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Components of Plumbing and Sanitation

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***Abstract*—The durability of a plumbing system is dependent on the quality of its component parts and the assembly skills of those who install it. No plumbing system, however designed, can be expected to operate safely or hygienically if the products or materials used are unsatisfactory.**

All pipes, valve, taps and other fittings used for the supply of drinking-water or the removal of wastewater must not contain harmful substances that could leach into the water. The pipes, valves, taps and other fittings must be capable of conveying water at a nominated pressure within a prescribed environment, and must be of sufficient strength to contain anticipated internal pressures. They must also be able to withstand external pressures if they are to be buried. The impact of environmental factors such as heat, cold, expansion, contraction, corrosion, pH and bacteria levels also need to be considered.

***Index Terms*—Durability, Plumbing, Component, Pipes, Valves, Taps, Fitting, Wastewater, Substances, Leach, Conveying, Environment.**

I. INTRODUCTION

Plumbing service originated and developed during the ancient civilizations such as Roman, Persian, Indian and Chinese as they developed public baths and provided potable water and drainage of wastes in the cities. Of all the services, plumbing and sanitation has acquired enormous importance as it is related directly to the health and hygiene of the people. It is reported that almost 14,000 people die every day due to non-availability of potable water and lack of sanitation. So proper care should be taken while designing and installing these services.

Plumbing, in general, refers to the system as well as the materials, fixtures and the apparatus used inside a building for supplying water and removing the used water without creating any nuisance to the occupants. Many components are involved in these services, among the components used in the system are pipes, fixtures, fittings, sinks, basins, faucets, valves, drains, toilets, and bathtubs.

For all above component the standards are sets of rules that outline specification of dimensions, design of operation, materials and performance, or describe quality of materials, products or systems. These standards should cover the performance expectations of the product for particular applications, as well as, in the case of drinking-water contact, the chemicals that may be leached from the product into the water.

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II. PIPES

A. Water Supply Pipes

All pipes run under pressure and mostly embedded in floors /walls or fixed on walls. Therefore one has to be very careful in selection of pipes as it should not become a permanent source of leakage. For water supply pipes material used is galvanized iron, copper stainless steel, rigid PVC, UPVC, CPVC, PPRC, KITEC, UNIPIPE.

B. Galvanized Iron (Wrought Iron, Steel and Tubes)

Pipes and tubes are manufactured for various purposes like conveying water, gas, sewerage or steam, and other precision use. The pipes are generally available in the range of 15-mm to 150mm nominal bore. Higher sizes up to 250-mm can be manufactured to order. They are tested for working pressures of 21 kg/cm² and a temperature 390ºC .However pipes can be generally manufactured in random lengths of 4m to 7m unless specified by the customer. However it is common to find the pipes in the market in lengths of 6 meters each. GI pipes are prone to corrosion. Corrosion in pipes reduces the bore diameter and subsequent water flow in the pipe and shortens its lifespan. GI pipes usually gives service for not more than 20 years.

C. Copper Pipes

Copper pipes are easier to assemble because in its popular form, it does not require threading .There are three types of copper water pipes of plumbing tube X, Y and Z. The tube sizes its thickness and temper is normally governed by service requirement and conditions upon the type and outside diameter. The outside diameter of the copper plumbing tubes ranges between 6 to 154mm.Copper tubes do not rust and do not require painting, which saves cost. In case of hot water pipes, it avoids and unpleasant smell of warm paint. The very smooth surface offers a very low frictional resistance to flow of water. The joints commonly used in plumbing are compression and capillary joints.

D. Plastic pipe

Now day's plastic pipes are becoming more and more common, due to their Properties of corrosion resistance, lightweight and economy. The plastic materials have their own merits, and therefore the plastic pipes have limitation and advantages for particular applications under condition of use. Following types of plastic pipes are available in the market.

E. Low Density Polyethylene (LDPE)

Pipes are flexible and this material is used up to 63mm diameter pipes. The pipes are recommended for use in long runs e: g for point-to –point conveyance of water. The LDPE pipes require supports at closer intervals for horizontal and vertical runs due to flexibility. These pipes are not suitable for installation of the internal water supply system.

F. High Density Polyethylene (HDPE)

Pipes are tougher compared to LDPE pipes .Pipes up to 1600-mm DIA are manufactured but in India pipes from 16mm to 700 mm diameter are available .These pipes are small diameter. Are not commonly used due to practical difficulties at site by joining and taking out various connections. These pipes, in large diameter, for conveyance of water/effluents or long run form point have been found very suitable.

G. Polyethylene Pipes

Pipes are normally available in black color. These pipes are resistant to most chemicals, except nitric acid, very strong acids, and oils and certain solvents particularly chlorinated ones. There is a phenomenon called environmental stress cracking which means that if polyethylene is stressed at normal temperature and comes into contact with certain material then it will crack and eventually fall .These materials include detergents organic acids, esters, aldehydes, ketones, amides, Nitro-compounds, and alcohols. The HDPE is worse than LDPE in this respect.

H. Rigid (Un-Plasticized)

PVC pipes are widely used for cold-water services, internal/external water supply systems, water mains, rainwater system, soil/waste piping system, and underground (Sewage pipes) drainage piping system. The rigid polygon chloride pipe is three times as rigid as polyethylene. It is stronger and can withstand much higher pressure for a given wall thickness. Joints can be easily made in rigid polyvinyl pipes by solvent welding and a whole range of injection molded matching fitting and specials are available in the market.

I. Rigid Polyvinyl Chloride

Pipes are generally available in the following color shades; white/cream, light to dark, black and green. Generally rigid polyvinyl chloride pipes are resistant to most inorganic acid, alkaline and salts, as well as many organic chemicals. It is quite resistant to most effluents, salt water and plating solution corrosive fumes. This material is also safe with potable water, whether hard or soft with hard water, it tends to retard the formation of scale. However concentrated oxidizing acids, esters, ketones, aromatic and chlorinated hydrocarbons, Organic compounds, oregano-amino compounds, Lacquer solvents and acetic anhydride do attack the rigid polyvinyl materials, and should be protected from them.

J. Chlorinated Polyvinyl Chloride (CPVC) Pipe

These pipes are made from specialty thermoplastics known chemically as post-chlorinated poly vinyl chloride-CPVC. These pipes are useful for hot and cold-water distribution. Pipes can withstand temperature up to 93°c without insulation. CPVC pipes do not support combustion, increasing the fire safety of the buildings. These pipes are joined by solvent cement. Pipe are available in sizes from 15-mm to 50 mm.

K. Green Polypropylene Random Copolymer (PPRC) Pipes

These pipes are green in color and are made of polypropylene random copolymer .These pipes are reliable for hot and cold water supply. Pipes are available in sizes from 20-mm to 63-mm DIA. Pipes are jointed with poly fusion welding or the electro-fusion couplers. The threaded joints are done by using the PP-R fittings having a metal insert in the fittings for proper jointing. The pipes are designed to last for 50 years at a pressure of 10-kg/cm² and temperature of 60°c with a safety factor as 1.50. These pipes can be exposed to solar application. The pipes can be used for compressed air system. The pipes can be subject to high flow speeds up to 7m/seconds for all liquid with a pH between1 to 14.

L. Composite Pipe

The composite pipes are made from different materials. These days' aluminum and copper pipes with polyethylene coating.

M. Pipes Used For Building Drainage

The building drainage or wastewater piping starts from the floors in a bathroom or toilet .These pipes are normally non-pressure type with perfect joints so that there is no chance for leakages. Cast-iron and PVC pipes are preferred for this purpose.

N. Cast-Iron Socket and Spigot Pipes

The cast iron pipes are normally used for above ground drainage works. The pipes and fittings should be free from all defects like warping, shrinkage etc. The pipes can be either rubber jointed or cement jointed. In case of rubber joints, the spigot ends should be chamfered for smoother entry of the pipe in the socket fitted with the rubber gasket. The pipes are coated after making clean dry and free from rust with tar or similar base. It should be done both internally and externally.

O. Cement Pipe

Cement concrete pipes with spigot and socket or collar joints may be used for diameter above 150-mm. These pipes may be used for surface drains in all diameters. The life of cement may increase by providing lining inside the concrete pipes of suitable coatings like epoxy/polyester, resin etc. The collar is placed symmetrically over the end of two pipes and the annular space between the inside of the collar and the outside of the pipe should be filled with cement mortar 1:2.The joints should be finished off with a fillet sloping at 45 °c to the surface of the pipe.

III. JOINTS

Connection between two pipes either of the same material or different material is made in different ways either fittings, solvent capillary joints or compression joints are used .For G. I pipes mostly various fittings such as union, elbow, tee extension etc. are used. For Copper pipes compression joints and capillary joints are used. For PVC pipes spigot and socket joints are generally used for all poly vinyl chloride pipes up to 150mm diameter. The pipes are joined either by solvent gluing. Other joints are flanges which are used for metal pipes .Union joints are used for composite metal and PVC, socket union method for joining PVC pipes to screw metallic fittings. Rubber joints can provide a watertight seal but are not designed to resist pull in un-plastics PVC or metallic housing. The rubber is compressed and makes a seal between the pipes. The CPVC pipes are joined by solvent cement. The threaded joints are used using PP-R fittings having metal inserted in the fittings for proper joints.

IV. FITTINGS

Fittings not only join the pipes together, but turn corners, branch out in several directions
And even enlarge or diminish the size of the pipe, all in accordance with the specific needs and conditions of the building.

Material with which a pipe is manufactured often forms as the basis for choosing any pipe. Materials that are used for manufacturing pipes include:

- Carbon Steel (CS)
- Low Temperature Service Carbon Steel (LTCS)
- Stainless Steel (SS)
- Copper (Cu)
- Non-ferrous Metals (Nickel etc.)
- Nonmetallic (ABS, PVC, HDPE, tempered glass, etc.)

Chrome-molybdenum steel (Alloy steel) — generally used for high temperature service.

A. Elbow

The elbow is a pipe fitting installed between two lengths of pipe or tubing to allow a change of direction; usually a 90° or 45° angle though 22.5° elbows are also made. The ends may be machined for butt welding threaded (usually female), or socketed, etc. When the two ends differ in size, the fitting is called a reducing elbow or reducer elbow.

B. Coupling

Coupling connects two pipes to each other. If the size of the pipe is not the same, the fitting may be called a reducing coupling or reducer, or an adapter.

C. Union

The union is similar to a coupling, except it is designed to allow quick and convenient disconnection of pipes for maintenance or fixture replacement.

D. Reducer

Reducer allows for a change in pipe size to meet hydraulic flow requirements of the system, or to adapt to existing piping of a different size.

E. Tee

The tee is the most common pipe fitting. It is available with all female thread sockets, all solvent weld sockets, or with opposing solvent weld sockets and a side outlet with female threads.

F. Cross Fittings

Cross fittings are also called 4-way fittings. If a branch line passes completely through a tee, the fitting becomes a cross. A cross has one inlet and three outlets, or vice versa. They often have solvent welded socket ends or female threaded ends.

Fig. 1 coupling

Fig. 2 elbows 45 & 90 M & F

Fig. 3 sockets, reducing

Fig. 4 FL/St F & F

Fig. 5 tees

Fig. 6 cross

Fig.7 plug

Fig. 8 caps

Fig. 9 nipples

Fig. 10 hex, nipples

Fig. 11 Barb

Fig. 12 sweep elbow 45^0

Fig. 13 sweep elbow 90^0

Fig. 14 closet flange

Fig. 15 clean-outs

G. Cap

Cap is a type of pipe fitting, usually liquid or gas tight, which covers the end of a pipe. A cap is used like a plug.

H. Plug

Plug closes off the end of a pipe. It is similar to a cap but it fits inside the fitting it is mated.

I. Nipple

The nipple is defined as a short stub of pipe which has external male pipe threads at each end for connecting to other fittings.

J. Barb

Barb is used to connect flexible hoses to pipes. Barb fittings are parts that insert directly into the tubing or hose, and are commonly clamped ensure a tight fit. They are easy to connect and assemble, and have the benefit of not being permanent, so that may be disassembled for maintenance and replacement.

K. Sweep Elbow

Sweep elbow is usually long radius or sweep types, to reduce flow resistance and solids deposition when the direction of flow is changed.

L. Closet Flange

Closet flange is the drain pipe flange to which a water closet (toilet) is attached. It is a specialized type of flange connection designed to sit flush with the floor.

M. Clean-Outs

Clean-outs are fittings with removable elements that allow access to drain without requiring removal of plumbing fixtures

N. Trap Primers

Trap primers regularly inject water into traps so that "water seals" are maintained, which is necessary to keep sewer gases out of buildings.

O. Combination Tee

Combination tee is a tee with a gradually curving center connecting joint. It is used in drain systems to provide a smooth, gradually curving path to reduce clogging.

P. Sanitary Tee

Sanitary tee is a tee with a curved center section designed to minimize the possibility of siphon action that could draw water out of a trap.

Q. Double Sanitary Tee

Double Sanitary tee differs from a standard cross in which two of the ports have curved inlets. This fitting has been used in the past for connecting the drains of back-to-back fixtures.

R. Wye 'Y'

'Y' shaped fitting which allows one pipe to be joined to another at a 45 degree angle.

S. Double-tapped bushing

Double-tapped bushing is a fitting that has opposing threads on the inside diameter of the bushing.

V. Fastening of Pipes

A. Fastener

The fastener is a hardware device that mechanically joins or affixes two or more objects together.

B. Threaded Pipe

Threaded pipe is a pipe with a screw thread at one or both ends for assembly. Steel pipe is often joined using threaded connections

C. Solvent

The solvent is applied to PVC, CPVC, ABS, or other plastic piping to partially dissolve and fuse the adjacent surfaces of piping and fitting.

To make a Solder connection, a chemical flux is applied to the inner sleeve of a sleeve type joint and the pipe is inserted.

D. Welding

Welding is a fabrication that joins materials, usually metals or thermoplastics, by causing coal essence.

E. Brazing

Brazing is a thermal joining process in which the two pieces of the base metal are joined when a molten brazing filler metal is allowed to be drawn into a capillary gap between them.

F. Compression Fittings

Compression fittings consist of a tapered concave conical seat, a hollow barrel-shaped compression ring, and a compression nut which is threaded onto the body of the fitting and tightened to make a leak proof connection.

G. Flared Connections

Flared connections should not be confused with compression connectors, with which they are generally not interchangeable. Flared connectors lack a compression ring, but do use a threaded nut.

H. Flanges

Flanges are generally used when there is a connection to valves, in-line instruments and/or connected to equipment nozzles is required.

VI. VALVES

A valve is a device that regulates the flow of substance by opening, closing, or partially obstructing various passageways.

Functions of valves are such as:

- Control of the water system
- Start or shut down a system
- Regulate pressure
- Check backflow
- Control the direction of water

VII. TYPES OF VALVES

A. Ball Valve

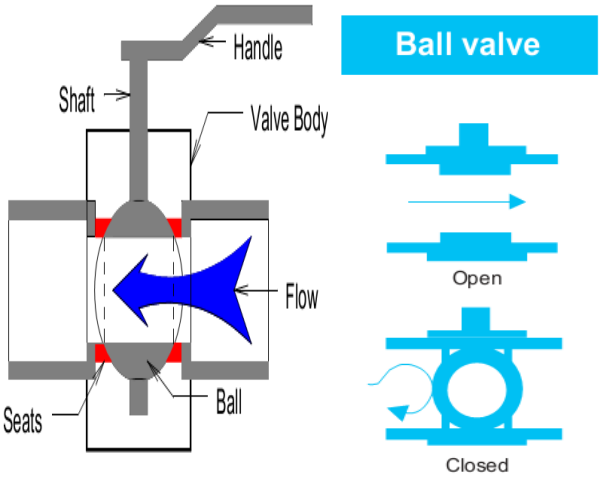

Fig. 17 ball valve

Ball Valves, as the name implies, have a ball with a hole drilled through the center swivel mounted within the valve body. When the hole in the ball is orientated in the same direction as the pipe, this will result in full flow rate. As the hole in the ball is oriented away from the direction of the pipe, the flow rate will be restricted and finally cut off completely when the hole is oriented at 90 degrees to the pipe direction. Note that the hole in the ball is a lesser diameter than the nominal bore of the pipe. Advanced technology is used to manufacture ball.

B. Butterfly Valves

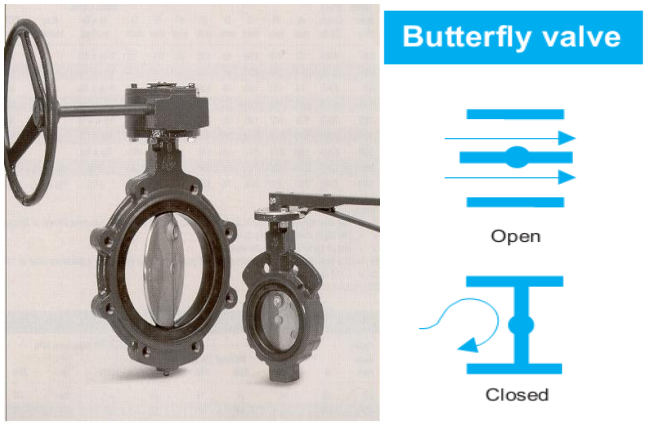

Fig. 16 butterfly valve

Butterfly valves use a similar principle to ball valves. However, instead of a ball mounted in the valve body a circular disc (called a butterfly because the two half circles around the vertical shaft appear like wings). Again the orientation of the butterfly determines the flow rate. When the butterfly is oriented in the same direction as the pipe (i.e. presenting the least cross sectional area to the moving fluid), this will result in full flow. As the butterfly is oriented away from the direction of the pipe, the flow rate will be restricted by the increased area of obstruction to the fluid and finally cut off completely when the butterfly is oriented at 90 degrees to the pipe direction.

C. Check (Non-Return) Valve

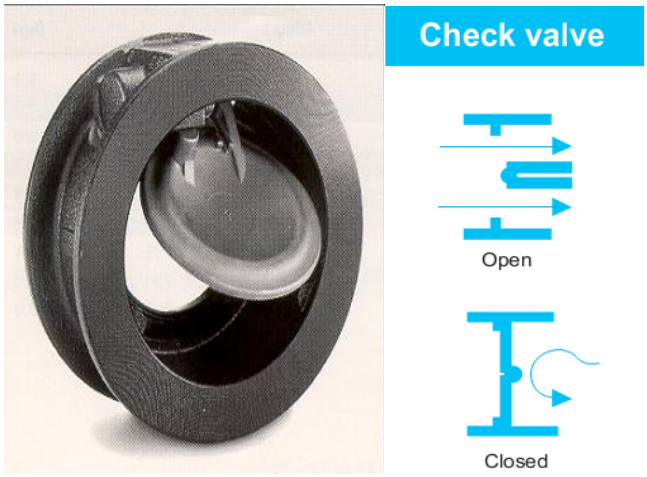

Fig. 18 check valve

Check valves or non-return valves are designed to ensure one way flow only. Usually used in water pipework systems and installed immediately after the pump. The most common check valve is the disc type (horizontal or vertical). When flow is sufficient the disc is pushed out. When flow reduces (or reverses if the pump fails) then the disc falls back into a seat blocking the flow. High operation speed of check valve prevents water hammer effect.

D. Gate Valve

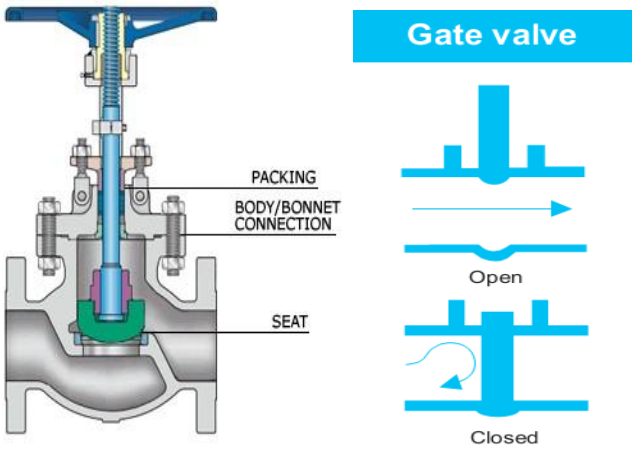

Fig. 19 gate valve

E. Globe Valve

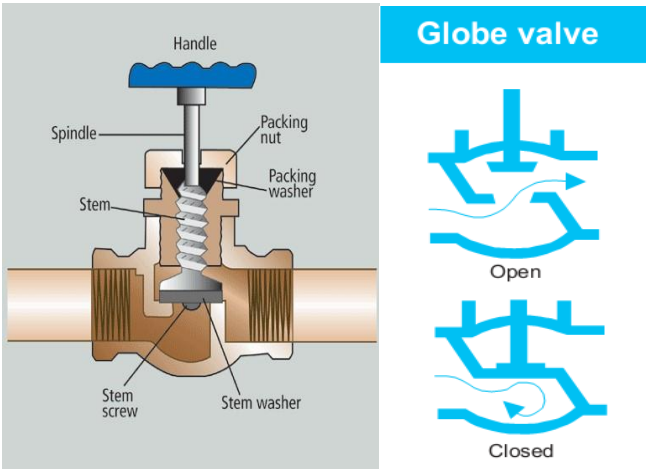

Fig. 20 globe valve

These are widely used in most piping for controlling air, steam and water. The globe shaped body of the valve has a partition in it. This partition closes off the inlet side of the valve from the outlet side, except for a circular opening. The globe shaped body controls the fluid into a S-shaped flow. The upper side of the opening is ground smooth. Rubber disc or washer attached to the end of the stem presses down against the smooth opening when the handle is turned clockwise. This closes the valve and stops the flow. Major advantages of globe valve are:

- Critical parts like washer, seat, and package can be replaced.
- The valve permits rather accurate control of the flow of water.
- Valve can be used repeatedly without becoming worm beyond repair.

Disadvantages are:

- It partially obstructs flow even when fully open
- It becomes impossible to completely drain the water line.
- It is not suitable for the large sizes as the more power is required to open and close the valve.

F. Flush Valve

Fig. 21 flush valve

Water closet or urinal fitted with flush valve has no need for storage tank. The water flows, under pressure, directly into the fixture. Fixture is flushed with a scouring action. Generally this dose a better job of cleaning them by gravity flow from a storage tank. There is an added advantage in direct connection to the water supply piping. The fixture can be flushed again and again without waiting for storage tank to refill. These two advantages make the flush valve very popular in commercial installations.

G. Pressure Regulating Valve

Fig. 22 pressure regulating valve

A water pressure regulator is a plumbing valve that reduces the water pressure coming from the main water line into the house. This valve brings down the pressure to a safe level before the water reaches any plumbing fixtures inside the home. Too much water pressure will cause many plumbing problems for the average homeowner so it is very important to keep the water pressure under control. A water pressure regulator, if you have one, is usually located where the main water line comes into the house and after the main shut off valve. This way if you need to work on or change the water pressure regulator you can simply shut off the water main to do so. An adjustable spring loaded diaphragm inside a water pressure regulator reduces the pressure of the water in the line within the valve body. Water coming into the valve is constricted and then released at a reduced pressure.

VIII. FAUCETS

Valves and faucets are used more often than any other part of the plumbing system. They are used to control flow of

water through and from pipes. Faucets can be categorized as being washer less faucet or of compression type.

A. Pillar Taps

The pillar tap is draw off tap with a vertical inlet and up-tilted or a horizontal free outlet. The pillar taps are made of cast brass and are nickel chromium plated. The taps must be free from laps, blowholes and pitting. The gland or shifting box is packed with suitable asbestos-cement or other equally efficient packing material suitable for cold and hot water. The stud is provided with a nut. The pillar taps are manufactured to withstand an internal pressure of 2-MPa maintained for a period of two minutes. During this period they should neither leak nor sweat. The pillar taps are generally available in 15mm and 20 mm diameter size.

B. Bib Tap and Stop Valve

A bib-tap is a draw off tap with a horizontal inlet and free outlet and available in sizes from10mm to 25mm.A stop valve is a valve with suitable in all sizes up to 50mm. Screw down bib-tap or stop valve. A bib taps or stop valve closed by means of a disc carrying a renewable non-metallic washer which shuts against the water pressure on a seating at right angles to the axis of the threaded spindle which operates it. Stop valves have generally both external and internal threads.

C. Shower Rose

Shower rose is used for obtaining spray of water from pipe connection for bathing purpose in bathrooms. The shower is made of metal and vitreous china, plastic etc. Shower rose is manufactured in round or octagonal shape. It is of generally of 100-mm diameter with 15-mm DIA inlet. Shower rose has generally 145 holes each of 1.2mm diameter. The shower rose should be placed uniform and when fixed at 2.10m from the floor and the floor and operated at 3-m pressure should wet an area of 450-mm on the floor.

Fig. 23 bib trap

Fig. 24 pillar tap

Fig. 25 shower rose

D. Aerated Faucets

This type of faucet aspirates air into the stream of water discharging from the nozzle. This admission of air into the tap increases the diameter of the stream, decreases the velocity and diminishes the splashing of water. This gives pleasant feel when used for washing hands.

E. Terminal Fittings/Faucets

In any water supply system the main purpose is to supply water for various uses needed by any population and this can be achieved by installing/fixing appropriate fittings for the end use.

F. Waste Couplings

Waste fittings are generally fitted to a sanitary appliance such as wash basin, sinks and urinals drain away the wastewater. External and internal surfaces should be clean and smooth. They should be of 32-mm DIA and for kitchen-sinks 30-mm diameter size.

IX. Sanitary Fittings

The sanitary fixtures or appliances can broadly be classified as –soil fixtures and ablution fixtures. The fixtures which are used to receive night soil, urinal or any other obnoxious waste, are called soil fixtures e.g. water closet, urinals and slope sinks. The sanitary fixtures are generally made of vitreous china, enameled cast iron, fiberglass and stainless steel. The fixtures which are used for cleaning purpose are called ablution fixtures and these include hand washbasins, sinks, bathtubs, bidets, flushing cisterns and drinking fountains.

A. Wash Basins

Washbasins are waste fixtures, used for ablution purposes, and are available in various patterns and size in the market. They can be wall mounted, pedestal and corner, below the counter or over-counter type. Basins are made of one-piece construction and are provided with a slotted overflow hole. Basins are provided with inlets for hot and cold water of 15mm DIA each. A circular waste hole in the bottom of basin of size 40/32-mm DIA is provided to receive to waste coupling for effective connection to waste drain. The bottle traps are provided with a cleaning plug either at the side or bottom to facilitate removal of clogging.

Fig. 26 wash basins

B. Sink

Sinks are rectangular, shallow receptacles designed for use in kitchens, laboratories, and laundries and in wash areas of factories and hospitals etc. It is a one-piece construction with or without rim. The floor of the sink is given a slope towards the waste outlet. Sinks are generally made of glazed fire clay, earthenware, vitreous china, enameled steel, stainless steel, aluminum and fiberglass. They are mounted either on bracket or in a table counter. The size of the waste outlet for all large

sinks is a minimum of 40-mm and fitted with a waste coupling and bottle trap before connecting to the main drain.

C. Kitchen Sink

Kitchen sinks are used to clean utensils. The wastewater obtained from them is normally foul as it contains a lot of food waste. The kitchen sinks are generally provided with drain boards and fixes on the right side of the user, these drain boards are approximately of the same dimensions as the sink in length and width. The drain boards are supported on brackets on mild steel and screwed to the wall at the required level. Stainless steel sinks are provided with integral drain boards and bowls either single or double.

D. Bath Tubs

Bathtubs may be either parallel or tapered. The bathtubs are made in standard size of 760-mm width and lengths of 1400-mm to1800-mm. The average depth of bath tubs is generally 450 to 500-mm. Bathtubs are provided with one inlet pipe with one or two taps for fillings and one outlet of 40mm to 80-mm DIA with trap. Bathtubs should be provided with an overflow to take excessive water. The waste pipe of bath is provided with a trap to prevent foul gases from entering the bathroom. Bath tubs are supported either on legs or pedestal and usually the legs are adjustable in heights. They are installed in position and plumbing connections done before the tiling work, and the sides and ends are sealed either by a flush panel or an integral apron, or a custom made panel or by a brick wall with tiling. Bathtubs are made either from cast iron enamelled or steel enamelled or fiberglass. They have provisions similar to the basins for tap holes for a mixer or separate taps with a provision of hot water supply inlet. The fittings provided for bathtubs are hot and cold-water inlet taps with or without mixer, spouts and shower roses.

Fig. 27 kitchen sink

Fig. 28 bathtub

E. Water Closets

Water closets are designed and installed to receive human excreta and discharge it efficiently to the drainage system .It is therefore , necessary that the water closets should be designed conforming to the following standards. Water closets are classified as floor mounted and wall-mounted (European), floor-embedded (Indian) and floor-mounted combination closets (universal closets) used as European and as well as squatting type.

F. European Water Closets

European water closets comprise of pan and integral (P or S) trap. They are colors on demand. EWC pans with traps having double seal are known as wash-down and one with double seal are known as siphon pattern.

G. Wall Mounted

The trap and behind the water closet generally inaccessible and that area does not get as clean as the rest of the toilet area. The joint where the water closet meets the floor also gets dirty and is difficult to keep clean. Therefore wall-mounted water closets are preferred. Pans hung from brackets are known as wall hung or corbel type water closets. The wall-hung water closets are available with P trap i.e. with a wall outlet. Wall mounted water closets are normally used with flush valves.

H. Indian Type

These water closets are embedded in the floor and classified as long pan pattern, Orissa pattern and rural pattern, Indian water closets with integral foot treads. The selection of trap 'P' or 'S' type can be done on the basis whether the outlet pipe has to go through the rear wall or vertically through the floor.

Fig. 29 indian W.C.

Fig. 30 european W.C.

I. Flushing Cisterns

A Flushing cistern is used for storing water and flushing water closets and urinals after use. The flushing cisterns are provided with inlet/outlet pipes, overflow pipe and automatic closing float ball valve. There are several varieties of cisterns. The bell type and flat bottom type are two types of cisterns which are in most common use. The flushing cisterns are also classified as low level, high level, and close-coupled, automatic and dual flushing type.

Fig. 31 Dual Flushing Cistern

Fig. 32 Flushing Cistern

J. Dual Flushing Cistern

These dual flushing cisterns avoid wastage of water by excess use in the low or high level cisterns. It is achieved by cutting the vacuum seal at the fixed water level in the flushing cistern. The fractional discharge is obtained by pulling the chain and leaving it instantly and full discharge is obtained by

pulling the chain and holding it in position till full capacity is discharged.

K. Concealed Flush Tank

It is a thin flush tank fitted in a cavity in the wall. Only a 30x20-cm panel housing a push-button is seen outside. In case of repairs the tank can be accessed after removing this panel. This is elegant and modern flushing system.

X. RESULT

The basic plumbing components of any building: water supply distributing pipes, fixture and fixture traps, soil waste and vent pipes, storm water drainage. The durability, water carrying capacity, life span, initial cost of installation and maintenance should be optimum. The component should not be cracked by environmental stress. If the connection of the two pipes are connected by different materials it causes leakage and inconvenience to the occupants that's why same materials must be used. Valve selection is also an important factor and that valve must be work properly of that place without any inconvenience to the occupants. Traps and faucets are should be made by a durable materials and not causes any problem while installing and its maintenance.

XI. CONLCLUSION

From above study it can be concluded that while selecting pipe its material, durability, the initial cost of installation and maintenance should be considered. The various materials used for pipes are metallic, cement pipes, plastic and composite pipes. The pipes required for water supply are mainly pressure pipes whereas for drainage system non-pressure pipes are used. Connection between two pipes either of the same material or different material is made in different ways either fittings, solvent capillary joints or compression joints are used. For G.I. pipes mostly various fittings such as union, elbow, tee extension etc. are used. For Copper pipes compression joints and capillary joints are used.

Fittings not only join the pipes together, but turn corners, branch out in several directions and even enlarge or diminish the size of the pipe, all in accordance with the specific needs and conditions of the building. Valves and faucets are used more often than any other part of the plumbing system. They are used to control flow of water through and from pipes. Faucets can be categorized as being washer less faucet or of compression type. Trap plays a very important part where drainage is concerned. It is a part of a sanitary appliance which is designed to hold a quantity of water. This part of water is called a trap seal. Trap seal acts as a barrier to prevent air from passing out from the water and into the room.

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