

**City of Santa Monica Energy and Green Buildings Program  
EVALUATION OF SANTA MONICA ENERGY EFFICIENCY STANDARDS  
RELATIVE TO 2005 TITLE-24 STANDARDS**



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## **EXECUTIVE SUMMARY**

Changes to the California Title-24 standard for energy efficiency which will take effect in October 2005 necessitate revisions to Santa Monica's municipal code with reference to Santa Monica's energy efficiency requirements. This report identifies energy efficiency measures that go beyond the scope of 2005 Title-24 standards, that Santa Monica can require for new building construction and substantial remodels. If implemented, these measures could curb future energy usage in Santa Monica by more than 1,000,000 kWh of electricity and 30,000 therms of natural gas annually, saving consumers over \$190,000 in annual utility bills. This energy efficiency program would also reduce Santa Monica residents' overall impact on the environment by limiting greenhouse gas emissions.

## **INTRODUCTION**

The City of Santa Monica proactively promotes sustainable building practices through its Green Building Guidelines, and through two performance-based ordinances contained in its municipal code. One of these performance ordinances requires an improvement in calculated building energy performance beyond 2001 California Title-24 energy standards. As of October 2005, the California Title-24 standards will be updated with revised standards that are significantly more stringent than the existing standards. Although the specific percentage improvement beyond 2001 Title-24 standards varies by building type and size, and by air conditioning system type and size, the average improvement in building energy performance beyond Title-24 2001 standards is estimated at 10%. Since the Santa Monica Municipal ordinance (SMMC #8.108.030 & #8.108.040) directly references the 2001 Title-24 standards, this ordinance needs to be updated to maintain consistency with 2005 Title-24 updates.

This preliminary study identifies appropriate edits for Santa Monica Municipal ordinance (SMMC #8.108.030 & #8.108.040) that will continue Santa Monica's legacy of sustainability and energy efficiency without putting excessive burdens on builders or developers. The study identifies energy efficiency measures not currently required by the 2005 Title-24 energy efficiency standards, and evaluates whether these measures can be cost-effectively incorporated into new building construction in Santa Monica. These measures are grouped into recommended options for each building type, which the City of Santa Monica can require in conjunction with minimum Title-24 2005 compliance.

## **METHODOLOGY**

The study incorporated the following analysis components:

1. Interaction with the California Energy Commission (CEC): A representative from the California Energy Commission confirmed that developing prescriptive lists of energy efficiency measures to choose from would be an appropriate approach for the new Santa Monica energy ordinance. This approach will reduce the amount of analysis required by builders and developers beyond the current performance-based standard, and will also assure that the goals are attainable for all building types and sizes.
2. Identification of target building types: A review of recent building projects in Santa Monica indicates that residential buildings compose the largest percentage of new construction within the city. Accordingly, the energy efficiency measures recommended for the 2005 standards pertain mostly to single family, multifamily low-rise, and multifamily high-rise residential projects.
3. Identification of energy efficiency measures: Energy efficiency measures that can be implemented into the target building types were identified for analysis. These energy efficiency measures were chosen based on ease of implementation and expected benefit to building energy performance.

4. Energy analysis of energy efficiency measures: Representative energy models were developed for single family, multifamily low-rise and multifamily high-rise residential homes in EnergyPro 3.95 (a beta-version software product for Title-24 compliance that reflects 2005 Title-24 updates). Energy efficiency measures impacting building envelope, cooling and heating systems, and domestic water heating systems were modeled for each building type to simulate the energy impact of each measure. Title-24 2005 standard case assumptions were used to generate the base case for each model.
5. Cost analysis: The incremental cost for each energy efficiency measure was determined, and simple paybacks and lifecycle cost analyses were generated based on the estimated energy savings for each measure. Current average SCE electric rates SCG gas rates were used to calculate the energy cost savings associated with each measure.
6. Grouping of Measures: Develop optional measure groups that have roughly equivalent energy savings for each building type.
7. Estimation of total energy savings for Santa Monica: Information regarding existing building construction in Santa Monica was used to estimate the expected energy savings that will be achieved through implementation of these measures.

## ENERGY EFFICIENCY MEASURES

The following table lists the energy efficiency measures that were considered for the analysis:

**Table 1: Energy Efficiency Measures by Occupancy Type**

	Energy Efficiency Measure Description	Occupancy Type					
		Single Family	Multi-family Low-Rise	Multi-family High-Rise / Hotel	Office	Retail	Enclosed Parking Garage
1	Efficient Domestic gas-fired water heating (for DHW input <75,000 Btuh).	x	x	x			
2	Domestic instantaneous gas-fired water heating (for systems serving 3 or less dwelling units)	x	x	x			
3	Domestic gas-fired boiler efficiency of 84% (DHW systems > 75,000 Btuh)		x	x			
4	Domestic gas fired boiler efficiency of 96% (DHW systems > 75,000 Btuh)		x	x			
5	Whole house gray water heat recovery system	x	x	x			
6	DX cooling efficiency of 14 SEER and 12 EER (5 tons or less)	x	x	x	x	x	
7	Central gas furnace efficiency (AFUE) of 90%	x	x	x			
8	Exterior shading for windows on south, east, and west exposures	x	x	x			
9	Fenestration U-value of 0.40						
10	Fenestration SHGC of 0.40	x	x	x			
11	Energy Star refrigerators	x	x	x			
12	Energy Star dishwashers	x	x	x			
13	Horizontal-Axis Energy Star rated clothes washers	x	x	x			
14	Natural gas dryers (in laundry rooms)	x	x	x			
15	No Mechanical Cooling	x	x	x			
16	Variable Speed Drives for domestic water booster pumps			x			
17	CO Sensors & fan speed controls for garage ventilation fans						x
18	Energy Star rated transformers		x	x	x	x	
19	Daylit area daylighting controls (open daylit areas > 250 sf)				x	x	
20	Occupant sensor lighting controls (offices < 250 sf)				x	x	

## DESCRIPTION OF ENERGY EFFICIENCY MEASURES

1. **Efficient Domestic gas-fired water heating (for DHW input <75,000 Btuh).** The energy performance of storage-type domestic water heaters with capacities less than 75,000 Btuh is rated using the Energy Factor (EF). A higher energy factor (EF) indicates better energy performance, while a lower EF indicates worse energy performance. This energy efficiency measure requires an Energy Factor matching that of the table shown below:

Tank Volume	Required EF
40	0.634
50	0.615
60	0.596
75	0.568

This measure would apply to all storage gas water heaters with input capacities of 75,000 Btuh or less that serve three or less dwelling units.

2. **Domestic water heating Energy Factor of 0.80.** Standby losses through the tanks of domestic water heaters account for a large portion of the annual energy used by these water heaters, limiting the energy factors of most storage-type water heaters to 0.65 or less. Tankless water heaters eliminate these standby losses, resulting in significantly higher Energy Factors (ranging from 0.78 to 0.83). This measure requires that a tankless water heater with an Energy Factor of 0.80 or greater be installed in place of a storage-type water heater, and would apply to all water heaters serving three or less dwelling units.
3. **Domestic water heating boiler efficiency of 84%.** For multifamily residential buildings with central domestic water heating, this measure requires a domestic water heating boiler efficiency of at least 84%. For domestic water heaters serving three or less attached units, and having input capacities of 75,000 Btuh or greater, this measure requires a domestic water heating recovery efficiency of at least 84%.
4. **Domestic water heating boiler efficiency of 96%.** For multifamily residential buildings with central domestic water heating, this measure requires a domestic water heating boiler efficiency of at least 96%. This level of efficiency can be achieved with condensing boilers (also called pulse combustion boilers). Condensing boilers have heat exchangers that utilize much of the heat from exhaust gases to pre-heat the water in the boiler system.
5. **Whole house gray water heat recovery system.** 80-90% of hot water energy usage goes down the drain. Gray water heat recovery systems use heat exchanger technology to transfer over 60% of the heat from drainwater to incoming cold water<sup>1</sup>. This results in increased domestic water heating capacity for the domestic water heating system, and significantly reduces domestic water heating energy consumption. Gray water heat recovery systems are effective for single family, multifamily low-rise, and high-rise residential applications, as well as laundry facilities.

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<sup>1</sup> Source: OIKOS product directory: <http://oikos.com/products/mechanical/gfx/>

6. **DX cooling efficiency of 14 SEER.** This measure proposes to increase DX unit cooling efficiency to 14 SEER for systems with 5 tons of cooling or less.
7. **Central gas furnace efficiency (AFUE) of 90%.** This measure requires that central gas furnaces serving residential units have Annual Fuel Utilization Energy (AFUE) of at least 90%.
8. **Exterior shading for windows on South, East, and West exposures.** This measure requires exterior overhangs for windows on the South, East, and West exposures of residential buildings in order to reduce cooling energy consumption.
9. **Fenestration U-value of 0.40.** This measure requires a fenestration U-value of 0.40 or less on all glazing. This generally must be achieved using wood or vinyl framing in conjunction with dual-pane low-E glazing.
10. **Fenestration Solar Heat Gain Coefficient (SHGC) of 0.40.** This measure requires a fenestration SHGC of 0.40 or less on all glazing in order to reduce cooling energy consumption.
11. **Energy Star Refrigerators.** This measure requires that all refrigerators installed in new residential buildings prior to building occupancy have an Energy Star rating. This measure only applies to new residential properties where the developer takes responsibility for the purchase and installation of refrigerators. Refrigerators purchased and installed by residential tenants or homeowners will not be regulated.
12. **Energy Star Dishwashers.** This measure requires that all dishwashers installed in new residential buildings prior to building occupancy have an Energy Star rating.
13. **Energy Star rated clothes washers.** This measure requires that all clothes washers installed in new residential buildings prior to building occupancy have an Energy Star rating. This measure only applies to new residential properties where the developer takes responsibility for the purchase and installation of clothes washers, either in a central laundry facility or in individual residential units. Clothes washers purchased and installed by residential tenants or homeowners will not be regulated.
14. **Natural gas dryers.** This measure requires that all dryers installed in central residential laundry facilities be fueled by natural gas rather than electricity. Natural gas dryers consume much less source energy than electric dryers. Also, the use of natural gas dryers in place of electric dryers will reduce the load on the power grid during peak periods when the grid is most congested.
15. **No Mechanical Cooling.** This measure acknowledges that cooling is not necessary for well-designed residential buildings located in Santa Monica's mild climate. Throughout most of the year, comfort can be maintained with appropriately placed operable windows that allow cross flow through each dwelling unit. Ceiling fans in each dwelling unit will further promote this cross-ventilation cooling effect. Eliminating cooling in residential dwelling units will reduce energy usage, and will reduce the load on the power grid during peak periods when the grid is most congested.
16. **Variable Speed Drives (VSDs) for domestic water booster pumps.** Most multifamily residential buildings use domestic water booster pumps to ensure adequate domestic water flow to each dwelling unit. These booster pumps generally operate at constant speed, even though the domestic water usage remains low throughout most of the day, peaking for only a few hours each morning and evening.

This measure requires variable speed drives controlled based on domestic water pressure in order to reduce booster pump energy usage during period of low domestic water consumption.

17. **CO Sensors & fan speed controls for garage ventilation fans.** Mechanical code requires that enclosed parking garages (including sub-terranean garages for multifamily residential, commercial and retail buildings) must have exhaust fans that operate continuously during the hours the garage is in use. Garage fans are not required to operate continuously if Carbon Monoxide (CO) monitoring is used to control fan operation. 90% to 100% of garage exhaust fan energy usage can be eliminated through the use of CO monitoring paired with variable speed fan control. This measure applies to garage exhaust fans 2 hp or greater.
18. **Energy Star rated transformers.** Commercial and industrial transformers decrease the voltage received from the utility to useful levels. Energy Star rated transformers have smaller losses associated with this process than most other transformers available in the market. This measure requires that all commercial and industrial transformers installed in new commercial or multifamily residential buildings have Energy Star ratings.
19. **Daylit area daylighting controls (open daylit areas > 250 sf).** Title-24 mandatory measures require separate switching for 50% of lighting in open daylit areas greater than 250 square feet. This measure requires that daylighting controls including photosensors and continuously dimmable ballasts or stepped dimming also be mandated in daylit spaces greater than 250 square feet. These controls will dim electric lighting when sufficient natural daylight is available.
20. **Occupant sensor lighting controls.** This measure requires occupant sensor lighting controls in all private office spaces smaller than 250 square feet.

## **ENERGY ANALYSIS RESULTS**

Energy analysis for single family residential units and townhouses with three or less attached units indicates a total potential energy savings of 148 kWh and 42 therms per unit per year.

Energy analysis for low-rise multifamily residential buildings indicates a total potential energy savings of 906 kWh and 28 therms per unit per year.

Energy analysis for high-rise multifamily residential buildings indicates a total potential energy savings of 906 kWh and 32 therms per unit per year.

The following tables document the energy and cost savings for each measure, along with the simple payback.

**Table 2: Results for Single Family, or 3 or less attached Residential Units**

	Energy Efficiency Measure Description	ANNUAL ENERGY & COST SAVINGS PER DWELLING UNIT					
		Electricity Consumption (kWh)	Natural Gas Consumption (Therms)	Title-24 Energy (TDV)	Annual Energy Cost	Additional Capital Cost	Simple Payback
1	Efficient Domestic gas-fired water heating (for DHW input <75,000 Btuh).	N/A	12.0	0.8	\$10.54	\$50	4.7
2	Domestic water heating EF of 0.80 (for systems serving 3 or less dwelling units)	N/A	76.9	5.4	\$67.55	\$700	10.4
5	Whole house gray water heat recovery system	N/A	92.8	6.4	\$81.53	\$397	4.9
6	DX cooling efficiency of 14 SEER and 12 EER (5 tons or less)	4	N/A	0.1	\$0.51	\$125	> 15
7	Central gas furnace efficiency (AFUE) of 90%	N/A	8.0	0.5	\$7.03	\$400	> 15
8	Exterior shading for windows on south, east, and west exposures	21	-4	0.4	-\$0.86	\$240	N/A (energy cost increases)
9	Fenestration U-value of 0.40	-1	24.0	0.8	\$20.96	\$180	8.6
10	Fenestration SHGC of 0.40	37	-35	-1.3	-\$26.06	\$120	N/A (energy cost increases)
11	Energy Star refrigerators	80	N/A	N/A	\$10.13	\$30	3.0
12	Energy Star dishwashers	103	N/A	N/A	\$19.98*	\$50	2.5
13	Horizontal-Axis Energy Star rated clothes washers	48	21	N/A	\$63 *	\$300	4.8
14	Natural gas dryers	1516	-76	N/A	\$125	\$575	4.6
15	No Mechanical Cooling	29	N/A	N/A	\$3.73	\$0	0 (no cost measure)

\* includes water cost savings associated with increased water efficiency

**Table 3: Multifamily Low-rise Residential Energy Analysis Results**

	Energy Efficiency Measure Description	ANNUAL ENERGY & COST SAVINGS PER DWELLING UNIT					
		Electricity Consumption (kWh)	Natural Gas Consumption (Therms)	Title-24 Energy (TDV)	Annual Energy Cost	Additional Capital Cost	Simple Payback
1	Efficient Domestic gas-fired water heating (for DHW input <75,000 Btuh).	N/A	14.3	1.4	\$12.59	\$50	4.0
2	Domestic water heating EF of 0.80 (for systems serving 3 or less dwelling units)	N/A	72.4	6.9	\$63.61	\$300 (assumes 1 system for 3 units)	4.7
3	Domestic water heating boiler efficiency of 84% (central DHW systems, and systems > 75,000 Btuh)	N/A	7.0	0.4	\$6.15	\$21 (assumes 24 dwelling units)	3.4
4	Domestic water heating boiler efficiency of 96% (central DHW systems)	N/A	24.6	2.1	\$21.59	\$200 (assumes 24 dwelling units)	9.3
5	Whole house gray water heat recovery system	N/A	57.1	4.8	\$50.11	\$167	3.3
6	DX cooling efficiency of 14 SEER and 12 EER (5 tons or less)	31	N/A	0.2	\$3.88	\$115	> 15
7	Central gas furnace efficiency (AFUE) of 90%	N/A	2.8	0.3	\$2.44	\$400	> 15
8	Exterior shading for windows on south, east, and west exposures	75	0	1.4	\$9.45	\$175	> 15
11	Energy Star refrigerators	80	N/A	N/A	\$10.13	\$30	3.0
12	Energy Star dishwashers	103	N/A	N/A	\$19.98*	\$50	2.5
13	Horizontal-Axis Energy Star rated clothes washers	48	21	N/A	\$63	\$300	4.8
14	Natural gas dryers (in laundry rooms). Assumes one gas dryer per 12 units	126	-6	N/A	\$10	\$48 (includes gas hookups)	4.6
15	No Mechanical Cooling	269	N/A	N/A	\$34	0	0 (no cost measure)
16	Variable Speed Drives and controls for domestic water booster pumps	312	N/A	N/A	\$40	\$125	3.2
17	CO Sensors & fan speed controls for garage ventilation fans (assumes 160 sf of subterranean garage per dwelling unit)	336	N/A	N/A	\$38	\$120	3.1
18	Energy Star rated transformers (assumes one 15 kVA transformer for apartment complex with 24 units)	30	N/A	N/A	\$3.82	\$19	4.9

**Table 4: Multifamily High-rise Residential Energy Analysis Results**

	Energy Efficiency Measure Description	ANNUAL ENERGY & COST SAVINGS PER DWELLING UNIT					
		Electricity Consumption (kWh)	Natural Gas Consumption (Therms)	Title-24 Energy (TDV)	Annual Energy Cost	Additional Capital Cost	Simple Payback
1	Efficient Domestic gas-fired water heating (for DHW input <75,000 Btuh).	N/A	14.3	1.4	\$12.59	\$50	4.0
2	Domestic water heating EF of 0.80 (for systems serving 3 or less dwelling units)	N/A	72.4	6.9	\$63.61	\$300 (assumes 1 system for 3 units)	4.7
3	Domestic water heating boiler efficiency of 84% (central DHW systems, and systems > 75,000 Btuh)	N/A	7.0	0.4	\$6.15	\$21 (assumes 24 dwelling units)	3.4
4	Domestic water heating boiler efficiency of 96% (central DHW systems)	N/A	24.6	2.1	\$21.59	\$200 (assumes 24 dwelling units)	9.3
5	Whole house gray water heat recovery system	N/A	68.5	4.8	\$60.14	\$167	2.78
6	DX cooling efficiency of 14 SEER and 12 EER (5 tons or less)	170	N/A	3.5	\$21.53	\$110	5.1
11	Energy Star refrigerators	80	N/A	N/A	\$10.13	\$30	3.0
12	Energy Star dishwashers	103	N/A	N/A	\$19.98	\$50	2.5
13	Horizontal-Axis Energy Star rated clothes washers	48	21	N/A	\$63	\$300	4.8
14	Natural gas dryers (in laundry rooms). Assumes one gas dryer per 12 units	126	-6	N/A	\$10	\$48 (includes gas hookups)	4.6
15	No Mechanical Cooling	2,224	N/A	N/A	\$284	\$0	0 (no cost measure)
16	Variable Speed Drives and controls for domestic water booster pumps	312	N/A	N/A	\$40	\$125	3.2
17	CO Sensors & fan speed controls for garage ventilation fans (assumes 160 sf of subterranean garage per dwelling unit)	336	N/A	N/A	\$38	\$120	3.1
18	Energy Star rated transformers (assumes one 15 kVA transformer for apartment complex with 24 units)	30	N/A	N/A	\$3.82	\$19	4.9

\* Note: cooling energy savings are based on low-rise residential predictions due to inadequacies in the high-rise residential model that overestimate cooling energy usage. The high-rise residential model does not account for natural ventilation assistance with cooling while the low-rise residential model does. In Santa Monica, natural ventilation plays a major role in reducing cooling loads.

**Table 5: Commercial/Retail Energy Analysis Results**

	Energy Efficiency Measure Description	ANNUAL ENERGY & COST SAVINGS PER SQUARE FOOT OF APPLICABLE SPACE					
		Electricity Consumption (kWh)	Natural Gas Consumption (Therms)	Title-24 Energy (TDV)	Annual Energy Cost	Additional Capital Cost	Simple Payback
6	DX cooling efficiency of 14 SEER and 12 EER (5 tons or less)	0.5	N/A	11.8	\$0.06	\$0.25	4.0
17	CO Sensors & fan speed controls for garage ventilation fans	1.9	N/A	N/A	\$0.24	\$0.75	3.1
18	Energy Star rated transformers	0.1	N/A	N/A	\$0.02	\$0.09	4.0
19	Daylit area daylighting controls (open daylit areas > 250 sf)	1.0	N/A	22.6	\$0.13	\$0.87	6.5
20	Occupant sensor lighting controls (offices < 250 sf)	0.7	N/A	14.6	\$0.09	\$0.42	4.9

## RECOMMENDATIONS

### **Prescriptive Method:**

The results of the energy analysis and simple payback reveal a number of energy efficiency opportunities that Santa Monica can require, without placing an undue burden or cost on new construction in Santa Monica. Building developers should have the option of selecting measures for each building type in order to allow flexibility in the building design. To accomplish this optional measure groups have been developed as options to the prescriptive package for each building type:

#### **Residential, Less than three attached dwelling units**

	Package A	Optional Measures Group 1 **	Optional Measures Group 2
Energy Efficiency Measures:	1. Whole house gray water heat recovery system	1. Efficient domestic water heater 2. Energy Star Dishwasher 3. Energy Star Refrigerator 4. Energy Star Clothes Washer	1. No mechanical cooling 2. Energy Star Dishwasher 3. Energy Star Refrigerator (when installed by builder)
Total Electric Savings (kWh/unit/yr)	0	183	212
Total Natural Gas Savings (therms/unit/yr)	93	12	0
Total Source Energy Savings (kbtu/sf/yr)	6.2	2.0	1.4
Approximate percentage of savings estimated versus Title-24*	25%	8%	6%
Annual Cost Savings (\$/unit/yr)	\$82	\$41	\$34
Incremental Capital Cost (\$/unit)	\$397	\$130	\$80
Simple Payback	4.9	3.2	2.4

\* Note – percentage of savings estimated versus Title-24 is approximate, since many of the measures identified can not receive credit under Title-24. Low-rise residential Title-24 energy includes only heating, cooling, fans, and DHW but some of the measures discussed above include appliances as well.

\*\* If using Option B to qualify for the Santa Monica energy requirements, at least two of the three EnergyStar appliances listed must be installed by the developer.

**Residential, Multifamily low-rise and high-rise, Hotel/Motel**

	Package A	Optional Measures Group 1 **	Optional Measures Group 2
Energy Efficiency Measures:	1. Whole house gray water heat recovery system	1. Efficient domestic water heater 2. Energy Star Dishwasher 3. Energy Star Refrigerator (when installed by builder)	1. No mechanical cooling 2. Energy Star Dishwasher 3. Energy Star Refrigerator (when installed by builder)
	AND		
	4. Energy Star Transformers (for all commercial transformers) 5. Variable Speed Drives for booster pumps larger than or equal to 2.5 hp 6. CO sensors and variable speed drives to control garage exhaust fans (for all parking garage spaces with ventilation fans larger than 2.0 hp)		
Total Electric Savings (kWh/unit/yr)	678	861	1,130
Total Natural Gas Savings (therms/unit/yr)	64	7	0
Total Source Energy Savings (kbtu/sf/yr)	13.2	9.5	11.6
Approximate percentage of savings estimated versus Title-24*	50% (low rise) 9% (high-rise)	35% (low rise) 6% (high-rise)	44% (low rise) 8% (high-rise)
Annual Cost Savings (\$/unit/yr)	\$140	\$118	\$146
Incremental Capital Cost (\$/unit)	\$431	\$365	\$344
Simple Payback	3.1	3.1	2.4

\* Note – percentage of savings estimated versus Title-24 is approximate, since many of the measures identified can not receive credit under Title-24. Low-rise residential Title-24 energy includes only heating, cooling, fans, and DHW, but some of the measures described above include appliances. High rise residential energy includes all indoor end-uses.

\*\* If using Option B to qualify for the Santa Monica energy requirements, at least two of the three EnergyStar appliances listed must be installed by the developer.

\*\*\* Hotel/Motel facilities are exempted from the EnergyStar appliance requirements.

## **Commercial / Retail Spaces**

Include two of the four following four energy efficiency measures in all new construction or substantial remodels:

1. Energy Star Transformers (for all commercial transformers)
2. Occupant Sensor Lighting Controls (for office spaces smaller than 250 sf)
3. Daylight Sensor Controls in Daylit Spaces
4. CO sensors and variable speed drives to control garage exhaust fans (for all parking garage spaces with ventilation fans larger than 2.0 hp)

## **Performance Method**

If any building performs 10% better than Title-24 using the performance compliance method (meaning that the Time Dependent Value (TDV) energy for the project is 10% less than the TDV energy for the Title-24 standard case), the project shall be exempt from the prescriptive requirements described above. This exemption applies for all building types.

For residential buildings, this level of Title-24 performance improvement can generally be met by installing tankless gas water heaters.

## **Recommended Text – Santa Monica Municipal Ordinances**

Based on the findings of the energy and cost-benefit analysis, the following recommendations are suggested as a starting point for revisions to the relevant Santa Monica Municipal Code sections.

### **8.108.020 Scope.**

The provisions of this Chapter shall apply to all new buildings, and existing buildings whose repair, alteration or rehabilitation costs exceed fifty percent of their replacement cost as determined by Section 8.84.040 except (a) qualified historic buildings as defined in the State Historic Building Code (Title 24, Part 8).

### **8.108.030 Compliance requirements.**

All buildings may use the prescriptive or performance approach set forth in the current California Title-24 standards for the envelope, space-conditioning, lighting and service water-heating systems.

All buildings must also meet the prescriptive requirements listed below.

Exception: Any project that documents a 10% improvement beyond Title-24 requirements using the performance compliance method shall be exempt from the prescriptive requirements described below. The documentation must show that the Time Dependent Value (TDV) energy for the project is 10% less than the TDV energy for the Title-24 standard comparison case.

#### **A. Prescriptive Requirements**

- (1) Residential buildings with three or less attached units must meet all of the requirements for the package or one of the options listed:
  - a) Package A:
    1. Plumbing systems shall be fitted with a gray water recovery system that preheats domestic hot water with heat recovered from shower drain water.
  - b) Optional Measure Group 1:

1. Domestic water heaters with input capacities less than or equal to 75,000 Btuh must have a minimum energy factor of:
    - 0.634 for 40 gallon water heaters
    - 0.615 for 50 gallon water heaters
    - 0.596 for 60 gallon water heaters
    - 0.568 for 75 gallon water heaters
    - 0.680 for tankless water heaters
  2. Domestic water heaters with input capacities exceeding 75,000 Btuh must have a recovery efficiency no less than 84%.
  3. All builder-installed dishwashers must have an Energy Star rating.
  4. All builder-installed refrigerators must have an Energy Star rating.
  5. All builder-installed clothes washers must have an Energy Star rating.
  6. At least two of the three appliances listed in Item #3, #4, and #5 above must be installed by the builder in order to use this Option Measure Group to meet the Santa Monica requirements.
- c) Optional Measure Group 2:
1. No mechanical cooling shall be installed for the residence (the residence shall be designed to maintain comfort conditions through natural ventilation, and other envelope measures)
  2. All builder-installed dishwashers must have an Energy Star rating.
  3. All builder-installed refrigerators must have an Energy Star rating.
- (2) Residential buildings with three or more attached units, including buildings classified as “low-rise residential” and “high-rise residential” and “hotel or motel” must meet all of the requirements for the prescriptive package or one of the optional measure groups listed:
- a) Package A:
    1. Plumbing systems shall be fitted with a gray water recovery system that preheats domestic hot water with heat recovered from shower drain water.
  - b) Optional Measure Group 1:
    1. All central domestic water heating systems (serving more than three residences per water heater) must have a minimum thermal efficiency of 84%.
    2. All individual domestic water heating systems (serving 3 or less residences per water heater, and with input capacities less than or equal to 75,000 Btuh) must have a minimum energy factor of:
      - 0.634 for 40 gallon water heaters
      - 0.615 for 50 gallon water heaters
      - 0.596 for 60 gallon water heaters
      - 0.568 for 75 gallon water heaters
      - 0.680 for tankless water heaters
    3. All individual domestic water heating systems (serving 3 or less residences per water heater, and with input capacities greater than 75,000 Btuh) must have a minimum recovery efficiency of 84%.
    4. All builder-installed dishwashers must have an Energy Star rating
    5. All builder-installed refrigerators must have an Energy Star rating
    6. At least two of the three appliances listed in Item #3, #4, and #5 above must be installed by the builder in order to use this Option Measure Group to meet the Santa Monica requirements.

7.

c) Optional Measure Group 2:

1. No mechanical cooling shall be installed for the residences (the residences shall be designed to maintain comfort conditions through natural ventilation, and other envelope measures)
2. All builder-installed dishwashers must have an Energy Star rating
3. All builder-installed refrigerators must have an Energy Star rating

Additionally, all low-rise residential, high-rise residential and hotel or motel buildings must meet all of the following three requirements.

1. Domestic water booster pumps greater than 2.5 hp shall be controlled with Variable Speed Drives.
2. All commercial transformers installed for the building must have an Energy Star rating.
3. Fans for garage ventilation that are 2.0 hp or greater shall be controlled with variable speed drives and CO monitoring.

(3) Commercial and institutional office buildings and retail buildings must implement two of the four following measures in the project:

1. All commercial transformers installed for the building must have an Energy Star rating.
2. Fans for garage ventilation that are 2.0 hp or greater shall be controlled with variable speed drives and CO monitoring.
3. Ambient lighting for all office spaces smaller than 250 square feet must be controlled with occupant sensor lighting controls.
4. In all spaces greater than 250 square feet classified as “daylit” spaces within Title-24, ambient lighting shall be controlled with photosensor controls and stepped or continuous dimming.

### 8.108.040

This section should be omitted.

### ***Projected Environmental Impact***

After three years, the total annual energy savings achieved through implementation of the recommended measures will be 1,035,000 kWh of electricity per year, and 38,000 therms of natural gas per year<sup>2</sup>. This will result in a reduction of greenhouse emissions equivalent to 456 tons of CO<sub>2</sub> per year, 985 pounds of NO<sub>x</sub> per year, and 660 pounds of SO<sub>x</sub> per year<sup>3</sup>. Assuming the program continues after three years, the reported annual energy savings due to implementation of the program will continue to rise each year.

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<sup>2</sup> The analysis assumes 32 single family residences, 81 low-rise residential units, 283 high-rise residential units, and 55,000 sf of office and retail space are permitted each year.

<sup>3</sup> Projections are based on the Western Systems Coordinating Council 2008 greenhouse gas emissions factors