Mixed Use – Residential & Commercial

Explainer

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Characteristics

Built after 2000

Low and mid rise (10 floors or less)

Commercial and retail uses at ground level

Residential units in upper levels

Energy Conservation Measures

HVAC heat pump / electrification retrofits

LED lighting upgrades

Demand control ventilation

Load shifting opportunities

According to Vital Signs (a data portal developed by the Association of Bay Area Governments and the Metropolitan Transportation Commission) the share of new residential construction across Bay Area counties is increasingly shifting toward multifamily and mixed-use projects.[1]

To shed light on low and mid-rise mixed use residential and commercial buildings across Bay Area counties, this analysis considers a mixed-use building constructed after 2000 with natural gas space heating and water heating, a building envelope that aligns with code requirements as of the early 2000s, and non-LED lighting fixtures.

Because energy and carbon reduction measures that are universally applicable to standalone residential or commercial buildings are similar to those described in the multifamily and office Explainer cases, this case will focus on unique considerations for the mixed-use context.

[1] https://vitalsigns.mtc.ca.gov/indicators/housing-production

Common multifamily residential energy efficiency measures
Measures that pertain to buildings that solely contain residential units can generally be applied to the residential spaces within a mixed-use context. These measures are summarized in the Multifamily Residential Explainer case, and include measures related to packaged heat pumps, heat pump water heaters, and energy efficient appliances. These upgrades should be prioritized at or near the end of existing equipment useful life.

For mixed use buildings constructed in the early 2000s, HVAC systems and appliances are likely at or near the end of their expected lifespans; energy efficient retrofits are most feasibly applied during routine equipment replacements.

Common commercial and retail energy efficiency measures
Similarly, the same energy efficiency measures that are suitable for standalone commercial buildings can often achieve savings for the commercial portions of mixed-use buildings. These include the measures listed in the Office Explainer case, including LED lighting upgrades and HVAC electrification.

Residential appliance replacement at equipment end-of-life
Typical residential appliances such as refrigerators, ovens, dishwashers and clothes washers/dryers have life expectancies ranging from 10-20 years.[2] Therefore, the age of buildings considered in this Explainer case (built after 2000) corresponds with normal appliance end-of-life replacement.

Appliance replacements should prioritize selecting energy efficient and ENERGYSTAR certified appliances, which are typically 10-20% more efficient than conventional models.[3] The payback period for these appliances depends on frequency of use and energy intensity, with an estimated range of 2-15 years.[4] As such, most ENERGYSTAR and other efficient appliances are likely to achieve overall payback during their useful life.

Smart HVAC scheduling based on operating hours
In a mixed-use building, commercial spaces will most likely be populated during daytime hours while residential spaces will be populated at night. Ensuring that space temperature setpoints and ventilation rates are controlled according to the precise operating hours of either space type will limit unnecessary energy consumption for HVAC systems.

For commercial spaces, this means employing controls schedules that correspond with business hours. For residential spaces, this means installing smart thermostats and ensuring that all residents are educated on how to program schedules according to their occupancy patterns.

For common areas that may have intermittent and unpredictable occupancy—such as gathering spaces within multifamily residential buildings—automatic sensors for lights can ensure that energy is only consumed as needed when people are present.

Diversity of end uses for different space types
A mixed-use building with both commercial and residential spaces will have very different end use breakdowns for different portions of the building. For example, residential floors are likely to have high domestic water heating demands, whereas office floors will be more heavily dominated by ventilation demands and miscellaneous electric equipment (plug loads). Decarbonization strategies will need to account for these varied uses and consider the most cost-effective and highest impact strategies for the aggregated building end use breakdown.

[2] https://www.nachi.org/life-expectancy.htm
[3] https://www.energystar.gov/sites/default/files/tools/ENERGY%20STAR%20Appliances%20Brochure_508.pdf
[4] https://energysavingslab.com/home-energy-savings/energy-efficient-appliances/how-long-does-it-take-for-energy-efficient-appliances-to-pay-for-themselves-in-terms-of-energy-savings/