SEWER MAINTENANCE *

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A properly functioning sewer system is next in importance only to a safe and potable water supply in its relationship to the health and welfare of the modern community.

Yet the average village official is more concerned about the outward appearance of his community than the 30 or 40 year old sewer system upon which its health depends. Not until some influential citizen discovers on some bright morning following a rainstorm that the sewer has backed up during the night and plastered his basement with dirt and filth, and with blood in his eye tells the district alderman to do something, or else, does the council become sewer conscious, and the conversation immediately turns to new sewers. When it is discovered that new sewers are an expensive proposition after streets have been paved and house connections installed, the sewer superintendent is usually given a blanket order to do something about fixing up the old sewer, and as far as the council is concerned the matter is settled.

There is no surer way to start a demand for new sewers than to have repeated flooding of basements every time it rains. Yet, the cost of removing the trouble which causes such flooding may be very slight compared to the cost of replacing the entire sewer. Just a small part of what it would cost to build a new sewer, properly applied to the purchase of the proper type maintenance equipment, might render the old sewer almost as good as new, and once such equipment is provided, it is always ready for similar jobs which may turn up in an entirely different location.

In my opinion, if sewer bond issues were stretched just a little bit to include the purchase of maintenance equipment when the sewers are installed, many of us sewer superintendents would look a lot younger with our hats off. True, it will take a convincing argument to make any council understand why you want to buy sewer cleaning equipment before it is needed, but are they buying it before it is absolutely necessary? Despite the most rigid inspection, construction gangs have been known to leave everything from a few bricks to a wheelbarrow in a newly completed sewer. A few years ago, when an inverted siphon which carries a trunk under the bed of a creek in Lancaster began to act up, we dragged the siphon to determine the cause of the trouble. In the 14 in. cast iron pipe we found an old fashioned dinner bucket, with the cover securely closed and the entire thing covered with rust and slime. When the cover was opened we found therein scratched faintly on the metal the name of a laborer who was employed when the sewers were installed 24 years previously. Nobody knows how far that bucket traveled before it came to its final resting place in the siphon—and every foot of sewer in town was said to have beer

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tested by dragging a ball through it before the village accepted the sewer system from the contractor. Had that dinner bucket chosen to lodge in a high joint, the sewer might have caused trouble within a few weeks after it was put into service—and only the proper type of sewer cleaning equipment would have been able to dislodge this obstruction.

Granting that the proper amount of sewer cleaning or maintenance equipment is necessary, what does the average sewer department need to meet emergencies? Well, there was a time, and it wasn’t so very long ago, when we considered that a water-pressure operated turbine ferret, so-called, would meet any problem which we might face in the matter of sewer stoppages or emergency sewer cleaning. These self-propelling nozzles, while they are without a doubt very effective pieces of first-aid equipment, are far from a superintendent’s dream of a cure-all for sewer troubles. In a municipality like Lancaster, where we buy our water wholesale and distribute it through our own mains at a small margin of profit, any water pressure-operated sewer cleaning device is expensive to use regardless of its efficiency. Added to the cost of water needed for their operation is the cost of necessary pressure hose, not only able to withstand the pressure of water from the inside but also resistant to the abrasive action of the sewer tile and its multiple joints on the outside. Add to this the cost of labor necessary to handle a fire hose under pressure, and subtract the fact that unless a drag cable is attached to the ferret, the distance which it will travel under its own power is relatively short, and it becomes very apparent that the results obtained are very much out of proportion to the amount of labor involved—because, with a ferret, or self-propelling nozzle, about all that you have done is to bore a four-inch hole through the obstruction, and the sewer is far from clean.

In my opinion, there is nothing superior to the cable and bucket method of cleaning, but the cost of cleaning sewers by this method is dependent to a great extent on the accessory equipment which is used. Take sewer rods, for instance. There are rods and rods, some good, some entirely unfitted to the type of work involved. In Lancaster we have used at various times five different makes of sewer rods, including every type from the ordinary hinge coupling to the hook and screw type rod. Everything being considered, we have found that the 120 degree type of rod, which can be coupled and uncoupled on the surface of the ground and fed into or pulled out of the sewer in a continuous series of rods, is the quickest and cheapest operated wooden rod on the market. With due respect to flexible steel sewer rods, may I say that we have never used this type of equipment, but I understand that the use of these steel units has worked out very well since they too are coupled and uncoupled on the top of the ground. Sewer rods, however, are used chiefly for the purpose of guiding the cable from the sewer cleaning machine through the sewer, but as far as doing a cleaning job with rods and rod attachments is concerned, we consider this also just a first-aid measure. In cases where sewers have stopped up and manholes up the sewer line are filled with water, we use the rods with just a leader
attached to punch through the obstruction and release the water which has been held back. After the sewers have drained out we immediately bring the sewer cleaning machines into action. Before dropping the subject of rods, may I say that some time ago we purchased a flat, flexible steel tape, 100 ft. long, about 3/4 in. wide and 1/8 in. thick from a plumbing supply house for emergency jobs, and that this has proved to be a very valuable piece of first aid equipment also. When a section of sewer between manholes is found to be blocked, we immediately resort to this flexible tape as a possible means of punching through the obstruction. The tape is first fed into the sewer for its full length from the lower end. If no results are accomplished, the tape is pulled out and fed into the blocked sewer from the upper end, and since this work can be done from the top of the ground, manholes half filled with water are no great hinderance. In nine out of ten cases, whether by luck or otherwise, we have reached the obstruction in the sewer with the tape from one end of the blocked section or the other, and it wasn’t even necessary to send a man down into the manholes until the cleaning machines were put into action. Had it been necessary to couple rods to reach the obstruction, much time would have elapsed before even temporary relief was forthcoming.

Our cleaning equipment consists of two windlass-type machines mounted on four wheeled trucks, together with various sized cleaning buckets and an expanding root cutter. We have found that we made a good investment by purchasing the truck-mounted windlasses, since they can be pushed from one manhole to the other by hand; and except for towing them to the job in the morning and away from it at night, they do not tie up any motor trucks for any great length of time. This, however, is not the case with the stationary windlass, which must be moved from manhole to manhole at the expense of tying up a truck and a truck driver’s time. The cleaning buckets are of the type which open when they are dragged forward and close when they are pulled back. The expanding root cutter we consider invaluable. It can be used in all sizes of sewer from 6 to 24 in. and does a great job of sawing off the roots inside the tile. We have used this accessory on jobs which looked like dig-ups at first glance and by proper manipulation finally cleaned the tile completely of huge accumulations of roots. One section of 15 in. tile was so badly clogged with roots that we had difficulty in getting the rods through in order to pull in the cable, yet by starting the root cutter at its smallest size and gradually expanding it as we worked, we finally removed the entire root mass. You may wonder how such a large amount of roots was ever allowed to accumulate. Excepting a self-propelling nozzle, the village had no sewer cleaning equipment whatsoever until 25 years after the sewers were installed, and the files of the State Health Department are filled with complaints of flooded cellars from Lancaster residents. When sections of sewer, such as the one I have just referred to, gave trouble, and the self-propelling nozzle wasn’t equal to the job, the old method of punching a hole in the side of a manhole and installing a bypass to the nearest ditch
or creek was resorted to in lieu of cleaning the sewer. However, even this system was ineffective when the mains were loaded with storm water; hence the complaints.

When we speak of stormwater, we have a real subject to discuss. Without trying to prescribe any remedy for the stormwater situation, I'll just tell you what some of our experiences have been at Lancaster. When I was given charge of the sewers, naturally one of the first things that I tried to find out was the source of the huge stormwater load which piled down into the disposal plant every time it rained. So the first thing that I did was to go back into the village records to the time when the sewer system was built and the disposal plant installed, which happened to be a joint proposition. The system and plant were constructed in 1908, I found, and six months after they had been accepted and turned over to the village, there was a notation in the records that the plant had been flooded out during a spring thaw to a depth sufficient to submerge even the electric motors. This, with a brand new sewer system and a population about half of what it is at the present time. Further investigation revealed the fact that within another year, the plant was flooded out on several other occasions, the motors and pumps removed to a higher level, but here was a brand new sewer system that leaked like a sieve and couldn't be replaced. Right then and there I felt like throwing up my hands, because this record indicated that the joints were poorly made and had leaked right from the start. 

So the next best thing was to look for the source of the storm water and attempt to divert it wherever possible. The first problem which we attacked was that of roof leaders. We employed a man to visit every home in the village, check upon the roof connections, and to report any case where roof leaders were connected to sanitary sewers. Following his inspection, we sent notices to all property owners who maintained such connections to disconnect them at once, and with a few exceptions which had to receive a little harsher treatment, got some excellent cooperation from home owners throughout the village.

Next, we made an inspection trip on foot over every sewer line on unimproved property and across private rights-of-way. Here we found some real cases of storm water infiltration. Sewer trenches which had been improperly backfilled and insufficiently tamped, and where the backfill had settled anywheres from six inches to two feet below the surface of the ground, had become drainage ditches without outlets, and here and there were huge washouts where the water was finding its way into open joints. Sewers had been laid along the banks of brooks and drainage ditches, and what at first appeared to be muskrat holes along the banks were found to be washouts into the tile. At practically every point where a drainage ditch crossed a sanitary sewer, we found some kind of a washout, despite the fact that cast iron pipe, according to the records, had been used for such crossings. Upon investigation, we found that the cast iron pipe was there all right but that the ditch had widened out and the water was entering the sewer at the point where cast iron pipe and tile joined. Along one paved road
in the village, which had been improved after the sewer system was installed, we found that the bottom had dropped out of the drainage ditches alongside the highway at nearly every point where the maps indicated that a Y connection had been installed. Upon digging up these connections, we found that anything from bricks to tin had been used to close the open end of the Y after the connection from the main sewer had been extended to the outer edge of the pavement. One generous source of storm water was discovered to be a concrete box culvert crossing under the same highway and which carried surface water to a nearby creek. The culvert was a concrete box 2 ft. square, with a concrete bottom about 4 in. thick. Investigation showed that the bottom of the culvert had settled away from the sides for about 3/4 in., and that the ditch water was running through these crevices into the sanitary sewer beneath. We recommended that the State Highway Department, which maintained this particular thoroughfare, jack a corrugated metal pipe into the culvert and seal the ends to eliminate any further possibility of leakage. By-passes which had been installed at manholes where the sewers backed up because of internal obstructions were found in many cases to be taking surface water into the sewer rather than to discharge the overload.

With the help of relief labor we began a thorough rehabilitation of the sewer system in 1933. Sewer cleaning equipment was purchased, and one crew set out to drag every foot of sewer in the village. Other gangs were put to work digging up spots where washouts were evident, repairing the defective joints in the tile beneath, and tamping the fill securely back into place. Sewer trenches which had settled and were serving as surface drainage ditches were filled to the proper level by the use of fresh fill which was hauled in and properly tamped. Other drainage ditches which had wandered away from their former courses and found openings into the sewers were relocated. Where sewers paralleled large brooks, the entire sewers were uncovered and recaulked. At points where drainage ditches crossed the sewers, the ditches were enclosed with tile rather than to disturb the sewer trench.

Results obtained and conditions discovered with the sewer cleaning apparatus were a good indication of the general condition of the sewer system. Where large quantities of sand and gravel were found in certain sections of sewer, we looked for trouble along the line and usually found it. Defective sewers reported by the cleaning gang were reported, and a follow-up crew went to work immediately to remedy the trouble. Much as we disliked to recaulk the joints with cement mortar, we found that they had leaked so long and were so badly coated with slime that no bituminous poured joint would hold, so we recaulked the joints with a rich mortar after thoroughly cleaning out the old caulking material which apparently had been a very lean mixture of cement and sand.

That first sewer cleaning taught us a lot about sewer rods. When the sewer cleaning equipment was purchased, we obtained with it about 600 feet of 90 degree, hinge-type rods. For a short time we experienced
no trouble with the rods whatsoever. Then one day the cleaning gang foreman reported that the rods were hung up at an apparently solid obstruction in an 8 in. tile. The follow-up gang dug up the sewer at the point where trouble was indicated, and instead of an obstruction merely found an irregular joint. The hinges on the rods had begun to wear, the rods buckled against the top of the sewer and one of the couplings had caught on the high joint. Repetitions of this occurrence came frequently after that, and after a conference with village officials we decided to purchase some hook and screw type rods. In due fairness to this type of rod, let it be said that they absorbed a terrific amount of punishment in some districts where the sewers were almost entirely obstructed by roots. They possessed the disadvantage, however, of requiring two operations to couple each joint, and the time lost in coupling and uncoupling more than offset the advantage of having a tightly-joined, solid rod to work with in the sewer. Furthermore, they were man-killers, in that they could only be coupled in the bottom of the manhole, and that a man had to almost stand on his head in small manholes to join them together. Because this type of rod was so hard to handle, it was the custom of the cleaning gang to leave them coupled together and shove them from one section of sewer to another, leaving them in the tile overnight after anchoring them to a ladder rung. This soon resulted in the deterioration of the wooden rod at the point where it socketed in the coupling, and when the couplings began to pull off from the wood shaft of the rod, it soon was apparent that the rods would have to be replaced. When they were finally replaced we made a trial purchase of 120 degree rods, which can be handled almost entirely above the ground, and have met with success with this type of stick even under the most trying conditions.

After cleaning all of the sewers and repairing all of the washouts which were visible above ground, diverting drainage ditches and generally overhauling the sewer system, we naturally expected that our troubles were about over. A careful survey had indicated that there were absolutely no catch basins connected to the sanitary sewers, roof leaders had been disconnected, and we awaited the rainy season to see just what had been accomplished. When the rains did come, we found, much to our dismay, that while the condition had improved somewhat it was still far from corrected. Every drop of sewage which enters the disposal plant must be pumped, and as the location of the plant is such that even the use of a by-pass is impractical, we again found that the pumps were overtaxed by storm water infiltration. Since elimination of this added flow was important from an economical as well as a sanitary standpoint, we decided that it was worth our while to find out just what was happening to the sewer system at times of rainfall. So when the next heavy rainstorm came a crew of men armed with pickaxes went along the sewer lines, opening manholes and carefully noting the difference in flow from one to the other.

That was when we got the most disagreeable surprise of all. We found that the cause of the trouble was again in poor construction—not
only in the sanitary sewers but in recently laid storm sewers on paved streets. These storm sewers, which had been laid in advance of the paving, had literally been tossed into the ground without any regard for the proper caulking of joints or back filling of trenches. Invariably located above the deeper sanitary sewers, they were discharging the majority of the load of water which they collected in the catch basins on the street through the open joints in the tile into the sanitary sewers below. Where the storm sewer was located a considerable distance away from the sanitary lines, we usually found that this leakage out of the storm sewers was entering the house connections into the sanitary sewers. Where the storm sewer was located in close proximity to the old sanitary sewer trench, in many instances the water was finding its way directly into unused Y connections along the main line. The amount of water which the storm sewer was discharging at its outlet was only a fraction of what was being collected on the road surface; and the rest was taking the path of least resistance, directly or indirectly into the sanitary sewer system.

Here is a real problem, involving an expensive repair program. It costs real money to dig up concrete paving and replace it, but in many instances that will be our only alternative. In others, we may find it practical to install additional outlet lines from the storm sewers to offer a path of still less resistance to the collected storm water. It seemed unbelievable that surface water should be entering the sanitary sewers along hard surfaced streets, but that was just what was happening, not from above but below ground. It is very imperative that the storm sewers be kept scrupulously clean and free from obstructions to remove any resistance to their flow, because the slightest accumulation of material would merely force the water out of the joints and into the nearest sanitary sewer connection.

All of which goes to prove that careful construction and rigid inspection are just as necessary in storm sewer installations as they are in the laying of sanitary lines. Joints should be just as tight, because tree roots have no conscience; and sanitary sewer laterals weren’t inspected so rigidly a few years ago as they are now. The efficient life of any sewer is dependent entirely upon the type of joint installed in the first place, and proper inspection by village authorities of any trunk sewer installation is just as important as the rigid scrutiny of the plumbing inspector who passes upon lateral installations. We have learned from sad experience that a lateral sewer is only as root-proof as its poorest joint, and after paying for several dig-ups where the house sewer was blocked because roots entered the Y connection, where some plumber “got by” with a poor joint despite the vigilance of the inspector, we are determined that there shall be no repetition of this experience in the future. Whether it be for storm or sanitary sewers, my preference is decidedly for the poured bituminous joint, as our experience with this material has been highly satisfactory.

Despite the fact that we in Lancaster are still handicapped with a set of sewer and water ordinances that are as out of date as a top
buggy, we still have hopes that some day the council will adopt an air-tight set of ordinances regulating the installation of sewer connections. Many of you fellows are fortunate in having a modern set of ordinances to work with—a set of regulations which specifies in plain terms the size, material, and type of joint to be used. Last summer I watched with dismay as a Buffalo plumber installed a 4 in. connection into the main sewer for the $80,000 Lancaster postoffice. Despite all of my objections and arguments, and despite the fact that there were no less than ten fixtures connected to it, this contractor installed a 4 in. cast iron pipe lateral from this modern building. Root-proof, certainly, but it doesn’t take much to block a 4 in. sewer. Yet there was nothing in what the village fathers call ordinances to prevent this obviously ill-advised construction.

The lack of improvement in economic conditions has forced our sewer department to venture further and further into the field of lateral sewer maintenance; yet we have been successful thus far in confining our activities to the flushing of laterals with fire hose. Ordinances or no ordinances, if a house sewer blocks up and the owner of the property is one of the many victims of the depression and unable to afford the services of a plumber, we have the choice of allowing a health menace to exist on this man’s property or trying to blow out the blockade with water pressure from a fire hose. When the stoppage is something easily removable, the job is done at little or no cost to the village. But when we encounter root conditions, and after wasting a lot of time and water must admit that ordinary measures will not afford relief, we must necessarily disregard the ordinances to the extent of allowing the property owner to dig up the sewer himself and loan him the tools to remove the obstruction as best he can. For flushing the sewer, we make a nominal charge of two dollars which is usually added to the current water bill.

One problem which the Lancaster sewer department has to contend with, that is not common to all other municipalities in this locality, is that of maintaining sewers in what we call the flood area. Due to circumstances over which we have no control, a good-sized portion of the village is visited about twice each year by floods from Cayuga Creek, which overflows its banks to such an extent as to close highways to traffic. In 1937, the most disastrous flood in its history visited Lancaster, and water reached a depth of six feet on some village streets. Homes were flooded to a depth of two and three feet on the first floor, and almost a half million dollars’ worth of damage was done. The flood water was heavily laden with silt, which was deposited generously on and in everything. Sanitary sewers in this area were loaded with mud, and we had a terrific job getting them open. Now, two years later, these same sewers in the same area still give trouble. Sanitary sewers on some streets have been cleaned as often as five times since the flood, and each time great accumulations of mud were removed. House connections in the area are a continuous source of trouble, the vent traps
loading up with silt two and three times a year. Where the silt comes from is a question—probably from underdrains around homes in the flood area which are gradually freeing themselves from the load of mud left by the receding water. To these victims of the 1937 disaster village authorities extend all of the facilities of the sewer department. No charge is made for flushing out lateral sewers in the flood area, nor will any be made until they cease to discharge the accumulation of silt with which they are gorged.

Despite this one unusual angle, however, our problems are the same as yours. Far be it from me to make any excuses or to indict publicly any village government for laxity in inspecting the installation of improvements. The Village of Lancaster is responsible for its own problems, as far as the sewer system is concerned. But what has happened in the past will never happen again, and we hope that other sewer departments will profit by our experience. Profit means gain—a real dollars and cents gain in reduced operating costs and increased efficiency.