DOCKETED

Docket Number:	17-BSTD-01
Project Title:	2019 Building Energy Efficiency Standards PreRulemaking
TN #:	221282-3
Document Title:	Draft 2019 Standards ACM Approval Manual Appendix B
Description:	Draft version of ACM Approval Manual Appendix B for the 2019 Standards update.
Filer:	Adrian Ownby
Organization:	California Energy Commission
Submitter Role:	Commission Staff
Submission Date:	9/21/2017 9:49:22 AM
Docketed Date:	9/21/2017

APPENDIX B. NONRESIDENTIAL CERTIFICATION TESTS

This section contains the procedures used to test and certify vendor's Compliance Software as acceptable for compliance with Title 24 Part 6. Compliance software is expected to conform to the modeling guidelines specified in the Nonresidential ACM Reference Manual. The tests used to verify software functionality and accuracy of simulation results are referred to as the Reference Method. The tests fall into the following categories:

1. Tests to verify that the software is evaluating thermal loads and the response of the HVAC systems to these loads in a manner that is acceptable. These tests reference *ASHRAE Standard 140-2007, Standard Method of Test for Evaluation of Building Energy Analysis Computer Programs*.

2. Tests that verify that compliance software is capable of modeling envelope, lighting, HVAC and water heating efficiency features and provides precise estimates of energy tradeoffs and reasonably accurate predictions of building energy consumption.

3. Tests to verify that the Standard Design (baseline building) is created correctly, e.g. that the baseline HVAC system is properly specified, that other components of the baseline are correctly defined and that rules that fix and restrict inputs (such as schedules and plug loads) are properly applied. These tests do not verify simulation outputs, but may require simulations to be run to specify inputs that are dependent on system sizing.

4. The Reference Method is designed to cover vendor software functionality for building envelope, space uses, lighting, daylighting, HVAC and water heating, both for simulation performance and for proper implementation of ACM rules described in the Nonresidential ACM Reference manual. The California Energy Commission reserves the right to add Ruleset Implementation Tests or Software Sensitivity Tests to verify existing or future compliance software requirements. Moreover, the California Energy Commission reserves the right to adjust the passing criteria (see Test Criteria, Section 1.7) for the Software Sensitivity Tests to reflect the capabilities of commonly available energy simulation programs.

1.1 ASHRAE Standard 140-2007 Tests

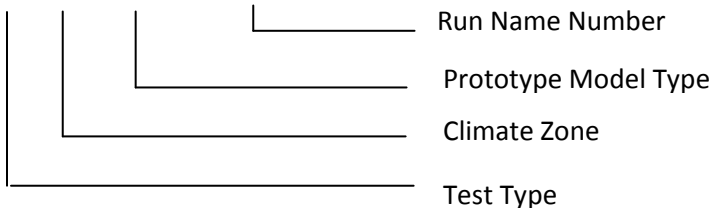
This method of testing is provided for analyzing and diagnosing building energy simulation software using software-to-software and software-to-quasi-analytical-solution comparisons. The methodology allows different building energy simulation programs, representing different degrees of modeling complexity, to be tested by comparing the predictions from other building energy programs to the simulation results provided by the Compliance Software in question.

Vendor software must pass the ASHRAE 140-2007 tests and provide a written statement verifying this in the Self Certification Form (see Appendix B).

1.2 Ruleset Implementation Tests

The Ruleset Implementation Tests are labeled using the format:

(S) 0200CZ-OffSml- Run01



The following tests shall be performed to verify that the compliance software correctly creates the Standard Design model and applies modeling rules as per the modeling guidelines provided in the 2016 Nonresidential ACM Reference manual. The user model shall be created by modifying the appropriate Prototype Model type. The Standard Design Model for each test case shall be generated automatically by the compliance software.

The intent of each test run, characteristics of the user model and inputs to be verified in the Proposed and Standard Design models, are described below.

1. (D/S) 020006-OffSml-Run01– This test will verify that the applicant software models the wall, floor and roof construction correctly in the Standard Design model and that the envelope and fenestration performance requirements for the Standard Design are correctly modeled.

2. (D/S) 020015-OffSml-Run02– This test will verify that the applicant software models the wall, floor, roof construction and fenestrations correctly and that the envelope performance requirements for the Standard Design are correctly modeled.

The user model is a small office building in climate zone 15 with the following envelope characteristics:

3. (D) 070015-HotSml-Run03 – This test will verify that the applicant software models the wall, floor and roof construction correctly in the Standard Design model and that the envelope and fenestration performance requirements for the Standard Design are correctly modeled.

The user model is a small hotel building in climate zone 15 with the following characteristics:

4. (D/S) 030006-OffMed-Run04 – This test will verify that mandatory minimum opaque envelope insulation requirements are applied. The user model is a small office building in climate zone 6, with a metal-framed wall containing R-5 continuous insulation on the exterior and a U-factor of 0.136.

    a. For this test, the user model should be ***undefined***, and the compliance simulation should not run.

5. (D) 040006-OffLrg-Run05 – Run 05 tests whether the applicant software correctly determines the window area of the Standard Design model.

The user model is the Large office building in climate zone 6 with an overall window-to-wall ratio (WWR) of 52% made of a continuous band of glass distributed evenly across all facades.

6. (D) 040006-OffLrg-Run06 – Run 06 tests whether the applicant software correctly determines the window area of the Standard Design model.

The user model is the Large office building in climate zone 6 with overall building WWR-46% and 50% WWR in the west, 40% in South, 45% in East and 50% in the North façade.

7. (D) 080006-Whse-Run07 – This tests verifies whether the applicant software models the Standard Design skylight correctly, and checks whether the applicant software determines the skylight area of the Standard Design model correctly.

8. (D) 080006-Whse-Run08 – This test checks whether the applicant software determines the skylight area of the Standard Design model correctly.

9. (D) 080006-Whse-Run09 – This test checks whether the applicant software determines the skylight area of the Standard Design model correctly.

10. (D) 030006-OffMed-Run10 – This test verifies whether the applicant software inserts the correct Standard Design inputs for schedules, occupant density, equipment power density, lighting power density, hot water load and ventilation rates using the Complete Building lighting method.

11. (D) 040006-OffLrg-Run11 – This test verifies whether the applicant software inserts the correct Proposed Design and Standard Design inputs for schedules, occupant density, equipment power density, lighting power density, hot water load and ventilation rates. This run also tests the capability of the applicant software to model Standard Design inputs for multiple space types using the Area Category lighting method.

12. (D) 030006-OffMed-Run12 – This test verifies if the applicant software applies the requirements of the Tailored Lighting Method appropriately.

13. (D) 030006-OffMed-Run13 – This test verifies if the applicant software applies the requirements of the Tailored Lighting Method appropriately.

14. (D/S) 020006-OffSml-Run14 – This test verifies if the applicant software correctly models lighting power density and schedules for eligible Califonia Power adjustment factors.

15. (D) 080006-Whse-Run15 – This test verifies the ability of the applicant software to correctly model daylighting controls.

16. (D) 050006-RetlMed-Run16 – This test verifies the ability of the applicant software to correctly model daylighting controls.

17. (D) 040006-OffLrg-Run17 – This test verifies if the rules for exterior lighting are applied accurately for exterior lighting power, exterior lighting control and schedules. This test also verifies if the Service Hot Water systems are modeled correctly.

18. (D/S) 020006-OffSml-Run18 – This test checks if the applicant software correctly models the Standard Design HVAC system.

19. (D) 030006-OffMed-Run19 – This test checks if the applicant software correctly models the Standard Design HVAC system.

20. (D) 040006-OffLrg-Run20 – This test checks if the applicant software correctly models the Standard Design HVAC system.

21. (D) 080006-Whse-Run21 – This test checks if the applicant software correctly models the Standard Design HVAC system.

22. (D) 07006-HotSml-Run22 – This test checks if the applicant software correctly models the Standard Design HVAC system.

23. (D) 030006-OffMed-Run23 – This test checks the Standard Design building for an existing, altered building that has the roof replaced with a metal building roof, R-15 continuous insulation, and that has the windows replaced on the South façade with low-e, double glazed windows with U=0.40, SHGC=0.33 and VT=0.50. The windows on the North, East and West facades are existing, unchanged single-paned windows with U=0.55, SHGC=0.56, VT=0.6.

24. (D) 020006-OffSml-Run24– This test checks the Standard Design building for an existing, altered building.

25. (D) 020006-OffSml-Run25– This test checks the Standard Design building for an existing, altered building.

26. (D) 020006-OffSml-Run26– This test checks the Standard Design building for an existing, altered building.

27. (D) 050006-RetlMed -Run27– This test checks the Standard Design building for an addition, modeled alone.

28. (D) 050006-RetlMed -Run28– This test checks the Standard Design building for an addition, modeled with existing, unaltered building.

29. (D) 030006-OffMed -Run29– This test checks the Standard Design building for an Envelope Only, partial compliance project.

30. (D) 020006-OffMed –Run30– This test checks the Standard Design building for a Lighting and Mechanical partial compliance project

1.2.1 Results Comparison

The applicant shall perform all tests specified in Section IV and report the outputs in their application. Forms for reporting this output are provided in the 2016 Nonresidential ACM Reference manual. Note that the Standard Design for some inputs, such as cooling efficiency and pump power, are dependent upon the autosizing of the HVAC equipment. The ruleset implementation tests do not check that the autosized capacity matches the Reference Method, but rather, that the Standard Design input is properly defined in relation to the autosized capacity.

1.3 Software Sensitivity Tests

This section details the eligibility requirements for an applicant simulation program to be approved for use as compliance software as specified in the 2016 ACM Approval Manual. A series of quantitative tests called the Software Sensitivity Tests shall be performed to measure the change in energy consumption when changing specified input parameters. Applicant software results will be compared against predetermined Reference results to demonstrate that the applicant software is acceptable for use in code compliance. There are a total of 96 tests. All the test cases described here shall be performed and results summarized in the approval application. Forms for providing this summary are provided in the 2016 Nonresidential ACM Reference Manual.

Each test case in the Software Sensitivity test is labeled uniquely to make it easier to keep track of the runs and to facilitate analysis. The following scheme is used:

XXYYZZ-Prototype-RunDescription

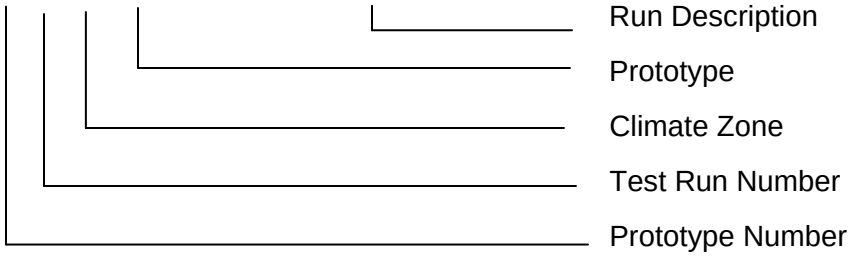
Where, XX denotes the Prototype Number

YY denotes Test Run Number

ZZ denotes Climate zone

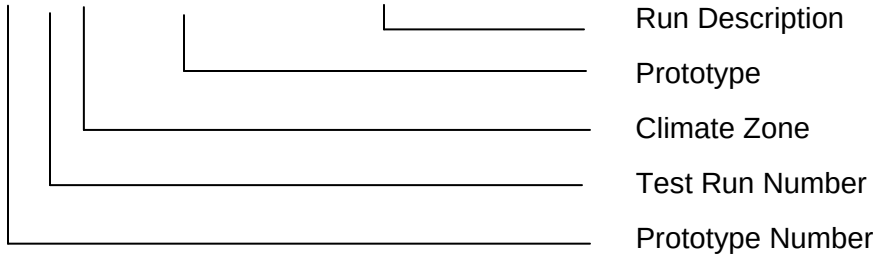
Example:

05 01 15-RetlMed-EnvelopeRoofInsulation



Example for Simple Geometry Test case

02 11 015-OffSml-SG-EnvRoofInsulation



1.3.1 Reporting Test Results

For each test case, the TDV energy use of the modeled building is reported (kBtu/ft2), along with the TDV energy use attributed to the major fuel types (electricity, gas), site energy use, and energy end use intensity for the regulated end uses (cooling, heating, lighting, etc.). The following energy totals are reported:

1. Annual TDV EUI (kBtu/ft2)
2. Annual Site EUI – Electricity (kWh/ft2)
3. Annual SiteEUI – Natural Gas (therm/ft2)
4. Annual Total End Use Site Energy EUI – kBtu/ft2

Site Energy End Uses

5. Site Energy: Heating (kBtu/ft2)
6. Site Energy: Cooling (kBtu/ft2)
7. Site Energy: Interior Lighting (kBtu/ft2)
8. Site Energy: Interior Equipment (kBtu/ft2)
9. Site Energy: Fans (kBtu/ft2) (Airside Fans, does not include tower fans)
10. Site Energy: Pumps (kBtu/ft2)
11. Site Energy: Towers (kBtu/ft2)Water heating (kBtu/ft2)
12. **TDV % Variation** – this field is used for the compliance test
13. Total End Use Site Energy % - percentage change in site energy use
14. Pass/Fail – test fails if it does not meet passing criteria
15. Unmet load hours – these are defined as the zone with the most unmet load hours

a. Reference Model Occupied Unmet Load Hours

b. Applicant Model Occupied Unmet Load Hours

c. Reference Model Number of Zones with excess unmet load hours (>150)

d. Applicant Model Number of Zones with excess unmet load hours (>150)

1.3.2 TDV Variation Test

Compiled results shall include annual site energy consumption for each end-use, overall site energy consumption, total unmet load hours and annual TDV and % variation of annual TDV and total end use site energy.

The annual TDV % variation shall be calculated using the formula:

$TDV_{\%} = (TDV_b - TDV_n)/TDV_b$

Where, $TDV_{\%}$ is the TDV % variation,

TDV_n is the annual TDV for test case number n and

TDV_b is the annual TDV for the base case run.

In order to be accepted, the applicant software shall fulfill the passing criteria below:

The change in energy for each test case must be in the same direction as the Reference Method test case result, and must be equal to the Reference Method test case percentage change in TDV energy, plus or minus 0.5% of baseline TDV energy.

1.3.3 Software Sensitivity Test Cases

Test cases assess the energy impact of one or more of the building or system input characteristics on the baseline model. Each test suite consists of a series of unique test cases aimed to test the impact of a specific characteristic on building energy performance. Simulations are grouped according to test criteria and sub-grouped based on the reference model type to allow for direct comparison of results. For each test case, the applicant software will modify the applicant baseline model with specific inputs as described in the Test Case description section.

The test cases are simulated on multiple California weather files to evaluate the sensitivity of the building or system input to extremes in climate. Results of the test case runs and the TDV percent variation over the baseline run shall be compiled and compared against the reference results.

Detailed descriptions of the Standard Design models are provided in the 2016 Nonresidential ACM Reference manual. Reference Method input files for all baseline and test case models are available from the California Energy Commission upon requested. Details on each Test Description can also be found in the 2016 Nonresidential ACM Reference manual.

Table 1 – Baseline Runs for Sensitivity Test Cases

Test Case Name	Baseline	Description
050115-RetlMed-EnvelopeRoofInsulation	050015-RetlMed-Baseline	Decrease overall U value of Roof compared to baseline case
050215-RetlMed-EnvelopeWallInsulation	050015-RetlMed-Baseline	Decrease overall U value of Exterior Wall compared to baseline case
050315-RetlMed-EnvelopeHeavy	050015-RetlMed-Baseline	Change Roof and Wall construction assembly to Wood Framed Roof and Heavy Mass wall.
050416-RetlMed-EnvelopeRoofInsulation	050016-RetlMed-Baseline	Decrease overall U value of Roof compared to baseline case
050516-RetlMed-EnvelopeWallInsulation	050016-RetlMed-Baseline	Decrease overall U value of Exterior Wall compared to baseline case
050616-RetlMed-EnvelopeHeavy	050016-RetlMed-Baseline	Change Roof and Wall construction assembly to Wood Framed Roof and Heavy Mass wall.
050706-RetlMed-EnvelopeRoofInsulation	050006-RetlMed-Baseline	Decrease overall U value of Roof compared to baseline case
050806-RetlMed-RetlMed-EnvelopeWallInsulation	050006-RetlMed-Baseline	Decrease overall U value of Exterior Wall compared to baseline case
050906-RetlMed-RetlMed-EnvelopeHeavy	050006-RetlMed-Baseline	Change Roof and Wall construction assembly to Wood Framed Roof and Heavy Mass wall.
031015-OffMed-FloorSlabInsulation	030015-OffMed-Baseline	Change slab F-factor
031215-OffMed-GlazingWindowU	030015-OffMed-Baseline	Decrease SHGC of windows by 20% compared to baseline case
031315-OffMed-GlazingWindowSHGC	030015-OffMed-Baseline	Decrease U value & SHGC of windows by 20% compared to baseline case
031415-OffMed-GlazingWindowUSHGC	030015-OffMed-Baseline	Change Floor slab F factor of permiter zones in the bottom floor to 0.45 0.46
031516-OffMed-FloorSlabInsulation	030016-OffMed-Baseline	Increase Exterior Wall Infiltration by 10% compared to baseline case
031716-OffMed-GlazingWindowU	030016-OffMed-Baseline	Decrease SHGC of windows by 20% compared to baseline case
031816-OffMed-GlazingWindowSHGC	030016-OffMed-Baseline	Decrease U value & SHGC of windows by 20% compared to baseline case
031916-OffMed-GlazingWindowUSHGC	030016-OffMed-Baseline	Change Floor slab F factor of perimeter zones in the bottom floor to 0.45 0.46
032006-OffMed-FloorSlabInsulation	030006-OffMed-Baseline	Increase Exterior Wall Infiltration by 10% compared to baseline case
032206-OffMed-GlazingWindowU	030006-OffMed-Baseline	Decrease SHGC of windows by 20% compared to baseline case
032306-OffMed-GlazingWindowSHGC	030006-OffMed-Baseline	Decrease U value & SHGC of windows by 20% compared to baseline case
032406-OffMed-	030006-OffMed-Baseline	Reduce window area

GlazingWindowUSHGC		
042507-OffLrg-WWR20%	040007-OffLrg-Baseline	Increase window area
042607-OffLrg-WWR60%	040007-OffLrg-Baseline	
042801-OffLrg-WWR20%	040001-OffLrg-Baseline	Increase window area
042901-OffLrg-WWR60%	040001-OffLrg-Baseline	Decrease LPD by 20% compared to baseline case
033015-OffMed-LightingLowLPD	030015-OffMed-Baseline	Increase LPD by 20% compared to baseline case
033115-OffMed-LightingHighLPD	030015-OffMed-Baseline	Decrease LPD by 20% compared to baseline case
033216-OffMed-LightingLowLPD	030016-OffMed-Baseline	Increase LPD by 20% compared to baseline case
033316-OffMed-LightingHighLPD	030016-OffMed-Baseline	Decrease LPD by 20% compared to baseline case
033406-OffMed-LightingLowLPD	030006-OffMed-Baseline	Increase LPD by 20% compared to baseline case
033506-OffMed-LightingHighLPD	030006-OffMed-Baseline	Decrease EPD by 20% compared to baseline case
044207-OffLrg-Daylighting Cont.DimHighVT	040007-OffLrg-Baseline	Change daylighting controls in Primary and Secondary daylit areas
044307-OffLrg-Daylighting StepDim	040007-OffLrg-Baseline	Change daylighting controls in Primary and Secondary daylit areas and increase visible transmittance
044407-OffLrg-Daylighting StepDimHighVT	040007-OffLrg-Baseline	Increase Visible Transmittance of windows compared to baseline case. Reduce window area
044507-OffLrg-Daylighting WWR20Cont.DimHighVT	042507-OffLrg-WWR20%	Change daylighting controls in Primary and Secondary daylit areas. Reduce window area
044607-OffLrg-Daylighting WWR20StepDim	042507-OffLrg-WWR20%	Change daylighting controls in Primary and Secondary daylit areas and increase visible transmittance of windows. Reduce window area
044707-OffLrg-47CZ07LargeOffice Daylighting WWR20StepDimHighVT	042507-OffLrg-WWR20%	Increase Visible Transmittance compared to baseline case. Increase window area
044807-OffLrg-48CZ07LargeOffice Daylighting WWR60Cont.DimHighVT	042607-OffLrg-WWR60%	Change daylighting controls in Primary and Secondary daylit areas. Increase window area
044907-OffLrg-49CZ07LargeOffice Daylighting WWR60StepDim	042607-OffLrg-WWR60%	Change daylighting controls in Primary and Secondary daylit areas and increase visible transmittance of windows. Increase window area
045007-OffLrg-50CZ07LargeOffice Daylighting WWR60StepDimHighVT	042607-OffLrg-WWR60%	Increase Visible Transmittance of windows compared to baseline case
045101-OffLrg-51CZ01LargeOffice Daylighting	040001-OffLrg-Baseline	Change daylighting controls in Primary and Secondary daylit areas

Cont.DimHighVT		
045201-OffLrg-52CZ01LargeOffice Daylighting StepDim	040001-OffLrg-Baseline	Change daylighting controls in Primary and Secondary daylit areas and increase visible transmittance of windows
045301-OffLrg-53CZ01LargeOffice Daylighting StepDimHighVT	040001-OffLrg-Baseline	Increase Visible Transmittance of windows compared to baseline case. Reduce window area
045401-OffLrg-Daylighting WWR20Cont.DimHighVT	042801-OffLrg-WWR20%	Change daylighting controls in Primary and Secondary daylit areas. Reduce window area
045501-OffLrg-Daylighting WWR20StepDim	042801-OffLrg-WWR20%	Change daylighting controls in Primary and Secondary daylit areas and increase visible transmittance of windows. Reduce window area
045601-OffLrg-Daylighting WWR20StepDimHighVT	042801-OffLrg-WWR20%	Increase Visible Transmittance of windows compared to baseline case. Increase window area
045701-OffLrg-Daylighting WWR60Cont.DimHighVT	042901-OffLrg-WWR60%	Change daylighting controls in Primary and Secondary daylit areas. Increase window area
045801-OffLrg-Daylighting WWR60StepDim	042901-OffLrg-WWR60%	Change daylighting controls in Primary and Secondary daylit areas and increase visible transmittance of windows. Increase window area
045901-OffLrg-Daylighting WWR60StepDimHighVT	042901-OffLrg-WWR60%	Increase Visible Transmittance of skylights compared to baseline case
056007-RetlMed-Daylighting SRRBaseHighVT	050007-RetlMed-Baseline	Increase skylight area.
056107-RetlMed-Daylighting SRR3.04	050007-RetlMed-Baseline	Increase skylight area and visible transmittance of skylights compared to baseline case.
056207-RetlMed-Daylighting SRR3.04HighVT	050007-RetlMed-Baseline	Increase Visible Transmittance of skylights compared to baseline case
056301-RetlMed-Daylighting SRRBaseHighVT	050001-RetlMed-Baseline	Increase skylight area
056401-RetlMed-Daylighting SRR3.04	050001-RetlMed-Baseline	Increase skylight area and visible transmittance of skylights compared to baseline case
056501-RetlMed-Daylighting SRR3.04HighVT	050001-RetlMed-Baseline	Increase ductloss in the zones served by Pacakaged Single Zone systems.
056616-RetlMed-HVAC DuctLoss	050016-RetlMed-BaselineDuctLoss	
056716-RetlMed-HVAC DuctLoss	050006-RetlMed-BaselineDuctLoss	Increase ductloss in the zones served by Pacakaged Single Zone systems.
036815-OffMed-HVACPVAV Design	030015-OffMed-Baseline	Change static pressure and motor efficiency of all VAV fans. See details below

036915-OffMed-HVACPVAV SATControl	030015-OffMed-Baseline	Change supply air temperature reset based on Outside air. See details below
037015-OffMed-HVACPVAV VAVControl	030015-OffMed-Baseline	Change VAV damper control to dual maximum.
037115-OffMed-HVACPVAV EconomizerType	030015-OffMed-Baseline	Change Economizer Type to Fixed Dry bulb with 70 F high limit
037216-OffMed-HVACPVAV Design	030016-OffMed-Baseline	Change static pressure and motor efficiency of all VAV fans. See details below
037316-OffMed-HVACPVAV SATControl	030016-OffMed-Baseline	Change supply air temperature reset based on Outside air. See details below
037416-OffMed-HVACPVAV VAVControl	030016-OffMed-Baseline	Change VAV damper control to dual maximum
037516-OffMed-HVACPVAV EconomizerType	030016-OffMed-Baseline	Change Economizer Type to Fixed Dry bulb with 70 F high limit
037606-OffMed-HVACPVAV Design	030006-OffMed-Baseline	Change static pressure and motor efficiency of all VAV fans. See details below
037706-OffMed-HVACPVAV SATControl	030006-OffMed-Baseline	Change supply air temperature reset based on Outside air. See details below
037806-OffMed-HVACPVAV VAVControl	030006-OffMed-Baseline	Change VAV damper control to dual maximum.
037906-OffMed-HVACPVAV EconomizerType	030006-OffMed-Baseline	Change Economizer Type to Fixed Dry bulb with 70 F high limit
048015-OffLrg-HVACVAV ChillerCOP	040015-OffLrg-Baseline	Increase Chiller COP compared to baseline case
048115-OffLrg-HVACVAV CHWdeltaT	040015-OffLrg-Baseline	Change the Chilled water loop design temperature difference
048215-OffLrg-HVACVAV CWSetpoint	040015-OffLrg-Baseline	Change condenser water setpoint reset based on Outdoor air wet bulb temperature
048315-OffLrg-HVACVAV TowerEff	040015-OffLrg-Baseline	Change Tower Efficiency
048416-OffLrg-HVACVAV ChillerCOP	040016-OffLrg-Baseline	Increase Chiller COP
048516-OffLrg-HVACVAV CHWdeltaT	040016-OffLrg-Baseline	Change the Chilled water loop design temperature difference
048616-OffLrg-HVACVAV CWSetpoint	040016-OffLrg-Baseline	Change condenser water setpoint reset based on Outdoor air wet bulb temperature
048706-OffLrg-HVACVAV TowerEff	040016-OffLrg-Baseline	Change Tower Efficiency
048806-OffLrg-HVACVAV ChillerCOP	040006-OffLrg-Baseline	Increase Chiller COP
048906-OffLrg-HVACVAV	040006-OffLrg-Baseline	Change the Chilled water loop design

CHWdeltaT		temperature difference
049006-OffLrg-HVACVAV CWSetpoint	040006-OffLrg-Baseline	Change condenser water setpoint reset based on Outdoor air wet bulb temperature
049106-OffLrg-HVACVAV TowerEff	040006-OffLrg-Baseline	Change condenser water setpoint reset based on Outdoor air wet bulb temperature
109215-RetlStrp-HVACPSZ DXCOP	100015-RetlStrp-BaselinePSZ	Increase COP of DX coil
109315-RetlStrp-HVACPSZ HeatEff	100015-RetlStrp-BaselinePSZ	Increase efficiency of the Heating coil
109415-RetlStrp-HVACPSZ EconomizerControl	100015-RetlStrp-BaselinePSZ	Change Economizer from Integrated as in baseline to NonIntegrated.
109516-RetlStrp-HVACPSZ DXCOP	100016-RetlStrp-BaselinePSZ	Increase COP of DX coil
109616-RetlStrp-HVACPSZ HeatEff	100016-RetlStrp-BaselinePSZ	Increase efficiency of the Heating coil
109716-RetlStrp-HVACPSZ EconomizerControl	100016-RetlStrp-BaselinePSZ	Change Economizer from Integrated as in baseline to NonIntegrated.
109806-RetlStrp-HVACPSZ DXCOP	100006-RetlStrp-BaselinePSZ	Increase COP of DX coil
109906-RetlStrp-HVACPSZ HeatEff	100006-RetlStrp-BaselinePSZ	Increase efficiency of the Heating coil
1010006-RetlStrp-HVACPSZ EconomizerControl	100006-RetlStrp-BaselinePSZ	Change Economizer from Integrated as in baseline to NonIntegrated.
1010115-RetlStrp-HVACPTAC DXCOP	100015-RetlStrp-BaselinePTAC	Increase COP of DX coil
1010215-RetlStrp-HVACPTAC DXCOP	100016-RetlStrp-BaselinePTAC	Increase COP of DX coil
1010315-RetlStrp-HVACPTAC DXCOP	100006-RetlStrp-BaselinePTAC	Increase COP of DX coil
1010415-RetlStrp-HVACPTAC vsFanCoil	100015-RetlStrp-BaselinePTAC	Comparison of PTAC system with Fan Coil system
1010516-RetlStrp-HVACPTAC vsFanCoil	100016-RetlStrp-BaselinePTAC	Comparison of PTAC system with Fan Coil system
1010606-RetlStrp-HVACPTAC vsFanCoil	100006-RetlStrp-BaselinePTAC	Comparison of PTAC system with Fan Coil system
0211015-OffSml-SG-EnvRoofInsulation	0200015-OffSml-SG-Baserun	Decrease overall U value of Roof by 20% compared to baserun case
0211116-OffSml-SG-EnvRoofInsulation	0200016-OffSml-SG-Baserun	Decrease overall U value of Roof by 20% compared to baserun case
0211206-OffSml-SG-EnvRoofInsulation	0200006-OffSml-SG-Baserun	Decrease overall U value of Roof by 20% compared to baserun case
0211315-OffSml-SG-EnvWallInsulation	0200015-OffSml-SG-Baserun	Decrease overall U value of Exterior Wall by 20% compared to baseline case
0211416-OffSml-SG-EnvWallInsulation	0200016-OffSml-SG-Baserun	Decrease overall U value of Exterior Wall by 20% compared to baseline case
0211506-OffSml-SG-	0200006-OffSml-SG-Baserun	Decrease overall U value of Exterior

EnvWallInsulation		Wall by 20% compared to baseline case
0311615-OffMed-SG-WWR40	0300015-OffMed-SG-Baseline	Change WWR from 33% to 40%
0311715-OffMed-SG-WWR20	0300015-OffMed-SG-Baseline	Change WWR from 33% to 20%
0311816-OffMed-SG-WWR40	0300016-OffMed-SG-Baseline	Change WWR from 33% to 40%
0311916-OffMed-SG-WWR20	0300016-OffMed-SG-Baseline	Change WWR from 33% to 20%
0312006-OffMed-SG-WWR40	0300006-OffMed-SG-Baseline	Change WWR from 33% to 40%
0312106-OffMed-SG-WWR20	0300006-OffMed-SG-Baseline	Change WWR from 33% to 20%
0312215-OffMed-SG-WinUSHGC	0300015-OffMed-SG-Baseline	Decrease U value of windows by 20% compared to baseline case
0312316-OffMed-SG-WinUSHGC	0300016-OffMed-SG-Baseline	Decrease SHGC of windows by 20% compared to baseline case
0312406-OffMed-SG-WinUSHGC	0300006-OffMed-SG-Baseline	Decrease U value & SHGC of windows by 20% compared to baseline case
0511615RetlMed-SG-SRR5	050015RetlMed-SG-Baseline	Change SRR to 5%
0511716RetlMed-SG-SRR5	050016RetlMed-SG-Baseline	Change SRR to 5%
0511806RetlMed-SG-SRR5	050006RetlMed-SG-Baseline	Change SRR to 5%
0511915RetlMed-SG-SRR1	050015RetlMed-SG-Baseline	Change SRR to 1%
0512016RetlMed-SG-SRR1	050016RetlMed-SG-Baseline	Change SRR to 1%
0512106RetlMed-SG-SRR1	050006RetlMed-SG-Baseline	Change SRR to 1%
0512215RetlMed-SG-SkyUSHGC	050015RetlMed-SG-Baseline	Decrease U value of skylights by 20% compared to baseline case
0512316RetlMed-SG-SkyUSHGC	050016RetlMed-SG-Baseline	Decrease U value of skylights by 20% compared to baseline case
0512406RetlMed-SG-SkyUSHGC	050006RetlMed-SG-Baseline	Decrease U value of skylights by 20% compared to baseline case