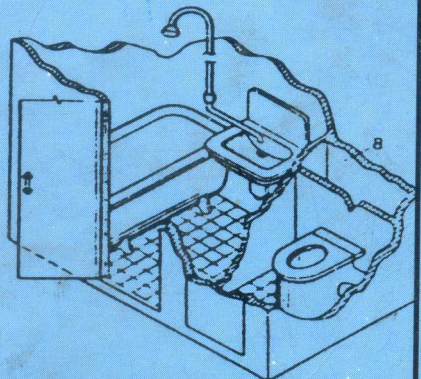
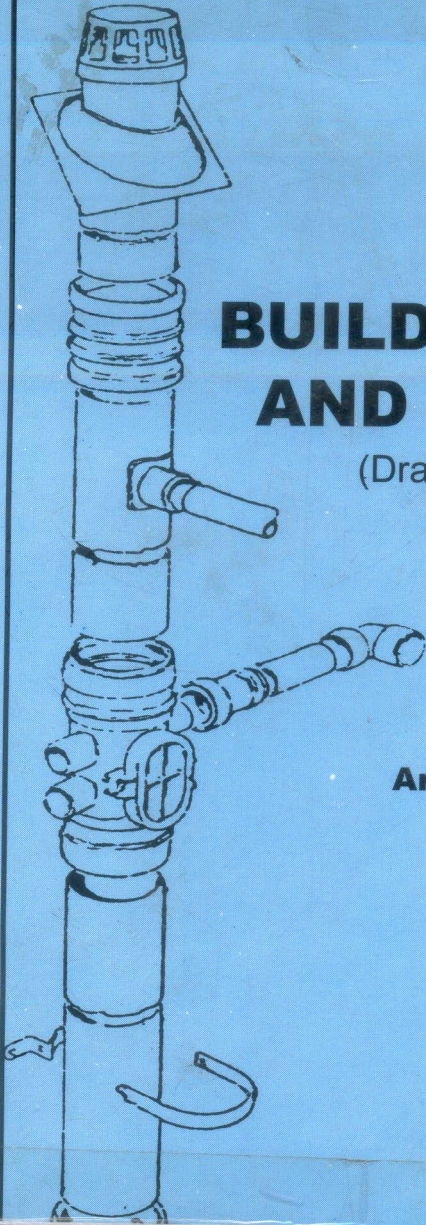


BUILDING SERVICES AND EQUIPMENTS

(Drainage & Water Supply)

Ar. Shubhangi Bhide



696
SHU/BUI
A0003679

BUILDING SERVICES AND EQUIPMENTS

(Drainage & Water Supply)

By **Mrs. Shubhangi Bhide**

(Faculty - Pillai's College of Architecture, New Panvel)



FIRST EDITION - 1999

Copyright © Author

No part of this book may be reproduced in any form or any means without permission in writing from Author

Printed by Rudra Offset, New Panvel, Dist. Raigad. Pin - 410206. © 022-7453198

Price Rs. 150/-

FOREWORD

The holistic understanding of architecture is vital for its true appreciation and practice. The organic completeness of a building is the syncretic result of its circulation, its structure and its service. Building Sciences are integral to the good health of a building and by extension to the well being of its occupations. This is a fact not properly communicated to students of architecture today; partly because of compartmentalization of syllabi and partly due to the notion that the services of a building are peripheral to the ("all important") design and are add-ons once the design is completed.

In fact the design of building services must be carried out alongwith (and not after) the larger design of a building.

In this regard the present book by Ms. Shubhangi Bhide should be an ideal work of reference. This book is most importantly written by an architect for the students of architecture, in itself a rare commodity. It covers as a good handbook should, the elements of sanitation and water supply in a graphic manner that can be easily absorbed by students and incorporated in their designs. This book brings to fruition a consolidation of the various aspects of sanitation and water supply, its theories and applications. Its repeated use would help a student of architecture, internalize the main concepts there in, and create the holistic and syncretic designs alluded to at the outset of this foreword.

MUSTANSIR DALVI
PRINCIPAL (Incharge)
PILLAI'S COLLEGE OF ARCHITECTURE
NEW PANVEL

PREFACE TO THE FIRST EDITION

Technology is advancing fast. Planning of building complexes had been the need of human beings since beginning of history of construction. Services are the life and soul of the same and contribute towards major cost of building construction. Plumbing and sanitation is very crucial and useful part of civilian domestic life in present times. Although the principles and hygiene are the same every where the methods employed and standards adopted vary according to the climatic environment, economic conditions, sociological circumstances and age long habits engrained in the people.

In the course of my work as a teacher of the subject of services to the degree students of Architecture, I experienced considerable difficulty in pointing out to them a book which could give them all the information they need. I have therefore attempted to present in this volume all the matter which students are likely to study under the various university courses. Here the subject matter has been explained in simple & lucid language with plenty of sketches to follow the contents. I hope this book will be certainly liked by the students.

I acknowledge my sincere gratitude to all those who have been helpful directly or indirectly in the task of making this book.

Author

CONTENTS

Chapter	Topic	Page No.
	WASTES FROM BUILDINGS - DRAINAGE	
1	Introduction & Importance	6
1.1	Building Wastes	
1.2	Drainage Systems	
2	Sanitary Fittings	12
2.1	Classification of Sanitary Fittings	
2.2	Sanitary Fittings	
2.3	Waste Water Fittings	
2.4	Associated Fittings	
3	Traps	32
3.1	Importance & Necessity of Traps	
3.2	Qualities of Traps	
3.3	Reasons for loss of water seals	
3.4	Commonly used types of traps	
4	Drain Pipes	37
4.1	Required qualities	
4.2	Commonly used Drain Pipes	
4.3	Norms of Pipe Jointing	
5	Inspection Chambers	43
5.1	Importance	
5.2	Ventilation of Drains	

Chapter	Topic	Page No.
5.3	Types of Inspection Chambers	
6	House Drainage	48
6.1	Basic Principles of house drainage	
6.2	Pre-requisite information for drainage plan	
6.3	Economy in drainage layouts	
6.4	Preparation of drainage plan	
6.5	Aesthetics & vertical pipes	
6.6	Rain water disposal	
6.7	Surface or storm water disposal	
7	Testing of drains	60
7.1	Types of tests	
7.2	Sanitary survey and report	
8	Alternative drainage system	65
8.1	Manual labour	
8.2	Septic tank	
8.3	Aqua-privy	
9	Single pipe system	71
9.1	Advantages and disadvantages	
9.2	Types of pipe systems	
	WATER SUPPLY	
10	Water supply	76
10.1	Importance	

Chapter	Topic	Page No.
11	Sources of water	77
11.1	Qualitative and quantitative aspects	
11.2	Ascertaining source of water supply	
12	Distribution of water	79
12.1	Purification of water	
12.2	Consumption of water	
12.3	Common impurities in water	
12.4	Tests for quality of water	
13	Hard and soft water	83
13.1	pH value and its importance	
14	Water supply to buildings	85
14.1	Different systems of water supply	
15	Water supply and distribution equipments	88
16	House connection	89
17	Direct and Indirect supply of water	90
17.1	Overhead storage tanks	
17.2	Distribution of water in buildings	
18	Water supply & distribution in multistoreyed buildings	94
19	Hot water supply in buildings	95
20	Conclusion	96

1. INTRODUCTION & IMPORTANCE

Every human being feels that the environment surrounding & within the building should be clean, healthy & pleasant. Good sanitary habits are the pre-requisite if such desire is to be fulfilled. Decisions for good sanitation should be taken at the planning stage itself. Sanitation through efficient services and equipment is a part of environmental engineering and it is a moral responsibility of every individual to inculcate sanitary habits. It aims at controlling spread of communicable diseases consequently leading to health of the entire community, with the following basic principles.

1. Every building should have adequate supply of potable water.
2. Every room should be properly ventilated with adequate and properly located windows to ensure fresh air within.
3. Every room should have adequate natural light.
4. Construction should be such as to ensure walls, floors and roofs free of dampness. Surrounding open areas too should be free from dampness.
5. All the building wastes should be rapidly disposed away from building.

Local authorities in cities have laid Building Regulation and Bye-laws in respect of surrounding open spaces, built up areas, window proportion in relation to floor area, heights and the like. Every architect, engineer and contractor should observe these scrupulously.

BUILDING WASTES :

These should be rapidly disposed away from the building and include dry and wet refuse, sewage, waste water, rain water, surface water, subsoil water etc.

Sr. No.	Source of Waste	Type of Waste	Common ingredient
1.	Residential or Public Bldg.	Dry refuse	Tree leaves, dust, sticks, cigarette butts, cartons, cans, tins, rags, iron scrap, plastic and glass pieces, fruit remains hair, cotton waste, etc.
2.	Kitchens	Wet refuse	Vegetable and fruit remains, food remains, egg shells, bones, meat pieces, etc.
3.	Washing places	a) Dry & Wet refuses b) Waste water	Food remains, rags, coconut skin, brick powder, coal ash, dried leaves, sticks papers & packings, etc. Silt, hair, water, etc.
4.	Bath room	Waste water	Silt, hair, water, urine, cotton waste, etc.
5.	Wash basin	Waste water	Silt, water, tooth powder, hair, food remains, beetlenut, etc.
6.	W.C.	Sewage	Human excreta, waste water, hair, toilet paper, cigaratte butts, etc.
7.	Urinals	Sewage	Urine, Waste water, hair silt, beetle nuts, pans, etc.
8.	Surrounding Open space	a) Surface water b) Dry and wet refuse	Water & silt Paper pieces, cartons, cigaratte butts, tins, cans, dried leaves & sticks, rags, iron scrap, broken glass & plastics, dung, silt, etc.

DRAINAGE SYSTEMS

For removal of sewage and waste water, following systems are in vogue.

a) **Conservancy Lane System** : (Fig. 1)

Also known as dry system and is considered outdated in present context and dangerous to human health. Since it requires less water, places having water shortage are provided with such system. It consists of 2.0 m to 3.0 m wide conservancy lane between rows of plots and latrines in each plot are built abutting this lane. Waste water from each plot is carried by open channels and connected to centrally located open channel in the conservancy lane. Manual cleaning of latrines, collection of refuse, cleaning of open channel is done through these lanes. Local authority has a separate organisation and once a day such cleaning takes place. Excreta baskets are cleaned, cesspools are emptied into the waiting tankers or bullock carts at the end of this lane for further transport to the point of disposal for further treatment. The system has several disadvantages.

1. Excreta/Urine lie uncleaned for several hours and give rise to flies. It pollutes the environment by abnoxious odour, creates nuisance of stray animals
2. When the tanker moves from one locality to another, there is obnoxious odour all over.
3. It is a great social injustice that the human beings are required to handle human waste.
4. If there is "drinking water well" nearby, chances of contamination of well water are more.
5. Due to detached latrines, its use during odd seasons and hours becomes very inconvenient.
6. System suffers from strike risk by the cleaning organisation.
7. Important urban land is lost in lanes.
8. Due to multistoreyed developments, such a system is just not suitable.

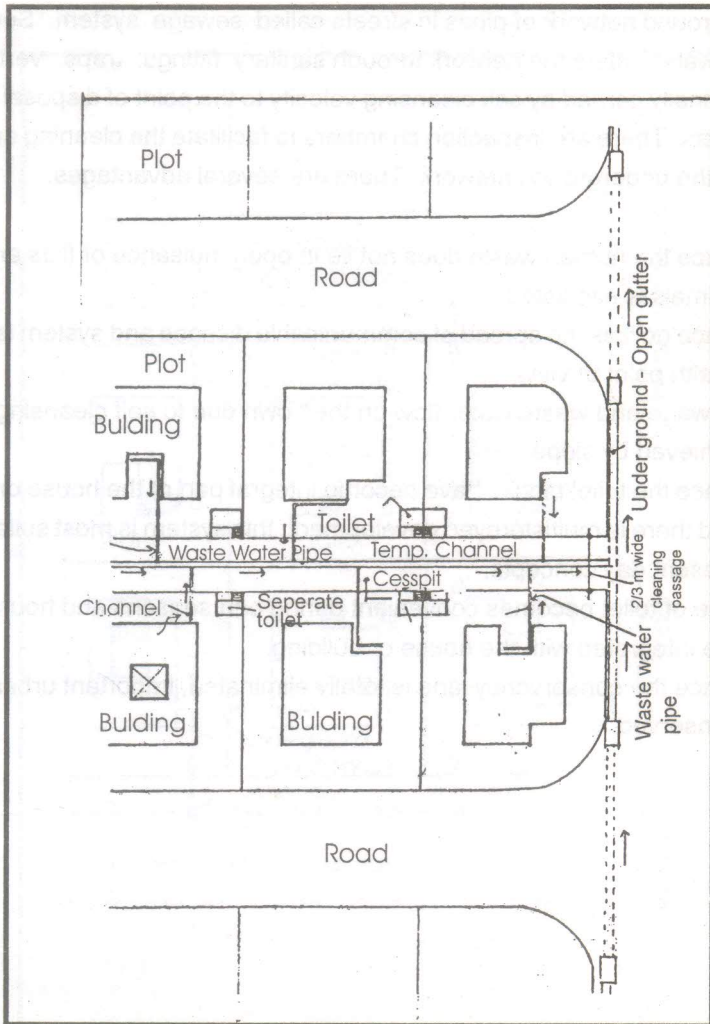


Fig. 1 Conservancy System

b) Water carriage system : (Fig. 2)

It is considered as best system from the point of view of sanitation and health; however adequate water supply is a prerequisite for this system. There is, in every plot, a network of underground pipes, laid to slope and connected to underground network of pipes in streets called sewage system. Sewage and waste water enters the network through sanitary fittings, traps, vertical pipes and is finally carried by self cleansing velocity to the point of disposal for further treatment. There are inspection chambers to facilitate the cleaning and inspection of the underground network. There are several advantages.

1. Since the human waste does not lie in open, nuisance of flies and stray animals is eliminated.
2. Since no flies, no spread of communicable disease and system is best from health point of view.
3. Sewage and waste water flow on their own due to self cleansing velocity achieved by slope.
4. Since the toilet blocks have become integral part of the house or a building and there is multistoreyed development, this system is most suitable for the present day concepts.
5. Use of toilet becomes convenient during odd seasons and hours as they are integrated with the house or building.
6. Since the conservancy lane is totally eliminated, important urban land is conserved.

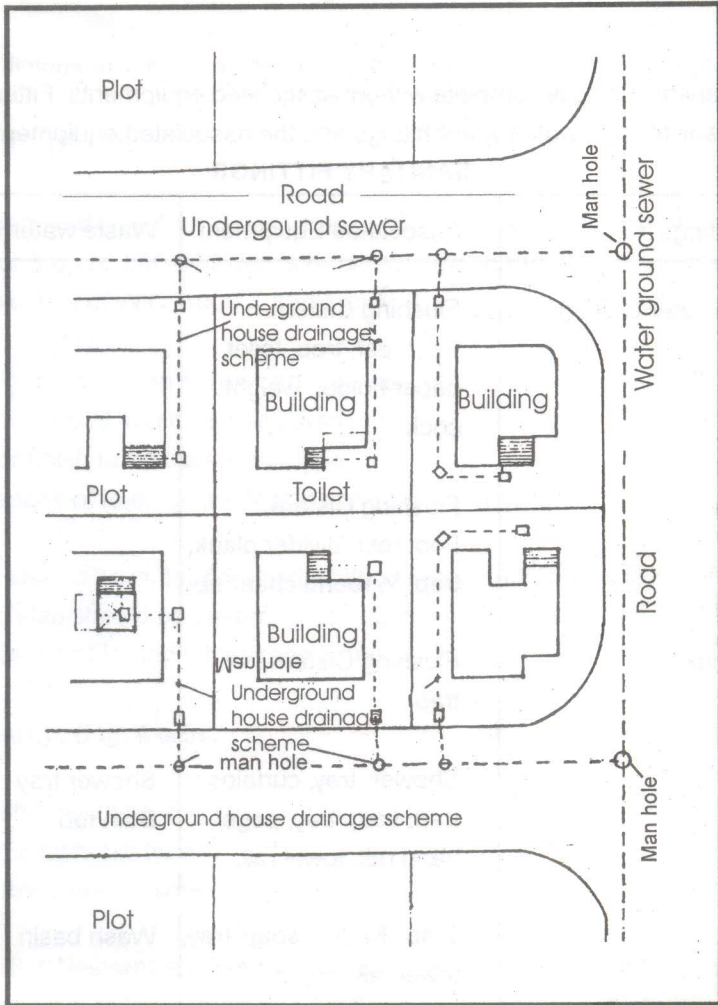


Fig. 2 Water Carriage Systems

2. SANITARY FITTINGS :

A thorough knowledge of these fittings is a must for architects and engineers which helps them to take proper decisions at planning stage. Commonly available fittings are marketed by various manufacturers and these are (a) Hindustan sanitary ware, (b) Parryware, (c) Cera, (d) Parshuram, (e) Khodiyar, (f) Nyser, (g) Johnson, etc.

No sanitary fitting is complete without associated equipments. Fittings are classified as soil fittings, waste water fittings and the associated equipments.

SANITARY FITTINGS

Soil Fittings	Associated Equipment	Waste water Fittings
W.C. (Water Closet)	Flushing Cistern, Foot rest, trap, toilet paper holder, weight cock.	
Urinals	Flushing Cistern, Foot rest, divider plank, trap, ½ round channel.	
Slop Sink	Flushing Cistern, trap.	
	Shower tray, curtains, trap, soap tray, pegs hand rail, towel rail.	Shower tray Bath tub
	Trap, Mirror, soap tray, towel rail.	Wash basin
	Drainboard, trap	Sink
	Trap	Bidet
	Trap	Drinking Fountain

Desirable Qualities in a Sanitary Ware :

- (a) Material used to be impermeable and easy to clean.
- (b) Surfaces to be nonporous, nonabsorbant and smooth.
- (c) Curves to be such as to permit easy flow.
- (d) Fittings to have adequate strength and durability.

Most of fittings are made of china clay and are glazed, with variety of colours.

W.C. (Indian) : (Fig. 3)

(a) Assembled type Pan - Pan + trap. Trap could be oriented in desired direction; floor drop of 500-600 mm is required. Floor finish to be cast-in-situ type. Desirable size of W.C. 1000 X 1350 mm.

(b) Integral Pan - Pan + trap cast together; Fixed orientation of trap.

Floor drop of 400 mm is required.

Floor finish to be cast in situ type.

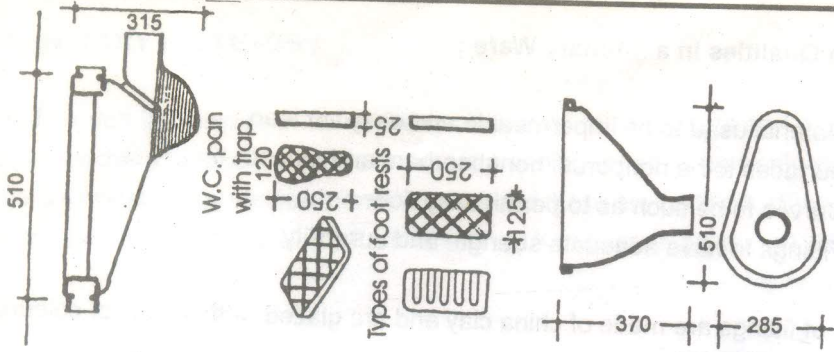
Chances of leakage are less as one joint is eliminated.

Terrace slab to have floor drops for future expansion. Before fixing of pan, dropped slab should be covered with water proofing with a 12 mm G.I. spout at the lowest point to drip off leakage if any.

W.C. (Western) : (Fig. 4 & 5)

- (a) Wash down type and suspended type.
- (b) Single siphonic type.
- (c) Double siphonic type.

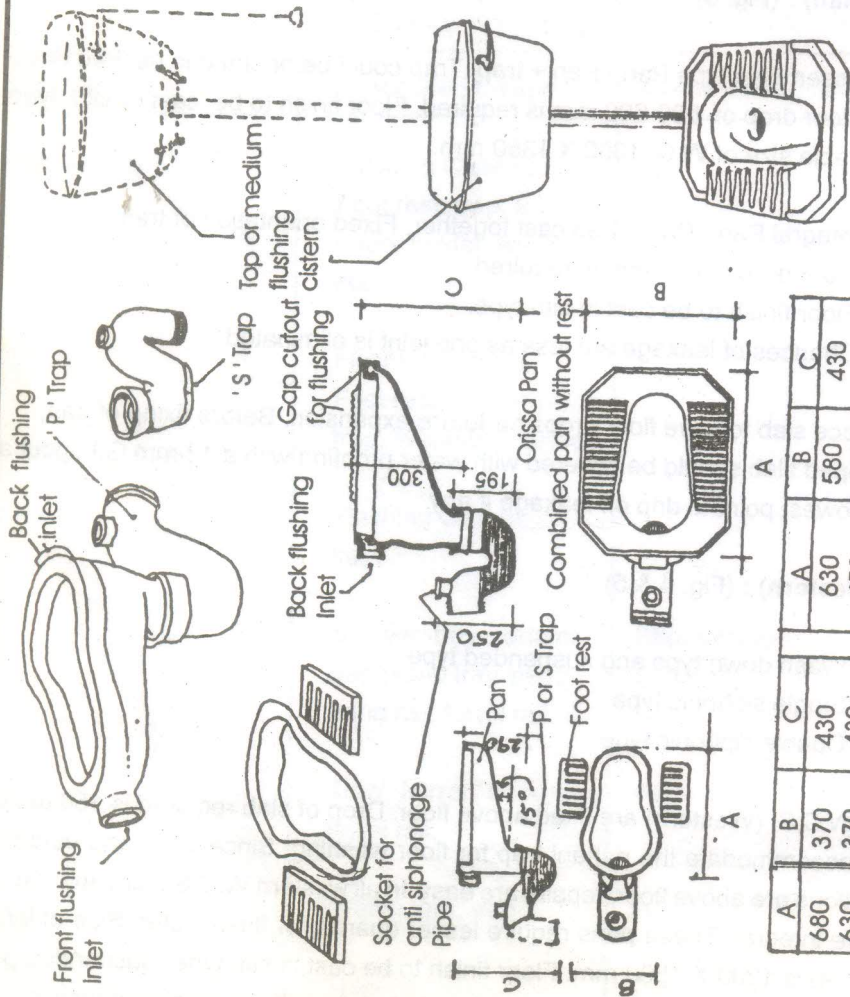
All W.C.S. (Western) are fixed above floor. Drop of slab required is 150 to 200 mm to accommodate the nahani trap for floor washing. Since W.C. and outgoing connections are above floor, repairs are easy. In all western W.C.S., pan and trap (P or S) are integral. These pans require lesser quantity of flush water. Size of W.C. (desirable) is 1200 X 1500 mm. Floor finish to be cast in situ type. Suspended pan is supported by hidden M.S. chairs so that it is free from floor. Single siphonic closet



Pan for W.C.

Note : All dimensions are in mm.

Indian W.C. Pans Fig. 3



		A			B			C		
A	B	A	B	A	B	A	B	A	B	C
680	370	630	580	580	430	430	430	430	430	490
630	370	450	440	440	430	430	430	430	430	490
580	370	580	440	440	430	440	480	480	480	490
510	305	590	440	440	400	440	480	480	480	490

has a bulbous shape with normal outlet. This helps in evacuation of air within the bulb once flush is operated. This sets the siphon, due to change in air pressure on two surfaces of water seal and cleans the W.C. In double siphonic closet there are two traps and two seals, the intervening space being connected to flush pipe. With operating of flush, the air between two traps is evacuated setting the siphon and effectively cleaning the pan.

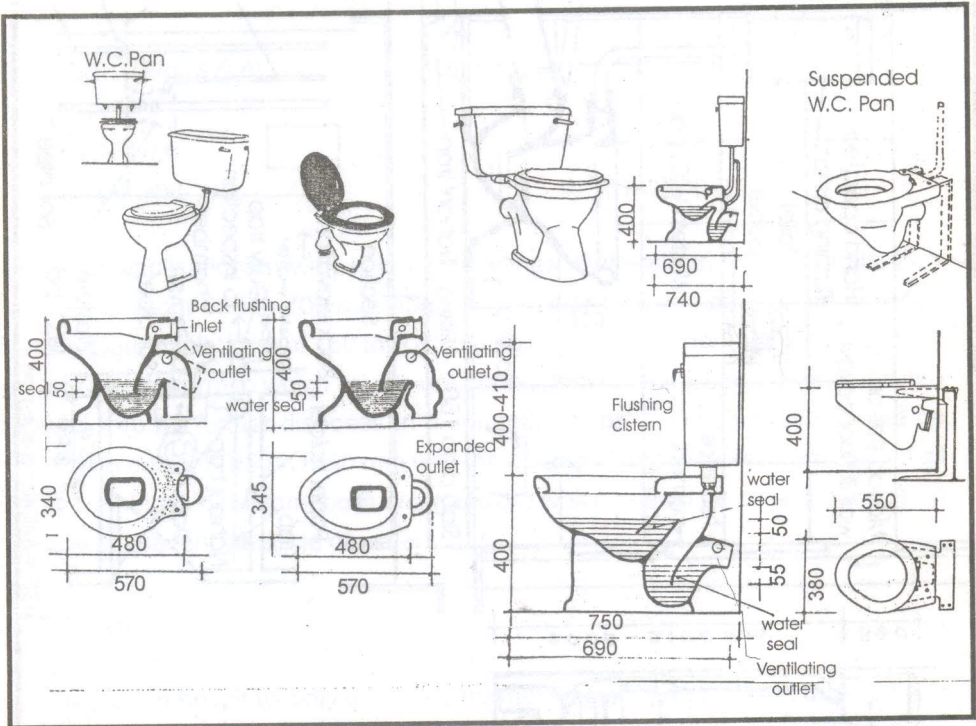


Fig. 4 European W.C. Pan

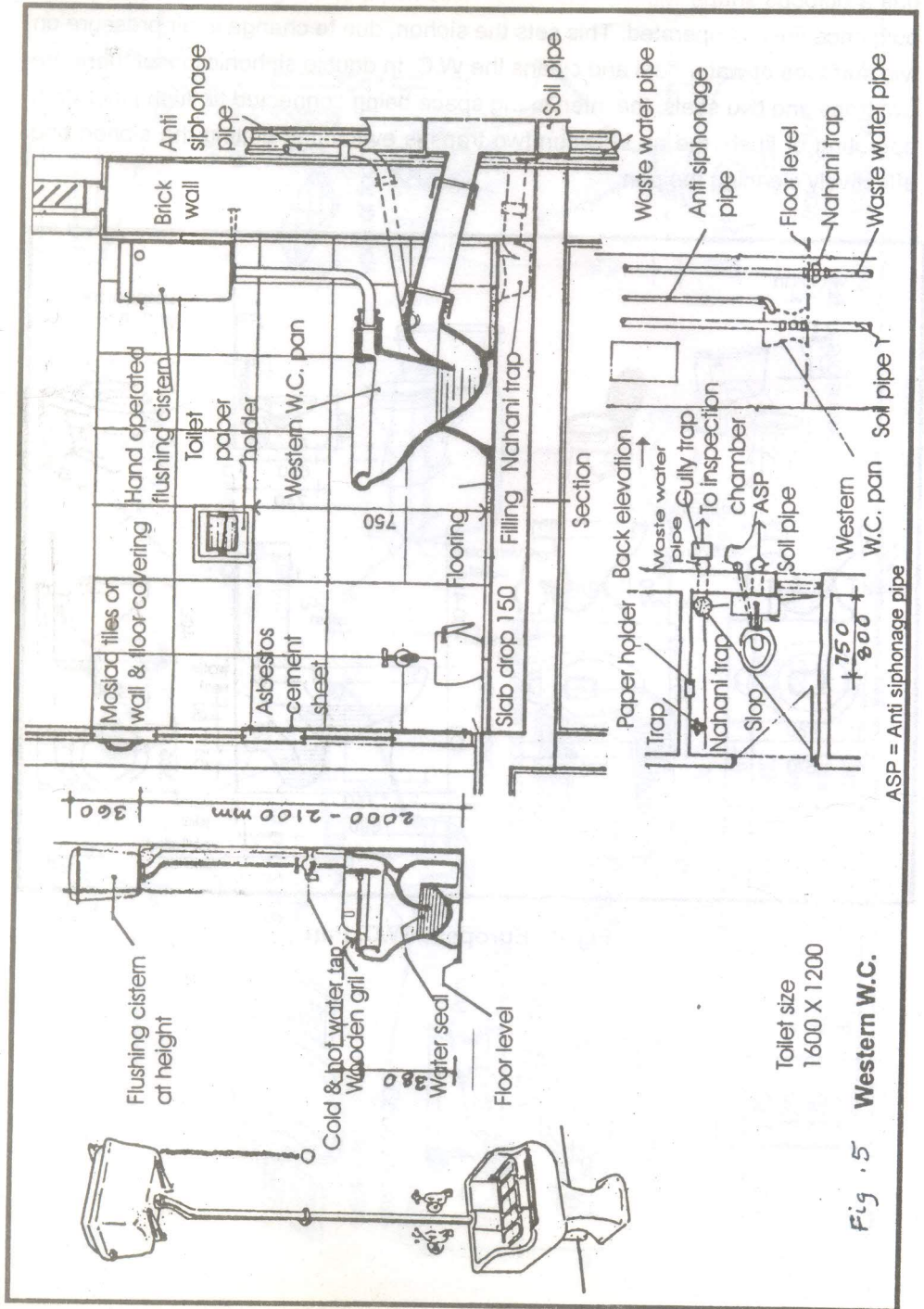


Fig . 5 Western W.C.

Toilet size
1600 X 1200

