APPENDIX A4

RESIDENTIAL VOLUNTARY MEASURES

Division A4.2 – ENERGY EFFICIENCY

SECTION A4.201

GENERAL

A4.201.1 Scope.

For the purposes of mandatory energy efficiency standards in this code, the California Energy Commission will continue to adopt mandatory standards. It is the intent of these voluntary provisions to encourage local jurisdictions through codification to achieve exemplary performance in the area of building energy efficiency. Local jurisdictions adopting these voluntary provisions as mandatory local energy efficiency standards shall submit the required application and receive the required approval of the California Energy Commission in compliance with ~~Chapter 10, Section 106 of the *California Administrative Code*,~~Title 24, Part 1, Section 10-106 prior to enforcement. Once approval is granted by the Energy Commission, local jurisdictions shall file an ordinance expressly marking the local modification along with findings and receive the required acceptance from the California Building Standards Commission in compliance with Section 101.7 of this code, prior to enforcement. (Title 24, Part 1, Section 10-106~~Chapter 10, Section 106 of the *California Administrative Code*~~ is available at http://www.energy.ca.gov/title24/2019standards/)

SECTION A4.202

DEFINITIONS

A4.202.1 Definitions. The following terms are defined in Chapter 2.

ENERGY BUDGET.

ENERGY DESIGN RATING~~.~~ (EDR).

ENERGY DESIGN RATING, ENERGY EFFICIENCY

ENERGY DESIGN RATING, SOLAR ELECTRIC GENERATION AND DEMAND FLEXIBILITY

ENERGY DESIGN RATING, TOTAL

TIME DEPENDENT VALUATION (TDV) ENERGY.

SECTION A4.203

PERFORMANCE APPROACH FOR NEWLY CONSTRUCTED BUILDINGS

A4.203.1 Energy efficiency. Newly constructed low-rise residential buildings shall comply with Sections A4.203.1.1 ~~and either A4.203.1.2.1,~~through A4.203.1.~~4.2.2 or A4.203.1.2.3.~~

A4.203.1.1 Tier 1~~, and~~ Tier 2~~, and zero net energy design~~ prerequisites. ~~Each of the following efficiency measures is~~A4.203.1.1.1 Energy design ratings AND A4.203.1.1.2 Quality Insulation Installation are required for all applicable components of the building project.

A4.203.1.1.1 Energy design ~~rating.~~ ~~An energy design rating~~**ratings: Total Energy Design Rating (Total EDR) and Energy Efficiency Design Rating (Efficiency EDR).** Total EDR and Efficiency EDR ratings for the Proposed Design Building shall be computed by Compliance Software certified by the Energy Commission ~~and this rating~~as described in Title 24, Part 6, Section 100.1 and 150.1(b), and these ratings shall be included in the Certificate of Compliance documentation.

Table A4.203.1.1.1

Recommended EDR Targets by Climate Zones

	Tier 1		Tier 2	
CZ	Mixed Fuel	All-Electric	Mixed Fuel	All-Electric
1	23	36	13	0
2	12	16	5	0
3	10	14	0	0
4	8	12	0	0
5	10	16	0	0
6	10	12	0	0
7	5	7	0	0
8	10	10	0	0
9	13	13	0	0
10	10	11	0	0
11	11	12	0	0
12	12	13	0	0
13	11	13	0	0
14	15	16	5	0
15	11	8	0	7
16	22	39	14	10

Note: Community shared options complying with Title 24, Part 1, Section 10-115 may be used to achieve Total EDR targets.

A4.203.1.1.2 Quality Insulation Installation (QII). The QII procedures specified in the Building Energy Efficiency Standards Reference Appendices~~Residential Appendix~~ RA3.5 shall be completed.

A4.203.1.2 Tier 1 and Tier 2 prerequisite options. In addition, ONE of the following efficiency measures will be required: A4.203.1.2.1 Roof deck insulation, or ducts in conditioned space OR A4.203.1.2.2 High

Performance Walls OR A4.203.1.2.3 HERS-Verified Compact Hot Water Distribution System OR A4.203.1.2.4 HERS-Verified Drain Water Heat Recovery.

A4.203.1.2.1 Roof deck insulation, or ducts in conditioned space. Meet one of the three options for the location of ducts and air handler as well as insulation R values and installation of a radiant barrier as specified in Title 24, Part 6, Section 150.1(c)9A or B:

1) Below roof deck insulation with a minimum R-value of 19; or,
2) Continuous above deck insulation with a minimum R-8 and with an air space present between the roofing and the roof deck; or,
3) All ducts and air handlers in conditioned space as specified in the Title 24, Part 6 Reference Appendices RA3.1.

A4.203.1.2.2 High Performance Walls (HPW). HPW meet the climate zone dependent U-factor and insulation values for either 2x6 or 2x4 framing as specified in Title 24, Part 6, Section 150.1(c)1B: maximum U-factor of 0.048.

A4.203.1.2.3 HERS-Verified Compact Hot Water Distribution System (CHWDS-H). CHWDS-H shall be installed as specified in the Title 24, Part 6 Reference Appendix RA3.6.5.

A4.203.1.2.4 HERS-Verified Drain Water Heat Recovery (DWHR-H). DWHR-H shall be installed as specified in Title 24, Part 6 Reference Appendix RA4.4.21.

A4.203.1.3 Performance standard. Comply with one of the advanced efficiency levels, either A4.201.1.3.1 OR A4.201.1.3.2, indicated below.

A4.203.1.~~2~~3.1 Tier 1. Buildings complying with the first level of advanced energy efficiency shall have ~~either an Energy Budget that is no greater than 85 percent of the Title 24, Part 6 Energy Budget for the Standard Design Building, or an Energy Design Rating showing a 15% or greater reduction in its Energy Budget component compared to the Standard Design Building,~~additional integrated efficiency and onsite renewable energy generation sufficient to achieve a Total EDR of the Tier 1 value indicated by Table A4.203.1.1.1 or lower as calculated by Title 24, Part 6 Compliance Software approved by the Energy Commission. This requirement is in addition to meeting the Efficiency EDR required for compliance with Title 24, Part 6. Measures considered to meet the Total EDR targets calculated by the compliance software include, but are not limited to, the prerequisite options specified in Section A4.203.1.2, use of Demand Response. additional energy efficiency measures (e.g. triple pane windows), as well as onsite electric battery and/or thermal storage.

A4.203.1.~~2~~3.2 Tier 2. Buildings complying with ~~the~~this second ~~level of advanced energy efficiency shall have either an Energy Budget that is no greater than 70 percent of the Title 24, Part 6 Energy Budget for the Standard Design Building, or an Energy Design Rating showing a 30% or greater reduction in its Energy Budget component compared to the Standard Design Building,~~elective designation shall have additional integrated efficiency and onsite renewable energy generation sufficient to achieve a Total EDR of the Tier 2 value indicated by Table A4.203.1.1.1 or lower as calculated by Title 24, Part 6 Compliance Software approved by the Energy Commission. This may be reached by various paths including improved space and water heating efficiencies, advanced electric battery controls, as well as modest oversizing of the photovoltaic system. This requirement is in addition to meeting the Efficiency EDR required for compliance with Title 24, Part 6. Measures considered to meet the Total EDR targets calculated by the compliance software include, but are not limited to, the prerequisite options specified in Section A4.203.1.2, use of Demand Response. additional energy efficiency measures (e.g. triple pane windows), as well as onsite electric battery and/or thermal storage.

A4.203.1.4 Consultation with local electric service provider. Local jurisdictions considering adoption of Tier I as specified by A4.203.1.3.1 or Tier II as specified by A4.203.1.3.2, including local jurisdictions considering community shared solar or storage options consistent with Part 1 Section 10-115, shall consult with the local electric service provider to ensure that that solar system sizing required to comply will be acceptable to the local electric service provider. The local jurisdiction shall not require onsite renewable energy generation systems that are larger than the local electric service provider will allow to be interconnected.

~~**A4.203.1.2.3 Zero net energy design.** Buildings complying with this elective designation shall have on-site renewable energy generation sufficient to achieve an Energy Design Rating of zero (0) as calculated by Title 24, Part 6 Compliance Software approved by the Energy Commission, and:~~

~~1. Single-family buildings in Climate Zones 6 and 7, and low-rise multifamily buildings in Climate Zone 3, 5, 6, and 7 shall comply with Section A4.203.1.2.1 (Tier 1); and~~

~~2. Single-family buildings in Climate Zones 1 through 5 and 8 through 16 and low-rise multifamily building in Climate Zones 1, 2, 4, and 8 through 16 shall comply with Section A4.203.1.2.2 (Tier 2).~~

~~Note:~~

~~For Energy Budget calculations, high-rise residential and hotel/motel buildings are considered nonresidential buildings.~~

~~SECTION A4.204~~

~~PERFORMANCE APPROACH FOR ADDITIONS~~

~~**A4.204.1 Energy efficiency.** Additions to low-rise residential buildings shall comply with Section A4.204.1.1 or A4.204.1.2.~~

~~**A4.204.1.1 Tier 1.** Buildings complying with the first level of advanced energy efficiency shall have an Energy Budget that is no greater than indicated below, depending on the number of mechanical systems added. Space heating systems, space cooling systems and water heating systems are each separate mechanical systems for the purpose of complying with this requirement. If the addition changes only the envelope with no change to any mechanical system, then no additional performance requirements above Title 24, Part 6 are required.~~

~~1. For one and only one mechanical system: No greater than 95 percent of the Title 24, Part 6 Energy Budget for the Standard Design Building as calculated by Compliance Software certified by the Energy Commission.~~

~~2. For two or more mechanical systems: No greater than 90 percent of the Title 24, Part 6 Energy Budget for the Standard Design Building as calculated by Compliance Software certified by the Energy Commission.~~

~~**A4.204.1.2 Tier 2.** Buildings complying with the second level of advanced energy efficiency shall have an Energy Budget that is no greater than indicated below, depending on the number of mechanical systems added. Space heating systems, space cooling systems and water heating systems are each separate mechanical systems for the purpose of complying with this requirement. If the addition changes only the envelope with no change to any mechanical system, then no additional performance requirements above Title 24, Part 6 are required.~~

~~1. For one and only one mechanical system: No greater than 90 percent of the Title 24, Part 6 Energy Budget for the Standard Design Building as calculated by Compliance Software certified by the Energy Commission.~~

~~2. For two or more mechanical systems: No greater than 85 percent of the Title 24, Part 6 Energy Budget for the Standard Design Building as calculated by Compliance Software certified by the Energy Commission.~~

Note: For Energy Budget calculations, high-rise residential and hotel/motel buildings are considered nonresidential buildings.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, Public Resources Code. Reference: Sections 25402, 25402.1, 25402.4, and 25402.8, Public Resources Code

APPENDIX A5

NONRESIDENTIAL VOLUNTARY MEASURES

Division A5.2 – ENERGY EFFICIENCY

SECTION A5.201

GENERAL

A5.201.1 Scope. For the purposes of mandatory energy efficiency standards in this code, the California Energy Commission will continue to adopt mandatory standards. It is the intent of these voluntary provisions to encourage local jurisdictions through codification to achieve exemplary performance in the area of building energy efficiency. Local jurisdictions adopting these voluntary provisions as mandatory local energy efficiency standards shall submit the required application and receive the required approval of the California Energy Commission in compliance with Title 24, Part 1, Section 10-106~~Chapter 10, Section 106 of the *California Administrative Code*~~, prior to enforcement. Once approval is granted by the Energy Commission, local jurisdictions shall file an ordinance expressly marking the local modifications along with findings and receive the required acceptance from the California Building Standards Commission in compliance with Section 101.7 of this code, prior to enforcement. (Title 24, Part 1, Section 10-106~~Chapter 10, Section 106 of the *California Administrative Code*~~ is available at http://www.energy.ca.gov/title24/2019standards/)

SECTION A5.202

DEFINITIONS

A5.202.1 Definitions. The following terms are defined in Chapter 2.

ENERGY BUDGET.

GEOTHERMAL.

PROCESS.

SOLAR ACCESS.

TIME DEPENDENT VALUATION (TDV).

SECTION A5.203

PERFORMANCE APPROACH

A5.203.1 Energy efficiency. Nonresidential, high-rise residential and hotel/motel buildings that include lighting and/or mechanical systems shall comply with Sections A5.203.1.1 and ~~either~~ A5.203.1.2.~~1 or A5.203.1.2.2.~~ Newly constructed buildings and additions are included in the scope of these sections. Buildings permitted without lighting or mechanical systems shall comply with Section A5.203.1.1 but are not required to comply with ~~Sections A5.203.1.1.2 or~~Section A5.203.1.2.

A5.203.1.1 Tier 1 and Tier 2 prerequisites. ~~Each~~To comply with Tier 1, ONE of the following efficiency measures is required for all applicable components of the building project. To comply with Tier 2, TWO of the following efficiency measures are required.

A5.203.1.1.1 Outdoor lighting. Newly installed outdoor lighting power shall be no greater than 90 percent of the Allowed Outdoor Lighting Power~~.~~, and general hardscape lighting within the scope of Title 24, Part 6, Section 140.7(b)1 shall have a color temperature no higher than 3000K. The Allowed Outdoor Lighting Power calculation is specified in Title 24, Part 6, Section 140.7 "Requirements For Outdoor Lighting."

Exception: The color temperature requirement is not applicable to the applications identified in the Exceptions to Section 140.7(a) nor to the applications identified as "specific applications" in Section 140.7(b)2 and Table 140.7.

A5.203.1.1.2 Service water heating in restaurants. Newly constructed restaurants 8,000 square feet or greater and with service water heaters rated 75,000 Btu/h or greater shall install a solar water-heating system with a minimum solar savings fraction of 0.15.

Exceptions:

1. Buildings with a natural gas service water heater with a minimum of 95-percent thermal efficiency.

2. Buildings where greater than 75 percent of the total roof area has annual solar access that is less than 70 percent. Solar access is the ratio of solar insolation, including shade, to the solar insolation without shade. Shading from obstructions located on the roof or any other part of the building shall not be included in the determination of annual solar access.

A5.203.1.1.3 Warehouse Dock Seal Doors Exterior loading dock doors that are adjacent to conditioned or indirectly conditioned spaces shall have dock seals or dock shelters installed at the time of permitting. This requirement shall apply to newly constructed buildings and to loading dock doors added to existing buildings.

A5.203.1.1.4 Daylight Design Power Adjustments Factors (PAFs). Daylighting devices shall be installed as specified in Title 24, Part 6, Section 140.3(d).

A5.203.1.1.5 Exhaust Air Heat Recovery. Heat recovery requirements based on ASHRAE 90.1 Section 6.5.6.1 are adapted and modified for California climate zones as described below.

1. Systems with minimum design outdoor air fraction of 80% or greater and supply air flow of 200 cfm or greater in climate zones 2, 9, 10, 11, 12, 13, 14, 15 shall have a heat recovery system.

2. Heat recovery systems required by this section shall result in a net sensible energy recovery ratio of at least 60 percent for both heating and cooling as tested using AHRI 1060-2014 or 1061-2014 and certified by AHRI. A 60 percent sensible energy recovery ratio shall mean a change in the dry-bulb of the outdoor air supply equal to 60 percent of the difference between the outdoor air and exhaust air dry-bulb at design conditions. Provisions shall be made to bypass or control the energy recovery system to permit air economizer operation as required by Title 24, Part 6, Section 140.4(e): Economizers.

EXCEPTION 1: Systems serving spaces that are not cooled and that are heated to less than 60°F.

EXCEPTION 2: Where more than 60 percent of the outdoor air heating energy is provided from site-recovered energy.

EXCEPTION 3: Where the sum of the airflow rates exhausted and relieved within 20 feet of each other is less than 75 percent of the design outdoor airflow rate, excluding exhaust air that is either:

1. used for another energy recovery system,

2. not allowed by ASHRAE Standard 170 for use in energy recovery systems with leakage potential, or

3. of Class 4 as defined in ASHRAE Standard 62.1.

EXCEPTION 4: Systems expected to operate less than 20 hours per week.

A5.203.1.2 Performance standard. Comply with one of the advanced efficiency levels indicated below.

A5.203.1.2.1 Tier 1. Buildings complying with the first level of advanced energy efficiency shall have an Energy Budget that is no greater than indicated below, depending on building type and the type of energy systems included in the building project. If the newly constructed building or addition does not include indoor lighting or mechanical systems, then no additional performance requirements above Title 24, Part 6 are required.

1. For nonresidential building projects that include indoor lighting or mechanical systems, but not both: No greater than 95 percent of the Title 24, Part 6, Energy Budget for the Standard Design Building as calculated by compliance software certified by the Energy Commission.

2. For nonresidential building projects that include indoor lighting and mechanical systems: No greater than 90 percent of the Title 24, Part 6 Energy Budget for the Standard Design Building as calculated by compliance software certified by the Energy Commission.

3. For high-rise residential and hotel/motel building projects: No greater than 95 percent of the Title 24, Part 6, Energy Budget for the Standard Design Building as calculated by compliance software certified by the Energy Commission.

A5.203.1.2.2 Tier 2. Buildings complying with the second level of advanced energy efficiency shall have an Energy Budget that is no greater than indicated below, depending on building type and the type of energy systems included in the building project. If the newly constructed building or addition does not include indoor lighting or mechanical systems, then no additional performance requirements above Title 24, Part 6 are required.

1. For nonresidential building projects that include indoor lighting or mechanical systems, but not both: No greater than 90 percent of the Title 24, Part 6, Energy Budget for the Standard Design Building as calculated by compliance software certified by the Energy Commission.

2. For nonresidential building projects that include indoor lighting and mechanical systems: No greater than 85 percent of the Title 24, Part 6, Energy Budget for the Standard Design Building as calculated by compliance software certified by the Energy Commission.

3. For high-rise residential and hotel/motel building projects: No greater than 90 percent of the Title 24, Part 6, Energy Budget for the Standard Design Building as calculated by compliance software certified by the Energy Commission.

Note: For Energy Budget calculations, high-rise residential and hotel/motel buildings are considered nonresidential buildings.

SECTION A5.211

RENEWABLE ENERGY

A5.211.1 On-site renewable energy. Use on-site renewable energy sources such as solar, wind, geothermal, low-impact hydro, biomass and bio-gas for at least 1 percent of the electric power calculated as the product of the building service voltage and the amperage specified by the electrical service overcurrent protection device rating or 1kW, (whichever is greater), in addition to the electrical demand required to meet 1 percent of the natural gas and propane use. The building project's electrical service overcurrent protection device rating shall be calculated in accordance with the ~~2016~~ *California Electrical Code*. Natural gas or propane use is calculated in accordance with the ~~2016~~ *California Plumbing Code*.

A5.211.1.1 Documentation. Using a calculation method approved by the California Energy Commission, calculate the renewable ~~onite~~onsite energy system to meet the requirements of Section A5.211.1, expressed in kW. Factor in net metering, if offered by local utility, on an annual basis.

A5.211.3 Green power. If offered by local utility provider, participate in a renewable energy portfolio program that provides a minimum of 50-percent electrical power from renewable sources. Maintain documentation through utility billings.

SECTION A5.212

ELEVATORS, ESCALATORS AND OTHER EQUIPMENT

A5.212.1 Elevators and escalators. In buildings with more than one elevator or two escalators, provide systems and controls to reduce the energy demand of elevators and escalators as follows. Document systems operation and controls in the project specifications and commissioning plan.

A5.212.1.1 Elevators. Traction elevators shall have a regenerative drive system that feeds electrical power back into the building grid when the elevator is in motion.

A5.212.1.1.1 Car lights and fan. A parked elevator shall turn off its car lights and fan automatically until the elevator is called for use.

A5.212.1.2 Escalators. An escalator shall have a VVVF motor drive system that is fully regenerative when the escalator is in motion.

A5.212.1.4 Controls. Controls that reduce energy demand shall meet requirements of CCR, Title 8, Chapter 4, Subchapter 6 and shall not interrupt emergency operations for elevators required in CCR, Title 24, Part 2, *California Building Code*.

SECTION A5.213

ENERGY EFFICIENT STEEL FRAMING

A5.213.1 Steel framing. Design steel framing for maximum energy efficiency. Techniques for avoiding thermal bridging in the envelope include:

1. Exterior rigid insulation;
2. Punching large holes in the stud web without affecting the structural integrity of the stud;
3. Spacing the studs as far as possible while maintaining the structural integrity of the structure; and
4. Detailed design of intersections of wall openings and building intersections of floors, walls and roofs.

Note: Authority: Sections 25213, 25218, 25218.5, 25402 and 25402.1, Public Resources Code. Reference: Sections 25402, 25402.1, 25402.4, and 25402.8, Public Resources Code