# Trade of Plumbing Module 2: Domestic Hot and Cold Water Service Unit 11: Sanitary Appliances Phase 2



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# **Document Release History**

Date	Version	Comments
June 2006	V.1.0	
04/03/14	2.0	SOLAS transfer

# Module 2 – Domestic Hot and Cold Water Services

#### **Unit 11 – Sanitary Fixtures**

#### Duration 11 hours

#### Learning Outcome:

By the end of this unit each apprentice will be able to:

- List the various types and applications of sanitary appliances.
- Describe the working principles of sanitary appliances.
- List the materials and design features of sanitary appliances.
- Install siphon and ballvalve in WC cistern.
- Fit taps and wastes in wash hand basins and baths.

#### **Key Learning Points:**

Rk	Various types and applications of sanitary appliance.
Rk	Working principles of sanitary appliances.
Sc	Principle of siphonic action.
Rk	Automatic-flushing cisterns.
Rk	Materials for sanitary appliances.
Rk	Design features of sanitary appliances.
Rk	Recommended fitting heights, brackets and supports for sanitary appliances.
Rk	Traps and depth of water seal.
Rk	Waste pipe connections.
Sk	Installation of ballvalve, siphon, handle in WC cistern.
Sk	Fitting taps and wastes to basins and baths.
Р	Good working practice.
Р	Problem solving.
Р	Working independently.

#### **Training Resources:**

- Classroom facilities and workshop facilities.
- Information sheets.
- Samples sanitary appliances.

#### **Exercise:**

- Apprentice to fit hot and cold taps and wastes to a wash hand basin and bath.
- Apprentice to fit ballvalve, siphon and handle to a WC cistern.

#### **Key Learning Points Code**

M = MathsD = DrawingRK = Related Knowledge Sc = ScienceP = Personal SkillsSk = SkillH = Hazards

# **Sanitary Fixtures**

One of the most important and interesting aspects of the plumber's work is the installation of sanitary appliances. This calls for a knowledge of many different fitments now available for this work; where they should be used; and how they should be connected to their respective water supply and waste pipes.

Sanitary appliances are divided into two main groups:

- "Waste" appliances.
- "Soil" appliances.

The most common types of sanitary appliances are listed below:

#### Waste Appliances

Appliance	Use
Bath	Washing the body, for which reason they are frequently
Bidet	referred to as ablution appliances.
Shower tray	
Wash hand basin	
Domestic sink	Household purposes
Cleaner's sink	Floor washing in large buildings
Utensil sink	Large kitchens, for example canteens and hotels
Vegetable sink	
Drinking fountain	Drinking water in schools, factories etc.

Table 1.Waste appliances and their use

#### Soil Appliances

Table 2.Soil appliances and their use

Appliance	Use
Urinal	Gentlemen's toilet, usually in large buildings and public conveniences
Water Closet (WC)	Ladies toilets and domestic toilets
Slop sink	For use in hospitals
Bed-pan washer	An item from the specialised range of equipment for hospitals

# **Design and Construction of Sanitary Appliances**

- 1. Durable (long lasting).
- 2. Impervious to water (it must not absorb water).
- 3. Resistant to corrosion (in order to make it long lasting and to be hygienic).
- 4. Simple in outline (so that there will be no crannies to hold dirt).
- 5. Smooth surfaced inside and out (for ease of cleaning and to be largely self cleansing internally as flushed in use).
- 6. With the inside so designed that the water will drain naturally to the outlet.

# **Materials for Sanitary Appliances**

The materials from which sanitary appliances are manufactured are dependent upon the type of fitment and the use of the building into which it is to be installed. In general terms the materials must be non-corroding, non-absorbent and easily cleaned. In factories and schools, materials must also be capable of withstanding rough treatment, but for domestic use this requirement can be discounted.

#### Metal

Baths, shower trays and flushing cisterns are commonly made out of **cast iron**, although this is being superseded to a large extent by the use of plastics. The interior surfaces of cast iron baths and shower trays are **vitreous enamelled** to provide a smooth, hard wearing surface that is corrosion resistant. Articles manufactured from cast iron are very heavy and brittle, and great care must be exercised when handling them.

#### Ceramic

**Ceramic** or **Pottery ware** has always been a popular material for such appliances as WCs, wash hand basins, urinals, sinks and shower trays. The term ceramic means a substance made by firing clay and includes various forms of pottery such as fireclay, stoneware and vitreous china. Fitments manufactured from fireclay and stoneware would be porous, i.e. would absorb moisture, unless coated with vitreous enamel. Appliances made from fireclay and stonewash are strong and heavy and this makes them particularly useful in situations where hardwearing qualities are essential, i.e. factories and schools. Belfast sinks, urinal slabs and stalls, shower trays and WCs are all made from these two materials.

**Vitreous china** is a special type of earthenware which, as a result of high firing temperature, is made impervious, i.e. will not absorb water. Its hard surface coating serves to aid cleaning and to improve its appearance. The strength of vitreous china allows fitments to be manufactured with a very thin section reducing their weight. Wash hand basin and WCs are the most common appliances made of vitreous china.

#### Plastic

Acrylic plastic produces appliances that are very light in weight and cheap to manufacture. A gloss finish can be obtained, but this must be carefully cleaned to avoid scratching. The plastic becomes soft when heated, so the appliances must always be exposed to cold water before being subjected to hot water, or mixing taps should be used. Baths must be provided with supports, which usually consists of timbers on metal cradles. A variety of colours can be obtained.

**Glass-reinforced polyester** appliances are much stronger than those made from acrylic plastic, but they are more expensive. Baths and shower trays are often made from this material, and should have a good gel coat finish. Thin coats may be worn away by cleaning, which could expose the glass fibre.

Vitreous enamelled pressed steel is also used for the manufacture of baths and sink units. It is cheaper material but does not have the long lasting qualities of cast iron. Manufacturers of **porcelain enamelled ware** always attached a label to the appliance giving instruction on its care and methods of cleaning. Always make sure that this is intact when the job is complete.

**Stainless steel** is also extensively used for a wide range of sanitary appliances including WCs, sink units, urinal stalls and wash hand basins. Its popularity derives from the properties it possesses:

- (a) It has a clean, pleasant appearance.
- (b) It is non-corrosive.
- (c) It is hard wearing.
- (d) It has no vitreous enamelled surface to chip.
- (e) It is easily cleaned.





#### **Flushing Cisterns**

The cistern is operated by depressing a lever which lifts the piston. This action forces or lifts a body of water over the crown of the siphon and into the flush pipe. Siphonic action is then created which empties the cistern.

For siphonic action to take place all siphons require a "short leg" and a "long leg" – see Fig 1.

In a WC cistern the short leg of the siphon is located within the cistern, and the long leg is created by the addition of a flush pipe to the outlet connection of the siphon – see Fig 2. This

pattern of cistern is the most common sort and is known as the "plunger" or "disc type" cistern.











Flushing Cisterns





Crown





Figure 5. Flushing Cistern

The bell-type flushing cistern is rather noisy but may be used in factories and schools. The cistern is operated by the chain being pulled down which also lifts the bell. When the chain is released the bell falls thus displacing water under the bell down the stand pipe. Siphonic action is then created which empties the cistern.



Bell type flushing cistern

Figure 6. Bell Type Flushing Cistern



PLUNGER TYPE









Figure 8. W.C. Flushing Cistern Maintenance

#### Wash Down PC Pans

The wash down WC pan is cheap, simple and efficient and rarely becomes blocked. It is used in all types of buildings and is made from vitreous china, glazed fireclay or stonewash.

The contents of the pan are removed by the momentum of the water flush. A high-level flushing cistern gives a good flush but is noisy. A low-level cistern gives a quieter flush, is neater and now more popular.

The outlet of the pan may be horizontal, P, S left or right hand.

A plastic connector is a popular outlet joint and only requires pushing over the outlet and into the soil pipe. The flush pipe joint is usually made by a rubber cone connector.



Figure 9. Wash Down WC Pan



LOW LEVEL WASHDOWN WITH REVERSIBLE SOIL PIPE FITTINGS FOR LEFT OR RIGHT.

Figure 10. Wash Down PC Pan





# CLOSE COUPLED WASHDOWN

Figure 12. Close Coupled Washdown







Figure 14. Flush Pipe

#### **Siphonic Water Closets**

With their silent and positive action, siphonic WCs are strongly recommended for fixing in houses, flats, hotels, hospitals etc. They also have a larger water area and a deeper seal than ordinary wash-down types. Siphonic WCs are, however, more expensive than the wash-down type and do not stand up as well to rough usage.

A variety of siphonic WCs can be obtained but all types fall within the category of either single or double traps.

Fig 1 shows a siphonic WC with two traps, and is known as the 'exhaust action' type. Its action is as follows:

- The flushing cistern lever is pulled down, causing water to pass down the flush pipe.
- Water passing the end of the air pipe at A draws some of the air from the space between the two traps at B, and creates a reduction in air pressure (partial vacuum) at this point.
- Immediately this partial vacuum has been created at B, the greater pressure of the atmosphere 103 kN/m<sup>2</sup> approximately, acting on the surface of the water in the pan, sets up siphonic action and forces the water with its contents out of the pan.
- This siphonic action is completed and the pan is emptied before the flush water enters the pan. The water therefore simply washes the pan down and refills the first seal.



Figure 15. Siphonic Action







Figure 17. Siphonic Action









Figure 19. Slop Hopper





Figure 21. Figure 21 - Sink



(a) Single drainer unit on cabinet.



(b) Double drainer unit.



NOTE POSITION OF TAP HOLES FOR MIXER TAPS

(c) Double sink single drainer unit.

Figure 22. Drainer Types





Figure 24. Urinal





Stall type urinal





bowl type urinals



*Figure 26.* Urinal Types



Figure 27. Spray

#### Bidets

A bidet is a sanitary fitting used for washing the lower parts of the body. A secondary but nevertheless important use of the bidet is as a footbath.

For identification purposes, bidets are usually classified in two distinct types which are as follows:

- Submerged inlet.
- Over-rim-supply.

Tap controls are conveniently placed to enable the user to adjust the flow rate and temperature of the water.

With most submerged inlet bidets the rim seat may be warmed by an ascending spray which then fills the bowl for washing.

Most water authorities have special requirements for bidets with submerged inlets.

Non-return valves should be fitted to both the hot and cold supplies.

Hot and cold pipes to the bidet should be taken at least two metres above the appliance before being connected into the main supplies.

In some instances a separate cistern may be required.

The reason for these recommendations is to prevent back siphonage.

Bidets with over-rim supply are simpler to install and are supplied with water in the same manner as a wash basin.



Figure 28.

Bidets

# Self Assessment

#### Exercises.

- 1. With the aid of sketches, show how a bell type cistern works.
- 2. Sketch and describe the operation of a dual action cistern.
- 3. Sketch and describe a washdown WC pan.
- 4. Sketch and describe two types of joint used to connect flush pipes to WC pans.
- 5. State the recommended depth of seal for a washdown WC pan.
- 6. Sketch and describe the types of joint used to connect a WC pan to a PVC soil pipe.
- 7. With the aid of sketches, describe how a double trap siphonic action WC pan operates.
- 8. Describe how the pan and cistern of a close-coupled WC suite are connected.
- 9. Describe the advantages of the siphonic WC.
- 10. Draw a section through an automatic flushing cistern and explain its operation.
- 11. State the recommended fitting height for wash hand basins.
- 12. Using a sketch, describe the means by which a washing machine is connected to both hot and cold supplies and connected to a single stack soil pipe system.
- 13. Using a sketch, describe how a bidet operates and make recommendations with regard to hot and cold supplies and waste outlet.
- 14. Using a sketch, describe how a slop hopper works including soil outlet, cistern, hot and cold supplies.

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