Pay for Performance – EB Technical Tip

Derating Equipment Efficiency

This technical topic expands on the guidelines within **P4P Existing Buildings Program Guidelines v4.1, Section 4.6.3.7 (page 4-29)**, for estimated existing HVAC system cooling efficiency. The Program Guidelines currently has guidance for derating furnace and boiler efficiency. This technical topic now allows cooling and DHW systems to be derated. Further, equipment age referenced in the derating method is clarified.

Efficiency of existing equipment affected by retrofit may be de-rated as follows due to age:

$$\textbf{Efficiency}_{\text{derated}} = \textbf{Efficiency}_{\text{original}} * (1-M)^{\text{age}}$$

Where:

- **Efficiency** $_{\text{original}}$ = nameplate efficiency
  - For equipment in which nameplate efficiency is unavailable, ASHRAE 90.1-2007 may be used as a proxy *(new)*.
- **Age** = equipment age or the equipment measure life in years per Appendix B, whichever is less *(new)*.
- **M** = Maintenance factor
  - $\mathbf{M_a}$ = Maintenance factor for equipment that received annual professional maintenance
  - $\mathbf{M_b}$ = Maintenance factor for equipment that was seldom or never maintained

Equipment Type	M_a	M_b
Gas burning furnaces and boilers *(new)*	0.0025	0.0050
Oil burning furnaces and boilers *(new)*	0.0050	0.0075
Air conditioners and heat pumps *(new)*	0.0050	0.0100
Gas DHW heaters *(new)*	0.0025	0.0050
Electric DHW heaters *(new)*	0.0050	0.0075
Electric chillers *(new)*	0.0025	0.0050

In the ERP Tables, the nameplate efficiency should be reported in the appropriate efficiency column. If equipment is derated in the model, the corresponding cell of the 'Additional Notes' should include the M factor used and calculated derated efficiency.

Example: A 22 year old, 11 EER air conditioner received annual professional maintenance.

Efficiency $_{\text{derated}}$ = Efficiency $_{\text{original}}$*(1-M)$^{\text{age}}$ = 11 EER *(1 – 0.005) $^{\text{minimum of (22 years old, 15 year lifetime)}}$
Efficiency $_{\text{derated}}$ = 10.2 EER (not 9.9 EER since measure life [15 yrs] < equipment age [22 yrs])