

PHCP SELF-INSTRUCTION PROGRAM

BOOK #11

- ***INTRODUCTION TO PLUMBING
FIXTURES AND FAUCETS***
- ***RESIDENTIAL WATER CLOSETS AND
BIDETS***

Introduction to Plumbing Fixtures & Faucets

Series Two Unit 1

PHCP Self Instruction Program

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For a complete list of topics covered, see the index.

UNIT OBJECTIVES

The information in this Manual has been selected to give you an overview of common information on fixtures and faucets. It includes definitions of common industry terms, descriptions of the major types of fixtures and information on the supply and DWV fitting most commonly specified for the installation of these fixtures. More detailed information on each fixture will be provided in Units 2-8 of this Series.

Some of the products reviewed in this Unit may not be a part of your company's current inventory. Other products which may be stocked by your company may not be discussed in this Unit. Always refer to manufacturers' literature and recommendations on the products your company sells if unsure about a particular product.

To do your job well, it is important that you learn the details about specific items stocked by your company. The most complete and accurate information can be found in manufacturers' catalogs and materials. Be certain to spend time studying these materials.

When completing this Unit, you will be able to

- identify the three major types of plumbing fixtures
- identify similarities and differences between fixture types
- understand and define common plumbing fixture terms
- identify the common specifications necessary in reading manufacturers' rough-ins and ordering plumbing fixtures

THESE MATERIALS SHOULD NOT BE USED TO PLAN ACTUAL INSTALLATIONS OR TO INSTALL FIXTURES OR REQUIRED FITTINGS.

DISCLAIMER

Although the information contained in this Unit is believed to be accurate, the ASA Education Foundation and the American Supply Association disclaim any and all warranties, expressed or implied, regarding both the accuracy of that information and its application.

STEPS FOR COMPLETING THIS UNIT

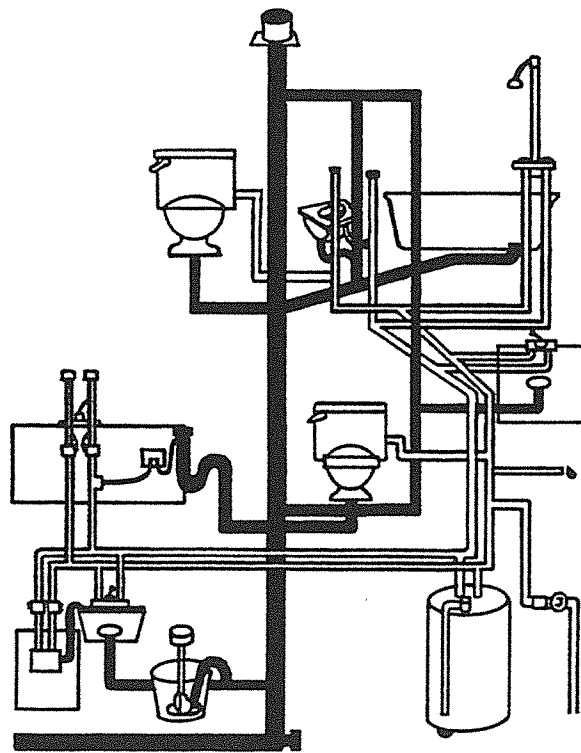
1. If your company has purchased the videotape for use with this Series, view the video before you start Unit One.
2. Use the answer mask/book mark to cover the printed answers in the left hand column. Read the information in each Frame carefully.
3. Keeping the answer covered, write your response to the Frame question in the empty column at the right of each page.
4. Move the answer mask to check your response with the answer in the left column.
 - If your response is reasonably close to the printed answer, go on to the next Frame.
 - If your response differs from the answer given, review the material in the Frame to see why the printed answer is considered the best answer for the question.
 - If after reviewing the material in the Frame you still believe that your response is better than the printed answer, circle the printed answer. If you agree that the printed answer is best, mark an "X" through your response.
 - If after several attempts, you cannot understand the Frame or the answer to the Frame question, ask someone in your company for help.
 - If you still feel confused, contact the Foundation, and we will try to find a product knowledge expert to assist you.
5. Answer the questions in the Review at the end of each section. Check your responses with the answers given at the back of the book. Reread the Frames indicated for answers you have missed.
6. When you've completed all Frames, prepare for the Unit Quiz by going over the Review pages and the definitions in the Glossary.
7. Take the Unit Quiz at the end of the Manual.
8. Send the whole book, with the completed Quiz, to the ASA Education Foundation for grading. You and your immediate supervisor will be notified about your completion of the Unit.

When you have completed all Units in Series Two, contact the ASA Education Foundation to make arrangements to take the Series Two Exam. You will receive a Certificate of Completion for Series Two when you have successfully completed all Units and the Series Two Exam.

PHCP wholesalers provide a wide variety of products. A large amount of revenue is generated from their distribution of plumbing fixtures.

In Series One, you studied about the supply system which is a system of pipes that brings the water supply into a building. You also studied about the Drain, Waste, and Vent (DWV) system which is the system of piping which takes solids, liquids and gas wastes out of a building.

Both systems are illustrated below. The water supply system is represented in white and the DWV system is represented in black.



As you can see, at the end of each set of pipes is a fixture.

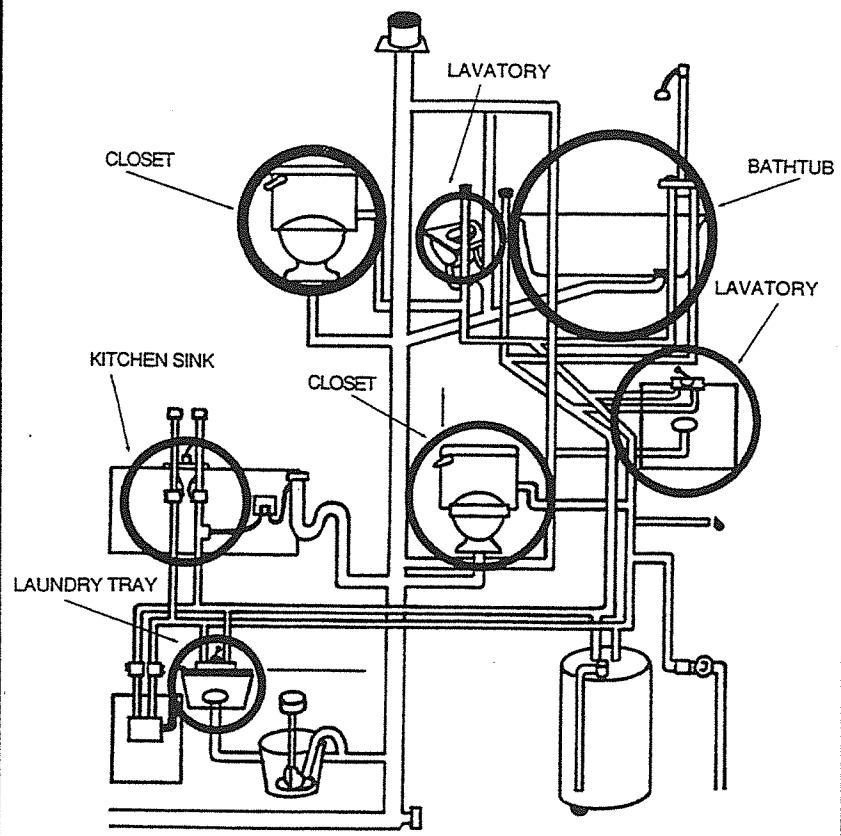
In this Series, you will be studying the common types of plumbing fixtures found in residential and non-residential applications. You will also be looking at the accompanying faucets that go with many of these fixtures.

The DWV system

Which system of piping takes waste out of a building?

A fixture is a plumbing device which receives water from the supply system. It serves as a receptacle for wastes, which are then discharged into the DWV system. All the fixtures you will study are connected to the water supply and DWV systems, except for two of the specialty fixtures.

Plumbing fixtures can be classified into three basic groups: sanitary fixtures, such as water closets; lavatories and sinks; and bathing fixtures, such as bathtubs and showers.



In this Series, you will find a Unit on each of these three classifications of fixtures.

Sanitary fixtures, lavatories & sinks, and bathing fixtures

What are the three basic groups of plumbing fixtures?

A Unit has also been added on specialty fixtures. These fixtures include whirlpool bathtubs, whirlpool spas, and hot tubs. These types of fixtures can be considered a special type of bathing fixture.

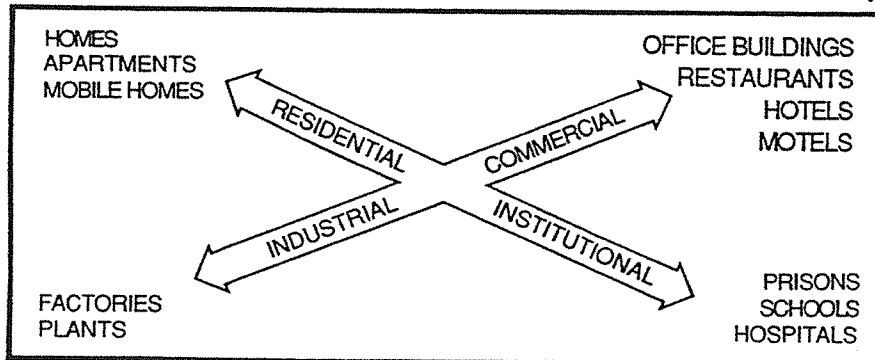
Whirlpool spas and hot tubs differ from the other types of fixtures in that they are not necessarily connected to the water supply system. They may or may not be connected to the DWV system.

You will find a separate Unit on non-residential or commercial fixtures, and also a Unit on fixtures made specifically for the disabled.

*Whirlpool spas
and hot tubs*

What type of fixtures are not necessarily connected to the water supply system?

Manufacturers make plumbing fixtures for both residential and non-residential applications. The four market sectors represented in the diagram below buy plumbing fixtures.



Residential applications represent those markets which sell fixtures for households. This would include sales to single and multi-family housing as well as mobile homes.

Non-residential applications are divided into three sectors: commercial; industrial; and institutional.

The commercial sector includes restaurants, office buildings, hotels and motels. Institutional sectors include prisons, schools and hospitals. The industrial sector includes factories and plants.

*Residential,
commercial,
institutional, and
industrial*

What are the four types of market sectors?

In residential applications, you will find fixtures primarily in the bathroom and kitchen. The bathroom will have the largest variety of fixtures. Utility, laundry, and recreation rooms may have fixtures also.

In non-residential use, you also will find fixtures in bathrooms as well as rooms requiring food preparation, utility or cleaning and personal hygiene.

Specialty bathing fixtures used for recreational purposes may be found in or out of doors in both residential and commercial applications.

The kitchen and bathroom

In a residential application, in which rooms are you most likely to find plumbing fixtures?

Sanitary fixtures are found in bathrooms in both residential and non-residential installations. Sanitary fixtures are used for disposing of bodily waste. These devices provide the convenience of disposing bodily waste and provide sanitary conditions to keep us healthy.

The two types of sanitary fixtures are:

- water closets
- urinals

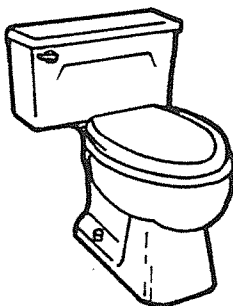
Water closets, or toilets are found in all installations. Urinals are most often found in non-residential applications.

Water closets and urinals

What are the two types of sanitary fixtures?

The water closet is the most common type of sanitary fixture. Also known as a toilet or commode, the water closet carries away bodily waste from the bowl and into the DWV system by way of water pressure or gravity.

It disposes of two body wastes: feces (pronounced fee-sees), and urine (yer-in). The act of removing feces from your body, or having a bowel movement is called defecating. The act of removing urine from your body is called urinating.

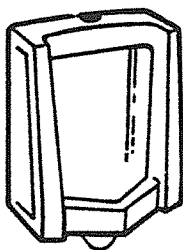


WATER CLOSET

What is the purpose of a water closet?

*To carry away
bodily waste*

Urinals are another type of sanitary fixture, but they are found most often in non-residential applications and are designed primarily for men's public restrooms. A urinal is used only for urinating, not defecating. Some manufacturers produce female urinals, but this type of fixture is not common.



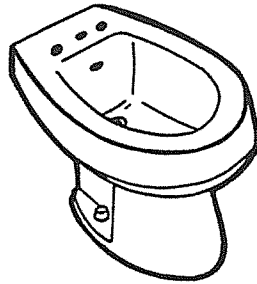
URINAL

Where would you most often find urinals?

*Non-residential
applications/
public restrooms*

Unlike the other two types of sanitary fixtures, the bidet (pronounced bee-day) does not dispose of bodily waste. The bidet is a special fixture used for personal cleansing. Its function is really more like that of a lavatory than a sanitary fixture.

Bidets are most common in Europe. However, they can be found in finer homes and hotels in the U.S.

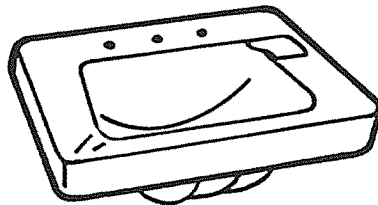


BIDET

*It does not dispose
of bodily waste*

How does the bidet differ from the other sanitary fixtures?

You also will find a lavatory in the bathroom in both residential and non-residential applications. A lavatory is a bathroom sink used for personal washing. This sink differs from other types of sinks in its size, style, installation and materials of construction.

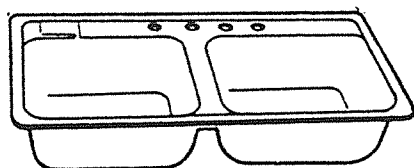


LAVATORY

The bathroom

In which room would you find a lavatory?

Sinks have the same purpose as lavatories: washing. However, lavatories are used for personal hygiene, and sinks are used to wash other items such as dishes, dishcloths, and food. A sink is any washing fixture found outside the bathroom. Sinks are usually larger than lavatories and are made of more durable materials.

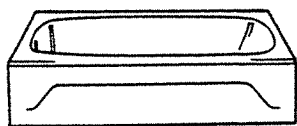


SINK

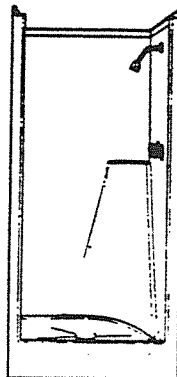
They are both used for washing

What do lavatories and sinks have in common?

Bathing fixtures are found primarily in the bathroom. Bathing fixtures are used for washing or soaking the entire body all at once. The most common types of bathing fixtures are bathtubs and showers.



BATHTUB



SHOWER

Bathtubs are found in residential and commercial applications. Showers are found in residential, institutional, industrial, and commercial installations.

Bathtubs and showers

What are the most common bathing fixtures?

Some specialty fixtures such as whirlpool spas and hot tubs differ from the other plumbing fixtures in that they do not necessarily need to be connected directly to the water supply and DWV systems. These fixtures are often filled from an outside source, such as a garden hose. They may be drained into an external drain.

You will often find in-ground spas connected directly to the DWV system. The plumbing is installed as the spa is constructed on-site. Because these fixtures hold such a large volume of water, direct drainage speeds up the process considerably.

They are not necessarily connected to the water supply and DWV systems.

How do hot tubs and whirlpool spas differ from other plumbing fixtures?

Now that we have looked at fixtures, let's examine the types of devices that are used with those fixtures. One example is the faucet. A faucet is a valve located at an outlet in the piping system which is used to control delivery of water to the fixture. A faucet is a component of another plumbing fixture such as a sink or tub. It is ordered separately from the plumbing fixture itself.

There are two basic types of faucets:

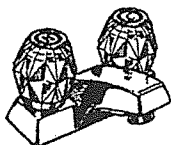
- single control
- two handle control

This classification is based on how the water is mixed.

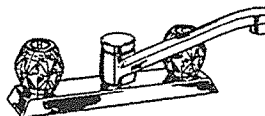
A valve used to control the delivery of water to a fixture

What is a faucet?

Most plumbing fixtures connected to the water supply system will have a faucet. Faucets are designed to fit a specific type of fixture. Therefore, the faucets for a kitchen sink will differ from those for a lavatory.

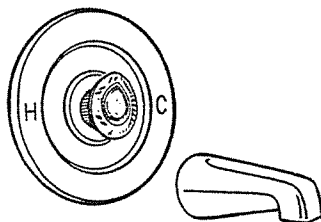


LAVATORY FAUCET



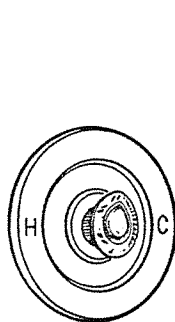
KITCHEN SINK FAUCET

A bathtub faucet is referred to as a tub filler.

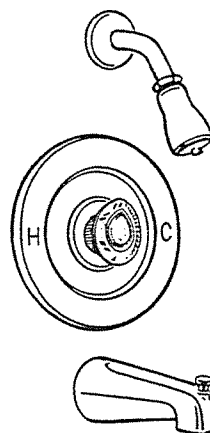


TUB FILLER

There are also faucets designed for showers and bath/shower combinations.



SHOWER VALVE



TUB/SHOWER COMBINATION

A tub filler

What is another name for a bathtub faucet?

While components of plumbing fixtures are important, more important are the materials in which the fixtures themselves are constructed. These materials must be durable because of their great amount of use, and non-absorbent for sanitary reasons.

Some of the more common materials you will find used for constructing plumbing fixtures are vitreous china, cast iron enameled steel, stainless steel, plastic, fiberglass, terrazzo and cement. Each type of fixture uses a different predominant material.

As you study each fixture, you will notice the differences in materials and construction.

*They must be
durable and
non-absorbent*

What are two characteristics of materials used for plumbing fixture construction?

DIRECTIONS: In the space to the left, write the term described in each of the following items.

1. Fixtures used for disposing of bodily waste

2. Room where you will find the most fixtures

3. Controls delivery of water to fixture

4. Fixtures usually filled from an outside source

5. Fixture used for washing hands

6. Fixture used for washing dishes

7. Sanitary fixture found most often in a non-residential applications

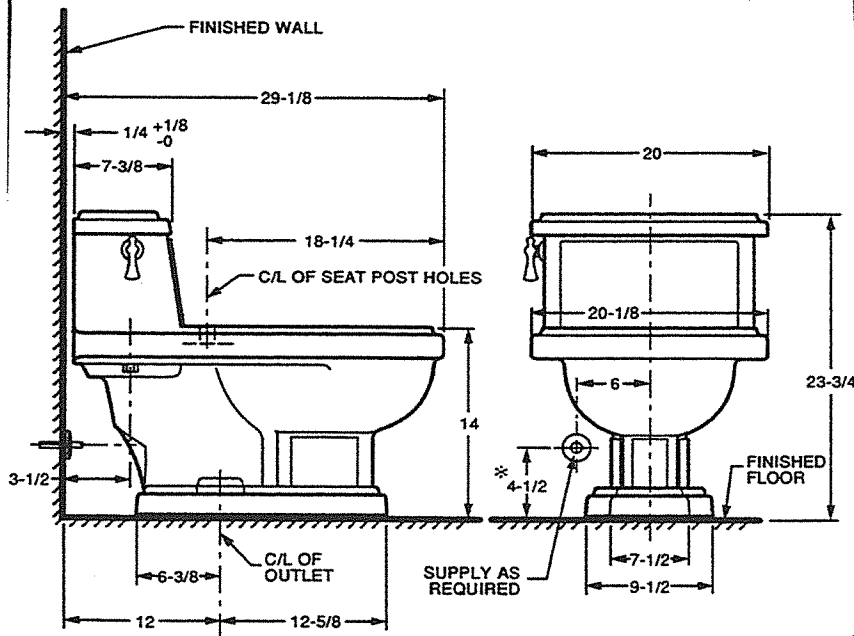
Compare your responses with the answers provided on page 39.

Those plumbing fixtures which are connected to the water supply and DWV systems require installation of all parts of the plumbing system before the fixture itself can be installed. This includes all the pipe concealed underneath the floors and walls. This is called the roughing-in stage. The DWV and water supply pipe as well as fixture supports must be completed before the fixture can be installed.

*The DWV pipe;
water supply pipe;
fixture supports*

What must be completed before a fixture is installed?

The rough-in drawings are pictures that show the dimensions for waste and water supply pipe going to and from the fixture. These drawings show how the piping fits to the fixture and gives you the appropriate dimensions of the fixture. This information is required for a proper installation. An example of a manufacturer's rough-in drawing for a water closet is shown below.



Each manufacturer will provide rough-in drawings for each fixture that they sell. Many manufacturers offer a rough-in book which describes all of their fixtures' rough-in dimensions. This information can help you in filling your customer's orders.

*The dimensions for
waste and water
supply pipe to and
from the fixture*

What do the rough-in drawings show?

Once the rough-in is completed, the next phase is the finishing stage. This refers to the actual installation or setting of the fixture. This is the final phase of installation where the fixtures are placed and connected. The rough-in drawings must be consulted during the installation of the fixture.

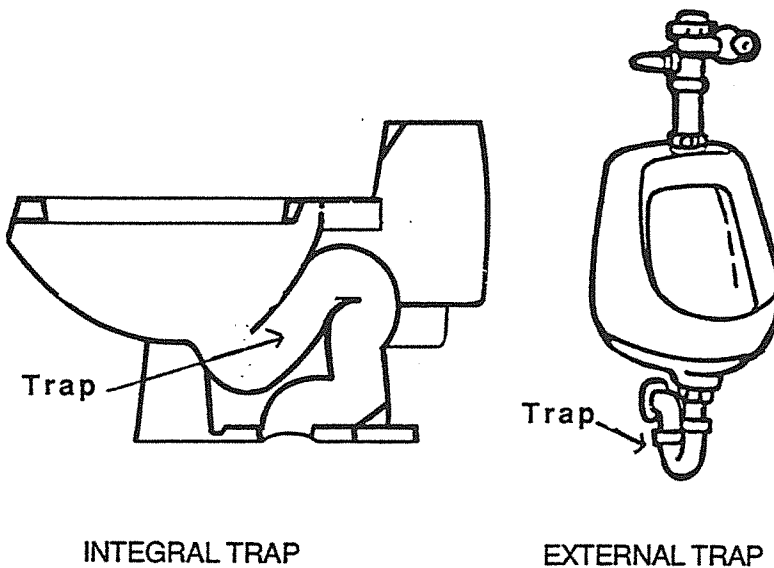
Some fixtures, such as bathing fixtures, must be installed in the roughing-in stage before walls and floors are completed.

Finishing stage

What is the actual installation of the fixture called?

Every fixture connected to the DWV system requires a trap. A trap is a fitting that provides a liquid seal to prevent sewer gas from seeping into the building. A trap is important for sanitary reasons.

Traps may be integral (built into the fixture), or they may be external to the fixture.



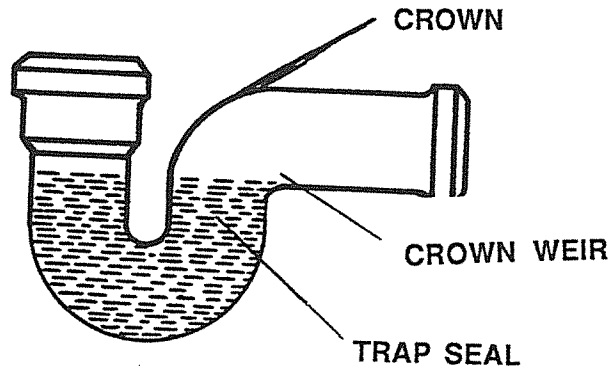
INTEGRAL TRAP

EXTERNAL TRAP

To provide a liquid seal to prevent sewer gas from seeping into the building

What is the purpose of a trap?

The most common type of external trap is the P trap. It is so named because its shape resembles the letter P. Each time the trap is discharged, a small amount of liquid is retained in the bend of the trap.



The liquid content left in the trap is called the trap seal. The most common seal you will find is two inches from the crown weir and the top of the dip of the trap. The crown weir is the highest part of the inside portion of the bottom surface at the crown of the trap.

A deep seal trap will measure four inches. Deep seal traps are usually found in the building drain and not at the individual fixtures.

Two inches

What is the most common depth on a P-trap seal?

Plumbing fixtures are installed so that the water from the supply lines will not mix with the waste from the DWV lines. However, when the water pressure drops in the supply piping, backflow or back siphonage may occur. Backflow, or back siphonage is the flowing back by negative pressure of contaminated or polluted water from a plumbing fixture into a potable water system.

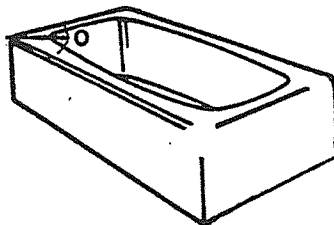
Special devices can be used to insure against backflow in a fixture. You will find fixtures with integral devices which prevent back siphonage.

When the water pressure drops in the supply piping

When might back siphonage occur?

An important part of the plumbing in most fixtures is the overflow. The overflow is a hole in the fixture which allows excess water to drain out, therefore avoiding water overflowing out of the fixture itself.

Overflow



BATHTUB WITH A BUILT IN OVERFLOW

Bathtubs, lavatories, water closets, and whirlpool bathtubs will always come with either a built in overflow, or a place for installation of a waste and overflow fitting.

A shower and sink, however, does not come with an overflow. These fixtures have drains that can always remain open. Hot tubs and whirlpool spas also do not have overflows.

A hole in the fixture which allows excess water to drain out

What is an overflow?

Along with the overflow, the drain is also an important part of the fixture. A drain is an opening in the fixture used to empty water from the fixture into the the DWV system.

In the case of hot tubs and whirlpool spas, the fixture does not usually empty into the DWV system. These types may empty into the outdoors and the water then used to irrigate the lawn.

Drains come in a variety of types depending upon the fixture. The drain is positioned at the lowest point in the fixture to allow the natural force of gravity to be used in emptying the water out of the fixture.

Most drains come with a device which allows them to be opened or closed. The drain on a shower always remains open. The drain on a sink has a special type of strainer basket which allows the drain to be opened or closed.

To use gravity to help empty the

Why is the drain found at the lowest point in the fixture?

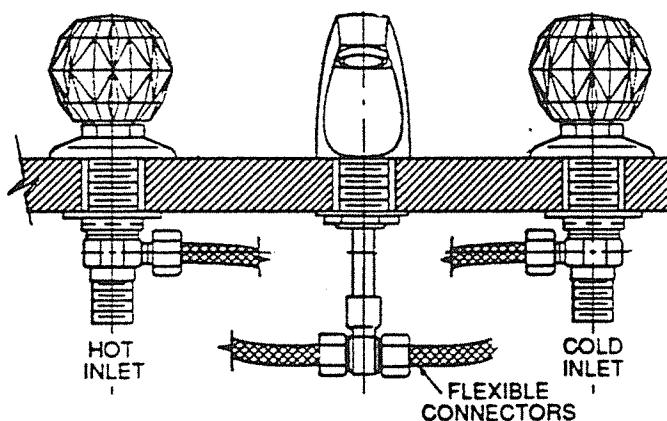
You will find valves on most fixtures. A valve is a mechanism which regulates the flow of water into a fixture. The valve can start or stop the water flow.

A faucet, as we have already discussed, is a type of valve. On a water closet, you will find a flushing mechanism. On a bathtub, the valves may be referred to as controls. On a bath-shower combination you may find a third control valve (diverter) which diverts water from the tub spout to the shower head.

Regulates water flow into the fixture

What does a valve do?

When using the valves, it is necessary to have supply lines. Supply lines are the actual hot and cold water lines that lead from the main piping system into the fixture itself. When facing the fixture, you will find the hot water supply line on the left, and the cold water line on the right. The lines are connected to the faucet where the valves will regulate water into the fixture.

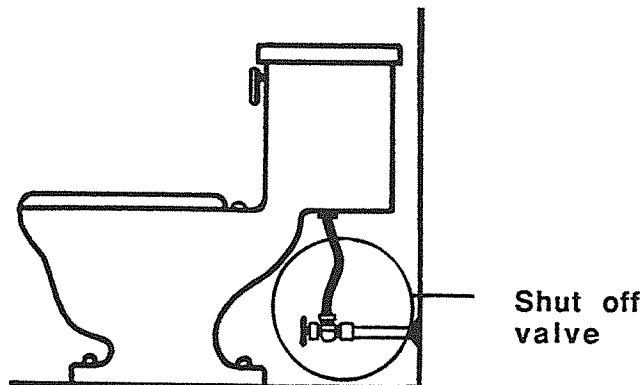


LAVATORY FAUCET SHOWING SUPPLY LINES

The left

When facing a fixture, on which side will you find the hot water supply lines?

Each fixture should have a shut off valve on each of the water supply lines. The shut off valve is a valve installed in the water line of a fixture wherever a shut off from the main water supply may be necessary. The shut off valve is most often called a stop.



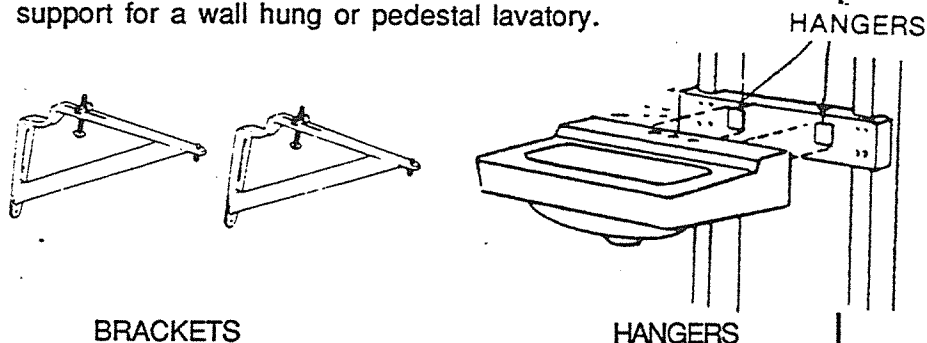
WATER CLOSET SHUT OFF VALVE (STOP)

This allows for easy repair or replacement of the fixture without disrupting the entire water supply system.

Where would you find a shut off valve?

On the water supply line

When installing fixtures and plumbing, it is necessary to use supports. For example, brackets may be used for hanging lavatories and some wall hung water closets. A hanger is a support for a wall hung or pedestal lavatory.



Each fixture will come with installation directions which will specify the type of supports required.

When would a hanger be used?

To support a wall hung or pedestal lavatory

When reading installation instructions, you may notice references to joists. Joists are found in both the floor and ceiling. They are horizontal framing members which carry the load to the supporting walls.

When installing heavy fixtures such as cast iron bathtubs, whirlpool bathtubs, hot tubs and whirlpool spas, the joists may need to be checked for reinforcement to be sure they can handle the load.

In the floor and ceiling

Where are the joists found?

Each fixture's installation must conform to the local building code. The building code represents a set of rules governing the quality of construction, design, and installation of plumbing in a particular community. Codes may vary from one governmental unit to the next.

The purpose of a building code is to protect the public's health and safety. When installing plumbing fixtures, local codes should first be consulted.

To protect the public's health and safety

What is the purpose of having building codes?

DIRECTIONS: In the space to the left, label each of the following statements "TRUE" or "FALSE."

- _____ 1. A sink has an overflow.
- _____ 2. All plumbing fixtures connected to the DWV system will have a trap.
- _____ 3. Building codes are uniform throughout the country.
- _____ 4. A deep seal trap is found on a water closet.
- _____ 5. Hangers and brackets are used to securely support plumbing fixtures to the wall.
- _____ 6. The shut off valve (stop) is found on the water supply line.
- _____ 7. Rough-in drawings are necessary for proper installation of a plumbing fixture.
- _____ 8. A trap is important because it prevents back siphonage.
- _____ 9. Rough-in refers to the pipes concealed underneath the floors and behind the walls.
- _____ 10. All fixtures have drains that may be opened or closed.

Compare your responses with the answers provided on page 39.

When reading manufacturers' roughing-in books and literature, you will find a number of specifications common to most plumbing fixtures. This information usually includes

- fixture dimensions
- material of fixture construction
- product weight
- installation requirements

As discussed in Frame 17, rough-ins are fixture specifications and drawings which are often found in special book distributed by the manufacturer for their product line.

Fixture dimensions, weight, material of construction and installation requirements

What are the four most common specifications found in manufacturers' roughing-in books?

You may find other specifications such as options and accessories, approvals, codes and standards for the fixture, and shipping weight.

Some literature will describe the special mechanical specifications for that particular product. Be sure to consult the manufacturers' literature to see which specifications are listed for each particular product you sell.

It is important for you to become familiar with the literature provided by the manufacturers your company deals with. The information provided will vary for each manufacturer and product.

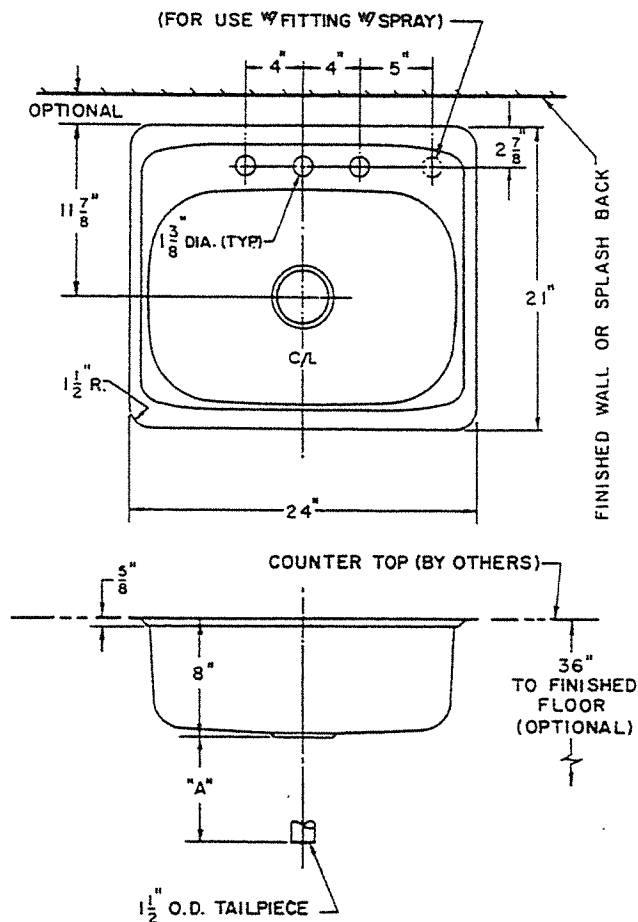
The manufacturer's literature

Where will you find information regarding the accessories available or shipping weight for a particular fixture?

Outside fixture dimensions for sinks, bathtubs, whirlpool bathtubs, and whirlpool spas are taken as length x width x height. In general, length refers to the longest dimension from one side of the fixture to the other. Width is the shorter side, or the dimension from front to back. Height refers to the measurement from the top of the fixture rim to the bottom of the fixture.

These measurements are necessary for proper ordering and refer to the outside dimensions of the fixture.

An example of a manufacturer's specification for a sink is shown below. This would be specified as 24 x 21 x 8. Both views of this fixture will help to determine the three necessary outside dimensions.



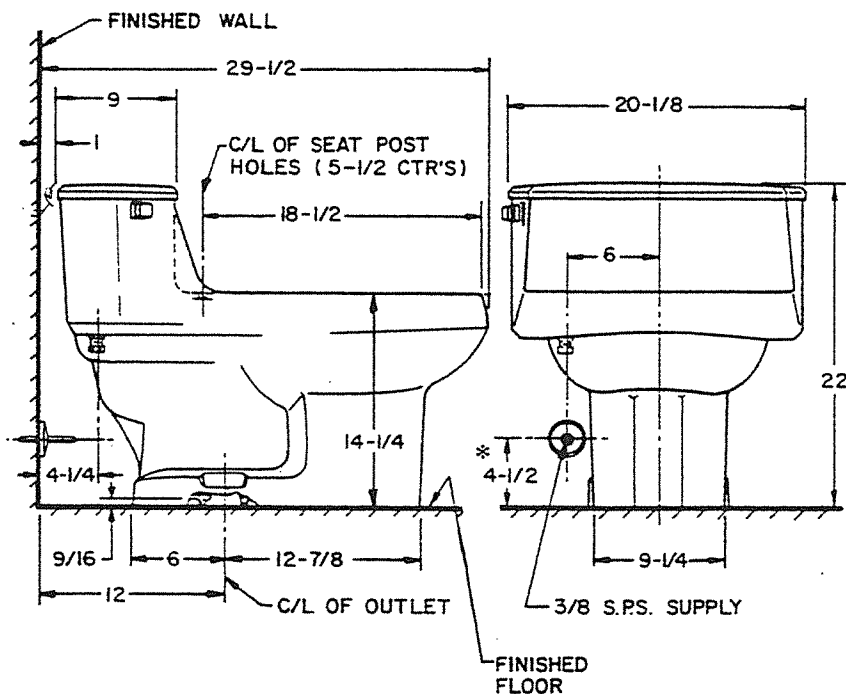
*Sinks, bathtubs,
whirlpool bathtubs
and whirlpool spas*

Which fixtures require the outside dimensions of length x width x height for ordering purposes?

Water closets, urinals and bidets do not use the same type of dimensions as the other fixtures. These sanitary fixtures use rough-in dimensions to determine whether the fixture fits a given installation.

These fixtures must fit a given fixture outlet. Their dimensions from the finished wall, where the water supply pipe is, to the outlet where the DWV pipe will be can help you in filling orders appropriately. Manufacturers will provide information on the outlet location in various charts as well as in their rough-in drawings.

A manufacturer's water closet is illustrated below. Notice that a measurement of 12" is given for the specification for the distance from the finished wall to the outlet to the DWV system. Also, the distance from the wall to the supply inlet is specified as 4 1/4".



12"

What is the measurement of the outlet location in the illustration shown above?

There are many different materials from which plumbing fixtures are constructed. The two major reasons for a manufacturer to choose a material is its durability for its given purpose as well as the fixtures' absorbency.

Some fixtures have a wide variety of materials to choose from, while others are greatly limited to one or two materials.

The most common types of materials used for most plumbing fixtures are vitreous china, plastics, cast iron and steel.

*Vitreous china,
plastics, cast iron,
and steel*

What are the most common types of materials used for the construction of plumbing fixtures?

Enameled cast iron is found in bathtub, whirlpool bathtub, sink, and lavatory construction. Enameled cast iron is an extremely durable and heavy material made from an alloy of iron, carbon, and silicon, which is cast in a mold. Baked-on porcelain gives it an enameled glasslike finish.

This type of material is chip resistant and maintains heat well. That is why it is so popular in bathing fixture construction.

*Because it resists
chipping and
maintains heat well*

Why is enameled cast iron a popular material for bathing fixture construction?

Enameled steel is manufactured by a stamping process. A coat of fused enamel is then applied to give it its glossy appearance. The enamel on the steel fixtures is thinner than that found on cast iron.

Enameled steel is most commonly used in making bathtubs, lavatories and sinks.

*By a stamping
process*

How is enameled steel manufactured?

Stainless steel is the most durable material used for plumbing fixtures. Stainless steel is made from various amounts of chromium and nickel to make it corrosion resistant.

You will also find galvanized steel used for commercial sinks. Galvanized steel has a zinc coating which protects it from rusting. It is not as durable as stainless, but is less expensive.

Stainless steel and galvanized steel are used most often in sink construction.

*Stainless steel and
galvanized steel*

What are the two types of steel used in sink construction?

Today, there are many different types of plastics which can be used in fixture construction. You will find plastic used primarily in constructing bathing fixtures, specialty bathing fixtures and sinks.

Acrylic is plastic manufactured by a vacuum molding process. It is cooled after the molding and reinforced with a mixture of polyester resin and fiberglass strands.

Acrylic is popular because it is durable and light. It can be manufactured in an array of colors to match a room's decor.

Gel coated fiberglass is manufactured through a spray up process, which does not require heat. It is a thin coated fixture which is reinforced with a sprayed mixture of polyester resin and fiberglass strands.

Many manufacturers have their own patented materials for plumbing fixture construction. These may be special mixtures of plastics or plastics used to reinforce metals. Check to see which materials are unique to each particular manufacturer your company purchases fixtures from.

*By a vacuum mold-
ing process*

How is acrylic manufactured?

Sanitary fixtures, such as water closets and urinals are almost always made of vitreous china.

Vitreous china is made from a clay and water mixture and baked at extremely high temperatures. The finished product has a "glasslike" finish making it hard to scratch and stain resistant. This material is also totally non-absorbent, making it ideal for sanitary fixtures where the overall concern is creating sanitary conditions for the user.

Vitreous china is considered a ceramic type of material. In addition to its use for water closets and urinals, it is also used for lavatories and bidets. It is not used for other types of fixtures because different, more durable materials tend to hold up better for the needs of those particular fixtures.

*Sanitary fixtures,
lavatories, and
bidets*

What types of fixtures might be made of vitreous china?

Water closets are also made of plastics, although it is not as prevalent as vitreous china. In addition, you may find stainless steel water closets in institutional settings, such as prisons. No other materials are really appropriate for water closet construction.

*Plastic and
stainless steel*

Besides vitreous china, what other materials might be used in water closet construction?

Just like fixtures, faucets are constructed of different types of materials. Faucets will be identified as being made of two materials; one for the faucet construction and one for the faucet finish.

Faucets are constructed from metal and plastic. The most common metals used are brass, zinc, stainless steel and copper.

The finish is the material which is visible to the customer. The most common finishes are chrome, brass, nickel, epoxy and gold.

One is for the faucet construction and the other is for the faucet finish

Why are two types of metals used in manufacturing faucets?

When ordering any type of fixture, you will notice that the manufacturer's literature will list the weight of the fixture in pounds. It will usually list either the actual weight of the fixture or the weight of the fixture when packaged (shipping weight.)

The information may indicate whether an item is shipped in one piece or in multiple parts that require assembly. Many manufacturers will inform you as to whether the fixture can fit through a standard doorway.

By actual weight of the fixture or the shipping weight

In what two ways is the weight of a fixture listed in manufacturer's literature?

In manufacturer's literature, many fixtures are classified by the type of installation. This refers to how and/or where the fixture is installed in a given application.

Bathtubs and showers are classified by where they are installed. For example, a corner bathtub or shower is installed where two walls meet. Or, a recess bathtub or shower is installed in the recess of a wall.

Kitchen sink installations are described by the type of rim required for the counter top; whereas lavatories are classified by the way they are supported or mounted.

As you study the Units in this Series you will learn more specifically about how each type of fixture is classified.

Where or how the fixture is installed

What does it mean for a fixture to be classified by type of installation?

As mentioned in the previous section, each plumbing fixture requires a trap to seal off sewer gas from the building. Water closets are special in that they have an integral trap built into the fixture itself.

All fixtures other than water closets use a trap. The trap for a common fixture can range in size from 1 1/4 to 2 inches in diameter.

Below you will find some common trap sizes for plumbing fixtures:

• bathtub (standard)	1 1/2 inches
• bathtub (oversized)	2 inches
• bidet	1 1/2 inches
• lavatory	1 1/4 inches
• shower stall	2 inches
• scullery sink	2 inches
• urinal	1 1/2 inches

Check with your local codes regarding accepted trap sizes for plumbing fixtures for your area.

1 1/4 to 2 inches

What is the range in sizes for common fixture traps?

Local building codes will determine how many of a certain type of plumbing fixture is necessary for a given application. Typically, a single family home will require a minimum of one kitchen sink, one water closet, one lavatory, and one bath/shower unit.

*One kitchen sink,
a water closet,
a lavatory and a
bath/shower unit*

What fixtures are typically required in a residential application?

Commerical settings for public use are divided into two classes. Each class will determine the number and type of plumbing fixtures required.

Establishments where there is countable seating are the first class of public use establishments. These would include theaters, stadiums, restaurants and churches.

The second class are establishments that have no seating capacity. These include stores, office buildings, and shopping centers.

The number of potential users will dictate the number of water closets and lavatories that each establishment must provide in accordance with local code.

*Those with
countable seating
capacity and those
with no seating
capacity*

What are the two classes of establishments for public use?

Plumbing fixtures must be installed so that there is adequate space between them for access in cases of maintenance and repair.

Codes will require minimum clearances. For example, a water closet must be set a minimum of 15 inches from the center of the bowl to any wall or partition, and 12 inches from the center of the bowl to the outside edge of the tub apron. In addition, it must be 21 inches from the front of the bowl to any finished wall, door or fixture.

Other fixtures in the bathroom which require clearances are the lavatory and shower compartment. Consult your local building codes for more information on fixture clearances in your area.

To provide adequate access for maintenance and repairs

Why must there be a certain clearance between fixtures?

Along with the standard fixtures, there are special plumbing fixtures designed for the disabled. Federal and State laws require that public and private buildings have facilities for the handicapped.

Unit 8 of this Series will discuss all fixtures, faucets, and accessories designed specifically to meet codes for the disabled.

DIRECTIONS: Fill in the blanks with the word or words which best complete each of the following statements.

1. The fixture specifications and drawings which are often found in a special book distributed by the manufacturer are called _____ .
2. The type of plastic which is made from a vacuum molding process is called _____ .
3. Faucets are identified as being made of two materials; one for the faucet _____ and one for the faucet _____ .
4. The plumbing fixture which always has an integral trap is the _____ .
5. The _____ is specified as length x width as its outside dimensions.
6. The length of a straight line across the center of a circle is called the _____ .
7. The most non-absorbent material used in manufacturing plumbing fixtures is _____ .
8. Lavatory installations are classified by the way they are _____ .
9. A standard bathtub trap will measure _____ inches.
10. The adequate spacing between fixtures is referred to as the _____ .

Compare your responses with the answers given on page 39.

REVIEW ANSWERS

Fixture and Faucet Classifications, page 18

1. water closet or urinal *See Frame 6*
2. bathroom *See Frame 5*
3. faucet *See Frame 14*
4. specialty bathing fixture
(hot tub or spa) *See Frame 13*
5. lavatory *See Frame 10*
6. kitchen sink *See Frame 11*
7. urinal *See Frame 8*

Common Fixture Terms, page 26

1. FALSE *See Frame 23*
2. TRUE *See Frame 20*
3. FALSE *See Frame 30*
4. FALSE *See Frame 21*
5. TRUE *See Frame 28*
6. TRUE *See Frame 27*
7. TRUE *See Frame 18*
8. FALSE *See Frame 22*
9. TRUE *See Frames 17 & 18*
10. FALSE *See Frame 24*

Plumbing Fixture Specifications, page 38

1. rough ins *See Frame 31*
2. acrylic *See Frame 40*
3. construction, finish *See Frame 43*
4. water closet *See Frame 46*
5. lavatory *See Frame 34*
6. diameter *See Frame 34*
7. vitreous china *See Frame 41*
8. supported or mounted *See Frame 45*
9. 1 1/2 *See Frame 46*
10. clearance *See Frame 49*



GLOSSARY

- acrylic** type of plastic manufactured by the vacuum forming process
- backflow** flowing back by negative pressure of contaminated water from a plumbing fixture, into the potable water system
- bathing fixture** fixtures which are used for washing and soaking the entire body all at once such as a bathtub, shower, or a bath-shower combination
- bidet** fixture for personal cleansing after defecating or urinating
- brackets** used for hanging and installing fixtures
- building code** set of rules governing the quality of construction, design and installation of plumbing in a governmental unit such as a village, town, or state
- crown weir** the highest part of the inside portion of the bottom surface at the crown of a trap
- defecating** act of removing feces from the body.
- diameter** length of a straight line across the center of a circle
- drain** opening in the fixture for emptying water from the fixture
- DWV system** system of pipe used to bring solid, liquid, and gas wastes out of a building
- enameled cast iron** durable and heavy material used in fixture construction which is made from an alloy of iron, carbon, and silicon
- enameled steel** steel manufactured by a stamping process, then coated with a fused enamel to give a glossy appearance
- faucet** valve which draws water from the supply line into a fixture
- feces** solid waste matter discharged through the bowel
- finishing** actual installation of a fixture
- fixture** plumbing device which receives water from the supply system and serves as a receptacle for wastes, which are then discharged into the DWV system
- galvanized steel** steel which has a zinc coating to protect it from rusting
- gel coated fiberglass** plastic manufacturing process
- hanger** a support for a wall hung or pedestal lavatory
- joists** horizontal framing member in the floor or ceiling which carries the load to the supporting walls
- lavatory** a bathroom sink used for personal washing

overflow hole in a fixture which allows excess water to drain from the fixture preventing spillage over the fixture rim

rough-in pipe concealed underneath floors and behind walls

rough-in drawings pictures that show the dimensions for waste and water supply going to and from the fixture

rough-in stage installation of all parts of the plumbing system needed before the fixture itself can be installed

sanitary fixtures plumbing fixtures used for disposing of bodily waste

shut off valve valve installed in the water line of a fixture wherever a shut off from the main water supply may be necessary

sink any washing fixture found outside the bathroom

stainless steel durable material for plumbing fixture construction made from varying amounts of chromium and nickel

supply lines the actual pipes for hot and cold water leading into a fixture

supply piping system system of piping used to bring liquids or gases into a building

trap fitting that provides a liquid seal to prevent sewer gas from seeping into the building

trap seal liquid content left in the trap after the fixture is discharged

tub filler bathtub faucet

urine liquid body waste secreted by the kidneys through the urinary organs

urinating act of removing urine from the body

valve mechanism which controls the flow of water into a fixture

vitreous china material for water closet construction made from a clay and water mixture and baked at extremely high temperatures

water closet also known as a toilet or commode, carries away bodily waste from its bowl/receptacle into the DWV system

INDEX

<p>acrylic</p>	<p>A</p>	<p>Frame 40</p>	<p>rough-in drawings roughing-in stage</p>	<p>R</p>	<p>Frame 18 Frame 17</p>
<p>backflow back siphonage bathing fixtures bidet brackets building codes</p>	<p>B</p>	<p>Frame 22 Frame 22 Frame 12 Frame 9 Frame 28 Frames 30, 47-48</p>	<p>sanitary fixtures shut off valve sink specialty fixtures specifications stainless steel supply lines supply system supply stop supports</p>	<p>S</p>	<p>Frames 6-9, 41 Frame 27 Frame 11 Frame 3 Frames 31-32 Frame 39 Frame 26 Frames 1-2 Frame 27 Frame 28</p>
<p>clearance</p>	<p>C</p>	<p>Frame 49</p>			
<p>deep seal traps dimensions drain DWV system enameled cast iron enameled steel</p>	<p>D, E</p>	<p>Frame 21 Frames 33-35 Frame 24 Frames 1-2 Frame 37 Frame 38</p>	<p>trap trap seal tub filler</p>	<p>T</p>	<p>Frames 19-21, 46 Frame 21 Frame 15</p>
<p>faucet fixture galvanized steel gel coated fiberglass hangers hot tubs</p>	<p>F, G, H</p>	<p>Frames 14-15, 43 Frame 2 Frame 39 Frame 40 Frame 28 Frames 13, 24</p>	<p>urinal valve vitreous china water closet whirlpool spas</p>	<p>U, V, W</p>	<p>Frames 6, 8 Frame 25 Frame 41 Frames 6-7, 41-42 Frames 13, 24</p>
<p>joists lavatory</p>	<p>I, J, K, L</p>	<p>Frame 29 Frame 10</p>			
<p>overflow</p>	<p>M, N, O</p>	<p>Frame 23</p>			
<p>P-trap plastics</p>	<p>P, Q</p>	<p>Frame 21 Frame 40</p>			
				<p>X, Y, Z</p>	

UNIT ONE QUIZ

DIRECTIONS: In the space to the left, write the letter which corresponds with the word or words that best complete each of the following sentences.

- _____ 1. The non-residential sector represents all of the following markets except
- a. commercial.
 - b. industrial.
 - c. homeowners.
 - d. institutional.
 - e. shopping centers.
- _____ 2. A building code
- a. is a federal requirement for all builders.
 - b. is a set of local rules governing quality of construction.
 - c. is mandated by State law.
 - d. requires a permit.
 - e. applies only to non-residential applications.
- _____ 3. A common faucet finish is
- a. zinc.
 - b. stainless steel.
 - c. chrome.
 - d. copper.
 - e. enameled cast iron.
- _____ 4. Round shaped lavatories are specified by the
- a. length of the fixture.
 - b. width of the fixture.
 - c. diameter of the fixture.
 - d. depth of the bowl.
 - e. overall length and width of the fixture.
- _____ 5. The DWV system
- a. brings liquids into a fixture.
 - b. takes solids, liquids and gases out of a building.
 - c. discharges wastes into a fixture.
 - d. is only found in residential applications.
 - e. is only found in non-residential applications.

- _____ 6. A sanitary fixture is a
- a. bathtub.
 - b. water closet.
 - c. kitchen sink.
 - d. all of the above.
 - e. none of the above.
- _____ 7. The water lines that lead from the main piping system into the plumbing fixture itself are called
- a. the flow lines.
 - b. the supply lines.
 - c. the DWV system.
 - d. all of the above.
 - e. none of the above.
- _____ 8. Plastics used in fixture construction include
- a. vitreous china.
 - b. enameled cast iron.
 - c. enameled steel.
 - d. all of the above.
 - e. none of the above.
- _____ 9. When reading manufacturers' literature, you will find a number of specifications given which are common to all plumbing fixtures. All fixture specifications will include the
- a. material of construction.
 - b. fixture weight.
 - c. fixture dimensions.
 - d. all of the above.
 - e. none of the above.
- _____ 10. The fixture drain will always remain open on a
- a. shower.
 - b. sink.
 - c. hot tub.
 - d. bathtub.
 - e. lavatory.

X

- _____ 11. A faucet
- a. is a valve.
 - b. controls the delivery of water into a fixture.
 - c. is often ordered separately from the plumbing fixture itself.
 - d. all of the above.
 - e. none of the above.
- _____ 12. Residential plumbing fixtures are most commonly found in
- a. the bathroom.
 - b. the kitchen.
 - c. the laundry room.
 - d. all of the above.
 - e. none of the above.
- _____ 13. A sink and lavatory are
- a. both found in the bathroom and kitchen.
 - b. both used for washing.
 - c. constructed to fit the same rough-in specifications.
 - d. the same size.
 - e. both installed in the same manner.
- _____ 14. The outside dimensions of a bathtub are specified as
- a. length x width.
 - b. length x width x depth.
 - c. length x width x height.
 - d. length x height.
 - e. width x depth.
- _____ 15. How a bathtub is classified is determined by
- a. where the tub is installed.
 - b. the rim type of the tub.
 - c. how the tub is supported.
 - d. where the tub meets the outlet.
 - e. how the tub is installed and supported.

- _____ 16. An external trap is used for all plumbing fixtures except for the
- a. bathtub.
 - b. shower.
 - c. sink.
 - d. water closet.
 - e. bidet.
- _____ 17. A urinal is
- a. a type of sanitary fixture.
 - b. found most often in non-residential applications.
 - c. designed to dispose of only liquid waste.
 - d. all of the above.
 - e. none of the above.
- _____ 18. Whirlpool spas and hot tubs
- a. are not necessarily connected directly to the water supply system.
 - b. can only be installed out-of-doors.
 - c. require a separate purchase of drain and waste fittings.
 - d. are constructed primarily from cast iron and steel.
 - e. always require a special type of overflow.
- _____ 19. Rough-in drawings
- a. are required for installing a plumbing fixture.
 - b. show the dimensions for waste and water supply pipe.
 - c. are usually provided by the manufacturer.
 - d. all of the above.
 - e. none of the above.
- _____ 20. A valve is
- a. used to prevent sewer gas from escaping.
 - b. not found on a water closet.
 - c. used to regulate the flow of water.
 - d. the same as a overflow pipe.
 - e. used to control waste entering the DWV system.

- _____ 21. Methods commonly used for support plumbing fixtures are
- brackets.
 - hangers.
 - joists.
 - all of the above.
 - none of the above.
- _____ 22. The number of water closets required for a public use setting is determined by
- the local code.
 - the class of the establishment.
 - the number of potential users.
 - all of the above.
 - none of the above.
- _____ 23. Stainless steel is most often used in manufacturing
- residential water closets.
 - residential sinks.
 - bidets.
 - residential lavatories.
 - shower stalls.
- _____ 24. A plumbing fixture is defined as
- an appliance.
 - a receptacle which receives water and removes waste.
 - a piping system.
 - a drainage system.
 - a kitchen or bathroom utility.
- _____ 25. A dimension which is a required specification for a water closet, urinal, or bidet, but is not for other types of fixtures is
- the location of the outlet.
 - the placement of the overflow.
 - the overall weight of the fixture.
 - all of the above.
 - none of the above.

Residential Water Closets and Bidets
Revised Edition

Series Two Unit 2

PHCP Self Instruction Program

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Chicago, Illinois 60654

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For a complete list of topics covered, see the index.

UNIT OBJECTIVES

The information in this Manual has been selected to give you an overview of residential water closets and bidets. It includes definitions of common industry terms, descriptions of the major types of residential bathroom fixtures, and information on their parts and how they work.

Some of the products reviewed in this Unit may not be a part of your company's current inventory. Other products which may be stocked by your company may not be discussed in this Unit. Always refer to manufacturers' literature and recommendations on the products your company sells if unsure about a particular product.

To do your job well, it is important that you learn the details about specific items stocked by your company. The most complete and accurate information can be found in manufacturers' catalogs and materials. Be certain to spend time studying those materials.

When completing this Unit, you will be able to

- recognize and use basic terms related to residential water closets and bidets
- discuss the specifications for different types of water closets and bidets
- understand which designs are best for a given installation or application

THESE MATERIALS SHOULD NOT BE USED TO PLAN ACTUAL INSTALLATIONS OR TO INSTALL FIXTURES.

DISCLAIMER

Although the information contained in this Unit is believed to be accurate, the ASA Education Foundation and the American Supply Association disclaim any and all warranties, expressed or implied, regarding both the accuracy of that information and its application.

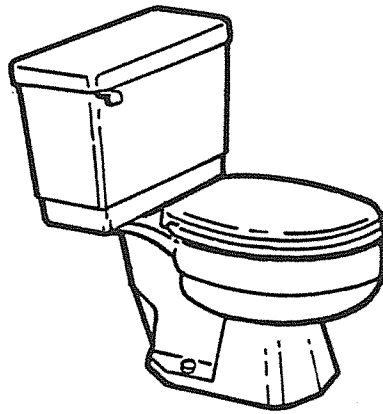
STEPS FOR COMPLETING THIS UNIT

1. If your company has purchased the videotape for use with this Series, view the video before you start Unit One.
2. Use the answer mask/book mark to cover the printed answers in the left hand column. Read the information in each Frame carefully.
3. Keeping the answer covered, write your response to the Frame question in the empty column at the right of each page.
4. Move the answer mask to check your response with the answer in the left column.
 - If your response is reasonably close to the printed answer, go on to the next Frame.
 - If your response differs from the answer given, review the material in the Frame to see why the printed answer is considered the best answer for the question.
 - If after reviewing the material in the Frame you still believe that your response is better than the printed answer, circle the printed answer. If you agree that the printed answer is best, mark an "X" through your response.
 - If after several attempts, you cannot understand the Frame or the answer to the Frame question, ask someone in your company for help.
 - If you still feel confused, contact the Foundation, and we will try to find a product knowledge expert to assist you.
5. Answer the questions in the Review at the end of each section. Check your responses with the answers given at the back of the book. Reread the Frames indicated for answers you missed.
6. When you've completed all Frames, prepare for the Unit Quiz by going over the Review pages and the definitions in the Glossary.
7. Take the Unit Quiz at the end of the Manual.
8. Send the whole book, with the completed Quiz, to the ASA Education Foundation for grading. You and your immediate supervisor will be notified about your completion of the Unit.

When you have completed all Units in Series Two, contact the ASA Education Foundation to make arrangements to take the Series Two Exam. You will receive a Certificate of Completion for Series Two when you have successfully completed all Units and the Series Two Exam.

The water closet is the most common type of sanitary fixture. It is used to dispose of two bodily wastes: Feces (pronounced *Fee-sees*) and urine (pronounced *Yer-in*). The act of having a bowel movement is called defecating. This is pronounced *deaf-ih-kate-ing*. The act of removing urine from your body is called urinating.

Water closets are specified for residential and non-residential installations. This unit will focus on water closets commonly specified for residential installations.



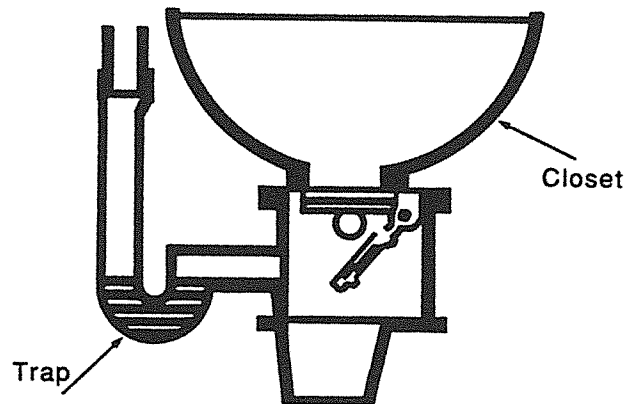
WATER CLOSET

To dispose of bodily wastes

What is a water closet used for?

Water closets flush waste into the DWV system. Flush means to produce a sudden flow of water. Even the ancient Romans used water to "flush" waste into rivers and streams.

The first flushing water closet was not developed until the 1500's. The flush closet was more widely accepted in 1775, when a London watchmaker, Alexander Cummings, improved the design and added curved pipe to the bowl outlet. The curved pipe was actually a trap. This trap provided the same function as the traps used today by creating a water seal to keep sewer gas from escaping up through the fixture.



CUMMINGS' FLUSH VALVE WATER CLOSET

*To produce a sudden
flow of water*

What does flushing mean?

The first flush closets were often viewed as luxury items. They were generally only found in wealthy homes. The bowl designs were often ornate, like the one shown below which was designed by Thomas J. Crapper. Special closet chairs were used to place over the top to conceal the bowl.



BOWL DESIGNED BY THOMAS J. CRAPPER

Appearance is still important for residential fixtures today. Residential closets are more decorative than non-residential closets and are available in a wide variety of designs and colors.

Closets made for installation in factories, offices, and institutions generally come only in white, with a limited selection of designs available.

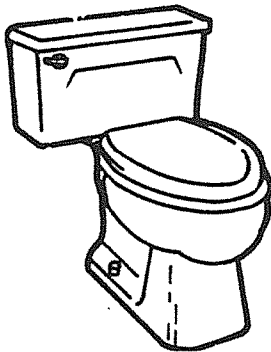
You will learn more about commercial water closets in Unit Seven of this Series.

Residential

Which water closets are more likely to be decorative, residential or institutional closets?

As you may have guessed, the water closet is the industry's term for what is commonly referred to as the "toilet." Many other terms or slang expressions are used for the water closet, such as "pot," "commode," or "stool."

One term you may have heard is the word "crapper." The dictionary shows that this word means toilet. It is possible that the word crapper came from Thomas J. Crapper, the English plumber who designed and manufactured water closets and other sanitary fixtures in the 1800's.



TYPICAL WATER CLOSET (Toilet)

What term other than the water closet is more commonly used today?

Toilet

Most water closets are made of vitreous china. "Vitreous" means glasslike. In the manufacture of plumbing fixtures, vitreous china refers to molded fixtures which are baked at very high temperatures to produce a strong, non-porous product.

Vitreous china is made from a clay and water mixture. The mixture is cast into the shape of the fixture, coated with a liquid glaze, and then fired under very high temperatures. This process makes the fixture hard and totally non-absorbent. In other words, no liquid or odor can seep through and permanently stain or soil the fixture. This makes it an especially good material for preventing the breeding of harmful bacteria contained in urine and feces.

During the manufacturing process, the vitreous china fixture will shrink approximately 11% in size. To accommodate for this shrinkage, vitreous china fixtures are made bigger when they are first cast.

What is the most common non-absorbent material used in manufacturing water closets?

Vitreous china

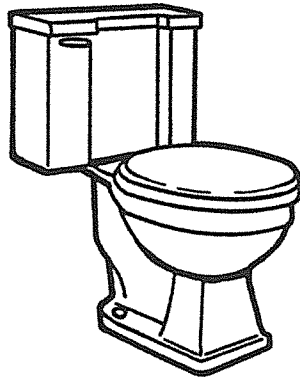
The tank on most residential water closets is made of vitreous china, although some may also be made of plastic. The major advantage of plastic tanks is the material's resistance to impact. Plastic tanks are also less likely to produce condensation (sweat) when it is warm and humid.

Residential water closet bowls are also made of vitreous china. Although they are rare, you may also see some bowls made of plastic.

*Impact resistant,
less likely to
produce
condensation*

What are the advantages of choosing a plastic tank?

A tank type closet is a water closet which requires the water to be stored in a tank above the bowl. This type is most commonly used in residential installations.

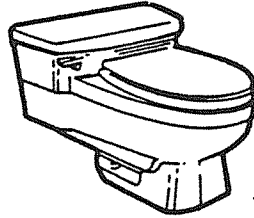


TANK TYPE WATER CLOSET

*In the tank
above the bowl*

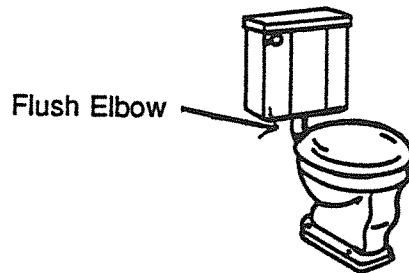
Where is the water stored on a tank type water closet?

Tank type closets come in either a one piece or two piece bowl/tank assembly. The illustration below shows a one piece bowl/tank design. In this type, the tank and bowl are combined into a single unit.



ONE PIECE BOWL/TANK DESIGN

There are two types of two piece bowl/tank designs. A wall mounted tank is found in older commercial and residential installations. The bowl sits on the floor and the tank hangs on the wall. A flush elbow (or "flush el") joins the two pieces.



WALL MOUNTED TWO PIECE BOWL/TANK DESIGN

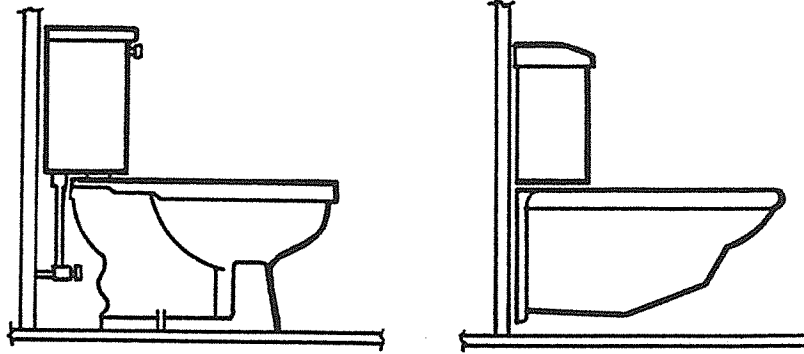
The second type of two piece bowl/tank design is called a close coupled design. With this design, the tank sits directly on the back of the bowl. This close coupled combination is the most common design used today. This design may be wall mounted or floor mounted. Close coupled designs like the one below are popular because all parts of the water closet are off the floor allowing for easier cleaning and more sanitary conditions.



CLOSE COUPLED TWO PIECE BOWL/TANK DESIGN

Close coupled design What is the most common type of bowl/tank design?

Water closets are available in either a floor mounted or wall hung mount design. These two mounting types of water closets are not interchangeable since each is connected in a different way to the DWV system.



FLOOR MOUNT

WALL HUNG MOUNT

*Floor or wall hung
mount*

What are the two methods of mounting water closets?

Regardless of the design or mount, all water closets have the following five components

- a closet bowl
- inlet
- outlet
- flush mechanism
- trap

The closet bowl is a receptacle for deposit of bodily waste. It has an inlet which provides an opening for flush water to enter the fixture, and an outlet for waste to be taken out of the fixture into the DWV system.

The flush mechanism allows flush water to be released into the bowl. All closets have a integral (built-in) trap to provide a passageway for removing waste from the fixture and to prevent backflow.

*Bowl, inlet, outlet,
flush mechanism,
and trap*

What are the five components which are common to all water closets?

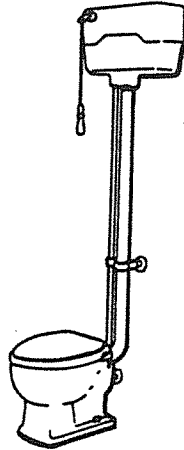
DIRECTIONS: In the space to the left, label each of the following statements "TRUE" or "FALSE."

- _____ 1. Vitreous china refers to molded fixtures baked at very high temperatures resulting in a strong non-porous product.
- _____ 2. Toilet is another name for a water closet.
- _____ 3. The first flushing water closet was developed in ancient Rome.
- _____ 4. Vitreous china expands during the manufacturing process.
- _____ 5. Vitreous china has excellent absorbency.
- _____ 6. A water closet must always have a integral (built-in) trap.
- _____ 7. A water closet is used to dispose of bodily wastes.
- _____ 8. Floor mount and wall mount designs are interchangeable.
- _____ 9. A close coupled combination is the most common type of tank design.

Compare your responses to the answers given on page 52

Now that you have been introduced to the general features of residential water closets, let's look more specifically at their uses and how they function.

The first tank type closets had tanks which were located high above the closet bowl as illustrated below. The height or distance between the two pieces was thought to have been needed to accomplish the flushing action.



HIGH TANK CLOSET WITH PULL CHAIN

High tank closets are operated by a long pull chain which releases the water, which is stored in the tank, into the closet bowl.

This type of high tank design is not commonly used today. However, some customers may request this older, high tank model for decorative purposes to recreate an older period in time.

To accomplish the flushing action

Why were tanks placed high above the closet bowl in early model water closets?

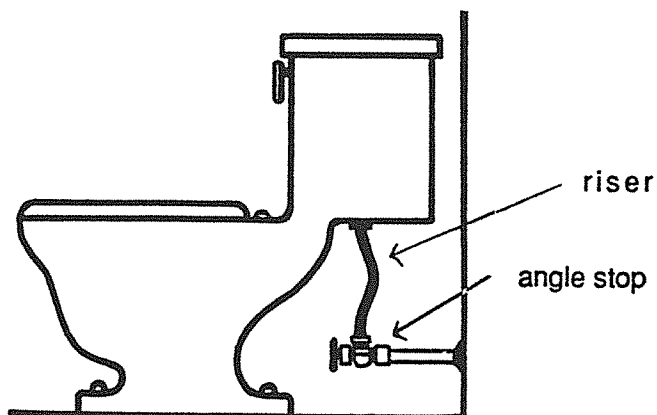
As improved trapway designs were introduced, the need for placing the tank high above the bowl became unnecessary. Today, most tank type closets have a low tank. Modern traps use a siphonic-suction to pull waste from the bowl rather than high pressure flushing.

Low tank

Is a high or low tank type most commonly used today?

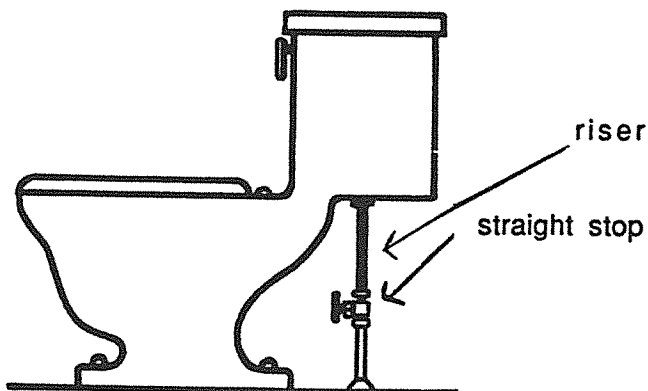
In modern water closets, water from the supply line enters the tank from the base, or bottom of the tank. A supply stop, the valve which turns the water flow on and off, is installed between the supply line and the tank, connected by a riser. The riser may be of flexible or rigid tube.

In the illustration below, an angle stop is used for the connection of the wall supply line to the riser.



WALL CONNECTION WITH AN ANGLE STOP

In this illustration, a straight stop is used for the connection of the floor supply line to the riser.



FLOOR CONNECTION WITH A STRAIGHT STOP

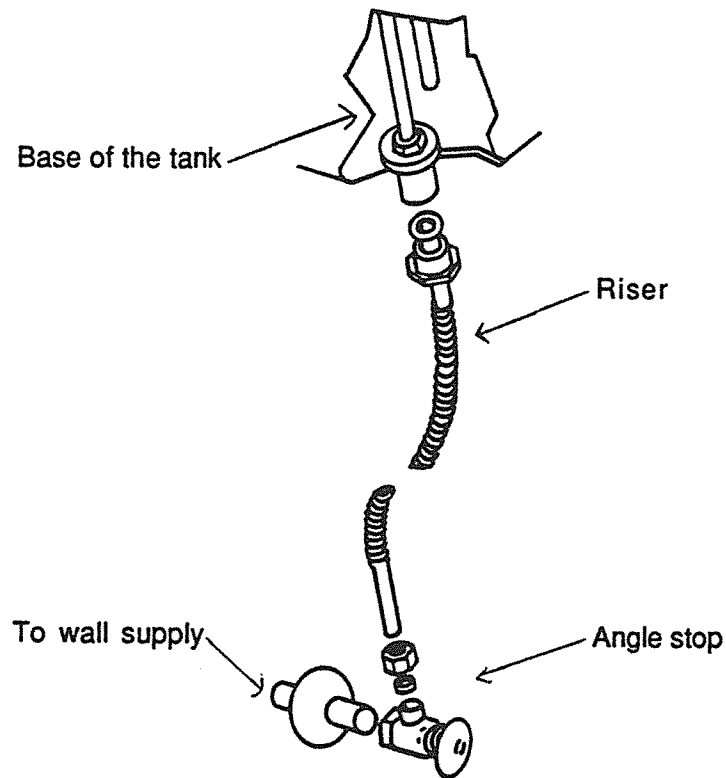
When taking an order for a water closet, you will need to identify whether a straight or an angle stop is needed and the type of riser required for the job.

What is the purpose of the stop in both of the above illustrations?

To turn the water flow to the closet tank on or off

As mentioned, the supply riser used with a water closet tank must be ordered separately. You need to be aware that this riser is different from the supply lines used with lavatories and sinks.

The illustration below is an inside view of the riser connection to the closet tank. A 3/8" supply connection is the most common, but some manufacturers may specify a larger size used.



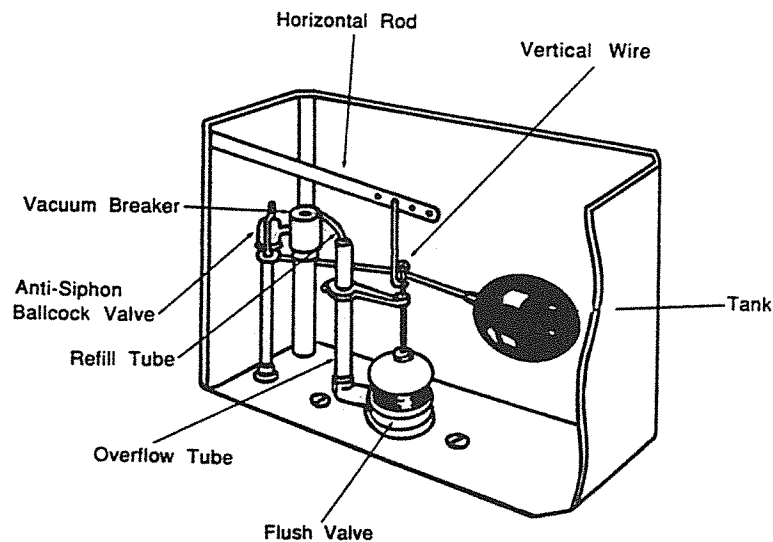
INSIDE VIEW OF A SUPPLY CONNECTION

3/8"

What is the most common size supply connection specified for a water closet?

Water from the riser enters the tank through the ballcock valve. The ballcock valve refills and controls the water level in the tank in conjunction with a float device. The ballcock shown has a vacuum breaker which prevents back siphonage. Ballcocks with vacuum breakers are called anti-siphon ballcocks. Codes require that all ballcock valves have vacuum breakers.

The trip lever, or tank handle, controls the horizontal rod which initiates the flushing action in the tank causing the flush valve to open. This valve releases a rapid flow of water into the closet bowl. When closed, the flush valve holds water in the tank until it is released to flush the bowl.



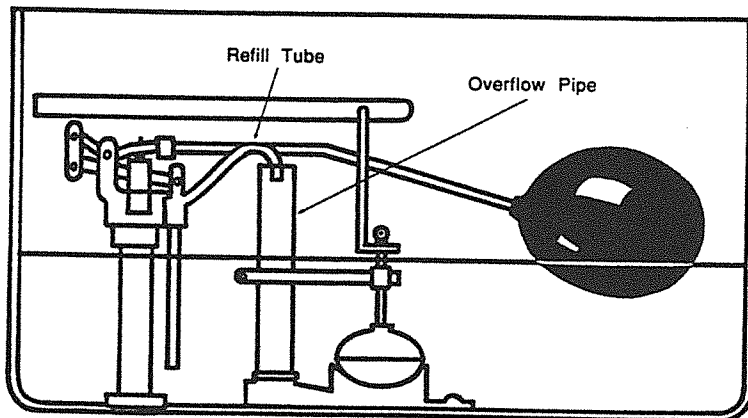
INSIDE OF CLOSET TANK WITH ANTI-SIPHON BALLCOCK

To hold water in the tank and release it when needed to flush the bowl

What is the purpose of the flush valve?

When the ballcock valve opens and begins refilling the tank, some of the water is diverted to a refill tube. The refill tube directs water to the overflow pipe.

The overflow pipe leads to the closet bowl inlet where the diverted water from the refill tube refills the bowl and reseals the trap to prevent sewer gas from entering.



The most important function of the overflow pipe is to keep the tank from overflowing if the ballcock does not close and shut off for any reason. If the ballcock should fail to shut off, the incoming tank water and any excess water flows into the overflow pipe. This water will flow over the trap and into the DWV system.

Refills the closet bowl and reseals the trap

What is the purpose of the overflow pipe?

Older water closets need 5-8 gallons of water per flush. Because of water shortage problems which exist in certain regions, many city codes specify that water conservation measures be taken.

Water saving toilets use 3.5 gallons of water per flush, saving 1.5 gallons or more per flush. Recent developments have produced low consumption water closets which use only 1.6 gallons or less per flush.

Local codes may determine which type of water conserving closet may be used for a specific installation.

1.6 gallons or less

How many gallons per flush does a low consumption water closet use?

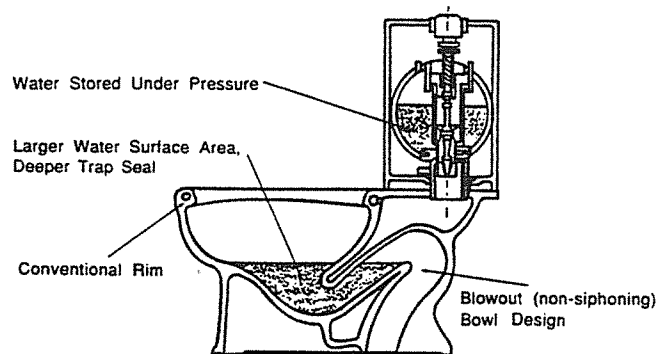
Low consumption water closets come in both tank and tankless models for residential and commercial applications.

Those with tanks have either one of two types of flush mechanisms: pressure assisted or gravity feed. You will need to know the differences between a pressure assisted closet and a gravity feed low consumption water closet. Both of these are used for residential installations.

*Pressure assisted
and gravity feed*

What are the two types of low consumption water closets?

The pressure assisted closet is an extension of the water supply line. It uses water in the supply system to compress trapped air. This "charges" the air, causing it to react like a tightly wound spring. When the toilet is flushed the air acts like a spring or siphon and forces the water out of the tank and into the bowl at a high velocity.



PRESSURE ASSISTED LOW CONSUMPTION WATER CLOSET

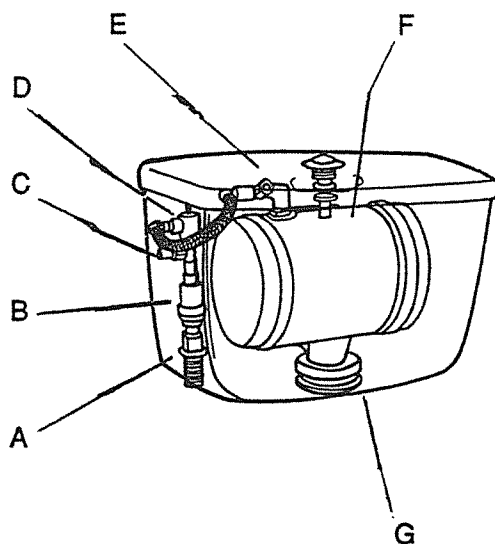
You may have noticed that the inside of the closet tank looks different than the ballcock type flush mechanism we have reviewed in previous frames. A pressure assisted closet has a flush mechanism called a flushometer.

The refill cycle begins after each flush. Water and air are drawn into the flushometer tank. When the water and air pressure are equal, the tank is ready to be flushed again.

Flushometer

What is the flush mechanism on a low consumption pressure assisted closet called?

The flushometer tank system has different components than is found on a ballcock system.



- A - Back check
- B - Pressure regulator
- C - Pressure relief valve
- D - Vacuum breaker
- E - Air inducer
- F - Vessel with flush cartridge
- G - Discharge extension with ball check drain port

Air is compressed in the vessel (F) at 35 PSI and is constantly regulated by the pressure regulator (B). This stored energy forces water through to the bowl at a rate of 60 gallons per minute. At the end of the flush, air is replaced through the air inducer (E). Any water that may collect inside the outer tank is allowed to drain through the ball check drain in the discharge extension (G).

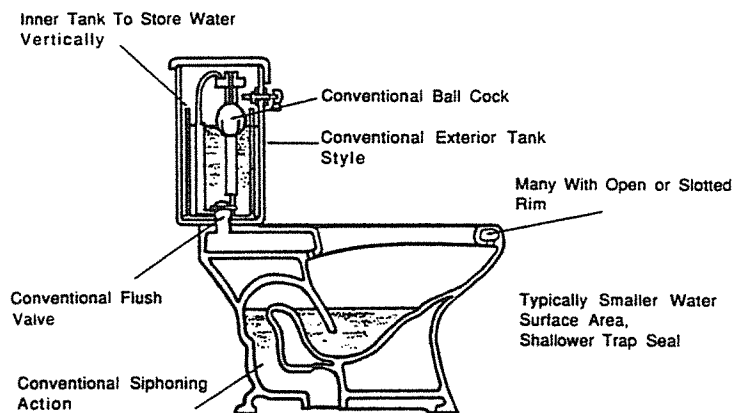
*60 gallons per
minute*

What is the rate of the water flow through the bowl when a flushometer is used?

The second type of low consumption closet is called a gravity feed closet. It is similar to a conventional closet because it also uses a ballcock and flush valve.

The water closet itself has been redesigned with a steeper bowl and an exposed trapway to allow greater velocity when flushing.

This type of flush mechanism uses the natural force of gravity, allowing water to drop down from the tank to begin the flushing action.

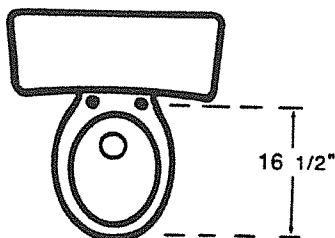


GRAVITY FEED LOW CONSUMPTION WATER CLOSET

It has a ballcock and flush valve

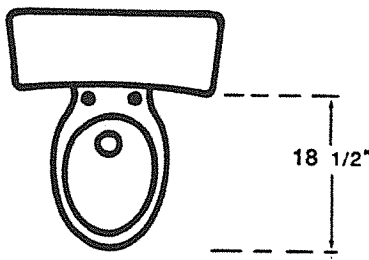
What makes a low consumption gravity feed closet similar to a conventional water closet?

Water closet bowls primarily come in two shapes, round and elongated. This is a round front or sometimes called a regular front.



BOWL WITH A ROUND FRONT

This bowl has an elongated front. The bowl has more of an oval shape and is usually longer by 2 inches.



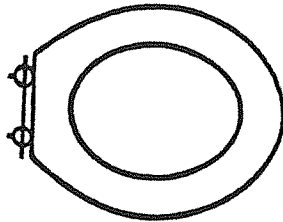
BOWL WITH A ELONGATED FRONT

*Round and
elongated*

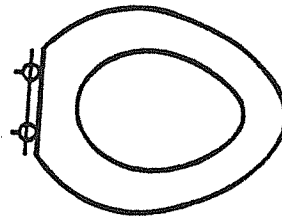
What are the two most common shapes in closet bowls?

Closet bowl seats are ordered separately to match the shape of the bowl. Most seats are available with or without seat lids.

Closet bowl seats come in four common shapes. The round and elongated seats shown below are referred to as closed front designs. As you can see, the seat makes a complete circle, and resembles the letter "O." Closed front designs are most commonly used for residential use with tank type closets.

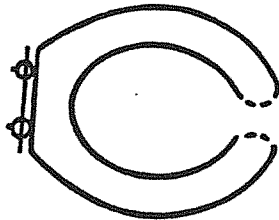


ROUND

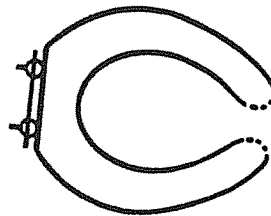


ELONGATED

The other two types of closet bowl seats have an opening in the front and resemble the letter "U." These are called open front designs and are most often used in commercial installations for tankless type water closets.



ROUND



ELONGATED

Check manufacturers' literature for more information on the shapes offered by your suppliers.

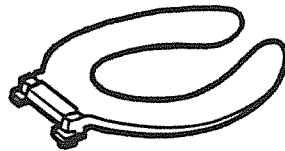
Closed front

What type of closet seat designs are specified for residential use with tank type closets?

When writing an order for a closet seat, standard abbreviations are used. These abbreviations reduce time spent writing and reading an order. The chart below shows the standard abbreviations for closet bowl seats.

SHAPE	SEAT	LID
E = Elongated R = Round	OF = Open Front CF = Closed Front OB = Open Back	WC = With Cover LC = Less Cover

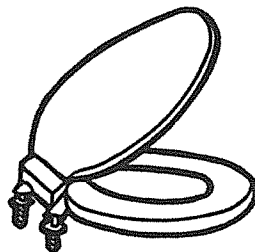
The abbreviation for the closet seat assembly shown below is #123, E, OF, LC



No. 123 Elongated

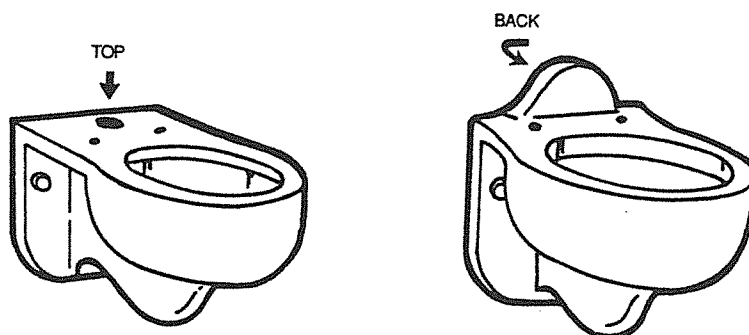
#4567, E, CF, WC

What would be the abbreviation for the seat assembly used for a residential closet shown below?

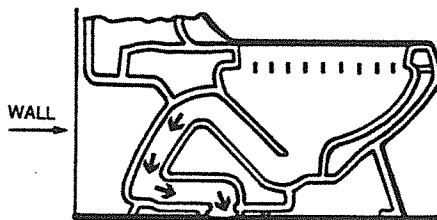
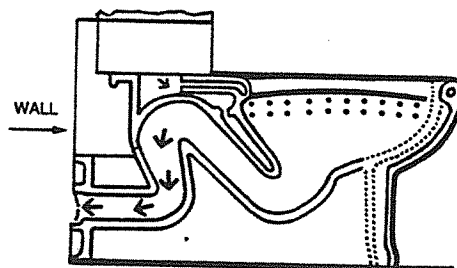


No. 4567 Elongated

The closet bowl has an inlet to provide an opening for flush water to enter the bowl. The inlet may be located on the top or at the back of the bowl.



The outlet location provides an opening for waste to be discharged from the fixture into the DWV system. Outlets may be located on the back of the bowl, discharging waste through the wall, or at the bottom of the bowl, discharging waste through the floor.

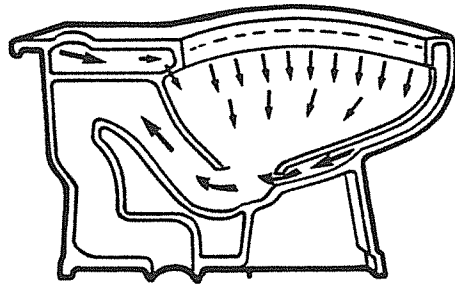


*Back or the Bottom
of the closet bowl*

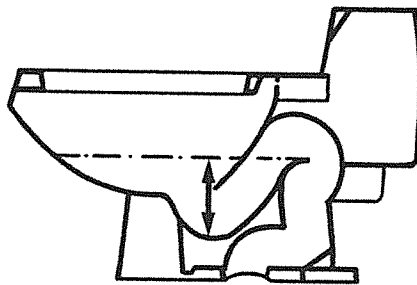
Where are the two possible locations for an outlet?

All closet bowls have integral (built-in) traps. The trap provides a passageway for removing waste from the fixture.

The design of the trap makes it easy for waste to be siphoned into the DWV system. The siphoning action begins in the downleg of the trap. Water is sucked through the trap until air entering the trap breaks the siphon.



Refill water slowly fills the trap. When the bowl water reaches the height of the dam, the seal is complete. The distance from the top of the water surface to the top of the trap entrance is called the water seal.

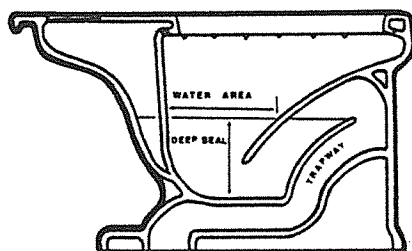


Water seal

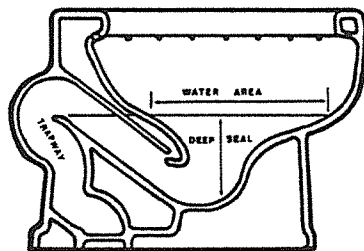
What is the area between the top of the water surface and the top of the trap entrance called?

The amount of water surface area inside the bowl depends upon the bowl design. Small water surface areas leave more dry bowl area. This dry bowl area is more likely to be left dirty by waste matter after flushing.

In this design, the trapway is at the front of the fixture. It does not allow much area inside the bowl to be covered with water. A bowl design with a front trapway is not used much today and is not allowed by many local codes.



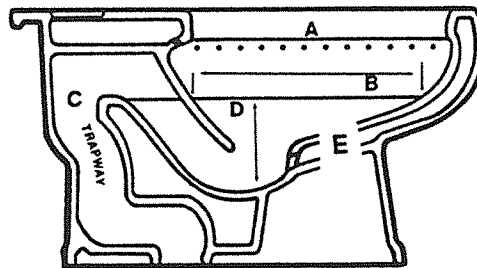
This bowl is designed opposite of the one illustrated above with the trap at the back of the fixture. Bowl designs with back trapways are the most common and permit larger water surface areas. The bowl is more likely to be left clean after flushing with a bowl design with a larger water surface area.



In the back of the bowl

In which location should a trap be on a bowl design to make it easier to flush the bowl clean?

There are a number of different bowl designs which accomplish the flushing action in different ways. The bowl design refers to how a closet bowl is constructed on the inside. However, there are elements which are common to all bowl designs.



All designs have a

- rim flush (A)
- water surface (B)
- trap (C)
- water seal (D)
- jet (E)

Water is released into the closet bowl from a tank or flush valve. Some of the water enters the bowl from the rim flush (A) and flows down inside the bowl surface to clean it after use.

The water surface (B) is the area inside the bottom of the bowl which remains covered with water.

The trap or trapway (C) allows a passageway for waste to be flushed out of the fixture and to seal it, preventing sewer gas from escaping up through the bowl.

The water seal (D) is actually the depth of the seal which is provided by the length of the trap.

The jet (E) is a stream of water discharged at the base of the passageway which shoots upward into the trap entrance to start the siphoning action.

Flushing actually happens when turbulent water has filled the downleg of the trap.

Rim flush, water surface, water seal, trap, and jet

What five elements are common to all closet bowls?

One and two piece closets are available with different bowl designs. The bowl design is named according to the type of flushing action it uses. The four basic bowl designs used in residential closet bowls are listed below.

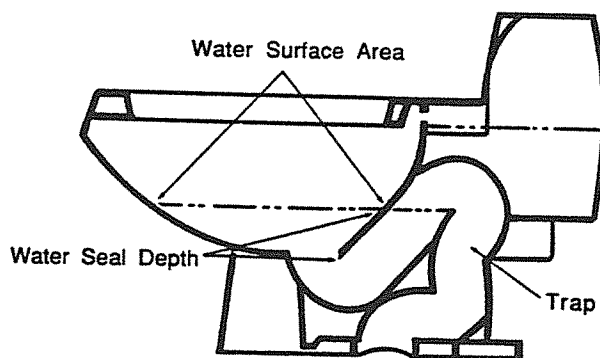
- washdown
- reverse trap
- siphon jet
- siphon vortex

Each of these will be reviewed in the next few frames to give you a basic idea of the differences between the water action in each.

By the type of flushing action it uses

How has a particular bowl design gotten its name?

Each bowl design has specifications which have been set by codes and standards. The three common specifications for all bowl designs are the water surface area, the water seal depth, and the trap size.

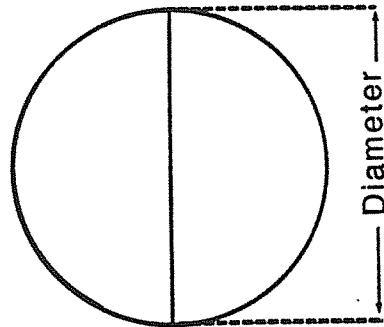


Water surface area, water seal depth, and trap size

What are the three common specifications which have been set for all bowl designs?

Codes require that the water surface area must be a minimum of 5" by 4". Also, the depth of the water seal from the surface of the water down to the top of the trap entrance must be a minimum of 2".

Trapway size is defined either in actual dimensions of the passageway or by ball pass. A ball pass measurement is the diameter of a ball which can pass through the trap.

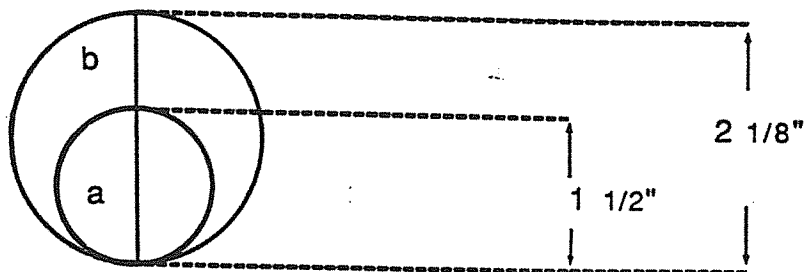


Above is a circle with a line down the center. This center line divides the circle into two equal parts. The diameter of a circle is any straight line which connects two points of the circle by passing through the center of the circle.

$$a = 1 \frac{1}{2}''$$

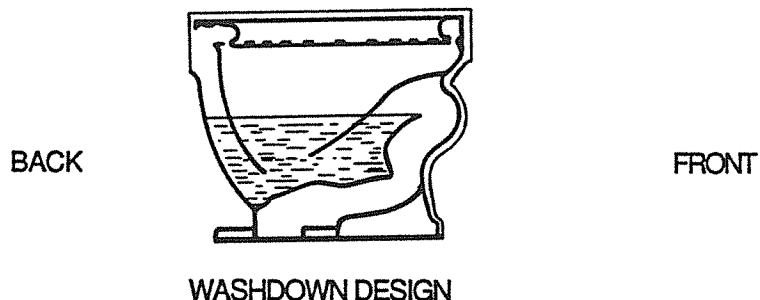
$$b = 2 \frac{1}{8}''$$

What is the diameter of the circles shown below?



A washdown bowl flush design is the only flush design which has the trap in the front of the bowl cavity. This design is the least expensive and is the noisiest design.

The washdown design is becoming obsolete because it is not allowed today by many local codes. The small trapway may clog more easily than other designs. It also has the smallest water surface area.

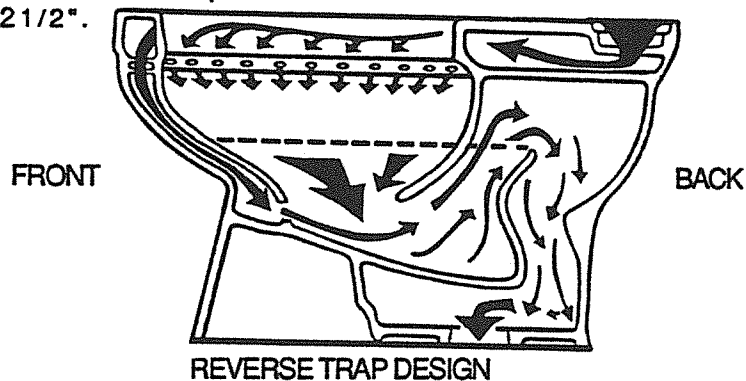


Washdown

Which flush design has a trapway in the front of the bowl cavity?

All other bowl designs also have traps which are located at the back of the bowl. The first to have this type of design was called a reverse trap design. This design is characterized by incoming water coming from around the rim of the bowl, and a jet outlet which is directed into the upward leg of the trap to enhance the siphoning action.

The reverse trap design has a larger water surface. Water surface dimensions are a minimum of 9" x 8". It also has a minimum ball pass of 1 1/2" and a water seal minimum of 2 1/2".

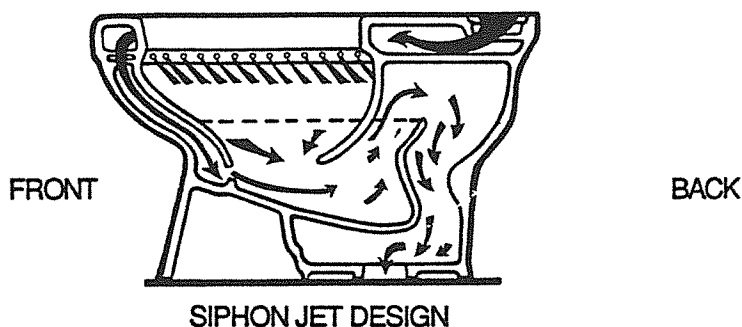


Reverse trap

Of washdown and reverse trap designs, which has a larger water surface?

A siphon jet design also has a trap at the back of the bowl, but the jet delivers a larger volume of water flow to immediately begin the siphoning action without causing a rise in the water level before the contents are drawn through the outlet.

This type of design has a larger water surface area than does a washdown design or reverse flow design. The water surface area is a minimum of 12" x 10". It also has a ball pass of 2" and has a 3" water seal.

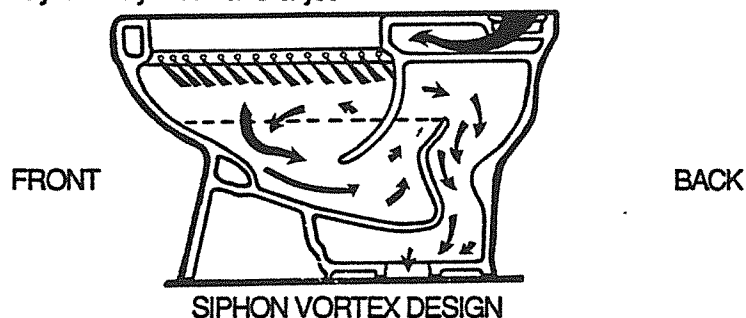


The back of the bowl

In a siphon jet design, where is the trap located?

A siphon vortex, which is sometimes called siphon action, is a design in which the flushing action is caused by diagonal rim outlets which generate a swirling or whirlpool action of the water in the bowl. The trap fills up quickly and triggers the siphoning of the bowl contents.

This type of flush design is used for one piece tank/bowl designs. The siphon vortex design is known for its large water surface area and the quietness of its operation. The water surface area is 11" x 9" and the water seal is 3". This design may or may not have a jet.

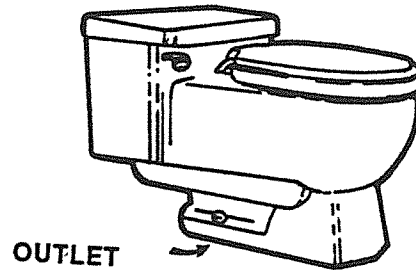


One piece bowl and tank designs

Which type of bowl/tank design is a siphon vortex flush design used with?

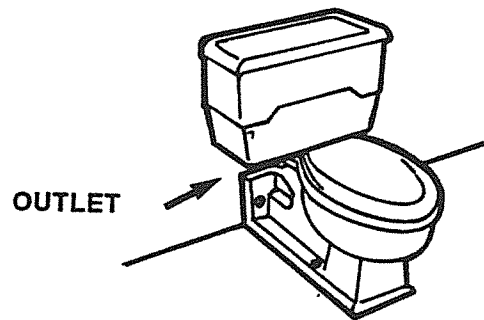
As discussed earlier, water closets are mounted either with a floor mount or a wall mount. These have different discharge locations.

A one piece bowl/tank design is floor mounted. The outlet is at the bottom, allowing connection through the floor.



ONE PIECE DESIGN FLOOR MOUNTED

Below is a close coupled two piece design which is floor mounted. The outlet on this design is in the back, allowing connection through the wall.



TWO PIECE DESIGN FLOOR MOUNTED

*On the bottom or
in the back*

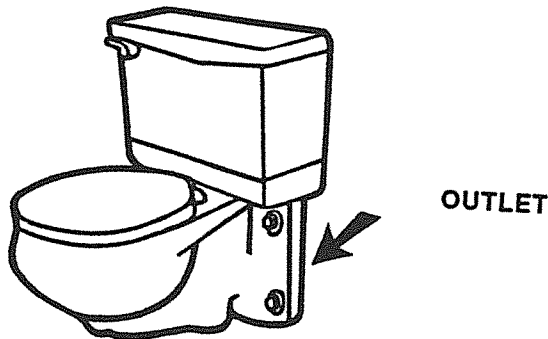
Where are the two possible outlet locations on a floor mounted closet?

A wall mounted closet is not mounted directly onto the wall, but is attached to a closet carrier which is a special fitting for connecting and supporting the closet. It may also be called a chair carrier.

Wall mounted closets are not connected directly to the wall because any shift in the foundation could cause a break in the connection. The carrier allows some space to be left between the closet and the wall helping to keep the closet attached to the DWV system if the wall or the plumbing system should move slightly.

The outlet for a wall hung mount is in the back, allowing connection through the wall.

When taking an order for a wall mounted closet, be sure to indicate the carrier that has been specified for that particular closet by the manufacturer.



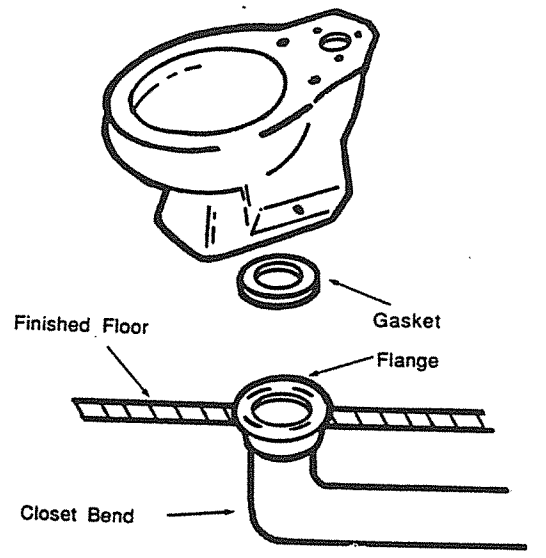
WALL MOUNTED DESIGN

At the back of the fixture, allowing connection through the wall

Where is the outlet for a wall hung mounted design?

The floor mounted closet and the wall hung mounted closet are not interchangeable due to the way each is connected to the DWV system.

With a floor mounted closet, waste flushed through the closet enters the DWV system through the closet bend in the DWV piping system. A closet flange is the fitting which is used to attach the bowl to the DWV system. The fixture outlet fits directly over the closet flange. Waxing or a gasket between the flange and the fixture provides the seal.



CONNECTION TO DWV OF FLOOR MOUNT DESIGN

Closet flange

What fitting provides the connection of a closet to the DWV system?

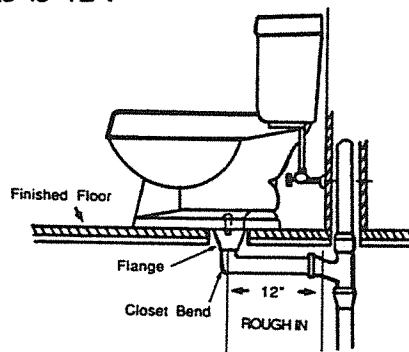
In order to fit the closet bowl over the closet flange you will need to know the rough-in (pronounced *ruff-in*) dimension.

Rough-in dimensions refer to pipe concealed behind walls or under floors and tells you the distance needed to connect the fixture to the pipe of the water supply system and the DWV system.

The rough-in for floor mounted closets measures from the finished wall to the centerline of the closet flange or fixture outlet.

The rough-in is available through two sources; manufacturers spec sheets or by actually measuring the distance.

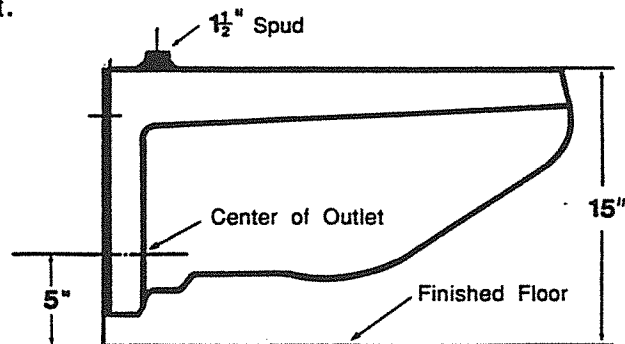
The most common rough-in specification for residential water closets is 12".



12"

What is the rough-in for the closet shown above?

The rough-in for wall hung closets measures the distance between two points as well. It is measured from the surface of the finished floor to the centerline of the closet carrier inlet.



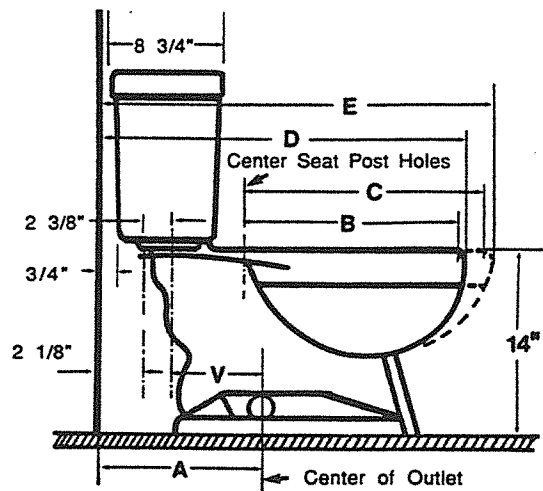
5"

What is the rough-in for the wall hung closet shown above?

Manufacturers do not always provide an illustration of each closet they make. Sometimes an illustration and a chart which shows the various sizes available are given.

In the illustration below, letters are used to represent the different dimensions of each closet. The chart then corresponds with the letters, giving the rough-in dimensions for the different styles available.

TANK AND BOWL COMBINATION NO.	BOWL NO.	A	B	C	D	E	V
2386	2385	10"	16 1/2"	-	27 3/8"	-	4 3/4"
2388	2387	14"	16 1/2"	-	27 3/8"	-	8 3/4"
2390	2389	12"	-	18 1/2"	-	29"	6 3/4"
2392	2391	12"	-	16 1/2"	-	27"	6 3/4"



2389

A customer wants to replace a bowl for a tank type closet with an elongated bowl shape. The distance from the finished wall to the center line of the closet flange measures 12". Using the chart above, give the manufacturer's number for the closet bowl which fits this customer's needs.

Aside from technical specifications such as roughing-in and the outlet location, a customer may consider many factors in choosing a water closet for installation. Local codes may dictate water conservation efforts in a particular area. Ease of cleaning, noise of flushing, appearance, color availability, and cost are also factors which will determine his choice.

Water conservation specifications

What specifications might local codes dictate for the installation of water closets in a given area?

DIRECTIONS: Write the answer to each of the following questions in the space provided.

1. What are the two types of flush mechanisms found in low consumption water closets?

2. What is the most common rough-in specification for a floor mounted residential water closet?

3. Which type of bowl seat would you choose for a residential installation?

4. Where are the two possible locations for an inlet?

5. What are the two methods of measuring trapway size?

6. How many gallons per flush does a low consumption water closet use?

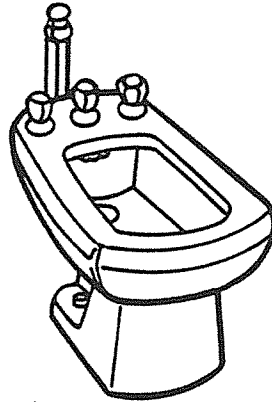
7. What is the name of the valve which turns the water flow from the supply riser to the tank on or off?

8. Which type of low consumption water closet is similar to a conventional water closet because it also uses a ballcock and flush valve?

Compare your responses to the answers given on page 52.

The bidet is used in homes and in finer hotels. It is more commonly found in Europe than in the U.S. A bidet looks like a water closet without a tank or seat on the bowl.

Bidets are made of vitreous china and are available in a wide variety of colors. Bidets are normally installed side by side with a water closet for easy access for the user.



BIDET

Europe

In which continent are bidets most commonly found?

Unlike the water closet, a bidet is not used for defecating or urinating. This special fixture is primarily used for cleansing the perineal (pronounced *pear-uh-knee-uh*) areas of the body after defecating or urinating. The perineal area includes the skin surrounding the sex organs to the anus. It is also often recommended for medical purposes to ease the discomfort of hemorrhoids or stitches.

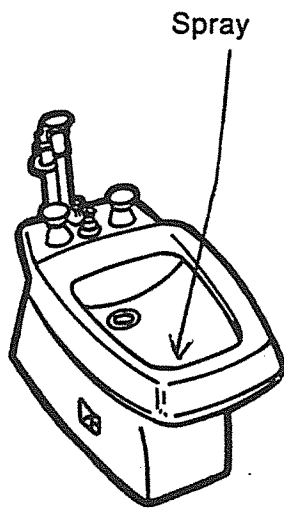
The bidet has special characteristics which make it easy to wash the perineal area. While all bidets have similar design characteristics, each manufacturer will have their own style. Become familiar with the bidets your company sells.

To wash perineal area of the body

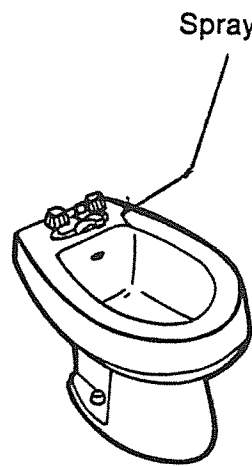
What is the primary purpose of a bidet?

There are two basic bidet designs. There is the vertical spray type and the horizontal spray type. The spray refers to the rinsing stream of water. The spray is the most important characteristic of a bidet.

With the vertical spray type of bidet, the spray comes from the opening in the bottom of the basin. With the horizontal spray type, the spray comes from a faucet on the top, back portion of the bowl.



VERTICAL SPRAY TYPE



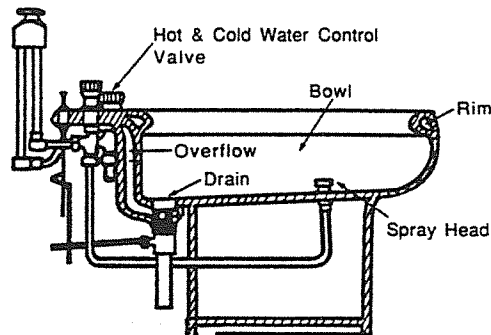
HORIZONTAL SPRAY TYPE

The spray

What is the most important characteristic of a bidet?

Bidets all have the following main parts

- bowl or basin
- control valves (hot or cold)
- rim
- spray
- two drains



The control valve controls the water flow into the bowl.

The two drains provide different functions. The upper drain is called the overflow, and prevents water from spilling over the bowl rim. The lower drain either holds water in the bowl or releases water into the DWV system.

In addition to the parts listed above, a diverter is found on a vertical spray type bidet. It is a special valve which directs the water either to the rim or through the spray. Water which is diverted to the rim rinses the inside surface of the bowl, while water diverted to the spray is used to wash the perineal area.

To prevent water from spilling over the rim of the bowl

What is the function of the overflow drain?

The water control valve and supply connections are ordered separately. The control valve may be installed on the bidet itself, or on a wall near the fixture.

Most bidets use a vacuum breaker as part of the control valve. This is a special fitting which prevents back siphonage of soiled water from entering the potable water supply system. In fact, many local codes require a vacuum breaker for bidet installations.

To prevent back siphonage of soiled water

What is the purpose of a vacuum breaker on the control valve of a bidet?

Since most people in the U.S. are not familiar with bidets, it is worthwhile to understand how a bidet is operated.

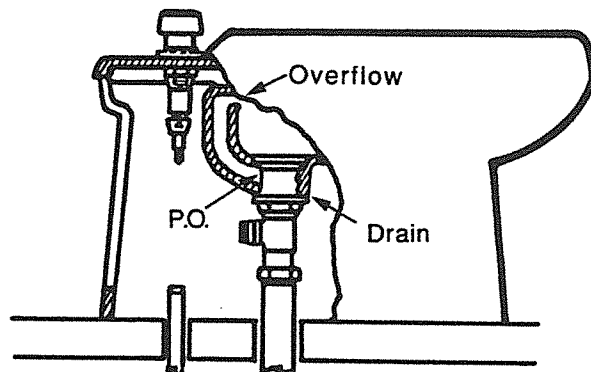
The first step in operating a vertical spray type bidet is to straddle the bowl facing the water controls. The shape of the bowl helps make it easier for the user to straddle the bowl.

After straddling the bowl, the diverter is set for rim fill. At this point the drain is open. Then the temperature of the water can be adjusted.

Rim fill

What is the first setting for the diverter?

Once a lukewarm temperature is found, the lower drain is closed. Water then fills the bowl until it reaches the overflow drain. The overflow leads directly to the lower drain plug which is called the patented overflow (P.O.). This plug allows water to escape if the bowl is in danger of water going over the rim.



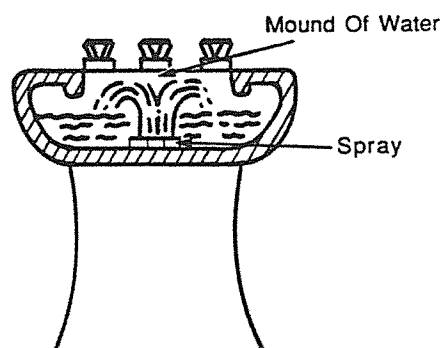
As the water is constantly filling the bowl, the overflow maintains a constant water level by letting the excess water drain out.

When the water in the bowl has reached the overflow, the diverter is set for spray.

To prevent water from overflowing the rim

What is the function of the overflow?

If the bidet has a vertical spray like the one illustrated, water is forced up through the bottom of the bowl. It mixes with the water in the bowl to form a 2" to 3" "mound" of water. This gently cleanses the perineal area.

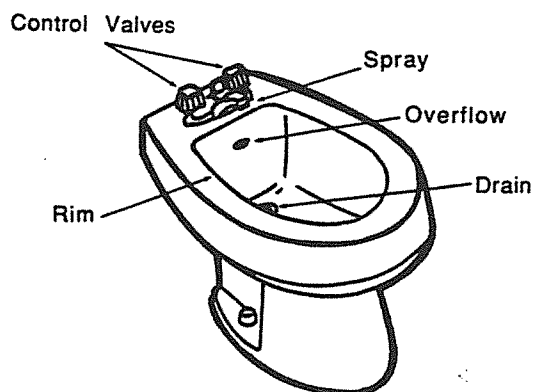


After cleansing, the diverter is set at rim fill again and the drain is opened. As the water drains out, the rim water rinses the bowl.

The bottom of the bowl

Where is the spray on a vertical spray type bidet?

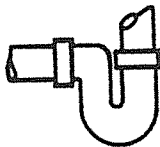
On a horizontal spray design, there is no diverter since the spray comes from the faucet. A horizontal spray bidet does not have a rim fill as found on a vertical type. Instead it has a swivel spout which easily directs the water down into the bowl.



A swivel spout

What feature of a horizontal spray replaces the diverter and rim fill on a vertical spray bidet?

Bidets do not have built in traps. The trap must be ordered separately. Most local codes require a P-trap to be used.

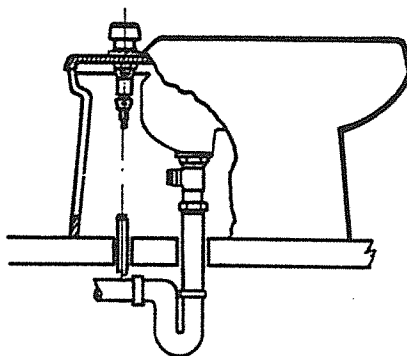


P-TRAP

P-trap

What type of trap do most local codes require for use with a bidet?

All bidets are floor mounted with the trap installed under the floor. Although a P-trap is designed so that it discharges through the floor or through the wall, most codes require that P-traps installed with bidets discharge through the floor.



BIDET WITH P-TRAP

Bidet trap size is regulated by local codes. Some codes require a 2" minimum trap size.

Floor mounted with the trap under the floor

How are bidets installed?

Installation of a bidet is like a cross between a lavatory and a water closet. Connection of the hot and cold water supply is the same as a lavatory with the addition of the vacuum breaker.

Bidets have a rim height of 14" - 16" and the rough-in measurements vary. Be sure to review materials provided by manufacturers on the bidets your company sells.

Rough-in measurements vary for bidets

What are the standard rough-in measurements for bidets?

DIRECTIONS: In the space to the left, write the term provided in the list of terms which corresponds with the definition.

DIVERTER
SPRAY
P-TRAP
SWIVEL SPOUT

VACUUM BREAKER
PATENTED OVERFLOW PLUG
DRUM TRAP
RIM FILL

- _____ 1. Directs water into the bowl of the bidet either through the rim or the spray at bottom of the bowl.
- _____ 2. The first setting a diverter is placed at when using a bidet.
- _____ 3. Rinsing stream of water.
- _____ 4. Used to direct water into the bowl and also to provide a spray for cleansing the perineal area.
- _____ 5. Allows water to escape to prevent overflow.
- _____ 6. Prevents back siphonage of soiled water.

Compare your responses to the answers given on page 53.

REVIEW ANSWERS

Introduction to Residential Water Closets, page 15

- | | |
|----------|---------------------|
| 1. TRUE | <i>See Frame 5</i> |
| 2. TRUE | <i>See Frame 4</i> |
| 3. FALSE | <i>See Frame 2</i> |
| 4. FALSE | <i>See Frame 5</i> |
| 5. FALSE | <i>See Frame 5</i> |
| 6. TRUE | <i>See Frame 10</i> |
| 7. TRUE | <i>See Frame 1</i> |
| 8. FALSE | <i>See Frame 9</i> |
| 9. TRUE | <i>See Frame 8</i> |

Residential Water Closet Specifications, page 42

- | | |
|---|---------------------|
| 1. pressure assisted or gravity feed | <i>See Frame 18</i> |
| 2. 12" | <i>See Frame 39</i> |
| 3. closed front design | <i>See Frame 23</i> |
| 4. top or back of the bowl | <i>See Frame 25</i> |
| 5. by the actual dimension or by ball pass size | <i>See Frame 31</i> |
| 6. 1.6 gallons per flush or less | <i>See Frame 17</i> |
| 7. supply stop | <i>See Frame 13</i> |
| 8. gravity feed | <i>See Frame 21</i> |

Bidets, page 51

- | | |
|---------------------------|---------------------|
| 1. DIVERTER | <i>See Frame 46</i> |
| 2. RIM FILL | <i>See Frame 48</i> |
| 3. SPRAY | <i>See Frame 45</i> |
| 4. SWIVEL SPOUT | <i>See Frame 51</i> |
| 5. PATENTED OVERFLOW PLUG | <i>See Frame 49</i> |
| 6. VACUUM BREAKER | <i>See Frame 47</i> |

GLOSSARY

- anti-siphoning ballcock** a ballcock valve which also has a vacuum breaker to prevent back siphonage
- ballcock valve** part of a flush mechanism which refills and controls the water level in the tank in conjunction with a float device
- bidet** fixture which is used for personal cleansing
- bowl design** label or name given to a closet bowl which refers to the way a closet bowl is constructed on the inside of the bowl
- close coupled** two piece bowl/tank design in which the tank sits directly on the back of the bowl
- closed front** term used to refer to a round or elongated closet seat design in which the seat is shaped in a complete circle and has no openings
- closet bowl** receptacle or basin on a water closet for deposit of bodily waste
- defecating** the act of having a bowel movement
- drain outlet** part of a sanitary fixture which empties waste into the DWV system
- feces** solid waste matter which is discharged from the bowel
- flush** to produce a sudden and large flow of water
- flush mechanism** part of water closet which releases flush water into the bowl or receptacle
- flushometer** flush mechanism used in a pressure assisted low consumption water closet
- gravity feed closet** type of low consumption water closet which is similar to a conventional water closet because it has a ballcock and flush valve, but is designed to use less water than a conventional water closet (*SEE LOW CONSUMPTION WATER CLOSET*)
- inlet** the part of a water closet which provides an opening for flush water to enter the fixture
- low consumption water closet** water closet which is designed to use 1.6 gallons of water per flush or less. Two types are available today: pressure assisted and gravity feed types (*SEE PRESSURE ASSISTED, GRAVITY FEED*)
- one piece bowl/tank design** tank type closet in which the bowl and the tank are combined into a single unit
- open front** term used to refer to a round or elongated closet bowl seat which has an opening in the front and the shape resembles the letter "U"
- outlet** part of a water closet which allows waste to be taken out of the fixture into the DWV system
- overflow pipe** part of a ballcock valve which carries water from the refill tube into the closet bowl inlet where it is used to refill and reseal the trap

plumbing fixture water receiving device which is connected to both the water supply system and the DWV system. Most of the plumbing fixtures sold by PHCP Wholesalers sell belong to three basic groups of plumbing fixtures: sanitary fixtures, sinks and lavatories, and bathtubs and showers

pressure assisted closet low consumption type water closet which uses the water in the supply system to compress trapped air. When the toilet is flushed the air acts like a spring or siphon and forces the water out of the tank by means of the flush mechanism called a flushometer. (*SEE LOW CONSUMPTION WATER CLOSET and FLUSHOMETER*)

refill tube part of a ballcock valve which diverts water to the overflow pipe

rim flush the area of a closet bowl which serves as an inlet for water from a tank or flush valve to enter the bowl

supply inlet part of a sanitary fixture which receives water into the fixture from the supply system

supply stop the valve on a fixture which turns the water flow on and off

tank type closet water closet design in which the water is stored in a tank above the closet bowl. Most common type of water closet used for residential applications

toilet most common term for a water closet

trap fitting which is used at a fixture outlet which provides a passageway for removing waste from a fixture and prevent sewer gas from reaching the fixture. Water closets have integral (built-in) traps.

trip lever handle on a fixture which initiates the flushing action

urinating the act of removing urine from the body

urine liquid bodily waste secreted by the kidneys through the urinary organs

vacuum breaker valve which prevents back siphonage

vitreous china clay and water mixture which is cast into a mold and baked at high temperatures producing a strong, non-porous, glasslike substance. Most common material used in manufacturing water closets

wall mounted closet two piece bowl/tank design water closet, joined by a closet elbow, in which the bowl sits on the floor and the tank hangs on the wall

water closet sanitary fixture which is used to dispose of feces and urine. The most common type of sanitary fixture

water seal the distance from the top of the water surface to the top of the trap entrance on a water closet

water saving toilets water closet which uses 3.5 gallons of water per flush, saving 1.5 gallons per flush

INDEX

<p>A</p> <p>angle stop connection Frame 13 anti-siphoning ballcock Frame 15</p>	<p>L, M, N</p> <p>low consumption water closets Frames 17-21</p>
<p>B</p> <p>ball pass Frame 31 ballcock valve Frame 15 bidet Frames 43-54 bowl design Frame 28</p>	<p>O, P</p> <p>one piece bowl/tank design Frame 8 open front Frame 23 outlet Frames 10, 25, 36 overflow Frame 46 overflow pipe Frame 16 P-trap Frames 52-53 patented overflow (P.O.) Frame 49 pressure assisted Frames 19-20</p>
<p>C</p> <p>chair carrier Frame 37 close coupled design Frame 8 closed front Frame 23 closet bowl Frames 10, 22 closet bowl seats Frames 23-24 closet carrier Frame 37 closet flange Frame 38 control valve Frames 46-47</p>	<p>Q, R</p> <p>refill tube Frame 16 reverse trap Frames 29, 33 rim flush Frame 28 rough-in Frames 39-41</p>
<p>D, E, F</p> <p>diameter Frame 31 diverter Frame 46 flush Frame 2 flush elbow Frame 8 flush mechanism Frame 10 flush valve Frame 15 flushometer Frames 19-20</p>	<p>S</p> <p>siphon jet Frames 29, 34 siphon vortex Frames 29, 35 straight stop connection Frame 13 supply connection Frame 14 supply stop Frame 13</p>
<p>G, H</p> <p>gravity feed closet Frames 17, 21 high tank closet Frame 11 horizontal spray type bidet Frames 45, 51</p>	<p>T</p> <p>tank Frame 6 tank type closet Frame 7-8 trap Frames 10, 26, 28, 30 trip lever Frame 15 two piece bowl/tank designs Frame 8</p>
<p>I, J, K</p> <p>inlet Frames 10, 25 jet Frame 28</p>	<p>U, V, W, X, Y, Z</p> <p>vacuum breaker Frames 15, 47 vertical spray type bidet Frames 45, 48-50 vitreous china Frame 5 washdown Frames 29, 32 water closet Frame 1 water seal Frames 26, 28, 30 water saving toilets Frame 17 water surface Frames 28, 30</p>