REPORT ON ASBESTOS/CEMENT PIPE USE IN THE EL PASO WATER UTILITIES

PREPARED FOR:

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REPORT ON A/C PIPE USE

AT

THE EL PASO WATER UTILITIES

Introduction

The El Paso Water Utilities was the eighth of ten systems studied under the Municipal Analysis Program of the A/C Pipe Producers Association. Water utilities personnel were interviewed regarding the use of A/C pipe in this west Texas border city. The objective was to investigate and trace the usage of A/C pipe through its entire life cycle. The broad functional categories covered by this fact-finding mission are as follows:

- o Institutional
- o Operational
  - Specification, Decisionmaking and Procurement
  - Installation and Testing
  - Operation and Maintenance
  - Repair and Replacement
  - Detection and Prevention
- o Financial

Each of these categories is discussed in detail herein.

Background on the El Paso Site Visit

The two-day site visit was conducted on February 9-10, 1982. The primary contact in El Paso is the Chief Engineer, John Hunsicker, P.E. Although several other department personnel were interviewed, most time was spent with Hunsicker and Ronald Echols, a supervisor in the maintenance department. A complete listing of persons contacted is shown below:

John T. Hickerson, P.E., General Manager
John D. Hunsicker, P.E. Chief Engineer
Armondo J. Flores, P.E., Water Systems Manager
Ronald Echols, Supervisor--Water Systems Division

All of the people interviewed were receptive and courteous, especially Ron Echols. Some time was spent with John Hickerson who has been the General Manager since 1965 and is credited with initiating large-scale use of A/C pipe in El Paso.

Hickerson is described by his employees as being "the antithesis" of Bob Van Dyke of San Antonio. Hickerson is not flambuoyant, does not like to spend money, runs the utility with an iron hand, and has an office which looks as if it was furnished with government surplus furniture. He appears to be extremely capable and is certainly knowledgeable of state water laws--as he demonstrated in the interview. Like most successful water systems managers, Mr. Hickerson spends considerable time on finance and it shows in the utility's debt service coverage ratio; the ratio is 6.43, about four times greater than the industry average.

Although El Paso is one of the fastest growing cities in the U.S., the frenzied pace observed in Phoenix, San Diego and later Houston, was not evident. According to utility officials, growth slowed considerably in 1981.

Institutional

The El Paso Water Utilities is a semi-autonomous organization governed by a Public Service Board. The Board is made up of four members appointed by the City Council plus the Mayor. The current Mayor of El Paso is Thomas D. Westfall.

According to the utilities "Statement of Purpose and Responsibility," the Public Service Board is the trustee for the water and sewer system with "complete authority and control of the management and operation" of the Utility. The Board provides management and financial stability to the Utility through the establishment of sound rules, regulations and policies for directing its operation.

The Board's duties and powers include approval of the annual budget and approval of any rate increases. According to Mr. Hunsicker, the General Manager normally gets "whatever he asks for" from the Board.

The City of El Paso turned over control of the utility system to the Public Service Board in 1954. The City charges no taxes to the Utilities Board, but accepts a yearly contribution "paid to the City in lieu of taxes." The contribution amounts to about 10% of net revenues.

El Paso, along with San Antonio, is one of few major cities in the country having groundwater as its primary source. It depends on underground water resources to provide about 90% of its requirements. The utility operates approximately 120 wells, 45 reservoirs, 106 boosters, and 36 stations eauipped with chlorination equipment. A contract with the Farmers' Irrigation District supplies approximately 10% of the City's water needs from the Rio Grande. River water is used solely to conserve the underground reserves since it costs more to produce and treat.

The Water Utilities serves about 425,000 persons and has about 104,000 service connections. The growth rate in El Paso, in terms of service connections, has averaged 4.05% per year over the period 1975-1979. The growth rate was reduced by half in 1981.

The average daily production of the water system is 86.3 mgd. Peak flow is about 158 mgd. Water usage appears to be extremely low for an arid Southwest city, averaging only about 100 gallons per capita per day. This low figure could perhaps be attributed to the high Mexican population which is said to be more than 70% of total.

The El Paso Water Utilities has approximately 485 employees to take care of both water supply and sewage treatment functions. A functional organizational chart of the Utilities is shown on the following page.

The Transmission and Distribution System

El Paso has approximately 1602 miles of water mains in place. As near as can be determined, the system components are approximately 1100 miles of A/C, 150 miles of cast iron, 50 miles of ductile iron, and 300 miles of steel cylinders lined with concrete. The rate of installation of mains has averaged 51.1 miles since 1975, peaking at 67.9 miles in 1979. The Utility also has replaced mains at the rate of 9.7 miles per year during the period 1975-80.

Asbestos-cement pipe is purchased in size ranges 4 inch - 16 inch. The City has had problems with 4-inch A/C, a complaint heard in every system purchasing this size pipe.

Most distribution system pipe installed in 1981 was A/C. In sizes 4-12 inch, 145,748 feet of A/C was installed by contractors or developers. Another 5 miles, or 26,400 feet of A/C, was installed by Utilities forces.

In the five-year period 1976-1980, contractors installed the following quantities of pipe, all of which went for main extension.

Year	Quantity (feet)
1976	210,327
1977	291,874
1978	293,443
1979	345,109
1980	143,677
1981	145,748

Almost all of this was A/C. A/C is installed almost exclusively in sizes 4-12 inch. In 16 inch, the decision is dictated by engineering considerations.

CITY OF EL PASO, TEXAS

EL PASO WATER UTILITIES
FUNCTIONAL ORGANIZATION PLAN

1981

1980-81 (475½) Employees
1981-82 484½ Employees

PUBLIC SERVICE BOARD

1. Establishes policies, goals and responsibilities.
2. Adopts Rules and Regulations governing services provided.
3. Directs the operation through the General Manager.
4. Adopts annual budgets for capital improvements and maintenance and operation of the system.

GENERAL ADMINISTRATION

1. Responsible for the general management and supervision of the operation under the direction and guidance of the Public Service Board.
2. Administers policies and Rules and Regulations adopted by the Public Service Board.

110 SECTION (2) 2

GEOLOGY

1. Coordinates well development.
2. Keep records and assemble information on ground water.

140 SECTION (1¼) 1¼

RESEARCH & PLANNING

1. Special studies.
2. EPA grant requests
3. Waste discharge permits.

130 SECTION (1) 1

INTERNAL SERVICES

1. Personnel processing and records.
2. Employee training.
3. Handles public liability and property damage claims.
4. Maintains general files.
5. Provides clerk-typists pool.
6. Investigates on the job injuries and workman compensation claims.

200 DIVISION (7) 7

ENGINEERING

1. Prepares plans and specifications for construction.
2. Coordinates the work of consulting engineers.
3. Provides engineering supervision of new construction.
4. Advises operation supervision.
5. Prepares and administers new service contracts.
6. Maintains maps and records of the system.

300 DIVISION (35½) 35½

LAND ADMINISTRATION

1. Negotiates and arranges for acquisition of land and right of ways as needed.
2. Negotiates and arranges for the rental or sale of excess land.
3. Administers rentals and right-of-way.
4. Negotiates for, and administers Utility water rights.
5. Maintains land records.

800 DIVISION (3) 3

CUSTOMER SERVICE & FINANCE

1. Customer services, including applications service, meter reading, inspections, cashiering, customer records and accounti
Central P.B.X.
2. Data processing.
3. General Accounting.
4. Banking and investments.
5. Purchasing

700 DIVISION (97)

GENERAL SERVICES

1. Warehouse.
2. Auto shop.
3. Heavy equipment operation.
4. Meter repair shop.
5. Print shop.

900 DIVISION (51) 51

SYSTEMS REPAIR & CONSTRUCTION

1. Maintains fire hydrants, distribution lines and valves.
2. Installs water services and repairs.
3. Operates meter repair shop.
4. Replaces deteriorated lines.
5. Repairs sewer lines.
6. Constructs new water and sewer lines.

500 DIVISION (105) 105

SEWAGE COLLECTION & TREATMENT

1. Operates and maintains sewage lift stations.
2. Cleans sewer lines.
3. T.V. inspection of lines.
4. Grease and Sand Trap inspection.
5. Operates and maintains Delta Street sewage treatment plant.
6. Operates and maintains small sewage treatment plants.
7. Processes sludge sold as soil conditioner.

600 DIVISION (93) 100

WATER SUPPLY & TREATMENT

1. Operates and maintains water treatment plants.
2. Operates wells and pump stations.
3. Maintains wells, pump stations and reservoirs.
4. Responsible for the purification of water.
5. Delivers sufficient quantity of safe water adequate pressures into the distribution system.
6. Building maintenance.

400 DIVISION (79¾)

With regard to PVC and ductile iron use, they are used for repairs and difficult installations, respectively. PVC C-900 is only now beginning to be used for some repairs. The reasons is the same given elsewhere: the diameter is consistent with the pipe it is replacing; no transition coupling is needed; and there is no need to use an A/C MOA.

About 2600 feet of ductile is purchased in a given year. This is used on steep slopes or in rocky areas where more beam strength is needed.

The purchasing trend in El Paso for water pressure pipe is static. A/C is purchased because 1) it is non-metallic, 2) it is inexpensive, and 3) the General Manager likes it. PVC is only beginning to be considered, but not seriously as yet. Ductile iron is considered to be too expensive and too difficult to install.

Specification, Decisionmaking and Procurement

Specification of pipe is done by the engineering division. El Paso buys Class 200 pipe almost exclusively; Class 150 is used only in those areas having relatively low service pressures. Service pressure in the system ranges from 35-156 psi. The extra wall thickness is specified for extra beam strength primarily; pressure considerations are secondary.

External design considerations consist largely of soil conditions. Local soil characteristics include sand, caliche, clay, and rock. There are lots of rocky areas (such as around the Sun Bowl) and many steep slopes. Due to these soil characteristics, external corrosion is somewhat serious; the corrosive soils were a significant factor leading to the initial purchase of A/C pipe in 1943.

According to John Hunsicker, engineering decisions with respect to the pipe material used for a specific application are made by "common sense." On steep slopes or in rocky areas, ductile iron is used. A/C is used under heavily travelled downtown streets, however. The Water Board has had no qualms about using A/C for this application nor have they had any breaks. The 10-inch section installed in 1943 is still in place; no breaks have been experienced.

The primary internal design consideration is hydraulic capacity. The quality of the groundwater is not a factor since it has an aggressiveness index of about 11.7.

El Paso is the only system visited which purchases pipe on an as-needed basis and not through an annual contract. There is virtually no decisionmaking on these purchases; it is simply an inventory control function handled by the stores department. On special jobs contracted out, the engineering director can make the decision on materials. If the engineering director does not specify the type of material, a contractor can purchase

A/C, cast iron or ductile iron, but not PVC. Asked how a new, currently unspecified pipe such as PVC could gain Board approval, the engineering director noted this decision would be made by the general manager, the operations manager, and the engineering director.

There has been only one incident involving health aspects of A/C. About a year ago, three samples were collected at locations determined by the longest routing possible. The samples were sent to "some government agency" for analysis. The results showed only a small concentration of A/C fibers.

The A/C pipe purchasing specification is quite brief. It references an out-of-date AWWA standard (C400-72). As noted earlier, Class 200 is specified and can be furnished in lengths of either 10 feet or 13 feet, along with "Ring-Tite," "Fluid-Tite" or equal couplings and rubber rings.

El Paso purchased the following quantities of A/C pipe in 1981:

Size (inches)	Quantity (feet
4	10,351
6	24,271
8	18,018
12	-0-
Total	52,640

Pipe purchases by the Water Utilities are used for either repairs or pipeline replacement. The utility prefers to do main replacement because they do not want to alienate customers. The pipeline replacement budget for fiscal year 1981-1982 (which ended on February 28, 1982) was $1,100,000. The replacement budget for 1982-83 is $660,000. Tbe budget for maintenance of mains has averaged $135,000 annually in recent years.

Installation and Testing

The general rule observed in installation is that main extensions are handled by developers or contractors hired by developers. The construction materials to be used are specified by the Utilities engineering division as are the installation specifications. The Utility does most of the main replacement, especially in sensitive customer areas. If the job is "clean-cut," the Utility hires a contractor to make the installation.

General specifications and contract documents for construction of water and sewer mains and structures have been developed by the engineering division. The current set of specs is dated June, 1977. The engineering department depends heavily on AWWA specs plus manufacturers' recommendations.

Excavation and Trenching

Trench excavation is required to be straight and true to the line and grade staked by the engineer. The trench width is specified as sufficient to install the pipe properly, but kept to a minimum width below the top of the pipe. The lower section of the trench is required to be 15 to 24 inches wider than the outside diameter of the pipe. The depth of the trench must be sufficient to allow a minimum of 3 feet of cover. Special depths may be required due to an obstruction or greater depth of a connecting line.

Bedding and Backfill

Special bedding is not required except in rocky soils. Select material (granular with no rock) six inches in depth is required when pipe is laid in shale or rock. Native materials are used in all other cases.

Excavated material may be used for backfilling provided it contains no large stones, excessive clay, or organic material. Select material must be used to a depth of 12 inches above the pipe when soil conditions require it. Backfilling must be compacted in 6-inch layers to the original ground surface or to the grade designated by the engineer. Compaction can be accomplished through flooding or jetting. The degree of compaction when the work is in a street under paving must be 95%. In other locations, the compaction must not be less than that of the undisturbed soil.

Special Pipe Handling Procedures

The specifications require the pipe to be lowered into the trench by means of belts, hooks, or wire rope slings. The number and size of slings must be adequate to prevent damage to the pipe. The specs also require cleaning of each pipe section prior to placing of the pipe. Cleaning methods are specified as brushing, blowing with compressed air, washing with water, or by any combination of these methods necessary to remove all foreign matter.

Disinfection and Hydrostatic Testing

The specifications call for "polypigging" of mains after completion of a suitable section of main laying. After flushing the pig through the line at a rate not to exceed 60 feet per minute, the Utilities people chlorinate the new water mains in accordance with AWWA Standard C601. Hunsicker notes that the spec is not adhered to religiously. Recently, the polypigging procedure has been ceased for smaller mains. Also, the mains are not disinfected according to AWWA C601; they simply admit water into the system, let it remain for awhile, then take a bacterial sample. If the test comes back negative, then no further disinfection is done.

Hydrostatic testing is accomplished by subjecting the new main to a hydrostatic test pressure equal to or greater than the distribution system pressure but not to exceed the working pressure of the pipe. In actual practice, pressure is built up to 200 psi and held for at least one hour. Approximately 95% of the mains pass this test the first time. Allowable leakage is calculated using the following formula:

$$L = \frac{ND \quad (P) \quad ½}{1850}$$

in which L = Allowable leakage in gallons per hour

N = Number of joints in pipeline tested

D = Nominal diameter of the pipe in inches

P = Average test pressure during the leakage test, in psi gauge

Tapping Methods

Wet taps are made with Mueller CL-12 or CC-25 drilling machines. Type of tapping sleeves specified are cast iron, caulked, or mechanical joint. Dry taps are made when the distribution system can be shut off without inconvenience to water users. If this method is possible, the line is cut out and tees and sleeves or couplings are installed in lieu of a tapping sleeve.

Some 3/4 inch connections are direct tapped and Hays seals used as corporations. There are approximately 30,000 such connections in the system. Tapping saddles are used for 1½ and 2 inch connections.

Recommended Work Practices

The Engineering Director says the Utility is aware of "Recommended Work Practices" and observes these practices. However, this statement contradicts actual observations made in a field trip. A field crew was observed reaming the end of a section of 12-inch A/C. Asbestos fibers and dust particles were flying in every direction and not one member of the crew had protection from airborne fiber inhalation in the form of an asbestos face mask.

Installation Costs

Substantial installation cost data were provided. The following table shows installation costs for several subdivisions. In each case, the installation was performed by a contractor retained by a developer. Categories of csts include pipe, valves,

fittings, and valve boxes. Costs shown do not include engineering or paving. El Paso engineering costs are estimated at 10% of unit costs; paving is estimated by the engineering department to be $8 per foot.

Development	Size (in.)	Length (ft.)	Unit Cost**	Engineering*	Paving*	Total
East Glen	4	140	4.20	0.42	8.00	$12.62
	6	2705	6.30	0.63	8.00	14.93
	8	1775	5.95	0.60	8.00	14.55
	12	2335	11.15	1.12	8.00	20.27
Colonia Del Valle	4	670	5.75	0.58	8.00	$14.33
	6	4490	6.50	0.65	8.00	15.15
	8	1275	8.50	0.85	8.00	17.35
	12	2325	14.00	1.40	8.00	23.40
Chaparral Park	4	565	6.50	0.65	8.00	$15.15
	6	8340	6.75	0.68	8.00	15.43
	8	9510	9.00	0.90	8.00	17.90
	12	2825	13.75	1.38	8.00	23.13
Vista Hills 1	4	80	4.10	0.41	8.00	$12.51
	6	7760	4.80	0.48	8.00	13.28
	8	1060	7.00	0.70	8.00	15.70
	12	2295	12.75	1.28	8.00	22.03
Vista Hills 2	4	235	5.50	0.55	8.00	$14.05
	6	2600	6.15	0.62	8.00	14.77
	8	165	9.20	0.92	8.00	18.12
	12	1515	13.75	1.38	8.00	23.13

(*Estimated; **Actual)

From this data, one can conclude that economies of scale do not appear to exist in pipe installation. Some of the highest unit costs paid were for the largest quantities.

Operation and Maintenance

Preventive and emergency maintenance of the water distribution system is the responsibility of the Water Systems Maintenance and Construction Division. Functions include maintenance of 1600 miles of water mains, fire hydrants, and valves. This division also is responsible for main replacement; in fiscal year 1980-81, they replaced 10.75 miles of deteriorated water mains.

El Paso had 277 leaks and main breaks in 1981. Of this total, only 35 (12.6%) were A/C breaks. The vast majority of pipe failures occurred in cast iron, 192 of 277 (69.3%). The remainder of breaks were in galvanized or steel pipes. The cast iron number is extremely high given the fact that the system contains more than 1100 miles of A/C and only 150 miles of cast iron.

According to Utilities personnel, the greatest number of breaks happen either in the coldest part of the year or during wet/dry cycles in the summer. The wet-dry cycles cause beam breaks through shifting of soils. Annual rainfall amounts to 7.5-8.0 inches and most of it comes in summer. The mainbreak records support the above statements. In 1981, the months with the highest number of mainbreaks were January (37), August (33), and May (32).

A/C pipe failures occurred in the following frequencies in 1981: 12 in 4 inch, 17 in 6 inch, 3 in 8 inch, and 3 in 12 inch. A/C pipe failures are attributed to 1) circle breaks due to settlement, 2) improper installation, and 3) disturbance by contractors. The biggest problem in A/C, according to a maintenance supervisor, is beam breaks. An inspection of the 1981 records reveals many A/C pipe failures were due to leaking or rusted repair clamps, joint leaks, or leaking saddles. Breaks in cast iron are almost all due to corrosion.

Water loss in the distribution system varies between 7 and 12%. The General Manager is concerned about water loss and intends to launch a campaign to reduce the percentage of unaccounted for water.

El Paso has a program which has as an objective the elimination of dead ends. They have lots of dead ends in the system, but in working to eliminate them, they create others.

Repair and Replacement

El Paso's repair policy is to make cast iron repairs with cast iron and A/C repairs with A/C. In short sections, they sometimes replace cast iron with A/C. Ron Echols, a maintenance supervisor, would prefer to use PVC C-900 for repairs in lieu of A/C MOA's.

A common complaint heard in many systems and echoed in El Paso is the problem of inconsistency among manufacturers with respect to outside diameter of pipe. Mexalit pipe usually has the largest outside diameter, but J-M and CertainTeed vary quite a bit also. This in turn causes a problem with leak clamps not fitting, and since the majority of repairs are made with clamps, this inconsistency of outside diameter presents a real dilemma. In 1981, 51 of 277 breaks (18.4%) were repaired by replacing a section while 170 of 277 (61.4%) were made with repair clamps.

Repair costs can only be estimated. The total budget for maintenance of mains was $130,000 in 1981-82. Given 277 main breaks, the average cost per break was about $470, excluding labor and paving.

El Paso has no frozen mains because the ground never freezes. Also, they do not have a leak detection program as yet.

FINANCIAL

The El Paso Water Utilities is in excellent condition financially. In fiscal year 1980, net income amounted to more than $5 million. Earned surplus of the system now exceeds $70 million. As noted earlier, the debt service coverage ratio stands at 6.43, about 4 times the required ratio.

The Water Utilities has not floated a bond issue in many years. All recent capital outlays have been made through retained earnings. As an example, additions financed by contributions and net profits amounted to more than $13 million in 1980 alone.

Utilities management looks upon their long-term indebtedness as being a blessing. The bond covenants require all water and sewer funds to remain separate from those of the City. There is a fear, voiced openly, that the City might attempt to take control again if this bond covenant did not exist.

El Paso maintains its excellent financial posture without having exorbitant rates. With a recent rate increase, the average price of water is 59¢ per 1000 gallons, one of the lowest rates in the Southwest.

Bid data for A/C pipe were obtained. The bid data are summarized below.

Date	Material Description	Quantity (feet)	Award Price	Manufacturer
9/22/81	6 inch A/C, Class 200, full sections	12,000	$2.70	Johns-Manville
12/7/81	4 inch A/C, Class 100, full sections	7,500	1.79	Mexalit
	6 inch A/C, Class 200, full sections	11,000	2.60	CertainTeed
	8 inch A/C, Class 200, full sections	8,000	3.75	CertainTeed

El Paso, unlike other systems, makes contract awards on an item-by-item basis as opposed to awarding the entire job on a combined bid.

Conclusions

If this report on the El Paso Water Utilities appears stark or sterile, it could be that it reflects reality-- that is, the water system itself. The water utility is managed in a strict, no nonsense manner by Mr. Hickerson, the General Manager. He personally makes all the decisions that count.

El Paso purchases A/C pipe because Mr. Hickerson likes it. There is no trend toward PVC because upper level management apparently does not like it. The system has only three complaints with respect to A/C pipe use: 1) lack of beam strength of 4 inch A/C; 2) inconsistent outside diameters furnished by Johns-Manville, CertainTeed, and Mexalit; and 3) Johns-Manville occasionally delivers 10 foot sections when 13 foot sections were ordered.

If John Hickerson can be characterized as "the antithesis" of Bob VanDyke, then the El Paso Water Utilities can likewise be described as an antithesis of the San Antonio Water Board. El Paso is highly conservative and resistant to change. Hickerson refers to VanDyke's decision to rush into the use of polypropylene service lines as being precipitous. El Paso also continues to use poured lead joints for sealing cast iron pipe.

In summary, unlike other utilities that need or desire some attention from the industry, El Paso neither needs nor desires such attention. El Paso is a solid account and probably will continue to be as long as Mr. Hickerson remains General Manager.