PLAINTIFF'S EXHIBIT
CT-1566

CertainTeed

Technical Bulletin

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All P&PG Group Officers
All A/C Marketing Personnel
All District Sales Managers
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FR: Norman P. Sutterer/bam NPS

RE: "ASBESTOS CEMENT SEWER PIPE - AN EVALUATION OF ITS INTEGRITY AND CAPABILITIES"

DATE: 6/12/78

Attached is a paper entitled "Asbestos Cement Sewer Pipe - An Evaluation of Its Integrity and Capabilities" which was written in 1969 by Frank T. Duffy, Marketing Manager for A/C Sewer Pipe.

The paper is an excellent overview of A/C sewer pipe and its' place in the market almost ten years ago. As you take a few minutes to read this article it will become apparent that the A/C sewer pipe of yesterday is still a viable, capable product in today's market.

It's note worthy to mention that ASTM currently has under consideration a change in the classes of sewer pipe to a three series pipe classification. You will be given more information as these developments become part of the standard.

I strongly urge you to take the time to review this bulletin as it is the perfect mini refresher course in what the A/C sewer pipe is all about.

ASBESTOS CEMENT SEWER PIPE

An Evaluation of Its

Integrity and Capabilities

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Asbestos cement sewer pipe was introduced in this country in the late nineteen thirties. In the succeeding thirty some odd years it has become a preferred sewer pipe throughout the United States. This preference is predicated on its excellent flow characteristics, exceptional chemical stability and resistance to scour, highest order of structural integrity, extremely tight yet flexible joints, competitive installation and material cost, full complement of fittings, most satisfactory use experience and life expectancy equal to any sewer pipe material.

This preference is understood if one considers that asbestos cement pipe is a superior reinforced concrete pipe that is inorganic and non-metallic. Asbestos fibers are employed for tensile reinforcing rather than steel wire. These fibers possess a tensile strength of 300,000 psi as compared to the 40,000 psi to 60,000 psi strength values of steel wire. Also, these fibers are inorganic and therefore cannot corrode and lose strength.

Silica, the hardest, most durable aggregate obtainable is used in the concrete mix. The silica is ground to the consistency of flour and mixed with Portland cement, water and asbestos fibers. The mix is then laminated under tremendous pressure to produce a high density concrete that has a modulus of rupture that is well in excess of three times the modulus of rupture for concrete sewer pipe.

The superior reinforced concrete sewer pipe is then cured by high pressure steam in huge autoclaves. Ordinary concrete sewer pipe is steam cured without the benefit of pressure. High pressure steam curing accomplishes two things. It produces a 28 day strength in sixteen hours, thereby accelerating production and reducing the cost of the pipe. It also induces a chemical reaction between the free lime in the cement and the silica to reduce the free lime to less than 1%. Hence asbestos cement sewer pipe possesses extraordinary chemical stability that eliminates the problem of corrosion. It should be noted that concrete sewer pipe contains between 8% and 12% free lime and it is the free lime that permits and promotes deleterious attack on sewer pipe.

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The lamination process is performed on a steel mandrel that has a trowelling effect on the interior surface of the pipe as it is withdrawn. The smooth, almost polished, surface thus produced in conjunction with pipe joints every thirteen feet creates a friction coefficient of n = 0.010. This friction coefficient was verified by R. D. Pomeroy in the field tests on asbestos cement, concrete and vitrified clay sewers. The test report was presented at the 1965 annual W.R.C.F. meeting in Atlantic City.

In this paper, Pomeroy debunked the age old myth that all sewer pipes have the same friction coefficient. He established that the innate smoothness of the pipe wall and the number of joints in the sewer line produce a marked differential in the flow capacity of various sewer pipe. This advantage in flow characteristics permits the use of 14" asbestos cement sewer pipe in lieu of 15" vitrified clay or concrete sewer pipe with the resultant first cost savings. In many instances, a 16" asbestos cement sewer pipe can be used in lieu of an 18" concrete or vitrified clay sewer pipe realizing an even greater first cost savings. There is also the advantage in situation when grade is critical, of achieving cleaning velocities at a lesser slope.

The quality of raw materials and the production techniques produce in asbestos cement sewer pipe the widest spectrum of pipe strength in the sewer pipe industry. Asbestos cement pipe offers the engineer crushing strengths of 1500 lbs./ft., 2400 lbs./ft., 3300./ft., 4000 lbs./ft. and 5000 lbs./ft. In situations of extraordinary earth or superimposed loads the wide range of pipe strengths available in asbestos cement pipe negate the necessity for concrete cradles. The substantial savings this affords is obvious.

The era of more sophisticated waste water treatment is rapidly arriving. Tertiary treatment is just around the corner. This cost of this more sophisticated treatment will preclude the luxury of exorbitant infiltration. An infiltration allowance of 250 gpd/in/mile is rapidly becoming obsolete and unacceptable. Sewers should be considered in terms of water main tightness.

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The joint on asbestos cement sewer pipe is machined to tolerances of 0.04 and the dual gasket controlled gap design of the coupling produces the tightest most flexible sewer joint available. Infiltration tests on asbestos cement pipe sewer of 50 gpd/in/mile are commonplace and 150 gpd/in/mile is considered an upper limit on performance.

The cost of sewer construction is ever spiralling upward but the engineer can help hold down these costs by affording the contractor an opportunity to bid a pipe material in which he has the most confidence. Time after time, in open competition with other pipe materials, the contractor has demonstrated the most confidence in the machined dual gasket joints on asbestos cement pipe. The contractor also enjoys reduced labor costs due to the relatively long lengths and light weight of asbestos cement pipe. The pipe is handled at the trench site with ease and the long lengths permit the pipe layer to establish line and grade more readily.

Air testing sewer lines in lieu of exfiltration tests is rapidly gaining wider and wider acceptance among the contractors and engineers. Compressing air is much less costly than trucking water. Air testing is quicker and is accomplished with greater ease. At the end of the day the contractor can proof test that day's production in about fifteen minutes. It is readily seen that air testing dramatically reduces the cost of testing sewers. Obviously, if a contractor has available to him a substantially improved, although much more rigid method of testing sewers, he will select the sewer pipe with the tightest joint and the greatest structural integrity. Asbestos cement pipe has demonstrated the greatest compatability with air testing.

Although first cost is not the sole factor in determining the selection of a sewer pipe material, it is, in these inflationary times, a factor that must be seriously considered.

Asbestos cement pipe, because of its great structural integrity, ease of installation and surety of performance, is completely competitive with the

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other sewer pipe materials. In open competitive bidding it has been demonstrated time and again that asbestos cement pipe offers a first cost saving. We do not seek a proprietary specification, although one could be justified. We welcome competition with the full knowledge we can compete.

Asbestos cement sewer pipe is complemented by a complete line of asbestos cement sewer fittings plus the capability of field tapping the pipe without compromising the tightness of the sewer system. The asbestos cement fitting line includes a complete size range of wyes, tees, 30 degree, 45 degree and 90 degree elbows, end caps and plugs, drop manhole connections and adaptors to both cast iron soil pipe and vitrified clay sewer pipe. Because asbestos cement pipe is readily machineable virtually any special requirement can be met on request.

Also, the machineability of this pipe permits the field insertion of wye or tee branches into the wall of the existing sewer by cutting a hole to close tolerances, rather breaking an undefined hold in the side of the pipe with the resultant risk of fracturing the existing sewer pipe and great difficulty of sealing the inserted wye leg against infiltration.

No discussion of sewer pipe materials would be complete without addressing the favorite straw men of the vitrified clay pipe and plastic pipe interest. Damaging ph values and H_2S generation have been played up out of all proportion to their frequency of occurence.

Asbestos cement sewer pipe can accommodate sewage with a ph value of 4.5. Because strongly acid wastes are corrosive to sewers, structures and equipment and also harmful to biological waste water treatment processes a ph below 5.5 is considered inadmissable by the Water Pollution Control Federation. Practically all sewer ordinances require equalization by mixing or neutralization by chemical additives to produce an industrial waste with a ph value higher than 5.5. This would indicate that the problem of corrosive attack by industrial waste on asbestos cement sewer pipe is controlled by sewage ordinances. The one exception would be those factories which use metal pickling or other acids in plant processes. Although the effluent from these

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plants is rigidly controlled human error could seriously damage a sewer line. Therefore, the use of asbestos cement pipe adjacent to chemical, electroplating, engraving, metal pickling plants or sulfite paper mills would be reluctantly recommended. It has been established that in sanitary sewers carrying industrial waste, there is sufficient dilution to raise the ph to acceptable levels for the intercepting sewer.

Numerous tests on domestic sewage shows conclusively that dilution tends to neutralize the sewage with slight variation back and forth on the acid and alkaline side. With the exception of highly acidic waste peculiar to a very limited number of industrial processes asbestos cement pipe can accommodate any industrial and domestic waste encountered.

Hydrogen sulfide disintegration is largely a myth. There has been no reported cases of H_2S disintegration in Ohio in the last twenty years. The reason, quite simply, is that modern sewers are so designed and constructed that they do not produce the conditions necessary for H_2S generation.

The conditions necessary for H_2S are low flows, high B.O.D., high temperatures and little ventilation. H_2S generation is a bio-chemical action promoted by the bacteria, as that of any living organism, must be supported by shelter or residence, food and oxygen.

The shelter or residence of these bacterial is the slime and sludge deposits peculiar to combined sewers with dry weather flow or sanitary sewers with less than 2 fps velocities. Cleaning velocities eliminate the breeding ground for these bacteria.

The food for these bacterial is found in the organic matter of the sewage and is most abundant in stagnant sewage. Cleaning velocities of 2fps minimizes the age of the sewage and promotes the absorption of oxygen which reduces the B.O.D. A minimum temperature of 70 degrees F. is necessary for any significant growth and reproduction of these bacteria.

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The oxygen requirements are met by consuming the oxygen in the sulphates dissolved in sewage and releasing the sulphur which then combines with hydrogen to form dissolved hydrogen sulphide. Ventilation permits self-oxidation of the sewage and deters the formation of sulphides.

The modern day sanitary sewer is designed and constructed to produce a 2 fps velocity which eliminates a home for the bacteria. It also reduces the age and concentration of the sewage which diminishes the bacteria's food supply. The sewer is designed to flow half full which permits adequate ventilation to produce self-oxidation of the sewage and prevent sulphide build up. In the northern half of the United States the sewage temperatures are too moderate to promote significant bacterial growth and reproduction. For these reasons it can be stated that sewer disintegration due to H_2S build up is largely a myth.

However, because of the lack of oxygen, sewage detained in force mains or siphons can produce a serious sulphide problem. Since H_2S in solution is very corrosive to metals, engineers are well advised to specify a non-metallic pipe such as asbestos cement pressure pipe for all force mains and siphons. Not only does asbestos cement pressure pipe possess an immunity to corrosion, with the resultant reduced maintenance cost; but its high flow characteristics reduce pumping cost and its prudent design criteria affords substantial first cost reductions.

As stated in the beginning of this paper asbestos cement sewer pipe is a superior reinforced concrete pipe and as such its use experience and life expectancy can be equated to concrete sanitary sewer pipe which was developed in this country in 1840. Since asbestos cement sewer pipe is denser, stronger and smoother than ordinary concrete sewer pipe its durability and capabilities are greater than ordinary concrete sewer pipe.

A manufacturers right to go freely into the marketplace and compete is fundamental to our economic system. It is this competitive abrasion that assures the owner of the best possible first cost and therefore, in the

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owner's interest, the competitive base should be made as broad as possible.

Asbestos cement pipe offers the engineer an opportunity to broaden this competition base with a proven product that has over thirty years of us experience to support it. Asbestos cement sewer pipe will reduce maintenance and operational costs because of its high flow capabilities and tight but flexible joints. Asbestos cement sewer pipe has a life expectancy equal to or greater than any sewer pipe available on the market today.

It would be a disservice to the owner and our industry to disallow our right to compete as equals with the other sewer pipe materials available in the market.

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