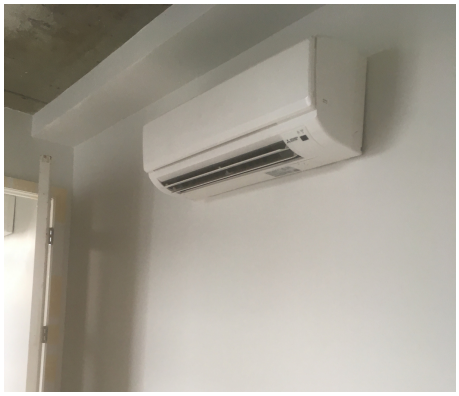
Heat pump system design

Choosing the electrification strategy for each space in a multifamily building is important for many reasons, including energy efficiency, cost control, and aesthetics. This document addresses some best practices for electrifying different types of spaces.

NOTE - Most retrofits use "ductless" high-wall or floor-mounted units (see photos) but there are also ducted systems. For ducted systems, if ceiling height allows, a single unit is concealed in a ceiling over a kitchen, bathroom, or entrance area and ducted to bedrooms and living areas. This is more common in new construction and gut rehabilitations.

Bedrooms

In most cases, each bedroom should have its own heat pump indoor unit. Try to avoid locating the indoor unit over a desk or bed, otherwise cold air can fall on occupants in the summer while in cooling mode. Options include above doors, above and below windows, or elsewhere away from desks or beds.



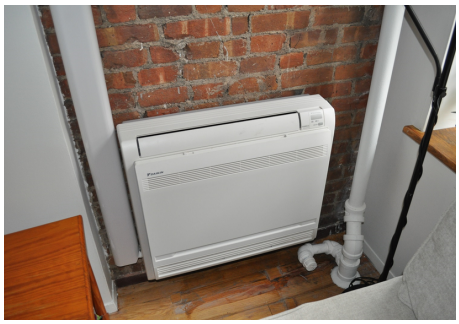
HIGH-WALL MOUNTED INDOOR UNIT

Living rooms

Living rooms should be served by their own indoor unit as well. As with bedrooms, the indoor unit should not be located over sofas or other seating areas. The indoor unit should be sized and placed to meet the heat loss of adjacent spaces that are intimately connected to the living room, such as open kitchens or entryways.

Bathrooms

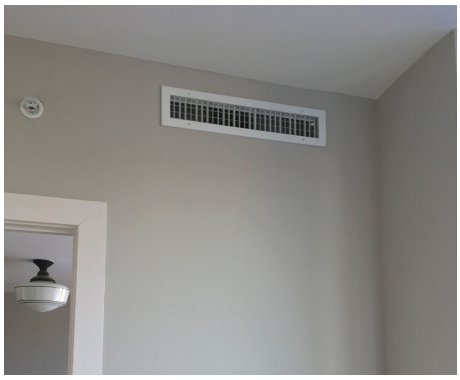
Heat loss in bathrooms is minimal, as is occupancy, so heating is often not needed in the space. If heat is found to be needed, bathrooms might best be served with electric resistance heat—either with a strip of baseboard or a heat lamp or a kickspace heater below the sink/vanity. The controls should limit run time, for example by using a timer switch.



FLOOR MOUNTED INDOOR UNIT

Kitchens

Kitchens are typically not served by their own indoor unit. In most cases, kitchens are connected to adjacent heated spaces like living or dining rooms. The indoor units in those areas should be sized and located to serve the kitchen space. In addition to sizing indoor units to heat adjacent spaces, the placement of the indoor units should also be considered. However, if the kitchen is a separate room and is large enough, it might need its own unit.



DUCTED INDOOR UNIT

Building corridors

Corridors are typically interior spaces with low loads and intermittent occupancy. Also, people in corridors are typically entering or leaving the building and so are dressed according to outdoor temperatures. In converted buildings to date, corridors have been found to be fully comfortable without any heat.

Stairwells

Stairwells, like corridors, have intermittent occupancy and thus, very possibly will not require heat. This should be decided on a case-by-case basis.

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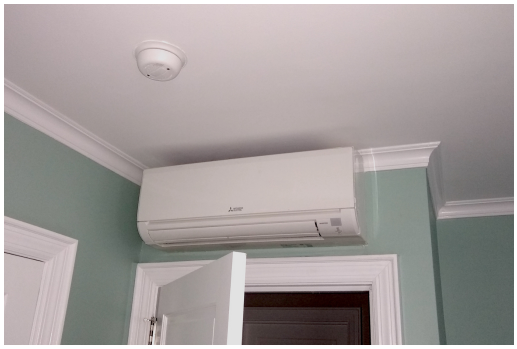
Lobbies and Entry Vestibules

These areas frequently have windows and certainly see the introduction of cold winter air as people open and close the front door. Even though they are intermittently occupied, they can be spaces with high heat loss. A heat pump indoor unit might make sense especially if the lobby contains seating areas or is used for other functions. Resistance heat should not be used. In many cases, no heat is required for these areas. If necessary, it is likely only for larger lobbies rather than vestibules. This should also be decided on a case-by-case basis.



INDOOR UNITS PLACED ABOVE DOORS REDUCE RISK OF COLD AIR FALLING ON OCCUPANTS IN COOLING MODE

Basements

A best practice is to not heat basements/cellars, except for habitable areas. Temperatures in these areas should be expected to be slightly lower than before electrification if fossil fuel equipment is not running or has been removed. Basements should stay well above freezing, but air sealing can help to offset the loss of heat from removing boilers. Attention should be paid to any water pipes that are close to an air entry point, such as boiler combustion air intake to prevent freezing.

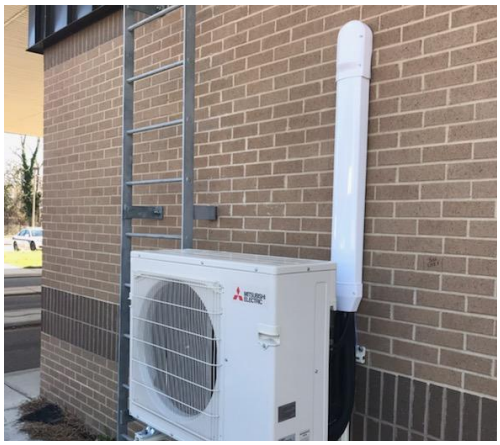
In one demonstration installation, no heat was put in the basement and residents found it to be slightly cold when going to the basement to do laundry. For intermittent comfort, in high-use areas in the basement (e.g. close to laundry machines), overhead resistance radiant heat could be considered. Again, for safety and efficiency, this space heating option should be on a timer switch to limit its use. A fallback, but more costly, option is to put an indoor heat pump unit in such areas.

OFF-DELAY TIMER SWITCH

Other Layout Considerations

Indoor units create condensate that must be drained. For retrofits, this is typically via pumps to the outdoors. Give careful consideration to condensate disposal to avoid drips on exterior walkways (a code violation), or risks of interior leaks. For new construction, condensate lines are typically located inside the walls.
Refrigerant piping, condensate piping, and electrical wiring need to be routed in apartments and around the building. These need to be done in aesthetically pleasing ways. Ideas for doing so include:

- minimize the length of pipe runs and turns
- conceal in existing chases, closets, or above ceilings; new soffits or chases, prefabricated covers
- route through basement or attics
- for floor-mounted indoor units, conceal in a properly fire-stopped soffit in the apartment below
- route piping outdoors where possible, consider grouping pipes and wires together and concealing with prefabricated cover on visible exterior walls
- route wiring alongside piping
- locate thermostats on interior walls, not close to indoor units
- minimize pipe lengths and turns/elbows where possible, to increase system efficiency
- allow access for repair (for example, for ducted units);
- follow manufacturer's instructions
- commercial spaces will have their own considerations but will need to be factored into the design



PIPING COVER

Please note, this FAQ is not to be substituted for professional design.

If you want to learn more, contact electrificationpilot@hpd.nyc.gov

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