

# SoffitDuct: An Easy and Innovative Retrofit Distribution Solution

A lightweight, prefabricated, and paintable soffit-integrated HVAC distribution solution helps overcome installation challenges in multifamily building retrofits.

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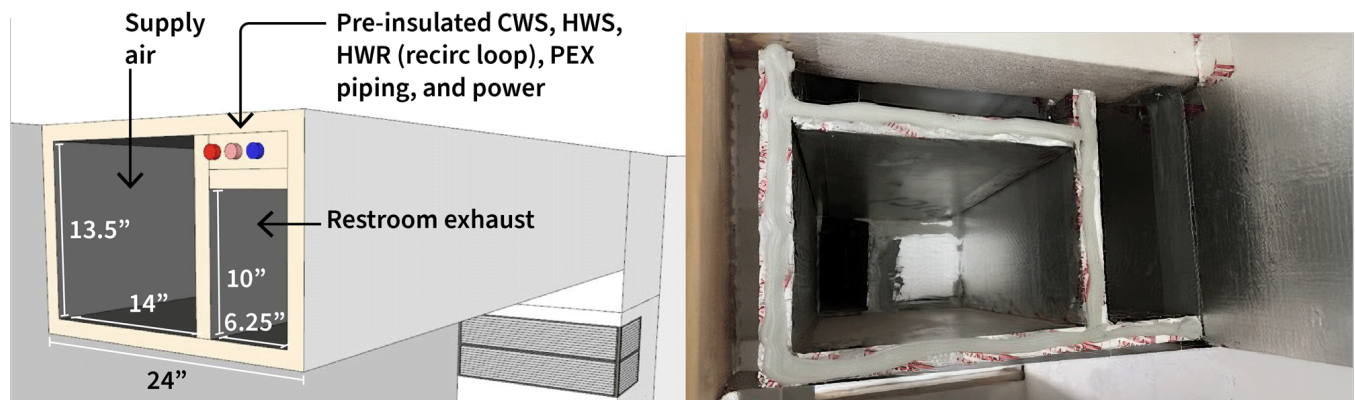
By Xinxin Hu, Brett Webster, and Meghan Duff

## Overview

A central challenge in mechanical retrofits of existing multifamily buildings is installing new heating, ventilation, and air conditioning (HVAC) distribution due to architectural constraints and space limitations. Running new mechanical, electrical, and plumbing distribution — such as ductwork, electrical wire, or pipes — frequently involves opening up walls or concealing the distribution with site-built soffits, practices that are invasive, disruptive, time-intensive, and costly.

A lightweight, prefabricated, and paintable rectangular HVAC ductwork system can help solve these challenges by providing air distribution, as well as potential chases for electrical and plumbing, with a “finish-ready” exterior face that avoids the need for a traditional site-built soffit. Through research funded by the California Energy Commission’s Electric Program Investment Charge (EPIC) program, Thermaduct collaborated with the research team to design, manufacture, and demonstrate the SoffitDuct product, as shown in Exhibits 1 and 2 below. The product was installed in one two-bedroom unit at Corona Del Rey apartments in Corona, California.

## Exhibit 1: SoffitDuct Rendering (left) and a section view during installation at Corona Del Rey (right)



Left image source: Stet Sanborn, SmithGroup

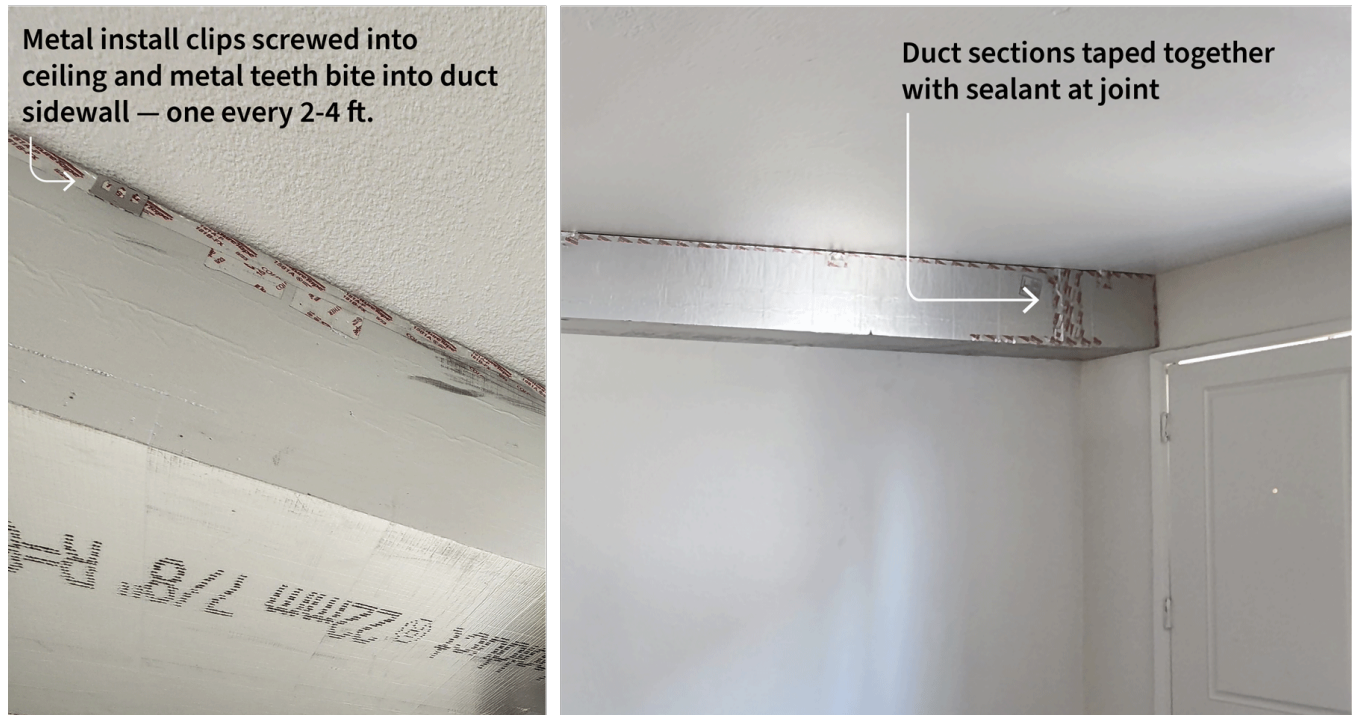
## Exhibit 2: Finished SoffitDuct at Corona Del Rey



### Benefits

- **Design flexibility:** The ductwork can be fabricated with a flexible aspect ratio (e.g., a flatter, wider rectangle to accommodate low ceiling heights); configurable dimensions of supply, return, and exhaust air pathways; and varying wall thickness depending on targeted insulation levels.
- **Lightweight:** Constructed mostly of foil-faced foam, the ductwork is very lightweight and requires minimal structural support.
- **Faster installation:** The ductwork is largely prefabricated, which reduces on-site contractor time associated with sheet metal fabrication and modifications, soffit framing, and drywall work. Due to the lightweight material and clip install mechanism, the installation is easy and fast. The foil-faced material can be directly mudded to match drywall texture and painted. Additionally, diffusers can be easily cut right into the sidewall of the duct once it is installed.
- **Air sealing:** The system reduces duct-leakage rates to [a fraction of typical sheet metal ductwork](#), resulting in energy and carbon savings.

### Exhibit 3: Installation details of SoffitDuct at Corona del Rey



### Demonstration Learnings

- Further design work is needed to develop a scalable solution for passing through walls with framing or structural members, ensuring feasibility for both product design and fabrication.
  - An example from Corona Del Rey: flanges were added to the product's exterior, allowing the SoffitDuct to pass through a wall without interfering with existing framing members. This made the design, fabrication, and transport more time-consuming and complex.
- Exploring wall and ceiling intersections is encouraged during the design process to identify any structural or otherwise physical barriers to running the SoffitDuct.

## Exhibit 4: SoffitDuct installation at Corona del Rey Apartments

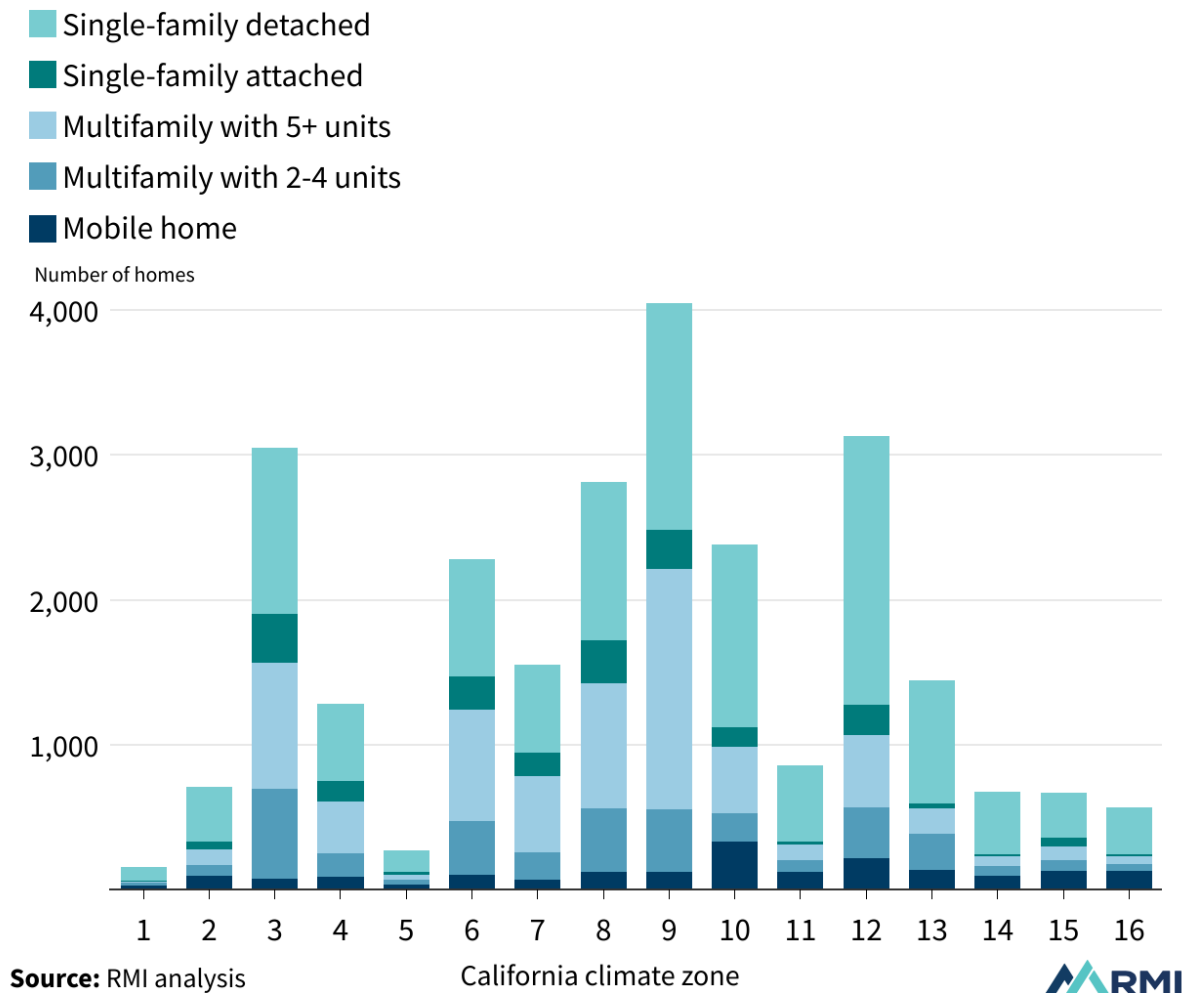


To keep the air pathways uninterrupted and allow the SoffitDuct to pass through interior walls, flanges had to be added that could be notched for framing members at the intersecting wall.

### Market potential in California

Given its broad applicability to any system that has air distribution, SoffitDuct could be used in retrofits for 45% of residential units in California, equivalent to 6.3 million units, according to recent data from [Accelerating Residential Building Decarbonization: Market Guidance to Scale Zero-Carbon-Aligned Buildings](#).<sup>1</sup> Single-story homes with attics or vented attics are excluded, as installing ducts in attic spaces is typically less costly. Studios and one-bedroom units are also excluded, as they are often better suited for ductless HVAC upgrades. The graph below shows the distribution of the units eligible for SoffitDuct applications, categorized by building type and California climate zone.

## SoffitDuct residential market potential across California climate zones



*This project was generously funded by the CA Energy Commission's EPIC program and was completed in partnership with RMI, Association for Energy Affordability, Emanant Systems, SmithGroup, Lawrence Berkeley National Lab, National CORE, and ThermaDuct Corporation.*

### Endnotes

1. Webster, B., A. Satre-Meloy, L. Badger, A. Donovan, D. Lane, K. McGrath, E. Wilson, J. Reyna, C. Metzger, T. Pilet, M. Campbell, L. Toffoli, *Accelerating Residential Building Decarbonization: Market Guidance to Scale Zero-Carbon-Aligned Buildings*, Advanced Building Construction Collaborative, 2024.