

PREVENTION OF LEAKAGE THROUGH BUILDING DRAINAGE SYSTEM

S. K. SHARMA and S. P. GUAKHADARTI
Scientists, Central Building Research Institute, Roorkh (U.P.)

Dampness in walls of buildings near the plumbing services is often observed spoiling the aesthetics and reducing the life of the building materials. This is attributed to leakage through junctions of sanitary appliances, pipes and fittings. The very characteristics of such leakages are that they can neither be rectified thoroughly nor the entire system can be reinstalled since dismantling of pipes etc. is out of bounds while the building is occupied by residents. As such, it becomes a perpetual headache for the maintenance engineers in the long run. The reasons for such happenings are lack of supervision and bad workmanship. Proper care at the installation stage can eliminate the problem to a great extent.

SOURCES OF LEAKAGE

The chief source of leakage is the improper joints of pipes and fittings which occur at the following junctions as illustrated in Fig. 1:

- (1) W.C. flush pipe and the inlet horn of the pan.
- (2) W.C. pan and trap
- (3) Trap and pipe or fittings main drainage stack.
- (4) Pipe and cross fittings in unsound pipes or fittings having cracks may also provide another source.

Since working space in the service area is very much restricted, sufficient care must be taken in making joints, the detailed procedure for which is described elsewhere in the article.

PIPING MATERIALS

Most commonly used materials for building drainage pipe works are cast-iron (C.I.) and Asbestos cement (A.C) and the types of joints practised are 'Caulked joint' using lead and 'Cement mortar' joints. Flanged and threaded joints are

rarely adopted although their use cannot totally be ruled out.

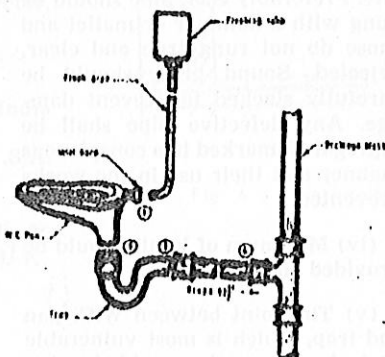


Fig 1 Joint of W.C. pan & trap with stack

Pipes made of a number of thermoplastics materials are suitable for use as discharge pipes. These include unplasticized polyvinylchloride (UPVC), Polyethylene (PE), Polypropylene and Acrylonitrile butadiene styrene (ABS). All these materials are light in weight and consequently easy to handle, and highly resistant to corrosion. Mostly UPVC pipes are used for large diameter and polyethylene for small diameter. The temperature of discharge water should not exceed 80° C. Plastic pipes should preferably be installed in ducts.

Whatever be the material of pipes and fittings, and the type of joint provided, the plumbing drainage system joints should be water tight to prevent leakage of contaminated water, as well as gas tight against emission of foul odour from sewer into the building.

JOINTING TECHNIQUES

(a) Caulked joint: Caulked joints for C.I. bell and spigot soil and waste pipes should be firmly packed with hemp and filled with molten lead not less than 1 inch (25 mm) deep and not to extend more than 1/8 inch

(3 mm) below the rim of the hub (Fig. 2). No paint, varnish or any other coating should be permitted on the jointing material until the joint has been tested and approved.

(b) Cement-mortar joint: A layer of jute or hemp should be inserted into the base of the joint space and properly rammed to prevent mortar from entering into the pipe. Jute or hemp should be dipped into a slurry suspension of portland cement in water prior to insertion into bell. Not more than 25 per cent of the joint space should be used for jute or hemp. The remaining space should be filled in one continuous operation with a thoroughly mixed mortar composed of 1 part cement and 2 parts sand, with only sufficient water to make the mixture workable by hand. After 1/2 hour of setting, the joint should be rammed around the entire periphery, with a blunt tool to force the partially stiffened mortar into the joint and to repair any cracks formed during initial setting period.

Pipe interior should be swabbed to remove any material that might have fallen into the interior. Additional mortar of the same composition should then be trowelled so as to form a 45° taper with the barrel of the pipe. After jointing, moist earth or wet sack should be used to cover the joint as a guard against rapid drying shrinkage cracks.

(c) Plastics pipe joint: Polyethylene pipe joints should be made by

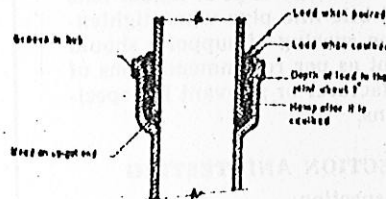


Fig 2 Bell & spigot joint

thermo-welding or by using standard Metallic fittings. Threads can be cut on Polyethylene pipes by ordinary metal cutting die.

UPVC pipes are mostly solvent welded. The technique is used for both spigot and socket type joints and injection moulded fittings. The cement solvent is applied on the inner surface of female end and outer face of male end. Then male end is inserted into female end and the remaining cement is wiped off immediately.

Rubber gasket joints are used with injection moulded fittings. The gasket is placed in injection moulded couplers. The gasket gets compressed when pipe is inserted and makes a water tight joint. The materials used for gasket is natural rubber or synthetic rubber.

FIXING AND LAYING OF PIPES

External pipe work of materials which require protection against atmospheric corrosion should be so fixed as to give free access, all round the pipe for application of paint or other protective coatings. The minimum clearance between pipe and structure should be 32 mm. Fixing of CI pipes may be done by using,

1. Ears on the pipe sockets
2. Cast Iron or Malleable Iron or steel holder bats.
3. Purpose made straps.

The maximum spacing of support should not exceed 3 m in vertical run and 1.8 m in horizontal run.

Asbestos Cement pipes may be fixed by using galvanised mild steel holder bats for building in or screwing to structure. The maximum spacing of support should not exceed 3 m in vertical run and 1 m in horizontal run.

The plastic pipes can be supported by saddle clips or holder bats and plastic coated metal. Care shall be taken that these clips or holder bats do not bite into pipe when tightened. The spacing of supports should be kept as per recommendations of manufacturer or relevant I.S. specifications.

INSPECTION AND TESTING

(a) Inspection:

Following points should be taken care of which would otherwise give

rise to leakage problems in the drainage system:

(i) Inspection of pipes and fittings shall be carried out as per relevant I.S. specification. Use of non standard fitting should be totally avoided.

(ii) All sanitary appliances and fittings shall be carefully examined for defects before installing them and also on completion of work.

(iii) Pipes are liable to damage on transit and not withstanding tests that may have been made before despatch, each pipe shall be carefully examined on arrival at the site. Preferably each pipe should be rung with a hammer or mallet and those do not rung true and clear, rejected. Sound pipes should be carefully stacked to prevent damage. Any defective pipe shall be segregated, marked in a conspicuous manner and their use in the works prevented.

(iv) Minimum of joints should be provided in the system.

(v) The joint between W.C. pan and trap, which is most vulnerable to leakage, can be avoided using integral pans i.e. pan and trap combined into a single unit, which is available in the market (Fig. 3).

(vi) When separate trap is used, the size of the trap should be so selected that there is enough space left between the pan spout and the socket of the trap to effect proper jointing.

(vii) The vertical drainage stack should be firmly fixed on walls by means of clamps and load of the entire piping work should not in any case be transferred to the bend provided at the foot of the stack to cause settlement and subsequent dislodgement of joints.

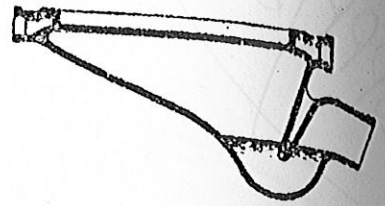


Fig. 3 Integrated squatting pan

(viii) No work shall be covered over or surrounded with concrete until it has been inspected and approved by the authority.

(b) Testing:

Testing of pipes and fittings and also the system as a whole should be carried out before finishing work e.g. flooring of W.C., grouting of walls etc. Comprehensive tests of all appliances should be made by simulating conditions of use as per relevant I.S. specification. There should not be any leakage of water through any portion of the system particularly joints. A slight amount of sweating which is uniform may be overlooked, but excessive sweating from a particular pipe or joint shall be watched for and taken as indicating a defect to be made good.

SMOKE TEST

All soil pipes, waste pipes, vent pipes and fittings when above ground should be approved gas-tight by a smoke test conducted under a pressure of 25 mm of water maintained for 15 minutes after all trap seals have been filled with water. The smoke is produced by burning oily waste, tar paper or similar material in the combustion chamber of smoke machine (Fig. 4) (page 15). Chemical smokes are not satisfactory.

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Conclusions

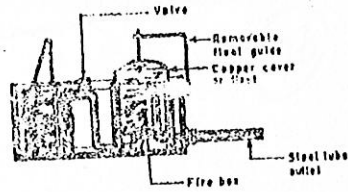
The various causes of leakage in sanitary installations have been described for ready reference of supervisors. Proper inspection and testing of installations before and after completion of work will lead to satisfactory performance of drainage system.

Acknowledgement

The work described in this paper forms the normal research programme of this Institute and is published with the permission of the Director, C.B.R.I., Roorkee.

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Smoke machine

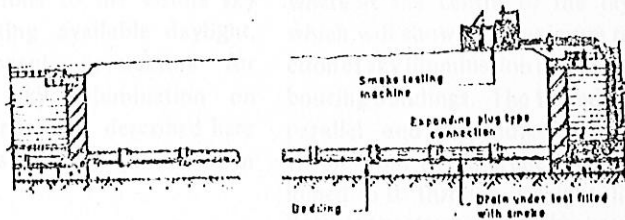


Fig 4. Smoke testing of drains