

ASHRAE Standard 140-2011

Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200

Results for BEST
(BEST1405dev)

vs.

Informative Annex B16, Section B16.5.1 Example Results

Prepared By
NIKKEN SEKKEI Ltd. nino
(nino)

Results Developed
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ASHRAE Standard 140-2011
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 140-2010 Section 5.3 - HVAC Equipment Performance Tests CE100-CE200
BEST (BEST1405dev) vs. Annex B16, Section B16.5.1 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014

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**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200
BEST (BEST1405dev) vs. Annex B16, Section B16.5.1 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014**

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

Table B16.5.1-1. Space Cooling Electricity Consumption

Energy Consumption, Total (kWh,e)								Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				nino
CE100	1531	1530	1521	1519	1520	1522	1512	1512	1531	1.2%	1531	1531	1531	1519
CE110	1077	1089	1061	1065	1069	1067	1061	1089	2.6%		1076	1077	1077	1056
CE120	1012	1012	1011	1003	1006	1007	1002	1012	1.0%		1013	1011	1011	997
CE130	110	109	105	106	109	109	105	110	4.3%		111	110	110	101
CE140	68	69	65	66	68	68	65	69	5.8%		69	69	68	63
CE150	1208	1207	1202	1183	1197	1199	1183	1208	2.1%		1206	1207	1207	1206
CE160	1140	1139	1138	1107	1132	1137	1107	1140	2.9%		1140	1139	1139	1136
CE165	1502	1501	1499	1470	1491	1500	1470	1502	2.1%		1498	1500	1500	1503
CE170	638	638	629	620	635	636	620	638	2.8%		641	638	638	623
CE180	1083	1082	1077	1080	1082	1081	1077	1083	0.5%		1083	1082	1082	1073
CE185	1544	1543	1541	1547	1540	1542	1538	1547	0.6%		1545	1543	1543	1538
CE190	164	164	160	160	164	164	160	165	3.1%		165	164	164	155
CE195	250	250	245	246	250	250	245	252	2.7%		252	250	250	237
CE200	1477	1464	1468	1440	1465	1480	1440	1480	2.7%		1476	1477	1477	1477
Energy Consumption, Compressor (kWh,e)								Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				nino
CE100	1319	1318	1307	1311		1311	1303	1319	1.2%		1319	1319	1319	1313
CE110	889	899	866	883		879	876	899	3.7%		888	889	889	880
CE120	840	840	850	838		836	832	850	2.2%		841	839	839	838
CE130	95	94	93	93		94	95	95	2.1%		95	94	94	90
CE140	57	57	55	56		56	57	57	3.9%		57	57	56	54
CE150	1000	999	1007	982		992	987	1007	2.5%		999	999	999	1002
CE160	950	949	963	926		947	944	963	3.9%		950	949	949	953
CE165	1283	1281	1291	1256		1280	1272	1291	2.8%		1279	1280	1280	1284
CE170	531	530	539	523		528	529	539	3.0%		533	530	530	529
CE180	909	908	914	912		907	906	914	0.9%		908	908	908	909
CE185	1340	1339	1343	1344		1337	1334	1344	0.7%		1340	1339	1338	1339
CE190	138	138	139	138		138	138	139	1.4%		138	138	138	135
CE195	217	217	219	217		216	218	219	1.1%		219	217	217	211
CE200	1250	1239	1249	1218		1253	1253	1253	2.8%		1249	1250	1250	1250
Energy Consumption, Supply Fan (kWh,e)								Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				nino
CE100	144	144	145	141	144	144	141	145	2.9%		144	144	144	140
CE110	128	129	133	122	128	128	122	133	8.5%		128	128	128	120
CE120	117	117	110	110	116	117	110	117	6.3%		117	117	117	108
CE130	10	10	8	8	10	10	8	10	23.1%		10	10	10	8
CE140	8	8	7	6	8	8	6	8	27.2%		8	8	8	6
CE150	141	141	133	136	140	141	133	141	5.7%		141	141	141	138
CE160	129	129	119	121	128	129	119	129	7.8%		129	129	129	124
CE165	149	150	142	145	149	149	142	150	5.6%		149	149	149	149
CE170	73	73	61	63	73	73	61	73	16.1%		74	73	73	64
CE180	118	119	111	112	118	118	111	119	6.9%		119	119	119	111
CE185	139	139	135	137	139	139	135	139	3.0%		139	139	139	136
CE190	18	18	14	14	18	18	14	18	22.9%		18	18	18	14
CE195	23	23	18	18	23	23	18	23	23.3%		23	23	23	18
CE200	154	153	149	151	153	155	149	155	3.5%		154	155	155	155
Energy Consumption, Condenser Fan (kWh,e)								Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				nino
CE100	68	68	68	67		67	67	68	2.0%		68	68	68	66
CE110	60	61	62	60		60	59	62	4.9%		60	60	60	56
CE120	55	55	51	55		55	54	55	6.5%		55	55	55	51
CE130	5	5	4	5		5	5	5	22.7%		5	5	5	4
CE140	4	4	3	4		4	4	4	19.3%		4	4	4	3
CE150	66	66	62	65		66	65	66	5.6%		66	66	66	65
CE160	61	61	56	60		61	60	61	8.4%		61	61	61	58
CE165	70	70	67	69		70	69	70	5.1%		70	70	70	70
CE170	34	34	29	34		34	29	34	16.1%		35	34	34	30
CE180	56	56	52	56		56	55	56	7.1%		56	56	56	52
CE185	65	65	63	66		65	65	66	3.9%		65	65	65	64
CE190	8	9	7	8		8	9	9	27.7%		9	9	9	7
CE195	11	11	8	11		11	11	11	25.2%		11	11	11	8
CE200	73	72	70	71		73	73	73	4.1%		73	73	73	73

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

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BEST (BEST1405dev) vs. Annex B16, Section B16.5.1 Example Results
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Note: The statistics in the tables below are based on the Standard 140 informative example results.
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Table B16.5.1-2. COP: Mean, and (Max-Min)/Mean

Mean COP								Statistics, All Results (Max-Min)			Analytical			03-Dec-14
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	BEST1405dev nino
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	2.41
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	3.46
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	3.66
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	1.96
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	2.89
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	3.64
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	3.86
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	2.93
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	3.46
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	4.08
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	2.86
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	3.55
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	2.40
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	3.63
(Max - Min)/Mean COP								Statistics, All Results (Max-Min)			Analytical			03-Dec-14
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	BEST1405dev nino
CE100	0.000	0.001	0.002	0.001	0.003	0.000	0.000	0.000	0.003	----	0.000		0.000	0.001
CE110	0.000	0.010	0.002	0.001	0.003	0.000	0.011	0.000	0.011	----	0.000		0.000	0.001
CE120	0.000	0.004	0.001	0.001	0.003	0.000	0.012	0.000	0.012	----	0.000		0.000	0.001
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	0.000
CE160	0.003	0.005	0.001	0.003	0.011	0.000	0.010	0.000	0.011	----	0.000		0.000	0.000
CE165	0.010	0.003	0.001	0.003	0.012	0.000	0.008	0.000	0.012	----	0.000		0.000	0.001
CE170	0.000	0.006	0.002	0.004	0.015	0.000	0.043	0.000	0.043	----	0.000		0.000	0.000
CE180	0.005	0.002	0.002	0.010	0.029	0.000	0.012	0.000	0.029	----	0.000		0.000	0.000
CE185	0.007	0.004	0.002	0.010	0.034	0.000	0.009	0.000	0.034	----	0.000		0.000	0.000
CE190	0.000	0.023	0.007	0.019	0.040	0.000	0.101	0.000	0.101	----	0.000		0.000	0.004
CE195	0.000	0.017	0.008	0.017	0.043	0.000	0.086	0.000	0.086	----	0.000		0.000	0.005
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)]

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

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

Coil Load, Total (kWh,thermal)								Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				nino
CE100	3800	3800	3841	3794	3798	3800	3798	3794	3841	1.3%	3800	3800	3800	3806
CE110	3765	3766	3804	3756	3763	3765	3763	3756	3804	1.3%	3765	3765	3765	3770
CE120	3749	3749	3763	3739	3747	3748	3747	3739	3763	0.6%	3749	3749	3749	3752
CE130	219	219	216	215	217	219	220	215	220	2.1%	219	219	219	205
CE140	198	198	196	195	196	198	199	195	199	2.0%	198	198	197	188
CE150	4517	4517	4543	4528	4509	4517	4515	4509	4543	0.8%	4518	4517	4518	4528
CE160	4501	4500	4516	4508	4491	4500	4499	4491	4516	0.6%	4501	4500	4500	4508
CE165	4538	4538	4567	4549	4529	4537	4535	4529	4567	0.9%	4537	4537	4538	4547
CE170	2233	2232	2226	2237	2225	2232	2232	2225	2237	0.5%	2232	2232	2233	2222
CE180	4495	4495	4510	4535	4481	4495	4494	4481	4535	1.2%	4495	4495	4494	4488
CE185	4507	4535	4565	4583	4523	4535	4534	4507	4583	1.7%	4535	4535	4534	4528
CE190	578	577	573	579	574	577	578	573	579	1.0%	578	577	578	566
CE195	602	601	595	602	598	601	601	595	602	1.1%	601	601	601	585
CE200	5498	5436	5534	5522	5484	5498	5498	5436	5534	1.8%	5498	5498	5498	5512
Coil Load, Sensible (kWh,thermal)								Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				nino
CE100	3800	3800	3841	3794	3798	3800	3798	3794	3841	1.3%	3800	3800	3800	3806
CE110	3765	3766	3804	3756	3763	3765	3763	3756	3804	1.3%	3765	3765	3765	3770
CE120	3749	3749	3763	3739	3747	3748	3747	3739	3763	0.6%	3749	3749	3749	3752
CE130	219	219	216	215	217	219	220	215	220	2.1%	219	219	219	205
CE140	198	198	196	195	196	198	199	195	199	2.0%	198	198	197	188
CE150	3778	3778	3804	3786	3776	3778	3776	3776	3804	0.7%	3778	3778	3779	3788
CE160	3761	3761	3777	3769	3759	3761	3760	3759	3777	0.5%	3761	3761	3761	3768
CE165	3798	3798	3828	3809	3795	3798	3796	3795	3828	0.9%	3798	3798	3799	3808
CE170	1493	1493	1487	1498	1491	1492	1492	1487	1498	0.7%	1493	1493	1493	1483
CE180	1537	1538	1553	1607	1537	1538	1537	1537	1607	4.5%	1538	1538	1538	1530
CE185	1548	1578	1608	1653	1577	1578	1577	1548	1653	6.6%	1578	1578	1578	1570
CE190	208	208	203	212	206	208	208	203	212	4.4%	208	208	208	196
CE195	232	232	226	235	230	231	232	226	235	4.1%	232	232	232	215
CE200	4276	4215	4313	4303	4274	4277	4277	4215	4313	2.3%	4277	4277	4277	4290
Coil Load, Latent (kWh,thermal)								Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				nino
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	739
CE160	740	739	739	739	732	739	739	732	740	1.1%	739	739	739	739
CE165	740	739	739	740	733	739	739	733	740	1.0%	739	739	739	739
CE170	740	739	739	739	734	739	739	734	740	0.9%	739	739	739	739
CE180	2958	2957	2957	2928	2944	2957	2957	2928	2958	1.0%	2957	2957	2956	2958
CE185	2959	2957	2957	2930	2946	2957	2957	2930	2959	1.0%	2958	2957	2956	2958
CE190	370	370	370	366	368	370	370	366	370	1.0%	370	370	370	370
CE195	370	370	370	367	368	370	370	367	370	0.9%	370	370	370	370
CE200	1222	1221	1221	1219	1210	1221	1221	1210	1222	1.0%	1221	1221	1221	1222

* 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			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD	Min	Max	/Analytical*				nino
CE100	144	144	187	139	144	144	142	139	187	33.6%	144	144	144	162
CE110	128	129	168	119	128	128	127	119	168	38.2%	128	128	128	141
CE120	117	117	133	108	116	117	115	108	133	21.8%	117	117	117	130
CE130	10	10	8	8	10	10	10	8	10	27.0%	10	10	10	9
CE140	8	8	7	6	8	8	8	6	8	25.6%	8	8	8	7
CE150	141	141	168	149	140	141	139	139	168	20.2%	141	141	142	160
CE160	129	129	147	137	129	129	128	128	147	14.3%	129	129	129	146
CE165	149	149	181	161	149	149	148	148	181	22.4%	149	149	150	171
CE170	73	73	69	79	73	73	73	69	79	14.2%	74	73	74	72
CE180	117	118	135	188	119	118	118	117	188	60.1%	118	119	118	120
CE185	109	139	171	215	140	139	139	109	215	76.5%	139	139	139	144
CE190	18	18	15	24	18	18	18	15	24	51.0%	18	18	18	15
CE195	23	23	18	28	23	23	23	18	28	40.8%	23	23	23	19
CE200	154	153	193	181	154	155	155	153	193	25.7%	154	155	155	179

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200
BEST (BEST1405dev) vs. Annex B16, Section B16.5.1 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014**

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

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

Zone Load, Total (kWh,thermal)									Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev nino
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD		Min	Max	/Analytical*				
CE100	3656	3656	3654	3655	3654	3656	3656		3654	3656	0.1%	3656	3656	3656	3650
CE110	3637	3637	3636	3637	3636	3637	3637		3636	3637	0.0%	3637	3637	3637	3628
CE120	3632	3632	3630	3632	3631	3632	3631		3630	3632	0.0%	3632	3632	3632	3623
CE130	209	209	207	208	207	209	209		207	209	1.3%	209	209	209	196
CE140	190	190	189	188	188	190	190		188	190	1.1%	190	190	190	181
CE150	4376	4376	4375	4376	4375	4376	4376		4375	4376	0.0%	4376	4376	4376	4367
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	4376
CE170	2159	2159	2157	2158	2157	2159	2159		2157	2159	0.1%	2159	2159	2159	2150
CE180	4376	4376	4375	4376	4375	4376	4376		4375	4376	0.0%	4376	4376	4376	4367
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	550
CE195	576	579	577	577	576	578	579		576	579	0.5%	579	579	579	566
CE200	5343	5283	5342	5343	5342	5343	5343		5283	5343	1.1%	5343	5343	5343	5332
Zone Load, Sensible (kWh,thermal)									Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev nino
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD		Min	Max	/Analytical*				
CE100	3656	3656	3654	3655	3654	3656	3656		3654	3656	0.1%	3656	3656	3656	3644
CE110	3637	3637	3636	3637	3636	3637	3637		3636	3637	0.0%	3637	3637	3637	3628
CE120	3632	3632	3630	3632	3631	3632	3631		3630	3632	0.0%	3632	3632	3632	3623
CE130	209	209	207	208	207	209	209		207	209	1.3%	209	209	209	196
CE140	190	190	189	188	188	190	190		188	190	1.1%	190	190	190	181
CE150	3637	3637	3636	3637	3636	3637	3636		3636	3637	0.0%	3637	3637	3637	3628
CE160	3632	3632	3630	3632	3631	3632	3631		3630	3632	0.0%	3632	3632	3632	3623
CE165	3649	3649	3647	3648	3647	3649	3648		3647	3649	0.1%	3649	3649	3649	3637
CE170	1420	1420	1418	1419	1418	1419	1419		1418	1420	0.1%	1420	1420	1420	1411
CE180	1420	1420	1418	1419	1418	1419	1419		1418	1420	0.1%	1420	1420	1420	1411
CE185	1439	1439	1437	1437	1437	1438	1438		1437	1439	0.2%	1439	1439	1439	1426
CE190	190	190	188	188	188	190	190		188	190	1.0%	190	190	190	181
CE195	209	209	207	208	207	209	209		207	209	1.1%	209	209	209	196
CE200	4122	4062	4121	4122	4121	4122	4122		4062	4122	1.5%	4122	4122	4122	4111
Zone Load, Latent (kWh,thermal)									Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev nino
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD		Min	Max	/Analytical*				
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	739
CE160	739	739	739	739	739	739	739		739	739	0.1%	739	739	739	739
CE165	739	739	739	739	739	739	739		739	739	0.1%	739	739	739	739
CE170	739	739	739	739	739	739	739		739	739	0.1%	739	739	739	739
CE180	2957	2957	2957	2958	2957	2957	2957		2957	2958	0.0%	2957	2957	2957	2957
CE185	2957	2957	2957	2958	2957	2957	2957		2957	2958	0.0%	2957	2957	2957	2957
CE190	367	370	370	370	370	370	370		367	370	0.8%	370	370	370	370
CE195	367	370	370	370	370	370	370		367	370	0.8%	370	370	370	370
CE200	1221	1221	1221	1221	1221	1221	1221		1221	1221	0.0%	1221	1221	1221	1221

* 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			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	(Max-Min)			TUD	HTAL1	HTAL2	BEST1405dev nino
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD		Min	Max	/Analytical*				
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	1
CE185	2	0	0	-28	-11	0	0		-28	2	----	1	0	-1	1
CE190	3	0	0	-3	-2	0	0		-3	3	----	0	0	0	0
CE195	3	0	0	-3	-1	0	0		-3	3	----	0	0	0	0
CE200	1	0	0	-2	-11	0	0		-11	1	----	0	0	0	1

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

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200
BEST (BEST1405dev) vs. Annex B16, Section B16.5.1 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014

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

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

Delta Qtot (kWh,e)									Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	BEST1405dev nino
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD					(Max-Min)			
CE110-CE100	-454	-441	-460	-454	-451	-455	-450	-460	-441	4.1%	-454	-454	-453	-464	
CE120-CE110	-65	-77	-50	-62	-63	-60	-60	-77	-50	41.2%	-64	-66	-66	-59	
CE120-CE100	-519	-518	-510	-516	-514	-515	-510	-519	-510	1.8%	-518	-520	-520	-523	
CE130-CE100	-1421	-1421	-1415	-1413	-1411	-1414	-1402	-1421	-1402	1.3%	-1420	-1421	-1421	-1419	
CE140-CE130	-42	-40	-40	-40	-41	-41	-41	-42	-40	4.8%	-42	-41	-41	-38	
CE140-CE110	-1009	-1020	-996	-999	-1001	-999	-993	-1020	-993	2.6%	-1007	-1009	-1009	-993	
CE150-CE110	131	118	141	118	128	132	130	118	141	17.9%	130	129	129	150	
CE160-CE150	-68	-68	-65	-76	-65	-62	-59	-76	-59	25.8%	-66	-67	-68	-70	
CE165-CE160	362	362	362	363	359	363	357	357	363	1.7%	357	360	361	367	
CE170-CE150	-570	-569	-573	-563	-562	-563	-556	-573	-556	3.1%	-565	-569	-569	-583	
CE180-CE150	-125	-125	-125	-103	-115	-118	-112	-125	-103	18.0%	-124	-124	-125	-133	
CE180-CE170	445	444	448	460	447	445	444	444	460	3.6%	442	445	444	450	
CE185-CE180	461	461	464	467	458	460	458	458	467	1.9%	462	461	461	465	
CE190-CE180	-919	-918	-917	-920	-918	-917	-915	-920	-915	0.6%	-917	-918	-918	-917	
CE190-CE140	96	95	95	94	96	96	96	94	96	2.6%	96	96	96	92	
CE195-CE190	86	86	85	86	86	86	86	85	86	2.0%	87	86	86	81	
CE195-CE185	-1294	-1293	-1296	-1301	-1290	-1292	-1287	-1301	-1287	1.1%	-1292	-1293	-1293	-1301	
CE195-CE130	140	141	140	140	142	141	141	140	142	1.5%	142	141	141	136	
CE200-CE100	-54	-66	-53	-79	-55	-42	-32	-79	-32	87.3%	-55	-53	-54	-42	
Del Qcomp (kWh,e)									Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	BEST1405dev nino
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD					(Max-Min)			
CE110-CE100	-430	-419	-442	-428	-432	-427	-427	-442	-419	5.3%	-431	-430	-430	-434	
CE120-CE110	-49	-59	-16	-45	-43	-44	-44	-59	-16	87.9%	-47	-50	-50	-42	
CE120-CE100	-479	-478	-457	-473	-475	-471	-471	-479	-457	4.5%	-478	-480	-480	-476	
CE130-CE100	-1224	-1224	-1214	-1218	-1218	-1208	-1208	-1224	-1208	1.3%	-1224	-1225	-1225	-1224	
CE140-CE130	-38	-37	-38	-37	-38	-38	-38	-38	-37	3.7%	-38	-38	-38	-35	
CE140-CE110	-832	-842	-811	-827	-823	-819	-819	-842	-811	3.7%	-831	-833	-833	-825	
CE150-CE110	111	100	141	99	113	111	111	99	141	38.3%	111	110	110	122	
CE160-CE150	-50	-50	-44	-56	-45	-42	-42	-56	-42	27.5%	-49	-50	-50	-49	
CE165-CE160	333	332	329	330	333	328	328	328	333	1.6%	328	331	331	331	
CE170-CE150	-469	-469	-468	-459	-464	-458	-458	-469	-458	2.3%	-466	-469	-469	-473	
CE180-CE150	-91	-91	-93	-70	-85	-80	-80	-93	-70	25.0%	-91	-91	-92	-93	
CE180-CE170	378	378	375	389	379	378	378	375	389	3.6%	375	378	378	380	
CE185-CE180	431	431	428	432	430	428	428	428	432	0.9%	432	431	431	429	
CE190-CE180	-771	-770	-775	-774	-770	-768	-768	-775	-768	0.9%	-770	-770	-770	-775	
CE190-CE140	81	81	85	82	82	82	82	81	85	4.5%	82	81	81	81	
CE195-CE190	79	79	79	79	79	80	80	79	80	0.8%	80	79	79	76	
CE195-CE185	-1123	-1122	-1124	-1127	-1120	-1116	-1116	-1127	-1116	1.0%	-1121	-1122	-1121	-1128	
CE195-CE130	122	123	126	124	123	123	123	122	126	3.0%	123	122	123	121	
CE200-CE100	-69	-79	-58	-93	-58	-50	-50	-93	-50	62.3%	-70	-69	-69	-63	
Del Q IDfan (kWh,e)									Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	BEST1405dev nino
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD					(Max-Min)			
CE110-CE100	-16	-15	-12	-19	-16	-16	-16	-19	-12	41.9%	-16	-16	-16	-21	
CE120-CE110	-11	-12	-23	-12	-11	-11	-11	-23	-11	111.4%	-11	-11	-11	-12	
CE120-CE100	-27	-27	-36	-31	-27	-27	-27	-36	-27	32.2%	-27	-27	-27	-32	
CE130-CE100	-134	-134	-137	-133	-133	-133	-132	-137	-132	3.7%	-134	-134	-134	-133	
CE140-CE130	-2	-2	-1	-2	-2	-2	-2	-2	-1	36.7%	-2	-2	-2	-2	
CE140-CE110	-120	-121	-126	-116	-119	-120	-118	-126	-116	8.3%	-120	-120	-120	-114	
CE150-CE110	13	12	0	14	13	13	13	0	14	106.4%	13	13	13	19	
CE160-CE150	-12	-12	-14	-15	-12	-12	-11	-15	-11	32.6%	-12	-12	-12	-14	
CE165-CE160	20	21	23	24	20	20	20	20	24	21.6%	20	20	20	25	
CE170-CE150	-68	-68	-72	-73	-67	-68	-66	-73	-66	9.7%	-68	-68	-68	-75	
CE180-CE150	-23	-22	-22	-24	-22	-22	-21	-24	-21	12.1%	-22	-23	-23	-27	
CE180-CE170	45	46	49	49	45	45	45	45	49	9.9%	45	45	45	48	
CE185-CE180	21	20	24	25	21	21	21	20	25	24.1%	21	21	21	24	
CE190-CE180	-100	-101	-97	-98	-100	-100	-100	-101	-97	4.3%	-101	-101	-101	-97	
CE190-CE140	10	10	7	8	10	10	10	7	10	28.2%	10	10	10	8	
CE195-CE190	5	5	4	4	5	5	5	4	5	30.8%	5	5	5	4	
CE195-CE185	-116	-116	-117	-119	-116	-117	-116	-119	-116	2.6%	-117	-117	-117	-118	
CE195-CE130	13	13	9	10	12	12	12	9	13	29.1%	12	12	12	10	
CE200-CE100	10	9	4	10	10	11	12	4	12	78.4%	10	11	11	14	
Del Q ODfan (kWh,e)									Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	BEST1405dev nino
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD					(Max-Min)			
CE110-CE100	-8	-7	-6	-7	-7	-7	-7	-8	-6	29.9%	-7	-7	-7	-10	
CE120-CE110	-5	-6	-11	-5	-5	-5	-5	-11	-5	114.1%	-5	-5	-5	-5	
CE120-CE100	-13	-13	-17	-12	-13	-13	-13	-17	-12	37.1%	-13	-13	-13	-15	
CE130-CE100	-63	-63	-64	-62	-63	-62	-62	-64	-62	3.7%	-63	-63	-63	-62	
CE140-CE130	-1	-1	-1	-1	-1	-1	-1	-1	-1	37.5%	-1	-1	-1	-1	
CE140-CE110	-56	-57	-59	-56	-56	-56	-56	-59	-56	6.3%	-56	-56	-56	-53	
CE150-CE110	6	5	0	5	6	6	6	0	6	100.7%	6	6	6	9	
CE160-CE150	-5	-5	-7	-5	-6	-5	-5	-7	-5	27.1%	-6	-6	-6	-7	
CE165-CE160	9	9	11	9	10	9	9	9	11	17.3%	9	9	9	12	
CE170-CE150	-32	-32	-34	-31	-32	-31	-31	-34	-31	8.2%	-32	-32	-32	-35	
CE180-CE150	-10	-10	-10	-9	-11	-10	-10	-11	-9	14.3%	-11	-11	-11	-13	
CE180-CE170	22	22	23	22	21	21	21	21	23	9.6%	21	21	21	22	
CE185-CE180	9	9	11	10	10	10	10	9	11	24.6%	10	10	10	11	
CE190-CE180	-48	-47	-45	-48	-47	-47	-47	-48	-45	5.5%	-47	-47	-47	-46	
CE190-CE140	4	5	3	4	5	5	5	3	5	34.5%	5	5	5	4	
CE195-CE190	3	2	2	3	2	2	2	2	3	62.1%	2	2	2	2	
CE195-CE185	-54	-54	-55	-55	-55	-54	-54	-55	-54	2.0%	-55	-55	-55	-55	
CE195-CE130	6	6	4	6	6	6	6	4	6	27.2%	6	6	6	5	
CE200-CE100	5	4	2	4	5	6	6	2	6	77.9%	5	5	5	7	

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

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200
BEST (BEST1405dev) vs. Annex B16, Section B16.5.1 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014

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

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

Delta COP (kWh,t)									Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD					TUD	HTAL1	HTAL2	
CE110-CE100	0.99	0.95	1.03	1.01	1.00	1.01	1.01	1.01	0.95	1.03	7.6%	0.99	0.99	0.99	nino
CE120-CE110	0.21	0.25	0.16	0.21	0.21	0.20	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	1.21	1.18	1.22	2.8%	1.20	1.20	1.20	1.24
CE130-CE100	-0.48	-0.48	-0.46	-0.45	-0.50	-0.48	-0.50	-0.50	-0.50	-0.45	10.0%	-0.50	-0.48	-0.48	-0.45
CE140-CE130	0.86	0.83	0.94	0.90	0.87	0.88	0.88	0.88	0.83	0.94	13.4%	0.86	0.86	0.86	0.92
CE140-CE110	-0.61	-0.61	-0.54	-0.56	-0.63	-0.61	-0.63	-0.63	-0.63	-0.54	13.9%	-0.63	-0.61	-0.61	-0.57
CE150-CE110	0.24	0.29	0.21	0.29	0.25	0.24	0.25	0.25	0.21	0.29	31.9%	0.25	0.25	0.25	0.18
CE160-CE150	0.22	0.21	0.20	0.25	0.21	0.20	0.19	0.19	0.19	0.25	30.4%	0.21	0.21	0.21	0.22
CE165-CE160	-0.92	-0.92	-0.91	-0.96	-0.92	-0.92	-0.92	-0.92	-0.96	-0.91	5.5%	-0.90	-0.91	-0.91	-0.93
CE170-CE150	-0.24	-0.24	-0.23	-0.22	-0.26	-0.26	-0.27	-0.27	-0.27	-0.22	19.1%	-0.26	-0.24	-0.24	-0.18
CE180-CE150	0.42	0.41	0.42	0.33	0.39	0.40	0.38	0.38	0.33	0.42	22.8%	0.42	0.41	0.41	0.44
CE180-CE170	0.66	0.65	0.64	0.55	0.65	0.65	0.65	0.65	0.55	0.66	16.9%	0.68	0.65	0.65	0.62
CE185-CE180	-1.19	-1.19	-1.21	-1.20	-1.19	-1.20	-1.20	-1.20	-1.21	-1.19	1.7%	-1.20	-1.19	-1.19	-1.22
CE190-CE180	-0.63	-0.63	-0.60	-0.57	-0.65	-0.64	-0.65	-0.65	-0.65	-0.57	12.7%	-0.66	-0.63	-0.63	-0.53
CE190-CE140	0.64	0.68	0.57	0.60	0.62	0.61	0.61	0.61	0.57	0.68	16.4%	0.64	0.64	0.64	0.66
CE195-CE190	-1.10	-1.10	-1.13	-1.12	-1.09	-1.09	-1.10	-1.10	-1.13	-1.09	3.3%	-1.09	-1.10	-1.10	-1.15
CE195-CE185	-0.54	-0.54	-0.51	-0.49	-0.55	-0.54	-0.55	-0.55	-0.55	-0.49	12.1%	-0.55	-0.54	-0.54	-0.46
CE195-CE130	0.40	0.40	0.38	0.38	0.40	0.40	0.39	0.39	0.38	0.40	4.2%	0.40	0.40	0.40	0.43
CE200-CE100	1.23	1.22	1.24	1.30	1.24	1.21	1.19	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			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD					TUD	HTAL1	HTAL2	
CE110-CE100	-35	-34	-38	-38	-35	-35	-35	-35	-38	-34	12.5%	-35	-35	-35	nino
CE120-CE110	-16	-17	-40	-16	-16	-16	-16	-16	-40	-16	146.5%	-16	-16	-17	-36
CE120-CE100	-51	-51	-78	-55	-51	-51	-51	-51	-78	-51	52.7%	-51	-52	-52	-17
CE130-CE100	-3581	-3581	-3626	-3579	-3581	-3581	-3578	-3578	-3626	-3578	1.3%	-3581	-3581	-3581	-54
CE140-CE130	-21	-21	-20	-21	-21	-21	-21	-21	-21	-20	4.9%	-21	-21	-22	-3601
CE140-CE110	-3567	-3568	-3608	-3561	-3567	-3567	-3565	-3565	-3608	-3561	1.3%	-3567	-3567	-3568	-17
CE150-CE110	752	751	739	772	746	752	752	752	739	772	4.4%	752	752	753	-3582
CE160-CE150	-16	-17	-26	-19	-18	-17	-16	-16	-26	-16	59.5%	-17	-17	-18	758
CE165-CE160	37	38	51	40	38	37	36	36	36	51	40.0%	36	37	38	-20
CE170-CE150	-2284	-2285	-2317	-2291	-2284	-2285	-2283	-2283	-2317	-2283	1.5%	-2285	-2286	-2286	40
CE180-CE150	-22	-22	-33	7	-28	-22	-21	-21	-33	7	172.5%	-22	-23	-25	-2306
CE180-CE170	2262	2263	2284	2298	2256	2263	2262	2262	2256	2298	1.8%	2263	2263	2261	-40
CE185-CE180	12	40	55	48	41	40	40	40	12	55	107.3%	40	40	40	2266
CE190-CE180	-3917	-3918	-3937	-3956	-3907	-3917	-3916	-3916	-3956	-3907	1.3%	-3918	-3918	-3916	40
CE190-CE140	380	379	377	384	378	380	379	379	377	384	1.8%	380	379	380	-3923
CE195-CE190	24	24	23	23	23	24	24	24	23	24	5.8%	24	24	24	378
CE195-CE185	-3905	-3934	-3970	-3981	-3925	-3934	-3933	-3933	-3981	-3905	1.9%	-3934	-3934	-3933	19
CE195-CE130	383	382	379	387	381	382	382	382	379	387	1.9%	382	382	382	-3943
CE200-CE100	1698	1636	1693	1728	1687	1698	1700	1700	1636	1728	5.4%	1697	1697	1697	380

Del Q coil,s (kWh,t)									Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD					TUD	HTAL1	HTAL2	
CE110-CE100	-35	-34	-38	-38	-35	-35	-35	-35	-38	-34	12.5%	-35	-35	-35	nino
CE120-CE110	-16	-17	-40	-16	-16	-16	-16	-16	-40	-16	146.5%	-16	-16	-17	-36
CE120-CE100	-51	-51	-78	-55	-51	-51	-51	-51	-78	-51	52.8%	-51	-52	-52	-17
CE130-CE100	-3581	-3581	-3626	-3579	-3581	-3581	-3578	-3578	-3626	-3578	1.3%	-3581	-3581	-3581	-54
CE140-CE130	-21	-21	-20	-21	-21	-21	-21	-21	-21	-20	4.9%	-21	-21	-22	-3601
CE140-CE110	-3567	-3568	-3608	-3561	-3567	-3567	-3565	-3565	-3608	-3561	1.3%	-3567	-3567	-3568	-17
CE150-CE110	13	12	0	30	13	13	13	13	0	30	228.7%	13	13	14	-3582
CE160-CE150	-17	-17	-26	-17	-17	-17	-16	-16	-26	-16	58.9%	-17	-17	-18	758
CE165-CE160	37	37	51	40	36	37	36	36	36	51	40.1%	36	37	38	-20
CE170-CE150	-2285	-2285	-2317	-2288	-2285	-2285	-2283	-2283	-2317	-2283	1.5%	-2285	-2286	-2286	40
CE180-CE150	-2241	-2240	-2250	-2179	-2239	-2240	-2239	-2239	-2250	-2179	3.2%	-2241	-2240	-2241	-2306
CE180-CE170	44	45	66	109	46	45	45	45	44	109	144.8%	45	45	45	-2258
CE185-CE180	11	40	55	46	39	40	40	40	11	55	110.0%	40	40	40	48
CE190-CE180	-1329	-1330	-1350	-1394	-1331	-1330	-1329	-1329	-1394	-1329	4.9%	-1330	-1330	-1330	40
CE190-CE140	10	10	7	18	10	10	9	9	7	18	100.3%	10	10	11	-1334
CE195-CE190	24	24	23	23	23	24	24	24	23	24	5.7%	24	24	24	8
CE195-CE185	-1316	-1346	-1382	-1418	-1347	-1346	-1345	-1345	-1418	-1316	7.6%	-1346	-1347	-1346	19
CE195-CE130	13	13	10	20	13	12	12	12	10	20	81.6%	12	12	12	-1355
CE200-CE100	476	415	472	509	477	477	479	479	415	509	19.7%	476	476	476	10

Del Qcoil,lat (kWh,t)									Statistics, All Results			Analytical			03-Dec-14
Case	CA-SIS	CLM2000	DOE21E	DOE21E	E+	TRN-id	TRN-re	TUD	Min	Max	/Analytical*	TUD	HTAL1	HTAL2	BEST1405dev
	EDF	EDF	CIEMAT	NREL	GARD	TUD	TUD					TUD	HTAL1	HTAL2	
CE110-CE100	0	0	0	0	0	0	0	0	0	0	----	0	0	0	nino
CE120-CE110	0	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	0
CE130-CE100	0	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	0
CE140-CE110	0	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE150-CE110	739	739	739	742	733	739	739	739	733	742	1.2%	739	739	739	0
CE160-CE150	1	0	0	-2	-1	0	0	0	-2	1	----	0	0	0	0
CE165-CE160	0	0	0	1	1	0	0	0	0	1	----	0	0	0	0
CE170-CE150	1	0	0	-3	1	0	0	0	-3	1	----	0	0	0	0
CE180-CE150	2219	2218	2218	2186	2211	2218	2218	2218	2186	2219	1.5%	2218	2218	2217	0
CE180-CE170	2218	2218	2218	2189	2210	2218	2218	2218	2189	2218	1.3%	2218	2218	2217	0
CE185-CE180	1	0	0	2	2	0	0	0	0	2	----	0	0	0	0
CE190-CE180	-2588	-2587	-2587	-2562	-2576	-2587	-2587	-2587	-2588	-2562	----	-2588	-2587	-2586	0
CE190-CE140	370	370	370	366	368	370	370	370	366	370	1.0%	370	370	370	0
CE195-CE190	0	0	0	0	0	0	0	0	0	0	----	0	0	0	0
CE195-CE185	-2589	-2587	-2587	-2563	-2578	-2587	-2587	-2587	-2589	-2563	----	-2588	-2587	-2587	0
CE195-CE130	370	370	370	367	368	370	370	370	367	370	0.9%	370	370	370	0
CE200-CE100	1222	1221	1221	1219	1210	1221	1221	1221	1210	1222	1.0%	1221	1221	1221	0

* ABSI (Max-Min) / (Mean of Analytical Solutions)

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200
BEST (BEST1405dev) vs. Annex B16, Section B16.5.1 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014**

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

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

Mean IDB (°C)								Statistics, All Results					Analytical			03-Dec-14
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	BEST1405dev nino		
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			03-Dec-14
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	BEST1405dev nino		
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	0.005		

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

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

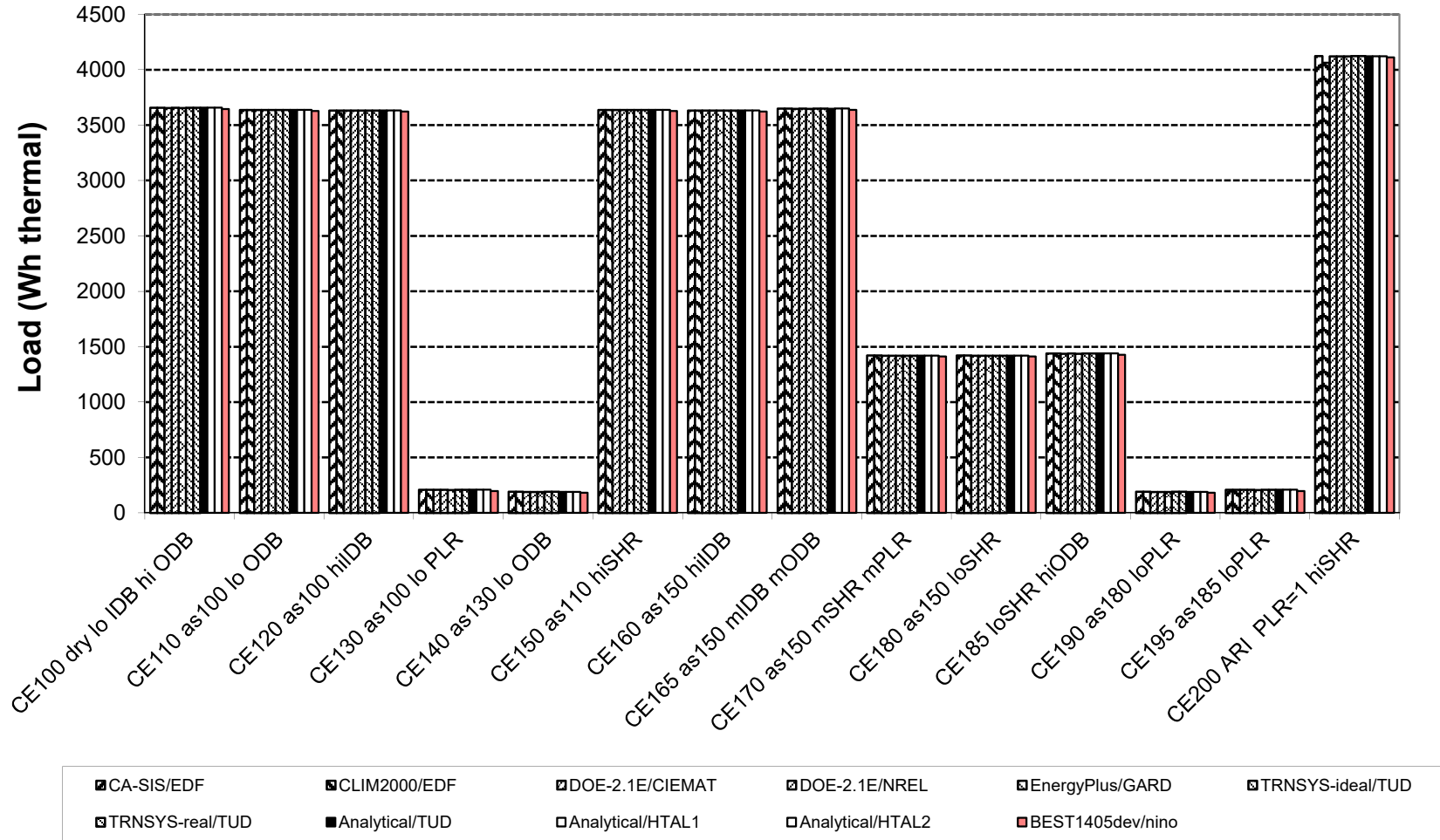
Mean Humidity Ratio								Statistics, All Results					Analytical			03-Dec-14
Case	CA-SIS EDF	CLM2000 EDF	DOE21E CIEMAT	DOE21E NREL	E+ GARD	TRN-id TUD	TRN-re TUD	Min	Max	(Max-Min) /Analytical*	TUD	HTAL1	HTAL2	BEST1405dev nino		
CE100	0.0075	0.0069	0.0076	0.0074	0.0075	0.0075	0.0075	0.0069	0.0076	9.4%	0.0074	0.0073	0.0073	0.0071		
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	0.0063		
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	0.0073		
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	0.0063		
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	0.0081		
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	0.0098		
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	0.0090		
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	0.0103		
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	0.0159		
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	0.0160		
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	0.0156		
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	0.0111		

(Max - Min)/Mean Humidity Ratio								Statistics, All Results					Analytical			03-Dec-14
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	BEST1405dev nino		
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	0.001		
CE160	0.020	0.000	0.010	0.010	0.013	0.000	0.011	0.0000	0.0196	----	0.000		0.000	0.001		
CE165	0.011	0.001	0.011	0.000	0.013	0.000	0.013	0.0000	0.0131	----	0.000		0.000	0.000		
CE170	0.000	0.000	0.010	0.000	0.011	0.000	0.024	0.0000	0.0238	----	0.000		0.001	0.003		
CE180	0.018	0.000	0.012	0.012	0.010	0.000	0.040	0.0000	0.0402	----	0.000		0.001	0.003		
CE185	0.012	0.006	0.018	0.012	0.011	0.000	0.025	0.0000	0.0246	----	0.000		0.001	0.003		
CE190	0.000	0.000	0.018	0.019	0.014	0.000	0.031	0.0000	0.0312	----	0.000		0.001	0.021		
CE195	0.000	0.006	0.019	0.019	0.014	0.000	0.024	0.0000	0.0241	----	0.000		0.001	0.023		
CE200	0.018	0.000	0.009	0.009	0.013	0.000	0.000	0.0000	0.0175	----	0.000		0.000	0.005		

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

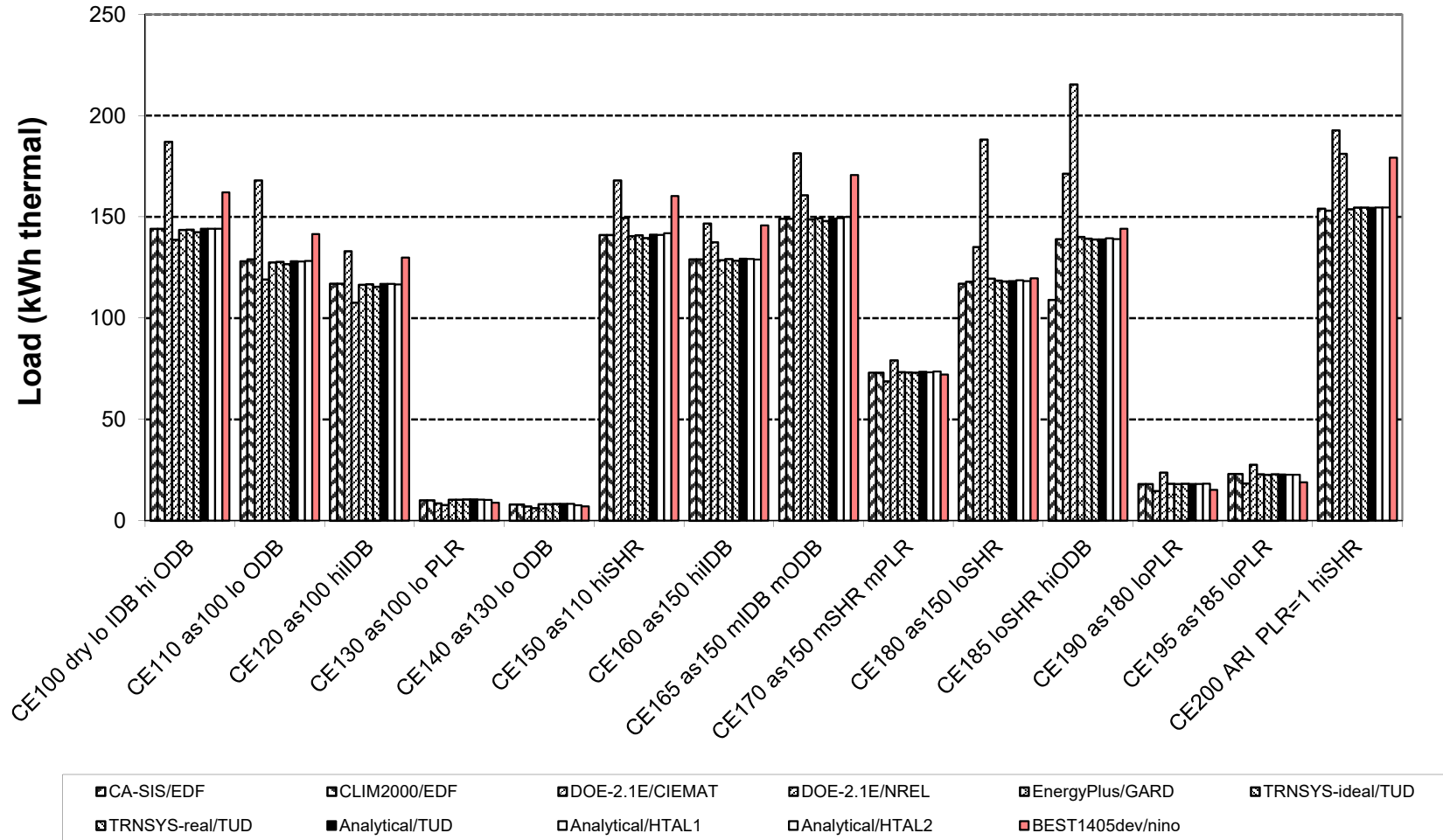
ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.1 Example Results, by NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014

Figure B16.5.1-23.
HVAC BESTEST: Sensible Zone Load



ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE100-CE200
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.1 Example Results, by NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014

Figure B16.5.1-25.
HVAC BESTEST: Sensible Coil Load - Zone Load (Fan Heat)



ASHRAE Standard 140-2011

Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545

Results for BEST
(BEST1405dev)

vs.

Informative Annex B16, Section B16.5.2 Example Results

Prepared By
NIKKEN SEKKEI Ltd. nino
(nino)

Results Developed
03-Dec-2014

ASHRAE Standard 140-2011
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 140-2010 Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
 By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Energy Consumption, Total (kWh,e)							Statistics, All Results				BEST1405dev nino
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean /Mean*		
CE300	35634	34750	34755	34746	34976	35070	34746	35634	34988	2.5%	34793
CE310	39973	39379	39384	39290	39520	39608	39290	39973	39526	1.7%	39273
CE320	40060	38745	38792	39079	39401	39457	38745	40060	39256	3.3%	39324
CE330	40963	39708	39438	40143	40535	40330	39438	40963	40186	3.8%	40331
CE340	40619	39358	39265	39783	40065	39947	39265	40619	39840	3.4%	39930
CE350	32237	30547	30548	31145	31587	31742	30547	32237	31301	5.4%	31180
CE360	55299	54064	54016	54705	54843	55068	54016	55299	54666	2.3%	54905
CE400	32045	30846	30876	31013		31413	30846	32045	31239	3.8%	30962
CE410	32078	31668	31699			31503	31503	32078	31737	1.8%	34378
CE420	33387	32530	32910	32736		33208	32530	33387	32954	2.6%	32948
CE430	32538	31932	31811	31772		31818	31772	32538	31974	2.4%	32164
CE440	33691	33032	32973	33032		33248	32973	33691	33195	2.2%	33094
CE500	22338	22817	22822	23035	22323	23138	22323	23138	22745	3.6%	22350
CE500 May-Sep	17391	17872	17870	17996	17435	18051	17391	18051	17769	3.7%	17538
CE510 May-Sep	34609	35971	35970	35732	34849	35845	34609	35971	35496	3.8%	35709
CE520	24987	25389	25390	25017	25131	25781	24987	25781	25282	3.1%	25469
CE522	23544	24293	24307	24078	23620	24360	23544	24360	24034	3.4%	23802
CE525	20321	20408	20421	20702	20242	21323	20242	21323	20569	5.3%	20025
CE530	17281	17540	17537	17742	17442	17875	17281	17875	17570	3.4%	17114
CE540	19430	19878	19874	19061	19537	20164	19061	20164	19657	5.6%	19576
CE545	15687	15802	15791	16636	15791	16339	15687	16636	16008	5.9%	14442

Energy Consumption, Compressor (kWh,e)							Statistics, All Results				BEST1405dev nino
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean /Mean*		
CE300	22354	21569	21573		21770	21876	21569	22354	21828	3.6%	21874
CE310	26340	25813	25817		25937	26053	25813	26340	25992	2.0%	25978
CE320	26433	25250	25294		25846	25912	25250	26433	25747	4.6%	25980
CE330	27300	26172	25925		26928	26775	25925	27300	26620	5.2%	26945
CE340	26963	25829	25745		26473	26400	25745	26963	26282	4.6%	26555
CE350	19317	17802	17801		18738	18891	17801	19317	18510	8.2%	18584
CE360	40106	38999	38955		39697	39941	38955	40106	39540	2.9%	39832
CE400	19179	18106	18131			18629	18106	19179	18511	5.8%	18375
CE410	19204	18823	18850			18685	18685	19204	18891	2.8%	21461
CE420	20359	19596	19934			20214	19596	20359	20026	3.8%	20185
CE430	19599	19059	18951			18966	18951	19599	19144	3.4%	19471
CE440	20629	20042	19989			20249	19989	20629	20227	3.2%	20323
CE500	17854	18473	18478		17858	18522	17854	18522	18237	3.7%	18354
CE500 May-Sep	13942	14508	14506		13989	14491	13942	14508	14287	4.0%	14439
CE510 May-Sep	27748	28811	28810		27902	28721	27748	28811	28398	3.7%	28759
CE520	19521	20121	20126		19655	20185	19521	20185	19922	3.3%	20368
CE522	18620	19407	19418		18690	19281	18620	19418	19083	4.2%	19301
CE525	16558	16880	16893		16507	17443	16507	17443	16856	5.6%	16800
CE530	13657	14127	14124		13856	14172	13657	14172	13987	3.7%	13991
CE540	15021	15680	15677		15164	15664	15021	15680	15441	4.3%	15643
CE545	12622	12967	12957		12751	13215	12622	13215	12902	4.6%	11729

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Energy Consumption, Supply Fan (kWh,e)							Statistics, All Results				BEST1405dev nino
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean /Mean*	(Max-Min)	
CE300	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10880
CE310	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10880
CE320	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10880
CE330	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10880
CE340	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10880
CE350	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10880
CE360	10880	10880	10880	10862	10880	10880	10862	10880	10877	0.2%	10880
CE400	10880	10880	10880	10862		10880	10862	10880	10876	0.2%	10880
CE410	10880	10880	10880			10880	10880	10880	10880	0.0%	10880
CE420	10880	10880	10880	10862		10880	10862	10880	10876	0.2%	10880
CE430	10880	10880	10880	10862		10880	10862	10880	10876	0.2%	10880
CE440	10880	10880	10880	10862		10880	10862	10880	10876	0.2%	10880
CE500	2564	2369	2369	2628	2553	2639	2369	2639	2520	10.7%	2285
CE500 May-Sep	1972	1837	1837	2029	1970	2035	1837	2035	1947	10.2%	1772
CE510 May-Sep	3923	4099	4099	4063	3972	4073	3923	4099	4038	4.4%	3974
CE520	3125	2874	2871	3019	3131	3200	2871	3200	3037	10.8%	2917
CE522	2816	2704	2707	2843	2819	2904	2704	2904	2799	7.1%	2574
CE525	2152	1886	1885	2180	2136	2221	1885	2221	2077	16.2%	1844
CE530	2072	1833	1833	2090	2051	2117	1833	2117	1999	14.2%	1786
CE540	2522	2258	2258	2309	2500	2573	2258	2573	2403	13.1%	2249
CE545	1753	1501	1501	1871	1739	1786	1501	1871	1692	21.9%	1552

Energy Consumption, Condenser Fan (kWh,e)							Statistics, All Results				BEST1405dev nino
Case	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean /Mean*	(Max-Min)	
CE300	2400	2301	2302		2326	2323	2301	2400	2331	4.3%	2039
CE310	2754	2686	2687		2703	2691	2686	2754	2704	2.5%	2416
CE320	2747	2615	2618		2675	2681	2615	2747	2667	4.9%	2465
CE330	2784	2656	2633		2727	2693	2633	2784	2699	5.6%	2506
CE340	2776	2649	2640		2713	2684	2640	2776	2692	5.1%	2495
CE350	2040	1865	1867		1969	1970	1865	2040	1942	9.0%	1716
CE360	4313	4185	4181		4266	4272	4181	4313	4243	3.1%	4193
CE400	1986	1860	1865			1902	1860	1986	1903	6.6%	1708
CE410	1994	1965	1969			1936	1936	1994	1966	3.0%	2038
CE420	2149	2054	2096			2115	2054	2149	2103	4.5%	1883
CE430	2059	1993	1980			1970	1970	2059	2001	4.5%	1813
CE440	2182	2110	2104			2120	2104	2182	2129	3.7%	1891
CE500	1920	1975	1975		1912	1976	1912	1976	1952	3.3%	1711
CE500 May-Sep	1477	1527	1527		1476	1524	1476	1527	1506	3.4%	1327
CE510 May-Sep	2938	3061	3061		2974	3050	2938	3061	3017	4.1%	2976
CE520	2340	2394	2393		2345	2396	2340	2396	2374	2.4%	2184
CE522	2108	2182	2182		2111	2174	2108	2182	2151	3.4%	1927
CE525	1611	1642	1643		1599	1663	1599	1663	1632	3.9%	1381
CE530	1552	1580	1580		1536	1585	1536	1585	1567	3.1%	1337
CE540	1888	1940	1939		1872	1926	1872	1940	1913	3.5%	1684
CE545	1312	1334	1333		1302	1337	1302	1337	1324	2.7%	1162

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

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

							Statistics, All Results				BEST1405dev nino
Variable	TRNSYS TUD	DOE-2.2 NREL	DOE21E-E NREL	EnergyPlus GARD	CODYRUN UR	HOT3000 NRCan	Min	Max	Mean /Mean*	(Max-Min)	
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%	0.01170
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%	35.00
OHR (kg/kg)	0.02188	0.02250	0.02250	0.02184	0.02241	0.02230	0.02184	0.02250	0.02224	3.0%	0.02253

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Total Sensible + Latent (kWh,thermal)							Statistics, All Results				BEST1405dev nino
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%	78397
CE310	99342	97395	97412	96448	97296	97261	96448	99342	97526	3.0%	97798
CE320	99792	96356	96493	96084	97141	96957	96084	99792	97137	3.8%	98377
CE330	105013	100730	100993	102211	103713	102008	100730	105013	102445	4.2%	104289
CE340	102728	99028	99223	99709	100676	99753	99028	102728	100186	3.7%	101646
CE350	69388	63736	63635	65790	66860	67389	63635	69388	66133	8.7%	66913
CE360	162974	159807	159854	161248	161200	162168	159807	162974	161209	2.0%	162455
CE400	68793	64918	65025	65414		66898	64918	68793	66209	5.9%	66951
CE410	68673	66780	66844			66175	66175	68673	67118	3.7%	78452
CE420	72609	69611	70882	70349		71803	69611	72609	71051	4.2%	72315
CE430	69756	67641	67219	67141		67200	67141	69756	67792	3.9%	69713
CE440	73711	71380	71181	71417		72029	71181	73711	71944	3.5%	72802
CE500	63357	65996	65992	65571	63105	65614	63105	65996	64939	4.5%	65215
CE500 May-Sep	48443	50693	50690	50354	48440	50357	48440	50693	49830	4.5%	50212
CE510 May-Sep	108974	114018	114015	112793	108979	112781	108974	114018	111927	4.5%	113147
CE520	63422	66571	66565	66088	63212	66146	63212	66571	65334	5.1%	66095
CE522	63389	66373	66372	65851	63157	65900	63157	66373	65174	4.9%	65603
CE525	63293	65399	65395	64973	63002	65155	63002	65399	64536	3.7%	64608
CE530	45046	46634	46631	46944	44875	47002	44875	47002	46189	4.6%	46477
CE540	45113	47130	47126	47297	44980	47462	44980	47462	46518	5.3%	47103
CE545	44981	46240	46236	46612	44775	46668	44775	46668	45919	4.1%	47312

Sensible Coil Load (kWh,thermal)							Statistics, All Results				BEST1405dev nino
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%	55182
CE310	56256	56301	56313	55225	55185	55083	55083	56313	55727	2.2%	54992
CE320	62859	62697	62747	62043	62009	62734	62009	62859	62515	1.4%	61702
CE330	63083	63311	63328	63779	62649	61822	61822	63779	62995	3.1%	62521
CE340	63033	63053	63111	62886	62381	61406	61406	63111	62645	2.7%	62089
CE350	50371	47684	47677	48545	48589	48768	47677	50371	48606	5.5%	48555
CE360	134977	134920	134940	135287	134206	134697	134206	135287	134838	0.8%	135156
CE400	41952	41419	41437	40688		41181	40688	41952	41335	3.1%	41069
CE410	45677	47659	47660			45585	45585	47660	46645	4.4%	55263
CE420	50390	49666	50612	49524		49984	49524	50612	50035	2.2%	50072
CE430	47863	47731	47454	46739		46143	46143	47863	47186	3.6%	47965
CE440	50876	50593	50492	50060		49785	49785	50876	50361	2.2%	50311
CE500	45044	47650	47646	47491	44874	47530	44874	47650	46706	5.9%	46856
CE500 May-Sep	34443	36596	36593	36476	34448	36480	34443	36596	35839	6.0%	36144
CE510 May-Sep	77489	82306	82303	81566	77499	81563	77489	82306	80454	6.0%	81654
CE520	45110	48102	48096	47986	44977	48059	44977	48102	47055	6.6%	47740
CE522	45076	47962	47961	47758	44924	47795	44924	47962	46913	6.5%	47258
CE525	44979	47218	47213	46930	44775	47110	44775	47218	46371	5.3%	46209
CE530	45046	46574	46570	46944	44874	47002	44874	47002	46168	4.6%	46477
CE540	45112	47023	47019	47288	44977	47460	44977	47460	46480	5.3%	47101
CE545	44981	46214	46210	46612	44775	46668	44775	46668	45910	4.1%	47312

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
 By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Case	Latent Coil Load(kWh,thermal)						Statistics, All Results				BEST1405dev nino
	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%	23215
CE310	43086	41094	41099	41222	42111	42178	41094	43086	41798	4.8%	42806
CE320	36932	33659	33746	34040	35133	34224	33659	36932	34622	9.5%	36675
CE330	41929	37419	37666	38433	41063	40186	37419	41929	39449	11.4%	41768
CE340	39695	35974	36113	36823	38296	38346	35974	39695	37541	9.9%	39558
CE350	19017	16052	15958	17245	18271	18621	15958	19017	17527	17.5%	18359
CE360	27997	24887	24914	25961	26994	27470	24887	27997	26371	11.8%	27298
CE400	26840	23498	23588	24726		25717	23498	26840	24874	13.4%	25882
CE410	22996	19121	19184			20590	19121	22996	20473	18.9%	23189
CE420	22219	19945	20270	20826		21855	19945	22219	21023	10.8%	22243
CE430	21893	19909	19765	20403		21057	19765	21893	20605	10.3%	21748
CE440	22835	20788	20689	21357		22244	20689	22835	21583	9.9%	22490
CE500	18313	18346	18346	18080	18231	18084	18080	18346	18233	1.5%	18359
CE500 May-Sep	14000	14097	14097	13879	13991	13877	13877	14097	13990	1.6%	14068
CE510 May-Sep	31485	31712	31712	31226	31480	31217	31217	31712	31472	1.6%	31493
CE520	18312	18470	18470	18101	18235	18087	18087	18470	18279	2.1%	18355
CE522	18313	18411	18410	18093	18233	18104	18093	18411	18261	1.7%	18345
CE525	18314	18182	18182	18044	18227	18045	18044	18314	18165	1.5%	18399
CE530	0	61	61	0	1	0	0	61	20	297.1%	1
CE540	1	107	107	9	3	2	1	107	38	278.2%	2
CE545	0	25	25	0	0	0	0	25	9	300.0%	0

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

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BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

COP2		TRNSYS	DOE-2.2	DOE21E-E	EnergyPlus	CODYRUN	HOT3000	Statistics, All Results				BEST1405dev nino
Case	TUD	NREL	NREL	GARD	UR	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%	3.278	
CE310	3.415	3.417	3.417	3.393	3.397	3.380	3.380	3.417	3.403	1.1%	3.444	
CE320	3.420	3.458	3.457	3.405	3.406	3.390	3.390	3.458	3.423	2.0%	3.459	
CE330	3.491	3.494	3.536	3.491	3.497	3.460	3.460	3.536	3.495	2.2%	3.541	
CE340	3.454	3.477	3.496	3.448	3.450	3.420	3.420	3.496	3.457	2.2%	3.499	
CE350	3.249	3.241	3.235	3.244	3.229	3.230	3.229	3.249	3.238	0.6%	3.296	
CE360	3.669	3.701	3.706	3.678	3.667	3.660	3.660	3.706	3.680	1.2%	3.690	
CE400	3.250	3.251	3.252	3.246		3.260	3.246	3.260	3.252	0.4%	3.334	
CE410	3.240	3.212	3.211			3.210	3.210	3.240	3.218	0.9%	3.339	
CE420	3.226	3.215	3.218	3.216		3.210	3.210	3.226	3.217	0.5%	3.277	
CE430	3.221	3.213	3.211	3.211		3.210	3.210	3.221	3.213	0.3%	3.275	
CE440	3.231	3.222	3.222	3.221		3.220	3.220	3.231	3.223	0.4%	3.277	
CE500	3.204	3.227	3.227	3.213	3.192	3.200	3.192	3.227	3.211	1.1%	3.250	
CE500 May-Sep	3.142	3.161	3.162	3.154	3.132	3.140	3.132	3.162	3.148	0.9%	3.185	
CE510 May-Sep	3.551	3.577	3.577	3.562	3.530	3.550	3.530	3.577	3.558	1.3%	3.565	
CE520	2.901	2.957	2.956	3.004	2.873	2.920	2.873	3.004	2.935	4.5%	2.595	
CE522	3.058	3.074	3.073	3.101	3.036	3.070	3.036	3.101	3.069	2.1%	2.756	
CE525	3.484	3.531	3.528	3.508	3.480	3.410	3.410	3.531	3.490	3.5%	3.554	
CE530	2.962	2.969	2.969	2.999	2.916	2.980	2.916	2.999	2.966	2.8%	3.032	
CE540	2.668	2.675	2.675	2.823	2.640	2.690	2.640	2.823	2.695	6.8%	2.718	
CE545	3.228	3.233	3.236	3.157	3.186	3.200	3.157	3.236	3.207	2.5%	3.670	

IDB (°C)		TRNSYS	DOE-2.2	DOE21E-E	EnergyPlus	CODYRUN	HOT3000	Statistics, All Results				BEST1405dev nino
Case	TUD	NREL	NREL	GARD	UR	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%	24.12	
CE310	23.76	24.11	24.06	24.09	24.09	24.01	23.76	24.11	24.02	1.5%	24.13	
CE320	23.90	24.39	24.39	24.25	24.33	24.53	23.90	24.53	24.30	2.6%	24.36	
CE330	23.88	24.28	24.28	24.27	24.30	24.18	23.88	24.30	24.20	1.7%	24.33	
CE340	23.88	24.28	24.28	24.30	24.31	24.21	23.88	24.31	24.21	1.8%	24.35	
CE350	25.66	26.17	26.17	26.24	26.27	26.15	25.66	26.27	26.11	2.3%	26.31	
CE360	25.36	25.61	25.56	25.32	25.48	25.37	25.32	25.61	25.45	1.1%	25.47	
CE400	24.13	24.06	24.06	24.09		23.99	23.99	24.13	24.06	0.6%	22.78	
CE410	24.12	24.06	24.06			23.99	23.99	24.12	24.06	0.5%	23.47	
CE420	23.93	24.06	24.06	24.09		23.99	23.93	24.09	24.02	0.7%	23.18	
CE430	23.99	24.06	24.06	24.09		23.99	23.99	24.09	24.04	0.4%	23.12	
CE440	23.91	24.06	24.06	24.09		23.99	23.91	24.09	24.02	0.7%	23.24	
CE500	20.23	20.67	20.56	20.38	21.10	22.86	20.23	22.86	20.97	12.5%	19.27	
CE500 May-Sep	24.57	25.00	25.00	24.98	25.00	25.00	24.57	25.00	24.93	1.7%	25.00	
CE510 May-Sep	25.82	25.11	25.11	24.96	25.00	25.00	24.96	25.82	25.17	3.4%	25.00	
CE520	13.52	13.78	13.72	13.58	14.14	14.89	13.52	14.89	13.94	9.9%	11.63	
CE522	16.95	17.28	17.22	17.00	17.73	18.70	16.95	18.70	17.48	10.0%	15.44	
CE525	26.84	27.39	27.28	27.10	27.77	30.69	26.84	30.69	27.85	13.8%	26.85	
CE530	20.03	20.61	20.56	20.59	21.10	22.86	20.03	22.86	20.96	13.5%	19.52	
CE540	13.29	13.78	13.72	13.79	14.14	14.98	13.29	14.98	13.95	12.1%	12.01	
CE545	26.61	27.33	27.28	27.31	27.72	30.69	26.61	30.69	27.82	14.7%	26.03	

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
 By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Humidity Ratio (kg/kg)								Statistics, All Results				BEST1405dev nino
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%	0.0112	
CE320	0.0100	0.0101	0.0101	0.0101	0.0100	0.0099	0.0099	0.0101	0.0100	2.1%	0.0101	
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%	0.0099	
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			0.0098	0.0101	0.0100	2.9%	0.0104	
CE410	0.0097	0.0095	0.0095			0.0095	0.0095	0.0097	0.0096	2.5%	0.0096	
CE420	0.0093	0.0094	0.0094	0.0094		0.0093	0.0093	0.0094	0.0094	2.0%	0.0097	
CE430	0.0093	0.0094	0.0094	0.0095		0.0094	0.0093	0.0095	0.0094	1.9%	0.0097	
CE440	0.0092	0.0093	0.0093	0.0093		0.0092	0.0092	0.0093	0.0093	1.9%	0.0096	
CE500	0.0098			0.0094	0.0102	0.0107	0.0094	0.0107	0.0100	13.2%	0.0089	
CE500 May-Sep	0.0110	0.0114	0.0114	0.0113	0.0113	0.0109	0.0109	0.0114	0.0112	4.5%	0.0111	
CE510 May-Sep	0.0114	0.0114	0.0114	0.0113	0.0113	0.0109	0.0109	0.0114	0.0113	4.4%	0.0111	
CE520	0.0067			0.0060	0.0070	0.0076	0.0060	0.0076	0.0068	23.1%	0.0056	
CE522	0.0082			0.0076	0.0086	0.0090	0.0076	0.0090	0.0083	16.8%	0.0071	
CE525	0.0137			0.0138	0.0140	0.0151	0.0137	0.0151	0.0141	9.8%	0.0136	
CE530	0.0062			0.0067	0.0058	0.0067	0.0058	0.0067	0.0064	14.4%	0.0059	
CE540	0.0045			0.0043	0.0039	0.0046	0.0039	0.0046	0.0043	17.9%	0.0042	
CE545	0.0062			0.0067	0.0067	0.0072	0.0062	0.0072	0.0067	14.8%	0.0068	

Relative Humidity (%)								Statistics, All Results				BEST1405dev nino
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%	47.94	
CE310	58.33	58.51	58.53	58.55	57.84	57.80	57.80	58.55	58.26	1.3%	57.82	
CE320	52.01	51.21	51.25	51.84	51.10	49.94	49.94	52.01	51.22	4.0%	51.29	
CE330	50.84	50.58	50.65	51.18	50.08	50.70	50.08	51.18	50.67	2.2%	50.38	
CE340	51.09	50.69	50.73	51.15	50.30	50.78	50.30	51.15	50.79	1.7%	50.50	
CE350	45.48	45.45	45.55	45.17	44.32	44.56	44.32	45.55	45.09	2.7%	44.55	
CE360	41.03	41.49	41.49	42.37	40.87	41.21	40.87	42.37	41.41	3.6%	41.37	
CE400	50.77	52.21	52.25	52.55		52.01	50.77	52.55	51.96	3.4%	51.94	
CE410	50.50	49.65	49.63			49.75	49.63	50.50	49.88	1.7%	48.03	
CE420	48.78	49.14	48.97	49.40		48.76	48.76	49.40	49.01	1.3%	48.80	
CE430	48.82	49.17	49.30	49.60		49.17	48.82	49.60	49.21	1.6%	48.83	
CE440	48.33	48.46	48.57	48.83		48.23	48.23	48.83	48.48	1.2%	48.23	
CE500	66.53			59.20	65.94	63.73	59.20	66.53	63.85	11.5%	48.68	
CE500 May-Sep	57.05	57.47	57.47	57.32	57.07	55.13	55.13	57.47	56.92	4.1%	56.01	
CE510 May-Sep	54.70	57.36	57.36	57.44	57.06	55.24	54.70	57.44	56.53	4.8%	55.84	
CE520	69.87			61.40	70.23	72.17	61.40	72.17	68.42	15.7%	55.23	
CE522	68.68			60.75	68.23	68.11	60.75	68.68	66.44	11.9%	51.79	
CE525	61.47			54.99	60.14	57.37	54.99	61.47	58.49	11.1%	43.51	
CE530	46.73			48.97	41.45	39.60	39.60	48.97	44.19	21.2%	54.81	
CE540	48.52			46.31	40.05	43.82	40.05	48.52	44.67	19.0%	57.75	
CE545	36.62			38.63	36.87	29.20	29.20	38.63	35.33	26.7%	48.05	

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

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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

Case	TRNSYS	DOE-2.2	DOE21E-E	EnergyPlus	CODYRUN	HOT3000	Statistics, All Results				BEST1405dev nino
	TUD	NREL	NREL	GARD	UR	NRCan	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%	3869
CE500Jun25	5045	5204	5204	5229	5067	5230	5045	5230	5163	3.6%	5099
Del CE500	1152	1229	1229	1200	1165	1157	1152	1229	1189	6.5%	1230
CE530Apr30	3023	3062	3062	3101	3092	3144	3023	3144	3081	3.9%	2923
CE530Jun25	3894	3978	3978	4029	3935	4043	3894	4043	3976	3.7%	3920
Del CE530	871	916	916	927	843	899	843	927	896	9.4%	996
Energy Consumption, Compressor (Wh,e)											
CE500Apr30	3015	3120	3120		3020	3159	3015	3159	3087	4.7%	3090
CE500Jun25	4084	4264	4263		4106	4239	4084	4264	4191	4.3%	4233
Del CE500	1069	1144	1144		1086	1080	1069	1144	1105	6.7%	1142
CE530Apr30	2311	2390	2390		2378	2411	2311	2411	2376	4.2%	2303
CE530Jun25	3118	3243	3243		3166	3248	3118	3248	3204	4.1%	3244
Del CE530	807	853	853		787	837	787	853	827	8.0%	941
Energy Consumption, Condenser Fan (Wh,e)											
CE500Apr30	376	389	389		377	391	376	391	385	3.9%	333
CE500Jun25	411	426	426		411	424	411	426	420	3.6%	371
Del CE500	35	37	37		34	33	33	37	35	12.0%	37
CE530Apr30	305	311	311		305	314	305	314	309	3.1%	265
CE530Jun25	332	340	340		329	340	329	340	336	3.2%	289
Del CE530	28	28	29		24	26	24	29	27	17.0%	24
Energy Consumption, Supply Fan (Wh,e)											
CE500Apr30	502	467	466	519	504	522	466	522	497	11.2%	445
CE500Jun25	550	514	514	566	549	566	514	566	543	9.5%	495
Del CE500	47	48	48	47	45	44	44	48	47	8.5%	50
CE530Apr30	407	361	361	412	408	419	361	419	395	14.8%	355
CE530Jun25	444	396	396	450	440	454	396	454	430	13.6%	386
Del CE530	37	35	35	38	32	35	32	38	35	16.0%	32
Sensible + Latent Coil Load (Wh,th)											
CE500Apr30	13186	13733	13733	13655	13170	13673	13170	13733	13525	4.2%	13544
CE500Jun25	13188	13838	13837	13733	13198	13727	13188	13838	13587	4.8%	13684
Del CE500	2	105	104	78	29	54	2	105	62	165.3%	140
CE530Apr30	9353	9721	9721	9775	9365	9798	9353	9798	9622	4.6%	9737
CE530Jun25	9376	9761	9761	9835	9388	9834	9376	9835	9659	4.8%	9743
Del CE530	23	40	39	60	22	36	22	60	37	102.8%	6
Sensible Coil Load (Wh,th)											
CE500Apr30	9375	9925	9925	9884	9365	9902	9365	9925	9729	5.8%	9716
CE500Jun25	9378	9981	9981	9953	9388	9946	9378	9981	9771	6.2%	9852
Del CE500	3	56	56	69	22	44	3	69	42	158.2%	136
CE530Apr30	9353	9721	9721	9775	9365	9798	9353	9798	9622	4.6%	9735
CE530Jun25	9376	9761	9761	9835	9388	9834	9376	9835	9659	4.8%	9743
Del CE530	23	40	39	60	22	36	22	60	37	102.9%	8
Latent Coil Load (Wh,th)											
CE500Apr30	3811	3808	3808	3772	3804	3770	3770	3811	3795	1.1%	3827
CE500Jun25	3810	3856	3856	3781	3810	3780	3780	3856	3816	2.0%	3831
Del CE500	-1	48	48	9	6	10	-1	48	20	242.3%	4
CE530Apr30	0	0	0	0	0	0	0	0	0	----	3
CE530Jun25	0	0	0	0	0	0	0	0	0	----	0
Del CE530	0	0	0	0	0	0	0	0	0	----	-3

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Case	TRNSYS	DOE-2.2	DOE21E-E	EnergyPlus	CODYRUN	HOT3000	Statistics, All Results				BEST1405dev nino
	TUD	NREL	NREL	GARD	UR	NRCan	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%	0.0108
CE500Jun25	0.0112	0.0115	0.0115	0.0115	0.0115	0.0110	0.0110	0.0115	0.0114	4.4%	0.0112
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%	0.0058
CE530Jun25	0.0062	0.0078	0.0078	0.0068	0.0055	0.0067	0.0055	0.0078	0.0068	34.2%	0.0058
Del CE530	0.0000	0.0007	0.0007	0.0000	0.0000	0.0000	0.0000	0.0007	0.0002	304.5%	-0.0001
COP2											
CE500Apr30	3.845	3.914	3.914	3.850	3.837	3.850	3.837	3.914	3.868	2.0%	3.956
CE500Jun25	2.931	2.951	2.951	2.943	2.921	2.940	2.921	2.951	2.939	1.0%	2.973
Del CE500	-0.914	-0.963	-0.963	-0.907	-0.916	-0.910	-0.963	-0.907	-0.929	6.1%	-0.983
CE530Apr30	3.543	3.599	3.599	3.441	3.460	3.590	3.441	3.599	3.539	4.5%	3.331
CE530Jun25	2.720	2.724	2.724	2.780	2.690	2.740	2.690	2.780	2.730	3.3%	2.486
Del CE530	-0.823	-0.874	-0.875	-0.662	-0.770	-0.850	-0.875	-0.662	-0.809	26.3%	-0.845
ODB (°C)											
CE500Apr30	16.79	16.83	16.83	16.81	16.88	16.96	16.79	16.96	16.85	1.0%	16.70
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%	12.82
CE530Apr30	16.79	16.83	16.83	16.81	16.88	16.96	16.79	16.96	16.85	1.0%	16.70
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%	12.82
EDB (°C)											
CE500Apr30	24.64	24.94	24.94	24.98	25.00	25.00	24.64	25.00	24.92	1.4%	25.00
CE500Jun25	24.55	25.00	25.00	24.98	25.00	25.00	24.55	25.00	24.92	1.8%	25.00
Del CE500	-0.09	0.06	0.06	0.00	0.00	0.00	-0.09	0.06	0.00	4740.8%	0.00
CE530Apr30	24.37	24.94	24.67	25.00	25.00	25.00	24.37	25.00	24.83	2.6%	24.16
CE530Jun25	24.35	24.94	24.94	25.00	25.00	25.00	24.35	25.00	24.87	2.6%	25.00
Del CE530	-0.01	0.00	0.28	0.00	0.00	0.00	-0.01	0.28	0.04	651.2%	0.84

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

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

Table 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				BEST1405dev								
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				nino	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*	nino	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%	11845	7-Jan	26
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%	12558	7-Jan	26
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%	13077	7-Jan	26
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%	13756	7-Jan	26
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%	13386	7-Jan	26
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%	11888	7-Jan	26
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%	12822	7-Jan	26
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%	11847	7-Jan	26
CE410	11628	20-Jul	15	11564	20-Jul	15	11602	20-Jul	15							11549	20-Jul	15	11549	11628	11586	0.7%	11853	7-Jan	26
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%	11847	7-Jan	26
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%	11847	7-Jan	26
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%	11847	7-Jan	26
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%	10346	7-Jan	26
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%	11422	7-Jan	26
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%	11101	7-Jan	26
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%	10916	7-Jan	26
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%	9696	7-Jan	26
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%	8080	7-Jan	26
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%	9089	7-Jan	26
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%	7297	7-Jan	26

Sensible + Latent Coil Load (Wh,th)													Statistics, All Results				BEST1405dev								
TRNSYS			DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)				nino	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*	nino	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%	32609	0-Jan	0
CE310	37328	03-Sep	15	36750	3-Sep	16	37033	3-Sep	16	37126	17-Sep	16	37261	3-Sep	15	36991	3-Sep	16	36750	37328	37082	1.6%	37104	0-Jan	0
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%	40536	0-Jan	0
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%	43584	0-Jan	0
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%	41866	0-Jan	0
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%	32793	0-Jan	0
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%	38986	0-Jan	0
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%	41154	0-Jan	0
CE410	32092	08-Jul	15	31401	20-Jul	15	31455	20-Jul	15							32073	20-Jul	15	31401	32092	31755	2.2%	32665	0-Jan	0
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%	32648	0-Jan	0
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%	32648	0-Jan	0
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%	32648	0-Jan	0
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%	27543	0-Jan	0
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%	31009	0-Jan	0
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%	28011	0-Jan	0
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%	27663	0-Jan	0
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%	28402	0-Jan	0
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%	19936	0-Jan	0
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%	19853	0-Jan	0

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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%	19865	0-Jan	0
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* ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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

Sensible Coil Load (Wh,th)													Statistics, All Results				BEST1405dev			
TRNSYS				DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)						
Case	TUD	Date	Hour	NREL	Date Hour	NREL	Date Hour	GARD	Date Hour	UR	Date Hour	NRCan	Date Hour	Min	Max	Mean	/Mean*	nino	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%	23351	0-Jan	0
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%	23079	0-Jan	0
CE320	31316	24-Apr	16	31119	24-Apr 16	31072	24-Apr 16	31972	24-Apr 16	31134	3-Jun 16	30967	24-Apr 16	30967	31972	31263	3.2%	31825	0-Jan	0
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%	34265	0-Jan	0
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%	33139	0-Jan	0
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%	23518	0-Jan	0
CE360	32061	24-Apr	16	32111	24-Apr 16	32065	24-Apr 16	32621	24-Apr 16	31981	24-Apr 16	32179	24-Apr 16	31981	32621	32170	2.0%	32562	0-Jan	0
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%	23394	0-Jan	0
CE410	23266	10-Sep	16	23203	20-Jul 15	23205	20-Jul 15					22893	29-Jul 15	22893	23266	23142	1.6%	23403	0-Jan	0
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%	23394	0-Jan	0
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%	23395	0-Jan	0
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%	23394	0-Jan	0
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%	19841	0-Jan	0
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%	22329	0-Jan	0
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%	20225	0-Jan	0
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%	19987	0-Jan	0
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%	20128	0-Jan	0
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%	19936	0-Jan	0
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%	19853	0-Jan	0
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%	19865	0-Jan	0

Latent Coil Load (Wh,th)													Statistics, All Results				BEST1405dev			
TRNSYS				DOE-2.2		DOE21E-E		EnergyPlus		CODYRUN		HOT3000		(Max-Min)						
Case	TUD	Date	Hour	NREL	Date Hour	NREL	Date Hour	GARD	Date Hour	UR	Date Hour	NRCan	Date Hour	Min	Max	Mean	/Mean*	nino	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%	10083	0-Jan	0
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%	15812	0-Jan	0
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%	23167	0-Jan	0
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%	27540	0-Jan	0
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%	25022	0-Jan	0
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%	10110	0-Jan	0
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%	9201	0-Jan	0
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%	27332	0-Jan	0
CE410	11139	16-Sep	15	9304	3-Sep 15	9391	3-Sep 15					10377	9-Sep 15	9304	11139	10053	18.3%	10086	0-Jan	0
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%	10080	0-Jan	0
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%	10080	0-Jan	0
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%	10080	0-Jan	0
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%	7753	0-Jan	0
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%	8771	0-Jan	0
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%	7786	0-Jan	0
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%	7722	0-Jan	0
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%	8273	0-Jan	0
CE530	0	18-Jun	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%	131	0-Jan	0
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%	1092	0-Jan	0

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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	0-Jan	0
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* ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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

Maximum COP2													Statistics, All Results				BEST1405dev								
TRNSYS			DOE-2.2			DOE21E-E			EnergyPlus		CODYRUN		HOT3000		(Max-Min)				nino	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*	nino	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%	4.124	0-Jan	0
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%	4.292	0-Jan	0
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%	4.412	0-Jan	0
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%	4.123	0-Jan	0
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%	4.447	0-Jan	0
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%	4.640	0-Jan	0
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%	4.434	0-Jan	0
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%	4.192	0-Jan	0
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%	4.761	0-Jan	0
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%	4.198	0-Jan	0
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%	4.208	0-Jan	0
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%	4.298	0-Jan	0
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%	4.518	0-Jan	0
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%	4.884	0-Jan	0
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%	3.958	0-Jan	0
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%	4.195	0-Jan	0
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%	5.359	0-Jan	0
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%	4.547	0-Jan	0
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%	3.924	0-Jan	0
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%	4.990	0-Jan	0

Minimum COP2													Statistics, All Results				BEST1405dev								
TRNSYS			DOE-2.2			DOE21E-E			EnergyPlus		CODYRUN		HOT3000		(Max-Min)				nino	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*	nino	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%	2.824	0-Jan	0
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%	2.929	0-Jan	0
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%	2.872	0-Jan	0
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%	2.883	0-Jan	0
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%	2.883	0-Jan	0
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%	2.827	0-Jan	0
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%	2.883	0-Jan	0
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%	2.825	0-Jan	0
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%	2.825	0-Jan	0
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%	2.826	0-Jan	0
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%	2.826	0-Jan	0
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%	2.826	0-Jan	0
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%	2.734	0-Jan	0
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%	2.938	0-Jan	0
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%	2.468	0-Jan	0
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%	2.601	0-Jan	0
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%	2.913	0-Jan	0
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%	2.549	0-Jan	0
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%	2.289	0-Jan	0

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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%	2.819	0-Jan	0
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* ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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

Maximum IDB (°C)													Statistics, All Results				BEST1405dev								
TRNSYS			DOE-2.2			DOE21E-E			EnergyPlus		CODYRUN		HOT3000		(Max-Min)				nino	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*	nino	Date	Hour
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%	25.29	0-Jan	0
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%	26.80	0-Jan	0
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%	32.38	0-Jan	0
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%	31.91	0-Jan	0
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%	32.19	0-Jan	0
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%	35.20	0-Jan	0
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%	32.95	0-Jan	0
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%	29.73	0-Jan	0
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%	26.54	0-Jan	0
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%	27.69	0-Jan	0
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%	28.21	0-Jan	0
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%	29.40	0-Jan	0
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%	25.27	0-Jan	0
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%	25.20	0-Jan	0
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%	17.05	0-Jan	0
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%	20.71	0-Jan	0
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%	37.63	0-Jan	0
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%	27.67	0-Jan	0
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%	16.30	0-Jan	0
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%	37.81	0-Jan	0

Minimum IDB (°C)													Statistics, All Results				BEST1405dev								
TRNSYS			DOE-2.2			DOE21E-E			EnergyPlus		CODYRUN		HOT3000		(Max-Min)				nino	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*	nino	Date	Hour
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%	9.04	0-Jan	0
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%	9.04	0-Jan	0
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%	9.05	0-Jan	0
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%	9.04	0-Jan	0
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%	9.04	0-Jan	0
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%	9.04	0-Jan	0
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%	9.04	0-Jan	0
CE400	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%	7.10	0-Jan	0
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%	7.10	0-Jan	0
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%	7.10	0-Jan	0
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%	7.10	0-Jan	0
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%	7.10	0-Jan	0
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%	17.09	0-Jan	0
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%	17.00	0-Jan	0
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%	10.36	0-Jan	0
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%	13.77	0-Jan	0
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%	23.60	0-Jan	0
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%	16.54	0-Jan	0
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%	10.55	0-Jan	0

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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%	22.97	0-Jan	0
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* ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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

Maximum Humidity Ratio													Statistics, All Results				BEST1405dev								
TRNSYS			DOE-2.2			DOE21E-E			EnergyPlus		CODYRUN		HOT3000		(Max-Min)				nino	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*	nino	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%	0.0136	0-Jan	0
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	0-Jan	0
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%	0.0185	0-Jan	0
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%	0.0181	0-Jan	0
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%	0.0182	0-Jan	0
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%	0.0170	0-Jan	0
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%	0.0136	0-Jan	0
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%	0.0195	0-Jan	0
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%	0.0143	0-Jan	0
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%	0.0147	0-Jan	0
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%	0.0168	0-Jan	0
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%	0.0143	0-Jan	0
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%	0.0169	0-Jan	0
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%	0.0167	0-Jan	0
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%	0.0083	0-Jan	0
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%	0.0134	0-Jan	0
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%	0.0234	0-Jan	0
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%	0.0091	0-Jan	0
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%	0.0091	0-Jan	0
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%	0.0091	0-Jan	0
Minimum Humidity Ratio													Statistics, All Results				BEST1405dev								
TRNSYS			DOE-2.2			DOE21E-E			EnergyPlus		CODYRUN		HOT3000		(Max-Min)				nino	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*	nino	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	0-Jan	0
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	0-Jan	0
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	0-Jan	0
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	0-Jan	0
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	0-Jan	0
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	0-Jan	0
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	0-Jan	0
CE400	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	0-Jan	0
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	0-Jan	0
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	0-Jan	0
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	0-Jan	0
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	0-Jan	0
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%	0.0103	0-Jan	0
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%	0.0102	0-Jan	0
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%	0.0064	0-Jan	0
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%	0.0084	0-Jan	0
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%	0.0145	0-Jan	0
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%	0.0058	0-Jan	0
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%	0.0036	0-Jan	0

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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%	0.0069	0-Jan	0
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* ABS[(Max-Min) / (Mean of Example Simulation Results)]

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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

Maximum Relative Humidity													Statistics, All Results				BEST1405dev								
TRNSYS				DOE-2.2			DOE21E-E			EnergyPlus		CODYRUN		HOT3000		(Max-Min)									
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	nino	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%	68.54	0-Jan	0
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%	77.72	0-Jan	0
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%	82.65	0-Jan	0
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%	75.78	0-Jan	0
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%	80.11	0-Jan	0
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%	68.47	0-Jan	0
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%	68.50	0-Jan	0
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%	83.99	0-Jan	0
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%	69.00	0-Jan	0
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%	73.58	0-Jan	0
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%	83.23	0-Jan	0
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%	68.55	0-Jan	0
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%	90.33	0-Jan	0
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%	90.54	0-Jan	0
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%	87.93	0-Jan	0
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%	89.17	0-Jan	0
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%	92.32	0-Jan	0
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%	50.68	0-Jan	0
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%	45.92	0-Jan	0
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%	39.36	0-Jan	0
Minimum Relative Humidity													Statistics, All Results				BEST1405dev								
TRNSYS				DOE-2.2			DOE21E-E			EnergyPlus		CODYRUN		HOT3000		(Max-Min)									
Case	TUD	Date	Hour	NREL	Date	Hour	NREL	Date	Hour	GARD	Date	Hour	UR	Date	Hour	NRCan	Date	Hour	Min	Max	Mean	/Mean*	nino	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%	13.31	0-Jan	0
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%	13.42	0-Jan	0
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%	13.44	0-Jan	0
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%	13.39	0-Jan	0
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%	13.39	0-Jan	0
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%	13.41	0-Jan	0
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%	13.39	0-Jan	0
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%	13.30	0-Jan	0
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%	13.47	0-Jan	0
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%	13.30	0-Jan	0
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%	13.30	0-Jan	0
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%	13.30	0-Jan	0
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%	53.66	0-Jan	0
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%	53.38	0-Jan	0
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%	64.00	0-Jan	0
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%	58.49	0-Jan	0
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%	45.30	0-Jan	0
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%	25.01	0-Jan	0
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%	33.63	0-Jan	0

ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.

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

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%	16.83	0-Jan	0
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* ABS[(Max-Min) / (Mean of Example Simulation Results)]

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE544
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

Table 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 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE54:
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

Table 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 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE54:
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

Table 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 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE544
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

BEST1405dev 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	1947	198	7683	5915	1768	0.0092	3.581	17.80	23.92	17.19	0.0111
2	1938	197	7637	5909	1728	0.0092	3.577	18.30	24.00	17.30	0.0115
3	1946	198	7674	5916	1758	0.0092	3.580	17.80	23.92	17.19	0.0111
4	1897	194	7505	5826	1679	0.0091	3.589	17.80	23.92	17.15	0.0111
5	1836	189	7282	5728	1554	0.0089	3.596	17.20	23.83	16.80	0.0102
6	1911	194	7428	5983	1445	0.0089	3.529	19.40	24.17	17.08	0.0110
7	2549	243	9221	7293	1927	0.0097	3.302	25.00	25.02	18.17	0.0132
8	3233	293	10918	8647	2271	0.0095	3.097	27.20	25.33	17.91	0.0112
9	4328	391	14387	11652	2735	0.0101	3.049	28.90	25.59	18.48	0.0122
10	4626	413	15259	11958	3301	0.0103	3.028	28.90	25.59	18.76	0.0130
11	4999	439	16316	12316	3999	0.0109	3.000	31.10	25.92	19.49	0.0151
12	5283	459	17073	12630	4443	0.0108	2.973	30.60	25.84	19.19	0.0135
13	6482	591	21505	17326	4179	0.0098	3.041	31.10	25.91	18.32	0.0116
14	6395	580	20765	17520	3245	0.0098	2.977	31.70	26.01	18.39	0.0120
15	7868	738	26328	22416	3912	0.0096	3.059	32.20	26.08	18.39	0.0127
16	8082	756	27103	22513	4590	0.0099	3.067	32.20	26.09	18.80	0.0146
17	5440	469	17221	13025	4196	0.0111	2.914	31.70	26.01	19.60	0.0150
18	5528	477	17808	12814	4994	0.0113	2.965	31.10	25.92	19.82	0.0160
19	5224	460	17387	12251	5136	0.0110	3.059	28.30	25.49	19.39	0.0147
20	4855	438	16797	11569	5229	0.0114	3.174	27.20	25.33	19.82	0.0170
21	3993	353	13729	9035	4694	0.0114	3.159	27.20	25.33	19.86	0.0170
22	3947	350	13631	8943	4688	0.0114	3.172	26.70	25.25	19.82	0.0169
23	3845	343	13420	8756	4664	0.0114	3.204	26.10	25.16	19.80	0.0170
24	3812	342	13403	8650	4753	0.0116	3.227	26.10	25.17	19.92	0.0174

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Total (kWh,e)							Statistics, All Results				BEST1405dev nino
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%	4480
CE320-CE300	4426	3995	4037	4333	4424	4387	3995	4426	4267	10.1%	4532
CE330-CE300	5330	4958	4683	5398	5559	5260	4683	5559	5198	16.8%	5538
CE330-CE320	904	963	646	1064	1134	873	646	1134	931	52.5%	1006
CE340-CE300	4986	4608	4510	5037	5089	4877	4510	5089	4851	11.9%	5137
CE330-CE340	344	350	173	360	470	383	173	470	347	85.6%	401
CE350-CE300	-3397	-4203	-4207	-3601	-3390	-3328	-4207	-3328	-3688	23.8%	-3613
CE360-CE300	19665	19314	19261	19959	19867	19998	19261	19998	19677	3.7%	20112
CE400-CE300	-3589	-3904	-3879	-3733		-3657	-3904	-3589	-3752	8.4%	-3831
CE410-CE300	-3555	-3082	-3056			-3567	-3567	-3056	-3315	15.4%	-414
CE420-CE300	-2247	-2220	-1845	-2010		-1862	-2247	-1845	-2037	19.7%	-1845
CE430-CE300	-3096	-2818	-2944	-2973		-3252	-3252	-2818	-3017	14.4%	-2629
CE440-CE300	-1942	-1718	-1782	-1714		-1822	-1942	-1714	-1796	12.7%	-1699
CE500-CE300	-13296	-11933	-11933	-11711	-12653	-11932	-13296	-11711	-12243	12.9%	-12442
CE510-CE500	17218	18099	18100	17736	17414	17794	17218	18100	17727	5.0%	18170
CE525-CE520	-4666	-4981	-4969	-4316	-4889	-4458	-4981	-4316	-4713	14.1%	-5444
CE530-CE500	-5057	-5277	-5285	-5293	-4880	-5263	-5293	-4880	-5176	8.0%	-5237
CE545-CE540	-3743	-4076	-4083	-2425	-3745	-3825	-4083	-2425	-3650	45.4%	-5134

Compressor (kWh,e)							Statistics, All Results				BEST1405dev nino
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%	4104
CE320-CE300	4080	3681	3721		4076	4036	3681	4080	3919	10.2%	4106
CE330-CE300	4946	4603	4352		5158	4899	4352	5158	4792	16.8%	5071
CE330-CE320	867	922	631		1082	863	631	1082	873	51.6%	965
CE340-CE300	4609	4260	4172		4703	4524	4172	4703	4454	11.9%	4682
CE330-CE340	337	343	180		455	375	180	455	338	81.4%	390
CE350-CE300	-3037	-3767	-3772		-3032	-2985	-3772	-2985	-3319	23.7%	-3289
CE360-CE300	17752	17430	17382		17927	18065	17382	18065	17711	3.9%	17958
CE400-CE300	-3175	-3463	-3442			-3247	-3463	-3175	-3332	8.7%	-3499
CE410-CE300	-3149	-2746	-2723			-3191	-3191	-2723	-2952	15.9%	-413
CE420-CE300	-1995	-1973	-1639			-1662	-1995	-1639	-1817	19.6%	-1688
CE430-CE300	-2755	-2510	-2622			-2910	-2910	-2510	-2699	14.8%	-2403
CE440-CE300	-1724	-1527	-1584			-1627	-1724	-1527	-1616	12.2%	-1551
CE500-CE300	-4499	-3096	-3095		-3912	-3354	-4499	-3095	-3591	39.1%	-3520
CE510-CE500	13806	14303	14304		13913	14230	13806	14304	14111	3.5%	14320
CE525-CE520	-2963	-3241	-3233		-3148	-2742	-3241	-2742	-3066	16.3%	-3568
CE530-CE500	-4197	-4346	-4354		-4002	-4350	-4354	-4002	-4250	8.3%	-4363
CE545-CE540	-2399	-2713	-2720		-2413	-2449	-2720	-2399	-2539	12.6%	-3914

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
 By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Supply Fan (kWh,e)							Statistics, All Results				BEST1405dev nino
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%	-8595
CE510-CE500	1951	2262	2262	2034	2002	2038	1951	2262	2092	14.9%	2202
CE525-CE520	-973	-988	-986	-839	-996	-979	-996	-839	-960	16.3%	-1072
CE530-CE500	-491	-536	-536	-538	-502	-522	-538	-491	-521	9.0%	-500
CE545-CE540	-769	-757	-757	-438	-762	-787	-787	-438	-712	49.0%	-698

Condenser Fan (kWh,e)							Statistics, All Results				BEST1405dev nino
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%	376
CE320-CE300	346	314	316		348	358	314	358	337	13.1%	425
CE330-CE300	383	355	331		401	370	331	401	368	19.0%	467
CE330-CE320	37	41	15		53	12	12	53	32	128.8%	41
CE340-CE300	376	348	338		386	361	338	386	362	13.3%	455
CE330-CE340	7	7	-7		15	9	-7	15	6	352.1%	11
CE350-CE300	-360	-436	-435		-358	-353	-436	-353	-388	21.4%	-324
CE360-CE300	1913	1884	1879		1940	1949	1879	1949	1913	3.7%	2154
CE400-CE300	-414	-441	-437			-421	-441	-414	-428	6.3%	-332
CE410-CE300	-406	-336	-333			-387	-406	-333	-366	20.1%	-1
CE420-CE300	-252	-247	-206			-208	-252	-206	-228	20.1%	-157
CE430-CE300	-341	-308	-322			-353	-353	-308	-331	13.6%	-226
CE440-CE300	-218	-191	-198			-203	-218	-191	-203	13.4%	-148
CE500-CE300	-481	-326	-327		-415	-347	-481	-326	-379	40.8%	-328
CE510-CE500	1461	1534	1534		1499	1526	1461	1534	1511	4.8%	1648
CE525-CE520	-729	-752	-750		-746	-733	-752	-729	-742	3.1%	-803
CE530-CE500	-368	-395	-395		-376	-391	-395	-368	-385	7.0%	-374
CE545-CE540	-576	-606	-606		-571	-589	-606	-571	-589	6.0%	-523

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

Table B16.5.2-19. Delta Annual Cooling Coil Loads

Sensible Coil Load (kWh,th)							Statistics, All Results				BEST1405dev nino
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%	-190
CE320-CE300	6197	6900	6942	6791	6799	7543	6197	7543	6862	19.6%	6520
CE330-CE300	6422	7514	7523	8527	7440	6631	6422	8527	7343	28.7%	7339
CE330-CE320	224	614	581	1735	641	-912	-912	1735	480	550.9%	819
CE340-CE300	6371	7257	7306	7634	7171	6215	6215	7634	6992	20.3%	6907
CE330-CE340	51	258	217	893	269	416	51	893	351	240.2%	432
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%	79974
CE400-CE300	-14709	-14378	-14368	-14564		-14010	-14709	-14010	-14406	4.9%	-14114
CE410-CE300	-10985	-8138	-8145			-9606	-10985	-8138	-9219	30.9%	80
CE420-CE300	-6272	-6131	-5193	-5728		-5207	-6272	-5193	-5706	18.9%	-5110
CE430-CE300	-8798	-8066	-8351	-8513		-9048	-9048	-8066	-8555	11.5%	-7217
CE440-CE300	-5786	-5204	-5313	-5192		-5406	-5786	-5192	-5380	11.0%	-4871
CE500-CE300	-11618	-8147	-8159	-7761	-10335	-7661	-11618	-7661	-8947	44.2%	-8326
CE510-CE500	43046	45710	45710	45091	43051	45083	43046	45710	44615	6.0%	45510
CE525-CE520	-131	-884	-882	-1057	-202	-949	-1057	-131	-684	135.4%	-1531
CE530-CE500	2	-1076	-1076	-547	0	-528	-1076	2	-538	200.6%	-380
CE545-CE540	-130	-809	-809	-676	-202	-792	-809	-130	-570	119.1%	211

Latent Coil Load(kWh,th)							Statistics, All Results				BEST1405dev nino
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%	19591
CE320-CE300	13167	12173	12259	11974	12597	11157	11157	13167	12221	16.4%	13460
CE330-CE300	18164	15932	16179	16367	18528	17119	15932	18528	17048	15.2%	18553
CE330-CE320	4997	3760	3919	4393	5931	5962	3760	5962	4827	45.6%	5093
CE340-CE300	15930	14488	14625	14757	15760	15279	14488	15930	15140	9.5%	16342
CE330-CE340	2234	1445	1553	1610	2768	1840	1445	2768	1908	69.3%	2210
CE350-CE300	-4748	-5435	-5529	-4821	-4264	-4446	-5529	-4264	-4874	26.0%	-4856
CE360-CE300	4232	3401	3427	3895	4459	4403	3401	4459	3970	26.7%	4083
CE400-CE300	3075	2012	2101	2660		2650	2012	3075	2500	42.5%	2667
CE410-CE300	-769	-2366	-2303			-2477	-2477	-769	-1979	86.3%	-26
CE420-CE300	-1546	-1542	-1217	-1240		-1212	-1546	-1212	-1351	24.7%	-972
CE430-CE300	-1872	-1577	-1722	-1663		-2010	-2010	-1577	-1769	24.5%	-1467
CE440-CE300	-930	-699	-798	-709		-823	-930	-699	-792	29.1%	-725
CE500-CE300	-5452	-3141	-3141	-3986	-4304	-4983	-5452	-3141	-4168	55.5%	-4856
CE510-CE500	17485	17615	17615	17348	17488	17340	17340	17615	17482	1.6%	17425
CE525-CE520	2	-288	-288	-58	-9	-42	-288	2	-114	255.0%	44
CE530-CE500	-18313	-18285	-18286	-18080	-18230	-18084	-18313	-18080	-18213	1.3%	-18359
CE545-CE540	-1	-81	-81	-9	-3	-2	-81	-1	-30	272.0%	-2

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

COP2							Statistics, All Results				BEST1405dev nino
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%	0.166
CE320-CE300	0.171	0.220	0.220	0.168	0.180	0.160	0.160	0.220	0.186	32.3%	0.180
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%	0.083
CE340-CE300	0.205	0.240	0.258	0.210	0.223	0.190	0.190	0.258	0.221	30.9%	0.221
CE330-CE340	0.036	0.017	0.041	0.043	0.048	0.040	0.017	0.048	0.037	82.5%	0.042
CE350-CE300	0.000	0.003	-0.002	0.006	0.003	0.000	-0.002	0.006	0.002	498.6%	0.018
CE360-CE300	0.420	0.463	0.468	0.441	0.440	0.430	0.420	0.468	0.444	10.9%	0.412
CE400-CE300	0.001	0.014	0.015	0.009		0.030	0.001	0.030	0.014	210.3%	0.055
CE410-CE300	-0.010	-0.025	-0.027			-0.020	-0.027	-0.010	-0.020	84.0%	0.060
CE420-CE300	-0.023	-0.022	-0.020	-0.021		-0.020	-0.023	-0.020	-0.021	14.9%	-0.002
CE430-CE300	-0.028	-0.025	-0.026	-0.026		-0.020	-0.028	-0.020	-0.025	33.0%	-0.003
CE440-CE300	-0.018	-0.015	-0.015	-0.016		-0.010	-0.018	-0.010	-0.015	51.9%	-0.001
CE500-CE300	-0.045	-0.010	-0.011	-0.024	-0.034	-0.030	-0.045	-0.010	-0.026	135.4%	-0.028
CE510-CE500	0.409	0.416	0.416	0.408	0.397	0.410	0.397	0.416	0.409	4.6%	0.381
CE525-CE520	0.582	0.574	0.572	0.504	0.606	0.490	0.490	0.606	0.555	21.0%	0.958
CE530-CE500	-0.242	-0.258	-0.257	-0.214	-0.276	-0.220	-0.276	-0.214	-0.245	25.5%	-0.218
CE545-CE540	0.560	0.559	0.560	0.334	0.546	0.510	0.334	0.560	0.511	44.3%	0.952

IDB (°C)							Statistics, All Results				BEST1405dev nino
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%	0.01
CE320-CE300	0.28	0.33	0.33	0.16	0.25	0.54	0.16	0.54	0.32	119.3%	0.25
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%	-0.03
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%	2.20
CE360-CE300	1.74	1.56	1.50	1.23	1.40	1.38	1.23	1.74	1.47	34.6%	1.36
CE400-CE300	0.50	0.00	0.00	0.00		0.00	0.00	0.50	0.10	498.8%	-1.34
CE410-CE300	0.50	0.00	0.00			0.00	0.00	0.50	0.12	400.0%	-0.65
CE420-CE300	0.30	0.00	0.00	0.00		0.00	0.00	0.30	0.06	500.3%	-0.93
CE430-CE300	0.37	0.00	0.00	0.00		0.00	0.00	0.37	0.07	500.3%	-1.00
CE440-CE300	0.29	0.00	0.00	0.00		0.00	0.00	0.29	0.06	500.2%	-0.88
CE500-CE300	-3.39	-3.39	-3.50	-3.71	-2.98	-1.13	-3.71	-1.13	-3.02	85.5%	-4.85
CE510-CE500	1.24	0.11	0.11	-0.02	0.00	0.00	-0.02	1.24	0.24	526.6%	0.00
CE525-CE520	13.33	13.61	13.56	13.53	13.63	15.80	13.33	15.80	13.91	17.8%	15.22
CE530-CE500	-0.21	-0.06	0.00	0.21	0.00	0.00	-0.21	0.21	-0.01	4302.5%	0.25
CE545-CE540	13.32	13.56	13.56	13.52	13.58	15.71	13.32	15.71	13.87	17.3%	14.02

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
 By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Humidity Ratio (kg/kg)							Statistics, All Results				BEST1405dev nino
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%	0.0007
CE360-CE300	-0.0006	-0.0005	-0.0005	-0.0005	-0.0006	-0.0006	-0.0006	-0.0005	-0.0006	22.0%	-0.0005
CE400-CE300	0.0007	0.0008	0.0008	0.0008		0.0008	0.0007	0.0008	0.0008	8.7%	0.0012
CE410-CE300	0.0007	0.0003	0.0003			0.0003	0.0003	0.0007	0.0004	94.5%	0.0004
CE420-CE300	0.0002	0.0002	0.0002	0.0002		0.0001	0.0001	0.0002	0.0002	58.3%	0.0005
CE430-CE300	0.0002	0.0002	0.0002	0.0002		0.0002	0.0002	0.0002	0.0002	19.7%	0.0005
CE440-CE300	0.0001	0.0001	0.0001	0.0000		0.0000	0.0000	0.0001	0.0001	148.5%	0.0004
CE500-CE300	0.0007			0.0001	0.0010	0.0015	0.0001	0.0015	0.0008	169.4%	-0.0003
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%	0.0080
CE530-CE500	-0.0035			-0.0027	-0.0044	-0.0040	-0.0044	-0.0027	-0.0037	48.0%	-0.0029
CE545-CE540	0.0018			0.0024	0.0029	0.0026	0.0018	0.0029	0.0024	46.8%	0.0026
Relative Humidity (%)							Statistics, All Results				BEST1405dev nino
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%	9.88
CE320-CE300	3.39	2.95	2.97	3.25	3.28	2.01	2.01	3.39	2.97	46.4%	3.36
CE330-CE300	2.23	2.32	2.37	2.59	2.26	2.77	2.23	2.77	2.42	22.3%	2.44
CE330-CE320	-1.16	-0.63	-0.60	-0.66	-1.02	0.76	-1.16	0.76	-0.55	347.8%	-0.92
CE340-CE300	2.47	2.43	2.45	2.56	2.47	2.85	2.43	2.85	2.54	16.5%	2.56
CE330-CE340	-0.24	-0.11	-0.08	0.03	-0.21	-0.08	-0.24	0.03	-0.12	232.7%	-0.12
CE350-CE300	-3.13	-2.81	-2.73	-3.42	-3.51	-3.37	-3.51	-2.73	-3.16	24.7%	-3.38
CE360-CE300	-7.58	-6.77	-6.79	-6.22	-6.96	-6.72	-7.58	-6.22	-6.84	19.9%	-6.57
CE400-CE300	2.16	3.95	3.97	3.96		4.08	2.16	4.08	3.62	53.1%	4.00
CE410-CE300	1.88	1.39	1.35			1.82	1.35	1.88	1.61	33.0%	0.09
CE420-CE300	0.16	0.88	0.69	0.81		0.83	0.16	0.88	0.67	106.1%	0.86
CE430-CE300	0.21	0.91	1.02	1.01		1.24	0.21	1.24	0.88	117.8%	0.89
CE440-CE300	-0.29	0.20	0.29	0.24		0.30	-0.29	0.30	0.15	394.1%	0.29
CE500-CE300	17.91			10.61	18.12	15.80	10.61	18.12	15.61	48.1%	0.74
CE510-CE500	-2.35			0.11	-0.01	0.11	-2.35	0.11	-0.53	461.4%	-0.17
CE525-CE520	-8.41			-6.41	-10.09	-14.80	-14.80	-6.41	-9.93	84.5%	-11.73
CE530-CE500	-19.80			-10.22	-24.49	-24.13	-24.49	-10.22	-19.66	72.6%	6.13
CE545-CE540	-11.90			-7.68	-3.18	-14.62	-14.62	-3.18	-9.34	122.5%	-9.70

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Case	Total Consumption (Wh,e)						Statistics, All Results				BEST1405dev nino
	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%	712
CE320-CE300	1402	1352	1379	1055	1172	1327	1055	1402	1281	27.1%	1232
CE330-CE300	1721	1648	1805	1414	1535	1787	1414	1805	1652	23.7%	1910
CE330-CE320	319	296	426	360	363	460	296	460	371	44.3%	678
CE340-CE300	1555	1594	1588	1234	1345	1553	1234	1594	1478	24.3%	1541
CE330-CE340	166	54	217	180	190	234	54	234	173	103.8%	369
CE350-CE300	1	90	0	0	0	-2	-2	90	15	621.2%	43
CE360-CE300	1143	1172	1124	844	931	1214	844	1214	1071	34.5%	977
CE400-CE300	2	0	75	0		-29	-29	75	10	1087.2%	2
CE410-CE300	2	0	0			1	0	2	1	258.7%	7
CE420-CE300	0	0	0	0		0	0	0	0	----	2
CE430-CE300	0	0	0	0		0	0	0	0	500.0%	2
CE440-CE300	0	0	0	0		-87	-87	0	-17	500.0%	2
CE500-CE300	-1460	-1133	-1177	-1501	-1755	-1274	-1755	-1133	-1383	45.0%	-1499
CE510-CE500	1038	1159	1162	1011	1009	1070	1009	1162	1075	14.2%	1076
CE525-CE520	-1669	-1451	-1483	-1531	-1625	-1099	-1669	-1099	-1476	38.6%	-1405
CE530-CE500	-2138	-2372	-2370	-2228	-2185	-2185	-2372	-2138	-2246	10.4%	-2266
CE545-CE540	-1494	-1593	-1593	-915	-1495	-1514	-1593	-915	-1434	47.3%	-1792

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Sensible + Latent Coil Load (Wh,th)							Statistics, All Results				BEST1405dev nino
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%	4495
CE320-CE300	8144	22412	22368	7032	7402	7848	7032	22412	12534	122.7%	7927
CE330-CE300	11318	12227	33117	10712	11476	10343	10343	33117	14865	153.2%	10976
CE330-CE320	3174	-10185	10749	3680	4074	2495	-10185	10749	2331	898.0%	3048
CE340-CE300	9478	19418	28094	8595	8864	9060	8595	28094	13918	140.1%	9257
CE330-CE340	1840	-7191	5023	2117	2612	1283	-7191	5023	947	1289.3%	1718
CE350-CE300	-82	0	-1	0	0	5	-82	5	-13	669.0%	184
CE360-CE300	6683	9212	9564	5726	5820	6379	5726	9564	7231	53.1%	6377
CE400-CE300	9005	9142	18383	7995		8702	7995	18383	10645	97.6%	8546
CE410-CE300	-82	0	0			1	-82	1	-20	409.8%	56
CE420-CE300	0	0	0	0		0	0	0	0	----	39
CE430-CE300	0	0	0	0		0	0	0	0	500.0%	40
CE440-CE300	0	0	0	0		-295	-295	0	-59	500.0%	39
CE500-CE300	-4689	-3694	-3749	-5087	-5935	-4517	-5935	-3694	-4612	48.6%	-5066
CE510-CE500	3108	3481	3482	3531	3381	3542	3108	3542	3421	12.7%	3466
CE525-CE520	410	-412	-412	-76	8	-881	-881	410	-227	568.4%	390
CE530-CE500	-7651	-8131	-8131	-8008	-7791	-7929	-8131	-7651	-7940	6.0%	-7607
CE545-CE540	500	-291	-292	-187	-30	-302	-302	500	-100	800.3%	12
Sensible Coil Load (Wh,th)							Statistics, All Results				BEST1405dev nino
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%	-272
CE320-CE300	8038	7916	7867	8441	7677	8059	7677	8441	8000	9.6%	8474
CE330-CE300	9949	10207	11285	11234	10540	10513	9949	11285	10621	12.6%	10914
CE330-CE320	1911	2291	3418	2793	2863	2454	1911	3418	2622	57.5%	2440
CE340-CE300	9552	8883	8881	9357	9483	9272	8881	9552	9238	7.3%	9788
CE330-CE340	397	1324	2404	1877	1057	1241	397	2404	1383	145.1%	1126
CE350-CE300	0	0	0	0	0	-32	-32	0	-5	603.8%	167
CE360-CE300	8783	8908	8860	9090	8524	9271	8524	9271	8906	8.4%	9211
CE400-CE300	0	0	0	0		-31	-31	0	-6	503.2%	43
CE410-CE300	-12	0	0			-15	-15	0	-7	224.7%	52
CE420-CE300	0	0	0	0		-15	-15	0	-3	500.0%	43
CE430-CE300	0	0	0	0		-15	-15	0	-3	500.0%	44
CE440-CE300	0	0	0	0		-33	-33	0	-7	500.0%	44
CE500-CE300	-3728	-3194	-3197	-3682	-4681	-3090	-4681	-3090	-3595	44.3%	-3510
CE510-CE500	2180	2504	2505	2441	2345	2451	2180	2505	2404	13.5%	2488
CE525-CE520	287	-309	-304	-336	-210	-717	-717	287	-265	379.1%	-96
CE530-CE500	285	-433	-433	-211	0	-192	-433	285	-164	437.9%	95
CE545-CE540	500	-291	-292	-187	-35	-302	-302	500	-101	793.7%	12

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
 By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Latent Coil Load (Wh,th)							Statistics, All Results				BEST1405dev nino
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%	5729
CE320-CE300	13512	22193	22109	11961	11322	11537	11322	22193	15439	70.4%	13084
CE330-CE300	18190	17637	31415	16899	17809	17096	16899	31415	19841	73.2%	17457
CE330-CE320	4678	-4556	9306	4939	6487	5559	-4556	9306	4402	314.9%	4373
CE340-CE300	15213	21147	26617	13676	13850	13402	13402	26617	17318	76.3%	14939
CE330-CE340	2977	-3510	4798	3223	3959	3694	-3510	4798	2523	329.2%	2519
CE350-CE300	116	-1	-1	1	380	1211	-1	1211	284	426.5%	28
CE360-CE300	-361	722	942	-1715	-1516	-1458	-1715	942	-564	470.9%	-882
CE400-CE300	17440	16274	23002	16082		16253	16082	23002	17810	38.9%	17249
CE410-CE300	1503	0	-3			-15	-15	1503	371	408.9%	3
CE420-CE300	115	0	0	0		2	0	115	23	491.5%	-3
CE430-CE300	0	1801	1707	839		2	0	1801	870	207.1%	-3
CE440-CE300	0	0	-3	0		-253	-253	0	-51	494.1%	-3
CE500-CE300	-1670	-1571	-1661	-2396	-2570	-2630	-2630	-1571	-2083	50.8%	-2330
CE510-CE500	927	990	990	1116	1045	1112	927	1116	1030	18.3%	1019
CE525-CE520	123	-122	-122	249	212	-144	-144	249	33	1201.2%	487
CE530-CE500	-7965	-7733	-7733	-7838	-7626	-7726	-7965	-7626	-7770	4.4%	-7621
CE545-CE540	-627	0	0	-1655	-841	-1181	-1655	0	-717	230.7%	-1092

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
 By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Maximum COP2							Statistics, All Results				BEST1405dev nino
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%	0.168
CE320-CE300	0.000	1.274	1.110	0.014	0.073	0.500	0.000	1.274	0.495	257.3%	0.288
CE330-CE300	0.000	0.240	1.738	0.146	0.251	0.170	0.000	1.738	0.424	409.6%	-0.001
CE330-CE320	0.000	-1.034	0.628	0.132	0.179	-0.330	-1.034	0.628	-0.071	2344.2%	-0.289
CE340-CE300	0.000	0.752	1.482	0.061	0.147	0.070	0.000	1.482	0.419	354.0%	0.324
CE330-CE340	0.000	-0.512	0.256	0.085	0.105	0.100	-0.512	0.256	0.006	13685.7%	-0.324
CE350-CE300	0.000	0.020	0.006	0.630	0.061	0.000	0.000	0.630	0.120	526.8%	0.516
CE360-CE300	0.233	0.559	0.570	0.530	0.561	0.560	0.233	0.570	0.502	67.2%	0.311
CE400-CE300	-0.091	0.219	0.919	0.146		0.170	-0.091	0.919	0.273	370.7%	0.068
CE410-CE300	-0.280	0.034	-0.002			-0.040	-0.280	0.034	-0.072	436.1%	0.638
CE420-CE300	-0.387	-0.062	-0.098	-0.104		0.060	-0.387	0.060	-0.118	378.3%	0.075
CE430-CE300	-0.387	-0.064	-0.098	-0.133		0.050	-0.387	0.050	-0.126	346.0%	0.084
CE440-CE300	-0.285	-0.095	-0.098	-0.123		-0.070	-0.285	-0.070	-0.134	160.0%	0.174
CE500-CE300	0.107	3.498	1.444	0.273	0.314	0.260	0.107	3.498	0.983	345.1%	0.394
CE510-CE500	0.417	0.000	0.000	0.487	0.505	0.390	0.000	0.505	0.300	168.4%	0.366
CE525-CE520	0.904	1.429	1.379	0.766	0.836	0.560	0.560	1.429	0.979	88.8%	1.401
CE530-CE500	-0.269	-3.386	-1.451	-0.273	-0.345	-0.260	-3.386	-0.260	-0.997	313.5%	0.029
CE545-CE540	0.794	0.819	0.973	0.470	0.490	0.480	0.470	0.973	0.671	74.9%	1.066
Minimum COP2							Statistics, All Results				BEST1405dev nino
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%	0.105
CE320-CE300	0.032	0.003	0.004	0.060	0.029	0.020	0.003	0.060	0.025	231.0%	0.048
CE330-CE300	0.032	0.000	0.000	0.063	0.038	0.030	0.000	0.063	0.027	231.1%	0.059
CE330-CE320	0.000	-0.003	-0.004	0.003	0.009	0.010	-0.004	0.010	0.002	584.2%	0.011
CE340-CE300	0.032	0.000	0.000	0.063	0.038	0.030	0.000	0.063	0.027	231.1%	0.059
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%	0.003
CE360-CE300	0.032	0.001	0.000	0.063	0.038	0.030	0.000	0.063	0.027	229.7%	0.059
CE400-CE300	-0.011	-0.064	-0.066	0.000		0.000	-0.066	0.000	-0.028	233.8%	0.001
CE410-CE300	-0.007	0.000	0.000			0.000	-0.007	0.000	-0.002	400.0%	0.001
CE420-CE300	0.000	0.000	0.000	0.000		0.000	0.000	0.000	0.000	----	0.002
CE430-CE300	-0.022	-0.064	-0.066	0.000		0.000	-0.066	0.000	-0.030	217.2%	0.002
CE440-CE300	-0.011	-0.064	-0.066	0.000		0.000	-0.066	0.000	-0.028	234.7%	0.002
CE500-CE300	-0.108	-0.105	-0.149	-0.076	-0.119	-0.100	-0.149	-0.076	-0.110	66.6%	-0.089
CE510-CE500	0.203	0.124	0.000	0.160	0.215	0.190	0.000	0.215	0.149	144.8%	0.204
CE525-CE520	0.469	0.476	0.420	0.408	0.561	0.430	0.408	0.561	0.461	33.2%	0.445
CE530-CE500	-0.184	-0.198	-0.154	-0.173	-0.193	-0.190	-0.198	-0.154	-0.182	24.2%	-0.186
CE545-CE540	0.479	0.459	0.460	0.277	0.549	0.440	0.277	0.549	0.444	61.2%	0.530

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Maximum IDB (°C)							Statistics, All Results				BEST1405dev nino
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%	1.51
CE320-CE300	6.16	6.50	6.39	6.71	7.27	5.46	5.46	7.27	6.41	28.2%	7.09
CE330-CE300	6.03	6.61	6.89	6.07	6.85	5.11	5.11	6.89	6.26	28.4%	6.62
CE330-CE320	-0.13	0.11	0.50	-0.64	-0.42	-0.35	-0.64	0.50	-0.15	736.8%	-0.47
CE340-CE300	6.11	6.50	6.45	6.50	7.10	5.39	5.39	7.10	6.34	27.0%	6.90
CE330-CE340	-0.07	0.11	0.44	-0.43	-0.25	-0.28	-0.43	0.44	-0.08	1078.3%	-0.28
CE350-CE300	8.38	9.83	9.83	10.00	9.95	8.81	8.38	10.00	9.47	17.1%	9.91
CE360-CE300	7.56	7.67	7.45	7.51	7.95	6.94	6.94	7.95	7.51	13.4%	7.66
CE400-CE300	0.91	2.45	3.72	1.91		-0.15	-0.15	3.72	1.77	218.8%	4.44
CE410-CE300	0.63	0.00	0.00			0.00	0.00	0.63	0.16	400.0%	1.25
CE420-CE300	0.00	0.00	0.00	0.00		0.04	0.00	0.04	0.01	500.0%	2.40
CE430-CE300	1.00	0.00	0.00	0.00		0.26	0.00	1.00	0.25	396.6%	2.92
CE440-CE300	0.85	0.00	0.00	0.00		0.07	0.00	0.85	0.18	461.5%	4.11
CE500-CE300	-0.39	0.00	0.00	0.00	-0.03	-1.19	-1.19	0.00	-0.27	441.5%	-0.02
CE510-CE500	0.29	0.00	0.00	0.00	0.00	0.00	0.00	0.29	0.05	600.0%	-0.07
CE525-CE520	19.96	18.95	19.12	20.00	19.02	16.38	16.38	20.00	18.90	19.1%	20.58
CE530-CE500	0.31	-0.05	-0.05	0.00	0.00	0.00	-0.05	0.31	0.04	1025.2%	2.40
CE545-CE540	19.53	19.89	19.89	20.00	19.95	20.00	19.53	20.00	19.88	2.4%	21.51

Minimum IDB (°C)							Statistics, All Results				BEST1405dev nino
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%	0.01
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%	-0.01
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%	-1.94
CE410-CE300	0.00	0.00	0.00			0.00	0.00	0.00	0.00	----	-1.94
CE420-CE300	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	500.0%	-1.94
CE430-CE300	0.00	0.00	0.00	0.00		0.00	0.00	0.00	0.00	500.0%	-1.94
CE440-CE300	0.00	0.00	0.00	0.00		0.01	0.00	0.01	0.00	500.0%	-1.94
CE500-CE300	0.50	-0.72	-0.89	0.22	0.54	17.05	-0.89	17.05	2.78	644.6%	8.05
CE510-CE500	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	-0.09
CE525-CE520	0.14	0.06	0.05	0.18	0.03	19.44	0.03	19.44	3.32	585.3%	13.24
CE530-CE500	-0.01	0.00	0.00	0.00	0.00	0.00	-0.01	0.00	0.00	533.6%	-0.55
CE545-CE540	0.22	0.06	0.05	0.18	0.03	18.06	0.03	18.06	3.10	581.6%	12.42

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
 By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Maximum Humidity Ratio (kg/kg)							Statistics, All Results				BEST1405dev nino
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%	0.0019
CE320-CE300	0.0047	0.0039	0.0039	0.0042	0.0041	0.0043	0.0039	0.0047	0.0042	19.9%	0.0049
CE330-CE300	0.0044	0.0040	0.0040	0.0043	0.0036	0.0043	0.0036	0.0044	0.0041	19.0%	0.0045
CE330-CE320	-0.0004	0.0001	0.0001	0.0001	-0.0005	0.0000	-0.0005	0.0001	-0.0001	696.5%	-0.0004
CE340-CE300	0.0046	0.0039	0.0037	0.0042	0.0038	0.0043	0.0037	0.0046	0.0041	21.8%	0.0046
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%	0.0034
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%	0.0058
CE410-CE300	0.0036	0.0031	0.0032			0.0039	0.0031	0.0039	0.0034	23.3%	0.0006
CE420-CE300	0.0010	0.0009	0.0004	0.0010		0.0013	0.0004	0.0013	0.0009	98.3%	0.0010
CE430-CE300	0.0029	0.0018	0.0019	0.0025		0.0024	0.0018	0.0029	0.0023	49.6%	0.0032
CE440-CE300	0.0000	0.0000	0.0000	0.0000		0.0000	0.0000	0.0000	0.0000	500.0%	0.0006
CE500-CE300	-0.0016	-0.0019	-0.0019	-0.0019	-0.0017	-0.0019	-0.0019	-0.0016	-0.0018	20.6%	0.0032
CE510-CE500	0.0002	0.0000	0.0001	0.0000	0.0000	0.0000	0.0000	0.0002	0.0000	352.6%	-0.0002
CE525-CE520	0.0104	0.0103	0.0102	0.0115	0.0101	0.0067	0.0067	0.0115	0.0099	48.3%	0.0151
CE530-CE500	-0.0047	-0.0038	-0.0037	-0.0049	-0.0062	-0.0047	-0.0062	-0.0037	-0.0047	53.9%	-0.0078
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				BEST1405dev nino
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%	0.0084
CE510-CE500	0.0000			0.0000	0.0000	0.0002	0.0000	0.0002	0.0001	400.0%	-0.0001
CE525-CE520	0.0007			0.0005	0.0004	0.0088	0.0004	0.0088	0.0026	322.8%	0.0081
CE530-CE500	-0.0006			-0.0003	-0.0015	-0.0037	-0.0037	-0.0003	-0.0015	226.1%	-0.0046
CE545-CE540	0.0021			0.0030	0.0034	0.0028	0.0021	0.0034	0.0028	47.3%	0.0032

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 03-Dec-2014.**

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

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

Maximum Relative Humidity (%)							Statistics, All Results				BEST1405dev nino
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%	9.18
CE320-CE300	13.05	14.06	14.82	14.60	15.00	14.44	13.05	15.00	14.33	13.6%	14.11
CE330-CE300	7.87	9.11	9.09	8.51	8.00	11.26	7.87	11.26	8.97	37.8%	7.24
CE330-CE320	-5.18	-4.95	-5.73	-6.09	-7.00	-3.18	-7	-3	-5.35	71.3%	-6.87
CE340-CE300	11.14	12.02	12.41	12.43	12.00	12.81	11	13	12.13	13.8%	11.57
CE330-CE340	-3.27	-2.91	-3.32	-3.92	-4.00	-1.55	-4	-2	-3.16	77.5%	-4.33
CE350-CE300	0.00	11.77	12.27	0.00	2.00	5.21	0.00	12.27	5.21	235.6%	-0.07
CE360-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	-0.04
CE400-CE300	14.96	16.22	16.72	16.27		18.87	14.96	18.87	16.61	23.5%	15.45
CE410-CE300	14.44	15.44	15.94			18.74	14.44	18.74	16.14	26.7%	0.46
CE420-CE300	2.05	5.16	2.68	4.92		6.41	2.05	6.41	4.24	102.7%	5.04
CE430-CE300	11.92	9.08	9.58	12.38		11.50	9.08	12.38	10.89	30.3%	14.69
CE440-CE300	-0.06	0.00	0.00	0.00		0.07	-0.06	0.07	0.00	13500.0%	0.01
CE500-CE300	31.21			31.63	32.00	-7.36	-7.36	32.00	21.87	180.0%	21.79
CE510-CE500	0.00			0.00	0.00	-2.57	-2.57	0.00	-0.64	400.0%	0.21
CE525-CE520	9.77			6.19	5.00	-20.65	-20.65	9.77	0.08	39706.5%	4.39
CE530-CE500	-8.96			-3.84	-21.00	-24.07	-24.07	-3.84	-14.47	139.8%	-39.65
CE545-CE540	29.60			41.06	50.00	-15.82	-15.82	50.00	26.21	251.1%	-6.56

Minimum Relative Humidity (%)							Statistics, All Results				BEST1405dev nino
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%	0.11
CE320-CE300	0.00	0.00	0.00	0.24	0.00	-2.02	-2.02	0.24	-0.30	761.2%	0.13
CE330-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	0.08
CE330-CE320	0.00	0.00	0.00	-0.24	0.00	2.02	-0.24	2.02	0.30	761.1%	-0.05
CE340-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	0.08
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	----	0.10
CE360-CE300	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	600.0%	0.08
CE400-CE300	-0.12	0.00	0.00	-0.48		-0.37	-0.48	0.00	-0.19	246.0%	-0.01
CE410-CE300	-0.12	0.00	0.00			-0.36	-0.36	0.00	-0.12	298.7%	0.16
CE420-CE300	-0.12	0.00	0.00	-0.48		-0.35	-0.48	0.00	-0.19	251.4%	-0.01
CE430-CE300	-0.12	0.00	0.00	-0.48		-0.36	-0.48	0.00	-0.19	248.3%	-0.01
CE440-CE300	-0.12	0.00	0.00	-0.48		-0.40	-0.48	0.00	-0.20	238.1%	-0.01
CE500-CE300	40.07			40.76	39.00	37.89	37.89	40.76	39.43	7.3%	40.35
CE510-CE500	-1.32			0.12	0.00	0.32	-1.32	0.32	-0.22	747.8%	-0.28
CE525-CE520	-15.74			-13.87	-17.00	-17.50	-17.50	-13.87	-16.03	22.6%	-18.70
CE530-CE500	-23.81			-21.14	-26.00	-19.15	-26.00	-19.15	-22.53	30.4%	-28.65
CE545-CE540	-19.35			-16.77	-12.00	-19.60	-19.60	-12.00	-16.93	44.9%	-16.80

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

**Figure B16.5.2-6. HVAC BESTEST: CE300 - CE545
 Annual Compressor Electricity Consumption Sensitivities**

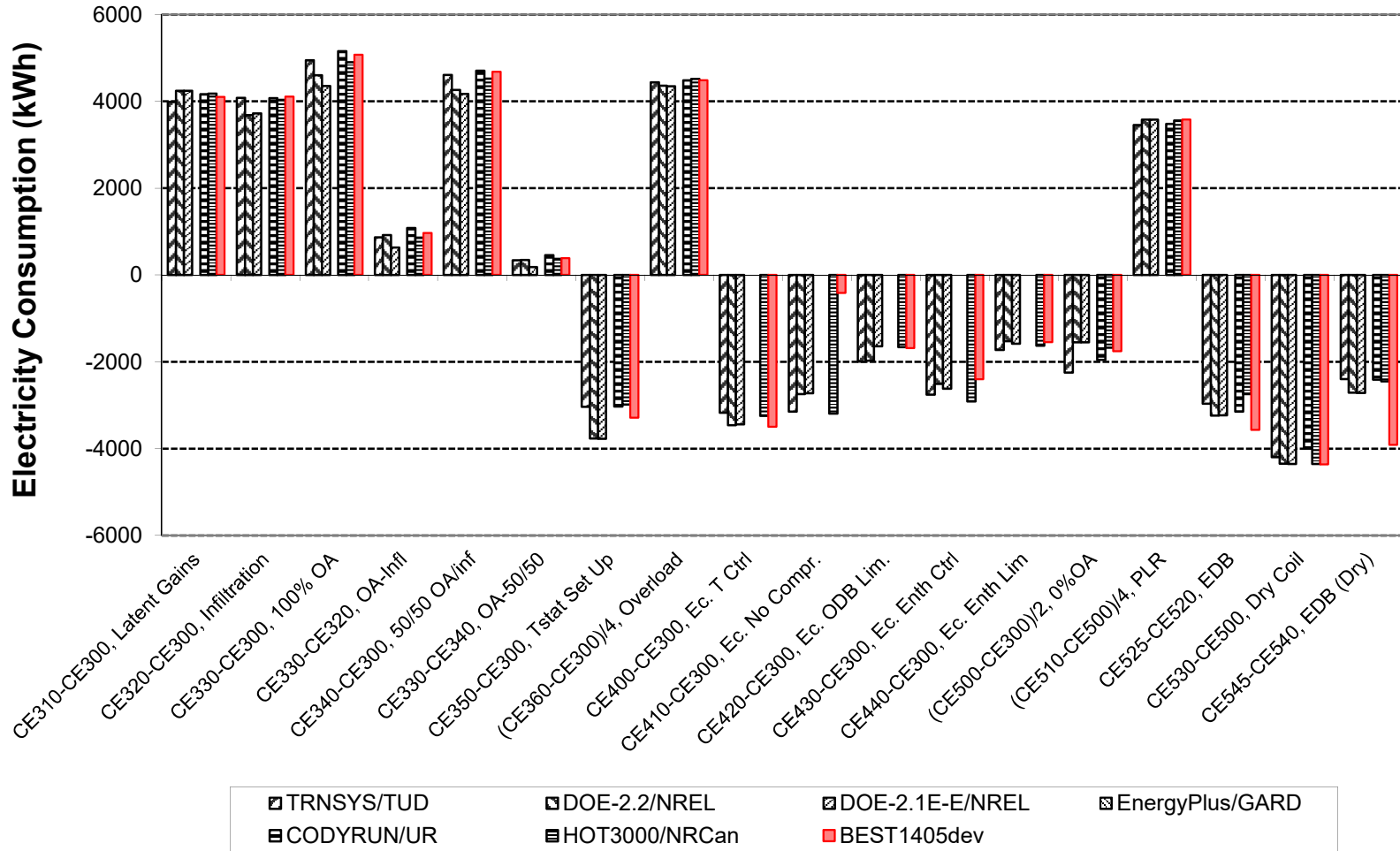
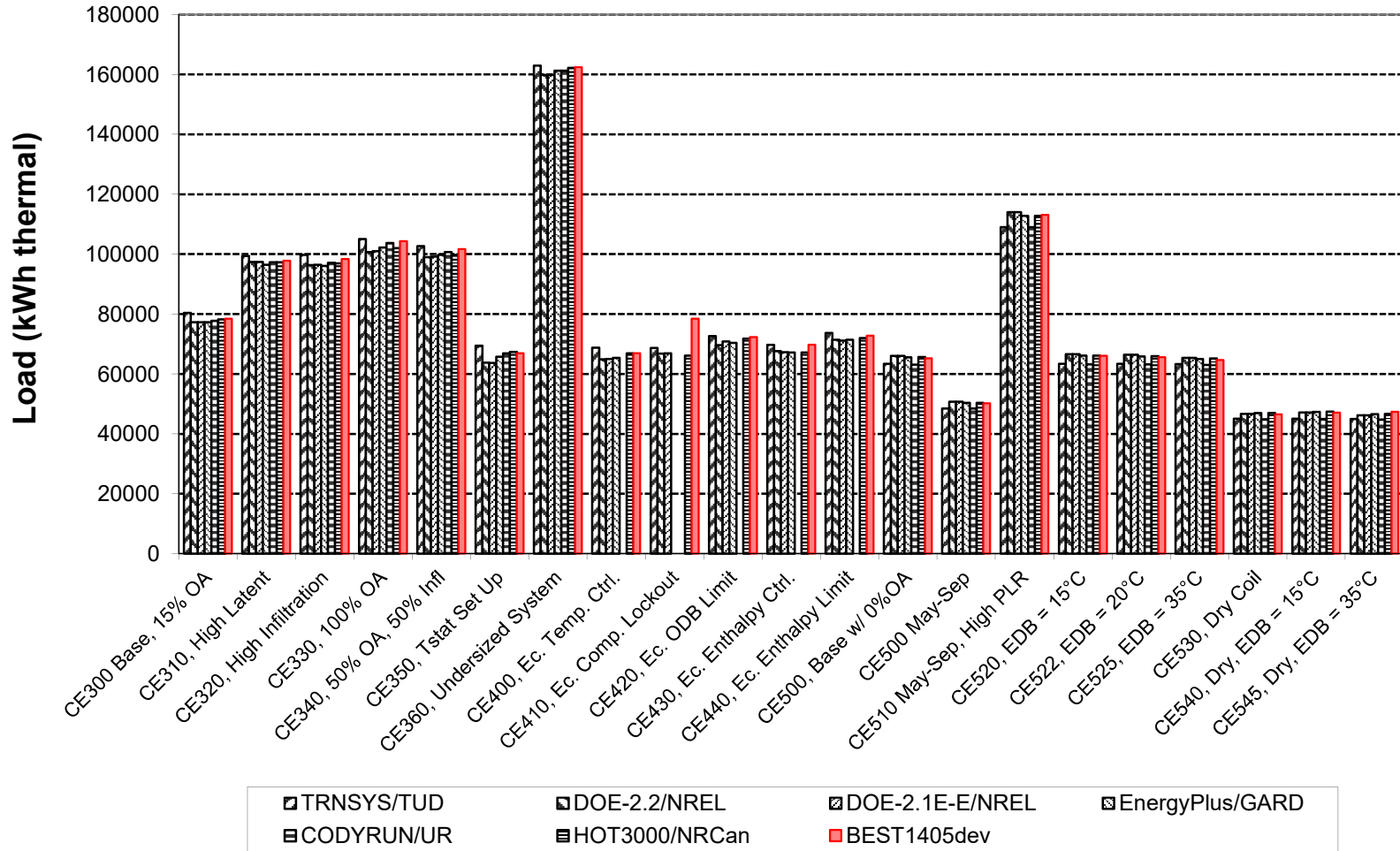
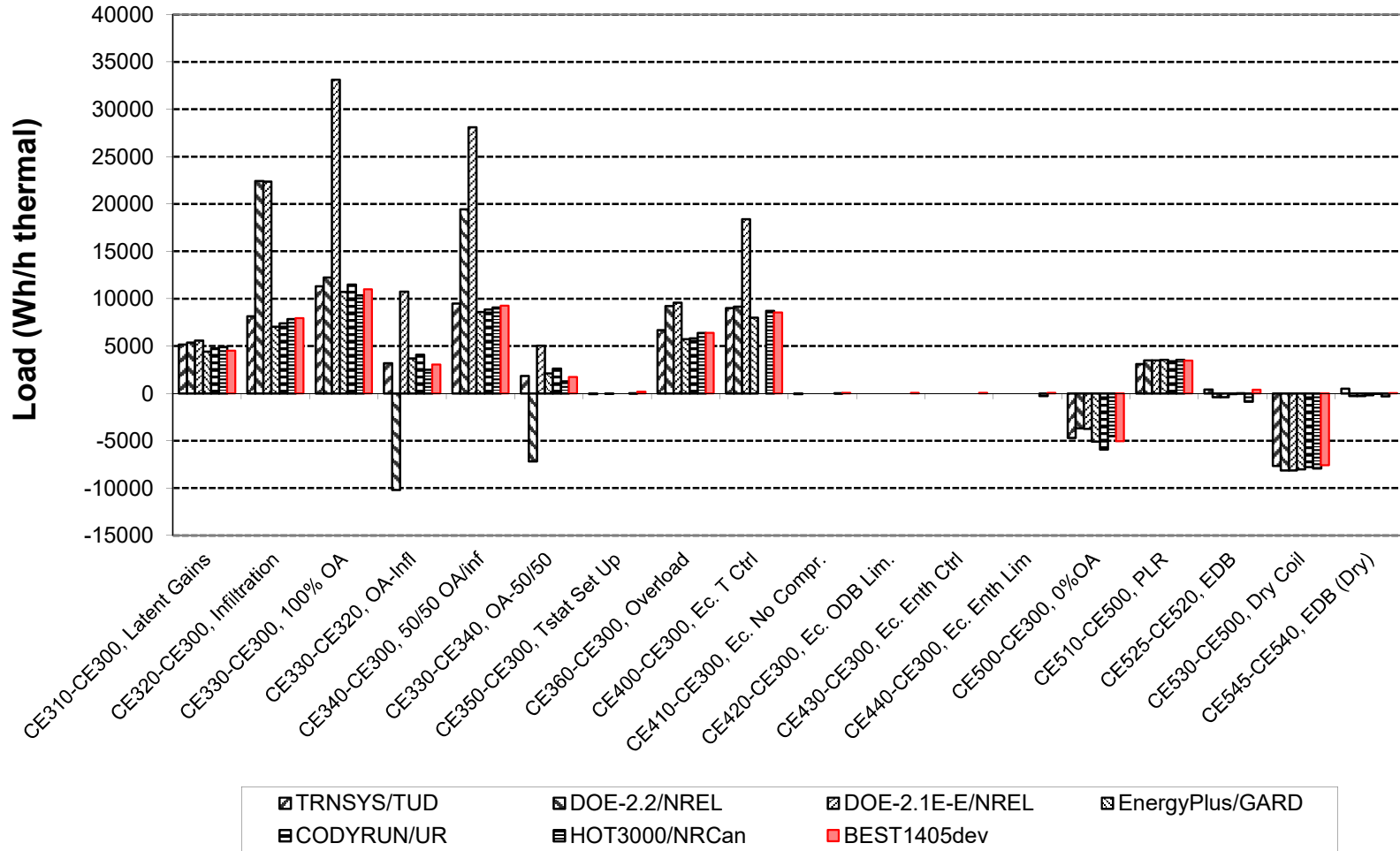


Figure B16.5.2-11. HVAC BESTEST: CE300 - CE545
Annual Total Coil Load

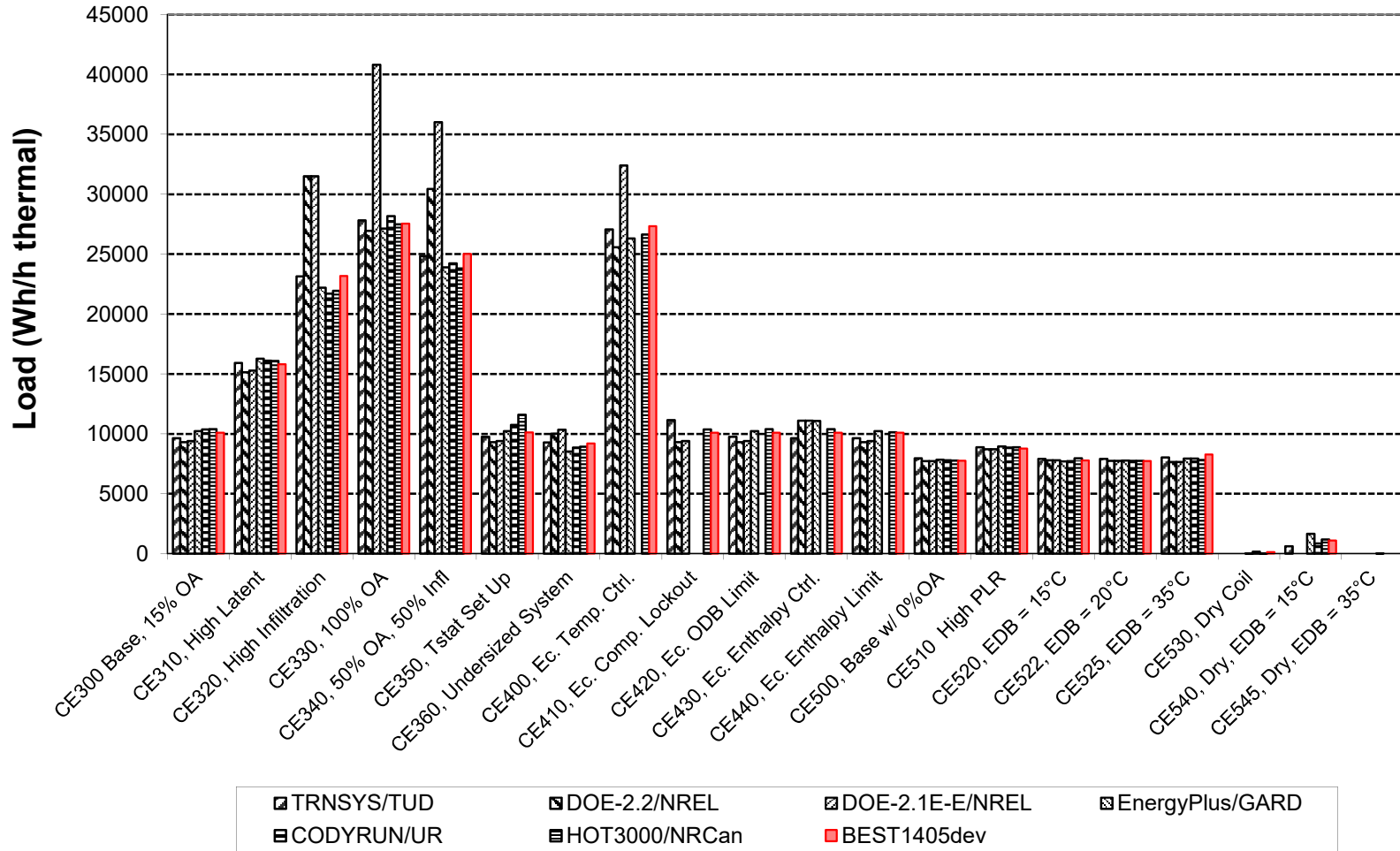


ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results

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

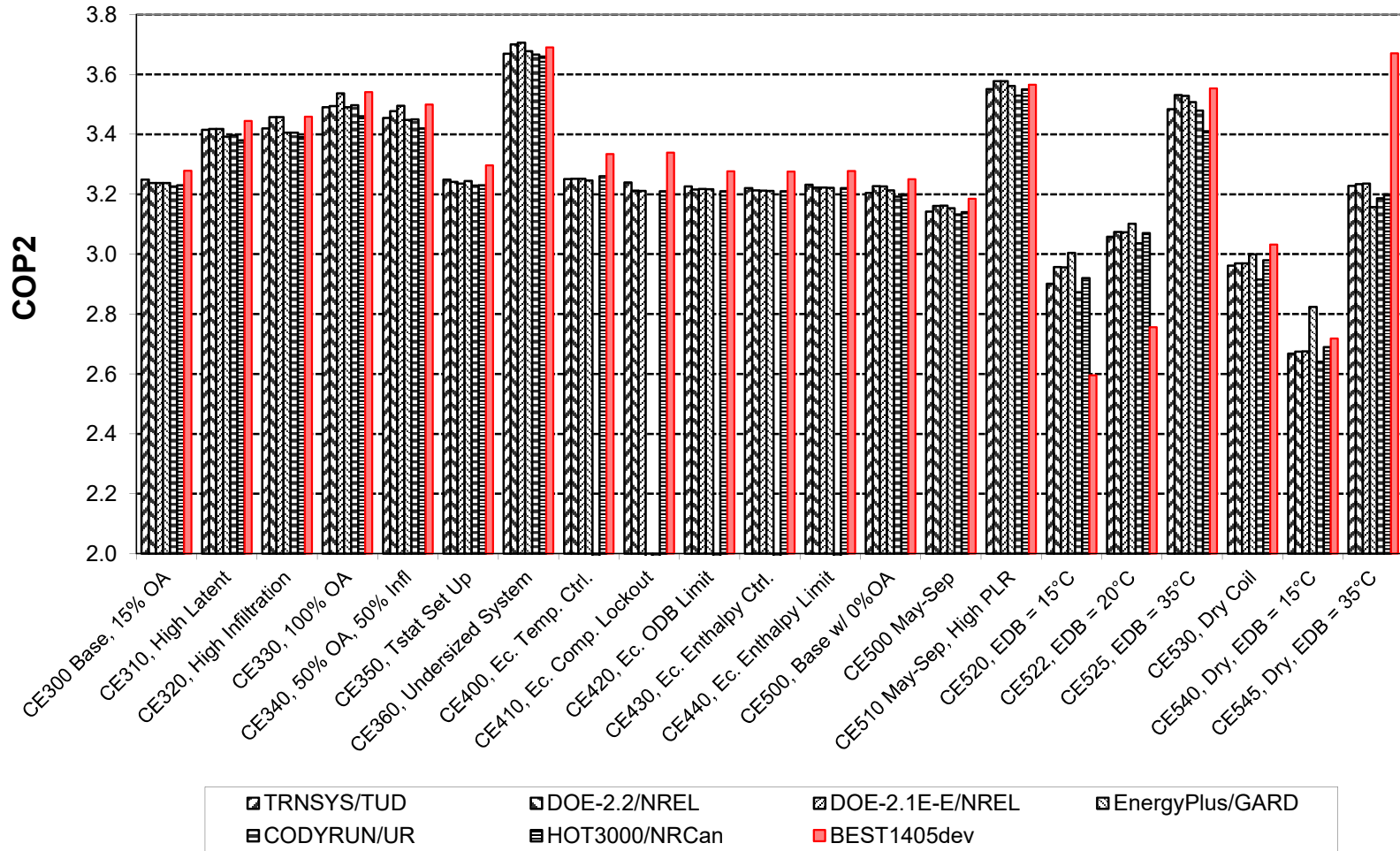


**Figure B16.5.2-19. HVAC BESTEST: CE300 - CE545
 Peak Hour Latent Coil Load**



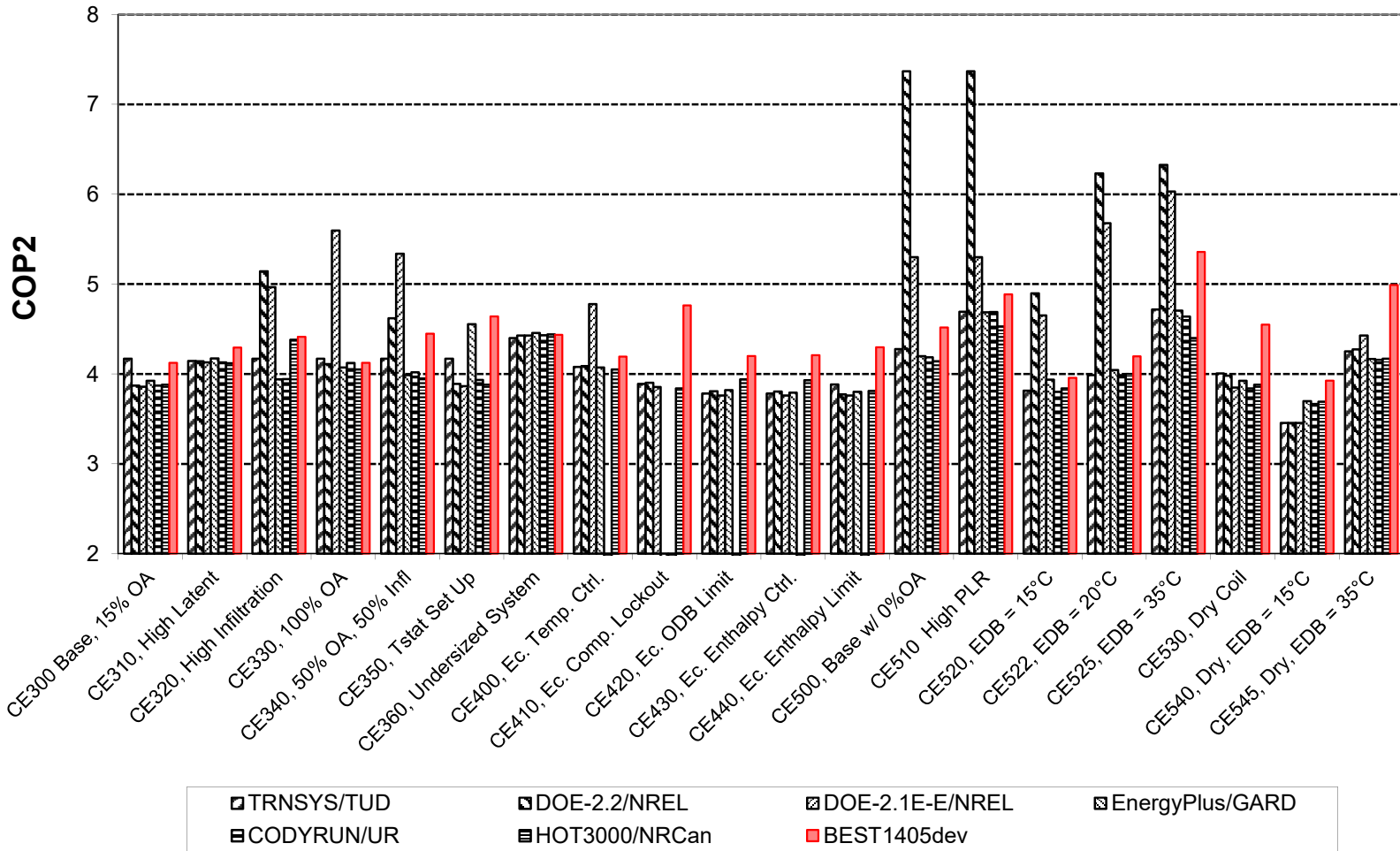
ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results

**Figure B16.5.2-21. HVAC BESTEST: CE300 - CE545
 Annual Mean COP2**



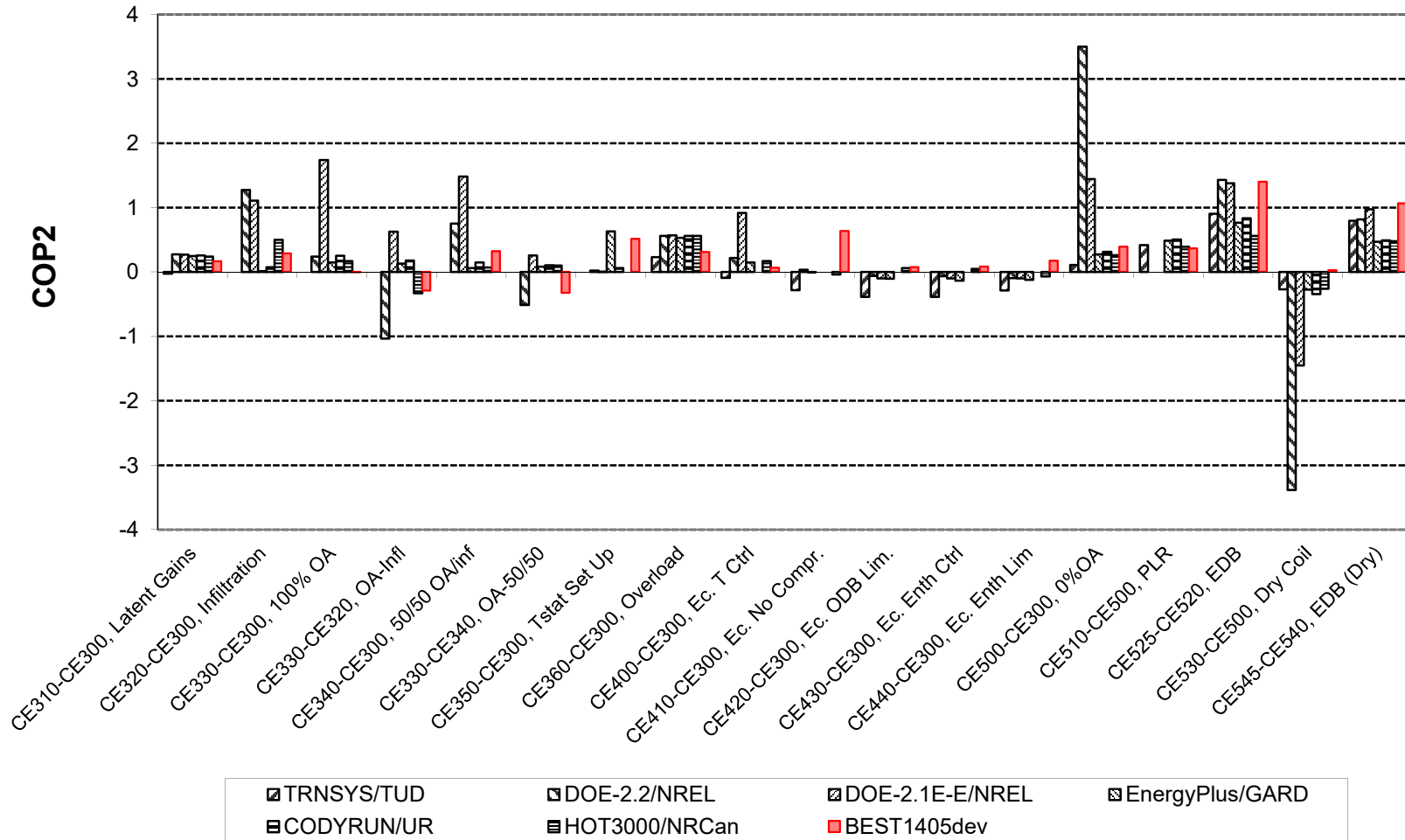
ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results

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



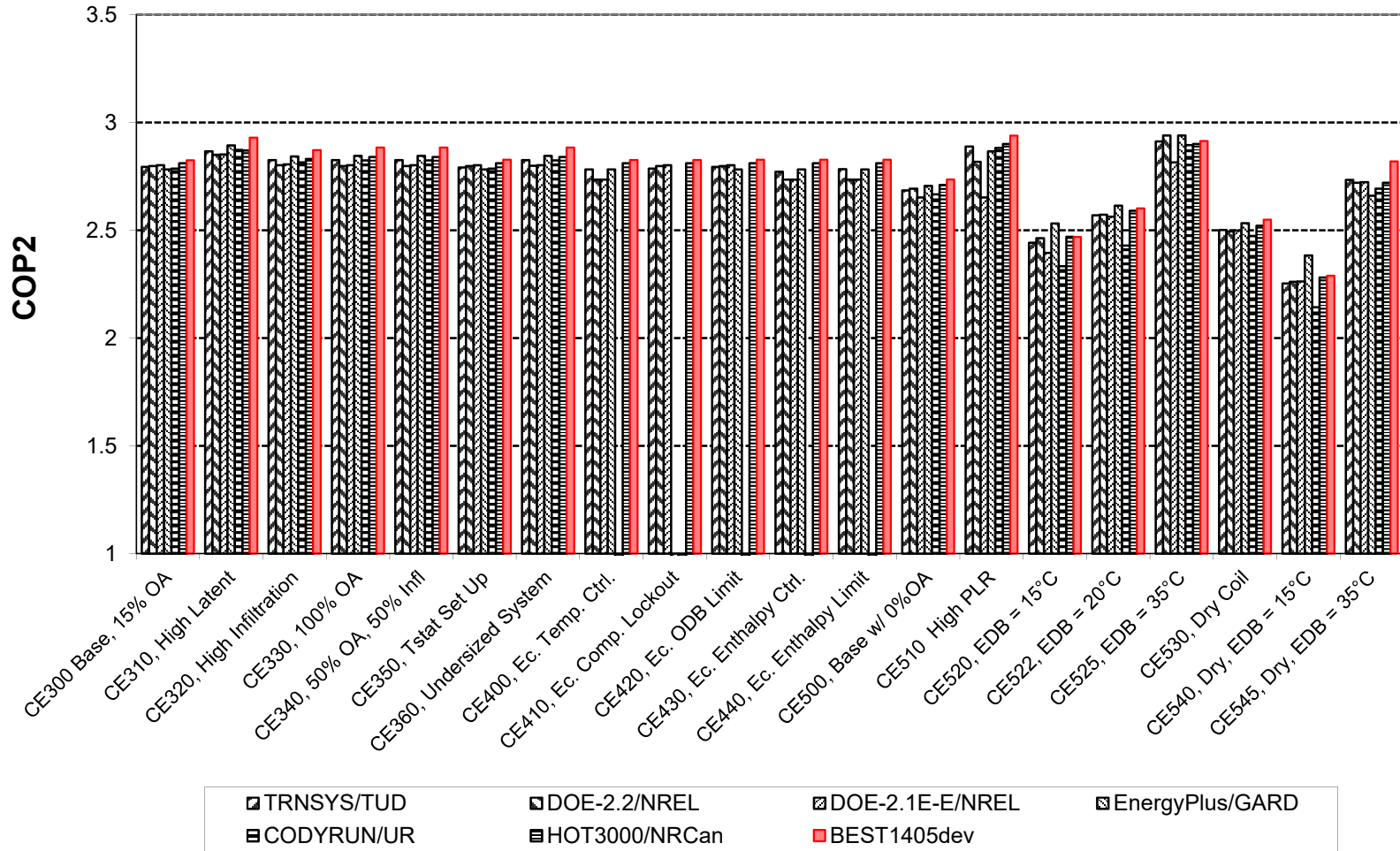
ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results

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



ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results

**Figure B16.5.2-25. HVAC BESTEST: CE300 - CE545
 Hourly Minimum COP2**



ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results

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

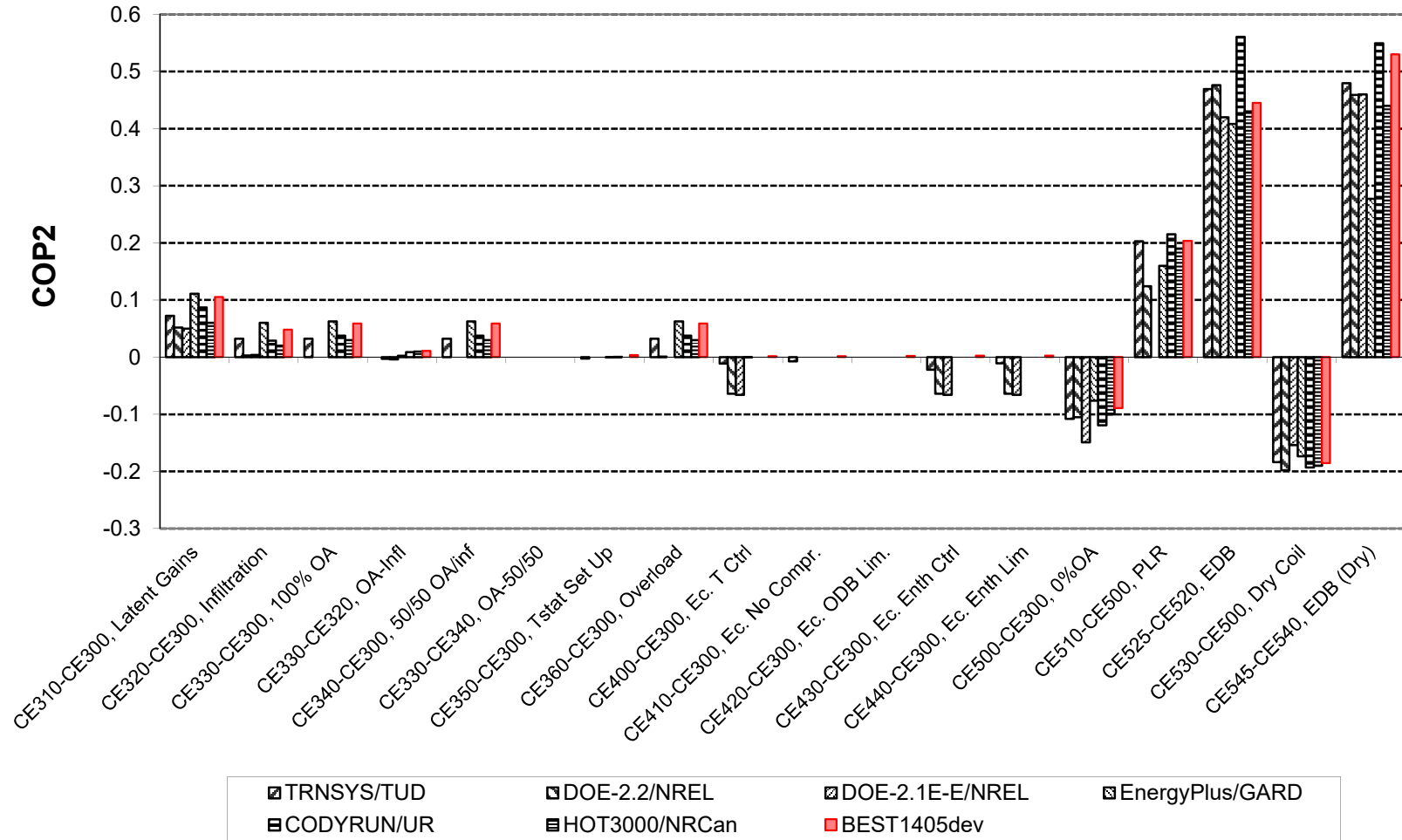
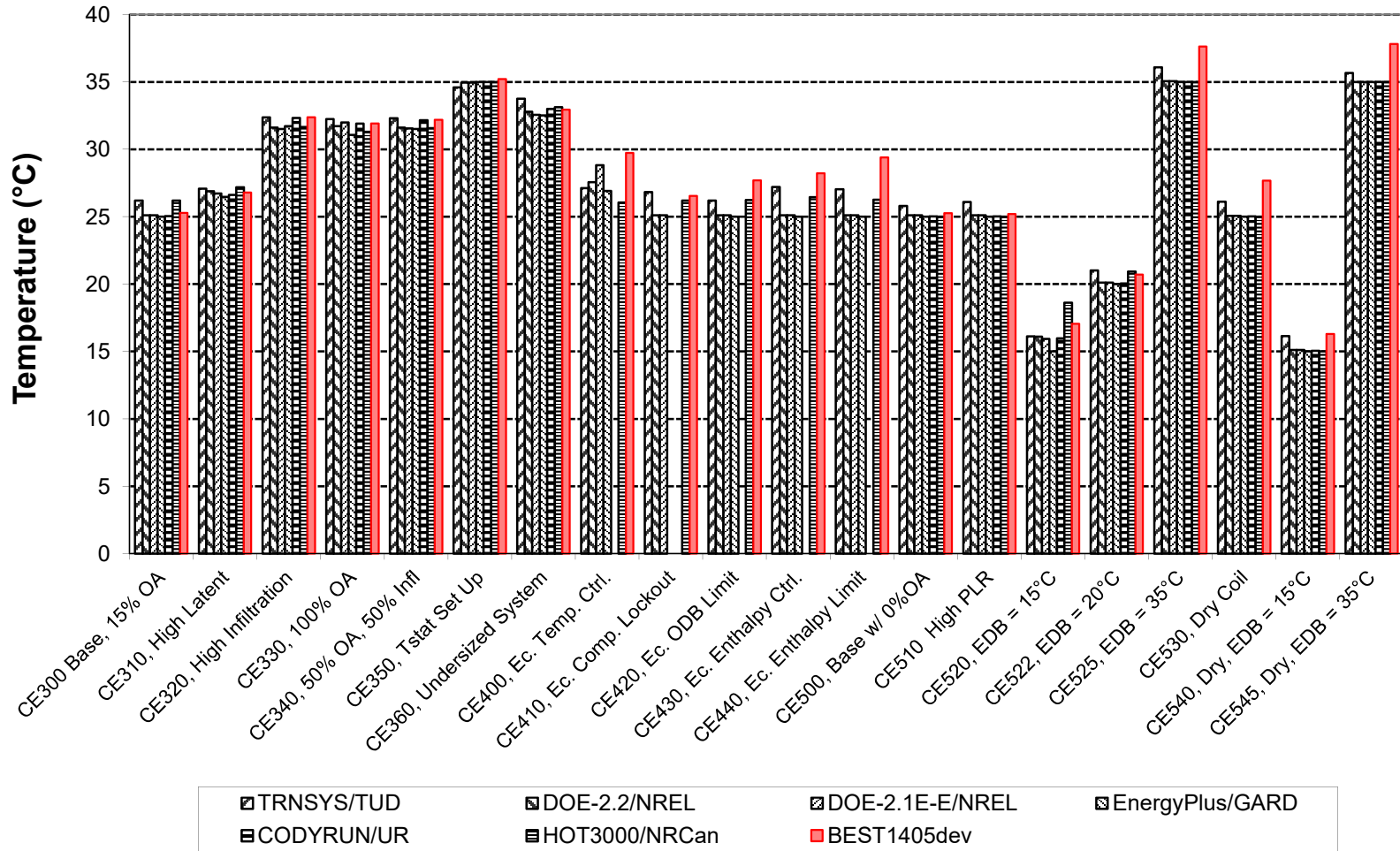
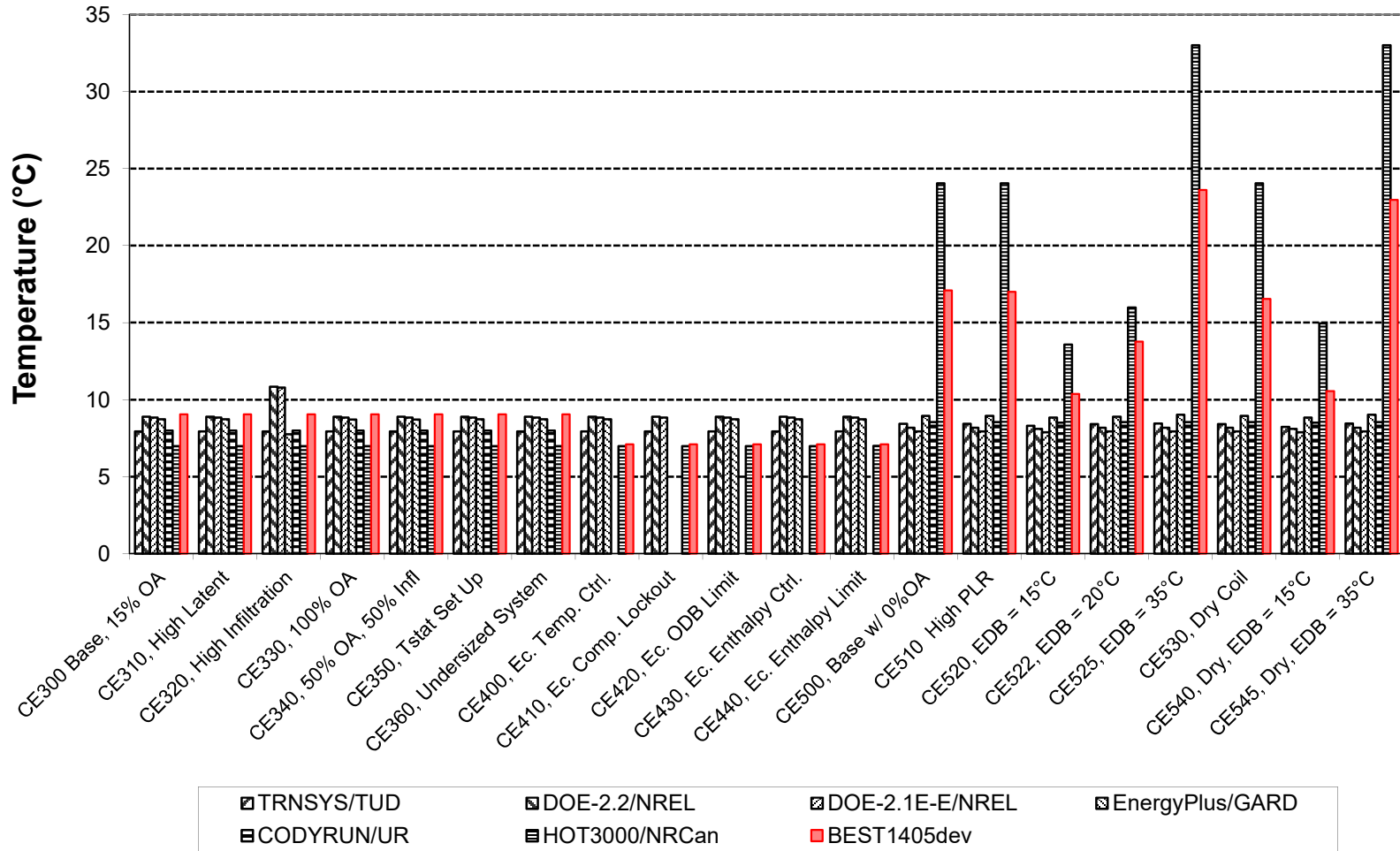


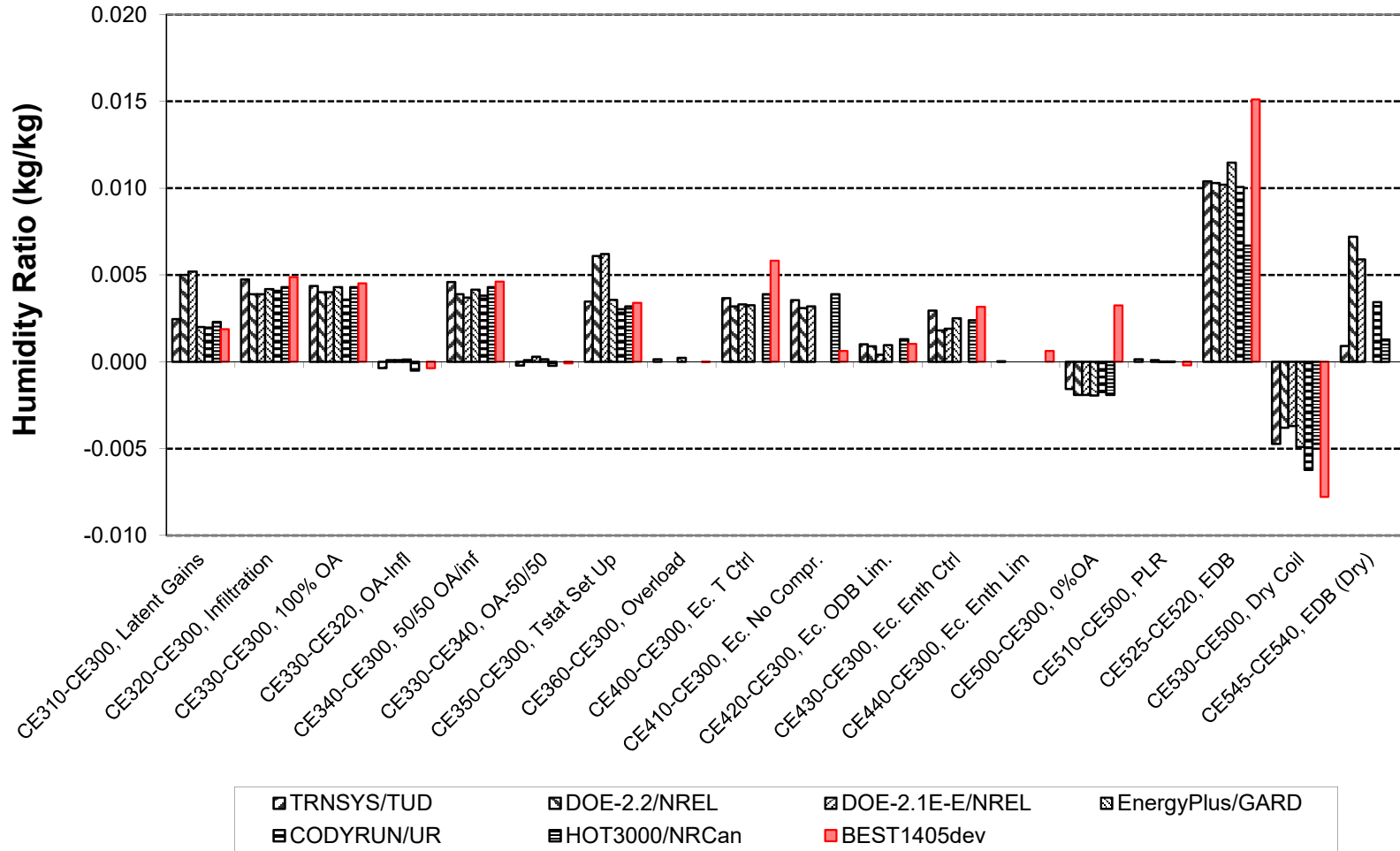
Figure B16.5.2-29. HVAC BESTEST: CE300 - CE545
Hourly Maximum Indoor Dry-Bulb Temperature



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

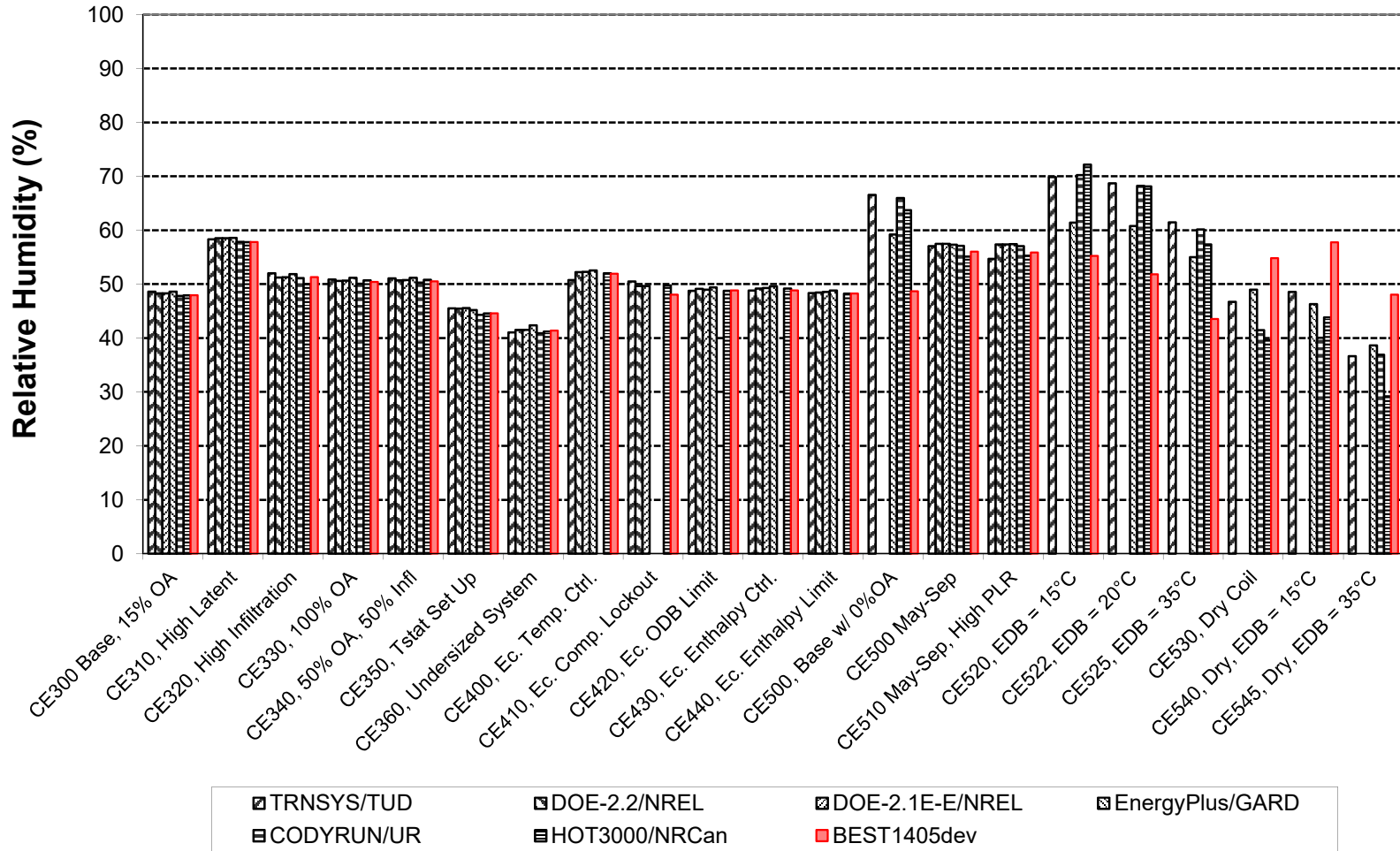


**Figure B16.5.2-35. HVAC BESTEST: CE300 - CE545
 Hourly Maximum Humidity Ratio Sensitivities**



ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
 BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results

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**

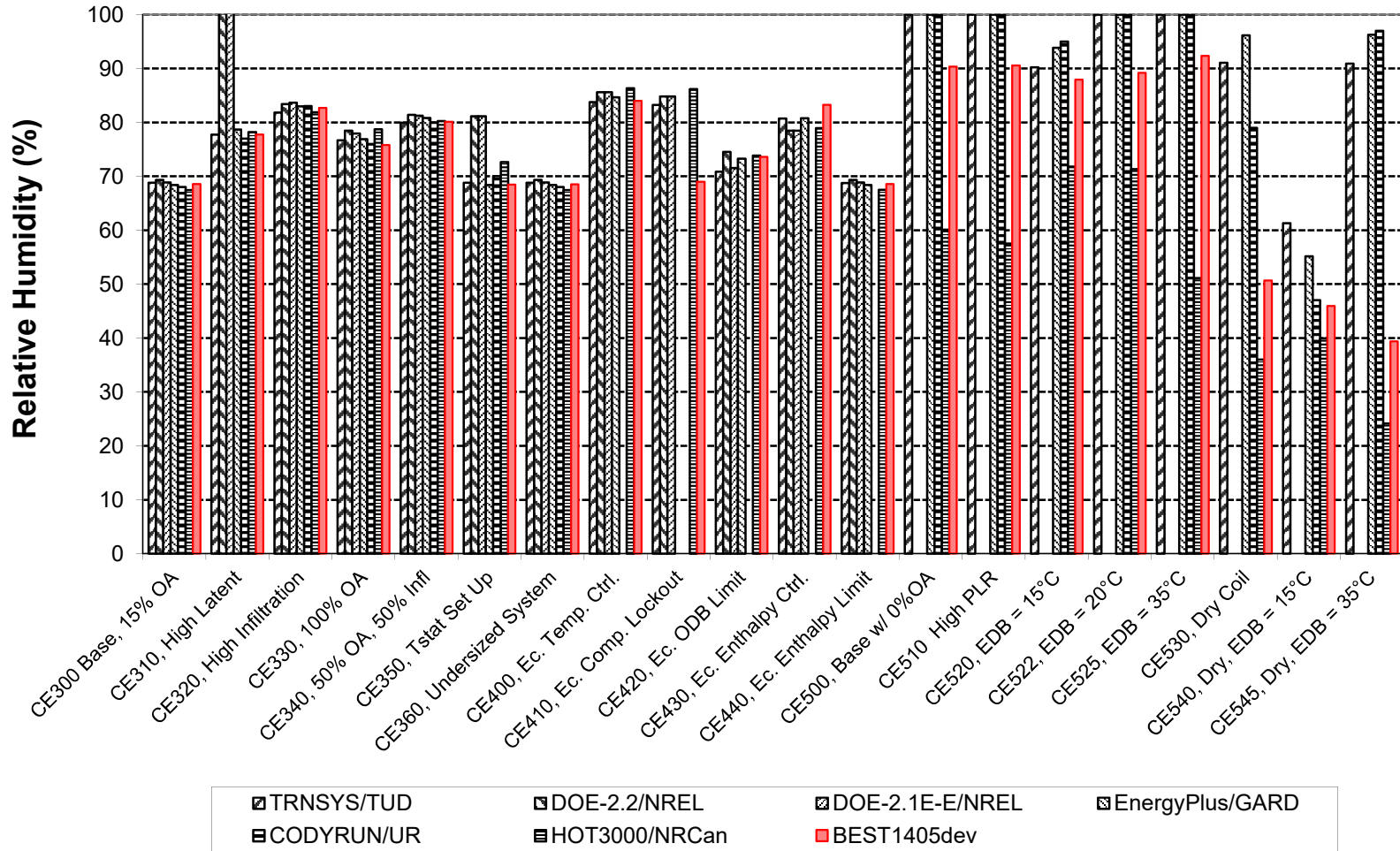
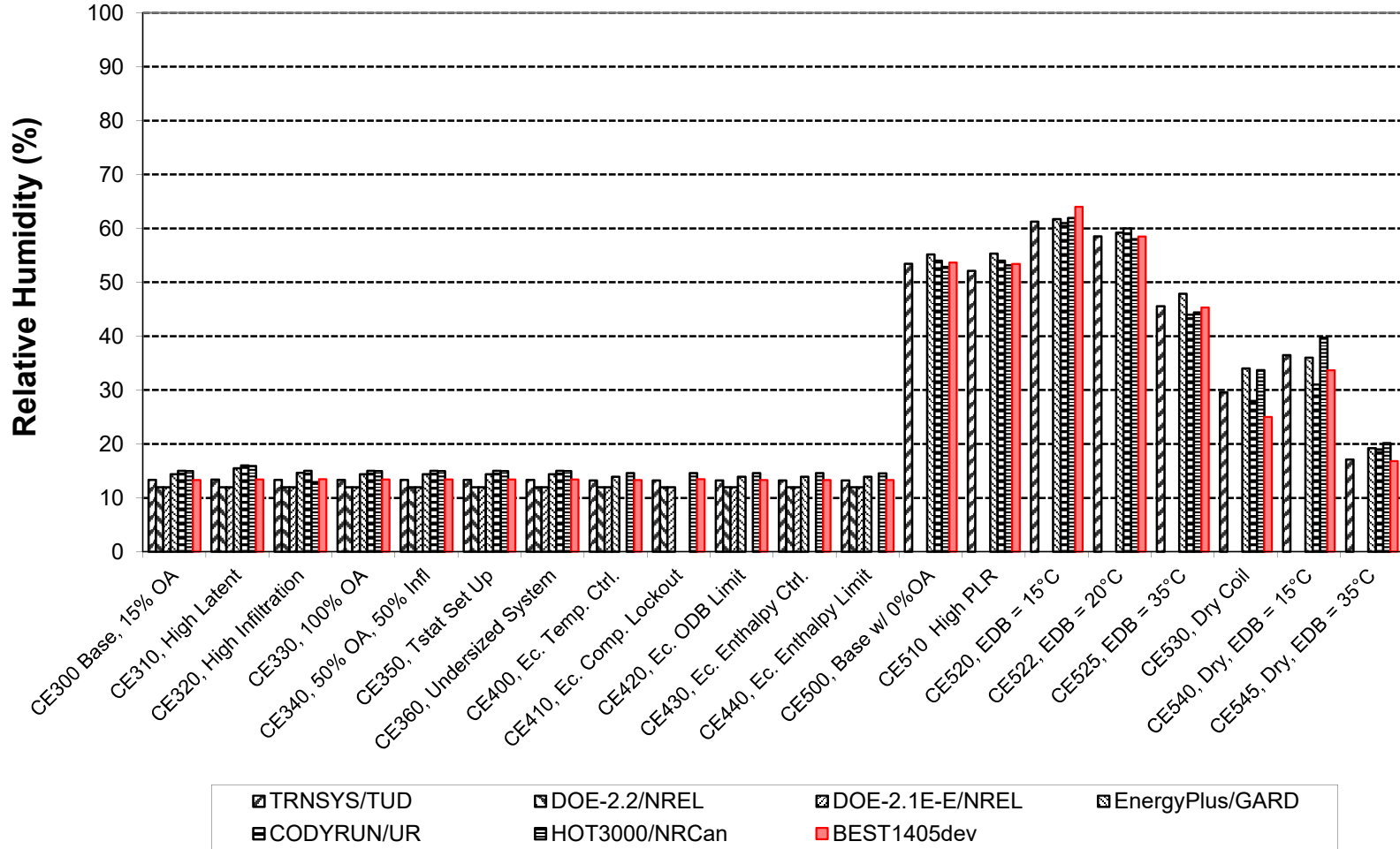
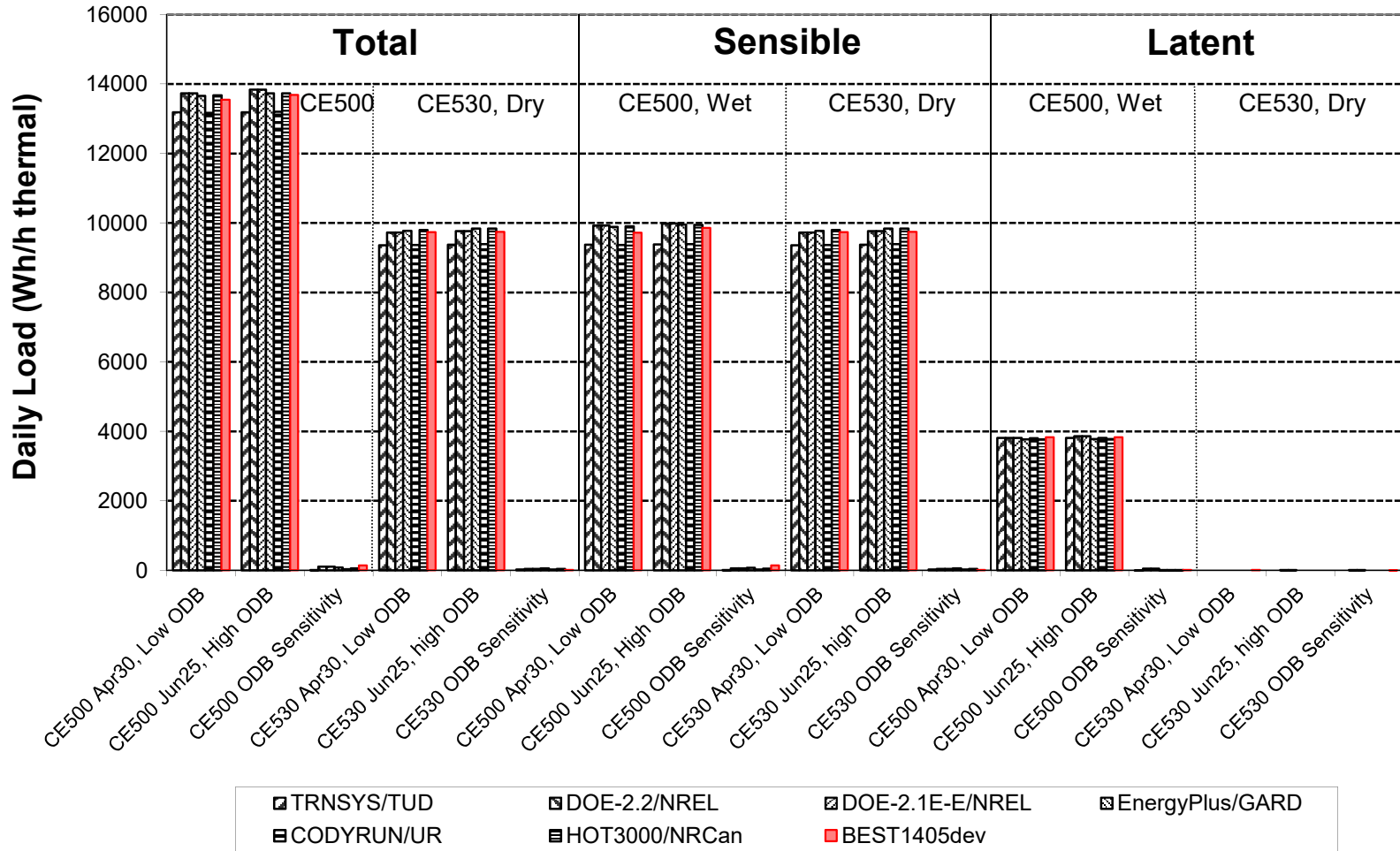


Figure B16.5.2-41. HVAC BESTEST: CE300 - CE545
Hourly Minimum Zone Relative Humidity

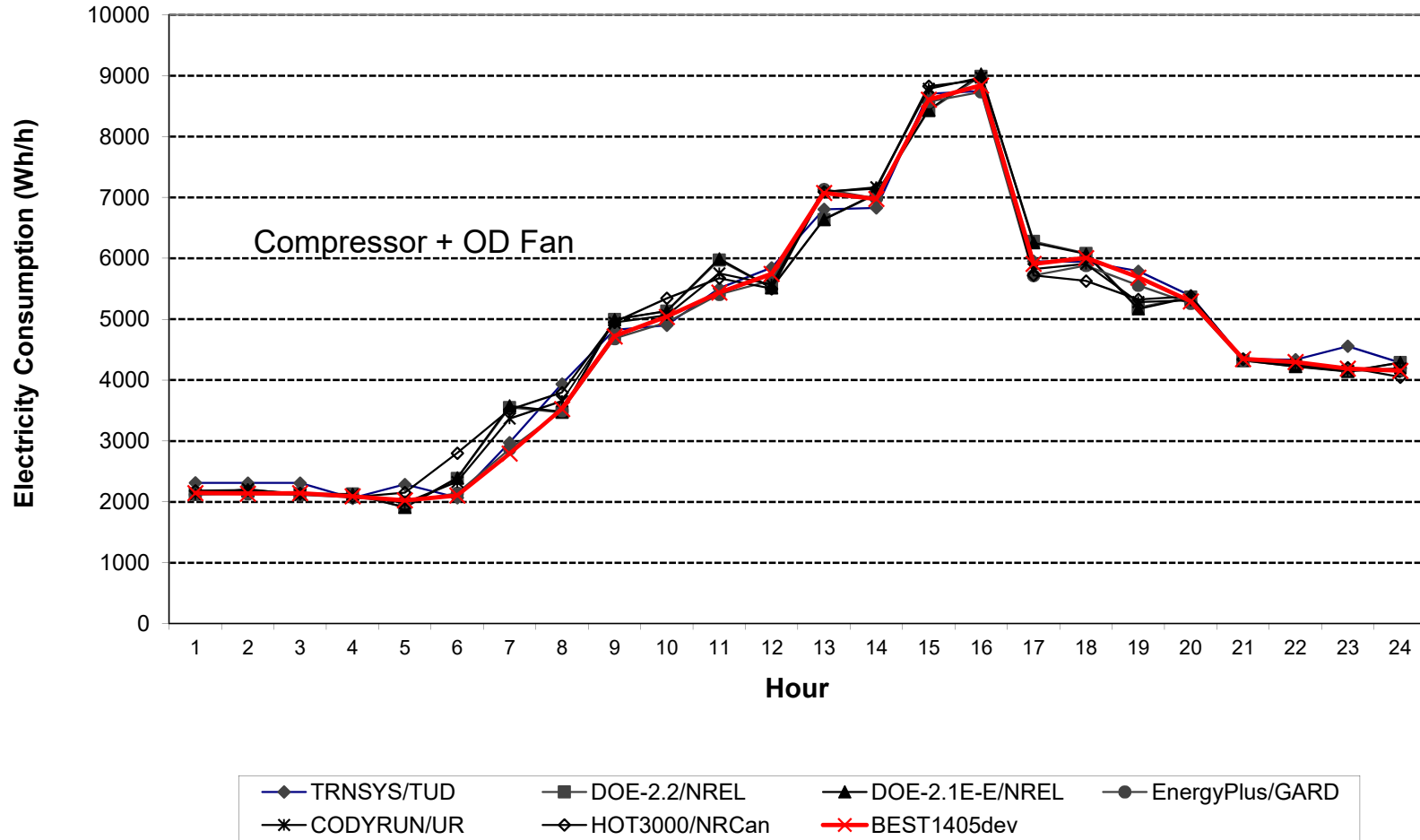


**Figure B16.5.2-43. HVAC BESTEST: f(ODB) for CE500, CE530
 Specific Day Coil Loads**



ASHRAE Standard 140-2011 Test Results Comparison for Section 5.3 - HVAC Equipment Performance Tests CE300-CE545
BEST (BEST1405dev) vs. Annex B16, Section B16.5.2 Example Results

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



ASHRAE Standard 140-2011

Test Results Comparison for Section 5.4 - HVAC Equipment Performance Tests HE100-HE230

Results for BEST
(BEST1405dev)
vs.
Informative Annex B16, Section B16.6 Example Results

Prepared By
NIKKEN SEKKEI Ltd. nino
(nino)

Results Developed
12-Nov-2014

ASHRAE Standard 140-2011
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 140-2010 Section 5.4 - HVAC Equipment Performance Tests HE100-HE230
BEST (BEST1405dev) vs. Annex B16, Section B16.6 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 12-Nov-2014**

List of Tables

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**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.4 - HVAC Equipment Performance Tests HE100-HE231
BEST (BEST1405dev) vs. Annex B16, Section B16.6 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 12-Nov-2014**

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

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

Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Statistics, All Results				Analytical/ Quasi-Analytical	BEST1405dev nino
				Min	Max	(Max-Min) /Analytical*			
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	31.57	
HE130: No Load	0.00	0.00	0.16	0.00	0.16	---	0.00	0.03	
HE140: Periodic PLR	31.26	31.10	31.12	31.10	31.26	0.5%	31.10	31.57	
HE150: Continuous Circ. Fan	29.88	29.59	29.57	29.57	29.88	1.1%	29.65	30.06	
HE160: Cycling Circ. Fan	31.26	30.46	30.49	30.46	31.26	2.6%	31.10	30.95	
HE170: Draft Fan	29.88	29.59	29.57	29.57	29.88	1.1%	29.65	30.06	
Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Min	Max	Mean	(Max-Min) /Mean**	Analytical/ Quasi-Analytical	BEST1405dev nino
HE210: Realistic Weather	41.36	42.04	42.06	41.36	42.06	41.82	1.7%	-	42.68
HE220: Setback Thermostat	39.41	39.87	39.76	39.41	39.87	39.68	1.2%	-	40.43
HE230: Undersized Furnace	34.32	34.59	34.37	34.32	34.59	34.43	0.8%	-	34.89

* 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	BEST1405dev nino
				Min	Max	(Max-Min) /Analytical*			
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	38.88	
HE130: No Load	0.00	0.00	0.14	0.00	0.14	---	0.00	0.81	
HE140: Periodic PLR	39.00	39.00	38.76	38.76	39.00	0.6%	39.00	39.48	
HE150: Continuous Circ. Fan	37.23	36.94	36.82	36.82	37.23	1.1%	37.02	37.62	
HE160: Cycling Circ. Fan	38.12	38.12	37.96	37.96	38.12	0.4%	38.09	38.69	
HE170: Draft Fan	37.23	36.94	36.82	36.82	37.23	1.1%	37.02	37.62	
Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Min	Max	Mean	(Max-Min) /Mean**	Analytical/ Quasi-Analytical	BEST1405dev nino
HE210: Realistic Weather	50.53	52.01	52.37	50.53	52.37	51.64	3.6%	-	53.23
HE220: Setback Thermostat	47.87	49.35	49.47	47.87	49.47	48.89	3.3%	-	50.35
HE230: Undersized Furnace	41.37	42.55	43.22	41.37	43.22	42.38	4.4%	-	43.69

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

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.4 - HVAC Equipment Performance Tests HE100-HE231
BEST (BEST1405dev) vs. Annex B16, Section B16.6 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 12-Nov-2014**

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

Table B16.6-3. Fuel Consumption (m³/s)

Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Statistics, All Results				Analytical/ Quasi-Analytical	BEST1405dev nino
				Min	Max	(Max-Min)			
						/Analytical*			
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	0.000132
HE130: No Load	0.000000	0.000000	0.000000	0.000000	0.000000	----		0.000000	0.000003
HE140: Periodic PLR	0.000132	0.000132	0.000131	0.000131	0.000132	0.6%		0.000132	0.000134
HE150: Continuous Circ. Fan	0.000126	0.000125	0.000125	0.000125	0.000126	1.1%		0.000125	0.000127
HE160: Cycling Circ. Fan	0.000129	0.000129	0.000129	0.000129	0.000129	0.4%		0.000129	0.000131
HE170: Draft Fan	0.000126	0.000125	0.000125	0.000125	0.000126	1.1%		0.000125	0.000127
Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Min	Max	Mean	(Max-Min) /Mean**	Analytical/ Quasi-Analytical	BEST1405dev nino
HE210: Realistic Weather	0.000171	0.000176	0.000177	0.000171	0.000177	0.000175	3.5%	-	0.000180
HE220: Setback Thermostat	0.000162	0.000167	0.000167	0.000162	0.000167	0.000165	3.3%	-	0.000170
HE230: Undersized Furnace	0.000140	0.000144	0.000146	0.000140	0.000146	0.000143	4.3%	-	0.000148

* 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	BEST1405dev nino
				Min	Max	(Max-Min)			
						/Analytical*			
HE150: Continuous Circ. Fan	432.0	433.3	432.1	432.0	433.3	0.3%		432.0	432.0
HE160: Cycling Circ. Fan	170.2	172.2	172.4	170.2	172.4	1.3%		172.8	171.9
HE170: Draft Fan	473.4	473.1	473.1	473.1	473.4	0.1%		473.2	473.7
Cases	ESP-r/HOT3000 CETC	EnergyPlus GARD	DOE-2.1E CETC	Min	Max	Mean	(Max-Min) /Mean**	Analytical/ Quasi-Analytical	BEST1405dev nino
HE210: Realistic Weather	281.6	291.4	298.9	281.6	298.9	290.6	6.0%	-	296.4
HE220: Setback Thermostat	268.3	276.1	281.2	268.3	281.2	275.2	4.7%	-	280.8
HE230: Undersized Furnace	458.3	431.4	478.4	431.4	478.4	456.0	10.3%	-	484.6

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

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

**ASHRAE Standard 140-2011 Test Results Comparison for Section 5.4 - HVAC Equipment Performance Tests HE100-HE231
BEST (BEST1405dev) vs. Annex B16, Section B16.6 Example Results
By NIKKEN SEKKEI Ltd. nino (nino), 12-Nov-2014**

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

Table B16.6-5. Mean Zone Temperature (°C)

Cases	ESP-r/HOT3000			EnergyPlus			DOE-2.1E			Statistics, All Results				BEST1405dev nino
	CETC			GARD			CETC			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						20.00
HE220: Setback Thermostat	18.75	18.53	18.53	18.53	18.75	18.60	1.2%	18.54						18.54
HE230: Undersized Furnace	15.48	15.17	15.64	15.17	15.64	15.43	3.0%	15.39						15.39

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

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

Cases	ESP-r/HOT3000			EnergyPlus			DOE-2.1E			Statistics, All Results				BEST1405dev nino
	CETC			GARD			CETC			Min	Max	Mean	(Max-Min) /Mean*	
HE210: Realistic Weather	21.45	20.00	20.06	20.00	21.45	20.50	7.1%	20.09						20.09
HE220: Setback Thermostat	22.70	20.00	20.11	20.00	22.70	20.94	12.9%	21.35						21.35
HE230: Undersized Furnace	20.14	20.00	20.06	20.00	20.14	20.07	0.7%	20.40						20.40

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

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

Cases	ESP-r/HOT3000			EnergyPlus			DOE-2.1E			Statistics, All Results				BEST1405dev nino
	CETC			GARD			CETC			Min	Max	Mean	(Max-Min) /Mean*	
HE210: Realistic Weather	20.00	20.00	19.89	19.89	20.00	19.96	0.6%	19.81						19.81
HE220: Setback Thermostat	15.00	15.00	14.94	14.94	15.00	14.98	0.4%	13.70						13.70
HE230: Undersized Furnace	1.45	4.48	3.22	1.45	4.48	3.05	99.3%	1.96						1.96

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

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

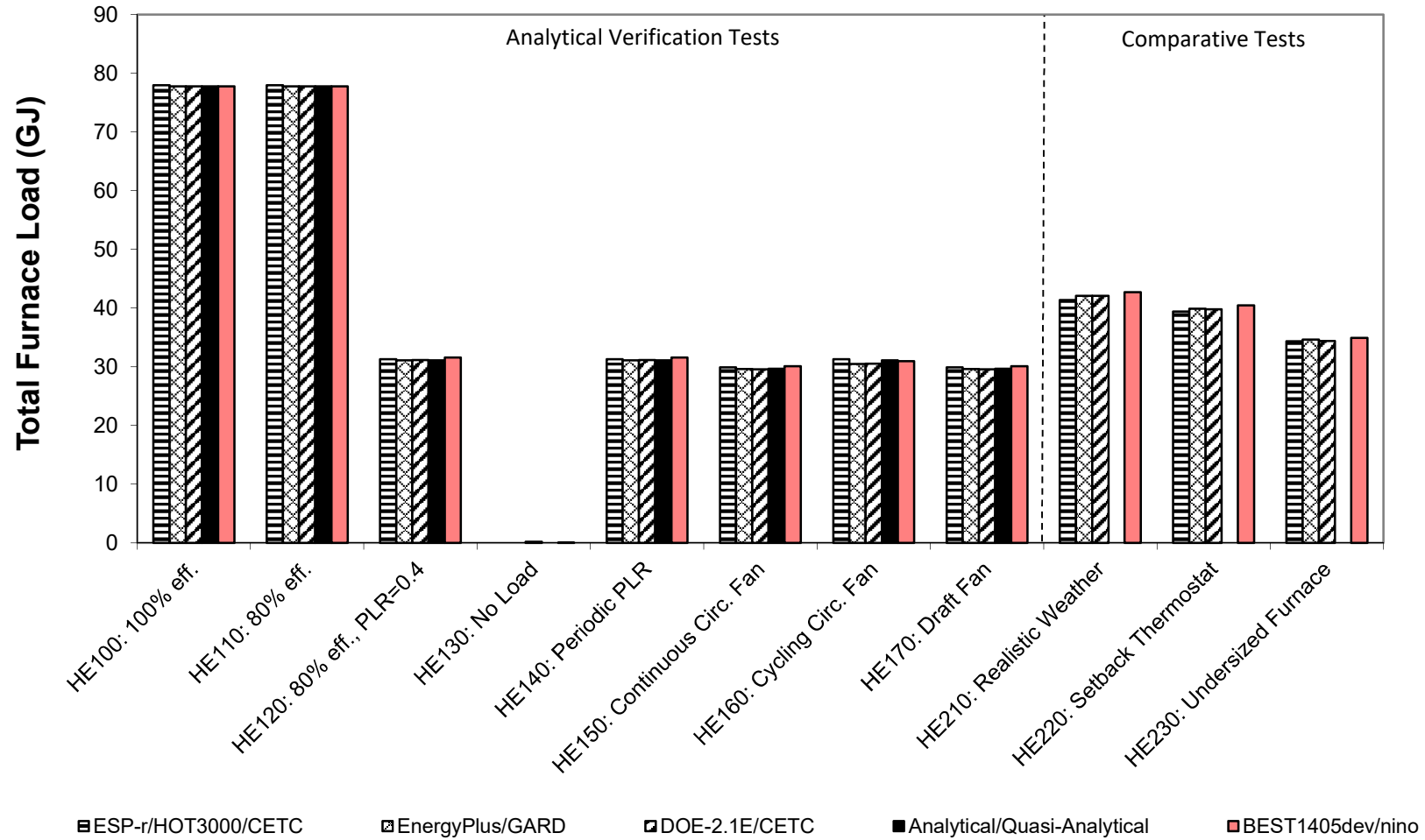


Figure B16.6-2. Comparison of the Energy Consumed for the Fuel-Fired Furnace Test Cases

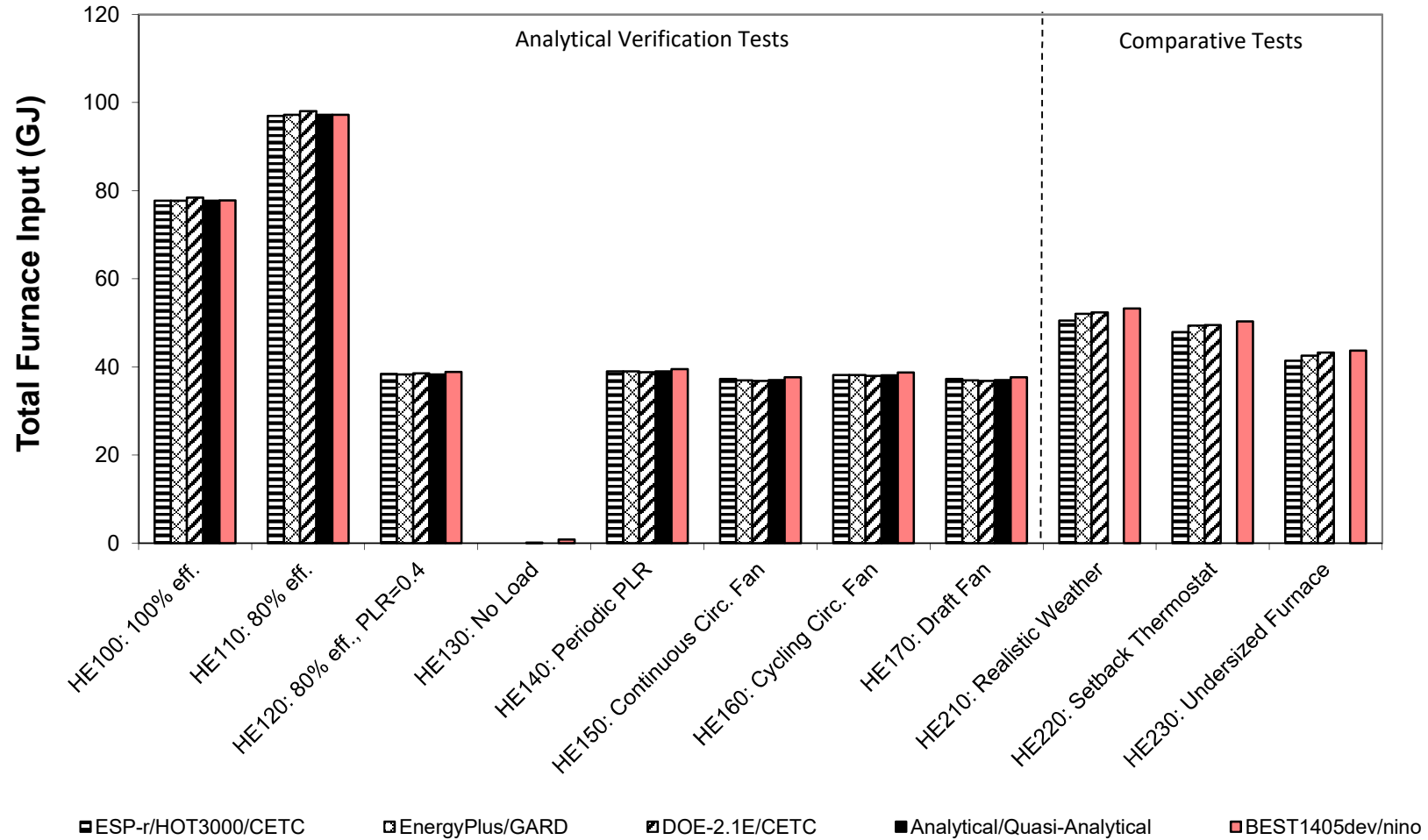


Figure B16.6-3. Comparison of the Fuel Consumed for the Fuel-Fired Furnace Test Cases

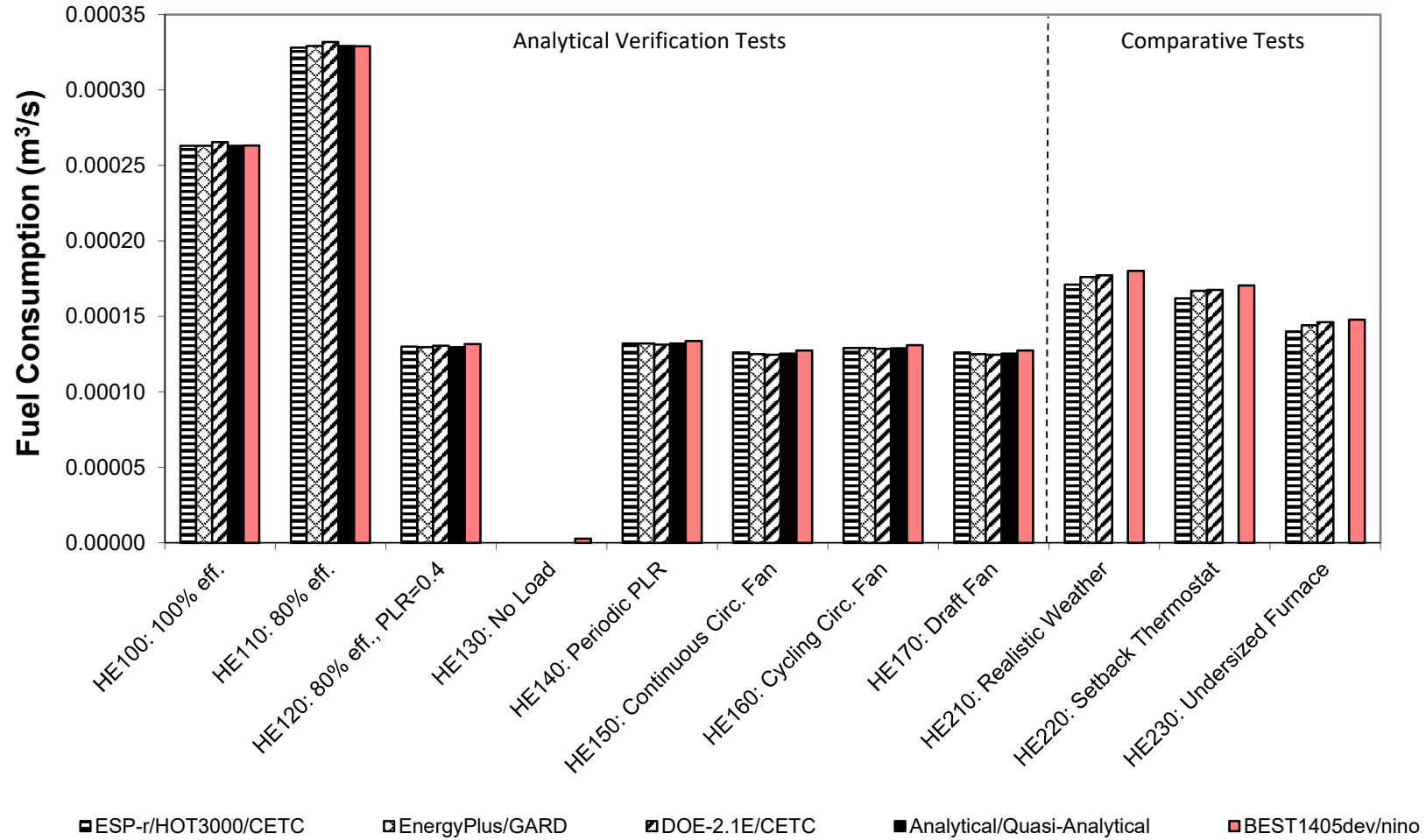
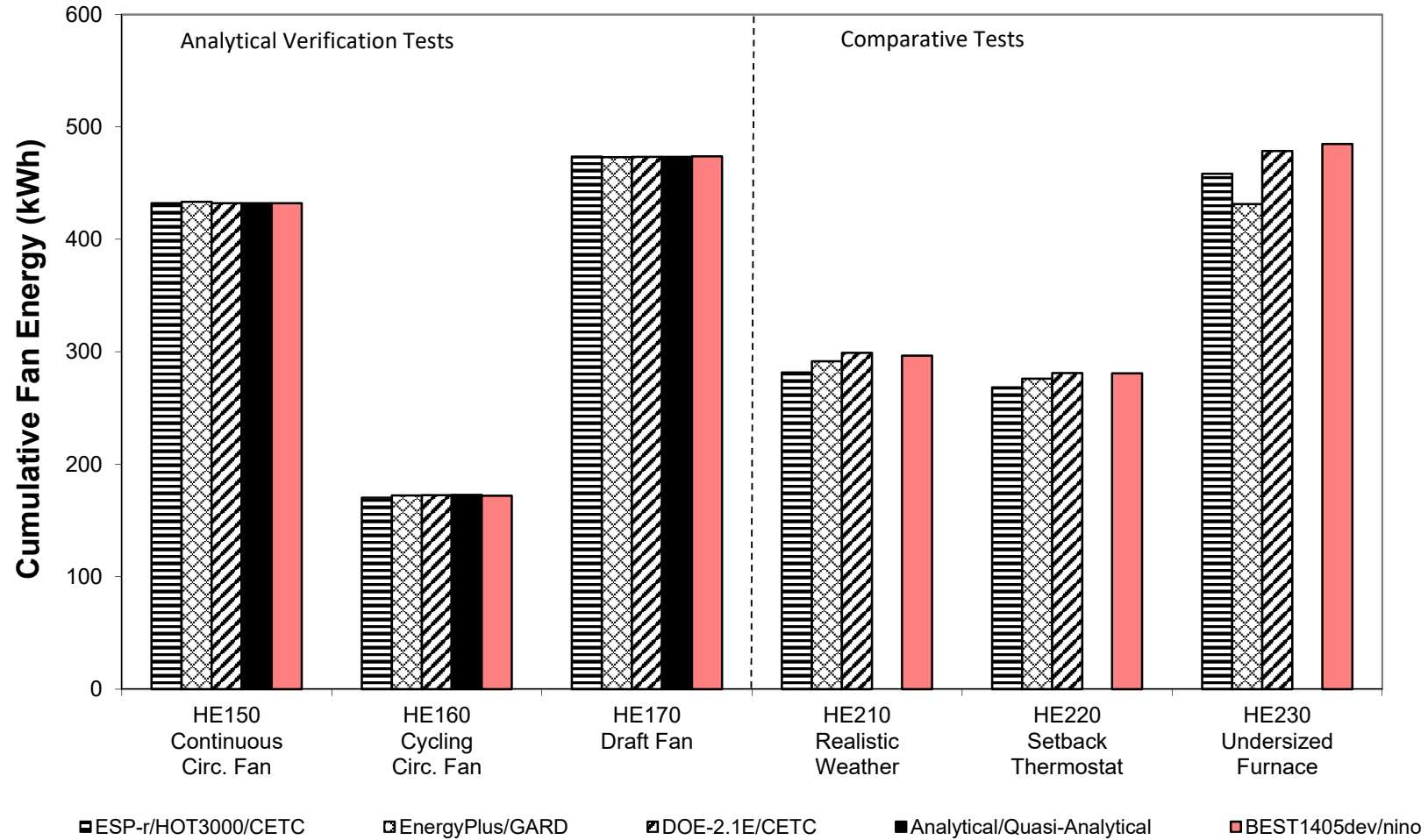


Figure B16.6-4. Comparison of the Fan Energy for the Fuel-Fired Furnace Test Cases



ASHRAE Standard 140-2011 Test Results Comparison for Section 5.4 - HVAC Equipment Performance Tests HE100-HE230
BEST (BEST1405dev) vs. Annex B16, Section B16.6 Example Results, by NIKKEN SEKKEI Ltd. nino (nino), 12-Nov-2014

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

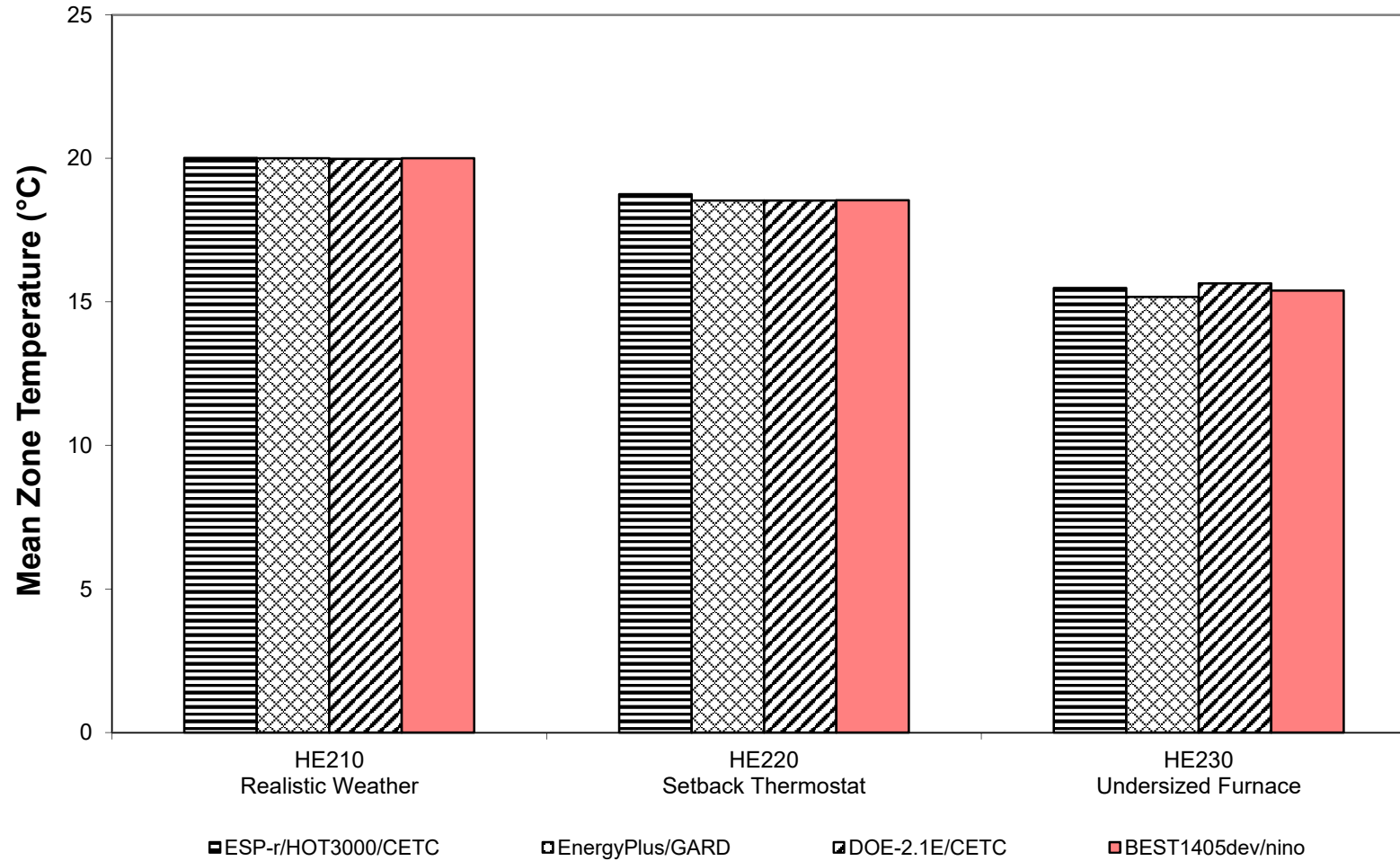


Figure B16.6-6. Comparison of the Maximum Zone Temperature for the Fuel-Fired Furnace Comparative Test Cases

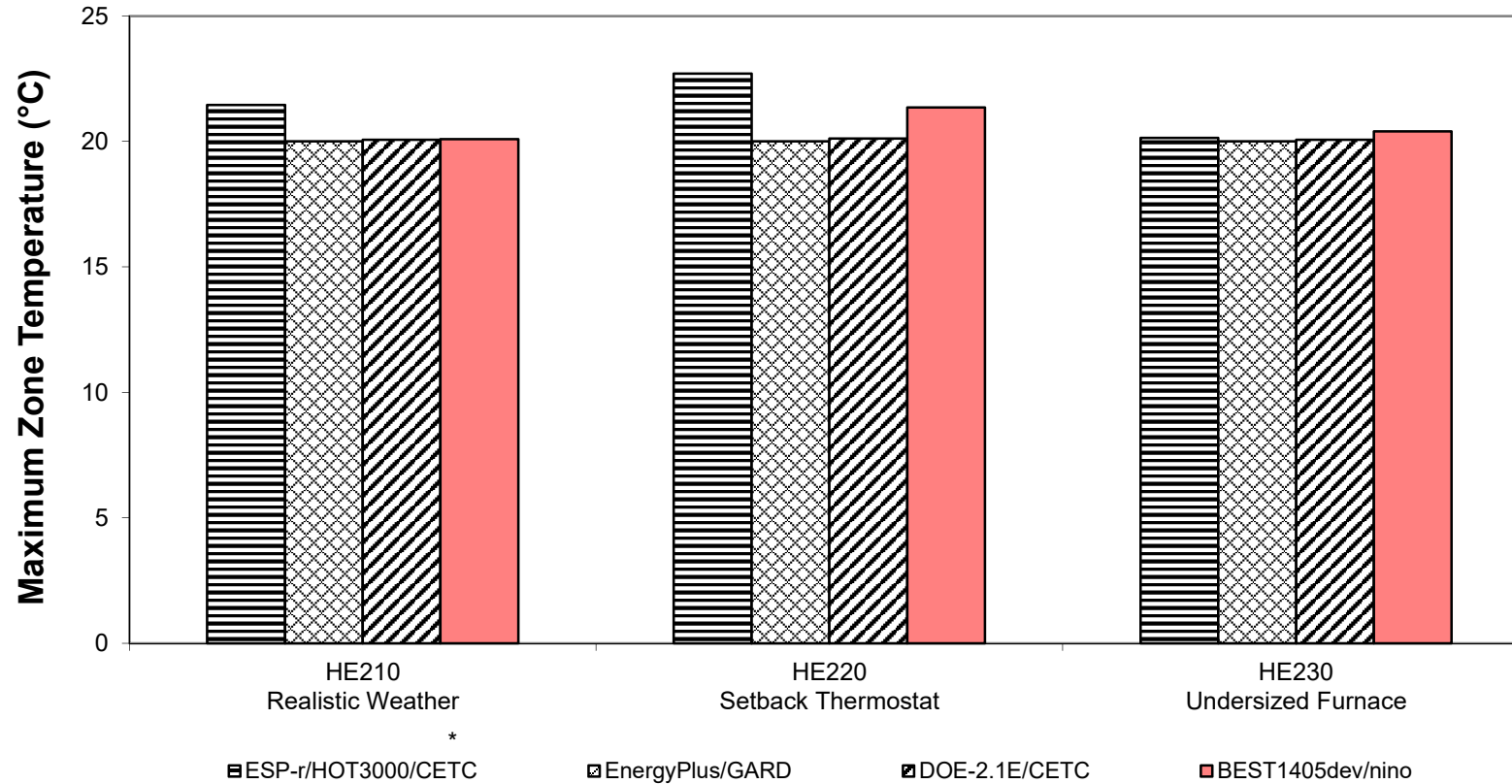


Figure B16.6-7. Comparison of the Minimum Zone Temperature for the Fuel-Fired Furnace Comparative Test Cases

