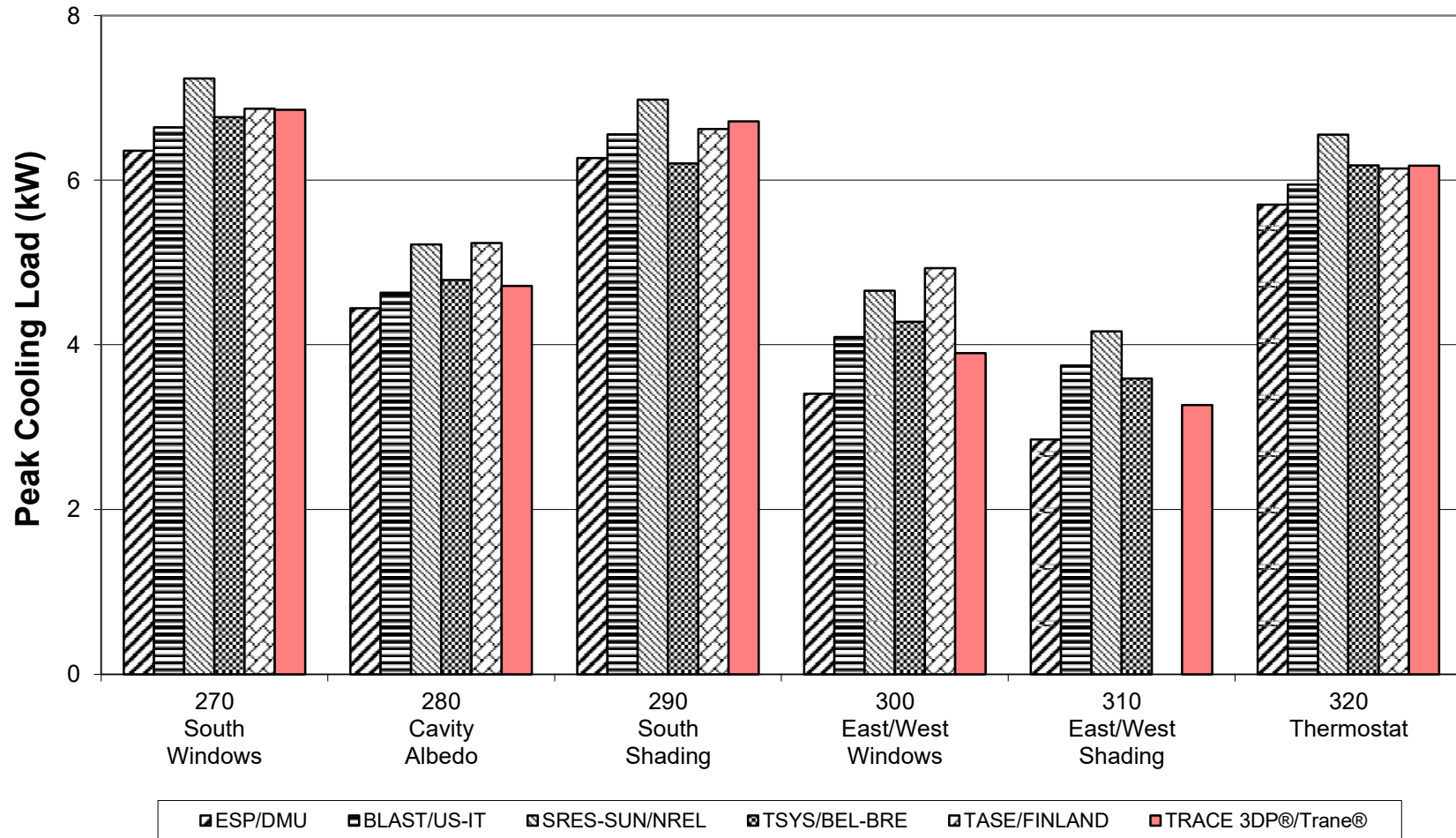


* SRES/BRE Cases 270, 290-320 have input error likely affecting results by <0.2 MWh/y (<3%)

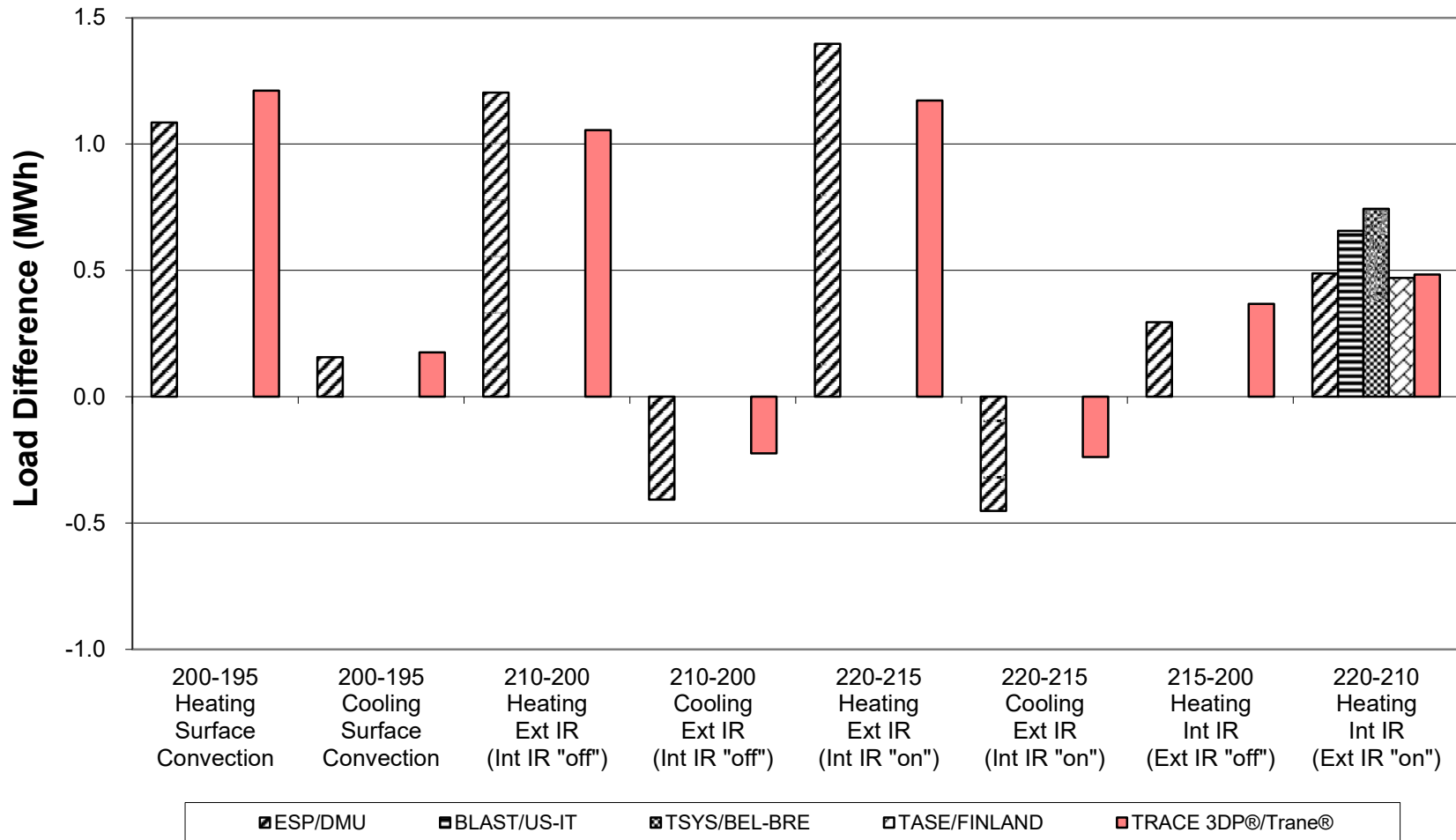
**Figure B8-39. BESTEST IN-DEPTH
Low Mass Peak Heating
Cases 270 to 320**



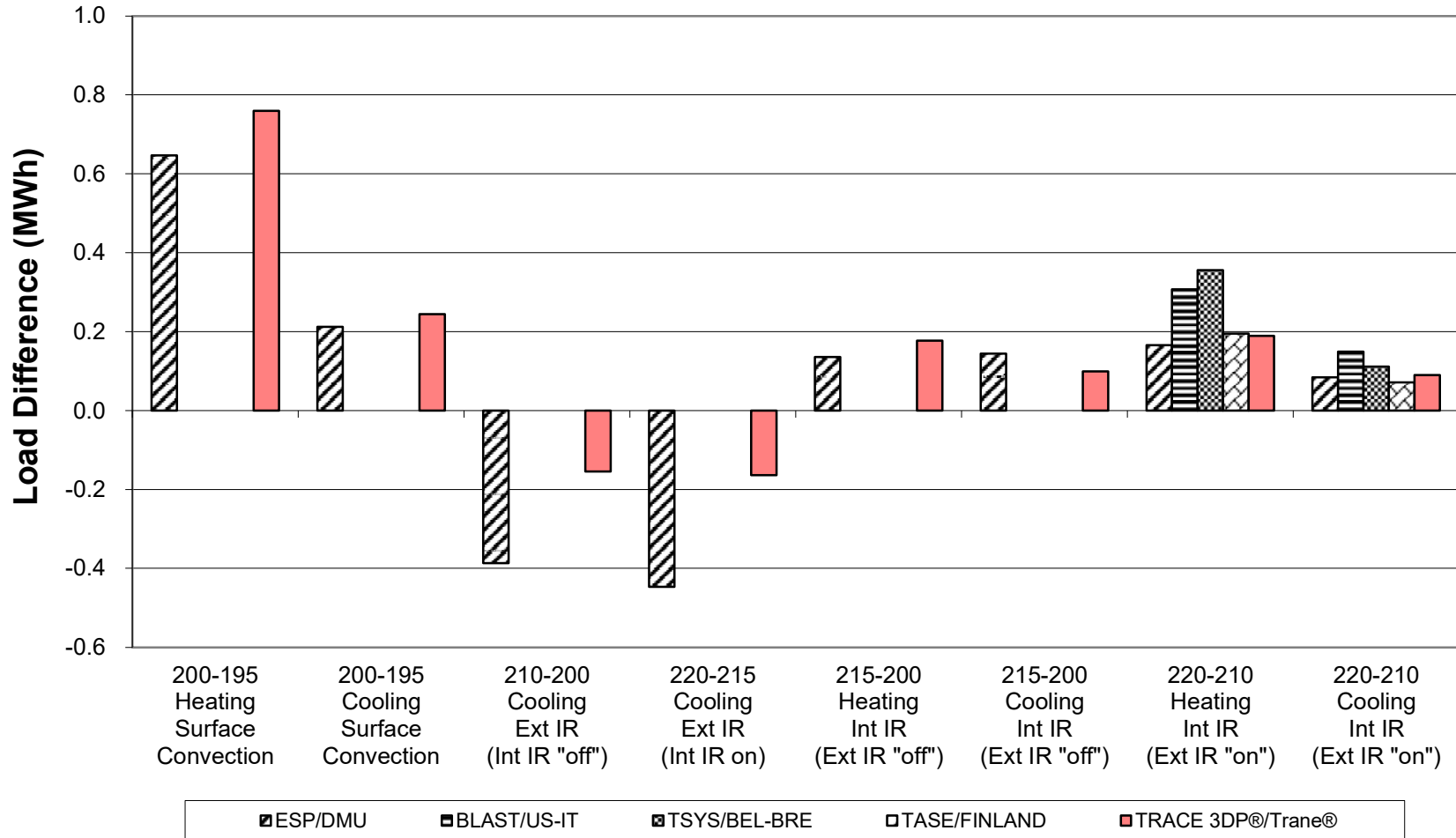
**Figure B8-40. BESTEST IN-DEPTH
 Low Mass Peak Sensible Cooling
 Cases 270 to 320**



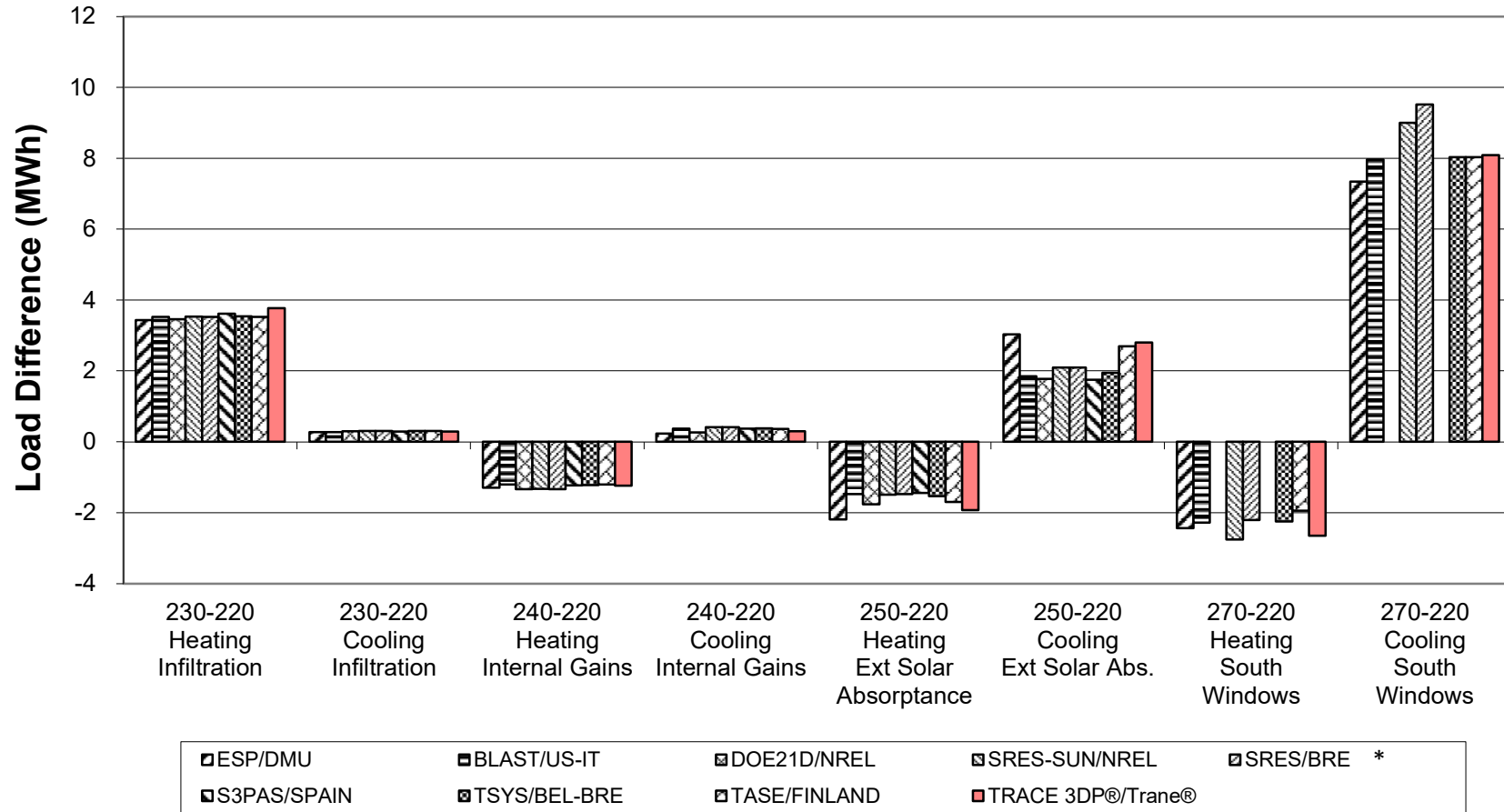
**Figure B8-41. BESTEST IN-DEPTH
 Cases 195 to 220 (Delta)
 Annual Heating and Sensible Cooling**



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

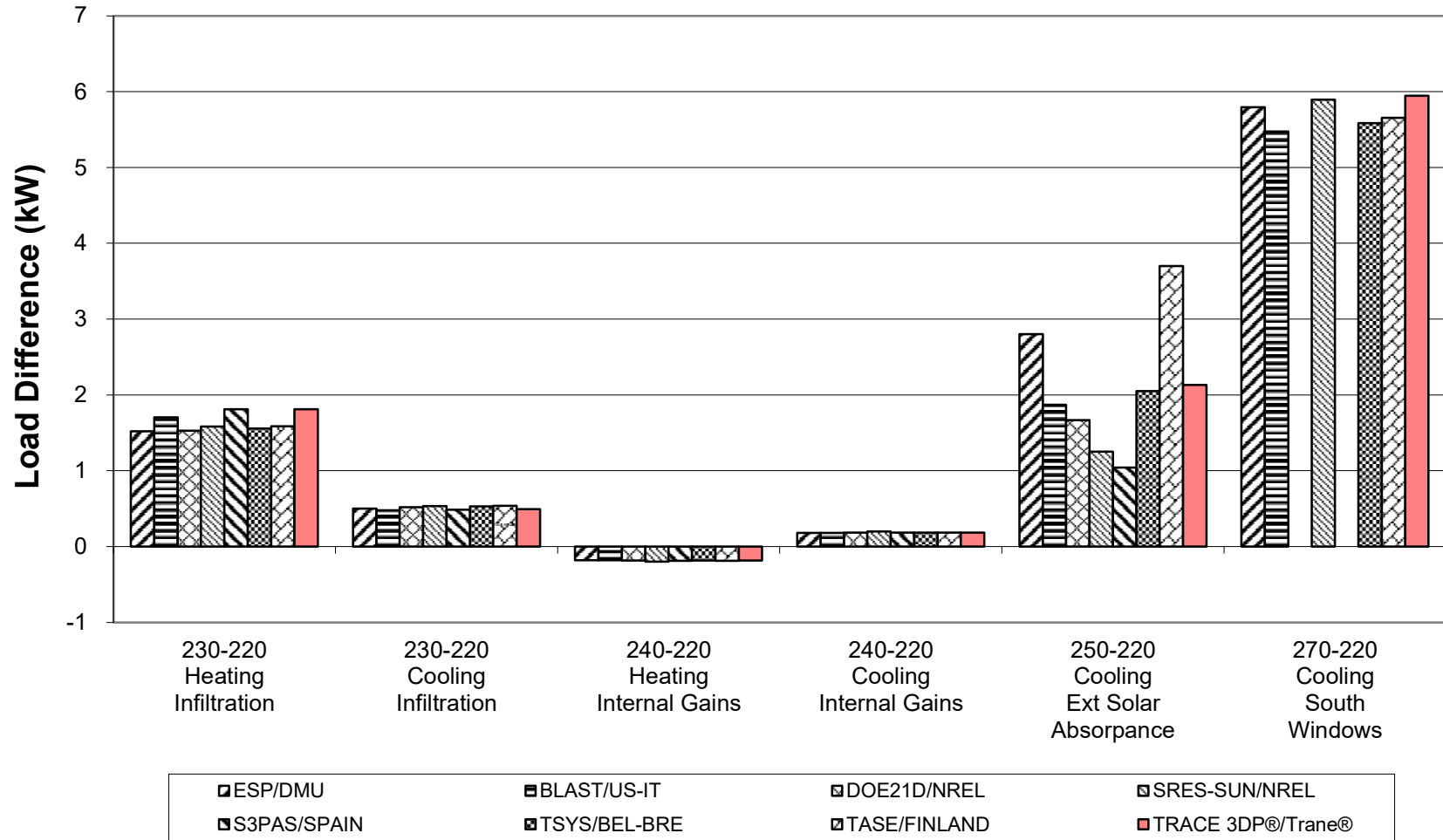


**Figure B8-43. BESTEST IN-DEPTH
 Cases 220 to 270 (Delta)
 Annual Heating and Sensible Cooling**

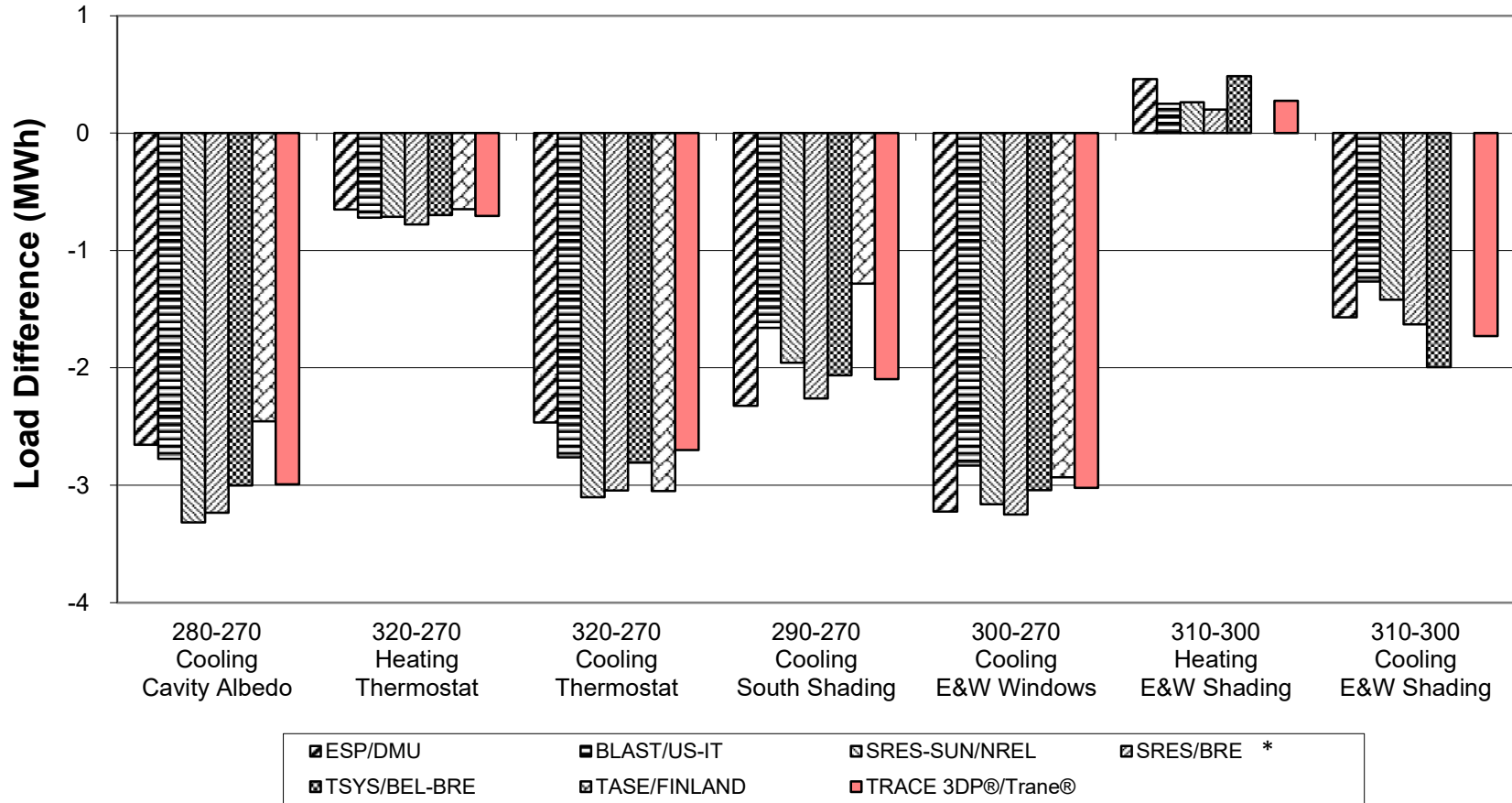


* SRES/BRE Case 270 has input error likely affecting 270-220 sensitivity results for heating by <0.2 MWh/y (<6%), and for cooling by <0.2 MWh/y (<3%)

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

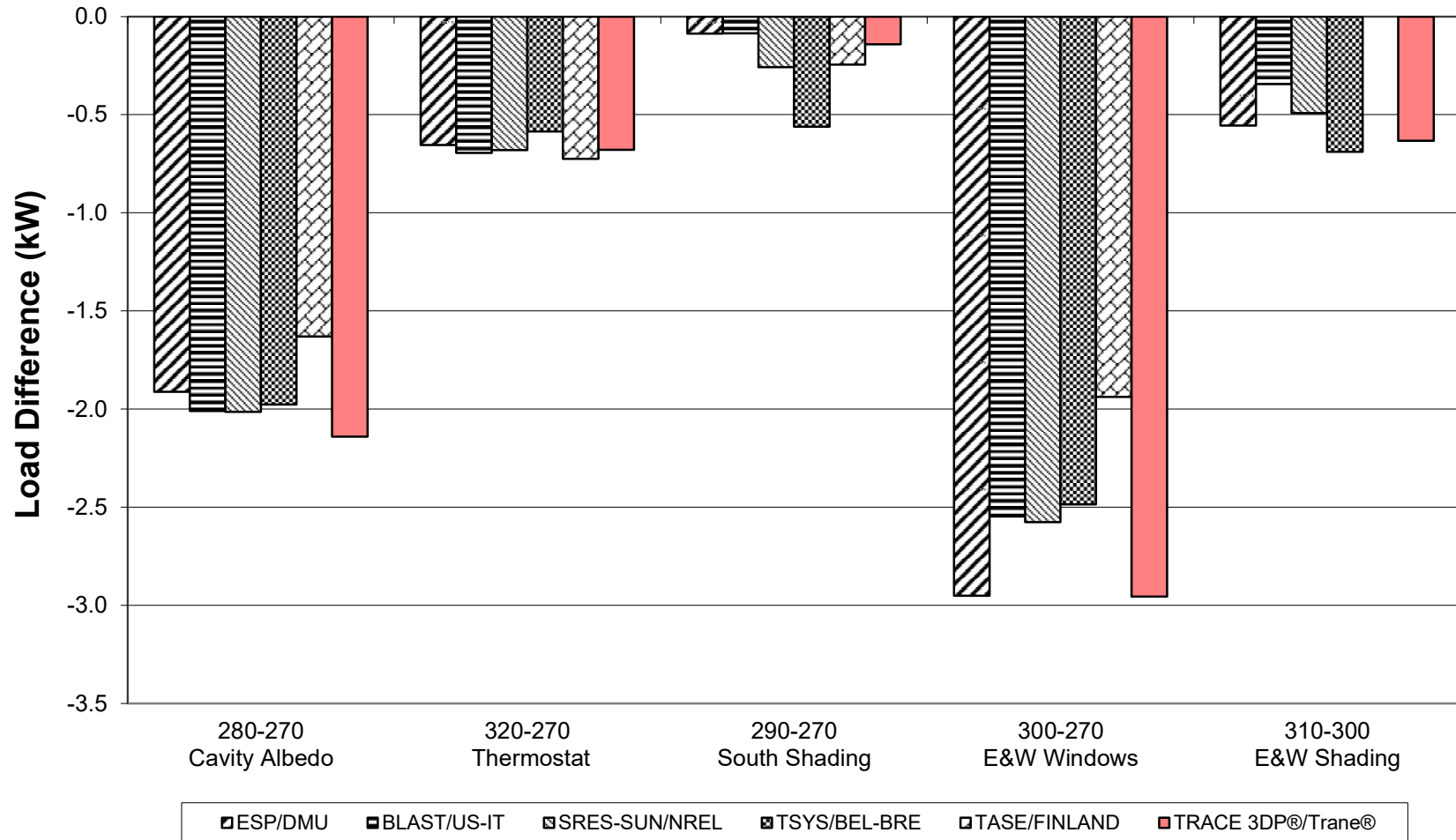


**Figure B8-45. BESTEST IN-DEPTH
 Cases 270 to 320 (Delta)
 Annual Heating and Sensible Cooling**

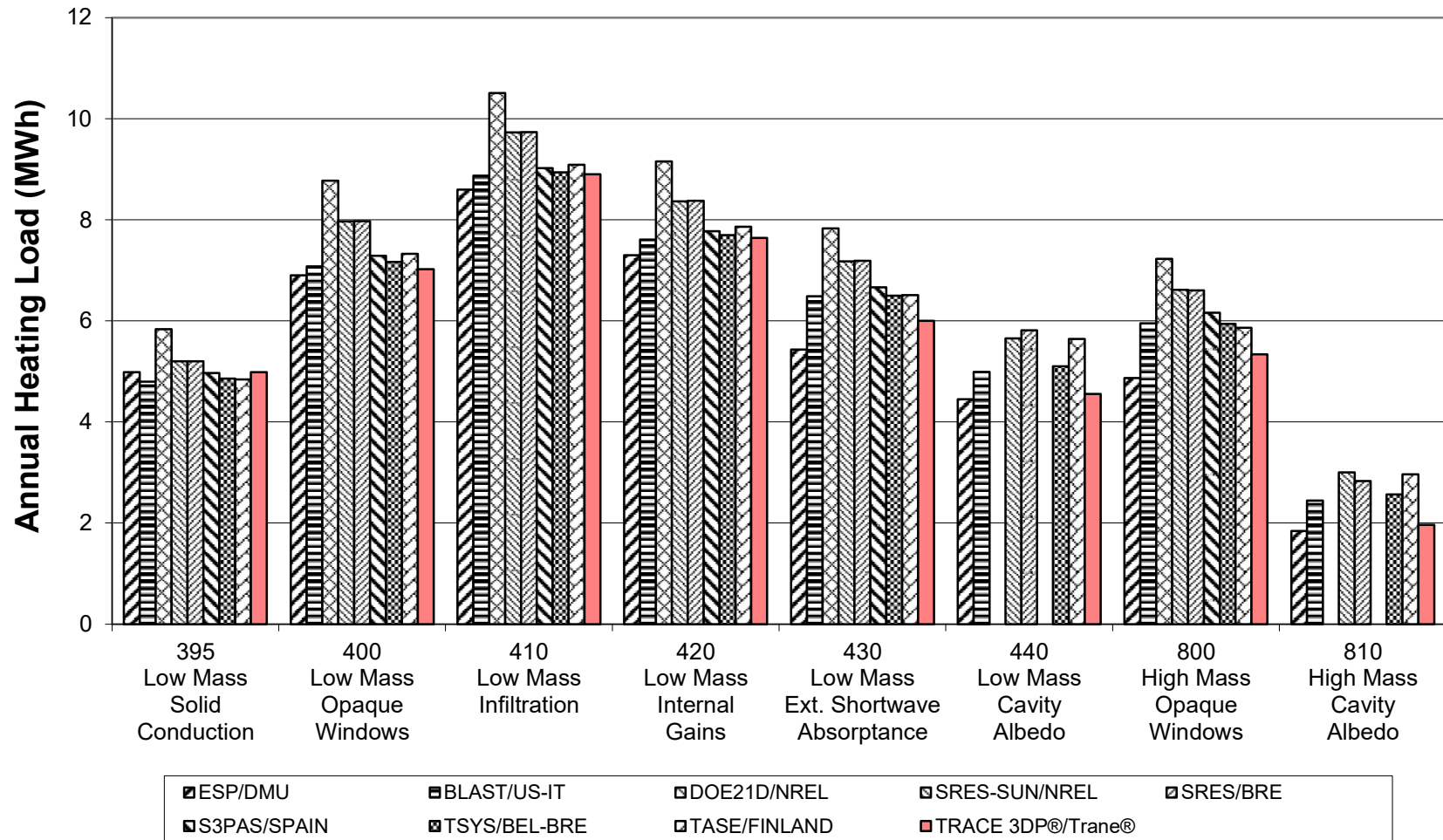


* SRES-BRE Cases 270, 290-320 have input error likely affecting sensitivity results for heating by <0.2 MWh/y (<6%), and for cooling by <0.2 MWh/y (<3%)

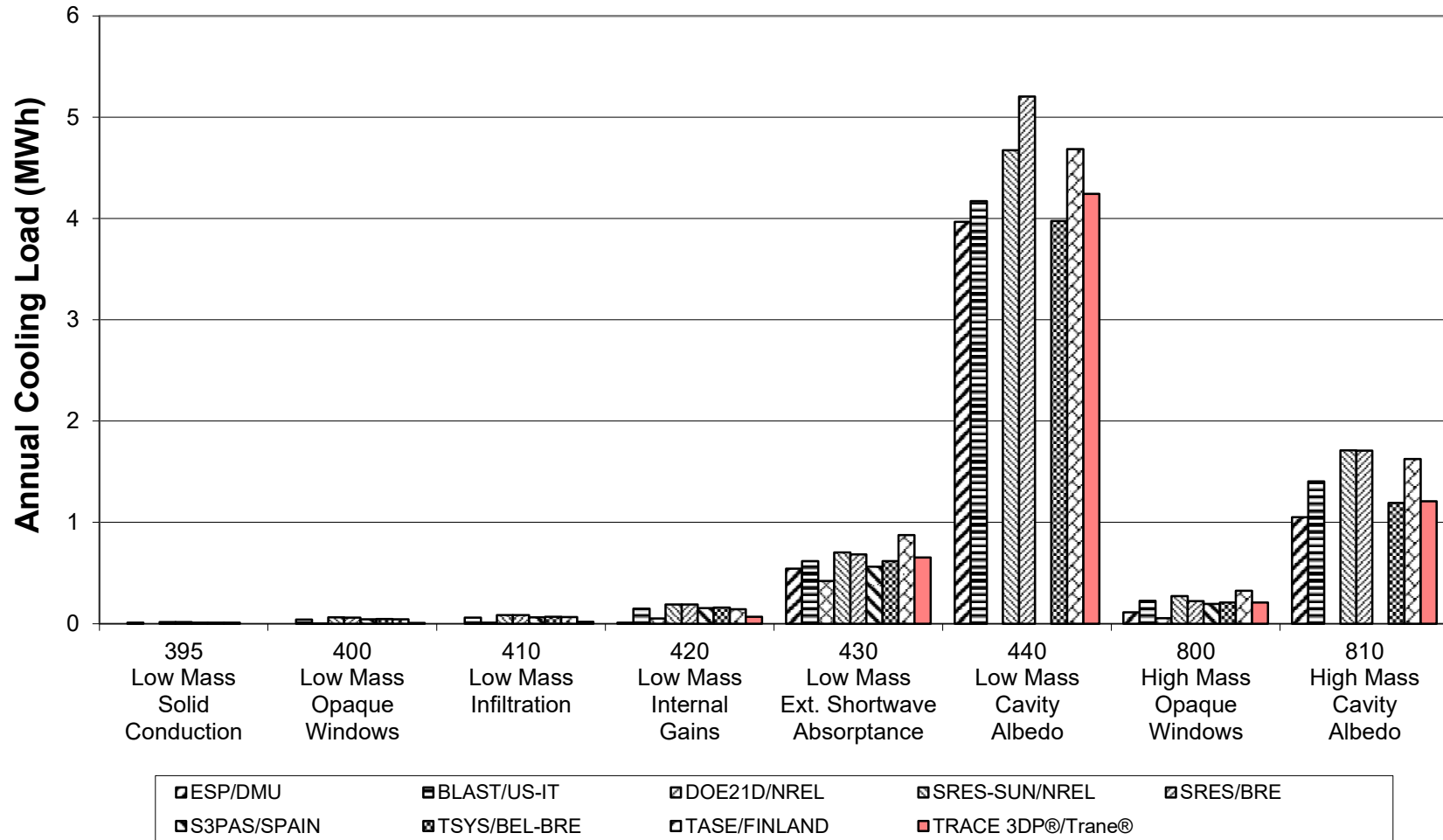
**Figure B8-46. BESTEST IN-DEPTH
 Cases 270 to 320 (Delta)
 Peak Sensible Cooling**



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



**Figure B8-48. BESTEST IN-DEPTH
 Annual Sensible Cooling
 Cases 395 to 440, 800, 810**



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

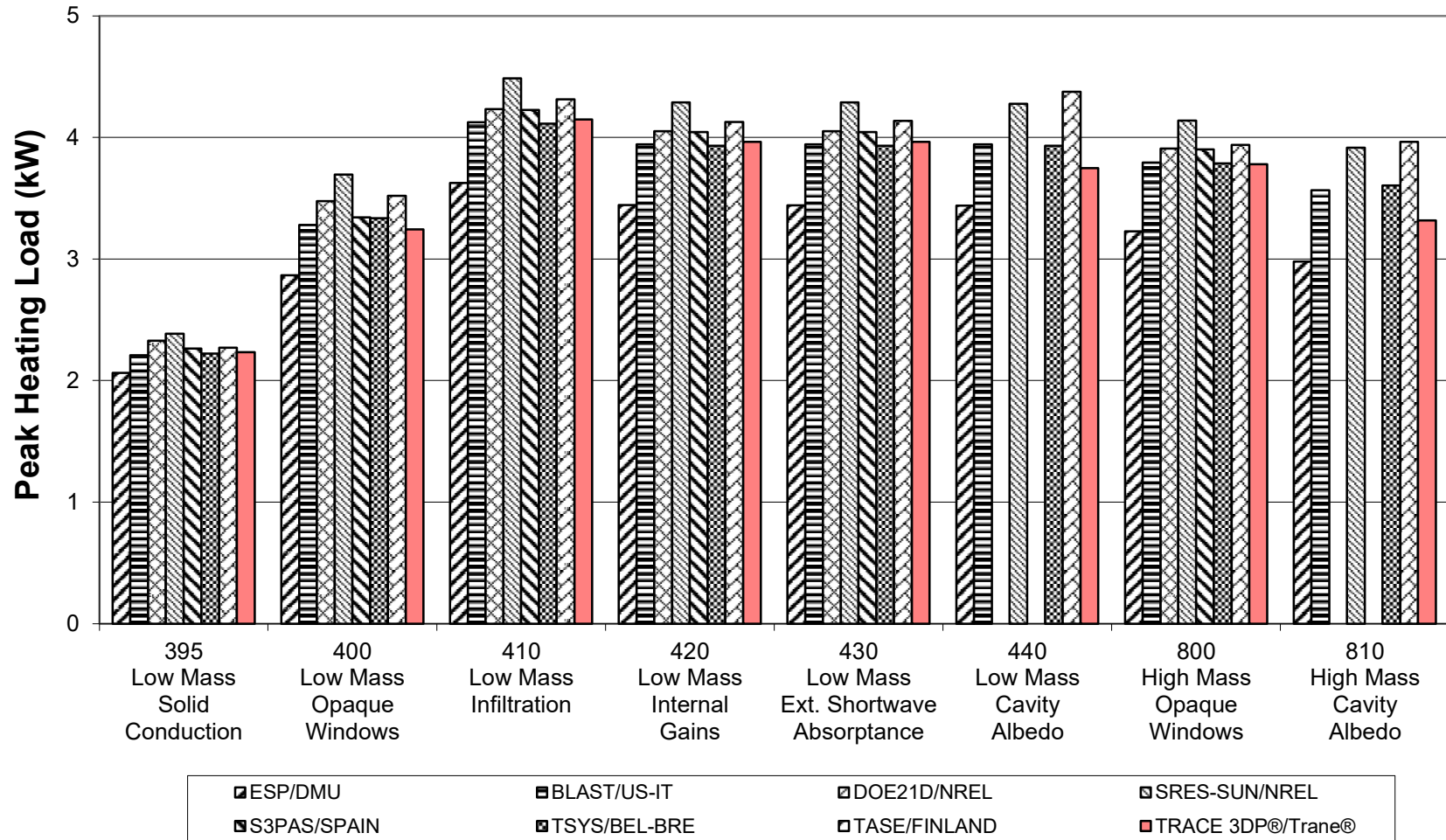
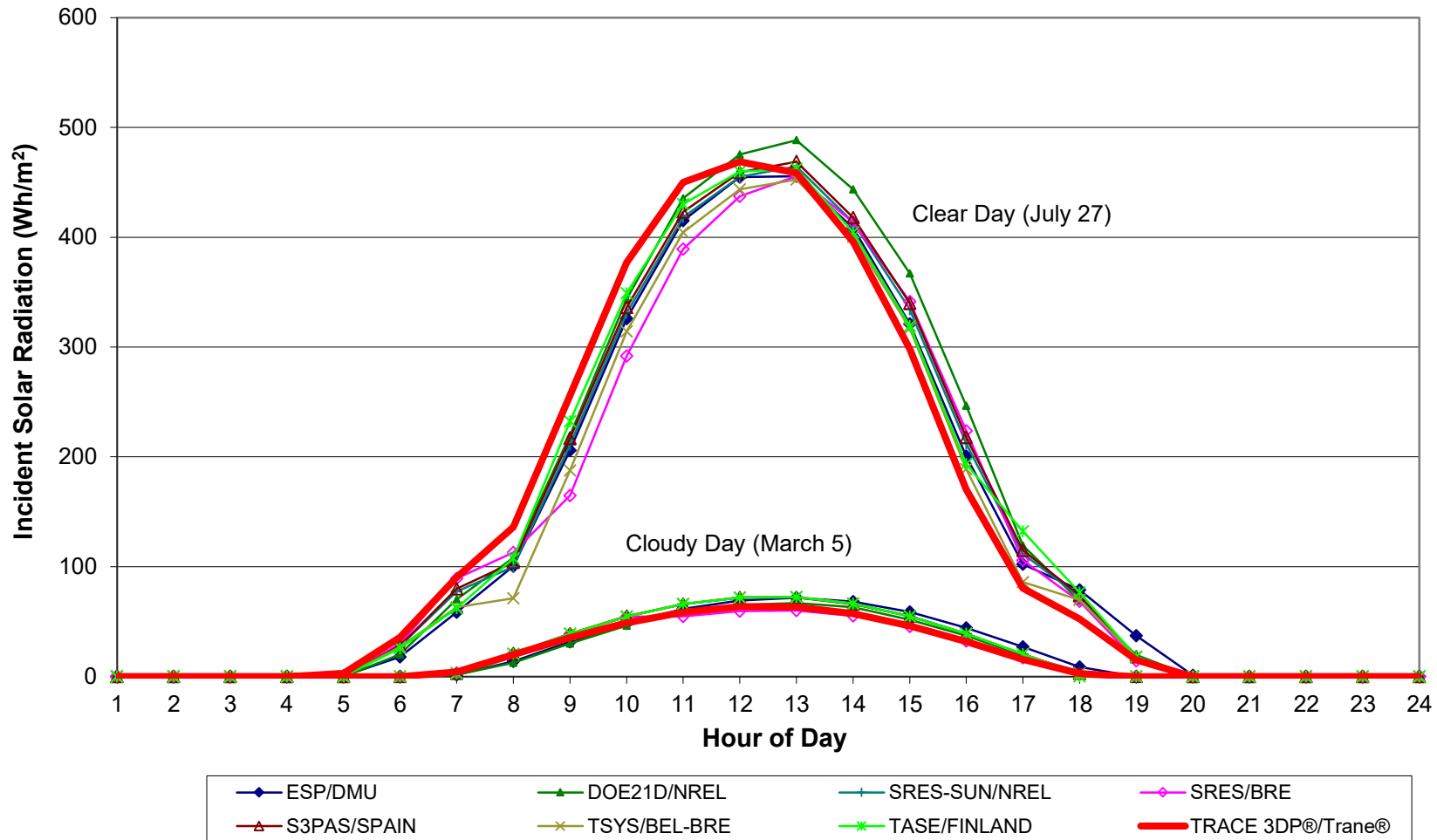
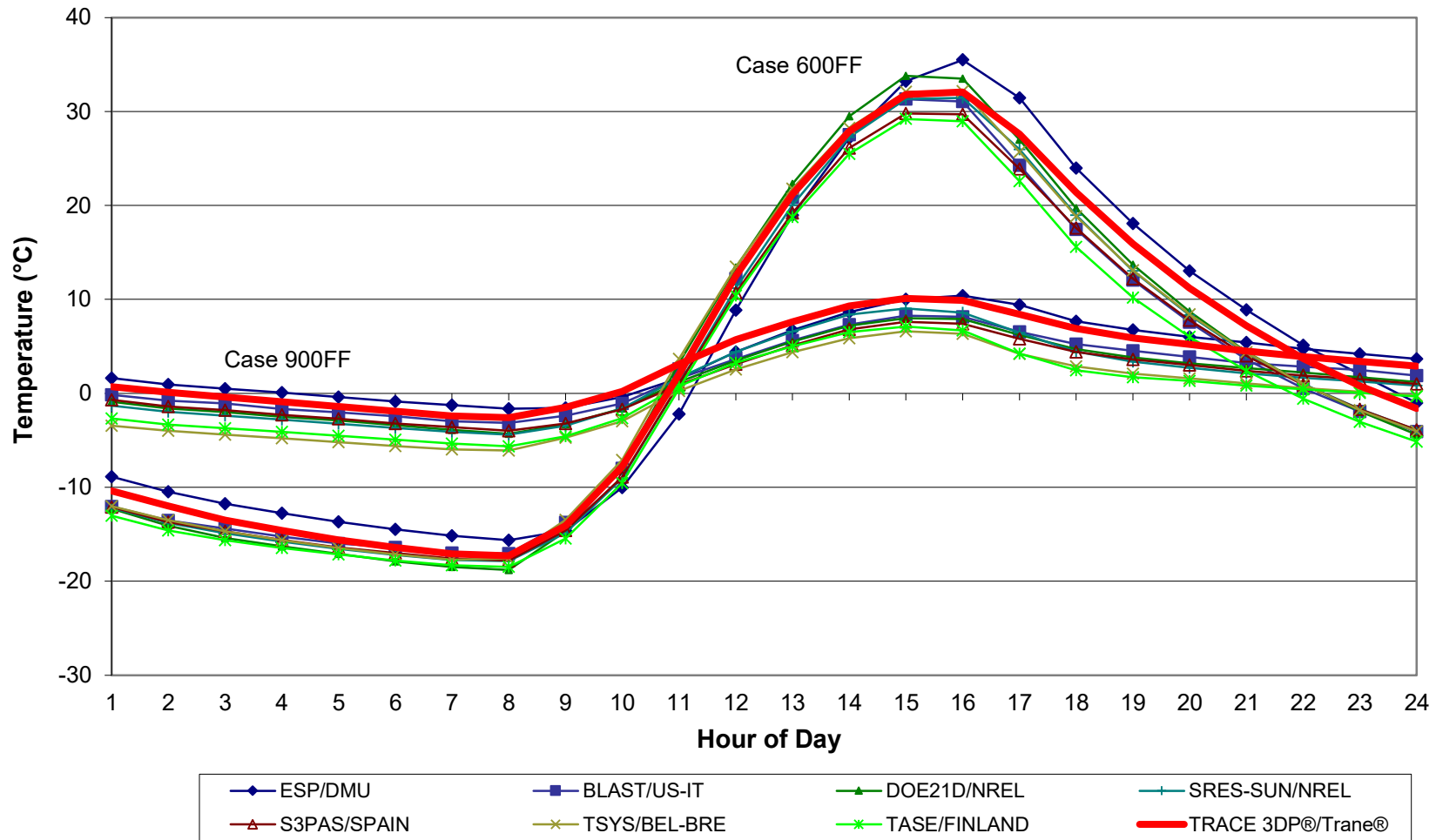


Figure B8-54. BESTEST Case 600
Cloudy & Clear Day Hourly Incident Solar
South Facing Surface



**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**

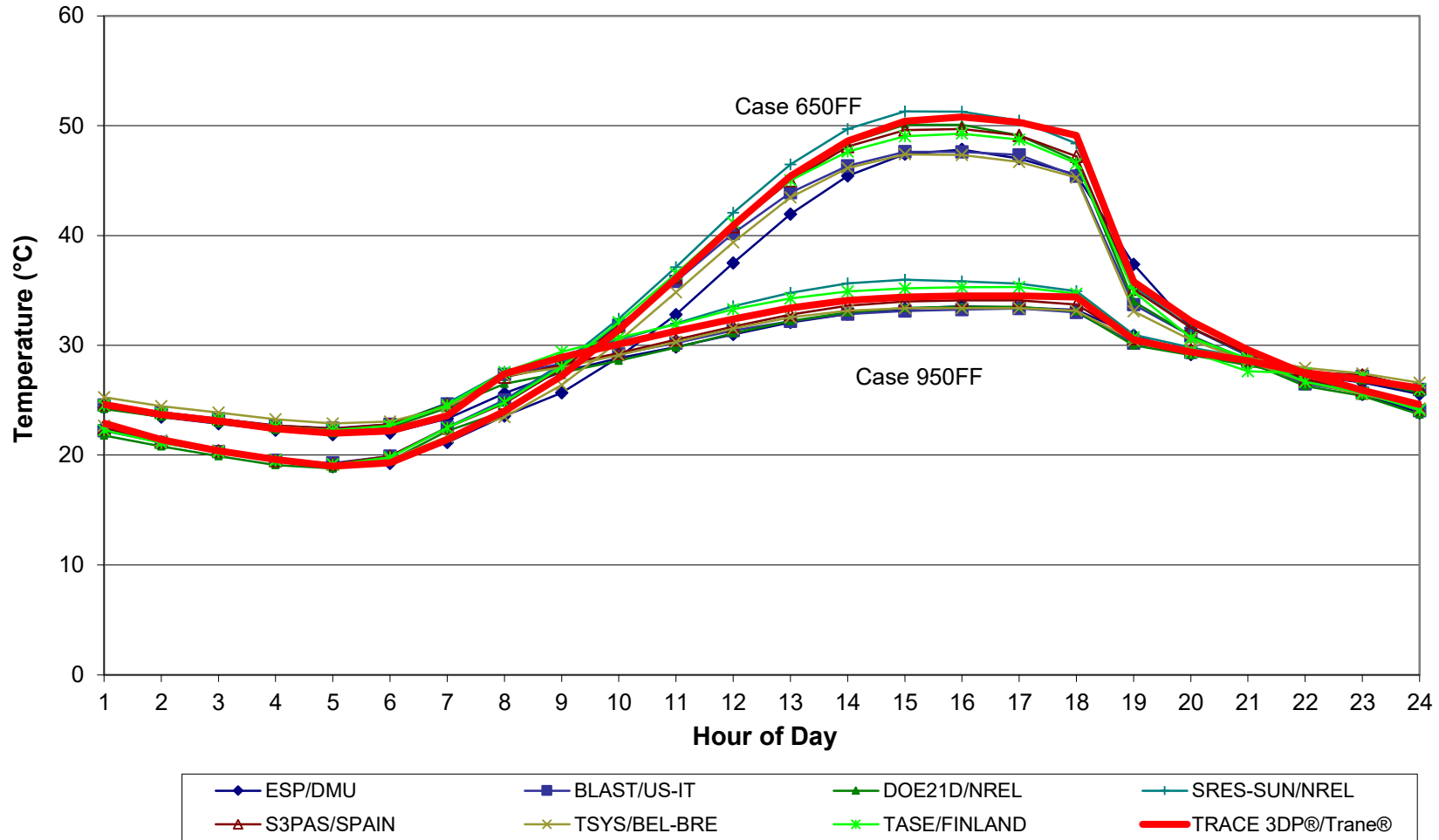
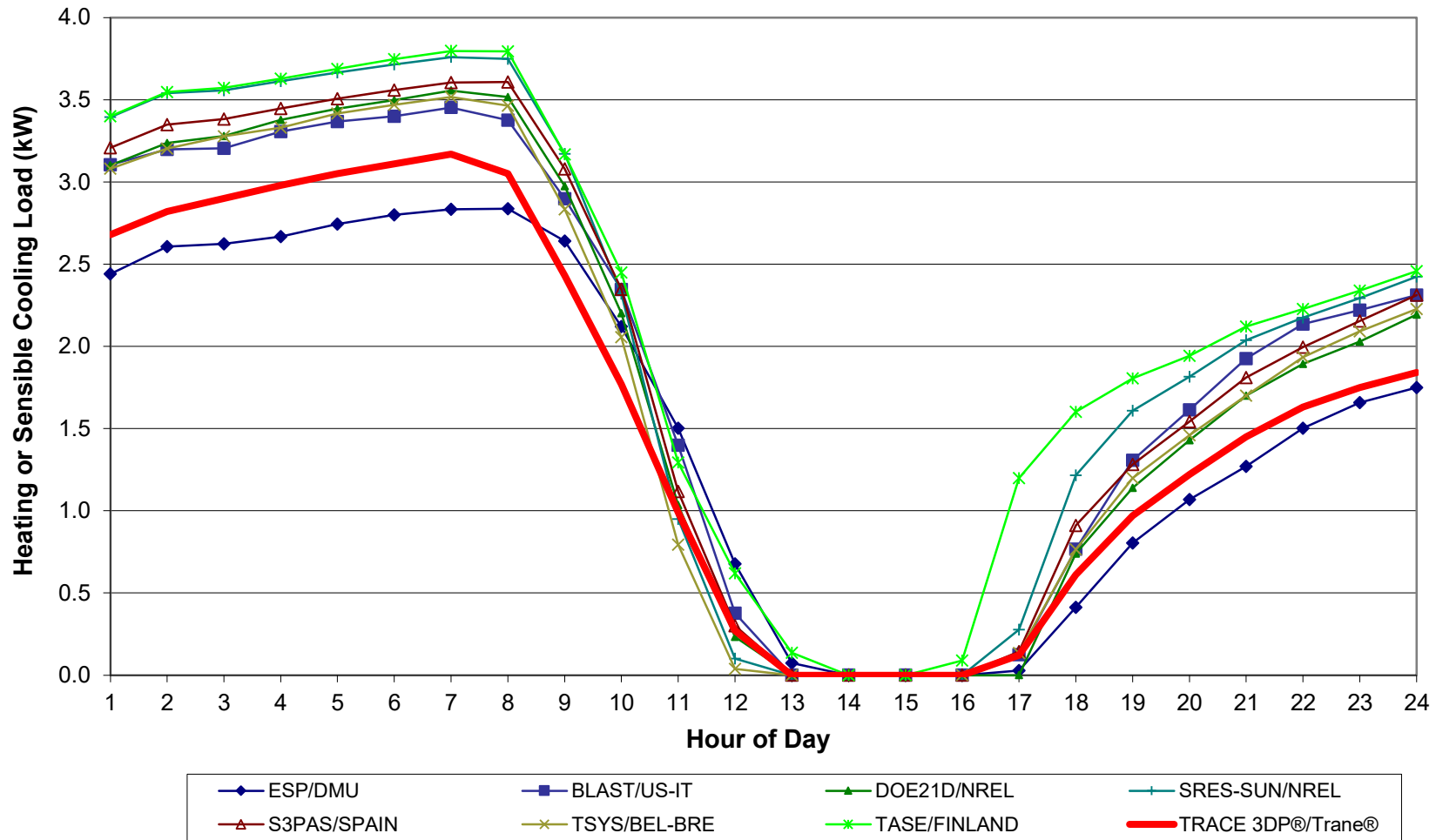


Figure B8-59. BESTEST HOURLY LOADS
Clear Cold Day, Case 900
Heating (+), Sensible Cooling (-)



ASHRAE Standard 140-2014
Informative Annex B16, Section B16.5.1

Example Results
for
Section 5.3 - HVAC Equipment Performance Tests CE100-CE200

ASHRAE Standard 140-2014
Participating Organizations and Computer Programs for
Quasi-analytical Solutions and Example Simulation Results
Section 5.3 - HVAC Equipment Performance Tests CE100-CE200

The quasi-analytical solutions and programs used to generate the example simulation results are described in Table B17-1. The first column of Table B17-1 ("Model"), indicates the proper program name and version number, or indicates a quasi-analytical solution.

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

The third column ("Implemented By") indicates the national research facility, university, or industry organization with expertise in building science that performed the simulations or did the quasi-analytical solutions.

The entries in the fourth column are the abbreviations for the simulations and quasi-analytical solutions generally used in the tables and charts which follow.

See Standard 140, Annex B17 for further details.

TABLE B17-1
Participating Organizations and Computer Programs

Model	Authoring Organization	Implemented By	Abbreviation
Quasi-Analytical solution with ideal controller model	Hochschule Technik & Architektur Luzern, Switzerland (HTAL)	Hochschule Technik & Architektur Luzern, Switzerland	HTAL1
Quasi-Analytical solution with realistic controller model	Hochschule Technik & Architektur Luzern, Switzerland	Hochschule Technik & Architektur Luzern, Switzerland	HTAL2
Quasi-Analytical Solution with ideal controller model	Technische Universität Dresden, Germany (TUD)	Technische Universität Dresden, Germany	TUD
CA-SIS V1	Electricité de France, France (EDF)	Electricité de France, France	CA-SIS
CLIM2000 2.1.6	Electricité de France, France	Electricité de France, France	CLM2000
DOE-2.1E-088	LANL/LBNL/ESTSC, ^{a,b,c} USA	CIEMAT, ^d Spain	DOE21E/CIEMAT DOE2.1-E/CIEMAT
DOE-2.1E-133	LANL/LBNL/JJH, ^{a,b,e} USA	NREL/JNA, ^f USA	DOE21E/NREL DOE2.1-E/NREL
ENERGYPLUS 1.0.0.023	LBNL/UIUC/CERL/OSU/GARD Analytics/FSEC/DOE-OBT, ^{a,g,h,i,j,k}	GARD Analytics, USA	E+ EnergyPlus
TRNSYS 14.2-TUD with ideal controller model	University of Wisconsin, USA; Technische Universität Dresden, Ger.	Technische Universität Dresden, Germany	TRN-id TRNSYS-ideal
TRNSYS 14.2-TUD with real controller model	University of Wisconsin, USA; Technische Universität Dresden, Ger.	Technische Universität Dresden, Germany	TRN-re TRNSYS-real

^aLANL: Los Alamos National Laboratory, United States

^bLBNL: Lawrence Berkeley National Laboratory

^cESTSC: Energy Science and Technology Software Center (at Oak Ridge National Laboratory, USA)

^dCIEMAT: Centro de Investigaciones Energeticas, Medioambientales y Tecnologicas

^eJJH: James J. Hirsch & Associates

^fNREL/JNA: National Renewable Energy Laboratory/J. Neymark & Associates

^gUIUC: University of Illinois Urbana/Champaign

^hCERL: U.S. Army Corps of Engineers, Construction Engineering Research Laboratories

ⁱOSU: Oklahoma State University

^jFSEC: University of Central Florida, Florida Solar Energy Center

^kDOE-OBT: U.S. Department of Energy, Office of Building Technology, State and Community Programs, Energy Efficiency and Renewable Energy

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.1
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200

List of Tables

<i>Table</i>	<i>Description</i>	<i>Sheet Tab</i>	<i>Cell Range</i>
B16.5.1-1	Space Cooling Electricity Consumption	Q-Prt1	A7 – Q76
B16.5.1-2	COP: Mean, and (Max-Min)/Mean	Q-Prt2	A7 – Q42
B16.5.1-3	Coil Loads: Total, Sensible, and Latent	Q-Prt3	A7 – Q59
B16.5.1-4	Sensible Coil Load minus Zone Load (Fan Heat)	Q-Prt3	A60 – Q78
B16.5.1-5	Zone Loads: Total, Sensible, and Latent	Q-Prt4	A7 – Q59
B16.5.1-6	Latent Coil Load minus Zone Load (Should be 0)	Q-Prt4	A60 – Q78
B16.5.1-7	Sensitivities for Space Cooling Electricity Consumption	Q-Prt5	A7 – Q96
B16.5.1-8	Sensitivities for COP and Coil Loads	Q-Prt6	A7 – Q96
B16.5.1-9	Indoor Drybulb Temperature: Mean and (Max-Min)/Mean	Q-Prt7	A7 – Q41
B16.5.1-10	Humidity Ratio: Mean and (Max-Min)/Mean	Q-Prt7	A43 – Q78

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.1
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200

List of Figures

<i>Figure</i>	<i>Title</i>	<i>Sheet Tab</i>
B16.5.1-1	HVAC BESTEST: Mean COP	Fig B16.5.1-1 COP
B16.5.1-2	HVAC BESTEST: (Maximum - Minimum)/Mean COP	Fig B16.5.1-2 COPvar
B16.5.1-3	HVAC BESTEST: Mean COP Sensitivities	Fig B16.5.1-3 delCOP
B16.5.1-4	HVAC BESTEST: Total Space Cooling Electricity Consumption	Fig B16.5.1-4 Qtot
B16.5.1-5	HVAC BESTEST: Total Space Cooling Electricity Sensitivities	Fig B16.5.1-5 dQtot
B16.5.1-6	HVAC BESTEST: Compressor Electricity Consumption	Fig B16.5.1-6 Qcomp
B16.5.1-7	HVAC BESTEST: Total Compressor Electricity Sensitivities	Fig B16.5.1-7 dQcomp
B16.5.1-8	HVAC BESTEST: Total Indoor (Supply) Fan Electricity Consumption	Fig B16.5.1-8 Qidfan
B16.5.1-9	HVAC BESTEST: Indoor (Supply) Fan Electricity Sensitivities	Fig B16.5.1-9 dQidfan
B16.5.1-10	HVAC BESTEST: Outdoor (Condenser) Fan Electricity Consumption	Fig B16.5.1-10 Qodfan
B16.5.1-11	HVAC BESTEST: Outdoor (Condenser) Fan Electricity Sensitivities	Fig B16.5.1-11 dQodfan
B16.5.1-12	HVAC BESTEST: Total Coil Load	Fig B16.5.1-12 QCtot
B16.5.1-13	HVAC BESTEST: Total Coil Load Sensitivities	Fig B16.5.1-13 dQCtot
B16.5.1-14	HVAC BESTEST: Sensible Coil Load	Fig B16.5.1-14 QCsens
B16.5.1-15	HVAC BESTEST: Sensible Coil Load Sensitivities	Fig B16.5.1-15 dQCsens
B16.5.1-16	HVAC BESTEST: Latent Coil Load	Fig B16.5.1-16 QClat
B16.5.1-17	HVAC BESTEST: Latent Coil Load Sensitivities	Fig B16.5.1-17 dQClat
B16.5.1-18	HVAC BESTEST: Mean Indoor Drybulb Temperature	Fig B16.5.1-18 IDB
B16.5.1-19	HVAC BESTEST: (Maximum - Minimum)/Mean Indoor Drybulb Temperature	Fig B16.5.1-19 IDBvar
B16.5.1-20	HVAC BESTEST: Mean Indoor Humidity Ratio	Fig B16.5.1-20 Humrat
B16.5.1-21	HVAC BESTEST: (Maximum - Minimum)/Mean Indoor Humidity Ratio	Fig B16.5.1-21 Humratvar
B16.5.1-22	HVAC BESTEST: Total Zone Load	Fig B16.5.1-22 QZtot
B16.5.1-23	HVAC BESTEST: Sensible Zone Load	Fig B16.5.1-23 QZsens
B16.5.1-24	HVAC BESTEST: Latent Zone Load	Fig B16.5.1-24 QZlat
B16.5.1-25	HVAC BESTEST: Sensible Coil Load - Zone Load (Fan Heat)	Fig B16.5.1-25 QZfan
B16.5.1-26	HVAC BESTEST: Latent Coil Load - Latent Zone Load (Should = 0)	Fig B16.5.1-26 QCL-QZL

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.1
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200

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 B16.5.1-1. Space Cooling Electricity Consumption

Energy Consumption, Total (kWh,e)									Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD		Min	Max	/Analytical*	TUD	HTAL1	HTAL2	TRACE® 3DP Trane®
CE100	1531	1530	1521	1519	1520	1522	1512	1512	1531	1.2%	1531	1531	1531	1520	
CE110	1077	1089	1061	1065	1069	1067	1061	1069	1089	2.6%	1077	1077	1077	1069	
CE120	1012	1012	1011	1003	1006	1007	1002	1012	1012	1.0%	1013	1011	1011	1009	
CE130	110	109	105	106	109	109	105	110	110	4.3%	111	110	110	108	
CE140	68	69	65	66	68	68	65	69	69	5.8%	69	69	68	68	
CE150	1208	1207	1202	1183	1197	1199	1183	1208	1208	2.1%	1206	1207	1207	1198	
CE160	1140	1139	1138	1107	1132	1137	1107	1140	1140	2.9%	1140	1139	1139	1132	
CE165	1502	1501	1499	1470	1491	1500	1470	1502	1502	2.1%	1498	1500	1500	1492	
CE170	638	638	629	620	635	636	620	638	638	2.8%	641	638	638	636	
CE180	1083	1082	1077	1080	1082	1081	1077	1083	1083	0.5%	1083	1082	1082	1081	
CE185	1544	1543	1541	1547	1540	1542	1538	1547	1547	0.6%	1545	1543	1543	1538	
CE190	164	164	160	160	164	164	160	165	165	3.1%	165	164	164	164	
CE195	250	250	245	246	250	250	245	252	252	2.7%	252	250	250	250	
CE200	1477	1464	1468	1440	1465	1480	1440	1480	1480	2.7%	1476	1477	1477	1473	
Energy Consumption, Compressor (kWh,e)									Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD		Min	Max	/Analytical*	TUD	HTAL1	HTAL2	TRACE® 3DP Trane®
CE100	1319	1318	1307	1311	1311	1311	1303	1319	1319	1.2%	1319	1319	1319		
CE110	889	899	866	883	879	876	866	899	899	3.7%	888	889	889		
CE120	840	840	850	838	836	832	832	850	850	2.2%	841	839	839		
CE130	95	94	93	93	94	95	93	95	95	2.1%	95	94	94		
CE140	57	57	55	56	56	57	55	57	57	3.9%	57	57	56		
CE150	1000	999	1007	982	992	987	982	1007	1007	2.5%	999	999	999		
CE160	950	949	963	926	947	944	926	963	963	3.9%	950	949	949		
CE165	1283	1281	1291	1256	1280	1272	1256	1291	1291	2.8%	1279	1280	1280		
CE170	531	530	539	523	528	529	523	539	539	3.0%	533	530	530		
CE180	909	908	914	912	907	906	906	914	914	0.9%	908	908	908		
CE185	1340	1339	1343	1344	1337	1334	1334	1344	1344	0.7%	1340	1339	1338		
CE190	138	138	139	138	138	138	138	139	139	1.4%	138	138	138		
CE195	217	217	219	217	216	218	216	219	219	1.1%	219	217	217		
CE200	1250	1239	1249	1218	1253	1253	1218	1253	1253	2.8%	1249	1250	1250		
Energy Consumption, Supply Fan (kWh,e)									Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD		Min	Max	/Analytical*	TUD	HTAL1	HTAL2	TRACE® 3DP Trane®
CE100	144	144	145	141	144	144	141	145	145	2.9%	144	144	144	144	
CE110	128	129	133	122	128	128	122	133	133	8.5%	128	128	128	128	
CE120	117	117	110	110	116	117	110	117	117	6.3%	117	117	117	117	
CE130	10	10	8	8	10	10	8	10	10	23.1%	10	10	10	10	
CE140	8	8	7	6	8	8	6	8	8	27.2%	8	8	8	8	
CE150	141	141	133	136	140	141	133	141	141	5.7%	141	141	141	140	
CE160	129	129	119	121	128	129	119	129	129	7.8%	129	129	129	128	
CE165	149	150	142	145	149	149	142	150	150	5.6%	149	149	149	149	
CE170	73	73	61	63	73	73	61	73	73	16.1%	74	73	73	73	
CE180	118	119	111	112	118	118	111	119	119	6.9%	119	119	119	118	
CE185	139	139	135	137	139	139	135	139	139	3.0%	139	139	139	139	
CE190	18	18	14	14	18	18	14	18	18	22.9%	18	18	18	18	
CE195	23	23	18	18	23	23	18	23	23	23.3%	23	23	23	23	
CE200	154	153	149	151	153	155	149	155	155	3.5%	154	155	155	155	
Energy Consumption, Condenser Fan (kWh,e)									Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD		Min	Max	/Analytical*	TUD	HTAL1	HTAL2	TRACE® 3DP Trane®
CE100	68	68	68	67	67	67	67	68	68	2.0%	68	68	68	68	
CE110	60	61	62	60	60	59	59	62	62	4.9%	60	60	60	60	
CE120	55	55	51	55	55	54	51	55	55	6.5%	55	55	55	55	
CE130	5	5	4	5	5	5	4	5	5	22.7%	5	5	5	5	
CE140	4	4	3	4	4	4	3	4	4	19.3%	4	4	4	4	
CE150	66	66	62	65	66	65	62	66	66	5.6%	66	66	66	66	
CE160	61	61	56	60	61	60	56	61	61	8.4%	61	61	61	61	
CE165	70	70	67	69	70	69	67	70	70	5.1%	70	70	70	70	
CE170	34	34	29	34	34	34	29	34	34	16.1%	35	34	34	34	
CE180	56	56	52	56	56	55	52	56	56	7.1%	56	56	56	56	
CE185	65	65	63	66	65	65	63	66	66	3.9%	65	65	65	65	
CE190	8	9	7	8	8	9	7	9	9	27.7%	9	9	9	9	
CE195	11	11	8	11	11	11	8	11	11	25.2%	11	11	11	11	
CE200	73	72	70	71	73	73	70	73	73	4.1%	73	73	73	73	

* ABS[(Max-Min) / (Mean of Analytical Solutions)]

**ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.1
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200**

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 B16.5.1-2. COP: Mean, and (Max-Min)/Mean

Mean COP									Statistics, All Results (Max-Min)			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	TRACE® 3DP Trane®	
CE100	2.39	2.39	2.43	2.41	2.40	2.40	2.42	2.39	2.43	1.7%	2.39	2.39	2.39	2.40	
CE110	3.38	3.34	3.46	3.41	3.40	3.41	3.43	3.34	3.46	3.5%	3.38	3.38	3.38	3.40	
CE120	3.59	3.59	3.61	3.62	3.61	3.61	3.63	3.59	3.63	1.1%	3.59	3.59	3.59	3.60	
CE130	1.91	1.91	1.98	1.95	1.90	1.92	1.92	1.90	1.98	3.8%	1.89	1.91	1.91	1.90	
CE140	2.77	2.73	2.92	2.85	2.77	2.80	2.80	2.73	2.92	6.6%	2.75	2.77	2.77	2.77	
CE150	3.62	3.63	3.67	3.70	3.65	3.65	3.67	3.62	3.70	2.2%	3.63	3.63	3.63	3.65	
CE160	3.84	3.84	3.87	3.95	3.86	3.85	3.86	3.84	3.95	2.9%	3.83	3.84	3.84	3.85	
CE165	2.92	2.92	2.95	2.99	2.94	2.93	2.94	2.92	2.99	2.2%	2.93	2.93	2.93	2.94	
CE170	3.38	3.39	3.44	3.48	3.40	3.39	3.40	3.38	3.48	2.9%	3.37	3.39	3.39	3.38	
CE180	4.04	4.04	4.08	4.03	4.04	4.05	4.06	4.03	4.08	1.4%	4.04	4.04	4.04	4.03	
CE185	2.85	2.85	2.87	2.82	2.85	2.85	2.86	2.82	2.87	1.8%	2.85	2.85	2.85	2.85	
CE190	3.41	3.41	3.49	3.46	3.39	3.41	3.40	3.39	3.49	2.7%	3.39	3.41	3.41	3.39	
CE195	2.31	2.31	2.36	2.34	2.30	2.32	2.31	2.30	2.36	2.5%	2.29	2.31	2.31	2.30	
CE200	3.62	3.61	3.67	3.71	3.65	3.61	3.61	3.61	3.71	2.7%	3.62	3.62	3.62	3.62	
(Max - Min)/Mean COP									Statistics, All Results (Max-Min)			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	TRACE® 3DP Trane®	
CE100	0.000	0.001	0.002	0.001	0.003	0.000	0.000	0.000	0.003	----	0.000		0.000	0.003	
CE110	0.000	0.010	0.002	0.001	0.003	0.000	0.011	0.000	0.011	----	0.000		0.000	0.003	
CE120	0.000	0.004	0.001	0.001	0.003	0.000	0.012	0.000	0.012	----	0.000		0.000	0.002	
CE130	0.000	0.038	0.013	0.009	0.004	0.000	0.172	0.000	0.172	----	0.000		0.000	0.004	
CE140	0.000	0.056	0.011	0.019	0.004	0.000	0.204	0.000	0.204	----	0.000		0.000	0.004	
CE150	0.003	0.003	0.001	0.005	0.011	0.000	0.009	0.000	0.011	----	0.000		0.001	0.003	
CE160	0.003	0.005	0.001	0.003	0.011	0.000	0.010	0.000	0.011	----	0.000		0.000	0.003	
CE165	0.010	0.003	0.001	0.003	0.012	0.000	0.008	0.000	0.012	----	0.000		0.000	0.003	
CE170	0.000	0.006	0.002	0.004	0.015	0.000	0.043	0.000	0.043	----	0.000		0.000	0.003	
CE180	0.005	0.002	0.002	0.010	0.029	0.000	0.012	0.000	0.029	----	0.000		0.000	0.007	
CE185	0.007	0.004	0.002	0.010	0.034	0.000	0.009	0.000	0.034	----	0.000		0.000	0.011	
CE190	0.000	0.023	0.007	0.019	0.040	0.000	0.101	0.000	0.101	----	0.000		0.000	0.009	
CE195	0.000	0.017	0.008	0.017	0.043	0.000	0.086	0.000	0.086	----	0.000		0.000	0.015	
CE200	0.006	0.000	0.000	0.005	0.012	0.000	0.000	0.000	0.012	----	0.000		0.000	0.002	

* ABS[(Max-Min) / (Mean of Analytical Solutions)]

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.1
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200

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 B16.5.1-3. Coil Loads: Total, Sensible, and Latent

Coil Load, Total (kWh,thermal)								Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	(Max-Min) Min Max /Analytical*			TUD	HTAL1	HTAL2	TRACE@ 3DP Trane®
CE100	3800	3800	3841	3794	3798	3800	3798	3794	3841	1.3%	3800	3800	3800	3797
CE110	3765	3766	3804	3756	3763	3765	3763	3756	3804	1.3%	3765	3765	3765	3763
CE120	3749	3749	3763	3739	3747	3748	3747	3739	3763	0.6%	3749	3749	3749	3748
CE130	219	219	216	215	217	219	220	215	220	2.1%	219	219	219	216
CE140	198	198	196	195	196	198	199	195	199	2.0%	198	198	197	196
CE150	4517	4517	4543	4528	4509	4517	4515	4509	4543	0.8%	4518	4517	4518	4509
CE160	4501	4500	4516	4508	4491	4500	4499	4491	4516	0.6%	4501	4500	4500	4491
CE165	4538	4538	4567	4549	4529	4537	4535	4529	4567	0.9%	4537	4537	4538	4528
CE170	2233	2232	2226	2237	2225	2232	2232	2225	2237	0.5%	2232	2232	2233	2225
CE180	4495	4495	4510	4535	4481	4495	4494	4481	4535	1.2%	4495	4495	4494	4473
CE185	4507	4535	4565	4583	4523	4535	4534	4507	4583	1.7%	4535	4535	4534	4507
CE190	578	577	573	579	574	577	578	573	579	1.0%	578	577	578	573
CE195	602	601	595	602	598	601	601	595	602	1.1%	601	601	601	596
CE200	5498	5436	5534	5522	5484	5498	5498	5436	5534	1.8%	5498	5498	5498	5486
Coil Load, Sensible (kWh,thermal)								Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	(Max-Min) Min Max /Analytical*			TUD	HTAL1	HTAL2	TRACE@ 3DP Trane®
CE100	3800	3800	3841	3794	3798	3800	3798	3794	3841	1.3%	3800	3800	3800	3797
CE110	3765	3766	3804	3756	3763	3765	3763	3756	3804	1.3%	3765	3765	3765	3763
CE120	3749	3749	3763	3739	3747	3748	3747	3739	3763	0.6%	3749	3749	3749	3748
CE130	219	219	216	215	217	219	220	215	220	2.1%	219	219	219	216
CE140	198	198	196	195	196	198	199	195	199	2.0%	198	198	197	196
CE150	3778	3778	3804	3786	3776	3778	3776	3776	3804	0.7%	3778	3778	3779	3776
CE160	3761	3761	3777	3769	3759	3761	3760	3759	3777	0.5%	3761	3761	3761	3759
CE165	3798	3798	3828	3809	3795	3798	3796	3795	3828	0.9%	3798	3798	3799	3795
CE170	1493	1493	1487	1498	1491	1492	1492	1487	1498	0.7%	1493	1493	1493	1491
CE180	1537	1538	1553	1607	1537	1538	1537	1537	1607	4.5%	1538	1538	1538	1537
CE185	1548	1578	1608	1653	1577	1578	1577	1548	1653	6.6%	1578	1578	1578	1576
CE190	208	208	203	212	206	208	208	203	212	4.4%	208	208	208	206
CE195	232	232	226	235	230	231	232	226	235	4.1%	232	232	232	229
CE200	4276	4215	4313	4303	4274	4277	4277	4215	4313	2.3%	4277	4277	4277	4276
Coil Load, Latent (kWh,thermal)								Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	(Max-Min) Min Max /Analytical*			TUD	HTAL1	HTAL2	TRACE@ 3DP Trane®
CE100	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE110	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE120	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE130	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE140	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE150	739	739	739	742	733	739	739	733	742	1.2%	739	739	739	733
CE160	740	739	739	739	732	739	739	732	740	1.1%	739	739	739	732
CE165	740	739	739	740	733	739	739	733	740	1.0%	739	739	739	733
CE170	740	739	739	739	734	739	739	734	740	0.9%	739	739	739	734
CE180	2958	2957	2957	2928	2944	2957	2957	2928	2958	1.0%	2957	2957	2956	2936
CE185	2959	2957	2957	2930	2946	2957	2957	2930	2959	1.0%	2958	2957	2956	2932
CE190	370	370	370	366	368	370	370	366	370	1.0%	370	370	370	367
CE195	370	370	370	367	368	370	370	367	370	0.9%	370	370	370	367
CE200	1222	1221	1221	1219	1210	1221	1221	1210	1222	1.0%	1221	1221	1221	1210

* ABS[(Max-Min) / (Mean of Analytical Solutions)]

Table B16.5.1-4. Sensible Coil Load minus Zone Load (Fan Heat)

Sensible Coil - Zone Load, (Fan Heat) (kWh,thermal)								Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	(Max-Min) Min Max /Analytical*			TUD	HTAL1	HTAL2	TRACE@ 3DP Trane®
CE100	144	144	187	139	144	144	142	139	187	33.6%	144	144	144	144
CE110	128	129	168	119	128	128	127	119	168	38.2%	128	128	128	128
CE120	117	117	133	108	116	117	115	108	133	21.8%	117	117	117	117
CE130	10	10	8	8	10	10	10	8	10	27.0%	10	10	10	10
CE140	8	8	7	6	8	8	8	6	8	25.6%	8	8	8	8
CE150	141	141	168	149	140	141	139	139	168	20.2%	141	141	142	141
CE160	129	129	147	137	129	129	128	128	147	14.3%	129	129	129	129
CE165	149	149	181	161	149	149	148	148	181	22.4%	149	149	150	149
CE170	73	73	69	79	73	73	73	69	79	14.2%	74	73	74	73
CE180	117	118	135	188	119	118	118	117	188	60.1%	118	119	118	119
CE185	109	139	171	215	140	139	139	109	215	76.5%	139	139	139	140
CE190	18	18	15	24	18	18	18	15	24	51.0%	18	18	18	18
CE195	23	23	18	28	23	23	23	18	28	40.8%	23	23	23	23
CE200	154	153	193	181	154	155	155	153	193	25.7%	154	155	155	155

* ABS[(Max-Min) / (Mean of Analytical Solutions)]

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.1
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200

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 B16.5.1-5. Zone Loads: Total, Sensible, and Latent

Zone Load, Total (kWh,thermal)								Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	(Max-Min) Min Max /Analytical*			TUD	HTAL1	HTAL2	TRACE@ 3DP Trane@
CE100	3656	3656	3654	3655	3654	3656	3656	3654	3656	0.1%	3656	3656	3656	3654
CE110	3637	3637	3636	3637	3636	3637	3637	3636	3637	0.0%	3637	3637	3637	3635
CE120	3632	3632	3630	3632	3631	3632	3631	3630	3632	0.0%	3632	3632	3632	3630
CE130	209	209	207	208	207	209	209	207	209	1.3%	209	209	209	206
CE140	190	190	189	188	188	190	190	188	190	1.1%	190	190	190	188
CE150	4376	4376	4375	4376	4375	4376	4376	4375	4376	0.0%	4376	4376	4376	4368
CE160	4371	4371	4370	4371	4370	4371	4371	4370	4371	0.0%	4371	4371	4371	4362
CE165	4388	4388	4386	4387	4386	4388	4387	4386	4388	0.0%	4388	4388	4388	4380
CE170	2159	2159	2157	2158	2157	2159	2159	2157	2159	0.1%	2159	2159	2159	2152
CE180	4376	4376	4375	4376	4375	4376	4376	4375	4376	0.0%	4376	4376	4376	4363
CE185	4396	4396	4394	4395	4393	4395	4395	4393	4396	0.1%	4396	4396	4396	4383
CE190	557	559	558	558	558	559	559	557	559	0.4%	559	559	559	556
CE195	576	579	577	577	576	578	579	576	579	0.5%	579	579	579	574
CE200	5343	5283	5342	5343	5342	5343	5343	5283	5343	1.1%	5343	5343	5343	5331
Zone Load, Sensible (kWh,thermal)								Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	(Max-Min) Min Max /Analytical*			TUD	HTAL1	HTAL2	TRACE@ 3DP Trane@
CE100	3656	3656	3654	3655	3654	3656	3656	3654	3656	0.1%	3656	3656	3656	3654
CE110	3637	3637	3636	3637	3636	3637	3637	3636	3637	0.0%	3637	3637	3637	3635
CE120	3632	3632	3630	3632	3631	3632	3631	3630	3632	0.0%	3632	3632	3632	3630
CE130	209	209	207	208	207	209	209	207	209	1.3%	209	209	209	206
CE140	190	190	189	188	188	190	190	188	190	1.1%	190	190	190	188
CE150	3637	3637	3636	3637	3636	3637	3636	3636	3637	0.0%	3637	3637	3637	3635
CE160	3632	3632	3630	3632	3631	3632	3631	3630	3632	0.0%	3632	3632	3632	3630
CE165	3649	3649	3647	3648	3647	3649	3648	3647	3649	0.1%	3649	3649	3649	3646
CE170	1420	1420	1418	1419	1418	1419	1419	1418	1420	0.1%	1420	1420	1420	1418
CE180	1420	1420	1418	1419	1418	1419	1419	1418	1420	0.1%	1420	1420	1420	1418
CE185	1439	1439	1437	1437	1437	1438	1438	1437	1439	0.2%	1439	1439	1439	1436
CE190	190	190	188	188	188	190	190	188	190	1.0%	190	190	190	188
CE195	209	209	207	208	207	209	209	207	209	1.1%	209	209	209	206
CE200	4122	4062	4121	4122	4121	4122	4122	4062	4122	1.5%	4122	4122	4122	4121
Zone Load, Latent (kWh,thermal)								Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	(Max-Min) Min Max /Analytical*			TUD	HTAL1	HTAL2	TRACE@ 3DP Trane@
CE100	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE110	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE120	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE130	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE140	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE150	739	739	739	739	739	739	739	739	739	0.1%	739	739	739	733
CE160	739	739	739	739	739	739	739	739	739	0.1%	739	739	739	732
CE165	739	739	739	739	739	739	739	739	739	0.1%	739	739	739	733
CE170	739	739	739	739	739	739	739	739	739	0.1%	739	739	739	734
CE180	2957	2957	2957	2958	2957	2957	2957	2957	2958	0.0%	2957	2957	2957	2945
CE185	2957	2957	2957	2958	2957	2957	2957	2957	2958	0.0%	2957	2957	2957	2947
CE190	367	370	370	370	370	370	370	367	370	0.8%	370	370	370	368
CE195	367	370	370	370	370	370	370	367	370	0.8%	370	370	370	368
CE200	1221	1221	1221	1221	1221	1221	1221	1221	1221	0.0%	1221	1221	1221	1211

* ABS[(Max-Min) / (Mean of Analytical Solutions)]

Table B16.5.1-6. Latent Coil Load minus Zone Load (Should be 0)

Latent Coil - Zone Load, (Should be 0) (kWh,thermal)								Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	(Max-Min) Min Max /Analytical*			TUD	HTAL1	HTAL2	TRACE@ 3DP Trane@
CE100	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE110	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE120	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE130	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE140	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE150	0	0	0	2	-7	0	0	-7	2	----	0	0	0	0
CE160	1	0	0	0	-7	0	0	-7	1	----	0	0	0	0
CE165	1	0	0	1	-6	0	0	-6	1	----	0	0	0	0
CE170	1	0	0	-1	-6	0	0	-6	1	----	0	0	0	0
CE180	1	0	0	-30	-13	0	0	-30	1	----	1	0	-1	-9
CE185	2	0	0	-28	-11	0	0	-28	2	----	1	0	-1	-15
CE190	3	0	0	-3	-2	0	0	-3	3	----	0	0	0	-1
CE195	3	0	0	-3	-1	0	0	-3	3	----	0	0	0	-1
CE200	1	0	0	-2	-11	0	0	-11	1	----	0	0	0	0

* ABS[(Max-Min) / (Mean of Analytical Solutions)]

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.1
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200

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 B16.5.1-7. Sensitivities for Space Cooling Electricity Consumption

Delta Qtot (kWh,e)									Statistics, All Results				18-Dec-20			
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TRN-re	(Max-Min)			Analytical			TRACE@ 3DP	
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD		Min	Max	/Analytical*	TUD	HTAL1	HTAL2		Trane@
CE110-CE100	-454	-441	-460	-454	-451	-455	-450	-450	-460	-441	-450	4.1%	-454	-454	-453	-451
CE120-CE110	-65	-77	-50	-62	-63	-60	-60	-60	-77	-50	41.2%	-64	-66	-66	-60	
CE120-CE100	-519	-518	-510	-516	-514	-515	-510	-510	-519	-510	1.8%	-518	-520	-520	-511	
CE130-CE100	-1421	-1421	-1415	-1413	-1411	-1414	-1402	-1402	-1421	-1402	1.3%	-1420	-1421	-1421	-1411	
CE140-CE130	-42	-40	-40	-40	-41	-41	-41	-41	-42	-40	4.8%	-42	-41	-41	-40	
CE140-CE110	-1009	-1020	-996	-999	-1001	-999	-993	-993	-1020	-993	2.6%	-1007	-1009	-1009	-1001	
CE150-CE110	131	118	141	118	128	132	130	130	118	141	17.9%	130	129	129	129	
CE160-CE150	-68	-68	-65	-76	-65	-62	-59	-59	-76	-59	25.8%	-66	-67	-68	-65	
CE165-CE160	362	362	362	363	359	363	357	357	362	363	1.7%	357	360	361	359	
CE170-CE150	-570	-569	-573	-563	-562	-563	-556	-556	-573	-556	3.1%	-565	-569	-569	-562	
CE180-CE150	-125	-125	-125	-103	-115	-118	-112	-112	-125	-103	18.0%	-124	-124	-125	-116	
CE180-CE170	445	444	448	460	447	445	444	444	444	460	3.6%	442	445	444	446	
CE185-CE180	461	461	464	467	458	460	458	458	458	467	1.9%	462	461	461	456	
CE190-CE180	-919	-918	-917	-920	-918	-917	-915	-915	-920	-915	0.6%	-917	-918	-918	-917	
CE190-CE140	96	95	95	94	96	96	96	96	94	96	2.6%	96	96	96	96	
CE195-CE190	86	86	85	86	86	86	86	86	85	86	2.0%	87	86	86	85	
CE195-CE185	-1294	-1293	-1296	-1301	-1290	-1292	-1287	-1287	-1301	-1287	1.1%	-1292	-1293	-1293	-1288	
CE195-CE130	140	141	140	140	142	141	141	141	140	142	1.5%	142	141	141	141	
CE200-CE100	-54	-66	-53	-79	-55	-42	-32	-32	-79	-32	87.3%	-55	-53	-54	-46	

Del Qcomp (kWh,e)									Statistics, All Results				18-Dec-20		
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TRN-re	(Max-Min)			Analytical			TRACE@ 3DP
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD		Min	Max	/Analytical*	TUD	HTAL1	HTAL2	
CE110-CE100	-430	-419	-442	-428	-432	-427	-427	-427	-442	-419	5.3%	-431	-430	-430	-430
CE120-CE110	-49	-59	-16	-45	-43	-44	-44	-44	-59	-16	87.9%	-47	-50	-50	-50
CE120-CE100	-479	-478	-457	-473	-475	-471	-471	-471	-479	-457	4.5%	-478	-480	-480	-480
CE130-CE100	-1224	-1224	-1214	-1218	-1218	-1208	-1208	-1208	-1224	-1208	1.3%	-1224	-1225	-1225	-1225
CE140-CE130	-38	-37	-38	-37	-38	-38	-38	-38	-38	-37	3.7%	-38	-38	-38	-38
CE140-CE110	-832	-842	-811	-827	-823	-819	-819	-819	-842	-811	3.7%	-831	-833	-833	-833
CE150-CE110	111	100	141	99	113	111	111	111	99	141	38.3%	111	110	110	110
CE160-CE150	-50	-50	-44	-56	-45	-42	-42	-42	-56	-42	27.5%	-49	-50	-50	-50
CE165-CE160	333	332	329	330	333	328	328	328	328	333	1.6%	328	331	331	331
CE170-CE150	-469	-469	-468	-459	-464	-458	-458	-458	-469	-458	2.3%	-466	-469	-469	-469
CE180-CE150	-91	-91	-93	-70	-85	-80	-80	-80	-93	-70	25.0%	-91	-91	-92	-92
CE180-CE170	378	378	375	389	379	378	378	378	375	389	3.6%	375	378	378	378
CE185-CE180	431	431	428	432	430	428	428	428	428	432	0.9%	432	431	431	431
CE190-CE180	-771	-770	-775	-774	-770	-768	-768	-768	-775	-768	0.9%	-770	-770	-770	-770
CE190-CE140	81	81	85	82	82	82	82	82	81	85	4.5%	82	81	81	81
CE195-CE190	79	79	79	79	79	80	80	80	79	80	0.8%	80	79	79	79
CE195-CE185	-1123	-1122	-1124	-1127	-1120	-1116	-1116	-1116	-1127	-1116	1.0%	-1121	-1122	-1121	-1121
CE195-CE130	122	123	126	124	123	123	123	123	122	126	3.0%	123	122	123	123
CE200-CE100	-69	-79	-58	-93	-58	-50	-50	-50	-93	-50	62.3%	-70	-69	-69	-69

Del Q IDfan (kWh,e)									Statistics, All Results				18-Dec-20		
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TRN-re	(Max-Min)			Analytical			TRACE@ 3DP
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD		Min	Max	/Analytical*	TUD	HTAL1	HTAL2	
CE110-CE100	-16	-15	-12	-19	-16	-16	-16	-16	-19	-12	41.9%	-16	-16	-16	-16
CE120-CE110	-11	-12	-23	-12	-11	-11	-11	-11	-23	-11	111.4%	-11	-11	-11	-10
CE120-CE100	-27	-27	-36	-31	-27	-27	-27	-27	-36	-27	32.2%	-27	-27	-27	-26
CE130-CE100	-134	-134	-137	-133	-133	-133	-132	-132	-137	-132	3.7%	-134	-134	-134	-133
CE140-CE130	-2	-2	-1	-2	-2	-2	-2	-2	-2	-1	36.7%	-2	-2	-2	-2
CE140-CE110	-120	-121	-126	-116	-119	-120	-118	-118	-126	-116	8.3%	-120	-120	-120	-119
CE150-CE110	13	12	0	14	13	13	13	13	0	14	106.4%	13	13	13	13
CE160-CE150	-12	-12	-14	-15	-12	-11	-11	-11	-15	-11	32.6%	-12	-12	-12	-12
CE165-CE160	20	21	23	24	20	20	20	20	20	24	21.6%	20	20	20	20
CE170-CE150	-68	-68	-72	-73	-67	-68	-66	-66	-73	-66	9.7%	-68	-68	-68	-67
CE180-CE150	-23	-22	-22	-24	-22	-21	-21	-21	-24	-21	12.1%	-22	-23	-23	-22
CE180-CE170	45	46	49	49	45	45	45	45	45	49	9.9%	45	45	45	45
CE185-CE180	21	20	24	25	21	21	21	21	20	25	24.1%	21	21	21	20
CE190-CE180	-100	-101	-97	-98	-100	-100	-100	-100	-101	-97	4.3%	-101	-101	-101	-100
CE190-CE140	10	10	7	8	10	10	10	10	7	10	28.2%	10	10	10	10
CE195-CE190	5	5	4	4	5	5	5	5	4	5	30.8%	5	5	5	5
CE195-CE185	-116	-116	-117	-119	-116	-117	-116	-116	-119	-116	2.6%	-117	-117	-117	-116
CE195-CE130	13	13	9	10	12	12	12	12	9	13	29.1%	12	12	12	12
CE200-CE100	10	9	4	10	10	11	12	12	4	12	78.4%	10	11	11	11

Del Q ODFan (kWh,e)									Statistics, All Results				18-Dec-20		
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TRN-re	(Max-Min)			Analytical			TRACE@ 3DP
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD		Min	Max	/Analytical*	TUD	HTAL1	HTAL2	
CE110-CE100	-8	-7	-6	-7	-7	-7	-7	-7	-8	-6	29.9%	-7	-7	-7	-7
CE120-CE110	-5	-6	-11	-5	-5	-5	-5	-5	-11	-5	114.1%	-5	-5	-5	-5
CE120-CE100	-13	-13	-17	-12	-13	-13	-13	-13	-17	-12	37.1%	-13	-13	-13	-13
CE130-CE100	-63	-63	-64	-62	-63	-62	-62	-62	-64	-62	3.7%	-63	-63	-63	-63
CE140-CE130	-1	-1	-1	-1	-1	-1	-1	-1	-1	-1	37.5%	-1	-1	-1	-1
CE140-CE110	-56	-57	-59	-56	-56	-56	-56	-56	-59	-56	6.3%	-56	-56	-56	-56
CE150-CE110	6	5	0	5	6	6	6	6	0	6	100.7%	6	6	6	6
CE160-CE150	-5	-5	-7	-5	-5	-5	-5	-5	-7	-5	27.1%	-6	-6	-6	-6
CE165-CE160	9	9	11	9	10	9	9	9	9	11	17.3%	9	9	9	9
CE170-CE150	-32	-32	-34	-31	-32	-31	-31	-31	-34	-31	8.2%	-32	-32	-32	-32
CE180-CE150	-10	-10	-10	-9	-11	-10	-10	-10	-11	-9	14.3%	-11	-11	-11	-11
CE180-CE170	22	22	23	22	21	21	21	21	21	23	9.6%	21	21	21	21
CE185-CE180	9	9	11	10	10	10	10	10	9	11	24.6%	10	10	10	10
CE190-CE180	-48	-47	-45	-48	-47	-47	-47	-47	-48	-45	5.5%	-47	-47	-47	-47
CE190-CE140	4	5	3	4	5	5	5	5	3	5	34.5%	5	5	5	5
CE195-CE190	3	2	2	3	2	2	2	2	2	3	62.1%	2	2	2	2
CE195-CE185	-54	-54	-55	-55	-55	-55	-54	-54	-55	-54	2.0%	-55	-55	-55	-55
CE195-CE130	6	6	4	6	6	6	6	6	4	6	27.2%	6	6	6	6
CE200-CE100	5	4	2	4	5	6	6	6	2	6	77.9%	5	5	5	5

* ABSJ (Max-Min) / (Mean of Analytical Solutions)]

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.1
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200

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 B16.5.1-8. Sensitivities for COP and Coil Loads

Delta COP (kWh,t)								Statistics, All Results					Analytical			18-Dec-20
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	TRACE@ 3DP		
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				Trane@		
CE110-CE100	0.99	0.95	1.03	1.01	1.00	1.01	1.01	0.95	1.03	7.6%	0.99	0.99	0.99	1.00		
CE120-CE110	0.21	0.25	0.16	0.21	0.21	0.20	0.20	0.16	0.25	44.5%	0.21	0.21	0.21	0.20		
CE120-CE100	1.20	1.20	1.18	1.22	1.20	1.20	1.21	1.18	1.22	2.8%	1.20	1.20	1.20	1.19		
CE130-CE100	-0.48	-0.48	-0.46	-0.45	-0.50	-0.48	-0.50	-0.50	-0.45	10.0%	-0.50	-0.48	-0.48	-0.50		
CE140-CE130	0.86	0.83	0.94	0.90	0.87	0.88	0.88	0.83	0.94	13.4%	0.86	0.86	0.86	0.87		
CE140-CE110	-0.61	-0.61	-0.54	-0.56	-0.63	-0.61	-0.63	-0.63	-0.54	13.9%	-0.63	-0.61	-0.61	-0.63		
CE150-CE110	0.24	0.29	0.21	0.29	0.25	0.24	0.25	0.21	0.29	31.9%	0.25	0.25	0.25	0.25		
CE160-CE150	0.22	0.21	0.20	0.25	0.21	0.20	0.19	0.19	0.25	30.4%	0.21	0.21	0.21	0.21		
CE165-CE160	-0.92	-0.92	-0.91	-0.96	-0.92	-0.92	-0.92	-0.96	-0.91	5.5%	-0.90	-0.91	-0.91	-0.92		
CE170-CE150	-0.24	-0.24	-0.23	-0.22	-0.26	-0.26	-0.27	-0.27	-0.22	19.1%	-0.26	-0.24	-0.24	-0.26		
CE180-CE150	0.42	0.41	0.42	0.33	0.39	0.40	0.38	0.33	0.42	22.8%	0.42	0.41	0.41	0.39		
CE180-CE170	0.66	0.65	0.64	0.55	0.65	0.65	0.65	0.55	0.66	16.9%	0.68	0.65	0.65	0.65		
CE185-CE180	-1.19	-1.19	-1.21	-1.20	-1.19	-1.20	-1.20	-1.21	-1.19	1.7%	-1.20	-1.19	-1.19	-1.18		
CE190-CE180	-0.63	-0.63	-0.60	-0.57	-0.65	-0.64	-0.65	-0.65	-0.57	12.7%	-0.66	-0.63	-0.63	-0.65		
CE190-CE140	0.64	0.68	0.57	0.60	0.62	0.61	0.61	0.57	0.68	16.4%	0.64	0.64	0.64	0.61		
CE195-CE190	-1.10	-1.10	-1.13	-1.12	-1.09	-1.09	-1.10	-1.13	-1.09	3.3%	-1.09	-1.10	-1.10	-1.09		
CE195-CE185	-0.54	-0.54	-0.51	-0.49	-0.55	-0.54	-0.55	-0.55	-0.49	12.1%	-0.55	-0.54	-0.54	-0.55		
CE195-CE130	0.40	0.40	0.38	0.38	0.40	0.40	0.39	0.38	0.40	4.2%	0.40	0.40	0.40	0.40		
CE200-CE100	1.23	1.22	1.24	1.30	1.24	1.21	1.19	1.19	1.30	8.9%	1.23	1.23	1.23	1.21		

Del Q coil,t (kWh,t)								Statistics, All Results					Analytical			18-Dec-20
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	TRACE@ 3DP		
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				Trane@		
CE110-CE100	-35	-34	-38	-38	-35	-35	-35	-38	-34	12.5%	-35	-35	-35	-34		
CE120-CE110	-16	-17	-40	-16	-16	-16	-16	-40	-16	146.5%	-16	-16	-17	-15		
CE120-CE100	-51	-51	-78	-55	-51	-51	-51	-78	-51	52.7%	-51	-52	-52	-49		
CE130-CE100	-3581	-3581	-3626	-3579	-3581	-3581	-3578	-3626	-3578	1.3%	-3581	-3581	-3581	-3581		
CE140-CE130	-21	-21	-20	-21	-21	-21	-21	-21	-20	4.9%	-21	-21	-22	-20		
CE140-CE110	-3567	-3568	-3608	-3561	-3567	-3567	-3565	-3608	-3561	1.3%	-3567	-3567	-3568	-3567		
CE150-CE110	752	751	739	772	746	752	752	739	772	4.4%	752	752	753	746		
CE160-CE150	-16	-17	-26	-19	-18	-17	-16	-26	-16	59.5%	-17	-17	-18	-18		
CE165-CE160	37	38	51	40	38	37	36	36	51	40.0%	36	37	38	37		
CE170-CE150	-2284	-2285	-2317	-2291	-2284	-2285	-2283	-2317	-2283	1.5%	-2285	-2286	-2286	-2284		
CE180-CE150	-22	-22	-33	7	-28	-22	-21	-33	7	172.5%	-22	-23	-25	-36		
CE180-CE170	2262	2263	2284	2298	2256	2263	2262	2256	2298	1.8%	2263	2263	2261	2248		
CE185-CE180	12	40	55	48	41	40	40	12	55	107.3%	40	40	40	34		
CE190-CE180	-3917	-3918	-3937	-3956	-3907	-3917	-3916	-3956	-3907	1.3%	-3918	-3918	-3916	-3900		
CE190-CE140	380	379	377	384	378	380	379	377	384	1.8%	380	379	380	377		
CE195-CE190	24	24	23	23	23	24	24	23	24	5.8%	24	24	24	23		
CE195-CE185	-3905	-3934	-3970	-3981	-3925	-3934	-3933	-3981	-3905	1.9%	-3934	-3934	-3933	-3911		
CE195-CE130	383	382	379	387	381	382	382	379	387	1.9%	382	382	382	380		
CE200-CE100	1698	1636	1693	1728	1687	1698	1700	1636	1728	5.4%	1697	1697	1697	1689		

Del Q coil,s (kWh,t)								Statistics, All Results					Analytical			18-Dec-20
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	TRACE@ 3DP		
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				Trane@		
CE110-CE100	-35	-34	-38	-38	-35	-35	-35	-38	-34	12.5%	-35	-35	-35	-34		
CE120-CE110	-16	-17	-40	-16	-16	-16	-16	-40	-16	146.5%	-16	-16	-17	-15		
CE120-CE100	-51	-51	-78	-55	-51	-51	-51	-78	-51	52.8%	-51	-52	-52	-49		
CE130-CE100	-3581	-3581	-3626	-3579	-3581	-3581	-3578	-3626	-3578	1.3%	-3581	-3581	-3581	-3581		
CE140-CE130	-21	-21	-20	-21	-21	-21	-21	-21	-20	4.9%	-21	-21	-22	-20		
CE140-CE110	-3567	-3568	-3608	-3561	-3567	-3567	-3565	-3608	-3561	1.3%	-3567	-3567	-3568	-3567		
CE150-CE110	13	12	0	30	13	13	13	0	30	228.7%	13	13	14	13		
CE160-CE150	-17	-17	-26	-17	-17	-17	-16	-26	-16	58.9%	-17	-17	-18	-17		
CE165-CE160	37	37	51	40	36	37	36	36	51	40.1%	36	37	38	36		
CE170-CE150	-2285	-2285	-2317	-2288	-2285	-2285	-2283	-2317	-2283	1.5%	-2285	-2286	-2286	-2285		
CE180-CE150	-2241	-2240	-2250	-2179	-2239	-2240	-2239	-2250	-2179	3.2%	-2241	-2240	-2241	-2239		
CE180-CE170	44	45	66	109	46	45	45	44	109	144.8%	45	45	45	46		
CE185-CE180	11	40	55	46	39	40	40	11	55	110.0%	40	40	40	39		
CE190-CE180	-1329	-1330	-1350	-1394	-1331	-1330	-1329	-1394	-1329	4.9%	-1330	-1330	-1330	-1331		
CE190-CE140	10	10	7	18	10	10	9	7	18	100.3%	10	10	11	10		
CE195-CE190	24	24	23	23	23	24	24	23	24	5.7%	24	24	24	23		
CE195-CE185	-1316	-1346	-1382	-1418	-1347	-1346	-1345	-1418	-1316	7.6%	-1346	-1347	-1346	-1347		
CE195-CE130	13	13	10	20	13	12	12	10	20	81.6%	12	12	12	12		
CE200-CE100	476	415	472	509	477	477	479	415	509	19.7%	476	476	476	479		

Del Qcoil,lat (kWh,t)								Statistics, All Results					Analytical			18-Dec-20
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	TRACE@ 3DP		
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				Trane@		
CE110-CE100	0	0	0	0	0	0	0	0	0	----	0	0	0	0		
CE120-CE110	0	0	0	0	0	0	0	0	0	----	0	0	0	0		
CE120-CE100	0	0	0	0	0	0	0	0	0	----	0	0	0	0		
CE130-CE100	0	0	0	0	0	0	0	0	0	----	0	0	0	0		
CE140-CE130	0	0	0	0	0	0	0	0	0	----	0	0	0	0		
CE140-CE110	0	0	0	0	0	0	0	0	0	----	0	0	0	0		
CE150-CE110	739	739	739	742	733	739	739	733	742	1.2%	739	739	739	733		
CE160-CE150	1	0	0	-2	-1	0	0	-2	1	----	0	0	0	-1		
CE165-CE160	0	0	0	1	1	0	0	0	1	----	0	0	0	1		
CE170-CE150	1	0	0	-3	1	0	0	-3	1	----	0	0	0	1		
CE180-CE150	2219	2218	2218	2186	2211	2218	2218	2186	2219	1.5%	2218	2218	2217	2203		
CE180-CE170	2218	2218	2218	2189	2210	2218	2218	2189	2218	1.3%	2218	2218	2217	2202		
CE185-CE180	1	0	0	2	2	0	0	0	2	----	0	0	0	-4		
CE190-CE180	-2588	-2587	-2587	-2562	-2576	-2587	-2587	-2588	-2562	----	-2588	-2587	-2586	-2569		
CE190-CE140	370	370	370	366	368	370	370	366	370	1.0%	370	370	370	367		
CE195-CE190	0	0	0	0	0	0	0	0	0	----	0	0	0	0		
CE195-CE185	-2589	-2587	-2587	-2563	-2578	-2587	-2587	-2589	-2563	----	-2588	-2587	-2587	-2564		
CE195-CE130	370	370	370	367	368	370	370	367	370	0.9%	370	370	370	367		
CE200-CE100	1222	1221	1221	1219	1210	1221	1221	1210	1222	1.0%	1221	1221	1221	1210		

* ABS| (Max-Min) / (Mean of Analytical Solutions)]

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.1
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200

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 B16.5.1-9. Indoor Drybulb Temperature: Mean and (Max-Min)/Mean

Mean IDB (°C)									Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD		Min	Max	(Max-Min) /Analytical*	TUD	HTAL1	HTAL2	TRACE® 3DP Trane®
CE100	22.2	22.2	22.3	22.3	22.2	22.2	22.6		22.2	22.6	2.0%	22.2	22.2	22.2	22.2
CE110	22.2	22.2	22.3	22.3	22.2	22.2	22.5		22.2	22.5	1.5%	22.2	22.2	22.2	22.2
CE120	26.7	26.7	26.8	26.7	26.7	26.7	27.1		26.7	27.1	1.4%	26.7	26.7	26.7	26.7
CE130	22.2	22.2	22.1	22.1	22.2	22.2	21.6		21.6	22.2	2.5%	22.2	22.2	22.2	22.2
CE140	22.2	22.2	22.1	22.1	22.2	22.2	21.5		21.5	22.2	3.1%	22.2	22.2	22.2	22.2
CE150	22.2	22.2	22.3	22.3	22.2	22.2	22.7		22.2	22.7	2.1%	22.2	22.2	22.2	22.2
CE160	26.7	26.7	26.8	26.7	26.7	26.7	27.0		26.7	27.0	1.1%	26.7	26.7	26.7	26.7
CE165	23.3	23.3	23.4	23.4	23.3	23.3	23.8		23.3	23.8	2.1%	23.3	23.3	23.3	23.3
CE170	22.2	22.2	22.2	22.2	22.2	22.2	22.1		22.1	22.2	0.5%	22.2	22.2	22.2	22.2
CE180	22.2	22.2	22.3	22.3	22.2	22.2	22.3		22.2	22.3	0.6%	22.2	22.2	22.2	22.2
CE185	22.2	22.2	22.3	22.3	22.2	22.2	22.4		22.2	22.4	0.8%	22.2	22.2	22.2	22.2
CE190	22.2	22.2	22.1	22.1	22.2	22.2	21.9		21.9	22.2	1.1%	22.2	22.2	22.2	22.2
CE195	22.2	22.2	22.1	22.1	22.2	22.2	22.0		22.0	22.2	0.9%	22.2	22.2	22.2	22.2
CE200	26.7	26.7	26.8	26.8	26.7	26.7	26.7		26.7	26.8	0.4%	26.7	26.7	26.7	26.7

(Max - Min)/Mean IDB (°C)									Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD		Min	Max	(Max-Min) /Analytical*	TUD	HTAL1	HTAL2	TRACE® 3DP Trane®
CE100	0.000	0.000	0.000	0.000	0.000	0.000	0.049		0.000	0.049	----	0.000		0.002	0.000
CE110	0.000	0.000	0.000	0.000	0.000	0.000	0.048		0.000	0.048	----	0.000		0.002	0.000
CE120	0.000	0.000	0.000	0.000	0.000	0.000	0.077		0.000	0.077	----	0.000		0.002	0.000
CE130	0.000	0.000	0.000	0.000	0.000	0.000	0.056		0.000	0.056	----	0.000		0.001	0.000
CE140	0.000	0.000	0.000	0.000	0.000	0.000	0.069		0.000	0.069	----	0.000		0.002	0.000
CE150	0.000	0.000	0.000	0.000	0.000	0.000	0.054		0.000	0.054	----	0.000		0.002	0.000
CE160	0.000	0.000	0.000	0.000	0.000	0.000	0.045		0.000	0.045	----	0.000		0.002	0.000
CE165	0.000	0.000	0.000	0.000	0.000	0.000	0.051		0.000	0.051	----	0.000		0.002	0.000
CE170	0.000	0.000	0.000	0.000	0.000	0.000	0.050		0.000	0.050	----	0.000		0.001	0.000
CE180	0.000	0.000	0.000	0.000	0.000	0.000	0.035		0.000	0.035	----	0.000		0.001	0.000
CE185	0.000	0.000	0.000	0.000	0.000	0.000	0.021		0.000	0.021	----	0.000		0.001	0.000
CE190	0.000	0.000	0.000	0.000	0.000	0.000	0.028		0.000	0.028	----	0.000		0.001	0.000
CE195	0.000	0.000	0.000	0.000	0.000	0.000	0.023		0.000	0.023	----	0.000		0.001	0.000
CE200	0.000	0.000	0.000	0.000	0.000	0.000	0.000		0.000	0.000	----	0.000		0.000	0.007

* ABS[(Max-Min)/(Mean of Analytical Solutions)]

Table B16.5.1-10. Humidity Ratio: Mean and (Max-Min)/Mean

Mean Humidity Ratio									Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD		Min	Max	(Max-Min) /Analytical*	TUD	HTAL1	HTAL2	TRACE® 3DP Trane®
CE100	0.0075	0.0069	0.0076	0.0074	0.0075	0.0075	0.0075		0.0069	0.0076	9.4%	0.0074	0.0073	0.0073	0.0075
CE110	0.0066	0.0069	0.0070	0.0064	0.0066	0.0066	0.0066		0.0064	0.0070	9.8%	0.0065	0.0064	0.0064	0.0066
CE120	0.0080	0.0070	0.0078	0.0078	0.0080	0.0080	0.0080		0.0070	0.0080	13.2%	0.0079	0.0079	0.0079	0.0077
CE130	0.0075	0.0069	0.0076	0.0073	0.0075	0.0075	0.0075		0.0069	0.0076	9.4%	0.0074	0.0073	0.0073	0.0075
CE140	0.0065	0.0069	0.0071	0.0064	0.0066	0.0066	0.0066		0.0064	0.0071	10.2%	0.0065	0.0064	0.0064	0.0066
CE150	0.0083	0.0085	0.0082	0.0083	0.0084	0.0083	0.0085		0.0082	0.0085	4.0%	0.0082	0.0082	0.0082	0.0084
CE160	0.0102	0.0101	0.0097	0.0099	0.0103	0.0101	0.0102		0.0097	0.0103	5.8%	0.0100	0.0099	0.0099	0.0102
CE165	0.0093	0.0099	0.0090	0.0092	0.0094	0.0093	0.0095		0.0090	0.0099	9.2%	0.0093	0.0092	0.0092	0.0094
CE170	0.0106	0.0107	0.0105	0.0105	0.0106	0.0105	0.0105		0.0105	0.0107	2.2%	0.0104	0.0105	0.0105	0.0105
CE180	0.0164	0.0164	0.0166	0.0164	0.0162	0.0163	0.0164		0.0162	0.0166	2.6%	0.0162	0.0162	0.0162	0.0161
CE185	0.0162	0.0171	0.0164	0.0162	0.0161	0.0162	0.0163		0.0161	0.0171	6.4%	0.0161	0.0161	0.0161	0.0160
CE190	0.0160	0.0161	0.0163	0.0159	0.0159	0.0159	0.0157		0.0157	0.0163	3.5%	0.0158	0.0159	0.0159	0.0158
CE195	0.0156	0.0164	0.0158	0.0155	0.0154	0.0155	0.0153		0.0153	0.0164	7.0%	0.0154	0.0154	0.0154	0.0154
CE200	0.0114	0.0115	0.0109	0.0111	0.0115	0.0113	0.0113		0.0109	0.0115	5.1%	0.0111	0.0111	0.0111	0.0112

(Max - Min)/Mean Humidity Ratio									Statistics, All Results			Analytical			18-Dec-20
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD		Min	Max	(Max-Min) /Analytical*	TUD	HTAL1	HTAL2	TRACE® 3DP Trane®
CE100	0.000	0.022	0.000	0.000	0.001	0.000	0.000		0.0000	0.0217	----	0.000		0.000	0.000
CE110	0.000	0.022	0.014	0.000	0.000	0.000	0.000		0.0000	0.0217	----	0.000		0.000	0.000
CE120	0.000	0.000	0.000	0.000	0.001	0.000	0.000		0.0000	0.0005	----	0.000		0.000	0.000
CE130	0.000	0.010	0.000	0.000	0.001	0.000	0.000		0.0000	0.0101	----	0.000		0.000	0.000
CE140	0.000	0.012	0.014	0.000	0.001	0.000	0.000		0.0000	0.0142	----	0.000		0.000	0.000
CE150	0.012	0.000	0.000	0.000	0.013	0.000	0.013		0.0000	0.0132	----	0.000		0.000	0.011
CE160	0.020	0.000	0.010	0.010	0.013	0.000	0.011		0.0000	0.0196	----	0.000		0.000	0.011
CE165	0.011	0.001	0.011	0.000	0.013	0.000	0.013		0.0000	0.0131	----	0.000		0.000	0.011
CE170	0.000	0.000	0.010	0.000	0.011	0.000	0.024		0.0000	0.0238	----	0.000		0.001	0.011
CE180	0.018	0.000	0.012	0.012	0.010	0.000	0.040		0.0000	0.0402	----	0.000		0.001	0.010
CE185	0.012	0.006	0.018	0.012	0.011	0.000	0.025		0.0000	0.0246	----	0.000		0.001	0.012
CE190	0.000	0.000	0.018	0.019	0.014	0.000	0.031		0.0000	0.0312	----	0.000		0.001	0.026
CE195	0.000	0.006	0.019	0.019	0.014	0.000	0.024		0.0000	0.0241	----	0.000		0.001	0.039
CE200	0.018	0.000	0.009	0.009	0.013	0.000	0.000		0.0000	0.0175	----	0.000		0.000	0.014

* ABS[(Max-Min) / (Mean of Analytical Solutions)]

**Figure B16.5.1-6.
HVAC BESTEST: Compressor Electricity Consumption**

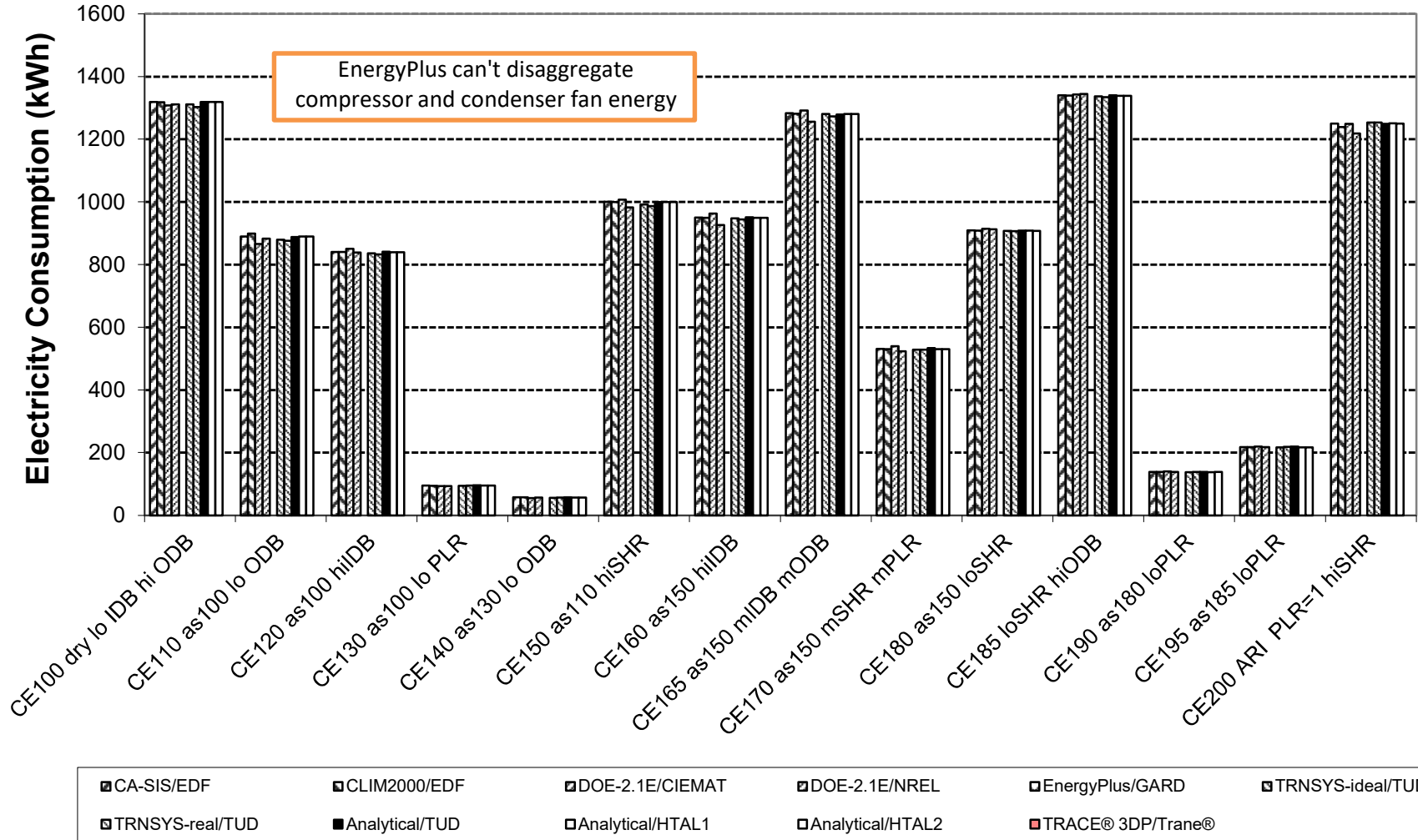


Figure B16.5.1-10.
HVAC BESTEST: Outdoor (Condenser) Fan Electricity Consumption

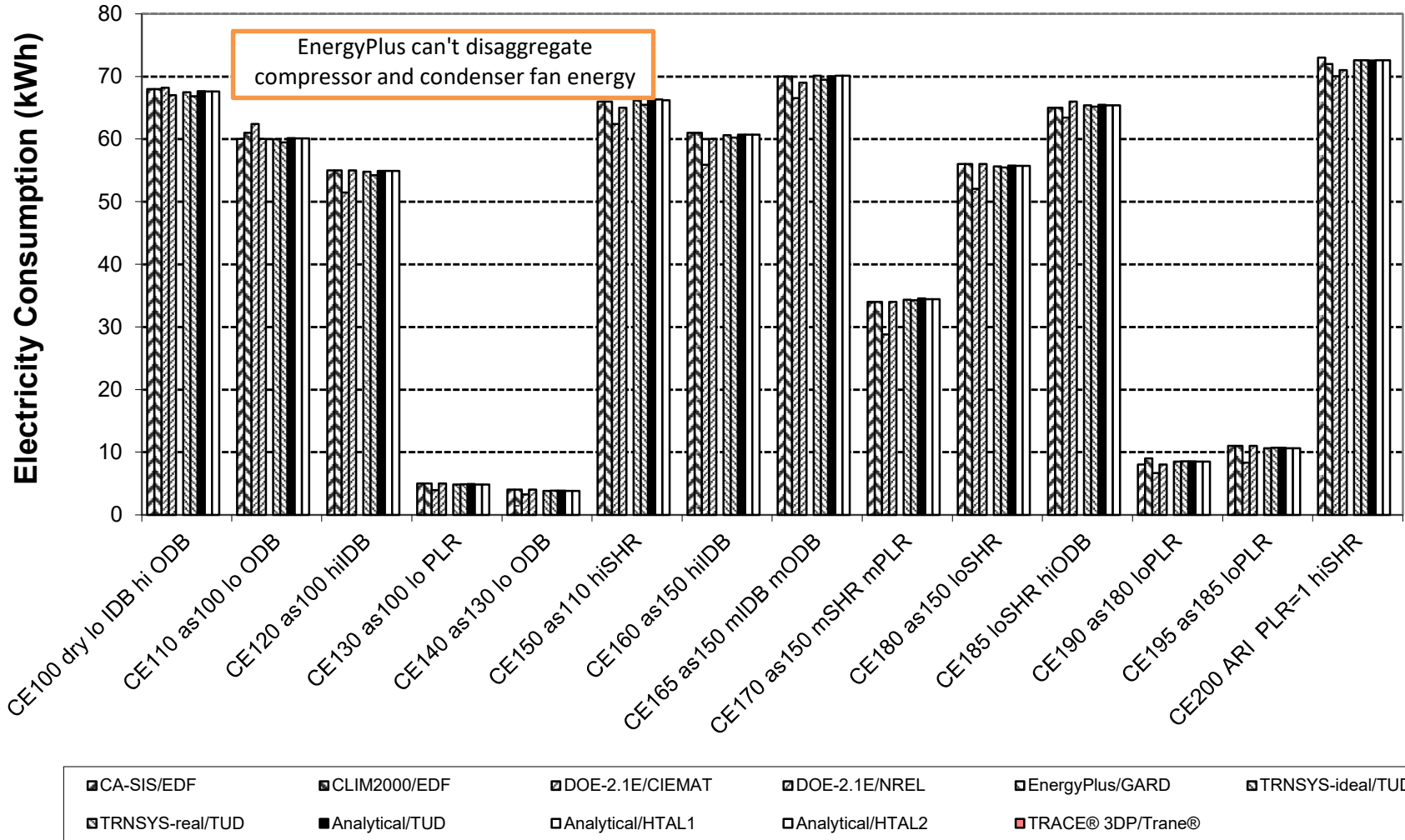


Figure B16.5.1-11.
HVAC BESTEST: Outdoor (Condenser) Fan Electricity Sensitivities

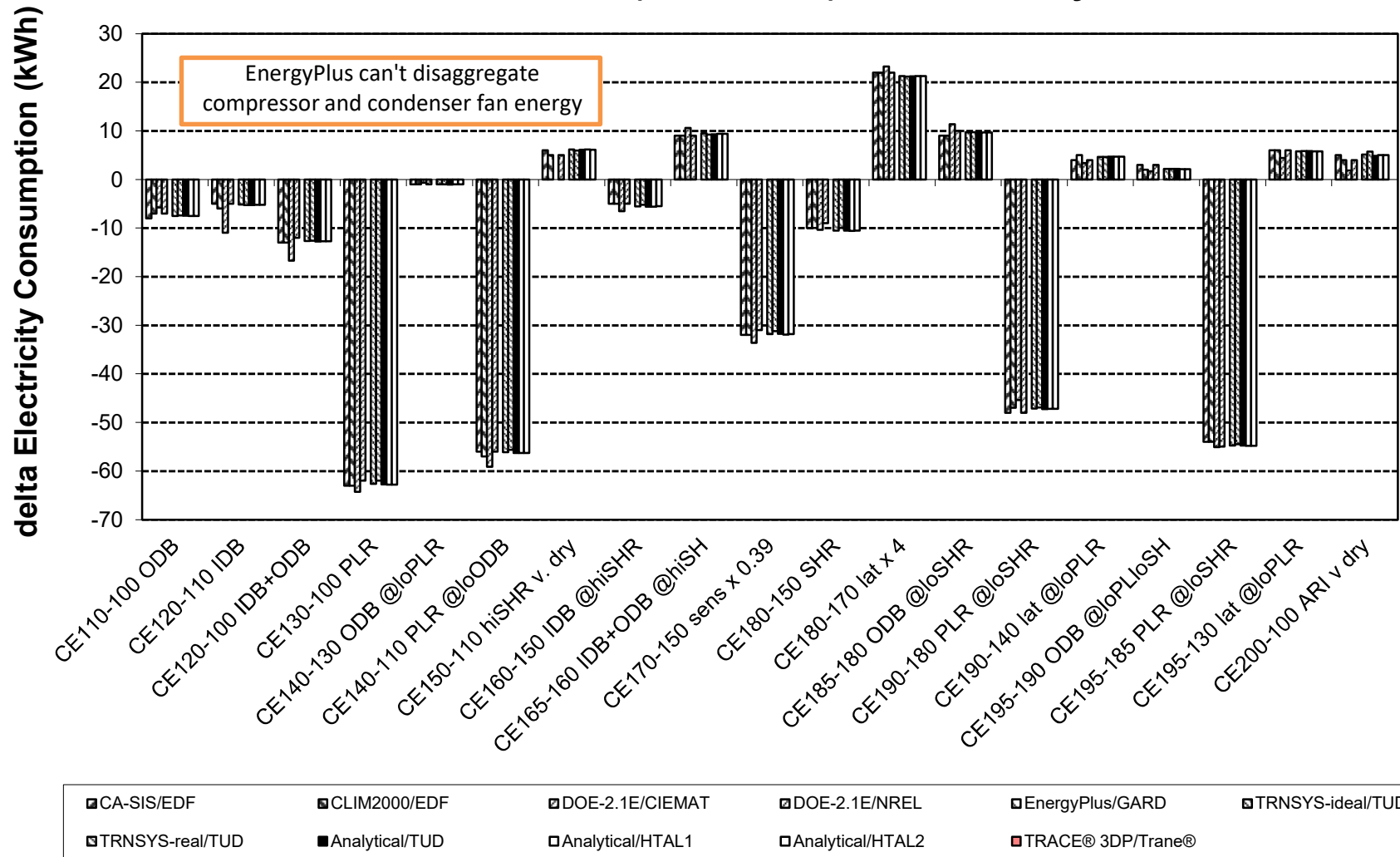


Figure B16.5.1-19.

HVAC BESTEST: (Maximum - Minimum)/Mean Indoor Drybulb Temperature

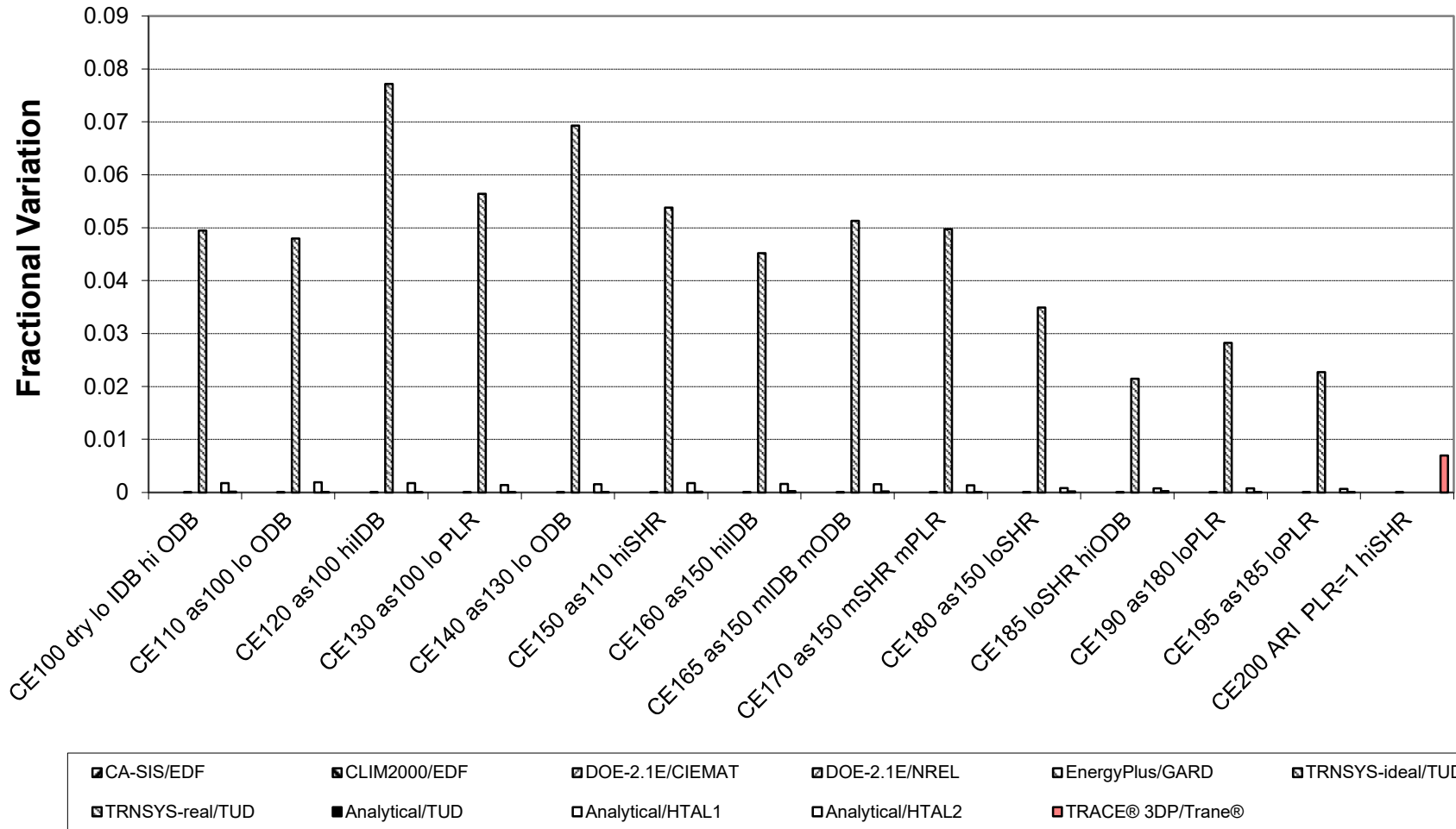
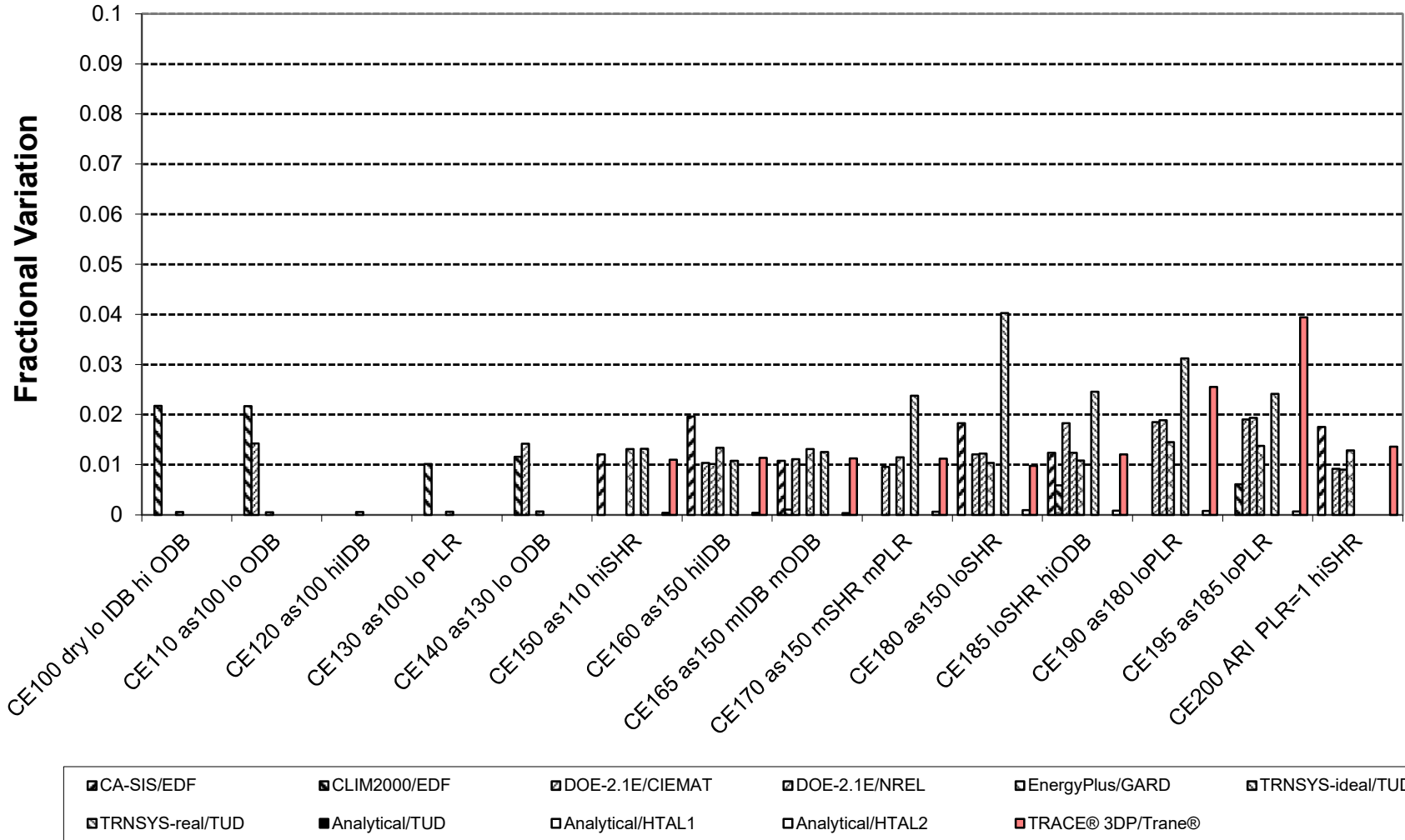


Figure B16.5.1-21.
HVAC BESTEST: (Maximum - Minimum)/Mean Indoor Humidity Ratio



ASHRAE Standard 140-2014
Participating Organizations and Computer Programs for
Quasi-analytical Solutions and Example Simulation Results
Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

The quasi-analytical solutions and programs used to generate the example simulation results are described in Table B17-2. The first column of Table B17-2 ("Model"), indicates the proper program name and version number, or indicates a quasi-analytical solution.

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

The third column ("Implemented By") indicates the national research facility, university, or industry organization with expertise in building science that performed the simulations or did the quasi-analytical solutions.

The entries in the fourth column are the abbreviations for the simulations and quasi-analytical solutions generally used in the tables and charts which follow.

See Standard 140, Annex B17 for further details.

TABLE B17-2
Participating Organizations and Computer Programs

Model	Authoring Organization	Implemented By	Abbreviation
CODYRUN/LGIMAT	Universite de la Reunion Island, France	Universite de la Reunion Island, France	CODYRUN/UR
DOE-2.1E version 120 (ESTSC release)	LANL/LBNL/ESTSC/JJH, ^{a,b,c,d} United States	NREL/JNA, ^e United States	DOE-2.1E-E/NREL DOE21E-E
DOE-2.2 NT42j	LBNL/JJH, ^{b,d} United States	NREL/JNA, ^e United States	DOE-2.2/NREL
EnergyPlus 1.1.0.020	LBNL/UIUC/CERL/OSU/GARD Analytics/FSEC/DOE-BT, ^{b,f,g,h,i,j}	GARD Analytics, United States	EnergyPlus/GARD
HOT3000/ESP-r	CETC/ESRU, ^{k,l} Canada/United Kingdom	CETC, ^k Canada	HOT3000/NRCan
TRNSYS 14.2-TUD with real controller model	University of Wisconsin, USA; Technische Universität Dresden, Ger.	Technische Universität Dresden, Germany	TRNSYS/TUD

^aLANL: Los Alamos National Laboratory, United States

^bLBNL: Lawrence Berkeley National Laboratory, United States

^cESTSC: Energy Science and Technology Software Center (at Oak Ridge National Laboratory, USA)

^dJJH: James J. Hirsch & Associates, United States

^eNREL/JNA: National Renewable Energy Laboratory/J. Neymark & Associates, United States

^fUIUC: University of Illinois Urbana/Champaign, United States

^gCERL: U.S. Army Corps of Engineers, Construction Engineering Research Laboratories, United States

^hOSU: Oklahoma State University, United States

ⁱFSEC: University of Central Florida, Florida Solar Energy Center, United States

^jDOE-BT: U.S. Department of Energy, Office of Building Technologies, Energy Efficiency and Renewable Energy, United States

^kCETC: CANMET Energy Technology Centre, Natural Resources Canada, Canada

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

List of Tables

Table	Description	Sheet Tab	Cell Range
B16.5.2-1	Annual Space Cooling Electricity Consumption (Total, Compressor)	Table-Q	A7 – O56
B16.5.2-2	Annual Space Cooling Electricity Consumption (Supply Fan, Condenser Fan)		A57 – O106
B16.5.2-3	Weather Data Checks, CE300 Only		A109 – O119
B16.5.2-4	Annual Space Cooling Coil Loads (Total, Sensible)		A120 – O169
B16.5.2-5	Annual Space Cooling Coil Loads (Latent)		A170 – O195
B16.5.2-6	Various Annual Means (COP2, IDB)		A196 – O245
B16.5.2-7	Various Annual Means (Humidity Ratio, Relative Humidity)		A246 – O295
B16.5.2-8	F(ODB) Sensitivities, CE500 and CE530, April 30 and June 25 (Energy, Coil Loads)		A296 – O349
B16.5.2-9	F(ODB) Sensitivities, CE500 and CE530, April 30 and June 25 (COP2, Zone Conditions)		A350 – O382
B16.5.2-10	Hourly Integrated Maxima (Total Cooling System Energy Consumption and Total Coil Load)		Table R
B16.5.2-11	Hourly Integrated Maxima (Sensible Coil Load and Latent Coil Load)	A55 – AB102	
B16.5.2-12	Hourly Integrated Maxima and Minima (COP2)	A103 – AB150	
B16.5.2-13	Hourly Integrated Maxima and Minima (IDB)	A151 – AB198	
B16.5.2-14	Hourly Integrated Maxima and Minima (Zone Humidity Ratio)	A199 – AB246	
B16.5.2-15	Hourly Integrated Maxima and Minima (Relative Humidity)	A247 – AB295	
B16.5.2-16	June 28 Hourly Output - Case CE300	Table-S	A7 – M215
	TRNSYS-TUD		A7 – M35
	DOE-2.2		A39 – M65
	DOE-2.1E-E		A69 – M95
	ENERGYPLUS		A99 – M125
	CODYRUN		A129 – M155
	HOT3000		A159 – M185
	Tested Program		A189 – M215
B16.5.2-17	Delta Annual Space Cooling Electricity Consumptions (Total, Compressor)	Table-T	A7 – O50
B16.5.2-18	Delta Annual Space Cooling Electricity Consumptions (Fans)		A52 – O95
B16.5.2-19	Delta Annual Cooling Coil Loads		A100 – O143
B16.5.2-20	Delta Various Annual Means (COP2, IDB)		A146 – O189
B16.5.2-21	Delta Various Annual Means (Zone Humidity, Relative Humidity)		A192 – O235
B16.5.2-22	Delta Hourly Integrated Maximum Total Consumptions		A243 – O265
B16.5.2-23	Delta Hourly Integrated Maximum Coil Loads (Total, Sensible)		A267 – O310
B16.5.2-24	Delta Hourly Integrated Maximum Coil Loads (Latent)		A311 – O333
B16.5.2-25	Delta Hourly Integrated Maximum and Minimum COP2		A336 – O379
B16.5.2-26	Delta Hourly Integrated Maximum and Minimum IDB		A381 – O424
B16.5.2-27	Delta Hourly Integrated Maximum and Minimum Zone Humidity Ratio		A426 – O469
B16.5.2-28	Delta Hourly Integrated Maximum and Minimum Zone Relative Humidity		A471 – O514

**ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545**

List of Figures

Figure	Title	Sheet Tab
B16.5.2-1	HVAC BESTEST: CE300 - CE545 Annual Total Electricity Consumption	Fig B16.5.2-1 Qtot
B16.5.2-2	HVAC BESTEST: CE300 - CE545 Annual Total Space Cooling Electricity Consumption Sensitivities	Fig B16.5.2-2 dQtot
B16.5.2-3	HVAC BESTEST: CE300 - CE545 Peak Hour Total Electricity Consumption	Fig B16.5.2-3 Ptot
B16.5.2-4	HVAC BESTEST: CE300 - CE545 Hourly Maximum Total Space Cooling Consumption Sensitivities	Fig B16.5.2-4 dPtot
B16.5.2-5	HVAC BESTEST: CE300 - CE545 Annual Compressor Electricity Consumption	Fig B16.5.2-5 Qcomp
B16.5.2-6	HVAC BESTEST: CE300 - CE545 Annual Compressor Electricity Consumption Sensitivities	Fig B16.5.2-6 dQcomp
B16.5.2-7	HVAC BESTEST: CE300 - CE545 Annual Indoor (Supply) Fan Electricity Consumption	Fig B16.5.2-7 Qidfan
B16.5.2-8	HVAC BESTEST: CE300 - CE545 Annual Indoor (Supply) Fan Electricity Consumption Sensitivities	Fig B16.5.2-8 dQidfan
B16.5.2-9	HVAC BESTEST: CE300 - CE545 Annual Outdoor (Condenser) Fan Electricity Consumption	Fig B16.5.2-9 Qodfan
B16.5.2-10	HVAC BESTEST: CE300 - CE545 Annual Outdoor (Condenser) Fan Electricity Consumption Sensitivities	Fig B16.5.2-10 dQodfan
B16.5.2-11	HVAC BESTEST: CE300 - CE545 Annual Total Coil Load	Fig B16.5.2-11 QCtot
B16.5.2-12	HVAC BESTEST: CE300 - CE545 Peak Hour Total Coil Load	Fig B16.5.2-12 PCtot
B16.5.2-13	HVAC BESTEST: CE300 - CE545 Hourly Maximum Total Coil Load Sensitivities	Fig B16.5.2-13 dPCtot
B16.5.2-14	HVAC BESTEST: CE300 - CE545 Annual Sensible Coil Load	Fig B16.5.2-14 QCSens
B16.5.2-15	HVAC BESTEST: CE300 - CE545 Annual Sensible Cooling Load Sensitivities	Fig B16.5.2-15 dQCsens
B16.5.2-16	HVAC BESTEST: CE300 - CE545 Peak Hour Sensible Coil Load	Fig B16.5.2-16 PCSens
B16.5.2-17	HVAC BESTEST: CE300 - CE545 Annual Latent Coil Load	Fig B16.5.2-17 QClat
B16.5.2-18	HVAC BESTEST: CE300 - CE545 Annual Latent Cooling Load Sensitivities	Fig B16.5.2-18 dQClat
B16.5.2-19	HVAC BESTEST: CE300 - CE545 Peak Hour Latent Coil Load	Fig B16.5.2-19 PClat
B16.5.2-20	HVAC BESTEST: CE300 - CE545 Hourly Maximum Latent Coil Load Sensitivities	Fig B16.5.2-20 dPClat
B16.5.2-21	HVAC BESTEST: CE300 - CE545 Annual Mean COP2	Fig B16.5.2-21 COP2
B16.5.2-22	HVAC BESTEST: CE300 - CE545 Annual Mean COP2 Sensitivities	Fig B16.5.2-22 dCOP2
B16.5.2-23	HVAC BESTEST: CE300 - CE545 Hourly Maximum COP2	Fig B16.5.2-23 MxCOP2
B16.5.2-24	HVAC BESTEST: CE300 - CE545 Hourly Maximum COP2 Sensitivities	Fig B16.5.2-24 dMxCOP2

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

List of Figures

<i>Figure</i>	<i>Title</i>	<i>Sheet Tab</i>
B16.5.2-25	HVAC BESTEST: CE300 - CE545 Hourly Minimum COP2	Fig B16.5.2-25 MnCOP2
B16.5.2-26	HVAC BESTEST: CE300 - CE545 Hourly Minimum COP2 Sensitivities	Fig B16.5.2-26 dMnCOP2
B16.5.2-27	HVAC BESTEST: CE300 - CE545 Annual Mean Indoor Dry-Bulb Temperature	Fig B16.5.2-27 IDB
B16.5.2-28	HVAC BESTEST: CE300 - CE545 Annual Mean IDB Sensitivities	Fig B16.5.2-28 dIDB
B16.5.2-29	HVAC BESTEST: CE300 - CE545 Hourly Maximum Indoor Dry-Bulb Temperature	Fig B16.5.2-29 MxIDB
B16.5.2-30	HVAC BESTEST: CE300 - CE545 Hourly Maximum IDB Sensitivities	Fig B16.5.2-30 dMxIDB
B16.5.2-31	HVAC BESTEST: CE300 - CE545 Hourly Minimum Indoor Dry-Bulb Temperature	Fig B16.5.2-31 MnIDB
B16.5.2-32	HVAC BESTEST: CE300 - CE545 Annual Mean Zone Humidity Ratio	Fig B16.5.2-32 Humrat
B16.5.2-33	HVAC BESTEST: CE300 - CE545 Annual Mean Humidity Ratio Sensitivities	Fig B16.5.2-33 dHumrat
B16.5.2-34	HVAC BESTEST: CE300 - CE545 Hourly Maximum Zone Humidity Ratio	Fig B16.5.2-34 MxHum
B16.5.2-35	HVAC BESTEST: CE300 - CE545 Hourly Maximum Humidity Ratio Sensitivities	Fig B16.5.2-35 dMxHumrat
B16.5.2-36	HVAC BESTEST: CE300 - CE545 Hourly Minimum Zone Humidity Ratio	Fig B16.5.2-36 MnHum
B16.5.2-37	HVAC BESTEST: CE300 - CE545 Annual Mean Relative Humidity	Fig B16.5.2-37 RelHum
B16.5.2-38	HVAC BESTEST: CE300 - CE545 Annual Mean Relative Humidity Sensitivities	Fig B16.5.2-38 dRelHum
B16.5.2-39	HVAC BESTEST: CE300 - CE545 Hourly Maximum Zone Relative Humidity	Fig B16.5.2-39 MxRelHum
B16.5.2-40	HVAC BESTEST: CE300 - CE545 Hourly Maximum Relative Humidity Sensitivities	Fig B16.5.2-40 dMxRelHum
B16.5.2-41	HVAC BESTEST: CE300 - CE545 Hourly Minimum Zone Relative Humidity	Fig B16.5.2-41 MnRelHum
B16.5.2-42	HVAC BESTEST: f(ODB) for CE500, CE530 Specific Day Electricity Consumptions	Fig B16.5.2-42 Qf(ODB)
B16.5.2-43	HVAC BESTEST: f(ODB) for CE500, CE530 Specific Day Coil Loads	Fig B16.5.2-43 QCf(ODB)
B16.5.2-44	HVAC BESTEST: f(ODB) for CE500, CE530 Specific Day COP2	Fig B16.5.2-44 COP2f(ODB)
B16.5.2-45	HVAC BESTEST: f(ODB) for CE500, CE530 Specific Day Humidity Ratio	Fig B16.5.2-45 Humratf(ODB)
B16.5.2-46	HVAC BESTEST: CE300 June 28 Hourly Electricity Consumption	Fig B16.5.2-46 HrQ
B16.5.2-47	HVAC BESTEST: CE300 June 28 Hourly Coil Loads	Fig B16.5.2-47 HrQC

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

List of Figures

<i>Figure</i>	<i>Title</i>	<i>Sheet Tab</i>
B16.5.2-48	HVAC BESTEST: CE300 June 28 Hourly COP2	Fig B16.5.2-48 HrCOP2
B16.5.2-49	HVAC BESTEST: CE300 June 28 Hourly Zone Humidity Ratio	Fig B16.5.2-49 HrHum
B16.5.2-50	HVAC BESTEST: CE300 June 28 Hourly EDB & EWB	Fig B16.5.2-50 HrEDB,EWB
B16.5.2-51	HVAC BESTEST: CE300 June 28 Hourly ODB	Fig B16.5.2-51 HrODB
B16.5.2-52	HVAC BESTEST: CE300 June 28 Hourly OHR	Fig B16.5.2-52 HrOHR

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-1. Annual Space Cooling Electricity Consumption (Total, Compressor)

Energy Consumption, Total (kWh,e)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean (Max-Min) /Mean*		
CE300	35634	34750	34755	34746	34976	35070	34746	35634	34988	2.5%	35020
CE310	39973	39379	39384	39290	39520	39608	39290	39973	39526	1.7%	39431
CE320	40060	38745	38792	39079	39401	39457	38745	40060	39256	3.3%	39309
CE330	40963	39708	39438	40143	40535	40330	39438	40963	40186	3.8%	40396
CE340	40619	39358	39265	39783	40065	39947	39265	40619	39840	3.4%	40023
CE350	32237	30547	30548	31145	31587	31742	30547	32237	31301	5.4%	31408
CE360	55299	54064	54016	54705	54843	55068	54016	55299	54666	2.3%	54921
CE400	32045	30846	30876	31013		31413	30846	32045	31239	3.8%	31257
CE410	32078	31668	31699			31503	31503	32078	31737	1.8%	31257
CE420	33387	32530	32910	32736		33208	32530	33387	32954	2.6%	32957
CE430	32538	31932	31811	31772		31818	31772	32538	31974	2.4%	32072
CE440	33691	33032	32973	33032		33248	32973	33691	33195	2.2%	33275
CE500	22338	22817	22822	23035	22323	23138	22323	23138	22745	3.6%	23050
CE500 May-Sep	17391	17872	17870	17996	17435	18051	17391	18051	17769	3.7%	18035
CE510 May-Sep	34609	35971	35970	35732	34849	35845	34609	35971	35496	3.8%	35798
CE520	24987	25389	25390	25017	25131	25781	24987	25781	25282	3.1%	25788
CE522	23544	24293	24307	24078	23620	24360	23544	24360	24034	3.4%	24361
CE525	20321	20408	20421	20702	20242	21323	20242	21323	20569	5.3%	20757
CE530	17281	17540	17537	17742	17442	17875	17281	17875	17570	3.4%	18446
CE540	19430	19878	19874	19061	19537	20164	19061	20164	19657	5.6%	20229
CE545	15687	15802	15791	16636	15791	16339	15687	16636	16008	5.9%	17037

Energy Consumption, Compressor (kWh,e)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean (Max-Min) /Mean*		
CE300	22354	21569	21573		21770	21876	21569	22354	21828	3.6%	
CE310	26340	25813	25817		25937	26053	25813	26340	25992	2.0%	
CE320	26433	25250	25294		25846	25912	25250	26433	25747	4.6%	
CE330	27300	26172	25925		26928	26775	25925	27300	26620	5.2%	
CE340	26963	25829	25745		26473	26400	25745	26963	26282	4.6%	
CE350	19317	17802	17801		18738	18891	17801	19317	18510	8.2%	
CE360	40106	38999	38955		39697	39941	38955	40106	39540	2.9%	
CE400	19179	18106	18131			18629	18106	19179	18511	5.8%	
CE410	19204	18823	18850			18685	18685	19204	18891	2.8%	
CE420	20359	19596	19934			20214	19596	20359	20026	3.8%	
CE430	19599	19059	18951			18966	18951	19599	19144	3.4%	
CE440	20629	20042	19989			20249	19989	20629	20227	3.2%	
CE500	17854	18473	18478		17858	18522	17854	18522	18237	3.7%	
CE500 May-Sep	13942	14508	14506		13989	14491	13942	14508	14287	4.0%	
CE510 May-Sep	27748	28811	28810		27902	28721	27748	28811	28398	3.7%	
CE520	19521	20121	20126		19655	20185	19521	20185	19922	3.3%	
CE522	18620	19407	19418		18690	19281	18620	19418	19083	4.2%	
CE525	16558	16880	16893		16507	17443	16507	17443	16856	5.6%	
CE530	13657	14127	14124		13856	14172	13657	14172	13987	3.7%	
CE540	15021	15680	15677		15164	15664	15021	15680	15441	4.3%	
CE545	12622	12967	12957		12751	13215	12622	13215	12902	4.6%	

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-2. Annual Space Cooling Electricity Consumption (Supply Fan, Condenser Fan)

Energy Consumption, Supply Fan (kWh,e)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE300	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10862
CE310	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10862
CE320	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10862
CE330	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10862
CE340	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10862
CE350	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10862
CE360	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10862
CE400	10880	10880	10880	10862		10880	10862	10880	10876	0.2%	10862
CE410	10880	10880	10880			10880	10880	10880	10880	0.0%	10862
CE420	10880	10880	10880	10862		10880	10862	10880	10876	0.2%	10862
CE430	10880	10880	10880	10862		10880	10862	10880	10876	0.2%	10862
CE440	10880	10880	10880	10862		10880	10862	10880	10876	0.2%	10862
CE500	2564	2369	2369	2628	2553	2639	2369	2639	2520	10.7%	2630
CE500 May-Sep	1972	1837	1837	2029	1970	2035	1837	2035	1947	10.2%	2032
CE510 May-Sep	3923	4099	4099	4063	3972	4073	3923	4099	4038	4.4%	4067
CE520	3125	2874	2871	3019	3131	3200	2871	3200	3037	10.8%	3140
CE522	2816	2704	2707	2843	2819	2904	2704	2904	2799	7.1%	2878
CE525	2152	1886	1885	2180	2136	2221	1885	2221	2077	16.2%	2192
CE530	2072	1833	1833	2090	2051	2117	1833	2117	1999	14.2%	2320
CE540	2522	2258	2258	2309	2500	2573	2258	2573	2403	13.1%	2560
CE545	1753	1501	1501	1871	1739	1786	1501	1871	1692	21.9%	2107

Energy Consumption, Condenser Fan (kWh,e)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE300	2400	2301	2302		2326	2323	2301	2400	2331	4.3%	
CE310	2754	2686	2687		2703	2691	2686	2754	2704	2.5%	
CE320	2747	2615	2618		2675	2681	2615	2747	2667	4.9%	
CE330	2784	2656	2633		2727	2693	2633	2784	2699	5.6%	
CE340	2776	2649	2640		2713	2684	2640	2776	2692	5.1%	
CE350	2040	1865	1867		1969	1970	1865	2040	1942	9.0%	
CE360	4313	4185	4181		4266	4272	4181	4313	4243	3.1%	
CE400	1986	1860	1865			1902	1860	1986	1903	6.6%	
CE410	1994	1965	1969			1936	1936	1994	1966	3.0%	
CE420	2149	2054	2096			2115	2054	2149	2103	4.5%	
CE430	2059	1993	1980			1970	1970	2059	2001	4.5%	
CE440	2182	2110	2104			2120	2104	2182	2129	3.7%	
CE500	1920	1975	1975		1912	1976	1912	1976	1952	3.3%	
CE500 May-Sep	1477	1527	1527		1476	1524	1476	1527	1506	3.4%	
CE510 May-Sep	2938	3061	3061		2974	3050	2938	3061	3017	4.1%	
CE520	2340	2394	2393		2345	2396	2340	2396	2374	2.4%	
CE522	2108	2182	2182		2111	2174	2108	2182	2151	3.4%	
CE525	1611	1642	1643		1599	1663	1599	1663	1632	3.9%	
CE530	1552	1580	1580		1536	1585	1536	1585	1567	3.1%	
CE540	1888	1940	1939		1872	1926	1872	1940	1913	3.5%	
CE545	1312	1334	1333		1302	1337	1302	1337	1324	2.7%	

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

Table B16.5.2-3. Weather Data Checks, CE300 Only

Variable	TRNSYS	DOE-2.2	DOE21E-E	EnergyPlus	CODYRUN	HOT3000	Statistics, All Results				TRACE® 3DP Trane®
	TUD	NREL	NREL	GARD	UR	NRCan	Min	Max	Mean	(Max-Min) /Mean*	
Annual Mean Output											
ODB (°C)	19.91	19.89	19.89	19.91	19.91	19.91	19.89	19.91	19.91	0.1%	19.91
OHR (kg/kg)	0.01164	0.01160	0.01160	0.01159	0.01165	0.01160	0.01159	0.01165	0.01161	0.5%	0.01161
Annual Hourly Integrated Maxima											
ODB (°C)	34.70	35.00	35.00	34.78	35.00	35.00	34.70	35.00	34.91	0.9%	34.78
OHR (kg/kg)	0.02188	0.02250	0.02250	0.02184	0.02241	0.02230	0.02184	0.02250	0.02224	3.0%	0.02187

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-4. Annual Space Cooling Coil Loads (Total, Sensible)

Total Sensible + Latent (kWh,thermal)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean (Max-Min) /Mean*		
CE300	80427	77283	77292	77318	77745	78257	77283	80427	78054	4.0%	78322
CE310	99342	97395	97412	96448	97296	97261	96448	99342	97526	3.0%	97335
CE320	99792	96356	96493	96084	97141	96957	96084	99792	97137	3.8%	97191
CE330	105013	100730	100993	102211	103713	102008	100730	105013	102445	4.2%	103508
CE340	102728	99028	99223	99709	100676	99753	99028	102728	100186	3.7%	100948
CE350	69388	63736	63635	65790	66860	67389	63635	69388	66133	8.7%	66849
CE360	162974	159807	159854	161248	161200	162168	159807	162974	161209	2.0%	162152
CE400	68793	64918	65025	65414		66898	64918	68793	66209	5.9%	66476
CE410	68673	66780	66844			66175	66175	68673	67118	3.7%	66476
CE420	72609	69611	70882	70349		71803	69611	72609	71051	4.2%	71171
CE430	69756	67641	67219	67141		67200	67141	69756	67792	3.9%	68243
CE440	73711	71380	71181	71417		72029	71181	73711	71944	3.5%	72325
CE500	63357	65996	65992	65571	63105	65614	63105	65996	64939	4.5%	65571
CE500 May-Sep	48443	50693	50690	50354	48440	50357	48440	50693	49830	4.5%	50358
CE510 May-Sep	108974	114018	114015	112793	108979	112781	108974	114018	111927	4.5%	112798
CE520	63422	66571	66565	66088	63212	66146	63212	66571	65334	5.1%	66213
CE522	63389	66373	66372	65851	63157	65900	63157	66373	65174	4.9%	65889
CE525	63293	65399	65395	64973	63002	65155	63002	65399	64536	3.7%	64993
CE530	45046	46634	46631	46944	44875	47002	44875	47002	46189	4.6%	47172
CE540	45113	47130	47126	47297	44980	47462	44980	47462	46518	5.3%	47521
CE545	44981	46240	46236	46612	44775	46668	44775	46668	45919	4.1%	46851

Sensible Coil Load (kWh,thermal)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean (Max-Min) /Mean*		
CE300	56662	55797	55805	55252	55209	55191	55191	56662	55653	2.6%	55281
CE310	56256	56301	56313	55225	55185	55083	55083	56313	55727	2.2%	55271
CE320	62859	62697	62747	62043	62009	62734	62009	62859	62515	1.4%	61782
CE330	63083	63311	63328	63779	62649	61822	61822	63779	62995	3.1%	63036
CE340	63033	63053	63111	62886	62381	61406	61406	63111	62645	2.7%	62450
CE350	50371	47684	47677	48545	48589	48768	47677	50371	48606	5.5%	48653
CE360	134977	134920	134940	135287	134206	134697	134206	135287	134838	0.8%	134894
CE400	41952	41419	41437	40688		41181	40688	41952	41335	3.1%	40688
CE410	45677	47659	47660			45585	45585	47660	46645	4.4%	40688
CE420	50390	49666	50612	49524		49984	49524	50612	50035	2.2%	49477
CE430	47863	47731	47454	46739		46143	46143	47863	47186	3.6%	47000
CE440	50876	50593	50492	50060		49785	49785	50876	50361	2.2%	50083
CE500	45044	47650	47646	47491	44874	47530	44874	47650	46706	5.9%	47490
CE500 May-Sep	34443	36596	36593	36476	34448	36480	34443	36596	35839	6.0%	36479
CE510 May-Sep	77489	82306	82303	81566	77499	81563	77489	82306	80454	6.0%	81572
CE520	45110	48102	48096	47986	44977	48059	44977	48102	47055	6.6%	48108
CE522	45076	47962	47961	47758	44924	47795	44924	47962	46913	6.5%	47793
CE525	44979	47218	47213	46930	44775	47110	44775	47218	46371	5.3%	46943
CE530	45046	46574	46570	46944	44874	47002	44874	47002	46168	4.6%	47172
CE540	45112	47023	47019	47288	44977	47460	44977	47460	46480	5.3%	47521
CE545	44981	46214	46210	46612	44775	46668	44775	46668	45910	4.1%	46851

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

**ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545**

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 B16.5.2-5. Annual Space Cooling Coil Loads (Latent)

Case	Latent Coil Load(kWh,thermal)						Statistics, All Results				TRACE® 3DP Trane®
	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE300	23765	21487	21487	22066	22535	23067	21487	23765	22401	10.2%	23041
CE310	43086	41094	41099	41222	42111	42178	41094	43086	41798	4.8%	42064
CE320	36932	33659	33746	34040	35133	34224	33659	36932	34622	9.5%	35410
CE330	41929	37419	37666	38433	41063	40186	37419	41929	39449	11.4%	40471
CE340	39695	35974	36113	36823	38296	38346	35974	39695	37541	9.9%	38498
CE350	19017	16052	15958	17245	18271	18621	15958	19017	17527	17.5%	18196
CE360	27997	24887	24914	25961	26994	27470	24887	27997	26371	11.8%	27258
CE400	26840	23498	23588	24726		25717	23498	26840	24874	13.4%	25788
CE410	22996	19121	19184			20590	19121	22996	20473	18.9%	25788
CE420	22219	19945	20270	20826		21855	19945	22219	21023	10.8%	21694
CE430	21893	19909	19765	20403		21057	19765	21893	20605	10.3%	21243
CE440	22835	20788	20689	21357		22244	20689	22835	21583	9.9%	22241
CE500	18313	18346	18346	18080	18231	18084	18080	18346	18233	1.5%	18082
CE500 May-Sep	14000	14097	14097	13879	13991	13877	13877	14097	13990	1.6%	13879
CE510 May-Sep	31485	31712	31712	31226	31480	31217	31217	31712	31472	1.6%	31226
CE520	18312	18470	18470	18101	18235	18087	18087	18470	18279	2.1%	18105
CE522	18313	18411	18410	18093	18233	18104	18093	18411	18261	1.7%	18095
CE525	18314	18182	18182	18044	18227	18045	18044	18314	18165	1.5%	18050
CE530	0	61	61	0	1	0	0	61	20	297.1%	0
CE540	1	107	107	9	3	2	1	107	38	278.2%	0
CE545	0	25	25	0	0	0	0	25	9	300.0%	0

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-6. Various Annual Means (COP2, IDB)

COP2							Statistics, All Results				TRACE® 3DP
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE300	3.249	3.238	3.237	3.237	3.226	3.230	3.226	3.249	3.236	0.7%	3.242
CE310	3.415	3.417	3.417	3.393	3.397	3.380	3.380	3.417	3.403	1.1%	3.407
CE320	3.420	3.458	3.457	3.405	3.406	3.390	3.390	3.458	3.423	2.0%	3.417
CE330	3.491	3.494	3.536	3.491	3.497	3.460	3.460	3.536	3.495	2.2%	3.505
CE340	3.454	3.477	3.496	3.448	3.450	3.420	3.420	3.496	3.457	2.2%	3.462
CE350	3.249	3.241	3.235	3.244	3.229	3.230	3.229	3.249	3.238	0.6%	3.254
CE360	3.669	3.701	3.706	3.678	3.667	3.660	3.660	3.706	3.680	1.2%	3.680
CE400	3.250	3.251	3.252	3.246		3.260	3.246	3.260	3.252	0.4%	3.259
CE410	3.240	3.212	3.211			3.210	3.210	3.240	3.218	0.9%	3.259
CE420	3.226	3.215	3.218	3.216		3.210	3.210	3.226	3.217	0.5%	3.221
CE430	3.221	3.213	3.211	3.211		3.210	3.210	3.221	3.213	0.3%	3.217
CE440	3.231	3.222	3.222	3.221		3.220	3.220	3.231	3.223	0.4%	3.227
CE500	3.204	3.227	3.227	3.213	3.192	3.200	3.192	3.227	3.211	1.1%	3.211
CE500 May-Sep	3.142	3.161	3.162	3.154	3.132	3.140	3.132	3.162	3.148	0.9%	3.147
CE510 May-Sep	3.551	3.577	3.577	3.562	3.530	3.550	3.530	3.577	3.558	1.3%	3.555
CE520	2.901	2.957	2.956	3.004	2.873	2.920	2.873	3.004	2.935	4.5%	2.924
CE522	3.058	3.074	3.073	3.101	3.036	3.070	3.036	3.101	3.069	2.1%	3.067
CE525	3.484	3.531	3.528	3.508	3.480	3.410	3.410	3.531	3.490	3.5%	3.501
CE530	2.962	2.969	2.969	2.999	2.916	2.980	2.916	2.999	2.966	2.8%	2.925
CE540	2.668	2.675	2.675	2.823	2.640	2.690	2.640	2.823	2.695	6.8%	2.690
CE545	3.228	3.233	3.236	3.157	3.186	3.200	3.157	3.236	3.207	2.5%	3.138

IDB (°C)							Statistics, All Results				TRACE® 3DP
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE300	23.62	24.06	24.06	24.09	24.08	23.99	23.62	24.09	23.98	1.9%	24.10
CE310	23.76	24.11	24.06	24.09	24.09	24.01	23.76	24.11	24.02	1.5%	24.10
CE320	23.90	24.39	24.39	24.25	24.33	24.53	23.90	24.53	24.30	2.6%	24.25
CE330	23.88	24.28	24.28	24.27	24.30	24.18	23.88	24.30	24.20	1.7%	24.32
CE340	23.88	24.28	24.28	24.30	24.31	24.21	23.88	24.31	24.21	1.8%	24.33
CE350	25.66	26.17	26.17	26.24	26.27	26.15	25.66	26.27	26.11	2.3%	26.23
CE360	25.36	25.61	25.56	25.32	25.48	25.37	25.32	25.61	25.45	1.1%	25.43
CE400	24.13	24.06	24.06	24.09		23.99	23.99	24.13	24.06	0.6%	24.10
CE410	24.12	24.06	24.06			23.99	23.99	24.12	24.06	0.5%	24.10
CE420	23.93	24.06	24.06	24.09		23.99	23.93	24.09	24.02	0.7%	24.10
CE430	23.99	24.06	24.06	24.09		23.99	23.99	24.09	24.04	0.4%	24.10
CE440	23.91	24.06	24.06	24.09		23.99	23.91	24.09	24.02	0.7%	24.10
CE500	20.23	20.67	20.56	20.38	21.10	22.86	20.23	22.86	20.97	12.5%	20.61
CE500 May-Sep	24.57	25.00	25.00	24.98	25.00	25.00	24.57	25.00	24.93	1.7%	24.98
CE510 May-Sep	25.82	25.11	25.11	24.96	25.00	25.00	24.96	25.82	25.17	3.4%	24.96
CE520	13.52	13.78	13.72	13.58	14.14	14.89	13.52	14.89	13.94	9.9%	13.71
CE522	16.95	17.28	17.22	17.00	17.73	18.70	16.95	18.70	17.48	10.0%	17.18
CE525	26.84	27.39	27.28	27.10	27.77	30.69	26.84	30.69	27.85	13.8%	27.44
CE530	20.03	20.61	20.56	20.59	21.10	22.86	20.03	22.86	20.96	13.5%	20.62
CE540	13.29	13.78	13.72	13.79	14.14	14.98	13.29	14.98	13.95	12.1%	13.72
CE545	26.61	27.33	27.28	27.31	27.72	30.69	26.61	30.69	27.82	14.7%	27.45

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-7. Various Annual Means (Humidity Ratio, Zone Relative Humidity)

Humidity Ratio (kg/kg)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE300	0.0091	0.0092	0.0092	0.0093	0.0092	0.0092	0.0091	0.0093	0.0092	2.4%	0.0092
CE310	0.0111	0.0113	0.0113	0.0113	0.0112	0.0111	0.0111	0.0113	0.0112	2.0%	0.0111
CE320	0.0100	0.0101	0.0101	0.0101	0.0100	0.0099	0.0099	0.0101	0.0100	2.1%	0.0100
CE330	0.0097	0.0099	0.0099	0.0100	0.0098	0.0099	0.0097	0.0100	0.0099	2.3%	0.0099
CE340	0.0098	0.0099	0.0099	0.0100	0.0099	0.0099	0.0098	0.0100	0.0099	1.9%	0.0099
CE350	0.0097	0.0100	0.0100	0.0099	0.0098	0.0098	0.0097	0.0100	0.0099	3.0%	0.0098
CE360	0.0085	0.0087	0.0087	0.0088	0.0086	0.0086	0.0085	0.0088	0.0086	3.1%	0.0086
CE400	0.0098	0.0100	0.0100	0.0101		0.0100	0.0098	0.0101	0.0100	2.9%	0.0100
CE410	0.0097	0.0095	0.0095			0.0095	0.0095	0.0097	0.0096	2.5%	0.0100
CE420	0.0093	0.0094	0.0094	0.0094		0.0093	0.0093	0.0094	0.0094	2.0%	0.0093
CE430	0.0093	0.0094	0.0094	0.0095		0.0094	0.0093	0.0095	0.0094	1.9%	0.0094
CE440	0.0092	0.0093	0.0093	0.0093		0.0092	0.0092	0.0093	0.0093	1.9%	0.0092
CE500	0.0098			0.0094	0.0102	0.0107	0.0094	0.0107	0.0100	13.2%	0.0092
CE500 May-Sep	0.0110	0.0114	0.0114	0.0113	0.0113	0.0109	0.0109	0.0114	0.0112	4.5%	0.0110
CE510 May-Sep	0.0114	0.0114	0.0114	0.0113	0.0113	0.0109	0.0109	0.0114	0.0113	4.4%	0.0110
CE520	0.0067			0.0060	0.0070	0.0076	0.0060	0.0076	0.0068	23.1%	0.0060
CE522	0.0082			0.0076	0.0086	0.0090	0.0076	0.0090	0.0083	16.8%	0.0075
CE525	0.0137			0.0138	0.0140	0.0151	0.0137	0.0151	0.0141	9.8%	0.0135
CE530	0.0062			0.0067	0.0058	0.0067	0.0058	0.0067	0.0064	14.4%	0.0029
CE540	0.0045			0.0043	0.0039	0.0046	0.0039	0.0046	0.0043	17.9%	0.0029
CE545	0.0062			0.0067	0.0067	0.0072	0.0062	0.0072	0.0067	14.8%	0.0029

Relative Humidity (%)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE300	48.61	48.26	48.28	48.59	47.83	47.93	47.83	48.61	48.25	1.6%	47.88
CE310	58.33	58.51	58.53	58.55	57.84	57.80	57.80	58.55	58.26	1.3%	57.89
CE320	52.01	51.21	51.25	51.84	51.10	49.94	49.94	52.01	51.22	4.0%	51.38
CE330	50.84	50.58	50.65	51.18	50.08	50.70	50.08	51.18	50.67	2.2%	50.51
CE340	51.09	50.69	50.73	51.15	50.30	50.78	50.30	51.15	50.79	1.7%	50.58
CE350	45.48	45.45	45.55	45.17	44.32	44.56	44.32	45.55	45.09	2.7%	44.62
CE360	41.03	41.49	41.49	42.37	40.87	41.21	40.87	42.37	41.41	3.6%	41.32
CE400	50.77	52.21	52.25	52.55		52.01	50.77	52.55	51.96	3.4%	52.23
CE410	50.50	49.65	49.63			49.75	49.63	50.50	49.88	1.7%	52.23
CE420	48.78	49.14	48.97	49.40		48.76	48.76	49.40	49.01	1.3%	48.78
CE430	48.82	49.17	49.30	49.60		49.17	48.82	49.60	49.21	1.6%	48.98
CE440	48.33	48.46	48.57	48.83		48.23	48.23	48.83	48.48	1.2%	48.20
CE500	66.53			59.20	65.94	63.73	59.20	66.53	63.85	11.5%	57.60
CE500 May-Sep	57.05	57.47	57.47	57.32	57.07	55.13	55.13	57.47	56.92	4.1%	55.48
CE510 May-Sep	54.70	57.36	57.36	57.44	57.06	55.24	54.70	57.44	56.53	4.8%	55.60
CE520	69.87			61.40	70.23	72.17	61.40	72.17	68.42	15.7%	60.79
CE522	68.68			60.75	68.23	68.11	60.75	68.68	66.44	11.9%	59.40
CE525	61.47			54.99	60.14	57.37	54.99	61.47	58.49	11.1%	53.35
CE530	46.73			48.97	41.45	39.60	39.60	48.97	44.19	21.2%	21.34
CE540	48.52			46.31	40.05	43.82	40.05	48.52	44.67	19.0%	30.16
CE545	36.62			38.63	36.87	29.20	29.20	38.63	35.33	26.7%	16.80

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-8. f(ODB) Sensitivity CE500 and CE530, April 30 and June 25 (Energy, Coil Loads)

Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Statistics, All Results				TRACE® 3DP Trane®
							Min	Max	Mean	(Max-Min) /Mean*	
Energy Consumption, Compr. + Both Fans (Wh,e)											
CE500Apr30	3893	3975	3975	4029	3901	4073	3893	4073	3974	4.5%	4021
CE500Jun25	5045	5204	5204	5229	5067	5230	5045	5230	5163	3.6%	5246
Del CE500	1152	1229	1229	1200	1165	1157	1152	1229	1189	6.5%	1225
CE530Apr30	3023	3062	3062	3101	3092	3144	3023	3144	3081	3.9%	3221
CE530Jun25	3894	3978	3978	4029	3935	4043	3894	4043	3976	3.7%	4196
Del CE530	871	916	916	927	843	899	843	927	896	9.4%	975
Energy Consumption, Compressor (Wh,e)											
CE500Apr30	3015	3120	3120		3020	3159	3015	3159	3087	4.7%	
CE500Jun25	4084	4264	4263		4106	4239	4084	4264	4191	4.3%	
Del CE500	1069	1144	1144		1086	1080	1069	1144	1105	6.7%	
CE530Apr30	2311	2390	2390		2378	2411	2311	2411	2376	4.2%	
CE530Jun25	3118	3243	3243		3166	3248	3118	3248	3204	4.1%	
Del CE530	807	853	853		787	837	787	853	827	8.0%	
Energy Consumption, Condenser Fan (Wh,e)											
CE500Apr30	376	389	389		377	391	376	391	385	3.9%	
CE500Jun25	411	426	426		411	424	411	426	420	3.6%	
Del CE500	35	37	37		34	33	33	37	35	12.0%	
CE530Apr30	305	311	311		305	314	305	314	309	3.1%	
CE530Jun25	332	340	340		329	340	329	340	336	3.2%	
Del CE530	28	28	29		24	26	24	29	27	17.0%	
Energy Consumption, Supply Fan (Wh,e)											
CE500Apr30	502	467	466	519	504	522	466	522	497	11.2%	518
CE500Jun25	550	514	514	566	549	566	514	566	543	9.5%	567
Del CE500	47	48	48	47	45	44	44	48	47	8.5%	49
CE530Apr30	407	361	361	412	408	419	361	419	395	14.8%	453
CE530Jun25	444	396	396	450	440	454	396	454	430	13.6%	502
Del CE530	37	35	35	38	32	35	32	38	35	16.0%	49
Sensible + Latent Coil Load (Wh,th)											
CE500Apr30	13186	13733	13733	13655	13170	13673	13170	13733	13525	4.2%	13654
CE500Jun25	13188	13838	13837	13733	13198	13727	13188	13838	13587	4.8%	13735
Del CE500	2	105	104	78	29	54	2	105	62	165.3%	81
CE530Apr30	9353	9721	9721	9775	9365	9798	9353	9798	9622	4.6%	9816
CE530Jun25	9376	9761	9761	9835	9388	9834	9376	9835	9659	4.8%	9888
Del CE530	23	40	39	60	22	36	22	60	37	102.8%	72
Sensible Coil Load (Wh,th)											
CE500Apr30	9375	9925	9925	9884	9365	9902	9365	9925	9729	5.8%	9883
CE500Jun25	9378	9981	9981	9953	9388	9946	9378	9981	9771	6.2%	9954
Del CE500	3	56	56	69	22	44	3	69	42	158.2%	71
CE530Apr30	9353	9721	9721	9775	9365	9798	9353	9798	9622	4.6%	9816
CE530Jun25	9376	9761	9761	9835	9388	9834	9376	9835	9659	4.8%	9888
Del CE530	23	40	39	60	22	36	22	60	37	102.9%	72
Latent Coil Load (Wh,th)											
CE500Apr30	3811	3808	3808	3772	3804	3770	3770	3811	3795	1.1%	3771
CE500Jun25	3810	3856	3856	3781	3810	3780	3780	3856	3816	2.0%	3781
Del CE500	-1	48	48	9	6	10	-1	48	20	242.3%	9
CE530Apr30	0	0	0	0	0	0	0	0	0	----	0
CE530Jun25	0	0	0	0	0	0	0	0	0	----	0
Del CE530	0	0	0	0	0	0	0	0	0	----	0

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-9. f(ODB) Sensitivity CE500 and CE530, April 30 and June 25 (COP2, Zone Conditions)

Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Statistics, All Results				TRACE® 3DP Trane®
							Min	Max	Mean	(Max-Min) /Mean*	
Humidity Ratio (kg/kg)											
CE500Apr30	0.0107	0.0110	0.0110	0.0110	0.0109	0.0160	0.0107	0.0160	0.0118	45.3%	0.0106
CE500Jun25	0.0112	0.0115	0.0115	0.0115	0.0115	0.0110	0.0110	0.0115	0.0114	4.4%	0.0111
Del CE500	0.0005	0.0005	0.0005	0.0005	0.0005	-0.0050	-0.0050	0.0005	-0.0004	1334.8%	0.0005
CE530Apr30	0.0062	0.0071	0.0071	0.0068	0.0055	0.0067	0.0055	0.0071	0.0066	24.6%	0.0029
CE530Jun25	0.0062	0.0078	0.0078	0.0068	0.0055	0.0067	0.0055	0.0078	0.0068	34.2%	0.0029
Del CE530	0.0000	0.0007	0.0007	0.0000	0.0000	0.0000	0.0000	0.0007	0.0002	304.5%	0.0000
COP2											
CE500Apr30	3.845	3.914	3.914	3.850	3.837	3.850	3.837	3.914	3.868	2.0%	3.898
CE500Jun25	2.931	2.951	2.951	2.943	2.921	2.940	2.921	2.951	2.939	1.0%	2.935
Del CE500	-0.914	-0.963	-0.963	-0.907	-0.916	-0.910	-0.963	-0.907	-0.929	6.1%	-0.963
CE530Apr30	3.543	3.599	3.599	3.441	3.460	3.590	3.441	3.599	3.539	4.5%	3.546
CE530Jun25	2.720	2.724	2.724	2.780	2.690	2.740	2.690	2.780	2.730	3.3%	2.677
Del CE530	-0.823	-0.874	-0.875	-0.662	-0.770	-0.850	-0.875	-0.662	-0.809	26.3%	-0.869
ODB (°C)											
CE500Apr30	16.79	16.83	16.83	16.81	16.88	16.96	16.79	16.96	16.85	1.0%	16.81
CE500Jun25	29.52	29.50	29.50	29.52	29.52	29.50	29.50	29.52	29.51	0.1%	29.52
Del CE500	12.73	12.67	12.67	12.70	12.63	12.54	12.54	12.73	12.66	1.5%	12.70
CE530Apr30	16.79	16.83	16.83	16.81	16.88	16.96	16.79	16.96	16.85	1.0%	16.81
CE530Jun25	29.52	29.50	29.50	29.52	29.52	29.50	29.50	29.52	29.51	0.1%	29.52
Del CE530	12.73	12.67	12.67	12.70	12.63	12.54	12.54	12.73	12.66	1.5%	12.70
EDB (°C)											
CE500Apr30	24.64	24.94	24.94	24.98	25.00	25.00	24.64	25.00	24.92	1.4%	24.98
CE500Jun25	24.55	25.00	25.00	24.98	25.00	25.00	24.55	25.00	24.92	1.8%	18.87
Del CE500	-0.09	0.06	0.06	0.00	0.00	0.00	-0.09	0.06	0.00	4740.8%	-6.11
CE530Apr30	24.37	24.94	24.67	25.00	25.00	25.00	24.37	25.00	24.83	2.6%	25.00
CE530Jun25	24.35	24.94	24.94	25.00	25.00	25.00	24.35	25.00	24.87	2.6%	11.45
Del CE530	-0.01	0.00	0.28	0.00	0.00	0.00	-0.01	0.28	0.04	651.2%	-13.55

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-10. Hourly Integrated Maxima (Total Cooling System Energy Consumption and Total Coil Load)

Energy Consumption, Compressor + Both Fans (Wh,e)														Statistics, All Results				TRACE® 3DP							
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour						
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	Trane®	Date	Hour
CE300	11626	20-Jul	15	11564	20-Jul	15	11602	20-Jul	15	11900	20-Jul	15	11932	20-Jul	15	11548	20-Jul	15	11548	11932	11695	3.3%	12003	20-Jul	15
CE310	12594	20-Jul	15	12583	20-Jul	15	12595	20-Jul	15	12541	20-Jul	15	12653	20-Jul	15	12162	16-Aug	16	12162	12653	12521	3.9%	12562	20-Jul	15
CE320	13028	20-Jul	15	12916	20-Jul	15	12981	20-Jul	15	12954	20-Jul	15	13104	20-Jul	15	12875	20-Jul	14	12875	13104	12976	1.8%	12974	20-Jul	15
CE330	13347	20-Jul	15	13212	20-Jul	15	13407	20-Jul	15	13314	20-Jul	15	13467	20-Jul	15	13335	20-Jul	15	13212	13467	13347	1.9%	13358	20-Jul	15
CE340	13181	20-Jul	15	13158	20-Jul	15	13190	20-Jul	15	13134	20-Jul	15	13277	20-Jul	15	13101	20-Jul	14	13101	13277	13174	1.3%	13168	20-Jul	15
CE350	11627	20-Jul	15	11654	20-Jul	15	11602	20-Jul	15	11900	20-Jul	15	11932	20-Jul	15	11546	20-Jul	15	11546	11932	11710	3.3%	12003	20-Jul	15
CE360	12770	20-Jul	15	12736	20-Jul	15	12726	20-Jul	15	12744	20-Jul	15	12863	20-Jul	15	12762	20-Jul	14	12726	12863	12767	1.1%	12778	20-Jul	15
CE400	11628	20-Jul	15	11564	20-Jul	15	11677	18-Sep	15	11900	20-Jul	15				11519	20-Jul	15	11519	11900	11658	3.3%	12003	20-Jul	15
CE410	11628	20-Jul	15	11564	20-Jul	15	11602	20-Jul	15							11549	20-Jul	15	11549	11628	11586	0.7%	12003	20-Jul	15
CE420	11626	20-Jul	15	11564	20-Jul	15	11602	20-Jul	15	11900	20-Jul	15				11548	20-Jul	15	11548	11900	11648	3.0%	12003	20-Jul	15
CE430	11626	20-Jul	15	11564	20-Jul	15	11602	20-Jul	15	11900	20-Jul	15				11548	20-Jul	15	11548	11900	11648	3.0%	12003	20-Jul	15
CE440	11626	20-Jul	15	11564	20-Jul	15	11602	20-Jul	15	11900	20-Jul	15				11461	16-Aug	16	11461	11900	11631	3.8%	12003	20-Jul	15
CE500	10166	20-Jul	15	10431	20-Jul	15	10425	20-Jul	15	10399	20-Jul	15	10177	20-Jul	15	10274	4-Jun	15	10166	10431	10312	2.6%	10440	20-Jul	15
CE510	11205	20-Jul	15	11590	20-Jul	15	11587	20-Jul	15	11410	20-Jul	15	11186	20-Jul	15	11344	20-Jul	14	11186	11590	11387	3.5%	11453	20-Jul	15
CE520	11035	20-Jul	15	10989	20-Jul	15	11014	20-Jul	15	11101	20-Jul	15	11044	20-Jul	15	10684	4-Jun	15	10684	11101	10978	3.8%	11261	20-Jul	15
CE522	10431	20-Jul	15	10972	20-Jul	15	10966	20-Jul	15	10762	20-Jul	15	10639	20-Jul	15	10747	16-Aug	15	10431	10972	10753	5.0%	10904	20-Jul	15
CE525	9367	20-Jul	15	9538	20-Jul	15	9531	20-Jul	15	9570	20-Jul	15	9419	20-Jul	15	9585	16-Aug	15	9367	9585	9502	2.3%	9590	20-Jul	15
CE530	8028	20-Jul	15	8059	20-Jul	15	8055	20-Jul	15	8171	20-Jul	15	7992	20-Jul	15	8089	16-Aug	15	7992	8171	8066	2.2%	8434	20-Jul	15
CE540	8699	20-Jul	15	8943	20-Jul	15	8939	20-Jul	15	8677	20-Jul	15	8846	20-Jul	15	8985	16-Aug	15	8677	8985	8848	3.5%	9110	20-Jul	15
CE545	7205	20-Jul	15	7350	20-Jul	15	7346	20-Jul	15	7763	20-Jul	15	7351	20-Jul	15	7471	4-Jun	15	7205	7763	7414	7.5%	7891	20-Jul	15
Sensible + Latent Coil Load (Wh,th)														Statistics, All Results				TRACE® 3DP							
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour						
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	Trane®	Date	Hour
CE300	32174	08-Jul	15	31401	20-Jul	15	31455	20-Jul	15	32733	20-Jul	15	32502	20-Jul	15	32072	20-Jul	15	31401	32733	32056	4.2%	33084	20-Jul	15
CE310	37328	03-Sep	16	36750	3-Sep	16	37033	3-Sep	16	37126	17-Sep	15	37261	3-Sep	15	36991	3-Sep	16	36750	37328	37082	1.6%	37379	17-Sep	15
CE320	40318	03-Sep	16	53813	2-Oct	9	53823	2-Oct	9	39765	3-Sep	16	39904	3-Sep	16	39920	3-Sep	16	39765	53823	44590	31.5%	39999	2-Oct	10
CE330	43492	02-Oct	9	43628	2-Oct	9	64572	2-Oct	9	43445	2-Oct	9	43978	2-Oct	9	42415	10-Jul	11	42415	64572	46922	47.2%	43602	2-Oct	9
CE340	41652	02-Oct	10	50819	2-Oct	9	59549	2-Oct	9	41328	2-Oct	10	41366	3-Sep	15	41132	3-Sep	16	41132	59549	45974	40.1%	41626	2-Oct	10
CE350	32092	08-Jul	15	31401	20-Jul	15	31454	20-Jul	15	32733	20-Jul	15	32502	20-Jul	15	32077	20-Jul	15	31401	32733	32043	4.2%	33085	20-Jul	15
CE360	38857	02-Oct	10	40613	2-Oct	9	41019	2-Oct	9	38460	2-Oct	11	38322	2-Oct	10	38451	2-Oct	10	38322	41019	39287	6.9%	38665	3-Sep	13
CE400	41179	16-Sep	15	40543	18-Sep	14	49838	18-Sep	15	40728	16-Sep	15				40774	16-Sep	14	40543	49838	42612	21.8%	41114	16-Sep	15
CE410	32092	08-Jul	15	31401	20-Jul	15	31455	20-Jul	15							32073	20-Jul	15	31401	32092	31755	2.2%	41114	16-Sep	15
CE420	32174	08-Jul	15	31401	20-Jul	15	31455	20-Jul	15	32733	20-Jul	15				32072	20-Jul	15	31401	32733	31967	4.2%	33084	20-Jul	15
CE430	32174	08-Jul	15	31401	20-Jul	15	31455	20-Jul	15	32733	20-Jul	15				32072	20-Jul	15	31401	32733	31967	4.2%	33084	20-Jul	15
CE440	32174	08-Jul	15	31401	20-Jul	15	31455	20-Jul	15	32733	20-Jul	15				31777	8-Jul	16	31401	32733	31908	4.2%	33084	20-Jul	15
CE500	27486	28-Oct	15	27707	16-Aug	16	27706	16-Aug	16	27646	29-Jun	16	26567	29-Jun	16	27555	29-Jun	15	26567	27707	27444	4.2%	27662	29-Jun	16
CE510	30593	29-Apr	19	31188	20-Jul	15	31188	20-Jul	15	31178	17-Jun	14	29948	17-Jun	14	31097	17-Jun	13	29948	31188	30865	4.0%	31203	17-Jun	14
CE520	27330	28-Sep	15	27878	14-Aug	16	27878	23-Jul	16	27653	29-Jun	16	26675	20-Jul	16	28343	23-May	15	26675	28343	27626	6.0%	27735	29-Jun	16
CE522	27384	12-Mai	15	27868	16-Aug	16	27866	16-Aug	16	27659	29-Jun	16	26514	29-Jun	16	27636	29-Jun	15	26514	27868	27488	4.9%	27703	29-Jun	16
CE525	27740	26-Jul	16	27466	8-Jul	16	27466	8-Jul	16	27577	29-Jun	16	26683	29-Jun	16	27462	29-Jun	15	26683	27740	27399	3.9%	27571	29-Jun	16
CE530	19834	29-Mai	15	19576	24-Apr	16	19575	24-Apr	16	19639	20-Jul	15	18776	4-Jun	15	19626	8-Jul	15	18776	19834	19504	5.4%	19737	20-Jul	15
CE540	19575	30-Aug	16	19766	24-Apr	16	19766	24-Apr	16	19726	20-Jul	15	18794	4-Jun	15	19799	16-Aug	15	18794	19799	19571	5.1%	19842	20-Jul	15
CE545	20075	17-Jun	16	19475	24-Apr	16	19474	24-Apr	16	19540	20-Jul	15	18764	20-Jul	15	19497	4-Jun	15	18764	20075	19471	6.7%	19639	20-Jul	15

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-11. Hourly Integrated Maxima (Sensible Coil Load and Latent Coil Load)

Sensible Coil Load (Wh,th)													Statistics, All Results				TRACE® 3DP								
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour						
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	Trane®	Date	Hour
CE300	23277	20-Jul	16	23203	20-Jul	15	23205	20-Jul	15	23531	20-Jul	15	23457	20-Jul	15	22908	4-Jun	15	22908	23531	23264	2.7%	23537	20-Jul	15
CE310	23094	10-Sep	15	23080	10-Sep	16	23119	4-Jun	16	23276	11-Jul	16	23078	10-Sep	15	22649	13-Jun	16	22649	23276	23049	2.7%	23218	11-Jul	16
CE320	31316	24-Apr	16	31119	24-Apr	16	31072	24-Apr	16	31972	24-Apr	15	31134	3-Jun	16	30967	24-Apr	15	30967	31972	31263	3.2%	31402	24-Apr	16
CE330	33226	14-Jun	14	33410	14-Jun	14	34490	14-Jun	15	34765	14-Jun	15	33997	24-Apr	16	33421	9-Sep	14	33226	34765	33885	4.5%	34710	14-Jun	14
CE340	32829	24-Apr	15	32086	16-May	16	32086	16-May	16	32888	24-Apr	15	32940	24-Apr	16	32180	24-Apr	15	32086	32940	32501	2.6%	32637	16-May	16
CE350	23278	29-Jul	15	23203	20-Jul	15	23205	20-Jul	15	23531	20-Jul	15	23457	20-Jul	15	22876	10-Jul	15	22876	23531	23258	2.8%	23539	20-Jul	15
CE360	32061	24-Apr	16	32111	24-Apr	16	32065	24-Apr	16	32621	24-Apr	16	31981	24-Apr	16	32179	24-Apr	15	31981	32621	32170	2.0%	32417	24-Apr	16
CE400	23278	29-Jul	15	23203	20-Jul	15	23205	20-Jul	15	23531	20-Jul	15				22877	8-Jul	16	22877	23531	23219	2.8%	23537	20-Jul	15
CE410	23266	10-Sep	16	23203	20-Jul	15	23205	20-Jul	15							22893	29-Jul	15	22893	23266	23142	1.6%	23537	20-Jul	15
CE420	23277	20-Jul	16	23203	20-Jul	15	23205	20-Jul	15	23531	20-Jul	15				22893	29-Jul	15	22893	23531	23222	2.7%	23537	20-Jul	15
CE430	23277	20-Jul	16	23203	20-Jul	15	23205	20-Jul	15	23531	20-Jul	15				22893	29-Jul	15	22893	23531	23222	2.7%	23537	20-Jul	15
CE440	23277	20-Jul	16	23203	20-Jul	15	23205	20-Jul	15	23531	20-Jul	15				22875	16-Aug	16	22875	23531	23218	2.8%	23537	20-Jul	15
CE500	19549	28-Oct	15	20009	4-Jun	16	20008	10-Sep	16	19849	20-Jul	15	18776	4-Jun	15	19818	29-Jul	15	18776	20009	19668	6.3%	19854	20-Jul	15
CE510	21729	29-Apr	19	22513	11-Jul	15	22513	11-Jul	15	22290	20-Jul	15	21121	4-Jun	13	22269	20-Jul	14	21121	22513	22073	6.3%	22293	29-Jul	17
CE520	19416	28-Sep	15	20159	26-May	16	20154	26-May	16	19999	20-Jul	15	18969	20-Jul	16	20378	23-May	15	18969	20378	19846	7.1%	20066	30-Jul	16
CE522	19489	12-Mai	15	20137	11-Jul	16	20135	11-Jul	16	19934	20-Jul	15	18785	4-Jun	15	19920	16-Aug	15	18785	20137	19733	6.9%	19955	20-Jul	15
CE525	19703	26-Jul	16	19850	24-Apr	16	19850	24-Apr	16	19664	20-Jul	15	18759	4-Jun	15	19661	4-Jun	15	18759	19850	19581	5.6%	19667	20-Jul	15
CE530	19834	29-Mai	15	19576	24-Apr	16	19575	24-Apr	16	19639	20-Jul	15	18776	4-Jun	15	19626	8-Jul	15	18776	19834	19504	5.4%	19737	20-Jul	15
CE540	19575	30-Aug	16	19766	24-Apr	16	19766	24-Apr	16	19726	20-Jul	15	18794	4-Jun	15	19799	16-Aug	15	18794	19799	19571	5.1%	19842	20-Jul	15
CE545	20075	17-Jun	16	19475	24-Apr	16	19474	24-Apr	16	19540	20-Jul	15	18759	4-Jun	15	19497	4-Jun	15	18759	20075	19470	6.8%	19639	20-Jul	15

Latent Coil Load (Wh,th)													Statistics, All Results				TRACE® 3DP								
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour						
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	Trane®	Date	Hour
CE300	9636	03-Sep	16	9304	3-Sep	15	9394	3-Sep	15	10235	10-Jul	13	10375	3-Sep	15	10392	3-Sep	15	9304	10392	9889	11.0%	10553	10-Jul	13
CE310	15907	03-Sep	15	15139	3-Sep	15	15270	3-Sep	15	16275	4-Aug	15	16112	4-Aug	15	16077	3-Sep	16	15139	16275	15797	7.2%	16564	4-Aug	15
CE320	23147	02-Oct	10	31497	2-Oct	9	31503	2-Oct	9	22195	2-Oct	10	21697	17-Sep	12	21929	1-Oct	20	21697	31503	25328	38.7%	22652	2-Oct	10
CE330	27825	18-Sep	16	26941	18-Sep	15	40809	2-Oct	9	27134	18-Sep	16	28184	18-Sep	15	27488	18-Sep	15	26941	40809	29730	46.6%	27597	18-Sep	16
CE340	24848	02-Oct	9	30451	2-Oct	9	36011	2-Oct	9	23911	2-Oct	10	24225	3-Sep	17	23794	1-Oct	20	23794	36011	27207	44.9%	24431	2-Oct	10
CE350	9751	01-Oct	13	9303	3-Sep	15	9393	3-Sep	15	10235	10-Jul	13	10755	2-Oct	8	11603	3-Aug	7	9303	11603	10173	22.6%	10554	10-Jul	13
CE360	9275	02-Oct	10	10026	2-Oct	9	10336	2-Oct	9	8520	2-Oct	11	8859	3-Sep	17	8934	3-Sep	17	8520	10336	9325	19.5%	12072	24-Apr	1
CE400	27075	16-Sep	15	25578	18-Sep	14	32396	18-Sep	15	26317	16-Sep	14				26645	16-Sep	14	25578	32396	27602	24.7%	26787	16-Sep	14
CE410	11139	16-Sep	15	9304	3-Sep	15	9391	3-Sep	15							10377	9-Sep	15	9304	11139	10053	18.3%	26787	16-Sep	14
CE420	9751	01-Oct	13	9304	3-Sep	15	9394	3-Sep	15	10235	10-Jul	13				10394	3-Sep	15	9304	10394	9816	11.1%	10553	10-Jul	13
CE430	9636	03-Sep	16	11105	24-Oct	14	11101	21-May	15	11074	24-Oct	13				10394	3-Sep	15	9636	11105	10662	13.8%	11419	24-Oct	13
CE440	9636	03-Sep	16	9304	3-Sep	15	9391	3-Sep	15	10235	10-Jul	13				10139	3-Sep	15	9304	10235	9741	9.6%	10553	10-Jul	13
CE500	7965	06-Oct	15	7733	3-Sep	15	7733	3-Sep	15	7839	29-Jun	16	7805	29-Jun	16	7762	29-Jun	15	7733	7965	7806	3.0%	7852	29-Jun	16
CE510	8893	15-Sep	11	8723	2-Oct	9	8723	2-Oct	9	8955	17-Jun	14	8850	17-Jun	14	8874	17-Jun	13	8723	8955	8836	2.6%	8977	20-Apr	1
CE520	7914	28-Sep	15	7785	3-Sep	15	7785	3-Sep	15	7699	29-Jun	16	7726	30-Jun	16	7964	23-May	15	7699	7964	7812	3.4%	7737	29-Jun	16
CE522	7907	02-Mai	15	7760	3-Sep	15	7760	3-Sep	15	7770	29-Jun	16	7743	29-Jun	16	7745	29-Jun	15	7743	7907	7781	2.1%	7798	29-Jun	16
CE525	8037	26-Jul	16	7663	3-Sep	15	7663	3-Sep	15	7947	29-Jun	16	7938	29-Jun	16	7820	29-Jun	15	7663	8037	7845	4.8%	7938	29-Jun	16
CE530	0	18-Jan	16	0	0-Jan	0	0	0-Jan	0	1	16-Mar	10	179	11-Mar	11	36	1-Nov	20	0	179	36	497.3%	0	1-Jan	1
CE540	627	11-Mar	10	0	0-Jan	0	0	0-Jan	0	1655	11-Mar	10	845	11-Mar	10	1181	11-Mar	10	0	1655	718	230.5%	0	1-Jan	1
CE545	0	01-Jul	16	0	0-Jan	0	0	0-Jan	0	0	23-May	15	4	20-Jul	15	0	1-Jan	1	0	4	1	600.0%	0	1-Jan	1

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-12. Hourly Integrated Maxima and Minima (COP2)

Maximum COP2													Statistics, All Results				TRACE® 3DP								
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour						
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	Trane®	Date	Hour
CE300	4.168	16-Apr	3	3.869	30-Apr	16	3.857	30-Apr	16	3.925	30-Apr	15	3.871	30-Apr	16	3.880	30-Apr	16	3.857	4.168	3.928	7.9%	4.085	15-Oct	6
CE310	4.143	30-Apr	15	4.141	30-Apr	16	4.128	30-Apr	16	4.173	30-Apr	15	4.128	30-Apr	15	4.120	30-Apr	15	4.120	4.173	4.139	1.3%	4.424	15-Oct	6
CE320	4.168	16-Apr	3	5.143	2-Oct	9	4.967	2-Oct	9	3.940	16-Sep	15	3.943	16-Sep	15	4.380	18-Dec	3	3.940	5.143	4.424	27.2%	4.152	15-Oct	6
CE330	4.168	16-Apr	3	4.109	17-Jun	16	5.595	2-Oct	9	4.071	16-Sep	14	4.122	17-Jun	16	4.050	17-Jun	16	4.050	5.595	4.353	35.5%	4.102	16-Sep	14
CE340	4.168	16-Apr	3	4.621	2-Oct	9	5.339	2-Oct	9	3.987	16-Sep	15	4.017	16-Sep	16	3.950	16-Sep	16	3.950	5.339	4.347	32.0%	4.085	15-Oct	6
CE350	4.168	16-Apr	3	3.889	27-Apr	5	3.863	5-Oct	3	4.555	13-Oct	1	3.932	4-Oct	24	3.880	30-Apr	16	3.863	4.555	4.048	17.1%	4.019	6-Nov	24
CE360	4.401	05-Oct	1	4.428	4-Oct	24	4.427	4-Oct	24	4.455	4-Oct	24	4.432	4-Oct	24	4.440	4-Oct	24	4.401	4.455	4.431	1.2%	4.791	15-Oct	6
CE400	4.077	16-Sep	15	4.088	17-Jun	16	4.776	18-Sep	15	4.071	16-Sep	14				4.050	17-Jun	16	4.050	4.776	4.212	17.2%	4.102	16-Sep	14
CE410	3.888	30-Apr	15	3.903	30-Apr	15	3.855	30-Apr	16							3.840	21-May	15	3.840	3.903	3.871	1.6%	4.102	16-Sep	14
CE420	3.781	27-Sep	16	3.807	21-May	15	3.759	27-Sep	15	3.821	21-May	15				3.940	21-May	13	3.759	3.940	3.822	4.7%	3.986	15-Oct	6
CE430	3.781	27-Sep	16	3.805	24-Oct	15	3.759	27-Sep	15	3.793	21-May	16				3.930	30-Apr	13	3.759	3.930	3.814	4.5%	3.986	15-Oct	6
CE440	3.883	12-Dec	7	3.774	27-Sep	15	3.759	27-Sep	15	3.802	21-May	15				3.810	30-Apr	15	3.759	3.883	3.806	3.3%	3.986	15-Oct	6
CE500	4.275	13-Oct	1	7.367	11-Mar	10	5.301	13-Oct	9	4.198	16-Mar	10	4.185	16-Mar	10	4.140	30-Apr	16	4.140	7.367	4.911	65.7%	4.618	6-Nov	24
CE510	4.693	05-Oct	1	7.367	11-Mar	10	5.301	13-Oct	9	4.685	5-Oct	1	4.690	4-Oct	24	4.530	4-May	3	4.530	7.367	5.211	54.4%	4.992	20-Apr	5
CE520	3.814	30-Apr	15	4.896	16-Mar	10	4.652	16-Mar	10	3.938	30-Apr	15	3.802	30-Apr	16	3.840	30-Apr	16	3.802	4.896	4.157	26.3%	4.150	6-Nov	24
CE522	3.986	16-Mar	10	6.233	11-Mar	10	5.678	11-Mar	10	4.042	30-Apr	15	3.986	30-Apr	16	4.000	30-Apr	16	3.986	6.233	4.654	48.3%	4.386	6-Nov	24
CE525	4.718	13-Oct	1	6.325	12-Apr	9	6.031	16-Mar	10	4.704	16-Mar	10	4.638	16-Mar	10	4.400	16-Mar	10	4.400	6.325	5.136	37.5%	5.058	6-Nov	24
CE530	4.006	02-Nov	1	3.981	11-Mar	10	3.850	13-Oct	9	3.925	16-Mar	10	3.840	16-Mar	10	3.880	16-Mar	10	3.840	4.006	3.914	4.2%	4.223	6-Nov	24
CE540	3.456	30-Apr	15	3.456	30-Apr	16	3.455	30-Apr	16	3.696	16-Mar	10	3.667	11-Mar	22	3.690	17-Oct	5	3.455	3.696	3.570	6.7%	3.834	6-Nov	24
CE545	4.250	16-Mar	10	4.275	16-Mar	10	4.428	16-Mar	10	4.166	16-Mar	10	4.156	16-Mar	10	4.170	16-Mar	10	4.156	4.428	4.241	6.4%	4.565	6-Nov	24

Minimum COP2													Statistics, All Results				TRACE® 3DP								
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour						
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	Trane®	Date	Hour
CE300	2.793	24-Apr	17	2.798	1-Dec	14	2.801	1-Dec	12	2.782	13-Jun	17	2.786	13-Jun	17	2.810	14-Jun	12	2.782	2.810	2.795	1.0%	2.775	13-Jun	17
CE310	2.865	01-Dec	15	2.850	1-Dec	14	2.851	1-Dec	12	2.893	1-Dec	15	2.873	1-Dec	15	2.870	1-Dec	14	2.850	2.893	2.867	1.5%	2.868	1-Dec	15
CE320	2.825	31-Mar	14	2.801	1-Dec	14	2.805	1-Dec	15	2.842	31-Mar	15	2.815	31-Mar	15	2.830	31-Mar	14	2.801	2.842	2.820	1.4%	2.823	31-Mar	15
CE330	2.825	31-Mar	14	2.798	1-Dec	14	2.801	1-Dec	12	2.844	31-Mar	15	2.823	31-Mar	15	2.840	31-Mar	14	2.798	2.844	2.822	1.6%	2.829	31-Mar	15
CE340	2.825	31-Mar	14	2.798	1-Dec	14	2.801	1-Dec	12	2.844	31-Mar	15	2.823	31-Mar	15	2.840	31-Mar	14	2.798	2.844	2.822	1.6%	2.829	31-Mar	15
CE350	2.790	24-Apr	17	2.798	1-Dec	14	2.801	1-Dec	12	2.782	13-Jun	17	2.786	13-Jun	17	2.810	14-Jun	12	2.782	2.810	2.794	1.0%	2.775	13-Jun	17
CE360	2.825	31-Mar	14	2.799	1-Dec	14	2.801	1-Dec	12	2.844	31-Mar	15	2.823	31-Mar	15	2.840	31-Mar	14	2.799	2.844	2.822	1.6%	2.829	31-Mar	15
CE400	2.782	31-Mar	19	2.734	3-Dec	15	2.735	3-Dec	13	2.782	13-Jun	17				2.810	14-Jun	12	2.734	2.810	2.768	2.7%	2.775	13-Jun	17
CE410	2.786	24-Apr	17	2.798	1-Dec	14	2.801	1-Dec	12							2.810	14-Jun	12	2.786	2.810	2.799	0.9%	2.775	13-Jun	17
CE420	2.793	24-Apr	17	2.798	1-Dec	14	2.801	1-Dec	12	2.782	13-Jun	17				2.810	14-Jun	12	2.782	2.810	2.797	1.0%	2.775	13-Jun	17
CE430	2.771	30-Mar	19	2.734	3-Dec	13	2.735	3-Dec	13	2.782	13-Jun	17				2.810	14-Jun	12	2.734	2.810	2.766	2.7%	2.775	13-Jun	17
CE440	2.782	31-Mar	19	2.734	3-Dec	13	2.735	3-Dec	13	2.782	13-Jun	17				2.810	8-Apr	13	2.734	2.810	2.769	2.7%	2.775	13-Jun	17
CE500	2.685	30-Jul	12	2.693	29-Jul	12	2.652	30-Mar	17	2.705	30-Jul	12	2.666	30-Jul	12	2.710	29-Jul	12	2.652	2.710	2.685	2.2%	2.694	30-Jul	12
CE510	2.888	31-Mar	15	2.817	5-Apr	17	2.652	30-Mar	17	2.865	31-Mar	18	2.882	31-Mar	15	2.900	31-Mar	14	2.652	2.900	2.834	8.8%	2.985	5-Apr	13
CE520	2.442	30-Jul	12	2.463	5-Apr	17	2.394	5-Apr	17	2.532	30-Jul	12	2.333	29-Jan	10	2.470	30-Jul	12	2.333	2.532	2.439	8.1%	2.462	30-Jul	12
CE522	2.569	08-Jul	17	2.572	29-Jul	12	2.562	31-Mar	17	2.613	30-Jul	12	2.429	30-Mar	17	2.590	29-Jul	12	2.429	2.613	2.556	7.2%	2.577	30-Jul	12
CE525	2.911	14-Jul	17	2.939	30-Jul	12	2.814	31-Mar	17	2.940	30-Jul	12	2.894	29-Jul	12	2.900	29-Jul	12	2.814	2.940	2.900	4.3%	2.933	30-Jul	12
CE530	2.501	30-Jul	12	2.495	29-Jul	12	2.498	29-Jul	12	2.532	30-Jul	12	2.473	29-Jul	12	2.520	29-Jul	12	2.473	2.532	2.503	2.3%	2.464	30-Jul	12
CE540	2.253	30-Jul	12	2.261	29-Jul	12	2.262	30-Jul	12	2.383	30-Jul	12	2.143	5-Apr	20	2.280	29-Jul	12	2.143	2.383	2.264	10.6%	2.275	30-Jul	12
CE545	2.733	14-Jul	17	2.720	29-Jul	12	2.722	30-Jul	12	2.660	30-Jul	12	2.692	29-Jul	12	2.720	29-Jul	12	2.660	2.733	2.708	2.7%	2.636	30-Jul	12

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-13. Hourly Integrated Maxima and Minima (IDB)

Maximum IDB (°C)														Statistics, All Results				TRACE® 3DP							
TRNSYS				DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour					
Case	TUD	Date	Hour	NREL	Date Hour	NREL	Date Hour	GARD	Date Hour	UR	Date Hour	NRCan	Date Hour	Min	Max	Mean	/Mean*								
CE300	26.20	07-Jul	15	25.11	22-Apr	15	25.11	22-Apr	15	25.00	23-Sep	8	25.05	21-Feb	17	26.19	3-Nov	15	25.00	26.20	25.44	4.7%	25.00	23-Sep	8
CE310	27.08	20-Jul	15	26.89	20-Jul	16	26.72	20-Jul	16	26.47	20-Jul	16	26.62	20-Jul	15	27.19	8-Jul	15	26.47	27.19	26.83	2.7%	26.55	20-Jul	16
CE320	32.36	20-Jul	15	31.61	8-Jul	16	31.50	8-Jul	16	31.71	20-Jul	15	32.32	20-Jul	15	31.65	8-Jul	15	31.50	32.36	31.86	2.7%	31.80	20-Jul	15
CE330	32.23	20-Jul	15	31.72	8-Jul	16	32.00	20-Jul	16	31.07	8-Jul	16	31.90	20-Jul	15	31.30	8-Jul	15	31.07	32.23	31.70	3.7%	31.57	20-Jul	15
CE340	32.31	20-Jul	15	31.61	8-Jul	16	31.56	8-Jul	16	31.50	20-Jul	15	32.15	20-Jul	15	31.58	8-Jul	15	31.50	32.31	31.78	2.5%	31.74	20-Jul	15
CE350	34.58	01-Oct	24	34.94	23-Jun	24	34.94	24-Jun	24	35.00	1-Oct	2	35.00	21-Apr	1	35.00	21-Apr	2	34.58	35.00	34.91	1.2%	35.00	14-Jun	7
CE360	33.76	10-Jul	13	32.78	20-Jul	15	32.56	20-Jul	16	32.51	10-Jul	13	33.00	20-Jul	15	33.13	10-Jul	12	32.51	33.76	32.96	3.8%	32.81	10-Jul	13
CE400	27.11	16-Sep	15	27.56	16-Sep	16	28.83	18-Sep	16	26.91	16-Sep	16				26.04	15-Aug	15	26.04	28.83	27.29	10.2%	26.95	16-Sep	15
CE410	26.83	23-Oct	15	25.11	22-Apr	15	25.11	22-Apr	15							26.19	3-Nov	15	25.11	26.83	25.81	6.6%	26.95	16-Sep	15
CE420	26.20	07-Jul	15	25.11	22-Apr	15	25.11	22-Apr	15	25.00	23-Sep	8				26.23	20-Oct	15	25.00	26.23	25.53	4.8%	25.00	23-Sep	8
CE430	27.20	01-Nov	16	25.11	22-Apr	15	25.11	22-Apr	15	25.00	18-May	19				26.45	23-Oct	15	25.00	27.20	25.77	8.5%	25.00	24-Apr	20
CE440	27.05	28-Apr	15	25.11	22-Apr	15	25.11	22-Apr	15	25.00	24-Apr	19				26.26	23-Oct	15	25.00	27.05	25.71	7.9%	25.00	24-Apr	19
CE500	25.81	30-Apr	15	25.11	21-Apr	16	25.11	21-Apr	16	25.00	31-Mar	18	25.02	30-Mar	17	25.00	11-Mar	11	25.00	25.81	25.17	3.2%	25.00	5-Apr	19
CE510	26.10	09-Jul	15	25.11	21-Apr	3	25.11	21-Apr	3	25.00	31-Mar	18	25.02	30-Mar	17	25.00	24-Apr	12	25.00	26.10	25.22	4.4%	25.00	5-Apr	19
CE520	16.12	15-Aug	15	16.11	16-Aug	16	15.94	10-Jul	16	15.00	16-Apr	1	15.98	20-Jul	15	18.62	4-Jun	16	15.00	18.62	16.30	22.2%	15.27	20-Jul	16
CE522	21.01	16-Jul	15	20.11	21-Apr	15	20.11	21-Apr	15	20.00	16-Apr	20	20.05	13-Mar	22	20.93	21-Apr	15	20.00	21.01	20.37	5.0%	20.01	2-Apr	5
CE525	36.08	10-Mai	16	35.06	21-Apr	16	35.06	21-Apr	16	35.00	11-Mar	12	35.00	11-Mar	10	35.00	11-Mar	11	35.00	36.08	35.20	3.1%	34.99	14-Jun	8
CE530	26.12	04-Jun	15	25.06	21-Apr	16	25.06	21-Apr	16	25.00	30-Mar	17	25.02	30-Mar	17	25.00	11-Mar	11	25.00	26.12	25.21	4.4%	25.01	23-Apr	21
CE540	16.15	21-Sep	16	15.11	31-May	16	15.11	31-May	16	15.00	25-Mar	8	15.05	28-Jan	20	15.00	11-Mar	10	15.00	16.15	15.24	7.5%	15.01	15-Apr	24
CE545	35.67	20-Jul	15	35.00	21-Apr	15	35.00	21-Apr	15	35.00	9-Jul	22	35.00	11-Mar	10	35.00	11-Mar	11	35.00	35.67	35.11	1.9%	35.00	14-Jul	18

Minimum IDB (°C)														Statistics, All Results				TRACE® 3DP							
TRNSYS				DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour					
Case	TUD	Date	Hour	NREL	Date Hour	NREL	Date Hour	GARD	Date Hour	UR	Date Hour	NRCan	Date Hour	Min	Max	Mean	/Mean*								
CE300	7.93	06-Jan	6	8.89	6-Jan	6	8.83	6-Jan	6	8.72	6-Jan	6	8.00	6-Jan	5	6.99	6-Jan	5	6.99	8.89	8.23	23.1%	8.77	6-Jan	6
CE310	7.93	06-Jan	6	8.89	6-Jan	6	8.83	6-Jan	6	8.72	6-Jan	6	8.00	6-Jan	5	6.99	6-Jan	5	6.99	8.89	8.23	23.1%	8.77	6-Jan	6
CE320	7.93	06-Jan	6	10.83	6-Jan	7	10.78	6-Jan	7	7.75	6-Jan	6	8.00	6-Jan	5	6.99	6-Jan	5	6.99	10.83	8.71	44.1%	7.84	6-Jan	6
CE330	7.93	06-Jan	6	8.89	6-Jan	6	8.83	6-Jan	6	8.72	6-Jan	6	8.00	6-Jan	5	6.99	6-Jan	5	6.99	8.89	8.23	23.1%	8.77	6-Jan	6
CE340	7.93	06-Jan	6	8.89	6-Jan	6	8.83	6-Jan	6	8.72	6-Jan	6	8.00	6-Jan	5	6.99	6-Jan	5	6.99	8.89	8.23	23.1%	8.77	6-Jan	6
CE350	7.93	06-Jan	6	8.89	6-Jan	6	8.83	6-Jan	6	8.72	6-Jan	6	8.00	6-Jan	5	6.99	6-Jan	5	6.99	8.89	8.23	23.1%	8.77	6-Jan	6
CE360	7.93	06-Jan	6	8.89	6-Jan	6	8.83	6-Jan	6	8.72	6-Jan	6	8.00	6-Jan	5	6.99	6-Jan	5	6.99	8.89	8.23	23.1%	8.77	6-Jan	6
CE400	7.93	06-Jan	6	8.89	6-Jan	6	8.83	6-Jan	6	8.72	6-Jan	6	8.00	6-Jan	5	6.99	6-Jan	5	6.99	8.89	8.27	23.0%	8.77	6-Jan	6
CE410	7.93	06-Jan	6	8.89	6-Jan	6	8.83	6-Jan	6							6.99	6-Jan	5	6.99	8.89	8.16	23.3%	8.77	6-Jan	6
CE420	7.93	06-Jan	6	8.89	6-Jan	6	8.83	6-Jan	6	8.72	6-Jan	6				6.99	6-Jan	5	6.99	8.89	8.27	23.0%	8.77	6-Jan	6
CE430	7.93	06-Jan	6	8.89	6-Jan	6	8.83	6-Jan	6	8.72	6-Jan	6				6.99	6-Jan	5	6.99	8.89	8.27	23.0%	8.77	6-Jan	6
CE440	7.93	06-Jan	6	8.89	6-Jan	6	8.83	6-Jan	6	8.72	6-Jan	6				7.00	6-Jan	5	7.00	8.89	8.27	22.8%	8.77	6-Jan	6
CE500	8.43	20-Dec	22	8.17	20-Dec	12	7.94	20-Dec	11	8.94	21-Dec	2	8.54	20-Dec	20	24.04	15-Apr	5	7.94	24.04	11.01	146.2%	9.07	21-Dec	2
CE510	8.43	20-Dec	22	8.17	20-Dec	12	7.94	20-Dec	11	8.94	21-Dec	2	8.54	20-Dec	20	24.04	15-Apr	5	7.94	24.04	11.01	146.2%	9.07	21-Dec	2
CE520	8.31	20-Dec	22	8.11	20-Dec	12	7.89	20-Dec	12	8.83	21-Dec	1	8.51	20-Dec	20	13.57	1-Nov	7	7.89	13.57	9.20	61.7%	8.93	21-Dec	2
CE522	8.41	20-Dec	22	8.17	20-Dec	12	7.94	20-Dec	11	8.90	21-Dec	1	8.54	20-Dec	20	15.98	12-Apr	19	7.94	15.98	9.66	83.3%	9.01	21-Dec	2
CE525	8.44	20-Dec	22	8.17	20-Dec	13	7.94	20-Dec	12	9.01	21-Dec	2	8.54	20-Dec	20	33.01	1-Apr	8	7.94	33.01	12.52	200.2%	9.17	21-Dec	2
CE530	8.42	20-Dec	22	8.17	20-Dec	12	7.94	20-Dec	11	8.94	21-Dec	2	8.54	20-Dec	20	24.04	15-Apr	5	7.94	24.04	11.01	146.3%	9.07	21-Dec	2
CE540	8.23	20-Dec	22	8.11	20-Dec	12	7.89	20-Dec	12	8.83	21-Dec	1	8.51	20-Dec	20	14.95	19-Dec	1	7.89	14.95	9.42	74.9%	8.93	21-Dec	2
CE545	8.45	20-Dec	22	8.17	20-Dec	13	7.94	20-Dec	12	9.01	21-Dec	2	8.54	20-Dec	20	33.01	1-Apr	8	7.94	33.01	12.52	200.2%	9.16	21-Dec	2

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-14. Hourly Integrated Maxima and Minima (Zone Humidity Ratio)

Maximum Humidity Ratio													Statistics, All Results				TRACE® 3DP								
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour						
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	Trane®	Date	Hour
CE300	0.0133	16-Nov	17	0.0138	16-Nov	16	0.0137	16-Nov	16	0.0136	16-Nov	17	0.0135	16-Nov	16	0.0134	16-Nov	16	0.0133	0.0138	0.0135	3.8%	0.0138	23-Apr	7
CE310	0.0158	01-Oct	23	0.0188	15-Oct	9	0.0189	15-Oct	9	0.0156	1-Oct	8	0.0154	2-Oct	8	0.0157	2-Oct	8	0.0154	0.0189	0.0167	20.8%	0.0155	1-Oct	8
CE320	0.0180	10-Jul	13	0.0177	10-Jul	12	0.0176	10-Jul	12	0.0178	10-Jul	13	0.0175	10-Jul	12	0.0177	10-Jul	12	0.0175	0.0180	0.0177	2.7%	0.0177	1-Oct	11
CE330	0.0177	10-Jul	12	0.0178	2-Oct	9	0.0177	10-Jul	13	0.0179	10-Jul	12	0.0170	10-Jul	13	0.0177	10-Jul	12	0.0170	0.0179	0.0176	5.0%	0.0178	10-Jul	12
CE340	0.0179	10-Jul	13	0.0177	10-Jul	12	0.0174	10-Jul	12	0.0178	10-Jul	12	0.0173	10-Jul	13	0.0177	10-Jul	12	0.0173	0.0179	0.0176	3.4%	0.0177	10-Jul	12
CE350	0.0168	01-Oct	24	0.0199	2-Aug	22	0.0199	2-Aug	22	0.0172	2-Oct	1	0.0165	2-Oct	2	0.0166	2-Oct	1	0.0165	0.0199	0.0178	19.2%	0.0169	2-Oct	1
CE360	0.0134	10-Jul	13	0.0138	16-Nov	16	0.0137	16-Nov	16	0.0139	10-Jul	13	0.0135	16-Nov	16	0.0134	16-Nov	16	0.0134	0.0139	0.0136	3.4%	0.0138	23-Apr	7
CE400	0.0169	05-Apr	22	0.0170	5-Apr	21	0.0170	5-Apr	21	0.0169	5-Apr	22				0.0173	22-Apr	6	0.0169	0.0173	0.0170	2.5%	0.0176	23-Apr	5
CE410	0.0168	05-Apr	22	0.0169	2-Apr	5	0.0169	2-Apr	5							0.0173	22-Apr	6	0.0168	0.0173	0.0170	2.7%	0.0176	23-Apr	5
CE420	0.0143	02-Apr	10	0.0147	1-Apr	21	0.0141	17-Apr	3	0.0146	2-Apr	18				0.0147	2-Apr	18	0.0141	0.0147	0.0145	4.1%	0.0146	2-Apr	18
CE430	0.0162	02-Apr	5	0.0156	2-Apr	4	0.0156	2-Apr	4	0.0161	2-Apr	5				0.0158	2-Apr	5	0.0156	0.0162	0.0159	4.0%	0.0161	2-Apr	5
CE440	0.0133	16-Nov	17	0.0138	16-Nov	16	0.0137	16-Nov	16	0.0136	16-Nov	17				0.0134	16-Nov	16	0.0133	0.0138	0.0136	3.6%	0.0138	23-Apr	7
CE500	0.0117	11-Jul	15	0.0119	20-Jul	15	0.0118	6-Apr	10	0.0117	20-Jul	15	0.0117	20-Jul	15	0.0115	11-Mar	10	0.0115	0.0119	0.0117	3.4%	0.0113	20-Jul	15
CE510	0.0119	07-Sep	15	0.0119	20-Jul	15	0.0119	20-Jul	15	0.0117	20-Jul	15	0.0117	20-Jul	15	0.0115	11-Mar	10	0.0115	0.0119	0.0118	3.4%	0.0114	20-Jul	15
CE520	0.0075	07-Sep	15	0.0077	10-Jul	16	0.0078	29-Mar	10	0.0070	20-Jul	15	0.0076	20-Jul	15	0.0106	5-Jan	16	0.0070	0.0106	0.0080	44.5%	0.0071	20-Jul	16
CE522	0.0094	20-Jul	16	0.0095	4-Jun	15	0.0138	6-Apr	10	0.0091	20-Jul	15	0.0094	20-Jul	15	0.0107	1-Jan	2	0.0091	0.0138	0.0103	45.4%	0.0090	20-Jul	15
CE525	0.0179	10-Mai	16	0.0180	20-Jul	15	0.0180	20-Jul	15	0.0185	20-Jul	15	0.0176	20-Jul	15	0.0173	20-Jul	15	0.0173	0.0185	0.0179	6.6%	0.0178	20-Jul	15
CE530	0.0070	01-Jan	1	0.0081	20-Jul	15	0.0081	20-Jul	15	0.0068	11-Mar	1	0.0055	1-Apr	1	0.0068	26-Oct	9	0.0055	0.0081	0.0070	37.1%	0.0029	31-Dec	19
CE540	0.0061	01-Jan	1	0.0050	4-Jun	13	0.0063	8-Apr	8	0.0068	11-Mar	1	0.0033	1-Apr	1	0.0063	11-Mar	9	0.0033	0.0068	0.0056	62.6%	0.0029	31-Dec	19
CE545	0.0070	01-Jan	1	0.0122	20-Jul	15	0.0122	20-Jul	15	0.0068	31-Dec	7	0.0067	1-Apr	1	0.0076	5-Nov	9	0.0067	0.0122	0.0087	63.0%	0.0029	31-Dec	20

Minimum Humidity Ratio													Statistics, All Results				TRACE® 3DP								
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour						
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	Trane®	Date	Hour
CE300	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24	0.0019	11-Jan	3	0.0020	11-Jan	3	0.0020	5-Jan	6	0.0017	0.0020	0.0019	14.5%	0.0019	11-Jan	3
CE310	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24	0.0019	5-Jan	7	0.0020	5-Jan	7	0.0020	5-Jan	7	0.0017	0.0020	0.0019	17.1%	0.0019	5-Jan	7
CE320	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24	0.0019	11-Jan	3	0.0020	11-Jan	3	0.0020	5-Jan	6	0.0017	0.0020	0.0019	14.5%	0.0019	11-Jan	3
CE330	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24	0.0019	11-Jan	3	0.0020	11-Jan	3	0.0020	5-Jan	6	0.0017	0.0020	0.0019	14.5%	0.0019	11-Jan	3
CE340	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24	0.0019	11-Jan	3	0.0020	11-Jan	3	0.0020	5-Jan	6	0.0017	0.0020	0.0019	14.5%	0.0019	11-Jan	3
CE350	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24	0.0019	11-Jan	3	0.0020	11-Jan	3	0.0020	5-Jan	6	0.0017	0.0020	0.0019	14.5%	0.0019	11-Jan	3
CE360	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24	0.0019	11-Jan	3	0.0020	11-Jan	3	0.0020	5-Jan	6	0.0017	0.0020	0.0019	14.5%	0.0019	11-Jan	3
CE400	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24	0.0019	11-Jan	3	0.0020	11-Jan	3	0.0020	5-Jan	6	0.0017	0.0020	0.0018	14.7%	0.0019	11-Jan	3
CE410	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24							0.0020	5-Jan	6	0.0017	0.0020	0.0018	14.9%	0.0019	11-Jan	3
CE420	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24	0.0019	11-Jan	3				0.0020	5-Jan	6	0.0017	0.0020	0.0018	14.7%	0.0019	11-Jan	3
CE430	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24	0.0019	11-Jan	3				0.0020	5-Jan	6	0.0017	0.0020	0.0018	14.7%	0.0019	11-Jan	3
CE440	0.0019	11-Jan	3	0.0017	4-Jan	24	0.0017	4-Jan	24	0.0019	11-Jan	3				0.0020	5-Jan	7	0.0017	0.0020	0.0018	14.7%	0.0019	11-Jan	3
CE500	0.0068	20-Dec	22							0.0070	20-Dec	12	0.0069	20-Dec	20	0.0103	2-Nov	2	0.0068	0.0103	0.0078	44.7%	0.0071	20-Dec	12
CE510	0.0068	20-Dec	22							0.0070	20-Dec	12	0.0069	20-Dec	20	0.0105	2-Apr	22	0.0068	0.0105	0.0078	47.0%	0.0071	20-Dec	12
CE520	0.0061	26-Nov	2							0.0065	10-Nov	9	0.0065	27-Nov	23	0.0066	1-Nov	7	0.0061	0.0066	0.0064	7.3%	0.0063	5-Nov	4
CE522	0.0068	20-Dec	22							0.0070	20-Dec	12	0.0069	20-Dec	20	0.0078	2-Apr	21	0.0068	0.0078	0.0071	14.1%	0.0070	20-Dec	12
CE525	0.0068	20-Dec	22							0.0070	20-Dec	12	0.0069	20-Dec	20	0.0154	2-Nov	2	0.0068	0.0154	0.0090	94.7%	0.0071	20-Dec	12
CE530	0.0062	01-Apr	1							0.0067	18-Oct	12	0.0055	1-Nov	21	0.0066	1-Apr	5	0.0055	0.0067	0.0063	20.5%	0.0029	31-Mar	10
CE540	0.0041	05-Oct	3							0.0038	18-Oct	9	0.0033	29-Apr	23	0.0042	15-Oct	5	0.0033	0.0042	0.0038	24.6%	0.0029	31-Mar	10
CE545	0.0062	01-Apr	1							0.0068	1-Apr	2	0.0067	20-Jul	15	0.0070	1-Apr	8	0.0062	0.0070	0.0067	11.9%	0.0029	29-Mar	9

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-15. Hourly Integrated Maxima and Minima (Relative Humidity)

Maximum Relative Humidity													Statistics, All Results				TRACE® 3DP								
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour						
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	Trane®	Date	Hour
CE300	68.79	16-Nov	17	69.35	16-Nov	16	68.85	16-Nov	16	68.37	16-Nov	17	68.00	16-Nov	16	67.44	16-Nov	16	67.44	69.35	68.47	2.8%	69.16	23-Apr	7
CE310	77.70	02-Oct	4	100.18	15-Oct	9	100.70	15-Oct	9	78.64	2-Oct	8	77.00	12-Jun	8	78.19	2-Oct	8	77.00	100.70	85.40	27.8%	77.68	2-Oct	8
CE320	81.84	18-Sep	10	83.41	2-Oct	9	83.67	22-Apr	18	82.97	18-Sep	10	83.00	3-Sep	17	81.88	16-Sep	20	81.84	83.67	82.79	2.2%	82.61	18-Sep	10
CE330	76.66	22-Sep	20	78.46	2-Oct	9	77.94	18-Sep	9	76.88	3-Sep	10	76.00	10-Jun	18	78.70	2-Sep	12	76.00	78.70	77.44	3.5%	76.52	22-Sep	20
CE340	79.93	18-Sep	10	81.37	18-Sep	9	81.26	22-Apr	18	80.80	18-Sep	10	80.00	3-Sep	17	80.25	16-Sep	20	79.93	81.37	80.60	1.8%	80.39	18-Sep	10
CE350	68.79	16-Nov	17	81.12	7-Aug	21	81.12	7-Aug	21	68.37	16-Nov	17	70.00	2-Oct	8	72.65	3-Aug	7	68.37	81.12	73.67	17.3%	69.17	23-Apr	7
CE360	68.79	16-Nov	17	69.35	16-Nov	16	68.85	16-Nov	16	68.37	16-Nov	17	68.00	16-Nov	16	67.44	16-Nov	16	67.44	69.35	68.47	2.8%	69.09	23-Apr	7
CE400	83.75	05-Apr	22	85.57	5-Apr	21	85.57	5-Apr	21	84.64	5-Apr	22				86.31	22-Apr	6	83.75	86.31	85.17	3.0%	87.63	23-Apr	7
CE410	83.22	05-Apr	22	84.79	2-Apr	5	84.79	2-Apr	5							86.18	22-Apr	6	83.22	86.18	84.75	3.5%	87.63	23-Apr	7
CE420	70.84	02-Apr	10	74.51	17-Apr	7	71.53	17-Apr	3	73.28	2-Apr	18				73.85	2-Apr	18	70.84	74.51	72.80	5.0%	73.28	2-Apr	18
CE430	80.71	02-Apr	5	78.43	2-Apr	4	78.43	2-Apr	4	80.74	2-Apr	5				78.94	2-Apr	5	78.43	80.74	79.45	2.9%	80.72	2-Apr	5
CE440	68.72	16-Nov	17	69.35	16-Nov	16	68.85	16-Nov	16	68.37	16-Nov	17				67.51	16-Nov	16	67.51	69.35	68.56	2.7%	69.16	23-Apr	7
CE500	100.00	21-Nov	24							100.00	21-Nov	9	100.00	14-Nov	5	60.08	1-Apr	5	60.08	100.00	90.02	44.3%	100.00	22-Nov	8
CE510	100.00	21-Nov	24							100.00	21-Nov	9	100.00	14-Nov	5	57.51	1-Apr	5	57.51	100.00	89.38	47.5%	100.00	22-Nov	8
CE520	90.23	20-Dec	22							93.81	20-Dec	11	95.00	20-Dec	17	71.77	16-Aug	17	71.77	95.00	87.70	26.5%	93.00	20-Dec	11
CE522	100.00	18-Dec	8							100.00	15-Dec	22	100.00	15-Dec	1	71.32	5-Apr	17	71.32	100.00	92.83	30.9%	100.00	16-Dec	5
CE525	100.00	12-Nov	20							100.00	12-Nov	19	100.00	11-Nov	23	51.12	1-Apr	8	51.12	100.00	87.78	55.7%	100.00	17-Nov	7
CE530	91.04	20-Dec	22							96.16	20-Dec	11	79.00	20-Dec	8	36.01	20-Apr	21	36.01	96.16	75.55	79.6%	40.83	20-Dec	11
CE540	61.28	20-Dec	22							55.18	20-Dec	11	47.00	20-Dec	6	39.96	18-Apr	18	39.96	61.28	50.85	41.9%	41.23	20-Dec	11
CE545	90.88	20-Dec	22							96.23	20-Dec	11	97.00	20-Dec	4	24.14	24-Dec	1	24.14	97.00	77.06	94.5%	40.57	20-Dec	11

Minimum Relative Humidity													Statistics, All Results				TRACE® 3DP								
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				Trane®	Date	Hour						
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	Trane®	Date	Hour
CE300	13.33	06-Nov	5	11.97	6-Nov	4	11.97	6-Nov	4	14.40	6-Nov	6	15.00	6-Nov	5	14.94	6-Nov	8	11.97	15.00	13.60	22.3%	14.38	6-Nov	6
CE310	13.39	06-Nov	6	11.97	6-Nov	4	11.97	6-Nov	4	15.50	6-Nov	8	16.00	6-Nov	8	15.93	6-Nov	8	11.97	16.00	14.13	28.5%	18.11	11-Jan	3
CE320	13.33	06-Nov	5	11.97	6-Nov	4	11.97	6-Nov	4	14.64	6-Nov	6	15.00	6-Nov	5	12.92	20-Dec	5	11.97	15.00	13.31	22.8%	14.80	6-Nov	6
CE330	13.33	06-Nov	5	11.97	6-Nov	4	11.97	6-Nov	4	14.40	6-Nov	6	15.00	6-Nov	5	14.94	6-Nov	8	11.97	15.00	13.60	22.3%	14.38	6-Nov	6
CE340	13.33	06-Nov	5	11.97	6-Nov	4	11.97	6-Nov	4	14.40	6-Nov	6	15.00	6-Nov	5	14.94	6-Nov	8	11.97	15.00	13.60	22.3%	14.38	6-Nov	6
CE350	13.33	06-Nov	5	11.97	6-Nov	4	11.97	6-Nov	4	14.40	6-Nov	6	15.00	6-Nov	5	14.94	6-Nov	8	11.97	15.00	13.60	22.3%	14.38	6-Nov	6
CE360	13.33	06-Nov	5	11.97	6-Nov	4	11.97	6-Nov	4	14.40	6-Nov	6	15.00	6-Nov	5	14.94	6-Nov	8	11.97	15.00	13.60	22.3%	14.38	6-Nov	6
CE400	13.21	06-Nov	5	11.97	6-Nov	4	11.97	6-Nov	4	13.93	6-Nov	6				14.57	6-Nov	5	11.97	14.57	13.13	19.8%	13.92	6-Nov	6
CE410	13.21	06-Nov	5	11.97	6-Nov	4	11.97	6-Nov	4							14.58	6-Nov	5	11.97	14.58	12.93	20.2%	13.92	6-Nov	6
CE420	13.21	06-Nov	5	11.97	6-Nov	4	11.97	6-Nov	4	13.93	6-Nov	6				14.59	6-Nov	5	11.97	14.59	13.13	19.9%	13.92	6-Nov	6
CE430	13.21	06-Nov	5	11.97	6-Nov	4	11.97	6-Nov	4	13.93	6-Nov	6				14.58	6-Nov	5	11.97	14.58	13.13	19.9%	13.92	6-Nov	6
CE440	13.21	06-Nov	5	11.97	6-Nov	4	11.97	6-Nov	4	13.93	6-Nov	6				14.54	6-Nov	5	11.97	14.54	13.12	19.6%	13.92	6-Nov	6
CE500	53.41	30-Apr	15							55.17	30-Apr	4	54.00	4-Oct	24	52.83	5-Oct	1	52.83	55.17	53.85	4.3%	52.33	6-Nov	24
CE510	52.09	04-Oct	23							55.29	4-May	3	54.00	4-Oct	23	53.15	4-May	4	52.09	55.29	53.63	6.0%	52.33	6-Nov	24
CE520	61.27	25-Nov	24							61.73	27-Nov	24	61.00	27-Nov	22	61.90	20-Jul	15	61.00	61.90	61.47	1.5%	59.55	5-Nov	2
CE522	58.51	30-Apr	15							59.18	30-Apr	4	60.00	4-Oct	23	57.97	5-Oct	1	57.97	60.00	58.91	3.4%	56.92	6-Nov	24
CE525	45.53	30-Apr	15							47.85	5-Oct	2	44.00	4-May	4	44.40	5-Oct	1	44.00	47.85	45.45	8.5%	44.88	6-Nov	24
CE530	29.59	04-Jun	15							34.03	18-Apr	18	28.00	1-Apr	10	33.68	1-Apr	13	28.00	34.03	31.33	19.2%	14.53	18-Apr	19
CE540	36.47	21-Sep	16							36.00	28-Sep	16	31.00	1-Apr	1	39.74	5-Oct	1	31.00	39.74	35.80	24.4%	27.01	28-Sep	18
CE545	17.12	20-Jul	15							19.23	18-Apr	17	19.00	1-Apr	10	20.14	1-Apr	12	17.12	20.14	18.87	16.0%	8.18	18-Apr	17

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-16. June 28 Hourly Output - Case CE300

TRNSYS-TUD Hour	Energy Consumption		Evaporator Coil Load			Zone Hum.	COP2	ODB (°C)	EDB (°C)	EWB (°C)	OHR (kg/kg)
	Compressor (Wh)	Cond Fan (Wh)	Total (Wh)	Sensible (Wh)	Latent (Wh)	Ratio (kg/kg)					
1	2056	257	8132	6189	1942	0.0091	3.517	18.05	23.41	16.96	0.0113
2	2054	257	8116	6202	1914	0.0090	3.513	18.05	23.37	16.90	0.0113
3	2054	257	8128	6194	1934	0.0091	3.517	18.05	23.38	16.94	0.0113
4	1830	230	7224	5549	1676	0.0090	3.507	17.80	23.37	16.86	0.0111
5	2029	256	8105	6319	1786	0.0088	3.546	17.50	23.35	16.70	0.0106
6	1839	230	7131	5686	1445	0.0087	3.447	18.30	23.42	16.57	0.0106
7	2667	309	9711	7597	2115	0.0092	3.263	22.20	24.04	17.32	0.0121
8	3553	384	12121	9558	2563	0.0095	3.079	26.10	24.57	17.79	0.0122
9	4365	458	14556	11758	2798	0.0097	3.018	28.05	25.09	17.97	0.0115
10	4441	458	14639	11506	3133	0.0101	2.988	28.90	25.28	18.40	0.0124
11	5000	506	16374	12342	4032	0.0104	2.974	30.00	25.36	18.82	0.0138
12	5317	529	17248	12810	4438	0.0107	2.950	30.85	25.59	19.12	0.0140
13	6189	617	20498	16816	3682	0.0101	3.012	30.85	26.53	18.84	0.0123
14	6211	616	20234	17284	2951	0.0098	2.964	31.40	26.56	18.55	0.0115
15	7922	781	26687	22882	3805	0.0096	3.066	31.95	26.78	18.55	0.0121
16	7965	781	26723	22285	4438	0.0097	3.055	32.20	26.56	18.67	0.0133
17	5421	529	17231	13048	4183	0.0108	2.896	31.95	26.20	19.40	0.0145
18	5410	529	17506	12721	4785	0.0112	2.947	31.40	26.23	19.77	0.0152
19	5260	529	17662	12491	5171	0.0111	3.051	29.70	25.70	19.58	0.0151
20	4880	506	16990	11655	5335	0.0110	3.154	27.75	25.17	19.37	0.0157
21	3939	409	13540	8882	4658	0.0111	3.114	27.20	24.65	19.44	0.0169
22	3924	410	13565	8880	4684	0.0112	3.130	26.95	24.74	19.48	0.0169
23	4123	434	14531	9449	5082	0.0112	3.189	26.40	24.67	19.47	0.0169
24	3877	410	13692	8807	4885	0.0113	3.194	26.10	24.73	19.57	0.0171

DOE-2.2 Hour	Energy Consumption		Evaporator Coil Load			Zone Hum.	COP2	ODB (°C)	EDB (°C)	EWB (°C)	OHR (kg/kg)
	Compressor (Wh)	Cond Fan (Wh)	Total (Wh)	Sensible (Wh)	Latent (Wh)	Ratio (kg/kg)					
1	1897	237	7552	5889	1663	0.0094	3.539	17.78	23.83	17.34	0.0114
2	1941	240	7630	6070	1560	0.0093	3.499	18.33	23.94	17.29	0.0112
3	1897	237	7550	5881	1669	0.0094	3.538	17.78	23.83	17.34	0.0114
4	1891	237	7534	5878	1656	0.0094	3.540	17.78	23.83	17.34	0.0114
5	1697	215	6798	5675	1123	0.0089	3.555	17.22	23.78	16.85	0.0103
6	2126	259	8136	6439	1698	0.0092	3.411	19.44	24.11	17.30	0.0113
7	3198	352	11076	8342	2734	0.0100	3.120	25.00	24.94	18.39	0.0133
8	3135	332	10291	9070	1221	0.0094	2.968	27.22	25.28	17.78	0.0109
9	4528	469	14786	11873	2913	0.0099	2.959	28.89	25.56	18.36	0.0117
10	4651	479	15340	12039	3301	0.0103	2.990	28.89	25.56	18.68	0.0125
11	5434	537	17455	12812	4643	0.0109	2.923	31.11	25.89	19.48	0.0148
12	5019	498	16215	12612	3603	0.0108	2.939	30.56	25.83	19.23	0.0134
13	6040	597	19723	17139	2584	0.0101	2.972	31.11	25.94	18.56	0.0115
14	6420	633	20808	17638	3170	0.0100	2.950	31.67	26.06	18.60	0.0121
15	7671	751	25387	22196	3191	0.0098	3.014	32.22	26.11	18.46	0.0119
16	8190	800	27581	22528	5053	0.0100	3.068	32.22	26.17	18.84	0.0144
17	5715	561	18205	13599	4605	0.0107	2.901	31.67	26.06	19.35	0.0146
18	5536	544	17933	12830	5103	0.0112	2.950	31.11	25.94	19.75	0.0157
19	4711	481	16012	11876	4137	0.0110	3.084	28.33	25.50	19.32	0.0143
20	4859	504	17082	11532	5550	0.0114	3.185	27.22	25.33	19.76	0.0164
21	3913	405	13435	9302	4133	0.0113	3.111	27.22	25.33	19.76	0.0164
22	3825	399	13280	8974	4307	0.0114	3.144	26.67	25.22	19.80	0.0167
23	3750	395	13192	8787	4404	0.0115	3.183	26.11	25.11	19.84	0.0169
24	3880	407	13724	8799	4925	0.0117	3.201	26.11	25.11	20.14	0.0178

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-16. June 28 Hourly Output - Case CE300 (continued)

DOE-2.1E-E Hour	Energy Consumption		Evaporator Coil Load			Zone Hum.	COP2	ODB (°C)	EDB (°C)	EWB (°C)	OHR (kg/kg)
	Compressor (Wh)	Cond Fan (Wh)	Total (Wh)	Sensible (Wh)	Latent (Wh)	Ratio (kg/kg)					
1	1894	237	7545	5887	1658	0.0094	3.541	17.78	23.83	17.34	0.0114
2	1941	241	7627	6067	1560	0.0093	3.495	18.33	23.94	17.29	0.0112
3	1894	237	7546	5878	1668	0.0094	3.541	17.78	23.83	17.37	0.0114
4	1890	236	7528	5873	1655	0.0094	3.541	17.78	23.83	17.37	0.0114
5	1694	215	6753	5672	1081	0.0090	3.537	17.22	23.78	16.94	0.0103
6	2133	259	8185	6439	1747	0.0092	3.422	19.44	24.11	17.30	0.0113
7	3223	353	11233	8348	2885	0.0098	3.141	25.00	24.94	18.23	0.0133
8	3145	335	10272	9069	1203	0.0094	2.952	27.22	25.28	17.78	0.0109
9	4526	467	14844	11875	2969	0.0099	2.973	28.89	25.56	18.28	0.0117
10	4655	478	15393	12041	3352	0.0102	2.999	28.89	25.56	18.60	0.0125
11	5456	536	17605	12818	4787	0.0107	2.938	31.11	25.89	19.33	0.0148
12	5015	498	16188	12611	3577	0.0108	2.936	30.56	25.83	19.23	0.0134
13	6036	600	19621	17135	2486	0.0102	2.957	31.11	25.94	18.64	0.0115
14	6429	635	20819	17639	3180	0.0100	2.947	31.67	26.06	18.60	0.0121
15	7683	754	25393	22197	3196	0.0098	3.010	32.22	26.11	18.46	0.0119
16	8222	803	27721	22533	5188	0.0098	3.072	32.22	26.17	18.76	0.0144
17	5696	556	18245	13600	4644	0.0107	2.918	31.67	26.06	19.35	0.0146
18	5531	541	17978	12832	5146	0.0112	2.961	31.11	25.94	19.68	0.0157
19	4689	479	15914	11871	4043	0.0111	3.079	28.33	25.50	19.40	0.0143
20	4855	503	17120	11534	5586	0.0113	3.195	27.22	25.33	19.76	0.0164
21	3918	406	13445	9303	4142	0.0113	3.109	27.22	25.33	19.76	0.0164
22	3823	399	13285	8974	4311	0.0114	3.147	26.67	25.22	19.80	0.0167
23	3748	394	13192	8787	4405	0.0115	3.185	26.11	25.11	19.84	0.0169
24	3880	407	13754	8800	4955	0.0117	3.208	26.11	25.11	20.06	0.0178

EnergyPlus Hour	Energy Consumption		Evaporator Coil Load			Zone Hum.	COP2	ODB (°C)	EDB (°C)	EWB (°C)	OHR (kg/kg)
	Compressor (Wh) *	Cond Fan (Wh) *	Total (Wh)	Sensible (Wh)	Latent (Wh)	Ratio (kg/kg)					
1	2119		7472	5811	1661	0.0094	3.527	17.99	23.95		0.0112
2	2131		7494	5853	1641	0.0094	3.516	18.11	23.96		0.0113
3	2113		7447	5809	1637	0.0094	3.525	17.99	23.95		0.0112
4	2075		7332	5744	1588	0.0093	3.534	17.80	23.92		0.0111
5	1997		7091	5614	1477	0.0092	3.550	17.43	23.86		0.0105
6	2142		7425	6015	1410	0.0090	3.467	18.58	24.03		0.0106
7	2870		9216	7532	1684	0.0093	3.212	22.90	24.68		0.0123
8	3499		10609	8757	1853	0.0096	3.033	26.38	25.21		0.0118
9	4682		14032	11767	2265	0.0098	2.997	28.26	25.49		0.0116
10	4948		14778	11996	2781	0.0102	2.987	28.90	25.59		0.0124
11	5407		15905	12488	3417	0.0106	2.942	30.28	25.79		0.0140
12	5632		16522	12671	3851	0.0109	2.933	30.79	25.87		0.0138
13	7133		21588	17401	4187	0.0104	3.027	30.91	25.88		0.0120
14	6983		20678	17592	3086	0.0100	2.961	31.48	25.97		0.0115
15	8572		26133	22481	3652	0.0098	3.049	32.01	26.05		0.0121
16	8733		26665	22557	4107	0.0099	3.053	32.20	26.08		0.0135
17	5718		16345	13061	3283	0.0106	2.858	31.89	26.04		0.0145
18	5881		17193	12870	4324	0.0112	2.924	31.33	25.95		0.0153
19	5555		16878	12170	4708	0.0113	3.038	29.35	25.65		0.0149
20	5259		16536	11556	4981	0.0113	3.144	27.61	25.39		0.0159
21	4326		13445	9063	4383	0.0116	3.108	27.20	25.33		0.0168
22	4279		13387	8953	4434	0.0116	3.129	26.89	25.29		0.0168
23	4173		13191	8753	4437	0.0116	3.161	26.33	25.20		0.0168
24	4152		13196	8674	4522	0.0117	3.178	26.10	25.17		0.0171

* For EnergyPlus results, the reported compressor energy includes the condenser fan energy.

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-16. June 28 Hourly Output - Case CE300 (continued)

CODYRUN Hour	Energy Consumption		Evaporator Coil Load			Zone Hum.	COP2	ODB (°C)	EDB (°C)	EWB (°C)	OHR (kg/kg)
	Compressor (Wh)	Cond Fan (Wh)	Total (Wh)	Sensible (Wh)	Latent (Wh)	Ratio (kg/kg)					
1	1886	237	7472	5788	1684	0.0093	3.520	17.80	23.92	17.16	0.0111
2	1964	244	7707	5961	1747	0.0093	3.490	18.30	24.00	17.24	0.0115
3	1881	236	7445	5788	1657	0.0092	3.517	17.80	23.92	17.12	0.0111
4	1878	236	7432	5788	1644	0.0092	3.516	17.80	23.92	17.10	0.0111
5	1756	224	7000	5580	1420	0.0090	3.535	17.20	23.83	16.79	0.0102
6	2075	253	7915	6341	1574	0.0090	3.400	19.40	24.16	17.03	0.0110
7	3035	334	10450	8277	2173	0.0095	3.102	25.00	25.00	17.91	0.0131
8	3303	352	10813	9038	1775	0.0093	2.958	27.20	25.33	17.65	0.0111
9	4483	463	14631	11971	2660	0.0097	2.958	28.90	25.59	18.12	0.0120
10	4594	472	15099	11971	3128	0.0100	2.980	28.90	25.59	18.44	0.0128
11	5238	516	16722	12731	3991	0.0106	2.906	31.10	25.91	19.14	0.0148
12	5066	504	16258	12559	3699	0.0106	2.919	30.60	25.84	18.94	0.0133
13	6442	642	21090	17422	3669	0.0100	2.977	31.10	25.91	18.33	0.0113
14	6523	645	21067	17629	3438	0.0098	2.939	31.70	26.00	18.27	0.0117
15	8000	785	26636	22491	4145	0.0096	3.032	32.20	26.08	18.24	0.0124
16	8169	799	27416	22491	4925	0.0097	3.057	32.20	26.08	18.56	0.0142
17	5306	519	16702	12939	3763	0.0104	2.867	31.70	26.00	19.06	0.0147
18	5381	528	17312	12729	4582	0.0109	2.930	31.10	25.91	19.46	0.0157
19	4791	492	16232	11761	4470	0.0109	3.072	28.30	25.50	19.20	0.0145
20	4809	498	16867	11381	5486	0.0113	3.178	27.20	25.33	19.65	0.0169
21	3939	408	13484	9036	4447	0.0113	3.102	27.20	25.33	19.71	0.0169
22	3852	402	13322	8864	4459	0.0114	3.132	26.70	25.25	19.70	0.0168
23	3752	395	13139	8656	4482	0.0114	3.168	26.10	25.16	19.69	0.0169
24	3794	399	13323	8656	4666	0.0115	3.177	26.10	25.16	19.81	0.0173

HOT3000 Hour	Energy Consumption		Evaporator Coil Load			Zone Hum.	COP2	ODB (°C)	EDB (°C)	EWB (°C)	OHR (kg/kg)
	Compressor (Wh)	Cond Fan (Wh)	Total (Wh)	Sensible (Wh)	Latent (Wh)	Ratio (kg/kg)					
1	1943	241	7668	5870	1798	0.0093	3.511	17.80	23.94	17.30	0.0111
2	1951	241	7674	5872	1803	0.0093	3.502	18.30	23.94	17.31	0.0114
3	1902	237	7528	5783	1745	0.0092	3.519	17.80	23.90	17.24	0.0111
4	1845	231	7317	5683	1634	0.0091	3.524	17.80	23.84	17.08	0.0111
5	1914	239	7514	5955	1559	0.0090	3.490	17.20	23.98	17.01	0.0102
6	2507	293	9223	7312	1911	0.0092	3.295	19.40	24.58	17.54	0.0110
7	3171	343	10770	8647	2123	0.0095	3.065	25.00	25.16	17.99	0.0131
8	3434	361	11186	9299	1888	0.0094	2.948	27.20	25.45	17.96	0.0110
9	4489	461	14744	11923	2821	0.0097	2.979	28.90	25.58	18.33	0.0120
10	4853	489	15882	12287	3595	0.0102	2.973	28.90	25.74	18.85	0.0127
11	5164	508	16615	12562	4053	0.0106	2.929	31.10	25.86	19.19	0.0148
12	5005	497	16030	12561	3468	0.0104	2.914	30.60	25.86	18.87	0.0132
13	6455	639	21180	17431	3749	0.0100	2.986	31.10	25.94	18.52	0.0113
14	6503	640	21055	17609	3447	0.0097	2.948	31.70	26.02	18.44	0.0117
15	8041	785	27070	22350	4719	0.0098	3.067	32.20	26.13	18.65	0.0123
16	8134	794	27623	22292	5331	0.0098	3.094	32.20	26.03	18.80	0.0142
17	5212	510	16551	12739	3812	0.0103	2.893	31.70	25.94	19.11	0.0147
18	5122	507	16830	12181	4649	0.0109	2.990	31.10	25.70	19.39	0.0156
19	4832	493	16635	11541	5095	0.0110	3.124	28.30	25.41	19.53	0.0145
20	4875	501	17131	11359	5772	0.0114	3.187	27.20	25.33	19.74	0.0168
21	3936	406	13525	8931	4593	0.0114	3.115	27.20	25.29	19.74	0.0168
22	3844	399	13356	8747	4609	0.0114	3.148	26.70	25.21	19.79	0.0168
23	3807	397	13343	8647	4697	0.0114	3.173	26.10	25.16	19.84	0.0168
24	3664	386	12973	8360	4613	0.0115	3.203	26.10	25.04	19.77	0.0173

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-16. June 28 Hourly Output - Case CE300 (continued)

TRACE® 3DP Hour	Energy Consumption		Evaporator Coil Load			Zone Hum.	COP2	ODB (°C)	EDB (°C)	EWB (°C)	OHR (kg/kg)
	Compressor (Wh)	Cond Fan (Wh)	Total (Wh)	Sensible (Wh)	Latent (Wh)	Ratio (kg/kg)					
1	2157		7615	5824	1792	0.0092	3.531	17.99	23.95	17.27	0.0112
2	2170		7641	5866	1775	0.0092	3.521	18.11	23.96	17.24	0.0113
3	2151		7592	5822	1770	0.0092	3.529	17.99	23.95	17.24	0.0112
4	2113		7476	5756	1720	0.0092	3.538	17.80	23.92	17.18	0.0111
5	2035		7230	5626	1604	0.0090	3.554	17.43	23.86	17.03	0.0105
6	2184		7574	6027	1548	0.0089	3.467	18.58	24.03	16.99	0.0106
7	2930		9406	7545	1861	0.0092	3.210	22.90	24.68	17.52	0.0123
8	3576		10834	8770	2064	0.0095	3.030	26.38	25.21	17.94	0.0118
9	4776		14296	11782	2515	0.0096	2.993	28.26	25.49	18.05	0.0116
10	5035		15024	12013	3011	0.0100	2.984	28.90	25.59	18.42	0.0124
11	5492		16150	12506	3644	0.0104	2.941	30.28	25.80	18.91	0.0139
12	5715		16765	12690	4075	0.0107	2.933	30.79	25.87	19.19	0.0138
13	7238		21892	17418	4474	0.0101	3.025	30.91	25.88	18.75	0.0120
14	7089		20945	17606	3339	0.0097	2.955	31.48	25.97	18.33	0.0115
15	8694		26448	22491	3957	0.0095	3.042	32.01	26.05	18.29	0.0121
16	8848		26962	22568	4395	0.0096	3.047	32.20	26.08	18.47	0.0135
17	5797		16545	13077	3468	0.0103	2.854	31.89	26.04	18.95	0.0145
18	5961		17432	12889	4543	0.0109	2.925	31.33	25.96	19.46	0.0153
19	5625		17108	12191	4917	0.0111	3.041	29.35	25.66	19.49	0.0149
20	5324		16770	11578	5192	0.0111	3.150	27.61	25.39	19.52	0.0160
21	4377		13636	9084	4551	0.0113	3.115	27.20	25.33	19.77	0.0168
22	4331		13586	8975	4612	0.0114	3.137	26.89	25.29	19.80	0.0168
23	4224		13390	8776	4614	0.0114	3.170	26.33	25.20	19.79	0.0168
24	4202		13396	8697	4700	0.0114	3.188	26.10	25.17	19.84	0.0171

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-17. Delta Annual Space Cooling Electricity Consumptions (Total, Compressor)

Total (kWh,e)								Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*		
CE310-CE300	4340	4629	4629	4545	4543	4538	4340	4629	4537	6.4%	4412	
CE320-CE300	4426	3995	4037	4333	4424	4387	3995	4426	4267	10.1%	4289	
CE330-CE300	5330	4958	4683	5398	5559	5260	4683	5559	5198	16.8%	5376	
CE330-CE320	904	963	646	1064	1134	873	646	1134	931	52.5%	1087	
CE340-CE300	4986	4608	4510	5037	5089	4877	4510	5089	4851	11.9%	5003	
CE330-CE340	344	350	173	360	470	383	173	470	347	85.6%	373	
CE350-CE300	-3397	-4203	-4207	-3601	-3390	-3328	-4207	-3328	-3688	23.8%	-3611	
CE360-CE300	19665	19314	19261	19959	19867	19998	19261	19998	19677	3.7%	19901	
CE400-CE300	-3589	-3904	-3879	-3733		-3657	-3904	-3589	-3752	8.4%	-3763	
CE410-CE300	-3555	-3082	-3056			-3567	-3567	-3056	-3315	15.4%	-3763	
CE420-CE300	-2247	-2220	-1845	-2010		-1862	-2247	-1845	-2037	19.7%	-2063	
CE430-CE300	-3096	-2818	-2944	-2973		-3252	-3252	-2818	-3017	14.4%	-2947	
CE440-CE300	-1942	-1718	-1782	-1714		-1822	-1942	-1714	-1796	12.7%	-1744	
CE500-CE300	-13296	-11933	-11933	-11711	-12653	-11932	-13296	-11711	-12243	12.9%	-11969	
CE510-CE500	17218	18099	18100	17736	17414	17794	17218	18100	17727	5.0%	17763	
CE525-CE520	-4666	-4981	-4969	-4316	-4889	-4458	-4981	-4316	-4713	14.1%	-5031	
CE530-CE500	-5057	-5277	-5285	-5293	-4880	-5263	-5293	-4880	-5176	8.0%	-4604	
CE545-CE540	-3743	-4076	-4083	-2425	-3745	-3825	-4083	-2425	-3650	45.4%	-3192	

Compressor (kWh,e)								Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*		
CE310-CE300	3986	4244	4244		4167	4177	3986	4244	4164	6.2%		
CE320-CE300	4080	3681	3721		4076	4036	3681	4080	3919	10.2%		
CE330-CE300	4946	4603	4352		5158	4899	4352	5158	4792	16.8%		
CE330-CE320	867	922	631		1082	863	631	1082	873	51.6%		
CE340-CE300	4609	4260	4172		4703	4524	4172	4703	4454	11.9%		
CE330-CE340	337	343	180		455	375	180	455	338	81.4%		
CE350-CE300	-3037	-3767	-3772		-3032	-2985	-3772	-2985	-3319	23.7%		
CE360-CE300	17752	17430	17382		17927	18065	17382	18065	17711	3.9%		
CE400-CE300	-3175	-3463	-3442			-3247	-3463	-3175	-3332	8.7%		
CE410-CE300	-3149	-2746	-2723			-3191	-3191	-2723	-2952	15.9%		
CE420-CE300	-1995	-1973	-1639			-1662	-1995	-1639	-1817	19.6%		
CE430-CE300	-2755	-2510	-2622			-2910	-2910	-2510	-2699	14.8%		
CE440-CE300	-1724	-1527	-1584			-1627	-1724	-1527	-1616	12.2%		
CE500-CE300	-4499	-3096	-3095		-3912	-3354	-4499	-3095	-3591	39.1%		
CE510-CE500	13806	14303	14304		13913	14230	13806	14304	14111	3.5%		
CE525-CE520	-2963	-3241	-3233		-3148	-2742	-3241	-2742	-3066	16.3%		
CE530-CE500	-4197	-4346	-4354		-4002	-4350	-4354	-4002	-4250	8.3%		
CE545-CE540	-2399	-2713	-2720		-2413	-2449	-2720	-2399	-2539	12.6%		

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-18. Delta Annual Space Cooling Electricity Consumptions (Fans)

Supply Fan (kWh,e)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	0	0	0	0	0	0	0	0	0	----	0
CE320-CE300	0	0	0	0	0	0	0	0	0	----	0
CE330-CE300	0	0	0	0	0	0	0	0	0	----	0
CE330-CE320	0	0	0	0	0	0	0	0	0	----	0
CE340-CE300	0	0	0	0	0	0	0	0	0	----	0
CE330-CE340	0	0	0	0	0	0	0	0	0	----	0
CE350-CE300	0	0	0	0	0	0	0	0	0	----	0
CE360-CE300	0	0	0	0	0	0	0	0	0	----	0
CE400-CE300	0	0	0	0	0	0	0	0	0	----	0
CE410-CE300	0	0	0	0	0	0	0	0	0	----	0
CE420-CE300	0	0	0	0	0	0	0	0	0	----	0
CE430-CE300	0	0	0	0	0	0	0	0	0	----	0
CE440-CE300	0	0	0	0	0	0	0	0	0	----	0
CE500-CE300	-8316	-8511	-8511	-8234	-8327	-8241	-8511	-8234	-8357	3.3%	-8232
CE510-CE500	1951	2262	2262	2034	2002	2038	1951	2262	2092	14.9%	2036
CE525-CE520	-973	-988	-986	-839	-996	-979	-996	-839	-960	16.3%	-948
CE530-CE500	-491	-536	-536	-538	-502	-522	-538	-491	-521	9.0%	-310
CE545-CE540	-769	-757	-757	-438	-762	-787	-787	-438	-712	49.0%	-453

Condenser Fan (kWh,e)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	354	385	385		376	368	354	385	374	8.4%	
CE320-CE300	346	314	316		348	358	314	358	337	13.1%	
CE330-CE300	383	355	331		401	370	331	401	368	19.0%	
CE330-CE320	37	41	15		53	12	12	53	32	128.8%	
CE340-CE300	376	348	338		386	361	338	386	362	13.3%	
CE330-CE340	7	7	-7		15	9	-7	15	6	352.1%	
CE350-CE300	-360	-436	-435		-358	-353	-436	-353	-388	21.4%	
CE360-CE300	1913	1884	1879		1940	1949	1879	1949	1913	3.7%	
CE400-CE300	-414	-441	-437			-421	-441	-414	-428	6.3%	
CE410-CE300	-406	-336	-333			-387	-406	-333	-366	20.1%	
CE420-CE300	-252	-247	-206			-208	-252	-206	-228	20.1%	
CE430-CE300	-341	-308	-322			-353	-353	-308	-331	13.6%	
CE440-CE300	-218	-191	-198			-203	-218	-191	-203	13.4%	
CE500-CE300	-481	-326	-327		-415	-347	-481	-326	-379	40.8%	
CE510-CE500	1461	1534	1534		1499	1526	1461	1534	1511	4.8%	
CE525-CE520	-729	-752	-750		-746	-733	-752	-729	-742	3.1%	
CE530-CE500	-368	-395	-395		-376	-391	-395	-368	-385	7.0%	
CE545-CE540	-576	-606	-606		-571	-589	-606	-571	-589	6.0%	

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-19. Delta Annual Cooling Coil Loads

Sensible Coil Load (kWh,th)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	-405	504	508	-27	-24	-108	-405	508	75	1224.5%	-10
CE320-CE300	6197	6900	6942	6791	6799	7543	6197	7543	6862	19.6%	6501
CE330-CE300	6422	7514	7523	8527	7440	6631	6422	8527	7343	28.7%	7755
CE330-CE320	224	614	581	1735	641	-912	-912	1735	480	550.9%	1255
CE340-CE300	6371	7257	7306	7634	7171	6215	6215	7634	6992	20.3%	7169
CE330-CE340	51	258	217	893	269	416	51	893	351	240.2%	587
CE350-CE300	-6291	-8112	-8128	-6707	-6621	-6423	-8128	-6291	-7047	26.1%	-6628
CE360-CE300	78315	79123	79135	80035	78996	79506	78315	80035	79185	2.2%	79613
CE400-CE300	-14709	-14378	-14368	-14564		-14010	-14709	-14010	-14406	4.9%	-14593
CE410-CE300	-10985	-8138	-8145			-9606	-10985	-8138	-9219	30.9%	-14593
CE420-CE300	-6272	-6131	-5193	-5728		-5207	-6272	-5193	-5706	18.9%	-5804
CE430-CE300	-8798	-8066	-8351	-8513		-9048	-9048	-8066	-8555	11.5%	-8281
CE440-CE300	-5786	-5204	-5313	-5192		-5406	-5786	-5192	-5380	11.0%	-5198
CE500-CE300	-11618	-8147	-8159	-7761	-10335	-7661	-11618	-7661	-8947	44.2%	-7791
CE510-CE500	43046	45710	45710	45091	43051	45083	43046	45710	44615	6.0%	45092
CE525-CE520	-131	-884	-882	-1057	-202	-949	-1057	-131	-684	135.4%	-1165
CE530-CE500	2	-1076	-1076	-547	0	-528	-1076	2	-538	200.6%	-318
CE545-CE540	-130	-809	-809	-676	-202	-792	-809	-130	-570	119.1%	-670

Latent Coil Load(kWh,th)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	19321	19607	19612	19156	19576	19111	19111	19612	19397	2.6%	19023
CE320-CE300	13167	12173	12259	11974	12597	11157	11157	13167	12221	16.4%	12369
CE330-CE300	18164	15932	16179	16367	18528	17119	15932	18528	17048	15.2%	17431
CE330-CE320	4997	3760	3919	4393	5931	5962	3760	5962	4827	45.6%	5062
CE340-CE300	15930	14488	14625	14757	15760	15279	14488	15930	15140	9.5%	15458
CE330-CE340	2234	1445	1553	1610	2768	1840	1445	2768	1908	69.3%	1973
CE350-CE300	-4748	-5435	-5529	-4821	-4264	-4446	-5529	-4264	-4874	26.0%	-4845
CE360-CE300	4232	3401	3427	3895	4459	4403	3401	4459	3970	26.7%	4217
CE400-CE300	3075	2012	2101	2660		2650	2012	3075	2500	42.5%	2747
CE410-CE300	-769	-2366	-2303			-2477	-2477	-769	-1979	86.3%	2747
CE420-CE300	-1546	-1542	-1217	-1240		-1212	-1546	-1212	-1351	24.7%	-1347
CE430-CE300	-1872	-1577	-1722	-1663		-2010	-2010	-1577	-1769	24.5%	-1798
CE440-CE300	-930	-699	-798	-709		-823	-930	-699	-792	29.1%	-799
CE500-CE300	-5452	-3141	-3141	-3986	-4304	-4983	-5452	-3141	-4168	55.5%	-4959
CE510-CE500	17485	17615	17615	17348	17488	17340	17340	17615	17482	1.6%	17348
CE525-CE520	2	-288	-288	-58	-9	-42	-288	2	-114	255.0%	-55
CE530-CE500	-18313	-18285	-18286	-18080	-18230	-18084	-18313	-18080	-18213	1.3%	-18082
CE545-CE540	-1	-81	-81	-9	-3	-2	-81	-1	-30	272.0%	0

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-20. Delta Various Annual Means (COP2, IDB)

COP2							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	0.166	0.180	0.180	0.155	0.171	0.150	0.150	0.180	0.167	18.0%	0.165
CE320-CE300	0.171	0.220	0.220	0.168	0.180	0.160	0.160	0.220	0.186	32.3%	0.174
CE330-CE300	0.242	0.256	0.299	0.253	0.271	0.230	0.230	0.299	0.259	26.7%	0.263
CE330-CE320	0.071	0.036	0.079	0.086	0.091	0.070	0.036	0.091	0.072	76.3%	0.088
CE340-CE300	0.205	0.240	0.258	0.210	0.223	0.190	0.190	0.258	0.221	30.9%	0.220
CE330-CE340	0.036	0.017	0.041	0.043	0.048	0.040	0.017	0.048	0.037	82.5%	0.043
CE350-CE300	0.000	0.003	-0.002	0.006	0.003	0.000	-0.002	0.006	0.002	498.6%	0.011
CE360-CE300	0.420	0.463	0.468	0.441	0.440	0.430	0.420	0.468	0.444	10.9%	0.438
CE400-CE300	0.001	0.014	0.015	0.009			0.001	0.030	0.014	210.3%	0.017
CE410-CE300	-0.010	-0.025	-0.027			-0.020	-0.027	-0.010	-0.020	84.0%	0.017
CE420-CE300	-0.023	-0.022	-0.020	-0.021		-0.020	-0.023	-0.020	-0.021	14.9%	-0.021
CE430-CE300	-0.028	-0.025	-0.026	-0.026		-0.020	-0.028	-0.020	-0.025	33.0%	-0.025
CE440-CE300	-0.018	-0.015	-0.015	-0.016		-0.010	-0.018	-0.010	-0.015	51.9%	-0.015
CE500-CE300	-0.045	-0.010	-0.011	-0.024	-0.034	-0.030	-0.045	-0.010	-0.026	135.4%	-0.031
CE510-CE500	0.409	0.416	0.416	0.408	0.397	0.410	0.397	0.416	0.409	4.6%	0.408
CE525-CE520	0.582	0.574	0.572	0.504	0.606	0.490	0.490	0.606	0.555	21.0%	0.577
CE530-CE500	-0.242	-0.258	-0.257	-0.214	-0.276	-0.220	-0.276	-0.214	-0.245	25.5%	-0.286
CE545-CE540	0.560	0.559	0.560	0.334	0.546	0.510	0.334	0.560	0.511	44.3%	0.448

IDB (°C)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	0.13	0.06	0.00	0.00	0.01	0.02	0.00	0.13	0.04	364.3%	0.00
CE320-CE300	0.28	0.33	0.33	0.16	0.25	0.54	0.16	0.54	0.32	119.3%	0.15
CE330-CE300	0.26	0.22	0.22	0.18	0.21	0.19	0.18	0.26	0.21	34.0%	0.22
CE330-CE320	-0.02	-0.11	-0.11	0.02	-0.03	-0.35	-0.35	0.02	-0.10	365.4%	0.07
CE340-CE300	0.25	0.22	0.22	0.21	0.23	0.22	0.21	0.25	0.23	19.5%	0.23
CE330-CE340	0.00	0.00	0.00	-0.02	-0.01	-0.03	-0.03	0.00	-0.01	319.0%	-0.01
CE350-CE300	2.04	2.11	2.11	2.15	2.19	2.16	2.04	2.19	2.13	7.1%	2.13
CE360-CE300	1.74	1.56	1.50	1.23	1.40	1.38	1.23	1.74	1.47	34.6%	1.34
CE400-CE300	0.50	0.00	0.00	0.00		0.00	0.00	0.50	0.10	498.8%	0.00
CE410-CE300	0.50	0.00	0.00			0.00	0.00	0.50	0.12	400.0%	0.00
CE420-CE300	0.30	0.00	0.00	0.00		0.00	0.00	0.30	0.06	500.3%	0.00
CE430-CE300	0.37	0.00	0.00	0.00		0.00	0.00	0.37	0.07	500.3%	0.00
CE440-CE300	0.29	0.00	0.00	0.00		0.00	0.00	0.29	0.06	500.2%	0.00
CE500-CE300	-3.39	-3.39	-3.50	-3.71	-2.98	-1.13	-3.71	-1.13	-3.02	85.5%	-3.49
CE510-CE500	1.24	0.11	0.11	-0.02	0.00	0.00	-0.02	1.24	0.24	526.6%	-0.02
CE525-CE520	13.33	13.61	13.56	13.53	13.63	15.80	13.33	15.80	13.91	17.8%	13.73
CE530-CE500	-0.21	-0.06	0.00	0.21	0.00	0.00	-0.21	0.21	-0.01	4302.5%	0.01
CE545-CE540	13.32	13.56	13.56	13.52	13.58	15.71	13.32	15.71	13.87	17.3%	13.73

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-21. Delta Various Annual Means (Zone Humidity, Relative Humidity)

Humidity Ratio (kg/kg)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	0.0020	0.0021	0.0021	0.0020	0.0020	0.0019	0.0019	0.0021	0.0020	9.9%	0.0020
CE320-CE300	0.0009	0.0009	0.0009	0.0008	0.0009	0.0007	0.0007	0.0009	0.0009	25.7%	0.0009
CE330-CE300	0.0007	0.0007	0.0007	0.0007	0.0006	0.0007	0.0006	0.0007	0.0007	9.3%	0.0007
CE330-CE320	-0.0002	-0.0002	-0.0002	-0.0001	-0.0002	0.0000	-0.0002	0.0000	-0.0002	143.9%	-0.0002
CE340-CE300	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	0.0007	4.1%	0.0007
CE330-CE340	-0.0001	0.0000	0.0000	0.0000	-0.0001	0.0000	-0.0001	0.0000	0.0000	277.9%	0.0000
CE350-CE300	0.0006	0.0008	0.0008	0.0006	0.0006	0.0006	0.0006	0.0008	0.0007	34.2%	0.0006
CE360-CE300	-0.0006	-0.0005	-0.0005	-0.0005	-0.0006	-0.0006	-0.0006	-0.0005	-0.0006	22.0%	-0.0006
CE400-CE300	0.0007	0.0008	0.0008	0.0008		0.0008	0.0007	0.0008	0.0008	8.7%	0.0009
CE410-CE300	0.0007	0.0003	0.0003			0.0003	0.0003	0.0007	0.0004	94.5%	0.0009
CE420-CE300	0.0002	0.0002	0.0002	0.0002		0.0001	0.0001	0.0002	0.0002	58.3%	0.0002
CE430-CE300	0.0002	0.0002	0.0002	0.0002		0.0002	0.0002	0.0002	0.0002	19.7%	0.0002
CE440-CE300	0.0001	0.0001	0.0001	0.0000		0.0000	0.0000	0.0001	0.0001	148.5%	0.0001
CE500-CE300	0.0007			0.0001	0.0010	0.0015	0.0001	0.0015	0.0008	169.4%	0.0000
CE510-CE500	0.0004			0.0000	0.0000	0.0000	0.0000	0.0004	0.0001	394.2%	0.0000
CE525-CE520	0.0070			0.0078	0.0070	0.0075	0.0070	0.0078	0.0073	10.9%	0.0075
CE530-CE500	-0.0035			-0.0027	-0.0044	-0.0040	-0.0044	-0.0027	-0.0037	48.0%	-0.0063
CE545-CE540	0.0018			0.0024	0.0029	0.0026	0.0018	0.0029	0.0024	46.8%	0.0000

Relative Humidity (%)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	9.72	10.25	10.25	9.96	10.01	9.87	9.72	10.25	10.01	5.3%	10.01
CE320-CE300	3.39	2.95	2.97	3.25	3.28	2.01	2.01	3.39	2.97	46.4%	3.50
CE330-CE300	2.23	2.32	2.37	2.59	2.26	2.77	2.23	2.77	2.42	22.3%	2.64
CE330-CE320	-1.16	-0.63	-0.60	-0.66	-1.02	0.76	-1.16	0.76	-0.55	347.8%	-0.87
CE340-CE300	2.47	2.43	2.45	2.56	2.47	2.85	2.43	2.85	2.54	16.5%	2.70
CE330-CE340	-0.24	-0.11	-0.08	0.03	-0.21	-0.08	-0.24	0.03	-0.12	232.7%	-0.06
CE350-CE300	-3.13	-2.81	-2.73	-3.42	-3.51	-3.37	-3.51	-2.73	-3.16	24.7%	-3.25
CE360-CE300	-7.58	-6.77	-6.79	-6.22	-6.96	-6.72	-7.58	-6.22	-6.84	19.9%	-6.55
CE400-CE300	2.16	3.95	3.97	3.96		4.08	2.16	4.08	3.62	53.1%	4.35
CE410-CE300	1.88	1.39	1.35			1.82	1.35	1.88	1.61	33.0%	4.35
CE420-CE300	0.16	0.88	0.69	0.81		0.83	0.16	0.88	0.67	106.1%	0.91
CE430-CE300	0.21	0.91	1.02	1.01		1.24	0.21	1.24	0.88	117.8%	1.10
CE440-CE300	-0.29	0.20	0.29	0.24		0.30	-0.29	0.30	0.15	394.1%	0.33
CE500-CE300	17.91			10.61	18.12	15.80	10.61	18.12	15.61	48.1%	9.72
CE510-CE500	-2.35			0.11	-0.01	0.11	-2.35	0.11	-0.53	461.4%	0.12
CE525-CE520	-8.41			-6.41	-10.09	-14.80	-14.80	-6.41	-9.93	84.5%	-7.44
CE530-CE500	-19.80			-10.22	-24.49	-24.13	-24.49	-10.22	-19.66	72.6%	-36.25
CE545-CE540	-11.90			-7.68	-3.18	-14.62	-14.62	-3.18	-9.34	122.5%	-13.36

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

**ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545**

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 B16.5.2-22. Delta Hourly Integrated Maximum Total Consumptions

Total Consumption (Wh,e)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean (Max-Min) /Mean*		
CE310-CE300	968	1019	993	641	721	614	614	1019	826	49.0%	559
CE320-CE300	1402	1352	1379	1055	1172	1327	1055	1402	1281	27.1%	970
CE330-CE300	1721	1648	1805	1414	1535	1787	1414	1805	1652	23.7%	1355
CE330-CE320	319	296	426	360	363	460	296	460	371	44.3%	385
CE340-CE300	1555	1594	1588	1234	1345	1553	1234	1594	1478	24.3%	1165
CE330-CE340	166	54	217	180	190	234	54	234	173	103.8%	190
CE350-CE300	1	90	0	0	0	-2	-2	90	15	621.2%	0
CE360-CE300	1143	1172	1124	844	931	1214	844	1214	1071	34.5%	775
CE400-CE300	2	0	75	0		-29	-29	75	10	1087.2%	0
CE410-CE300	2	0	0			1	0	2	1	258.7%	0
CE420-CE300	0	0	0	0		0	0	0	0	----	0
CE430-CE300	0	0	0	0		0	0	0	0	500.0%	0
CE440-CE300	0	0	0	0		-87	-87	0	-17	500.0%	0
CE500-CE300	-1460	-1133	-1177	-1501	-1755	-1274	-1755	-1133	-1383	45.0%	-1563
CE510-CE500	1038	1159	1162	1011	1009	1070	1009	1162	1075	14.2%	1012
CE525-CE520	-1669	-1451	-1483	-1531	-1625	-1099	-1669	-1099	-1476	38.6%	-1671
CE530-CE500	-2138	-2372	-2370	-2228	-2185	-2185	-2372	-2138	-2246	10.4%	-2007
CE545-CE540	-1494	-1593	-1593	-915	-1495	-1514	-1593	-915	-1434	47.3%	-1219

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-23. Delta Hourly Integrated Maximum Coil Loads (Total, Sensible)

Sensible + Latent Coil Load (Wh,th)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	5154	5349	5578	4393	4759	4919	4393	5578	5025	23.6%	4296
CE320-CE300	8144	22412	22368	7032	7402	7848	7032	22412	12534	122.7%	6915
CE330-CE300	11318	12227	33117	10712	11476	10343	10343	33117	14865	153.2%	10519
CE330-CE320	3174	-10185	10749	3680	4074	2495	-10185	10749	2331	898.0%	3603
CE340-CE300	9478	19418	28094	8595	8864	9060	8595	28094	13918	140.1%	8543
CE330-CE340	1840	-7191	5023	2117	2612	1283	-7191	5023	947	1289.3%	1976
CE350-CE300	-82	0	-1	0	0	5	-82	5	-13	669.0%	1
CE360-CE300	6683	9212	9564	5726	5820	6379	5726	9564	7231	53.1%	5581
CE400-CE300	9005	9142	18383	7995		8702	7995	18383	10645	97.6%	8031
CE410-CE300	-82	0	0			1	-82	1	-20	409.8%	8031
CE420-CE300	0	0	0	0		0	0	0	0	----	0
CE430-CE300	0	0	0	0		0	0	0	0	500.0%	0
CE440-CE300	0	0	0	0		-295	-295	0	-59	500.0%	0
CE500-CE300	-4689	-3694	-3749	-5087	-5935	-4517	-5935	-3694	-4612	48.6%	-5422
CE510-CE500	3108	3481	3482	3531	3381	3542	3108	3542	3421	12.7%	3541
CE525-CE520	410	-412	-412	-76	8	-881	-881	410	-227	568.4%	-164
CE530-CE500	-7651	-8131	-8131	-8008	-7791	-7929	-8131	-7651	-7940	6.0%	-7924
CE545-CE540	500	-291	-292	-187	-30	-302	-302	500	-100	800.3%	-202

Sensible Coil Load (Wh,th)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	-183	-123	-86	-254	-379	-259	-379	-86	-214	136.9%	-319
CE320-CE300	8038	7916	7867	8441	7677	8059	7677	8441	8000	9.6%	7865
CE330-CE300	9949	10207	11285	11234	10540	10513	9949	11285	10621	12.6%	11173
CE330-CE320	1911	2291	3418	2793	2863	2454	1911	3418	2622	57.5%	3307
CE340-CE300	9552	8883	8881	9357	9483	9272	8881	9552	9238	7.3%	9100
CE330-CE340	397	1324	2404	1877	1057	1241	397	2404	1383	145.1%	2072
CE350-CE300	0	0	0	0	0	-32	-32	0	-5	603.8%	1
CE360-CE300	8783	8908	8860	9090	8524	9271	8524	9271	8906	8.4%	8880
CE400-CE300	0	0	0	0		-31	-31	0	-6	503.2%	0
CE410-CE300	-12	0	0			-15	-15	0	-7	224.7%	0
CE420-CE300	0	0	0	0		-15	-15	0	-3	500.0%	0
CE430-CE300	0	0	0	0		-15	-15	0	-3	500.0%	0
CE440-CE300	0	0	0	0		-33	-33	0	-7	500.0%	0
CE500-CE300	-3728	-3194	-3197	-3682	-4681	-3090	-4681	-3090	-3595	44.3%	-3683
CE510-CE500	2180	2504	2505	2441	2345	2451	2180	2505	2404	13.5%	2439
CE525-CE520	287	-309	-304	-336	-210	-717	-717	287	-265	379.1%	-399
CE530-CE500	285	-433	-433	-211	0	-192	-433	285	-164	437.9%	-116
CE545-CE540	500	-291	-292	-187	-35	-302	-302	500	-101	793.7%	-202

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-24. Delta Hourly Integrated Maximum Coil Loads (Latent)

Latent Coil Load (Wh,th)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	6271	5835	5876	6040	5737	5685	5685	6271	5907	9.9%	6011
CE320-CE300	13512	22193	22109	11961	11322	11537	11322	22193	15439	70.4%	12099
CE330-CE300	18190	17637	31415	16899	17809	17096	16899	31415	19841	73.2%	17044
CE330-CE320	4678	-4556	9306	4939	6487	5559	-4556	9306	4402	314.9%	4945
CE340-CE300	15213	21147	26617	13676	13850	13402	13402	26617	17318	76.3%	13878
CE330-CE340	2977	-3510	4798	3223	3959	3694	-3510	4798	2523	329.2%	3166
CE350-CE300	116	-1	-1	1	380	1211	-1	1211	284	426.5%	1
CE360-CE300	-361	722	942	-1715	-1516	-1458	-1715	942	-564	470.9%	1519
CE400-CE300	17440	16274	23002	16082		16253	16082	23002	17810	38.9%	16234
CE410-CE300	1503	0	-3			-15	-15	1503	371	408.9%	16234
CE420-CE300	115	0	0	0		2	0	115	23	491.5%	0
CE430-CE300	0	1801	1707	839		2	0	1801	870	207.1%	866
CE440-CE300	0	0	-3	0		-253	-253	0	-51	494.1%	0
CE500-CE300	-1670	-1571	-1661	-2396	-2570	-2630	-2630	-1571	-2083	50.8%	-2701
CE510-CE500	927	990	990	1116	1045	1112	927	1116	1030	18.3%	1125
CE525-CE520	123	-122	-122	249	212	-144	-144	249	33	1201.2%	200
CE530-CE500	-7965	-7733	-7733	-7838	-7626	-7726	-7965	-7626	-7770	4.4%	-7852
CE545-CE540	-627	0	0	-1655	-841	-1181	-1655	0	-717	230.7%	0

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-25. Delta Hourly Integrated Maximum and Minimum COP2

Maximum COP2							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	-0.025	0.272	0.271	0.248	0.257	0.240	-0.025	0.272	0.210	141.1%	0.339
CE320-CE300	0.000	1.274	1.110	0.014	0.073	0.500	0.000	1.274	0.495	257.3%	0.067
CE330-CE300	0.000	0.240	1.738	0.146	0.251	0.170	0.000	1.738	0.424	409.6%	0.017
CE330-CE320	0.000	-1.034	0.628	0.132	0.179	-0.330	-1.034	0.628	-0.071	2344.2%	-0.050
CE340-CE300	0.000	0.752	1.482	0.061	0.147	0.070	0.000	1.482	0.419	354.0%	0.000
CE330-CE340	0.000	-0.512	0.256	0.085	0.105	0.100	-0.512	0.256	0.006	13685.7%	0.017
CE350-CE300	0.000	0.020	0.006	0.630	0.061	0.000	0.000	0.630	0.120	526.8%	-0.066
CE360-CE300	0.233	0.559	0.570	0.530	0.561	0.560	0.233	0.570	0.502	67.2%	0.706
CE400-CE300	-0.091	0.219	0.919	0.146		0.170	-0.091	0.919	0.273	370.7%	0.017
CE410-CE300	-0.280	0.034	-0.002			-0.040	-0.280	0.034	-0.072	436.1%	0.017
CE420-CE300	-0.387	-0.062	-0.098	-0.104		0.060	-0.387	0.060	-0.118	378.3%	-0.099
CE430-CE300	-0.387	-0.064	-0.098	-0.133		0.050	-0.387	0.050	-0.126	346.0%	-0.099
CE440-CE300	-0.285	-0.095	-0.098	-0.123		-0.070	-0.285	-0.070	-0.134	160.0%	-0.099
CE500-CE300	0.107	3.498	1.444	0.273	0.314	0.260	0.107	3.498	0.983	345.1%	0.533
CE510-CE500	0.417	0.000	0.000	0.487	0.505	0.390	0.000	0.505	0.300	168.4%	0.374
CE525-CE520	0.904	1.429	1.379	0.766	0.836	0.560	0.560	1.429	0.979	88.8%	0.909
CE530-CE500	-0.269	-3.386	-1.451	-0.273	-0.345	-0.260	-3.386	-0.260	-0.997	313.5%	-0.395
CE545-CE540	0.794	0.819	0.973	0.470	0.490	0.480	0.470	0.973	0.671	74.9%	0.731

Minimum COP2							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	0.072	0.052	0.050	0.111	0.087	0.060	0.050	0.111	0.072	84.8%	0.093
CE320-CE300	0.032	0.003	0.004	0.060	0.029	0.020	0.003	0.060	0.025	231.0%	0.049
CE330-CE300	0.032	0.000	0.000	0.063	0.038	0.030	0.000	0.063	0.027	231.1%	0.054
CE330-CE320	0.000	-0.003	-0.004	0.003	0.009	0.010	-0.004	0.010	0.002	584.2%	0.006
CE340-CE300	0.032	0.000	0.000	0.063	0.038	0.030	0.000	0.063	0.027	231.1%	0.054
CE330-CE340	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	----	0.000
CE350-CE300	-0.003	0.000	0.000	0.000	0.000	0.000	-0.003	0.000	0.000	742.2%	0.000
CE360-CE300	0.032	0.001	0.000	0.063	0.038	0.030	0.000	0.063	0.027	229.7%	0.054
CE400-CE300	-0.011	-0.064	-0.066	0.000		0.000	-0.066	0.000	-0.028	233.8%	0.000
CE410-CE300	-0.007	0.000	0.000			0.000	-0.007	0.000	-0.002	400.0%	0.000
CE420-CE300	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	----	0.000
CE430-CE300	-0.022	-0.064	-0.066	0.000		0.000	-0.066	0.000	-0.030	217.2%	0.000
CE440-CE300	-0.011	-0.064	-0.066	0.000		0.000	-0.066	0.000	-0.028	234.7%	0.000
CE500-CE300	-0.108	-0.105	-0.149	-0.076	-0.119	-0.100	-0.149	-0.076	-0.110	66.6%	-0.080
CE510-CE500	0.203	0.124	0.000	0.160	0.215	0.190	0.000	0.215	0.149	144.8%	0.290
CE525-CE520	0.469	0.476	0.420	0.408	0.561	0.430	0.408	0.561	0.461	33.2%	0.471
CE530-CE500	-0.184	-0.198	-0.154	-0.173	-0.193	-0.190	-0.198	-0.154	-0.182	24.2%	-0.230
CE545-CE540	0.479	0.459	0.460	0.277	0.549	0.440	0.277	0.549	0.444	61.2%	0.362

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-26. Delta Hourly Integrated Maximum and Minimum IDB

Maximum IDB (°C)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	0.88	1.78	1.61	1.47	1.57	1.00	0.88	1.78	1.39	65.1%	1.55
CE320-CE300	6.16	6.50	6.39	6.71	7.27	5.46	5.46	7.27	6.41	28.2%	6.80
CE330-CE300	6.03	6.61	6.89	6.07	6.85	5.11	5.11	6.89	6.26	28.4%	6.57
CE330-CE320	-0.13	0.11	0.50	-0.64	-0.42	-0.35	-0.64	0.50	-0.15	736.8%	-0.23
CE340-CE300	6.11	6.50	6.45	6.50	7.10	5.39	5.39	7.10	6.34	27.0%	6.74
CE330-CE340	-0.07	0.11	0.44	-0.43	-0.25	-0.28	-0.43	0.44	-0.08	1078.3%	-0.17
CE350-CE300	8.38	9.83	9.83	10.00	9.95	8.81	8.38	10.00	9.47	17.1%	10.00
CE360-CE300	7.56	7.67	7.45	7.51	7.95	6.94	6.94	7.95	7.51	13.4%	7.81
CE400-CE300	0.91	2.45	3.72	1.91		-0.15	-0.15	3.72	1.77	218.8%	1.95
CE410-CE300	0.63	0.00	0.00			0.00	0.00	0.63	0.16	400.0%	1.95
CE420-CE300	0.00	0.00	0.00	0.00		0.04	0.00	0.04	0.01	500.0%	0.00
CE430-CE300	1.00	0.00	0.00	0.00		0.26	0.00	1.00	0.25	396.6%	0.00
CE440-CE300	0.85	0.00	0.00	0.00		0.07	0.00	0.85	0.18	461.5%	0.00
CE500-CE300	-0.39	0.00	0.00	0.00	-0.03	-1.19	-1.19	0.00	-0.27	441.5%	0.00
CE510-CE500	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.05	600.0%	0.00
CE525-CE520	19.96	18.95	19.12	20.00	19.02	16.38	16.38	20.00	18.90	19.1%	19.71
CE530-CE500	0.31	-0.05	-0.05	0.00	0.00	0.00	-0.05	0.31	0.04	1025.2%	0.00
CE545-CE540	19.53	19.89	19.89	20.00	19.95	20.00	19.53	20.00	19.88	2.4%	19.99

Minimum IDB (°C)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	0.00
CE320-CE300	0.00	1.94	1.95	-0.96	0.00	0.00	-0.96	1.95	0.49	597.5%	-0.93
CE330-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	0.00
CE330-CE320	0.00	-1.94	-1.95	0.96	0.00	0.00	-1.95	0.96	-0.49	596.8%	0.93
CE340-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	0.00
CE330-CE340	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	----	0.00
CE350-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	----	0.00
CE360-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	0.00
CE400-CE300	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	500.0%	0.00
CE410-CE300	0.00	0.00	0.00			0.00	0.00	0.00	0.00	----	0.00
CE420-CE300	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	500.0%	0.00
CE430-CE300	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	500.0%	0.00
CE440-CE300	0.00	0.00	0.00	0.00		0.01	0.00	0.01	0.00	500.0%	0.00
CE500-CE300	0.50	-0.72	-0.89	0.22	0.54	17.05	-0.89	17.05	2.78	644.6%	0.30
CE510-CE500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	0.00
CE525-CE520	0.14	0.06	0.05	0.18	0.03	19.44	0.03	19.44	3.32	585.3%	0.23
CE530-CE500	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	533.6%	0.00
CE545-CE540	0.22	0.06	0.05	0.18	0.03	18.06	0.03	18.06	3.10	581.6%	0.23

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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 B16.5.2-27. Delta Hourly Integrated Maximum and Minimum Zone Humidity Ratio

Maximum Humidity Ratio (kg/kg)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	0.0025	0.0050	0.0052	0.0020	0.0020	0.0023	0.0020	0.0052	0.0032	102.1%	0.0016
CE320-CE300	0.0047	0.0039	0.0039	0.0042	0.0041	0.0043	0.0039	0.0047	0.0042	19.9%	0.0039
CE330-CE300	0.0044	0.0040	0.0040	0.0043	0.0036	0.0043	0.0036	0.0044	0.0041	19.0%	0.0040
CE330-CE320	-0.0004	0.0001	0.0001	0.0001	-0.0005	0.0000	-0.0005	0.0001	-0.0001	696.5%	0.0001
CE340-CE300	0.0046	0.0039	0.0037	0.0042	0.0038	0.0043	0.0037	0.0046	0.0041	21.8%	0.0039
CE330-CE340	-0.0002	0.0001	0.0003	0.0001	-0.0002	0.0000	-0.0002	0.0003	0.0000	3174.2%	0.0001
CE350-CE300	0.0035	0.0061	0.0062	0.0036	0.0030	0.0032	0.0030	0.0062	0.0043	74.6%	0.0031
CE360-CE300	0.0001	0.0000	0.0000	0.0002	0.0000	0.0000	0.0000	0.0002	0.0001	366.5%	0.0000
CE400-CE300	0.0037	0.0032	0.0033	0.0033		0.0039	0.0032	0.0039	0.0035	20.2%	0.0038
CE410-CE300	0.0036	0.0031	0.0032			0.0039	0.0031	0.0039	0.0034	23.3%	0.0038
CE420-CE300	0.0010	0.0009	0.0004	0.0010		0.0013	0.0004	0.0013	0.0009	98.3%	0.0008
CE430-CE300	0.0029	0.0018	0.0019	0.0025		0.0024	0.0018	0.0029	0.0023	49.6%	0.0023
CE440-CE300	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	500.0%	0.0000
CE500-CE300	-0.0016	-0.0019	-0.0019	-0.0019	-0.0017	-0.0019	-0.0019	-0.0016	-0.0018	20.6%	-0.0025
CE510-CE500	0.0002	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	352.6%	0.0000
CE525-CE520	0.0104	0.0103	0.0102	0.0115	0.0101	0.0067	0.0067	0.0115	0.0099	48.3%	0.0107
CE530-CE500	-0.0047	-0.0038	-0.0037	-0.0049	-0.0062	-0.0047	-0.0062	-0.0037	-0.0047	53.9%	-0.0085
CE545-CE540	0.0009	0.0072	0.0059	0.0000	0.0034	0.0013	0.0000	0.0072	0.0031	230.7%	0.0000

Minimum Humidity Ratio (kg/kg)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	0.0000	0.0000	0.0000	0.0000	0.0001	0.0000	0.0000	0.0001	0.0000	646.4%	0.0000
CE320-CE300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	600.0%	0.0000
CE330-CE300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	600.0%	0.0000
CE330-CE320	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	600.0%	0.0000
CE340-CE300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	600.0%	0.0000
CE330-CE340	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	----	0.0000
CE350-CE300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	----	0.0000
CE360-CE300	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	600.0%	0.0000
CE400-CE300	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	500.0%	0.0000
CE410-CE300	0.0000	0.0000	0.0000			0.0000	0.0000	0.0000	0.0000	----	0.0000
CE420-CE300	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	500.0%	0.0000
CE430-CE300	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	500.0%	0.0000
CE440-CE300	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	500.0%	0.0000
CE500-CE300	0.0050			0.0051	0.0049	0.0083	0.0049	0.0083	0.0058	58.2%	0.0051
CE510-CE500	0.0000			0.0000	0.0000	0.0002	0.0000	0.0002	0.0001	400.0%	0.0000
CE525-CE520	0.0007			0.0005	0.0004	0.0088	0.0004	0.0088	0.0026	322.8%	0.0008
CE530-CE500	-0.0006			-0.0003	-0.0015	-0.0037	-0.0037	-0.0003	-0.0015	226.1%	-0.0042
CE545-CE540	0.0021			0.0030	0.0034	0.0028	0.0021	0.0034	0.0028	47.3%	0.0000

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

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.

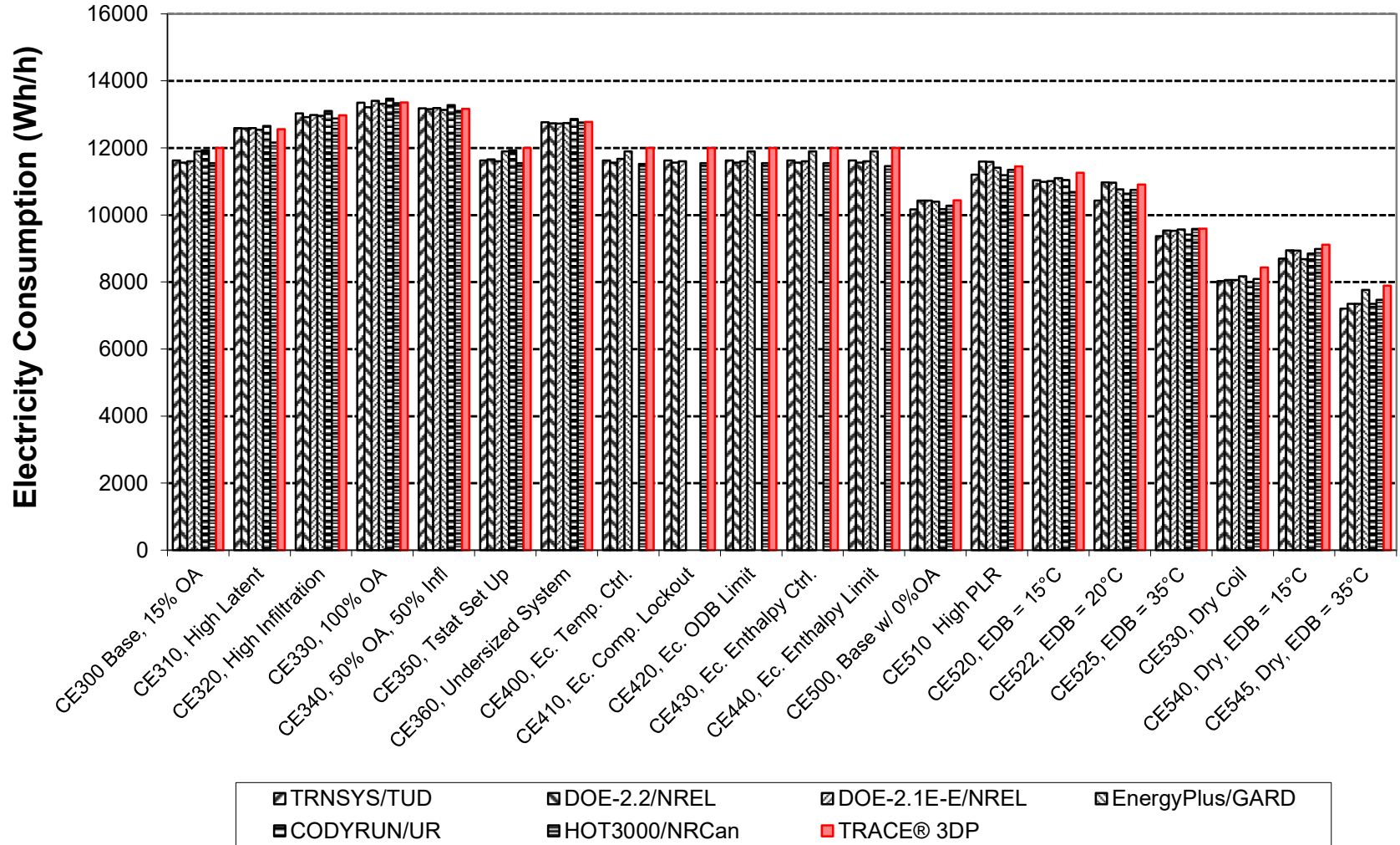
Table B16.5.2-28. Delta Hourly Integrated Maximum and Minimum Zone Relative Humidity

Maximum Relative Humidity (%)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	8.91	30.83	31.85	10.28	9.00	10.75	8.91	31.85	16.94	135.4%	8.52
CE320-CE300	13.05	14.06	14.82	14.60	15.00	14.44	13.05	15.00	14.33	13.6%	13.46
CE330-CE300	7.87	9.11	9.09	8.51	8.00	11.26	7.87	11.26	8.97	37.8%	7.36
CE330-CE320	-5.18	-4.95	-5.73	-6.09	-7.00	-3.18	-7	-3	-5.35	71.3%	-6.09
CE340-CE300	11.14	12.02	12.41	12.43	12.00	12.81	11	13	12.13	13.8%	11.24
CE330-CE340	-3.27	-2.91	-3.32	-3.92	-4.00	-1.55	-4	-2	-3.16	77.5%	-3.87
CE350-CE300	0.00	11.77	12.27	0.00	2.00	5.21	0.00	12.27	5.21	235.6%	0.01
CE360-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	-0.07
CE400-CE300	14.96	16.22	16.72	16.27		18.87	14.96	18.87	16.61	23.5%	18.47
CE410-CE300	14.44	15.44	15.94			18.74	14.44	18.74	16.14	26.7%	18.47
CE420-CE300	2.05	5.16	2.68	4.92		6.41	2.05	6.41	4.24	102.7%	4.12
CE430-CE300	11.92	9.08	9.58	12.38		11.50	9.08	12.38	10.89	30.3%	11.56
CE440-CE300	-0.06	0.00	0.00	0.00		0.07	-0.06	0.07	0.00	13500.0%	0.00
CE500-CE300	31.21			31.63	32.00	-7.36	-7.36	32.00	21.87	180.0%	30.84
CE510-CE500	0.00			0.00	0.00	-2.57	-2.57	0.00	-0.64	400.0%	0.00
CE525-CE520	9.77			6.19	5.00	-20.65	-20.65	9.77	0.08	39706.5%	7.00
CE530-CE500	-8.96			-3.84	-21.00	-24.07	-24.07	-3.84	-14.47	139.8%	-59.17
CE545-CE540	29.60			41.06	50.00	-15.82	-15.82	50.00	26.21	251.1%	-0.66

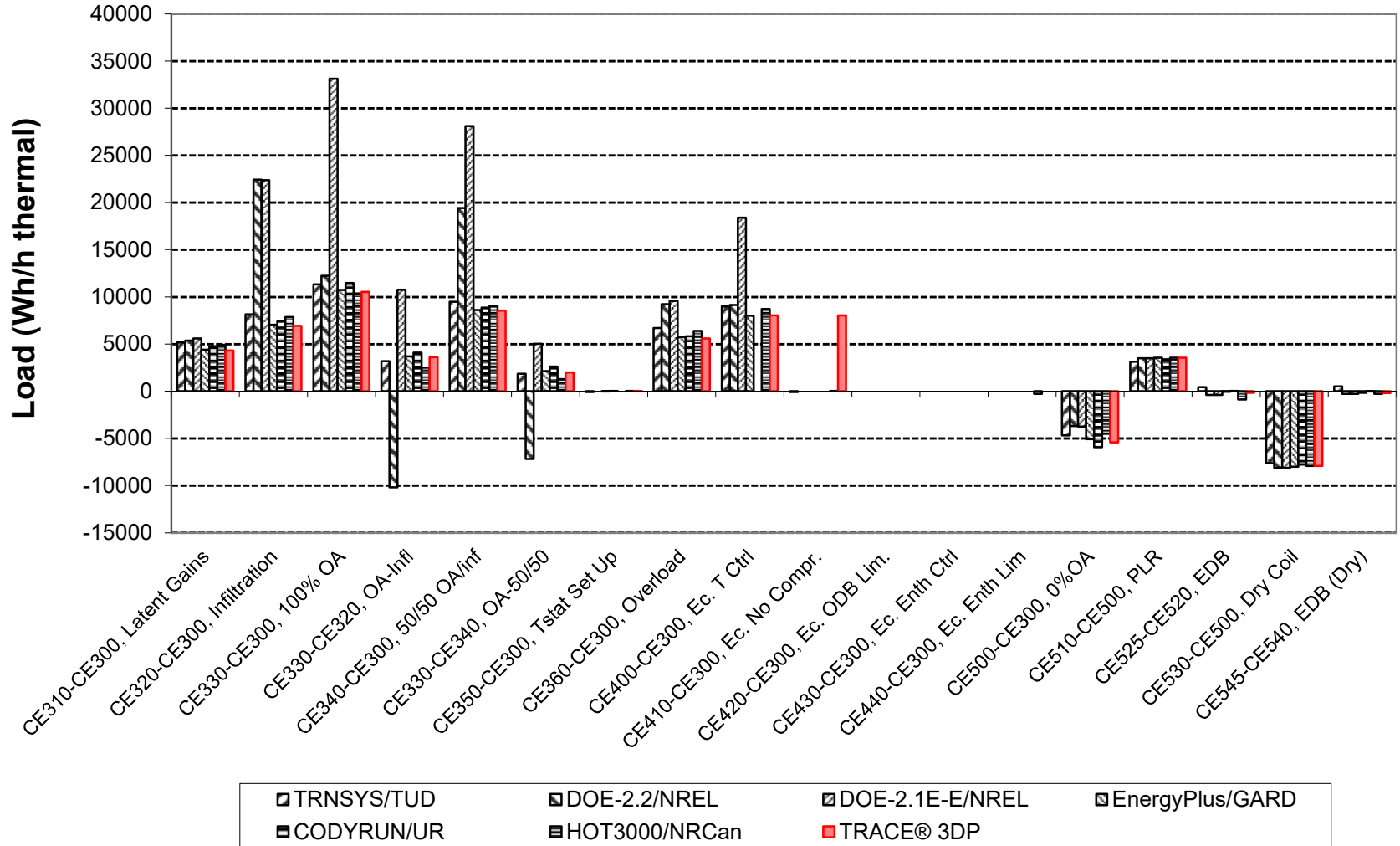
Minimum Relative Humidity (%)							Statistics, All Results				TRACE® 3DP Trane®
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean	(Max-Min) /Mean*	
CE310-CE300	0.06	0.00	0.00	1.10	1.00	0.99	0.00	1.10	0.52	209.6%	3.73
CE320-CE300	0.00	0.00	0.00	0.24	0.00	-2.02	-2.02	0.24	-0.30	761.2%	0.41
CE330-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	0.00
CE330-CE320	0.00	0.00	0.00	-0.24	0.00	2.02	-0.24	2.02	0.30	761.1%	-0.41
CE340-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	0.00
CE330-CE340	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	----	0.00
CE350-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	----	0.00
CE360-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	0.00
CE400-CE300	-0.12	0.00	0.00	-0.48		-0.37	-0.48	0.00	-0.19	246.0%	-0.46
CE410-CE300	-0.12	0.00	0.00			-0.36	-0.36	0.00	-0.12	298.7%	-0.46
CE420-CE300	-0.12	0.00	0.00	-0.48		-0.35	-0.48	0.00	-0.19	251.4%	-0.46
CE430-CE300	-0.12	0.00	0.00	-0.48		-0.36	-0.48	0.00	-0.19	248.3%	-0.46
CE440-CE300	-0.12	0.00	0.00	-0.48		-0.40	-0.48	0.00	-0.20	238.1%	-0.46
CE500-CE300	40.07			40.76	39.00	37.89	37.89	40.76	39.43	7.3%	37.95
CE510-CE500	-1.32			0.12	0.00	0.32	-1.32	0.32	-0.22	747.8%	0.00
CE525-CE520	-15.74			-13.87	-17.00	-17.50	-17.50	-13.87	-16.03	22.6%	-14.66
CE530-CE500	-23.81			-21.14	-26.00	-19.15	-26.00	-19.15	-22.53	30.4%	-37.80
CE545-CE540	-19.35			-16.77	-12.00	-19.60	-19.60	-12.00	-16.93	44.9%	-18.82

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

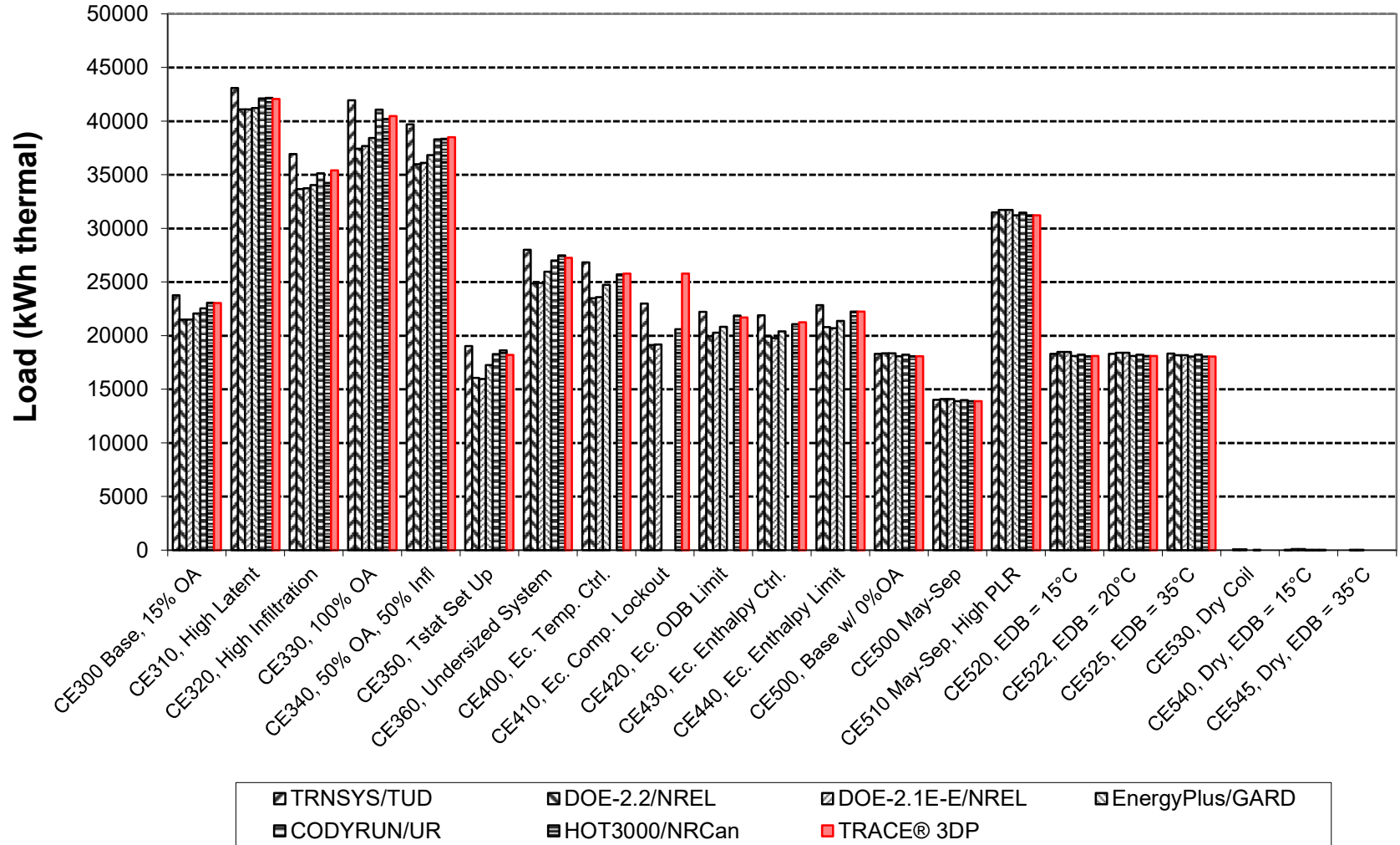
**Figure B16.5.2-3. HVAC BESTEST: CE300 - CE545
 Peak Hour Total Electricity Consumption**



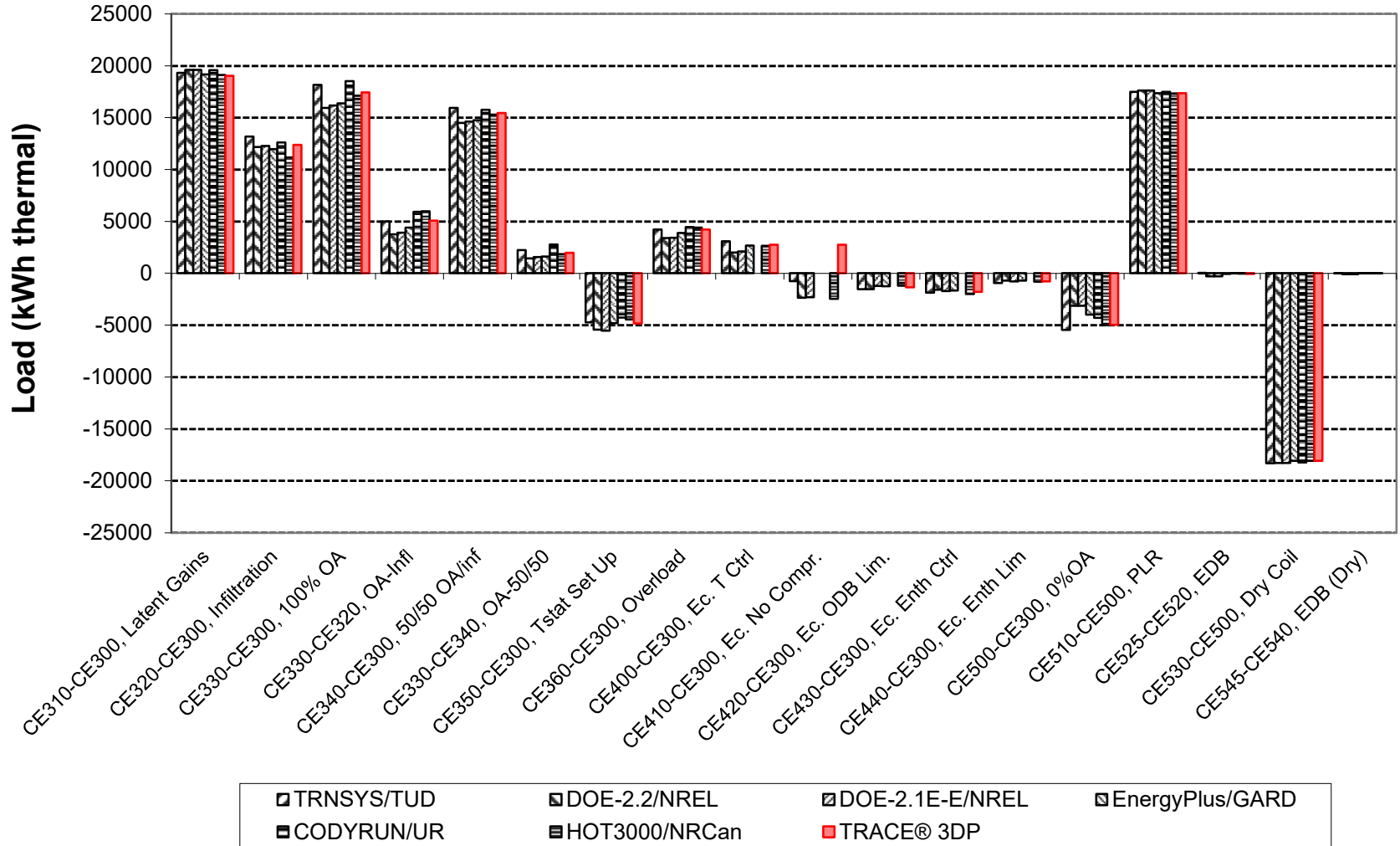
**Figure B16.5.2-13. HVAC BESTEST: CE300 - CE545
 Hourly Maximum Total Coil Load Sensitivities**



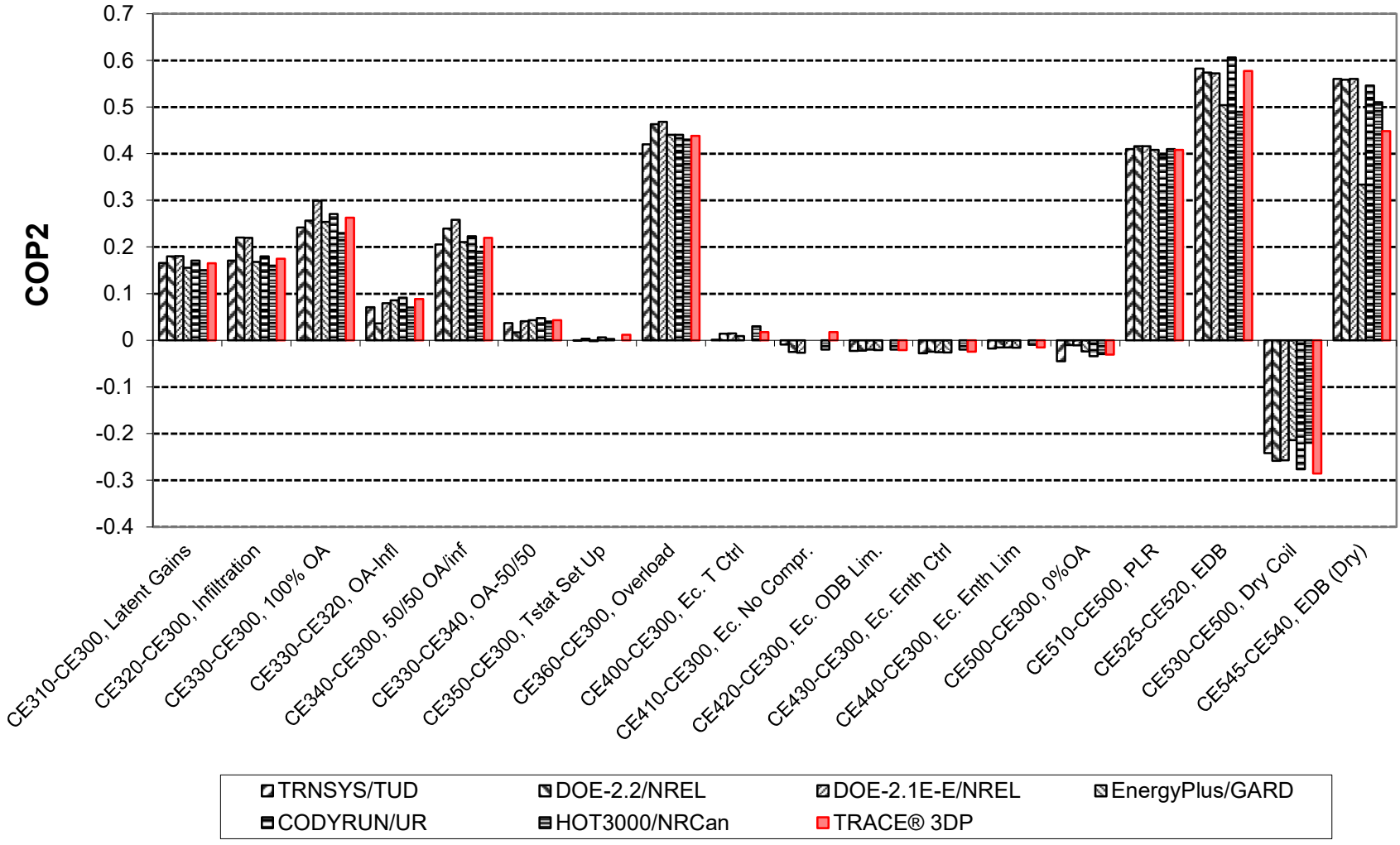
**Figure B16.5.2-17. HVAC BESTEST: CE300 - CE545
 Annual Latent Coil Load**



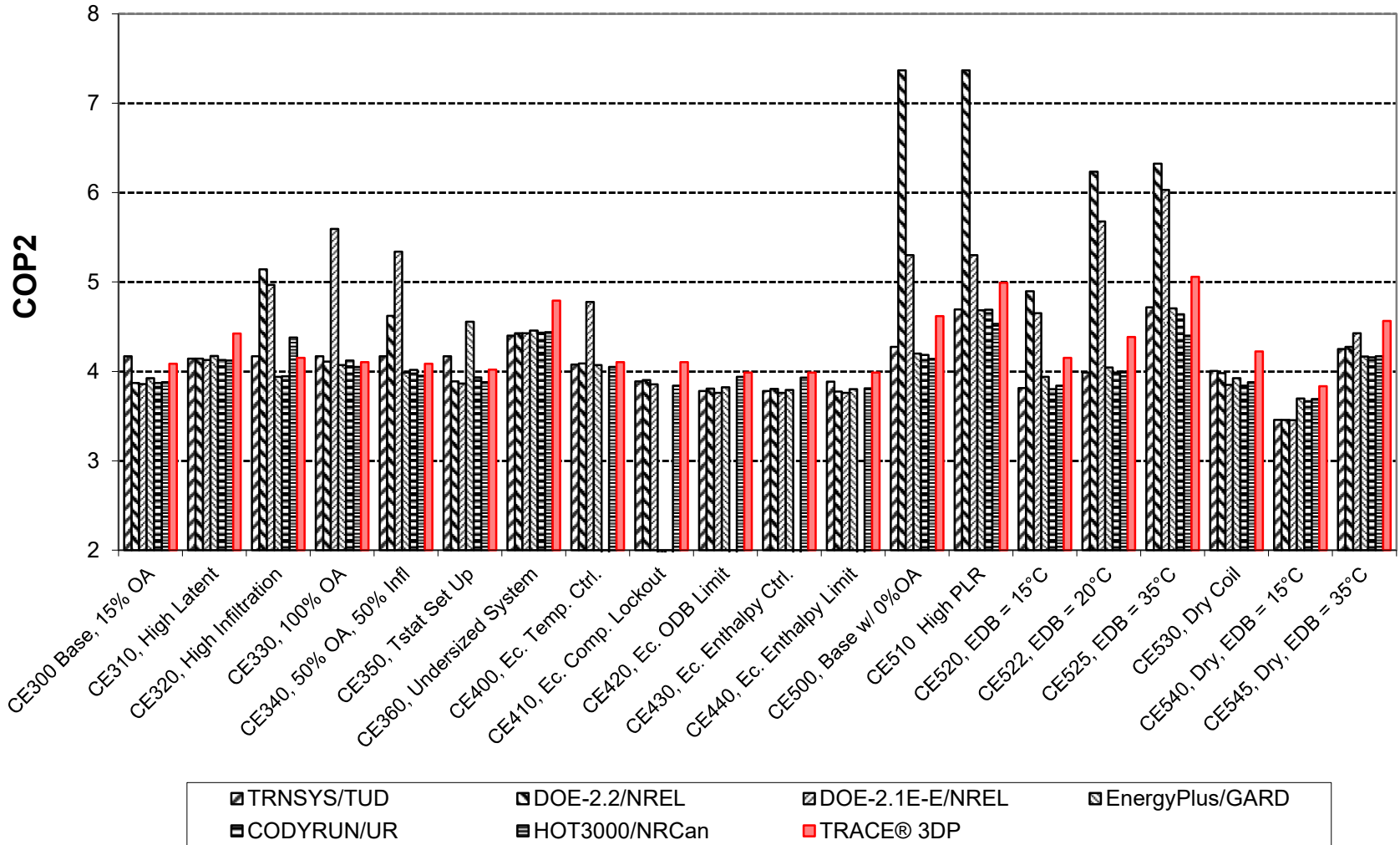
**Figure B16.5.2-18. HVAC BESTEST: CE300 - CE545
 Annual Latent Cooling Load Sensitivities**



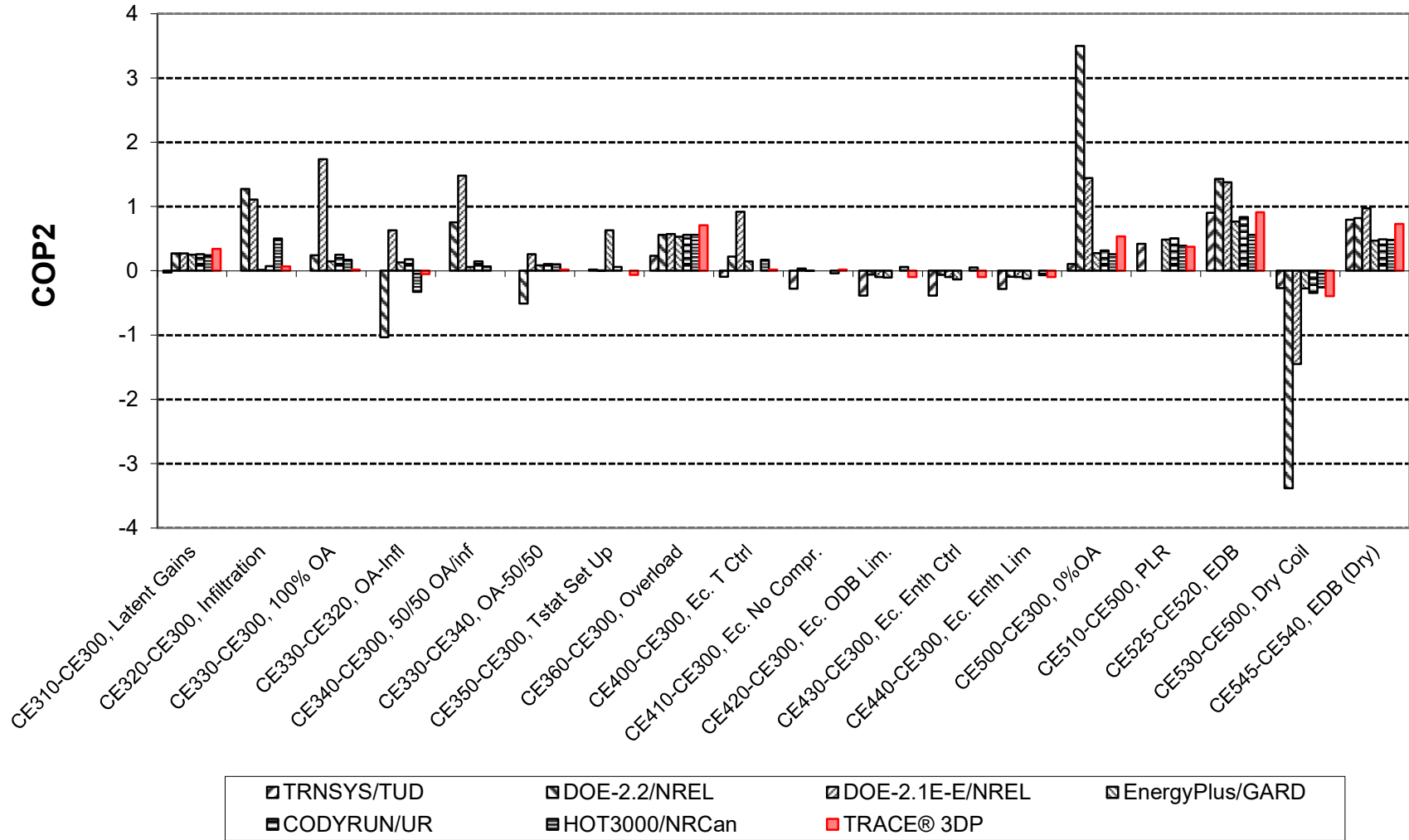
**Figure B16.5.2-22. HVAC BESTEST: CE300 - CE545
 Annual Mean COP2 Sensitivities**



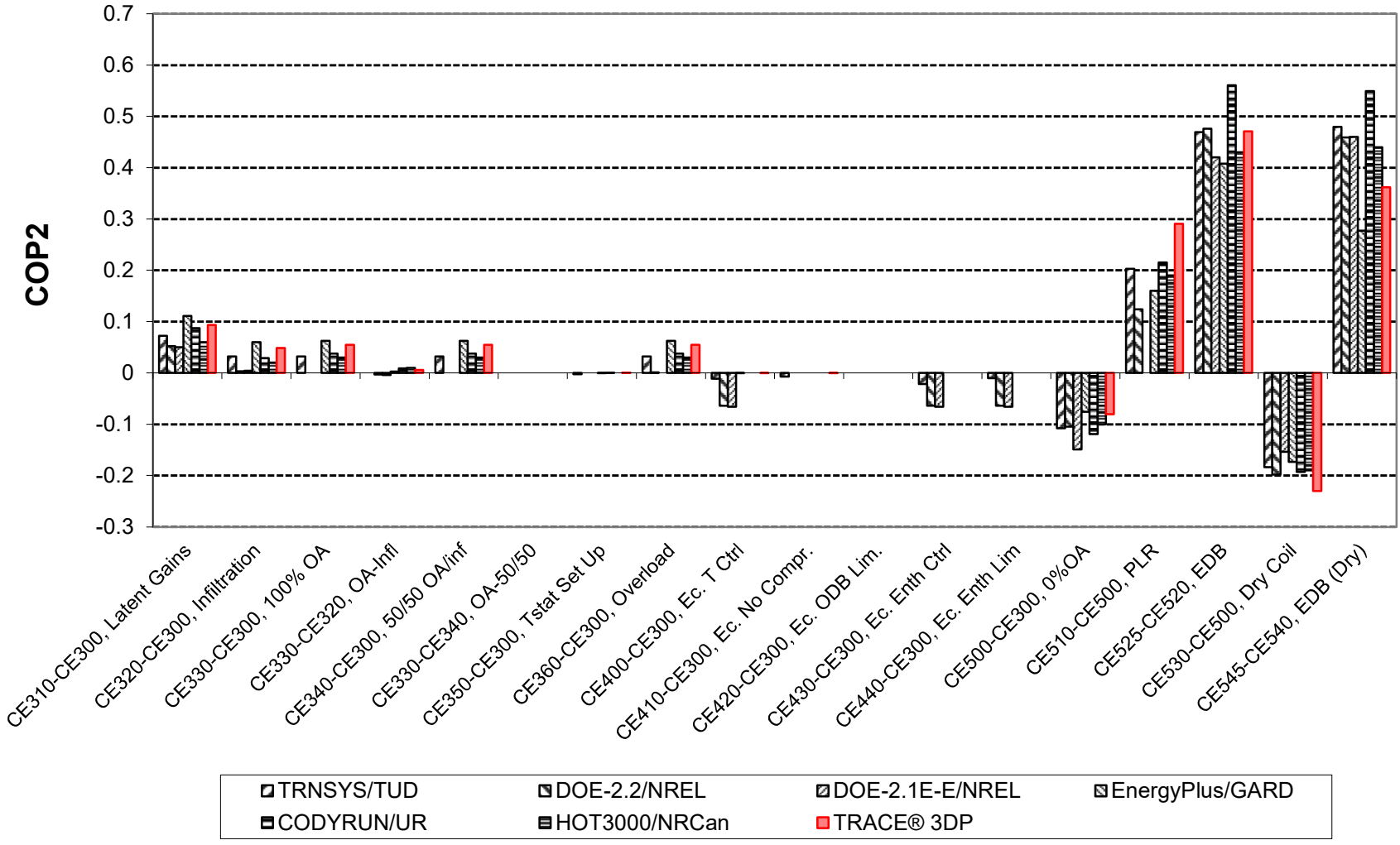
**Figure B16.5.2-23. HVAC BESTEST: CE300 - CE545
 Hourly Maximum COP2**



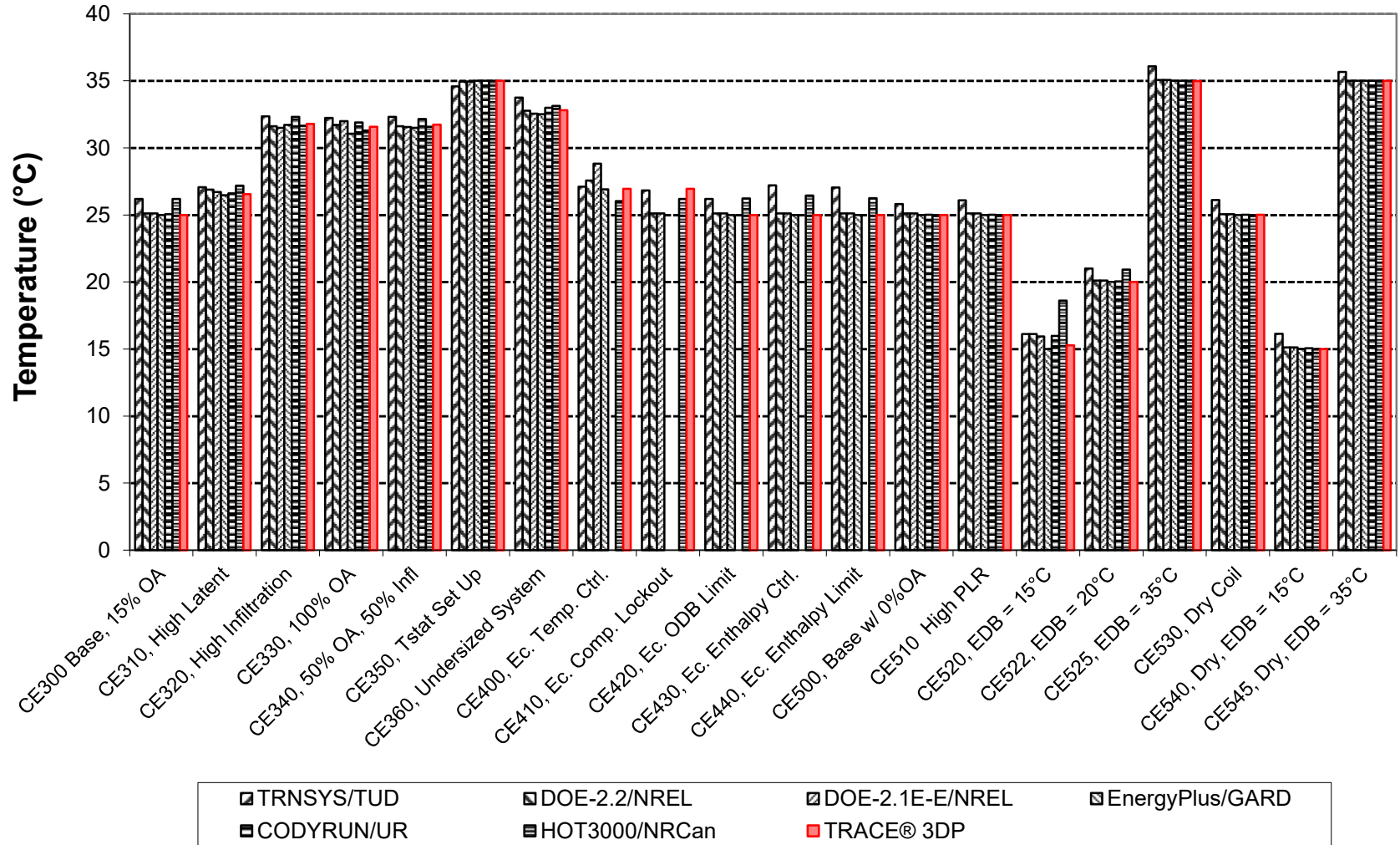
**Figure B16.5.2-24. HVAC BESTEST: CE300 - CE545
 Hourly Maximum COP2 Sensitivities**



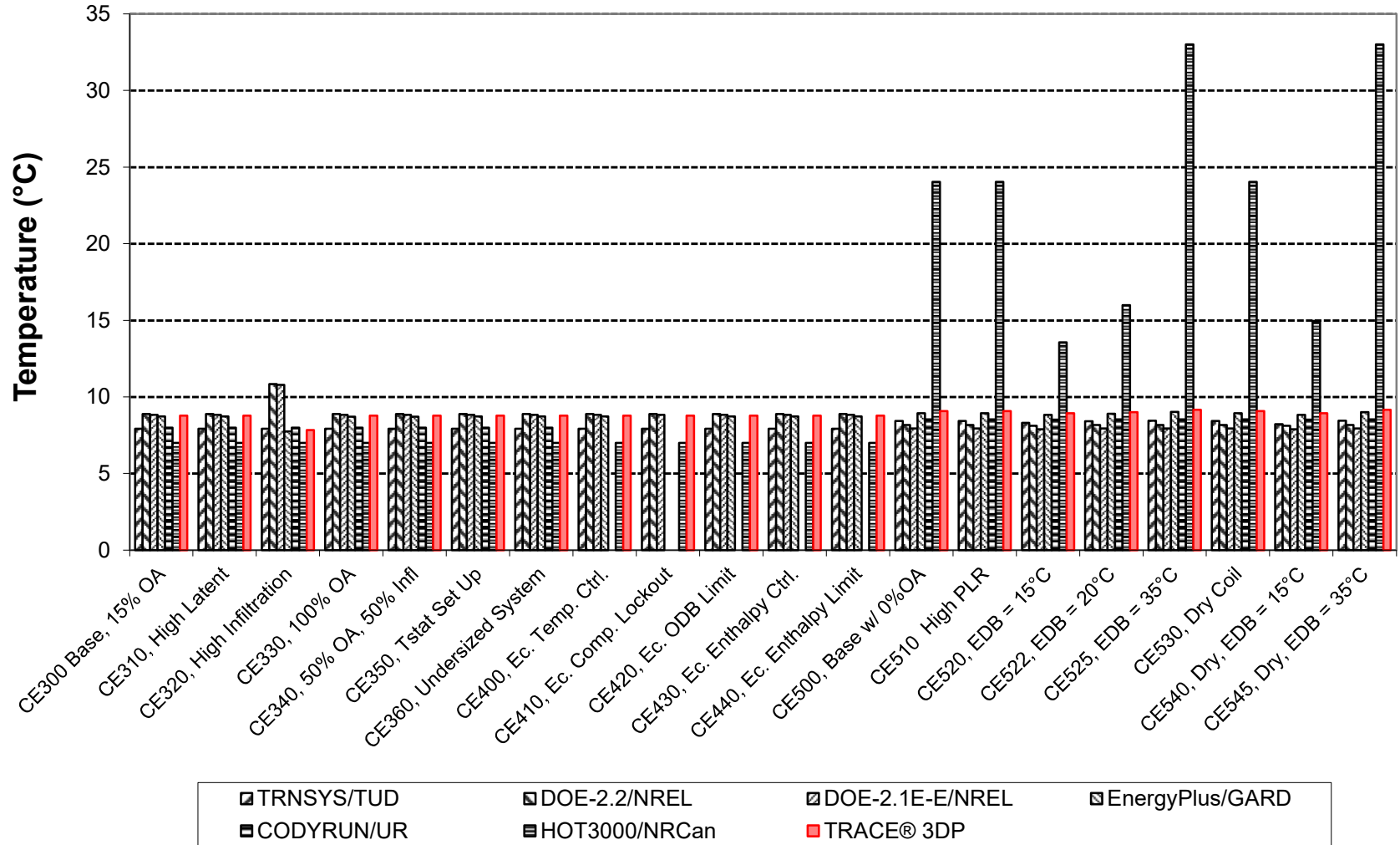
**Figure B16.5.2-26. HVAC BESTEST: CE300 - CE545
 Hourly Minimum COP2 Sensitivities**



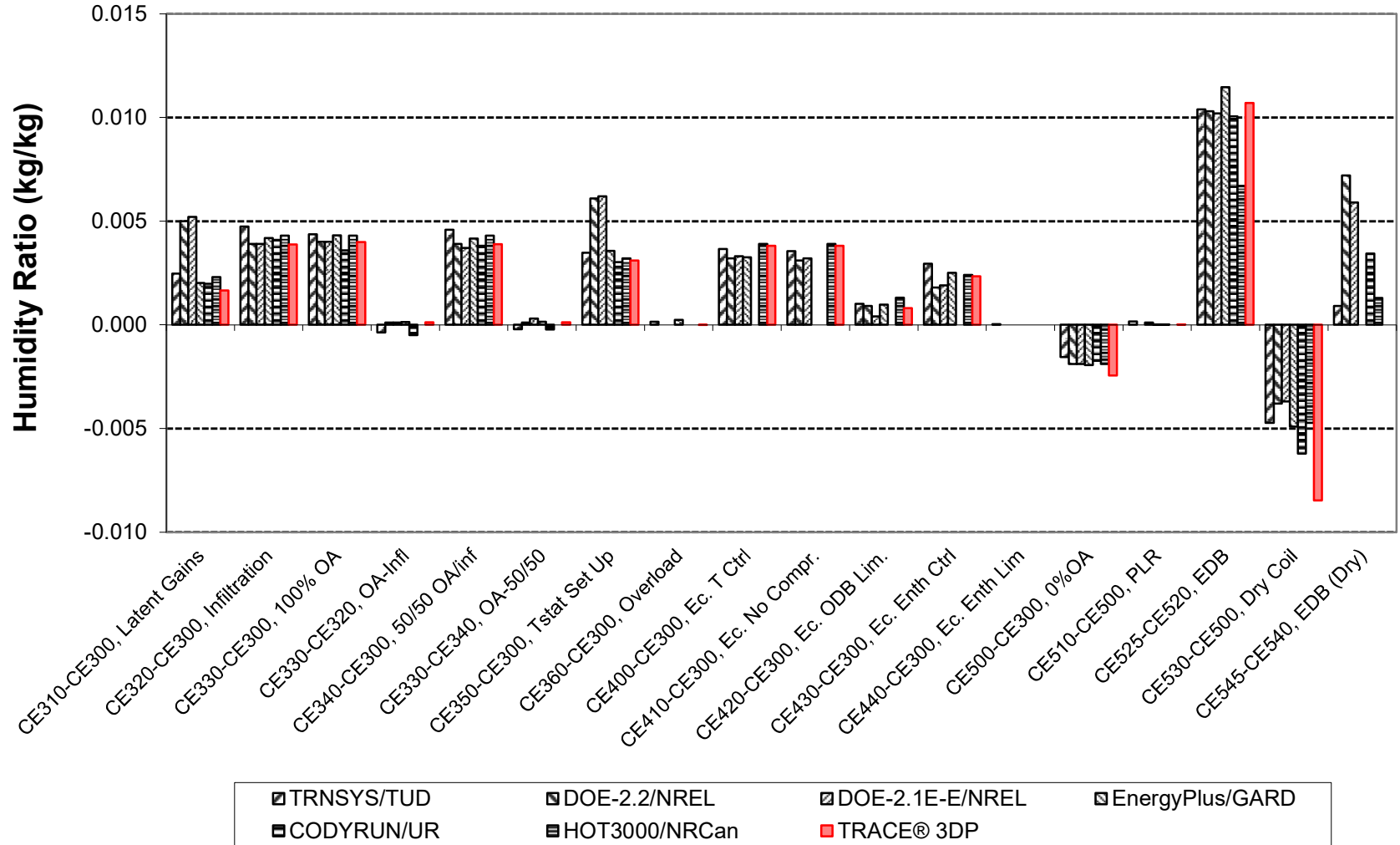
**Figure B16.5.2-29. HVAC BESTEST: CE300 - CE545
 Hourly Maximum Indoor Dry-Bulb Temperature**



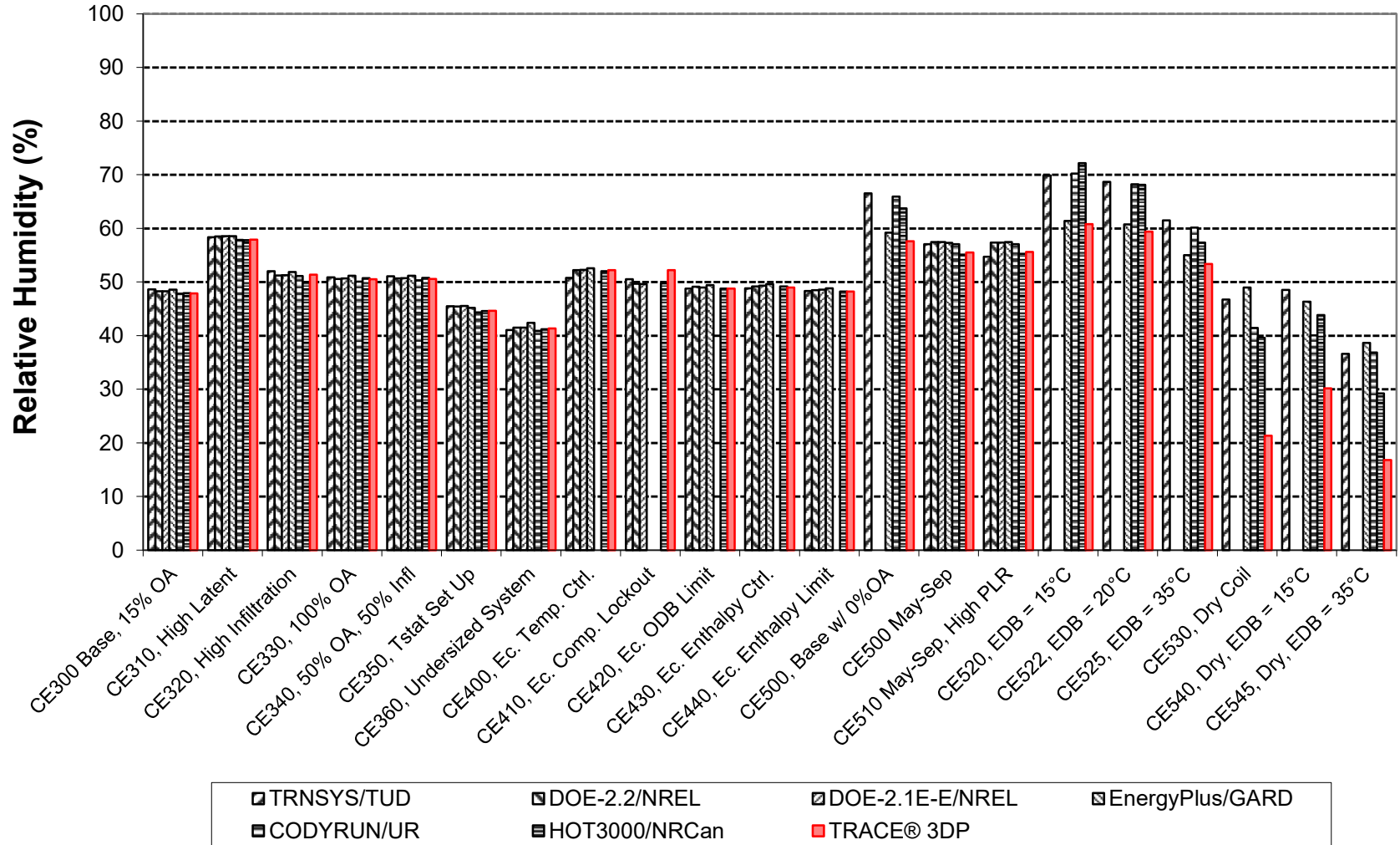
**Figure B16.5.2-31. HVAC BESTEST: CE300 - CE545
 Hourly Minimum Indoor Dry-Bulb Temperature**



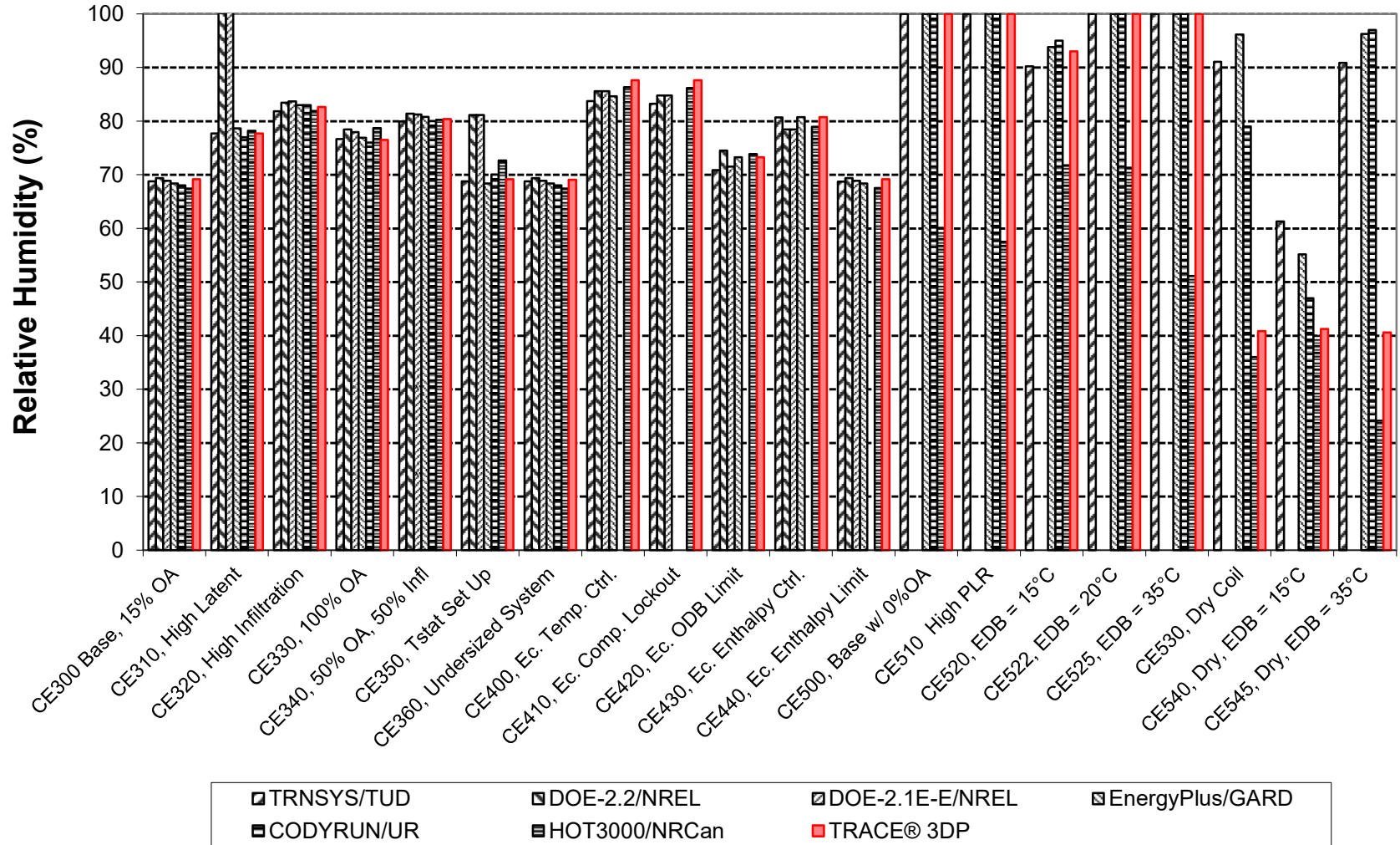
**Figure B16.5.2-35. HVAC BESTEST: CE300 - CE545
 Hourly Maximum Humidity Ratio Sensitivities**



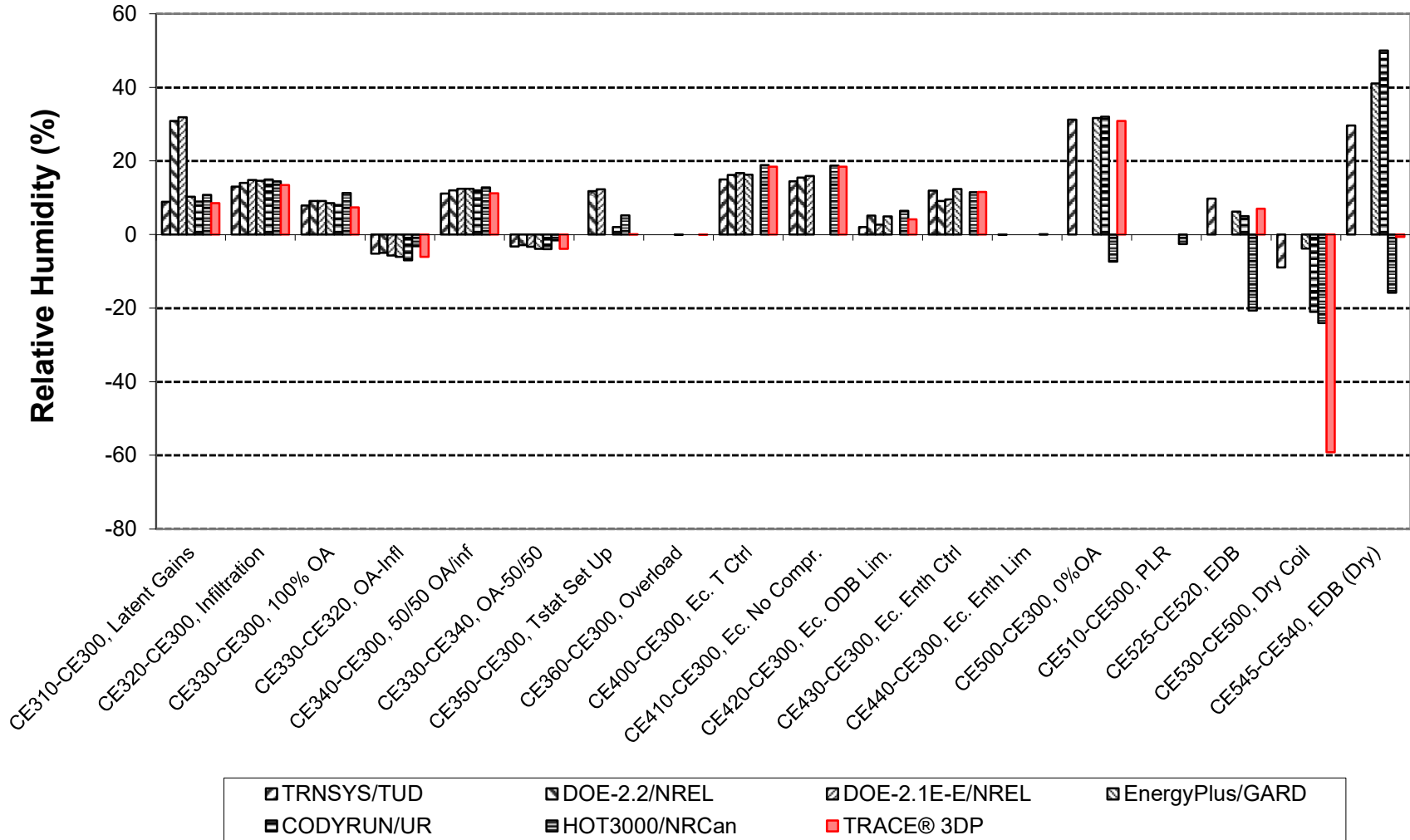
**Figure B16.5.2-37. HVAC BESTEST: CE300 - CE545
 Annual Mean Relative Humidity**



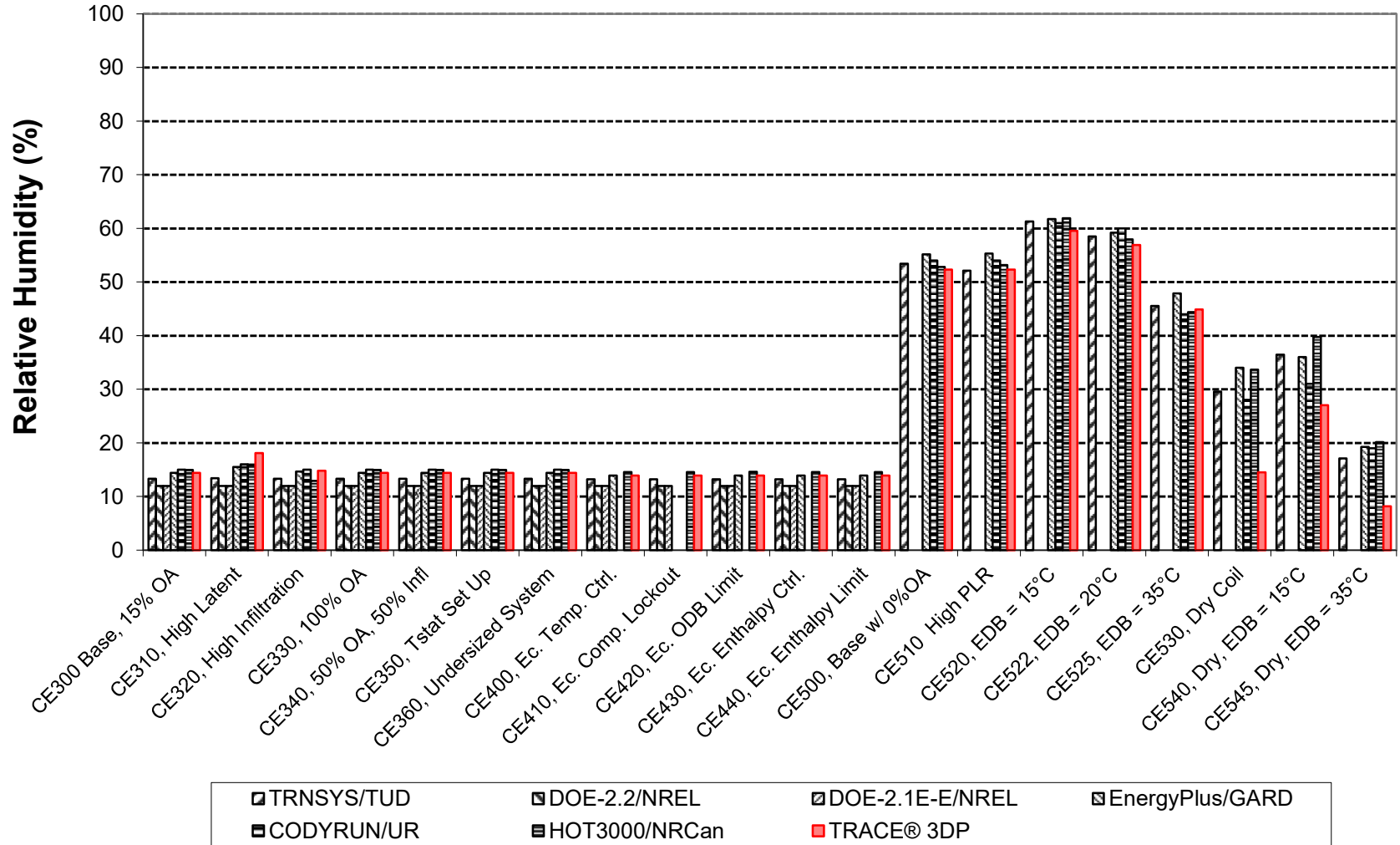
**Figure B16.5.2-39. HVAC BESTEST: CE300 - CE545
 Hourly Maximum Zone Relative Humidity**



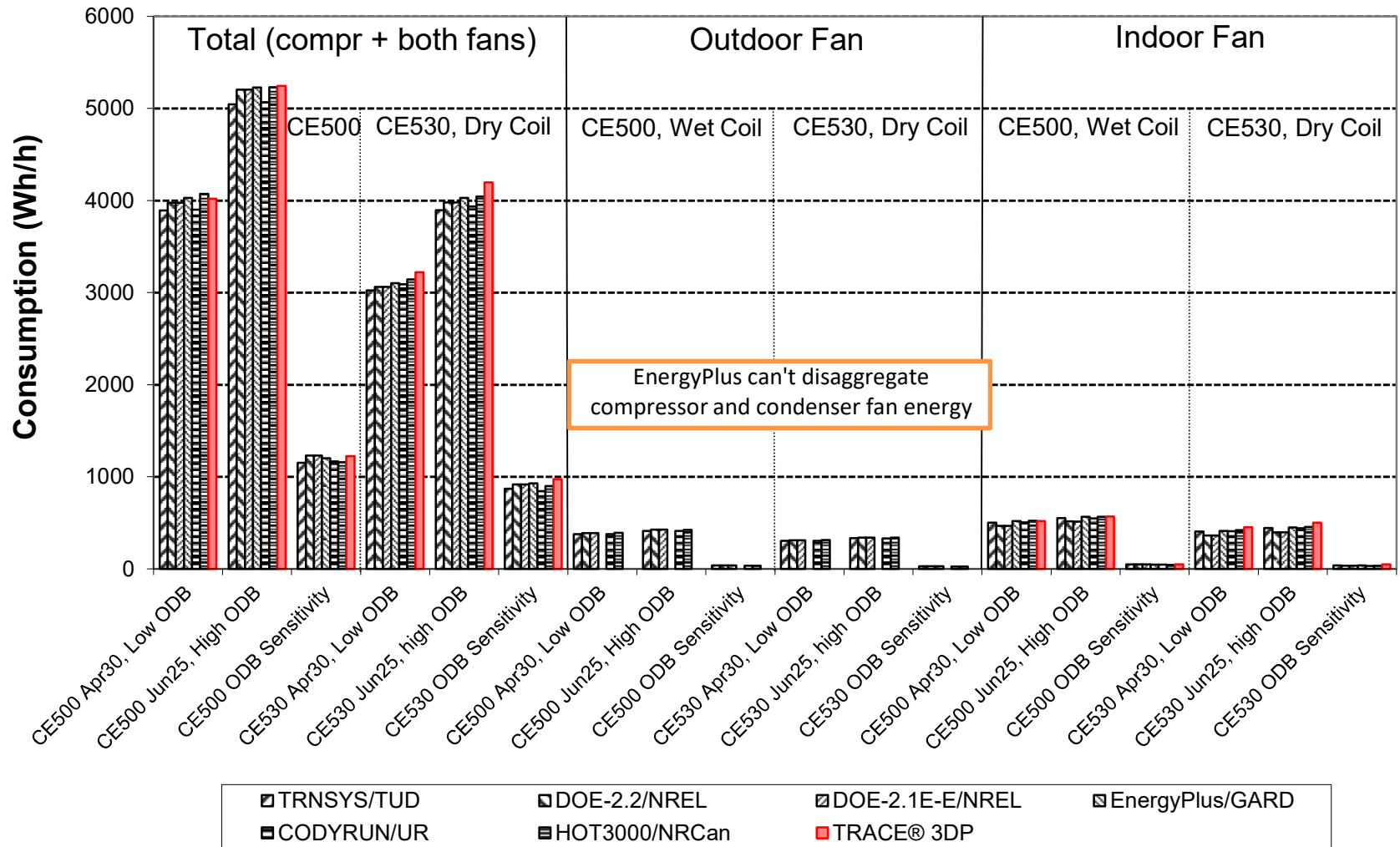
**Figure B16.5.2-40. HVAC BESTEST: CE300 - CE545
 Hourly Maximum Relative Humidity Sensitivities**



**Figure B16.5.2-41. HVAC BESTEST: CE300 - CE545
 Hourly Minimum Zone Relative Humidity**

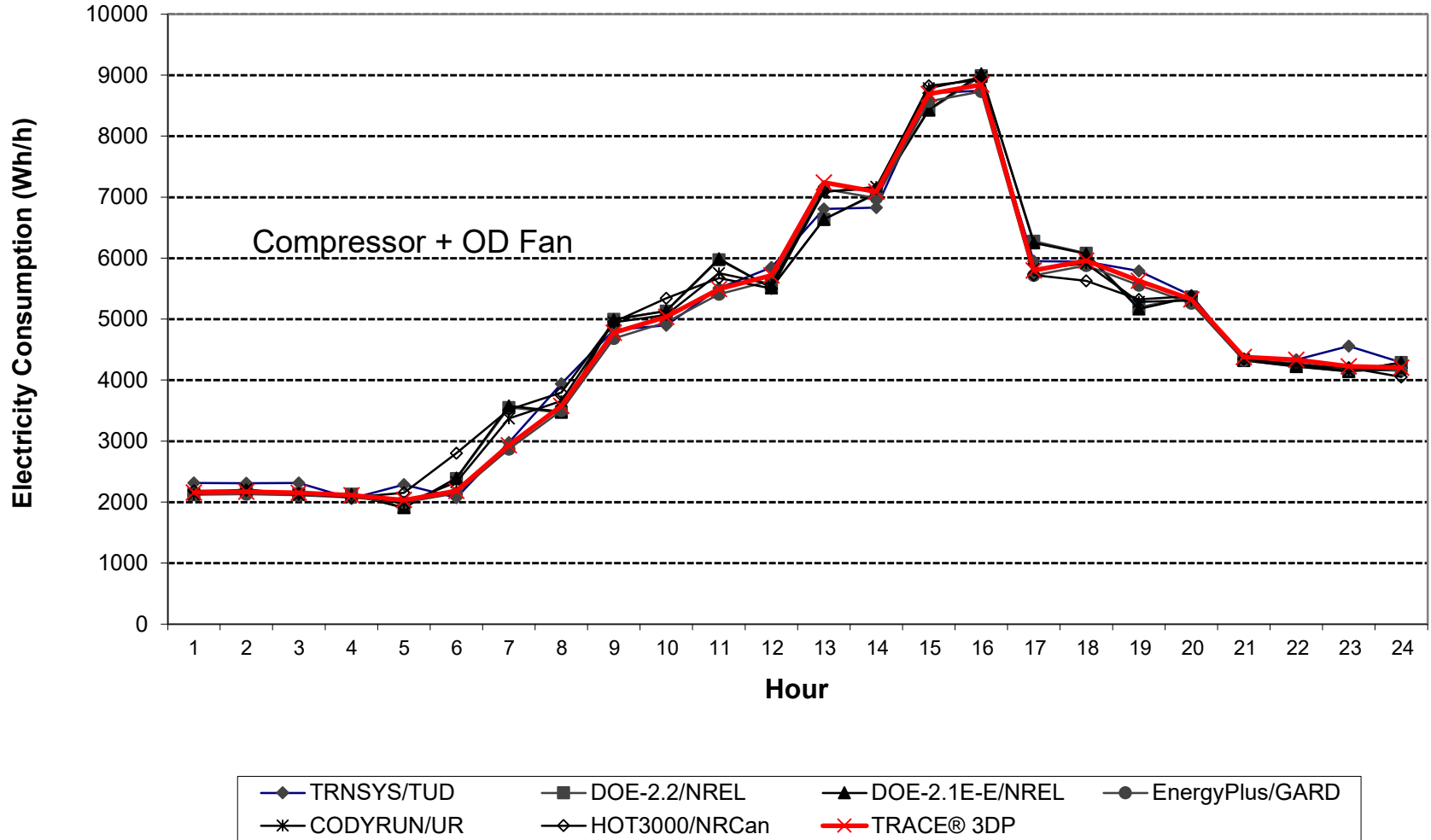


**Figure B16.5.2-42. HVAC BESTEST: f(ODB) for CE500, CE530
 Specific Day Electricity Consumptions**

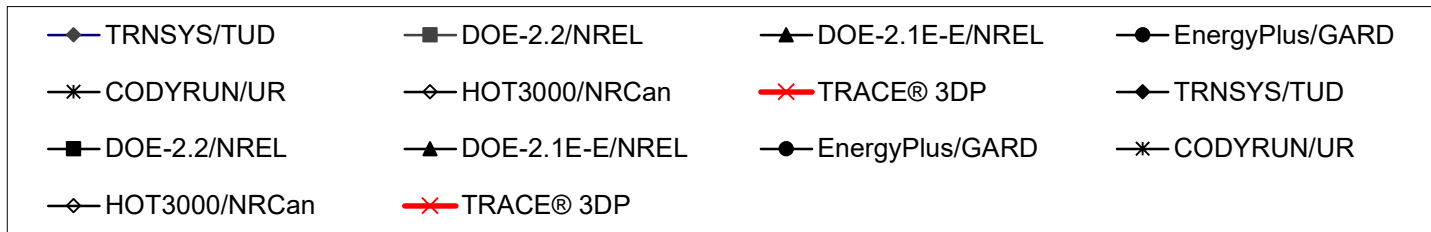
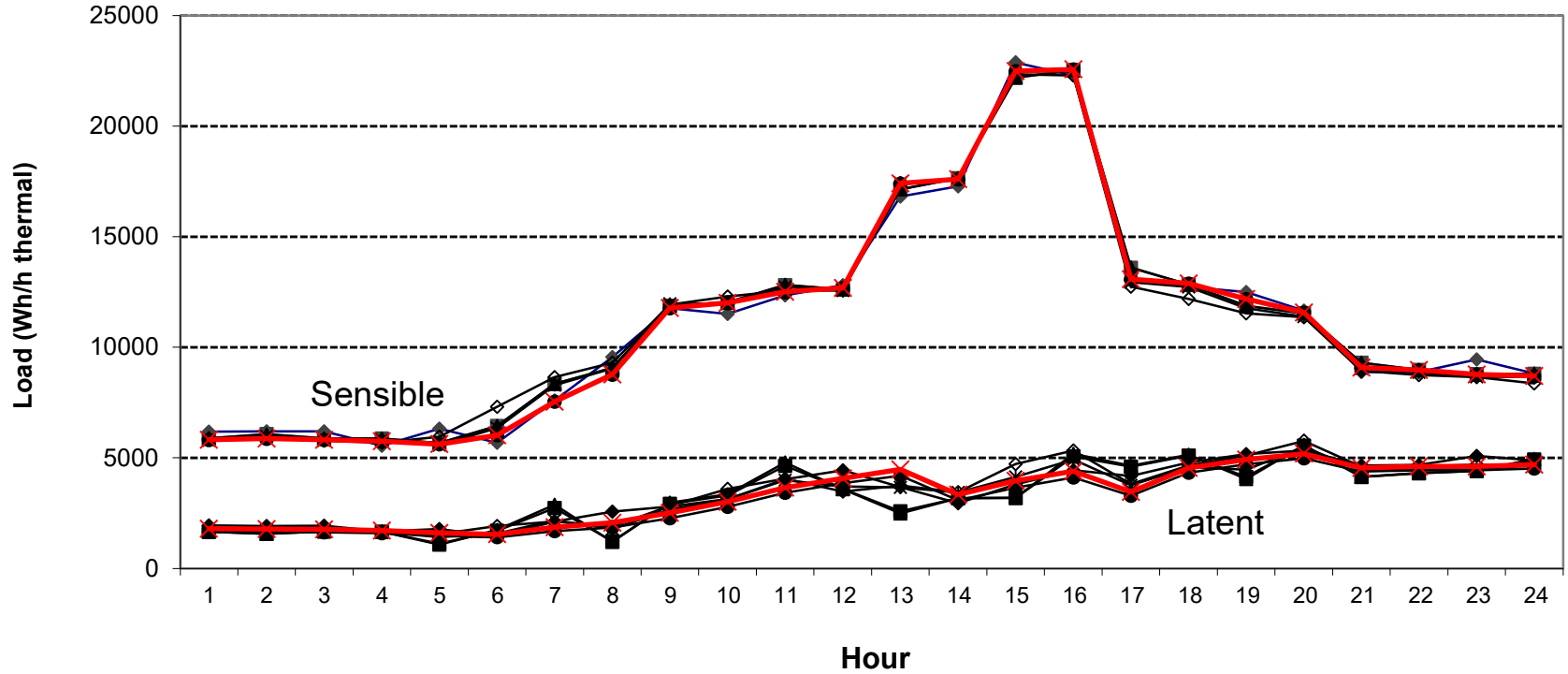


ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

**Figure B16.5.2-46. HVAC BESTEST: CE300
June 28 Hourly Electricity Consumption**

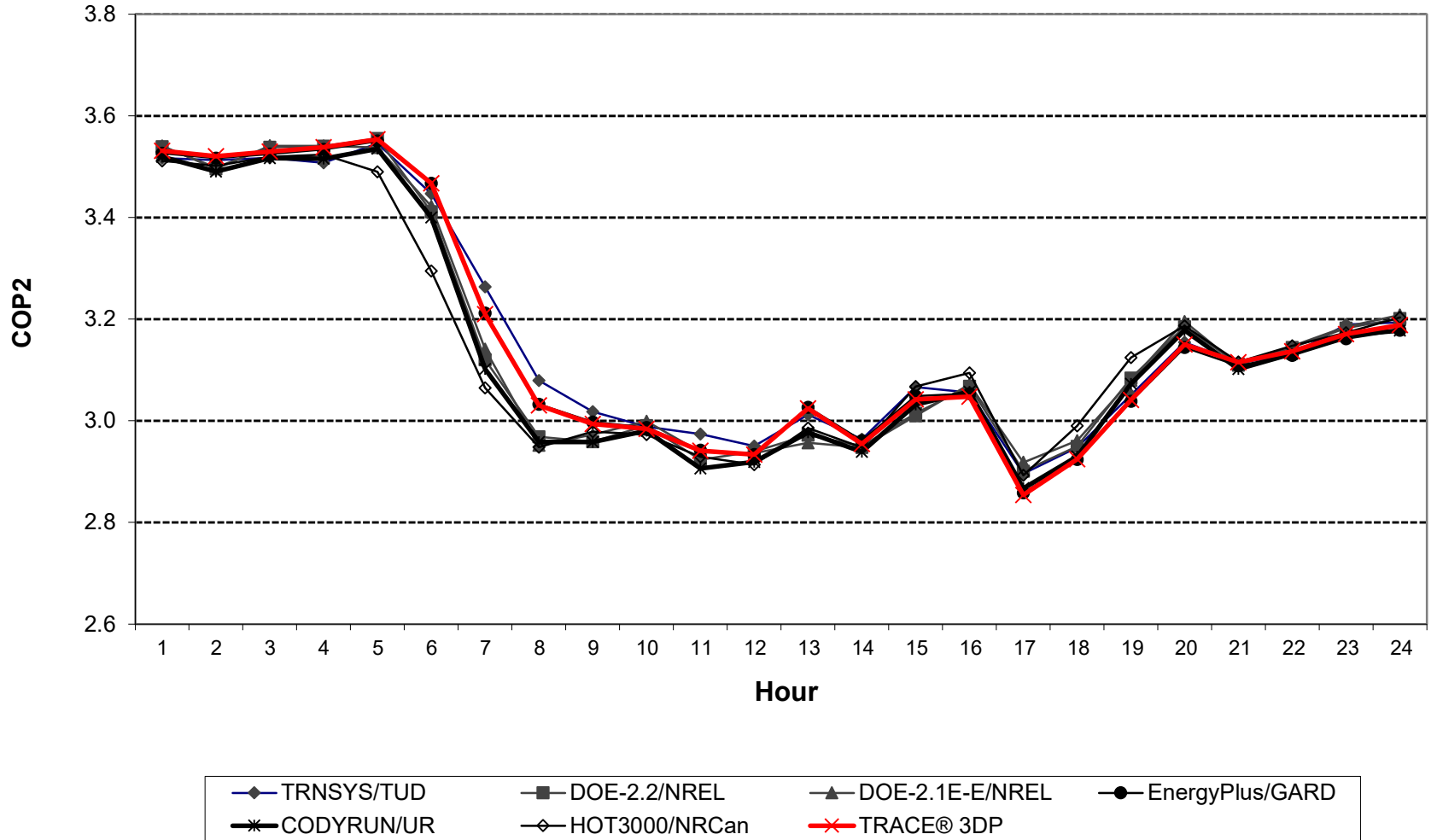


**Figure B16.5.2-47. HVAC BESTEST: CE300
 June 28 Hourly Coil Loads**



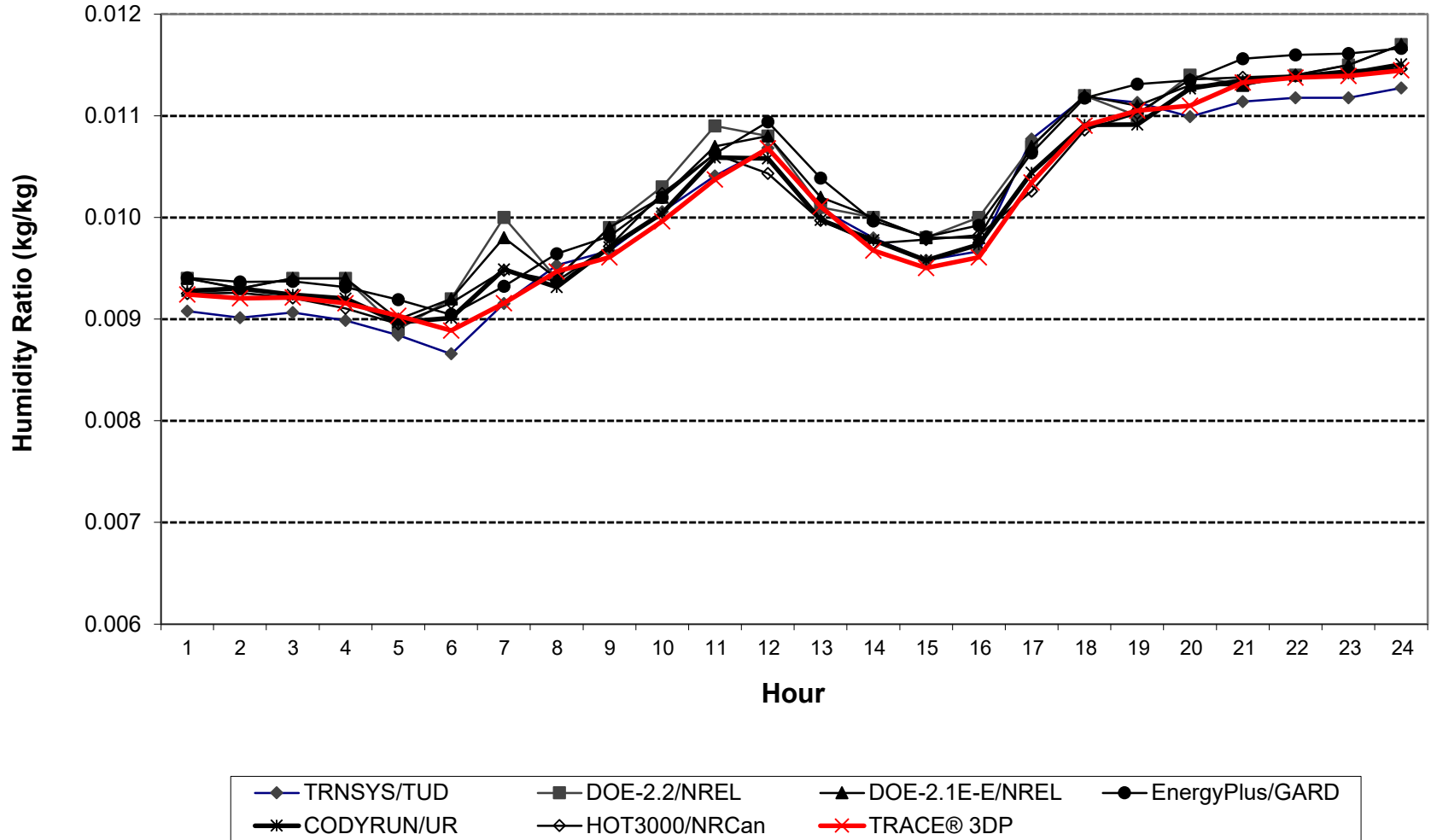
ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

**Figure B16.5.2-48. HVAC BESTEST: CE300
June 28 Hourly COP2**

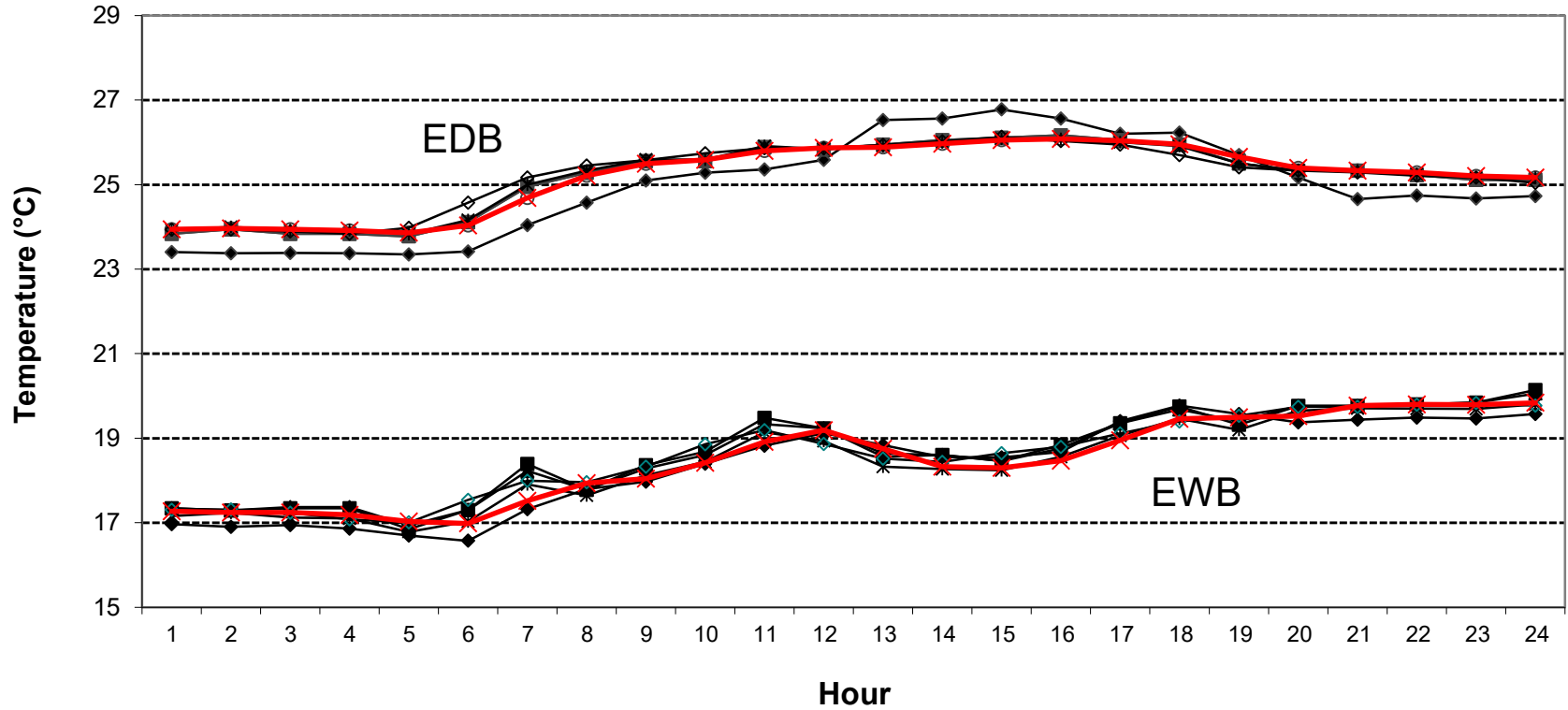


ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

**Figure B16.5.2-49. HVAC BESTEST: CE300
June 28 Hourly Zone Humidity Ratio**



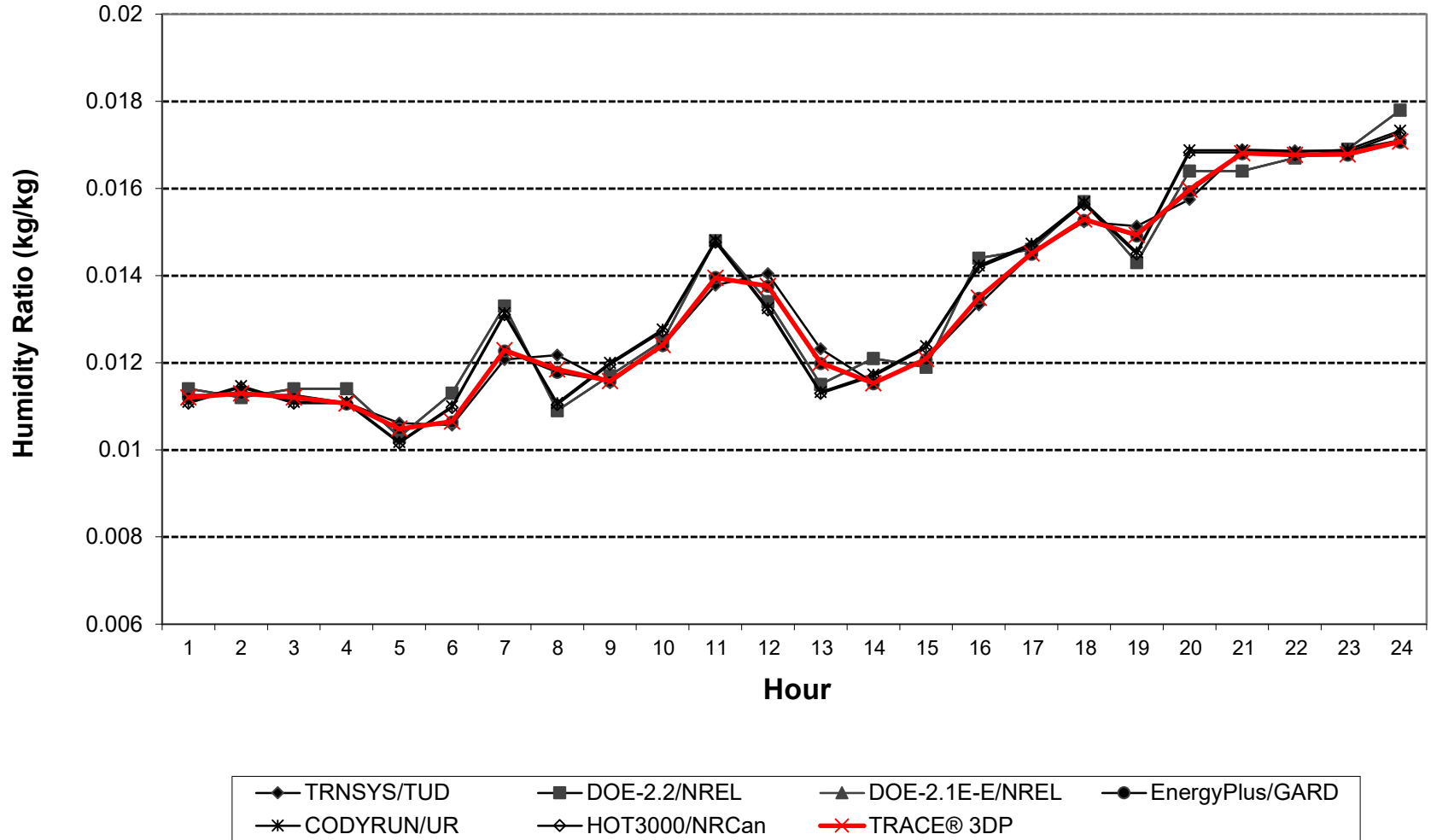
**Figure B16.5.2-50. HVAC BESTEST: CE300
 June 28 Hourly EDB & EWB**



◆ TRNSYS/TUD	■ DOE-2.2/NREL	▲ DOE-2.1E-E/NREL	○ EnergyPlus/GARD	* CODYRUN/UR
◇ HOT3000/NRCan	✕ TRACE® 3DP	◆ TRNSYS/TUD	■ DOE-2.2/NREL	▲ DOE-2.1E-E/NREL
○ EnergyPlus/GARD	* CODYRUN/UR	◇ HOT3000/NRCan	✕ TRACE® 3DP	

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.5.2
Example Results for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

**Figure B16.5.2-52. HVAC BESTEST: CE300
June 28 Hourly OHR**



ASHRAE Standard 140-2014
Participating Organizations and Computer Programs for
Quasi-Analytical Solutions and Example Simulation Results
Section 5.4 - HVAC Equipment Performance Tests HE100-HE230

The quasi-analytical solutions and programs used to generate the example simulation results are described below. The first column ("Model"), indicates the proper program name and version number, or indicates a quasi-analytical solution.

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

The third column ("Implemented By") indicates the national research facility, university, or industry organization with expertise in building science that performed the simulations or did the quasi-analytical solutions.

The entries in the fourth column are the abbreviations for the simulations and quasi-analytical solutions generally used in the tables and charts which follow.

See Standard 140, Annex B17 for further details.

Participating Organizations and Computer Programs

Model	Authoring Organization	Implemented By	Abbreviation
ESP-r/HOT3000 Tier 1 tests - version 1.1 Tier 2 tests - version 1.7	CETC/ESRU, ^{a,b} Canada/United Kingdom	CETC, ^a Canada	ESP-r/HOT3000/CETC
EnergyPlus 1.0.2.008	LBNL/UIUC/CERL/OSU/GARD Analytics/FSEC/DOE-OBT, ^{c,d,e,f,g,h}	GARD Analytics, USA	EnergyPlus/GARD
DOE-2.1E version 107	LANL/LBNL/JJH, ^{i,c,j} USA	CETC, ^a Canada	DOE-2.1E/CETC
Analytical/Quasi-Analytical	CETC ^a	CETC ^a	Analytical/Quasi-Analytical

^aCETC CANMET Energy Technology Centre, Natural Resources Canada, Canada

^bESRU: Energy Systems Research Unit, University of Strathclyde, Scotland, United Kingdom

^cLBNL: Lawrence Berkeley National Laboratory, United States

^dUIUC: University of Illinois Urbana/Champaign, United States

^eCERL: U.S. Army Corps of Engineers, Construction Engineering Research Laboratories, United States

^fOSU: Oklahoma State University, United States

^gFSEC: University of Central Florida, Florida Solar Energy Center, United States

^hDOE-OBT: U.S. Department of Energy, Office of Building Technology, State and Community Programs, Energy Efficiency and Renewable Energy, United States

ⁱLANL: Los Alamos National Laboratory, United States

^jJJH: James J. Hirsch & Associates, United States

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.6
Example Results for Section 5.4 - HVAC Equipment Performance Tests HE100-HE230

List of Tables

<i>Table</i>	<i>Description</i>	<i>Sheet Tab</i>	<i>Cell Range</i>
B16.6-1	Total Furnace Load (GJ)	Tables	A7 – L24
B16.6-2	Total Furnace Input (GJ)	Tables	A26 – L43
B16.6-3	Fuel Consumption (m ³ /s)	Tables	A45 – L62
B16.6-4	Fan Energy, both fans (kWh)	Tables	A64 – K76
B16.6-5	Mean Zone Temperature (°C)	Tables	A78 – J85
B16.6-6	Maximum Zone Temperature (°C)	Tables	A87 – J94
B16.6-7	Minimum Zone Temperature (°C)	Tables	A96 – J103

List of Figures

<i>Figure</i>	<i>Description</i>	<i>Sheet Tab</i>
B16.6-1	Total Furnace Load (GJ)	B16.1-1 LOAD
B16.6-2	Total Furnace Input (GJ)	B16.1-2 INPUT
B16.6-3	Fuel Consumption (m ³ /s)	B16.1-3 FUEL
B16.6-4	Fan Energy, both fans (kWh)	B16.1-4 FANS
B16.6-5	Mean Zone Temperature (°C)	B16.1-5 MEAN T
B16.6-6	Maximum Zone Temperature (°C)	B16.1-6 MAX T
B16.6-7	Minimum Zone Temperature (°C)	B16.1-7 MIN T

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.6
Example Results for Section 5.4 - HVAC Equipment Performance Tests HE100-HE230

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 B16.6-1. Total Furnace Load (GJ)

Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Statistics, All Results				Analytical/ Quasi-Analytical	TRACE® 3DP Trane®
				Min	Max	(Max-Min) /Analytical*	Mean /Mean**		
HE100: 100% eff.	77.94	77.75	77.76	77.75	77.94	0.2%	77.74	77.76	
HE110: 80% eff.	77.94	77.75	77.76	77.75	77.94	0.2%	77.74	77.76	
HE120: 80% eff., PLR=0.4	31.25	31.10	31.13	31.10	31.25	0.5%	31.10	31.22	
HE130: No Load	0.00	0.00	0.16	0.00	0.16	----	0.00	0.04	
HE140: Periodic PLR	31.26	31.10	31.12	31.10	31.26	0.5%	31.10	31.22	
HE150: Continuous Circ. Fan	29.88	29.59	29.57	29.57	29.88	1.1%	29.65	31.23	
HE160: Cycling Circ. Fan	31.26	30.46	30.49	30.46	31.26	2.6%	31.10	31.22	
HE170: Draft Fan	29.88	29.59	29.57	29.57	29.88	1.1%	29.65	31.23	
Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Min	Max	Mean /Mean**	(Max-Min) /Analytical*	Analytical/ Quasi-Analytical	TRACE® 3DP Trane®
HE210: Realistic Weather	41.36	42.04	42.06	41.36	42.06	41.82	1.7%	-	43.06
HE220: Setback Thermostat	39.41	39.87	39.76	39.41	39.87	39.68	1.2%	-	40.76
HE230: Undersized Furnace	34.32	34.59	34.37	34.32	34.59	34.43	0.8%	-	35.81

* Abs[(Max-Min) / (Analytic Solution)]

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

Table B16.6-2. Total Furnace Input (GJ)

Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Statistics, All Results				Analytical/ Quasi-Analytical	TRACE® 3DP Trane®
				Min	Max	(Max-Min) /Analytical*	Mean /Mean**		
HE100: 100% eff.	77.74	77.71	78.42	77.71	78.42	0.9%	77.71	77.76	
HE110: 80% eff.	96.92	97.22	98.02	96.92	98.02	1.1%	97.22	97.20	
HE120: 80% eff., PLR=0.4	38.41	38.27	38.56	38.27	38.56	0.8%	38.27	38.42	
HE130: No Load	0.00	0.00	0.14	0.00	0.14	----	0.00	0.05	
HE140: Periodic PLR	39.00	39.00	38.76	38.76	39.00	0.6%	39.00	39.06	
HE150: Continuous Circ. Fan	37.23	36.94	36.82	36.82	37.23	1.1%	37.02	37.37	
HE160: Cycling Circ. Fan	38.12	38.12	37.96	37.96	38.12	0.4%	38.09	38.35	
HE170: Draft Fan	37.23	36.94	36.82	36.82	37.23	1.1%	37.02	37.37	
Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Min	Max	Mean /Mean**	(Max-Min) /Analytical*	Analytical/ Quasi-Analytical	TRACE® 3DP Trane®
HE210: Realistic Weather	50.53	52.01	52.37	50.53	52.37	51.64	3.6%	-	52.81
HE220: Setback Thermostat	47.87	49.35	49.47	47.87	49.47	48.89	3.3%	-	50.08
HE230: Undersized Furnace	41.37	42.55	43.22	41.37	43.22	42.38	4.4%	-	43.44

* Abs[(Max-Min) / (Analytic Solution)]

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.6
Example Results for Section 5.4 - HVAC Equipment Performance Tests HE100-HE230

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 B16.6-3. Fuel Consumption (m³/s)

Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Statistics, All Results				Analytical/ Quasi-Analytical	TRACE® 3DP Trane®
				Min	Max	(Max-Min) /Analytical*	Mean		
HE100: 100% eff.	0.000263	0.000263	0.000265	0.000263	0.000265		0.9%	0.000263	0.000263
HE110: 80% eff.	0.000328	0.000329	0.000332	0.000328	0.000332		1.1%	0.000329	0.000329
HE120: 80% eff., PLR=0.4	0.000130	0.000130	0.000131	0.000130	0.000131		0.8%	0.000130	0.000130
HE130: No Load	0.000000	0.000000	0.000000	0.000000	0.000000		---	0.000000	0.000000
HE140: Periodic PLR	0.000132	0.000132	0.000131	0.000131	0.000132		0.6%	0.000132	0.000132
HE150: Continuous Circ. Fan	0.000126	0.000125	0.000125	0.000125	0.000126		1.1%	0.000125	0.000126
HE160: Cycling Circ. Fan	0.000129	0.000129	0.000129	0.000129	0.000129		0.4%	0.000129	0.000130
HE170: Draft Fan	0.000126	0.000125	0.000125	0.000125	0.000126		1.1%	0.000125	0.000126
Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Min	Max	Mean	(Max-Min) /Mean**	Analytical/ Quasi-Analytical	TRACE® 3DP Trane®
HE210: Realistic Weather	0.000171	0.000176	0.000177	0.000171	0.000177	0.000175	3.5%	-	0.000179
HE220: Setback Thermostat	0.000162	0.000167	0.000167	0.000162	0.000167	0.000165	3.3%	-	0.000169
HE230: Undersized Furnace	0.000140	0.000144	0.000146	0.000140	0.000146	0.000143	4.3%	-	0.000147

* Abs[(Max-Min) / (Analytic Solution)]

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

Table B16.6-4. Fan Energy, both fans (kWh)

Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Statistics, All Results				Analytical/ Quasi-Analytical	TRACE® 3DP Trane®
				Min	Max	(Max-Min) /Analytical*	Mean		
HE150: Continuous Circ. Fan	432.0	433.3	432.1	432.0	433.3		0.3%	432.0	419.4
HE160: Cycling Circ. Fan	170.2	172.2	172.4	170.2	172.4		1.3%	172.8	172.2
HE170: Draft Fan	473.4	473.1	473.1	473.1	473.4		0.1%	473.2	461.1
Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Min	Max	Mean	(Max-Min) /Mean**	Analytical/ Quasi-Analytical	TRACE® 3DP Trane®
HE210: Realistic Weather	281.6	291.4	298.9	281.6	298.9	290.6	6.0%	-	294.4
HE220: Setback Thermostat	268.3	276.1	281.2	268.3	281.2	275.2	4.7%	-	280.6
HE230: Undersized Furnace	458.3	431.4	478.4	431.4	478.4	456.0	10.3%	-	483.3

* Abs[(Max-Min) / (Analytic Solution)]

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

ASHRAE Standard 140-2014, Informative Annex B16, Section B16.6
Example Results for Section 5.4 - HVAC Equipment Performance Tests HE100-HE230

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 B16.6-5. Mean Zone Temperature (°C)

Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Statistics, All Results				TRACE® 3DP Trane®
				Min	Max	Mean	(Max-Min) /Mean**	
HE210: Realistic Weather	20.01	20.00	19.98	19.98	20.01	20.00	0.2%	20.00
HE220: Setback Thermostat	18.75	18.53	18.53	18.53	18.75	18.60	1.2%	18.52
HE230: Undersized Furnace	15.48	15.17	15.64	15.17	15.64	15.43	3.0%	15.35

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

Table B16.6-6. Maximum Zone Temperature (°C)

Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Statistics, All Results				TRACE® 3DP Trane®
				Min	Max	Mean	(Max-Min) /Mean*	
HE210: Realistic Weather	21.45	20.00	20.06	20.00	21.45	20.50	7.1%	20.00
HE220: Setback Thermostat	22.70	20.00	20.11	20.00	22.70	20.94	12.9%	20.00
HE230: Undersized Furnace	20.14	20.00	20.06	20.00	20.14	20.07	0.7%	20.00

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

Table B16.6-7. Minimum Zone Temperature (°C)

Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Statistics, All Results				TRACE® 3DP Trane®
				Min	Max	Mean	(Max-Min) /Mean*	
HE210: Realistic Weather	20.00	20.00	19.89	19.89	20.00	19.96	0.6%	20.00
HE220: Setback Thermostat	15.00	15.00	14.94	14.94	15.00	14.98	0.4%	15.00
HE230: Undersized Furnace	1.45	4.48	3.22	1.45	4.48	3.05	99.3%	1.85

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

Figure B16.6-1. Comparison of the Energy Delivered for the Fuel-Fired Furnace Test Cases

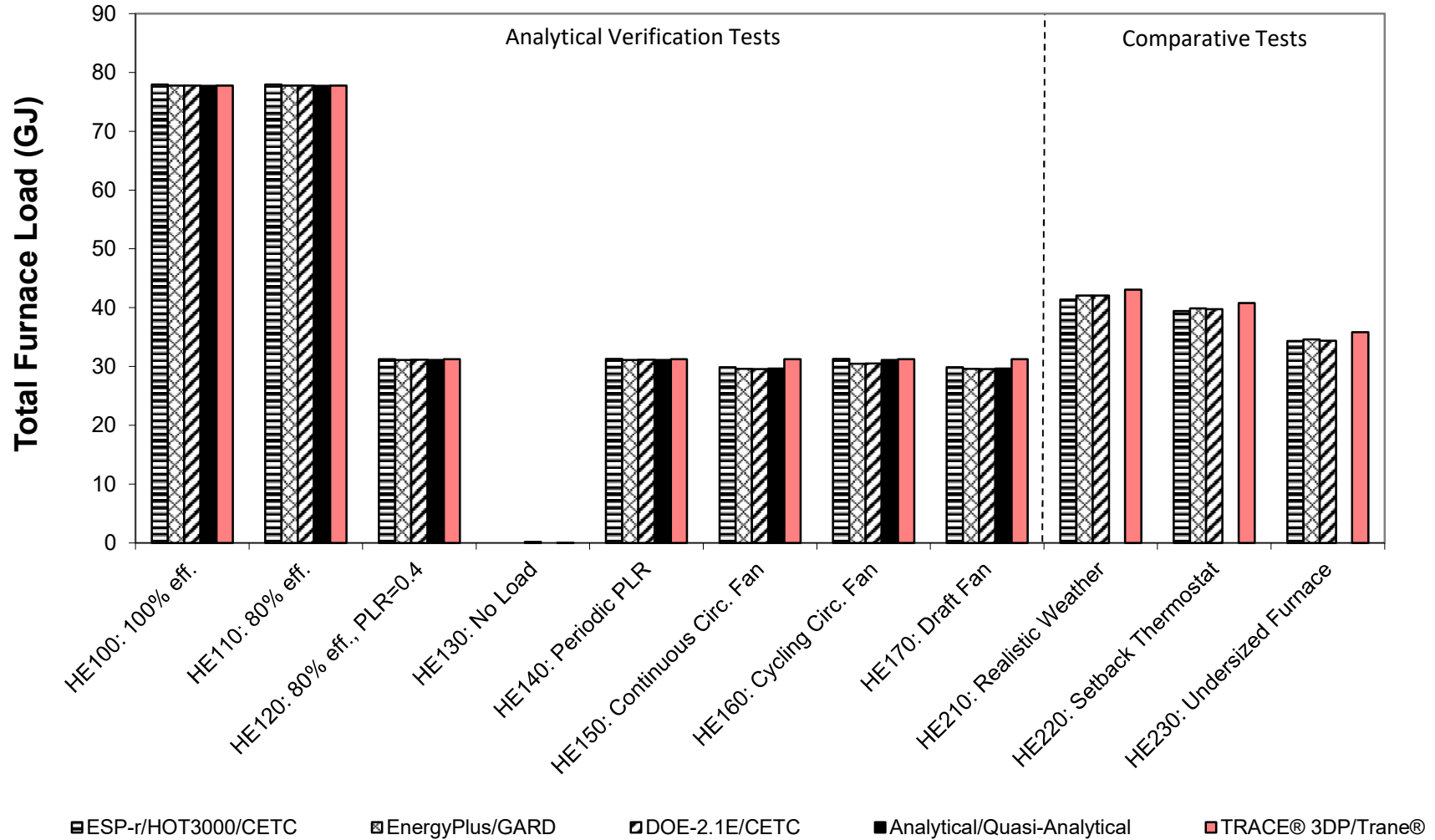


Figure B16.6-2. Comparison of the Energy Consumed for the Fuel-Fired Furnace Test Cases

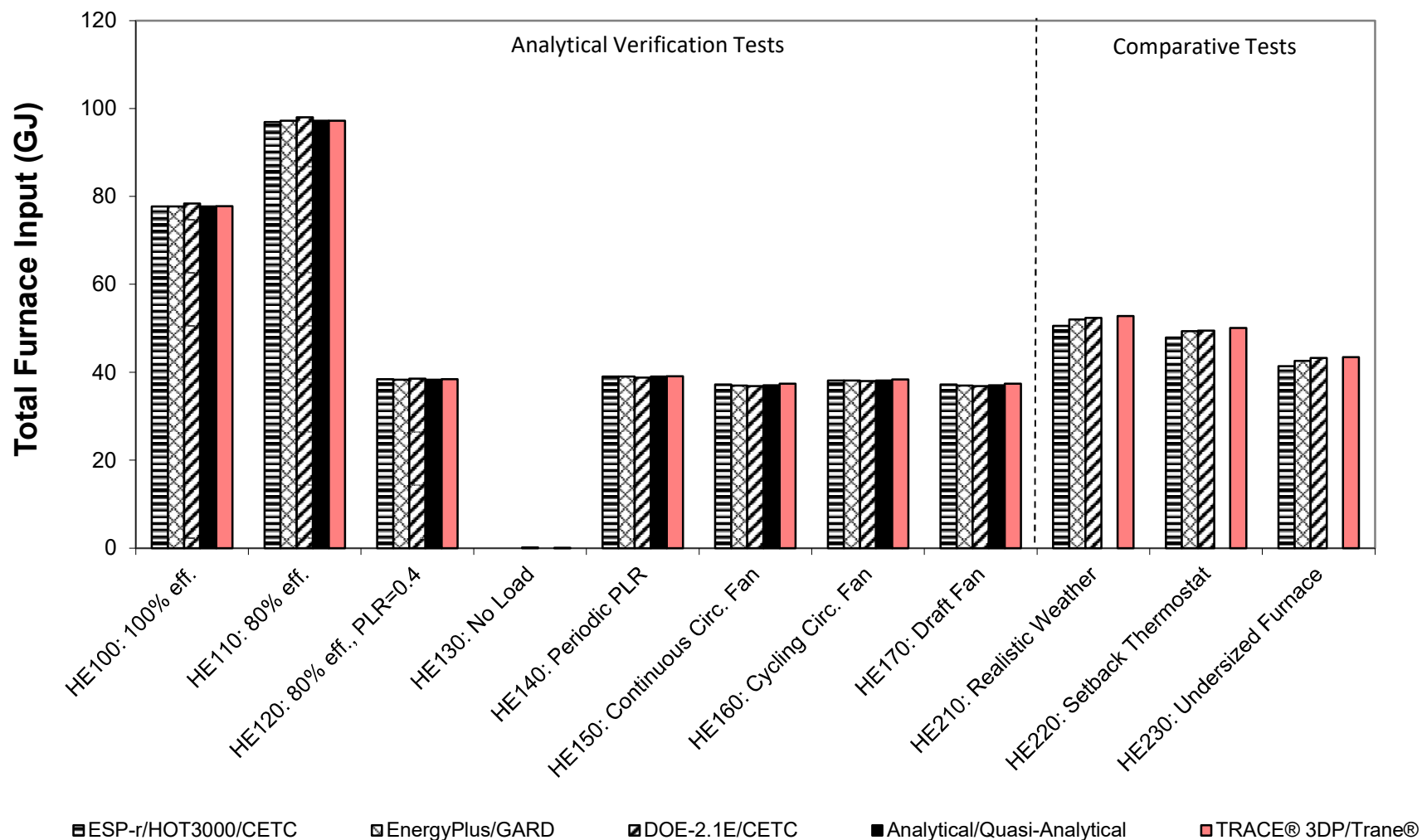


Figure B16.6-3. Comparison of the Fuel Consumed for the Fuel-Fired Furnace Test Cases

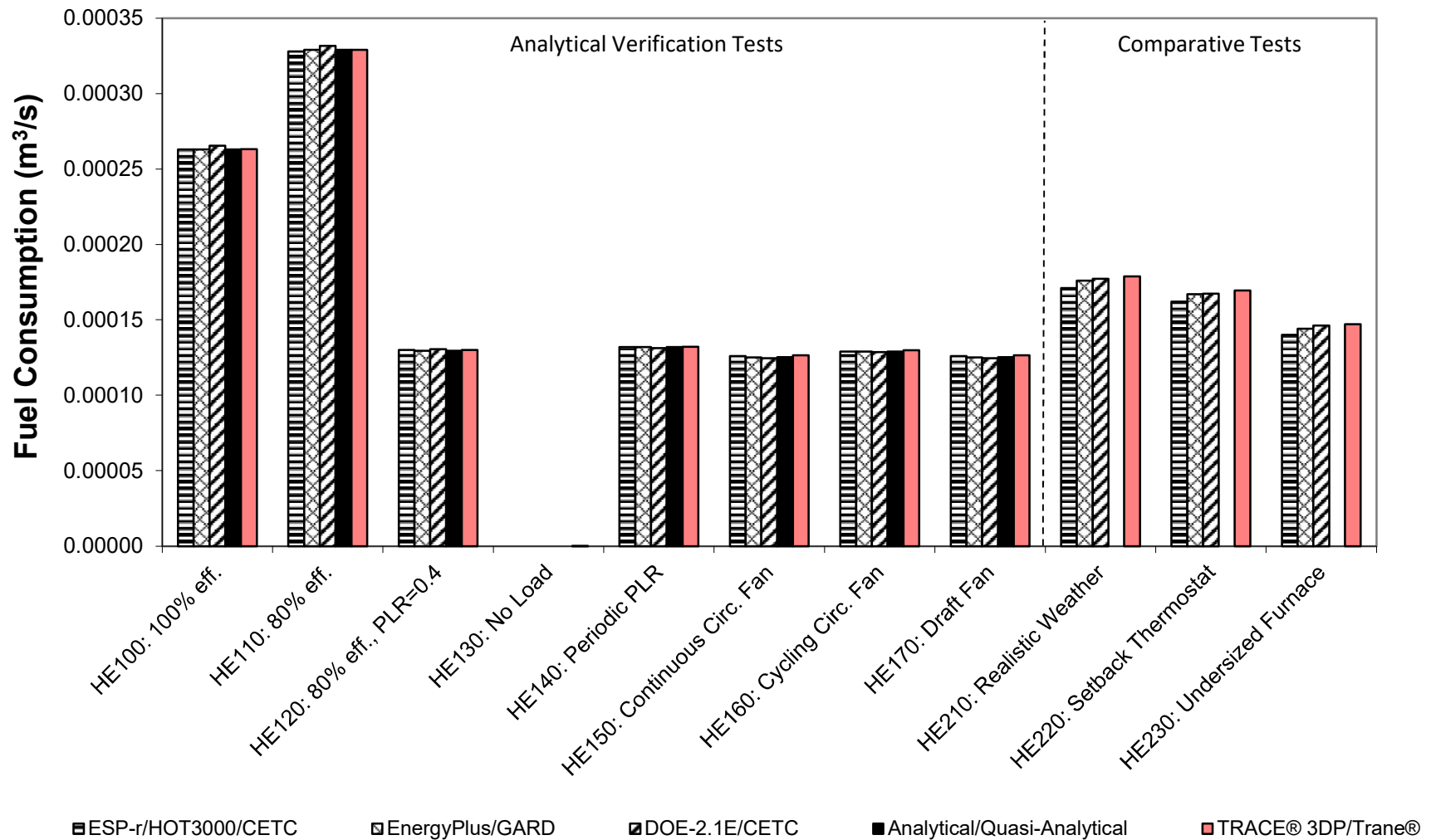


Figure B16.6-4. Comparison of the Fan Energy for the Fuel-Fired Furnace Test Cases

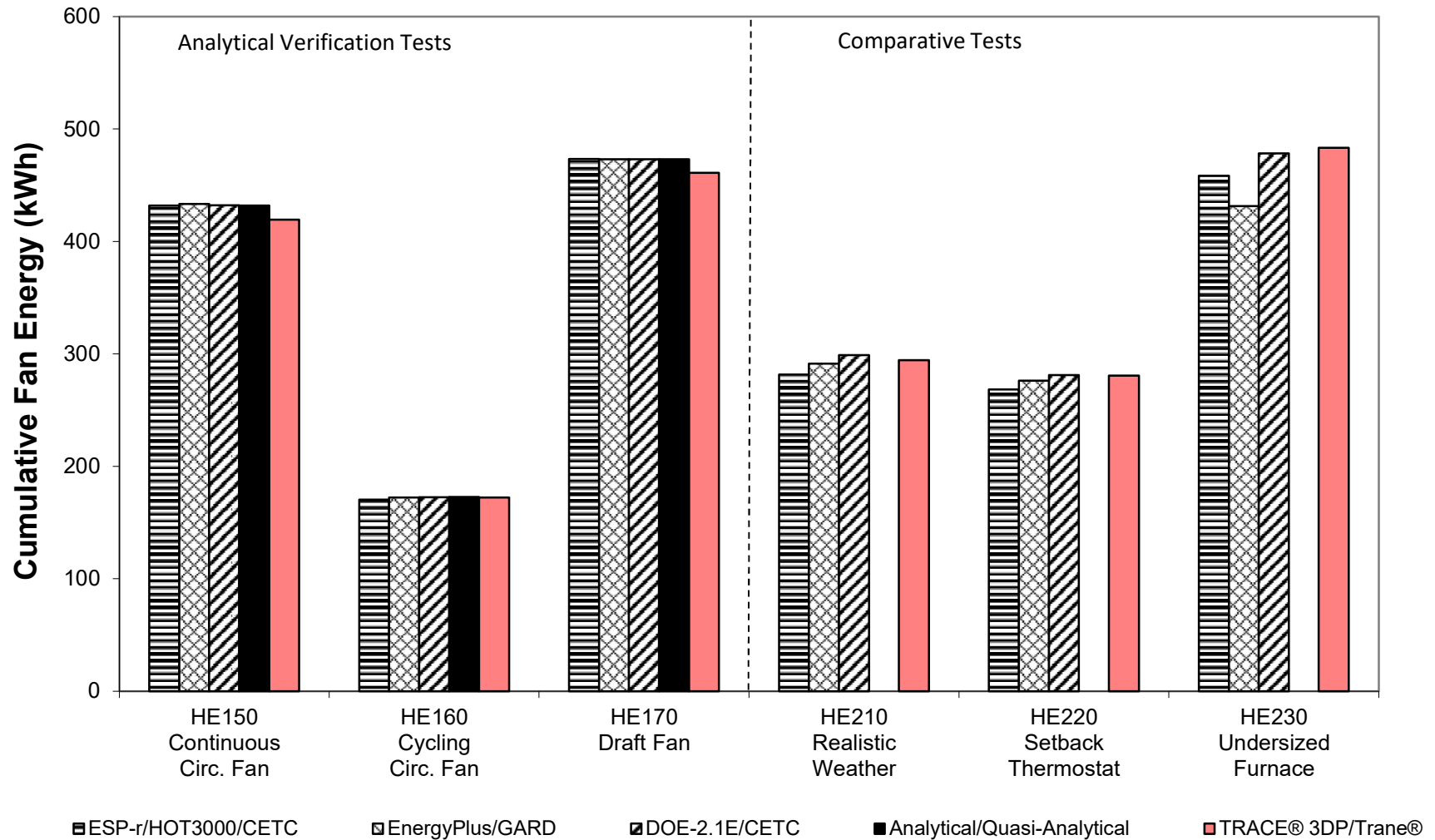


Figure B16.6-5. Comparison of the Mean Zone Temperature for the Fuel-Fired Furnace Comparative Test Cases

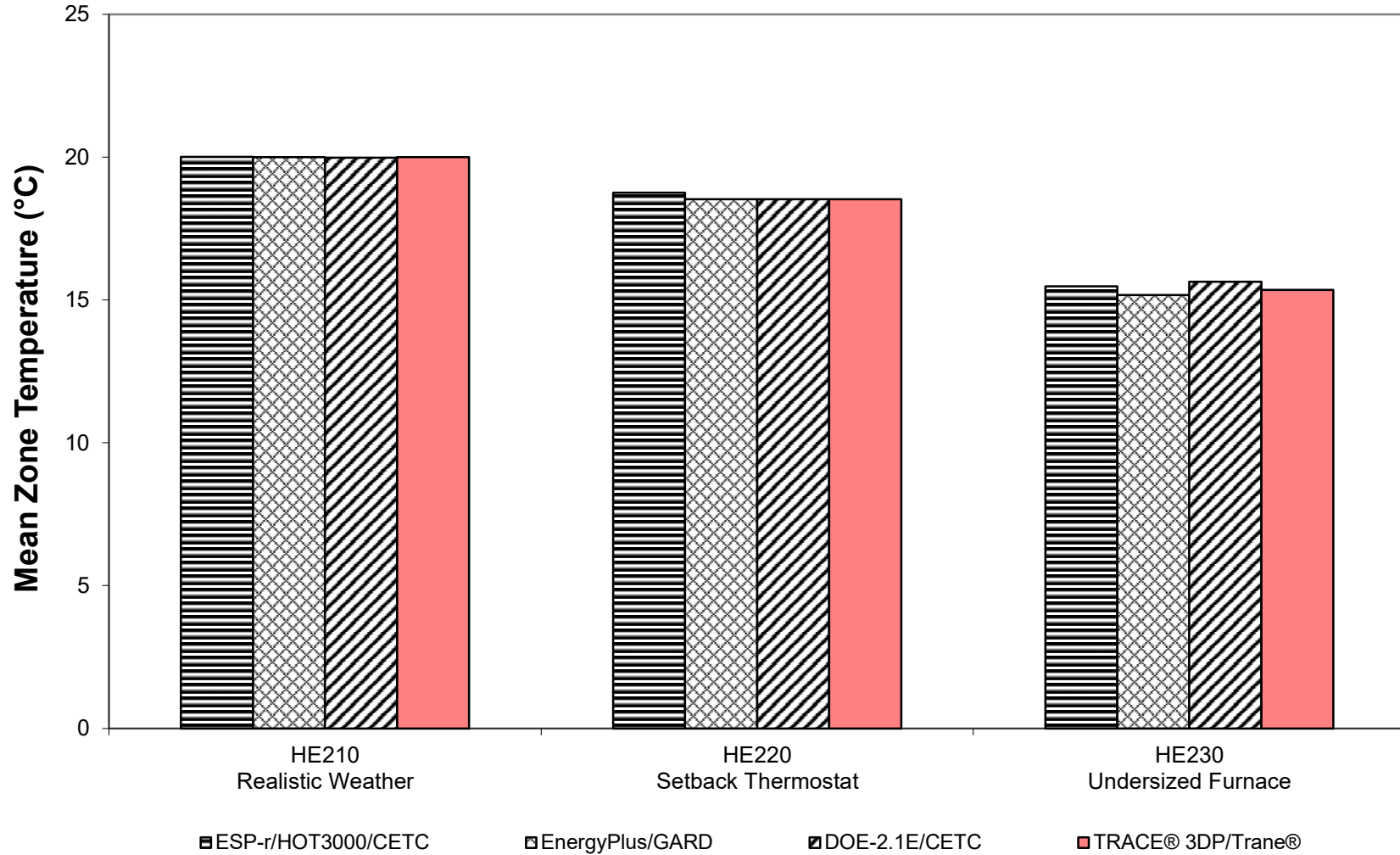


Figure B16.6-6. Comparison of the Maximum Zone Temperature for the Fuel-Fired Furnace Comparative Test Cases

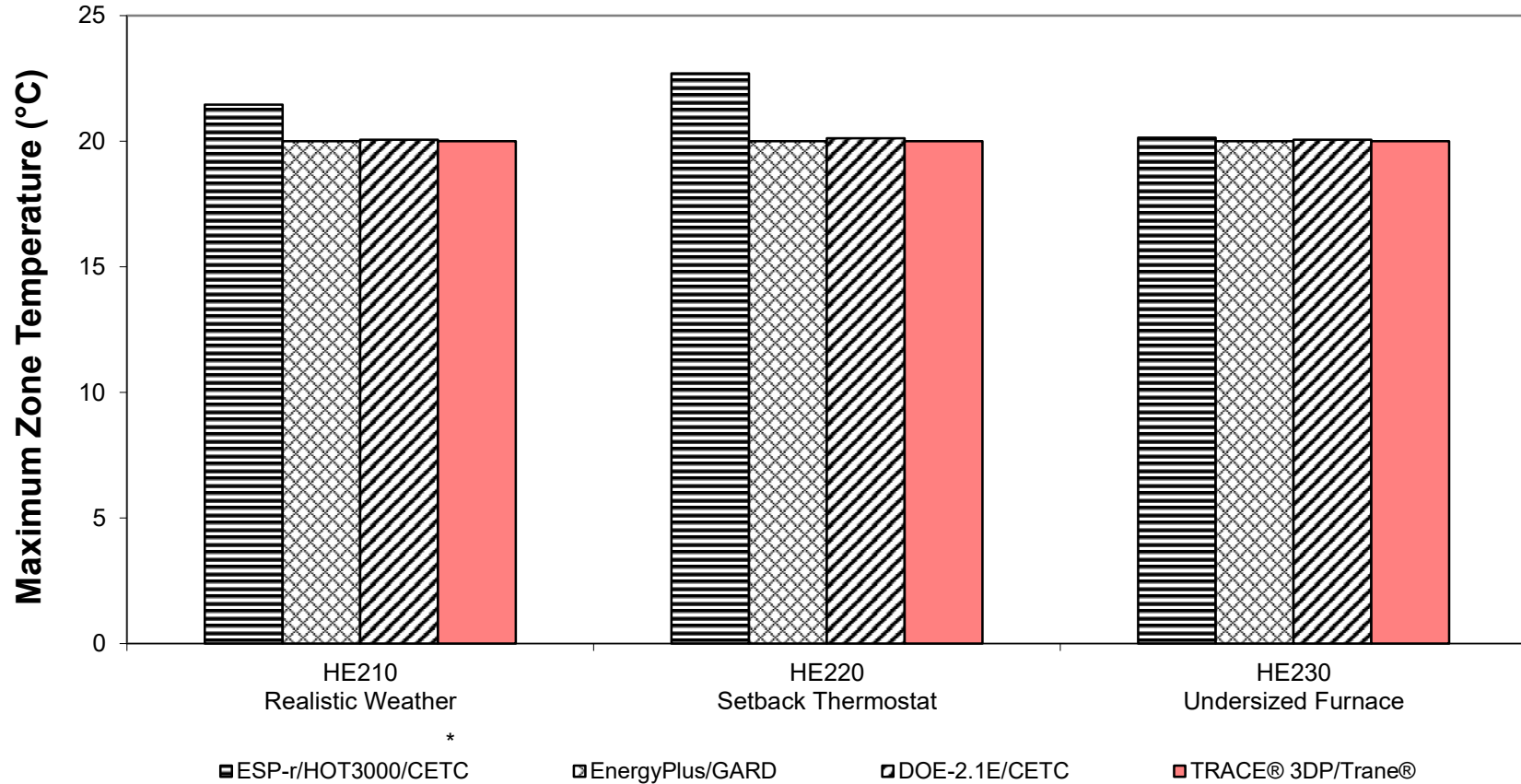


Figure B16.6-7. Comparison of the Minimum Zone Temperature for the Fuel-Fired Furnace Comparative Test Cases

