



City of Palo Alto City Council Staff Report

(ID # 14643)

Meeting Date: 10/17/2022

Report Type: Action Items

Title: PUBLIC HEARING: Adoption of Nine Ordinances That Repeal and Adopt Various Sections of the Palo Alto Municipal Code (PAMC) Related to the 2022 CA Building Codes (CA Code of Regulations Title 24) Update and Proposed Local Amendments; including: (1) Chapter 15.04 Incorporating the 2022 CA Fire Code With Local Amendments; (2) Chapter 16.04 Incorporating the 2022 CA Building Code With Local Amendments; (3) Chapter 16.05 Incorporating the 2022 CA Mechanical Code With Local Amendments; (4) Chapter 16.06 Incorporating the 2022 CA Residential Code With Local Amendments and Amending Chapter 16.52 to Align Federal, State, and Local Flood Hazard Regulations; (5) Chapter 16.08 Incorporating the 2022 CA Plumbing Code With Local Amendments; (6) Chapter 16.16 Incorporating the 2022 CA Electrical Code With Local Amendments; (7) Chapter 16.18 Incorporating the 2021 International Swimming Pool and Spa Code With Local Amendments; (8) Chapter 16.14 Incorporating the 2022 CA Green Building Standards Code with Local Amendments; (9) Chapter 16.17 Incorporating the 2022 CA Energy Code Without Local Amendments. Environmental Assessment: Project is Exempt Under CA Environmental Quality Act CEQA Guidelines Sections 15061(b)(3) and 15308.

From: City Manager

Lead Department: Planning and Development Services

RECOMMENDATION

Staff recommends that the City Council adopt the attached nine ordinances that repeal and adopt various sections of the Palo Alto Municipal Code (PAMC) related to the 2022 California Building Codes (Cal. Code of Regulations Title 24) and proposed local amendments:

- (1) An ordinance repealing PAMC Chapter 15.04 and adopting a new Chapter 15.04 incorporating the 2022 Cal. Fire Code with local amendments;
- (2) An ordinance repealing PAMC Chapter 16.04 and adopting a new Chapter 16.04 incorporating the 2022 Cal. Building Codes and local amendments;

- (3) An ordinance repealing PAMC Chapter 16.05 and adopting a new Chapter 16.05 incorporating the 2022 Cal. Mechanical Code with local amendments;
- (4) An ordinance repealing PAMC Chapter 16.06 and adopting a new Chapter 16.06 incorporating the 2022 Cal. Residential Code with local amendments and amending PAMC Chapter 16.52 to align federal, state, and local regulations regarding flood hazards;
- (5) An ordinance repealing PAMC Chapter 16.08 and adopting a new Chapter 16.08 incorporating the 2022 Cal. Plumbing Code with local amendments;
- (6) An ordinance repealing PAMC Chapter 16.16 and adopting a new Chapter 16.16 incorporating the 2022 Cal. Electrical Code with local amendments;
- (7) An ordinance repealing PAMC Chapter 16.18 and adopting a new Chapter 16.18 incorporating the 2021 International Swimming Pool and Spa Code with local amendments;
- (8) An ordinance repealing PAMC Chapter 16.14 and adopting a new Chapter 16.14 incorporating the 2022 Cal. Green Building Standards Code with local amendments;
- (9) An ordinance repealing PAMC Chapter 16.17 and adopting a new Chapter 16.17 incorporating the 2022 Cal. Energy Code without local amendments.

EXECUTIVE SUMMARY

Every three years the State of California adopts and publishes a set of new construction codes referred to as the California Building Standards Code (CBSC) or California Code of Regulations (CCR), Title 24. Local jurisdictions must either adopt the CBSC for local enforcement or enact more stringent building standards to protect the community due to local conditions.

This year, amendments to the 2022 California Green Building Standards Code (CALGreen) will continue to support Palo Alto's leadership in promoting energy efficiency and reducing greenhouse gas emissions by requiring all-electric new construction buildings and will continue supporting sustainable design related to electric vehicle (EV) charging infrastructure, building electrification, water efficiency, material conservation and resource efficiency, and environmental quality in new and existing buildings.

All of the nine ordinances required to adopt the 2022 CBSC will be transmitted late packet to the City Council. A summary of the changes for each ordinance is included with this report and will be reprinted with the late packet memo.

Most of the proposed local changes carry forward previous amendments and provide further clarification on previously adopted Building and Fire Codes. Some previously adopted local amendments have now become statewide standards and are no longer necessary as local amendments. The local amendments that are proposed mainly relate to soils susceptible to liquefaction, expansive soil, and some structural amendments required due to the proximity of

Palo Alto to the major San Andreas and Hayward earthquake fault lines. Some notable proposed local amendments include disallowing gypsum board (sheetrock) as a structural resistance element to resist earthquake and requiring additional fire sprinkler protection in higher firefighting hazardous conditions. One new recommended amendment establishes a dwelling unit occupancy threshold that currently does not exist.

The proposed Fire and Building Code amendments are similar to the code amendments of neighboring jurisdictions, such as City of Sunnyvale and the City of Fremont, that have similar local climatic, geologic, topographic, and environmental conditions.

The California Building Standards Code no longer includes minimum requirements for the design, construction, alteration, repair and maintenance of swimming pools and spas as provided by the 2021 International Swimming Pool and Spa Code (ISPSC); these requirements are proposed as locally adopted standards and included as part of the proposed ordinances.

Lastly, parts of Palo Alto are in special flood hazard areas established by the Federal Emergency Management Agency (FEMA). Palo Alto Municipal Code Chapter 16.52 includes construction provisions for structures in the flood zone. Sections of this chapter are proposed to be amended to align with the California Building Standards Code (California Building and Residential Code) and with new Federal requirements.

A public hearing is required to adopt the model State codes and local amendments, which must be supported by applicable findings, which are provided as exhibits to the ordinances. This report explains the process for adoption of the 2022 California Building Standards Code that will become effective statewide on January 1, 2023 and summarizes the proposed local amendments.

BACKGROUND

The California Building Standards Commission is an independent commission within the State Consumer Services Agency responsible for reviewing, adopting, and publishing building standards for the State of California. Every three years, the California Building Standards Commission adopts a compilation of building regulations referred to as the California Building Standards Code (California Code of Regulations, Title 24). Through the code adoption process, the California Building Standards Commission selects and approves a set of model codes. Inclusive in these regulations are the California Building, Mechanical, Plumbing, Electrical, Existing Buildings, Fire, Energy, Residential Building, Historical Building, and Green Building Codes. Participating State agencies, such as State Fire Marshal (SFM), Division of the State Architect (DSA), Housing and Community Development (HCD), and Office of Statewide Health Planning and Development (OSHPD), have an opportunity to amend the code for the occupancy groups under their respective authorities. Local governments or jurisdictions can also modify the code to add more restrictive provisions based on their specific local geologic, climatic, and topographic conditions to protect their communities. Any local amendments to the above-mandated codes must be more restrictive than the State Building Standards Code and must be

substantiated with findings, per California Health & Safety Code Section 17958. The administrative provisions of the code can be modified without specific justification based on local conditions per California Health & Safety Code Section 18909(C). Staff also recommends adopting the 2021 International Swimming Pool and Spa Code (ISPSA). This model code provides minimum requirements for the design, construction, alteration, repair, and maintenance of swimming pools and spas, which are not available in the California Building Standards Code.

Palo Alto has long been a leading jurisdiction in the areas of sustainability and energy efficiency. In June 2008, the City adopted its first set of green building regulations to incorporate green building techniques and materials in private residential and nonresidential development projects¹. Later that year, the City adopted a local energy ordinance to require new buildings to exceed California's building energy efficiency standards by 15%²; this is commonly known as the Energy Reach Code. These local energy and green building regulations are intended to create a generation of efficient, environmentally responsible, and healthy buildings.

In 2010, the State of California published the first version of the California Green Building Standards Code, also known as CALGreen. CALGreen includes certain mandatory requirements as well as two tiers of voluntary green building measures for enhanced building design and performance. The mandatory requirements involve water and energy efficiencies, indoor air quality, and the use of sustainable building materials. Voluntary measures, on the other hand, are encouraged to enhance the requirements and/or add sustainable features, such as photovoltaic solar. Palo Alto adopted the 2010 CALGreen voluntary tiers as locally mandatory requirements for non-residential projects that meet specific criteria. For residential projects, the City also adopted additional green building requirements beyond CALGreen³.

In April 2016, Council adopted a Sustainability and Climate Action Plan (S/CAP) framework, with the ambitious goal of reducing greenhouse gas emissions 80% below 1990 levels by 2030, which is 20 years ahead of California's goal (EO S-3-05). The four focus areas in the S/CAP include energy, electric vehicles, mobility, and water. The City's Green Building Ordinance and Energy Reach Code (collectively referenced as "Reach Codes" in this staff report) address three of these four areas. The Palo Alto Green Building Advisory Group (GBAG), consisting of green building professionals including architects, engineers, energy compliance designers, and contractors, convened to develop recommendations on local amendments that go beyond the state's 2016 building standards. Based on the GBAG recommendations, Council adopted the 2016 Energy Reach Code that exceeded the state's building energy standards by 10 to 20% depending on the building type; all-electric designs were exempted from these Energy Reach

¹ [Ordinance No. 5006](#) was passed in June 2008 to add a new chapter of Green Building Regulations in the City's Zoning code.

² [Ordinance No. 5024](#) was passed in December 2008 to add Chapter 16.18 in the Palo Alto Municipal code establishing local energy efficiency standards for new buildings.

³ [Ordinance No. 5107](#) was passed in December 2010.

Code

requirements.

In December 2019, Council adopted local amendments to the 2019 California Building Energy Efficiency Standards (California Energy Code) that require: (i) all-electric design for low-rise residential new construction projects beginning in April 2020, and (ii) all-electric preferred design for nonresidential new construction projects; mixed-fuel design will need to be more efficient than the State's building energy standard and also meet electric-readiness requirements. Council further directed staff to return to City Council with:

- an updated energy code ordinance to mandate an all-electric design for all new buildings by the end of 2020
- research efficient electric alternatives to replace gas appliances in existing homes, along with funding sources
- engage stakeholders in a discussion regarding changes to the zoning and building codes to define when a substantially remodeled structure is considered new construction and therefore, subject to current standards.

Staff is presenting updated codes in accordance with California Code of Regulations (CCR), Title 24, and the 2022 Codes will become effective on January 1, 2023; however, the building permit application date establishes which specific code edition applicable to a building project. Therefore, projects submitted for a permit on or after January 1, 2023, must be designed to the 2022 edition of the California Building Standards Code. Nine ordinances are included in the recommended code updates as described below:

- A. **Ordinance repealing Chapter 15.04 of the Palo Alto Municipal Code and adopting a new Chapter 15.04, California Fire Code, 2022 Edition, and local amendments and related findings** – The 2022 California Fire Code is based on the 2021 International Fire Code. The 2022 code improves upon the 2019 Standards for reducing hazards, increasing fire and life safety, and property preservation. Most local amendments are derived from the collaborative efforts of the Santa Clara County Fire Marshal's Association. (Attachment A)

- B. **Ordinance repealing Chapter 16.04 of the Palo Alto Municipal Code and adopting a new Chapter 16.04, California Building Code, California Historical Building Code, and California Existing Building Code, 2022 Editions, and local amendments and related findings** – The California Building Code (CBC) is the fundamental building code within the State of California that regulates most new building construction and is based on the 2021 International Building Code (IBC), written by the International Code Council (ICC), as amended by the California Building Standards Commission. The 2022 California Historical Building Code (CHBC) is unique to California and prescribes building standards for designated historic structures aimed at balancing the goals of historic preservation with life safety and accessibility concerns when the provisions of the regular building code cannot be achieved. The 2022 California Existing Building Code (CEBC) is based on the 2021 International Existing Building Code, also written by the ICC, as amended by

the Building Standards Commission. Like the CHBC, the CEBC prescribes alternative building standards for repairs to existing structures when the provisions of the regular code cannot be achieved. (Attachment B)

- C. **Ordinance repealing Chapter 16.05 of the Palo Alto Municipal Code and adopting a new Chapter 16.05, California Mechanical Code, 2022 Edition, and local amendments and related findings** – The California Mechanical Code (CMC) is based on the 2021 Uniform Mechanical Code (UMC), written by the International Association of Plumbing & Mechanical Officials (IAPMO), as amended by the California Building Standards Commission, and prescribes standards for mechanical heating, ventilating and cooling systems, and appurtenant equipment, within buildings. (Attachment C)
- D. **Ordinance repealing Chapter 16.06 of the Palo Alto Municipal Code and adopting a new Chapter 16.06, California Residential Code, 2022 Edition, and local amendments and related findings; and amending Chapter 16.52 to align with federal, state, and local regulations for flood hazards** – The California Residential Code (CRC) is based on the 2021 International Residential Code (IRC), which is written by the International Code Council, as amended by the California Building Standards Commission. The Residential Code is a simplified version of the Building Code and prescribes building standards for low-rise (one and two-story), detached single and two-family dwelling units, and townhouses not more than three stories in height. (Attachment D)

Chapter 16.52 was last updated in May of 2004 through ordinance 4824. The codified requirements were consistent with the 2001 CBSC. Beginning with the 2010 CBSC, however, the state has required a minimum one-foot of freeboard requirement, which exceeds the requirement codified in Chapter 16.52. In addition, in 2021 the Community Rating System (CRS) Coordination Manual, a manual for a National Flood Insurance Program that incentivizes communities to participate by associating a lower CRS rating number with higher flood insurance premium discounts, amended one of the pre-requisite requirements. As of 2021, a community must set a minimum 1-foot of freeboard requirement to maintain a rating of 8 or lower. The Palo Alto community has a CRS rating of 6 and receives a 20% discount in flood insurance for residents who purchase flood insurance. City staff have recently been requiring applicants to comply with the more stringent requirement and now propose to align the municipal code with current practice and the state and federal standards. (Attachment D)

- E. **Ordinance repealing Chapter 16.08 of the Palo Alto Municipal Code and adopting a new Chapter 16.08, California Plumbing Code, 2022 Edition, and local amendments and related findings** – The California Plumbing Code (CPC) is based on the 2018 Uniform Plumbing Code (UPC), also written by the International Association of Plumbing and Mechanical Officials (IAPMO), as amended by the California Building Standards Commission, and prescribes standards for water and wastewater distribution systems, and appurtenant equipment, within buildings. (Attachment E)

- F. **Ordinance repealing Chapter 16.16 of the Palo Alto Municipal Code and adopting a new Chapter 16.16, California Electrical Code, 2022 Edition, and local amendments and related findings** – The 2022 California Electrical Code (CEC) is based on the 2020 National Electrical Code, written by the National Fire Protection Agency (NFPA), as amended by the California Building Standards Commission, for appurtenant equipment within buildings. (Attachment F)
- G. **Ordinance repealing Chapter 16.18 of the Palo Alto Municipal Code and adopting a new Chapter 16.18, Private Swimming Pool and Spa Code, 2022 Edition** – The Private Swimming Pool and Spa Code is based on the 2021 International Swimming Pool and Spa Code (ISPSC) to regulate private residential swimming pools and spas. (Attachment G)
- H. **Ordinance repealing Chapter 16.14 of the Palo Alto Municipal Code and adopting a new Chapter 16.14, California Green Building Standard Code, 2022 Edition, and local amendments and related findings** – The California Green Building Standard Code (CALGreen) is unique to California. The purpose of CALGreen is to improve public health, safety, and general welfare through enhancement of the design and construction of buildings using building concepts that reduce negative impacts, generate positive environmental impacts, and encourage sustainable construction practices. As such, CALGreen in conjunction with City of Palo Alto amendments apply to planning, design, operation, construction, use, and occupancy of residential and non-residential construction. (Attachment H)
- I. **Ordinance repealing Chapter 16.17 of the Palo Alto Municipal Code and adopting a new Chapter 16.17, California Energy Code, 2022 Edition** – The California Energy Code is unique to California. The 2022 Energy Code encourages efficient electric heat pumps in an effort to reduce energy usage and to produce fewer emissions than traditional HVACs and water heaters; establishes electric-ready requirements for buildings for cleaner electric heating, cooking, and electric vehicle charging; and expands solar photovoltaic and battery storage standards to be ready when needed and reduce the grid’s reliance on fossil fuel power plants; and strengthens ventilation standards to reduce illness from poor air quality and reduce disease transmission. (Attachment I)

DISCUSSION

The City has historically amended the California Building Standards Code triennially. The proposed amendments represent a continuation of some of the local amendments currently in effect. A discussion of the more substantive local amendments to the 2022 California Building Standards Code, include the following, which are discussed in more detail below:

1. Administrative Amendments;

2. Soils Reports requirement;
3. Plain Concrete, Embodied Concrete, and Concrete Special Inspection;
4. Ventilation of weather-exposed enclosed assemblies;
5. Fire Resistant Construction and Fire Separation;
6. Wood Structures and Prescriptive Conventional Construction;
7. California Mechanical Code Amendments;
8. California Plumbing Code Amendments;
9. California Electrical Code Amendments;
10. Automatic Fire Extinguishing Systems;
11. California Fire Code Amendments;
12. Flood resistance construction;
13. Structural Amendments and Suspended Ceiling;
14. Appendix chapters in 2022 California Building Standards Code;
15. California Residential Building Code; and
16. California Green Building Standards Code (CALGreen) and Energy Code

1. **Administrative Amendments:** The administrative amendments for the Building, Electrical, Green Standards, Mechanical, Plumbing, Residential, Existing Building, Historic, and Fire codes include:
 - Work exempt from a building permit;
 - When a demolition permit is required;
 - Time limitation of application, its expiration, and term limit for permit;
 - Process for permit refunds and when re-inspection fee is assessed;
 - Application process to obtain a building permit;
 - Preliminary accessibility inspection is required;
 - Use and occupancy, change of occupancy, and temporary occupancy requirements;
 - Stop work order for violations of the ordinance; and

Many of these administrative amendments are carried forward from the previous code adoption and clarified as needed. To avoid confusion and enable ease of application, Chapter 1 of the 2022 California Building Code will serve as the primary administrative chapter for all adopted codes in lieu of including a separate administrative chapter for each code. New amendments pertain to fence material and its height. The fence height code is amended to define the fence materials (a wood fence 7 feet or less or concrete/masonry fence 4 feet or less is exempt from permit requirements). Taller walls with heavier materials will require engineering to avoid failure due to high wind and earthquake events.

2. **Soils Reports Requirements:** The amendment is carried forward to allow light framed construction to use a prescriptive thicker, wider and deeper continuous footing in lieu of requiring a soils report for 1, 2, and 3 stories of light-framed construction.
3. **Plain Concrete, Embodied Concrete, and Concrete Special Inspection:** Concrete is strong in compression and is weak in tension. For this reason, it needs help in resisting

tensile stresses caused by bending forces from applied loads, which would ultimately result in cracking and potentially failure. Plain concrete has proven to perform poorly due to dynamic cyclic loading in the Loma Prieta and Northridge earthquakes; structural elements require reinforcements. This amendment is carried forward from the previous code adoption. The concrete special inspection code section is amended and provides further clarification when special inspection by a special inspector agency is required. This is to ensure the quality of major structural elements and their connections are constructed correctly with proper inspections and confirm these elements perform effectively as part of the vertical and lateral resisting systems of the buildings. As part of the proposed code adoption, staff proposes low carbon concrete requirements in the area of building construction when concrete is used. See the CALGreen discussion below for detailed discussion.

4. **Ventilation of weather-exposed enclosed assemblies:** The amendment is deleted as the requirement to provide cross ventilation in the enclosed floor space of a balcony to avoid dry-rotting of the structural framing members is now in the California Building Code. This amendment was added previously in the last code adoption due to the Berkeley balcony collapse which resulted in the death of six people.
5. **Fire Resistant Construction and Fire Separation:** The 2022 Codes continue to rely heavily on the installation of fire sprinkler systems. Under the 2022 Codes, a fire extinguishing system can be used to increase the overall building height and floor area and to reduce the fire resistivity of its structural elements, exterior walls, and exit corridors. The California State Fire Marshal's Office (SFM), again, rejected some of these provisions for occupancy groups under their authority and limited the use of fire sprinkler systems to either increase floor area or height, but not both. The SFM also does not allow a sprinkler system to be used to reduce the required fire-resistant construction of roof-tops, exit corridors, and occupancy separations between units of multi-unit residential units. The local amendments maintain fire resistance of walls separating sleeping units in multifamily, hotels and motels, and extend this requirement to duplexes. This fire-resistant specification is already required for all other multi-unit residential buildings.
6. **Wood Structures and Prescriptive Conventional Construction:** The amendments carry forward from previous code adoption the requirements disallowing certain types of brittle wall coverings (stucco, sheetrock) for seismic load-resisting elements, which have performed poorly in previous earthquakes.
7. **California Mechanical Code Amendments:** The proposed amendment requires fire protection of the kitchen type I hood and duct system for all buildings to prevent the spread of fire into concealed ceiling space. There were a number of grease duct fires in single-story buildings, which were contained by shafts. If the shaft had not been fire-rated, the fire would have easily spread to the roof and other portions of the building.

Therefore, the amendment will ensure that any new hood or duct is enclosed and protected by fire-rated materials.

8. **California Plumbing Code Amendments:** These Plumbing Code amendments are intended to promote consistency with Palo Alto's Sewer Use Ordinance (PAMC Chapter 16.09), support the City's efforts to reduce copper and other heavy metal discharges to the Wastewater Treatment Plant, and increase water conservation efforts (e.g. the prohibition of single-pass cooling systems). This amendment carries forward previous code adoption.
9. **California Electrical Code Amendments:** The Electrical Code amendments carry forward the requirement of a housekeeping pad under electrical equipment directly supported on slab floor subject to shallow floods and floor cleaners for protection of equipment and third-party field evaluation for unlisted equipment to protect the end users.
10. **Automatic Fire Extinguishing Systems Amendments:** Most requirements for Automatic Fire Extinguishing Systems (AFES) are being carried forward with minor changes made for clarification purposes. These include minor language updates for residential sprinkler systems required in new or altered basements and altered single-family dwellings. New amendments include an increase in fire protection for laboratory storage/use of hazardous materials and structures with higher firefighting hazardous conditions and the wildland-urban interface fire area.
11. **California Fire Code Amendments:** The majority of proposed amendments are mostly administrative and are similar to amendments or practices currently in place. Several sections of the California Fire Code (CFC) related to definitions, fire sprinkler specifications and hazardous materials are amended to allow the Fire Department greater flexibility and application of life safety and property conservation controls. New amendments include: HazMat permits, lithium battery storage, fire equipment identification, and fire sprinkler design. These can be summarized as follows:
 - Amended or added operational permits for underground storage tanks, battery operated equipment, liquid gas fueled equipment, and hot work.
 - Removed a significant portion of section 315.8 Lithium battery storage and section 321 related to additive manufacturing due to new sections added to 2022 CFC.
 - Added a section on Fire protection equipment to be painted red for identification.
 - Specified language on residential sprinklers required in basements and single-family dwellings.
 - Amended the qualifications for NFPA 13 sprinkler systems to further define where and what densities are required for higher level of protection to life and property, including light hazard designed with larger remote area, laboratory areas with ordinary hazard 2 density, and parking areas with mechanical vehicle

storage equipment with extra hazard 2 density. Multi-residential apartments, townhomes, and condominiums must also be designed to NFPA 13.

- Increased fire sprinkler design criteria for residential structures determined to have higher firefighting hazardous conditions or located in the wildland urban interface.
- Defined where emergency lighting is required in a building, all public restrooms will be covered.
- Amended emergency escape and rescue openings in basements and storm shelters to match CRC ordinance.
- Amended the large-scale fire test for energy storage systems to include reference to NFPA 855 Standard for the Installation of Stationary Energy Storage Systems. Placement of residential energy storage systems also amended to exclude below or above emergency escape and rescue openings.
- Amended Chapter 49 Requirements for Wildland-Urban Interface Fire Area to incorporate new code section from 2022 CFC.
- Provided administrative updates to hazmat sections with new formatting, and clarification of definitions and processes.

12. Flood resistant construction: The California Residential and Building Codes provide minimum requirements to safeguard the public health, safety, and general welfare and to minimize public and private losses due to flooding through regulations of development in flood hazard areas. These code provisions specify flood loads and flood resistant construction materials and installation methods, which include construction practices to minimize unnecessary disruption of commerce and allow access and public service during times of flooding. The proposed amendments to the Municipal Code Chapter 16.52 include adding frequently used terms and definitions and clarifying the flood resistant provisions for basements, garages and openings within crawl spaces. This ordinance will also codify the minimum freeboard requirement for finished floor elevation and language regarding technical data submittals to FEMA. The minimum one-foot of freeboard requirement was introduced in the 2010 CBC. It was also adopted in 2021 as a federal prerequisite to reduced insurance premiums under the National Flood Insurance Program. Palo Alto has recently required compliance by applicants with the one-foot freeboard requirement per the 2010 CBC, but the Municipal Code has not yet been updated and currently includes a standard of setting the finished floor at or above the base flood elevation. The proposed amendments to Chapter 16.52 align the Municipal Code with the CBC. This amendment includes a new section 16.52.075 that was not previously in the chapter. This language is based on the Chapter 44 of the Code of Federal Regulations section 65.3. This codifies submittals to FEMA when new technical or scientific data is available that may alter flooding conditions, risk premium rates, and flood plain management requirements.

13. Structural Amendments and Suspended Ceiling: The California Building Code has little information regarding seismic design requirements for suspended ceilings. It is through

the experience of prior earthquakes, such as the Northridge and Loma Prieta Earthquakes, that this local amendment is proposed to minimize the amount of body and building damage where these ceilings are installed. Since a great deal of emphasis has been placed on sprinkler systems, all measures that further ensure the sprinkler system will function after an earthquake are of great importance to Palo Alto due to proximity to the San Andreas and Hayward Faults. Additionally, nonstructural components such as mechanical and electrical equipment, shelving, and similar components failed and compromised building occupants during past earthquakes when proper anchoring to the floor or ceiling supports were not provided. All other proposed structural amendments are based on Uniform Code Committee and regional branches of Structural Engineers Association of California recommendations.

The structural amendment is also carried forward repair and reconstruction standards incorporation into the Building Code to meet the Federal Emergency Management Association's (FEMA's) eligibility requirements for post-disaster funding assistance for repairs to public and private non-profit-owned buildings damaged in disasters.

14. **California Building Standards Code Appendices:** Appendices are not adopted as part of the California Building Standards Code. They are provided in the Code to offer optional or supplemental criteria to the provisions in the main chapters of the code. The proposed ordinance adopts the following appendix chapters of the 2022 California Building Standards Code and references:

California Building Code: These appendices are carried forward from the current code in effect.

- Appendix Chapter I: This appendix chapter contains requirements for patio covers.
- Appendix Chapter J109.4: This section of appendix J carries forward the drainage across property lines.
- Appendix Chapter P: This chapter includes provisions that provide emergency housing design.

California Electrical Code: These appendices are carried forward from the current code in effect.

- Appendix Chapter B: This appendix chapter contains application information for ampacity calculations.
- Appendix Chapter C: This appendix chapter contains conduit, tubing and cable tray fill tables for conductors and fixture wires of the same size:
- Appendix Chapter I: This chapter includes provisions on tightening and torque requirements.

California Residential Code: These appendices are carried forward from the current code in effect except Appendix AX, which is added.

- Appendix Chapter AH: This appendix chapter contains requirements for patio covers.
- Appendix Chapter AJ: This appendix chapter contains provisions for the construction of Existing Buildings and Structures.
- Appendix Chapter AK: This appendix chapter contains provisions for sound transmission between attached dwelling units.
- Appendix Chapter AX: This is a new appendix chapter that contains provisions for swimming pools and spas.

California Mechanical Code: These appendices are carried forward from the current code in effect.

- Appendix Chapter B: This appendix chapter contains procedures to be followed to place gas equipment in operation.
- Appendix Chapter C: This appendix chapter contains provisions for installation and testing of oil (liquid) fuel-fired equipment.
- Appendix Chapter G: This appendix chapter contains provisions for Sizing of venting systems and outdoor combustion and ventilation.

California Plumbing Code: These appendices are carried forward from the current code in effect.

- Appendix Chapter A: This appendix chapter contains provisions for the sizing of water supply system and outdoor combustion and ventilation.
- Appendix Chapter D: This appendix chapter contains provisions for the sizing of storm water systems.

California Green Building Standards Code: These appendices are carried forward from the current code in effect.

- Appendix Chapter A4: This appendix chapter contains residential voluntary green measures adopted by the City to enhance greener design provisions in existing and new residential buildings.
- Appendix Chapter A5: This appendix chapter contains non-residential voluntary green measures adopted by the City to enhance greener design provisions in existing and new non-residential buildings.

California Existing Building Code: These appendices are carried forward from the current code in effect.

- Appendix Chapter A1 – Seismic Strengthening Provisions for Unreinforced Masonry Bearing Wall Buildings
- Appendix Chapter A2 – Earthquake Hazard Reduction in Existing Reinforced Concrete and Reinforced Masonry Wall Buildings with Flexible Diaphragms.
- Appendix Chapter A3: This appendix chapter contains prescriptive provisions for seismic strengthening of cripple walls.

- Appendix A4 – Earthquake Risk Reduction in Wood-Frame Residential Buildings with Soft, Weak or Open Front Walls
- Appendix A5 – Referenced Standards

California Fire Code: These appendices are carried forward from the current code in effect.

- Appendix Chapter B: This appendix chapter contains fire-flow requirements for buildings.
- Appendix Chapter C: This appendix chapter contains provisions for fire hydrant locations and distribution.
- Appendix Chapter D: This appendix chapter contains provisions for fire apparatus access roads.
- Appendix Chapter E: This appendix chapter contains hazard categories for classifying hazardous materials.
- Appendix Chapter F: This appendix chapter identifies hazard ranking for hazardous materials.
- Appendix Chapter G: This appendix chapter contains tools to measure cryogenic fluids.
- Appendix Chapter H: This appendix chapter contains provisions for hazardous materials management plans and inventory statements.
- Appendix Chapter K: This appendix chapter contains provisions for construction requirements for existing ambulatory care facilities.

15. **California Residential Code:** Except as noted below, the proposed amendments are administrative and similar to the amendments for adoption to California Building Code for residential buildings. The administrative chapter of the California Residential Code is no longer adopted but refers to the administrative provisions of the California Building Code. The technical provisions include requirements for fire-sprinkler, smoke alarm and carbon monoxide alarm, emergency escape and rescue opening, and window well protection. The amendments also prohibit the use of brittle materials for bracing dwellings due to its poor performance in a seismic event. These provisions are currently in effect in the City of Palo Alto and are carried forward to the 2022 Code.

Dwelling Unit and Congregate Housing Occupancy

A new section being introduced as a local amendment to this code cycle establishes standards that regulate the number of individuals that can occupy the same dwelling unit. A jurisdiction might be interested in establishing such regulation to ensure living spaces are adequate for the number of occupants living in a dwelling and to minimize overcrowding. The language included in the draft ordinance is borrowed from the City of San Francisco's municipal code and based on staff's review, is a balanced regulation that is not anticipated to generate any significant compliance constraints. The ordinance as drafted would apply prospectively to future projects, including new construction,

remodels of existing buildings, and changes in occupancy. This regulation is provided in building code section 16.04.265.

16. California Energy and Green Building Standards Code:

The proposed 2022 Reach Codes (in effect between January 2023 and December 2025) carry forward the local amendments from the 2019 Reach Codes and specify additional requirements in the areas of building electrification, EV infrastructure, water efficiency and embodied carbon in building materials. In developing these proposed requirements, staff has considered environmental benefits, cost impacts to the project applicant and building occupant, compliance flexibility, and code enforceability.

The proposed requirements under each of these areas are described below.

a. Proposed Building Electrification Requirements

Natural gas use in buildings account for 35% of the City's greenhouse gas emissions⁴ in 2020. To meet the City's aggressive greenhouse gas reduction goal, it is critical to begin the shift away from burning natural gas for water heating, space heating, cooking, and other end uses to clean and efficient electric alternatives, as the City provides 100% carbon-neutral electricity. The easiest and most cost-effective way to make this shift is to require an all-electric design for all new buildings. All-electric buildings are also healthier and safer for the occupants as there are no natural gas combustion byproducts released into the living space and no open flame that carries the risk of fire.

Staff has continued to participate in the California Codes and Standards Reach Codes Program ("Statewide Reach Codes Program") funded by the state's investor-owned utilities. Over the past two years, the Statewide Reach Codes Program has hired consultants to develop cost-effectiveness studies for all-electric buildings including new detached ADUs⁵, new large office buildings⁶, and new multifamily buildings⁷ based on the 2019 California Energy Code. These studies examined the cost-effectiveness of mixed-fuel buildings with additional efficiency (including solar) measures as well as all-electric buildings with additional efficiency measures⁸.

For all-electric new buildings, the preliminary cost-effectiveness results show a minimal amount of cost-effective energy efficiency beyond the state's 2022 building energy standards ("2022 Energy Code"). This is attributed to the fact that the state's building

⁴ [Palo Alto's 2020 Greenhouse Gas Emissions Inventory](#)

⁵ [2020 Cost-Effectiveness Study for New Detached ADUs](#), March 2021

⁶ [2019 Cost-Effectiveness Study for Large Office](#), October 2021

⁷ The Cost-Effectiveness Study for new Multifamily Buildings is expected to be published by the end of 2022.

⁸ There are also cost-effectiveness studies on the efficiency and electrification upgrades of existing buildings including [single family residential buildings](#), [multifamily residential buildings](#), and [nonresidential buildings](#).

energy standards have become increasingly stringent⁹. For example, new single-family homes built under the 2019 Energy Code use about 7 percent less energy than homes built under the 2016 Energy Code due to improved energy efficiency requirements.

The 2022 California Energy Code is designed to meet the state’s building decarbonization goals by encouraging adoption of on-site photovoltaic generation and efficient electric technologies, and increasing electric load flexibility to support grid reliability. For new single-family homes in Climate Zone 4 where Palo Alto is located, heat pump space heating and water heating are adopted as prescriptive requirements in the 2022 Energy Code. For new nonresidential buildings, heat pump space conditioning and heat pump water heating systems are also prescriptive requirements for buildings that meet specific requirements such as space type and cooling capacity.

For the 2022 building code cycle, staff recommends requiring all-electric designs for new construction projects; this requirement applies to all single-family buildings, detached ADUs, multifamily buildings, nonresidential buildings, and mixed-use buildings. Given that heat pump space heating and water heating equipment is prescriptively required in the 2022 Energy Code for most projects, there is no additional cost for most all-electric projects. Without requiring additional energy efficiency savings, this proposed all-electric requirement does not constitute a local building energy standard and therefore does not need to be approved by the California Energy Commission as required by Public Resources Code section 25402.1(h)(2). The proposed all-electric building pathway is instead adopted as a local amendment to the Green Building Standards Code and justified based on Health & Safety Code sections 17958.5 and 17958.7(a) with topographic, climatic, environmental, and geologic findings. The proposed all-electric design amends CALGreen’s site development sections for both residential and non-residential buildings. Staff estimates the avoided greenhouse gas (GHG) emissions of this proposed all-electric mandate at 340 MT CO₂-e/yr, compared to mixed-fuel buildings. By 2030, the estimated annual emissions reductions attributed to this proposed requirement is 2,700 MT CO₂-e (the GHG emission associated with demolition and site-prep are not accounted).¹⁰

Neither the California Building Standards Code nor Palo Alto Municipal Code has a definition for substantial remodel/alteration or rebuilt. Staff attempted to define a global or ‘one size fit all’ definition for substantial remodel/rebuilt definition that would apply to multiple city regulations but was unable to do so in a timely manner. Instead, staff proposes an incremental step to define a substantial remodel definition for electrification purposes at this time and will work with city staff and the community to derive a more encompassing definition as the next step. Currently, alteration projects do not need to be rebuilt to meet the all-electric requirements. Staff proposes the following Substantial Remodel definition

⁹ The Energy Code is updated every three years with the mandate to increase building energy efficiency while staying cost-effective for building owners over the lifespan of a building.

¹⁰ This assumes that each year there are 100 new single-family projects, 25 new detached ADU projects, 8 multifamily dwelling units, and 9 new nonresidential projects.

that triggers the all-electric building requirements: “For the purpose of electrification, substantial remodel shall mean the alteration of any structure, including cumulative projects or additions to the existing structure within any three (3) year period, that affects the removal or replacement of 50% or more of the linear length of the exterior weight-bearing walls of the building, 50% or more of the wall plate height is raised, and/or 50% or more of the roof structural framing.” The proposed definition provides an easy and simple method for the applicant and staff to determine whether a remodeling project needs to meet require the all-electric requirements. The 3-year period is measured between the first building permit issuance to the submittal of the next building permit application for any remodel or building addition. Staff estimates the avoided GHG emissions of this proposed substantial remodel definition at 90 MT CO₂-e/yr. By 2030, the estimated annual emissions reduction attributed to the proposed substantial remodel definition is 720 MT CO₂-e per year¹¹.

Besides requiring all-electric design for new buildings and substantial remodels, staff recommends prohibiting the extension of gas infrastructure in existing buildings to outdoor amenities such as pools, spas, fireplaces, and grills in order to minimize the carbon footprint of this equipment. Heat pump pool and spa heating systems are six times more efficient than their gas counterparts, and there is a wide range of heating capacity available for backyard pools¹². Such heat pump systems have been widely accepted outside of California, especially in mild climate locations such as Florida. A 2019 cost-effectiveness study¹³ of heat pump pool heating in Santa Monica shows that heat pump pool heaters have a lifecycle benefit-cost ratio ranging from 0.87 to 1.27, based on an incremental equipment cost between \$900 and \$1,300. The study estimates the annual GHG savings of a heat pump pool heater to be slightly higher than a heat pump water heater, around 1.5 MT CO₂-e . For outdoor grills and fireplaces, portable propane tanks are simple substitutes for gas line extensions, avoid the cost of trenching a gas line to the equipment, and also do not require a building permit for its installation.

To address electrification in existing buildings, staff proposes requiring a heat pump water heater when the existing water heater is replaced or a new water heater is added as part of a residential addition/alteration project. The federal tax credit for installing heat pump equipment offered by the Inflation Reduction Act of 2022, plus the projected bill savings over the lifetime of the heat pump water heater (HPWH), has made HPWH more cost-effective compared to a gas water heater.

Staff has also considered requiring a heat pump space conditioning system when the gas furnace/boiler is replaced as part of an alteration project. However, the electric demand of a heat pump space heating system is significantly higher than that of a heat pump water heater. In discussions this spring, the Council Ad Hoc S/CAP Committee agreed to focus

¹¹ This assumes that each year there are 50 single-family projects that meets the substantial remodel definition.

¹² A Pocket Guide to All-Electric Retrofits of Single-Family Homes, Redwood Energy, August 2021, pp 66-67

¹³ [Cost-Effectiveness Study: All-Electric Heat Pump Pool Heating – Non-Preempted](#), August 2019

primarily on water heater conversion in the near term while electric grid modernization efforts ramped up, and a focus on space conditioning would be at odds with that prioritization. Also, while a heat pump space conditioning system offers space cooling which is a desirable feature, it will cost substantially more than simply replacing the gas furnace. Staff proposes revisiting this requirement at a later point when the grid modernization effort is underway and a predictable schedule is in place.

City Programs to Support Building Electrification

Over the past few years, the Utilities Department has actively promoted the many benefits of all-electric buildings and is planning to launch new programs to support electrification retrofit projects in existing residential buildings. Most single-family homes currently use natural gas as the primary fuel source for water heating, space heating, and cooking. The current S/CAP goals assume that all single-family homes will be all-electric homes. There is much work that lies ahead to fully electrify the 15,600 single-family homes. The lowest cost pathway would be to replace the gas equipment with efficient electric alternatives as they reach the end of useful life. Electric equipment typically has higher amp draw than its gas counterparts and may also require a dedicated circuit. To support customers with electrification planning, CPAU has offered a home electrification readiness assessment service since August 2019.

Over the next year, CPAU will focus on promoting the adoption of heat pump water heaters (HPWH) by offering an advanced HPWH pilot that covers turnkey equipment installation and financing to residential customers¹⁴. This pilot is designed to equitably support heat pump water heater replacement regardless of whether the customer is a homeowner or renter and the customer's financial status, with the goal of retrofitting 1,000 residential gas water heaters primarily in single-family homes. The pilot will create a foundation for similar programs for heat pump space heating and other electric equipment and appliances in the future. CPAU will continue to collaborate with Development Services to develop a streamlined process to permit HPWH and other electrification installations.

Besides water heating, space heating represents the biggest end use for natural gas in a typical home in Palo Alto. However, CPAU has decided to delay offering rebates for residential heat pump space conditioning systems. This is because the typical load for a heat pump space conditioning system in a single-family home is five times the typical load of a heat pump water heater, and many transformers in residential neighborhoods are already near capacity. As stated earlier, staff is prioritizing water heater conversion in the near term and will revisit program options to encourage the electrification of gas space heating equipment at a later point.

For non-residential customers, CPAU has expanded its business rebate offerings to include electrification rebates¹⁵ to incentivize commercial customers to replace gas equipment with efficient electric alternatives. Both prescriptive and custom electrification rebates are

¹⁴ Staff Report #14542, September 27, 2022

¹⁵ <https://www.cityofpaloalto.org/businessrebates>

available to support a variety of projects. In August 2022, CPAU launched the Business Electrification Technical Assistance Program (BE TAP)¹⁶ which offers free onsite assessment to identify electrification opportunities in commercial buildings, school facilities, and public facilities, and serves as a resource to support a customer’s electrification journey.

In FY 2023, building electrification programs are funded from three sources: (i) Electric Public Benefit funds, which is collected through a mandated charge of 2.85% of the electric retail rate for all electric utility customers, to fund energy efficiency programs, renewable energy projects, research and development projects, and low-income efficiency programs; (ii) Electric Local Decarb Reserves, which is funded by the Renewable Energy Certificate (REC) Exchange program¹⁷; and (iii) Gas Local Decarb Reserves, which is funded by a portion of the Cap and Trade auction proceeds from the sale of allocated Cap and Trade allowances to the Gas Utility. The total building electrification budget in FY 2023 is \$4 million, although staff is currently proposing a FY 2023 budget amendment to fund the advanced HPWH pilot¹⁸

Other Cities’ Policies Related to Building Electrification

As of August 2022, 59 other jurisdictions in California have adopted all-electric or natural gas ban ordinances for new construction projects, with more cities and counties anticipated to adopt all-electric codes with the 2022 building code cycle. Some of these local jurisdictions include San Francisco, South San Francisco, Oakland, Berkeley, Brisbane, Marin County, Burlingame, Millbrae, San Carlos, San Mateo, San Mateo County, Redwood City, Menlo Park, East Palo Alto, Sunnyvale, Mountain View, Morgan Hill, San Jose, Milpitas, and Hayward. All of these cities have performed a similar analysis and have adopted the all-electric code in order to meet their climate action plan’s GHG reduction targets. Each city adapts the all-electric ordinance to suit the building types, uses, sizes, and age of the building stock within the jurisdiction.

In addition to the all-electric requirement for new construction projects, City of San Mateo has also proposed the following 2022 reach code requirements for existing residential buildings (to be enforced at the time of permit application):

(i) requires panel replacement and panel upgrade projects to include panel capacity/breaker space for future electrification;

(ii) requires all kitchen and laundry renovations include installation of an electric outlet to support future electrification of gas appliances:

(iii) requires installation of heat pump air conditioning when new air conditioning is installed

¹⁶ <https://www.cityofpaloalto.org/business/electrification>

¹⁷ <https://www.cityofpaloalto.org/files/assets/public/agendas-minutes-reports/reports/city-manager-reports-cmrs/year-archive/2020-2/id-11566.pdf>

¹⁸ Staff Report 14606, September 27, 2022

or replaced, in conjunction with furnace replacement;

(iv) requires new pools to use electric or solar pool heating, and prohibit the extension of fuel gas infrastructure into the backyard for uses such as fire pits, grills, and pools;

(v) require heat pump water heater installation during addition and alteration projects that include water heater replacement.

b. Proposed EV Infrastructure Requirements

Palo Alto has long recognized the need to support EV adoption through the city's building standards to offer easily accessible EV charging stations at the time of construction; retroactive installation of electrical wiring for EV charging would be much more costly across all building types. In December 2013¹⁹, City Council adopted the requirement for EV charging infrastructure in new single-family homes; six months later, City Council adopted EV charging infrastructure requirements for new multifamily and nonresidential buildings including hotels²⁰. The definitions used for EV charging infrastructure have remained largely unchanged since 2014.

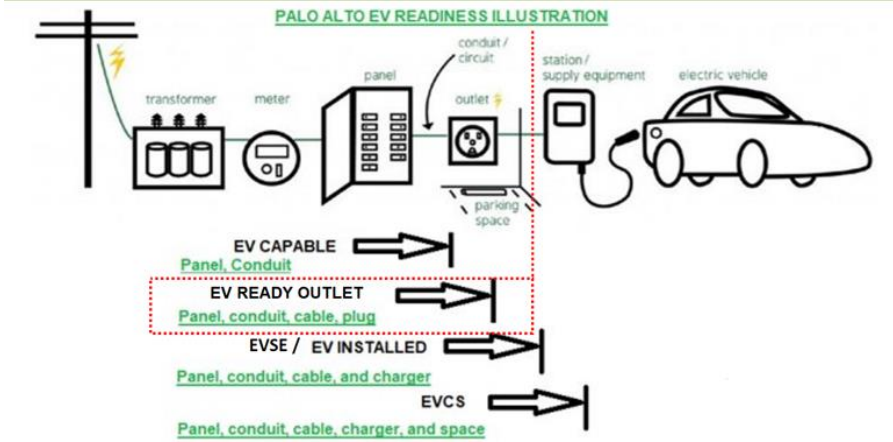
California began mandating EV charging infrastructure for new single-family homes via CALGreen since 2015 and for nonresidential buildings since 2017²¹. CALGreen provides definitions for EV charging requirements that are commonly accepted by the building industry. For the 2022 building code cycle, staff proposes that Palo Alto align the current definitions for EV charging requirements to match CALGreen. Consistency in terminologies for EV charging requirements across jurisdictions helps to minimize confusion among developers and architects. These definitions are provided below and illustrated in Figure 1:

Figure 1: An Illustration of different levels of EV Readiness

¹⁹ [Staff Report 4315](#), December 9, 2013

²⁰ [Staff Report 4823, June 16, 2014](#)

²¹ [Light-Duty Electric Vehicle Charging Infrastructure Analysis for California's CALGreen Building Code](#), September 2021



EV Capable Space: a vehicle space with electrical panel space and load capacity to support a branch circuit and necessary raceways, both underground and/or surface mounted, to support EV charging

EV Ready Space: a vehicle space which is provided with a branch circuit and any necessary raceways to accommodate EV charging, terminating in a receptacle or a charger

Level 2 EV Supply Equipment (EVSE): The 208/240 Volt 40-ampere branch circuit, and the electric vehicle charging connectors, attachment plugs, and all other fittings, devices, power outlets, or apparatus installed specifically for the purpose of transferring energy between the premises and the EV.

Low Power Level 2 EV Charging Receptacle: A 208/240 Volt 20-ampere minimum branch circuit and a receptacle for use by an EV driver to charge their EV or hybrid electric vehicle. For the 2022 building code cycle, staff proposes the following EV charging requirements as shown in Table 1:

Table 1: Summary of EV Infrastructure Requirements

Type of building	Proposed 2022 requirements	Current 2019 requirements
New Single-Family Homes/ Duplexes	One (1) EV-Ready space or Level 2 EVSE installed per dwelling unit (Low Power Level 2 ok). ADU is exempt since it doesn't require parking.	One (1) EV-Capable, EV-Ready space or Level 2 EVSE
New Multifamily Dwellings	At least 1 Level 2 or EV Ready Space for each residential unit (Low Power Level 2 Charging Receptacle ok for up to 60% of the total EV parking spaces) EV-Capable space, EV-Ready space or Level 2 EVSE installed, for at least 25% of guest parking spaces, among which	One (1) Level 2 EV-Ready space or EVSE installed per residential unit EV-Capable space, EV-Ready space or Level 2 EVSE installed, for at least 25% of guest parking spaces, among which

	at least 5% (and no fewer than one) shall be Level 2 EVSE installed.	at least 5% (and no fewer than one) shall be Level 2 EVSE installed.
New Hotels	At least 30% EV Ready Space and at least 10% Level 2 EVSE installed	EV-Capable space, EV-Ready space, or Level 2 EVSE installed for at least 30% of parking spaces, among which at least 10% (and no fewer than one) shall be Level 2 EVSE installed.
New Non-Residential Structures other than Hotels	For building with 10 to 20 parking spaces, 20% EV-Capable space or EV-Ready space and 20% Level 2 EVSE installed. For building with over 20 parking spaces, 15% EV-Capable space or EV-Ready space and 15% Level 2 EVSE installed.	EV-Capable space, EV-Ready space, or Level 2 EVSE installed for at least 25% of parking spaces, among which at least 5% (and no fewer than one) shall be Level 2 EVSE installed.

The proposed EV infrastructure requirements are slightly higher than the 2019 requirements. Low Power Level 2 EV infrastructure will be allowed in new single-family and multi-family residential buildings but not non-residential buildings. In proposing the Low Power Level 2 EV infrastructure requirement in new multifamily dwellings, staff acknowledges the need to balance the demand for EV charging with the cost to support the electrical infrastructure to meet this demand. This includes both utility and customer equipment including the electric panel, the transformer, and the feeder line serving the building. For an 8-hour charging session, a 40-amp Level 2 EV charger can provide 220 to 240 miles, while a 20-amp low-power Level 2 EV charger can provide 110 to 120 miles, which is likely more than enough to meet the daily commute needs of most people.²²

c. Proposed Water Efficiency Requirements

For the upcoming code cycle, staff recommends all new pools and outdoor spas shall be provided with a vapor retardant cover. The objective of this code is to reduce evaporation loss of heated water; it will have the added benefit of reducing pool heating energy needs. Based on recent permit records, staff expects between 10 to 20 permit applications for new pools and spas each year. According to the U.S. Department of Energy, pool covers conserve

²² The 2022 CALGreen allows the local code enforcement agency to make the determination that the required EV charging infrastructure is infeasible on a case-by-case basis based on electric grid constraint or the added cost to support the local utility infrastructure (Section 4.106.4.1 and Section 5.106.5.3).

water by reducing the amount of make-up water needed by 30% to 50% and can provide savings on heating costs of up to 50 to 70%²³. Pool covers can cost anywhere from \$50 to thousands of dollars depending on the size and shape of the pool, as well as the type of cover installed²⁴. Since 2020, Palo Alto Municipal Code²⁵ has mandated a vapor retardant cover for all new *heated* pools and outdoor spas, and included an exception stating that pools or spas derive at least 60% of the annual heating energy from site solar or recovered energy. The proposed 2022 code update will expand the regulation to cover *all* pools and spas (heated or not) with no exception for solar-heated pools²⁶.

In addition to the pool cover requirement, staff propose an update to water efficiency management in cooling towers. In Palo Alto, cooling towers are used primarily to provide air conditioning in large commercial, lab, research, and multifamily buildings whereby heat rejection is achieved through water evaporation. The City has banned single-pass cooling since 2020²⁷. For the coming code cycle, staff recommends an update to require cooling tower projects to perform potable water analysis at the project site to calculate the maximum number of cooling tower cycles based on the maximum concentrations of parameters listed in Table 2. This follows the current LEED guideline for optimizing process water use²⁸. These calculations are typically performed by the project design team and are coordinated with the cooling tower manufacturer. Staff further proposes that cooling towers meet the maximum calculated number of cycles. In reality, the number of cycles can exceed the maximum calculated number of cycles by increasing the level of treatment and/or maintenance in the condenser or make-up water systems²⁹. This proposed update can provide significant water efficiency savings in a cooling tower project; as an example, increasing from three to four will reduce make-up water use by 11%³⁰.

Table 2. Maximum concentrations for parameters in condenser water

Parameter	Maximum Level
Ca (as CaCO ₃)	600 ppm
Total alkalinity	500 ppm

²³ [Swimming Pool Covers | Department of Energy](#)

²⁴ [Pool Cover Cost Breakdown - Pool Research](#)

²⁵ [16.18.130 Section 301.3 amended - Covers. \(amlegal.com\)](#)

²⁶ Similar regulation has been proposed in Santa Clara County's Model Water Efficient New Development Ordinance (MWENDO), which would require all new pools and spas to have some type of cover depending on feasibility (https://www.localenergycodes.com/download/536/file_path/fieldList/ModelOrd-WaterEfficiency.docx pages 22-23)

²⁷ [16.08.100 Section 808.2 Cooling water. \(amlegal.com\)](#)

²⁸ LEED v4.1 has developed a methodology to optimize water use in cooling tower by achieving the maximum number of cooling tower cycles while controlling corrosion and scale in the condenser water system ([Optimize Process Water Use | U.S. Green Building Council \(usgbc.org\)](#))

²⁹ LEED has set a precedent for optimizing cooling tower cycles and reducing water use by offering credits for cooling towers achieving the maximum number of cycles achieved without exceeding any maximum concentration levels or affecting operation of condenser water system and additional credits for using 20% or higher recycled non-potable water ([Optimize Process Water Use | U.S. Green Building Council \(usgbc.org\)](#))

³⁰ [Water Efficiency Management Guide for Mechanical Systems](#), EPA, November 2017

SiO ₂	150 ppm
Cl ⁻	300 ppm
Conductivity	3300 μS/cm

ppm = parts per million

μS/cm = micro siemens per centimeter

d. Proposed Embodied Carbon Limits in Building Materials for 2023-2025

Besides transportation and direct emissions in buildings, the embodied carbon of building materials during extraction, manufacturing, and disposal represent a very significant source of carbon emissions. In particular, concrete, with the cement that binds it together, has emerged as a leading contributor to embodied carbon. Cement production alone accounts for as much as 8% of global CO₂ emissions³¹. Ways to reduce carbon emissions associated with concrete manufacturing include limiting cement content to the extent possible while maintaining strength and utilizing greener alternative materials and/or processes.³² In 2019, Marin County adopted low carbon concrete code requirements that include both cement and embodied carbon guidelines³³; this is modeled after the Low Carbon Concrete Code developed by StopWaste³⁴. Passed in September 2021, Senate Bill 596 directs the California Air Resources Board to develop and implement a comprehensive strategy to achieve net-zero greenhouse gas emissions associated with cement used within California.

Palo Alto Municipal Code currently only covers reduction in cement usage as an elective measure³⁵. For the 2023-25 code cycle, staff recommends the use of concrete in new construction projects to adhere to cement limits (prescriptive compliance path) or embodied carbon limits (performance compliance path) as outlined in Table 3 below. These limits are based on the current Marin County low carbon concrete code. Based on staff preliminary research, all ready mix suppliers should be able to meet the code and there are at least three large concrete suppliers in the Bay Area that meet these requirements. with little or no incremental cost associated with low carbon concrete.

Table 3. Low Carbon Concrete Code Compliance Pathways

	Cement limits	Embodied Carbon limits
Minimum specified compressive strength f'_c , psi (1)	Maximum ordinary Portland cement content, lbs/yd ³ (2)	Maximum embodied carbon kg CO ₂ e/m ³
up to 2500	362	260
3000	410	289
4000	456	313
5000	503	338
6000	531	356
7000	594	394

³¹ [Concrete needs to lose its colossal carbon footprint](#), Nature Journal, September 2021

³² [UN Environment Global Status Report 2017](#), [EIA International Energy Outlook 2017](#), Architecture 2030 2018.

³³ [Marin County Low Carbon Concrete code](#)

³⁴ <https://www.stopwaste.org/concrete>

³⁵ [16.14.250 Section A4.403.2 Reduction in cement use. \(amlegal.com\)](#)

7001 and higher	657	433
up to 3000 light weight	512	578
4000 light weight	571	626
5000 light weight	629	675
Notes: (1) For concrete strengths between the stated values, use linear interpolation to determine cement and/or embodied carbon limits. (2) Portland cement of any type per ASTM C150.		

RESOURCE IMPACT

Resource impacts from the adoption of these ordinances are limited to staff training costs, purchasing copies of the new codes, updating and creating new handouts for new proposed amendments, and implementation of public outreach efforts.

POLICY IMPLICATIONS

The State of California mandates enforcement of the updated California Building Standards Code and it will go into effect regardless of whether a City adopts local amendments to the CBSC or not. The 2022 CBSC will become effective on January 1, 2023. These costs can be absorbed through the department budget.

The proposed Reach Codes support the City’s S/CAP Framework and the greenhouse gas reduction goal of 80% from the 1990 level by 2030. Staff estimates the avoided emissions attributed to the proposed Reach Codes at over 3,420 MT CO₂-e per year by 2030, or about 1% to 1.5% of the remaining emissions reductions needed to achieve the 80x30 goal (about 1.5% to 2% when upstream emissions from fuel use are included).³⁶

The proposed Reach Codes also align with one of the top four Council Priorities for CY 2022: “Climate Change – Protection and Adaptation”.

Additional code changes may be required in zoning code sections to allow for residences to exceed maximum building heights where the proposed 1-foot of freeboard may cause the buildings to exceed current height limitations. Compatibility with existing homes is another policy consideration. Several of the City’s Eichler tracts and Eichler single-story overlays are located in these flood zone areas; Eichlers are typically slab-on-grade construction and with low-pitched roofs. New homes meeting the new finished floor requirements in predominately single-story home neighborhoods in the flood zone may not be as compatible with existing homes. Additionally, state legislation enables owners to rebuild or repurpose detached accessory buildings for dwelling units (ADUs) in rear yards. A requirement for a higher finished floor will result in taller ADU structures; this could result in privacy concerns for neighbors and concerns about taller ADUs near backyards and side yards of adjacent one-story homes.

³⁶ Using 20-year global warming potentials.

STAKEHOLDER ENGAGEMENT

In developing the proposed Reach Codes recommendation, staff solicited input from various City departments including Planning & Development Services, Utilities (including Engineering division), and Public Works. On June 14, 2022, staff convened a meeting with the Green Building Advisory Group (GBAG), a group of green building professionals and stakeholders including architects, green building inspectors, and contractors, who have provided valuable input to the development of Palo Alto's Energy Reach Code and Green Building Ordinance in prior code cycles. Staff subsequently created a public [website](#) that outlines the proposed requirements under the 2022 Green Building regulations and Local Energy Reach Code, along with information for two public meetings in August. The Reach Code website and the public meetings were publicized through the city's sustainability e-newsletter and community e-newsletter ("Uplift Local"), emails to residents and builders, as well as various social media platforms (Facebook, Twitter). The two public meetings were held on August 16 and 18, 2022, and were attended by 28 and 31 community members, respectively.

Staff separately conducted a focus group meeting on August 12 with local architects to solicit feedback on the proposed definition of Substantial Remodel. This meeting was attended by seven architects; staff also received one set of comments through email. The proposed definition of Substantial Remodel was presented in the subsequent Reach Code public meetings.

ENVIRONMENTAL REVIEW

The recommended action in this report is exempt from the California Environmental Quality Act (CEQA) in accordance with CEQA Guidelines section 15308 as an action by the City for the protection of the environment, and under section 15061(b)(3) on the grounds that the proposed standards are more stringent than the State energy standards, there are no reasonably foreseeable adverse environmental impacts and there is no possibility that the activity in question may have a significant adverse effect on the environment.