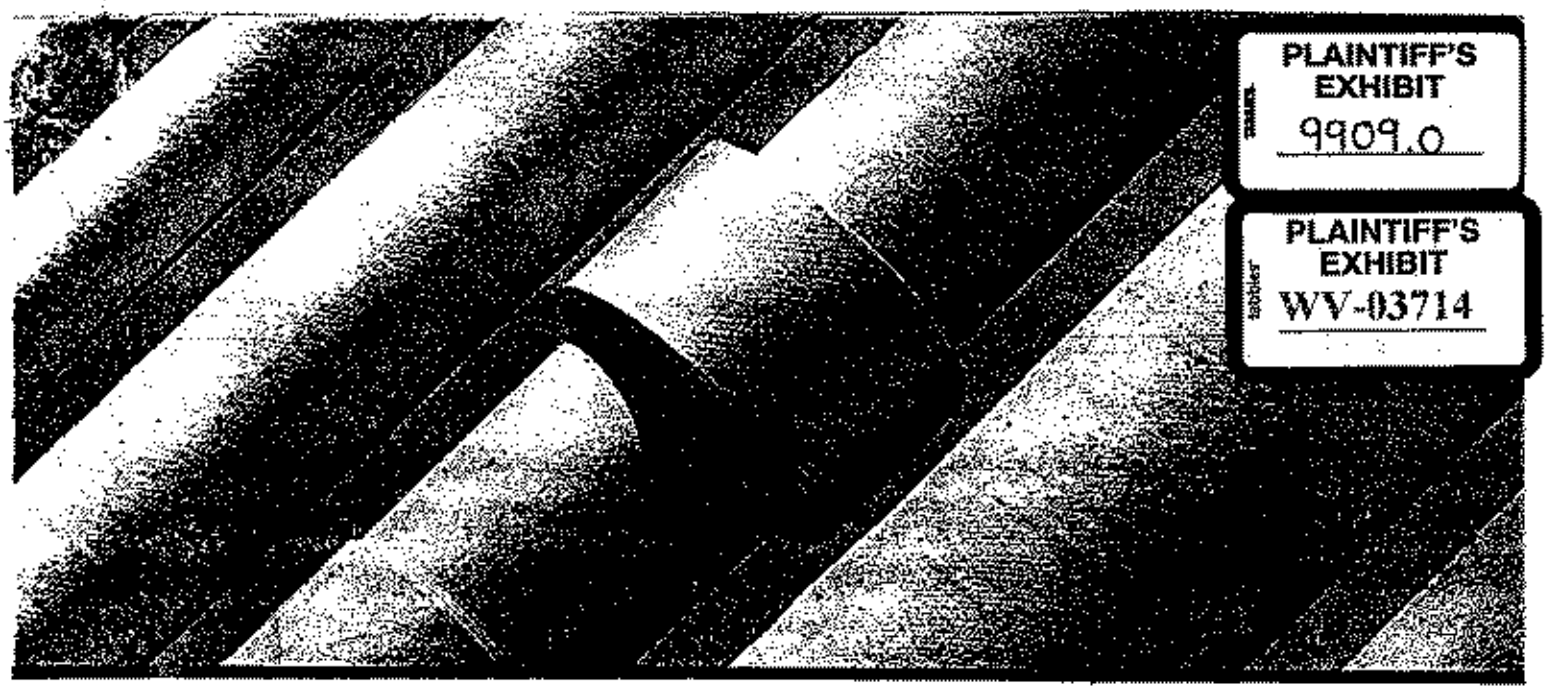
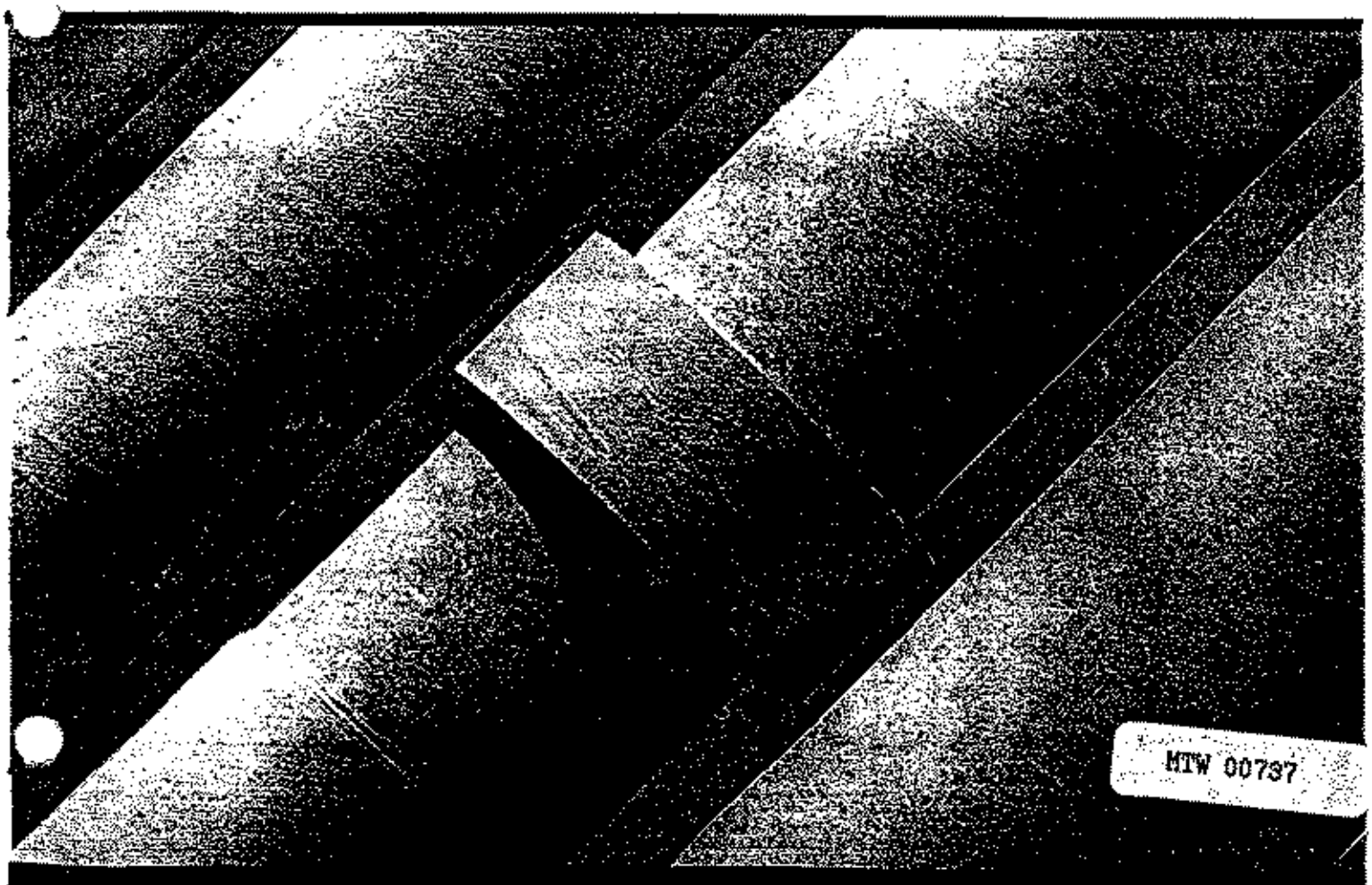


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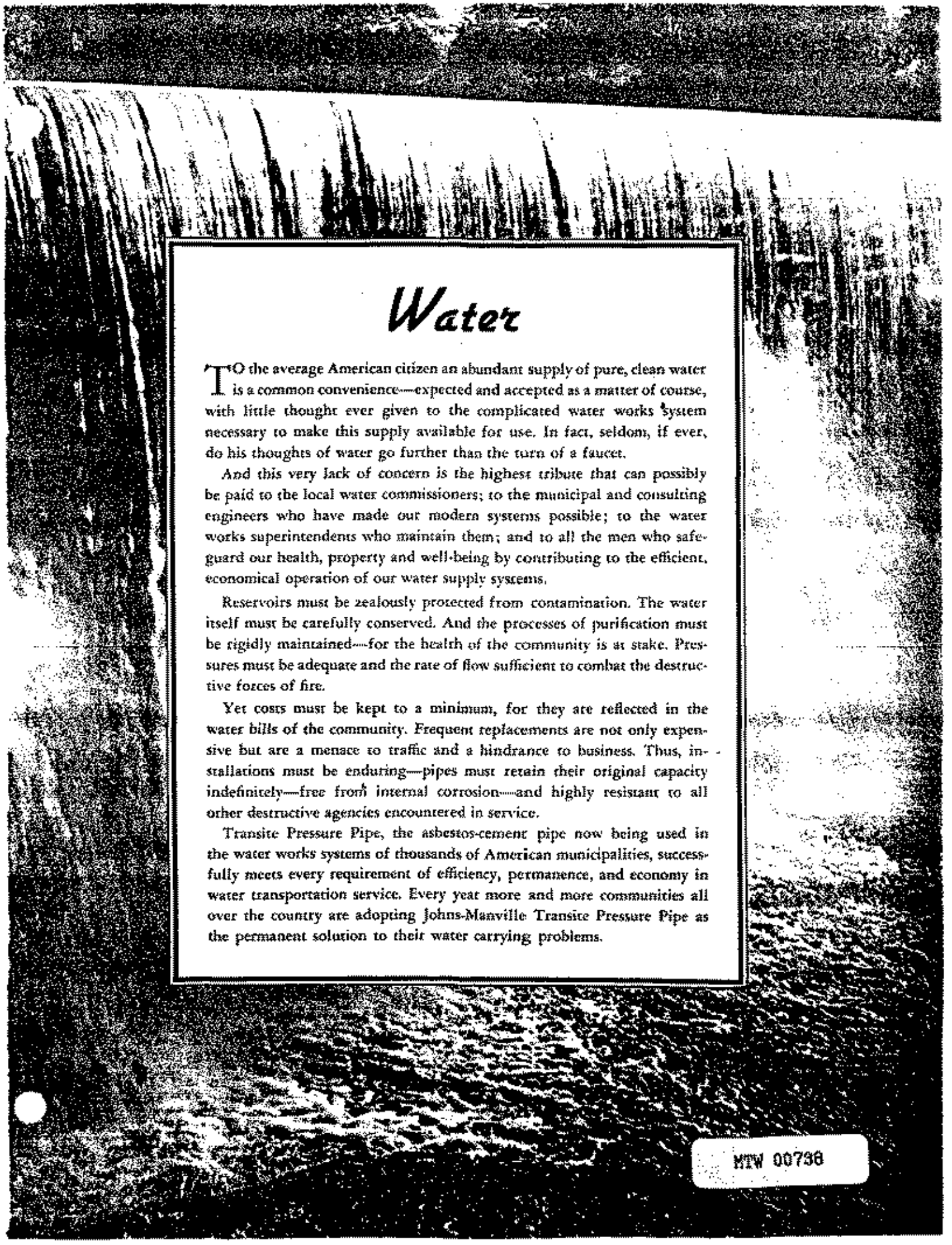
PLAINTIFF'S EXHIBIT WV-03714

TRANSITE PRESSURE PIPE



MTW 00737

FOR EFFICIENT, ECONOMICAL WATER TRANSPORTATION



Water

TO the average American citizen an abundant supply of pure, clean water is a common convenience—expected and accepted as a matter of course, with little thought ever given to the complicated water works system necessary to make this supply available for use. In fact, seldom, if ever, do his thoughts of water go further than the turn of a faucet.

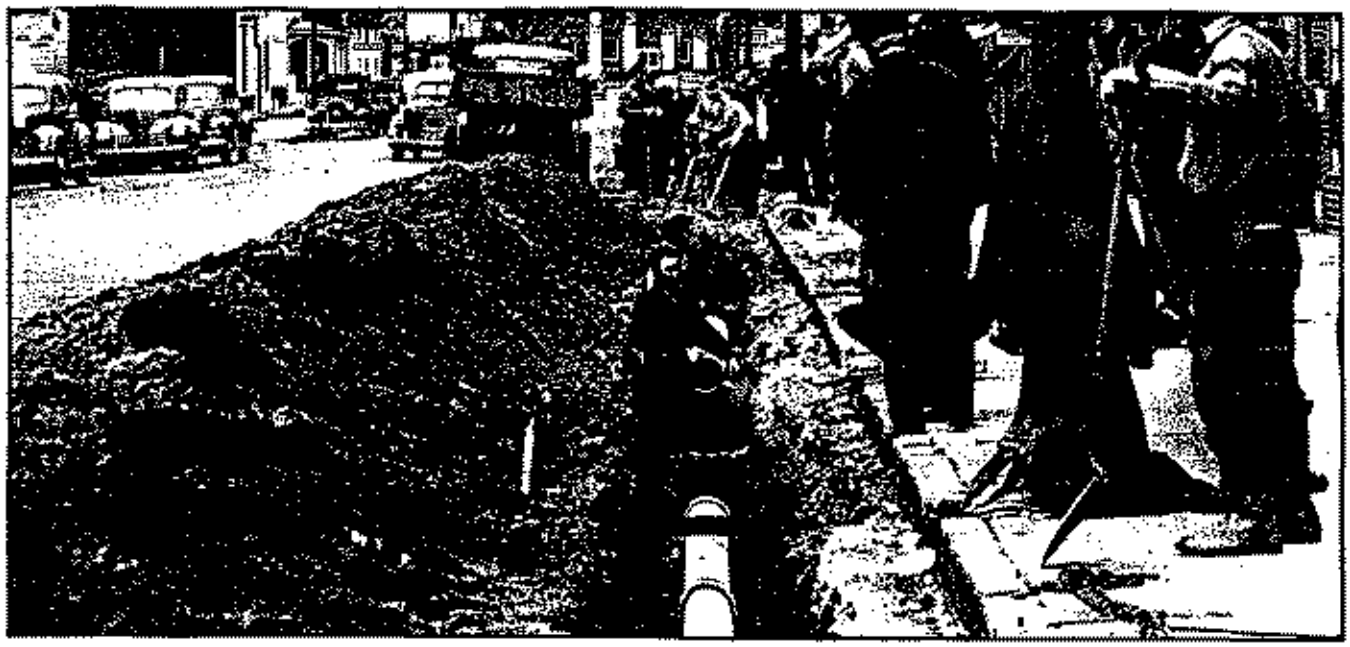
And this very lack of concern is the highest tribute that can possibly be paid to the local water commissioners; to the municipal and consulting engineers who have made our modern systems possible; to the water works superintendents who maintain them; and to all the men who safeguard our health, property and well-being by contributing to the efficient, economical operation of our water supply systems.

Reservoirs must be zealously protected from contamination. The water itself must be carefully conserved. And the processes of purification must be rigidly maintained—for the health of the community is at stake. Pressures must be adequate and the rate of flow sufficient to combat the destructive forces of fire.

Yet costs must be kept to a minimum, for they are reflected in the water bills of the community. Frequent replacements are not only expensive but are a menace to traffic and a hindrance to business. Thus, installations must be enduring—pipes must retain their original capacity indefinitely—free from internal corrosion—and highly resistant to all other destructive agencies encountered in service.

Transite Pressure Pipe, the asbestos-cement pipe now being used in the water works systems of thousands of American municipalities, successfully meets every requirement of efficiency, permanence, and economy in water transportation service. Every year more and more communities all over the country are adopting Johns-Manville Transite Pressure Pipe as the permanent solution to their water carrying problems.

MTW 00736



Johns-Manville Transite* Pressure Pipe assures permanently economical water transportation

ASBESTOS-CEMENT PIPE was first developed in a sea-coast town in Europe over a quarter of a century ago. Used there to carry sea water for fire-fighting and street-cleaning purposes, it proved so successful in this severe service that it was soon adopted for use in many other water carrying systems.

Today, many thousands of miles of asbestos-cement pipe are providing highly efficient, economical service in the water carrying systems of every leading industrial country throughout the world. It has been used for many important water distribution systems on which the maximum bonding period for any type of water pipe has been allowed . . . ample proof of its recognized value in water line service.

In fact, so rapid has been the acceptance of this material that many thousands of miles are now in use throughout the world, and over a score of factories are engaged in its production.

Since the first Johns-Manville asbestos-cement pipe, or Transite, was manufactured in America, thousands of installations have been made in the United States and Canada. Four factories in this country are kept in continuous operation to supply the ever-increasing demand for this modern, economical water carrier.

There are very definite reasons for this wide acceptance of Transite Pipe. Manufactured in a wide range of sizes—from 4 to 36 inches inclusive—and in pressure classes of 100, 150 and 200 lbs., it is composed of an intimate mixture of asbestos fibres and cement, formed under high pressure into a dense, tough structure. It is strong, durable and highly resistant to all destructive agencies. Being non-metallic, Transite is entirely unaffected by electrolysis and tuberculation—the internal corrosion that cuts down flow rates and increases pumping costs—and it is highly resistant to all forms of soil corrosion.

Economical, Virtually Maintenance-Free

Yet, in spite of these many advantages, Transite Pipe is decidedly economical. In addition to its low first-cost, its immunity to tuberculation assures a permanently low coefficient of friction with large savings in pumping costs. Freedom from periodic cleaning and costly renewals cuts maintenance expense to an absolute minimum. And the relatively light weight and speed of assembly of Transite Pipe means that installation is accomplished rapidly, economically—even with unskilled labor.

*Reg. U.S. Pat. Off.

MTW 00739

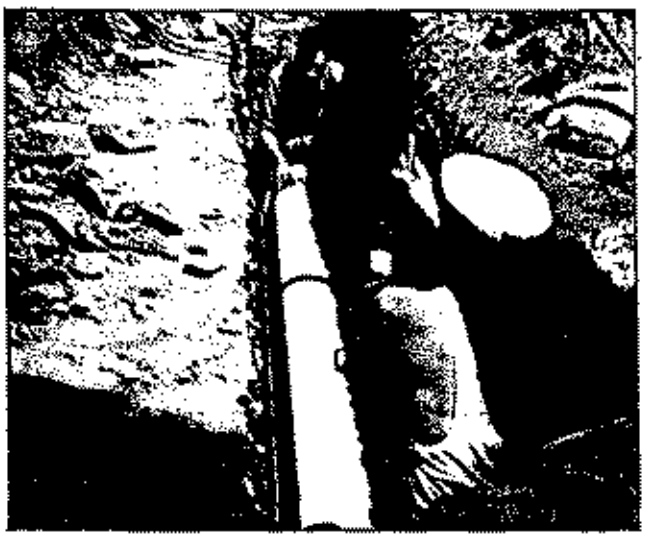
J-M TRANSITE PRESSURE PIPE

Cuts OPERATING Costs!

AND PERMITS THE USE OF SMALLER DIAMETER PIPE

Because Transite cannot tuberculate, its initial high delivery capacity cannot be reduced even by highly tuberculating water. Pumping pressures and pipe sizes are kept to a minimum—thus assuring lowest operating costs with no sacrifice of convenience to operators or consumers.

THE OUTSTANDING ECONOMY of a pipe line over a period of years in either a pumping or gravity flow system is best determined by its carrying capacity—the amount of water which will flow through a unit length of a particular size of pipe in a specific period of time, with a given loss of pressure head. In order to be truly economical that carrying capacity must remain permanently high throughout the years. For it is no longer accepted that an installation is economical simply because it is structurally intact after many years of service.



Transite was chosen by the town of Belmont, Mass., because it is immune to tuberculation, the internal corrosion that had seriously reduced the carrying capacity of their previous installations within a few years time.

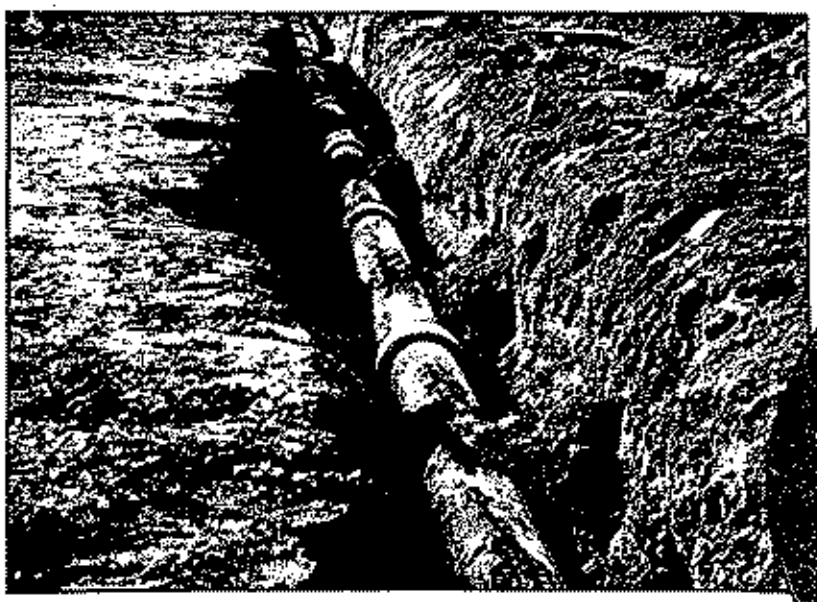
All other things being equal, the relative carrying capacity of two or more types of pipe is best indicated by the Williams and Hazen flow coefficient designated by the letter C. If, for example, the inside of the pipe wall is rough and uneven, the flow coefficient is low and carrying capacity is greatly reduced. A smooth pipe, however, has a high flow coefficient and a correspondingly high carrying capacity.

The Conservative Minimum Flow Coefficient for Transite Pipe is C-140

Its original smooth interior surface offers minimum resistance to the flow of water and because Transite is non-metallic, it is absolutely immune to tuberculation and the resultant loss in carrying capacity.

This means that even after 5—10—and 25 years of service, carrying highly tuberculating waters, the high carrying capacity of Transite Pipe remains unaffected by this costly economic evil.

MTW 00740



A series of tests conducted on a 14" Transite line by the Pitometer Company, a nationally known engineering concern and a recognized authority on the flow coefficient of water pipes, revealed a coefficient of C=145 for Transite Pressure Pipe in service.



PITOMETER CO. TESTS SHOW HIGH CARRYING CAPACITY OF TRANSITE PIPE IN SERVICE

NUMEROUS TESTS have proved that the coefficient C for asbestos-cement pipe in service is *even greater than 140.*

In 1935, the Pitometer Company conducted a series of tests to establish the flow coefficient on a 14" Transite pipe line carrying water from the city main into the Passaic, N. J. plant of the Forstmann Woolen Mills. The line was installed under average trench conditions in 1932 and had been in continuous service for over two years at time of test.

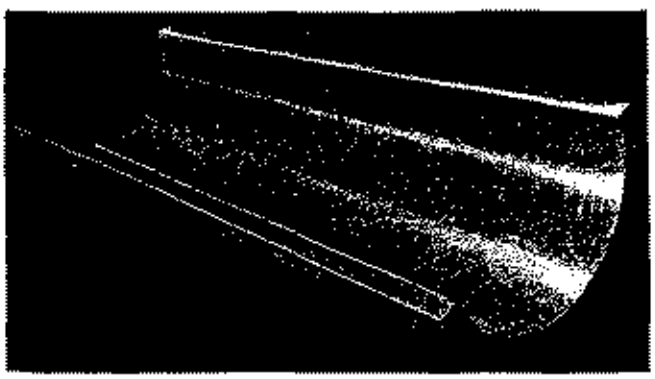
The results of the tests were summarized by the Pitometer Company in the following conclusion to their report: *"From a study of the data, we believe that an average coefficient of C=145 is very nearly correct for this pipe."*

Other tests conducted by ourstanding Water Works authorities give further evidence of Transite's unusually high flow coefficient in service.

Sir Alex Binnie, well known English hydraulic engineer, during a series of flow tests, found coefficient values on asbestos-cement pipe from 142 to as high as 165.

Another recognized authority, W. S. Pardoe, Professor of Hydraulic Engineering, University of Pennsylvania, reported in an article "Tests of Cement-asbestos Pipe" (ENGINEERING NEWS-RECORD, Jan. 28, 1926): "These figures indicate that the cement-asbestos pipe will discharge 15% more than clean cast-iron and 45% more than slightly tuberculated cast-iron pipe."

High coefficient values such as these are an inherent feature of Transite Pipe—because, being non-metallic, Transite *cannot tuberculate!* Its smooth interior provides an initial high delivery capacity that can never be reduced by rusting or tuberculation.



Because Transite is non-metallic, its original smooth interior surface remains permanently unaffected by the destructive, choking effects of tuberculation.

MTW 00741

Progressive Reduction of Carrying Capacity Constitutes a Major Problem in the Water Works Industry

THAT THE CONSTANT high delivery capacity of Transite Pipe is an important advantage to the Water Works Industry is clearly indicated by the fact that tuberculation cuts down the carrying capacity of ordinary pipe to such an extent that it represents one of the major problems of the water works industry.

In fact, this condition is so serious with ordinary pipe that engineers generally allow for this reduction by specifying a larger diameter pipe than would otherwise be necessary. Even this, however, is not a remedy but merely a temporary compensation.

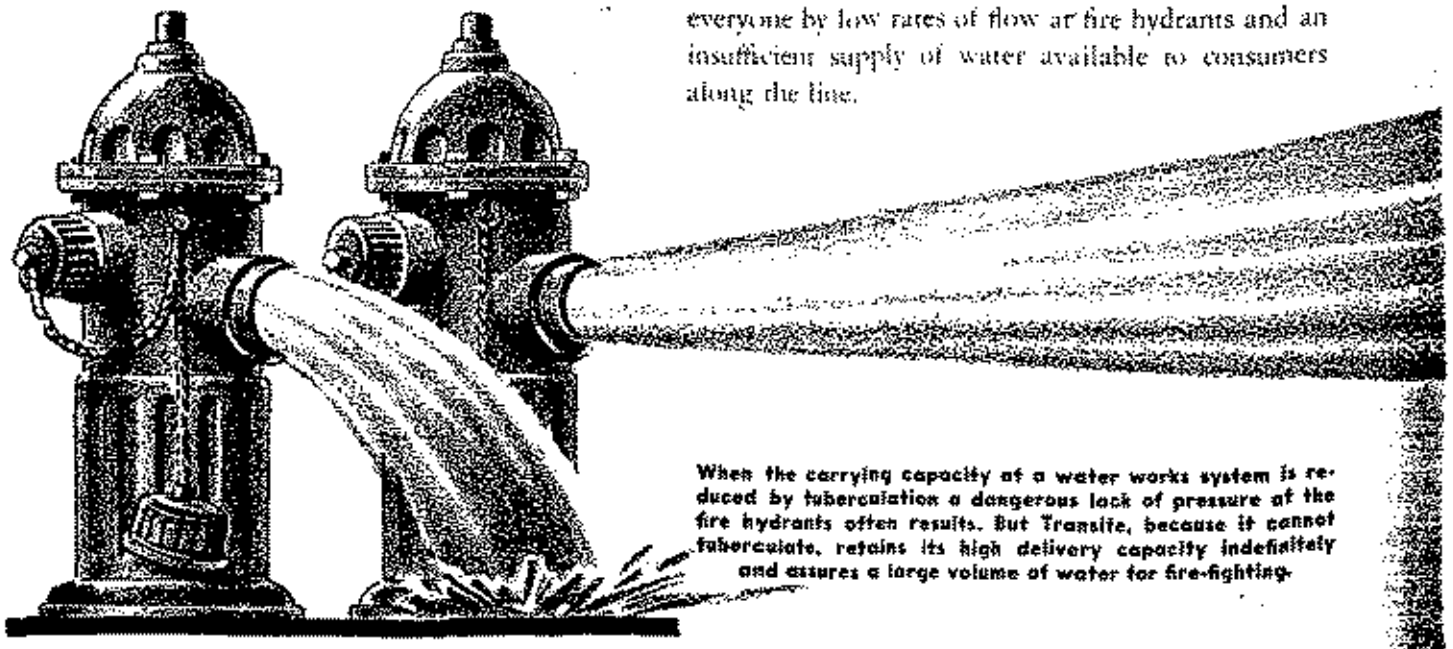
The Williams and Hazen coefficient trend expressing the carrying capacity of ordinary pipe recognizes the effect of tuberculation by progressively reducing the value of "C" for every year in service. This trend points definitely to the conclusion that a water main, even though it may be structurally strong after a period of time, may have completely out-lived its usefulness if it will no longer carry economically a sufficient volume of water to meet the demand.

To illustrate, in the Williams and Hazen tables the value of C for ordinary 6" new pipe is assumed to be 130. At the end of only four years, *under average conditions*, this coefficient is reduced to 120. After fifteen years C is reduced to 100, and after thirty years the coefficient of flow is only 80—a decrease in carrying capacity of 38%!

The effects of this condition are made apparent to everyone by low rates of flow at fire hydrants and an insufficient supply of water available to consumers along the line.

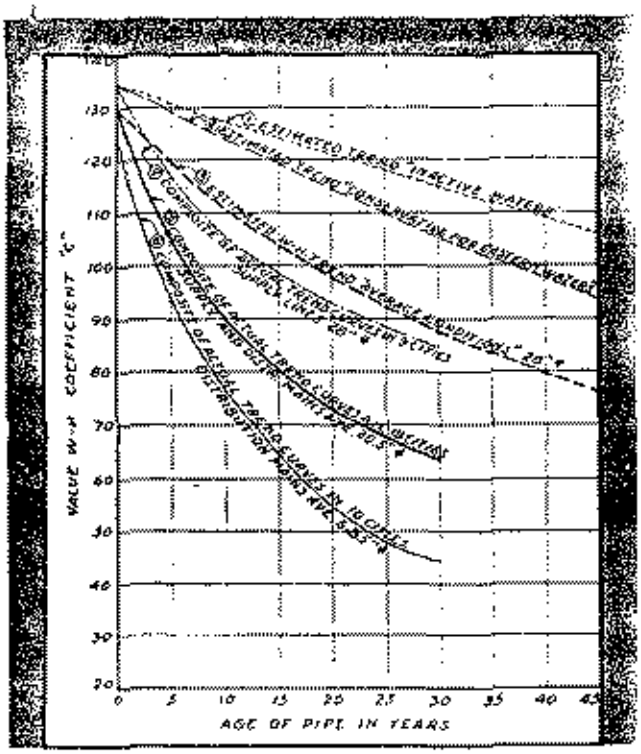


By using Transite — the modern, asbestos-cement water pipe—this New York municipality has assured minimum maintenance expense, permanent freedom from tuberculation, and low pumping costs on the installation shown above.



When the carrying capacity of a water works system is reduced by tuberculation a dangerous lack of pressure at the fire hydrants often results. But Transite, because it cannot tuberculate, retains its high delivery capacity indefinitely and assures a large volume of water for fire-fighting.

MTW 00742



From a study of the chart at the left, which summarizes the data on pipe line friction coefficients compiled by a committee of the New England Water Works Association, it is immediately apparent that the average actual rate of capacity loss is greatly in excess of any predicted trends. This chart includes 3 composite curves showing actual trends, based on 473 tests in 19 systems, and 3 estimated trends, reproduced for comparison.

N. E. W. W. A. Report Indicates That Tuberculation Causes A Reduction in Carrying Capacity Far More Serious Than That Predicted by the Williams-Hazen Coefficient Trend

A special committee appointed by the New England Water Works Association recently conducted an extensive investigation to determine the flow coefficient trend of ordinary water pipe. A total of 473 field tests were made on existing systems in nineteen different cities throughout the country.

These tests brought to light much new information concerning the rate of reduction in carrying capacity of typical water mains and clearly showed the actual time in which serious loss occurs is much less than is generally realized. In fact, in many cases the real loss in carrying capacity may be *more than double that forecast by the Williams-Hazen Trend.*

For example, starting from a value of C=130 for new pipe, where the Williams-Hazen Tables indicate a flow coefficient of C=80 for 6" pipe after 30 years service, the committee shows that this low coefficient is actually reached after only 8 years. And at the end of 30 years the flow coefficient is only C=45, or 43% less than that predicted by the Williams and Hazen Hydraulic Tables.

In the conclusion to the report published by this committee, the following statement summarizes conditions observed: "Data furnished to the committee *indicates that the average rate of capacity reduction* is, in the majority of cities, and particularly for mains less than 16 inches in diameter, substantially greater than the rate indicated in the Williams-Hazen Tables for average soft unfiltered water."

The great significance of this report is immediately obvious. For it clearly indicates the extent to which tuberculation is impairing the useful life and efficiency of ordinary water pipe lines throughout the country—it points to a vast financial loss that cannot be disregarded by anyone interested in economical, efficient water transportation.

Increased Pumping Costs

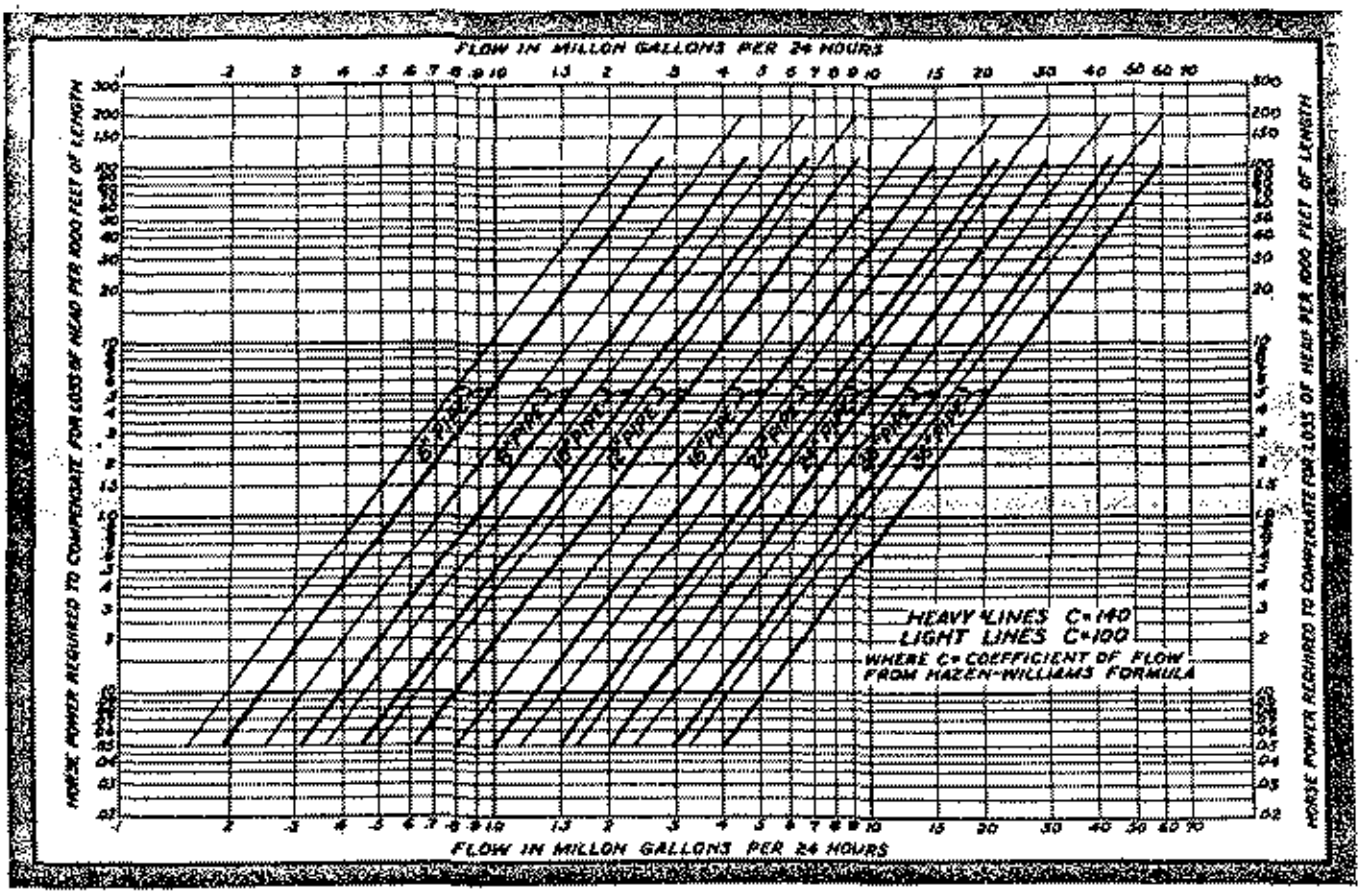
In an effort to offset the effects of this progressive reduction it becomes necessary to increase the working pressure of the pumps to such an extent that operating costs become exorbitant. It has been definitely proved that it costs almost twice as much to pump against a friction head in a pipe having a co-

Origin of Composite Trend Curve	Average Pipe Diameter All Tests* (inches)	Actual Trends: Value of C	Actual Trends: Equivalent Cap. Loss (Per Cent)	Williams-Hazen Predicted Trends: Value of C	Williams-Hazen Predicted Trends: Equivalent Cap. Loss (Per Cent)
Average Trend Curves for Supply Lines in 9 Cities	28.0	85	37	90	30.8
Average Trend Curves for Distribution Mains in 10 Cities	6.85	45	64	82	37
Average Trend Curves for all 19 Individual Trend Curves	20.5	63	51.5	88	32.3

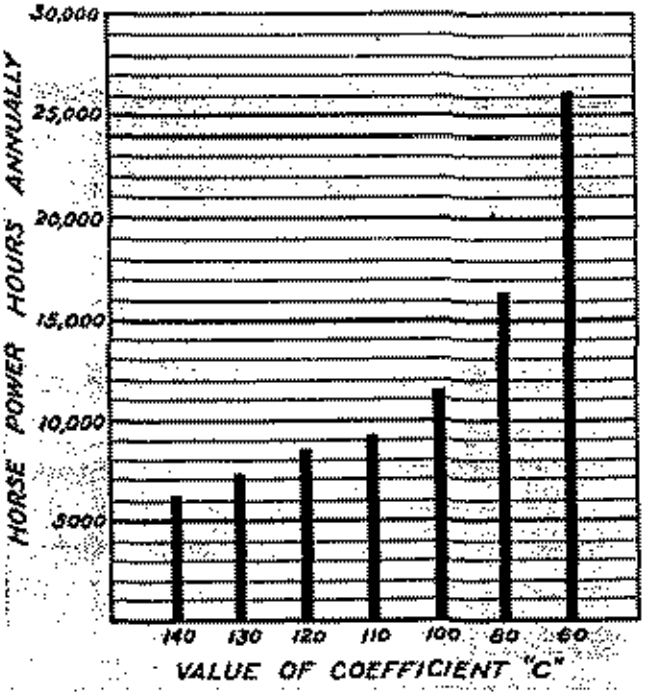
* Weighted by number of tests of each size; length disregarded.

A summarized comparison of actual and predicted values of the Williams-Hazen coefficient C for Tar-Coated Cast Iron Pipe after 30 years of service, as published by the committee appointed by the N.E.W.W.A. to study pipe line friction coefficients.

MTW 00743



This chart, adapted from the Williams-Hazen tables, may be used to determine the horse power required to overcome friction for coefficient C=100 and C=140. Because Transite lines cannot tuberculate, they maintain a minimum coefficient of C=140.



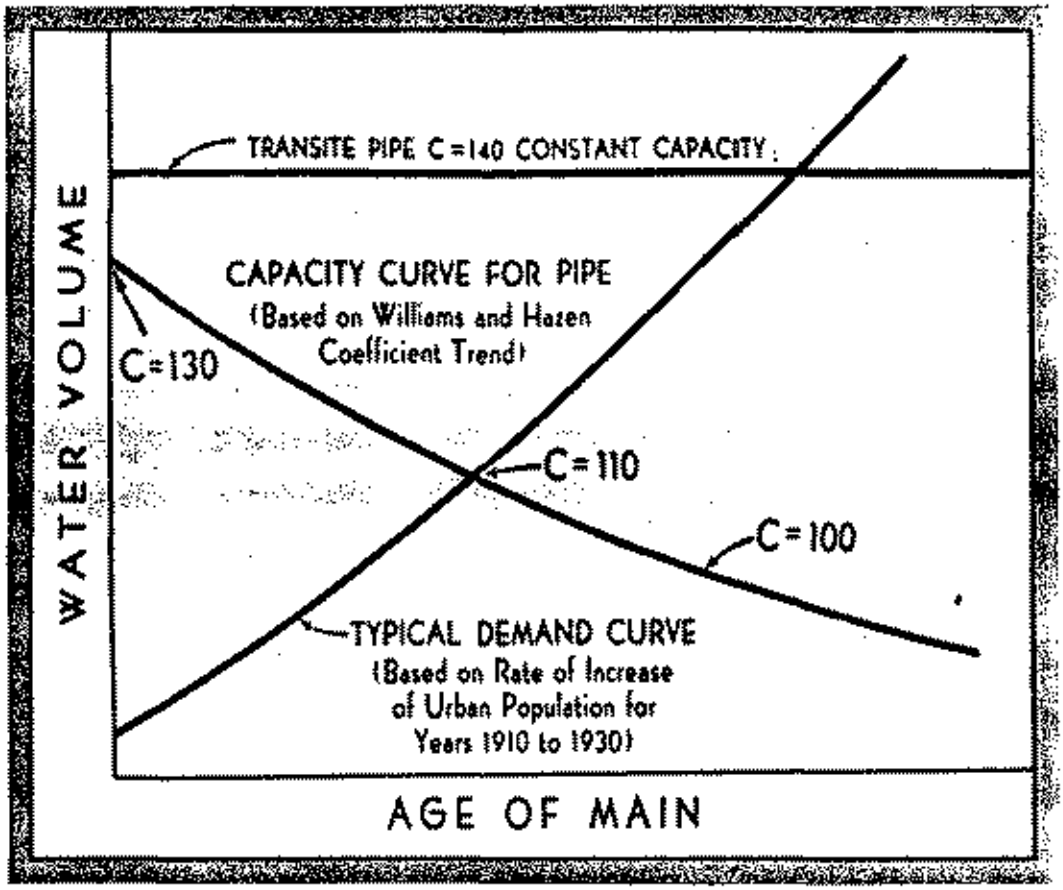
Annual power requirements to overcome friction losses in pumping 700,000 gals. per day through 1,000 ft. of 8" pipe, with combined motor and pump efficiency of 80%.

efficient of 100 as against 140. For example, assume a 12" pipe delivering 1,000 gallons per min. With a flow coefficient of C=140, 0.413 k.w. will be required to overcome friction loss of head per thousand feet of pipe. However, when the coefficient is reduced to C=100, 0.756 k.w. will be required, or an increase of 83%.

The increased power cost per year pump operation based on a power cost of two cents per kilowatt hour and combined motor and pump efficiency of 75% amounts to $79.91, or approximately 8 cents per linear foot of pipe per year. This capitalized at 4% amounts to $2.00 per linear foot of pipe. In other words, pipe with a high coefficient of C=140 could actually cost $2.00 more per linear foot than pipe with a coefficient of 100 and still be just as economical on the basis of yearly operating costs.

The chart above presents in concise, usable form the power required to overcome friction loss of head in various size pipe, with various quantities of water and flow coefficients.

MTW 00744



As water demand progressively increases through the years, the carrying capacity of typical water mains is continually decreasing, thereby necessitating expensive cleaning or the addition of new lines. These facts definitely emphasize the economy of Transite's permanently high carrying capacity.

Transite Pressure Pipe Assures Permanently Low Pumping Costs

TRANSITE PRESSURE PIPE, because it cannot tuberculate, *retains its original high delivery capacity indefinitely*, and assures permanently low pumping costs. Pumps may be operated at constant peak economy with no increase in pressure necessary to compensate for reduced carrying capacity and excessive loss of head in the line.

These are valuable features under any condition, yet they assume even greater significance when attention is given to the chart above. It will be noted that as the carrying capacity of typical water mains decreases through the years, the average water demand progressively increases, due to the normal growth of the community. In a relatively short time a point is reached where pipe subject to tuberculation cannot carry a sufficient volume of water to meet the demand. And in an attempt to compensate for this condition pressures must be increased excessively or additional pipe lines must be laid, either remedy involving a *great increase in operating costs*.

With Transite, however, the system may be laid out originally with the definite assurance that the capacity will never be decreased by tuberculation. With this established fact on which to base their calculations, engineers may proceed with due consideration for the normal increase in water demand through the years.

Furthermore, this constant high delivery capacity often makes it possible to use pipe of smaller diameter than would otherwise be required. This means that due to the immediate economies effected, a more extensive system may be installed for the same appropriation. And, because pumping pressures remain permanently low, it is seldom necessary to add additional pumping equipment to handle small additions to the line.

MTW 00745

J-M TRANSITE PRESSURE PIPE

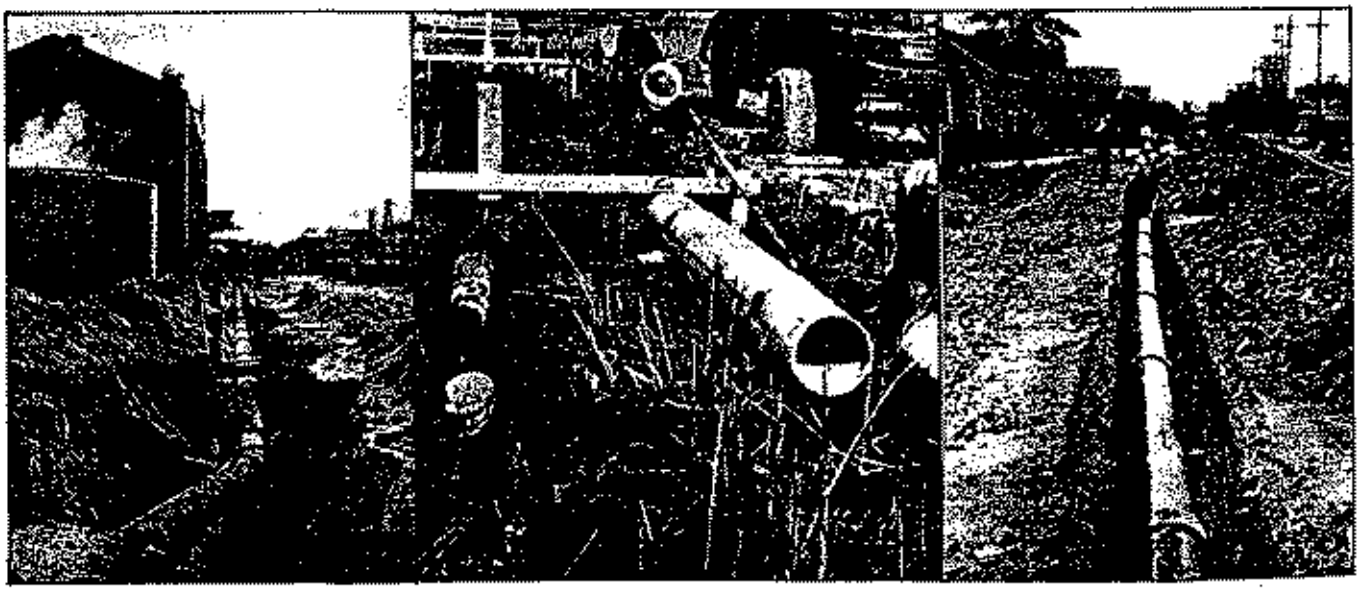
Cuts MAINTENANCE Costs!

Highly resistant to soil corrosion—absolutely unaffected by electrolysis and tuberculation — and sealed against leakage by tight Simplex couplings, Transite Pressure Pipe provides a valuable safeguard against the expense and inconvenience of shutdowns, repairs and replacements.

THE EXCEPTIONAL permanence of Transite Pipe is directly traceable to the nature of the materials from which it is made. Asbestos and cement, both of stone origin, are combined to form Transite, a tough, durable, non-metallic material possessing all the natural permanence of stone itself.

And stone is actually a symbol of long life and dependability! All through the ages it has been used wherever permanence of construction is an important consideration. The Pyramids and Sphinx, the Coliseum at Rome and the Great Wall of China are a few of the many examples that have existed for thousands of years.

Centuries ago the Romans built huge aqueducts entirely of stone—some of them are still in use at the present time. And the excellent condition of these



Transite Pipe has demonstrated its high resistance to the corrosive action of alkaline soil encountered in this industrial installation.

Even in the corrosive location as shown in the above salt marsh, Transite's remarkable corrosion resistance assures long life and efficient service.

In corrosive cinder fills and acid soils Transite Pressure Pipe is establishing records of enduring trouble-free service.

MTW 00746

structures today proves the advantages of stone and stone products as water carriers.

It is an economic necessity that any material used underground must successfully resist a large variety of destructive conditions. Transite Pressure Pipe, because of its stone origin, assures maximum long life and virtual freedom from maintenance in water transportation service.

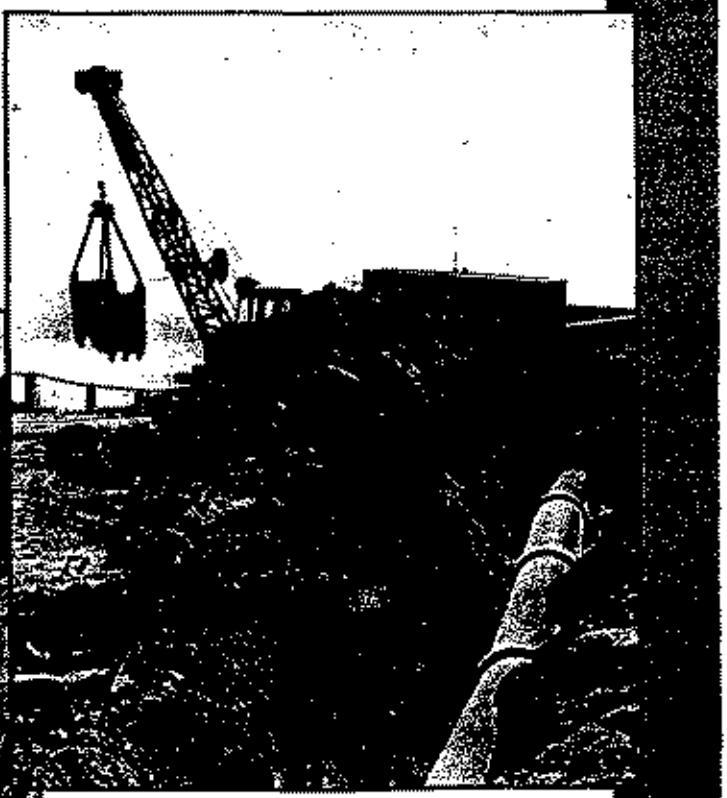
Highly Resistant to Soil Corrosion

One of the important advantages of Transite's asbestos-cement composition and unusually low free-lime content is its high resistance to external corrosion. Practically unaffected by all active agents in the strength encountered underground, Transite assures large economies in maintenance even when laid under conditions that rapidly destroy other materials.

Extensive investigations conducted by soil corrosion engineers of the Department of Agriculture, the Bureau of Standards and private companies, indicate that even in a limited area soil conditions and corrosive intensity may vary greatly. And even a relatively inactive soil may become highly corrosive with an increase in moisture content or a change in chemical characteristics due to fertilization, alterations in drainage, cinder-filling, etc. Therefore, it is vitally important that pipe lines provide high resistance to all types of corrosive conditions.



In selecting Transite Pipe, this Texas municipality assured itself of unusually efficient, economical water service—low maintenance through the years.



A portion of a 4,000 ft. 24 inch Transite supply line which will help assure adequate flow at minimum pumping and maintenance costs. Transite's high flow coefficient C=140 eliminates all the expenses incident to tuberculation.



Over 62,000 feet of 10 inch to 30 inch Transite Pipe were used on this water collection and transmission system. Because of its light weight and speed of assembly, the pipe was laid as fast as the trench was opened.

MTW 00747

Types of Soil Corrosion

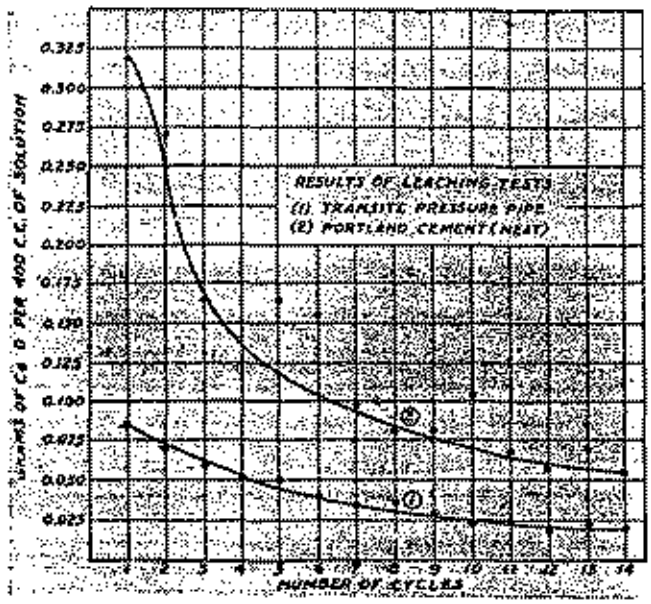
Broadly speaking, there are two principal forms of soil corrosion—chemical and electro-chemical.

Chemical corrosion is caused by the action of acids and salts encountered in the soil. While neat cement contains an appreciable amount of lime which may be leached out by these active agents, Transite Pipe, due to its curing process, has the free lime set as insoluble silicates. It is for this reason that Transite is so highly resistant to all forms of chemical corrosion.

A comparison of the two curves in the diagram below shows the much greater degree of insolubility of Transite Pipe. This exceptional resistance to chemical corrosion is a valuable feature of Transite because it eliminates the expense of pipe wrapping and other forms of protection often required by ordinary materials due to the great variety of soil conditions that may exist within a limited area.

Electro-chemical corrosion is caused by the electrolytic action between ordinary pipe and materials in the soil. This action is similar to that of a simple electric cell. In this case the materials in the soil represent the positive pole; the soil moisture, the electrolyte; and the pipe wall serves as the negative pole. The current generated passes from the metal pipe to the positive pole and causes a gradual disintegration of the pipe structure. With Transite, however, this condition can never occur, because being non-metallic, Transite is a non-conductor—therefore absolutely free from electrical corrosion.

Furthermore, the successful performance of Transite Pressure Pipe in all kinds of soil and under many varying climatic conditions provides practical proof of its exceptional resistance to corrosion.



The chart at the left represents a series of leaching cycles for both pulverized Transite Pipe and neat cement. The small amount of free lime extracted from Transite indicates that for all practical purposes it may be considered insoluble—one of the major factors responsible for its unusual resistance to soil corrosion.



Because of Transite's relatively light weight, installation is accomplished easily and rapidly. On this Arizona installation, for example, only a simple tripod is required to lower this large pipe into the trench.

Transite is Unaffected by Electrolysis

Electrolysis due to stray electric currents from high voltage lines, street railways, etc., causes much damage to ordinary pipe. In some locations this condition is so acute it is responsible for considerable expense and inconvenience.

But Transite, being non-metallic, cannot be damaged by electric currents—it provides complete protection against any danger of electrolysis.

No Periodic Cleaning Required

Because Transite Pressure Pipe cannot tuberculate, it eliminates the need for periodic cleaning that is so often required to remove this interior growth in ordinary pipe. This represents still another appreciable saving in maintenannce expense.

MTW 00748

The Simplex Couplings used on Transite Lines Minimize Underground Leakage

UNDERGROUND LEAKAGE has long been recognized as a serious menace to water conservation and to the efficient operation of pipe line systems. For *today water is literally a manufactured product—it* must be passed through settling chambers, chlorinated and filtered—and every operation adds to its expense. Therefore, every gallon of water that is wasted through underground leaks represents a direct financial loss to the Water Department, and increases the *cost of water to the consumer.*

Many underground leaks never come to the surface and therefore are difficult to discover. Year after year such leaks continue, not only wasting the profits of the Water Department but often excavating a hole under the street surface until a serious cave-in occurs.

Waste water surveys conducted by the Pitometer Company in cities ranging in size from 6,000 to 2,000,000 population, revealed leakage up to more than *one third the actual total consumption!*

A paper presented before the American Water Works Association in 1932 says in part: "This insidious loss may continue until the total leakage is so enormous that large sums of money must be expended to develop new sources of supply, construct new feed lines, increase the size of distribution mains or all of these combined."*

Breaks in mains are usually directly due to water leakage at joints washing away the supporting soil and causing the unsupported pipe to fracture under traffic or earth loads. And the most common cause of joint leakage is the fact that ordinary metal pipe lines are connected by rigid joints. When subjected to sudden jars or ground settling movements these inflexible joints may crack open and develop leaks.

Tight Joints That Stay Tight

Consisting of a Transite sleeve and two rubber rings, the Simplex Coupling used on Transite Pressure Pipe lines assures a tight joint that provides an unusually high degree of protection against leakage. When the coupling is assembled the rubber rings are tightly compressed between the pipe and the sleeve, forming a flexible, remarkably tight connection. This reduces to the minimum the possibility of excessive joint leakage and breaks in mains which result in water loss, high pumping pressures and expensive repairs.

Long Life of Rubber Rings

The durability of rubber when used as the jointing material in water pipe lines was expressed by Thorndike Saville** as follows: "the rubber rings in the joints of water pipes are practically indestructible, provided that they are conserved damp and protected from light".

The use of rubber as a sealing agent in water mains is not a new development. It has been used for this purpose for more than sixty years in this country and for even longer periods in Europe. One of many typical examples is a rubber gasket removed from a Brooklyn, N. Y. water main in 1932, which after more than 60 years of service was still in excellent condition, retaining its elasticity and showing no sign of deterioration.

And the great improvement in the art of compounding rubber during recent years, combined with the extreme care employed in manufacturing the rubber rings for Simplex Couplings, clearly indicate that even much longer life may be expected.

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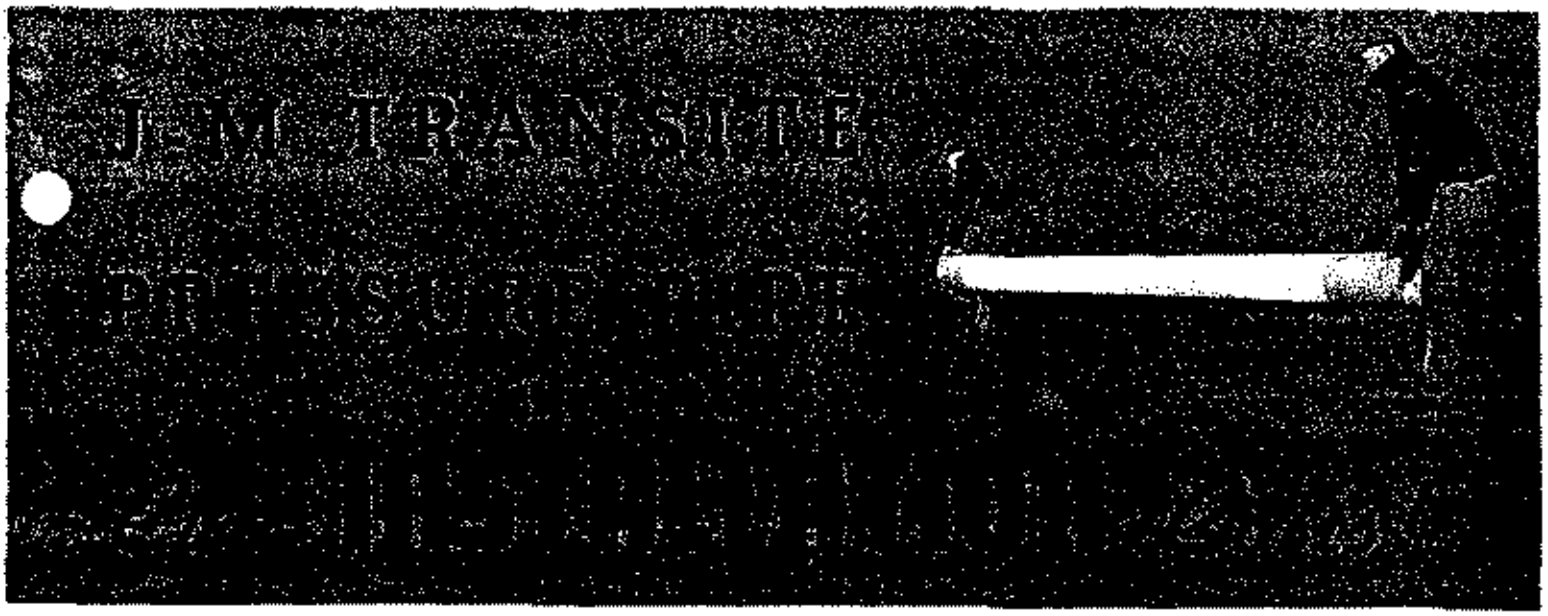
* Causes of Waste in Distribution Systems, Alfred E. Skinner, Pitometer Co., Journal of the American Water Works Association, Vol. 24, No. 11, November, 1932.

** Dean of the College of Engineering, New York University, New York City.



In Angell, Arizona, Transite is laid between two main like railway tracks. Flexible Simplex Couplings prevent leaks at joints due to vibration from passing trains.

MTW 00749



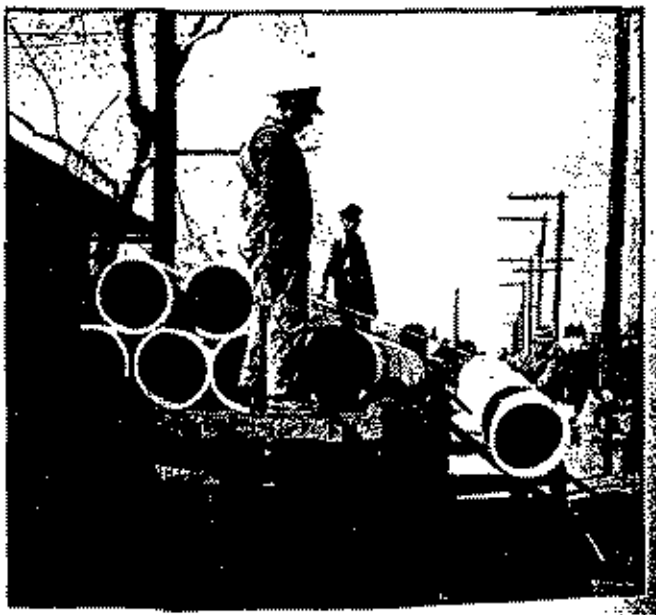
Light weight and speed of assembly make Transite an economical pipe to install. More footage may be carried per truck-load, fewer men are required for assembly of joints, and narrow trenches, with no bell holes, keep the cost of trenching and backfilling to an absolute minimum.

SAVINGS in installation costs with Transite Pipe begin at the very outset. Because of its relatively light weight, appreciable savings are effected with every handling operation.

In trucking the pipe to the job, a smaller truck may be used and more linear feet of pipe may be carried at every truck-load, thereby considerably reducing trucking costs.

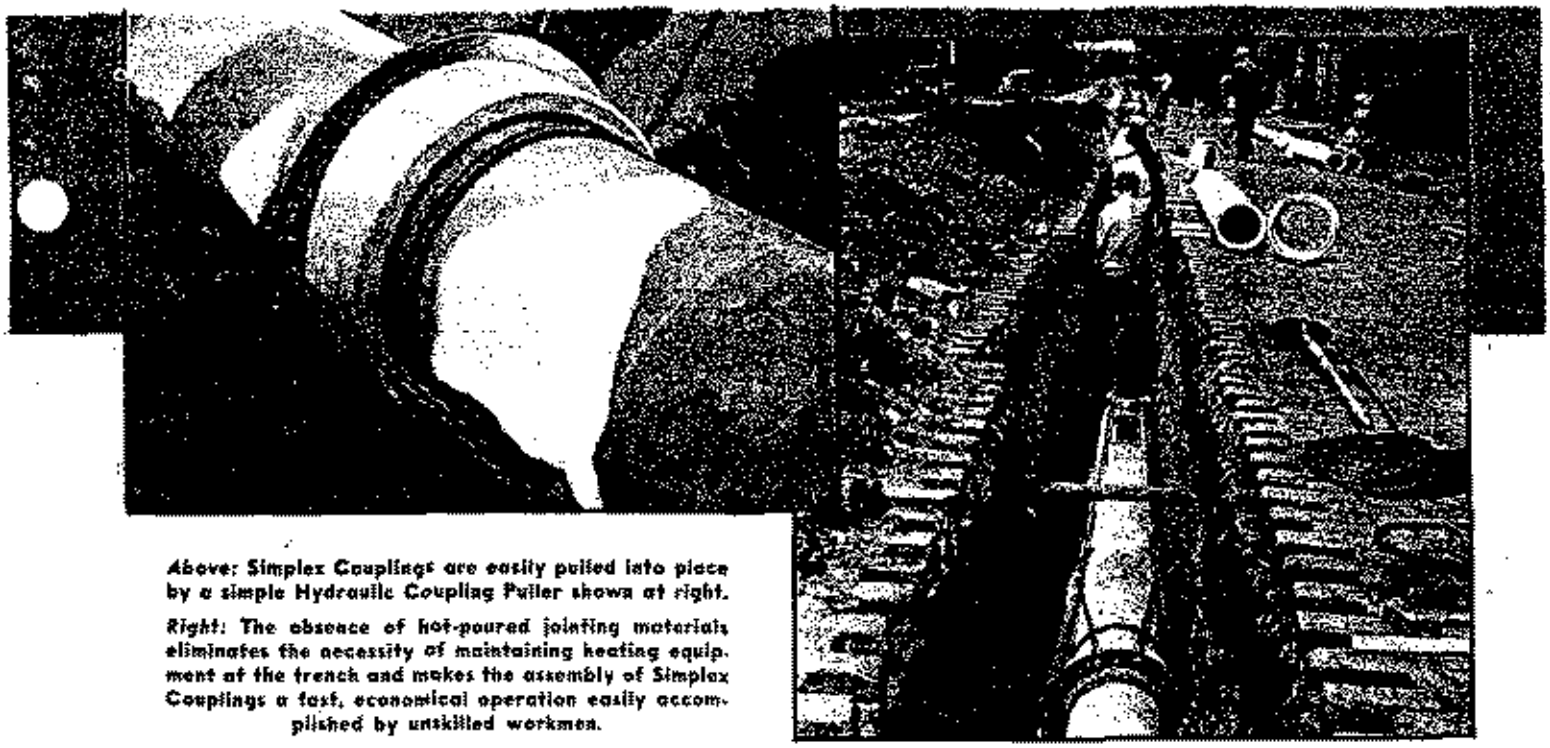
At the trench it is handled with ease and convenience. Its light weight permits lowering it into the *trench by hand without the use of mechanical equipment* except in the largest sizes. This light weight facilitates laying the pipe under or around obstructions which may be encountered in the trench. In fact, all sizes under 10 inches may be lowered into position and installed by only two men.

Due to the type of coupling used, no large bell-holes are required at joints. A narrow trench may be used, thus minimizing the cost of excavation, and replacement of pavement.



Because of its light weight, more footage of Transite Pipe may be carried at every truck-load, a smaller truck may be used, and fewer men are required for every handling operation — thus reducing installation costs.

MTW 00750



Above: Simplex Couplings are easily pulled into place by a simple Hydraulic Coupling Puller shown at right.

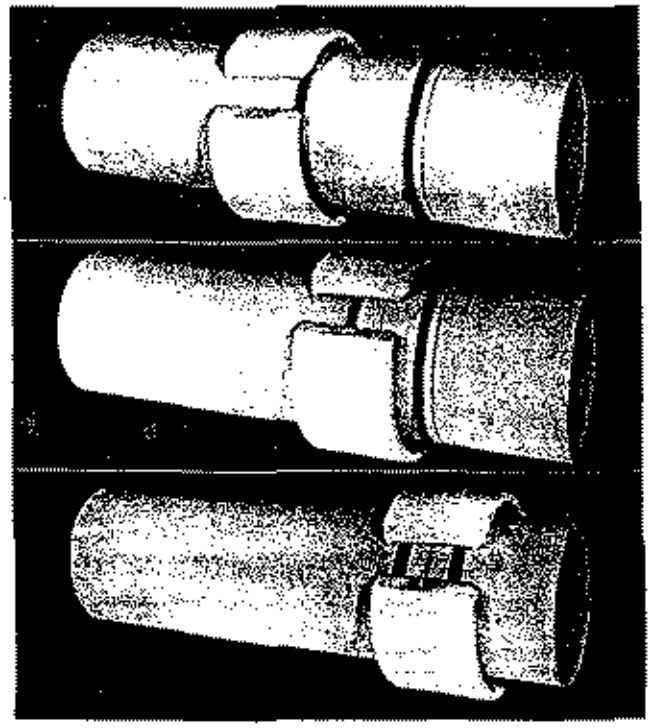
Right: The absence of hot-poured jointing materials eliminates the necessity of maintaining heating equipment at the trench and makes the assembly of Simplex Couplings a fast, economical operation easily accomplished by unskilled workmen.

SIMPLEX COUPLINGS are rapidly, easily assembled at minimum expense

THE EASE AND SPEED of assembly of the Simplex Coupling is one of the major factors contributing to installation savings. These unusually tight joints are easily assembled in much less time than that required by ordinary types. They permit the laying crew to install the pipe as fast as the trench is opened.

Unlike ordinary rigid types of joints, no hot poured jointing materials are required. The Simplex Couplings are assembled cold just as they are received from the factory; therefore it is not necessary to maintain heating equipment at various points on the job. And there is no need for a skilled pipe-fitter to assemble the joints—ordinary unskilled workmen can do the job rapidly and efficiently. A simple hydraulic coupling puller is the only tool required.

The Transite sleeve and the two rubber rings are easily slipped over the end of the pipe, the collar of the puller is fitted to the edge of the coupling and the jack is quickly placed in position at the other end of the section. As the handle is worked back and forth, the sleeve is forced over the rubber rings, compressing them tightly in position against the pipe.



In the above illustration the Transite sleeve has been cut to show how the rubber rings are compressed between the sleeve and the pipe. *Top:* rings and sleeve at start of operation. *Center:* sleeve pulled over one ring. *Below:* final position, sleeve centered over joint.

MTW 00751

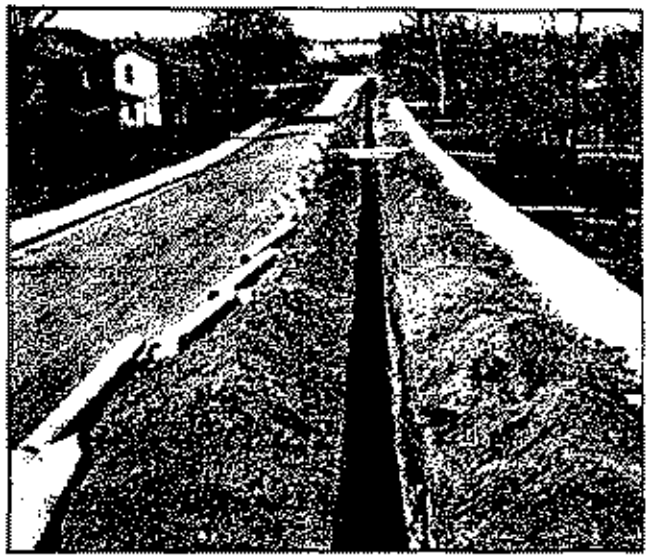
Wet weather does not interfere with a Transite installation, for the coupling can be assembled whether the trench is wet or dry. In fact, when necessary, a Simplex Coupling can actually be assembled under water!

The unusual simplicity of the entire operation accounts for the remarkable speed with which a Transite installation may be made.

Employing a crew of six unskilled workers, a midwest town recently laid an 11-mile, 8 inch Transite water line with exceptional speed and economy. For the entire installation they averaged 1170 feet of pipe per eight-hour day.

And a town in Florida, when laying an 8,946 foot 6 inch Transite line established the remarkable average of 330 feet of pipe per man per eight-hour day.

While these cases represent good weather and trench conditions, they point definitely to the conclusion that Transite Pressure Pipe is notably easy and economical to install. And when laid under adverse conditions, the simplicity of the Simplex Coupling assembly, its great adaptability and the speed with which the pipe may be laid, represent even greater economies in time and labor.



The absence of large bell holes at joints permits the use of narrow, less expensive trenching as is well illustrated by this installation of six inch Transite Pipe.

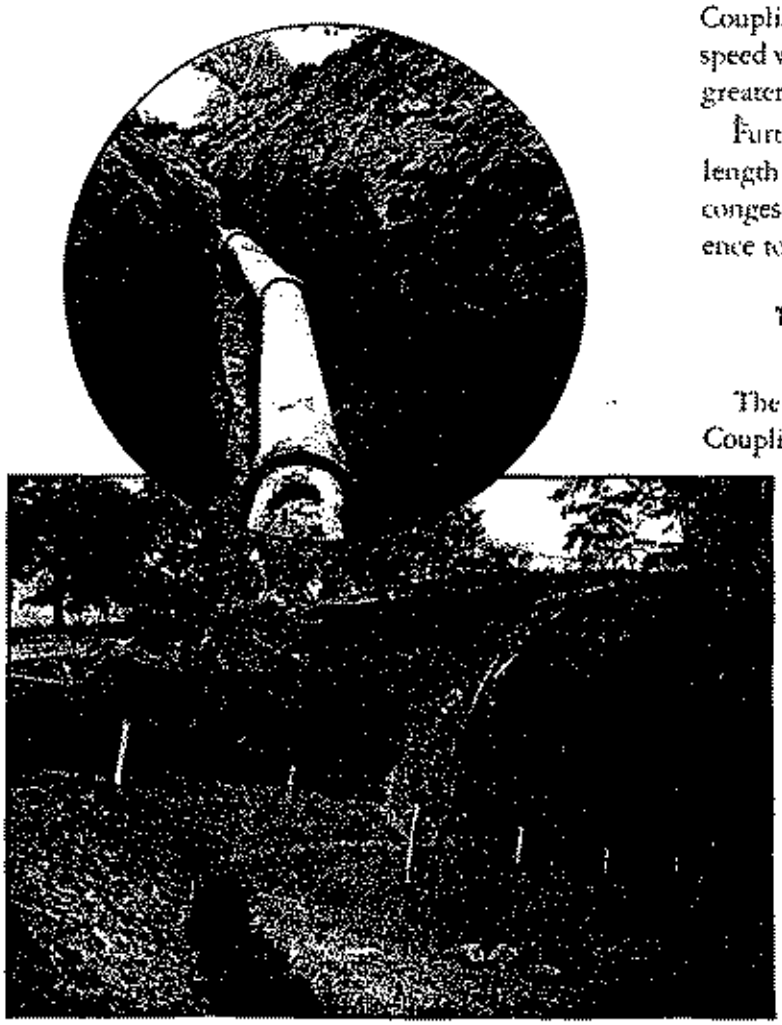
Furthermore, this speed of assembly reduces the length of time the trench must be opened. Traffic congestion is minimized and there is less inconvenience to business and residents along the line.

Transite Can Be Laid Around Curves Without Special Fittings

The ability to deflect Transite Pipe in the Simplex Coupling permits laying standard lengths of pipe on long sweeps without the use of special fittings. And when short radius curves are required they can be made easily by using half lengths of pipe to provide more joints in the line. Deflections up to 5° are possible at each joint.

This flexibility is a desirable feature also when the pipe is laid in hilly ground or where obstructions in the trench line must be avoided.

* * *



Circle: The flexibility of Simplex Couplings permits laying the pipe around curves without special fittings.

Left: This flexibility is also particularly desirable when pipe must be laid in hilly ground.

MTW 00752

Service Connections are Easily Made with Johns-Manville Transite Pressure Pipe

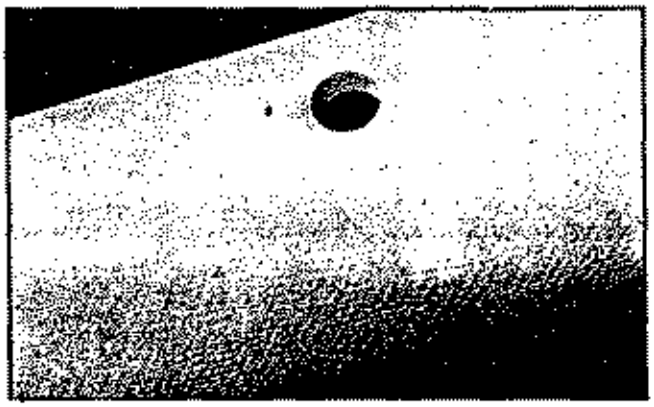
BECAUSE OF THE TOUGH, dense structure of Transite Pipe, it may be drilled and tapped perfectly with standard tapping tools and methods. The deep, clean threads have the necessary strength for installing corporation stops to provide a connection that is strong and water-tight.

Numerous tests conducted to determine the strength of these connections show that it requires a force of several thousand pounds to pull a ¾" corporation stop from the pipe—a force far in excess of any encountered in normal service.

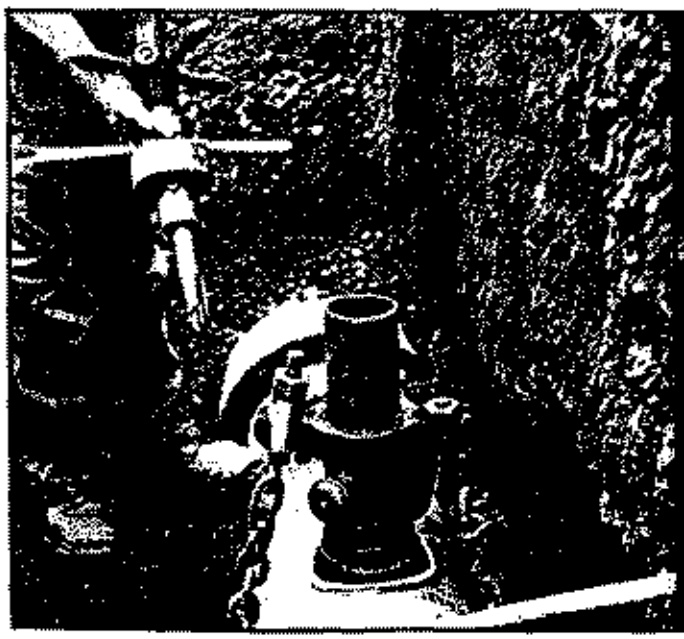
Other tests conducted on hydrostatic test machines prove that even excessively high pressures will not cause leakage around the threads of the connection.

The practical strength of corporation stops tapped directly into Transite Pipe has been proved by many individual towns and cities using thousands of such service connections for many years.

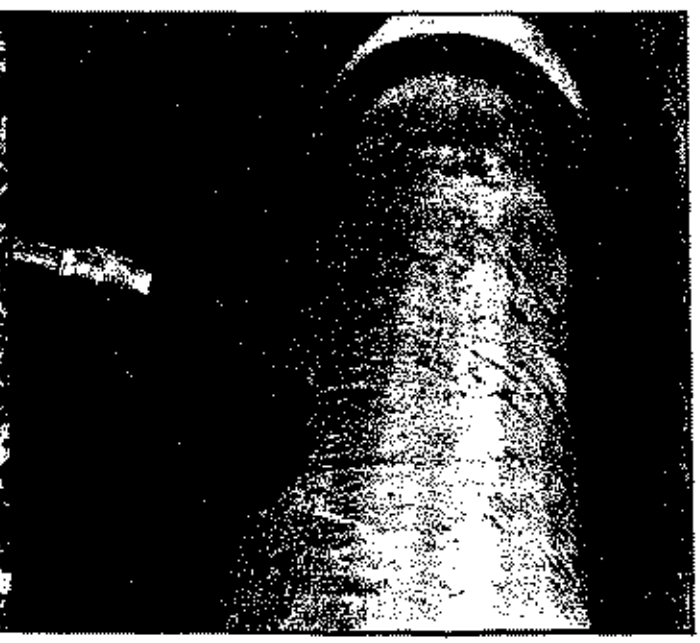
When it is necessary to connect Transite Pipe to the bell of cast iron elbows, tees and other fittings, standard joint compounds such as sulphur base jointing material or metallic lead may be used. The light weight of Transite makes it possible to assemble all of these fittings at one central point and lower the completed units into the trench at their particular locations. This again minimizes installation costs and prevents delays when assembling the pipe in the trench.



The sharp, deep threads it is possible to make in Transite Pressure Pipe are strong and firm. They provide perfect seating for threads on corporation stops and eliminate leakage at these points.



Transite Pipe may be tapped quickly and easily with standard tapping tools. No special operations are required and it may be done while main is under pressure.

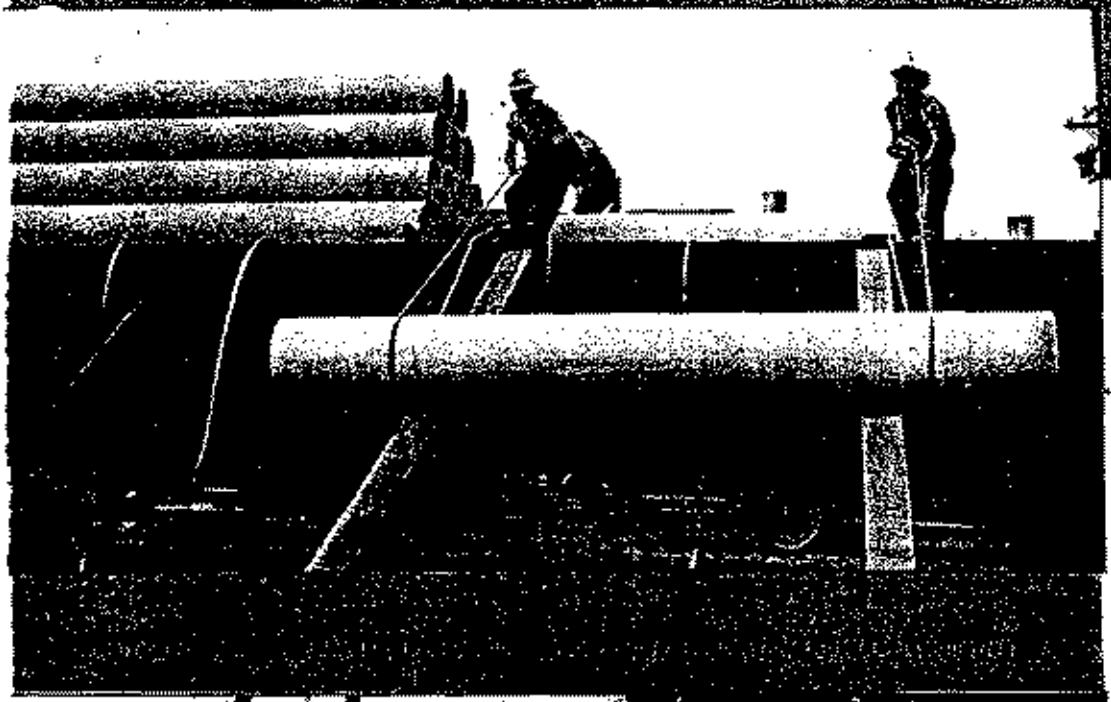


Service connections tapped into Transite lines are strong and free from leakage. Thousands of such service connections on water works systems attest to their efficiency.

MTW 00753

JM Transite Pressure

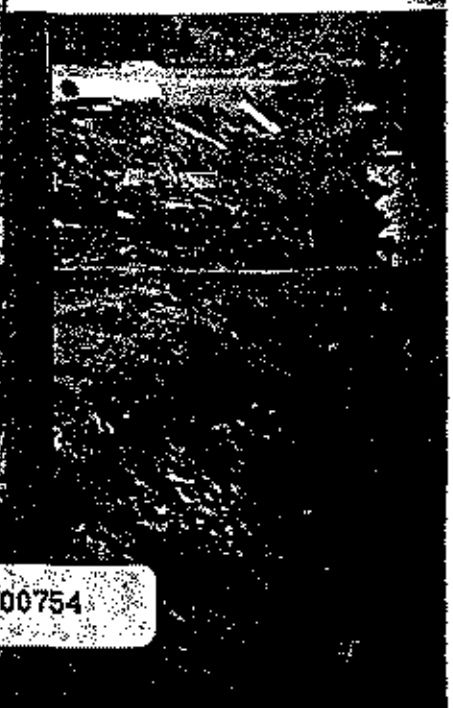
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Transite Pipe is installed
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MTW 00754

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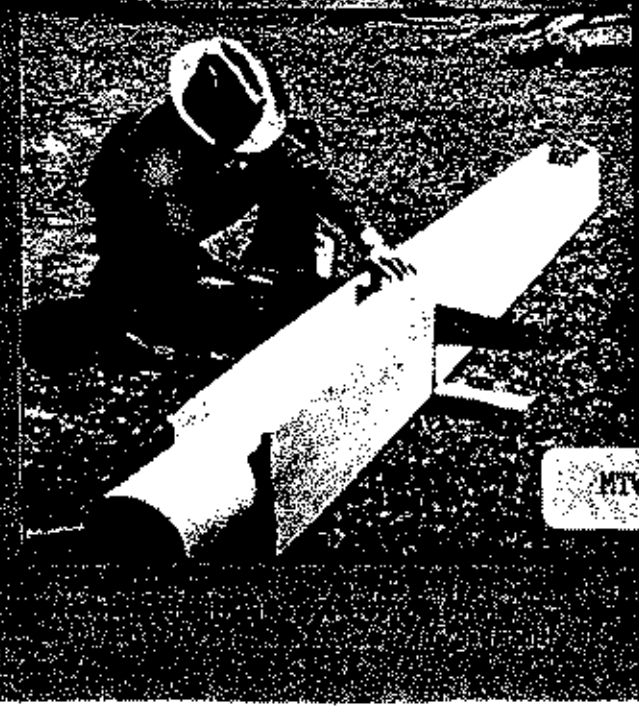




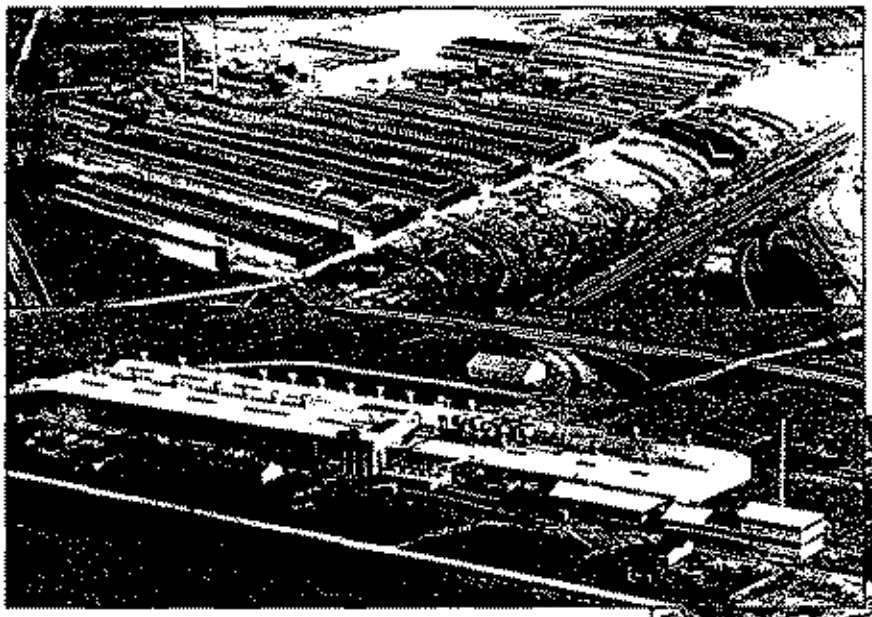








MTW 00755



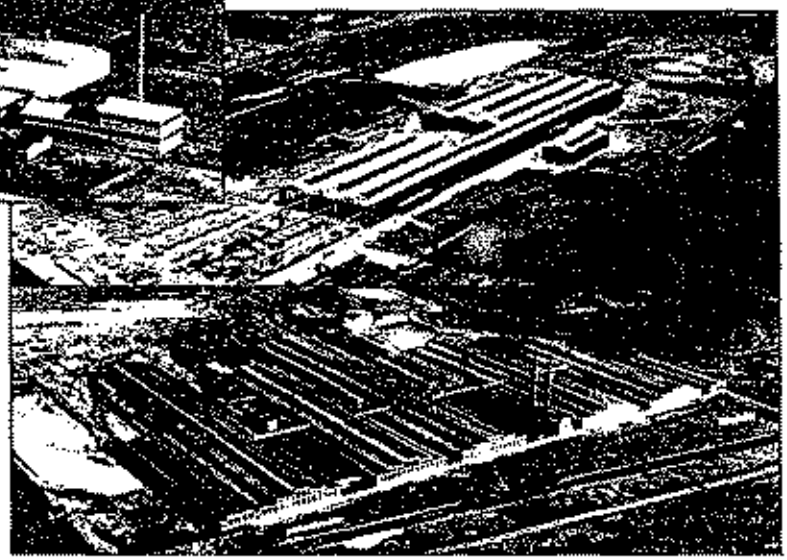
From top to bottom:

NEW JERSEY—An air view of the Johns-Manville factory at Manville.

LOUISIANA—The Transite Pipe plant at Marrero serves the south and southwest.

CALIFORNIA—A view of the J-M Transite factory at Watson.

ILLINOIS—The J-M Transite Pipe plant at Waukegan is centrally located.



Rigid Control Through Every Step of Production Assures Uniform High Quality

MANUFACTURED in diameters of 4 to 36 inches inclusive, and in pressure classes of 100, 150 and 200 lbs., Transite Pressure Pipe is produced by a series of accurately controlled operations. Each step is designed to add permanence and efficiency to the finished pipe. And every operation is supervised and checked by a staff of highly trained inspectors.

Asbestos Fibres Provide Strong Reinforcement

The asbestos fibres serve as reinforcement in much the same way that steel reinforces concrete structures, but to an even greater extent because they are thoroughly mixed with the cement to provide uniform strength throughout the material. The tensile strength of asbestos fibres runs as high as 400,000 psi.

To assure maximum durability and toughness, the asbestos fibres are carefully selected and blended. In pre-determined proportions they are mixed with a weighed amount of cement and a sufficient volume of water is added to disperse the fibre uniformly through the mixture.

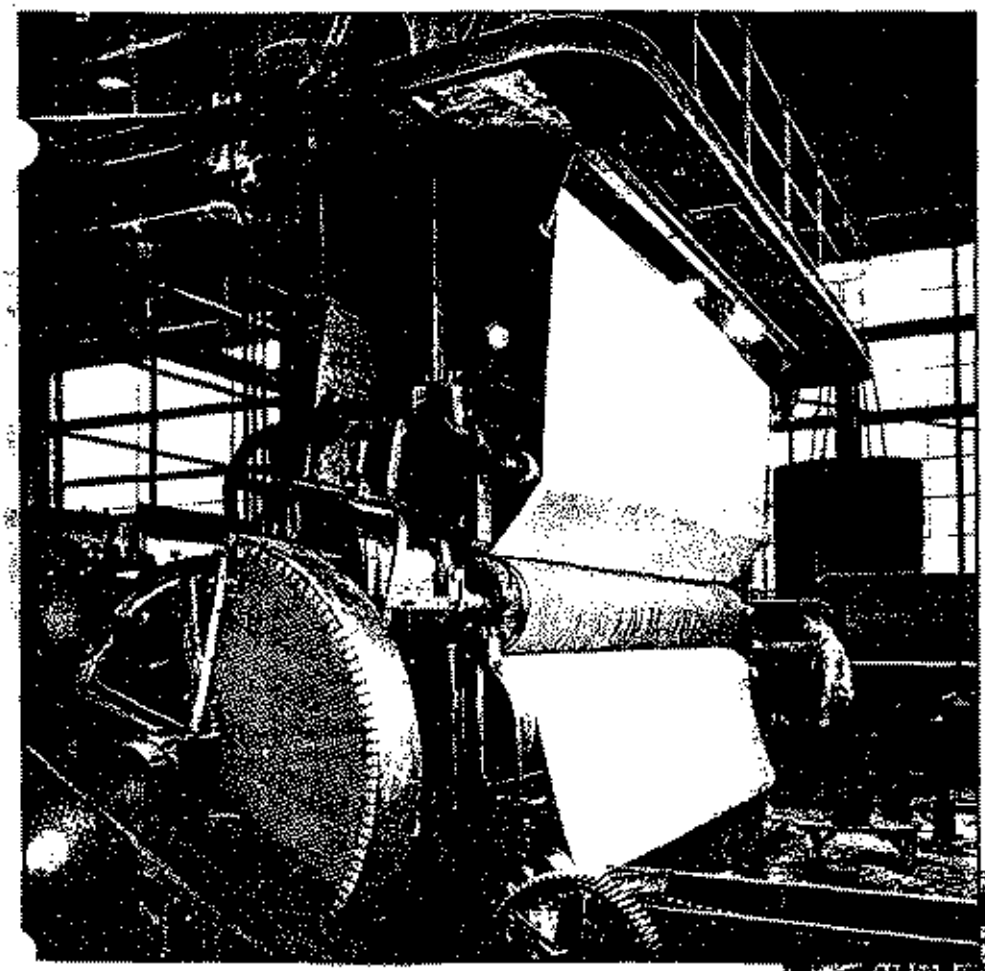
Formed Under Pressure on a Polished Mandrel

An endless felt picks up a thin coating of the mixture 1/100 of an inch thick and conveys it to the polished steel mandrel at the front of the machine. The excess moisture is removed by suction created by vacuum chambers over which the felt is carried.

As the mandrel revolves, the asbestos-cement is "built up" on its polished surface. Heavy hydraulic pressure rolls are forced against the mandrel while the pipe is being formed. The tremendous pressure exerted compresses the mixture into a tough, dense, homogeneous structure of unusual strength and uniformity.

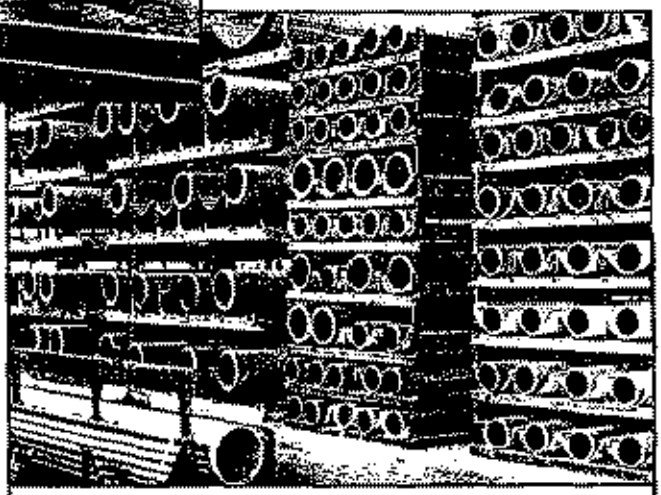
The highly polished steel surface of the mandrel

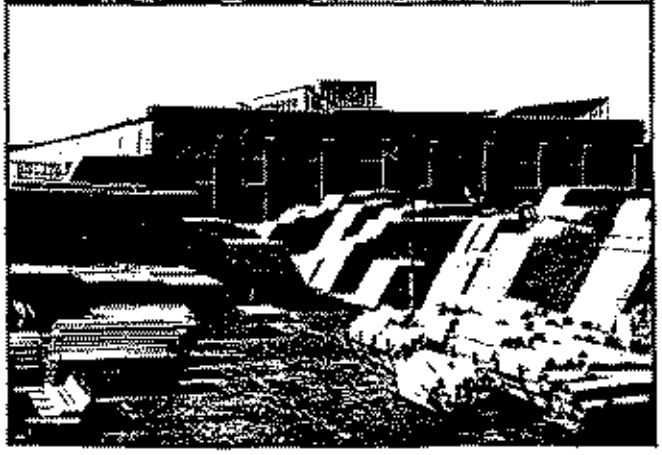
MTW 00756



Left: A view showing the front section of the complex machine on which Transite Pipe is formed. Note the large polished steel mandrel on which the pipe is "built up" and compressed into a dense, tough structure by heavy hydraulic pressure rolls.

Below: The drying racks where the newly-formed pipe is stored before passing to the final curing operation. Bottom: Part of the stock of finished Transite Pipe at the Manville, N. J., plant.





# of Transite Pipe

imparts the smooth interior surface to Transite Pipe that accounts for its exceptionally high delivery capacity.

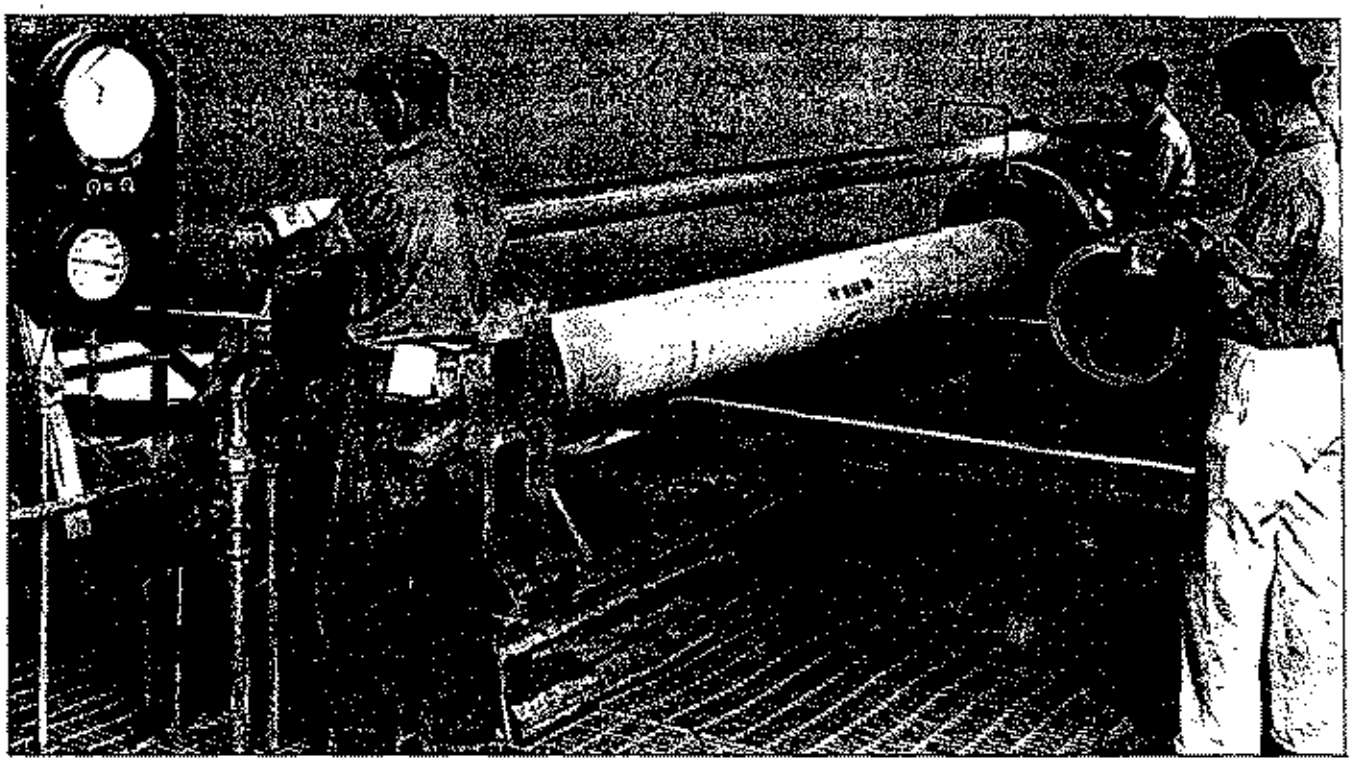
Carefully Inspected and Machined

After the pipe is inspected and calipered by trained inspectors, it is subjected to a series of curing operations especially designed to give additional strength and permanence to the material.

In the finishing department the ends are trimmed and machined to furnish a perfectly smooth exterior surface. This assures perfect seating of the rubber rings and a remarkably tight joint.

The permanence of the materials from which it is made and the extreme care exercised during every phase of manufacture, curing and finishing are directly responsible for the uniformly high quality and structural soundness of Transite Pressure Pipe.

MTW 00757



Before shipment, every length of Johns-Manville Transite Pressure Pipe is accurately calipered and then tested at four times its specified working pressure in specially designed hydrostatic test machines.

Every length of pipe, every coupling and rubber ring is thoroughly tested before shipment

TYPICAL of the extreme care exercised to assure permanent serviceability of Transite Pipe is the work of the inspection department at the Johns-Manville factories.

This department operates independently of any phase of manufacture. It functions as a separate organization whose only concern is a thorough examination of Transite Pressure Pipe to assure complete conformance with the rigid manufacturing specifications set by the laboratory.

Skilled technicians put every length of pipe, every coupling and rubber ring, through a rigorous series of practical tests to prove their ability to withstand every condition encountered in service.

Testing the Pipe

Each length of pipe is accurately calipered, and then individually tested in a hydrostatic test machine



The couplings, too, are tested in hydrostatic testers at 4 times their specified working pressure to assure the same margin of safety as in the pipe itself.

MTW 00756

to prove its ability to withstand internal pressure. Water is forced into the pipe and pressure is raised to four times the specified rating of the pipe.

This assures a high margin of safety to accommodate line surges and variable pressures often encountered in service.

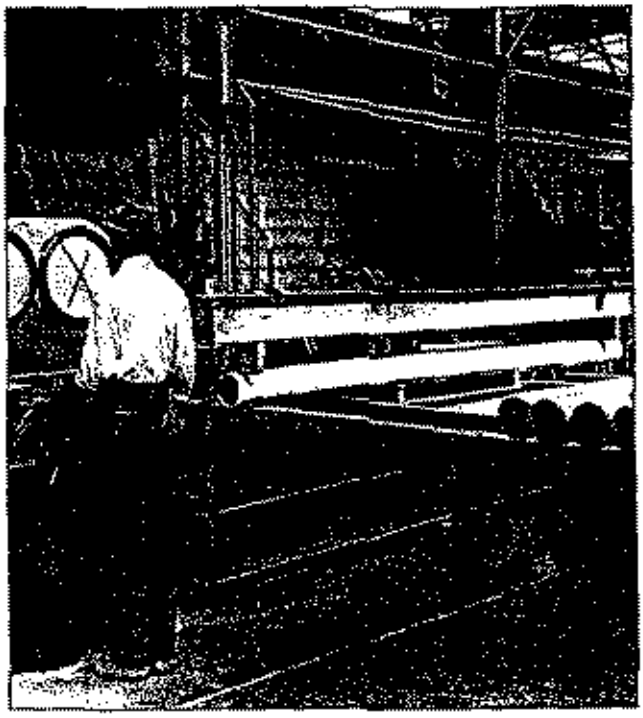
In those sizes where resistance to flexural stresses due to earth loads and street traffic may be an important consideration, each section of pipe is subjected to a beam test with the load applied at the one third points of the pipe span. Eight inch, Class 150 pipe, for example, is loaded with a total of 6300 lbs. Under this extreme force the pipe is bent—and then released.

In this way the user of water pipe is definitely assured that every section of Transite Pressure Pipe will satisfactorily withstand the stresses and strains encountered in normal water-carrying service.

Testing the Couplings

The couplings, too, are thoroughly checked by the inspection department. After gauging the inner diameter and carefully measuring the wall thickness, they also are tested for resistance to internal pressure.

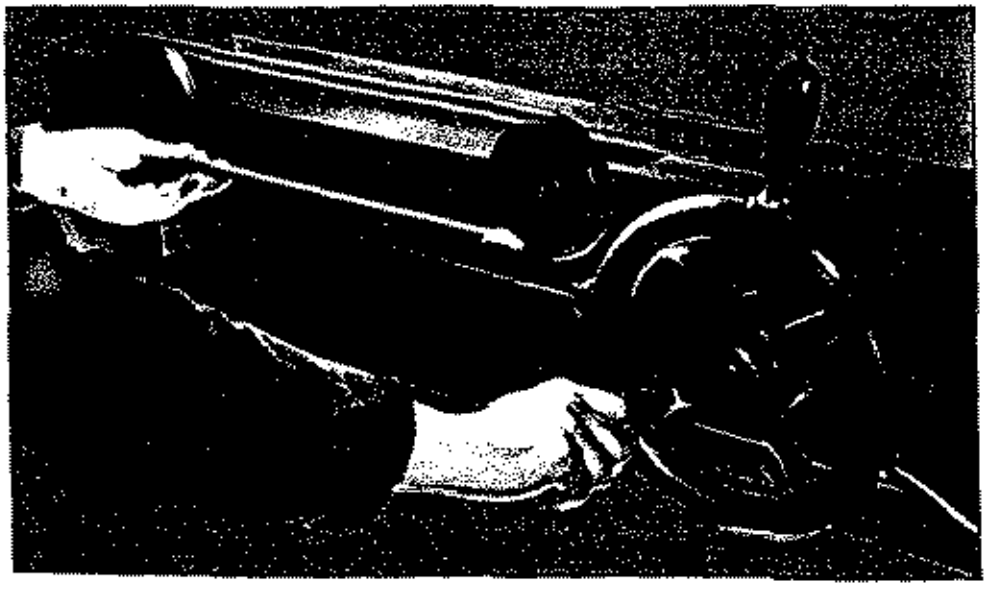
A specially designed hydrostatic coupling tester is used. And here again pressure is raised to four times the rated capacity to assure the same high factor of safety as that of the pipe itself.



In those sizes where flexural strength is important, each length of pipe is subjected to a beam test with the load applied at the one-third points of the pipe span.

Testing the Rubber Rings

The rubber rings used in the Simplex Coupling assembly are subjected to a mechanical stretch test and while in a stretched condition are given a visual examination by trained inspectors.



Rubber rings used in the Simplex Coupling assembly are rigidly tested and examined by trained inspectors before being released for shipment to the field.

MTW 00759

Johns-Manville Transite Pressure Pipe is Listed by Underwriters' Laboratories, Inc.

THE UNDERWRITERS' LABORATORIES, INC. is an impartial, non-profit organization established and maintained by the National Board of Fire Underwriters. Its function is the examination and testing of devices, systems and materials for the purpose of reporting thereon to insurance organizations. Billions of dollars worth of insurance is dependent upon its decisions. For the information gathered by the Underwriters' Laboratories is used in connection with the establishment of rates on fire risks throughout the country.

Therefore it is of extreme importance that any material entering into a water works system be accepted and listed by the Underwriters' Laboratories, Inc. For in this way every citizen served by that particular system is assured of lower insurance rates than he would otherwise receive.

The acceptance of Transite Pressure Pipe for listing by the Underwriters' Laboratories indicates their satisfaction with Transite's practicability and efficiency as a water carrier. The listing of this material was based upon the results of their comprehensive tests and investigations of Transite Pipe, and the fact that Transite successfully met every one of their rigid manufacturing, testing and service requirements.

Excerpts from the conclusions to the complete report on Transite Pressure Pipe issued by the Underwriters' Laboratories, Inc. are given below.



The Underwriters' Laboratories, Inc., conducted a complete series of tests to determine the chemical stability, structural strength and practicability of Transite.

CONCLUSIONS

"The following conclusions apply to Transite Class 150 pressure pipe and couplings in sizes from 4 to 24 in., inclusive, for use in underground water service where the working pressure does not exceed 150 lbs. per sq. in.

PRACTICABILITY: "The pipe and couplings can be handled and shipped by the methods employed without excessive damage or breakage. They can be properly installed under conditions ordinarily met with in service, by those reasonably familiar with the installation of underground pipe; and repairs and renewals of Transite pipe lines can be accomplished without unusual difficulty.

"The Service Record investigation also shows that the pipe and couplings can be handled, shipped, and installed without breakage or excessive damage under customary practices, and the fact that large users of this material are consistently sending in new orders indicates that the pipe and couplings already laid are giving good service.

"The results of the Tapping Tests show that if a reasonable amount of care is exercised, it is practical to drill and tap directly into the wall of the pipe for service connections and that such connections are free from excessive leakage.

"The results of the Restrained Joint Tests show that the joints possess sufficient flexibility to enable the pipe to be laid to curves and the joints will withstand a reasonable amount of deflection after they are assembled, without leakage.

DURABILITY: "The Transite pipe and couplings dealt with in this report, when installed according

MTW 00760

to the methods advocated by the manufacturer, will probably withstand deteriorating influences resulting from exposure to potable waters and ordinary ground conditions for long periods of time.

"The Service Record investigation shows that Transite pipe has been used in alkali soil for a period of four years without showing signs of disintegration. Two of the replies indicated that the pipe was being used successfully in conveying acid mine waters.

"Experience has shown that rubber used in underground joints has given long and satisfactory service, the life of the rubber being favored by the dampness and darkness conditions.

"The Service Record investigation showed that the Transite pipe and couplings made by this manufacturer have been in service for periods over four years, and none of the replies received indicated that the pipe was not giving satisfactory service for the purpose for which it was used.

RELIABILITY IN SERVICE: "When properly installed, Transite pipe and couplings will withstand without failure, the stresses to which they will ordinarily be subjected in service. Due to the smooth, glossy interior surface, the friction loss in this pipe is low and is likely to remain low indefinitely.

"The Service Record investigation indicates that the pipe and couplings have given good service under working pressures as high as 145 lb. There were no complaints either on the holding power of the joints or leakage under pressure.

"The pipe and couplings which have been in service have not developed any defects which would indicate that they are not reliable under the conditions met in ordinary mains for underground water service.

STRENGTH: "Transite pipe and couplings made in conformity with the specifications for its manufacture and installed according to the methods advocated are capable of withstanding the working pressures for which they are designed and all stresses to which they are likely to be subjected in service.

"The Service Record shows that Transite pipe and couplings used in underground water service in a number of municipalities have proven reliable in service and none of the replies received indicated that this material was lacking in strength under the service for which it was used.

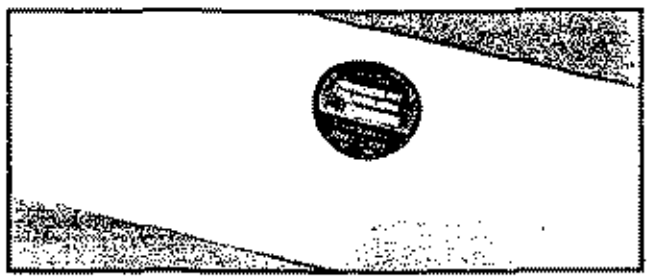
"The results of the Impact Tests show that the pipe is not unduly susceptible to breakage from impact.

UNIFORMITY: "The facilities and methods employed in the manufacture of the pipe and couplings which are the subject of this report are such as to insure an accurate and uniform product. The uniformity with which the pipe is assembled under practical conditions in the field will be dependent upon the experience of those doing the installation work, the extent to which the instructions for installation and handling are complied with, and the thoroughness of the tests and inspections after the pipe and couplings are laid.

"Examination of the pipe and couplings shows that a high degree of uniformity is obtainable. The external and internal diameters are uniformly concentric and the pipe is straight. No marked variations in the smoothness of the interior or exterior surfaces was found in the examinations.

"Observations during the preparation of the test samples and during the tests show that the pipe and couplings can be made uniformly right at pressures considerably in excess of the working pressures.

SUMMARY: "From the conclusions drawn it will be noted that it is practical to handle and ship the pipe and couplings and install and maintain them in underground piping systems; that systems constructed of them are not subject to rapid deterioration; that the pipe and couplings are capable of withstanding all reasonable stresses to which they are likely to be subjected under ordinary service conditions; that they are reliable in service; that they are uniformly made and can be uniformly assembled."



MTW 00761







Thousands of Have Transite

Thousands of installations of Transite Pipe in cities and towns all over the country are providing permanently efficient and economical service under every conceivable condition. The Underwriters' Laboratories, during the investigation of Transite Pressure Pipe, asked the water department officials of scores of these towns for their frank, unbiased opinion of Transite Pipe. On the following three pages will be found a number of excerpts from the most typical of these replies as they were reproduced in the report of the Underwriters' Laboratories, Inc.



Cities in the United States Pressure Pipe in Service

"In October of 1934 we installed about 3500 ft. of Johns-Manville 6-in., Class "C" Transite pipe in a line supplying the Village of—— with water for domestic use; the greater part of the line crossing a marsh where wood stave pipe had failed after some years of service. To date we have experienced no difficulties of any kind with the line."

* * *

"Our opinion of Transite pipe for this type of service can probably be best stated by saying that we are now contemplating the installation of about 6,000 ft. for water main extension."

* * *

"The Department is very well satisfied with the Transite mains we have laid, and we expect to complete an entire loop main around the city with this material. The difference in the interior surfaces of cast-iron and Transite pipe gives the Transite pipe considerable advantage and makes a 12-in. Transite equivalent to a 16-in. cast-iron pipe".

* * *

"Although we have not investigated the smaller sizes used in the transmission system, we are convinced that this pipe offers an advantage over cast iron for use in feeder mains where the capacity of the main is of greatest importance."

* * *

"In May 1933, we completed and put into service a 16-in. diameter Transite water main which was laid in soft meadow marsh and beneath the —— River, at a point where the tidal flow changes the depth about 12 ft. The pressure in this line varies from 50 to 115 lb. per sq. in. Fire flow tests were made and the results approved by the New England Exchange.

"A severe test with fire department pumps developed a burst in the other type of pipe in the system, but to date we have had no trouble with the Transite.

"Since that time we have installed several miles of Transite pipe, diameters from 2 to 8 in., with entirely satisfactory results.

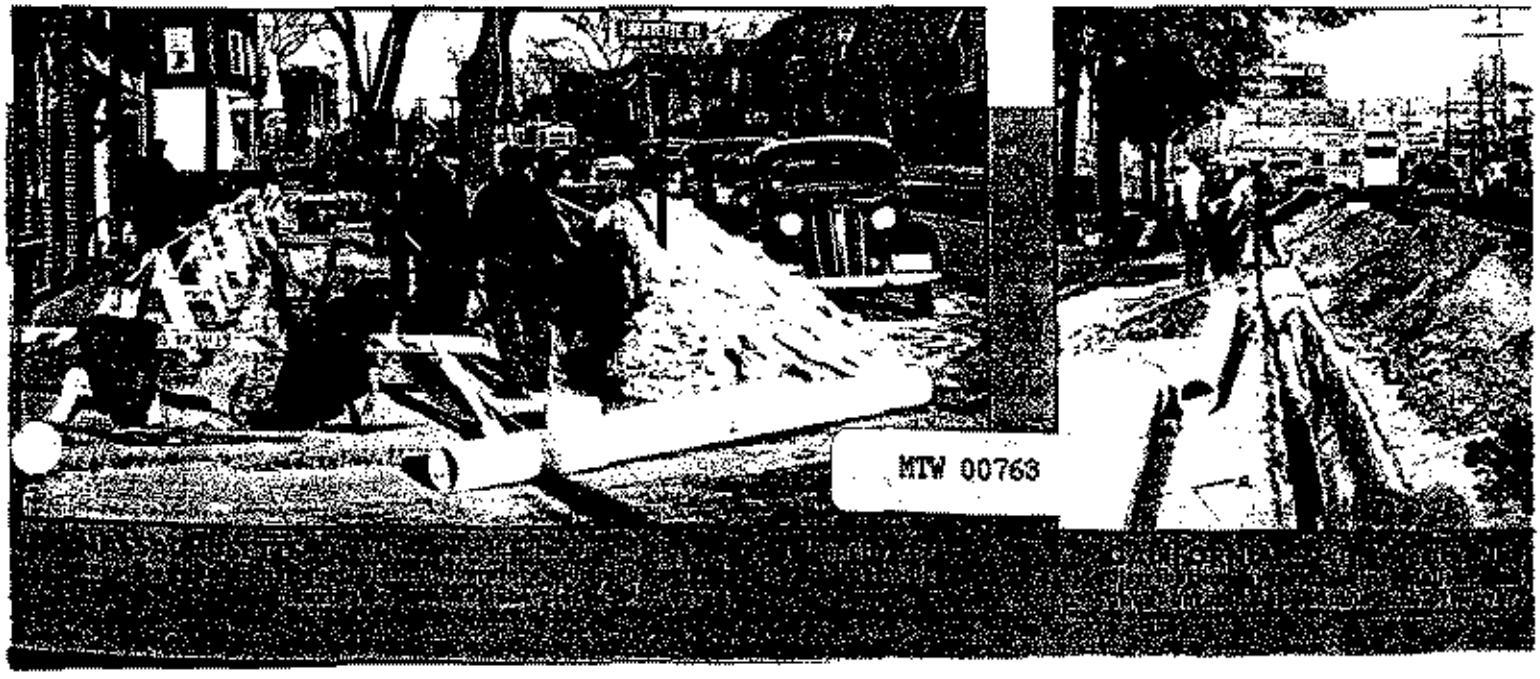
"This pipe is being tapped in the regular way for services.

"At present we are laying 11,000 ft. of 8-in. diameter Class 150, feeling that tuberculation troubles are over in these lines."

* * *

"Let me say at the outset that I am very much taken with the many good qualities of Transite pipe— not the least of which is ease in handling, and its adaptability for use with standard fittings."

* * *



"Altogether we find Asbestos Cement Pipe rugged and well adapted for laying without special tools or fittings. The only special tool required is the coupling puller.

"The pipe has many advantages. It is obviously free from electrolysis, rusting and tuberculation and that without any kind of coating. Another advantage that the pipe seems to have is that the joints are bottle tight. Our experience would confirm this, and we see no reason why they should not remain tight. This would be a big advantage as our lead joints often require attention."

* * *

"The success of the original test installation has resulted in the District's use of Transite pipe in many other sections where soil conditions are found by experience with metal pipes or by electrical resistance tests to be of a corrosive nature. There have been no failures to date to indicate that its use is not warranted in such locations."

* * *

"We put in 2,000 ft. of this pipe early last spring, in connection with our irrigating system. To date it has been perfectly satisfactory, and we have no reason or evidence that will warrant our anticipating future trouble."

* * *

"We laid an 8-in. line about two years ago with Johns-Manville Transite pipe. To date we have had no trouble whatever with this line, and this year I have just put in an order for about 1200 ft. of 10-in. Transite pipe.

"Personally I think this pipe has a great many advantages. It certainly will stand adverse soil conditions, and it is very easy to handle and lay. The only thing that I do not know is the life of the pipe. As I understand it, it has only been manufactured some 30 or 35 years.

* * *

"The Transite Pipe was installed by our own men very easily. Pressure was turned on before couplings were backfilled, and absolutely no leakage occurred. The lines have given complete satisfaction to date, and a recent test showed no appreciable drop on the Transite sections.

"In conclusion, I might say that the statement of the Johns-Manville Company regarding the ease of laying and the tightness of joints has been completely borne out."

* * *

"We have in service approximately 1,200 ft. of 8-in., 1000 ft. of 6-in. installed in 1934, and 2700 ft. of 4-in. installed in 1935, Class C Transite pipe. To date we have had no operating difficulty whatever with this class of pipe. With steel pipe and even with cast-iron pipe we are troubled with tuberculation in our lines, which of course greatly decreases their carrying capacity, and we expect that the Transite pipe will eliminate this difficulty - we think well enough of the pipe that we have on order 1,400 ft. of 6-in., 1,570 ft. of 6-in., and 580 ft. of 8-in. Class C Transite pipe - we are satisfied that the friction loss in this pipe is materially less than that in metal pipe."

* * *

"If we were to put in further underground lines for water supply, I am sure we would specify Transite again."

* * *

"At present we are well satisfied with both of these pipe lines and do not hesitate to recommend them for general pipe line purposes."

* * *

"We would not hesitate to recommend this pipe for service where strong mine acid water is encountered."

* * *

"We have had in service for about two years some of J-M Transite pipe.

"To date this pipe has given excellent service both as to the pipe itself and to the couplings."

* * *

"We have used considerable Transite pipe, manufactured by the Johns-Manville Company, for mine use, and so far it has given satisfactory service. The water it is used in is highly acid, and so far the Transite pipe has shown no indication of deterioration. We have been using it for a few years only."

* * *

"Regarding your letter on Transite



pipe, we had installed in spring of 1934 about 14,000 ft. of assorted size pipe ranging from 2 to 8-in., and so far we have had no trouble with same and would say it has proven everything that the Johns-Manville Co. claimed for it. We are very much satisfied."

* * *

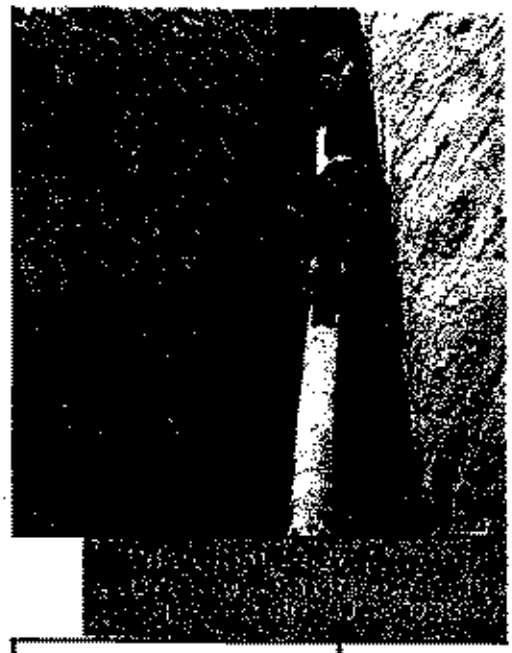
"So far we have found the material entirely satisfactory, and we are planning to install about 1300 ft. of 12-in. and 5,000 ft. of 6-in. Class 150 Transite pipe in the next month."

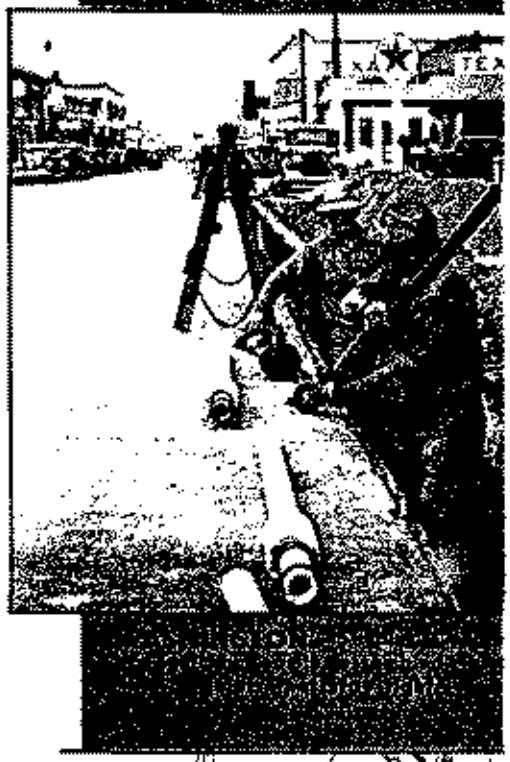
* * *

"Asbestos Cement Pipe was first used in ———— in March 1934. The material was chosen after some investigation as to its properties, and particularly for the job we have in hand, namely, the crossing of a ravine about 900 ft. in width and with quite an uneven surface profile. The flexibility of the joints rather appealed to us as meeting the ground conditions without an undue amount of excavating. The working pressure at the bottom of the ravine is around 80 lb. per sq. in.

"Eight-Inch Class C Pipe, ¾-in. thick, and 150-lb. working pressure was used. 'Simplex' couplings were chosen as no bolts are used, which would be detrimental to long life. The coupling consists only of an Asbestos Cement Sleeve which is pulled over two rubber rings of circular cross section.

"The makers guaranteed that an 8-in. joint could be deflected 8 deg from true alignment, and, in laying the pipe, some 7-deg bends and many smaller bends were made. In fact, there were hardly more than three consecutive lengths in vertical alignment on the job. Yet it was bottle-tight when finished.





And every day throughout the United States and Canada, more and more Johns-Manville Transite Pipe line systems are being installed—bringing economical relief from the destructive effects of tuberculation, soil corrosion, electrolysis and leakage. Assuring large savings in installation, maintenance and operating costs. And providing definite assurance of an adequate volume of water—for fire-fighting, private consumption and other demands throughout the years.

MTW 00765












A Few Typical Installations













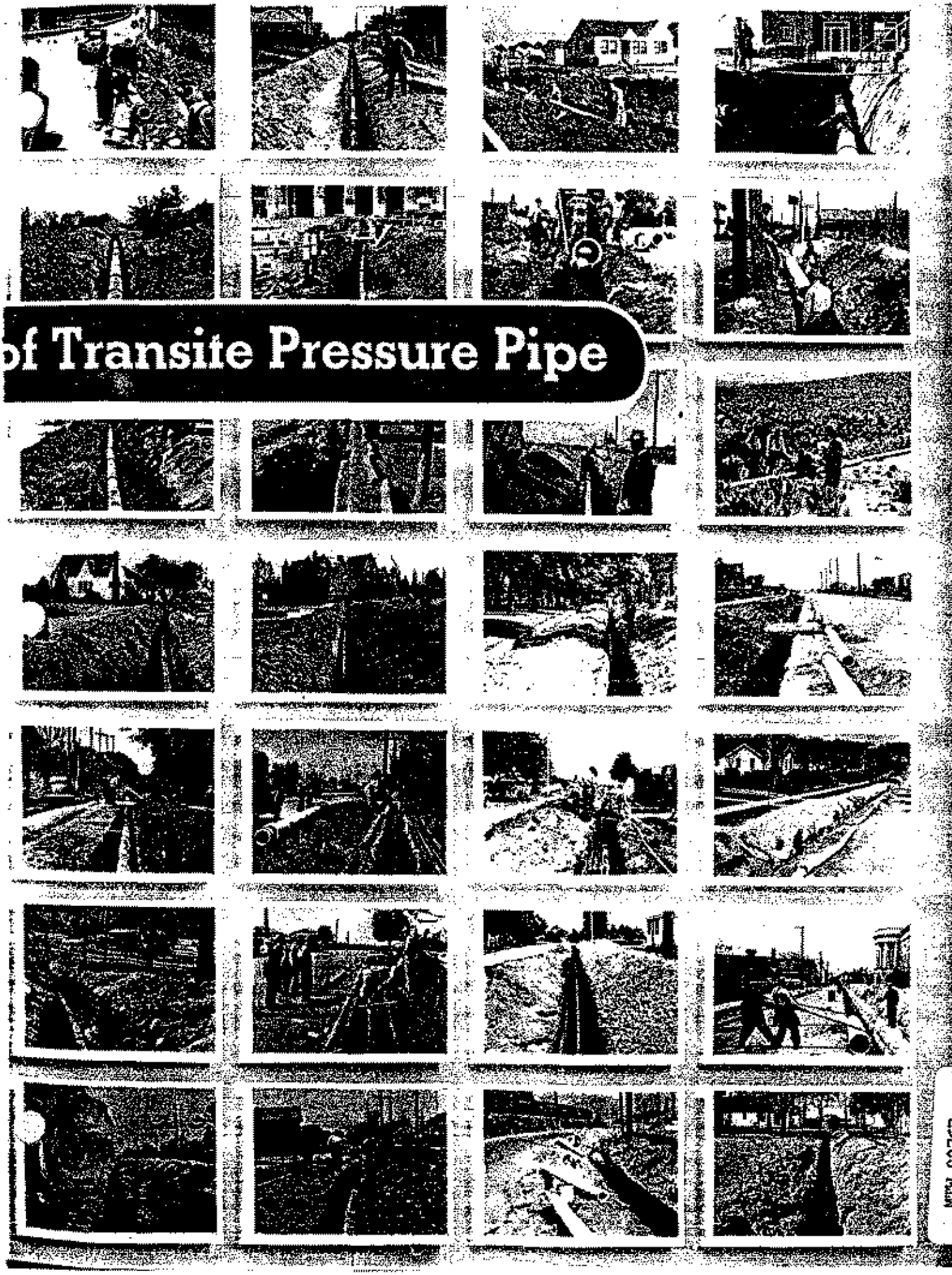









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