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Module 06: HVAC

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Recommended Citation

Johnson, Keith and Uddin, Mohammad Moin. 2022. Module 06: HVAC. *ENTC 2160: Architectural CAD*. <https://dc.etsu.edu/entc-2160-oer/8>

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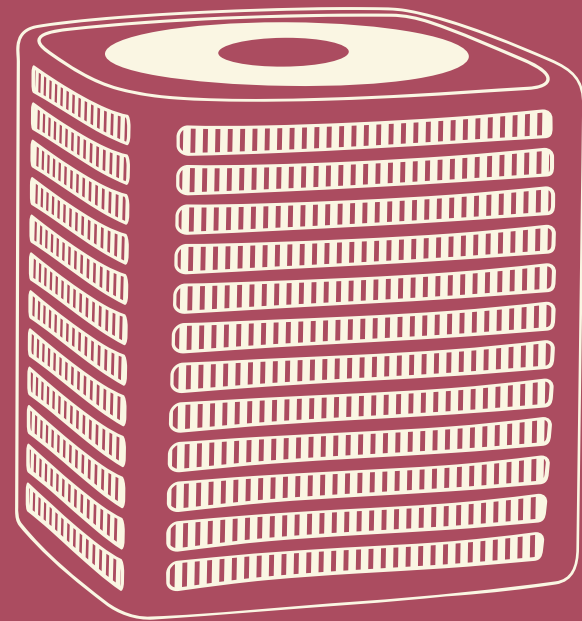
HEATING, VENTILATING, AND AIR CONDITIONING



INTRODUCTION

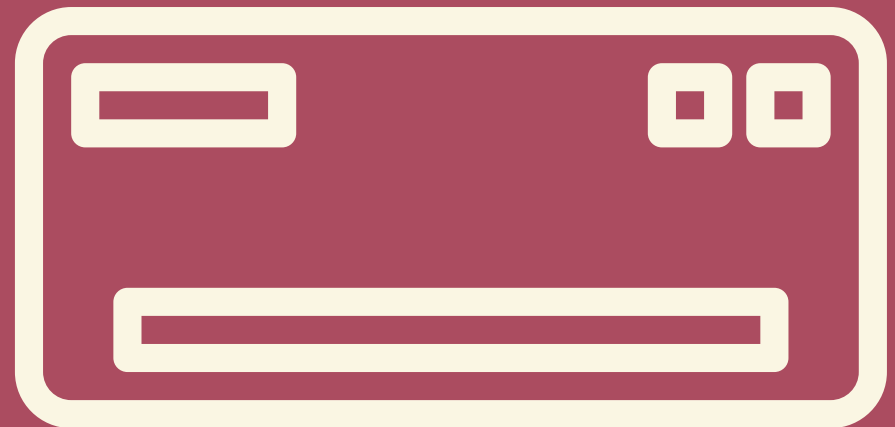
Heating, ventilating, and air-conditioning (HVAC)

- Heating and air-conditioning equipment, and systems found in a building
- Also referred to as the mechanical system
- Regulates temperature
- International Residential Code (IRC)
- Requires a heating unit in any residence built in an area where winter design temperature is below 60°

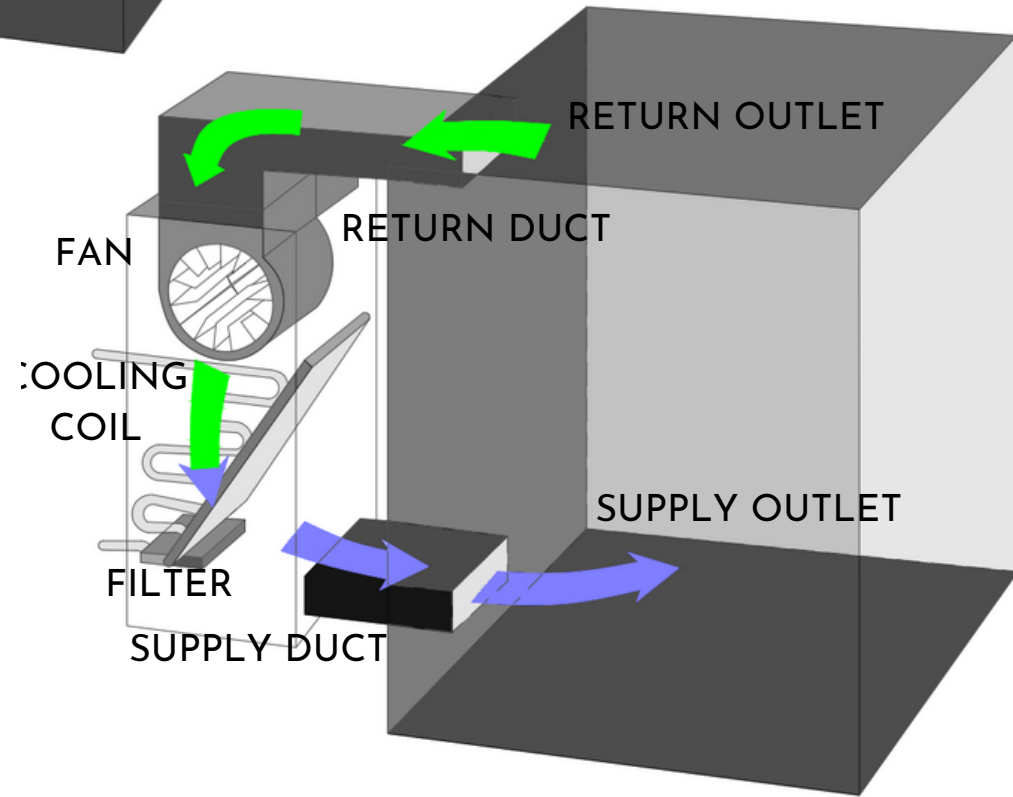
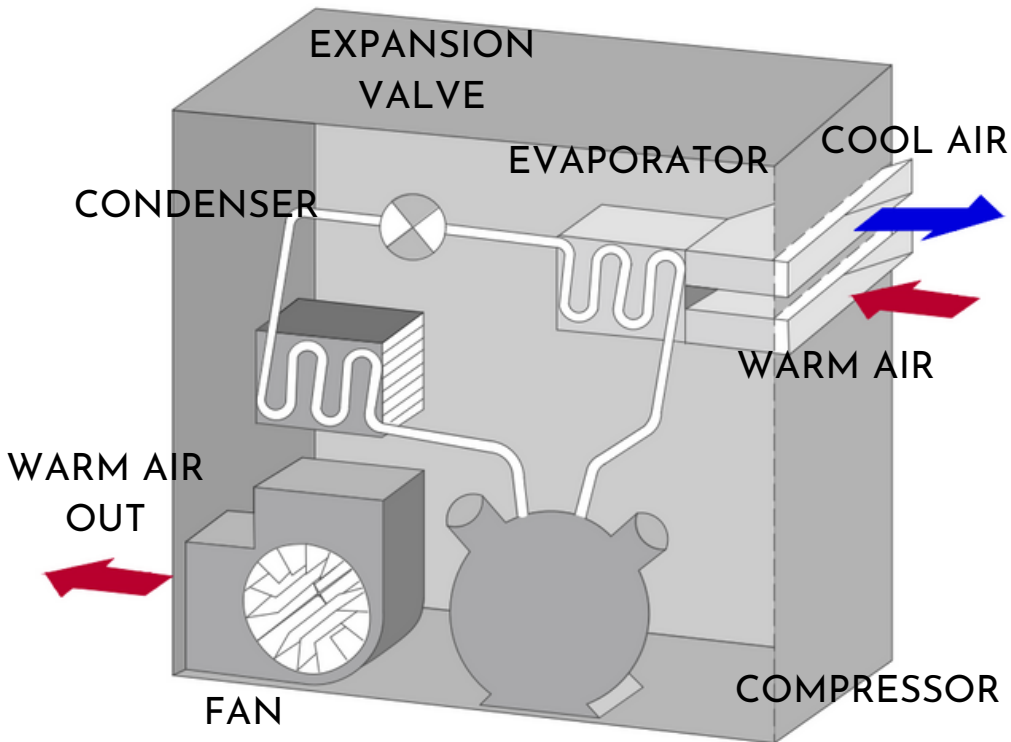
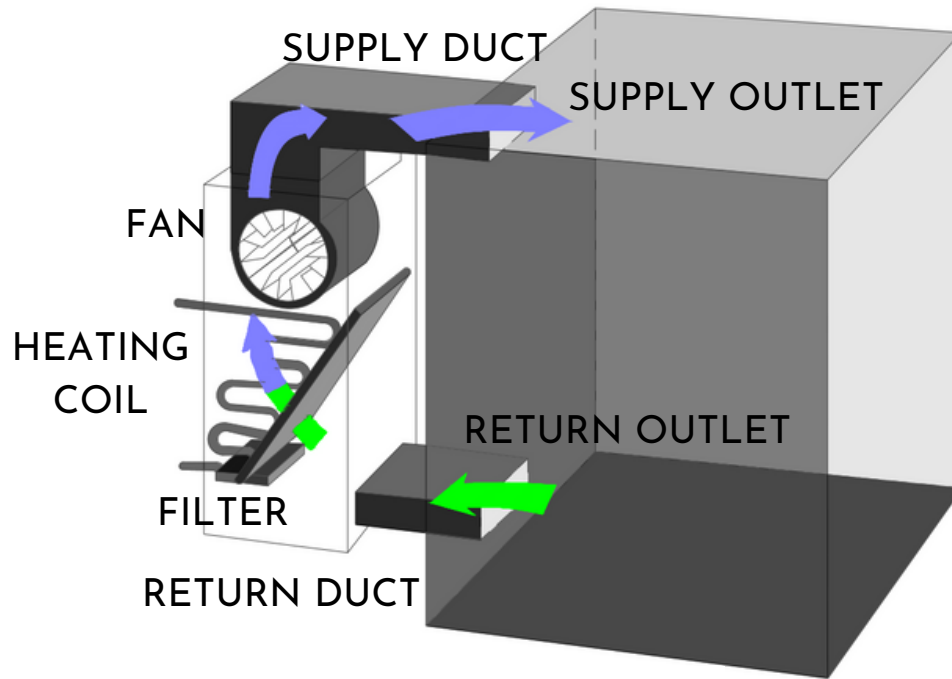


HVAC TERMS

- Internal heat gain
- Latent load
- Mechanical ventilation
- Outdoor temperature
- Outdoor wet bulb
- R-factor
- Sensible load calculations
- Temperature difference
- U-factor
- Btu
- Compass point
- Duct loss
- Grains
- Heat transfer multiplier
- Indoor temperature
- Indoor wet bulb
- Infiltration



CENTRAL FORCED-AIR SYSTEMS



FORCED AIR HEATING PLANS

- Complete forced-air heating plans show:
 - Size, location, and number of British thermal units (Btu) dispersed from warm-air supplies
 - Location and size of cold-air return
 - Location, type, and output of furnace
- Providing duct space (i.e., chase)
 - When ducted heating and cooling systems are used, duct location becomes important

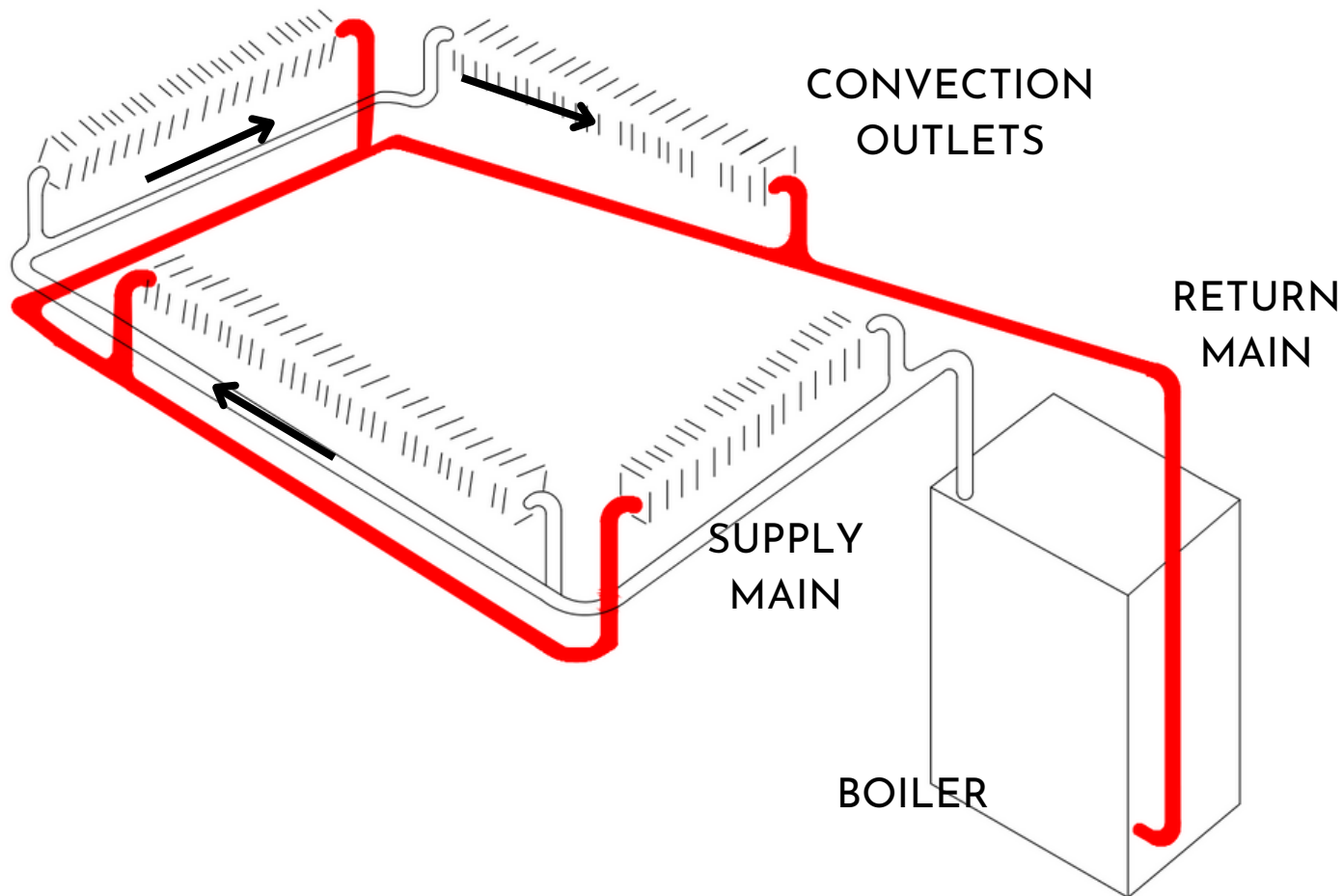
HVAC SYMBOLS

More than a hundred HVAC symbols can be used

- Only a few are typically used in residential HVAC
 - Refer to Figure 21-13 for common HVAC symbols

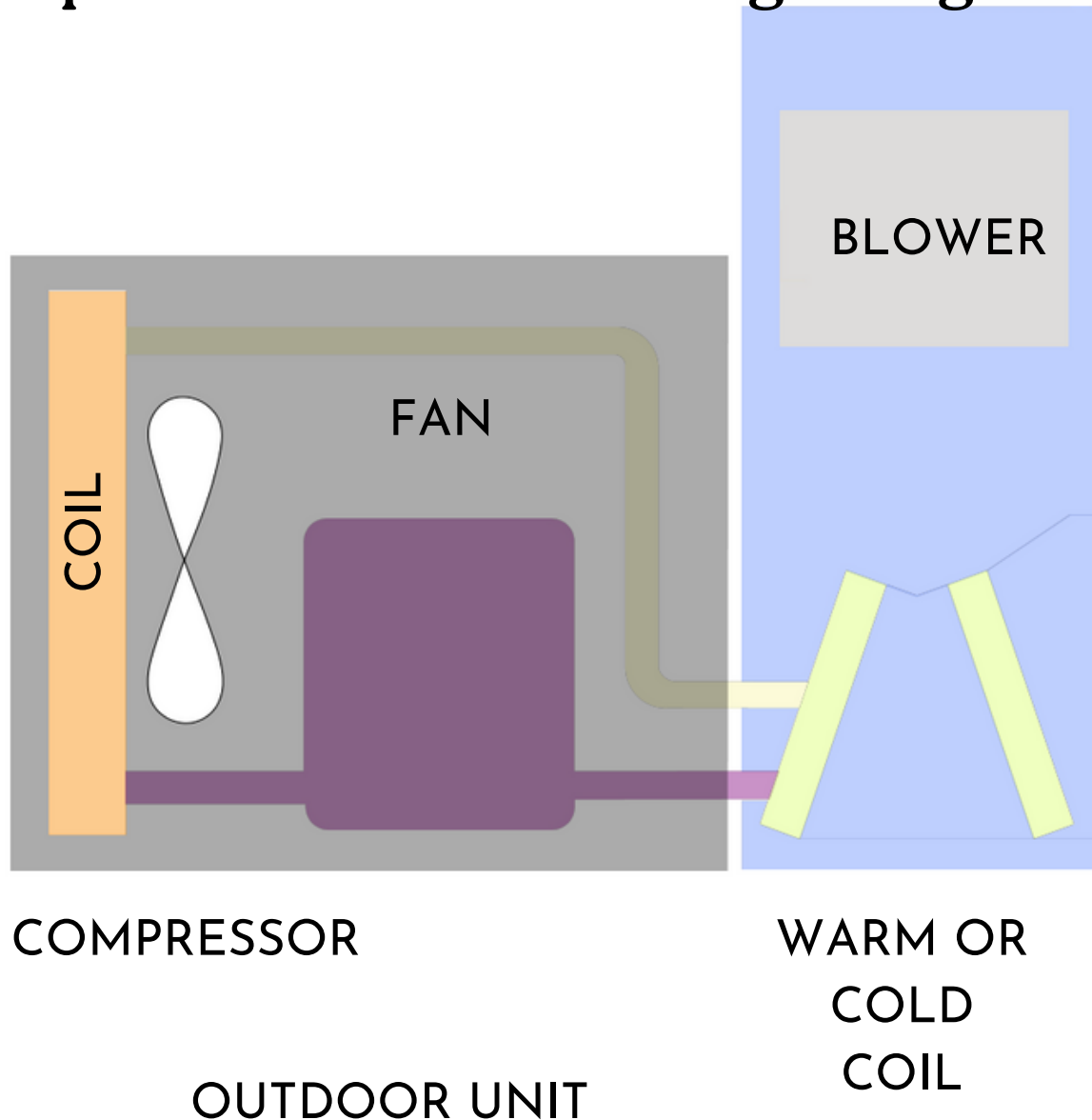
HOT WATER SYSTEMS

- Water is heated in an oil- or gas-fired boiler
 - Then circulated through pipes to radiators or convectors



HEAT PUMP SYSTEMS

- Forced-air central heating and cooling system
 - Compressor and circulating refrigerant system



ZONE CONTROL SYSTEMS

One heater and one thermostat per room

- No duct work
- Only heaters in occupied rooms need to be turned on

Types:

- Baseboard
- Fan heaters
- Split systems

RADIANT HEAT

- Radiant heating and cooling systems
 - Control surface temperatures
 - Minimize excessive air motion
 - Annual operating cost savings of 20% to 50%
 - Lower thermostat settings
 - Superior, cost-effective design

THERMOSTATS

- Automatic mechanism for controlling heating or cooling by a central or zonal system
- Location is important

CENTRAL VACUUM SYSTEMS

Advantages:

- Affordability and increased home resale value
- Removal of dirt too heavy for most units
- Exhaust of dirt and dust out of the space
- No motor unit or electric cords
- Less noise
- Savings in cleaning time
- Ability to vary vacuum pressure

EXHAUST SYSTEMS

- Exhausts are part of the HVAC system
- Exhaust systems are required to remove odors, steam, moisture, and pollutants
- Refer to the text for basic general code requirements

HEAT RECOVERY & VENTILATION

- Uses a counter flow heat exchanger between inbound and outbound airflow
- Air pollutants
- Principle reason for installation
- Air-to-air heat exchangers
- Pulls polluted, stale, warm air from the space and transfers heat in that air to fresh, cold air being pulled into the space

THERMAL CALCULATIONS **FOR HEATING/COOLING**

Necessary to establish the correct:

- Furnace
- Ductwork
- Supply
- Return register specifications

Historical primary use

- Calculate design heat load of houses to estimate gas and oil heating systems size

UNIVERSAL HVAC DESIGN

Issues to consider in designing a building for people with disabilities

- Thermostats
 - Placement
 - Available in Braille, large print, or with clicks
- Heating systems
 - Electric forced-air furnaces or heat pumps may be preferred
 - Consider placement, allergies, filters, and timers

HVAC CODE REQUIREMENTS

National Energy Conservation Code regulates the design and construction of:

- Exterior envelope and selection of HVAC
- Service water heating
- Electrical distribution
- Illuminating systems and required equipment

STEPS IN FILLING OUT THE RESIDENTIAL DATA SHEET

Completed residential heating data sheet

- Two-page data sheet
- Divided into several categories
- Calculations result in total heat loss
- Refer to the text for steps to complete the form
 - Also refer to Figures 21-14 and 21-15

Completed residential cooling data sheet

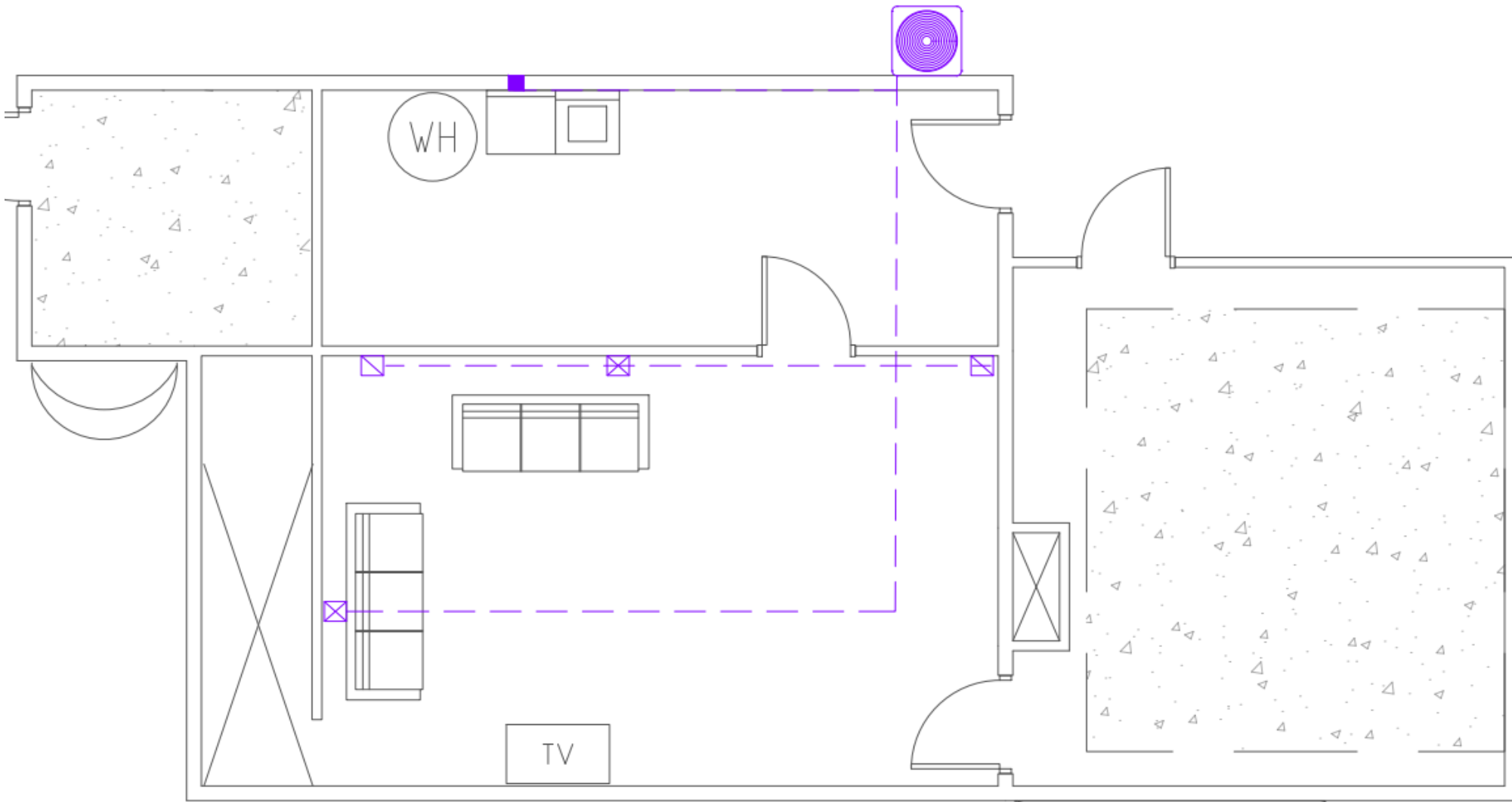
- Two-page data sheet
- Divided into several categories
- Calculations result in total sensible and latent heat gain
- Refer to the text for steps to complete the form
 - Also refer to Figures 21-14 and 21-16

HVAC DRAWINGS

- Drawings for the HVAC system show:
- Size and location of all equipment, ductwork, and components
- Use accurate symbols, specifications, notes, and schedules
- Form the basis of contract requirements for construction

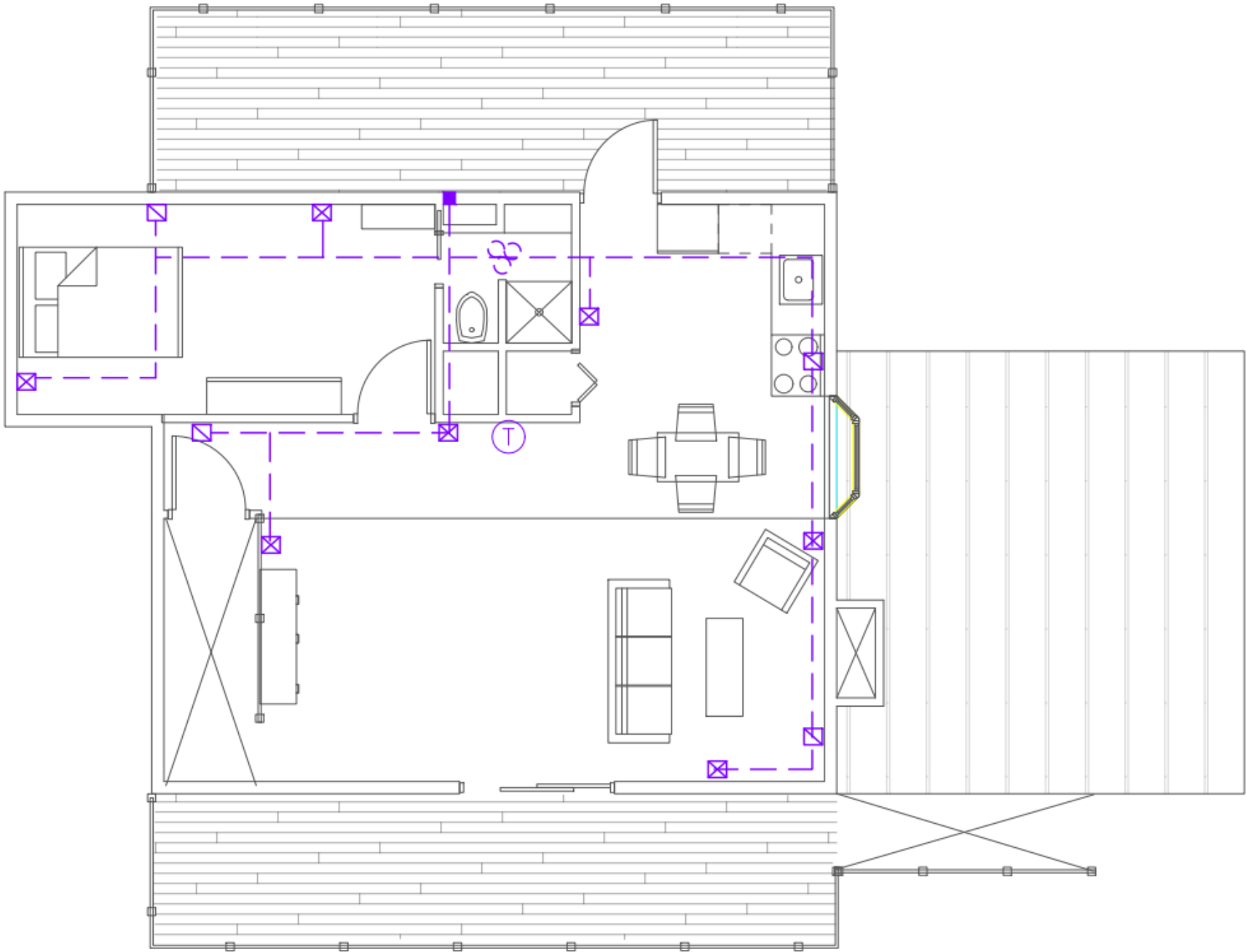
Include:

- Single-and double-line HVAC plans
- Detail drawings
- Section drawings
- HVAC schedules
- HVAC pictorial drawings
- Refer to the text for a HVAC drawing checklist
- Check off the items in the list as you work on the HVAC plan



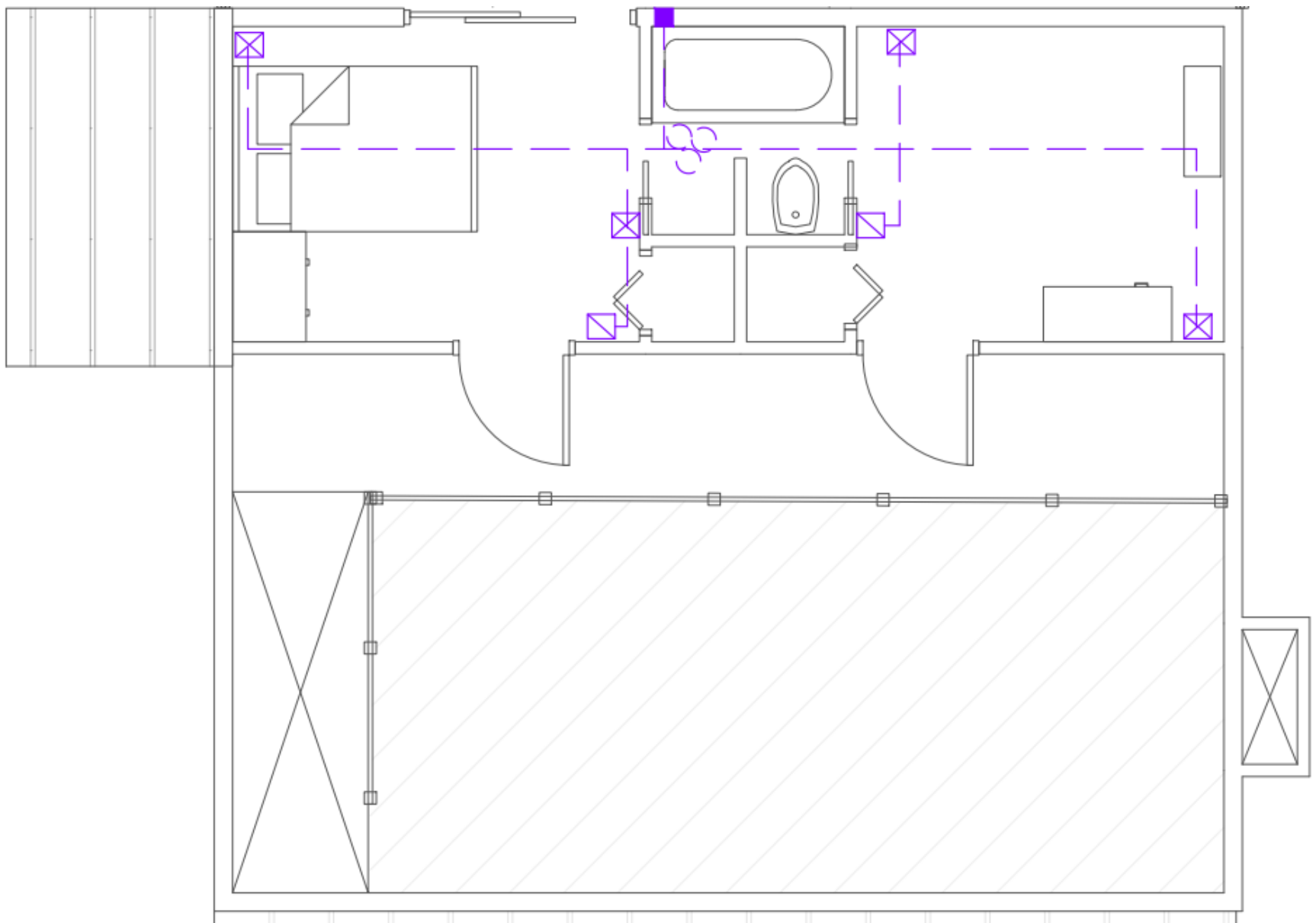
HVAC PLAN — BASEMENT

NOT TO SCALE



HVAC PLAN — FIRST FLOOR

NOT TO SCALE



HVAC PLAN — SECOND FLOOR

NOT TO SCALE