UNDERGROUND COSTS AND INSTALLATION TRADE-OFFS

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I'm sure all of us will agree that the most undesirable subject to discuss is how much is it going to cost me to install my facilities. And what am I going to get in return for these costs?

As you know, there are two types of construction that you can use to install your facilities - Aerial and Underground. Aerial involves the associated cost of pole rental rates, as well as make-ready costs. I am sure that you are all familiar with these costs, and realize that they are continuing to increase steadily. The other method is placing your facilities below ground. When we mention the placing of your facilities underground -- we all seem to shudder. We say we cannot afford to do this type of installation, as the costs are extremely high. Let's examine that statement!

Let's look at some of the reasons why underground installations are increasing in the communication industry. The public is getting disturbed by the unsightly pole lines and the miles and miles of wire. This is causing the public to become insistent for underground installations. Today, better public relations are created by placing your facilities underground. You're the "good guy." Also on the plus side, you will reduce possible damage to your facilities from storms -- such as ice and snow in the north, hurricanes and tornadoes in other parts of the country. You also have a more stable facility, due to the constant temperature range found below ground as compared with the variances encountered in an aerial installation.

We are seeing something else, too -- the local governmental agencies are beginning to insist that all new construction be placed underground.

Of course, with any change, there are certain disadvantages. There are some unknown costs that must be considered on any underground installation, such as locating existing underground facilities of other companies. To name a few -- Power, Telephone, Sanitary, Gas and Water. We must know where they are located in order to eliminate any damage to them while installing our underground services. If there is damage, the repairs can be excessive. In a narrow easement where the other facilities are already in place, we may not be able to use trenching or plowing equipment to place your facilities. This means that the trench must be dug by hand in many cases.

Pre-planning your installation will save you many dollars on your underground construction. Let's now analyze what goes into your pre-planning of going underground. Proper planning the path or route of your installation is one big item. Should your facilities be placed in a rear easement or must they be placed in the front or street side? If they can be placed in a rear easement, you can then serve more houses on both sides of the easement, and also you won't have as many streets, driveways or sidewalks to cross under as compared to a front line installation. Regardless of which method you choose, you will still be placing your facilities under streets, driveways and sidewalks. You will be required in most cases to bore or jack and place a pipe or casing under them. This is one item that can be most costly to you.

Some other items involved in underground CATV construction are as follows:

1. Remove and restore sod.
2. Open trench and install cable.
3. Place pledestals and vaults.
4. Install electronic devices.

With this in mind, using a hypothetical case, let's explore the labor costs for a typical normal installation -- and to keep it as simple as possible, let's use for our cost basis a typical city block with a house on each lot, and each lot 75 feet wide. First, we will place your facilities using the direct burial method in the rear easement. By placing this cable in the rear easement, (see Exhibit A) we will have to remove and restore 610 feet of sod. We will place and splice 650 feet of cable and place 4 pedestal terminals. Let's also use one street crossing that we will have to bore or jack under to serve this easement, and make this 40 feet wide. The total cost for this rear easement installation, for the purpose of illustration, will be $600.

Now -- let's take the same city block and move out to the front or street side (see Exhibit B). Again, we will place the cable using the direct burial method. We will also place and splice the same amount of cable -- 650 feet, and place 4 pedestal terminals. But now, we will only remove and restore 482 feet of sod. You will note that the total feet of sod has decreased -- Why? This is due to our boring or jacking under one driveway at each house lot with an average width of 16 feet or for a total number of 128 feet of boring or jacking. We will also be boring or jacking under the same street to serve this run as we did for the rear easement, which was 40 feet wide. The total cost of this front or street side direct burial installation will be $1,000, which is $400 more than for the rear easement installation.

Let's consider another thing, and that is how are you going to serve your customers on the other side of the street? One method which you could use would be to bore and jack under or cut the street at every other lot line in order to serve your customers. Or, you could duplicate the system on the other side of the street. For boring and jacking or cutting at every other lot line (see Exhibit C the additional cost for the city block would be $300, assuming the average street was 20 feet wide. For placing a duplicate system (see Exhibit D), your costs would double, which means an additional cost of $1,000 for the city block. You would be placing double plant footage. Rather than placing a 100 mile system using rear easements, you would actually be placing a 200 mile system if you went entirely on the front or street side.

Now, let's consider again both installations, but instead of placing your facilities by direct burial method, let's place them in conduit. For ease of comparison, we will use one mile as our measuring unit, which comprises 8 city blocks. All your costs will vary depending upon the type of installation that you make, and the type of conduit that you use. Assuming this, then your labor cost for a mile of direct burial facilities in the back easement will be $4,800 per mile, or said more easily $600 times 8 blocks. In the front, or street side, direct burial installation will cost you $8,000 per mile. The labor cost for back easement facilities using conduit will be $6,000 per mile, and the front or street side installation using conduit will be $9,400 per mile.

Logically, looking at pure initial labor costs alone, you would say the best method would be rear easement without conduit. However, we must always look at the future. With the fast changes that are taking place in our industry today -- and changes that are going to take place in the future, such as:

1. Increased bandwidth capabilities;
2. System redesign for dual plant capacity;
3. Increased labor and maintenance costs;

the obvious is not always the most economical. You, the operator, must decide what type of installation you want and how many dollars you care to spend -- however, proper planning and scheduling will help you save many dollars.

In closing, two points to remember when discussing underground installation costs. Choose a reputable CATV contractor who will work in close liaison with the other utilities and knows the inherent problems in going underground. Be sure that he is capable of installing your facilities to your specifications. Make sure that he keeps an accurate set of as-built drawings, because it is the only way you are going to know where your underground

facilities are located. Once the trench has been closed, and the grass has completely covered the trench line, no one can tell you where your facilities are located -- not even the person who put them in originally.

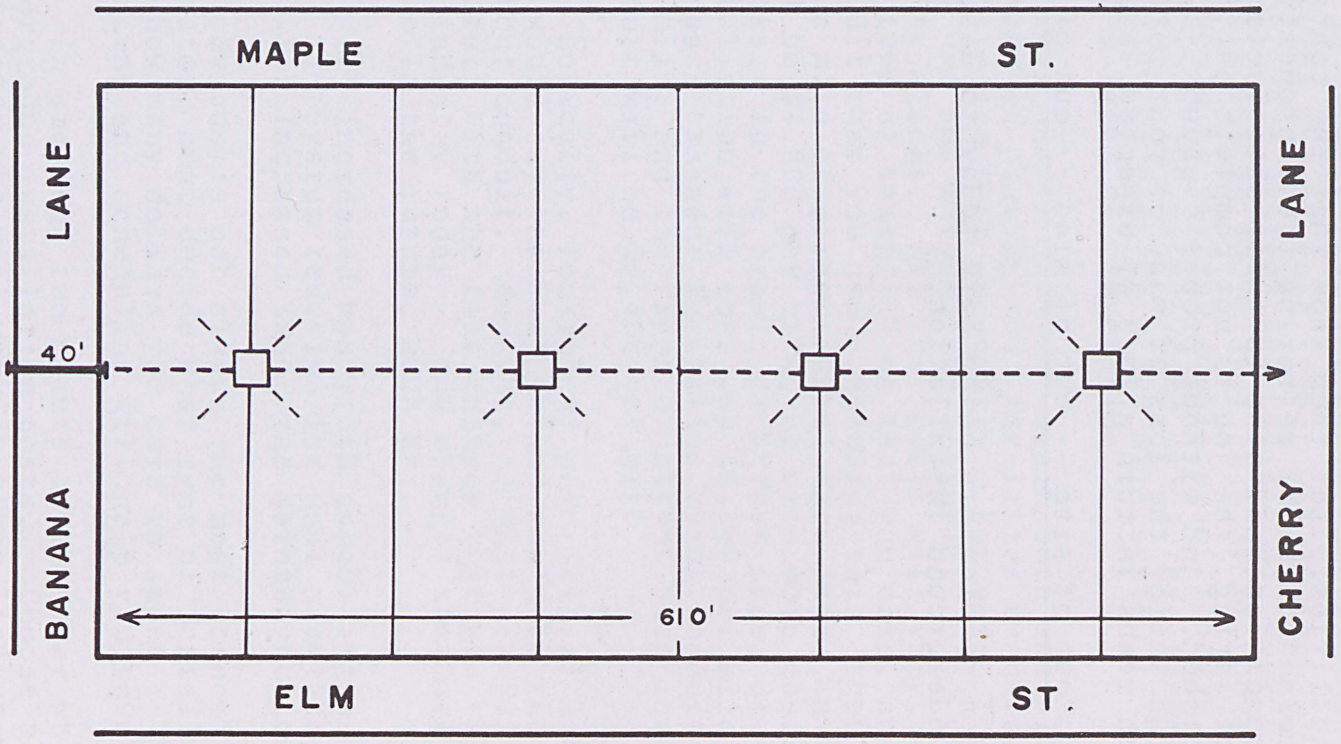
Lastly, don't forget your public image. Let your customer know in advance that you are planning to install underground facilities. Let them know that the contractor will be held responsible for restoring their property to its original condition, and also to their satisfaction. It goes without saying, the job is not complete until the cleanup is finished. And without proper cleanup -- you, the operator can suffer the loss of many of your potential customers which means in turn a loss of expected revenue.

Remember, "out of site -- out of mind -- out of trouble."

It has been my pleasure being here today to discuss the costs of underground installation.

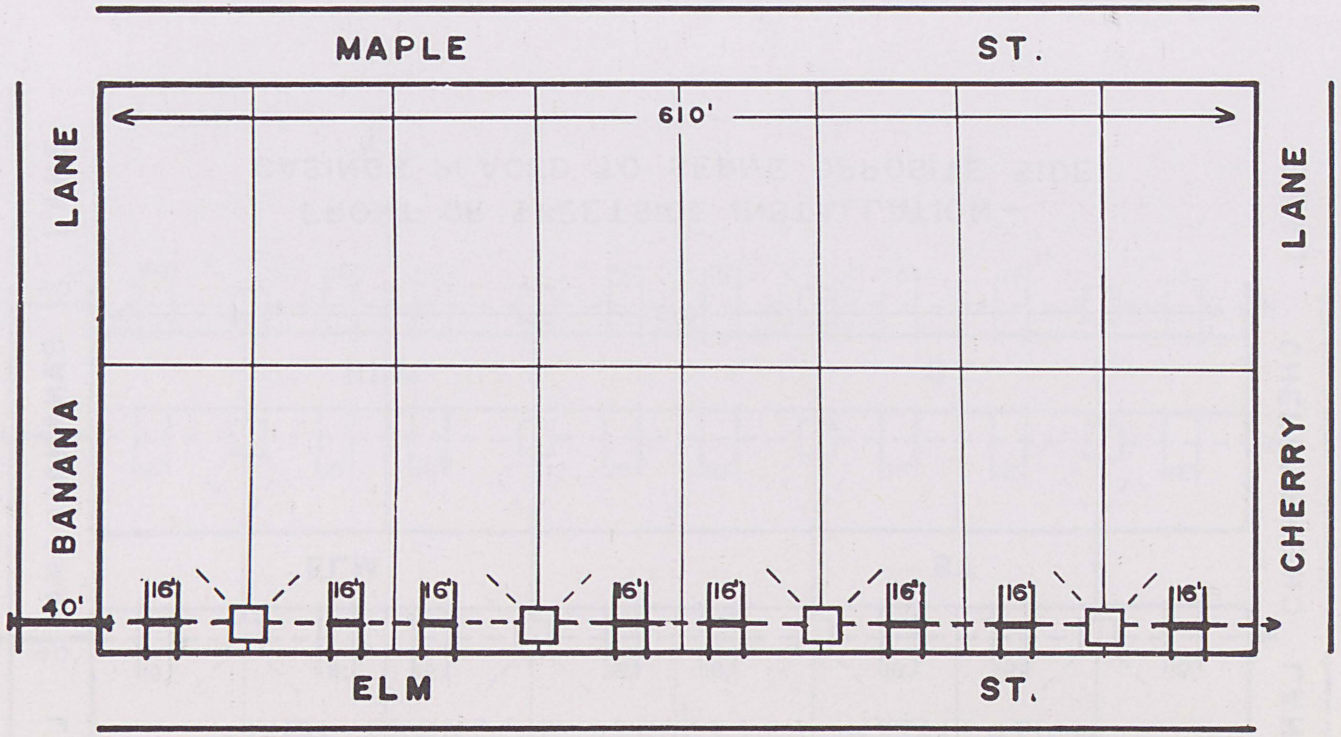
Thank you.

EXHIBIT A



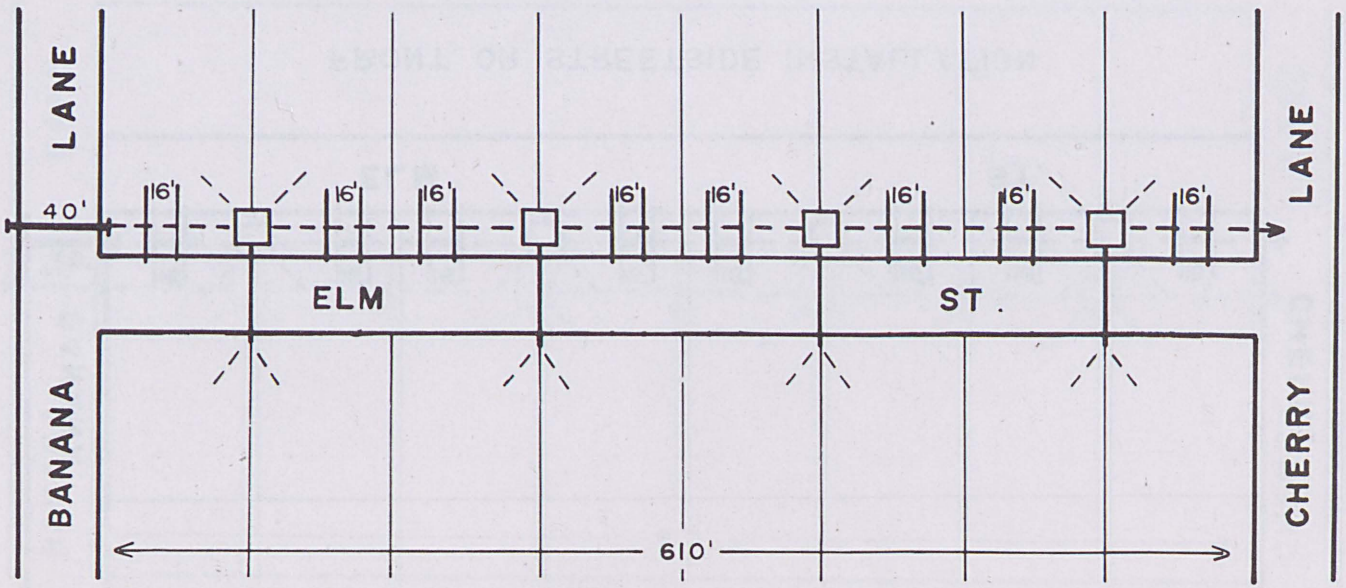
REAR EASEMENT INSTALLATION

EXHIBIT B



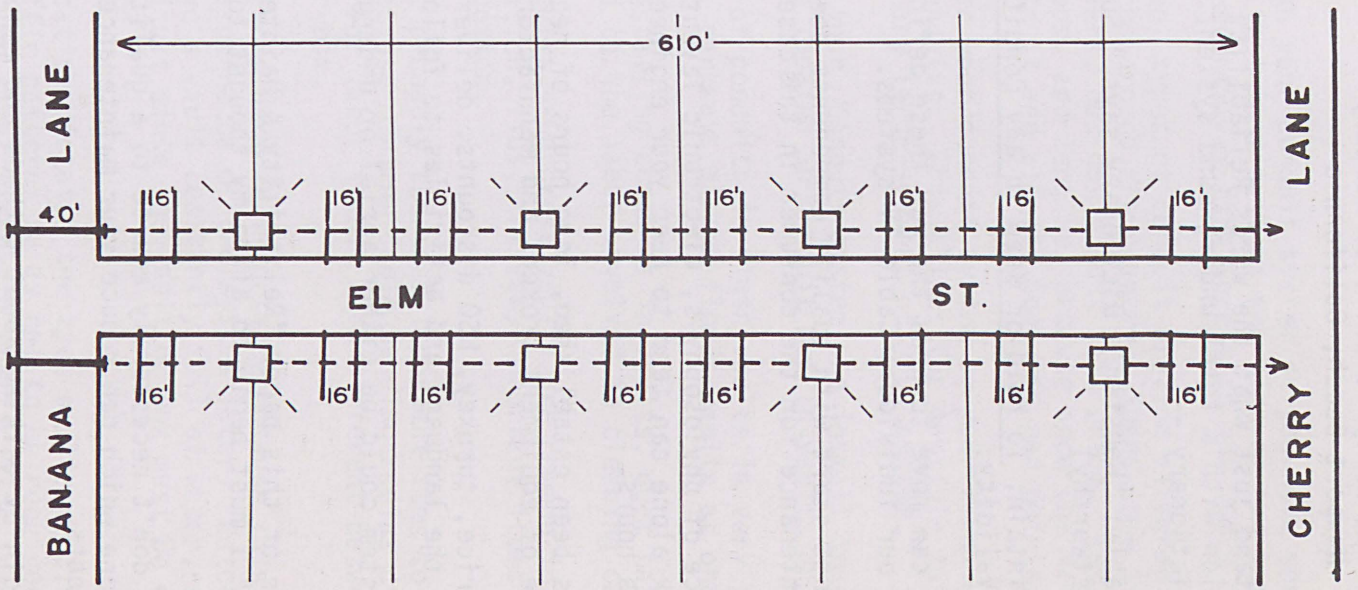
FRONT OR STREETSIDE INSTALLATION

EXHIBIT C



FRONT OR STEETSIDE INSTALLATION –
CASINGS PLACED TO SERVE OPPOSITE SIDE

EXHIBIT D



DUAL FRONT OR STREETSIDE INSTALLATION

RELIABILITY AND MAINTENANCE OF TOTAL UNDERGROUND SYSTEMS

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In order to better understand just what the words Reliability and Maintenance mean in relation with a total underground system, let's first consult Webster's Dictionary --

First there's Reliable; "Webster's Dictionary says," Suitable or Fit to be Relied on. (Trustworthy)

Second, there's Maintain; To Hold or Keep in any Condition, esp. in a State of Efficiency or Validity.

From this point we can move towards the way these definations affect the bottom line of our individual Cable TV systems.

To begin with we must start with quality components designed with longivity and ease of maintenance for the consumer in this case the CATV Operator.

With the wide choice of phylosophy's, electronic layouts and physical shpaes and sizes this task alone can tend to keep your engineering staff busy for many long tedious hours.

Once the format has been established, long hours of negotiating with the never ending line of equipment brokers and manufactors begins.

Unit price, bulk price, turnkey, MSO discounts, deliver schedules, and financing are some of the language and activities to follow --

At this point a system could be either aerial or underground in the method of construction.

But since the title of this paper "Reliability & Maintenance of Total Underground System" I must begin to align my thought towards this end.

Quality components don't necessarily equate to a quality system. To Build a reliable system, one which can reduce your maintenance cost you must begin with quality components.

I would like to begin by talking about methods and manpower which are important to reliability in your total underground system.

I. Conduit.--Conduit in Underground construction is the most important single item next to waterproofing.

Plan your conduit system so you have space for future expansion. I believe today that most systems who plan on two-way transmissions for the consumer will eventually find more than one cable in their conduits.

Different types of conduit provide different results in the varied earth conditions around the country. Spend some time with the various conduit suppliers, but don't just talk price. Ask about wall strength, couplers, sweeps, and lengths, because once the material is in the ground your stuck with it and all its good and bad points.

Engineer your conduit system so your trunk cable & feeder cable are in separate conduits. This allows for possible replacement with minimum down time for any large segment of your system.

Design your conduit system and install trunk or feeder cable so no splices are located in conduit but in vaults or pedestals.

Daming of conduits in flush vaults is very important since irrigation of greenbelts, parkways always floods vaults at one time or another.

When installing conduits in vaults, duct tape (silver tape) is very cheap compared to the labor involved in cleaning conduits later.

II. Vaults.--Concrete vaults are common in a total underground system and size, location, lids, are very important items to discuss prior to actual construction.

Size is probably the most important item to understand when designing your system because minimum cable bending radius dictates the size, not price - The unit cost for labor is not much different between a #3 and a #5 water meter vault or box.

Location is next in importance because this element in construction effects the maintenance of the system later. Watch for drainage routes which may leave a vault constantly full of water, and make future installs extremly difficult since the vault or box must be drained prior to work commencing.

The location dictates the type of lid required. You should know potential traffic patterns so as not to be required to continualy replace broken lids. The steel fishplate traffic lids in some cases will save money due to constant breakage.

On last item is the care in which vaults or boxes are installed. They should be square with the curb and at a grade commensurate with the surrounding grade or curb. Some areas a coat of green asphalt paint will provide that extra positive public relations we are striving for.

III. Pedestals.--Above ground pedestals are the least expensive protection for active & passive components, but also have some pitfalls.

The most common problem is the condensation action when the pedestal has no free air circulation designed into the design. Past experiences have shown that with an adequate air space between the ground level and the base of the pedestal that no condensation or practically no condensation takes place.

To provide continued protection even in pedestal construction, heat shrink sleeves or tape and c oating of liquid neoprene. Above all don't just "think dry construction" but "Practice Dry Construction."

IV. Waterproof Equipment Enclosures.--This section on construction is without a doubt the most single important item relating to reliability and maintenance of total underground systems. For it is waterproofing that will make or break an operator when first getting his feet wet in underground construction.

In the past few years I have been involved in total underground system construction and manage a system with 300 cable miles made up of both above ground and flush types of underground construction. The first cable installed in late 1965, and today expanding by approximately 50 miles each year. We serve one of the "Master Planned Cities of the Future" just outside the 35-mile zone of the second television market in the world, Los Angeles, California. Our potential mileage is 1500 to 2,000 miles by the year 2000. I make mention of these facts to emphasize our dedication to reliable underground system construction. As experienced constructors we rely heavily upon good pedestals and hermetically-sealed enclosures.

Our first exposure to completely flush construction was 1967. The first enclosure used was the Channel Corporation 6-inch plastic hermetically-sealed enclosures which, to this day, have provided 100% security for our splitters, directional taps, and tap-off units. These units or ones which will provide the same protection are a must for the dry equipment required for system reliability.

There is no fear in our operation when it ran because of this method of construction.

In fact the 1971/72 Fiscal Year with a quarterly subscriber count of 3676 . . our system service calls per working day were .95% and on a yearly day average were .83%, and thats with 300 miles of plant in the ground.

The additional cost of the enclosure and labor to install are quickly recaptured by lower maintenance expenses. In fact we have only two system technicians, whose duties include supervision of construction as well as system maintenance.

I have gotten ahead of myself into system maintenance, but the additional information is only ammunition for the point I am trying to make about dry equipment and system reliability.

We also believe in heat-shrink sleeves for all connectors not in hermetically-sealed enclosures, in flush-mounted vaults. In above-ground the use of heat-shrink sleeves can be augmented with self-vulcanizing tape and liquid neoprene if cost is a major factor. But make sure you use one or the other and not a dab of RTV here and there.

There has been no mention of brands or type of electronic equipment because it makes no difference to me what you use, only how you protect it at the time of construction.

Remember only a damm fool walks around all day in the rain in his $35.00 pair of wingtips.

My next topic is maintenance. The mere though of maintenance of a total underground CATV system would almost induce labor pains from a CATV technician who's whole background is in aerial plant maintenance.

Today there are techniques in protecting CATV components such as I mentioned earlier which can make maintenance very easy in underground plant.

The AGC problem is almost solved due to the constant temperatures of cable when installed underground -- no climbing of the telephone poles to repair equipment. The speed in which system balancing can be performed.

The complete removal of pole line attachment agreements a long with repair and maintenance of guy wire, guards, ground rods, and many more items. All these make underground easier to maintain once installed properly.

Commercial power outages are fewer in areas where all utilities are lunderground. But you should seriously consider installation of battery powered standby power supplies. The prime locations are backbone trunk lines where one small power failure can create one very big system outage.

Preventative Maintenance schedules in underground constructed systems are similar to aerial only that it is good procedure and not because there are more problems.

Pressuring backbone trunkline is one of our practices only because our trunk line is so long. We use air dielectric cable and pressurizing is done with nitrogen gas. Our annual nitrogen expense is less than $100.00. Pressure gauges and sectioned areas of cable give us good control over this maintenance chore.

A good selection of test equipment is as essential in underground as it is in aerial systems. A fault locator is like your right arm in locating cable for contractors who plan on digging near your cables.

Other items of importance in the maintenance of underground is in keeping good up-to-date as built prints in case repairs are needed. Complete evaluation of service calls will assit in keeping the pulse of your system in safe zone.

IN SUMMARY - our experiences with a total underground system has proved the reliability and maintenance are strictly in your hands . . . so use them carefully and your new or old underground system will be a success.