"HOUSE CONNECTION WORK IN SEWER LINE"

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Abstract

Sewerage involves the major portion of the cost of a wastewater system. In the design of a sewerage system the sewer line is the basic unit occurring repeatedly in the design process. Any savings during the design of this unit will affect the overall cost of the sewerage system. There are two types of sewer systems: storm water systems and sanitary sewers. Storm water systems or drains carry rainwater, ground water and road runoff water to an open body of water, such as streams, lakes and oceans. Sanitary sewers, however, carry wastewater from residential and commercial buildings to a treatment plant where the contaminants in the water can be removed. Since the 1930s, storm drains and sanitary drains have been installed separately to prevent cross contamination. In a residence, the home's drain system is connected to the city sewer by an underground pipe called a lateral line, usually 4 to 6 inches in diameter, installed at a slope to use gravity for water flow. The size of the home's drain piping is determined by the amount of flow possible and the type of waste material anticipated. For example, a bathroom sink usually has low volume and little if any solids in the water. These pipes are normally 1 ¼ inches in diameter. Bathtub, washing machine and kitchen sink drains carry larger volumes, with food and other solids possible in the kitchen sink. Therefore, a larger diameter pipe is necessary, usually 1 ½ inches in diameter. Any plumbing beneath the house is large enough to accept the flow from the fixture drains. A 2-inch diameter pipe is common. All of these drains flow into the toilet drain to exit the building, so the toilet drain is the largest and matches the lateral line going to the city sewer system.

Keywords- Sewer Network, Sewage, Connections

Introduction-

A sewerage system is composed of various sewer lines terminating at the junction of a large sewer line. The large sewer line also terminates at the junction of a still larger sewer line. Finally, the main sewer line terminates at the outfall. Thus, a sewerage system can be viewed as a set of sewer lines collecting discharges at their nodal points and emptying into another set of sewer lines.

Sewerage networks are an important part of the infrastructure of any society. The main purpose of providing the sewer network is to carry away sanitary waste from a municipal area in such a way that it does not cause any public health related problems. It is known that urban sewerage system provide one of the basic infrastructure facilities to transport sanitary waste to sewage treatment plant. Sewerage network infrastructure conveys wastewater used by individuals, commercial and industrial establishments to wastewater treatment facilities, ultimately to be returned to the natural environment. A sewerage network is just a reverse action of water supply network. The cost of laying a sewerage system is appreciably high compared to the water supply system. It involves a large cost with need for daily maintenance, and the operational coast is one of the major expenditures. In respect of this view, many research works are being done to design a cost effective sewerage network with the given constraints and guidelines.

A house sewer is the term given to the connection of the horizontal house drainage system to the public sewer. It is where all waste and soil pipes inside the home or building will ultimately discharge. The house drain extends through the foundation wall and continues from the main drain to where it enters a public sewer or cesspool.

Under most conditions, it is highly recommended that a house sewer drain be used to serve only one building. Large metro areas often have huge buildings that require two drains and sewers in order to manage the enormous amount of sewage created in them. Even in this case, the two sewer systems are completely separated according to whichever side of the building each serves.

Usually, the house drain stops about 10 feet (3.04 meters) outside the home's foundation walls. It is here that it enters the house sewer, which is usually made out of vitrified earthenware pipe, although in some homes it may be constructed of cast-iron. Most plumbing ordinances prohibit the existence of earthenware piping anywhere inside the foundation walls, including any part of the drainage system. This is due to the fact that cement joints used in this version of piping are prone to crack or bust open. If that happens, sewage will leak out, causing unsanitary conditions.

How drain lines work

All drain pipes should be connected to a network of ventilation pipes that go up through the roof. Venting prevents sewer gases from drifting out of drains into living quarters. Experts say it's a good idea to inspect a sewer line with a camera before you purchase a home. During the inspection, make sure the inspector confirms that all venting pipes are present.Most plumbing fixtures have curved "trap" sections that hold a little water, forming an airtight seal to keep gases in. This section of pipe is easily removed to clear clogsToilets also have a trap, which is what keeps standing water in the bowl. The toilet drain is the largest drain pipe in the house.All household drains meet below the house in a main drain that carries the wastewater to the municipal sewer lines or to a septic system. A Y-shaped pipe in a basement or crawlspace provides clean-out access.

Sanitary vs. storm sewers

There are two types of sewer systems: storm water systems and sanitary sewers. Storm water systems or drains carry rainwater, ground water and road runoff water to an open body of water, such as streams, lakes and oceans. Sanitary sewers, however, carry wastewater from residential and commercial buildings to a treatment plant where the contaminants in the water can be removed.Since the 1930s, storm drains and sanitary drains have been installed separately to prevent cross contamination. In a residence, the home's drain system is connected to the city sewer by an underground pipe called a lateral line, usually 4 to 6 inches in diameter, installed at a slope to use gravity for water flow.The size of the home's drain piping is determined by the amount of flow possible and the type of waste material anticipated. For example, a bathroom sink usually has low volume and little if any solids in the water. These pipes are normally 1 ¼ inches in diameter. Bathtub, washing machine and kitchen sink drains carry larger volumes, with food and other solids possible in the kitchen sink. Therefore, a larger diameter pipe is necessary, usually 1 ½ inches in diameter.Any plumbing beneath the house is large enough to accept the flow from the fixture drains. A 2-inch diameter pipe is common. All of these drains flow into the toilet drain to exit the building, so the toilet drain is the largest and matches the lateral line going to the city sewer system.

Drain clogs

Home owners can often fix drain clogs themselves if the problem is confined to specific fixtures such as a sink drain or a toilet. However, when all drains are affected — or when you see warning signs, such as water going down one drain and backing up in another — that generally means the main drain is clogged. Call a plumber who specializes in clearing drains.If it's a blockage from something flushed down a toilet, clear the drain by using a plumber's auger or snake. However, in older neighborhoods, the cause may be tree roots. Older sewer lines were made from fired clay and as they age and weaken the tree roots creep in.Drain experts are often able to bore through the roots and clear the drain, but in many cases the original drain pipe has become so deteriorated that the new passageway eventually collapses. When this happens the drain line usually needs to be replaced.When lines become clogged and damages occur, in the majority of cases, the homeowners' responsibility begins at the connection point to the city sewer system and includes the lateral lines and all drain plumbing in the home. Any maintenance, repairs and unclogging of these lines must be done by the homeowner, often with the help of a plumbing service.While the indoor piping is relatively easy to repair, underground lateral lines require specialized equipment and tools, so those repairs often require a plumber.

House Sewer Connections In New York City

When a new house sewer is installed in NYC there are 6 basic types of sewer connections that meet code requirements. The most usual is the spur connection, and a spur is also the least costly to connect to when it is available. However, as time has passed it is more and more usual for building lots to be split. This creates new buildable lots, and decreases the availability of spur connections. Another factor involving the availability of a spur connection is when previously undeveloped land is developed. Due to the above factors, more often than in the past other types of house sewer connections have to be utilized and built.If you are developing a property in NYC it is important to familiarize yourself with these connections as they can add substantial cost to a project. What follows is a description of the 6 types of sewer connections used to connect a house sewer to a city sewer.

1. Supur connection- A spur connection is the most common of all connections used for a house sewer. Basically a spur on a city sewer is a wye in the city sewer with a plug on the outlet side. The plug is removed when a future house sewer connection is made. The spur itself is typically 6″, with the exception being 8″ sizes in Manhattan. This is because the minimum size for a house sewer in Manhattan is 8″. Having a spur available for connection prevents the need for drilling into the public sewer which is more costly and if not done properly can cause damage to the public sewer. In most cases spurs are ideal for a new sewer connections.

2. Fold in sewer connections

Fold in sewer connection

When the city sewer is only one size larger than the connection size required, and no spur exists, a sewer contractor must fold in a new spur in most cases. This typically occurs when the public sewer is 8″, a size no longer legal as a public sewer in NYC, and a 6″ connection is required.

A fold in requires actually removing sections of the city sewer, then folding in three new sections of pipe one of which is a wye to be used as the connection for the house sewer. All new sections of pipe must then be encased with an approved concrete mixture. A new fold in connection adds to the cost of a new sewer installation.

3. Curb connection

A curb connection is usually found on two occasions. A curb connection avoids the need to open the roadway in order to complete a sewer installation. The first case is when a new public sewer is installed. Frequently as part of the new public sewer project a new pipe is installed up to the curb line for each building, and also for buildable lots that have not yet been developed.

The second case where curb connections are found is when a previous building has been demolished and the service for that property was plugged at the curb line, as is required by code. When a property is redeveloped a plugged curb connection can be frequently re-used at a substantial savings to the property owner.

4. Drill in sewer connections

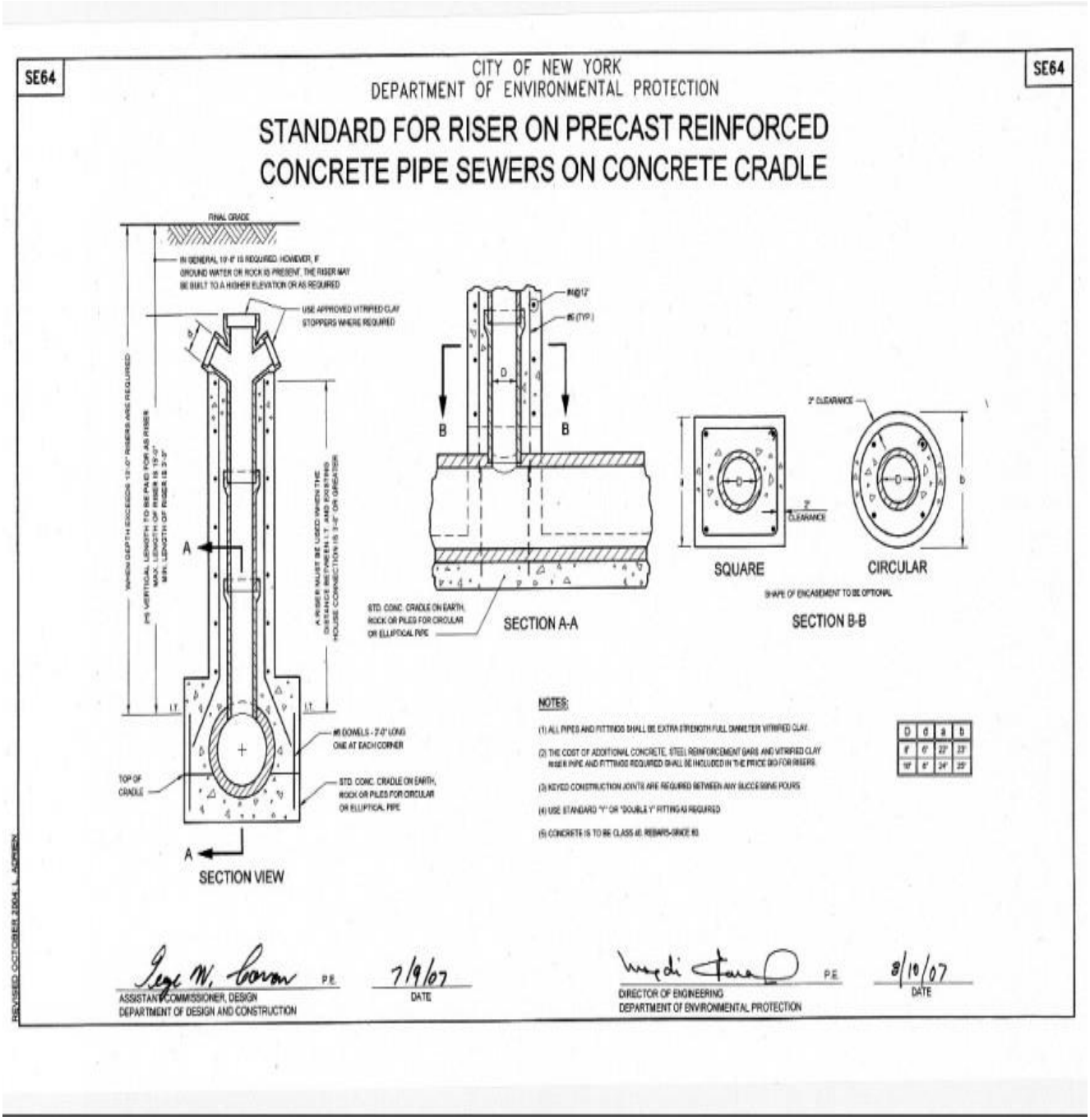
Core drilling machine

When a new connection is required into a NYC sewer and no connection is available, the most usual connection required is a drill in. This is performed using a core drill machine. It is not permitted to chop into a NYC sewer using hand or power tools.

A hole is carefully cored through the NYC sewer a specific size larger than the pipe size to be connected. In most cases the city sewer must be prepared before the core drill is done by encasing the public sewer in concrete. In other cases a concrete cradle must be installed under the public sewer. The concrete reinforces and strengthens the city sewer from the added stress of the core drilling and the future house connection.

5. Riser connection

A riser connection is a vertical connection built on the top of a city sewer for use as a connection for a house sewer. Depending on the size and type of the public sewer different designs are used in the construction of a riser.



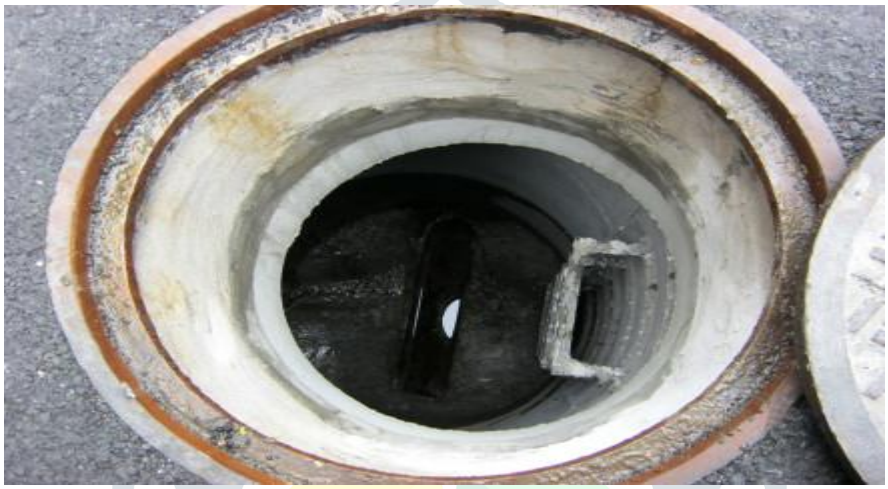
When is a riser connection required?

It is usual for a riser connection to be required when the depth of the public sewer is greater then 13′. A riser connection can also be required if a groundwater or a rock condition exists. In these cases it is meant to alleviate the cost to property owners of having to excavate to great depths, or through groundwater and rock, in order to connect properly to the main sewer line. If a future sewer repair is needed, a riser also lowers the cost at that time as well. A riser is also required when the difference in elevation from the point where the house drain exits the building to the city sewer is greater than the pitch that is allowed to be used. As sewers work on the principal of gravity, pitching the pipe is used so the waste-water runs off properly.

Only a maximum of 1′ of pitch is permitted for every 4′ of run of pipe. Therefore a riser must be built sometimes when the difference in elevation is too great to use allowable pitch. Risers must always be one size greater than the size of the connection size from the building. In NYC where the minimum size of a sewer connection is 6″ the size of a typical riser is 8″.

8″ Riser Connection Being Built

6. New manhole connection



Finished manhole built by Balkan

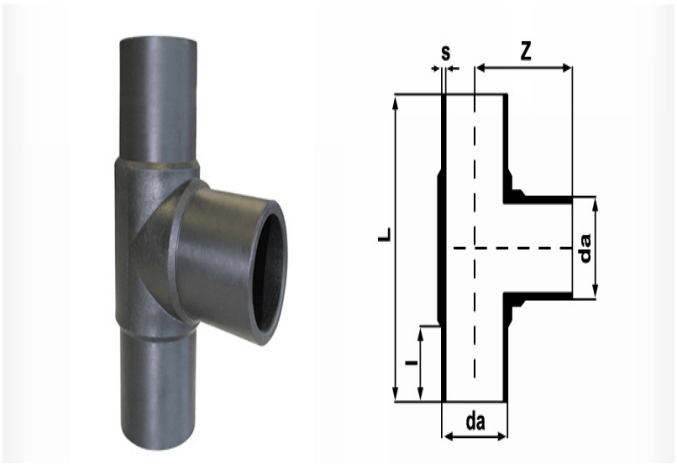
In rare instances a new NYC DEP approved manhole has to be built for connection to the city sewer. This is required typically for very large house sewer connections such as for a 12″ house sewer.

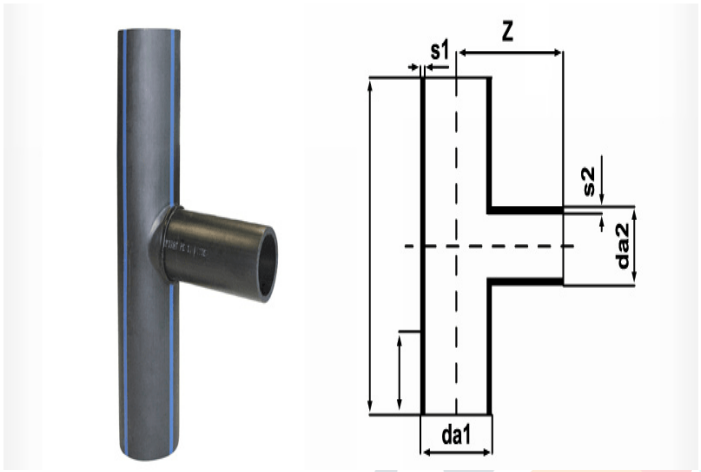
A manhole connection involves purchasing precast concrete rings from an approved vendor. The other components are a top slab with a ring and manhole cover. Using precast concrete lowers the total cost by eliminating form work , and the associated lumber and labor. All the steps involved in building a manhole are very closely monitored and inspected by NYC DEP field inspectors.

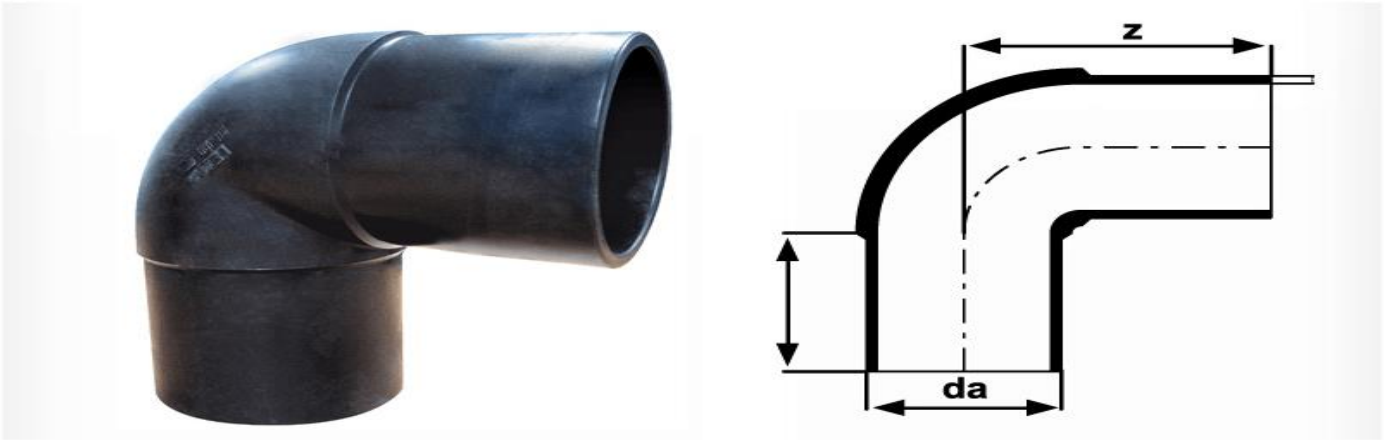
In terms of cost the manhole material alone costs in excess of $2,000.00 including delivery. Once other costs such a labor, ready mix concrete, and roadway restoration are factored in a manhole connection, it is by far the costliest means to connect to a city sewer. In some cases it is less expensive to install two smaller sized house sewers in order to avoid having to build a new manhole connection.

HDPE Pipe-

HDPE Pipe, Polyethylene (PE Pipe) are sorted by strength classified according to the intensity of the earlier technological developments. HDPE Pipe pressure classes that can be made between Pn4-Pn32 and the production of the desired diameter and size of HDPE pressure pipe system has undergone many tests in 1950, particularly in the carriage of drinking water. After the result of these tests of HDPE Pipe, if all reports are positive then it has no harmful effect on human life. One of today's most widely used pipe is HDPE piping systems which is economical, easy in handling, efficient performance, easy method of coupling. Is quite useful and is produced by KUZEYBORU







RAW MATERIAL OF POLYETHYLENE PIPE

Polyethylene Pipe, Pe 32 class is developed in 1950 with improving technology and low density. 3rd Generation PE 100 Polyethylene raw materials are used in drinking water pipelines, desalination plants, biological treatment plants, swimming pool piping, sea discharge lines, gravity flow water lines, gas stations , irrigation lines, compressed air lines, cooling-heating lines, pre-insulated sheathing for pipes. Because Low Density Polyethylene Pipe is economical and has high-performance in many areas, such as sewer lines has been a solution. (C2H4) has the general formula of crude oil of 97% polyethylene and is a thermoplastic polymer as shown. The production of raw materials, entirely depends on the availability and price of crude oil. Polyethylene density is divided into three main groups according to their crystalline structure percent.

• Low density polyethylene raw material (LDPE)

• Medium density polyethylene raw materials (MDPE)

• High density polyethylene raw materials (HDPE)

According to other types of raw materials as well as their field of high performance and long life due to the strength of economy most preferably 97% of the product which is used crude for the production of the polyethylene raw material. So the production of polyethylene raw materials, the availability and the price depends entirely on crude oil. It also has many superior properties compared to other thermoplastic polyethylene. The main ones are

* **HDPE Pipe** is resistant to weather conditions

* **HDPE Pipe** High resistance to tearing and pressure

* **HDPE Pipe** Despite high resistance to stress cracking

* HDPE Polyethylene Pipe -30 And -60 degree to strength

* High Density Polyethylene Pipe have corrosion resistance

* Easy and reliable assembly of HDPE Pipe

* In HDPE Pipes Lower level compared to metal pipe friction losses

* HDPE Pipes, Reduced flow noise

* Electrical full insulation, it is a good thermal insulation

* HDPE Pipes are non toxic.

* HDPE Pipe is suitable for radioactive waste.

Advantages of HDPE Pipes

HDPE pipes with a history of 60 years of technological developments that have positively influenced and until today has become one of today's most preferred tube.

• HDPE pipes**;** It maintains the general properties of the fluid inside.

• HDPE pipes; moss on hold due to the inner surface can be used in drinking water systems.

• HDPE pipes; Due to its chemical nature, it has a high resistance to chemicals.

• HDPE pipes; To take shape and slope of the sloping terrain by laying is very simple due to be flexible.

• HDPE pipes; Due to its high elasticity properties, for use in areas where a lot of seismic activity is very comfortable. It can orient itself according to the direction of movement of ground motion and does not break.

• HDPE pipes; Other types of pipes

• HDPE pipes; welding and assembly methods are very simple.

•HDPE pipes; Easy to carry because of the weight and thus shipping is cheap.

• HDPE pipes; It is highly resistant to acids and alkalis. Only damaged by nitric acid.

• HDPE pipes; Environmentally Friendly.

• HDPE pipes; Are not affected by underground, there is no refractive properties.

• HDPE pipes; it do Not conduct electricity.

• HDPE pipes; a good level of friction, wear and has a rustproof.

• HDPE pipes**;** It is strong against microorganisms.

Guidelines for Plumbing/Sewerage Pipe Works

Proper pipe work for sewerage and plumbing work ensures hygienic conditions in any building. All connections with main or branch pipes should be arranged in a way that can prevent cross flow from one appliance to another. Soil, waste and building sewer pipes should be of sufficient diameter in the direction of flow. Keep in following tips while designing and executing layout of sanitary pipes for the drainage of a building.

- In sewer line minimum gradient should be 1 in 57 for 100 mm diameter pipe and 1 in 100 for 150 mm diameter.
- Pipe works and appliances should be arranged in a way that allows close grouping of connections with water closet near main soil pipe.
- Branch pipes should be kept short to reduce noise.
- When washbasin and bathroom are at some distance from stack, it may be cheaper and simpler to combine their waste pipe in to one pipe.
- Any bend in waste pipe should be of large radius.
- Pipe works in branch connections should be arranged to allow free drainage of system.
- Connections with main or branch pipes should be arranged in a way that can prevent cross flow from one appliance to another.
- Branch connections should be of large radius along the invert.
- Minimum diameter of soil and waste stacks should be 100 and 75 mm respectively.
- Covered pipes or hard to find pipes along internal face of walls should be of cast iron.
- On ground floor all pipes including those laid on external face of the wall should be of cast iron also.
- Sufficient condition should be made to access all pipe works.
- Embedding of joints in walls should be avoided.
- All appliances connected to stack should be trapped directly.
- The soil, waste and building sewer pipes should not be reduced in diameter in the direction of flow.
- Cast iron fittings and branches for waste pipes should be of same quality.

7 References-

1. Argaman, Y., Shamir, U., and Spivak, E. (1973). ‘‘Design of optimal sewerage system.’’ J. Envir. Engrg. Div., ASCE, 99(5), 703–716. ASCE Task Force on Friction Factors in Open Channels. (1963). ‘‘Friction factors in open channels.’’ J. Hydr. Div., ASCE, 89(2), 97–143.
2. Binder, R. C. (1975). Fluid mechanics, 5th Ed., Prentice-Hall of India, New Delhi. Camp, T. R. (1946). ‘‘Design of sewers to facilitate flow.’’ Sewage Works J., 18(1), 3–16.
3. Charalambous, C., and Elimam, A. A. (1990). ‘‘Heuristic design of sewer networks.’’ J. Envir. Engrg., ASCE, 116(6), 1181–1199.
4. Christensen, B. A. (1984). ‘‘Discussion of ‘Flow velocities in pipelines,’ by Richard R. Pomeroy.’’ J. Hydr. Engrg., ASCE, 110(10), 1510–1512. Cook, L. A., and Lockwood, B. (1977). ‘‘The investigation of sewer network by computer.’’ J. Inst. of Civ. Engrs., Part 2, 63(2), 481–494.
5. Dajani, J. S., Gemmel, R. S., and Morlok, E. K. (1972). ‘‘Optimal design of urban wastewater collection networks.’’ J. Sanit. Engrg. Div., ASCE, 98(6), 853–867.
6. Dajani, J. S., and Hasit, Y. (1974). ‘‘Capital cost minimization of drainage networks.’’ J. Envir. Engrg. Div., ASCE, 100(2), 325–337.
7. Dasher, D. P., and Davis, P. K. (1986). ‘‘Designing sanitary sewers with microcomputers.’’ J. Envir. Engrg., ASCE, 112(6), 993–1007.
8. Elimam, A. A., Charalombus, C., and Ghobrial, F. H. (1989). ‘‘Optimal design of large sewer networks.’’ J. Envir. Engrg., ASCE, 115(6), 1171–1189.
9. Gupta, J. M., Agarwal, S. K., and Khanna, P. (1976). ‘‘Optimal design of wastewater collection system.’’ J. Envir. Engrg. Div., ASCE, 102(5), 1029–1041.