

Envelope Air Sealing

Building Envelope and Air Leakage

The building envelope is the exterior components, including demising partitions, which enclose conditioned space, separating it from unconditioned space (such as attics, garages) and outdoor space. Air leakage occurs when outside air enters and conditioned air leaves through cracks and openings in the building envelope. Envelope air sealing limits this unintentional air movement by sealing all joints, penetrations and other openings using caulking, gaskets, weather-stripping, or continuous air barriers.

Benefits of Limiting Air Leakage

An effective building envelope provides a continuous barrier and is key to a building's energy efficiency performance. Properly sealed

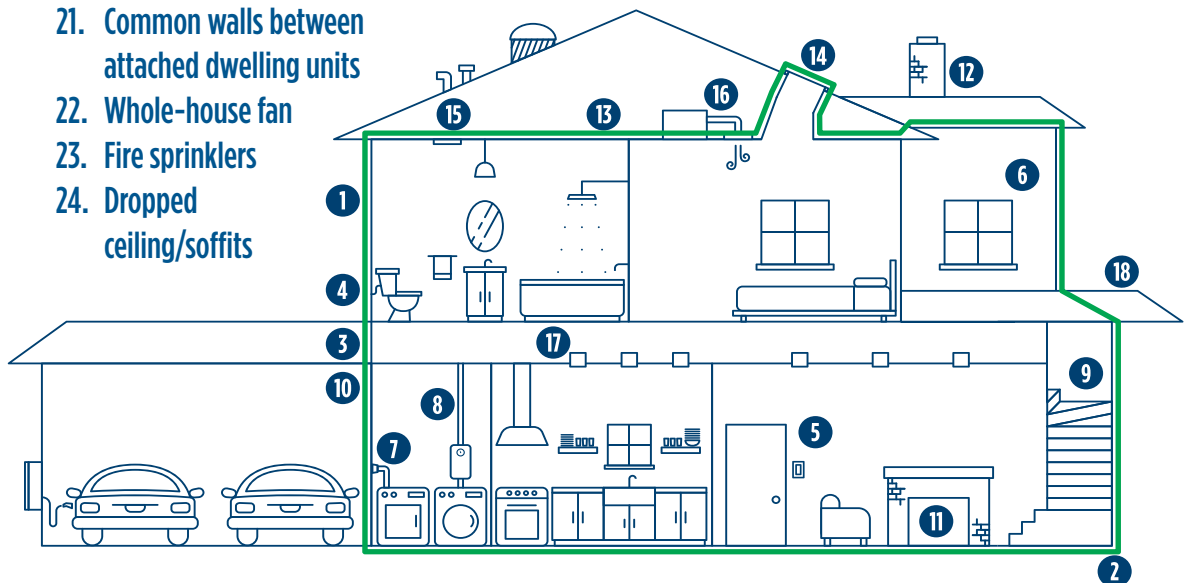
buildings have low rates of air leakage, which can reduce energy used to heat or cool the building. It also makes it easier for mechanical ventilation fans to control healthy indoor-outdoor air exchange. Owners save money on energy bills, while occupants experience stable interior temperatures and improved indoor air quality.

Are there Mandatory Requirements?

Yes. The Building Energy Efficiency Standards (Energy Code) has required air sealing of the building envelope in California since 1982. The 2019 Energy Code mandatory requirements in [§ 110.7](#) limit air leakage in newly constructed low-rise residential, nonresidential, hotel, motel, and high-rise residential buildings, as well as additions and alterations to existing buildings. Design and construction documents should clearly identify the air barrier components for each assembly, including detailing joints, interconnections and sealing of penetrations. For more information on the Energy Code requirements, visit the [Online Resource Center](#).

Residential Air Sealing Locations

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| 1. Continuous air barrier seams | 17. Recessed lighting |
| 2. Floor/subfloor bottom plate | 18. Porch roof and overhangs |
| 3. Rim joists | |
| 4. Exterior wall penetrations | 19. Cantilevered floor |
| 5. Electrical boxes/knockouts | 20. Chases for piping or ducts |
| 6. Windows and doors | 21. Common walls between attached dwelling units |
| 7. Fan and dryer exhausts | 22. Whole-house fan |
| 8. Plumbing and gas lines | 23. Fire sprinklers |
| 9. Staircase framing | 24. Dropped ceiling/soffits |
| 10. Attached garage walls | |
| 11. Fireplace wall | |
| 12. Flue or chimney shaft | |
| 13. Attic top plate | |
| 14. Attic kneewalls and skylight shafts | |
| 15. Attic access doors | |
| 16. HVAC ducts/registers | |



Nonresidential Air Sealing Locations

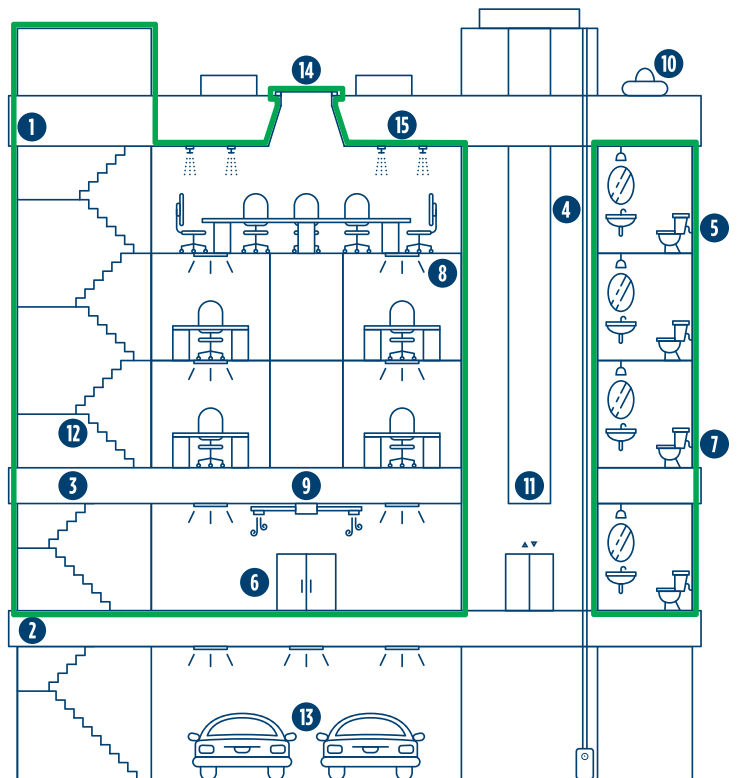
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| 1. Air barrier and thermal barrier alignment | 11. Elevator shafts |
| 2. Rim joists, sill plates, foundations, floor | 12. Stairwells |
| 3. Soffits | 13. Attached parking garages |
| 4. Risers and shafts for piping or ducts | 14. Skylights |
| 5. Exterior wall penetrations | 15. Fire sprinklers |
| 6. Windows and doors | |
| 7. Plumbing, gas lines | Not Shown |
| 8. Lighting fixtures | 16. Common walls between attached dwelling units |
| 9. Ducts and registers | 17. Cantilevered floors |
| 10. Ventilation fans | 18. Flue and chimney shafts |
| | 19. Fireplace walls |
| | 20. Electrical conduits |

Additional Mandatory Requirements for Multifamily Buildings

Since multifamily buildings share walls and floors with adjacent homes and garages, sealing the building envelope is very important. The Energy Code includes additional requirements for multifamily buildings to minimize the transfer of air pollutants between dwellings and garages. Individual dwelling unit envelope air leakage testing may be required, depending on the type of ventilation system used. For more information see § 120.1(b)2 and § 150.0(o)1E.

What are the Prescriptive Requirements?

For nonresidential buildings, there is a prescriptive requirement for a continuous air barrier as part of the building envelope in § 140.3(a)9. For low-rise residential buildings, there is a prescriptive requirement for quality insulation installation



(QII), which includes envelope air sealing and home energy rating system (HERS) testing. Following the QII procedures will reduce envelope air leakage. For more information on QII see [Residential Reference Appendix RA3.5](#).

Are there Performance Credits for Envelope Air Leakage Testing?

Yes. In single-family residential buildings, under the performance approach, there is a credit given when the rate of the envelope air leakage is less than five air changes per hour at 50 pascals. A certified HERS rater shall verify the air leakage with a blower door test. For more information on HERS testing requirements for air leakage of building enclosures see [Residential Reference Appendix RA3.8](#).



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