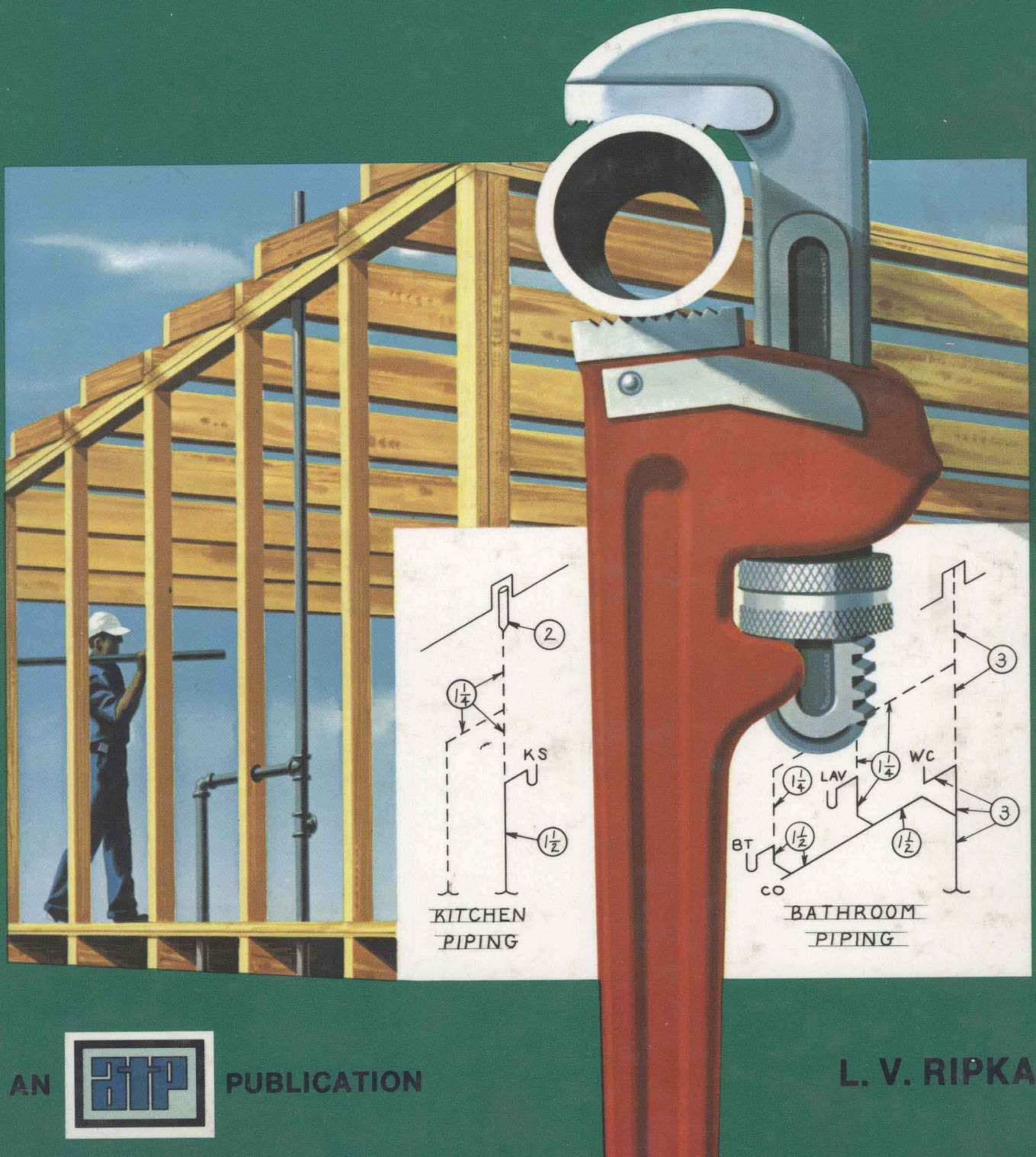
plumbing

INSTALLATION AND DESIGN

second edition



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L. V. RIPKA

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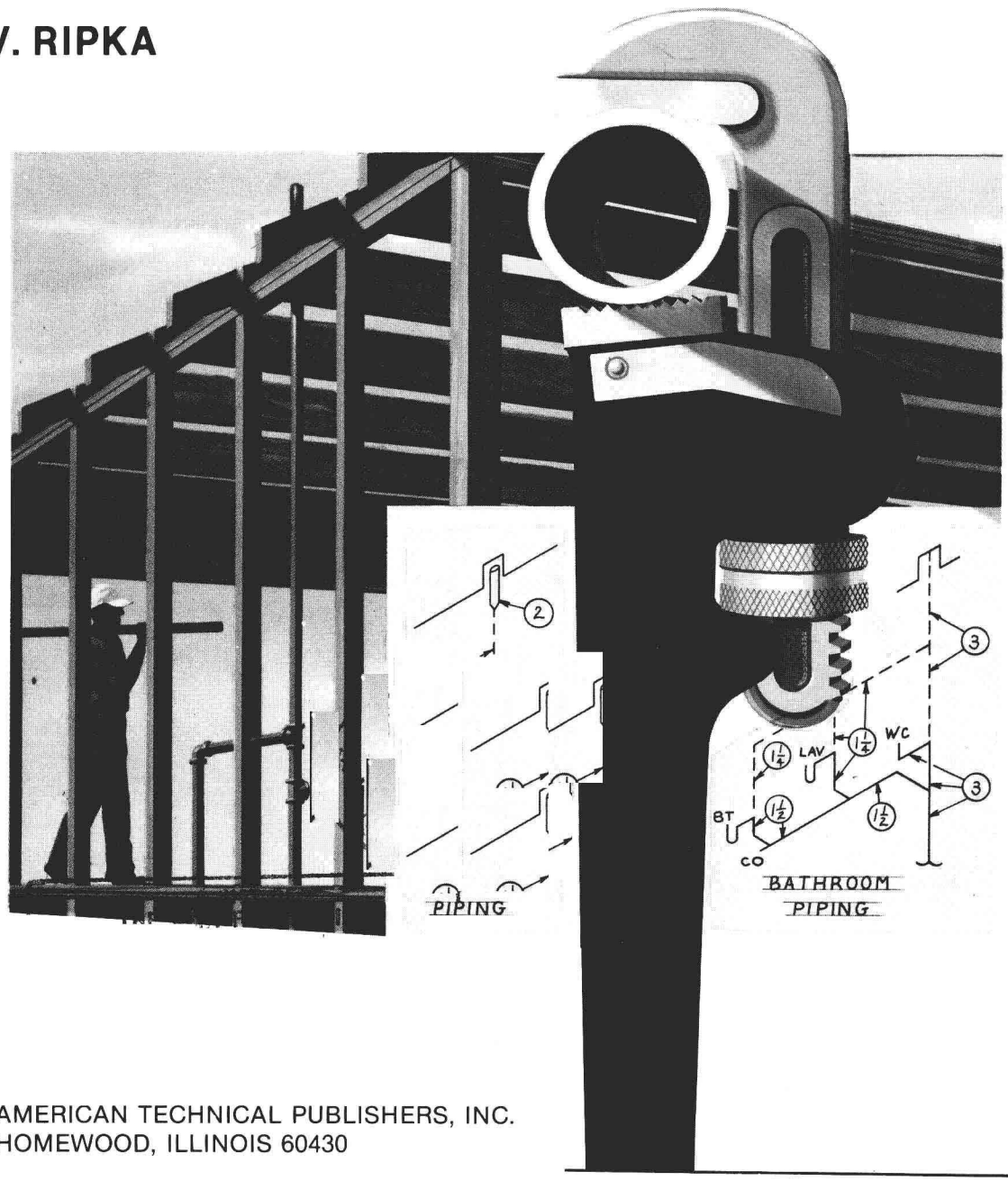

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Introduction

PLUMBING INSTALLATION AND DESIGN is a complete learning program designed to help the beginning student of the plumbing trade develop and apply the technical knowledge necessary to attain job-entry skills. Although the major scope of this text relates to residential plumbing design, commercial plumbing design is also covered.

The objective of this text is to develop the basic skills of beginning students in the use of plumbing materials, tools, and equipment together with the basic technical knowledge required for them to enter the plumbing trade. The students will learn how to make common joints, install the systems common to the plumbing trade, and also to learn to install plumbing fixtures and appliances.

Contents

CHAPTER 1

Plumbing as a Trade

What are a plumber's responsibilities? The plumber is responsible for the public health and sanitation. To meet this responsibility, the plumber must provide a safe or potable supply of water into a building, distribute this water supply to the various plumbing fixtures, and remove the waste water and water-borne waste materials. The plumber is also responsible for the maintenance and repair of these water supply and waste pipes. In the process of supplying water to the building and removing the water-borne waste materials, the plumber constructs the plumbing systems of a building. A typical plumbing code might use the following definition of plumbing and a plumbing system:

> ***Plumbing.*** Plumbing is the art of installing in buildings, the pipes, fixtures, and other apparatus for bringing in the water supply and removing waste water and water-carried waste.
>
> ***Plumbing System.*** The plumbing system of a building includes the water supply distributing pipes; the fixtures and fixture traps; the soil, waste, and vent pipes; the building drain and building sewer; the storm water drainage; with their devices, appurtenances, and connections within the building and outside the building within the property line.

The plumber is usually guided in the job of supplying a building with a safe water supply and removing the water-borne waste materials by state and/or municipal plumbing codes. Figure 1-1 shows the 23 basic plumbing principles on which a typical state plumbing code is based.

The plumbing trade has an old and interesting history. Prehistoric man of a hundred thousand years ago left indications of sanitation and plumbing skill. Crude as these devices were, they offered proof that even these primitive people realized the consequences of poor plumbing. The rulers of Egypt, Greece, and Rome, thousands of years before Christ, advocated sanitary facilities of one kind or another. Bathtubs that were mere holes in the ground lined with tile, and water-conveying aqueducts constructed of terra cotta and brick and terminating in a reservoir, were some of these historic accomplishments.

The individual who worked in the sanitary field in ancient Rome was called a *plumbarius,* taken from the Latin word *plumbum,* meaning lead.

Basic Plumbing Principles. This code is founded upon certain basic principles of environmental sanitation and safety through properly designed, acceptably installed and adequately maintained plumbing systems. Some of the details of plumbing construction may vary but the basic sanitary and safety principles desirable and necessary to protect the health of the people are the same everywhere. As interpretations may be required, and as unforeseen situations arise which are not specifically covered in this code, the twenty three principles which follow shall be used to define the intent.

(a) All premises intended for human habitation, occupancy, or use shall be provided with a potable water supply which meets the requirements of the Minnesota State Board of Health. Such water supply shall not be connected with unsafe water sources nor shall it be subject to the hazards of backflow or back-siphonage.

(b) Plumbing fixtures, devices, and appurtenances shall be supplied with water in sufficient volume and at pressures adequate to enable them to function properly and without undue noise under normal conditions of use.

(c) Plumbing fixtures shall be designed and adjusted to use the minimum quantity of water consistent with proper performance and cleaning. Hot water shall be supplied to all plumbing fixtures which normally need or require hot water for their proper use and function.

(d) Devices for heating water and storing it shall be designed and installed to prevent all dangers from explosion and over heating.

(e) Every building with installed plumbing fixtures and intended for human habitation, occupancy or use when located on premises where a public sewer is available within a reasonable distance shall be connected to the sewer.

(f) Each family dwelling unit shall have at least one water-closet, one lavatory, one kitchen type sink, and one bathtub or shower to meet the basic requirements of sanitation and personal hygiene. All other structures for habitation shall be equipped with sufficient sanitary facilities.

(g) Plumbing fixtures shall be made of durable, smooth, non-absorbent and corrosion resistant material and shall be free from concealed fouling surfaces.

(h) The drainage system shall be designed, constructed, and maintained to conduct the waste water with velocities which will prevent fouling, deposition of solids and clogging.

(i) The piping of the plumbing system shall be of durable material free from defective workmanship and so designed and constructed as to give satisfactory service for its reasonable expected life.

(j) The drainage system shall be provided with an adequate number of cleanouts so arranged that in case of stoppage the pipes may be readily cleaned.

(k) Each fixture shall be provided with a separate, accessible, self-scouring, reliable water-seal trap placed as near to the fixture as possible.

(l) The building drainage system shall be designed to provide adequate circulation of air in all pipes with no danger of siphonage, aspiration or forcing of trap seals under conditions of ordinary use.

(m) Each vent terminal shall extend to the outer air and be so installed as to minimize the possibilities of clogging and the return of foul air to the building.

(n) The plumbing system shall be subjected to adequate tests and to inspections in a manner that will disclose all leaks and defects in the work or the material.

(o) No substance which will clog or accentuate clogging of pipes, produce explosive mixtures, destroy the pipes or their joints, or interfere unduly with the sewage-disposal process shall be allowed to enter the drainage system.

(p) Proper protection shall be provided to prevent contamination of food, water, sterile goods, and similar materials by backflow of sewage. When necessary, the fixtures, device, or appliance shall be connected indirectly with the building drainage system.

(q) No water-closet or similar fixture shall be located in a room or compartment which is not properly lighted and ventilated.

(r) If water-closets or other plumbing fixtures are installed in a building where there is no sewer within a reasonable distance, suitable provision shall be made for disposing of the building sewage by methods of disposal which meets the requirements of the Minnesota State Board of Health and the Minnesota Pollution Control Agency.

(s) Where a building-drainage system may be subjected to back flow of sewage, suitable provision shall be made to prevent its overflow in the building.

(t) Plumbing systems shall be maintained in a safe and serviceable condition from the standpoint of both mechanics and health.

(u) All plumbing fixtures shall be so installed with regard to spacing as to be accessible for their intended use and cleansing.

(v) Plumbing shall be installed with due regard to preservation of the strength of structural members and prevention of damage to the walls and other surfaces through fixture usage.

(w) Sewage or other waste shall not be discharged into surface or sub-surface water unless it first has been subjected to an acceptable form of treatment.

Figure 1-1. Basic plumbing principles on which plumbing codes are based. (Minnesota Plumbing Code)

Because this individual's work consisted of shaping lead, this name seemed fitting. It is interesting to note that until just recently much lead was still used for waste and water supply, and after two thousand years the sanitarian is still called a plumber. Evidence of the skill of these artisans can be seen in the aqueducts they built, some of which are still in use today.

During the period known as the Dark Ages (A.D. 400 to 1400) the culture of the early Romans deteriorated. Disease was rampant, and unsanitary conditions were responsible for destroying at least one quarter of the population of ancient Europe. In the fight for supremacy during this period, the Goths, Christians, and other invaders destroyed what remained of Roman culture. Europe was dormant for almost ten centuries.

During the Renaissance, a gradual upbuilding of plumbing again began. Early in the 17th century the first plumbing apprentice laws were passed in England. France began building public water service installations in the 18th century. In general, Europe was in a period of building, including in this progress the art of sanitary science.

In the United States, which was largely devoted to agriculture, very little progress in plumbing was made up to the year 1800. The kitchen sink and portable bathtub were the first two indoor plumbing fixtures. The outside privy was a common means of disposing of waste matter. Water closets, imported from England (where they were first patented), were in use in a few instances, but it is doubtful whether scientific principles were applied in installations of that day.

After the Civil War, plumbing improvements came slowly but steadily. Patents were issued on traps and methods of ventilation. Public water supply and sewage disposal systems became more evident, and plumbing came to be regarded as a necessity rather than the luxury it was considered twenty years before. Up to 1900 very few homes in urban localities provided more than a hydrant and a slop hopper for the disposal of waste. After the turn of the century, plumbing progressed more rapidly. Water closets of the hopper and washout varieties as well as sinks, wash basins, and bathtubs were provided within the walls of a building. Scientific methods were becoming used in constructing plumbing installations.

Fixture traps were ventilated, and hot and cold running water was introduced. The siphon washdown closet appeared during this period, and states were developing legislation for the control of sanitation. The greatest progress in plumbing took place after the year 1910, which is rather recent for a trade that has a background of thousands of years. Modern manufacturing methods provided materials and equipment that could be scientifically incorporated into a plumbing system. Buildings became larger, and the people who occupied them demanded more sanitary facilities.

STRUCTURE OF THE TRADE

The plumbing trade is structured into various levels of craftsman: apprentice, journeyman, foreman, superintendent.

Apprenticeship or learning usually lasts from four to five years. Dating back to early history apprentices in the various crafts were *indentured* (a contract binding one person to work for another for a given length of time to learn a trade) to a master craftsman, most often a contractor, for a number of years to learn the trade.

In many cases, the apprentice's father had to pay the master a fee to get him to teach his son the trade. From the medieval days down through most of the 19th century, the apprentice would live with the master and would get room and board plus some clothing. However, he was a virtual slave to the master, subject to his every wish.

Today in the plumbing trade, apprentices are protected by federal and state laws, and the local JATC (Joint Apprenticeship and Training Committee) in regard to hours of work, wages, and conditions of employment. Furthermore, there is no control over the apprentices outside of the working hours. Also, apprentices are now selected from applicants who meet the standards of the local JATC. The apprentice is indentured to the JATC and then assigned to a contractor. If the contractor runs out of work the JATC will

place the apprentice with another contractor. This permits the JATC to control the training and handle the federal, state, and veterans' paperwork.

The *journeyman,* or experienced craftsman, is one who has completed an apprenticeship in the trade. The journeyman is now a free agent and can work for any contractor. The journeyman plumber may travel from place to place, going where the work is to be found.

The *foreman* (or supervisor) is a journeyman who has been placed in the job of supervising a group of workers. A supervisor is given this position because of ability shown as a craftsperson, as well as the ability to supervise other craftpersons. The supervisor is responsible for laying out the work for the journeyman and apprentices on the job and seeing that they have enough tools and material to work with. On larger jobs there will sometimes be a general foreman who supervises the foremen.

The *superintendent* is usually a foreman who has been promoted to this important position. A superintendent is in charge of all the work in the field for the contractor and supervises the work of the foremen and general foremen.

In the construction industry, the foremen, general foremen, and superintendent keep their union membership. Many of the smaller contractors are permitted to retain their union cards in some unions. Plumbers, too, permit this in some areas.

Large plumbing contractors will employ an *estimator* who works in their offices to estimate the cost of the jobs the contractor wants to bid on. Working from the blueprints and specifications, the estimator *takes off* (measures and/or counts) the plumbing fixtures and equipment, and measures the footage of piping required to install the given job. This is done to figure costs of material and labor so that a fair bidding figure may be obtained for the contractor to make a profit on the job. The estimator must be skilled in mathematics, blueprint reading, trade practices, and estimating the cost of labor and materials.

The last person in this team of workers, supervisors, and estimator is the *contractor.* The contractor must know all phases of the business. This includes knowing all the regulations governing the construction industry, being licensed to install plumbing, and being able to provide the money for payrolls and materials. The livelihood of the company's employees depends on the overall ability of the contractor to run the business successfully.

JOINT APPRENTICESHIP AND TRAINING COMMITTEE APPRENTICESHIP STANDARDS

The plumbing industry has, in cooperation with the U. S. Department of Labor, Bureau of Apprenticeship and Training, set up National Standards of Apprenticeship. These standards define what the term *apprentice* in the trade shall mean. The standards set forth age limits, educational requirements, length of apprenticeship, ratio of apprentices to journeymen, hours of work, and wages.

The Joint Apprenticeship and Training Committee, commonly known as the JATC, is composed of equal representation from labor and management, with consultants from the Bureau of Apprenticeship and the state or local board of education attending as nonvoting advisors.

The JATC has the delegated power to set the local standards consistent with the basic requirements established by the national committee. These local standards are particularly important in the plumbing industry; the apprentice plumber must learn the local plumbing codes and ordinances so that upon completion of the apprenticeship training the candidate will be able to pass a plumbing license examination based upon them. Figure 1-2 shows a typical set of local standards for a four-year program. Note that the standards also include the wage rate structure the apprentice will receive during the term of the apprenticeship.

When signing the indenture agreement, the apprentice agrees to live up to all its provisions and in turn is protected by its rules and regulations. Some state Bureaus of Apprenticeship and Training will then issue the apprentice an identification card. This card will be the apprentice's personal identification when on the job site, until a journeyman plumber's license has been obtained.

In addition to supervising the on-the-job train-

PLUMBER QUALIFICATIONS

Age—At least 17 years of age

Education—High School graduation or equivalent

Physical Examination—Physical examination by a doctor may be required by the JATC.

Other—Applicants must be citizens of the United States, or in the process of naturalization.

Term of Apprenticeship

The term of apprenticeship shall be not less than four years, to be divided as follows: 7024 hours of work experience, and not less than 800 hours of related instruction (200 hours per year); shall be considered to be the minimum requirements for the development of a journeyman.

Work Processes Covered During Training

Installation of piping for waste, soil sewerage, vent, and leader pipes	1760 hours
Installation of piping for hot and cold water for domestic purposes	640 hours
Installation of tin pipe, lead pipe, sheet lead	80 hours
Assembly and connection of fixtures and appliances	1600 hours
Welding	320 hours
Maintenance and repair of plumbing	1200 hours
Installation of other work usually performed by plumbers	1424 hours
Total	7024 hours

Apprentice Wages

1st 1756 hours	50%
2nd 1756 hours	60%
3rd 1756 hours	70%
4th 1756 hours	80%

of journeyman wage rate

Figure 1-2. Typical local apprenticeship standards.

ing the apprentice receives, the JATC also establishes the curriculum for the related instruction the apprentice receives. This related instruction consists of both classroom and shop classes.

During the period of the four-year apprenticeship the apprentice plumber will receive classroom instruction in the following areas: plumbing theory, natural gas piping, blueprint reading, and plumbing codes. Typical plumbing shop classes are: gas welding, arc welding, soldering and silver brazing, and lead working.

When an apprentice completes the classroom training and the required number of hours of on-the-job training, the JATC notifies the Bureau of Apprenticeship and Training, and this agency issues a completion certificate. In addition, upon passing the plumbing license examination(s) the apprentice plumber will be issued the state and/or local plumbing licenses. These licenses are important because local plumbing ordinances usually require that a plumber be licensed in the area before work can be done there, and the ordinances usually do not permit apprentices (who are not licensed) to work alone on jobs.

BLUEPRINT READING AND SPECIFICATIONS

In addition to practical training with tools and materials, the apprentice plumber will have to devote much time to learning to read and understand blueprints and specifications. Blueprints and specifications are the working drawings and the written instructions that tell the various crafts how the architect and the various engineers (electrical, mechanical, and structural) want the building constructed.

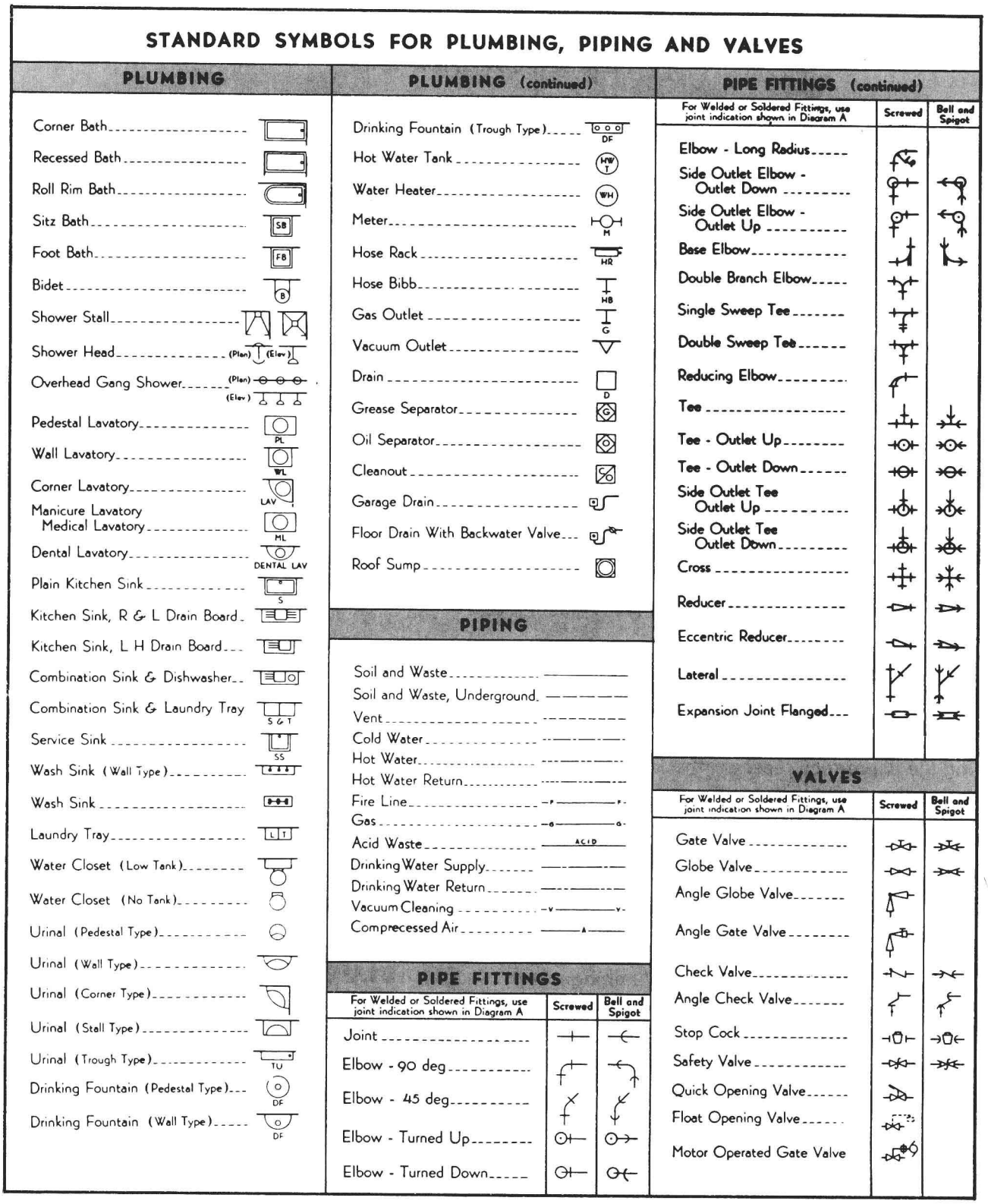

Figure 1-3. Symbols used for plumbing fixtures, piping, fittings, and valves. (American National Standards Institute)

The working drawings are called blueprints because in years past the common building drawing was a blue background sheet with white lines. However, in most cases today, they are white prints (white background with blue or black lines). The name blueprint is still commonly used to describe these drawings.

The blueprints for most larger buildings are divided into three sets:

1. *Structural blueprints* show the supporting structure of the building. This includes the necessary pilings, footings, foundation walls, columns, beams, floor slabs, and roof.
2. *Architectural blueprints* are the complete building plan (except for structural and mechanical details). Architectural blueprints show framing, walls, partitions, wall finish schedules, trim, cabinets, and all the measurements for walls and partitions.
3. *Mechanical blueprints* show the plumbing, heating, and electrical systems of the building. The mechanical blueprints are an outline of the architectural blueprints, but in the case of the plumbing systems, give a complete drawing of the plumbing fixture installation and piping.

On smaller buildings and residential construction, the structural and mechanical blueprints will quite often be incorporated in the architectural blueprints.

Symbols. Piping symbols are used by architects and mechanical engineers on the blueprints to represent the various plumbing fixtures and piping systems as well as the pipe fittings and valves used to construct these systems. Figure 1-3 illustrates the standard symbols used for plumbing fixtures, piping, fittings, and valves that the apprentice will encounter on blueprints.

Plan Views. On the mechanical blueprints, the apprentice will find plan views of the plumbing fixtures and piping as they are to be installed as well as schematic and isometric piping drawings.

A plan view is simply drawn as though the viewer were looking down into the rooms from above. Figure 1-4 illustrates a plan view of the plumbing fixture installation in a bathroom.

Schematics. A schematic, or diagrammatic, piping drawing is a drawing of an entire piping system without regard to either scale or the exact location of the items shown on the drawing. Figure 1-5 is a schematic piping drawing of the sanitary drainage and vent piping for the bathroom illustrated in Figure 1-4 (Figures 1-7, 1-8, and 1-9 are also schematic drawings).

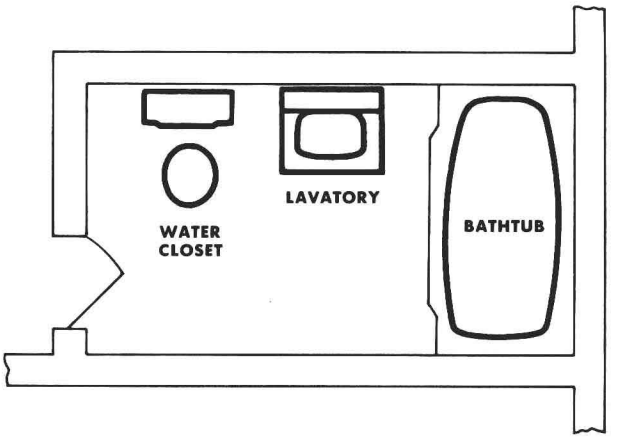

Figure 1-4. Plan view of the plumbing fixtures in a bathroom.

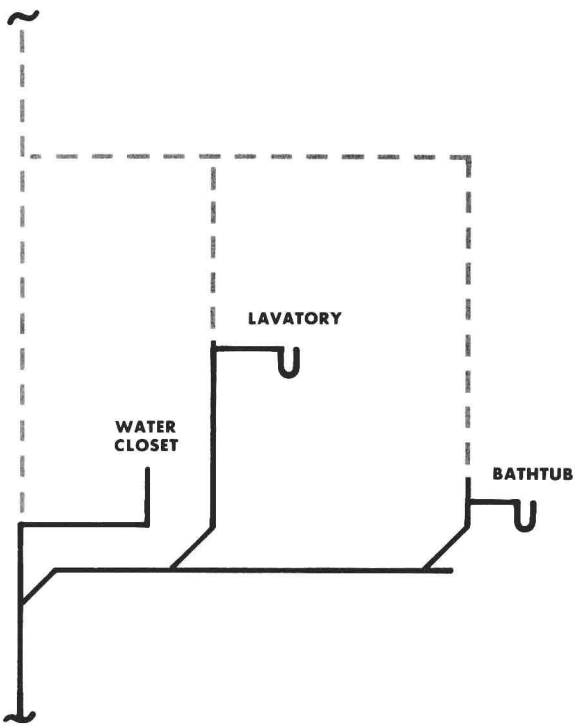

Figure 1-5. A schematic piping drawing of sanitary drainage and vent piping for the bathroom pictured in Figure 1-4.

Isometrics. An isometric piping drawing, or 30°/60° isometric piping drawing, is a three-dimensional drawing. On isometric drawings all pipes which are installed in the horizontal position are drawn as 30° lines whereas all vertical pipes are drawn as vertical lines. In other words, all slanting lines in an isometric drawing actually represent horizontal pipes, and all vertical lines represent vertical pipes. Figure 1-6 is an isometric piping drawing of the sanitary waste and vent piping for the bathroom illustrated in Figure 1-4. (The piping drawings found in Chapters 7, 9, and 12 of this text are nearly all isometric piping drawings.)

On many smaller jobs, the blueprints will not show any piping drawings. The only information provided for the plumber will be the architectural plan views, which show where the plumbing fixtures are to be installed. On these jobs, it will be necessary for the plumber to make schematic and isometric piping drawings. For this reason, the apprentice will have to spend a considerable amount of time making schematic and isometric drawings of the different piping systems so that familiarity for the layout of the different piping systems located in buildings can be acquired.

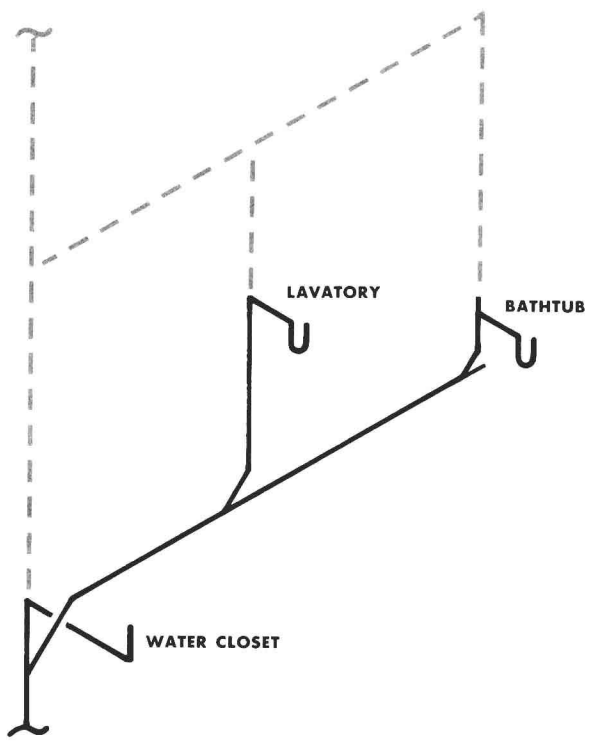

Figure 1-6. An isometric piping drawing of sanitary drainage and vent piping for the bathroom pictured in Figure 1-4.

Specifications. Specifications are the written instructions from the architect and engineers that amplify and supplement the working drawings. Depending on the size of the job, the specifications may consist of a few notations printed on the blueprints, a few sheets of paper, or even elaborate books covering hundreds of pages. The specifications give information that cannot be adequately shown on the working drawings. They also include information on legal responsibilities, insurance, quality of workmanship, and other necessary details such as brands and types of plumbing fixtures and equipment.

It is not the intent of this text to teach blueprint reading. The chapters covering the installation of piping systems in buildings will illustrate the architectural and mechanical prints or piping drawings for these buildings. To further your knowledge of blueprint reading you should obtain some basic blueprint reading texts. From these manuals you can learn about floor plans, elevations, building cross sections, and details. You might consider making your own sketches of the piping systems of buildings to appreciate how the building's piping systems fit within the building framework.

PLUMBING SYSTEMS OF A BUILDING

At the beginning of this chapter, it was stated that the plumber constructed the plumbing systems of a building to supply water to that building and remove the liquid and water-borne waste materials. A plumbing code's definition of plumbing systems was also given. In this text the apprentice will be concerned with the 3 most basic plumbing systems of a building:

1. The Potable Water Supply System.
2. The Sanitary Drainage and Vent Piping System.
3. The Storm Water Drainage System.

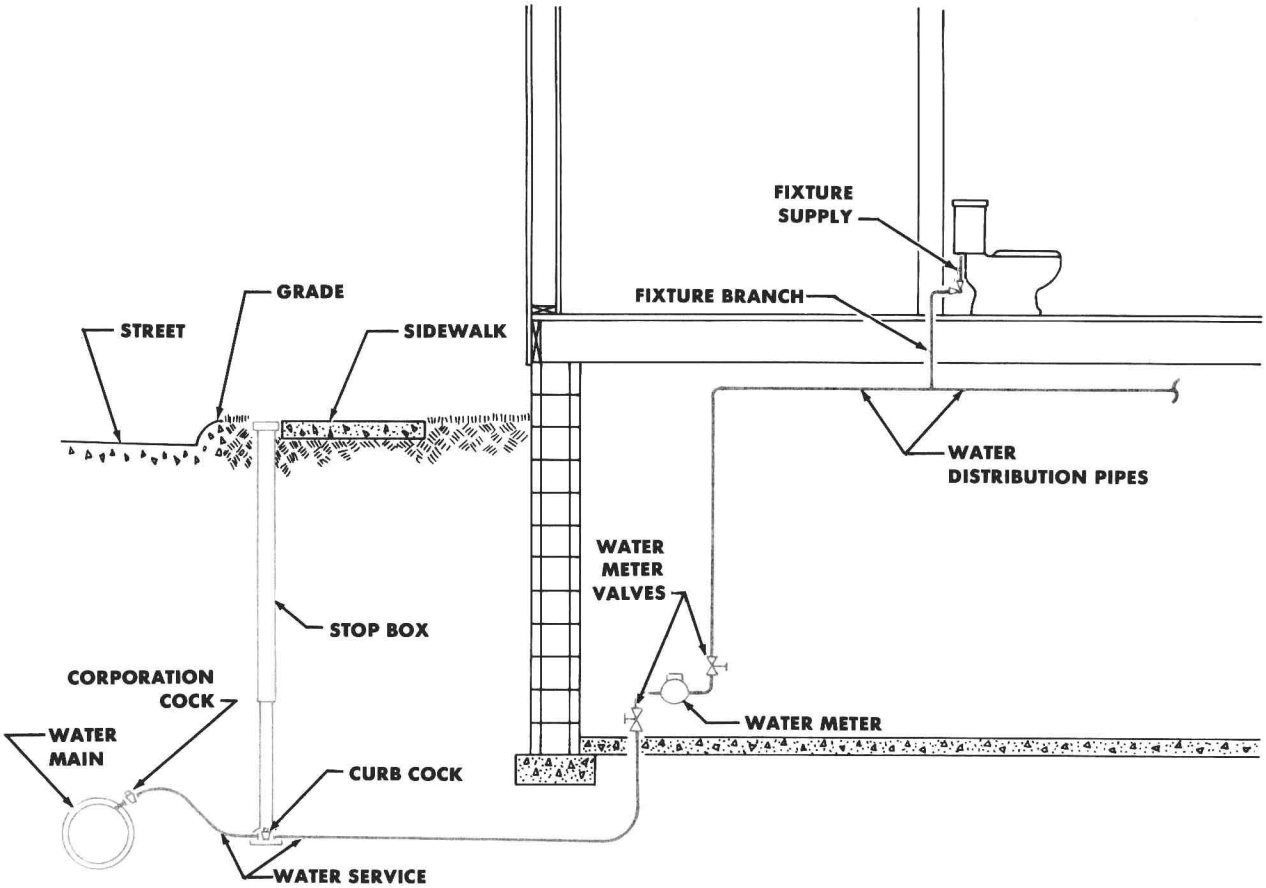

Figure 1-7. Potable water supply system of a building.

Included with the following explanations of each of these 3 systems are a schematic drawing of each system and a list of terms and definitions pertinent to each system. As an apprentice, you will need to know the meaning of these terms and definitions in order to understand the material presented in the later chapters of this text.

The Potable Water Supply System. The potable water supply system of a building is illustrated in Figure 1-7. This supply system supplies and distributes potable water to the points of use within the building.

The following terms (most of which are shown in Figure 1-7) relate to the potable water supply system.

Potable Water. Water free from impurities present in amounts sufficient to cause disease or harmful physiological effects. Its bacteriological and chemical quality shall conform to the requirement of the state board of health. (Minnesota Plumbing Code.)

Potable Water Supply System. The water service pipe, the water distributing pipes, and the necessary connecting pipes, fittings, control valves, and all appurtenances within the building or outside the building within the property lines.

Water Main. The pipe that conveys potable water for public or community use from the municipal water supply source.

Corporation Cock or Corporation Stop. A valve placed on the water main to which the building water service is connected.

Water Service. The pipe from the water main or other source of water supply to the water distributing system of the building.

Curb Cock or Curb Stop. A valve placed on the water service usually near the curb line.

Stop Box or Curb Box. An adjustable cast iron box that is brought up to grade with a

removable iron cover. By inserting a shutoff rod down into the stop box it is possible to turn off the curb cock.

Water Meter. A device used to measure the amount of water in cubic feet or gallons that passes through the water service.

Water Distributing Pipe. A pipe that conveys water from the water service pipe to the point of use.

Main. The principal pipe artery to which branches may be connected.

Riser. A water supply pipe that extends vertically one full story or more to convey water to fixture branches or to a group of fixtures.

Fixture Branch. A water supply pipe between the fixture supply pipe and a water distributing pipe.

Fixture Supply. A water supply pipe connecting the fixture with the fixture branch pipe.

The Sanitary Drainage and Vent Piping System. The sanitary drainage and vent piping systems are installed by the plumber to remove the waste water and water-borne wastes from the plumbing fixtures and appliances, and to provide a circulation of air within the drainage piping. A sanitary drainage and vent piping system is illustrated in Figure 1-8. The following terms relate to sanitary drainage and vent piping systems *in general:*

Sanitary Drainage Pipe. Pipes installed to remove the waste water and water-borne wastes from plumbing fixtures and convey these wastes to the sanitary sewer or other point of disposal.

Vent Pipe. A pipe installed to ventilate a building drainage system and to prevent trap siphonage and back pressure.

Sewage. Any liquid waste containing animal or vegetable matter in suspension or solution. It may include liquids containing chemicals in solution. (Minnesota Plumbing Code.)

Sewer Gas. The mixture of vapors, odors, and gases found in sewers.

Cleanout. A fitting with a removable plate or plug that is placed in plumbing drainage pipe lines to afford access to the pipes for the purpose of cleaning the interior of the pipes.

Waste Pipe. A pipe that conveys only liquid waste free from fecal material.

Soil Pipe. A pipe that conveys the discharge of water closets or similar fixtures containing fecal matter with or without the discharge of other fixtures to the building drain or building sewer.

Stack. A general term for any vertical line of soil, waste, or vent piping extending through one or more stories.

The following terms apply *specifically* to Figure 1-8:

Sanitary Sewer. A sewer that carries sewage and excludes storm, surface, and groundwater.

Building Sewer. That part of the drainage system that extends from the end of the building drain and conveys its discharge to the public sewer, private sewer, individual sewage-disposal system, or other point of disposal.

Front Main Cleanout. A plugged fitting located near the front wall of a building where the building drain leaves the building. The front main cleanout may be either inside or directly outside of the building foundation wall.

Building Drain. That part of the lowest piping of the drainage system that receives the discharge from soil, waste, and other drainage pipes inside the walls of the building and conveys it to the building sewer.

Building Drain Branch. A soil or waste pipe that extends horizontally from the building drain and receives only the discharge from fixtures on the same floor as the branch.

Stack Cleanout. A plugged fitting located at the base of all soil or waste stacks.

Waste Stack. A vertical line of piping that extends one or more floors and receives the discharge of fixtures other than water closets and urinals.

Soil Stack. A vertical line of piping that extends one or more floors and receives the discharge of water closets, urinals, and similar fixtures. It may also receive the discharge from other fixtures.

Horizontal Branch. A soil or waste pipe that extends horizontally from a stack which receives only the discharge from fixtures on the same floor as the branch.

Fixture Drain. The drain from the trap of a fixture to the junction of that drain with any other drain pipe.

Fixture Trap. A fitting or device that provides, when properly vented, a liquid seal to prevent

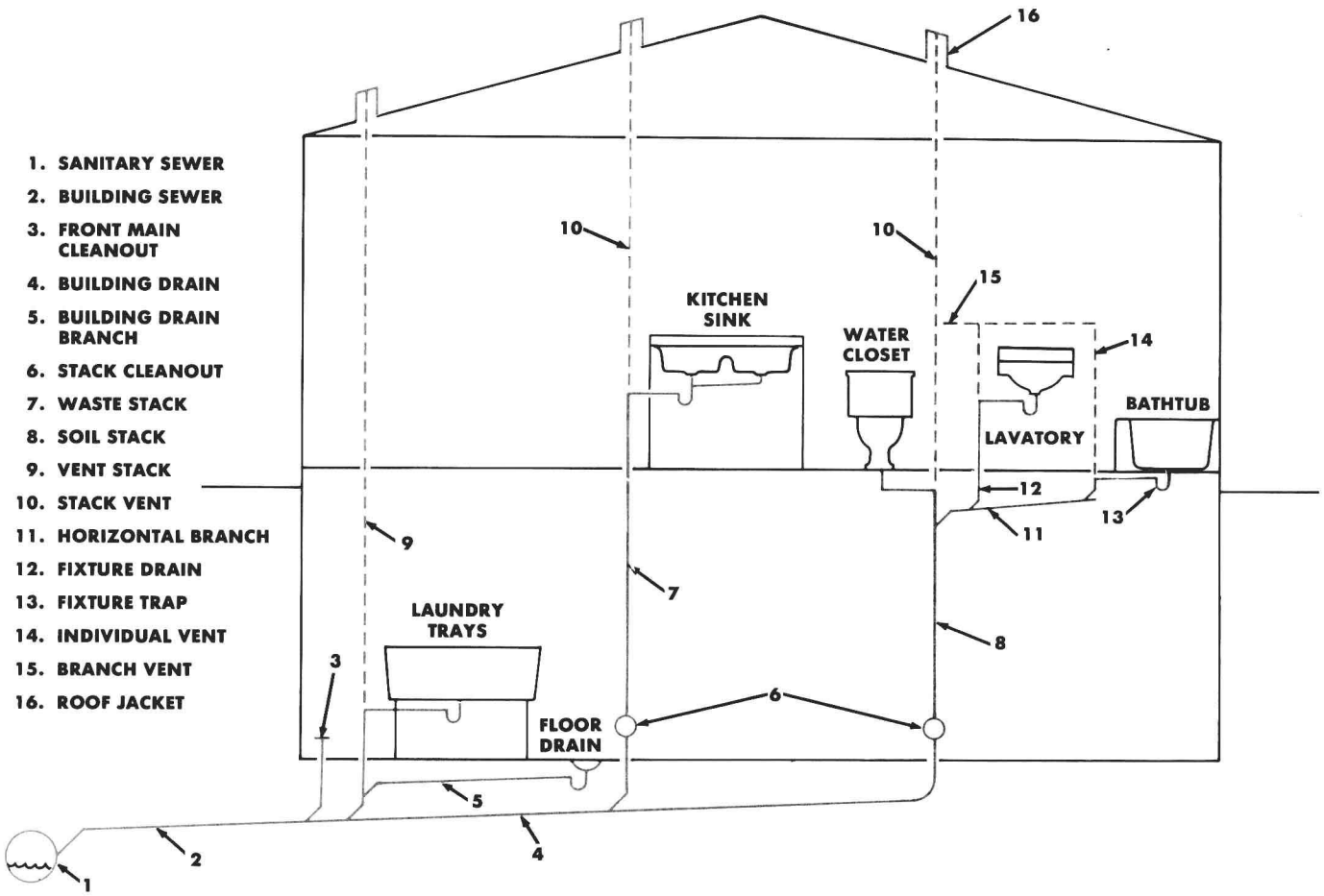

Figure 1-8. Sanitary drainage and vent piping system of a building. (Ralph R. Lichliter)

the emission of sewer gases without materially affecting the flow of sewage or waste water through it.

Individual Vent. A pipe installed to vent an individual fixture trap. It may terminate either into a branch vent, a vent stack, a stack vent, or the open air.

Branch Vent. A vent pipe connecting two or more individual vents with either a vent stack or a stack vent.

Stack Vent. The extension of a soil or waste stack above the highest horizontal drain connected to the stack.

Vent Stack. A vertical pipe installed to provide circulation of air to and from the drainage system.

Roof Jacket or Flange. A jacket or flange installed on the roof terminals of vent stacks and stack vents to seal this opening to prevent rainwater from entering into the building around the vent pipe.

The Storm Water Drainage System. The storm water drainage system, illustrated in Figure 1-9, is the piping system used for conveying rainwater or other precipitation to the storm sewer or other place of disposal.

The following terms apply to Figure 1-9:

Storm Sewer. A sewer used for conveying groundwater, rainwater, surface water, or similar nonpollutional wastes.

Building Storm Sewer. A building sewer that conveys storm water but no sewage.