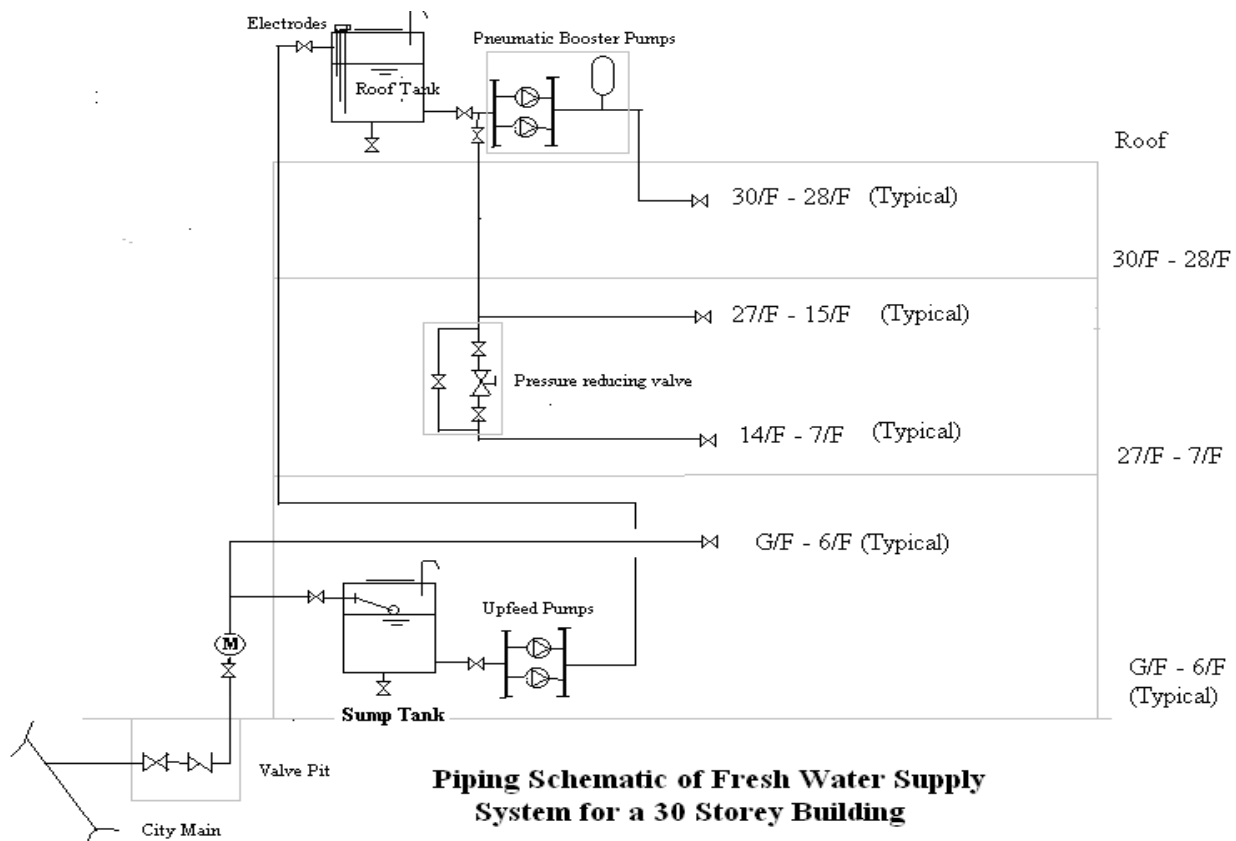


Tutorial – Cold water Supply

1. The pressure on the water mains during peak period is capable of supplying water up to 6/F. A high rise commercial building has the following cold water supply system design information:
 - a) G/F: intake from city water mains, sump tank and pumps;
 - b) 1/F to 30/F: residential flats;
 - c) Roof: roof storage tank;
 - d) Storey height: 3 meters.

Draw a schematic diagram of potable water supply system for this building. Label all the major components in the diagram and briefly describe their functions.

- 1) Sump tank and roof tank – to provide water storage for cold water system;
- 2) Up-feed pumps – to transfer water from sump tank to roof tank;
- 3) Pneumatic booster pump – to boost up water pressure for the top 4 floors;
- 4) Pressure reducing valve – to serve to reduce water to acceptable level for lower floors as the water pressure may be excessive due to gaining of static pressure.



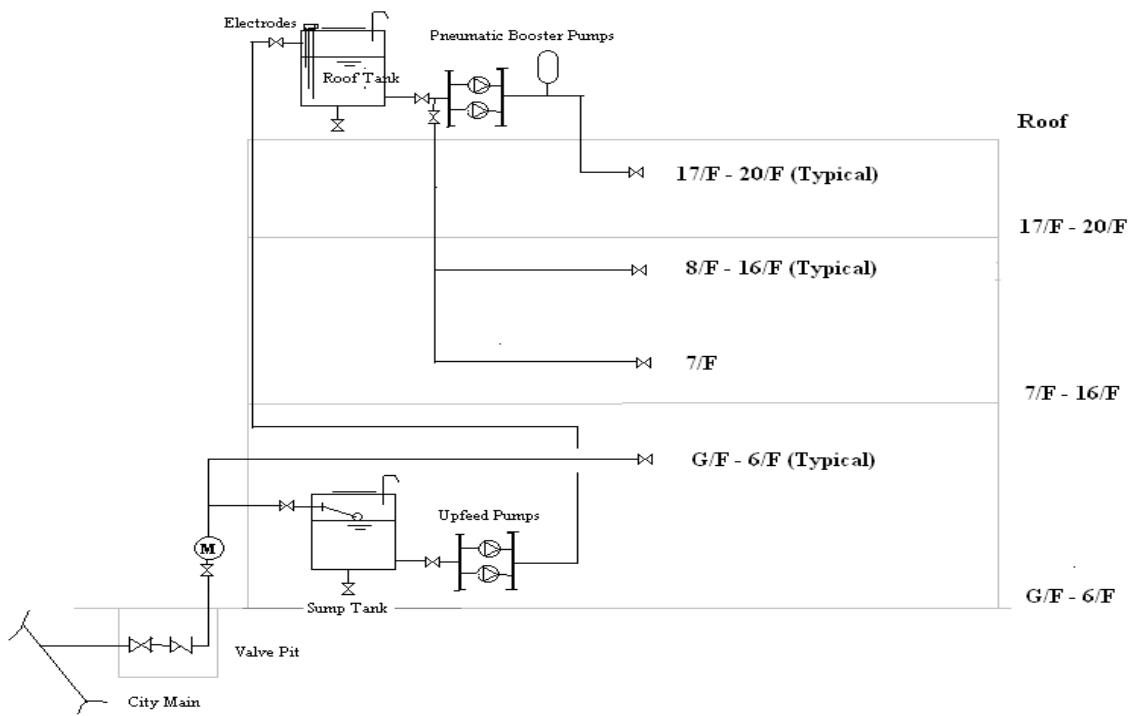
2. Compare the advantages and disadvantages of providing large water storage tanks in a building.

Advantages	Disadvantages
It prevents contamination of the main supply	Space and support have to provide for the storage cistern and incurred higher initial cost.
It provides a reserve against failure if the main supply	Regular cleaning and maintenance of the storage cistern are required.
It permits suspended matters to settle at the bottom of the storage cistern.	It reduces the available pressure head and larger distribution pipes are required.
It reduces pressure to the system that minimizes noise and wastage.	Transfer pumps are required and incurred higher initial and maintenance costs.
It serves as a vent for heating and hot water systems.	

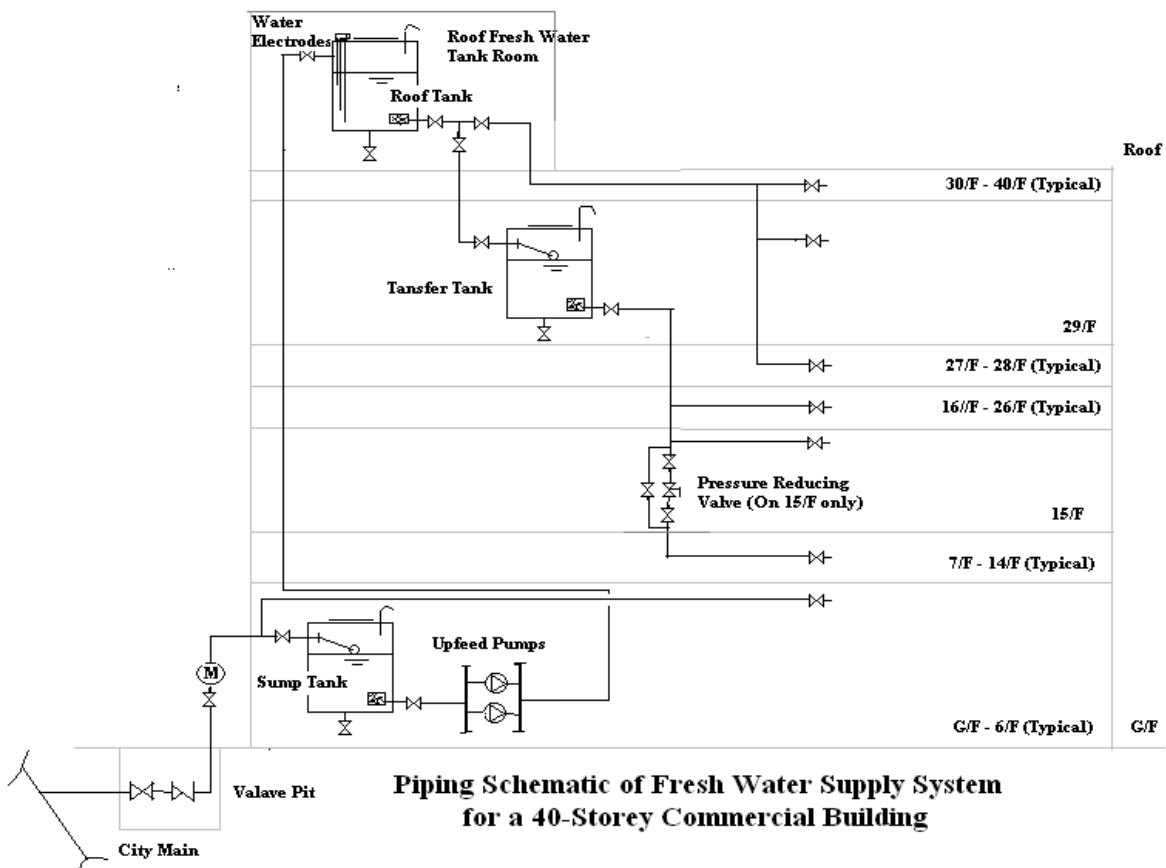
3. Sketch a schematic diagram of the fresh water supply system for a 20-storey office building.

The following information are given:

- i) no basement;
- ii) floor to floor height including G/F is 3m;
- iii) sump tank to be located on G/F;
- iv) water pressure from roof tank is insufficient for the top 4 floors.



4. With aid of a piping schematic diagram, briefly describe the operation of a sump and pump system for supplying potable water to a 40-storey commercial building.
- The water supply system for the building is divided into three zones. For low- zone floors, the supply points are connected directly to the city main. Booster pumps are provided to pump the water from ground floor up to the roof tank. The roof tank provides water supply for high-zone floors and the break tank serving the mid-zone floors. The break tank at mid-zone provides water supply for the mid-zone floors. Both roof tank and break tank should be located at least the two floors above their highest supply points. With this system, the velocity of supply water could be maintained to below the critical velocity of 3 m/s.



5. Describe with the aid of a diagram, the operating principle of a hydro-pneumatic system.

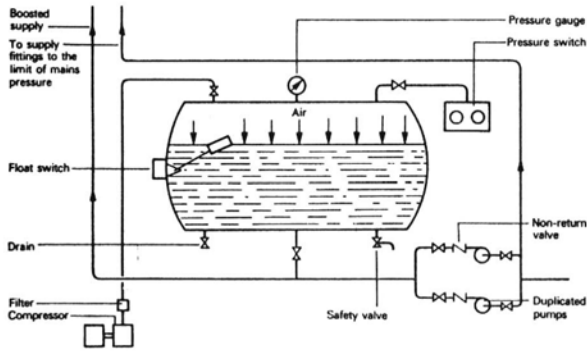


Fig. 4.2 Pneumatic tank structure

Water supplies are pumped into a pressure vessel, the pressure vessel is normally filled about 2/3 of its height and 1/3 being filled with compressed air.

The compressed air imposed a pressure on the surface of the water which in turn imposed the same pressure on the entire system.

As water is drawn off at various point, the pressure inside the pressure vessel will fall and at this time a pressure switch will operate the pump to refill the pressure vessel.

Second pressure switch may be fitted to bring on the stand by pump in the event of selected pump being unable to meet with a period of excessive demand.

Float switch comes into action at high water level to start the compressor to replenish air which is periodically absorbed by the water.

Ball valve to storage cistern of this type of system should be of the delayed action type to conserve the pressure built up and minimize the number of pump operation. Refer to Fig.4.2.

(End)

Cold Water Supply – Tutorial 2 Answers

1. State four advantages of providing water storage for water supply to buildings.

The advantages are:

- a) to serve as a position break and prevent contamination of the main supply;
- b) to provide a reserve against failure of the main supply;
- c) to reduce pressure of the installation which minimizes noise and wastage;
- d) to serve as a vent for heating or hot water supply system.

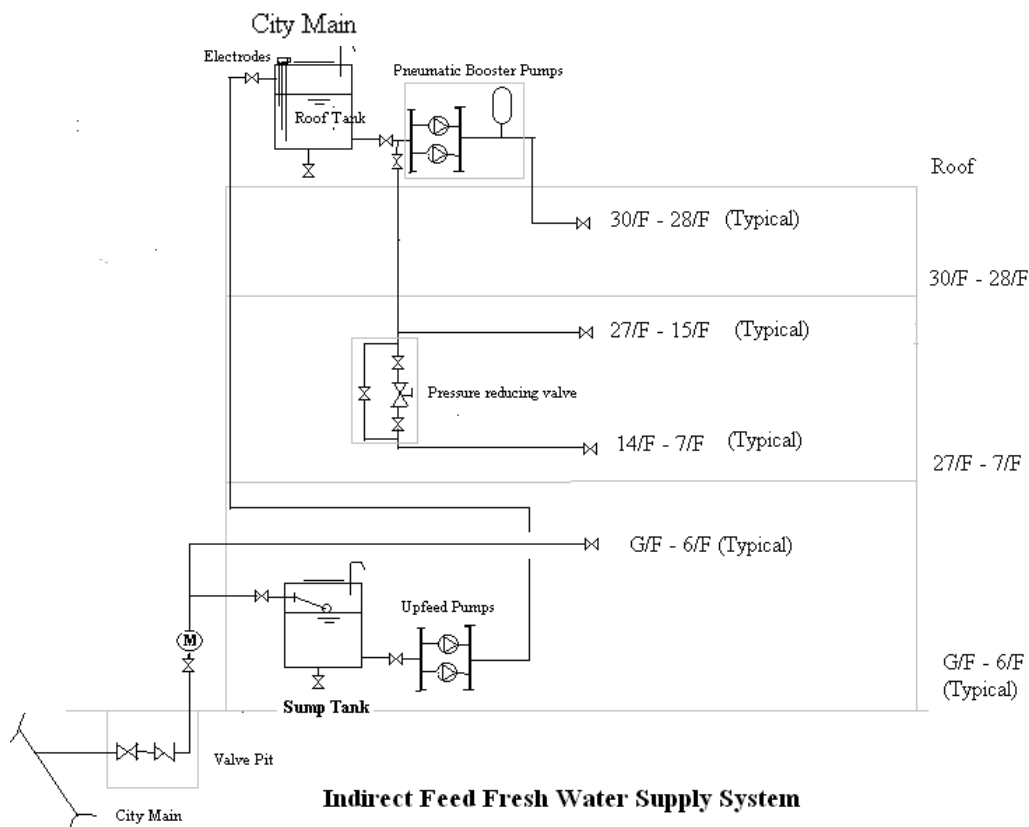
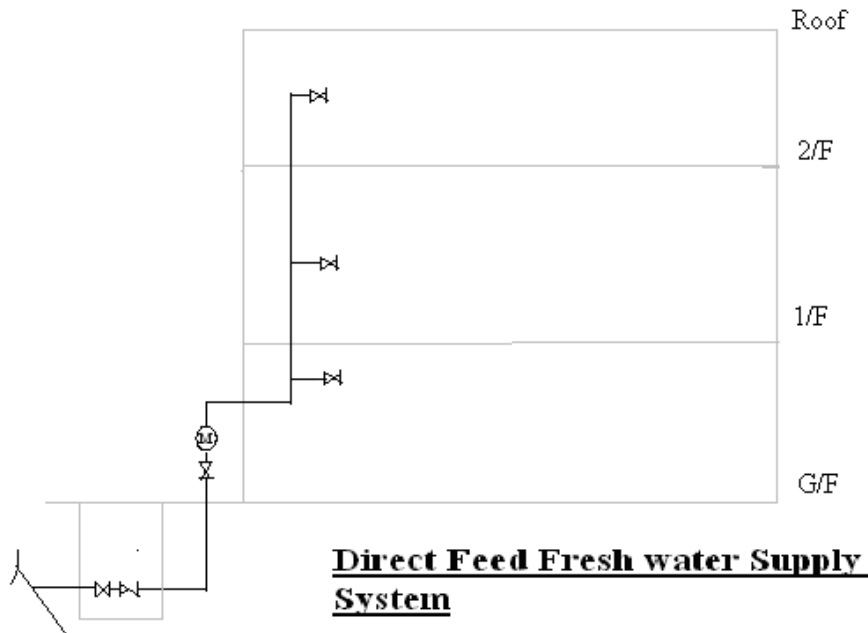
- 2 With aid of a piping schematic diagram, briefly describe the direct and indirect feed fresh water supply system.

Direct feed fresh water system – all the fresh water supply points of sanitary fittings are directly connected to city main. The system is suitable for a building in which the pressure is enough to feed water to highest floor of the building.

Indirect feed fresh water system – the water pressure of city main is insufficient to feed water to the higher floors of a building. The water pressure has to be boosted by one of the following methods:

- a) an elevated water tank system;
- b) a hydro-pneumatic system;
- c) a booster pump system.

Fresh water supply system involves the use of one or above methods to maintain the desired pressure to the supply points on higher floors is called indirect feed system.



3. State the functions of the service reservoir.

The functions of a reservoir are:

- a) to maintain a constant pressure to all supply points;
- b) to serve as a storage tank for peak demands;
- c) to permit solid particulates in water to settle in the service reservoir.

4. State the advantages and disadvantages of the sump and pump system.

Advantages	Disadvantages
Relatively constant pressure to all supply points.	Space required to install sump pumps.
Sump tank serves as a buffer for peak demands.	Maintenance cost for sump pumps.
Sump tank permits solid particulates to settle at the bottom of the tank.	Cost for construction of sump tank.
Sump tank eliminates the risk of contaminating the water source.	Cleaning of sump tank is required at proper time intervals.

6. State the piping materials to be used for potable and flush water systems.
The piping materials used for:
- Potable water system - Copper tube;
Stainless steel pipe;
Lined galvanized iron pipe;
Ductile iron pipe.
 - Flush water system - PVC pipe;
Ductile iron pipe;
Galvanized iron pipe.

(End)

Cold Water Supply – Tutorial 3 Solution

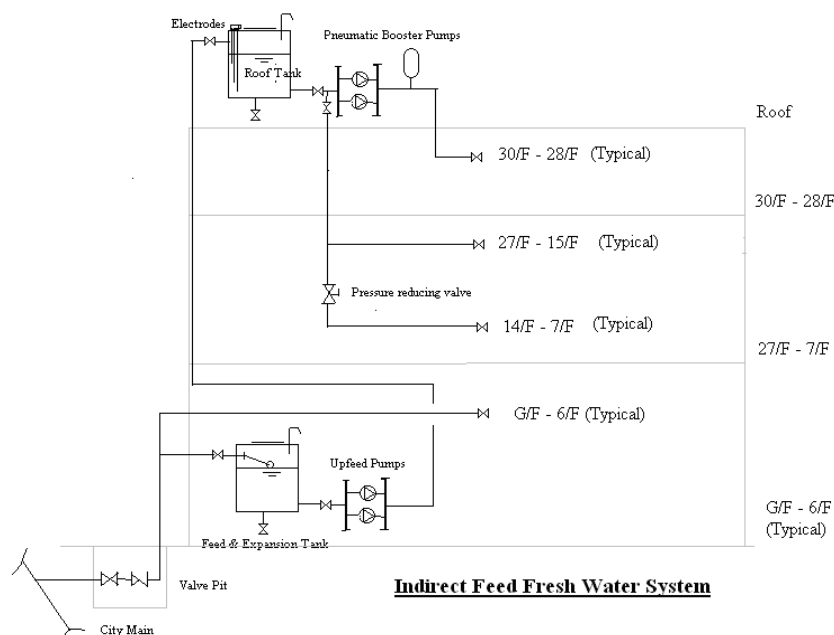
- Excessive or insufficient pressure head of cold water supply may be encountered in high-rise building using gravity supply system.
 - Identify the locations where low pressure and high pressure problems may occur, and
 - Illustrate with the aid of sketches, the possible ways to solve these problems.

For direct water supply system, insufficiency pressure may occur at the top floors (above 6th Floor). This problem can only be resolved by increasing the size of pipe riser to minimize the pipe friction loss and to maintain sufficient pressure at the highest draw off point. Excessive system pressure rarely occurs in direct water supply system, as pressure head is maintained by the service reservoir which is very constant with little fluctuation.

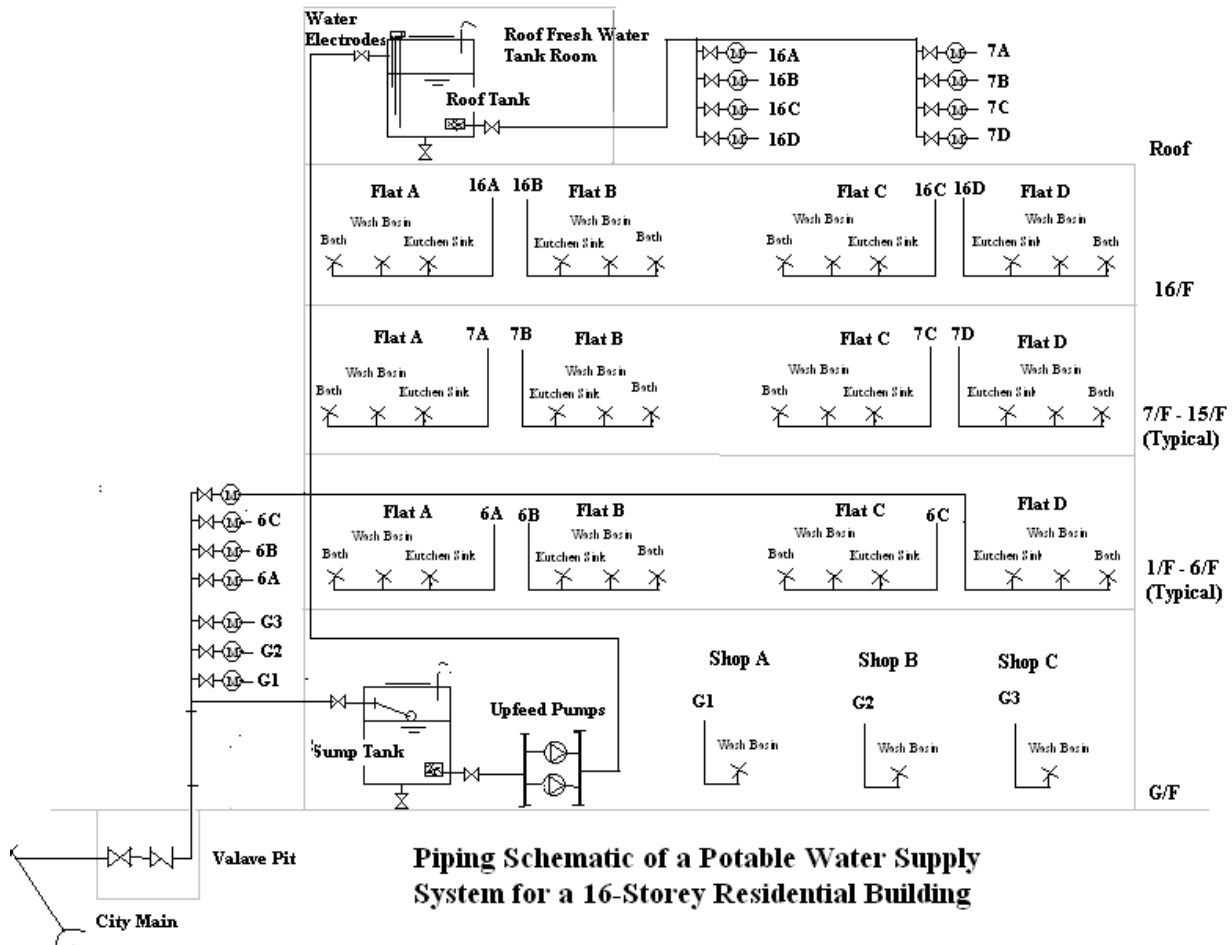
For indirect water supply system, insufficiency pressure may occur at the top three floors. This problem can be resolved with one of the following methods:

- Raise the water supply tank to increase the available static pressure head;
- Install a hydro-pneumatic pump set to boost the supply water pressure;
- Increase the pipe size of the down pipe to minimize the pipe friction loss so as to increase the available static pressure head.

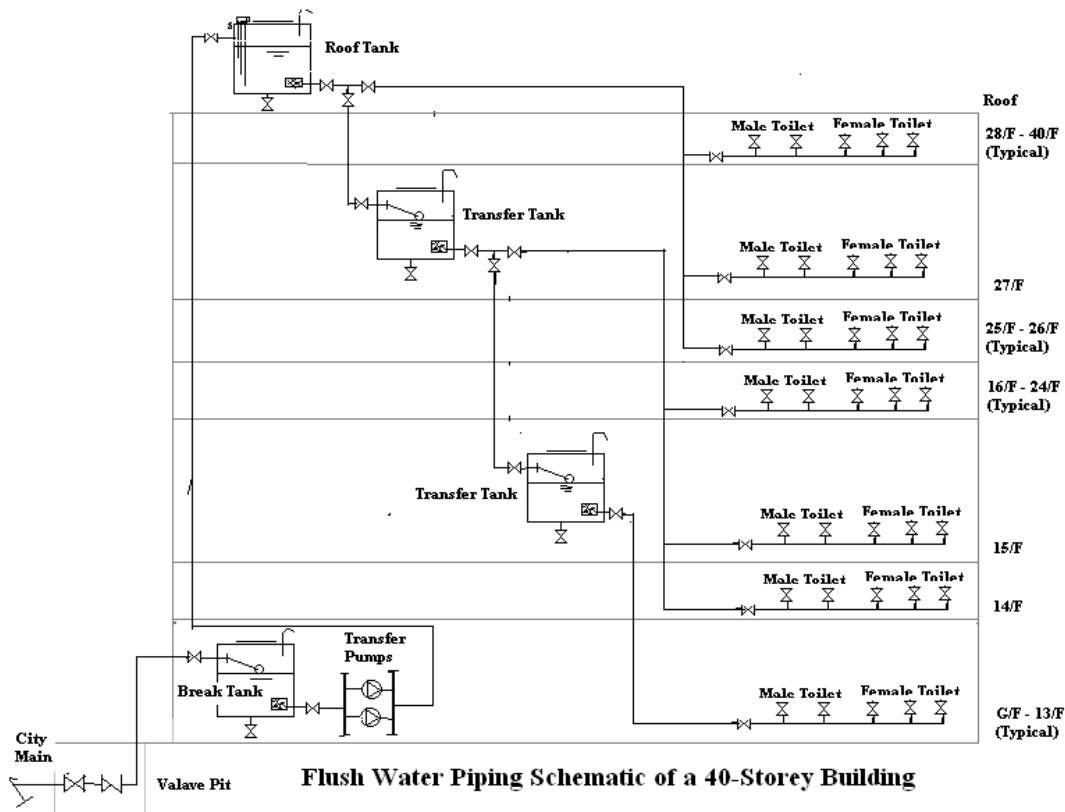
Excessive water pressure always occur in indirect water supply system. Pressure reducing set has to install at about 15 floors below the storage tank or every 15 floor interval to reduce supply water pressure to desired level.



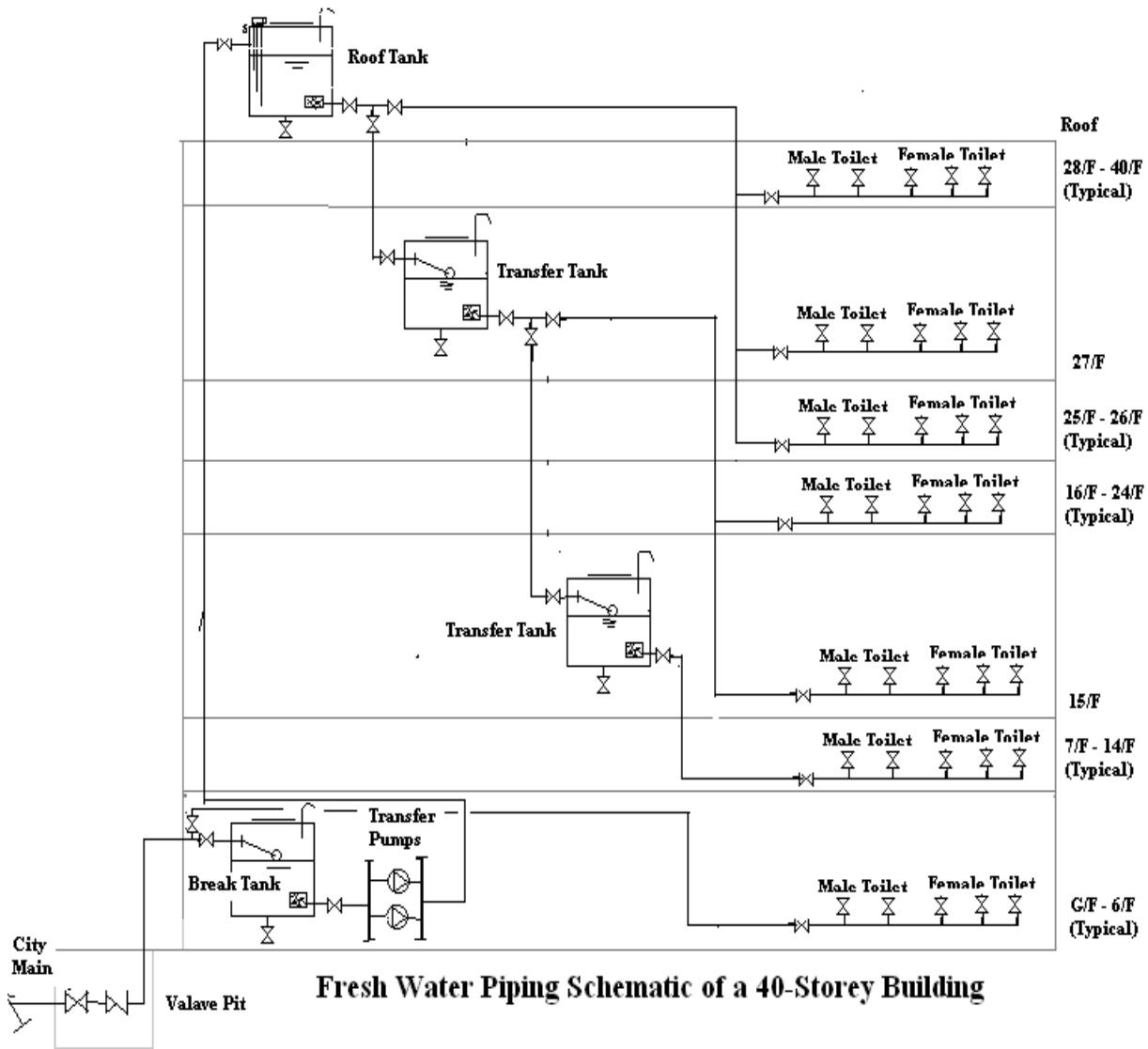
2. Draw a suitable schematic diagram of the fresh water supply system for a 16 storey (G/F to 15 /F) residential building which has four flats on each floor except G/F. Each flat is equipped with a bath, a wash basin and a kitchen sink. It is known that Government supply water main pressure can supply water up to 6/F.



3. Sketch a piping schematic diagram of a flush water system for a 40-storey office building.



4. Sketch a piping schematic diagram of a fresh water system for a 40-storey office building.



(End)