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Problems Associated With Plumbing and its Maintenance

Shashikant Gopal Kamble
M.E.II(Civil - CM)
Dept. Of Civil Engineering
Government College Of Engineering, Karad
Karad, Maharashtra, India

Prof. M. B. Kumthekar
Professor
Dept. Of Civil Engineering
Government College Of Engineering, Karad
Karad, Maharashtra, India

***Abstract*—Plumbing maintenance plays an important role among other activities in plumbing operation. Plumbing damages and defect are part of the plumbing maintenance. There will be no way to or short cut from plumbing maintenance work. In plumbing and sanitation various components are involved which should be studied, so there is possibility of failure of one or other components. These components can cause a number of temporary problems and also long-term structural damage due to water seepage into the walls and floors. In order to avoid these types of problems it is essential to remedy plumbing issues as soon as they are observed. 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 well designed, can be expected to operate safely or hygienically if the products or materials used are unsatisfactory. The inverse is also true if the best quality products or materials are used but are installed incorrectly, the system will be a failure. That's why there proper study and its performance give optimum success and satisfactorily meet the plumbing expectation. The efficiency and quality of maintenance operation of plumbing depends on the expectation from the house holder, condition of plumbing work which will carried out and its maintenance activity. The objective of this paper reviews is to get the critical success in plumbing maintenance of the proposed building, and enhancing all the perspectives which are stable to get the maintenance of plumbing system.**

***Keywords* —Maintenance, Damage, Sanitation, Seepage, Plumbing.**

I. INTRODUCTION

Plumbing is the system of pipes, drains fittings, valves, valve assemblies, and devices installed in a building for the distribution of water for drinking, heating and washing, and the removal of waterborne wastes, and the skilled trade of working with pipes, tubing and plumbing fixtures in such systems. A plumber is someone who installs or repairs piping systems, plumbing fixtures and equipment such as water heaters and backflow preventers. Thus, plumbing usually deals with laying of pipe lines which provide a means of transportation for fluids.

Most industrialized countries have national standards or codes that set out the minimum requirements for the material specifications, design and use of specific plumbing products. However, plumbing codes of practice vary considerably according to the extent to which they specify the detailed standards for plumbing products and other matters. Some countries take the view that the level of detail should be minimized, whereas others are very prescriptive. However, even prescriptive codes should allow for the introduction and innovative use of promising new products, materials and installation practices without undue delay.

In the initial period these services work satisfactory but at a later stage it needs frequent maintenance so as to keep building in serviceable condition. Due to this fact maintenance has become a common feature in many apartments in these metros. Another fact about the plumbing and sanitation services is that proper planning and designing are rarely done in the residential apartments. Many times installation of these services are done by non-technical persons and they carry out the job with their experience based on limited knowledge domain, such as plumbers.

In the metros there is another class of people who is ready to pay more if they are provided with good facilities and services, and have minimum maintenance. Presently the regular maintenance is not carried out, so it causes a major problem, which damage the components, stability of the structure, health of the occupants and structure, it also increases the maintenance cost hence there is need to frame proper plumbing and sanitation maintenance management to increase the life span of the structure.

From the field data it is observed that 20% of total building cost is spend on plumbing and sanitation services, this percentage may depend upon the quality of plumbing material, user behaviour, installation and proper design. This can be further reduced and more cost effective by selecting appropriate material, technique and by proper installation. Considering the facts mentioned above it is need of time to go for proper planning of plumbing and sanitation service so as to reduce the maintenance cost and health of occupants.

II. PROBLEMS CAUSED DUE TO PIPES

A. Pipes (Water Supply Pipes)

In market various type of pipes are available such like steel, cast iron, plastic etc. And the most common plumbing problems with water supply pipes are leakages, low pressure, breakage and corrosion of pipes. These problems revolve around two things: material used for pipes, and how pipes are installed by the worker. All piping related problems stem from these two factors.

B. Leakage In Pipes

Leaking pipes are major issues. It not only wastes the water but also affects daily routine of the occupants. Constant leakages through pipes in walls lead to water seepage, which may damage structural components of the building. Leakages may prove to be costly, if the problem is left undetected. For example, the continuously dripping of a tap if left undetected may damage the external surface of wall, plaster, ceilings and destroy paint finishes. Repair of such damage may prove to be expensive. Damage to pipes may occur due to external climatic conditions, which may lead to frosting, thawing, bursting and cracking, or there may be problems like mishandling of pipes on site, poor installation, fittings and joints not properly connected.

III. OTHER PROBLEMS RELATED TO WATER SUPPLY PIPES ARE

A. Cracks in The Pipes: Cracks in pipes occur due to poor material quality, mishandling on site, hammering of heavy tool and due to external temperature.

B. Corrosion of Pipes Due To Hard Water: Corrosion in pipes occurs due to hard water, the amount of minerals content in water or due to external climatic condition. It may not occur at initial stage but problems may arise at a later stage with the increase in its use.

Fig 1. corrosion in pipes

C. Poor quality materials used for pipes: As water supply is continuously required, so pipes of superior quality material should be used for a long maintenance free life. The chances of problems like leaks are higher with low quality materials.

D. White deposits around the pipes: In hard water their may be high mineral content due to which white deposits are found around the pipes.

E. High pressure: Water pressure is always a problem for water supply; it may be high or low. If it is low then it may not reach at upper floors, but if it is high it may damage the pipe or system. Therefore, it should be controlled, and there should be proper water pressure.

F. Poor Installation of Pipes during Construction: Installation of pipes during construction should be done properly by skilled plumber. If it is installed by local or unskilled labor then there may not be the problem at the initial stage, but problems may occur at a later stage with increased use.

G. Bursting of Pipes Due To Temperature: Sometimes pipes may burst due to external climatic condition or due to high pressure of water.

H. Temporary Repair of Pipes by Local People: In the event of damage, repairs carried out by unskilled and untrained person may lead to major repairs in the future.

I. Fittings Used During Repairs And Replacement Of Pipes: After repairs, replaced fittings should be of appropriate size and material otherwise mismatch may cause leaks.

Fig 2. temporary repair in pipes

J. Joints between Two Pipes of Different Material: For horizontal or vertical length of pipes and for turning the pipe at an angle joints are used. If they are not properly connected, it may lead to leakages.

K. Deposition around Pipes: Around the pipes there is stain or scaly deposits or even algae this may occur due to hard water and water dripping from pipes, which forms algae.

L. Rupture of Pipe: Extreme variation of temperature or applied external pressure may rupture the pipe. Freezing of water in pipes results in volume increase, causing expansion and opening of joints.

IV. DRAINAGE PIPES

These pipes are normally non-pressure type, so mostly Cast-iron and PVC pipes are preferred for this purpose**.** The building drainage or wastewater piping starts from the floors in a bathroom or toilet. Common problems related to these pipes are leakages and blockages.

A. Leakages:

Leakages in drainage pipes are either due to poor quality of material or poor installation during construction. Since it is a basic service of any type of building quality of material plays an important role. Initially there may not be any problems with the pipe but at later stage problems may occur. Leakages may occur at the joints of pipes if they are not properly connected. Common problems of leakage occur at the connection of traps, pipes and W.C pan. This is due to poor installation during construction or if skilled labor is not used. The possibility of leakage increases with the number of joints. Another cause for leakage in drainage pipe is roots of

trees. As the plant grows, its roots reach out farther to support its weight and in search of more nutrients and moisture from the pipe wall. This damages the pipes causing it to leak.

Fig 3. algae deposits around the pipe

Fig 4. Fittings between pipes are at right angle

B. Clogging:

Clogging of waste pipes occurs due to disposal of other waste such as cotton, sanitary napkins, plastic bag, rubber etc. Black flow of waste to W.C pan is a common problem in apartments. This is due to fittings of pipes; if pipes are connected at right angles then problems may occur, or in case a proper alignment of trap is lacking.

V. JOINTS

The most common material use for joints is cement, hemp, lead, rubber rings, solvent cements and other jointing materials. Jointing systems vary as per the type and design of joints, for example threaded or spigot – socket type of joints. Some metal pipes are connected by capillary joints. Compression and union joints are used for composite metal and PVC pipes, where as a socket union method is used for jointing PVC pipes to screw metallic fittings. The threaded joints are used using PP-R fittings having a metal insert in the fittings for proper jointing. It means each pipe system has its own jointing material.

A. Leakages: In joint leakage is due either to poor installation or poor material. Seepage through these joints to the wall and slab may corrode the steel used in the structural component and causing damage to the whole structure.

B. External Damage: Joints when exposed to external climatic conditions are prone to damage by extreme cold or hot weather. Thermal expansion/contraction due to hot and cold-water circulation is another factor.

C. Poor Installation: If the joints are not properly installed with skilled labor during construction stage then it may lead to leakage.

D. Bimetallic Corrosion: when dissimilar metals are used in one system then there is possibility of corrosion of one metal.

E. Chemical Action: the chemical action on metals may damage the joints and make them weak such as G.I and copper pipes.

F. Damage during Replacement: Minor repair and replacement jobs, if not properly executed, may cause leakage.

Fig 5. connection between two different materials.

Fig 6. connection between two different materials

VI. FITTINGS

For connecting two pipes different types of fittings at different levels such as elbow, tee, extension piece, shoulder nipple, adapter coupling etc. are used. The type of material used and installation of fittings are two major issues in fitting. If any one of these had a problem then there are chances of leakage.

The common problems with fittings are:

A. Poor Quality Material: Material is always an important factor in any type of fittings. If poor quality of material is used then it may damage and cause problems such as leakage.

B. Threads of Fittings: Fittings thread gets damaged due to frequently operating or due to corrosion

C. External Climatic Condition: Fittings which are exposed to the atmosphere may get damaged earlier due to the effects of climate such as rain, extensive heat etc.
D. Chemical Action: chemical composition in hard water may affect the fittings and they get damaged.
E. Poor Installation: If fittings are not properly installed at construction stage then it may cause problems at operation stage, because when it is installed each and every fitting is not checked and there is no flow of liquid. So the problem is not identified. But when it is used it may lead to leakage. So poor installation may cause leakage problems.
F. Use of Dissimilar Material: When fittings of two different materials are used then fittings may not appropriate for both materials e.g. G.I. and PVC/ CPVC.

Fig 7. connection between different materials of pipes

VII. TRAPS

Various traps are used in plumbing and sanitation such as 'S','P', Q', bottle trap, gully trap nahani trap, and intercepting trap. Common problems with traps are leakages, foul smell, blockages and water seal loss.
Leakage: It may be due to poor installation, cracks in the trap or poor quality of material.

A. Kitchen Sink:

For kitchen sink mostly bottle trap or grease traps are used which are connected to gully trap through the pipe. Problems in traps are caused due to waste food, fats, oils, grease, tea, and coffee residue. When this material is in correctly disposed it may lead to blockages. During installation, if traps are not properly connected to pipes then it may lead to leakage problem. So use of proper trap and good quality material of trap is very important. If poor quality traps are used then it may get damaged early.

B. Bathroom Trap:

In bathroom mostly nahani trap are used, and problems associated with it are blockages and leakages. If these traps are not properly installed then they may be lead to leakages and there may be water seepage in wall of toilet slab. Blockages in the trap are due to hairs, soap scum, beauty products and hard water.

C. Wash Basin:

In wash basin mostly 'P' or bottle trap is used, problems associated with the trap is blockages and leakages this is due to shaved hair, cotton buds, razor blades, soap scum and improper installation.

VIII. W.C.

In W.C 'P', 'S' traps are mostly used. The most common problem with W.C traps is blockages, foul smell and back flow. These problems are usually due to

- Cotton, Wool disposal
- Water seal broken due to evaporation and drying of water seal
- Disposal of Nappies
- Sanitary Products
- Inadequate water discharge
- Poor installation

A. Trap Seal Loss

The direct effect of the Minus and Plus Pressure in the system due to inadequate ventilation of traps-Attributed to the following conditions:

- Siphonage-direct and momentum.
- Back Pressure.
- Evaporation-caused by extreme temperatures, idleness.
- Wind Effects-strong winds blow the trap seal.
- Retardation of flow-Due to the effect of atmospheric pressure or gravity.
- Deterioration of the Materials-Due to the formation of acids.

Fig 8. wash basin with 's. trap

Fig 9. nahani traps

B. Gully Trap

Gully trap is used between waste pipeline and the building sewer line. Blockages and overflow are major problems with gully trap. This is due to waste food, fats, oils, grease, tea, and coffee residue. These materials cause blockages. In case of gully chambers which do not have proper cover, external material such as dirt, leaves, construction material etc. enter into chamber. If the gully trap is not properly installed it may lead to leakage and foul smell and re-entry of foul gases.

IX. INSPECTION CHAMBER

A. The inspection chamber is outside kitchen or bath where the wastewater from kitchen, washbasin and bath is collected. They get either blocked or overflow. This is due to waste from sanitary area, poor construction of the chamber and improper trap used inside the chamber.

B. Many times cover of I.C is not proper and so external material enter into the chamber and may lead to blockage.

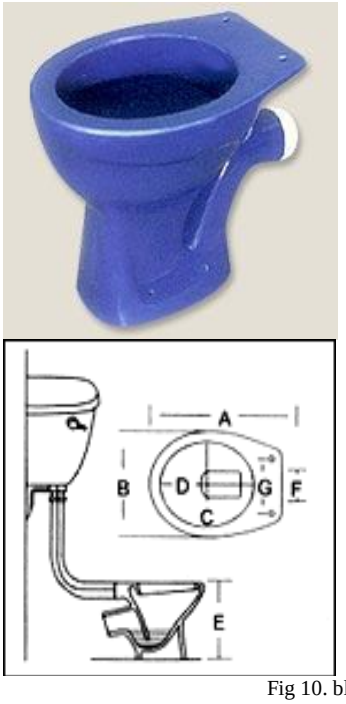

Fig 10. blockages near trap

X. VALVES

Though the valves are pipefittings, they regulate the flow of substance by opening, closing, or partially obstructing various passageways. Constant use of valves it may lead to leakage, overflow and backflow etc.

A. Gate Valve: There may be problem in regulating the amount of fluid that flows through a pipe. Loss of pressure and control of liquid are typical problems related to gate valve. This is due to handling and seat of the valve.

B. Globe Valves: The loss of control on the flow of water, which may lead to leakage problem. Major problem in the globe valve occurs due to the washer and spindle.

C. Flush Valve: Due to frequent use of flush valve there are leakages problem at handle. Handle may not operate and discharge water, or the handle may become loose. This is because the handle and stem connection gets damaged and there is problem with washer. So valve does not operate properly.

D. Ball Valve: Loss of control over the flow of liquid and leakages are problems associated with ball valve and this is due to loose lever and ball.

XI. FAUCETS

To control the flow of water through and from pipes faucets are used. Problems related to faucet are dripping, low pressure and leakage at the level where pipes are connected. These problems are due to spindle becoming loose, damaged washer due to hard water or mishandling and constant use, or sometimes it may even be due to improper connection of pipes.

Other problems with valves are:

A. Valve fails to close properly due to faulty washer, or eroded seating or presence of grit or lime deposits.

B. Use of high pressure instead of low pressure valve

C. Hard water and poor quality

Fig 11. faucets where leakages arise

XII. SANITARY FITTINGS

The sanitary fixtures can broadly be classified as soil fixtures and ablution fixtures. They are water closet, urinals, sinks, hand washbasins, sinks, bathtubs, bidets and flushing cisterns. Problems occur in these fixtures is mainly due to low quality material and improper installation.

A. Wash Basin: Problem related to wash basin are clogging and leakages. These problems occur due to traps fixtures and taps. These problems occur due to shaved hair, beauty products and soap scum. If traps are not properly installed then there may be a problem of blockage. When taps are not properly installed it may drip.

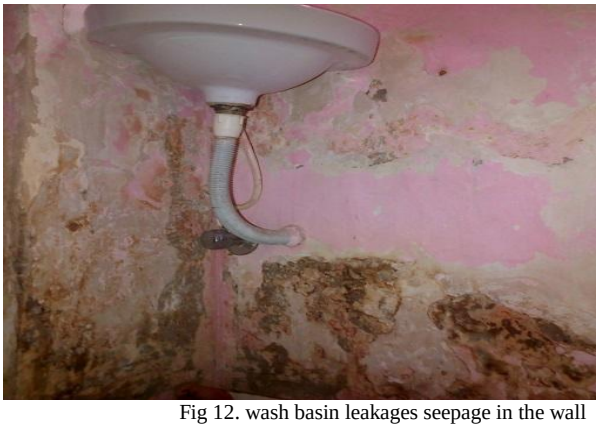

Fig 12. wash basin leakages seepage in the wall

B. Water Closet: Water closet used in residential building may be Indian, European or combination. But problems related to all types of W.C are flush do not operate, overflow of flushing cistern, foul smell, black flow and leakage. This is due to traps, connection with pipes and fittings. Sometimes these leakages cause seepage in a wall and damage the structural component**.**

C. Kitchen Sink: Problems related to kitchen sinks are clogging and leakages. These problems occur due to disposal of oily matter, coffee, tea residue and waste food, leakages from taps or traps at the bottom where it is connected to pipe and poor installation of the sink at the edges of the sink and kitchen platform.

D. Bath Tubs: With bathtubs major problem is clogging and leakages. These are due to soap scum and hair. And leakages are due to poor installation. Gap between fixtures and side wall.

XIII. TOILETS

The major problem with plumbing and sanitation is with toilet as many fixtures are installed in toilet so one or other has a problem during the operating stage. The toilet gets either clogged; tap drips, toilet slab leaks, foul smell, and lack of basic service that we need to do every day. Any problem related to it should be immediately repaired otherwise routine life gets disturbed. Clogging many be because of disposal of hair, soap scum, beauty products, shampoo sachets.

Leakages may cause due to poor installation of pipes, either waste pipe or water supply may get damaged and water seepage through walls or slab may deteriorate structural component and steel may get corroded, which damages the stability of the structure and may create major problems. Leakage of a toilet slab of above floor is a common problem. This is due to poor casting of sunken slab, and while the installation of sanitary fixtures such as W.C pan, traps and pipes it may get damaged. Other common problems are gap between nahani trap and floor tile, poor installation of the trap and incorrect jointing of W.C pan to pipe. Pipes are concealed so it may damage and there may be water seepage through walls. (Common-residential plumbing problem-can solved)

XIV. RESULTS

From site visit and from all above study the results is seen that problems caused in plumbing and sanitation due to material is about 40%, from the poor installation is about 20%, poor maintenance 15%, use behavior is about 11%,from climatic condition is about 9% and from other reason causes is about 5%.

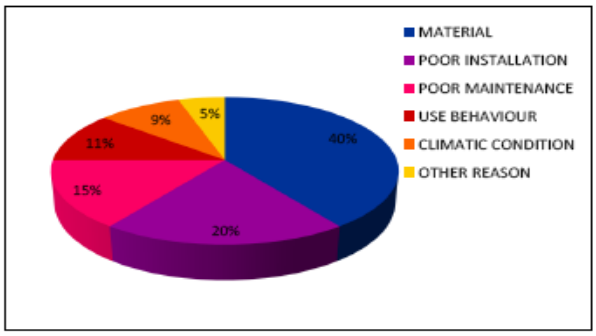

Fig 13. the causes for plumbing and sanitation problems

XV. COLCLUSION

From above study it can be concluded that the problems related to plumbing are very dangerous to building life and also to the occupant which are live in building. Problem are occurred due to various reason are studied and that problem should be minimized by its proper study and its proper operations. The problem in water supply pipes can be minimized by using high quality materials and its proper installation. For drainage purpose mostly Cast-iron and PVC pipes are preferred. Joints of the pipes should be properly worked and should not be damaged during repairs. The type of material used and installation of fittings should be of same materials and When fittings of two different materials are used then fittings may not appropriate for both materials e.g. G. I and PVC/ CPVC. Common problems with traps are leakages, foul smell, blockages and water seal loss and it can be avoided by proper disposing of Cotton, Wool, Nappies and Sanitary Products in proper way.

Leakages in traps may be due to poor installation, cracks in the trap or poor quality of material and be maintained by using high quality materials and its effective installation. Inspection chamber be maintained by taking care of its maintenance. Though the valves are pipefittings, they regulate the flow of substance by opening, closing, or partially obstructing various passageways. Constant use of valves it may lead to leakage, overflow and backflow etc. The major problem with plumbing and sanitation is with toilet as many fixtures are installed in toilet so one or other has a problem during the operating stage. The toilet gets either clogged; tap drips, toilet slab leaks, foul smell, and lack of basic service that we need to do every day.

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