



A STATEWIDE UTILITY PROGRAM

California Compliance Software Symposium 2

Update on Software Efforts: Fixed Baseline

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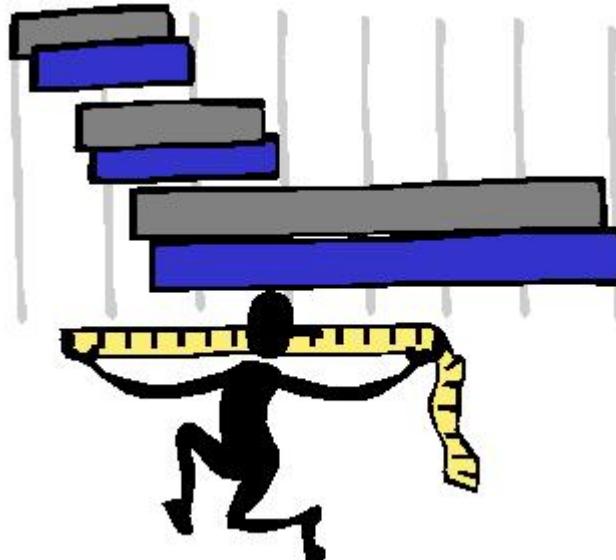
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Energy for What's AheadSM



Application of the Standard 90.1 Static Baseline Approach to Title 24 Performance Compliance



- Intent of Baseline
- “Static Baseline” model
- Establishment of a Performance Rating Method (PRM) using a baseline energy based on a fixed standard. ASHRAE 90.1-2004
- Residential Compliance already uses this approach

Specification of the Baseline Energy Model

Table G3.1.1-3 Baseline HVAC System Types

Building Type, Number of Floors, and Gross Conditioned Floor Area	Climate Zones 3B, 3C, and 4 to 8	Climate Zones 0 to 3A
Residential	System 1—PTAC	System 2—PTHP
Public assembly <120,000 ft ²	System 3—PSZ-AC	System 4—PSZ-HP
Public assembly ≥120,000 ft ²	System 12—SZ-CV-HW	System 13—SZ-CV-ER
Heated-only storage	System 9—Heating and ventilation	System 10—Heating and ventilation
Retail and 2 floors or fewer	System 3—PSZ-AC	System 4—PSZ-HP
Other residential and 3 floors or fewer and <25,000 ft ²	System 3—PSZ-AC	System 4—PSZ-HP
Other residential and 4 or 5 floors and <25,000 ft ² or 5 floors or fewer and 25,000 ft ² to 150,000 ft ²	System 5—Packaged VAV with reheat	System 6—Packaged VAV with PFP boxes
Other residential and more than 5 floors or >150,000 ft ²	System 7—VAV with reheat	System 8—VAV with PFP boxes

Notes:

1. Residential building types include dormitory, hotel, motel, and multifamily. Residential space types include guest rooms, living quarters, private living space, and sleeping quarters. Other building and space types are considered nonresidential.
2. Where attributes make a building eligible for more than one baseline system type, use the predominant condition to determine the system type for the entire building except as noted in Section G3.1.1.
3. For laboratory spaces in a building having a total laboratory exhaust rate greater than 15,000 cfm, use a single system of type 5 or 7 serving only those spaces.
4. For hospitals, depending on building type, use System 5 or 7 in all climate zones.
5. Public assembly building types include houses of worship, auditoriums, movie theaters, performance theaters, concert halls, arenas, enclosed stadiums, ice rinks, gymsnasiums, convention centers, exhibition centers, and natatoriums.

Table G3.1.1-3 which specifies baseline model HVAC system type in 90.1-2016 Appendix G

- “Traditional” specifications use minimum prescriptive requirements
- 90.1-2016 PRM’s approach: Establishment of a Performance Rating Method (PRM) minimize the dependence on the characteristics of the proposed design.
- Table G3.1.1-3 A notable difference compared to the ACM approach, and the approach used in older versions of Standard 90.1.
- Baseline is independent of the proposed design is that the HVAC system type and heating fuel source is fixed based on the building type, building size, and the climate zone.

Metrics - Traditional



- The ACM, uses Time Dependent Valuation (TDV) of energy. TDV is a metric which is calculated to reflect the societal impacts of source energy, emissions, and system demand
- Traditional performance approach compliance requires that the energy consumption of the proposed design, measured using a particular metric, be less than or equal to the consumption of the baseline. This is the method used by the ACM, with energy consumption measured using TDV.
- The PRM uses energy cost as the metric for determining compliance. Energy cost has the advantage of being applicable to all buildings, and can be determined for all energy sources, including heat and cooling provided from a district plant.

Metrics - PRM

$$PCI_t = \frac{[(BPF \times BBREC)]}{BBP} \quad (1)$$

$$\text{Proposed building performance}/BBP \quad (2)$$

Where:

PCI_t = Performance Cost Index Target

$BBUEC$ = Baseline Building Unregulated Energy Cost

$BBREC$ = Baseline Building Regulated Energy Cost

BPF = Building Performance Factor

BBP = Baseline Building Performance

PCI = Performance Cost Index

- The PRM uses energy cost as the metric for determining compliance.
- Energy cost has the advantage of being applicable to all buildings, and can be determined for all energy sources, including heat and cooling provided from a district plant.
- A series of equations is provided for use in compliance.

PRM for Compliance in CA

Table 4.2.1.1 Building Performance Factor (BPF)

Building Area Type ^a	Climate Zone																
	0A and 1A	0B and 1B	2A	2B	3A	3B	3C	4A	4B	4C	5A	5B	5C	6A	6B	7	8
Multifamily	0.73	0.73	0.71	0.69	0.74	0.73	0.68	0.78	0.81	0.81	0.76	0.80	0.81	0.76	0.79	0.74	0.80
Healthcare/hospital	0.64	0.56	0.60	0.56	0.60	0.56	0.54	0.57	0.53	0.55	0.59	0.52	0.55	0.57	0.52	0.56	0.56
Hotel/motel	0.64	0.65	0.62	0.60	0.63	0.65	0.64	0.62	0.64	0.62	0.60	0.61	0.60	0.59	0.61	0.57	0.58
Office	0.58	0.62	0.57	0.62	0.60	0.64	0.54	0.58	0.60	0.58	0.60	0.61	0.58	0.61	0.61	0.57	0.61
Restaurant	0.62	0.62	0.58	0.61	0.60	0.60	0.61	0.58	0.55	0.60	0.62	0.58	0.60	0.63	0.60	0.65	0.68
Retail	0.52	0.58	0.53	0.58	0.54	0.62	0.60	0.55	0.60	0.60	0.55	0.59	0.61	0.55	0.58	0.53	0.53
School	0.46	0.53	0.47	0.53	0.49	0.52	0.50	0.49	0.50	0.49	0.50	0.50	0.50	0.49	0.50	0.47	0.51
Warehouse	0.51	0.52	0.56	0.58	0.57	0.59	0.63	0.58	0.60	0.63	0.60	0.61	0.65	0.66	0.66	0.67	0.67
All others	0.62	0.61	0.55	0.57	0.56	0.61	0.59	0.58	0.57	0.61	0.57	0.57	0.61	0.56	0.56	0.53	0.52

a. In cases where both a general building area type and a specific building area type are listed, the specific building area type shall apply

$$\text{BPF} = (\text{T24SMP} - \text{PRMBUEP}) / \text{PRMBREP} \quad (3)$$

Where:

T24SMP = Title 24-2019 Standard Model Performance

PRMBUEP = 90.1-2016 PRM Baseline Unregulated Energy Performance

PRMBREP = 90.1-2016 PRM Baseline Regulated Energy Performance

BPF = Building Performance Factor

- A number of changes to the PRM would need to be made if it were to be used in Title 24.
- These changes are primarily in the areas of metrics and compliance calculations
 - Baseline Model Specification Changes
 - Metrics and Compliance Calculations
- Table 4.2.1.1 which specifies the Building Performance Factor (BPF) The BPF is the reduction in regulated energy cost that must be achieved by the proposed design in order to comply.
- BPF is multiplied only by regulated energy cost, it cannot be used to require ZNE performance.

Concluding Thoughts

Use of PRM baseline has many advantages:

- Consistent with modeling approach used in many other applications – LEED, utility incentive programs, other energy codes.
- Fixed over time – update for future code versions requires only update to BPFs.
- Comparison of changes in stringency between codes is greatly simplified.
- Compliance software much more widely used – possible development cost sharing.
- Compliance software updates greatly simplified.

Next Steps



- Finalize the report and make available to general public
- BPFs be developed which would specify stringency equivalent to Title 24-2019 for a selected set of building types
- Equation 3 above will be used to calculate the BPF for that building and climate zone using each metric

What do you think?



Let's move on to a discussion of...

California Energy Commission Status Update

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