

Proposed Reach Codes for Existing Buildings

2022 Building Code Cycle (January 1, 2023 – December 31, 2025)

Reach code option	Impacted buildings	Proposed reach code requirement
1) Electric-readiness: panel capacity	Residential buildings	Requires panel replacement and panel upgrade projects to include panel capacity/breaker space for future electrification
2) Electric-readiness: outlets installed	Single family homes and duplexes	Requires all residential kitchen and laundry renovations include installation of an outlet to allow for the use of electric appliances in the future
3) Heat pump air conditioning	Single family homes and duplexes	Requires installation of heat pump air conditioning when new air conditioning is installed or replaced, in conjunction with furnace replacement
4) Pools and outdoor equipment	Residential buildings	4A) Requires new pools to use electric or solar pool heating at residences 4B) Prohibits the extension of fuel gas infrastructure into the backyard for uses such as fire pits, grills, and pools
5) Heat pump water heaters	Single family homes and duplexes	Requires heat pump water heater installation during addition and alteration projects that include water heater replacement

Discussion

Currently, the City does not have any reach codes in place for existing buildings. In February 2022, staff began collaborating with PCE to explore reach code options for existing buildings that would be effective during the upcoming building code cycle January 1, 2023 through December 31, 2025. PCE provided technical support to City staff in the drafting and development of the proposed reach code options detailed below:

1) Electric-readiness (panel capacity) at time of electrical panel upgrade – Residential

This measure requires the reservation of breaker space in the existing or new electrical panel to accommodate anticipated future electrification of the buildings' electrical load at the time of electrical panel upgrade or replacement. The measure would require dedicated breaker spaces for future electric appliances, including a heat pump water heater, heat pump space heater, EV charger and other end uses. Electrical capacity is key to future electrification of a building's systems. By requiring the reservation of breaker space when a building owner is already making changes their electrical panel, gas equipment can more easily be converted to electric at the end of equipment life.

The City of Piedmont adopted this measure and their reach code went into effect on June 1, 2021. Piedmont staff noted that project applicants are typically able to reserve breaker space without upgrading the panel beyond their project scope. Staff estimates that reservation of breaker space for additional electrification would not add to the project cost given Piedmont's implementation

experience. This requirement would not directly result in emissions reductions but prepares the property owner for future electrification of systems that would result in emissions reductions.

Over the past five years, there was an average of 192 permits per year for electrical panel upgrades. Electrical service upgrades can occur in combination with solar panel installation, electric vehicle charger installation and major renovation or as a standalone permit.

2) Electric-readiness (outlets installed) at time of kitchen or laundry room renovations – Single Family Homes and Duplexes

This measure requires the installation of electrical outlets at the time of kitchen or laundry room renovation if a gas appliance is installed. This means at least one outlet capable of serving electric equipment is located within six feet of the kitchen stove during a kitchen renovation and clothes dryer during a laundry room renovation. This requirement enables electric equipment to be easily installed at a later date.

The City of Piedmont adopted this measure and their reach code went into effect on June 1, 2021. This measure aligns with the 2022 State Code update that will require pre-wiring in new construction when gas appliances are installed. PCE estimates that installation of an outlet for future electrification would add \$500 - \$2000 to the project cost. The costs are highly varied depending on the location of the panel relative to the location of the renovation in the home. Cost estimates are highly sensitive to material availability and inflation. This requirement would not directly result in emissions reductions but prepares the property owner for future electrification of systems that would result in emissions reductions.

Over the past five years, there was an average of 98 permits for kitchen renovations and 49 permits for laundry room renovations per year.

3) Heat pump air conditioning – Single Family Homes and Duplexes

This measure requires the installation of a heat pump air conditioning (AC) unit at the time of installation of a new AC system or replacement of an existing AC unit at single family homes and duplexes. AC condensing units are electric but the requirement to install of heat pump technology would electrify both the home's space heating and cooling.

PCE estimates that the installation of an AC condenser unit would cost \$17,500 and the installation of a heat pump unit would cost \$19,000. TECH Clean California incentives provide a \$3,000 rebate for residential heat pump units, making the heat pump option slightly less expensive when the rebate is layered in. Currently TECH Clean California incentives have all been reserved and incentive funding is anticipated to be fully funded by late 2022. Without incentives, the heat pump unit would cost \$1,500 more than the AC condenser unit.

If the homeowner is adding a new AC unit, their electricity costs would increase regardless of the equipment type (heat pump versus condenser unit). When examining the utility bill impacts of a gas furnace and AC condenser unit compared to heat pump HVAC, staff found varied results. One study

estimated that homeowners would save \$10 per month¹ while another study estimated homeowners would pay \$11 more per month² with a heat pump unit.

Over the past five years, there was an average of 299 permits for new and replacement AC units at single family homes and duplexes per year. Staff does not have specific data regarding the type of HVAC equipment (gas versus electric) installed in San Mateo. Generally, staff observed the majority of HVAC projects include the installation of gas furnaces and AC condenser units. Staff have observed an increase in the installation of ductless heat pump mini split systems in Accessory Dwelling Units.

Space heating accounts for 36% of fossil gas use in a typical household in San Mateo's climate zone, representing a significant greenhouse gas emissions savings opportunity. If adopted, the City of San Mateo would be the first city in California to adopt a requirement for heat pump air conditioning. The City of Vancouver (British Columbia) has a such a requirement that is slated to go into effect January 1, 2023.

4) Pools and outdoor equipment – Residential

A) Electric/solar pool heating - Residential

This measure would require installation of electric or solar pool heating equipment when a new heated pool is installed at an existing residential building. If a pool is installed as part of the construction of a new residential building, the pool is already required to use electric equipment according to the City's current building electrification reach code.

In 2019, the City of Santa Monica commissioned a cost-effectiveness study³ to analyze electric pool heating for Santa Monica's climate zone. The study found the heat pump pool heater option could cost \$800 - \$1,300 more than the traditional gas pool heater at the time of installation. Over 10 years, the estimated annual utility savings of the electric option would be greater than the upfront cost of the initial investment in electric equipment. Since the lifecycle utility savings exceeded the upfront costs, the report concludes that there is a cost-effective option for solar and electric pool heating equipment. It should be noted that the analysis assumes an avoided cost of \$200 per gas appliance. Since pool heaters are located outside and sometimes further away from the house, running a gas line extension to the backyard could be more costly than this conservative estimate, resulting in additional cost savings for the property owner with the electric option. The City of Santa Monica's electric and solar pool heating reach code has been in effect since January 1, 2020.

If adopted, this measure would apply to a small number of projects each year. Over the past five years, there was an average of five permits per year for the installation of new pools at existing residences. However, this measure has a significant greenhouse gas emissions reduction opportunity. Electric pool heating would avoid 83% of emissions compared to the gas pool heating option. Though heat pump pool heaters are not a new technology, they represent a

¹ https://www.ethree.com/wp-content/uploads/2019/04/E3_Residential_Building_Electrification_in_California_April_2019.pdf

² <https://frontierenergy.com/wp-content/uploads/2019-Cost-Effectiveness-Study-Existing-Single-Family-Residential-Building-Upgrades-report.pdf>

³ https://localenergycodes.com/download/481/file_path/fieldList/2019%20Electric%20Pool%20Heat-Santa%20Monica.pdf

small market share in California. Currently, most pools use natural gas pool heaters. Heat pump pool heaters are more popular in other markets, including Florida.

The cost-effectiveness study for Santa Monica's climate zone indicates that this measure could be potentially adopted in San Mateo. A cost-effectiveness study is underway and estimated to be completed August 2022.

B) Prohibition of fuel gas infrastructure in backyard - Residential

This measure would prohibit the extension of existing fuel gas infrastructure in the backyard of an existing residence. Fossil gas infrastructure could not be used for pools, grills, and fire pits. In effect, this measure would require the use of electric or solar equipment for pool heating and would allow property owners to use other fuels for grills and fire pits such as propane or electricity. This requirement would prevent investment in the extension fossil gas infrastructure, a costly project compared to propane and electric options for grills and fire pits. It could also potentially save property owners money as explained in the previous section regarding pools.

Over the past five years, there was an average of 10 permits per year for new gas fire pits or grills at residential buildings.

5) Heat pump water heating – Single Family Homes and Duplexes

This measure would require the installation of a heat pump water heater if a water heater was replaced as part of a major renovation in a single family home. The intent would be to impact projects that are not replacing the equipment at time of failure, allowing for the project applicant to have more time to plan for electrification. Staff estimates this requirement would impact less than 134 projects per year in San Mateo based on the number of permits issued for water heater replacement.

PCE estimates a gas water heater costs \$2,500, an instantaneous gas water heater costs \$5,500, and a heat pump water heater costs \$7,000. There are rebates available for \$2,000 for a heat pump unit. Even with incentives, a heat pump water heater would cost \$2,500 more than the gas unit. Ongoing operational/utility costs are estimated to be the same as the gas water heater option or even save you money depending on the efficiency of the heat pump equipment installed. PCE estimates that the heat pump option could save \$1/month in utility savings compared to the gas water heater. The City of Palo Alto is also considering this reach code option.

The City of San Mateo does not track whether a water heater permit is for a gas or electric equipment; anecdotally, staff observed that most projects include the installation of gas water heaters and heat pumps are not a common choice. Over the past five years, there was an average of 134 permits per year for water heater replacement. This includes permits for remodels or alterations that include the replacement of a water heater. Requiring the installation of heat pump water heaters represents an important opportunity to reduce carbon emissions as water heating accounts for the majority of natural gas use (55%) in a typical household in San Mateo's climate zone. However, because of the increased costs and challenges summarized above, staff does not recommend moving forward with a reach code requirement that requires all water heaters be replaced with heat pump water heaters at time of replacement.