



## City of Lancaster- Building Department

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### HVAC

#### Heating, Ventilating, and Air-Conditioning Systems

##### Equipment Access

- 30 inches deep minimum workspace on the control (front) side of equipment
- 18 inches deep minimum front side workspace on room, wall and unit heaters
- Door to enclosed equipment room 24 inches wide and 30 inches deep minimum or must be greater than the size of the equipment.
- 30 inches minimum clearance from front side to end of opened door to equipment room.

##### Equipment Location

###### Attic

- Access minimum 22 inches by 30 inches or dimension of appliance
- Maximum distance from access opening to equipment is 20 feet.
- Solid floor from access opening to equipment minimum 24 inches wide.
- Minimum 30 inch by 30 inch platform in front of service side of unit.
- Upright furnace requires minimum 5 feet headroom clearance
- Lighting outlet must be switched from access door to equipment.

###### Under floor

- Appliance mounted on slab must be elevated 3 inches above grade minimum
- Appliance suspended from joist must be minimum 6 inches from ground and minimum 12 inches if located in a flood plain area.
- Access space to pass equipment opening must be 22 inches by 30 inches minimum or per manufactures specifications.
- Passageway not required if equipment can be serviced or removed from access opening.
- Access door maximum 20 feet to equipment location.
- Access door rough opening 22 inches by 30 inches minimum or 18 inches by 24 inches if a floor furnace.
- Light switch must be located at access door to equipment.
- Below ground mounted units must have 12 inches minimum clearance on all sides.
- 30 inch by 30 minimum clearance, level space on service side unless otherwise specified  
Below ground mounted units excavation greater than 12 inches, line with concrete or masonry to 4 inches above grade.

###### Garage

- Furnace unit with any flame or sparking devices must be mounted greater than 18 inches above garage floor.
- Furnace unit and all components must be protected from physical damage such as protective bollards.
- Ducts ran through fire-resistive wall s must be 26 gauge thickness.
- No duct opening may be made into the garage area(s).

###### Roof top

- All equipment must be listed for outdoor location or be protected per manufactures specifications.
- All equipment must be securely anchored in place using seismic design category D1 or D2 (wind loading, ice loading for Ohio)
- A 30 inch platform must be installed at the equipment site
- Accessibility to equipment must use a catwalk with railing for sloped roofs.

## **Appliance Installation**

### General

- Approved plans and permit must be on-site for new installations.
- All equipment shall be listed and labeled for the intended use.
- All installation instructions must be on-site
- Alterations & repairs shall comply with current code.
- Alterations & repairs cannot make the current system overloaded
- Mechanical systems shall be properly maintained.
- Provide access for removal and servicing
- Use only designated fuel(s) unless factory approved kit is installed and labeled.
- Configuring equipment sizing shall be per approved methods
- Foundations for outdoor installations shall prevent movement of equipment.
- A heat source is required in each habitable room
- All vents, caps, and flashing must be fasten or anchored in approved manner.
- If more than one system, permanently mark each system and what it serves.
- All drilling and notching of wood must be per building code,

### Electric Central Heat

- All branch circuits must be sized for 125% of the anticipated heating load
- The maximum unsubdivided load current is 48 amperes.
- A disconnecting means must be in sight of the heating equipment

### Electric Baseboard Heat

- Must be installed per manufacturers specifications and listing
- No electrical receptacles are permitted above permanently installed heaters
- No baseboard heaters can be permanently installed below a receptacle

### Electric Radiant-Heat Systems

- Must be installed per manufacturer's instructions
- All heating panels must be installed parallel to the framing
- All fasteners must be more than ¼ inch from the heating element(s)
- No field modifications of the heating panels is permitted
- No bridging of expansion joints is permitted when installed in concrete.

### Electric Duct Heaters

- Must be installed per the manufacturer's instructions.
- If located less than 4 feet from heat pump/air conditioning units, both must be listed for clearances less than 4 feet.
- All duct heaters installed must be accessible for servicing.
- All duct heaters must have an interlock that prevents operation without a blower.

## **Central Forced-Air Furnace**

### General

- All fuel burning furnaces cannot be open to bedrooms, storerooms or bathrooms.
- All fuel burning furnaces must be behind gasket self closing doors AND all combustion air is supplied from the outside to the enclosure OR use of a direct vent type with enclosed combustion chamber.
- All furnace room passage openings must be 24 inches minimum wide.
- Must provide a work space depth of 30 inches, height of 30 inches or to the height of the unit.
- The total space provided must be 12 inches greater than the furnace.
- Replacement furnaces located in exiting alcoves must have clearance per manufacturers labels

- Distance from the combustion chamber measured horizontally to the closed door of the enclosure must be a minimum of 6 inches.
- Return air duct intake must be a minimum of 10 feet from any combustion such as a gas water heater or gas clothes drier or be separated by a tight-fitting door.
- An electrical receptacle must be provided within 25 feet of the furnace.
- The automatic outlet air temperature must have a limit system for temperatures over 250 degrees F.
- An air filter is required on all furnaces.

#### Condensing High-Efficiency Furnace

- The flue must be gas tight
- The flue cannot have any other natural or forced vents “Y” into the same piping.
- A condensate drain pipe is required and must not exit into a public way or nuisance location.
- The drainpipe cannot be less than ¾ inch pipe with less than a 1/8 inch per feet slope.
- The drainpipe is permitted to be connected to indirect receptor such as a lavatory, tub overflow or tailpiece.

#### **Heat Pumps & Air Conditioning**

- Heat-pump return air minimum clearance area is 6 square inches per 1,000 BTU of output
- An air filter is required
- Outdoor unit must be mounted on a minimum 3 inch thick raised pad sloped to drain defrost water.
- Horizontal air handler must be set level or slightly sloped to condensate drain.
- No cooling coils can be mounted upstream from heat exchangers.
- All refrigerant vapor or suction lines must be insulated using minimum R-4 insulation.
- Installer must use nail-plate protection for refrigerant piping closer than 1.5 inches of framing edges.
- The condenser unit cannot be placed next to a dryer output vent.
- Use of a heat pump with strip (emergency) heaters requires a two-stage thermostat.

	<b><u>Heat-Pump Return &amp; Supply Main Duct Sizes</u></b>					
BTU Rating	24,000	30,000	36,000	42,000	48,000	60,000
Tons	2	2.5	3	3.5	4	5
Blower sq.in.	144	180	216	252	288	360
Round duct dia.	14”	16”	18”	18”	20	20

#### Electrical Requirements

- Power disconnect must be insight of condenser unit
- Must maintain working clearance in front of disconnect (cannot mount disconnect directly behind condenser unit).
- The thermostat cable cannot be run through the same conduit as the power conductors.
- Conductor sizes must be rated the same as the overcurrent nameplate rating of the unit.

#### Window and Through-Wall Units

- Maximum permitted cord length is 10 feet for 120 volt units and 6 feet for 240 volt units.
- Cord & plug may serve as a disconnecting means if unit controls are less than 6 feet from floor.
- The maximum load can only be 80% of the rating of the single branch circuit.
- Maximum 50% of the rated load if the cooling circuit has other outlets.

### Condensate

- Condensate may not drain to any public street or way.
- The drainpipe cannot be less than ¾ inch and must slope 1/8 inch per foot.
- Use of PVC female threaded fittings is prohibited
- Drain line may not be directly connected to waste or vent pipes.
- The drain line may connect to indirect receptor such as lavatory, tailpipe or bath tub overflow.
- A secondary drain and/or pan required for equipment mounted above framing.
- The secondary drain must drain to conspicuous point of disposal.
- A water level detector device in the overflow pan may be used in lieu of a pan drain.
- Drilling of other pipes to accept drain pipes is not permitted.

### Evaporative (Swamp) coolers

- Units mounted at ground level must be placed on 3 inch minimum base and be level.
- Units mounted on platforms must be no less than 6 inches above grade
- All supports must be rated per manufactures specifications.
- Openings into buildings must be flashed.
- A backflow water protection device must be used on potable water supplies.

### Ducts

#### General

- Ducts insulation shall not flame or smoke (no class 2 ducts)
- Concealed ductwork must be #30 gage sheet or greater if less than 14 inches
- Exposed ductwork must be #28 gage or greater if less than 14 inches
- Riser that is factory-made cannot raise vertically more than two stories.
- Fire blocking must be used around duct where passing between floors in concealed spaces.
- Fire stopping damper must be used between occupancies per manufactures specifications.

#### Penetration between house and garage

- No duct openings into garage
- Ducts used in attached garage must be greater than 26 gage sheet steel.

#### Return Air

- Must have sufficient volume = 25% of the area served
- No ducts mounted in bathrooms, kitchen, garage, furnace room, or another dwelling.
- Ducts must be no closer than 10 feet from natural draft appliances using combustion chamber or draft hood or wood burning fireplace.
- All ducts must be 2 square inches per KBtu output or per manufactures specifications.
- Air conditioning and heat pumps return air ducts minimum clearance area is 6 square inches per 1,000 Btu nominal.
- Studs used as partition or cavities are permitted if not greater than one floor in height and isolated with tight-fitting metal or 2 inch wood.
- Gypsum board permitted in return air if air is less than 125 degrees and no moisture.

#### **Central Heating Main Duct Sizes**

Btu	50K	60K	80K	100K	125K	150K	200K
Gravity feed	280	336	448	560	700	840	1120
Gravity round duct	20"	22"	24"	30"	30"	36"	42"
Blower sq. in.	80	96	128	160	200	240	320
Blower round duct	12"	12"	14"	16"	16"	18"	22"

### Supply Air

- Ducts must be minimum 2 sq.in. per KBtu output rating or per manufacturer specifications.
- Ducts must be minimum 6 sq.in. per KBtu nominal rating for AC or heat pump or per manufacturer
- Stud or partition cavities not approved for supply air.
- Vibration isolators can be a maximum of 10 inches long.

### Installation

- Distance from duct to ground must be 4 inches minimum.
- Ducts in concrete must be encased with a minimum 2 inches of concrete unless factory protected.
- No flexible ducts are permitted underground
- All joints must be airtight.
- All manufactured ducts must be taped with UL181 tape.
- All joints to the air-handler equipment must be mechanical.
- Flexible duct must be supported using an 1 1/2 inch strap every 4 feet or per manufacturer specifications.
- Metal duct must be supported every 10 feet minimum.
- All ducts in garages must be protected from physical damage.

### Combustion air

Combustion air ducts are normally two ducts running from the outside air supply to the furnace room. One duct stops at the ceiling level and the other stops low to the floor level close to the appliances that are burning oil or gas. The lower duct serves to provide fresh air to the appliance and the higher duct provides an exhaust for any fumes. As houses are built tighter and to higher energy-efficiency standards, the interior of the building does not provide enough fresh air to supply and fully burn the fuel at the correct temperature, as a result deadly carbon monoxide can be a product of the combustion.

### General

- Duct for the upper opening may not slope down to the fresh air intake.
- Ducts entering from the outdoors must be fitted with a 3/4 inch or larger mesh screen.
- No screen is necessary for ducts ending in the attic.
- Maintain duct separation from furnace room to fresh air source.
- Duct openings must terminate in open space in front of the appliance firebox.
- The area around the appliance must remain open space from floor to ceiling
- No dampers are permitted in combustion air ducts
- Use of joist/stud bay is acceptable if not greater than one fire block removed.
- Consider exhaust fans when determining combustion-air requirements.
- Confined space is less than 50 square feet.
- Unconfined space is greater than 50 square feet.
- Appliances installed in unconfined space may rely on infiltration alone.
- Installers should follow manufacturer instructions for combustion air.
- Two openings are required from confined space to adjacent unconfined space required, one at top of ceiling and one less than 12 inches from floor level.
- Openings to unconfined spaces must be a minimum of 100 square inches.
- Openings to confined spaces must be 1 square inch per 1,000 Btu.

### Combined Inside and Outside Source- Nontight construction only

- Ducts may draw through two 100 square inch openings from adjacent space & one opening to an external source required at 1 square inch per 3,000 Btu per hour.

Outside source (required for tight construction)

- One single opening is permitted at upper 12 inch section of enclosure directly connected to external source with minimum 1 square inch per 3,000 Btu and greater than or equal to the cross sectional area of all vent connectors.

Crawl space source

- Crawl space air may only be used for lower combustion use only.
- Minimum opening shall be 1 square inch per 4,000 Btu of input.
- Ventilation into crawl space must be increased two-times the normal amount required.
- The crawl space must meet the minimum building code regulation code requirements, 18 inches from joists to earth clearance.

**Combustion Air- Opening Sizes**

BTU	Inside Air		Outside Air Openings	
	Opening size	Cubic feet min.	1 in./2K BtuPH	1 in./4K Btu PH
30,000		1,500 (188 sq.ft)	15 sq.in.	7.5 sq.in.
40,000		2,000 (250 sq.ft.)	20 sq.in.	10 sq.in.
50,000		2,500 (313 sq.ft.)	25 sq.in.	12.4 sq.in.
60,000	100 sq. inch	3,000 (375 sq.ft.)	30 sq.in.	15 sq.in.
80,000		4,000 (500 sq.ft.)	40 sq.in.	20 sq.in.
100,000		5,000 (625 sq.ft.)	50 sq.in.	25 sq.in.
125,000	125 sq. inch	6,250 (781 sq.ft.)	62.5 sq.in.	31.3 sq.in.
150,000	150 sq. inch	7,500 (938 sq.ft.)	75 sq.in.	37.5 sq.in.

**Area of a Circle**

<u>Dia.</u>	<u>Area (square inches)</u>
3 inch	7 sq. inches
4 inch	12.6 sq. inches
5 inch	20 sq. inches
6 inch	28 sq. inches
7 inch	38.5 sq. inches
8 inch	50.3 sq. inches
9 inch	63.6 sq. inches
10 inch	78.5 sq. inches
12 inch	113 sq. inches
14 inch	154 sq. inches
16 inch	201 sq. inches

Other references can be found in the 2005 Ohio Mechanical Code and the International Building Code 2003 version.