PLAINTIFF'S
EXHIBIT
CT-80

INSTALLATION GUIDE

CERTAINTEED

FLUID-TITE PRESSURE PIPE

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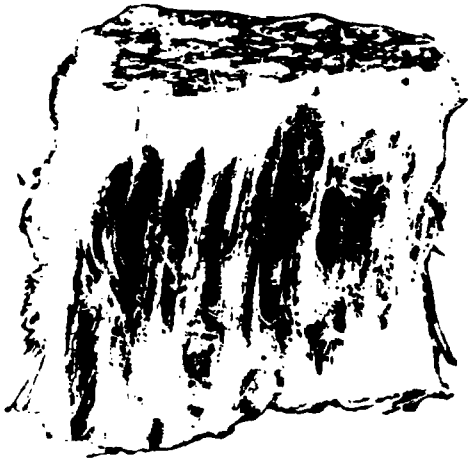
CERTAIN-TEED®

ASBESTOS-CEMENT PIPE

with the time saving, trouble saving

FLUID-TITE® Coupling

ASBESTOS THE IDEAL PERMANENT MATERIAL



Indestructible Asbestos is as permanent as rock itself. It will not burn, will not rot, cannot corrode. In ready-to-use form, these fibers are finer than silk, stronger than iron, flexible enough to be spun into threads and woven into cloth.

The ancient Chinese, the early Greeks and the Egyptians used Asbestos centuries ago. The Greeks named it "Amianthus," meaning "Incorruptible." We call it "Asbestos."

The ancient people prized Asbestos for its resistance to fire, heat, most acids and the weather — and its durability. They used it for centuries without finding the adequate substitute for these unusual properties. They learned how to card the flexible fiber, and to weave cloth from it. In the nineteenth century a third outstanding quality of Asbestos was discovered:



ASBESTOS IS ONE OF THE VERY FEW MINERALS THAT CAN BE USED AS A REINFORCING MATERIAL WITH PORTLAND CEMENT

The two ancient and durable materials of Asbestos and Portland Cement combine immediately, developing high bond strength. The Asbestos fibers add toughness and tensile strength to the mass. Silica is the third important ingredient that is added to the mixture in the manufacturing process, along with water.

It is this perfect marriage of materials that makes Certain-teed Asbestos-Cement Pipe so outstanding. The stresses inherent in concrete are reduced to a minimum, while all the virtues of asbestos are retained.

Certain-teed Asbestos-Cement Pipe was first manufactured at Ambler, Pennsylvania, in 1938. The first Asbestos-Cement Pressure Pipe from this factory was installed along Route 1, a main highway, in Pennsylvania. It has been operating under a pressure of 110 lbs. ever since. That same year, a 6" force sewer main was installed. It, too, is delivering equal-to-new service after many years use.

Experience like this has convinced engineers throughout the United States that Certain-teed Asbestos-Cement Pipe, once laid, may be forgotten as far as maintenance is concerned.

CERTAIN-TEED ASBESTOS-CEMENT PIPE IS MADE TO HIGH QUALITY STANDARDS

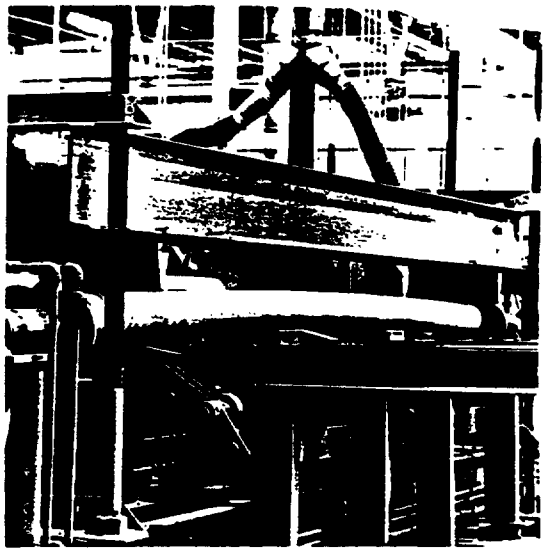
The manufacture of top-quality Asbestos-Cement Pipe is a complex process. Certain-teed's reputation for quality is built on strict control of the manufacturing process. Modern electronic instrumentation throughout the plant substitutes exact values for the variables of human judgment.

Certain-teed's precision control makes sure every piece of pipe and every coupling that leaves the plant is in first class condition. If there are any defects that might cause a failure, these are found before shipment.

Before it leaves the production line every piece of pipe is carefully inspected to assure our high standards of quality are maintained and is then tested for hydrostatic strength. Each 13 foot pressure pipe up to and including 8" is given a flexural test.

After manufacturing and before curing, every piece of pipe is identified with a complete production code that tells exactly when the pipe was made: the year, month, day, shift and individual piece made by that shift.

The Production Control Laboratory at Certain-teed is an integral part of the manufacturing process. It controls all materials going into the manufacturing process, checks the production of every shift and controls the inspection of each pipe and coupling before shipment.



FLEXURE TEST
This test actually bends the pipe to make sure it can withstand outside pressure and loads without failure.

14 STAR ADVANTAGES OF CERTAIN-TEED ASBESTOS-CEMENT PRESSURE-PIPE

EXCEPTIONALLY LONG LIFE

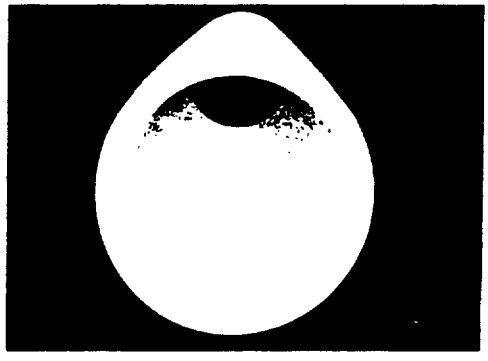
Made from Asbestos, Pulverized sand, Portland Cement —known and used since ancient times for projects built to endure. Our first Asbestos-Cement Pipe laid is still in use . . . and still delivering full flow . . . and will continue to do so.



CORROSION RESISTANT

Note the Smooth Bore of
Certain-teed Pipe

Of all pipes in general use, Certain-teed Asbestos-Cement Pipe is one of the most resistant to attack by corrosion. One of the first uses was for piping salt water . . . rigorous service which few materials can withstand. This ability to give day after day service without need of replacement means big maintenance savings for you.





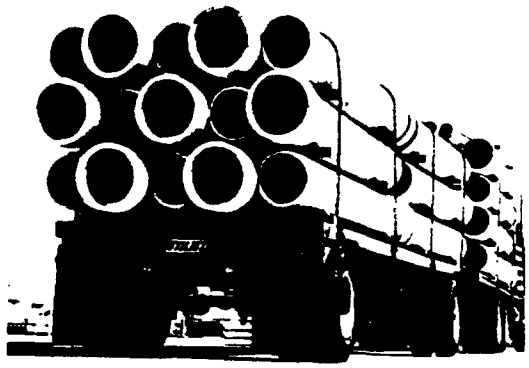
EASY TO LAY

Certain-teed Asbestos-Cement Pipe weighs approximately one-half as much as cast-iron pipe of equal size and class. These pipes are easier to handle and easier to join. They can be quickly laid under almost any ground or weather conditions by common labor.



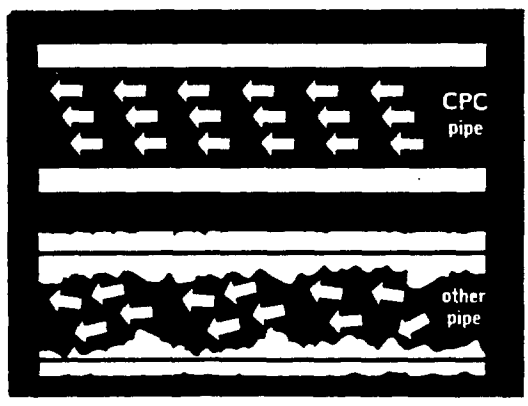
IMMUNE TO ELECTROLYSIS

Once this pipe is in the ground, you can stop worrying about electrolysis from nearby high voltage cables or ground transmission from a TV or radio station. Being non-metallic, Asbestos-Cement is not affected by stray currents.



COSTS LESS TO TRANSPORT

The light weight of Certain-teed Asbestos-Cement Pressure Pipe reduces transportation costs. You move more pipe per truckload, pay less freight per foot.

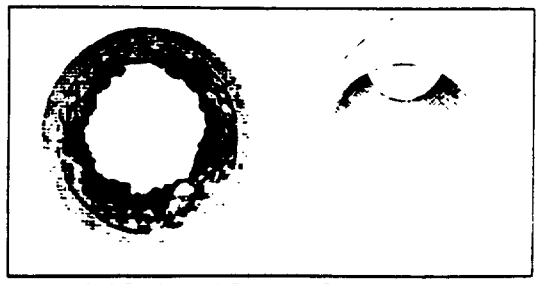


PRESSURE REMAINS CONSTANT

Certain-teed Asbestos-Cement Pipe has a smooth bore, uniform from end to end. This reduces the load on your pumps and keeps the load from increasing with age. The Williams and Hazen Constant "C" is conservatively placed at 140 for Asbestos-Cement Pipe. It will retain this initial figure. ("C" is a term used by the engineers Williams and Hazen to denote the resistance to the flow of water. The higher the "C" number the smoother the surface of the pipe; the lower the "C" number the rougher the surface.)

DOES NOT TUBERCULATE

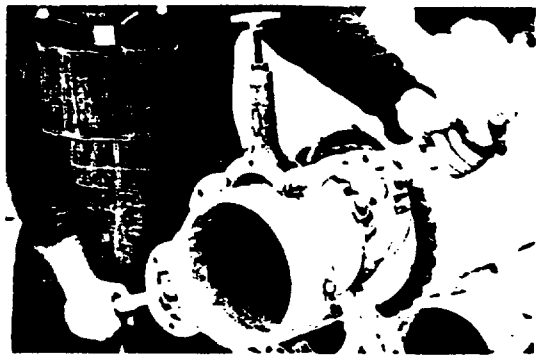
Being non-metallic, Certain-teed Asbestos-Cement Pipe cannot tuberculate. It remains free from this enemy that chokes so many metallic water lines.



Old Fashioned Pipe Certain-teed Pipe

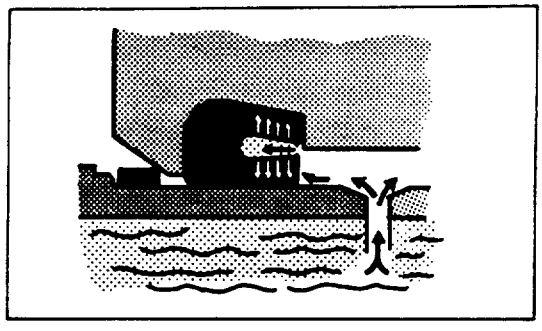
EASY TO CUT AND MACHINE IN THE FIELD

Lightweight cutting and machining tools operated by one man can be used to cut pipe on the job site.



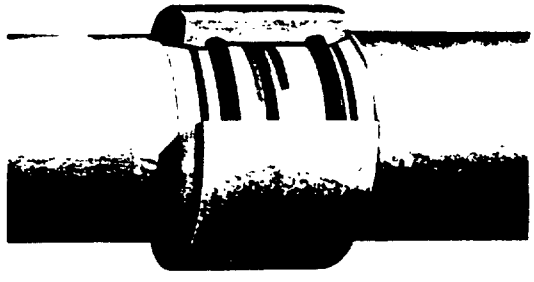
NO LEAKAGE PROBLEMS

The FLUID-TITE Coupling automatically forms a permanent leak-tight seal. There is no slow leakage to undermine the soil, or increase your pumping costs. Close tolerances, assure maximum performance.



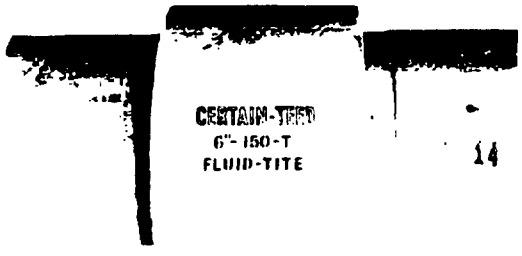
THE PATENTED CERTAIN-TEED FLUID-TITE COUPLING

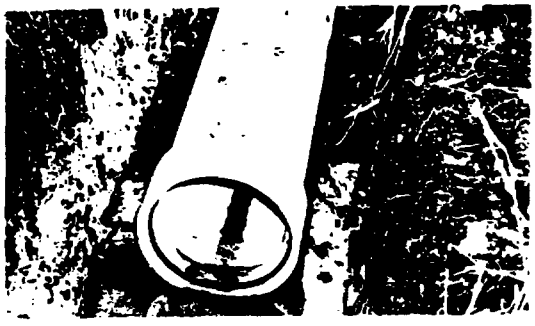
Here is the latest and finest in pipe connections. The initial compression of the gaskets seals the joints. You get quick, easy, economical installations with a minimum of skilled labor, regardless of weather or ground conditions. This outstanding coupling saves money all the way. Deepsealed highly compressed gasket provides freedom from leakage due to changing pressures within the line.



EASY ASSEMBLY

Certain-teed Pipe slides into the FLUID-TITE Coupling easily. Certain-teed lubricant is supplied to permit easy assembly of all sizes — even the largest pipes. The couplings are strong yet light in weight. No special skills are needed for assembly. Certain-teed Pipe is joined with approximately ½" between pipe ends for expansion and resistance to vibration. The pipe actually floats on the rubber rings within the coupling.





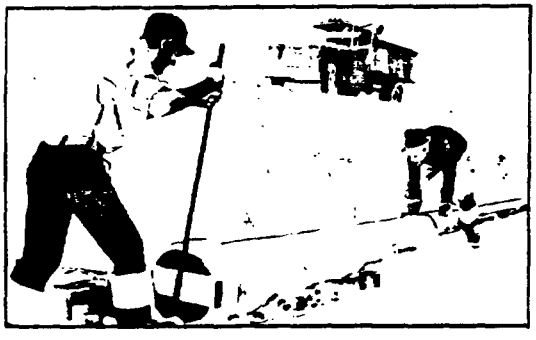
NO STOPPING UNDER BAD LAYING CONDITIONS

Under adverse circumstances, Certain-teed Pipe can be laid and assembled quickly with the FLUID-TITE self-aligning Coupling.



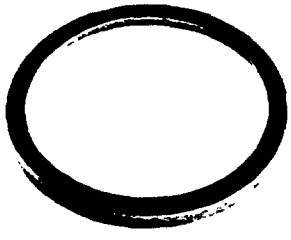
DEFLECTION FOR CURVES WITHOUT FITTINGS

FLUID-TITE Couplings 3" thru 12" allow 5° deflection (2½ degrees deflection on each side of coupling). The 14" thru 24" permits 3° deflection (1½ degrees on each side of coupling).



NO HEAVY MACHINERY

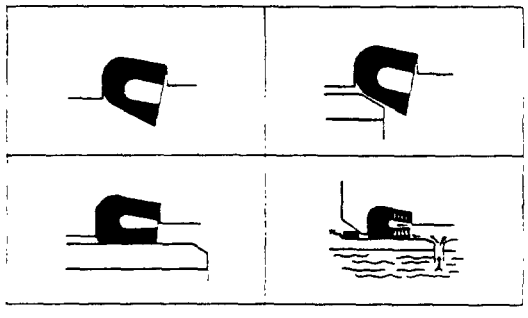
Lightweight Certain-teed Pipe and easily-handled FLUID-TITE Couplings cut costs by requiring fewer men and no machinery for laying and assembly under average conditions. (Machinery may be required under unusual conditions and for the larger pipe sizes. A lightweight coupling puller may also be required for the larger sizes of pipe).



EXCLUSIVE FLUID-TITE GASKETS

(Combined Coupling and Gasket —
Patented, U. S. Patent No. 2871031)

Used with the Certain-teed FLUID-TITE Coupling, they are tapered for ease of installation. The outer surface of the gasket fits into the corresponding grooves of the Coupling. The tapered inner surface provides ease of assembly for the pipe to slide into the Coupling.



GASKET CROSS-SECTION

The FLUID-TITE gaskets are initially compressed to seal the joint against internal pressure and also against negative back pressure caused by vacuum in the line.

CERTAIN-TEED®
PIPE AND COUPLINGS MEET THE FOLLOWING SPECIFICATIONS:

Underwriters Laboratories, Inc. of Chicago, Illinois

American Water Works Association Specification C 400

American Society of Testing Materials Specification C 296

American Society of Testing Materials Specification D1869

Federal Specification SS-P-351c

Associated Factory Mutual Fire Insurance Companies

THE RIGHT WAY TO:

RECEIVE

UNLOAD

HANDLE

STORE

CERTAIN-TEED® Asbestos-Cement Pipe and Pipe Accessories

These pages are written for the individuals responsible for the handling of Asbestos-Cement Pipe when it arrives at the storage area or at the job site. Remember: if there are any questions pertaining to the condition of the load, call your Certain-teed Pipe Agent or Representative who will be glad to help you.

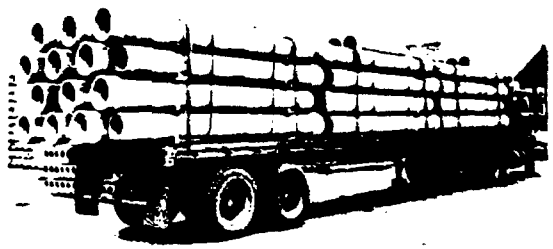


FIG. 14

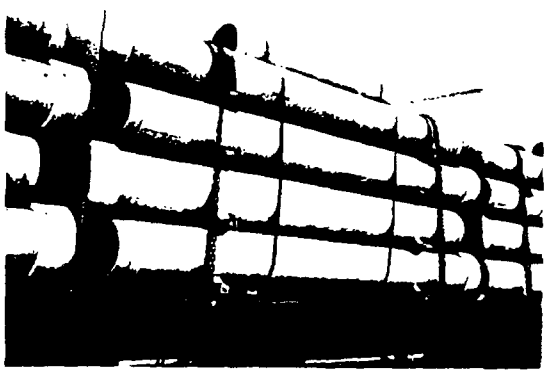


FIG. 15

INSPECT EACH SHIPMENT AS SOON AS POSSIBLE

Step 1 — Inspect the shipment for damage

Every shipment has been carefully loaded, and the load braced to insure safe arrival. However, extremely rough handling enroute can cause pipe damage. (Illustration of standard load on a flat bed truck. (Figure 14)

Begin by making an overall inspection of the load. If the bands or wooden braces are intact and the load has not shifted, no overall damage has occurred. Make sure the wooden chocks are still in place, securely fastened to each end of the stacking board. (Figure 15) *Do not remove chains or bands until truck is positioned for unloading.*

If the load has shifted, straps or braces broken, inspect the load carefully. Examine each piece of pipe and accessory as it is unloaded. *Have the truck driver make an itemized notation of any damage on the Delivery Receipt, and have it signed by the receiver. On rail shipments* call the carrier's agent and note any damage on the carrier's receipt or on the inspection report supplied by the railroad and signed by the Inspector.

Chipped ends or gouges may not mean the entire length of pipe is unusable. See Section III for procedures to salvage the pipe by cutting out the damaged section.

Step 2 — Check the entire load and contents against the packing list

Make a thorough check to make sure every item on the packing list is received. Any shortage must be shown on signed receipt. Check the number and footage of standard, random and short lengths of pipe, the number of standard and special couplings, adaptors and fittings. The rubber rings and lubricant are packed either in a burlap bag or carton. Check the contents. Don't throw the bag or carton from the truck or car — handle carefully.

Short lengths of pipe ($\frac{1}{2}$ lengths 6'6" machined ends only, referred to as M. E. O.) may be placed end to end in the load and may appear as a single long length before you start unloading.

Each M. E. O. section is marked to indicate the size, type (Pressure, Irrigation, Non-Pressure Sewer) Pipe, making it convenient to check a mixed load. In rail shipments the couplings are placed end to end in the center of the stack of pipe.

Step 3 — Unload

Certain-teed Asbestos-Cement Pipe is manufactured to withstand normal field handling, but like any pipe, it can be damaged by careless handling. (Refer to Page 29 & 30, Section III, on repairing damaged pipe in the field).

Before starting, make sure you have enough help and equipment on hand to properly handle the load. The following table should serve as a working guide:



FIG. 16

Pipe Size	Approx. Wt. per Lin. Ft Pipe and Couplings			Method of Unloading	
	Class 100	Class 150	Class 200	Truck	Freight Car
3	4.8	5.2	5.9	Skids or Hand	Skids or Hand
4	6.6	7.4	8.8	passing	passing
6	10.0	11.7	14.9	Ropes and	Ropes and
8	15.6	19.2	24.7	Skids	Skids
10	22.2	28.7	33.7	Ropes and	Ropes and
12	29.4	38.4	47.0	Skids or	Skids or
14	35.3	51.5	60.0	Boom	Boom
16	45.5	64.7	77.7		
18	65.0	87.9	–	Sling	Sling
20	74.3	108.0	–	and	and
24	111.0	154.0	–	Boom	Boom

Standard lengths of 3" and 4" pipe, all types and classes, are the largest sizes that are normally handled by men (two on the truck and two on the ground) without ropes. Pipe 6" to 16" is lowered with ropes and skids or by the use of a crane. 18" and larger use sling and boom.

NORMAL PROCEDURE FOR UNLOADING A TRUCK OR FREIGHT CAR

1. Spot the truck on level ground. Place supports of ample size on level ground so that the pipe, when stacked, will be resting on the supports and not on the ground. A support should be placed about three feet from each end of the 13-foot pipe lengths.

2. Insert a stake made from a 2 x 4 in the socket on the truck bed at a point about two feet from each end of the pipe pile to be unloaded. These stakes are placed on the side opposite the one to be unloaded. (Figure 17)

3. Use two lengths of rope at least 50 feet long as slings. Tie one end of each rope to the stakes placed in the previous step. (Figure 22)

4. Run the free end of each rope under the top layer of pipes, and double the rope back across the top of the load. (Figure 22)

5. Place two sturdy skids at least 14 feet long at the edge of the pipe to be unloaded. The top of the skids should be beveled. (Figure 22)

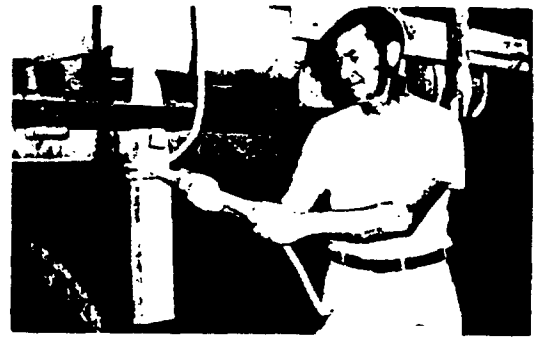


FIG. 17



FIG. 18

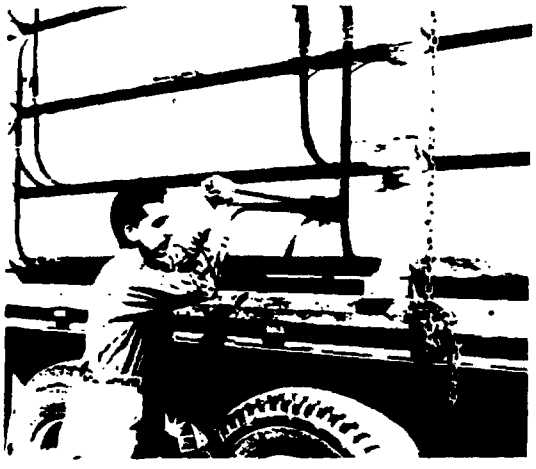


FIG. 19

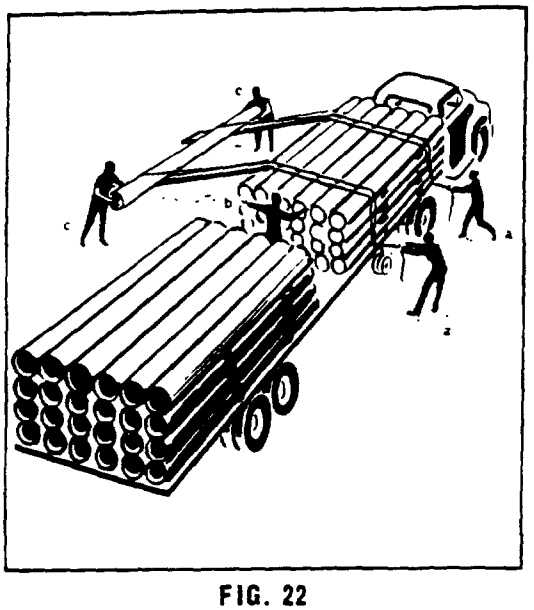


FIG. 22

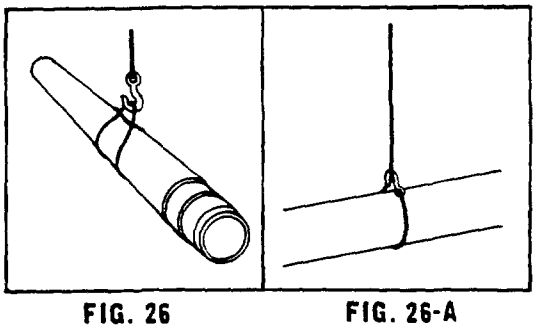


FIG. 26 FIG. 26-A

6. Cut the metal straps holding the top rows. Use a hacksaw, heavy wire cutters or snips. Do not use a cold chisel. DO NOT CUT THE STRAPS WHILE STANDING ON THE PILE. (Figure 19)

7. For 6" and 8" pipes, station a man at one end of the pile to start the pipe down the skids. Two snub lines located on the pipe as illustrated in Fig. 22 are sufficient to lower the pipe down to the ground men. DO NOT ALLOW MEN ON TOP OF LOAD AFTER THE BANDS ARE CUT.

8. After the pipe is safely down, slide the rope out from underneath both ends.

9. Remove the two wooden chocks from the separator board between the top two rows of pipe. These chocks were left in place until now to keep other lengths of pipe in the top row from rolling off.

10. Place chocks between the next two lengths of pipe in the top row, and unload the next outside length as shown. (Figure 16)

11. Continue in this manner until the truck is unloaded. Be sure to use the chocks to keep loose pipes from rolling.

12. Pass couplings, fittings, and accessories, including burlap bag or carton down by hand. (Figure 18)

BE VERY CAREFUL NOT TO DROP PIPE, OR BUMP THE ENDS TOGETHER

When unloading pipe 10" to 16" a crew of five men is required: one man snubbing rope at each snubber on the opposite side of unloading (a); one man at the end starting pipe on skid (b); and two men receiving pipe on the ground (c). (Figure 22)

Pipe larger than 16" should be unloaded with a sling and boom.

IF A CRANE OR HOIST IS AVAILABLE

If slings are used: Use a continuous length of rope, cable or chain, fastened around the center of the pipe as illustrated in Figure 26. This type of sling prevents pipe from slipping. Tight single slings (Figure 26A) can be used for pipe sizes 10" and above.

FORK LIFT TRUCKS

When unloading with a fork lift, remove only the number of pipe lengths which the length of the fork arms will accommodate.

TRUCKING FROM STORAGE AREA TO SITE

When a flatbed truck is used, place two timbers across the floor of the truck about 30 inches from each end of the pipe. Nail stop blocks on each side of the timber to prevent movement. Pipe should not extend more than 3 feet out the back of the truck.

If more than one tier of pipe is carried, use stacking boards between each tier. Secure the load with load binders, using two for each pile. Locate binders outside of and close to the bottom timbers. (Figure 27)

NUMBER OF STANDARD LENGTHS WITH COUPLINGS PER TON

Pipe Size Inches	Class 100	Class 150	Class 200
3	32.1	29.6	26.1
4	23.3	20.8	17.5
6	15.4	13.1	10.4
8	9.9	8.0	6.2
10	6.9	5.4	4.6
12	5.2	4.0	3.3
14	4.4	3.0	2.6
16	3.4	2.4	2.0
18	2.4	1.8	–
20	2.1	1.4	–
24	1.4	1.0	–

STRINGING PIPE

Certain-teed Asbestos-Cement pressure pipe with FLUID-TITE Couplings is light enough to handle and assemble easily. It is not necessary to distribute the pipe along the trench before the trench is opened. Most contractors prefer to string the pipe as the trench is excavated. This cuts handling time to a minimum.

When unloading pipe, be careful not to drop or let it strike against another pipe. Make sure you have enough men and equipment on hand. A crew of four men is needed for 6-inch and 8-inch pipe, two on the ground and two on the truck. Handle each length separately.

Be careful not to damage the machined areas of the pipe. Scratches or chipping may necessitate cutting and re-machining the pipe end.

Short lengths of pipe, fittings, lubricant and rubber gaskets should be stored at a central point where they will be protected against loss. Keep rubber gaskets away from oil and grease, sunlight, heat and ozone producing equipment. Store in their original container in a cool, dark place.

CHAIN BINDERS

When reloading and banding is not available, chain binders may be used. Padding should be placed under the chain at points where the chain binds on the pipe. Place the chain over the area where stacking boards are placed. *Do not use a pipe or other extension to increase the leverage on the binder.*

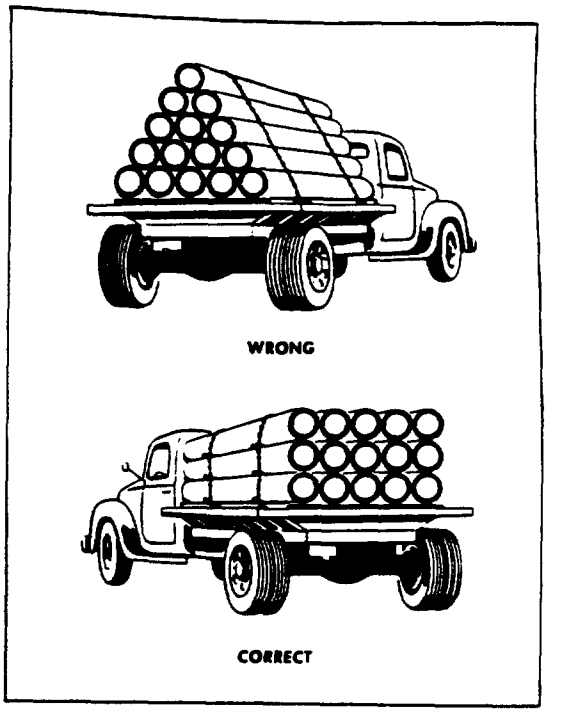


FIG. 27

ALL CERTAIN-TEED ASBESTOS-CEMENT PRESSURE PIPE AND COMPONENT PARTS ARE COLOR CODED AT THE FACTORY.

— CAUTION —

DO NOT JOIN DISSIMILAR COLORS;

DO NOT STOCK IN SAME LOCATION.

PRESSURE

class 100 . . . . . **black**
class 150 . . . . . **orange**
class 200 . . . . . **black**

Make sure to check FLUID-TITE Gaskets for proper size and class.

INSTALLING AND TESTING

CERTAIN-TEED® ASBESTOS-CEMENT

PRESSURE PIPE

EXCAVATION AND PREPARATION OF TRENCH

General: The trench shall be dug to the required alignment and depth shown on the contract drawings or as directed by the Engineer and only so far in advance of pipelaying as the Engineer shall permit. The trench shall be braced and drained when necessary so that workmen may work therein safely and efficiently.

Width: The trench width at the ground surface may vary with, and depend upon, its depth and the nature of the ground encountered. The minimum clear width of unsheeted or sheared trench measured at the horizontal diameter of the pipe shall be 18 in., or 1 ft. greater than the outside diameter of the barrel of the pipe, whichever is greater. The maximum clear width of trench at the top of the pipe shall be not more than the outside diameter of the barrel of the pipe plus 2 ft. Greater width of trench at the top of the pipe shall be permitted only on written approval by the Engineer.

Foundation: The pipe shall be laid on stable soil. Any part of the trench excavated below grade shall be backfilled to grade with thoroughly compacted material approved by the Engineer. When an unstable subgrade condition is encountered and, in the opinion of the Engineer, it cannot support the pipe, an additional depth shall be excavated and refilled to pipe foundation grade with crushed stone or other suitable material as required by the Engineer to achieve a satisfactory trench bottom.

Rock excavation: Ledge rock, boulders, and large stones shall be removed to provide 6 in. of clearance to each side of and below all pipe and accessories. Excavations below subgrade in rock or in boulders shall be refilled to subgrade with material approved by the Engineer, and thoroughly compacted.

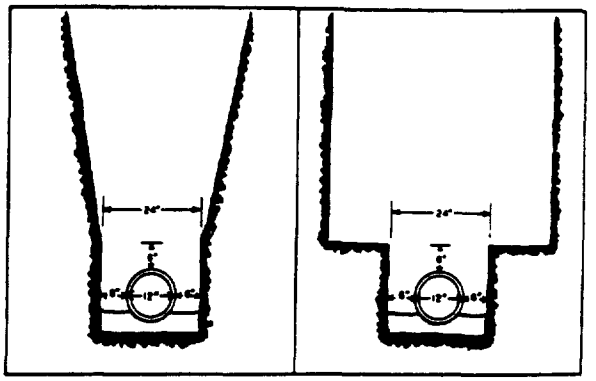


Figure 28

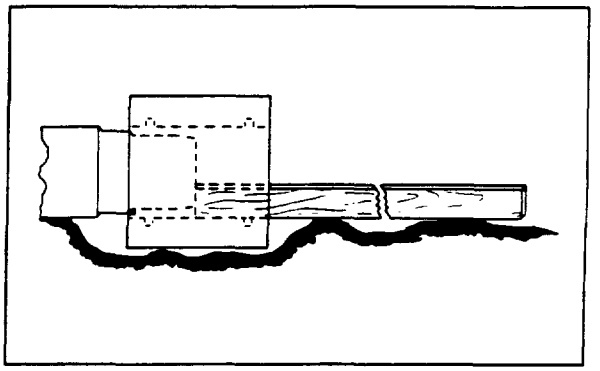


Figure 29

CURVES

The FLUID-TITE Couplings 3" thru 12" permit up to 5 degrees deflection (2½ degrees of deflection on each side of the coupling). The 14" thru 24" permit 3 degrees (1½ degrees of deflection on each side of coupling). If less radius is needed, shorter lengths of pipe may be used.

The table on right side of this page shows the amount of offset in inches and the radius of the curve that will be made.

TRENCHING FOR CURVES

The coupling is assembled on the pipe in a normal straight line position. Then the coupling is cocked to the right or left to allow the next section of pipe to follow the curvature of the trench. (Figure 30).

OFFSET OF PIPE AND RADIUS OF PERMISSIBLE CURVE

Degree of Deflection	LENGTH OF PIPE IN FEET					
	3¼ feet		6½ feet		13 feet	
	Offset Inches	Radius Feet	Offset Inches	Radius Feet	Offset Inches	Radius Feet
1	.7	187	1.3	374	2.7	748
2	1.4	93	2.7	186	5.4	372
3	2.0	62	4.0	124	8.0	248
4	2.7	46	5.4	93	10.8	186
5	3.4	37	6.8	74	13.6	148

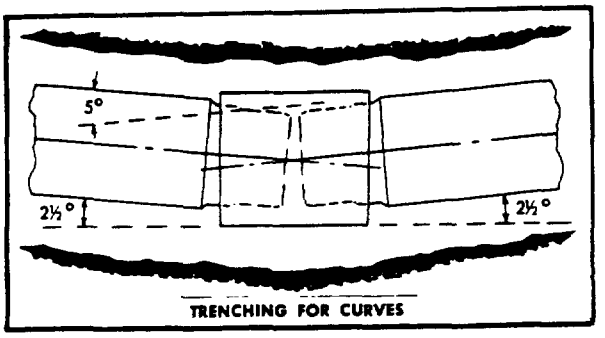


Figure 30



Figure 31

FLUID-TITE®

Asbestos-cement Pipe and Piping System Components

These products are especially designed and adapted for use in the pipe coupling system covered by U. S. Patent 2,871,031 and by Canadian Patent 612,654 issued January 17, 1961.

FLUID-TITE is a registered trademark of Certain-teed Products Corporation, Valley Forge, Pennsylvania, U.S.A.

SHARP CHANGES IN DIRECTION

Use a 90°, 45°, 22½°, or 11¼° bend where sharp changes in direction are necessary. These may be obtained from your waterworks supply house. Leave room for thrust blocking (Page 24).

LAYING PIPE

LOWERING PIPE INTO TRENCH

In most cases four men constitute a crew: two above the trench, and two in the trench. Pipe 8 inches in diameter and smaller can be lowered by hand into the trench. Larger pipe should be lowered with ropes. Anchor one end of the rope by standing on it (Figure 31). Use as shown. Lower pipe slowly.

The men in the trench should look through the pipe as it is being lowered to make sure the inside is free from earth and foreign matter. Where the pipe is being lowered by ropes, the men in the trench guide the pipe.

METHODS OF SUPPORTING PIPE

1. Pipe Laid on Trench Bottom
2. Pipe Laid on Earth Pads

They are listed and described below. No matter what method is used, it is necessary to provide sufficient clearance under the coupling so the weight of the pipe does not rest on the coupling. It is necessary to align each succeeding length of pipe to the coupling before assembly.

PIPE LAID ON TRENCH BOTTOM

Pipe can be laid directly on the trench bottom, provided the bottom has been properly leveled. It is necessary to dig a coupling hole 3 inches deep and 6 inches longer than the coupling wherever a coupling will be located. (Figure 33).

A leveling board or straight edge 14-feet long (Figure 29) is recommended to be sure there are no voids or high spots and that the grade is correct. Any uneven areas in the trench bottom should be shaved off or filled in with well-tamped soil. Recheck with leveling board.

If the trench bottom is cut through shale, the trench bottom should be lowered 6 inches and brought back to grade with crushed stone. Sand can filter into shale and cause an uneven support under the pipe.

If rock ledge or soils which are too hard to level are encountered, the trench bottom should be lowered 6 inches and brought up to grade with sand or select soil, well-tamped.

PIPE LAID ON EARTH PADS

In this method, the pipe is laid on two earth pads, 12 inches wide, minimum 2 inches high and the full width of trench (Figure 34). These provide the clearance needed for coupling the pipe. The pads must be built from good backfill material and tamped. Do not use stones, lumps or other hard material. The pads should be located 31 inches from each end of the 13-foot length of pipe. If shorter lengths are used, locate one-fifth of the pipe length from each end.

Place pipe firmly in position on these pads with the ends in alignment. It may be necessary to add or remove pad material to bring the pipe faces into alignment. Check to make sure that a minimum of two inches clearance is left under the unsupported area of the pipe (Figure 34).

Suitable material should then be carefully tamped under the barrel of the pipe between the pads and in 4-inch layers, above the pipe to a minimum depth of 12 inches. See "Initial Backfill" on Page 26 for details.

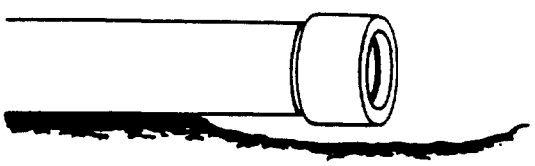


Figure 33

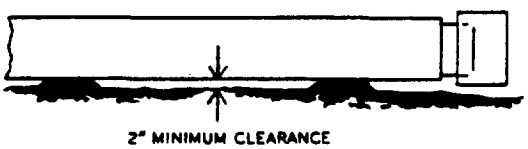


Figure 34

CERTAIN-TEED FLUID-TITE COUPLING ASSEMBLY INSTRUCTIONS

Certain-teed FLUID-TITE Couplings are easily assembled. The scientifically designed and patented rubber gaskets have tapered surfaces that allow the pipe to assemble easily — yet seal perfectly. (Figure 36).

BEFORE ASSEMBLY, MAKE SURE THAT THE GASKET, COUPLING GROOVES, THE COUPLING, AND THE PIPE ENDS TO BE ASSEMBLED ARE CLEAN.

A. Place rubber gaskets inside coupling groove with holes facing center. After placing, snap the gasket at the four quarters of its circumference to insure that the gasket is properly seated in the groove. (Figure 36).

B. Thoroughly clean pipe ends to be assembled before lubricating. The lubricant should be applied either by a 2" flat paint brush, glove, cloth pad, or by hand: to the entire machined pipe end and to the rubber ring. Keep lubricated pipe ends and coupling clean after lubricant has been applied. DO NOT LEAVE DRY SPOTS.

C. Align the ends of each pipe, then separate about two feet (for UNbelled pipe) to allow for assembly. On PREbelled pipe, align pipe end with coupled end. (Figure 37). IMPORTANT: Make sure CERTA-SPACER® band is flush against first shoulder of unbelled end of pipe.

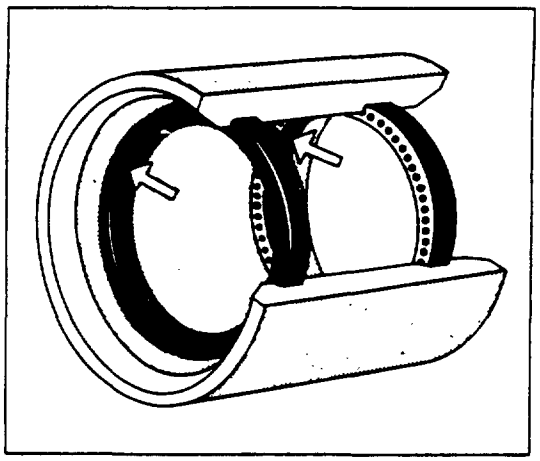


Figure 36

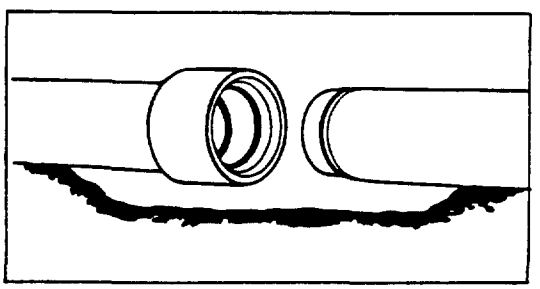


Figure 37

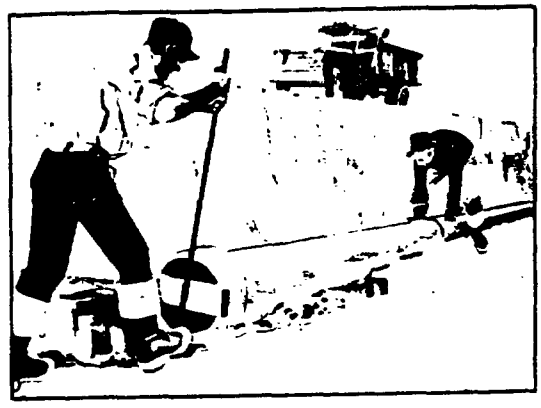


Figure 38

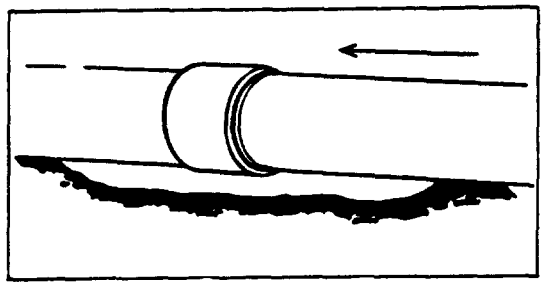


Figure 39

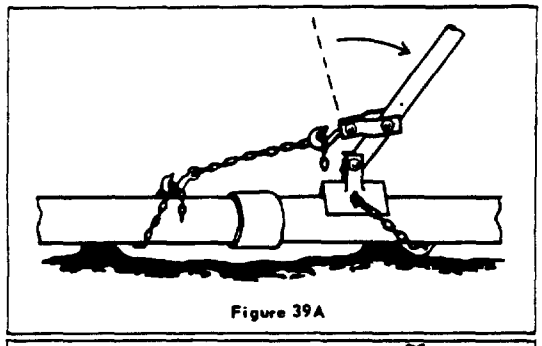


Figure 39A

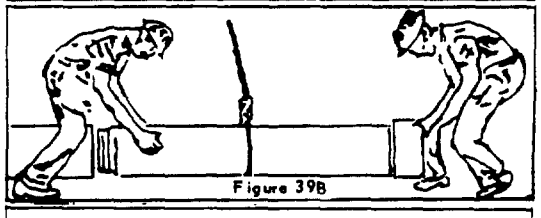


Figure 39B

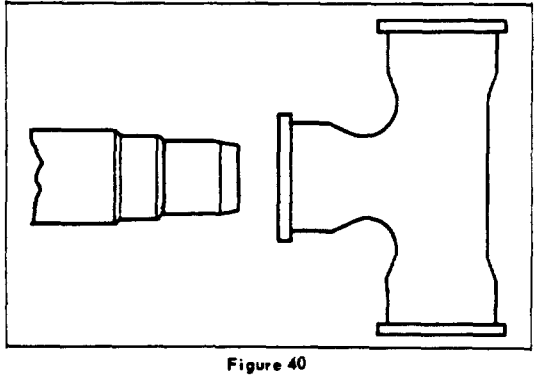


Figure 40

D. Just push pipe home.

E. For UNbelled pipe place coupling over the lubricated pipe end. Push couplings with a crowbar. use a protective wood block between bar and coupling. Push until coupling is against CERTA-SPACER band. For PREbelled pipe. align the pipe end. with the coupled end and shove. until the assembly is made. (Figure 38).

F. Proceed to make next joint in the same manner.

Completed joint is shown in Figure 39.

ITEMS NEEDED FOR JOINING THE PIPE

3" to 8" Pipe	10" to 24" Pipe
Large Crowbar	FLUID-TITE Coupling Puller (optional)
Block of Wood	Large Crowbar
Lubricant	Block of Wood
	Lubricant
2" Flat Paint Brush	2" Flat Paint Brush

FOR LARGER PIPES WHEN USING PULLER

G. Guide the end of the free pipe into the coupling. Use a coupling puller to complete the joint.

H. Set base of coupling puller on top of fixed pipe, approximately 12 inches from the coupling.

I. Place puller base chain tightly around pipe. Fasten link into slot. (Figure 39-A).

J. Fasten pull chain around free pipe about one foot from the pipe end.

K. With puller handle leaning slightly toward free pipe, tighten pull chain and fasten to pull hook.

L. Pull handle toward fixed pipe with one continuous motion until coupling is seated against both CERTA-SPACER rings. (Figure 39-A).

M. Unfasten chains. Remove puller.

CONNECTING FLUID-TITE PIPE TO C.I. FITTINGS (Figure 40)

See Inter-connection sheet page 45. Important: The ring grooves of the C.I. Fittings *MUST* be fully coated with lubricant before inserting the FLUID-TITE ring. The ring must also be lubricated.

The contractor may elect to leave the pipe supported by the lowering cable and swing the pipe into the coupling. Figure 39B

1. If this method is used, a minimum length of swing should be used to make the assembly complete.
2. The pipe end must be in perfect alignment with the receiving coupling.
3. The pipe end and rubber ring must be thoroughly lubricated.
4. If assembly is not made on the first attempt, re-lubricate the pipe end before making the next swing.
5. If there is a miss and the pipe end strikes the coupling, examine both coupling and pipe end for damage.
6. Before disconnecting the cable from the pipe be sure tamped earth pads are at the right grade to receive the pipe.

To check the location of the gasket after field assembly, the CERTA-SPACER on that side is removed by either cutting or pulling back over the shoulder. To assure total flexibility in the smaller sizes of pipe, 12" and below, the CERTA-SPACER *must* be positioned to its original location to prevent "closing" as succeeding assemblies are made. If the CERTA-SPACER has been cut it is sufficient to "drape" it over the pipe in its original position so that there is approximately 180° contact with the pipe. This will prevent further "closing" of the pipe ends.

SUPPORTING FITTINGS

Fittings should always be supported so their weight is independent of the pipe. Use substantial supports under the fittings. When pouring concrete thrust blocks (Page 24) around a fitting, make sure the concrete runs under and against the body of the fitting. Be sure the joint is left exposed. (Figure 48).

BELL TYPE END CAPS

Cast iron end caps are available for all sizes of Asbestos-Cement pipe. End caps are drilled and tapped off center with standard iron pipe threads, for bleeding air from the line. The 4-inch caps are tapped for 1-inch iron pipe; the larger sizes are tapped for 2-inch iron pipe. Thrust blocking is required when end caps are used.

LENGTH OF PIPE AT FITTINGS AND RIGID STRUCTURES

When rigid joints — that is, those formed by poured- or caulked-joint materials, or both, or by bolts with rubber ring seals — are used at the fitting, the length of the pipe fitted into the bell of the fitting shall not be more than 3'3" in pipe of 6" diameter and smaller, or 6'6" in pipe of 8" diameter and larger.

When a rubber ring is used to make the seal, and flexibility is provided by a grooved design profile similar to that of the coupling used to join pipe between fittings, up to a full 13-foot length may be used.

With all the rigid joints named above, the pipe connecting any two valves or fittings shall be in two or more lengths jointed with one or more couplings to provide flexibility. If a flexible seal is used, a single 13-foot or shorter length may be used to connect the two fittings without any intermediate coupling.

A coupling shall be cast in the wall of rigid structures at the point of entry of pipelines to provide flexibility at the wall. To provide additional flexibility, the pipe at the point of entry shall have a laying length of not more than 6'6".

CERTA-SPACER®

Pipe Positioning Bands

These positioning bands are especially adapted for use in the pipe coupling system covered by U. S. Patent 3,129,964 and by Canadian Patent 699,859 issued December 15, 1964.

CERTA-SPACER is a registered trademark of Certain-teed Products Corporation, Valley Forge, Pennsylvania, U.S.A.

CONNECTING FLUID-TITE TO STEEL PIPE

Special Certain-teed adaptors are available for connecting 3-inch Asbestos-Cement pipe to 2-inch steel pipe or connecting other sizes of Asbestos-Cement to steel pipes of the same nominal diameter. These adaptors have FLUID-TITE gaskets which seal both pipes. Assemble these adaptors in the same manner as a standard FLUID-TITE coupling. A strap clamp is necessary on the steel pipe against the coupling. (Page 42)

CONNECTING F.T. PIPE TO OTHER TYPES OF ASBESTOS-CEMENT PIPE. (Figure 41).

See interconnection sheet page 45.

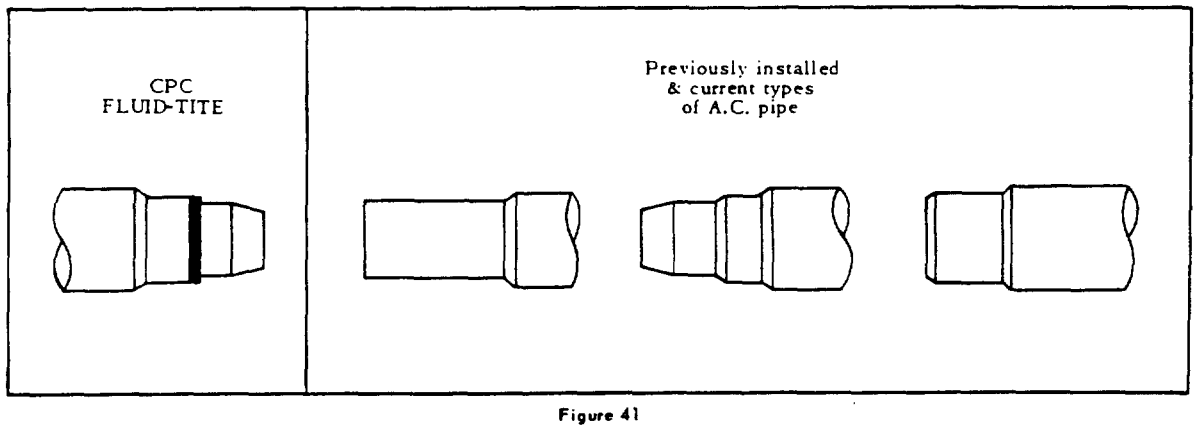
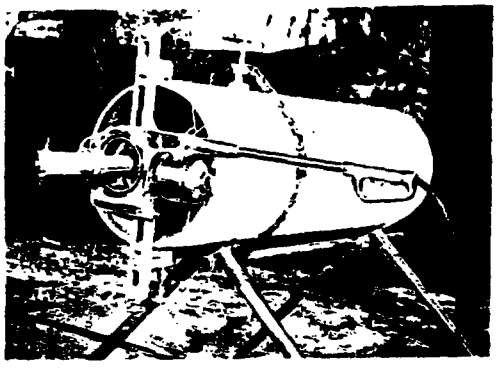


Figure 41

POWER DRIVES FOR FIELD LATHES



FIELD CUTTING AND MACHINING

Any desired length of Certain-teed Asbestos-Cement pipe can be cut on the job. Cuts can readily be made by using a "Pilot," "Matthews," "Tapertool," "Reed," or similar cutter.

Your Certain-teed Agent will be glad to quote prices for hand operated cutters on request. These cutters are adjustable to the full range of pipe sizes and can be easily dismantled for storage (Figure 43).

In emergencies, if only a few pieces are to be cut, a standard two-man cross-cut saw may be used. Since Certain-teed pipe is abrasive, frequent resharpening and resetting will be necessary. Teeth should be set wide. Before beginning cut, mark the pipe all the way around to help keep the cut square. Rotate pipe while cutting. Saw should follow a circular pattern. Do not try to cut completely through pipe wall on first cut. Do not use a cold chisel or standard iron pipe cutter as they may fracture the pipe, producing ragged, uneven edges.

A portable electric saw with a flexible or abrasive blade may also be used. The pipe is rolled as the cut is made.

FIELD MACHINING

A coupling surface can be machined on the rough barrel of the pipe, using "Pilot," "Matthews," "Tapertool," "Reed" or similar machining tools (Figure 42). Mount pipe to provide sufficient clearance for the tool. Use the manufacturer's instructions for tool use.



Figure 42
Machining and
End Cutting Tool

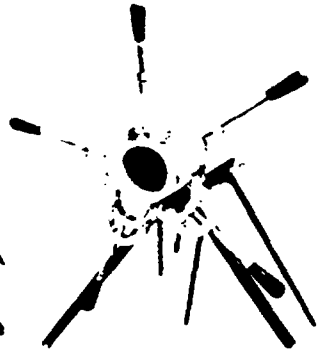


Figure 43
Cutting Tool

SERVICE CONNECTIONS

Certain-teed pipe can be tapped wet or dry, using a "Mueller," "Hays," "Dresser" or similar machine (Figure 44).

The machine should employ a guiding mechanism for the drill-tap, which permits disengaging the pressure feed when tapping, and keeps the drill tap in alignment during the tapping operations.



Figure 44
Tapping
Machine

DRILLING

The machine should be in good repair. It is important that the machine and boring-bar do not wobble. Always use a new or sharp drill-tap that is recommended for use with A/C pipe. Be sure that the drill section of this tool is long enough to go completely through the pipe wall before the tap engages. The machine may be clamped perpendicular to the top of unassembled pipe. When the pipe is assembled, clamp the machine at a 45° angle toward the service line, or as specified by the engineer.

Use a mixture of powdered graphite and linseed oil to lubricate the drill and tap. *Do not* use any lubricant or sealant when inserting the corporation stop.

DO NOT FORCE the drill through pipe wall. Boring-bar should rotate freely at all times — use the follower lightly — do not force the drill.

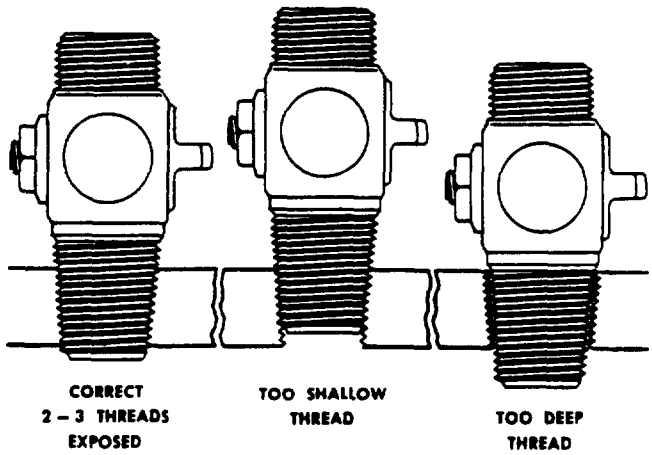


Figure 45

TAPPING

After the drilling cycle is completed, release the feed mechanism. This will allow the tap to function properly and form a clean sharp thread.

Tapping should be of sufficient depth to allow one to three threads exposed when the corporation stop is inserted. (Figure 45). It is advisable to make a test tap and mark the boring-bar to the proper depth. When a new or reconditioned drill-tap is used, this mark should be rechecked.

The stop should be inserted with the machine in the same setting that the tap was made. When a dry tapping machine is used, it will be necessary to insert the stop by hand.

DO NOT TIGHTEN MORE THAN NECESSARY TO MAKE A WATER-TIGHT JOINT. DO NOT USE ANY LUBRICANT OR SEALANT WHEN INSTALLING THE CORPORATION STOP.

For best results, only A.W.W.A. threads should be used with A.W.W.A. A/C pipe. Be sure both the corporation and tapped threads are clean.

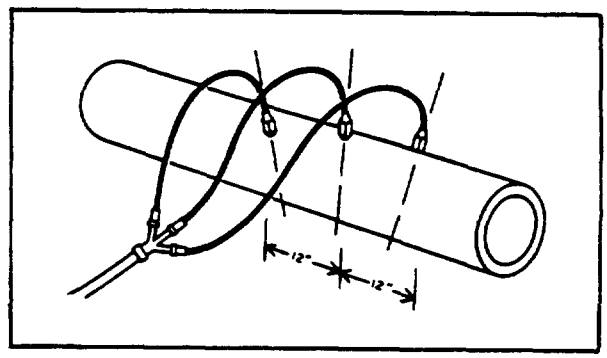


Figure 46

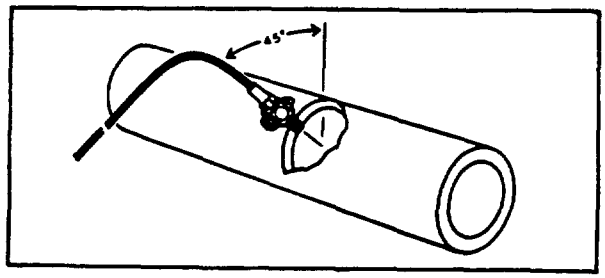


Figure 47

MAXIMUM SIZE CORPORATION STOP THAT CAN BE TAPPED DIRECTLY INTO PIPE

PIPE SIZE	TAP SIZE
4" – 200 4" thru 16" – 150	¾-inch
6" thru 16" – 200 8" thru 16" – 150	1-inch

If more than one corporation stop is to be used within the same area, stagger them at least 12 inches apart (Figure 46), and not on the same center line.

A gooseneck is required between the corporation stop and the service pipe — regardless of the type of service pipe (Figure 47). This provides a spring-like action to take care of pipe movement due to earth settlement or movement of the service pipe. *Swing ells must not be used to connect the corporation stop to the service line*, when taken directly from the barrel of Asbestos-Cement pipe.

SERVICE CLAMPS, TAPPING SLEEVES AND TAPPED COUPLINGS

Where greater outlet size is required, service clamps, tapping sleeves, or threaded brass insert couplings are used. These may be obtained from your waterworks supply house. Double flat strap service clamps should be used where the outlet is over 1 inch. Do not use larger outlet sizes than those shown in the table below. Tighten bolts on saddle evenly and avoid over-tighten-

When ordering Service Clamps or accessories, specify O.D. of pipe plus ¼ inch. Swing ells may be used to connect corporation stop to the service line when saddles are used.

MAXIMUM SIZE OUTLET FOR USE WITH DOUBLE STRAP SERVICE CLAMPS OR SADDLES

PIPE SIZE	OUTLET SIZE
4"	1"
6"	1½"
8"	2"
10"	2½"
12"	3"
14"	3"
16"	3"
18"	3"
20"	3"
24"	3"

File the surface of the pipe to clean off all loose material before placing clamp or saddle on the pipe. Place corporation stop in outlet and drill through the corporation stop. Full circle clamps with side outlets of various sizes are available.

See Page 46 for Threaded Brass Insert Couplings

THRUST BLOCKING

Thrust blocking prevents the line from moving when the pressure load is applied. In effect, the thrust block transfers the load from the pipe to a wide load-bearing area. Thrust blocks are required at points where the pipe changes direction such as:

At All Tees, Elbows, Wyes, Caps, Valves, Hydrants, Reducers, etc. (Figure 48)

Thrust Block all in-line valves

The size and type of thrust block depends on pipe size, line pressure, type of fitting, degree of bend and type of soil. In most cases, the size and type of thrust block will be determined by the engineer. Thrust block size can be calculated by the following procedures:

For an example, use 8" Class 150 pipe with a 90° elbow. The soil is medium clay which can be spaded.

Step 1. Add 50 lbs. for pressure testing to the maximum rating of the pipe. Multiply this figure by the appropriate value shown in the following table:

THRUST PER POUND OF WATER PRESSURE AT VARIOUS FITTINGS

Pipe Size	Dead End or Tee	90° Elbow	45° Elbow	22½° Elbow
4	19	27	15	7
6	39	55	30	15
8	67	94	51	26
10	109	154	84	43
12	155	216	119	61
14	210	296	161	82
16	272	383	209	106
18	351	494	269	137
20	434	611	333	169
24	623	878	478	244

Example: The thrust of an 8-inch 90° elbow at 150 pounds pressure plus an additional 50 lbs. for testing totals 200 lb. maximum pressure. Using the foregoing table, the thrust would be 18,800 lbs. (94 x 200).

Step 2. Determine the bearing strength of the soil from the table below.

BEARING STRENGTH OF SOILS

Soils and Safe Bearing Loads	Lbs. Sq. Ft.
Sound Shale	10,000
Cemented Gravel and Sand difficult to pick	4,000
Coarse and fine compact Sand	3,000
Medium Clay — Can be spaded	2,000
Soft Clay	1,000
Muck	0

Step 3. Divide the total thrust obtained in Step 1 by the bearing strength of the soil.

Example: From the table-bearing strength of soils—it shows that medium clay which can be spaded has a bearing strength of 2000 lbs. per sq. ft. Divide the total thrust (18,800 lbs.) by 2000, which gives the sq. ft. of area needed. In this case it is 9.4 sq. ft., for which an approximate area of 3 x 3 ft can be used.

Side Thrust on Curves

An outward pressure exists on all deflections from a straight line. Good soil, properly tamped, is sufficient to hold side thrust — unless soil conditions are unstable. In that case, some anchorage must be provided on each side of the coupling (Figure 49). Do not thrust block the coupling.

SIDE THRUST PER 100 lbs./sq. in. PRESSURE PER DEGREE OF DEFLECTION

Pipe Size — Inches	Side Thrust — Lbs.
4	35
6	72
8	122
10	197
12	278
14	377
16	486
18	665
20	790
24	1150

Note: Multiply thrust by degree of deflection to obtain total side thrust.

Construction of Thrust Blocks

Thrust blocks are anchors placed between the pipe or fitting and the solid trench wall. They can be constructed from available lumber, if braced properly.

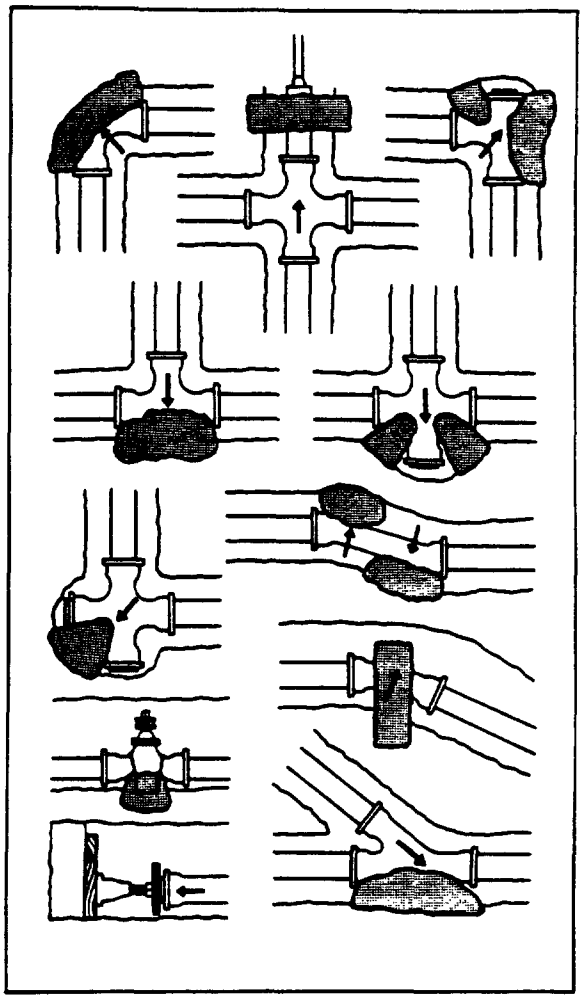
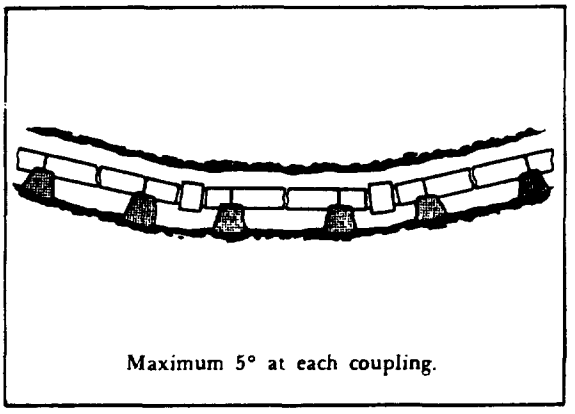


Figure 48



Maximum 5° at each coupling.

Figure 49

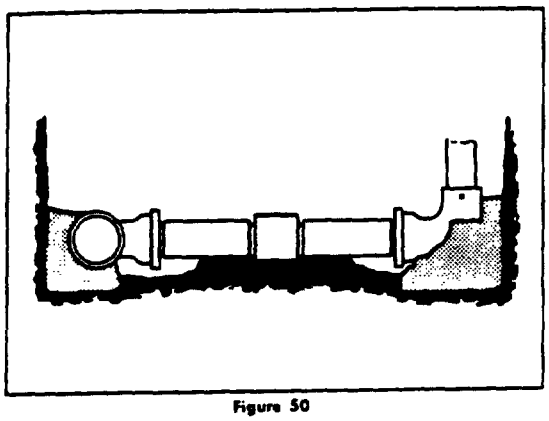


Figure 50

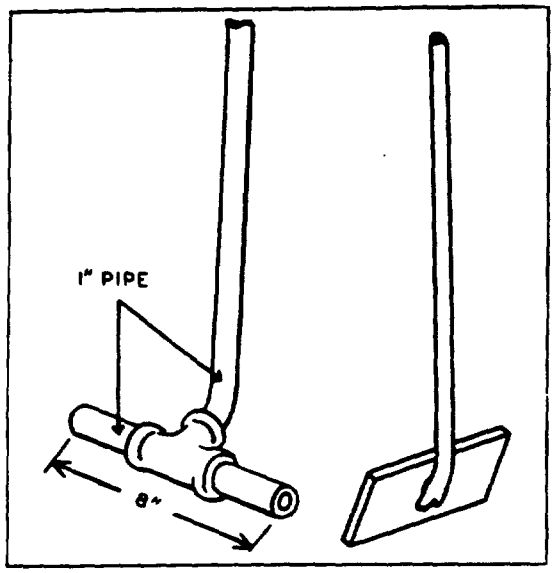


Figure 51

Figure 52

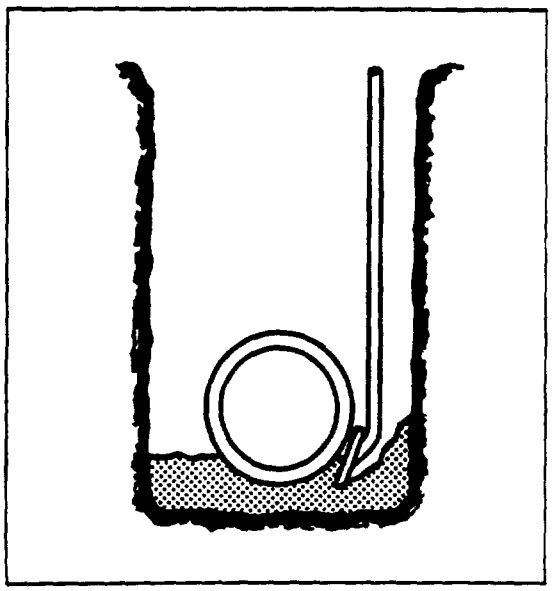


Figure 53

However, the recommended blocking is concrete calculated to have a compressive strength of 2000 lbs. per sq. inch. The mixture is 1 part cement, 2 parts washed sand and 5 parts gravel.

Thrust blocks should be constructed so their bearing surface is in direct line with the major force created by the pipe or fitting (Figure 48).

The earth bearing surface should be undisturbed. Only the simplest of forms are required. Use concrete, fluid enough so it can be worked under the fitting, around and up to the top of the fitting.

Keep all joints free from concrete. Hydrants require thrust blocking at both the 90° elbow and the Tee in the main line (Figure 50).

INITIAL BACKFILL

Initial backfill should be done as soon as possible after the pipe has been laid. This protects the pipe—and avoids shifting due to cave-ins.

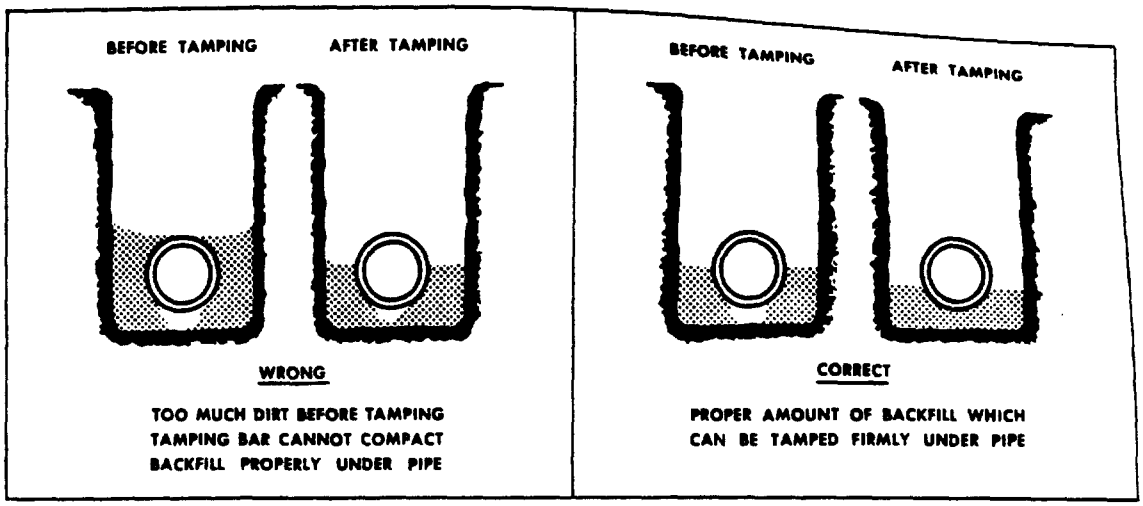
Initial backfilling is very important. It provides the firm bed that will cushion the pipe during the period when the earth settles. All pipe lines are subjected to considerable stress from earth and other loads. Unless these loads are evenly distributed, a break may result.

The couplings are normally exposed until the line has been tested. However, if conditions are such that the exposed coupling area may be filled with water, snow or objectionable material which might cause the pipe bed to become unstable, or rain and freezing conditions prevail, the trench should be completely backfilled. (See "Final Backfill" — Page 29).

BACKFILL with Hand Tamping

Place selected dirt (that is, dirt free from rocks, frozen lumps and other objectionable material) along each side of the pipe but not higher than the center line. Then using a curved railroad tamping bar (Figure 52) or a bar made from iron pipe and fittings (Figure 51) tamp dirt under the pipe so no voids are left (Figure 53). Continue adding selected dirt in approximately 4" layers, tamping each layer, until you have fully compacted dirt over the pipe. Then a flat tamper (Figure 4) can be used. Initial backfill should proceed until the pipe has been covered by at least 12 inches of well compacted material.

Mechanical compactors should not be used directly on top of the pipe until a minimum of 12" of hand-tamped backfill has been completed.



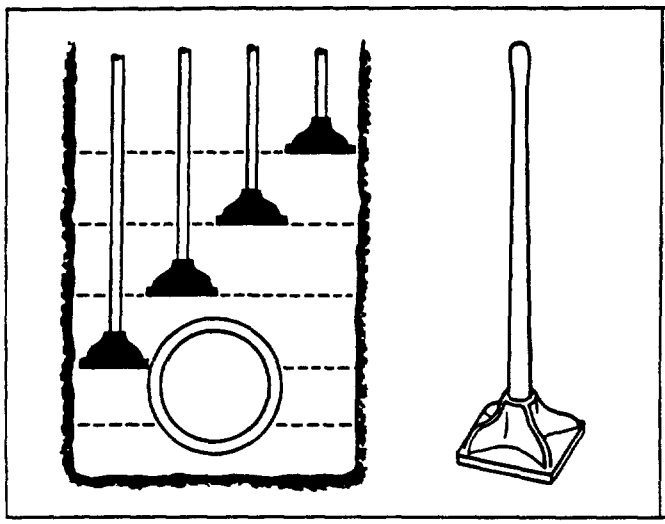


Figure 54

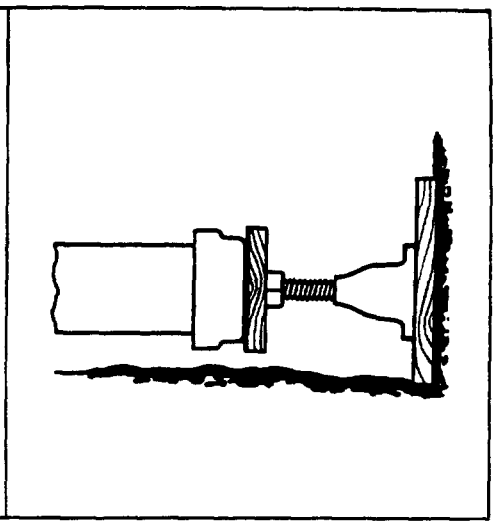


Figure 55

TEMPORARY THRUST BLOCKING

Install an end cap or valve (Figure 56) as a temporary line seal. Notch the sides of the trench for a heavy timber or put heavy sheathing at the end of the trench. Use table on page 25 to calculate the necessary bearing area.

Place a screw jack between the cap or valve and the timber (Figure 55). Tighten jack until firmly wedged against the cap or valve. Wedge the pipe solidly in place, so it cannot move vertically or horizontally when pressure is applied.

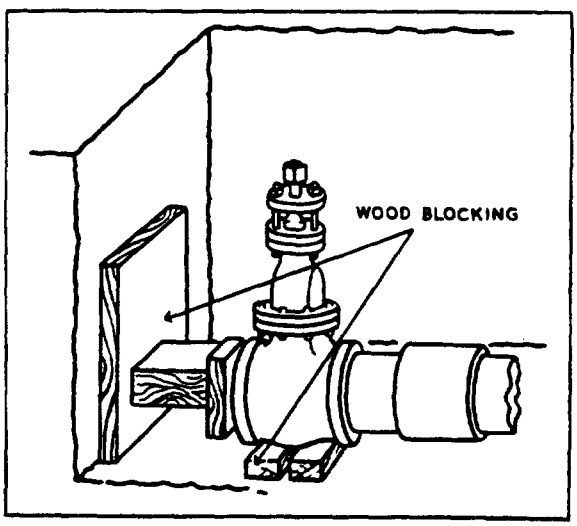


Figure 56

Volume of Water Required for Testing in gallons Per 100 Feet

Pipe Size	Approximate Gallons
3	
4	75
6	169
8	300
10	468
12	674
14	917
16	1,198
18	1,516
20	1,872
24	2,696

TESTING

At this point, the line has been partially backfilled, with coupling and fittings exposed. It should now be tested before further backfilling. If possible test sections should not be more than 1,000 feet long.

Be sure the concrete thrust blocks have been cured 24 hours to prevent cracking. If the entire line is not complete at this point, temporary test ends may be installed and given temporary thrust blocking.

HYDROSTATIC TEST

It is advantageous to test a pipe line in short sections. A run of one thousand feet would be ideal. This is especially true at the beginning of a job, as it gives the contractor and all concerned a check on the initial installation. Some jobs are installed in their entirety before testing, and any installation errors are carried through the whole job. Corrective repairs are then very expensive.

The pipe should be bedded by hand tamping good compaction soil *under, alongside and over the top* of the pipe to a depth of 12 inches. All fittings should be thrust blocked to *virgin soil*. If the permanent block is made of poured cement, at least 24 hours should be allowed for curing. The size of the thrust area can be figured by using the tables on pages 24 and 25 of this manual.

The end cap, usually a mechanical type, with a tapped offset bleeder should be temporarily blocked to virgin soil at the ditch end or by timbers set in notches in the ditch wall. A jack should be used between the cap and the blocking to take up any movement of the cap until the blocking is firmly set.

If the couplings are left uncovered for inspection, the soil around the bottom half should be firmly tamped. Sufficient earth load should be placed on the pipe between couplings to resist any upward thrust. If the couplings are not left open, complete the backfill after soil has been hand tamped to 12" over pipe and couplings.

Venting air from the line is of *major importance.* Each coupling is in itself a small air dome. Pressure pipe is seldom laid to grade, so there are high and low sections along the line. If the high section elevation is considerably above the low part of the line, a large amount of air will be trapped. Corporation stops or automatic air relief valves should be installed at these high points. Air can be blown from hydrants in pipe sizes up to 8".

In larger diameter pipes air will not enter the hydrant branch, so it will be necessary to install the air vents at high points. Low static water pressure (50 psi) held on the line for at least twenty-four hours will force any normal amount of air from the test section. Some water will be absorbed by the pipe during this time. Before the line is brought up to full test pressure, all air vents should be opened and any remaining air blown from the line again.

A test pressure of 50 psi over the actual working pressure is generally sufficient unless the specifications call for a higher pressure. This pressure should be held constant for two hours. Gauge readings should be taken at the low point in the line. This will insure that the test pressure does not exceed the specified pressure anywhere in the line.

The leakage test should be made with normal constant working pressure. Generally, the engineer will specify the leakage allowance and describe the methods for testing. If not, use the leakage allowance table on page 29 of this manual. A straight sided vessel (55 gal. drum) that can be calibrated to gallons per inch of depth can be used to pump from. After the test limit is up, the amount of water pumped from the drum can be measured and checked with the specified leakage allowance. A meter which has been checked for accuracy can also be used.

If either of the above tests fail, the following check points may be helpful in locating the leak:

1. A hydrant valve held open by a piece of rag, wood or some other foreign matter. When the valve is held slightly open, line pressure will be relieved through the hydrant drain.
2. Dirt or foreign material under the coupling gasket.
3. Pipe not sufficiently covered in trench.
4. Fittings and valves in test section not sufficiently blocked.
5. Corp. cocks not tightly closed.
6. Air in line (no relief valve).
7. Leakage through valve at end of test section.
8. Valve Bonnet plug leaking.
9. Packing on valves and wet-barrel hydrants leaking.
10. Test pump leaking. Check-valve as well as gate-valve.
11. Curves not sufficiently thrust blocked.
12. Testing too long a section of pipeline.
13. Insufficient saturation time (24 hours).

14. Ruptured pipe—cracked, blown out.
15. Broken couplings.
16. Faulty accessory equipment—valves, fittings, hydrants, saddles, corps., relief valves.
17. Faulty test gauge.
18. Test pump suction line drawing air.

Occasionally a leak will not show on the surface due to good draining soil under the pipe. Sensitive transistorized leak detectors can be employed to locate a hard-to-find leak.

After all tests are made, all couplings left open for inspection should be covered, tamped and final backfill completed.

*Allowable Leakage per 100 Couplings**

Pipe Diameter *in.*	Test Pressure at Lowest Point in Line—*psi*						
	50	75	100	125	150	200	225
	Leakage — *gph*						
4	0.71	0.87	1.00	1.02	1.23	1.42	1.51
6	1.06	1.29	1.51	1.68	1.84	2.12	2.25
8	1.42	1.72	2.00	2.24	2.45	2.84	3.00
10	1.77	2.15	2.50	2.79	3.07	3.54	3.75
12	2.12	2.58	3.00	3.35	3.68	4.24	4.52
14	2.48	3.01	3.50	3.91	4.28	4.96	5.26
16	2.83	3.44	4.01	4.47	4.89	5.68	6.00
18	3.18	3.87	4.52	5.02	5.52	6.37	6.75
20	3.54	4.30	5.00	5.58	6.12	7.08	7.51
24	4.24	5.16	6.00	6.69	7.34	8.50	9.01

*The data are based on 150 psi and represent a leakage of approximately 30 gpd per mile of pipe per inch of pipe diameter for pipe in 13-ft. lengths.

FINAL BACKFILL

After completion of test, backfill around the exposed couplings and fittings should be carried out as detailed in "Initial Backfill" on Page 26. Curved tamping bars should be used to compact the backfill under the couplings.

Fill After Testing

Follow the same procedures until the backfill has been built up in 4-inch layers to 12 inches above the pipe. After the pipe line has been properly covered to the 12" depth, the balance of the excavated earth may be moved into the trench by a bulldozer or other mechanical methods.

Water Tamping

Where the soil is loose and friable enough to provide good drainage, water compacting may be used. This starts after initial backfill has been completed, and the entire pipe including couplings have been covered to a depth of 12 inches.

Three to four inches of water is run on top of the initial backfill. The balance of the excavated earth is then moved into the trench. The puddling action of the water compacts the earth without further hand or mechanical tamping.

Trench on Slope

If the trench is on a slope, use extra care in backfilling and packing. Until the earth completely settles, the trench is in danger of becoming a gulley.

Planks, 8 to 10 inches wide and 3 feet wider than the trench can be placed on edge across the top of the trench to act as baffles. Bury them into the ground, leaving from 2 to 4 inches exposed (Figure 57). Drive 2" x 4" stakes into the solid ground to support the baffles. Depending on the slope, baffles should be used at frequent enough intervals to prevent wash-out. Rocks can also be used on top of the trench to prevent erosion.

MAKING CLOSURES AND REPAIRING PIPE

Repairing Bruises, Holes or Gouges

A repair clamp (Figure 58) may be used to reinforce damaged pipe areas such as punctures, flexural breaks, blown corporation stops or damage caused by rocks or excavating machinery.

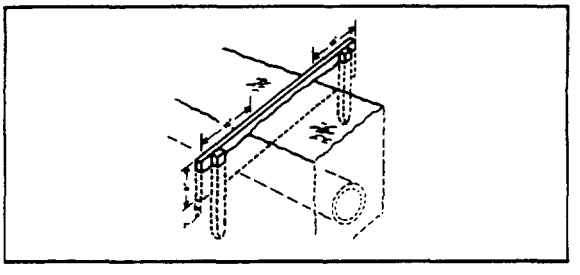


Figure 57

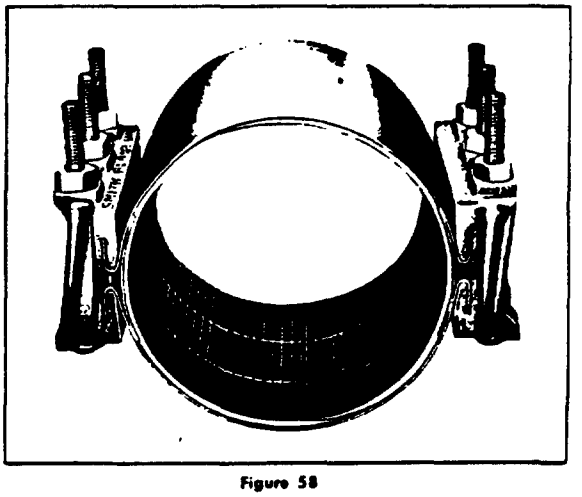


Figure 58

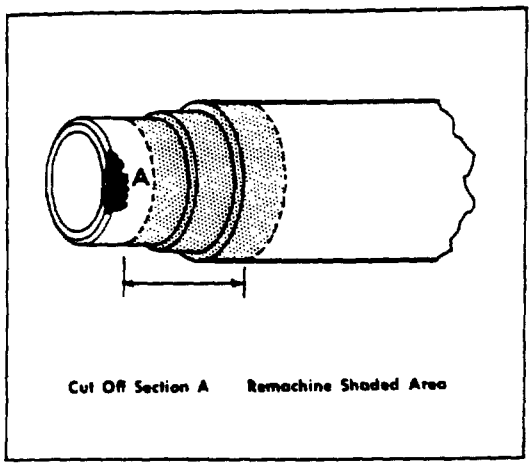


Figure 59

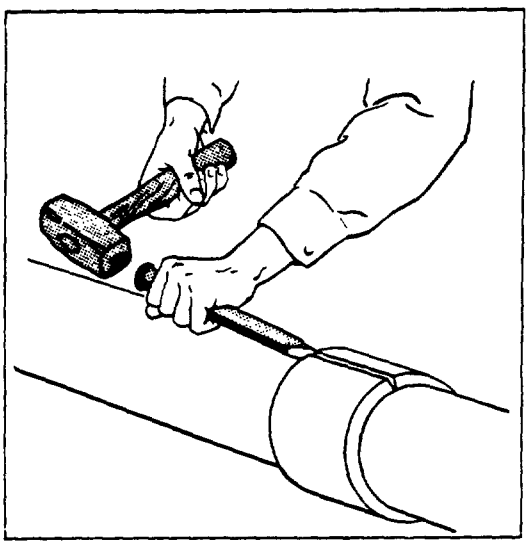


Figure 60

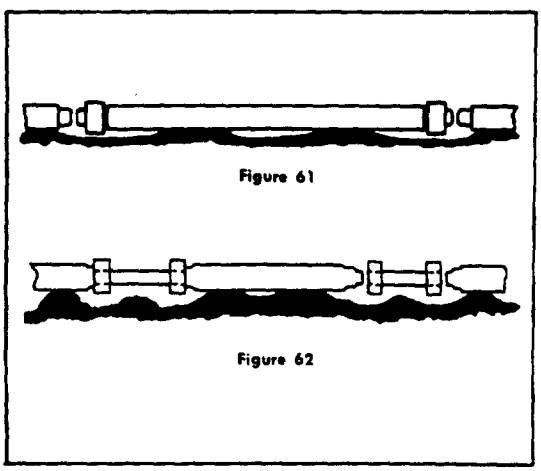


Figure 61

Figure 62

Cutting Out Damaged Portion

Pipe sections damaged before installation can be cut off, and the balance used for short lengths where needed. See Page 22 for cutting instructions.

If the coupling area of the pipe has been chipped or cracked more than ½ inch from the end (Figure 59) cut off the damaged area at least one inch beyond the defect and re-machine the end (Page 22).

Shallow scratches on the machined end of the pipe should be sanded smooth so the rubber ring can seal the area. Deeper scratches or gouges will prevent the ring from seating and the entire area should be cut off, and the end of the pipe re-machined (Page 22).

When installing repair clamps, clean surface under the clamps with a file or wire brush. Follow manufacturer's instructions for installation.

If a pipe section must be replaced in the field, dig the trench at least 12 inches wider than the diameter of the pipe, and 2 feet longer at each end than for the pipe section being replaced. This provides room for removing or assembling the coupling.

Replacing Damaged Pipe in the Line

If the pipe has not been damaged and is being removed for insertion of fittings, remove the couplings by holding the cutting tool parallel to the pipe (Figure 60). Use a cold chisel, hack saw or carpenter's saw. *Be careful not to damage machined surfaces* of pipe to be left in trench. Dig a coupling hole 6" longer than the coupling.

If the pipe is damaged, break the damaged pipe with a sledge hammer. Remove broken pieces of pipe from couplings. Remove couplings, dig a coupling hole 12 inches long under each pipe end.

After couplings have been removed, use either of the following methods to replace section:

Where a field machining tool is available, a special closure section may be made by machining each pipe end back 8 inches to receive the full length of the coupling (Fig. 61). Each end is machined back 8 inches to receive the full length of the coupling. Use extra lubricant when placing couplings on the repair length. After placing couplings on the repair length, align each end with the fixed pipes in the trench. Lubricate the fixed pipe ends and slide couplings into place, completing the joint. Do not place couplings on repair section until ready to install.

Also, one length MEO and two lengths FM pipe will make a 13-foot closure. If length is shorter than 13 feet use one length MEO and two lengths FM pipe (one cut to length) as in Figure 62. Allow ½" space between pipe ends.

Lubricate the end of the fixed pipe and the ring in the coupling and assemble a coupling and FM piece. Place a coupling on the MEO section and join to the FM piece. Lubricate both ends of the field cut FM piece to the full length of the coupling. Slide the couplings onto the pipe until the bevelled lip is clear of the couplings. Lubricate the ends of the MEO, the fixed pipe and the coupling rings. Align the field piece and slide the couplings into place.

This installation will place one CERTA-SPACER band at each coupling. Check the spacing on the FM pieces to assure proper pipe end separation. Rasp the cut end of the field cut piece to conform with factory machining.

Another method can be used to replace a full section of pipe with a single full section. Place coupling on one fixed end, cocked slightly. Assemble new length in coupling in the normal manner. Set free end over until it aligns with fixed pipe. Couple in place with a full circle repair clamp.

When pipe is in place, backfill and tamp in the normal manner (Page 26).

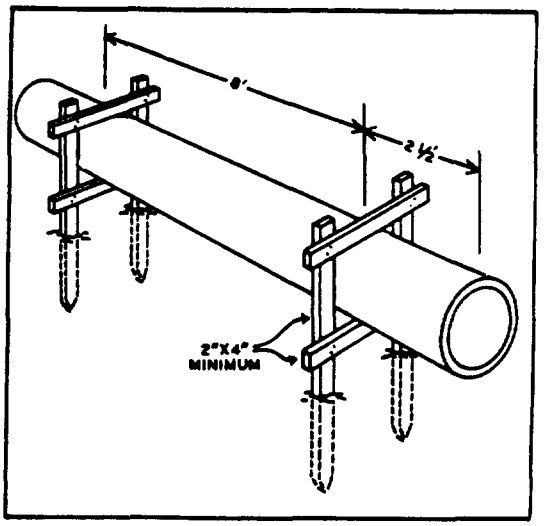


Figure 63

SPECIAL INSTALLATIONS

Certain-teed pipe has the strength and lightness needed to simplify many "problem" installations. If you have any unusual installation problems, send a complete description to your nearest Certain-teed Sales Office. They will be glad to offer suggestions.

Installation Using "A" Frames or "H" Frames

Where the pipe must be supported above the ground, timber "A" frames, (Figure 64) or "H" frames (Figure 63) may be used. "H" frames offer the most substantial support, and should be used where vertical thrusts are encountered. Use 2" x 4" or heavier timbers driven far enough in the ground to offer adequate support. Support the pipe above and below by timbers nailed to vertical supports. Use two supports per 13-foot length, located approximately 31 inches from each end (under the painted rings). Shorter lengths also require two supports, located one-fifth the distance from each end.

"A" frames are often used to anchor emergency lines. Use 2 x 4's long enough to drive firmly into the ground and nail together above the pipe. Locate the "A" frames as described under "H" frames above.

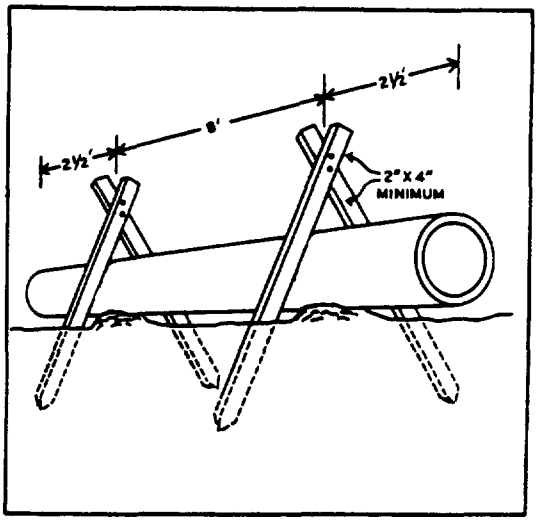


Figure 64

Installations for Bridge Crossings

Bridge crossing installations should follow the recommendations of a competent engineering authority. Certain-teed will be glad to work with you on any problems you may encounter.

CASINGS

Pipe under railroads, highways, etc., should be installed in casings. Wooden skids are used to move the pipe through the casing and to keep the weight of the line off of the couplings.

The skids should be at least 24" long, 2" wide and thick enough to give clearance between the casing bottom and the coupling. (Figure 65). Round or bevel the leading edges of the skids and notch as shown.

When strapping or wiring the skids onto the pipe place the skids at 1/5 the distance from each pipe end and approximately 20° from the center line of the pipe.

Pass a cable, with an eye, through the casing and pipe. Place a wooden block, slightly longer than the OD of the coupling, through the eye and pull the pipe into the casing. Assemble the next section of pipe and proceed as above.

After the pipe is completely installed in the casing sand should be washed in with a pressure hose until it is level with the top of the pipe. Be careful not to allow too much water to accumulate as the pipe could float and cause uneven bearing.

Expansion Joints

For normal installations the FLUID-TITE coupling provides sufficient flexibility to eliminate the need for expansion joints. For bridge crossings, expansion joints are necessary.

RECOVERY

Certain-teed pipe can be dug up and re-used after any period of service. It can be used again on the same pressure service as it was originally designed to withstand.

MINIMUM CASING SIZES
(IN INCHES)

Pipe Size	Casing Size
3	9
4	10
6	12
8	16
10	18
12	20
14	24
16	26
18	32
20	35
24	40

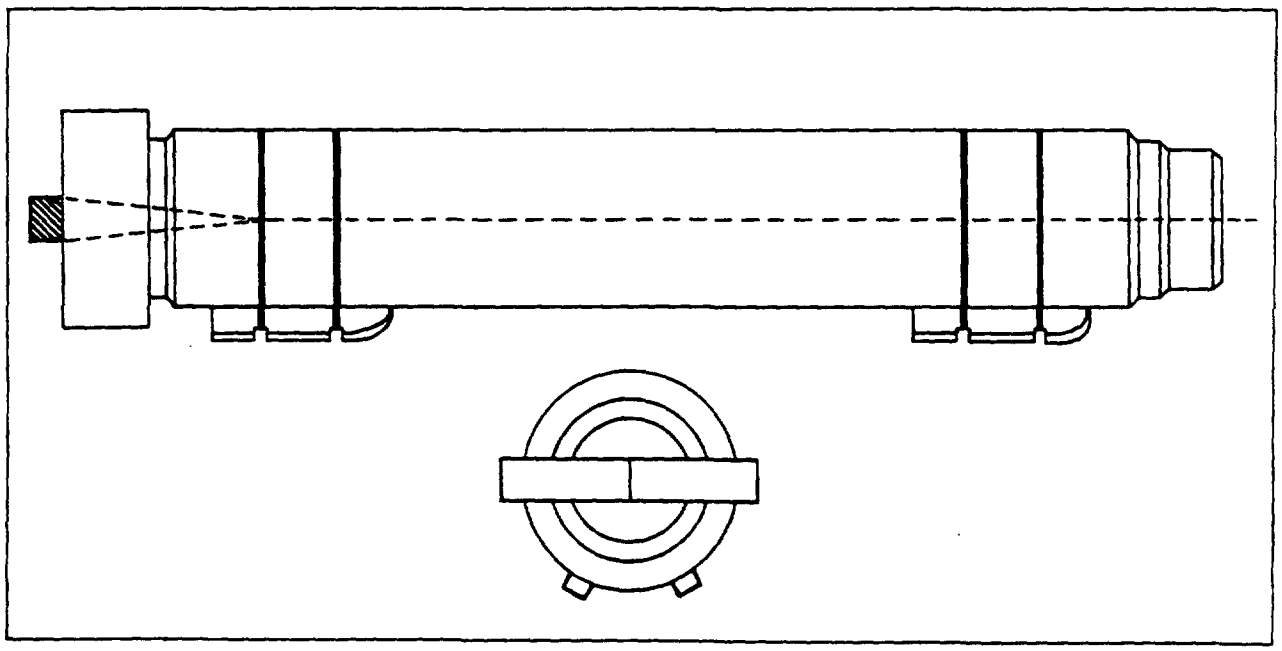
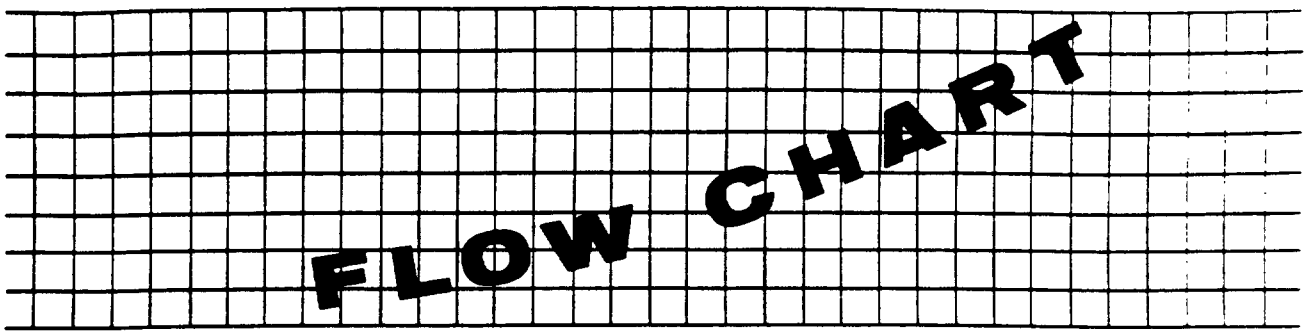


Figure 65



FOR

CERTAIN-TEED®
FLUID-TITE®
ASBESTOS-CEMENT
PRESSURE PIPE

based on the

Williams and Hazen Formula

C=140

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A DIVISION OF CERTAIN-TEED PRODUCTS CORPORATION

CERTAIN-TEED PRODUCTS CORPORATION
Valley Forge, Pennsylvania 19481

EXAMPLES OF PROBLEMS WHICH CAN BE SOLVED WITH THIS CHART AND OTHER PERTINENT ENGINEERING DATA USED IN HYDRAULICS

Pertinent Hydraulic Data

1 barrel (liquid) = 32½ gallons

1 barrel (oil) = 42 gallons

.434 p.s.i. = 1 foot of head

PROBLEM #1

A water superintendent has determined his system needs a flow of 600 gallons per minute at the end of a 1,000-foot line to service homes in the area. He desires to use a 10" line which will be serviced by a water tank 150 feet high. Therefore, he needs to find out the loss of head in feet due to friction in order to determine if sufficient water pressure will exist at the end of the line to service all customers. The loss of head caused by variation in grade is negligible, therefore the line is considered level for purposes of this problem.

SOLUTION

Find on the bottom of the graph the discharge which is 600 gallons per minute. Follow line upward until it intersects with the 10" pipe curve. Then follow horizontal line to the left to the loss of head in feet of 2.1. The loss of head in feet of 2.1 is equal to .91 pounds per square inch. (2.1 × .434). The entry point has approximately 65 pounds per square inch, (150 × .434) therefore, the pressure at the exit is 64.09 pounds per square inch. This is sufficient pressure to service the area properly.

PROBLEM #2

A housing developer needs to determine what diameter pipe should be used to provide adequate fire protection in his development.

DATA

Available head at entry to the main	190 feet
Required head at exit	80 feet
Elevation at exit of main above entrance	100 feet
Required rate of flow for adequate protection	780 gals./min.
Length of main	1,000 feet

CALCULATION

Rise from entry to exit	100 feet
Required head at exit of main	+ 80 feet
Head to be overcome	180 feet

Available head at entry of the main	190 feet
Head to be overcome	−180 feet
Permissible loss of head in friction	10 feet

SOLUTION

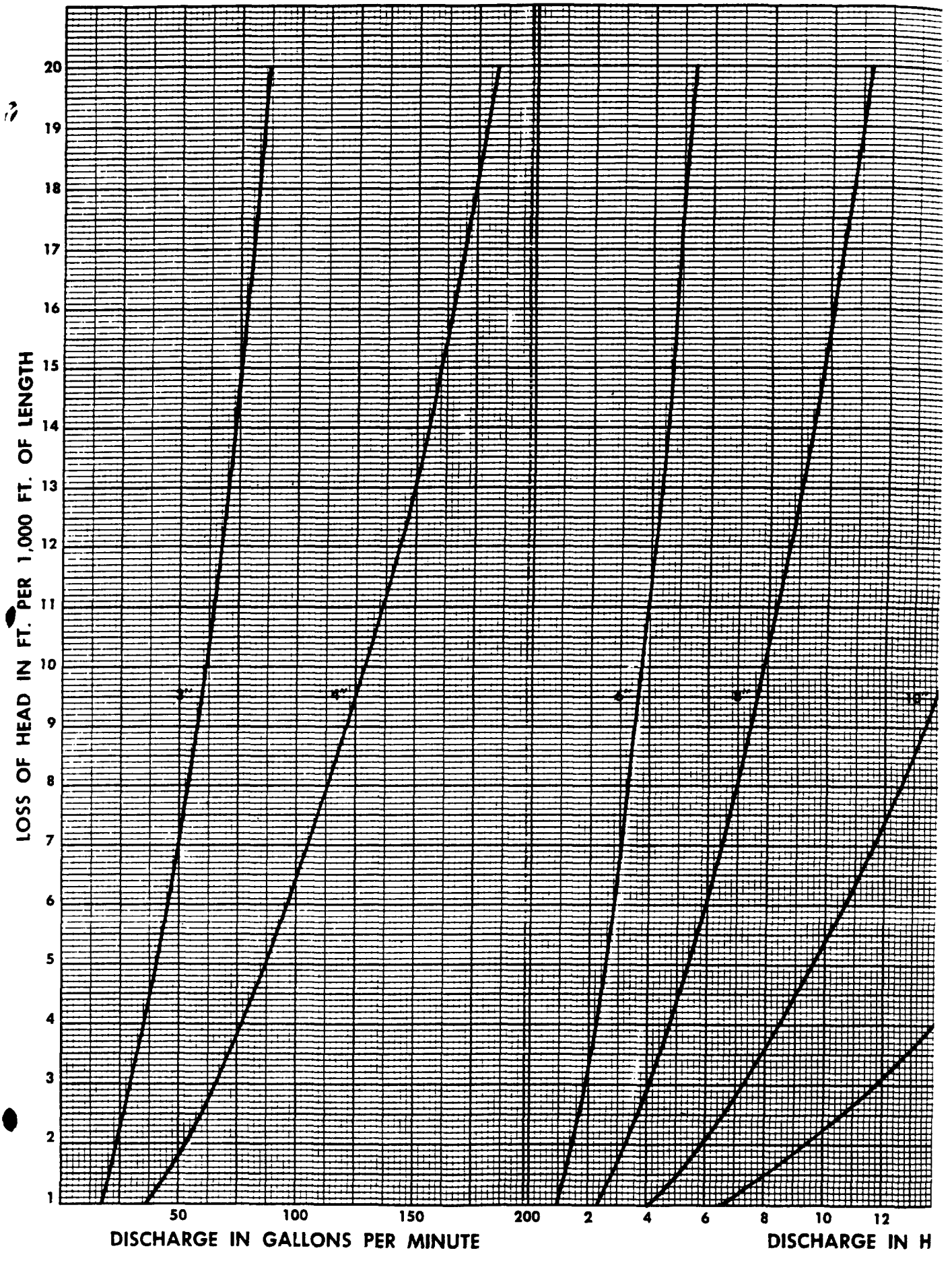
Find on the bottom of the graph a discharge of 780 gallons per minute. Follow this line upward until it intersects with the loss of head in feet of 10.0 feet. These two lines intersect at a point on the 8" pipe curve. Therefore, 8" pipe is the minimum diameter necessary to meet the above requirements.

PROBLEM #3

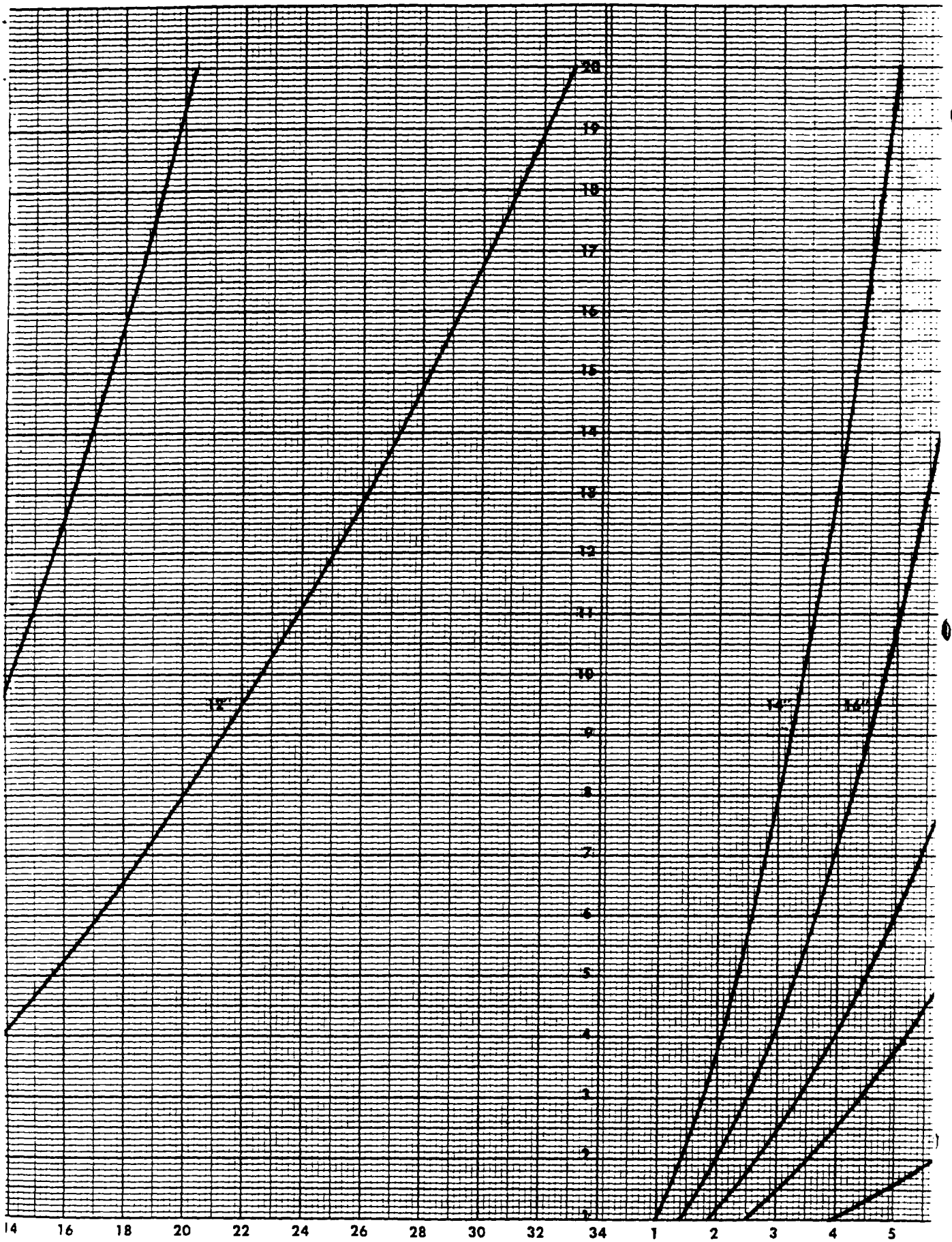
A design engineer wants to determine the discharge in gallons per minute for possible extension of a 6" line, 1,000 feet long, in which the maximum permissible loss of head due to friction has been predetermined to be not more than 10 feet. It is assumed that the loss of head due to variation in elevation is negligible.

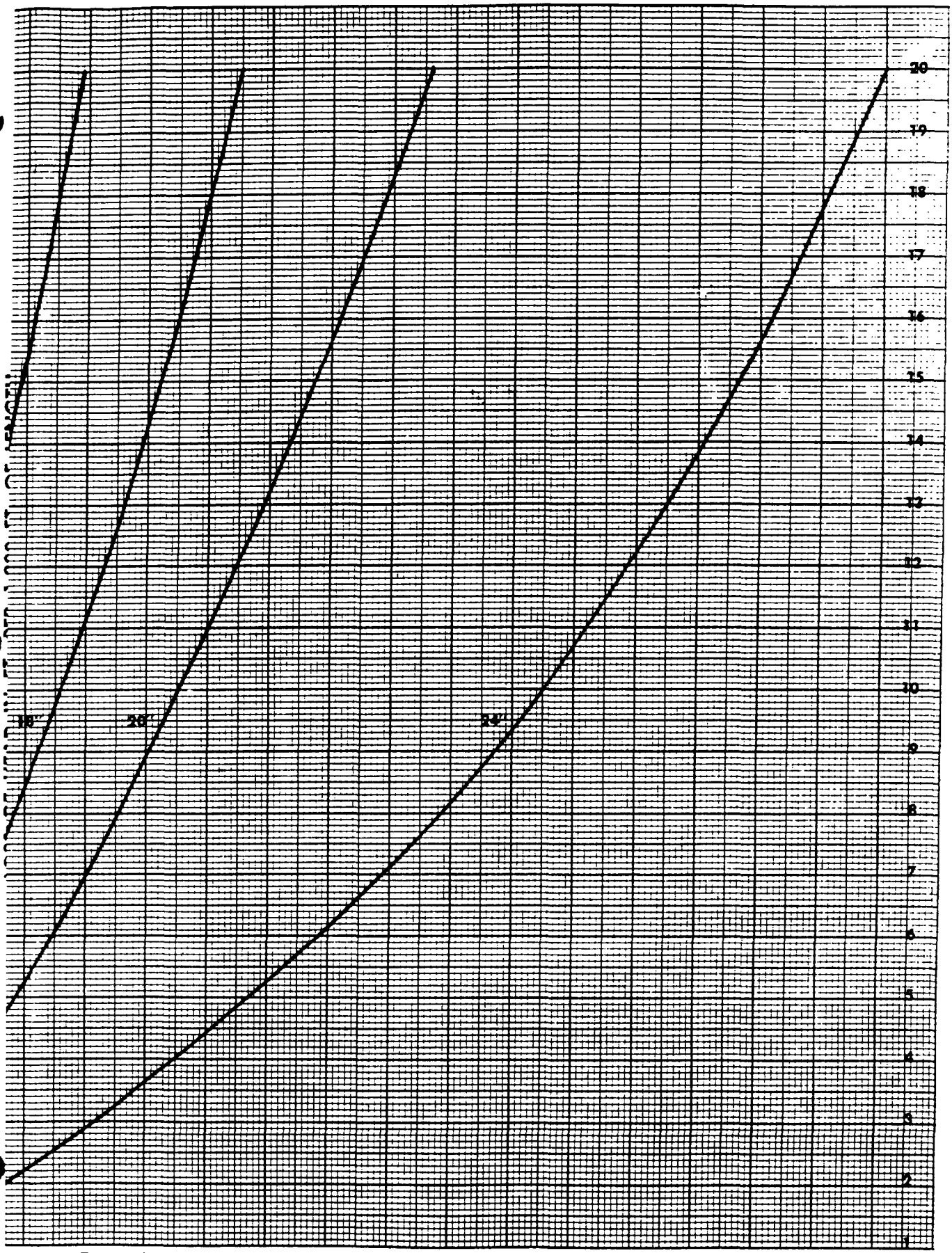
SOLUTION

On the vertical line titled "Loss of head in feet" at the left of the chart; find 10—follow this number 10 line to the right until it intersects with the 6" pipe curve. At the point of intersection follow directly down until it intersects a point on the horizontal line which is "discharge in gallons per minute." At the point of intersection you will find it is 365 gallons per minute. Therefore, the discharge of the 6" line with the loss of head of 10 feet in 1,000 feet is 365 gallons per minute.


LOSS OF HEAD IN FT. PER 1,000 FT. OF LENGTH
20
19
18
17
16
15
14
13
12
11
10
9
8
7
6
5
4
3
2
1
50
100
150
200
2
4
6
8
10
12
DISCHARGE IN GALLONS PER MINUTE
DISCHARGE IN H

.OW CHART ON CERTAIN-TEED ASBESTOS CEMENT PIPE




18"
20"
24"
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19
18
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10
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5
4
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11
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13
14
15
16
17
18
19
20
DISCHARGE IN THOUSANDS OF GALLONS PER MINUTE

DIMENSIONS

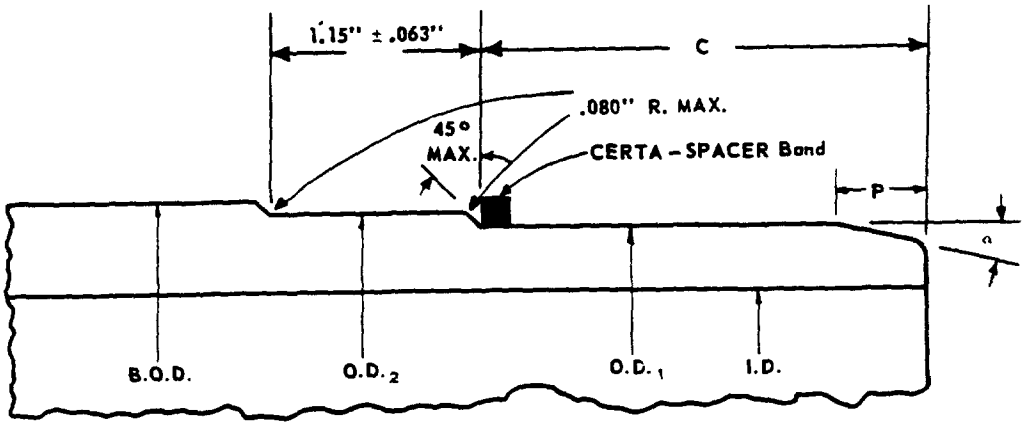
OF CERTAIN-TEED®

ASBESTOS-CEMENT

- PRESSURE PIPE
- FLUID-TITE COUPLINGS
- ACCESSORIES

CERTAIN-TEED®

FLUID-TITE® Pipe End With CERTA-SPACER® Band

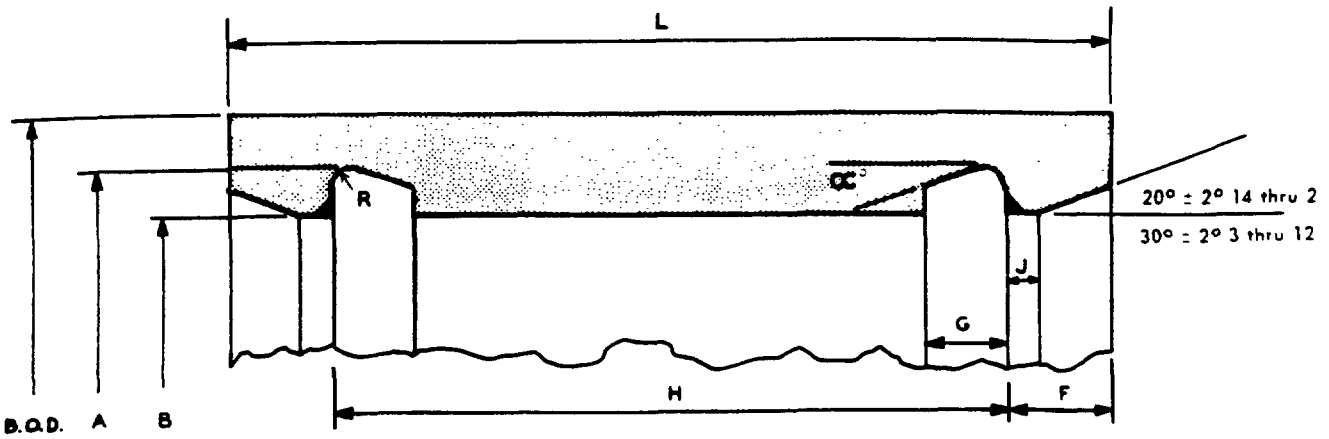


NOM. SIZE PIPE & CLASS	NOM. I.D.*	B.O.D.***	O.D.1 ±.02*	O.D.2 ±.02*	C ±.06	P ±.06	a ±2
3 -100	3.00	3.93	3.74	3.90	2.60	.50	16
4 -100	4.00	5.02	4.64	4.80	2.90	.75	16
6 -100	6.00	7.10	6.91	7.07	2.90	.75	16
8 -100	8.00	9.30	9.11	9.27	3.40	1.00	16
10 -100	10.00	11.44	11.14	11.30	3.40	1.00	16
12 -100	12.00	13.66	13.32	13.48	3.50	1.00	16
14 -100	13.60	15.36	15.07	15.23	4.00	1.00	20
16 -100	15.50	17.50	17.15	17.31	4.00	1.00	20
18 -100	18.00	20.44	19.90*	20.06*	4.88	1.00	22
20 -100	20.00	22.50	22.12*	22.28*	4.88	1.00	22
24 -100	24.00	27.17	26.48*	26.64*	4.88	1.00	22
3 -150	3.00	4.03	3.84	4.00	2.60	.50	16
4 -150	4.00	5.14	4.81	4.97	2.90	.75	16
6 -150	5.85	7.12	6.91	7.07	2.90	.75	16
8 -150	7.80	9.44	9.11	9.27	3.40	1.00	16
10 -150	10.00	11.85	11.66	11.82	3.40	1.00	16
12 -150	12.00	14.11	13.92	14.08	3.50	1.00	16
14 -150	14.00	16.41	16.22	16.38	4.00	1.00	20
16 -150	16.00	18.65	18.46	18.62	4.00	1.00	20
18 -150	18.00	21.20	20.94*	21.10*	4.88	1.00	22
20 -150	20.00	23.54	23.28*	23.44*	4.88	1.00	22
24 -150	24.00	28.22	27.96*	28.12*	4.88	1.00	22
3 -200	3.00	4.18	3.84	4.00	2.60	.50	16
4 -200	3.95	5.32	4.81	4.97	2.90	.75	16
6 -200	5.70	7.36	6.91	7.07	2.90	.75	16
8 -200	7.60	9.68	9.11	9.27	3.40	1.00	16
10 -200	9.60	11.85	11.66	11.82	3.40	1.00	16
12 -200	11.44	14.11	13.92	14.08	3.50	1.00	16
14 -200	13.60	16.44	16.22	16.38	4.00	1.00	20
16 -200	15.50	18.74	18.46	18.62	4.00	1.00	20

CERTAIN-TEED., FLUID-TITE and CERTA-SPACER are registered trademarks of Certain-teed Products Corp., Valley Forge, Pa.

CERTAIN-TEED®

FLUID-TITE® Coupling



NOM. SIZE PIPE & CLASS	A ±.025"	B ±.025"	B.O.D." **	H +.000" −.063"	L ±.25" −.00"	F −.000"	G −.04" −.00"	R ±.01	J −.03" −.00"	OC° +0° −1°
3"-100	4.57	3.850	5.35	4.500	6.25	.812	.62	.125	.375	18
4"-100	5.57	4.755	6.47	4.875	6.50	.812	.70	.125	.375	18
6"-100	7.84	7.025	8.76	4.875	6.50	.812	.70	.125	.375	18
8"-100	10.10	9.230	11.40	5.875	7.50	.812	.75	.125	.375	18
10"-100	12.13	11.260	13.51	5.875	7.50	.812	.75	.125	.375	18
12"-100	14.31	13.440	15.96	6.125	7.75	.812	.75	.125	.375	18
14"-100	16.10	15.205	17.86	7.000	9.00	1.000	.85	.125	.375	12
16"-100	18.18	17.285	20.11	7.000	9.00	1.000	.85	.125	.375	12
18"-100	21.20*	20.080*	23 40	8.500	11.10	1.300	1.00	.125	.50	12
20"-100	23.42*	22.300*	25.82	8.500	11.10	1.300	1.00	.125	.50	12
24"-100	27.78*	26.660*	30.60	8.500	11.10	1.300	1.00	.125	.50	12
3"-150	4.69	3.950	5.55	4.500	6.25	.812	.62	.125	.375	18
4"-150	5.74	4.925	6.66	4.875	6.50	.812	.70	.125	.375	18
6"-150	7.84	7.025	8.96	4.875	6.50	.812	.70	.125	.375	18
8"-150	10.10	9.230	11.46	5.875	7.50	.812	.75	.125	.375	18
10"-150	12.65	11.780	14.61	5.875	7.50	.812	.75	.125	.375	18
12"-150	14.91	14.040	17.13	6.125	7.75	.812	.75	.125	.375	18
14"-150	17.25	16.365	19.80	7.000	9.00	1.000	.85	.125	.375	12
16"-150	19.49	18.605	22.28	7.000	9.00	1.000	.85	.125	.375	12
18"-150	22.24*	21.120*	25.33	8.500	11.10	1.300	1.00	.125	.50	12
20"-150	24.58*	23.460*	27.97	8.500	11.10	1.300	1.00	.125	.50	12
24"-150	29.26*	28.140*	33 44	8.500	11.10	1.300	1.00	.125	.50	12
3"-200	4.69	3.950	5.75	4.500	6.25	.812	.62	.125	.375	18
4"-200	5.74	4.925	6.94	4.875	6.50	.812	.70	.125	.375	18
6"-200	7.84	7.025	9.24	4.875	6.50	.812	.70	.125	.375	18
8"-200	10.10	9.230	11.70	5.875	7.50	.812	.75	.125	.375	18
10"-200	12.65	11.780	14.85	5.875	7.50	.812	.75	.125	.375	18
12"-200	14.91	14.040	17.67	6.125	7.75	.812	.75	.125	.375	18
14"-200	17.25	16.365	20.67	7.000	9.00	1.000	.85	.125	.375	12
16"-200	19.49	18.605	23.41	7.000	9.00	1.000	.85	.125	.375	12

*—A and B Tolerance for 18", 20" and 24": ±.040"

**—Subject to Manufacturing Tolerances.

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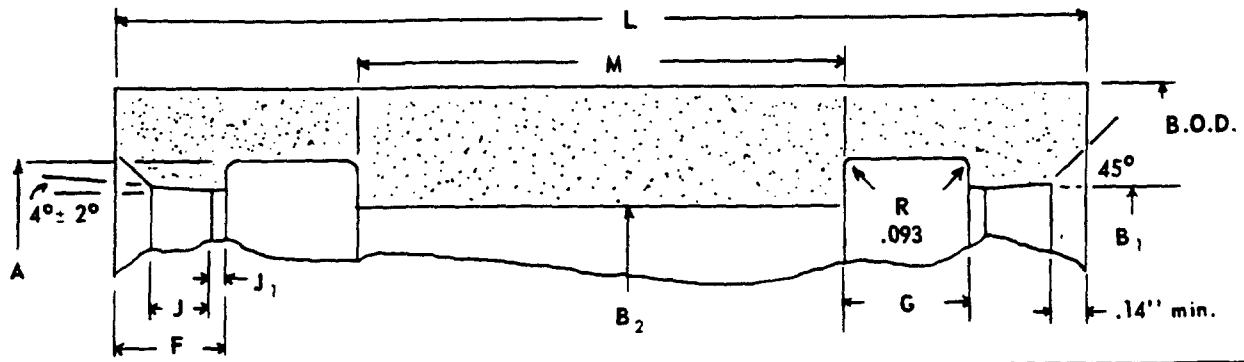
CERTAIN-TEED®

CG FLUID-TITE® Coupling

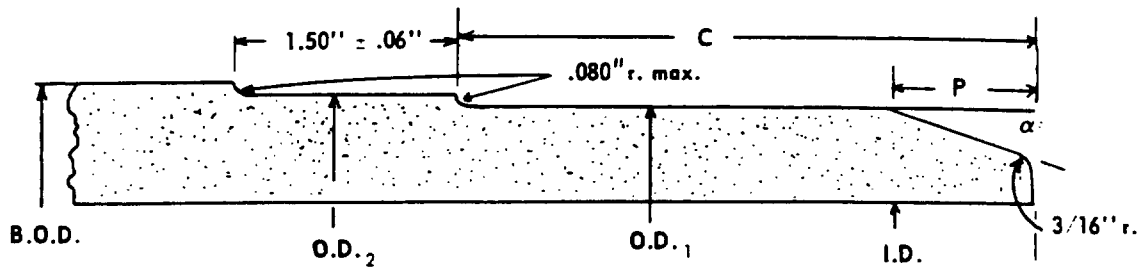


NOM. SIZE & CLASS	A ±.025	B_1 ±.025	B_2 ±.025	B.O.D.**	M +.000 -.060	L +.25 -.06	F MIN.	G +.030 -.010	J +.000 -.040	J_1 +.020 -.000
6" - 100	7.65	7.20	7.03	8.40	3.50	7.00	.76	.92	.42	.18
8" - 100	9.85	9.40	9.23	10.80	3.50	7.00	.76	.92	.42	.18
10" - 100	11.98	11.53	11.36	13.30	3.50	7.00	.76	.92	.42	.18
12" - 100	14.18	13.73	13.56	15.55	4.50	8.00	.76	.92	.42	.18
14" - 100	15.95	15.39	15.20	17.60	5.20	9.00	.83	1.00	.42	.25
16" - 100	18.03	17.47	17.28	19.80	5.20	9.00	.83	1.00	.42	.25
6" - 150	7.65	7.20	7.03	8.76	3.50	7.00	.76	.92	.42	.18
8" - 150	9.85	9.40	9.23	11.32	3.50	7.00	.76	.92	.42	.18
10" - 150	12.40	11.95	11.78	14.36	3.50	7.00	.76	.92	.42	.18
12" - 150	14.66	14.21	14.04	17.00	4.50	8.00	.76	.92	.42	.18
14" - 150	17.10	16.54	16.35	19.80	5.20	9.00	.83	1.00	.42	.25
16" - 150	19.34	18.78	18.59	22.28	5.20	9.00	.83	1.00	.42	.25
6" - 200	7.65	7.20	7.03	9.35	3.50	7.00	.76	.92	.42	.18
8" - 200	9.85	9.40	9.23	12.00	3.50	7.00	.76	.92	.42	.18
10" - 200	12.40	11.95	11.78	15.15	3.50	7.00	.76	.92	.42	.18
12" - 200	14.66	14.21	14.04	17.90	4.50	8.00	.76	.92	.42	.18
14" - 200	17.10	16.54	16.35	20.50	5.20	9.00	.83	1.00	.42	.25
16" - 200	19.34	18.78	18.59	23.20	5.20	9.00	.83	1.00	.42	.25

** Subject to Manufacturing Tolerances.

CERTAIN-TEED®

CG FLUID-TITE® Pipe

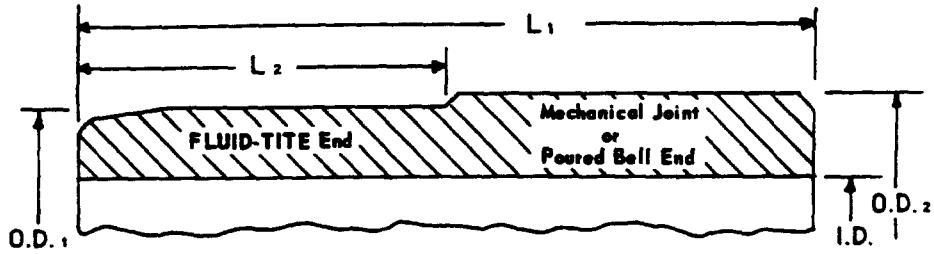


NOM. SIZE PIPE & CLASS	NOM. I.D.	B.O.D.**	O.D.1 ± .02	O.D.2 ± .02	C ±.00 −.06	P +. − .06	α° ± 2
6" – 100	6.00	7.16	6.91	7.07	2.40	.75	16
8" – 100	8.00	9.32	9.11	9.27	2.40	.75	16
10" – 100	10.00	11.46	11.24	11.40	2.40	.75	16
12" – 100	12.00	13.70	13.44	13.60	2.90	1.00	16
14" – 100	13.60	15.36	15.07	15.23	3.25	1.00	18
16" – 100	15.50	17.50	17.15	17.31	3.25	1.00	18
6" – 150	5.80	7.12	6.91	7.07	2.40	.75	16
8" – 150	7.80	9.44	9.11	9.27	2.40	.75	16
10" – 150	10.00	11.85	11.66	11.82	2.40	.75	16
12" – 150	12.00	14.11	13.92	14.08	2.90	1.00	16
14" – 150	14.00	16.41	16.22	16.38	3.25	1.00	18
16" – 150	16.00	18.65	18.46	18.62	3.25	1.00	18
6" – 200	5.70	7.36	6.91	7.07	2.40	.75	16
8" – 200	7.60	9.68	9.11	9.27	2.40	.75	16
10" – 200	9.60	11.88	11.66	11.82	2.40	.75	16
12" – 200	11.44	14.11	13.92	14.08	2.90	1.00	16
14" – 200	13.60	16.44	16.22	16.38	3.25	1.00	18
16" – 200	15.50	18.74	18.46	18.62	3.25	1.00	18

** Subject to Manufacturing Tolerances.

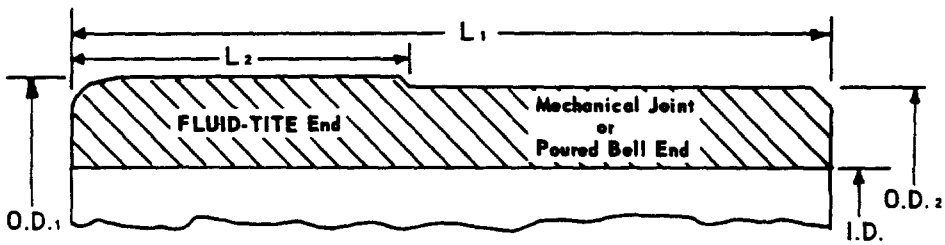
PIPE ADAPTORS

WHEN ORDERING ADAPTORS STATE SPECIFICALLY WHAT THE ADAPTOR IS GOING FROM AND TO.
EXAMPLE: PAD-3 FROM CLASS 150 10" ASBESTOS-CEMENT FLUID-TITE PIPE TO 10" MECHANICAL JOINT C.I.



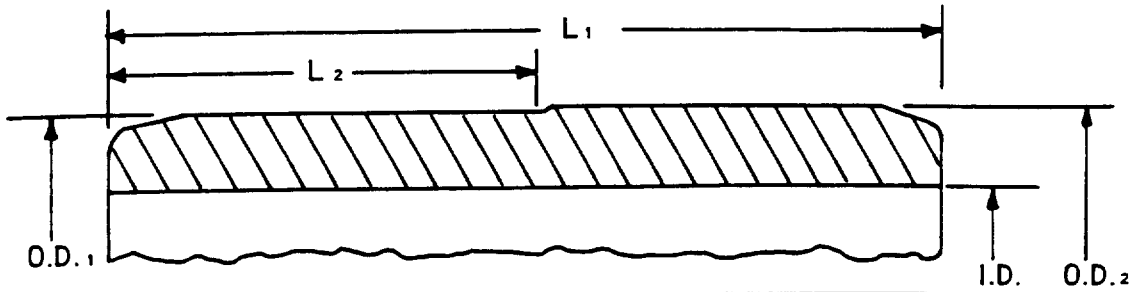
PAD 2 – CLASS 100					
PAD 2 SIZE	NOMINAL I.D.	L1" ±0.5"	L2" ±0.5"	O.D.1"	O.D.2"
3	2.92	15	8	3.74	3.96
4	3.73	15	8	4.64	4.80
6	5.54	15	8	6.91	6.91
8	7.45	15	8	9.11	9.05
10	8.94	15	8	11.14	11.10
12	10.98	15	8	13.32	13.20
14	13.17	19.5	11.5	15.07	15.30
16	15.16	19.5	11.5	17.15	17.40
18	17.34	19.5	11.5	19.90	19.50
20	19.02	19.5	11.5	22.12	21.60
24	22.98	19.5	11.5	26.48	25.80

Tolerance O.D.1 and O.D.2, 3" through 24"; ±0.020"

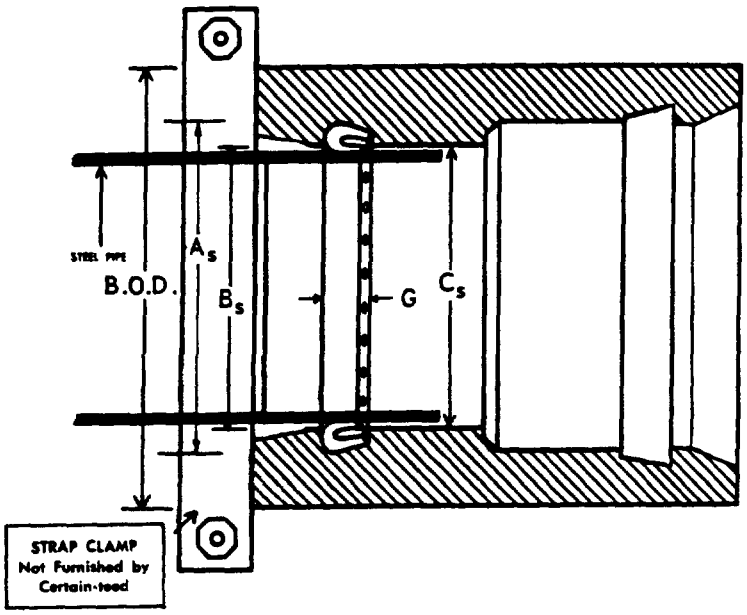


PAD 3 – CLASS 150 & 200					
PAD 3 SIZE	NOMINAL I.D.	L1" ±0.5"	L2" ±0.5"	O.D.1"	O.D.2"
Class 150					
3	2.92	15	8	3.84	3.96
4	3.73	15	8	4.81	4.81
6	5.54	15	8	6.91	6.91
8	7.45	15	8	9.11	9.05
10	8.94	15	8	11.66	11.10
12	10.98	15	8	13.92	13.20
14	13.17	19.5	11.5	16.22	15.30
16	15.16	19.5	11.5	18.46	17.40
18	16.81	19.5	11.5	20.94	19.50
20	18.15	19.5	11.5	23.28	21.60
24	21.82	19.5	11.5	27.96	25.80
PAD 3 – CLASS 200					
Class 200					
8	7.60*	15	8	9.11	9.05

For Class 200 Adaptors, 3" through 16" only.
Tolerance O.D.1 and O.D.2, 3" through 24"; ±0.020"



PAD 5 – CLASS 100 TO CLASS 150					
PAD 5 100 to 150	NOMINAL I.D.	L_1" +0.0" -0.5"	L_2" +0.0" -0.5"	O.D.$_1$" ±0.020	O.D.$_2$" ±0.020
3	2.92	15	8	3.74	3.84
4	3.80	15	8	4.64	4.81
10	9.76	15	8	11.14	11.66
12	11.44	15	8	13.32	13.92
14	13.30	19.5	11.5	15.07	16.22
16	15.16	19.5	11.5	17.15	18.46
18	17.34	19.5	11.5	19.90	20.94
20	19.63	19.5	11.5	22.12	23.28
24	23.37	19.5	11.5	26.48	27.96
PAD 11					
PAD 11 SIZE	NOMINAL I.D.	L_1" +0.0" -0.5"	L_2" +0.0" -0.5"	O.D.$_1$" ±0.020"	O.D.$_2$" ±0.020"
10	9.76	15	8	11.24	11.14
12	11.44	15	8	13.44	13.32



PRESSURE PIPE COUPLING ADAPTOR
FLUID-TITE PIPE TO STEEL PIPE

CAS

CLASSES 100, 150, 200				
COUPLING SIZE	As" ±0.025"	Bs" ±0.025"	Cs" ±0.025"	G" +0.03" −0.01"
3	4.430	3.560	3.620	0.625
4	5.520	4.560	4.630	0.700
6	7.410	6.685	6.765	0.625
8	9.450	8.685	8.775	0.625
10	11.550	10.810	10.910	0.625
12	13.550	12.810	12.920	0.625

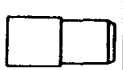
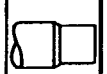
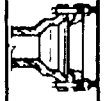
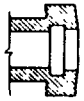
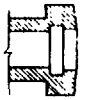
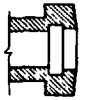
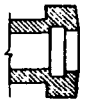
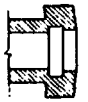
Other Dimensions

For other dimensions not shown, refer to standard coupling dimension page 39.

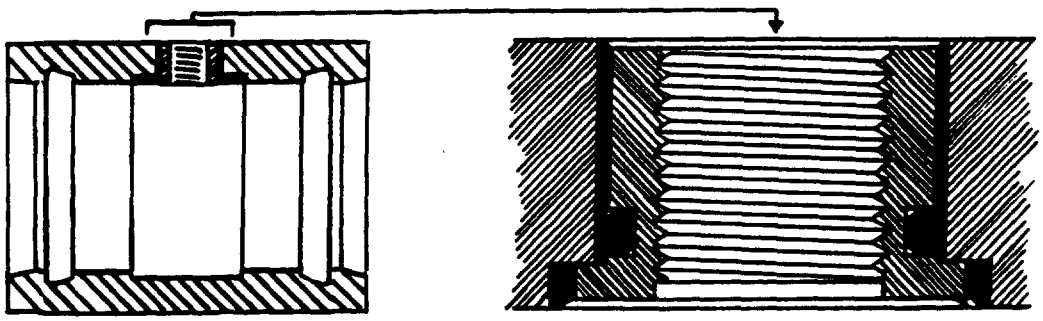
Note

For excessively oval steel pipe, field reworking of the Bs to the Cs dimension is permitted.

How To Connect
FLUID-TITE® pipe with CERTA-SPACER® Band,
To Other Pipe, Fittings And Valves

How To Connect F.T. Pipe ↓ To →		PIPE			FITTING & VALVE HUBS											
	FLUID-TITE CERTA-SPACER	FLUID-TITE	Johns-Manville & Flintkote	Simplex	Class "D" Poured	Mech. Joint	C. I. Pipe Slip Joint	A-C Common Groove Cl. 100	A-C Common Groove Cl. 150-200	Johns-Manville & Flintkote Cl. 100	Johns-Manville & Flintkote Cl. 150-200	FLUID-TITE (w/o CERTA-SPACER) Cl. 100	FLUID-TITE (w/CERTA-SPACER) Cl. 150-200	Roll-On Cl. 100	Roll-On Cl. 150-200
															
3"	CLASS 100 150/200	Direct Direct	Direct Direct	Direct Direct	PAD 2 FM	PAD 2 PAD 3	PAD 2 PAD 3	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct
4"	CLASS 100 150/200	Direct Direct	Direct Direct	Direct Direct	PAD 2 FM	PAD 2 FM	PAD 2 FM	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct
6"	CLASS 100 150/200	PAD 11* Direct	Direct Direct	PAD 11* Direct	FM FM	FM FM	FM FM	Direct No	Direct Direct	Direct No	Direct Direct	PAD 11* No	Direct Direct	PAD 11* No	Direct Direct
8"	CLASS 100 150/200	PAD 11* Direct	Direct Direct	PAD 11* Direct	PAD 2 FM	PAD 2 PAD 3	PAD 2 PAD 3	Direct No	Direct Direct	Direct No	Direct Direct	PAD 11* No	Direct Direct	PAD 11* No	Direct Direct
10"	CLASS 100 150/200	Direct Direct	PAD 11 Direct	Direct Direct	PAD 2 PAD 3	PAD 2 PAD 3	PAD 2 PAD 3	PAD 11 No	PAD 5 Direct	PAD 11 No	PAD 5 Direct	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct
12"	CLASS 100 150/200	Direct Direct	PAD 11 Direct	Direct Direct	PAD 2 PAD 3	PAD 2 PAD 3	PAD 2 PAD 3	PAD 11 No	PAD 5 Direct	PAD 11 No	PAD 5 Direct	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct
14"	CLASS 100 150/200	Direct Direct	Direct Direct	* Direct	PAD 2 PAD 3	PAD 2 PAD 3	PAD 2 PAD 3	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct	* No	PAD 5 Direct
16"	CLASS 100 150/200	Direct Direct	Direct Direct	* Direct	PAD 2 PAD 3	PAD 2 PAD 3	PAD 2 PAD 3	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct	Direct No	PAD 5 Direct	* No	* Direct
18"	CLASS 100 150	Direct Direct	Direct † Direct †	Direct *	PAD 2 PAD 3	PAD 2 PAD 3	PAD 2 PAD 3	Direct † No	PAD 5 † Direct †	Direct † No	PAD 5 † Direct †	Direct No	PAD 5 Direct	Direct No	PAD 5 *
20"	CLASS 100 150	Direct Direct	Direct † Direct †	Direct *	PAD 2 PAD 3	PAD 2 PAD 3	PAD 2 PAD 3	Direct † Nd	PAD 5 † Direct †	Direct † No	PAD 5 † Direct †	Direct No	PAD 5 Direct	Direct No	* *
24"	CLASS 100 150	Direct Direct	Direct † Direct †	Direct *	PAD 2 PAD 3	PAD 2 PAD 3	PAD 2 PAD 3	Direct † No	PAD 5 † Direct †	Direct † No	PAD 5 † Direct †	Direct No	PAD 5 Direct	Direct No	* *
		Use old F.T. gasket in F.T. Cplg.	Use F.T. gasket or J-M gasket in J-M cplg. †Use special CPC Fittings Gasket	Use Simplex gasket in Simplex cplg. and F.M. pc.				Use F.T. or J-M gasket - remove CERTA-SPACER. †Use special CPC Fittings Gasket	Use F.T. or J-M gasket - remove CERTA-SPACER. †Use special CPC Fittings Gasket	Use F.T. or J-M gasket - remove CERTA-SPACER. †Use special CPC Fittings Gasket	Use F.T. or J-M gasket - remove CERTA-SPACER. †Use special CPC Fittings Gasket	Use only Old F.T. gasket	Use only Old F.T. gasket	Use Simplex gasket w/Fully-Machined Piece.	Use Simplex gasket w/Fully-Machined Piece.

*1. All connections marked with an asterisk (*) are available on special order only.
2. Where "No" is indicated – CL 150 pipe should not be used in CL 100 fittings.



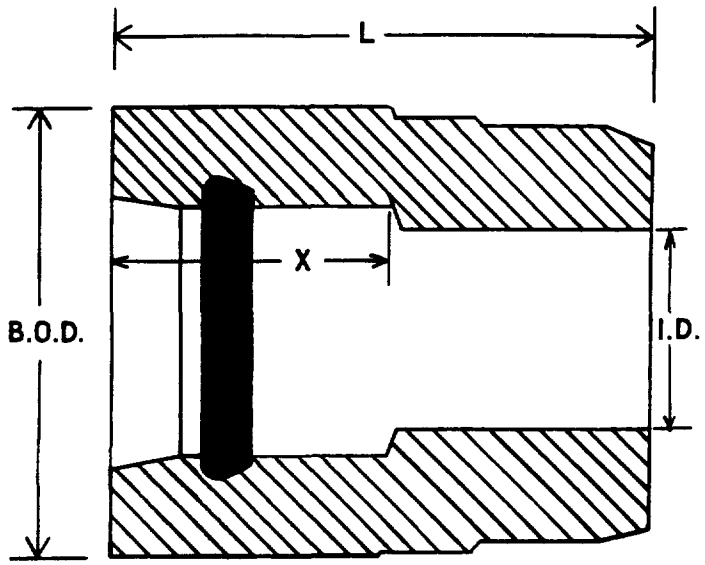
CERTAIN-TEED®

FLUID-TITE THREADED BRASS INSERT COUPLING

TBIC

A.W.W.A. THREAD		IRON PIPE THREAD	
CLASS 100 OR FT. HD. 225		CLASS 100 OR FT. HD. 225	
Size	Tap Size	Size	Tap Size
3", 4", 6", 8", 10", 12"	¾", 1"	3", 4", 6", 8", 10", 12"	¾", 1", 1¼", 1½"
CLASS 150 OR FT. HD. 325		CLASS 150 OR FT. HD. 325	
Size	Tap Size	Size	Tap Size
3", 4", 6", 8", 10", 12"	¾", 1"	3", 4", 6", 8", 10", 12"	¾", 1", 1¼", 1½"
CLASS 200 OR FT. HD. 450		CLASS 200 OR FT. HD. 450	
Size	Tap Size	Size	Tap Size
3", 4", 6", 8", 10", 12"	¾", 1"	3", 4", 6", 8", 10", 12"	¾", 1", 1¼", 1½"

Where 2-inch services are required, use an increaser from the 1¼" or 1½" iron pipe tap.
The head loss from either tap to 2" is negligible.
Tap placement at manufacturer's option.



PRESSURE PIPE COUPLING REDUCER
FLUID-TITE PIPE TO FLUID-TITE PIPE

COUPLING REDUCER SIZE	I.D."	B.O.D."	L" + 0.25 − 0.00	X" ± 0.13
Class 100				
4 to 3	3.51	5.35	6.25	3.13
6 to 4	4.56	7.16	6.50	3.25
8 to 6	6.81	9.36	6.50	3.25
10 to 8	8.95	11.39	7.50	3.75
12 to 10	11.01	13.57	7.50	3.75
14 to 12	13.19	15.64	7.75	3.88
16 to 14	14.85	18.02	9.00	4.50
18 to 16	16.82	20.28	11.10	4.50
20 to 18	19.64	23.24	11.10	5.55
24 to 20	21.81	26.86	11.10	5.55
Class 150				
4 to 3	3.51	5.55	6.25	3.13
6 to 4	4:56	7.16	6.50	3.25
8 to 6	6.81	9.52	6.50	3.25
10 to 8	8.95	12.01	7.50	3.75
12 to 10	11.01	14.61	7.50	3.75
14 to 12	13.19	17.13	7.75	3.88
16 to 14	14.47	19.80	9.00	4.50
18 to 16	16.82	22.28	11.10	4.50
20 to 18	19.64	25.33	11.10	5.55
24 to 20	21.81	28.34	11.10	5.55
Class 200				
4 to 3	3.82	5.75	6.25	3.13
6 to 4	4.68	7.46	6.50	3.25
8 to 6	6.81	9.67	6.50	3.25
10 to 8	8.95	12.10	7.50	3.75
12 to 10	11.47	14.85	7.50	3.75
14 to 12	13.77	17.67	7.75	3.88
16 to 14	15.86	20.67	9.00	4.50

I.D. – Subject to Manufacturing Tolerances. Machining Not Required.

B.O.D. Tolerance: Up to 10" to 8" Unit; – 0.150"
12" to 10" Unit and Above; – 0.200"

Any of the following Certain-teed Products Company pipe district offices will be delighted to give you the name and telephone number of your nearest Certain-teed Pipe Agent. Why not call today?

DISTRICT OFFICES

ATLANTA PIPE DISTRICT
Suite 470
3272 Peachtree Rd., N.E.
Atlanta, Ga. 30305
Area Code 404 Telephone: 237-6331

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23200 Chagrin Boulevard
(Beachwood)
Cleveland, Ohio 44122
Area Code 216 Telephone: 464-8060

HOUSTON PIPE DISTRICT
Suite 412
2500 Dunston
Houston, Texas 77005
Area Code 713 Telephone: 526-3717

LOS ANGELES PIPE DISTRICT
California Federal Savings Bldg., Suite 242
1695 Crescent Avenue
Anaheim, California 92801
Area Code 714 Telephone: 774-3900
From Los Angeles: 213-625-1915

Phoenix Branch Office
Suite 112, Playton Bldg.
3625 No. 16th Street
Phoenix, Arizona 85016
Area Code 602 Telephone: 274-3642

NEW ORLEANS PIPE DISTRICT
Suite 30
3968 North Boulevard
P. O. Box 66312, Central City Station
Baton Rouge, Louisiana 70806
Area Code 504 Telephone: 344-0374

PHILADELPHIA PIPE DISTRICT
Valley Forge, Pennsylvania 19481
Area Code 215 Telephone: 265-7282, 7283, 7284

ST. LOUIS PIPE DISTRICT
Suite 110
12015 Manchester Road
(Des Peres)
St. Louis, Missouri 63131
Area Code 314 Telephone: 966-3010

SAN FRANCISCO PIPE DISTRICT
325 Village Square
Orinda, California 94563
Area Code 415 Telephone: 254-1500

PIPE FACTORIES AT AMBLER, PA.; ST. LOUIS, MO.; SANTA CLARA & RIVERSIDE, CALIF.; HILLSBORO, TEXAS

NOTES

Warranty

Our products are carefully inspected for manufacturing defects; however, it is not always possible to detect hidden defects. Our products are warranted only to the extent that we will replace without charge, products proved to have manufacturing defects within six months of the date of delivery thereof and provided we have been given an opportunity to inspect the product alleged to be defective and the installation or use thereof. No warranty is included against any expense for removal, re-installation or other consequential damages arising from any defect. Owing to the widely varying conditions under which our products are installed and used we cannot be and are not bound, and no person is authorized to bind us, by any further warranty whatsoever, expressed or implied.