Terminology and Symbols: Mechanical

LEARNING MECHANICAL TERMINOLOGY and symbols is vital to understanding mechanical drawings and designs. Almost everything communicated on a set of mechanical documents uses a symbol, a term, or an abbreviation. Engineers, draftsmen, contractors, and fabricators use symbols, terms, and abbreviations daily. The great benefit to learning these symbols, terms, and abbreviations is that you will be able to create and read mechanical construction documents.

Objectives:

1. Interpret basic mechanical terminology and symbols.
2. Interpret basic plumbing terminology and symbols.
3. Interpret basic HVAC terminology and symbols.

Key Terms:

cleanout
copper type
damper
diffuser
drain-waste-vent (DWV)
ductwork
elbow
equipment schedule
humidistat
HVAC
mechanical designers
plumbing
pressure test
P trap
rough-in plumbing
smoke damper
solder
soldering
tee
thermostat
transitions
trap
union

Understanding Mechanical Terminology and Symbols

Mechanical designers are people who create machines, products, and new technologies; they often specialize. Specialized fields include power systems, welding, plumbing, pipefitting, HVAC, hydroelectric, and pneumatic. **HVAC** stands for heating, ventilation, and air conditioning. Mechanical design typically involves the use of computer-aided design software (CAD) and other hand-held tools. Mechanical drawings use a graphic language; they have rules (guidelines) similar to those governing other languages. Therefore, mechanical designers and drafters need a working knowledge of drafting practices and standards for specific industries and specific products.

Mechanical engineers redesign existing manufacturing systems and processes. Much of the work requires special machinery for improved efficiency. The information and data conveyed in drawings must be accurate and clear. Symbols, abbreviations, and specific terminology produce clean graphic drawings and ensure that everyone involved understands what is being conveyed.

EQUIPMENT SCHEDULE

Mechanical drawings are typically combined with design, architectural, structural, and/or construction plans that include symbols and notes. Some symbols are defined in an **equipment schedule**, which is a list of equipment, parts, and systems required for the design to function properly. The schedule includes the abbreviations and/or symbols that represent the equipment. Then it lists all the specifics about the equipment, including size, type, and manufacturer. In contrast, mechanical system drawings, for most construction plans, are shown with little detail. Typically, only the most important features are shown.

℄ –CENTERLINE	TYP –TYPICAL
⌵ –COUNTER SINK	DP –DEEP
□ –SQUARE	MIN –MINIMUM
// –PARALLEL	MAX –MAXIMUM
↧ –DEPTH	BC –BOLT CIRCLE
⌴ –COUNTER BORE	REQD –REQUIRED
Ø –DIAMETER	THRU –THROUGH
⊥ –PERPENDICULAR	CHAMF –CHAMFER
C'BORE –COUNTER BORE	2X –OCCURS TWICE (ETC)
DIA –DIAMETER	QTY –QUANTITY
D –DIAMETER	HD –HEAD
R –RADIUS	SECT –SECTION
RAD –RADIUS	S'FACE –SPOT FACE

FIGURE 1. Mechanical plans are rather basic. They include only what is needed. Most of it involves understanding symbols and terms.

FURTHER EXPLORATION...

ONLINE CONNECTION: Mechanical Engineering Drafters

Mechanical engineering drafters have a lot of responsibility. They interpolate (insert) information and create 2D drawings and 3D models. These people must be very detail-oriented and must have an aptitude for mechanical things to succeed as mechanical engineering drafters. They produce drawings that contractors or machinists use to build designs. They also have to complete the design and consult with engineers. To learn more about mechanical drafters, visit the following website:

http://www.youtube.com/watch?v=Tmu_mQWJ8PQ

Plumbing Terminology and Symbols

Plumbing is any apparatus (e.g., pipe, fixture, or line) used in the distribution of water, gas, and sewer in a building. On construction plans, plumbing lines are shown as single lines of different types to represent various piping. The symbols used are graphically similar to the fittings they represent. For instance, a hash mark or short line shows the joint between the pipe and the fitting. Plumbing fixture drawings closely resemble the actual fixture (e.g., a bathroom sink or tub). This allows a person to make sure the fixtures fit within the dimensions of the plan.

PLUMBING TERMINOLOGY

- A **cleanout** is a plumbing fitting with a removable plug installed to provide access for cleaning and inspection of plumbing waste lines. It has an easily replaceable airtight cover. In-line, fittings, and end are types of cleanouts.
- **Copper type** is the wall thickness of the copper piping. The three standard types—from thickest to thinnest—are K, L, and M.
- The **drain-waste-vent** (DWV) is the part of the plumbing system that removes sewage from a building and regulates air pressure in the waste system pipes.
- An **elbow** is a pipefitting with two openings that changes the direction of the line. The standard angles are 90 degrees and 45 degrees.
- A **trap** is a curved section of drain line that prevents sewer odors from escaping into the atmosphere. A **P trap** is a "J-" or "U-"shaped pipe located below or within a plumbing fixture, along the waste line. The bottom of the shape retains water after the fixture is used to stop sewer gas from escaping back into a building through the fixtures.
- A **pressure test** is a check of the pressurized plumbing lines to ensure that a constant pressure, with no leaks, is maintained. Water supply lines and DWV pipes are tested when the entire plumbing system is installed but is not yet covered by drywall. If the pressure falls below a set limit (often five PSI), the fittings must be checked for leaks.

- **Rough-in plumbing** is the installation of drain, waste, vent, and supply lines in a structure to the proposed location of each fixture; it does not refer to fixtures (e.g., sink, shower, and tub). Typically, wall finishes cover all rough-in plumbing work.
- **Solder** is a metal alloy (filler metal) melted to create a fused joint between metal pieces. **Soldering** is the process of joining two or more metal items together by melting and flowing filler metal between the two.
- A **tee** is a T-shaped pipefitting with three openings used to create branch lines. One line is at a 90-degree angle to the other two and is in the shape of a "T."
- A **union** is a three-piece pipefitting that joins two sections of pipe and allows them to be disconnected without cutting the pipe. A union allows for the quick disconnection of two pipes. It consists of a threaded nut, a male end, and a female end.

PLUMBING SYMBOLS

Plumbing symbols and abbreviations are defined on plumbing legends and/or schedules. Legends contain information about the rough-in plumbing and the supply and drain lines. The fixture schedules contain information about the actual plumbing fixtures: sink, bathtub, toilet, and shower types. Fixture schedules may contain the graphic symbols used to note hot and cold water and venting.

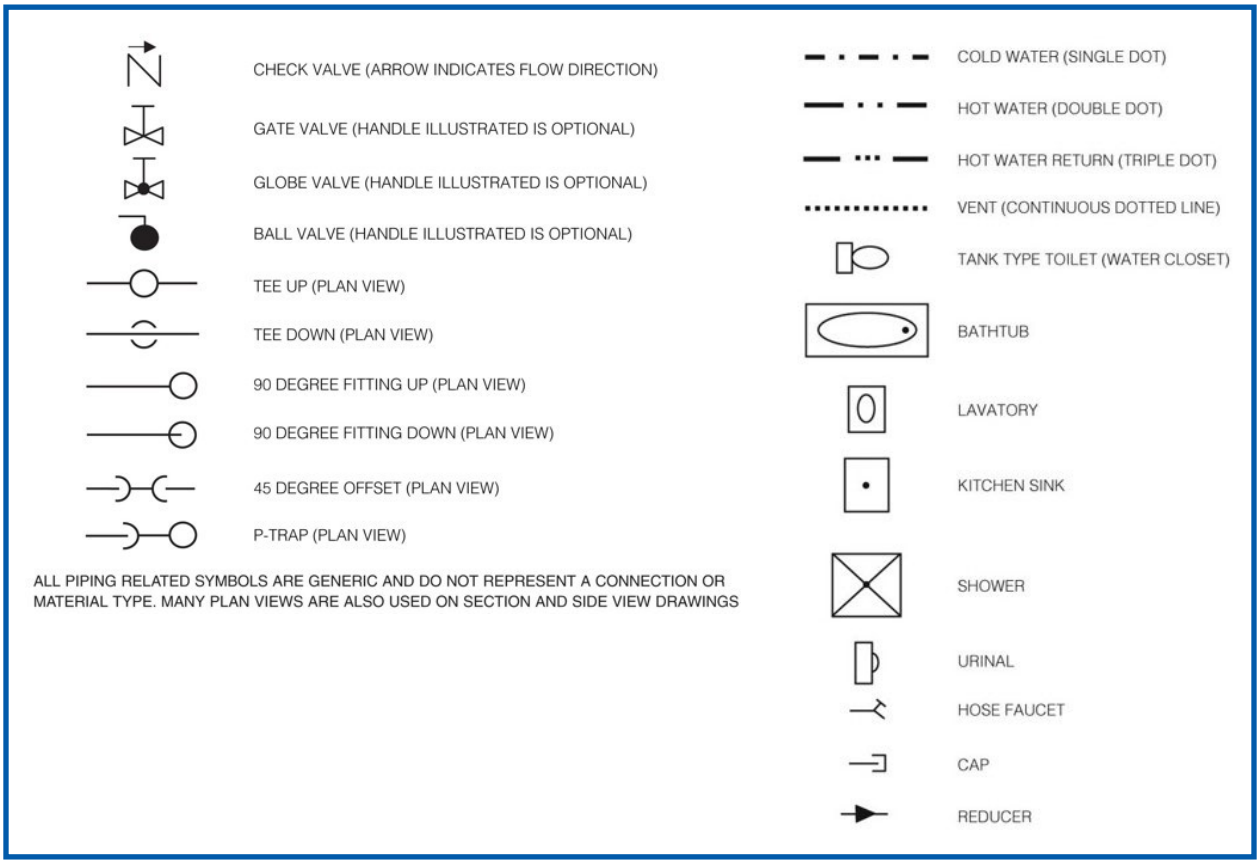

FIGURE 2. Plumbing symbols. (Courtesy, Shanghai Jiao Tong University, Shanghai, China)

HVAC Terminology and Symbols

HVAC lines on a construction plan are shown as single lines or as double lines that represent the actual dimension of the ductwork. **Ductwork** is a system of ducts (pipes, tubes, or channels that carry a substance) used to circulate air for heating, cooling, and/or ventilation.

The symbols used for air diffusers are drawn realistically and to their correct dimension on a floor plan or on a reflected ceiling plan. Peripheral equipment (e.g., a balancing damper or a smoke damper) is shown with a simple graphic or an abbreviation. A **damper** is a device used to regulate airflow. Each air supply branch will have a damper installed; adjusting the position of the damper regulates the airflow. A **smoke damper** is a device that controls or stops the flow of smoke through an opening or duct; it is a type of passive fire protection used in air conditioning and ventilation ductwork to prevent the spread of smoke inside the ductwork. Smoke and fire dampers are found in ductwork that passes through a firewall or fire curtain.

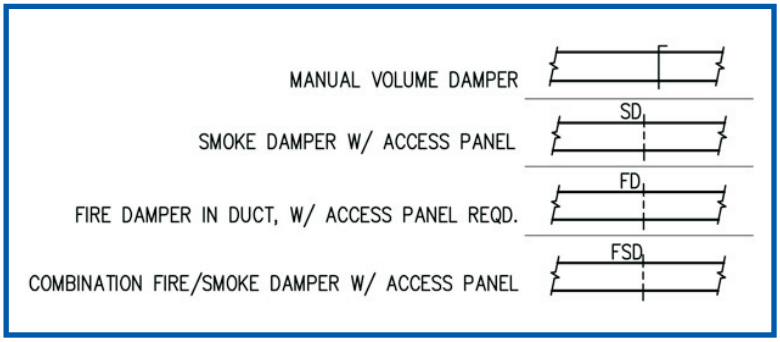

FIGURE 3. Balancing dampers are used at several locations in an HVAC system. They help adjust the amount of airflow. They can be electronic (automatic) or manual. In this image, you see the symbols used for standard dampers.

HVAC TERMINOLOGY

- **Transitions** are devices used to change the size or shape of the ductwork. They can be used to increase or decrease airflow or to move from a round- to a square-shaped duct. Transitions are also used to alter the size of a duct from a regular-size vertical duct to a thin, wall-mounted duct. A register head allows the transition to a wall-mounted air register.
- A **diffuser** is a circular, square, or rectangular grille over an air supply duct, with vanes that distribute the discharging air in a specific pattern or direction. An air diffuser is generally located in the ceiling and is comprised of deflecting members discharging supply air in various directions and planes. In addition, a return air diffuser is used for air intake.
- A **humidistat** is an instrument that measures the humidity in a building and then turns the humidifier on or off.
- A **thermostat** is a sensor device that automatically monitors and controls the output of an HVAC system. The thermostat responds to temperature changes and activates switches controlling the equipment in a home heating system, a refrigerator, or an air conditioner.

HVAC SYMBOLS

HVAC symbols and abbreviations are located on a legend or on a mechanical fixture schedule in construction plans. The legend defines each symbol and abbreviation. The mechanical fixture schedule contains information about the actual mechanical fixtures (e.g., air diffusers and thermostats). It may show the graphic symbols for the equipment used in the system.

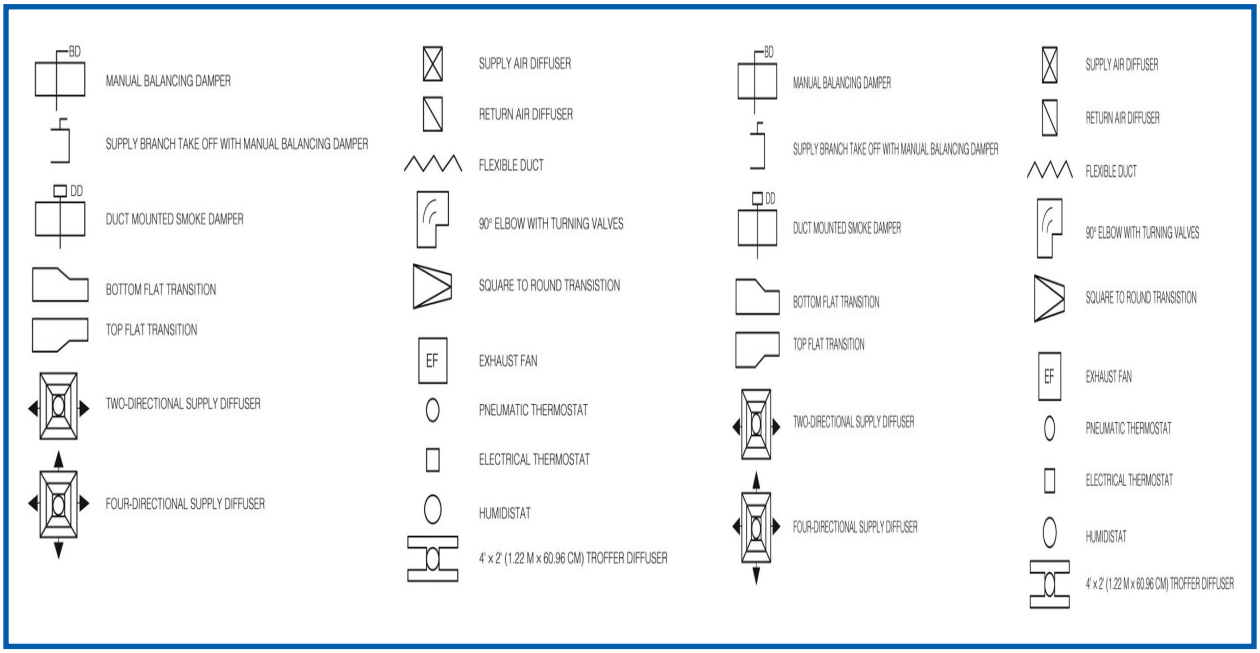

FIGURE 4. HVAC symbols. (Courtesy, Shanghai Jiao Tong University, Shanghai, China)

Summary:

Mechanical drawings use a graphic language, with rules similar to those governing other languages. Therefore, mechanical designers or drafters need to have knowledge of drafting practices and standards for specific industries and products.

Plumbing lines are shown as single lines. “Line types” represent different piping. The symbols used are graphically similar to the fittings they represent.

HVAC lines can be shown as single or double lines that represent the actual dimension of the ductwork. The symbols used for air diffusers are drawn close to the diffuser actual appearance and to the correct dimension. Peripheral equipment, such as balancing or smoke dampers, is shown with a simple graphic or abbreviation.

Checking Your Knowledge:

1. What do plumbers install to ensure the easy evacuation of a clog?
2. Explain how soldering two joints works.
3. What do dampers regulate?
4. What is the shape of a P trap, and why is it an important safety feature?
5. How do air diffusers work?

Expanding Your Knowledge:

A great way to learn more about mechanical terminology and symbols is to plan a trip to a local mechanical engineer's office to see how he or she uses the terminology and symbols daily. Schedule a time to visit, and create a list of questions beforehand so you are prepared to discuss the details of mechanical drawings. Ask to see some drawings.

Web Links:

Mechanical Terminology
http://www.iienet2.org/Details.aspx?id=645

Mechanical Topics
http://mechanicalebook.com/topics.htm

HVAC Terms
http://www.engineeringtoolbox.com/hvac-terms-d_246.html

Plumbing
http://plumbing.1800anytyme.com/plumbing-glossary.php

Mechanical Designers and Drafters
http://www.engineersedge.com/mechanical_engineering/what_do_mechanical_designers_do.htm