

GUIDELINES FOR THE INSTALLATION OF HVAC EQUIPMENT IN HISTORIC AND NEIGHBORHOOD CONSERVATION DISTRICTS

As technologies improve, more homeowners are choosing to install HVAC (heating, ventilating, & air conditioning) systems or upgrade their existing ones. HVAC systems often require the installation of exterior mechanical units and related fixtures, typically air conditioning condenser units, which can impact the visual character of a historic property and introduce unwelcome levels of noise. The city's locally-designated historic and neighborhood conservation district commissions regulate exterior alterations visible from a public way to designated properties, including the installation of HVAC systems.¹ The following guidelines are intended to expedite the review process by addressing several key points concerning the installation of exterior HVAC equipment.

HVAC SYSTEMS AT A GLANCE²

There are several types of HVAC systems on the market, the most popular being the **SPLIT SYSTEM**. In a traditional split system, also known as "central air conditioning," refrigerant circulates between an indoor coil and an outdoor condenser with a compressor. The refrigerant cools the air and a blower circulates air through ducts inside the house. Outdoor condenser/compressors units are large, cube-like devices that may be noisy and difficult to screen.

A recent variant is the **DUCTLESS SPLIT SYSTEM**, which eliminates ductwork by installing indoor evaporator units in each room to be cooled; an outdoor condenser is still required. Ductless systems are convenient for older homes that are being retrofitted for new HVAC, but may be significantly more expensive than a split system with ductwork. "Suitcase" style condensers are relatively small and quiet, but serve only two rooms at most. Also, the insulated coolant tube may need to be installed on an exterior wall.

A **PACKAGED/INTEGRAL** system contains the same components you find in a typical split system, however, they're all engineered to work together in one cabinet. This means the exterior components will be much larger than a single condenser unit.

A **HEAT PUMP** system works like in the same manner as a typical air conditioner condenser, only it can also work in reverse to provide warm air during the heating season. This works by heating up a piped refrigerant in the outdoor air, then pumping the heat that is generated by the warmed refrigerant inside to warm the indoor air. This type of system works best in moderate climates and becomes less efficient in very cold winter temperatures, when electrical heat is needed for auxiliary heating demands. A "reverse cycle chiller" is a new variant of the heat pump, which heats or cools an insulated tank of water and then distributes the heating or cooling either through fans and ducts or radiant floor systems. The need for auxiliary electric heating coils and defrosting cycles to prevent icing of the refrigerant is eliminated thus making these systems more suitable for cold climates. Newer models now offer solar

¹ No building permit may be issued for work on a designated property until a commission has issued a Certificate of Appropriateness, Nonapplicability, or Hardship. A Certificate of Appropriateness will be issued when the commission determines that the work is not incongruous with the character of the building or district; a Certificate of Hardship will be issued if the applicant demonstrates hardship, financial or otherwise, and the proposed work will not have an adverse effect on the district; and a Certificate of Nonapplicability will be issued if the work is judged to be not within the jurisdiction of the commission, or not visible from a public way.

² Window air conditioners are regulated in the Old Cambridge Historic District, but not in the neighborhood conservation districts.

powered hot water heating for the unit. These systems still require an exterior condenser unit similar to traditional HVAC systems.

A **GEOTHERMAL HEAT PUMP** uses the constant temperature of the earth accessed by deep wells to provide cooling and heating for a home. These systems are very quiet and can be located indoors because there is no need to exchange heat with the outdoor air. Although more expensive to install than traditional HVAC systems, geothermal systems will greatly reduce gas or electric bills, allowing for relatively short payback periods. However, this is still a very new technology, and homeowners should satisfy themselves that the system will be well engineered and reliable.

FACTORS FOR PROPERTY OWNERS TO CONSIDER

Placement and Screening

To lessen the visual impact of conventional HVAC equipment on a designated property, it is important to consider an appropriate installation location. **Rear yards** that are not visible from a public way are the preferred location and may allow for review and approval at the staff level only. **Side yards** are an alternative location, but will often require a screening plan. **Front yards** and **walls and rooftops** (and other above-ground locations) are the least preferred options. However, rooftop mechanical equipment that is not visible from a public way, mostly in the case of larger commercial buildings, is often an acceptable option. Another consideration when choosing a site is the proximity to abutting houses, specifically when factoring in noise levels (see below for more discussion on noise).

Screening the visibility of ground-level HVAC equipment that is visible from a public way is an important part of the installation. The size of a unit, combined with the additional height created by the concrete pad it sits on, will often create the need for **fencing, latticework, plantings**, or similar screening options. If fencing is the preferred approach, it is important to consider how the fence will relate with the architecture and materials of the house and existing landscaping features. Plantings also must be chosen carefully, as the goal is to provide year-round screening consistency; evergreen shrubs and bushes are typically used for this reason. Keep in mind that some plantings may not thrive if they are situated too close to a source of heat or air exhaust. Rooftop mechanical equipment can usually be screened, but sometimes the screen may be more intrusive than the mechanical unit itself.

All screening options must be discussed with the installation contractor, as condenser units require ample clearance to provide adequate air flow so that the coils will be cooled efficiently. Units mounted too close to a wall or surrounded by shrubs, or multiple units located too closely together may not receive enough cool air to function properly. The result can be a shorter compressor life and/or less efficient cooling operation. Most manufacturers call for a separation of at least 12 inches between the condenser and any nearby wall, wood fence, shrub, or tree.

In addition to condenser units, homeowners should realize that supplementary equipment such as circuit breakers and electrical conduits are often installed nearby. These components are typically attached to a building and should be factored in to the screening plan.

Noise

Another factor for a homeowner to consider is the noise impact of an exterior condenser unit. Although technology has improved and newer units are quieter than ever, their placement relative to abutting houses still has the potential to create conflict with one's neighbors. Homeowners interested in installing new HVAC equipment should become familiar with the Cambridge Noise Control Ordinance,

administered by the License Commission, as well as mechanical permit application requirements and affidavit requirements. Under the Noise Control Ordinance, Chapter 8.16 of the City Code, there are restrictions on decibel levels as measured from lot lines. A reading over 60 decibels during daytime hours (7:00am-6:00pm) or over 50 decibels at night, for example, would be considered a violation of the ordinance. With this in mind, it is important to know the decibel levels of condenser units when purchasing a HVAC system.

The more energy efficient a condenser unit, the quieter it will be. As of January 2006, HVAC manufacturers could no longer produce residential central air conditioners with a Seasonal Energy Efficiency Ratio (SEER) rating of less than 13. The higher the SEER rating, the more efficient the unit. However, condenser units usually grow larger as the SEER rating is increased because manufacturers need to install more coils to more efficiently transfer heat. So while noise might be reduced, the visual impact may increase. Screening can act as a sound attenuation strategy to help reduce noise while also reducing the visual impact of an exterior condenser unit.

When multiple condenser units are installed together, the noise levels will also increase. Even if each unit would pass the requirements of the noise ordinance on its own, the cumulative effect may exceed the allowed noise levels. Stated levels in literature may be in optimal/laboratory settings and actual decibel levels will vary depending on materials and configuration of the built environment.

For more information on the Noise Control Ordinance contact the License Commission at (617) 349-6140 or at <http://www.cambridgema.gov/License/>. Noise control regulations are listed in Chapter 8.16 of the Cambridge Municipal Code (<http://bpc.iserver.net/codes/cbridge/index.htm>).

Ventilation

A final consideration regarding the installation of mechanical systems is the impact of associated parts used for exterior ventilation. These parts, constructed of modern materials such as PVC and galvanized sheet metal, should ideally be installed in rear locations or at non-visible locations on the roof to avoid a direct visual impact on a designated property. Moreover, proper installation of exterior vents should take into account the impact on cladding and roofing materials, as well as the heat, moisture and noise generated from the vents. Oftentimes, old heating systems are vented through historic chimneys. When new HVAC systems are installed in a designated property with updated ventilation devices, the removal of abandoned historic chimneys may be considered inappropriate and in any case would require review.

CONTACT THE HISTORICAL COMMISSION FOR MORE INFORMATION

Manufacturers of HVAC systems frequently change their specifications, so it would not be useful to publish a list of recommended equipment. However, the Historical Commission staff has compiled information on condenser makes and models and owner satisfaction with their noise, efficiency, screening, and overall performance of installations approved by the city's historic and neighborhood conservation district commissions. Call (617) 349-4683 to ask for the latest results and for all other questions related to HVAC installation in Cambridge's historic and neighborhood conservation districts.