



BUILDING RESEARCH NOTE

B. R. N. 65

SINGLE STACK SYSTEM OF BUILDING DRAINAGE

Conventional drainage system recommended in Municipal Bye-laws for a building involves use of two separate pipes, the soil pipe taking discharge from water closet and urinals while the waste pipe takes discharge from baths, sinks and wash basins. In addition, vent pipes are fitted to both the stacks to prevent unsealing of the traps of different appliances. It is known as 'Two-pipe fully ventilated system'. The other system is 'One - pipe fully ventilated system' wherein a single soil waste pipe conveys both soil and waste and the various appliances are ventilated. A recent development is the single stack system, wherein all the appliances are connected to one pipe which itself provides all the vent requirements. It is simple, economical and functionally efficient.

Requirements

Main consideration in plumbing system is to prevent loss of seal due to self siphonage, induced siphonage and back pressure. The shape of appliances, length, slope and diameter of the branch pipes play an important part in preventing self siphonage. Induced siphonage and back pressure at the foot of a stack are governed by the height of the stack, its diameter and the amount of water flowing in. Researches carried out by Building Research Station, U.K. and certain plumbing contractors in England have led to certain restrictions for the depth of seals, the length and slope of branch pipes for the single stack system of plumbing wherein the appliances are directly connected to the stack which is the practice in Western countries.

Due to the difference in the living pattern

and habits in European countries and India, the appliances, namely, wash hand basin and sink are often not connected directly to the stack but the waste pipes of these appliances are taken to a floor trap and the latter is connected to the stack. As such the restrictions such as

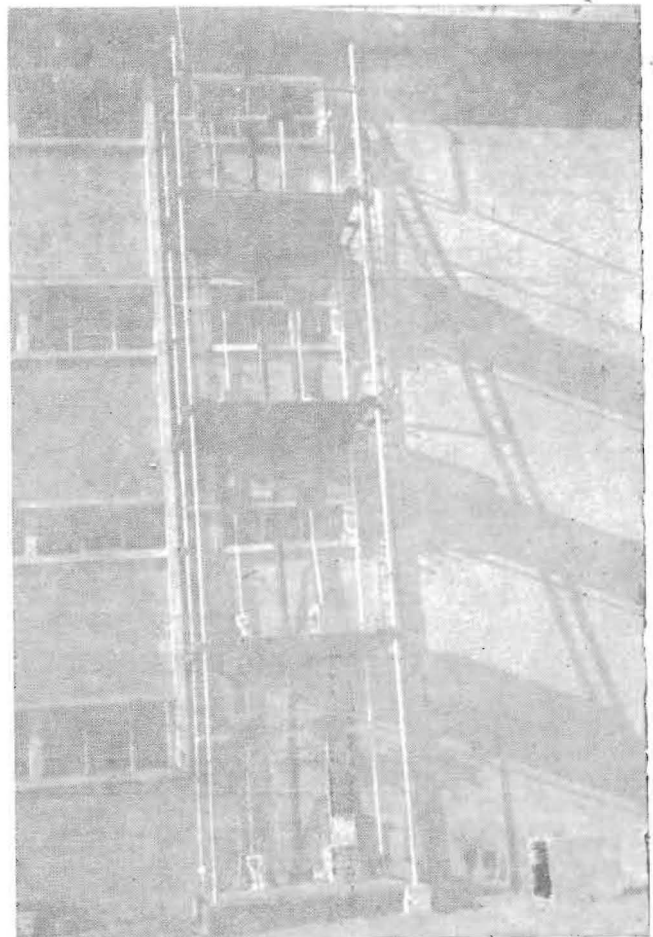
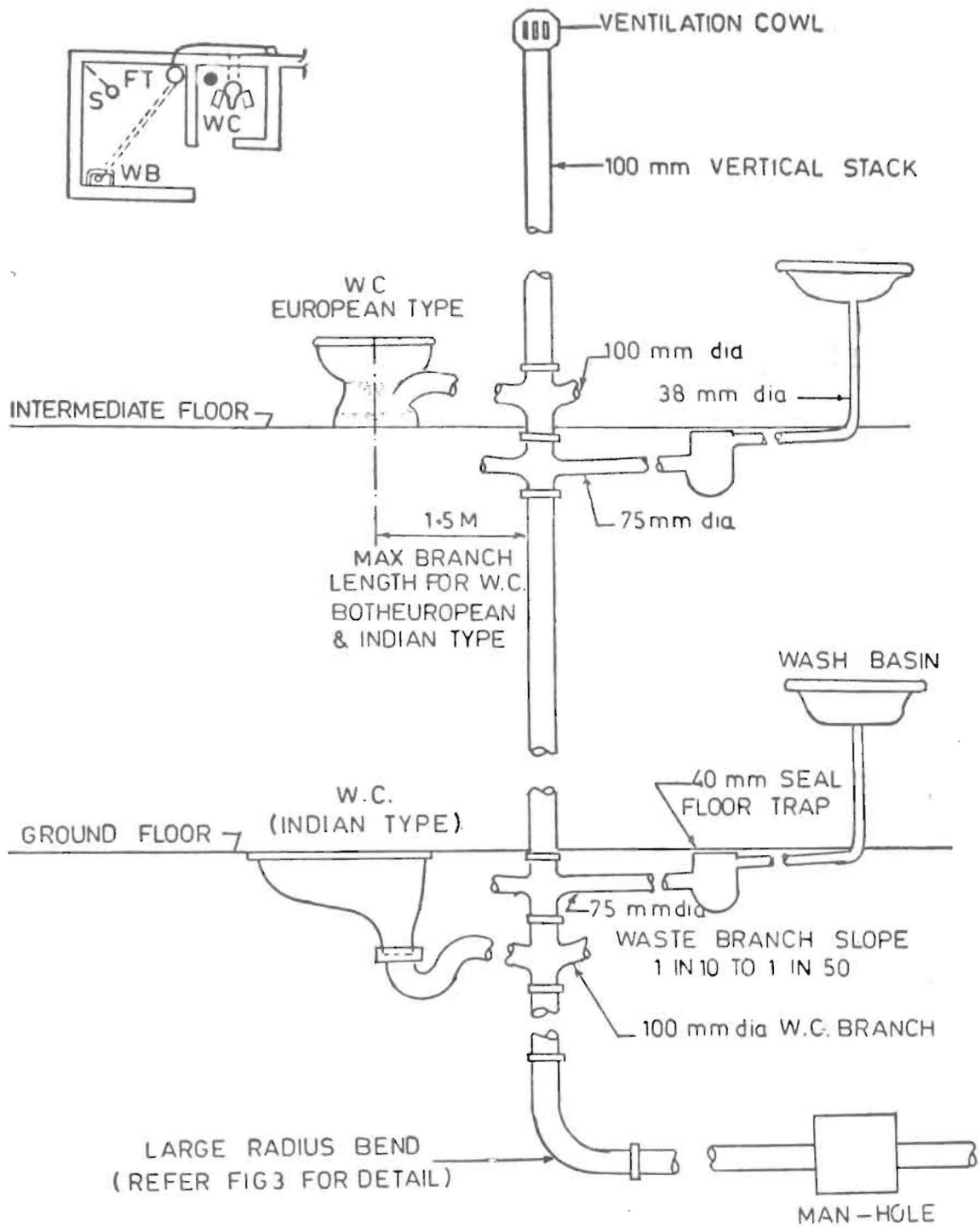


Fig. 1. Mock-up of Single Stack System of Plumbing



SINGLE STACK SYSTEM OF PLUMBING
(INDIAN PRACTICE)

FIG 2

provision of deep seal traps for wash basins and sinks followed in the European practice are not directly applicable but the same becomes necessary for the floor traps. Similarly because of provision of a floor trap there is no necessity of restricting the length of waste pipe from the appliances.

Experimental Work

Thus studies on the performance of single stack system under Indian conditions were carried out at this Institute. A five storey mock-up (Fig. 1) with a toilet unit on either side of the stack at each floor, comprising of one W.C., one wash basin and one floor trap was made and all combinations of loading conditions were studied.

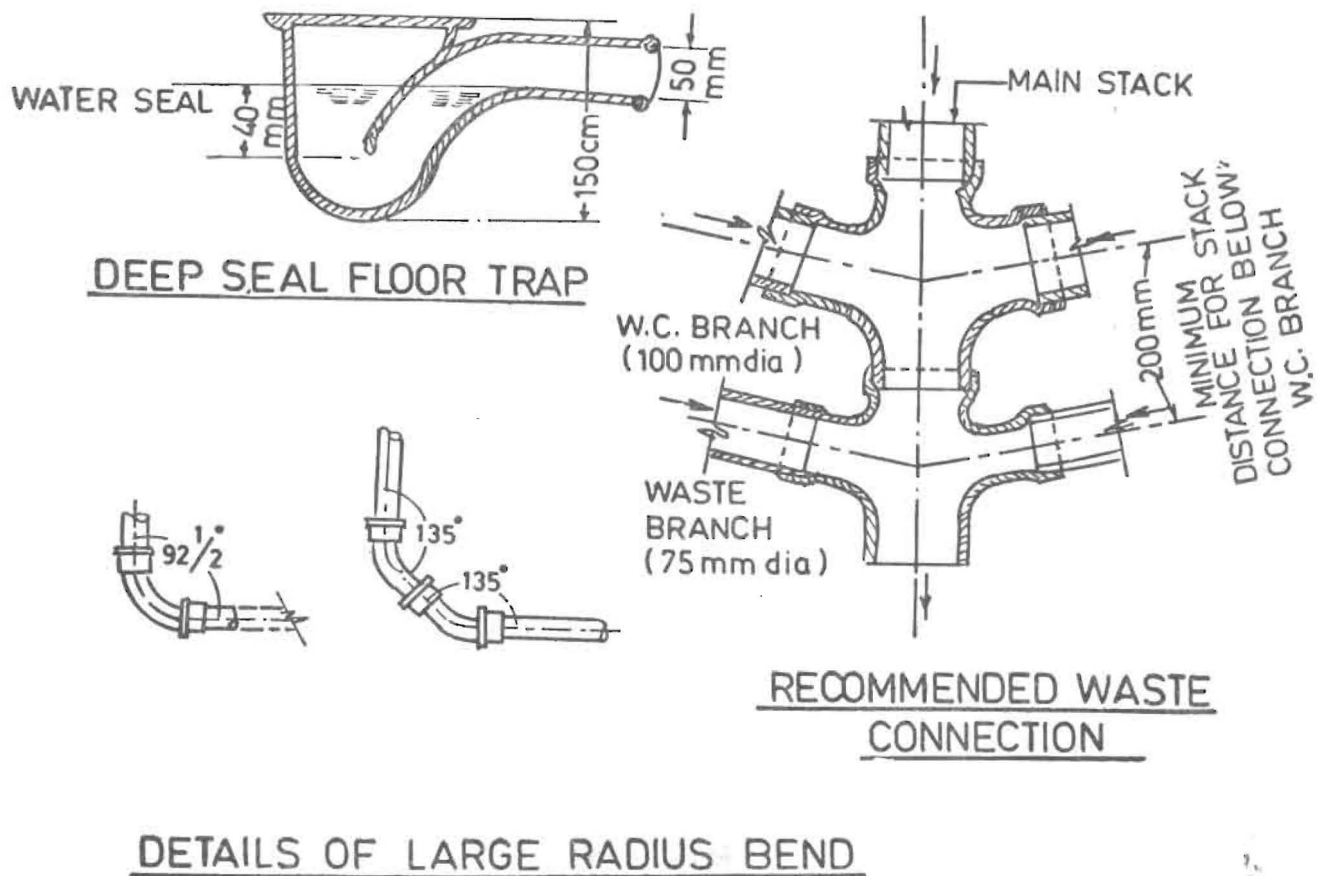
It has been observed that a negative pressure of 40 mm water gauge (W.G.) causes a loss of seal of 25 mm. Thus in a trap of 50 mm deep water seal, it leaves a safe residual seal of 25 mm. Hence a permissible negative pressure limit of 40 mm is considered safe for design.

The negative pressure (h) is a function of peak discharge (Q) and stack diameter (D). It has been seen that the ratio Q/D should not exceed 2.5. Hence for the design of main stack the peak flow rate in litres per minute should not exceed 2.5 times the diameter of stack in millimetres.

Connection of Appliances

Water closet branch pipe should be directly connected to main stack with 100 mm dia. pipe, generally referred to as stack. The connection should be swept in the direction of flow. W.C. trap should have a minimum water seal of 50 mm.

All other appliances except W.C. should be connected to stack through a floor trap. Single stack system of plumbing with typical connection details for Indian practice using Indian and European type of W.C. pans are shown in Fig. 2.



Recommendations

1. The appliances should be grouped as closely as possible around the main stack so as to keep the branch pipe short and to reduce the noise.
2. The maximum distance of W.C. branch pipe should be 1.5m from main stack.
3. The W.C. branch should be 100 mm diameter and waste branch from floor trap should be 75 mm dia.
4. The slope of waste branches should vary between 1 in 10 and 1 in 50 and no waste branch should be connected within 20 cm below the centre line of W.C. branch (Fig. 3).
5. The depth of water seals in W.C. and floor traps should be 50 mm and 40 mm respecti-

vely. Other appliances need not have water seal traps, when connected through a floor trap.

6. Large radius bend $92\frac{1}{2}^\circ$ or two bends of 135° should be used at the foot of the stack to avoid back pressure (Fig. 3).

The above recommendations have been incorporated in I S. : 5322-1969 'Code of Practice for sanitary. Pipe Work Above Ground for Buildings' and also in the National Building Code of India 1970

Cost Economics

It has been estimated that there is saving of 54 per cent in overall cost of piping by adoption of single stack system as compared to two-pipe system in a five storeyed building having twin units on either side of the stack.

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Prepared by : Sudesh Kumar Sharma
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