APPENDIX G:
Verification of the Existing Features of a Home for Existing + Addition + Alteration Performance Approach

When adding to or altering an existing home, compliance credit can be taken for upgrading existing features by using the performance approach when the existing features are verified by a qualified Energy Code Compliance (ECC)-Rater before registration of the certificate of compliance (CF1R).

The performance approach provides a means to trade off against features that may not meet the prescriptive requirements, such as exceeding the allowed maximum glass area, by demonstrating that the project (proposed design) achieves the same level of efficiency as it would if it were built to the prescriptive requirements (standard design). The standard design is a hypothetical building with prescriptive requirements from Table 150.1-A that sets the target energy budget for the proposed project.

The Existing + Addition + Alteration approach gives further credit for upgrading existing features. It does this by modifying the standard design for an altered building feature to match the requirements specified in Section 150.2, particularly Table 150.2-G. The greater the efficiency of the altered building feature is relative to the existing energy efficiency, the greater the compliance credit will be. Third-party verification of the features before construction is required to achieve the maximum compliance credit.

The proposed design is calculated using the actual energy efficiency values of the existing unaltered components of the existing building, and the proposed values of the altered components, plus the proposed addition's features. Each building component must be modeled with one of the following classifications to determine the standard design:

"Existing" — building components that remain unchanged (e.g., exterior walls in the existing portion of the building that will not be altered) but must be verified.

"Altered" existing building components proposed to be changed (e.g., added roof insulation, or a furnace that is being replaced).

"New" — building components that do not exist prior to the construction work (e.g., new walls added to create the addition). This includes building components in a previously unconditioned space being converted to conditioned space.

All these building components determine how the standard design is calculated. Existing features are modeled the same in the proposed and standard designs. New features are modeled in the standard design according to prescriptive requirements in Table 150.1-A. Altered features are modeled in the standard design according to Table 150.2-D.

There are two columns in Table 150.2-D. One column defines how the standard design is calculated for altered components when the existing features are not verified by an ECC-Rater. The other column indicates how the standard design is calculated when the existing features are verified by an ECC-Rater before construction.

For the building to comply, the proposed design (proposed project details as modeled) must be equal to or less than the standard design. When a feature in the proposed design is better than the standard design, it receives a compliance credit that can be used to trade against less efficient features. For example, without third-party verification, windows to be altered are assumed to have 0.40 U-factor and 0.35 solar heat gain coefficient (SHGC). With ECC-Verification, if the existing windows are single-pane metal-framed, they are assumed to have 1.28 U-factor and 0.80 SHGC, resulting in substantial potential compliance credit if the new windows meet current prescriptive requirements of 0.30 U-factor and 0.23 SHGC.

Example:

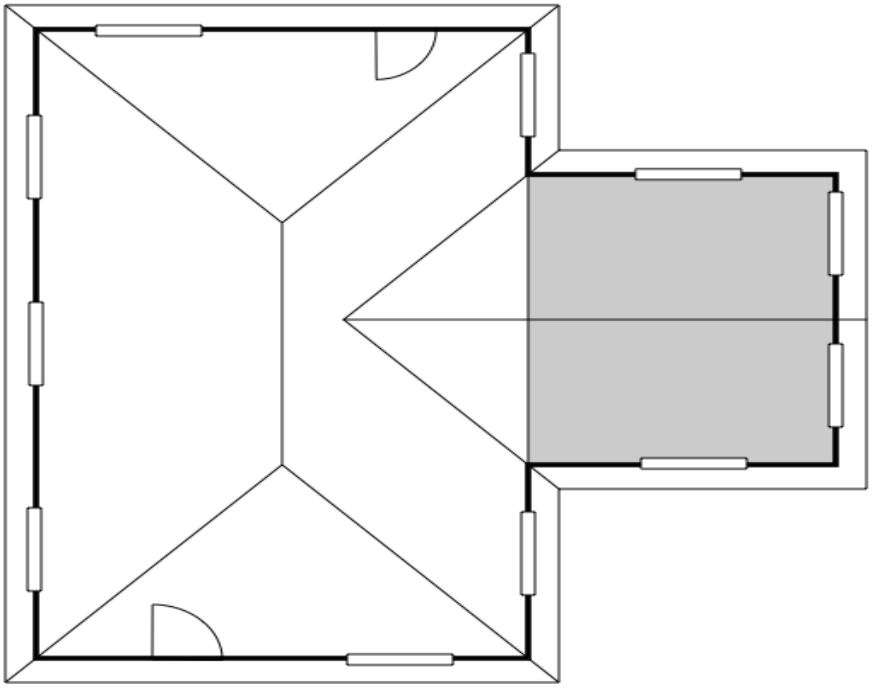
Consider the house in Figure G-1: The Proposed Addition and Alterations in Climate Zone 12. The shaded area is the addition. Some windows and walls are removed to build the addition. These are ignored. The existing home has the following features:

Single-pane metal-framed windows

2x4 R-0 walls, and R-19 attic insulation

AFUE 75 furnace

Figure G- 1: The Proposed Addition and Alterations



Source: California Energy Commission

Table G- 1: Standard Design for Component

Component	Status	Proposed	Standard Design w/o verification	Standard Design w/ verification
Attic	Existing/Altered	NA	R-22	R-19
Attic[i]	New	R-38	n/a	n/a

Component	Status	Proposed	Standard Design w/o verification	Standard Design w/ verification
Wall	Existing/Altered	n/a	R-13	R-0
Walls[ii]	New	R-15	n/a	n/a
Window	Existing/Altered U-factor; SHGC	n/a	0.40; 0.35	1.28; 0.80
Window	New	0.30; 0.23	n/a	n/a
Furnace	Existing/Altered/New	0.92 AFUE	0.80 (Federal Minimum)	0.75

Source: California Energy Commission

Part of the construction work includes replacing all of the windows with low-emissivity (low-E) vinyl windows to match the new windows in the addition, adding insulation to the existing attic, and replacing the existing furnace.

For the proposed design, none of the attic is modeled as existing because insulation is being added to the existing building ("altered"), and the attic in the addition is "new." None of the windows are modeled as existing (unless any are not replaced). Replaced windows in the existing building are "altered" and the windows in the addition are "new." The furnace, even though it is new, is modeled as "altered" because it is replacing an existing heating system. The walls, windows, and other components that are removed as part of the addition and alterations are ignored.

Table G-1: Standard Design for Component illustrates how the proposed features and the standard design features are calculated, depending on whether there is ECC-Verification of the existing conditions.

The ECC-Rater must complete the verification of the existing conditions to register the certificate of compliance (CF1R).

ECC-Raters follow the protocols for a Whole-House Home Energy Rating (WHHER) when verifying existing conditions. The WHHER protocols are established by the HERS Technical Manual (CEC-400-2008012). Appendix A of that document details the protocols for verification of each component. ECC-Raters must follow all Energy Commission approved procedures established by the ECC-Provider. The HERS Technical Manual can be downloaded from: https://www.energy.ca.gov/publications/2019/hers-home-energy-rating-system-technicalmanual. The ECC-Rater is trained by an ECC-Provider to verify the existing conditions of the home consistent with Energy Commission-approved ECC-Provider training for the verification requirements specified in Table 150.2-D. The data registry will generate a CF3R-EXC-20-H compliance document based on the output from the performance compliance software. The CF3R-EXC-20-H will list the features of the existing conditions that must be field-verified by the ECC-Rater. A registered CF3R-EXC-20-H that agrees with the existing conditions input for the proposed building is required by the ECC-Registry as a prerequisite the registration of the CF1R for the project.

ECC-Raters must follow all CEC-approved procedures established by the ECC-Provider.

For comparisons with approaches used during the 2016 Energy Code cycle and before, Table G- 2: Standard Design for an Altered Component (2016 Code Cycle and Before) below was

used to model existing conditions based on the year that a building was constructed. This table was superseded during the 2019 code cycle, and in the 2022 Energy Code, the table that supersedes Table G-2: Standard Design for an Altered Component (2016 Code Cycle and Before) is Table 150.2-G.

Table G-2: Standard Design for an Altered Component (2016 Code Cycle and Before)

Conservation Measure	Before 1978	1978 to 1983	1984 to 1991	1992 to 1998	1999 to 2000	2001 to 2003	2004 to 2005	2006 to 2013	2014 to Present
Cool Roof Solar Reflectance	0.10	0.10	0.10	0.10	0.10	0.10	0.10	Table 150.1-A	Table 150.1-A
Radiant Barrier	None	None	None	None	None	None	Table 150.1-A	Table 150.1-A	Table 150.1-A
Roof/Ceiling U-factor	0.079	0.049	0.049	0.049	0.049	0.049	0.049	0.049	0.031
Wall U-factor	0.356	0.110	0.110	0.102	0.102	0.102	0.102	0.102	0.102
Raised Floor – Crawl Space U-factor	0.099	0.099	0.099	0.049	0.049	0.049	0.049	0.049	0.037
Raised Floor- No Crawl Space U-factor	0.238	0.238	0.238	0.064	0.064	0.064	0.064	0.064	0.049
Slab Edge F-factor	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73	0.73
Duct R-value	R-2.1	R-2.1	R-2.1	R-4.2	R-4.2	R-4.2	R-4.2	Table 150.1-A	Table 150.1-A
Building Leakage (ACH50)	7.7	7.7	7.7	7.7	7.7	7.7	7.7	6.8	5.0
Duct Leakage (%)	15%	15%	15%	15%	15%	15%	15%	15%	6%

Conservation Measure	Before 1978	1978 to 1983	1984 to 1991	1992 to 1998	1999 to 2000	2001 to 2003	2004 to 2005	2006 to 2013	2014 to Present
Fenestration U-factor	Use Energy Standards Table 110.6-A, §110.6 for all vintages	Use Energy Standards Table 110.6-A, §110.6 for all vintages	Use Energy Standards Table 110.6-A, §110.6 for all vintages	Use Energy Standards Table 110.6-A, §110.6 for all vintages	Use Energy Standards Table 110.6-A, §110.6 for all vintages	Use Energy Standards Table 110.6-A, §110.6 for all vintages	Use Energy Standards Table 110.6-A, §110.6 for all vintages	Use Energy Standards Table 110.6-A, §110.6 for all vintages	Use Energy Standards Table 110.6-A, §110.6 for all vintages
Fenestration SHGC	Use Energy Standards Table 110.6-B, §110.6 for all vintages.	Use Energy Standards Table 110.6-B, §110.6 for all vintages.	Use Energy Standards Table 110.6-B, §110.6 for all vintages.	Use Energy Standards Table 110.6-B, §110.6 for all vintages.	Use Energy Standards Table 110.6-B, §110.6 for all vintages.	Use Energy Standards Table 110.6-B, §110.6 for all vintages.	Use Energy Standards Table 110.6-B, §110.6 for all vintages.	Use Energy Standards Table 110.6-B, §110.6 for all vintages.	Use Energy Standards Table 110.6-B, §110.6 for all vintages.
Fenestration Shading Devices	Exterior: Assumed to have 50% bug screens, model actual overhangs	Exterior: Assumed to have 50% bug screens, model actual overhangs	Exterior: Assumed to have 50% bug screens, model actual overhangs	Exterior: Assumed to have 50% bug screens, model actual overhangs	Exterior: Assumed to have 50% bug screens, model actual overhangs	Exterior: Assumed to have 50% bug screens, model actual overhangs	Exterior: Assumed to have 50% bug screens, model actual overhangs	Exterior: Assumed to have 50% bug screens, model actual overhangs.	Exterior: Assumed to have 50% bug screens, model actual overhangs
Space Heating Central Gas Furnace (AFUE)	0.75	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78

Conservation Measure	Before 1978	1978 to 1983	1984 to 1991	1992 to 1998	1999 to 2000	2001 to 2003	2004 to 2005	2006 to 2013	2014 to Present
Space Heating Gas Room Heater (AFUE)	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
Space Heating Hydronic/Comb Hydronic (TE)	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78	0.78
Space Heating Heat Pump (HSPF)	5.6	5.6	6.6	6.6	6.8	6.8	6.8	7.4	7.7
Space Heating Electric Resistance (HSPF)	3.413	3.413	3.413	3.413	3.413	3.413	3.413	3.413	3.413
Electric Resistance Radiant (HSPF)	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.55	3.413
Space Cooling All Types (SEER)	8.0	8.0	8.9	9.7	9.7	9.7	9.7	13.0	13.0
Water Heating Energy Factor	0.525	0.525	0.525	0.525	0.575	0.575	0.575	0.575	0.575

Source: California Energy Commission