

Installation Guide

TRANSITE®
RING-TITE®
PRESSURE
PIPE

JOHNS-MANVILLE
JM
PRODUCTS

Johns-Manville

HOW THIS GUIDE CAN HELP YOU

THIS booklet was written especially for the men who direct and do the actual work of handling and installing Transite Ring-Tite® Pressure Pipe. It explains how to install Transite Pressure Pipe under average conditions so as to comply with the "Standard Johns-Manville Laying Specifications."

This guide is not intended to supply design information nor to assume the responsibility of the Engineer (or other customer representative) in establishing procedures best suited to individual job conditions so as to attain satisfactory performance.

Engineers, Superintendents, Contractors, Foremen, and the laying crew will find much to guide them in following specifications so as to result in the most satisfactory installation of Transite Ring-Tite Pressure Pipe. The booklet will also be of help in determining pipe needs when ordering.

Installation Instructor Service

As an added service, if a request is made with adequate advance notice (such as at the time of placing the pipe order), an Installation Instructor will be provided, without charge, for such a period of time as Johns-Manville will consider necessary to furnish preliminary instructions as a supplement to the instructions contained in this guide. This service is offered, however, on the condition that by rendering it, Johns-Manville shall not be deemed to have approved or in any manner to have assumed responsibility for the engineering design of the job, supervision, inspection or quality of workmanship employed in the installation of materials.

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Receiving and Handling Pipe Shipments

INSPECTION

Each pipe shipment should be inspected with care on its arrival. The pipe was carefully loaded at the factory, using methods acceptable to the carrier and it is his responsibility to deliver in good order. *It is up to the receiver to make certain there has been no loss or damage.*

The tally sheet which accompanies each shipment provides a complete list of all the items included. *Check the load against the tally sheet and report any error to the transportation agent immediately and have proper notation made on delivery receipt.*

A bright yellow instruction sheet is included with each load as a service in reminding the man on the job of the following points in checking off the load:

1. MAKE OVERALL EXAMINATION OF LOAD. If load is intact, ordinary inspection while unloading should be enough to make sure pipe has arrived in good condition.
2. IF LOAD HAS SHIFTED or shows ROUGH TREATMENT then EACH PIECE must be CAREFULLY INSPECTED for DAMAGE.
3. CHECK TOTAL QUANTITIES of each item against TALLY SHEET (pipe, couplings, rings, fittings, lubricant, etc.)
4. Any DAMAGE or missing items MUST BE NOTED on DELIVERY RECEIPT and returned to transportation company.
5. Also—NOTIFY CARRIER IMMEDIATELY—and make claim in accordance with their instructions.
6. DO NOT DISPOSE OF ANY DAMAGED MATERIAL—carrier will notify you of procedure to follow.

Releasing the Load for Removal

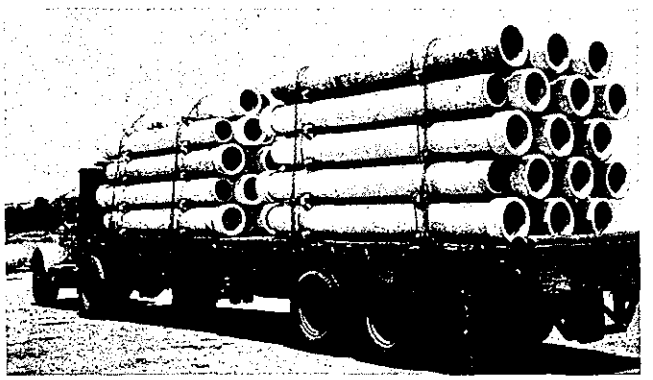


FIG. 1 — Truckload

Truck shipments are secured with load binders and are usually released by the driver.

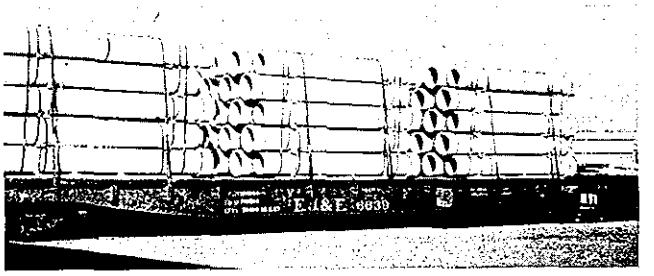


FIG. 2 — Carload

In freight cars, straps are used to make tight shipping units. To release the pipe, cut the straps with heavy wire cutters, snips or a fine-tooth hacksaw.

For either rail or truck shipments the couplings, if shipped separately, are stowed in a separate area or lined up to resemble full lengths of pipe and secured at the top of the load. Rubber rings are packed in cartons. Cartons should be opened, rings checked against the tally sheet, then put in a safe place to insure against loss.

HANDLING PIPE

Keep all pipe under control during unloading. This will greatly reduce the possibility of damage caused by careless handling. If a pipe section is accidentally damaged, mark it plainly and set it aside. Repairs (described on page 93) can be made later on, so long as any damage is noted at the time. The greater danger is in not noting and then installing such abused pipe. This could result in having to repair the line after installation is completed. *Table A (below) gives the approximate weight of Transite Pipe.*

Size Pipe Inches	WEIGHT OF TRANSITE PRESSURE PIPE					
	Class 100		Class 150		Class 200	
	Pipe Wgt. Lbs. Per Ft.	Cplg. Wgt. each	Pipe Wgt. Lbs. Per Ft.	Cplg. Wgt. each	Pipe Wgt. Lbs. Per Ft.	Cplg. Wgt. each
3	4.5	5.1	5.0	5.6	5.9	5.6
4	5.7	5.9	6.5	6.9	8.6	8.5
6	10.0	9.7	11.2	11.3	14.0	15.8
8	15.4	13.8	17.3	17.5	21.6	23.8
10	19.9	16.4	27.9	26.8	32.2	36.5
12	26.5	25.0	37.8	41.5	44.6	57.2
14	33.2	38.5	50.0	64.2	60.5	88.6
16	41.6	48.2	62.0	81.0	78.3	111.3

TABLE A

UNLOADING

Hand-Passing

Hand-passing (without ropes and skids) should only be used on small sizes of pipe. As a general rule, 75 lbs. is enough weight for one man to handle repeatedly. Therefore two men, one at each end, can pass pipes weighing up to 150 lbs. Pipes heavier than this should be lowered with ropes and skids. (See Table A, for weight of pipe.)

Using Ropes and Skids

All sizes of Transite Pipe can be unloaded from flat trucks and cars with ropes and with skids set not steeper than 45 degrees. Always use two ropes, passing them under

each end of each row outside the skid (as in Fig. 3). The ropes should be tied on the side opposite the unloading because the loop thus formed gives better control as the pipe goes "over the edge" onto the skids, and better control while pipe is rolling down the skids.

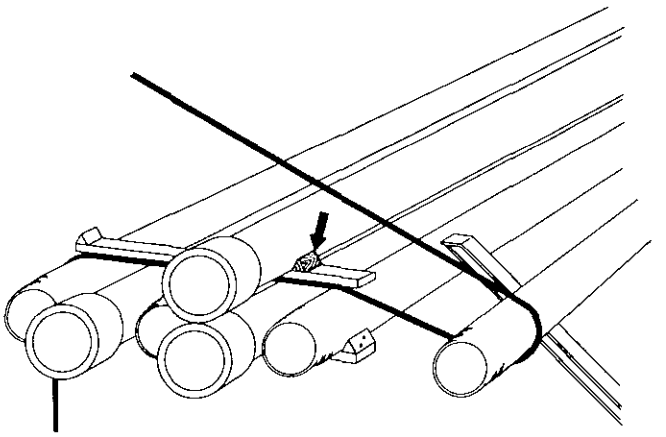


FIG. 3 — Chock-block loose pipes as shown by arrow

Pipe should be lowered one length at a time. For larger pipe, snubbing stakes should be used. Two typical methods are shown in Figs. 4 and 5.

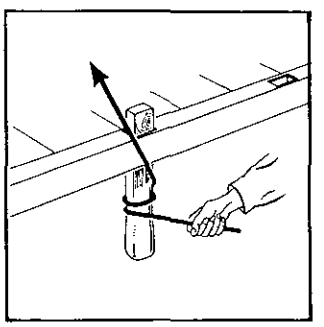


FIG. 4

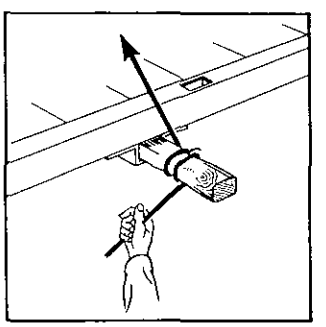


FIG. 5

Narrower units (4 ft. wide) are used in some cases. These are loaded side by side to make up the full truck width. In unloading, take off the entire row from *both* units so as to save time in setting skids.

Nested rows, sometimes used where pipe is shipped unbelled, can also be unloaded with skids and ropes. In this case, leave the chock blocks in place until the top row is rolled off, into the sling, and lowered—see Fig. 6. Then remove the chock blocks and lower the bottom row chocking loose pipes as before.

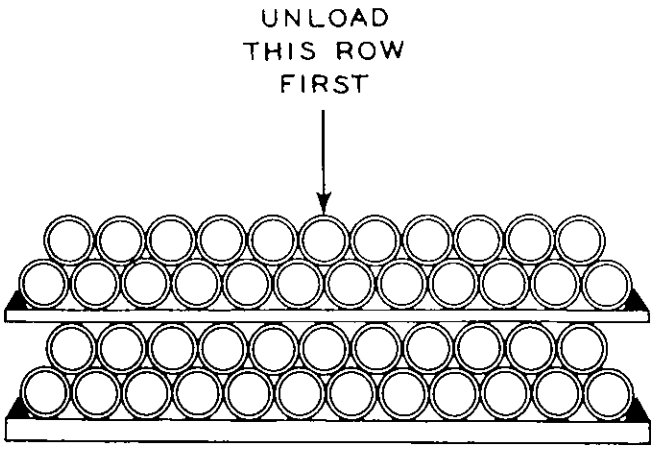


FIG. 6 — Leave chock-blocks in place while unloading top rows.

USING MECHANICAL EQUIPMENT

HOOKS

Do not use hoist hooks for lifting single lengths... They can damage the coupling groove and the pipe end.

Slings—For single lengths

If a sling is used, center it and adjust it so as to prevent the pipe tipping or sliding out. For example—with chain, cable or rope slings, a double bight with loops spread well apart is the most secure. (See Fig. 7.) If pipe is to be balanced in a single loop, keep the loop tight as in Fig. 8 (especially in the smaller sizes) so as to prevent slipping. In general, use single loops with the heaviest pipes only, because greater weight reduces the tendency to slip. Canvas slings are easy to place and are usually available in widths that will support pipe properly.

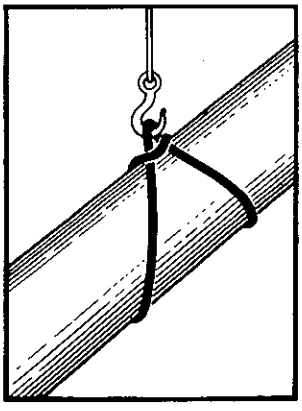


FIG. 7— This double-bight sling, with loops spread well apart, can be used with all pipe sizes

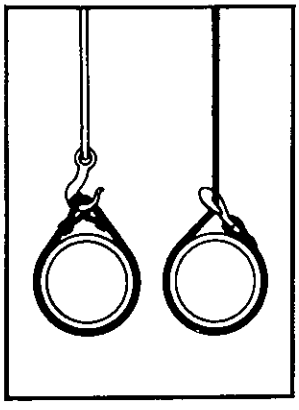


FIG. 8 — Keep single loops tight — especially in the smaller pipe sizes

Slings for Units or Double Rows

Flexible slings, of cable or chain, should first be run through a length of hose to prevent abrasion of the pipe.

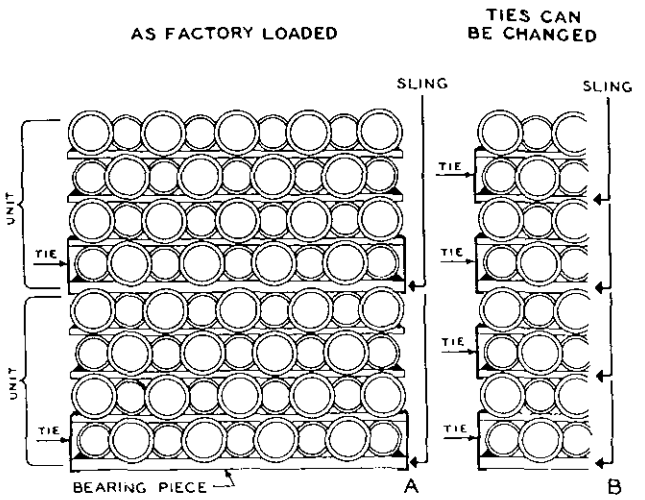


FIG. 9 — When a sling is used, bottom two rows must be tied —see A and B

The sling loops can be passed in from the ends of the pipes—and should be snugged all the way in to the timber bearing piece. The sling can be located at any point indicated by the arrows in Fig. 9. Note that each bearing piece is tied to the separator above it—therefore they stay in place as the load is lifted. (If the sling is passed in at any other point, the timber will drop off as the load is raised and let the bottom row of pipes go slack.)

Pipe can be unloaded in smaller bundles (See 'B'—Fig. 9) by tieing any two rows together with strap as shown in Fig. 10. This is sometimes desirable either because of limited lifting capacity of equipment or so as to distribute smaller unit stockpiles.

Here's an easy-to-remember rule for using flexible slings: At least *two* rows must be lifted and the timbers must be tied (see Fig. 9).

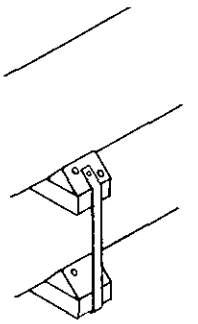


FIG. 10—Ties can be changed by using strapping as shown. DO NOT *nail into end grain* of wood — it may not hold.

Slings and Spreader Bars For single row or more

Spreader bars can be made up of channel iron as shown in Fig. 11. These are passed (flat side up) under the row of pipes and the slings attached to them. One row, or any number of rows within the lifting capacity of the equipment, can be handled by this method.

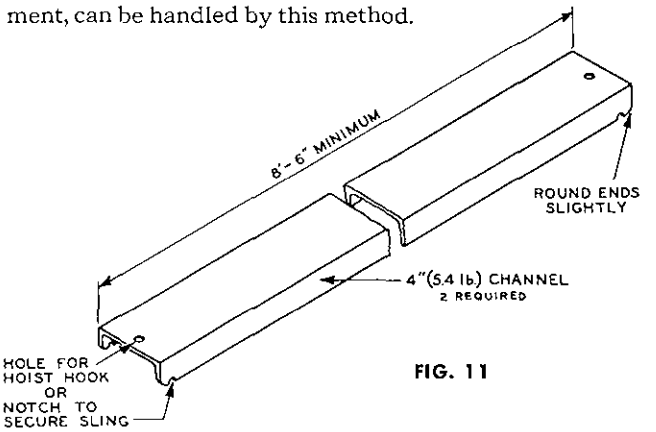


FIG. 11

Fork Lifts

Pneumatic-tired fork trucks are often used to advantage in unloading. Chock blocks are left in place and pipe lifted off.

Usually the fork arms are short and so a part of the row is taken at each lift—rolling the balance toward the chock block for the next lift.

LOADING TRANSFER TRUCKS

Selecting and Preparing the Truck

Use flat, stake-bodied trucks because they permit side loading and unloading. Table B can be used to determine the number of lengths of pipe that can be carried by trucks of various capacities.

Lay two timbers, spaced same as factory load, on the floor of the truck for each tier of pipe. This will prevent damage to pipe by bolt heads or uneven bottom. If factory units are being reloaded with mechanical equipment, the necessary timbers will of course be tied in with the units so that no other timbers will be required. Do not use short-bodied trucks which allow pipes to extend, unsupported, for more than one-third of their length. If a tailgate is used, make certain it is adjusted so that pipe cannot ride on a sharp edge.

Generally pipe is stacked on the transfer truck in the same manner as it was stacked for shipment from the factory. Any chock blocks that may have been removed during unloading should be replaced in the re-loading.

Secure each tier with two chains and load binders. Locate them close to the timbers as shown in Fig. 12, NOT in the middle of the pile.

Feet Per Ton and Lengths Per Truckload (including couplings)

Pipe Size	Feet Per Ton			Number Std. Lgths.* Per Truckload					
				Class 100		Class 150		Class 200	
	Class 100	Class 150	Class 200	1 Ton	5 Ton	1 Ton	5 Ton	1 Ton	5 Ton
3	400	360	310	40	200	36	180	31	155
4	341	287	229	33	166	28	140	22	110
6	192	165	131	14	74	12	63	10	50
8	130	107	85	10	50	8	41	6	32
10	93	66	57	7	36	5	25	4	21
12	71	48	40	5	27	3	16	3	15
14	54	36	29	4	21	2	14	2	11
16	43	29	23	3	16	2	11	1	8

*Data in this table based on 10 ft. lengths for 3" and 4" sizes; 13 ft. lengths for all other sizes.

TABLE B

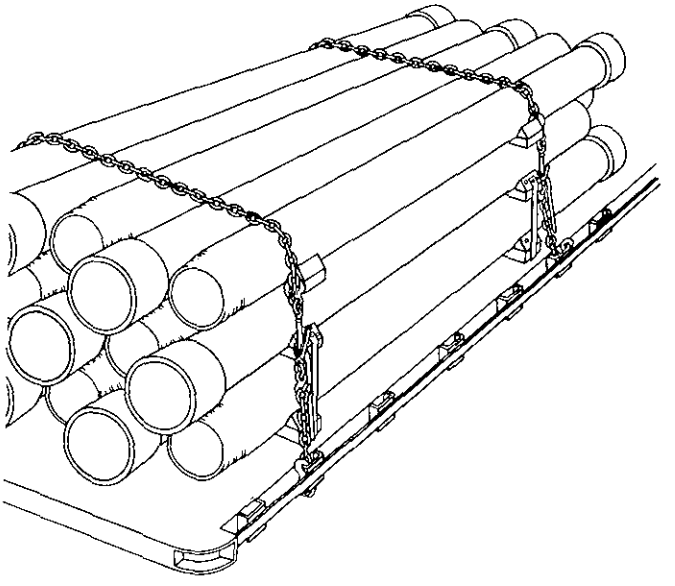


FIG. 12 — Locate binder chains close to timbers—not in the middle of the pile

DISTRIBUTING ALONG TRENCH

In stringing out pipe, keep these points in mind:

1. Line pipe as near the trench as possible to avoid excess handling later.
2. If trench is open, it is advisable to string pipe on the side away from excavated earth, wherever possible, so that pipe can be moved easily to the edge of the trench for lowering into position.
3. If trench is not yet open, find out to which side excavated earth will be thrown—then string out on the opposite side. (Leave room for excavator.)
4. Place pipe so as to protect it from traffic and heavy equipment. Also safeguard it from the effect of any blasting that may be done.

About Couplings and Rubber Rings

1. In those cases where pipe has not been factory-belled, the couplings, especially in the small and medium sizes, should be stored at a central point so as to avoid loss.
2. Store all rubber rings at a central point and distribute as needed. Keep them clean, away from *oil, grease, excessive heat and electric motors* which produce ozone.
3. If rubber rings are not to be used immediately for installation, store them in their cartons, as shipped, in a cool dark place and out of the direct rays of the sun.

STOCKPILES

Stockpiles should always be built up on a flat base. If mechanical equipment is being used for handling, the unit bearing pieces provide an excellent base. If unloading by hand, secure two timbers for a base. Set them on a flat area, spaced same as factory load. Nail stop blocks at each end. Build up the stockpile in the same manner as it was stacked for shipment, transferring dunnage and chock-blocks from load to stockpile. Un-belled pipe can be "cannon-balled" on the base using either chock-blocks or substantial stakes driven into ground. Keep various sizes and classes grouped. Put short lengths in separate piles where they will be readily available.

Excavating the Trench

ABOUT OPENING THE TRENCH

As a general rule, do not open the trench too far ahead of pipe-laying. Avoiding long stretches of opened trench will often pay dividends. For example:

It may reduce, or even eliminate, pumping or sheeting;
It minimizes the possibility of flooding the trench;
It reduces caving caused by ground water;
It helps avoid frozen trench bottom and backfill;
It reduces hazards to traffic and workmen.

On many jobs it will be desirable to keep excavation, pipe laying and backfill close together, so as to reduce the cost of supervision. If this is done, one man can direct all operations. Transite Pipe can be assembled quickly and can generally be laid as rapidly as the excavator opens the trench.

Belled Pipe a Time Saver

Pipe which has been belled ahead either factory belled or belled on the job, (see page 40) speeds up installation because of faster in-trench assembly—especially valuable in trench conditions where it is desirable to "get in and out" quickly. Where belling is to be done on the job, the pipe crew can get started, even before the excavator has opened trench, by completing one half of the assembly "on top".

THE LINE OF TRENCH

The line of trench may include one or more curves. Such curves can often be made without fittings since the Ring-Tite coupling permits the pipe to be deflected, either after assembly or during assembly as noted in Table C. The *maximum* recommended deflection that can be taken at any one coupling is given in Table C AND SHOULD NOT BE EXCEEDED.

☞ NOTE: *Assembly in a deflected position should only be done with belled pipe.*

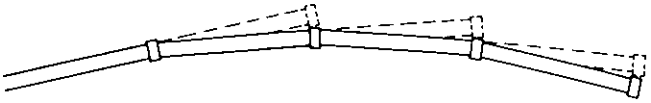


FIG. 13 — Assemble straight, then set the free end over

Pipe to be deflected, can be assembled straight as shown by the dotted lines in Fig. 13, and then set over as necessary. (The trench can be dug a bit wider, on the outside of the curve, to provide room for this straight assembly.

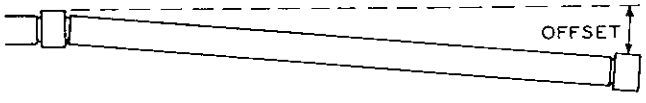
Maximum Recommended Deflection at Ring-Tite Couplings

Pipe Size DEFLECTION (Degrees)	During Assembly (Belled Pipe Only)	
	Thru 12"	14" & 16"
	2°	1½°
	After Assembly	
	5°	4°

TABLE C

A glance at Table D will show how many inches the end of a 13-foot length would be set over for various angles from 1 to 5 degrees. For example, for pipe sizes up to 12" the offset for 5 degrees is 13.6" and *should not be exceeded.*

Offsets for Pipe on Curves (In Inches)



ANGLE OF DEFLECTION AT COUPLING (DEGREES)	OFFSET PER PIPE LENGTH (IN INCHES)		
	1 Ft.*	6½ Ft.	13 Ft.
1	.2	1.3	2.7
2	.4	2.7	5.4
3	.6	4.0	8.1
4	.8	5.4	10.9
5	1.0	6.8	13.6

*Approximate—to tenths of an inch.

TABLE D

If the offset exceeds the maximum recommended deflection, the curve is too sharp to allow the use of full lengths. Short lengths can be used *if* extra ones were ordered for this purpose. (But—be sure to check page 44 before using any short lengths on curves.) When short lengths are used, the maximum deflection at each coupling cannot be any greater than for the full length—but, since there will be more couplings in the same length of line, a sharper curve can be made. (See Fig. 14.)

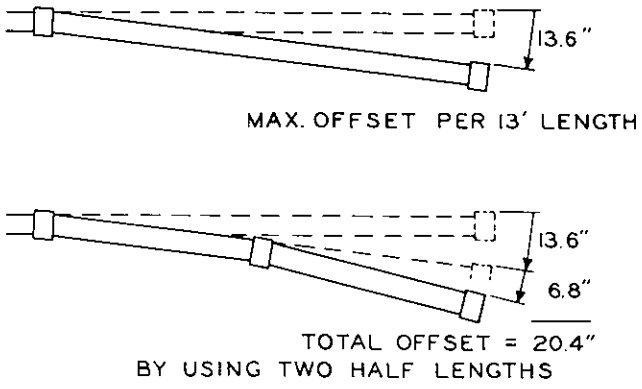
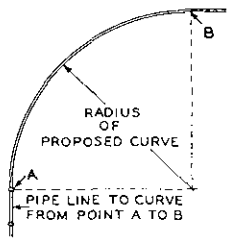


FIG. 14 — Short lengths allow sharper curves

To check the offset for lengths other than 13 feet use the column in Table D which shows the offset *per foot.* For example, for 5 degrees the offset for each foot of length is 1.0"—so a 10 foot length would be 10 times 1.0 making the offset 10.0"—an 8 foot length would be 8 times 1.0" or 8.0"—and so on.

If it is necessary to stake out, or re-adjust a curve, Table E shows the radius of curves for various angles and pipe lengths and includes an example of its use.

Minimum Radius of Curvature for Pipe on Curves



MINIMUM RADIUS OF CURVE (FEET)			Deflection per Coupling (Degrees)	Offset per 13′ Length (Inches)
Length of Pipe (Feet)				
1	6½	13		
57.4	373.5	747	1°	2.7″
28.5	185.5	371	2°	5.4″
19.1	124.0	249	3°	8.1″
14.3	93.1	186	4°	10.9″
11.4	74.3	149	5°	13.6″

TABLE E

How to Use

(1) Find the radius of the proposed curve by actual measurement or by making a sketch to scale. (See diagram above.)

(2) Check the table to make sure the radius is not too small. For example: Assume the radius will be 188 ft. and that 8″ pipe in 13 ft. lengths will be used.

Under the 13 ft. column the figure nearest 188 ft. is 186 ft.—checking to the right we find this is equal to 4 degrees of deflection at each coupling. (Referring to Table C shows that 4 degrees is satisfactory for 8″ pipe.)

(3) Then, by checking the offset column above, we find that the required curve can be made by offsetting each 13 ft. length 10.9″.

Note: If the radius had been shorter, say 125 ft., the deflection at couplings would be too great and the curve should be eased up or short lengths used if they were available. The table (see second column) shows that 6½′ lengths on a curve of 125 ft. radius would give 3 degrees deflection per coupling.

WIDTH OF TRENCH

Sometimes a wide trench will be necessary. In other cases the soil will be such that a narrow cut could be made. Whatever width may be used at the *top* of the trench, be sure that, at the pipe-level, it is kept between the maximum and minimum widths given in Table F, page 20. There are two reasons for this:

1. *About Loads on Pipe*—The wider the trench at the top level of the pipe, the greater the earth load on the pipe will be. It is desirable to keep earth loads on pipe lines at a minimum. Therefore, keep within the maximum width shown in Table F. As the drawing shows, no additional earth load will result from wide, sloping trenches so long as the extra width is kept above the pipe. It's the width at the top level of the pipe that imposes the extra earth load.

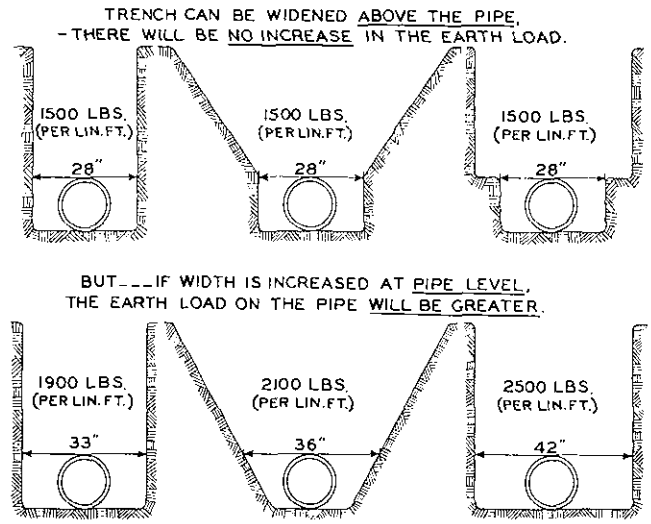


FIG. 15

2. *About Working Space*—On the other hand, a trench that is too narrow will make assembly difficult and slow. Furthermore, a poor job may result. Lack of space also prevents checking of field-assembled rubber rings. In addition, if there is not ample room, backfill cannot be tamped so as to support the pipe-line properly as described on page 80.

   Use Table F to determine the minimum width.

If sheeting is used, maintain the minimum trench width *inside* the faces of the sheeting.

Trench Widths at Top Level of Pipe

PIPE SIZE (In Inches)	TRENCH WIDTH (In Inches) Minimum	Maximum
3- 4	18	28
6- 8	20	32
10-12	24	36
14-16	30	42

**Widths should be maintained within these limits. Wherever, it seems necessary to exceed these limits, provision should be made for the additional load imposed on the pipe.*

TABLE F

Plan Ahead for Thrust Blocks

At changes in direction a tee or bend may be needed and eventually a thrust-block will be built. Do not try to machine dig for thrust-blocks as the excavator will usually dig too far and damage the bearing surface of the trench. A small amount of hand digging just behind the fitting location will keep the trench-wall solid and undisturbed. This will simplify thrust-block construction later on (see page 67).

DEPTH OF TRENCH

NOTE: *In specifying the grade to which pipe is to be laid, the engineer will have considered such things as frost penetration, surface loads and earth loads. In those cases where this has not been done, weather records and local experience as to depth of frost penetration together with engineering reference books covering surface and earth loads imposed on pipe can be used to establish the grade of the pipe.*

Grade of the Trench Bottom

As shown in Fig. 16 the actual grade of the trench bottom may be the same as pipe grade at (A) or may be below pipe grade (as in B) in which case earth mounds are used to support pipe during assembly. After assembly, soil is thoroughly tamped under pipe and couplings so as to provide uniform and continuous support for the entire line.

In either case, the clearance under the coupling must be at least 2"....

1. To provide clearance under the couplings which move with the pipe during assembly.
2. To prevent any possibility of couplings resting on original trench bottom (which would result in pipes acting as beams—see "C" in Fig. 17 next page).

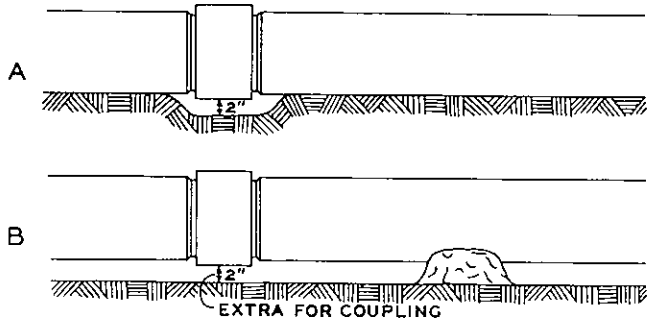


FIG. 16

In Rock Excavation

In rock excavation, go 6" deeper than pipe-grade—then bring back up to trench-grade with *tamped* soil to provide the proper cushion for pipe.

Supporting the Pipe

METHODS OF SUPPORTING PIPE

The method used to support any pipe during installation is of great importance. To begin with, it establishes the actual grade of the trench bottom below the pipe-grade. Of even greater importance, it becomes the basis for *final* bedding of the completed pipe-line. This final bedding must be as *uniform* and as *continuous* as possible. Such support can be attained by following these two simple rules:

1. *Couplings.* NEVER ALLOW COUPLINGS TO REST ON, OR TO SETTLE DOWN TO, ORIGINAL TRENCH BOTTOM.
2. *Pipe.* MAKE CERTAIN THAT PIPE BARREL IS GIVEN AN EVEN BEARING FOR ITS FULL LENGTH.

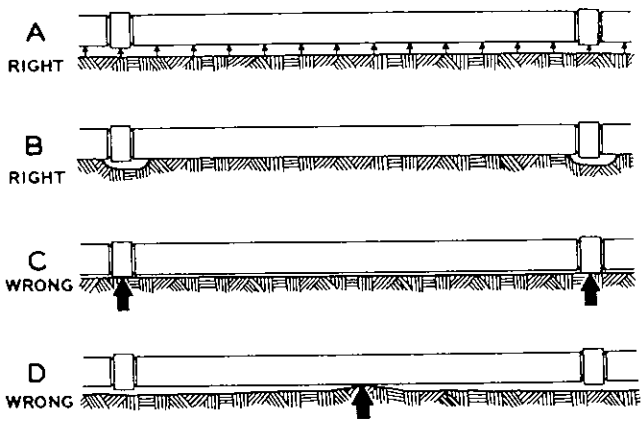


FIG. 17

Fig. 17 shows the difference between the right and wrong kind of support. At "A" and "B" the pipe is supported for its entire length—the couplings are kept off hard bottom with tamped backfill. At "C" the couplings rest on hard bottom. This is wrong! This pipe straddles from coupling to coupling and is supported only at the ends. "D" is also wrong!—the pipe rests on a "high spot"—and will be

supported only at such high points. These lengths (C and D) will sustain much less load than the continuously supported pipes.

Which Method of Pipe Support to Use

Two methods of pipe support are described in this guide. Either can be used in stable soils as defined in the following paragraphs. Soils that are unstable must be stabilized before actual installation.

STABILITY OF SOILS

General

Pipe installations are made in a wide variety of wet and dry conditions of loam, swamp, clay, sand and other soils. In this booklet the words "stable" or "firm" will indicate good or fair trench conditions such as normally damp loam, sand, clay, etc. The word "unstable" will indicate poor trench conditions such as soft mucky soils, dry lumpy soils, etc. In such cases soils should be stabilized or tests should be made to prove that the soil is capable of supporting the pipe line. (Some conditions are so bad that other means of support must be designed—such as mats, piles, etc. When such conditions occur the design engineer in cooperation with a J-M representative will have decided what method of support to use and will have included it in his specifications.) The actual supporting strength of any soil must be judged, on the job, by individual experience or by having tests made.

Unique Clay Soil Conditions

In a relatively few geographical areas there is a type of clay soil that is drastically affected by extremes of saturation and dryness. In changing from totally saturated to a completely dry condition, these clays are subjected to extraordinary shrinkage. This shrinkage is usually seen in the form of wide and deep cracks in the earth's surface and may result in damage to underground structures, including pipe materials. The

clay forms a tight gripping bond with the structure, subjecting it to excessive stresses as the clay shrinks. In such areas, the engineer should establish whether the condition exists to a degree justifying special precautions. If it does, then it is good engineering practice with all pipe materials to avoid the bonding action by using an envelope of a minimum of four inches of tamped sand around the pipe line.

EARTH MOUNDS

Earth mounds can be used for pipe support if the trench bottom is firm, and, if firm mounds can be built that will hold the pipe from settling—during assembly and after—until finally backfilled.

Do not use mucky soil (such as in swamps)—it will not support the pipe. Do not use in wet, mushy trenches—even good soil will sluff down when water-soaked. Extremely sandy soils may be unsatisfactory for mounds unless backfilling is done immediately. (Such soils dry out quickly and may let pipe down on the couplings.) Damp, loamy earth or sand is best.

Locate the mounds so that they will be under the "supporting points" which are indicated by wide, black marks stencilled on the pipes. (There are two marks on each length.) The sketches show how the mound is made. For making mounds use soil free from rocks, large stones, lumps of clay or frozen material. Unless the trench is sheeted, or tends to cave in, an easy way to get the soil is to shave it down from the trench wall.

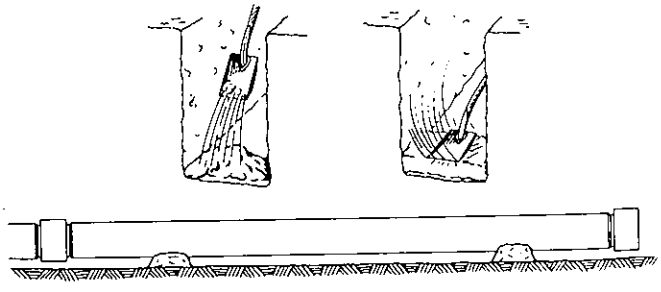


FIG. 18

The mounds should run right across the trench—and be at least 6" wide. (Skimpy mounds will not hold pipe in position.) When about the right thickness (between 6" and 8")—tamp it lightly with the flat of the shovel. Then check to make certain it is high enough to provide a clearance of *at least 2" under the coupling.* If it isn't—put more soil on and tamp it again.

NOTE: *If water tamping is to be used (see "Backfill and Tamping" page 80) the mounds should be built up somewhat higher to allow for settlement that will occur when water is flushed into the trench.*

Remember that the mound must keep couplings up, off the hard bottom. The pipe invariably settles down into the mound a little, so it is best to make them a bit *higher* than required—then pipe can be worked down to accurate grade by merely lifting the end a bit and letting pipe drop. Its weight will settle it some and, at the same time, compact the soil even more. (This bedding down, into the mound, also keeps pipe from rolling sideways.)

Where the type of clay soil condition described on page 23 is encountered, do not use mounds. Instead, bed the pipes full length on the 4 inch sand bed, scooping coupling holes for assembly.

PIPE ON LEVELLED TRENCH BOTTOM

If soil conditions are stable, and the trench bottom is of a material that can be cut true and straight without too much difficulty, pipe can be installed using the trench bottom as support for the pipe barrel. When using the levelled trench bottom for support, the trench bottom must contact the pipe barrel continuously at every point from one coupling to the other. (As shown in the sketch irregularities, lumps, ridges, hollows, etc., will result in an uneven bearing.)



FIG. 19 — Trench bottom must be levelled carefully to avoid an uneven bearing

Preparing Trench Bottom

☞ NOTE: *When pipe is to be supported by levelled trench bottom the machine excavator should not dig to trench grade. Final grade should always be achieved by hand grading.*

To prepare trench bottom, hand shape it to level with coupling holes deep enough to provide a minimum clearance of 2″ below the coupling.

As the pipe is laid, the use of a wood template (as shown in Fig. 20) is recommended to assure a straight trench bottom free of bumps or hollows and at the correct grade. Any irregularities in the trench bottom must be either levelled off or filled in with tamped soil.

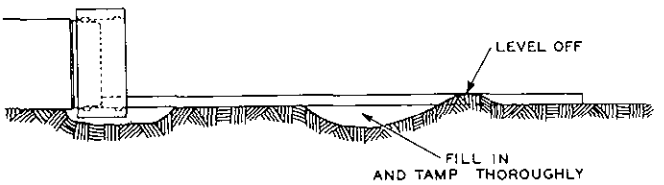


FIG. 20 — The use of a template is recommended for accurate grading and levelling of the trench bottom

The trench bottom may also be prepared by digging at least 4″ deeper than pipe grade and then bringing the trench bottom up to grade with selected refill material tamped to provide the proper cushion for the pipe.

If the trench bottom is extremely hard (such as shale, ledge, some types of hard pan, etc.) or is loose, stony soil where there is the possibility of pipe being subjected to "point" contacts, the trench should be excavated at least 6″ below trench grade and then brought back to grade with selected, tamped, soil.

Where the type of clay soil conditions described on page 23 is encountered, the pipe should be enveloped in a minimum of four inches of sand. In such instances trench

bottom must be dug at least four inches deeper and then brought back to grade with tamped sand.

In unstable (soft) soils it will be necessary to dig deeper and refill with selected material (such as gravel or crushed stone) until pipe grade is reached. The design engineer should be consulted whenever soils are encountered about which there will be doubt as to the adequacy of the support provided.

When spreading refill soil on the trench bottom, make sure that coupling holes are left deep enough to provide a minimum clearance of two inches below the coupling. This allows room for tamping beneath the coupling and assures that the line is being supported for its full length, not at the couplings alone.

Lowering Pipe Into the Trench

The overall speed of installation can usually be increased if the trench crew and the "top" crew know their job and work together. For example:

1. The pipe-laying crew should have trench ready for pipe—mounds, or bottom, should be so placed and graded that a minimum of last minute adjustment is required.
2. The top crew should have pipes lined up, ready for lowering, ahead of time. If pipe is to be lowered with ropes, spot the lengths as close to their final position as possible—so as to cut down on movement in the trench—(where it is usually more difficult than up on top).
3. The top crew should "service" the pipe crew by having rubber rings, lubricant and assembly equipment ready to pass into the trench without delay when needed.

☞ NOTE: *Coupling grooves must be clean before assembly can be made (see page 30). There it will save time to keep dirt out of the couplings in lowering belled pipe into the trench. This can be accomplished by lifting clear and lowering with mechanical equipment; by hand passing over edge of trench in small sizes, or by using ropes and rolling down skids in medium sizes.*

PASSING BY HAND—WITHOUT ROPES

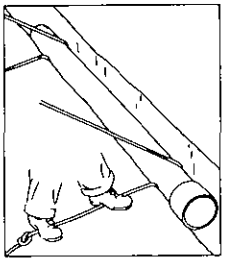
In hand passing, use only one man at each end. (More men will only get in each other's way and increase the possibility of dropping pipe.) 75 lbs. is considered a reasonable weight for one man to lift repeatedly—so this method should only be used for pipes weighing up to 150 lbs.

Hand passing is best suited to straight-walled trenches with firm edges that will not crumble under the weight of men and pipe. The men in the trench must be able to reach the length easily—so this method should be used for trenches of 5 ft. depth or less. (Use ropes, even in the smaller sizes, if the trench-wall slopes or is crumbly.)

Lowering Pipe with Ropes

Using two to four men, pipes weighing up to 800 lbs. per length can be lowered with two ropes—one at each end. In deep, sloping or crumbly trenches, skids will help keep dirt out of couplings. If pipe is laid on earth mounds, place ropes clear of the support points on the pipe so they can be pulled free after pipe has been lowered. In lowering, tie stop-knots on the end of each rope and stand on them to prevent slippage (see Fig. 21). Stakes can also be used as anchors (see Fig. 22).

FIG. 21



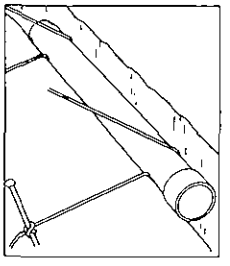


FIG. 22

Where the trench passes through paved areas, or where sheeting is used—take *two* turns of the rope around each end. This provides better control of the pipe as it passes over the hard edge and starts to drop.

Lower slowly and avoid striking couplings or machined pipe ends against rocks or boulders that may be imbedded in the side.

Lowering with Mechanical Equipment

Although all but the largest sizes can be lowered by hand with ropes, mechanical equipment is generally faster and requires fewer men. A cable can be used from an excavator boom, but this ties up the excavator and slows progress. Transite assembles quickly and the contractor may find it to his advantage to use separate equipment for lowering (and assembly, pages 37,38). This is a matter of judgment, available equipment and trenching conditions.

In lowering with mechanical equipment, slings of wire-rope, chain or canvas are recommended (see page 9). Pipe tongs are also popular and offer the advantage of quick release with nothing to pull out from under the pipe barrel.

Assembly of Ring-Tite Pressure Pipe

The Ring-Tite assembly is a *sliding* assembly in which the lubricated pipe-end slides under the rubber ring and into the coupling. The machined shoulders and the compressed, locked-in rings keep the pipe ends separated, automatically providing for expansion and flexibility.

NOTE: *Although bells could be faced in either direction, the general practice is to face the belled ends forward, in the direction of laying. This helps keep dirt out, because the bell of the pipe already "in the line" doesn't move during assembly. Belling forward also prevents soil from being "plowed" into the bell of the next pipe, which does move during the assembly, because the* back *of the coupling moves toward any loose soil in the trench.*

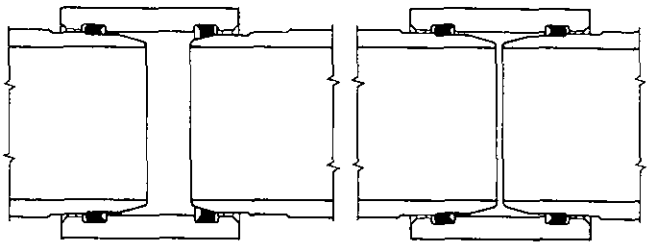


FIG. 23 — Pipe end slides under ring until automatically stopped by shoulder

INSERTING THE RUBBER RING

When inserting the ring in the groove there are two important points to keep in mind:

1. THE GROOVE MUST BE CLEAN—dirt under the ring will not allow it to seat completely and will cause trouble. One good way to make sure there's no dirt under the ring is to have the next length already lowered before inserting the ring. Then, any dirt that may have worked in during handling, can be cleaned out.
2. FACE THE RING IN THE RIGHT DIRECTION—see sketch.

Now smooth the ring into the groove, making certain it is *faced properly* and *completely seated,* all around.

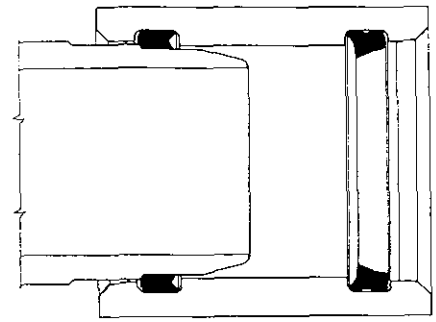


FIG. 24 — Enlarged view, with ring properly faced in groove

LUBRICATING PIPE ENDS

Before lubricating pipe ends they should be cleaned thoroughly by wiping the entire circumference back to the first shoulder. This allows lubricant to be applied directly to pipe surface. It will not function over caked dirt.

Johns-Manville Ring-Tite lubricant should be applied to the *entire circumference* of the pipe back to the stop shoulder. (This includes the nose, taper and machined surface as shown in Fig. 25.) Apply lubricant *thoroughly* using either the hand, a cloth pad, a sponge or a glove. See illustrations. Coating should be about the thickness of a brush coat of enamel paint. Use lubricant as it comes from container—stir if necessary but—DO NOT THIN IT.

NOTE: *Johns-Manville Ring-Tite lubricant has been tested and approved for use in potable water service. Do not use non-approved lubricant which may harbor bacteria.*

Where underwater assembly is necessary, see page 39 for method of lubricating.

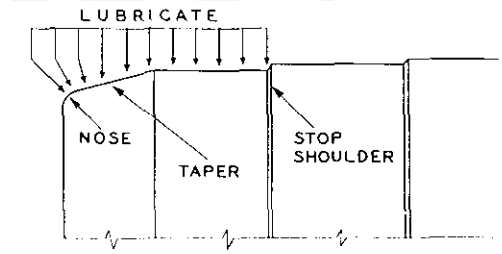
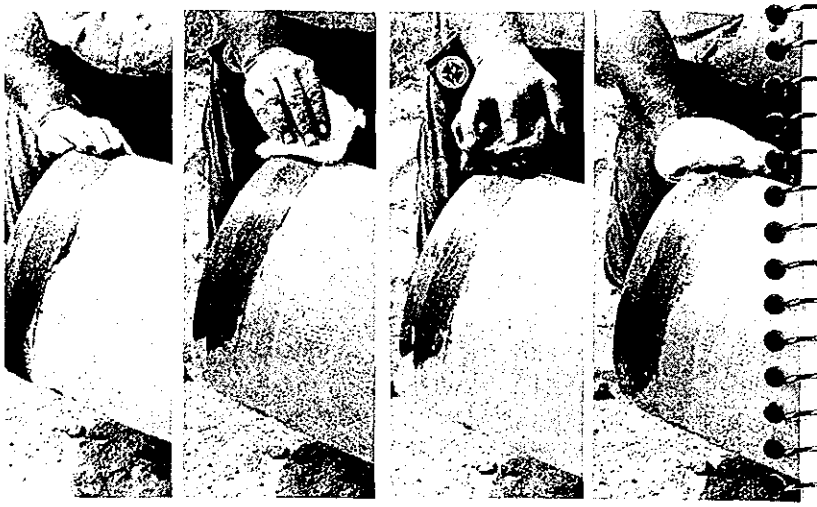


FIG. 25 — Apply lubricant to *entire circumference,* back to the stop shoulder

RIGHT — Lubricant applied evenly.



Hand Cloth Sponge Glove

WRONG — Too much lubricant — unevenly applied.



Sufficient lubricant is included to do the job. DON'T WASTE IT.

Lubricant Requirements

The following table gives the number of BELLED pipe lengths that can be lubricated from a 1½ quart can of lubricant.

PIPE SIZE	BELLED PIPE LENGTHS PER CAN
3	160
4	128
6	88
8	68
10	52
12	36
14	26
16	24

ASSEMBLY METHODS

General

Various methods are used—for example:

1. A bar and wood block can be used to assemble sizes through 10″ if trench bottom is suitable. A bar does not work well in loose sand, hard shale or soft muddy bottom—nor on tamped soil over rock as described on page 26.
2. Pullers can be used under all conditions. There are two types: (1) a "lever" puller which pulls from on top of the pipe and (2) a "friction" puller which pulls from both sides of the pipe. Their use is described on following pages.
3. A third method is to hold the pipe suspended (by hand for small sizes — from a cable in larger sizes) and "swing" it into the bell using its own weight to force it into final position. This method (also called "stabbing" or "popping") requires care and accurate control of aim, angle and amount of swing.

NOTE: *With any of the above methods, a friction puller will be needed to make closures.*

Also, with the "swing-in" method, a puller will be needed for joining Ring-Tite fittings on to pipe. See page 58.

ASSEMBLY WITH BAR AND WOOD BLOCK

With the pipe properly supported, line up the bevel-end so that it just "snugs" all around into the ring in the bell. Drive the bar in for purchase—then, using a wood block, shove the pipe home. See Fig. 26. The wood block gives a straight "center-line" push and also protects against damage by the bar.

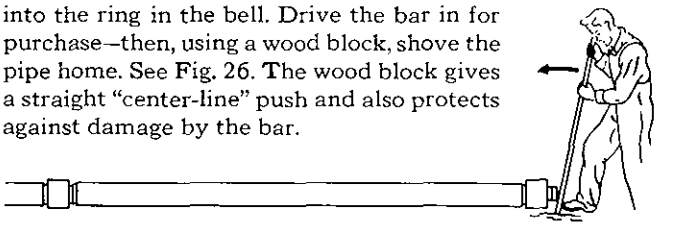


FIG. 26

CHECKING FIELD ASSEMBLY

With the ring *completely seated* in a *clean groove* and with pipe-end *properly lubricated*, the ring cannot be displaced during assembly.

To make certain that the field work is being done properly, the ring position should be checked with the feeler gage shown in Fig. 27.

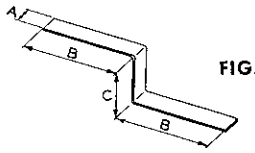


FIG. 27

A	.25"
B	1.50"
C	.75"

Material: .016 x ¼"
Tempered Spring Steel

Insert the gage as shown in Fig. 28. The clearance (see arrow) proves that gage is touching the ring. Slide the gage all the way around the coupling. As long as the ring can be touched by the gage it is correctly assembled.

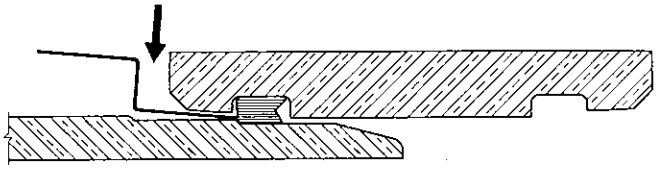


FIG. 28

ASSEMBLY WITH LEVER TYPE PULLER

With rubber ring correctly inserted in a clean groove in the belled couplings, anchor puller to installed pipe length by setting binder chain in slots on puller base—see Fig. 29. (If pipe is laid on levelled trench bottom, dig a small channel under the pipe for clearance for the chain.)

The pipe to be installed should be lined up, ready for assembly and have end cleaned and lubricated.

Wrap the pulling chain around the barrel of the pipe to be installed, fastening with grab hook as in Fig. 29. With the pulling-handle forward to provide travel for the pull, engage pulling chain in hook on puller-handle and pull pipe into bell until movement is positively stopped. (A wider channel for chain travel under this length may be needed

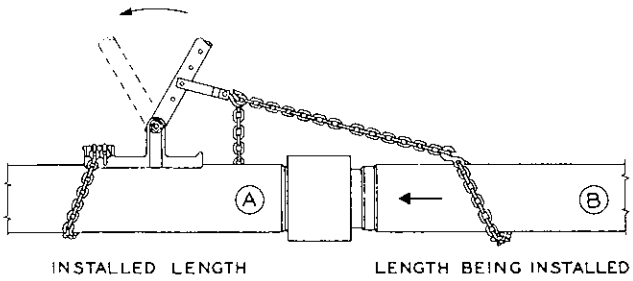


FIG. 29 — To complete assembly anchor puller to installed length (A) and pull length being installed (B) into bell

if on levelled trench bottom—total travel is one-half the coupling length if nose of pipe is touching ring at start of pull.)

Check the field-assembled ring with the gage. See page 34.

ASSEMBLY WITH FRICTION PULLER

The friction puller consists of two jack bodies connected with chains so that there is one jack body at each side of the pipe—see Fig. 30. The length of the chains can be adjusted for various pipe sizes. Make the initial adjustments as shown in Fig. 31. The jack bodies should hang halfway up the pipe (the horizontal diameter). Once adjusted, no change is needed until pipe size is changed.

Insert ring *completely* in a *clean* coupling groove of the belled pipe. Check line-up of pipe to be installed and clean and lubricate the end. Move it into position for assembly (nose of pipe just started on to ring).

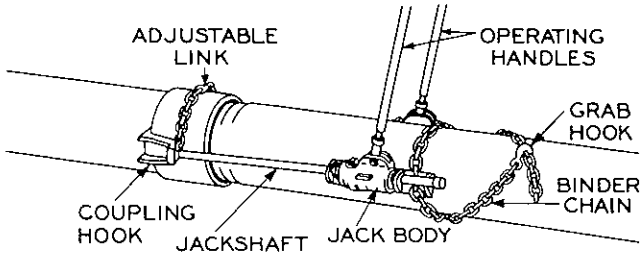


FIG. 30 — Friction type coupling puller—in position for pipe assembly

Set the puller on the pipe to be installed as shown in Fig. 30 with both jack bodies all the way back on the shafts so as to have enough travel for the pull. (To slide jack bodies, release the catches as shown in Fig. 34.)

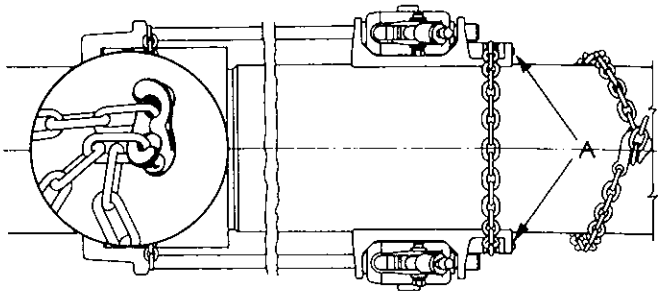


FIG. 31 — Supporting chains can be lengthened or shortened as needed. "Figure eight" link (in circle) opened to change length of coupling chain. At right (see A) removable pins, passing through chain links, allow adjustment of binder chain length

Engage coupling hooks at each side of coupling and then anchor the puller, as follows:

1. *Cross* the long chain under the pipe as in Fig. 32 (dig a channel for chain if pipe barrel is on levelled trench bottom).
2. Bring the ends up and around (keep the chain tight) and join with the grab-hook.
3. Take up slack by pulling back as in Fig. 33. Insert the puller handles in their sockets and move them in the same direction at the same time—pulling the pipe to which the puller is fastened into the bell until movement is positively stopped.

Release the tension on the shafts by inserting the jack

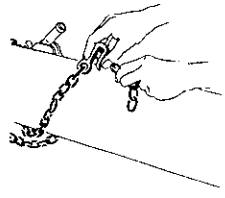


FIG. 32

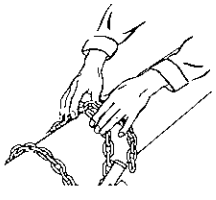


FIG. 33

handles ahead of the release catches as in Fig. 34. The binder chain is released by giving it a kick, at the top, toward the coupling. This loosens it so it can be unhooked.

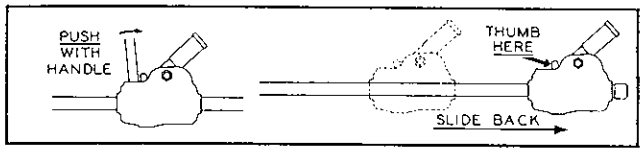


FIG. 34 **FIG. 35**

Reset the puller for the next assembly by holding the release catches back with the thumbs and sliding the jack bodies to the starting points at the ends of the shafts. See Fig. 35. (Use the coupling as an anchor for doing this.)

Check the field assembled ring position with the gage. See page 34.

ASSEMBLY BY "SWINGING IN"

An alternate method which can be employed if proper care is taken to prevent damage to either pipe end or coupling is the "swing-in" method.

This method requires that the pipe length be suspended (by hand or by cable – see illustrations) and ACCURATELY aimed and swung into the bell, letting the

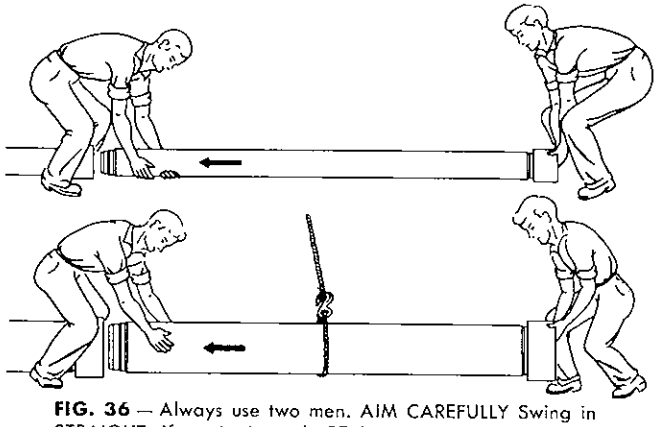


FIG. 36 — Always use two men. AIM CAREFULLY Swing in STRAIGHT. If a miss is made RE-CHECK RING and RE-LUBRICATE pipe before trying again

weight of the pipe carry it to final position.

Two men should be used, even when a cable supports pipe, to maintain the accurate control necessary to enter the bell without hitting coupling.

Keep the swing short, just enough to drive pipe all the way home but not slamming pipe ends together within the coupling.

Keep the pipe *straight*—as it enters the bell, deflection can be taken later, if needed.

IMPORTANT: If a "miss" is made and pipe does not go "home". . .

1. RECHECK RING AND MAKE SURE IT IS COMPLETELY SEATED BEFORE MAKING THE NEXT TRY.
2. RE-LUBRICATE THE PIPE END TO REPLACE ANY LUBRICANT THAT WAS SQUEEGEED OFF ON THE FIRST ATTEMPT.
3. IF THE PIPE END STRIKES THE COUPLING, BOTH SHOULD BE EXAMINED FOR POSSIBLE DAMAGE.

ALSO: After a "swing-in" assembly, "tamp up" earth mounds to make certain that clearance under pipe and *especially* couplings is maintained. (Earth mounds generally become flattened down during this method of assembly.)

Check the field-assembled ring with the gage—see page 34.

TRANSITIONS FROM SIMPLEX TO RING-TITE

For Class 150—Simplex

To make a transition from an existing Simplex line to Ring-Tite, first bevel the nose of the Simplex machined pipe to allow the ring to start onto the pipe easily. Line up a belled length of Ring-Tite as in Fig. 37. Insert rubber ring in coupling groove, lubricate Simplex pipe end. Set puller as shown and pull Ring-Tite pipe onto Simplex.

(A friction puller can also be used or, in the smaller sizes, a bar and wood block if bottom is suitable.)

The Ring-Tite pipe can now be belled at the other end so as to have "bells forward"—or it could have been "double belled" before lowering. Check the field assembled rubber ring position.

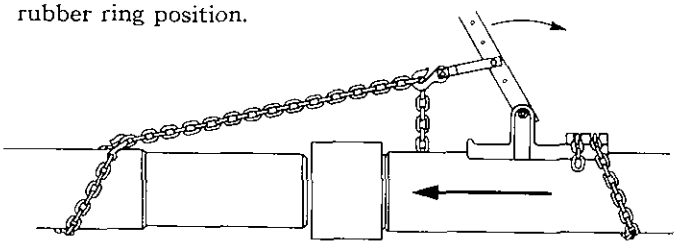


FIG. 37 — Transition from Simplex to Ring-Tite. Beveling the nose of the Simplex pipe will make assembly easier—(See Fig. 43)

For Classes 100 and 200—Simplex

1. Machine the end of 4", 6" and 8" Class 100 and 4" Class 200 Simplex pipe in the field with a machining tool with blades and holder set for Ring-Tite dimensions.
2. For other sizes use Simplex to Ring-Tite Adaptor.

LUBRICATING FOR UNDERWATER ASSEMBLY

Although not generally recommended, underwater assemblies are sometimes necessary. As noted on page 30, the usual practice is to have bells "forward" in the direction of laying. In this case the pipe to be assembled into the line will be *above* water—for lubricating. DOUBLE LUBRICATION IS RECOMMENDED. To do this, lubricate thoroughly as described on page 32; wait 4 to 5 minutes and then RE-LUBRICATE,—then IMMEDIATELY lower and assemble.

If the end to be joined is a spigot end already immersed, double-bell the next length to be lowered (see page 40 for belling on the job.) Insert the ring in the groove and then *lubricate all exposed surfaces of the ring.* Then lubricate the immersed spigot heavily and assemble IMMEDIATELY. The forward end will then already be belled—so proceed with double lubrication as in the preceding paragraph.

BELLING PIPE

General

Although pipe can be belled in the trench, it is usually done "on top". This speeds up the "in trench" assembly and, if all belling is done on the job, enables the crew to get started belling, even before the excavator has opened trench.

BELLING WITH BAR AND WOOD BLOCK

Set the coupling over the nose of the pipe so that the ring is partly started onto the taper—see Fig. 38. Note that the bottom of the coupling is angled about ½" toward the pipe. Shove home with bar and block.

Check ring position with gage. See page 34.

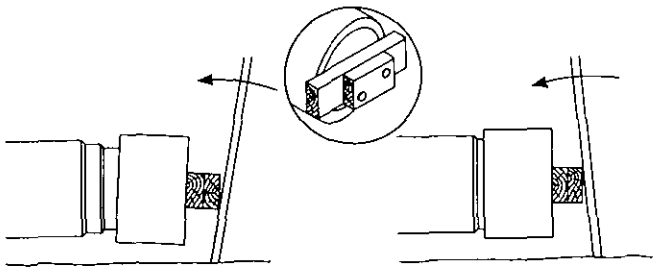


FIG. 38 — Belling with a bar. Bottom of coupling should be approximately ½ inch forward on pipe at start of assembly as shown on left. *Note: The block can be 2"x4" or 4"x4" (as shown). A 4x4 requires less care to locate the bar at the right point as it is driven in.*

BELLING WITH LEVER PULLER

Set puller 4' to 6' back so as to have the least chain angle and, therefore, the straightest pull. Anchor puller to pipe with binder chain (Fig. 39).

Adjust the light connecting chain so that the coupling hooks hang at the horizontal diameter. (This adjustment need be made only once for each pipe size.)

Set coupling over nose of pipe with ring resting on pipe taper. In this position it will be easy to support the coupling by leaning against it, leaving hands free to place the coupling hooks in position. (Handle should be forward [dotted line Fig. 39] so as to provide travel for the pull.)

Hold hooks firmly against side of coupling while helper drops puller chain into hook on puller handle. (A 2x6 board can be substituted for the coupling hooks if preferred.) As the pull is started, the coupling should be held slightly cocked with bottom about ½" ahead of top (See A, Fig. 39).

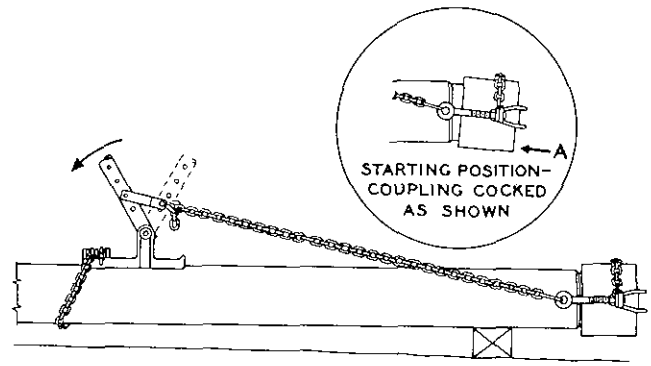


FIG. 39 — Note that puller is set well back from the coupling. This reduces the chain angle and results in the straightest pull.

Pull the coupling on with a smooth, even pull. Control the riding angle of the coupling by pressure of foot or knee. Don't jerk. Coupling will stop, automatically, when it reaches the stop shoulder—*do not force beyond that point.*

Check ring position with gage. See page 34.

BELLING WITH FRICTION PULLER

Adjust the connecting chain so that the coupling hooks hang at the horizontal diameter of the coupling. Anchor puller to pipe as described on page 36.

Place coupling so that rubber ring rests on pipe taper. Engage coupling hooks at end of coupling. Move both

operating handles in the same direction at the same time —this keeps coupling moving straight with a minimum of cocking to left or right. If severe up or down cocking takes place, the hooks are too low or too high. Re-adjust to pull on center. If coupling is removed to re-adjust, *re-check ring seating* and *re-lubricate pipe* before starting again. Once correct adjustment is made, no further changes should be necessary for that pipe size.

To release jack bodies and binder chain see pages 36-37.

Check rubber ring position with gage. See page 34.

BELLING BY "POPPING" ON

By using care and with experience, pipe sizes through 8" can be belled by sitting on the pipe and holding the coupling straight out 10 or 12 inches, then pulling it back hard and *straight* onto and over the end of the pipe and into final position—*all in one stroke.*

As shown in Fig.40 pull straight back, DO NOT SWING IN A CURVE.

IMPORTANT: Whenever the attempt to "pop" on fails:

1. RECHECK RING AND MAKE SURE IT IS COMPLETELY SEATED BEFORE MAKING THE NEXT TRY.
2. RE-LUBRICATE THE PIPE END TO REPLACE ANY LUBRICANT THAT WAS SQUEEGEED OFF ON THE FIRST ATTEMPT.

Check rubber ring position with gage. See page 34.

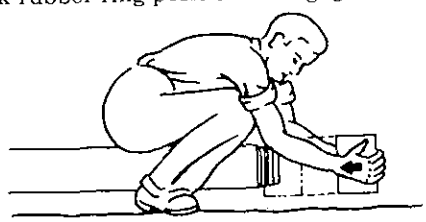
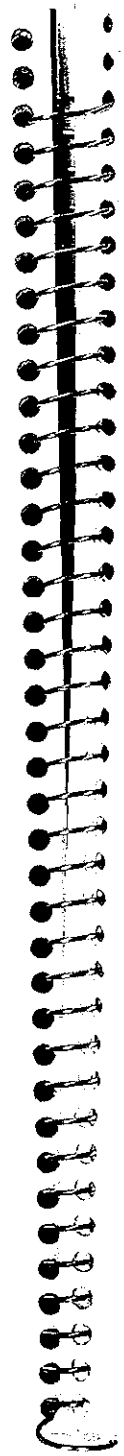


FIG. 40 — PULL STRAIGHT BACK. DO NOT SWING IN A CURVE



Use of Short Lengths

Short lengths are used in Ring-Tite lines—

- —at rigid structures
- —at rigid joint fittings
- —on curves
- —to replace a section of installed pipe
- —to make closures and locate fittings exactly.

Short lengths are *not* required at Ring-Tite fittings. With Ring-Tite fittings, full lengths can be used because the rubber ring joint at the fitting provides the necessary flexibility. With rigid joint fittings and at rigid structures short lengths are required in order to provide a flexible joint close to the fitting or structure.

As shown and explained in Fig. 41, short lengths may be machined-over-all (MOA) or machined-each-end (MEE). Following is a listing of the lengths and type of machining available:

For 3"-4" & 6" pipe in 10' lgths..... 3'-3" MOA and 6'-9" MEE
For 4" & 6" pipe in 13' lgths..... 3'-3" MOA and 6'-6" MEE
For 8" thru 16" pipe..... 6'-6" both MOA and MEE
For 18" thru 36" pipe (see appendix)..... 6'-6" MEE only

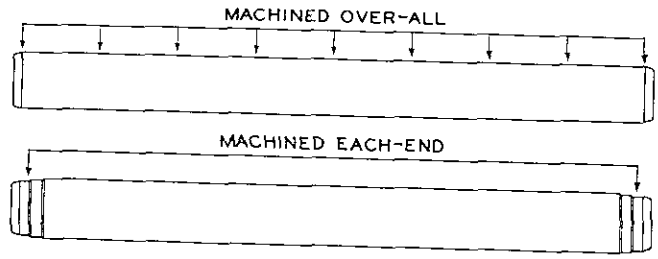


FIG. 41 — Short lengths

Note that—

1. The Ring-Tite coupling requires a pipe surface that is machined to a specific diameter—assembly on rough, unmachined pipe should never be attempted. Machined-over-all short lengths (MOA) can be cut at any point on the pipe barrel and used because they are accurately machined the entire length for Ring-Tite assembly. (See page 50 for methods of cutting pipe).
2. As a general rule the number of all short lengths on a job is limited. Therefore, they should be set aside and

used only as planned when the pipe order is placed.

3. The use of a Transite adaptor eliminates the requirement for a short length at the fitting.

Use of Short Lengths*

Note: See page 54 Table H to Determine need for short lengths at rigid joint fittings.

WHERE USED	3", 4" & 6" PIPE	8" THRU 16" PIPE
At Rigid Structures	3'-3" or shorter	6'-6" or shorter
On Curves	Use shorts or randoms, *machined-each-end*, on curves if use of standard lengths will exceed maximum deflection as recommended on page 16 and if planned on when order was placed. Do not use machined-over-all pipe on curves as it will be needed for tie-ins and locating fittings.	
Making Closures and Repairs	Use of short lengths will depend on situation—see section beginning below.	
Locating Fittings Exactly	See section beginning page 48.	

*The Transite MJ-B adaptor (used for both mechanical joint and poured bell fittings) eliminates the need for a short length.

TABLE G

USING SHORT LENGTHS AT CLOSURES

To make a closure between two pipe ends, various combinations of short lengths can be used as long as the final piece inserted is machined-over-all or has ends "long machined" so that couplings can be pulled completely on to the ends of the pipe.

☛ NOTE: *Using a nipple less than twice the coupling length plus 2" is not practical in making the final closure. Nipples that are too short can be avoided by using another MOA length at A, cutting it so that final nipple is long enough to handle.*

Use Stop Marks When Joining Two MOA Pipe

In most cases the length used at A is machined-each-end, with shoulders to automatically stop and center the coupling. However, if A is MOA then there is no shoulder—in such cases stop-marks must be made to make certain

coupling is correctly centered over the pipe ends and that rubber rings are in the correct sealing position. The stop-marks are necessary for this since the ring checking gage will not aid in locating the rings with relation to the pipe ends. "X" in Fig. 42 gives stop mark locations. A bar is sometimes used at the stop-mark to make certain the coupling does not move too far on to one pipe.

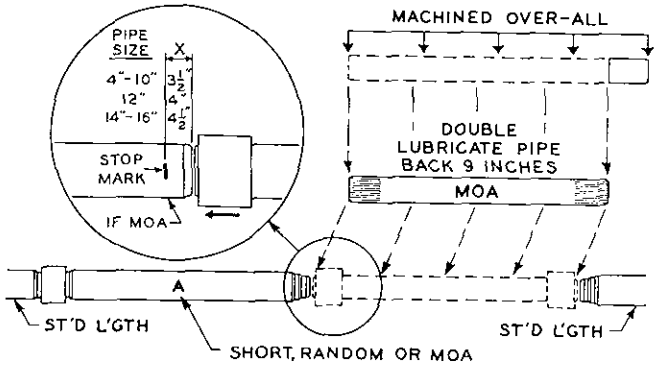


FIG. 42 — Closure made by installing any length at A. Then cut a machined-over-all section to length for closing gap. If A is MOA then stop mark must be used to make certain coupling is centered over pipe ends. (See insert detail.)

Bevel Field Cut Ends

The field cut ends are then beveled for ease in assembly. To do this use a coarse wood-rasp to form a taper approximately the same as that on the factory beveled end. A machining tool can also be used for beveling field cut ends. Then, round the nose (see insert, Fig. 43) to allow the rings to start sliding more easily.

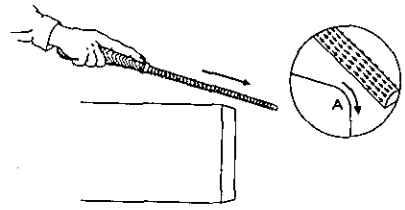


FIG. 43 — Use a coarse wood rasp to bevel field-cut ends

Lubrication and Assembly

To make assembly simpler, double lubrication (that is,—after lubricating once, wait 4 to 5 minutes and re-lubricate) is recommended when making a closure so the rings will slide easier. In any case lubrication should always be closely followed by assembly as coupling may "freeze" if left longer than 30 minutes.

After inserting rings, lubricate heavily all exposed surfaces of the rings. Then double lubricate both pipe ends back nine inches so that couplings can be pulled completely onto the pipe until they are *just flush with pipe ends*,—DO NOT PULL FARTHER.

Final Assembly

The insertion piece is then placed into the gap, and the couplings are pulled onto the ends of the pipe already installed, completing the closure (see Fig. 44). Assembly effort (greater with two rings) can be eased by "wobbling" the couplings slightly as they are being pulled. Operating the handles of the friction puller in alternately opposite directions will cause coupling to wobble.

Check rubber ring position with gage. See page 34.

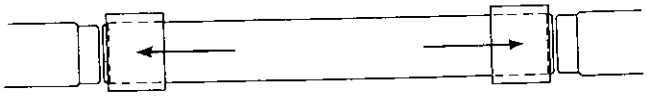


FIG. 44 — After insertion piece is placed in gap, couplings are pulled onto ends of adjacent pipes. A coupling puller is used for this purpose

Using Field Machined Pipe For Closures

Standard or random sections (either full length or by cutting as needed) can be used for making closures if a field machining tool *equipped with an extension cutter* is on the job so that the ends can be machined the full length

of the coupling. Each end is then double-lubricated and the couplings pulled all the way on as described under Lubrication and Assembly on page 46. The section is then inserted into the gap and the closure made.



FIG. 45 — Field machined (at B) pipe used in making a closure. Make standard assembly at A. Swing pipe into line and pull coupling (B) into position

Only one end need be "long machined" if trench is open so that at least one of the already installed pipes can be shifted temporarily to one side—see Fig. 45. First make a standard assembly at the offset pipe (A)—(no extra machining required). Next, double lubricate and pull a coupling all the way on to the long-machined end (B). Then swing both pipes into line and complete the closure.

Removing Pipe From Line

If the reason for the closure is to replace a pipe section, the couplings are removed by breaking off as follows:

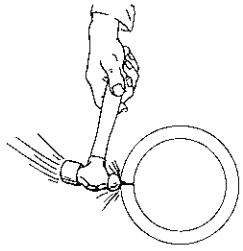
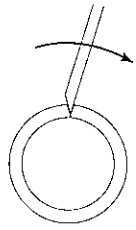


FIG. 46— First widen trench for room. Hit coupling a series of smart blows with the ball end of o ball-peen hammer along each side. This splits coupling for easy removal



Alternate method — Crack coupling along top with ball-peen hammer. Complete splitting with bar using care so as not to damage pipe ends

Remove the pipe from the trench and the rubber rings from the adjacent pipe ends. After the pipe ends have been wiped clean, the gap is ready for a closure.

TO TIE-IN OR TO LOCATE FITTINGS EXACTLY

☛ *Note: For assembly at fittings see section starting on page 54.*

To locate fittings exactly or to tie into fittings already in a fixed location, combinations of MEE and MOA pipe may be used as shown in Figs. 47 and 48. (If an adaptor is joined to MOA pipe, stop-marks will be required to accurately position the coupling—see page 45.)

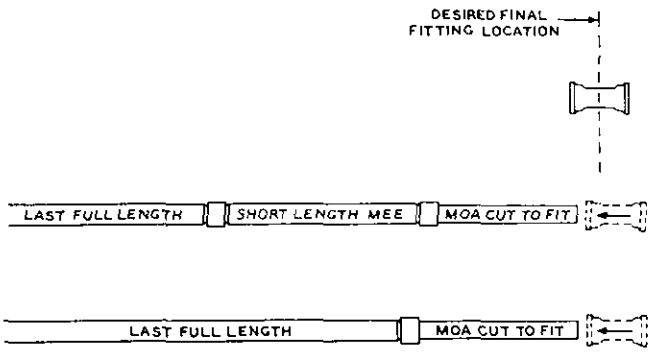


FIG. 47 — To locate fittings exactly various combinations of machined-over-all or machined-each-end pipe can be used

IF A RING-TITE FITTING IS ALREADY IN A FIXED LOCATION, the tie-in is made by installing a full length at the fitting first, and then making the closure between this length and the run of pipe as shown in Fig. 48.

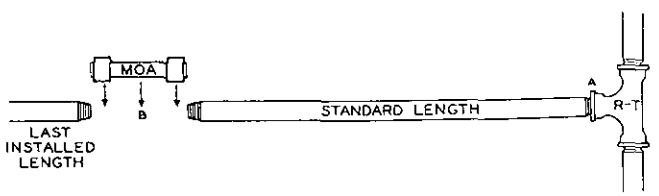


FIG. 48 — When tying into a Ring-Tite fitting (already in a fixed position) install a full length at A and make a closure at B (see Page 45)

If a poured bell or mechanical joint fitting is already in a fixed location, this results in a "rigid joint" at the bell, requiring a quarter or half length (see page 56). In this case the method shown in Fig. 49 is used to tie into the fitting.

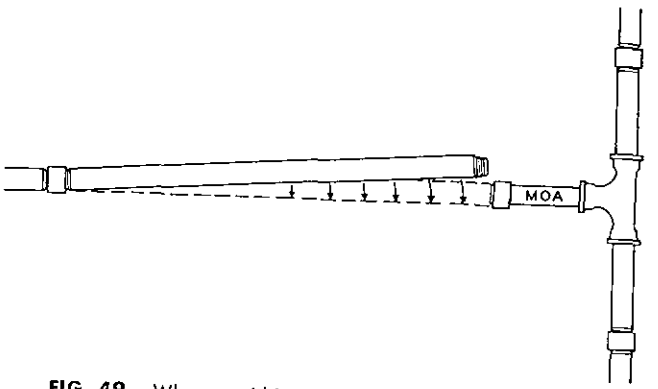


FIG. 49 — When a rgid joint fitting is in a fixed location make tie-in by assembling MOA pipe at fitting and making closure as shown

Cutting and Machining Transite Pipe

Transite Pipe can be cut with hand pipe-cutters which use a *cutting* edge (do not use wedge-type roller cutters), motor-driven saws using abrasive discs, and with hand saws.

USING PIPE-CUTTERS

Pipe-cutters which provide a true *cutting* action by means of a blade (not rollers) offer a means of making fast, accurate cuts. The cutting tip of the blades supplied should be of tungsten carbide, which will make a maximum number of cuts before needing to be sharpened.

There are various designs of cutters available that provide this type of long-lasting cutting blade. The frames of these cutters are adjustable to a range of pipe sizes. They are spaced around and attached to the pipe with roller wheels which are forced into the pipe so as to "track in" squarely on the first revolutions and automatically follow the cut thereafter. See Fig. 50. Instructions are usually included with the cutters.

In addition to standard vises, pipe can be held for cutting by twisting a bar tightly in a rope, or chain, loop (Fig. 51)—or by using a chain type pipe-wrench.

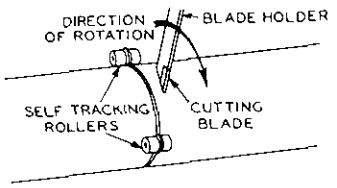


FIG. 50 – This diagram shows the typical arrangement of cutters using a true cutting blade—not rollers

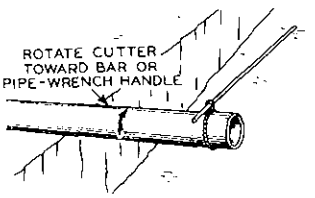


FIG. 51 – Placing pipe across the trench provides plenty of room for operating the cutter

USING ABRASIVE DISCS

Medium to coarse-grit abrasive wheels can be used successfully where power is available. Cut dry and use care to avoid cramping the blade by twisting.

The following abrasive discs are recommended for use with Transite Pipe:

Beaver Falls—#C120-N-R91
Eveready Brick Saw—#BTF-303
Norton—#37C 24-014BN
Carborundum D5 or CF
Skil Saw #11645
Disston #H-1210-5
Porter Cable—Green Label Stone Wheel

The pipe is usually set on planks, or any level spot, and rolled slowly toward the operator as the cut is made.

USING HAND-SAWS

Either one- or two-man cross-cut saws can be used—depending on the pipe size. For best results and maximum number of cuts, the saw should be kept sharp and the teeth at twice their normal set.

Before making the cut, a mark should be made all the way around to assure cutting square and at the location desired. The pipe should be supported to prevent breaking away as the cut nears completion. A 4′ to 6′ plank with batten strips nailed on as shown in Fig 52 is easily made, keeps pipe from rolling and provides good support. (A miter-box is also useful, both for guiding the cut and providing even support.)

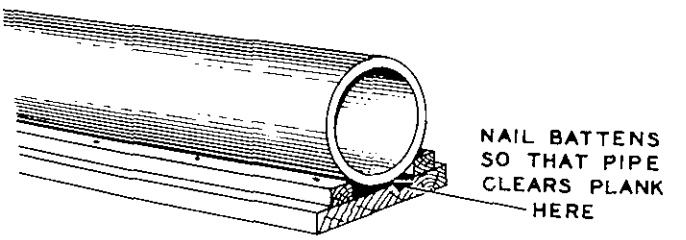


FIG. 52 – A plank with two batten strips nailed on keeps pipe from rolling and provides good support

USING MACHINING TOOLS

Field machining tools are available for machining the rough pipe barrel of Transite Pipe when it has been cut—or for extending the Ring Sealing portion (D-2, Fig. 53) for use in making closures.

There are various designs of field machining tools all utilizing the same basic principles consisting of:

—an adjustable arbor which is inserted into the pipe barrel and acts as a mandrel upon which the turning handle operates.

—a turning handle with blade holders.

—and tungsten carbide tipped blades. See Fig. 53.

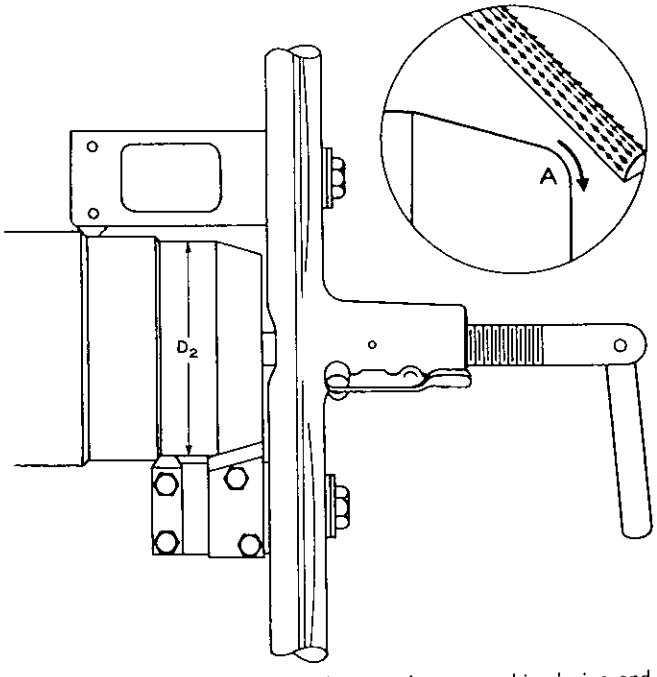


FIG. 53 — Typical machining tool. Use a factory-machined pipe end as a gauge to set cutting blades of machining tool.

As the blade starts in on D_2, the ring sealing area, machine about ½", then check to make certain no "springing" has occurred, and that final dimension will be correct. (Dimension, page 104)

Field machining tools should be used in accordance with the manufacturer's instructions. The following suggestions are general and apply to all machining tools.

1. Use a factory machined end as a guide for setting blades.

2. Turn handle clockwise; never turn backwards when blade is in contact, as blade may break from carrier.

3. Check dimensions of field machined end (dimension table on page 104) to assure that machining tool did not loosen during operation. See Fig. 53.

4. Round the pipe nose with a coarse wood rasp to allow the rings to start easier. See A, Fig. 53.

SUPPORT OF THE FITTING

Fittings should be supported independently of the pipe. Wood skids can be used for this purpose. They help to align the fitting with the pipe end during assembly. They make it easier to assemble the fitting onto the pipe end.

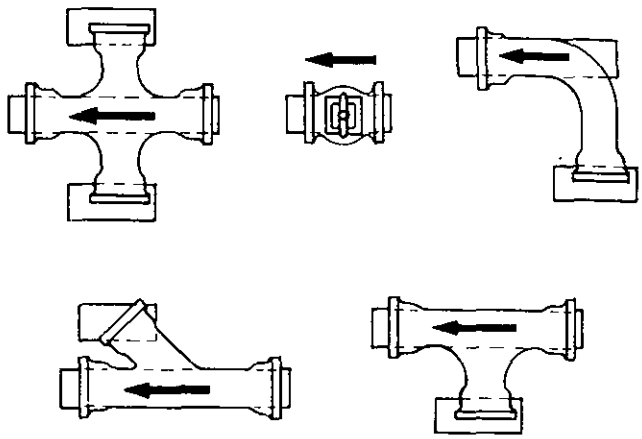


FIG. 54— Wood skids can be used to support fittings and help align fitting during assembly. Note: valves may require concrete-block anchorage—see page 67

Temporary supports (which are to be removed) should not be used because their removal, later, may result in throwing the weight of the fitting on the pipe. Set fittings on supports that will remain in place.

Gate-valves, reducers and fittings with different diameters result in thrusts in the line. They may be supported on wood blocks if the line pressure is low. If considerable thrust, due to high pressure, is expected, the valve or other fitting should be set on, and anchored to, concrete blocks as shown under "Thrust Blocks," page 62.

Hydrants should be set on solid, permanent foundations which act as thrust blocks as well as hold-downs against frost-heave—see page 70.

USE OF SHORT LENGTHS

Short lengths are to be used at each bell of each poured bell or mechanical joint fitting as outlined on page 44.

Where adaptors are used, as described on next page, note that use of the Transite adaptor eliminates need for a short length because the adaptor itself is a short length which provides a flexible coupling close to the fitting.

ADAPTOR REQUIREMENTS

The following types of adaptors are available. (Table H indicates which, if any, adaptor is needed.)

1. MJ-B Adaptor—For connecting Transite to Mechanical Joint and Poured Bell Fittings. See Fig. 55. In ordering show size and class of pipe to be connected—as—MJ-B Adaptor—8"-150 (etc.).
2. Class to Class Adaptor—is a transition piece used to:
   1. Change from class 100 to class 150 Transite in sizes 4" and 10"-thru-16" (not needed for 6" or 8").
   2. Join class 100 Transite to class 150 Ring-Tite fittings, in the same size range as above.

   In ordering show size only as—Cl. to Cl. Adaptor—10" (etc.)

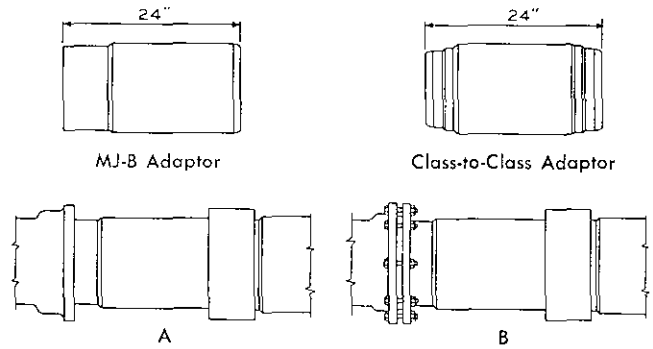


FIG. 55 — MJ-B Adaptor at —
A — Poured Bell Fitting
B — Mechanical Joint Fitting

Short Length and Adaptor Requirements at Fittings

Note: 6'-6" MEE shorts are available on order for pipe sizes 3", 4" & 6" in 10' lgths. These can be cut in two for use into poured bell fittings (see table). As noted on page 43, the standard shorts regularly shipped with these sizes are 3'-3" and 6'-9" for making tie-ins and repairs.

Pipe Size and Class	TYPE OF FITTING		
	Ring-Tite Hub	Mechanical Joint	Poured Bell
		Requires Machined Pipe Surface	
3"-100	Cl to Cl Adaptor†	MJ-B Adaptor	3'-3" MOA (1)
-150	—	MJ-B "	3'-3" MOA (1)
-200	—	MJ-B "	3'-3" MOA
4"-100	Cl to Cl Adaptor†	MJ-B Adaptor	3'-3" MOA (1)
-150	—	3'-3" MOA	3'-3" MOA (1)
-200	—	3'-3" MOA	3'-3" MOA
6"-100	—	3'-3" MOA	3'-3" MOA (1)
-150	—	3'-3" MOA	3'-3" MOA (1)
-200	—	3'-3" MOA	3'-3" MOA
8"-100	—	MJ-B Adaptor	6'-6" (2)
-150	—	MJ-B "	6'-6" (2)
-200	—	MJ-B "	6'-6" Machined Surface only
Following are adaptor requirements for sizes 10"-12"-14" and 16"			
Class 100	Cl to Cl Adaptor†	MJ-B Adaptor	MJ-B Adaptor
" 150	—	MJ-B "	MJ-B "
" 200	—	MJ-B "	MJ-B "

†Some manufacturers are supplying Class 100 Ring-Tite fittings for which no adaptor would be needed.
(1) 6'-6" lengths (MEE) can be cut in two. Unmachined barrel will fit into bell.
(2) Full lengths (MEE) can be cut in two. Unmachined barrel will fit into bell.

TABLE H

STEEL TO RING-TITE ADAPTOR COUPLING

When a transition from standard steel pipe to Transite Pipe is required, a Steel to Ring-Tite Adaptor coupling is used. This adaptor is machined on one end to allow for regular lubricated assembly with Transite Pipe. The other end is machined for a rolling assembly onto steel pipe.

To assemble the Steel to Ring-Tite Adaptor—

1. Bell the Adaptor on to the Transite (check this field assembled ring with the standard gage).

2. Put a stop-mark on the steel pipe (see A, Fig. 56).
3. Put a round rubber ring on the end of the steel pipe (see page 102 for "Placing Rubber Rings").
4. Pull the belled adaptor onto the steel pipe over the ring until the adaptor reaches the stop-mark. To make the assembly use either—
   a. a friction puller anchored to the steel pipe end with coupling hooks engaging Ring-Tite end of adaptor.
   b. a lever type puller, anchored to either steel or Transite--whichever is most convenient.

NOTE: *Do not use a bar and block—a rolling ring assembly requires more effort and a positive, slow, steady movement.*

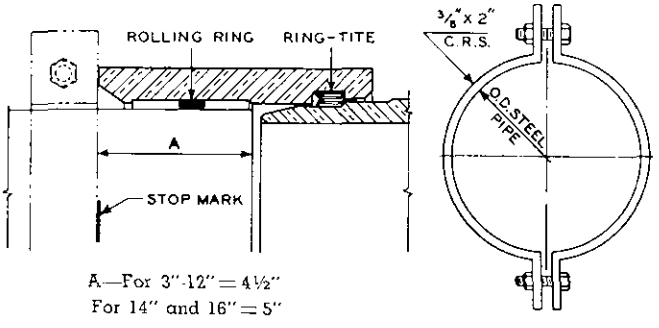
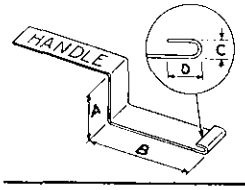


FIG. 56

5. Check the position of the rubber ring. The Ring-Tite gage cannot be used for checking at the rolling end of the adaptor. A gage (as shown in Fig. 57) can be made



Ring Gage for Rolling Assembly

Pipe Size	A	B	C	D
3"—12"	1.0"	2.25"	.25"	.125"
14"—16"	1.5"	2.50"	.25"	.125"

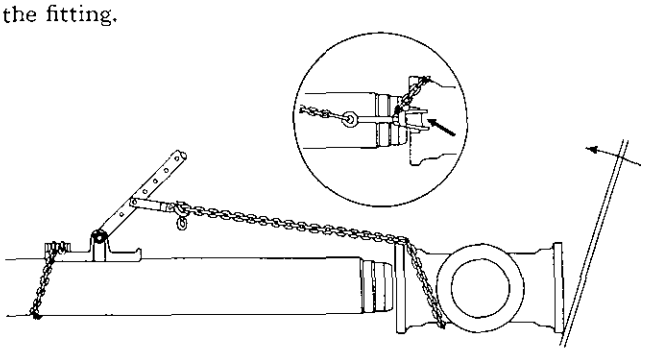
FIG. 57 — Gage for checking rolling end of a "Steel to Ring-Tite Adaptor."

from a ½" wide steel band. Gage must touch ring all the way around. It must also be possible to hook the lip on the shoulder with tip of gage to assure that ring is not too far out.

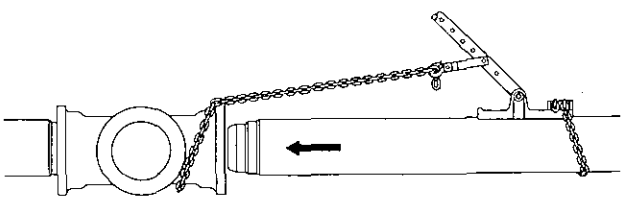
6. Bolt the locking clamp on the steel pipe up against the adaptor. (This is to brace against the end thrust created by the difference in diameters.)

ASSEMBLY AT RING-TITE FITTINGS

The bells of Ring-Tite fittings, like the Ring-Tite Couplings, have grooves in which rubber rings are placed. The fittings are installed with the same sliding assembly as that used for the couplings. Full lengths can be used at Ring-Tite fittings because the rubber ring joint at the fitting is flexible. Use an un-belled length for joining to the fitting.



A. Set puller well away from fitting to give least chain angle and straightest pull. Follow with bar as shown. See text.



B. Change puller, as shown, and pull pipe into the fitting to complete this assembly and to join to the branch of the tee or to any other fitting.

FIG. 58 — Assembly of Ring-Tite Fitting — Insert shows lugs (arrow) on side of bell for use with coupling hooks

NOTE: *USE RING-TITE RINGS ONLY. Dimensions are designed for R.T. rings—and no other ring should be used.*

To assemble a Ring-Tite Fitting

–Clean groove in bell, removing dirt, excess tar, bumps and burrs.
–Insert rubber ring completely in groove.
–Anchor puller on adjacent pipe length.
–Lubricate pipe end as described on page 31.
–Wrap pulling chain around the fitting and pull it onto the pipe end. (Some fittings have lugs on the side of the bells allowing assembly with coupling hooks instead of puller chain—see insert Fig. 58
–Use a bar as shown in Fig. 58 to aid in guiding and pushing the fitting into place, and to prevent pull-out of last coupling assembled.
–Check ring position to complete assembly.

ASSEMBLY OF MECHANICAL JOINT AND POURED BELL FITTINGS

Assembly of fittings other than Ring-Tite requires the use of short lengths (page 43) or adaptors (page 56) at each bell. Joints can be mechanical, or sealed with lead, or sulfur-base (self-calking) compounds. Standard tools and methods are employed. The following suggestions will assist in achieving the best results.

Assembly of Mechanical Joints

1. Clean dirt off pipe end.
2. Lubricate pipe end and entire rubber gasket.
3. Slip follower ring over pipe end with the lip side facing the bell.
4. Slip gasket over pipe end with small side facing the bell.
5. Socket the pipe in the bell and push the gasket into position making sure it is evenly seated in the socket.
6. Insert bolts and finger-tighten the nuts.
7. Tighten bolts to uniform tightness with ratchet wrench. Tighten opposite bolts in pairs to bring up follower ring evenly all around.

Pouring and Calking Lead Joints

Metallic lead should not be over-heated. It is ready for pouring when it just reaches a cherry red.

After making the pour, the lead must be calked to make up for normal shrinkage and secure a water-tight joint.

Use the following suggestions to achieve the best results with Transite Pipe:

1. The "inside iron" is used first. It is important to hold this iron *flat to the pipe* as shown in Fig. 59. Use a 1½ to 2 lb. hammer and strike light, even blows.

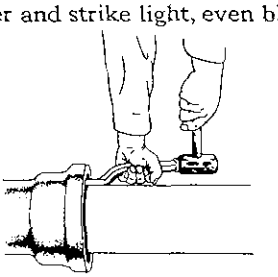


FIG. 59 — Note that calking iron is held flat to the pipe

2. In using the "outside iron" to seal the joint between the lead and the iron bell, calk just enough to overcome the shrinkage away from the bell. Then go around once more to pack the lead tightly—using firm, even blows. Excess lead at the gate is cut off with a flat chisel—and the lead underneath tightened up with the outside iron.

Sulfur-Base (self-calking) Compounds

1. Such compounds have a lower melting point than lead —therefore use a small fire to avoid burning. If the compound burns it must be thrown away.
2. Stir continually while compound is melting. As soon as it has melted, reduce the amount of applied heat.
3. Continue to stir until compound has a smooth, mirror-like surface. Do not pour if any lumps or bubbles show. Keep stirring and heating until they disappear. While pouring, the compound should have a consistency of medium grade motor oil—so as to be free flowing or watery rather than thick or viscid.



FIG. 60 — Always use a pouring gate and pour from a pot large enough to fill the joint and gate in one pour

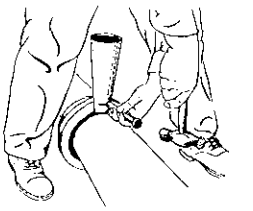
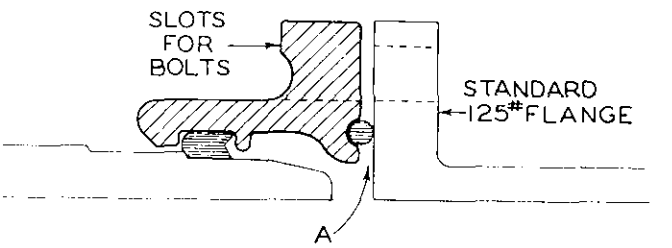


FIG. 61 — Use a chisel in the slot provided, so that the cooled material can be snapped off cleanly

4. Any one joint must be made *all in one pour.* Always use a pouring pot big enough to more than fill both the joint *and* the pouring gate. See Fig. 60.
5. Always use a pouring gate—and fill it to the top. This provides enough pressure and surplus material to compensate for shrinkage during cooling of the joint.
6. Wait until compound is cold before removing gate.
7. Do not break gates off with a blow of the hand—this may tear out some compound at the base of the gate and cause a leak. Use a chisel, first, in the slot—so that a clean break-away is obtained. See Fig. 61.

Adaptor, Ring-Tite to Flange



Full lengths can be used with this type of adaptor. Available for Transite pipe sizes 4" through 12" in Classes 150 and 200 and for 6" and 8" in Class 100. Flange sealing ring (A) is supplied with the adaptor.

Thrust Blocks at Fittings

When Thrust-Blocks are Used

Blocks are installed wherever the pipe-line—
—changes *direction,* as at tees and bends,
—changes *size,* as at reducers (also some crosses and tees),
—*stops,* as at a dead-end,
—or is expected to develop thrusts at valves (see page 67)

SIZE AND TYPE OF THRUST BLOCKS

Their size and type depends on pressure, pipe size, kind of soil and the type of fitting—and will usually be indicated by the engineer.

The drawings on the facing page show how the area of a block for resisting horizontal thrusts must increase as the pressure and the pipe size increase. The top drawings show two sizes of 90 degree bends in place in a trench. Below each of these is shown the area of the thrust block needed to resist the different pressures.

First—compare the drawings downward—greater pressure for the same pipe size requires larger thrust-block area. Next—compare across—bigger pipe size (even though at the same water pressure) requires greater thrust-block area.

How to Determine the Required Thrust-Block Area

If the size of a thrust block has not been specified by an engineer the following example shows the steps that are taken to determine the bearing area required:

First let's assume that the block is to hold against the horizontal thrust at a 90 degree bend—for 10″ Class 150 pipe. Let's further assume that the pipe line will be pressure tested at 200 lbs.

The soil, for this example is sand.

1. Check Table I, page 64. Find 10″ Class 150 pipe size—moving to the right (to the 90 deg. bend column) we find 15,200 lbs. for each *100 lbs.* per sq. inch of water pressure. Since we are working on a total test pressure

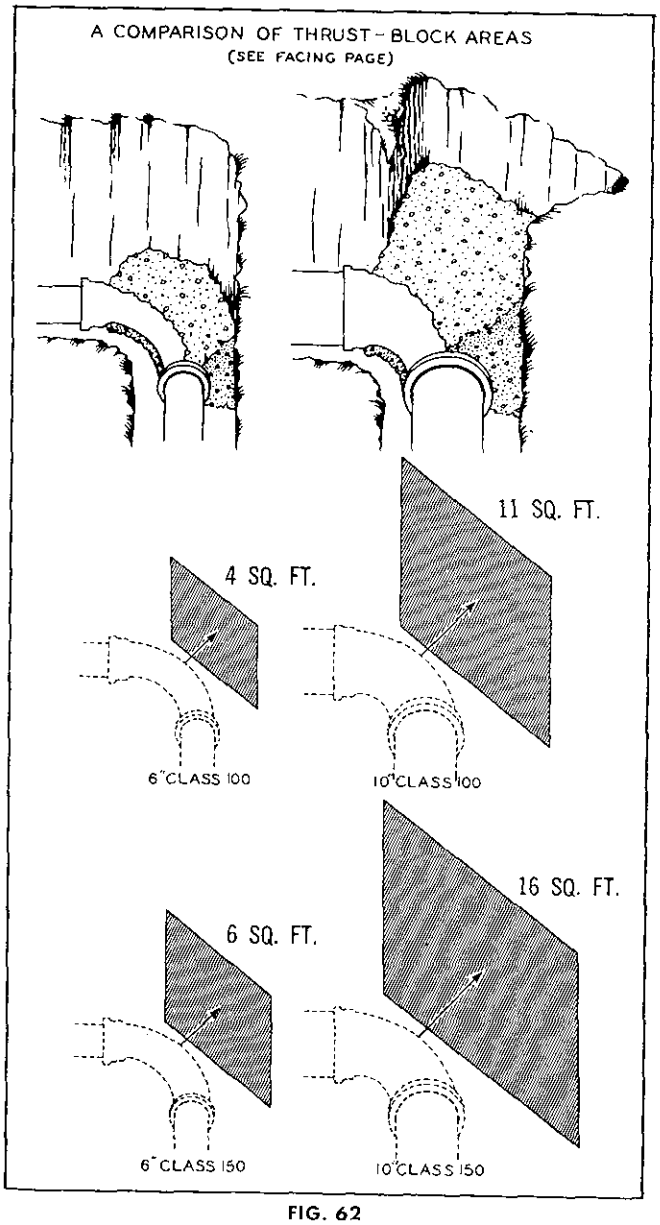


FIG. 62

of 200 lbs.—double 15,200, making the total 30,400 lbs.

Thrust at Fittings in Pounds at 100 Pounds per Square Inch of Water Pressure

Transite Pipe Size and Class	Tees	90 deg. Bend	45 deg. Bend	22½ deg. Bend
3"—100	1,190	1,690	915	460
150	1,260	1,790	970	485
200	1,260	1,790	970	485
4"—100	1,720	2,440	1,320	660
150	1,850	2,610	1,420	720
200	1,850	2,610	1,420	720
6"—100	3,800	5,370	2,910	1,470
150	3,800	5,370	2,910	1,470
200	3,800	5,370	2,910	1,470
8"—100	6,580	9,300	5,040	2,550
150	6,580	9,300	5,040	2,550
200	6,580	9,300	5,040	2,550
10"—100	9,380	13,270	7,190	3,640
150	10,750	15,200	8,240	4,170
200	10,750	15,200	8,240	4,170
12"—100	13,330	18,860	10,240	5,170
150	15,310	21,640	11,720	5,940
200	15,310	21,640	11,720	5,940
14"—100	17,930	25,360	13,740	6,960
150	20,770	29,360	15,910	8,060
200	20,770	29,360	15,910	8,060
16"—100	23,210	32,820	17,880	9,000
150	26,880	38,010	20,590	10,430
200	26,880	38,010	20,590	10,430

TABLE I

For Class 100 pipe—add 50 for test—total 150. Table shows 13,270 lbs. for Class 100 pipe at 100 lbs. pressure—so increase 13,270 half as much again to obtain thrust at 150 lbs., the answer would be 19,905 lbs. total.

2. Check Table J for bearing power of soils. It shows that each sq. ft. of sand will hold 2000 lbs.—then divide the total force (30,400 lbs.) by 2000—which shows the sq. ft. of area needed. In this case it is 15.2—or practically 16 sq. ft. for which a bearing area 4 by 4 ft. can be used.

OTHER THRUST AND ANCHORAGE PROBLEMS

Thrusts in Soft, Unstable Soils

In soft, unstable soils, thrusts are resisted by running tie-rods to solid foundations or by removing the soft material and replacing it with ballast of sufficient size and weight to resist thrusts. (Table I shows amount of thrust.)

Safe Bearing Loads

The safe bearing loads given in the following table are for horizontal thrusts when the depth of cover over the pipe exceeds 2 feet.

Soil	Safe Bearing Load lb. per sq. ft.
*Muck, peat, etc.	0
Soft clay	1,000
Sand	2,000
Sand and gravel	3,000
Sand and gravel cemented with clay	4,000
Hard shale	10,000

**In muck or peat, all thrusts are resisted by piles or tie rods to solid foundations or by removal of muck or peat and replacement with ballast of sufficient stability to resist thrusts.*

TABLE J

Upward Thrusts at Ring-Tite Couplings

Where thrusts act *upward* (as at vertical curves) the weight of the pipe, the water in the pipe and the weight of the soil over the pipe should be determined to make certain that the total weight is sufficient to resist upward movement. If there is not enough soil or if it will not compact over the pipe or it is too soft and mushy to resist movement, then ballast is placed or concrete may be placed around the pipe in sufficient weight and volume to counteract the thrust. (Table K shows the amount of thrust at deflected couplings.)

Upward Thrusts at Fittings

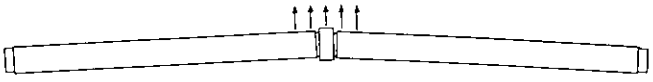
Where a fitting is used to make a vertical bend (see page 68) anchor the fitting to a concrete thrust block designed to key in to undisturbed soil and to have enough weight to resist upward and outward thrust, since the new-placed backfill may not have sufficient holding power (Table I shows thrusts at fittings).

See also page 70 for Hydrant Bases.

Side Thrusts at Ring-Tite Couplings

When the line is under pressure there is an outward thrust at each deflected coupling. Good soil, properly tamped, is usually sufficient to hold pipe from side movement. If soft soil conditions are encountered it may be necessary to provide side thrust-blocks or other means of anchor-

age. Table K shows the amount of side thrust at Ring-Tite Couplings. In such cases DO NOT RESTRICT THE COUPLING—run blocks, or anchors, to the *pipe* on each side of each deflected coupling.



Side Thrust at Deflected Ring-Tite Couplings Per Degree Deflection At 100 lb. per sq. in. Water Pressure

Pipe Size	Side Thrust (lbs.)	Pipe Size	Side Thrust (lbs.)
3	24	10	197
4	35	12	278
6	72	14	377
8	122	16	486

TABLE K

Anchorage of Pipe on Slopes

Pipe anchors on slopes are only needed when there is a possibility of the backfill around the pipe slipping down hill and carrying the pipe with it. Generally, good, well-drained soil, carefully tamped in 4″ layers under and over the pipe right up to the top of the trench, will not require anchoring. Where the possibility of soil slippage does exist, anchors, keyed or tied into undisturbed soil, can be used at every third length of pipe.

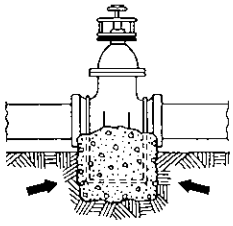
If concrete anchors are cast around the pipe they, of course, become "rigid structures" which require *short lengths* as described on page 43. This requirement is easily met as follows: In sizes below 6″, use a 6′-9″ or 6′-6″ length for every third pipe; cast the concrete around these short lengths at the center—thus leaving 3′ 3″, or less, out of each side of the concrete anchor. For pipe sizes 8″ and larger, use full standard lengths and cast the anchor at the center of each third length—thus automatically leaving the required 6′ 6″ or less at each side.

(See also page 86 for backfilling of pipe on slopes.)

Anchorage of Valves in Line

Under pressure conditions given in Table L, all valves (including those in hydrant run-outs) require anchorage against thrust created when valve is closed.

Area of undisturbed soil (arrows, Table L) should be adequate to withstand the thrust in whichever direction it will occur. See page 62 for area of thrust-blocks.



Anchorage of Valves

Working Pressure lb. per sq. inch	Size of Valve Requiring Anchorage
50-100	12 inch and up
101-150	8 inch and up
151-200	all sizes

TABLE L

CONSTRUCTION OF THRUST BLOCKS

Thrust blocks are made of concrete, usually placed between the fitting and the trench wall. It is important to place the concrete so that it extends to *undisturbed* (freshly cut) trench wall—soft stuff will not hold.

The concrete mix used should be of adequate strength and will often be specified by the engineer. A typical mix consists of one part cement, two parts sand and five parts gravel. (Washed sand and gravel should be used.)

On the smaller sizes of pipe, the construction of horizontal thrust blocks requires only the simplest of forms. The concrete is mixed and placed fairly dry—thus making it easy to shape the block to a wedge with its widest part against solid trench-wall (see Fig. 62, page 63).

Concrete should be kept behind the bell of the fitting—do not let it run over against the pipe or in the joint. Larger blocks require some form-construction at sides and top to achieve the proper bearing area with a minimum of concrete.

LOCATION OF THRUST BLOCKS

The location of thrust blocks depends on direction of thrust and type of fitting as shown below. WITH FITTINGS OTHER THAN RING-TITE, SHORT LENGTHS MUST BE USED. —See page 43.

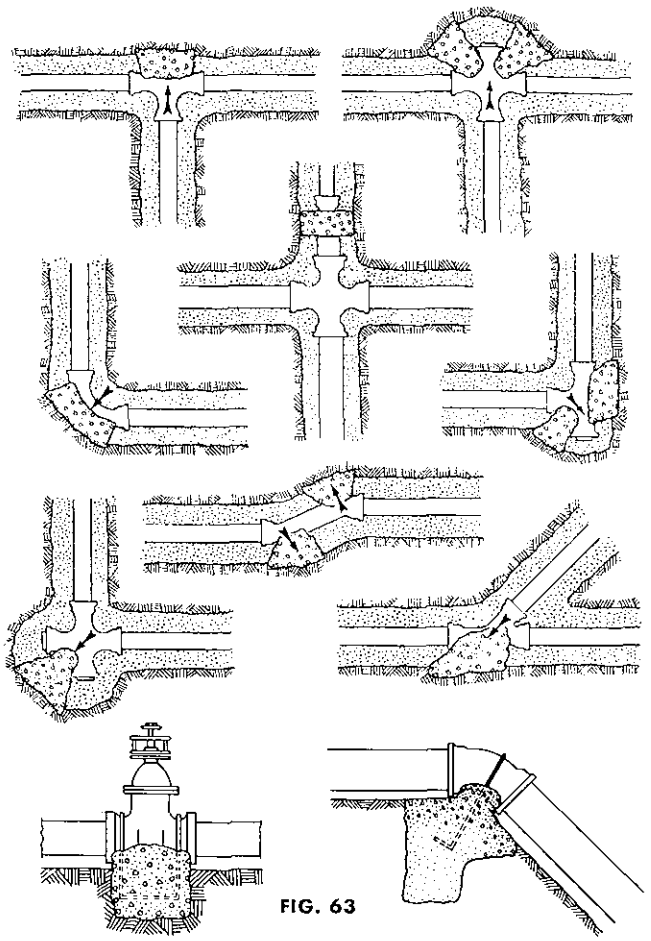


FIG. 63

If thrusts, due to high pressure, are expected, anchor valves as above (see also page 67).

At vertical bends, anchor to resist outward thrusts—see page 65.

Installation at Hydrants

Each hydrant run-out is normally equipped with a valve. The valve may be located at the main, at the hydrant, or in between. Whatever location is used, each fitting (branch-tee, gate-valve and hydrant) should be separately supported.

When Ring-Tite fittings are used in a hydrant run-out, a single length of pipe can be used to connect two fittings because flexibility is provided directly at the fitting by the rubber rings.

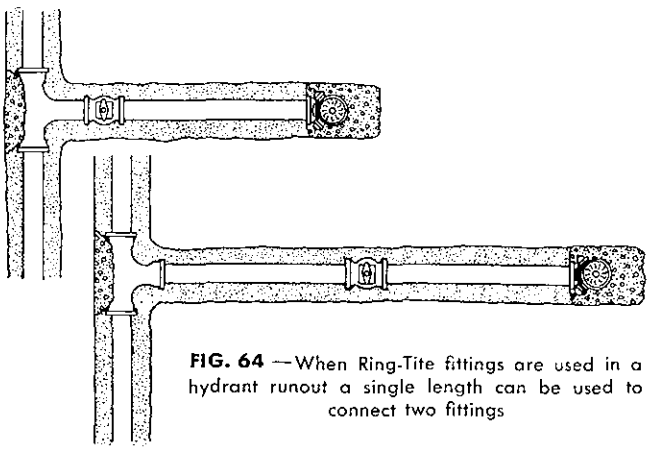


FIG. 64 —When Ring-Tite fittings are used in a hydrant runout a single length can be used to connect two fittings

Be sure to brace the hydrant firmly while the Transite connections are being made up—and until the final foundation has been poured and has set. Do not make the pipe support the hydrant.

Fire hydrants present a special problem when installed in freezing climates. Frost in the ground causes a heaving action tending to raise the hydrant—this sets up shearing stress in the pipe leading to it which, under severe weather conditions, may prove excessive. Some fire hydrant manufacturers taper the barrel of the hydrant so that the frozen soil will pull away and not tend to raise the hydrant, but this device is not always effective.

Other stresses are sometimes caused by water from the drain in the base of the hydrant washing away the support from around and under the hydrant.

Still another consideration in proper hydrant installation is the overturning force that is created when a flexible fire hose is used. When the hydrant is opened, this overturning force tends to cause excessive flexural stress in the lateral pipe from the main to the hydrant.

All of these problems can be considerably minimized through the use of a concrete foundation of the type shown in Fig 65.

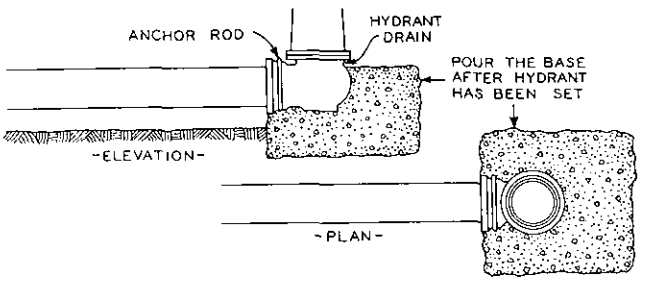


FIG. 65 — This type of hydrant foundation acts as a thrust-block, as an anchorage against frost-heave and eliminates wash-outs from waste-water drain

This concrete foundation can be poured around the base of the hydrant after it has been set in position. With the anchor rods set into the concrete as shown in Fig. 65 the block will serve—

—as a thrust block

—as a hold-down, or anchorage, against frost-heave and

—as a foundation which eliminates wash-outs from the waste water discharged through the hydrant drain.

Note that hydrant drain must be left clear when pouring concrete.

IF THE FITTINGS ARE NOT RING-TITE (MECHANICAL JOINT OR POURED BELL) USE SHORT LENGTHS OF TRANSITE PIPE TO CONNECT THEM AND HAVE AT LEAST ONE RING-TITE COUPLING BETWEEN EACH FITTING TO PROVIDE FLEXIBILITY. —As shown by the typical examples in Fig 66.

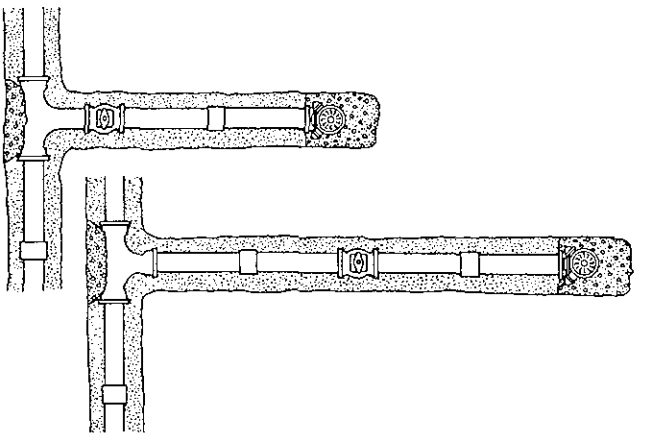


FIG. 66 With rigid joint fittings short lengths are used at each fitting—and at least one R-T Coupling is used between any two fittings joined with Transite Pipe

Service Connections

Service connections vary in size from small services supplying individual homes, to large outlets for industrial and other users.

Transite Pipe can be tapped wet or dry, using standard water works equipment, for the insertion of corporation stops. The largest size corporation stop which can be tapped directly into the pipe is given in Table M. (Larger outlet size can be secured by using service clamps (page 75) or bossed sleeves (page 78). Corporation stops should be located at least one foot from pipe ends. If two insertions are made, one on each side of the main, they should be separated (measured along the pipe length) by at least one foot.

CORPORATION STOPS

1. The machine used should be in good condition. It is important that the boring-bar does not wobble.
2. In selecting the drill-tap tool—
   (a) For best results use a tool that has not been dulled by use on other materials—select a clean, sharp tool and set it aside for use with Transite Pipe only.

☞ NOTE: *Special Tungsten-carbide-tipped drill-tap tools are available for use with Transite Pipe from your supplier. These will make about twice as many taps in Transite as the regular tool will.*

   (b) BE ABSOLUTELY CERTAIN that the threads on the tap *match* the threads on the corporation stop. Do not mix iron pipe thread with standard corporation stop threads. Fig. 67 illustrates the effect of mismatching the threads.

   (c) Check to make sure that the drill portion is long enough to go completely through the thicker wall of Transite Pipe before tapping of the drilled hole starts.

Largest Size Corporation Stop Recommended

Pipe Size	Corporation Stop
3" thru 6" Classes 100 & 150	¾"
6" Class 200	1"
8" thru 16" Classes 100, 150 & 200	1"

Larger outlet size can be secured by using service-clamps or bossed-sleeves, see pages 75-78.

TABLE M

If the drill tap tool becomes dull return it to the manufacturer for resharpening, or contact the manufacturer's representative for instructions on sharpening tools in the field.

Making the Tap and Insertion

1. Make the tap at least 12" from the end of the pipe. Clamp the machine on *firmly*—and at an angle of about 45 degrees—as indicated by Fig. 68.

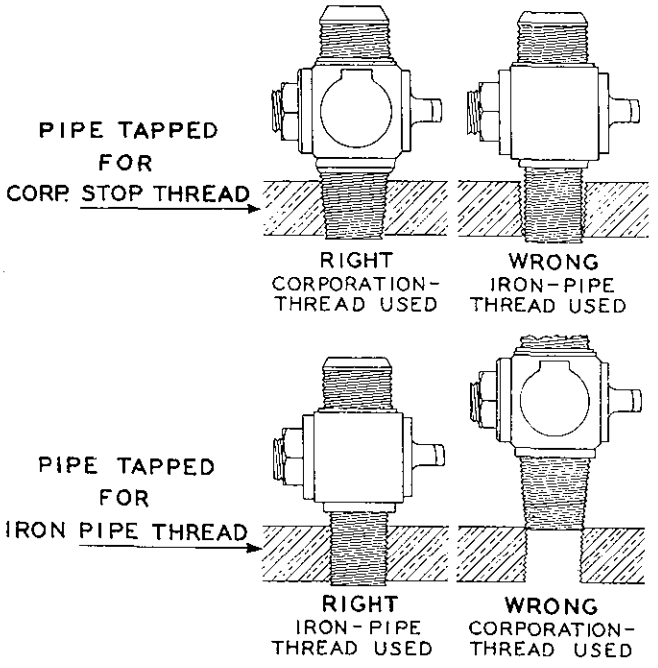


FIG. 67

2. Use graphite and oil as a lubricant during drilling and tapping. Mix powdered graphite and linseed oil to consistency of medium weight motor oil and brush it on to the drill-tap combination and also on the corporation stop.
3. DO NOT *FORCE* drill through pipe wall. Boring-bar should rotate freely at all times—use the follower very lightly—do not force the drill.

4. Transite has a thick wall and will therefore engage more threads of the corporation stop—so the boring-bar must travel farther down in order to thread the corporation stop in properly. When the stop is inserted and tightened, *there should be one to three threads showing—no more.* (See Fig. 68.) (It may be desirable to make a "shop-tap" ahead of time, and make a new stop-mark on the boring-bar for use with Transite.)

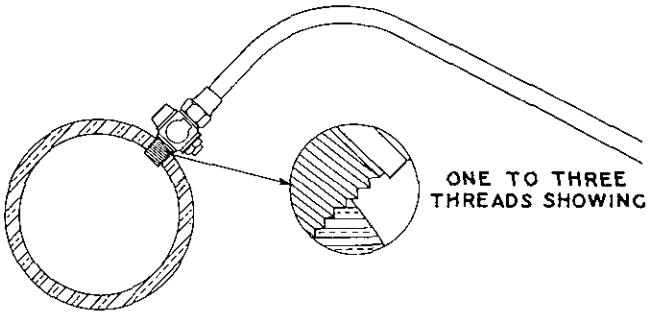


FIG. 68 — A properly installed corporation stop—showing gooseneck in service pipe and detail of correct number of threads exposed after tightening

5. Always insert the corporation stop with the machine used in drilling and tapping the pipe—even when making a dry tap. (If the dry-tapping machine is used, the stop will, of course, have to be inserted by hand.)

6. Avoid over-tightening of corporation stops — tighten just sufficiently to make a water-tight joint (50 to 65 foot lbs. with a torsion wrench).

Connecting the Service Pipe

Always put a bend or "gooseneck" in the service pipe to provide flexibility and "give" in the event of a load due to settlement or to expansion and contraction or other pulling and thrusting that may happen to the service pipe. (See Fig. 68.)

SERVICE CLAMPS

As shown in Table N, using a service clamp allows greater outlet capacity than is permitted with ordinary tapping. The drilling machines used attach to the corporation stop

for drilling pipe either dry or under pressure and they can also be attached directly to the service clamps for drilling when pipe is dry.

The clamps should be made of a ductile material and the ***straps should be flat.*** Rubber gaskets are required for all pipe sizes and classes. ***Do not use lead gaskets.***



Maximum Size of Outlet Recommended with Service Clamps (Inches)

Pipe Size	OUTLET SIZE (Classes 100-150-200) Single Strap	Double Strap
3″	1″	1″
4″	1″	1″
6″	1½″	1½″
8″	2″	2″
10″	2″	2″
12″	2″	2″
14″	2″	2″
16″	2″	2″

TABLE N

Before placing the clamp, file the surface of the Transite to clean off all loose material and provide a hard clean surface. Place gasket and clamp and tighten firmly.

Lubricate the drill with graphite and oil as described on page 73.

Do not force the drill with the follower.

CAUTION: The drills used on these machines are quite long—so be careful that the drill used does not go all the way through and make a hole in the opposite side of the pipe.

After removing the drilling machine, re-check the service-clamp bolts to make sure they are still firmly (but not excessively) tightened.

HEAVY COUPLING— FACTORY THREADED OUTLETS

These are made available to satisfy either of two needs:

1. To supply a pre-threaded coupling-outlet for customer convenience.
2. To provide greater outlet capacity than can be obtained by drilling and tapping pipe. (See table below.)

It may be ordered with threads for either C.C. (AWWA) thread or Iron Pipe Thread. Couplings are stencilled to show diameter of outlet and type of thread. Orders should clearly state the outlet size and the type of thread required.

Assemble into the line in the same manner as a standard Ring-Tite coupling. For house services the outlet is positioned at 45° off top center line. (See Fig. 69.) For irrigation systems the outlet is positioned at the horizontal dia. (Figs. 70 and 71.)

OUTLET SIZES AVAILABLE

3" & 4" Pipe	¾" — 1" — 1¼"
6" thru 16" Pipe	¾" — 1" — 1¼" — 1½"

TABLE O

Lubricate threads of corp. stops or iron pipe nipples before inserting. Use a thin paste of powdered graphite and lubricating oil.

Connection for House Service

Always put a bend or "gooseneck" in the tubing to provide for flexibility and "give" in the event of a load due to settlement or to expansion and contraction. See Fig. 69.

Connections for Irrigation Systems

Copper Tubing

When copper tubing is used as the riser connection to the irrigation valve, install it as shown in Fig. 70. With copper tubing the radius of bend should not be less than shown in table.

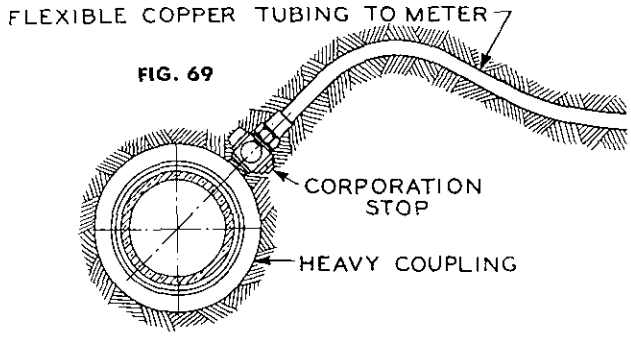


FIG. 69

Outlet Size	Min. Rad.
¾"	6½"
1"	10½"
1¼"	15"
1½"	21"

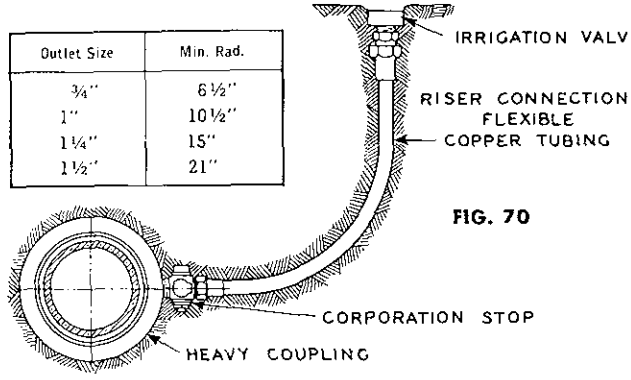


FIG. 70

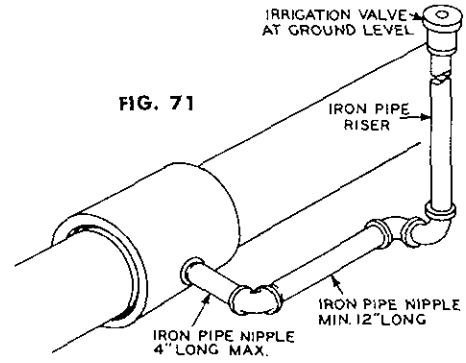


FIG. 71

Iron Pipe Connections for Irrigation Systems

When iron pipe is used the riser should have a "swing" connection as shown in Fig. 71.

BOSSED SLEEVES

Bossed sleeves may also be used to obtain larger outlet capacity than is obtainable with ordinary tapping. Sleeves may be either solid or split.

Of course, solid sleeves must be slipped over the end of a pipe *before* the pipe is joined into the line. The AWWA sleeve is yarned at each end and poured as with any fitting. The sleeve shown in Fig. 72 is designed for Transite Pipe in sizes up to 12″ and is poured solid—no yarn being required.

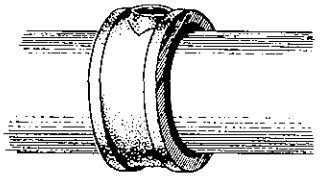


FIG. 72 — Solid-Bossed-Sleeve

Split sleeves can be assembled on the pipe either before or after the pipe is joined into the line. Split sleeves are, depending on the type used, either poured solid or, as with any poured bell fitting, yarned at each end and poured.

After placing and pouring these sleeves, the procedure for drilling the pipe is the same as with a service clamp. Here, again, the drill should not be forced and care should be taken so as not to drill too far. Such sleeves are quite heavy and should be carefully supported by a thorough tamping job all along the pipe length and under the fitting.

TAPPING SLEEVES AND VALVES

Tapping sleeves with either calked lead or mechanical joints can be used for making large taps in Transite Pipe under pressure.

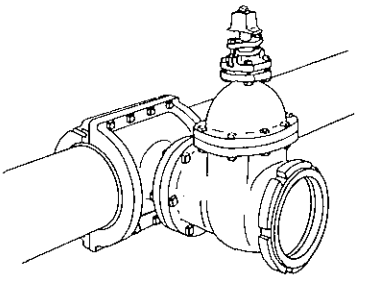


FIG. 73 — Tapping sleeve and valve

When tapping sleeves are ordered from the manufacturer, the actual outside diameter of the pipe being tapped, the size of the outlet desired and the working pressure should be specified to assure that the sleeve furnished will be satisfactory.

☞ *Note: Before assembling, pipe barrel should be cleaned thoroughly with a wire brush to provide a smooth, hard surface for the sleeve.*

Tapping sleeves should be assembled in accordance with manufacturer's directions. Drilling equipment can be bought or rented from sleeve manufacturers who also furnish instructions and/or instructors trained in making such taps.

Tapping sleeves should be well supported independently of the pipe during the tapping and the support used should be left in place. Thrust blocks should be used as with any other fitting as described in section starting on page 62.

Backfilling and Tamping

Backfilling usually follows pipe installation as closely as possible. This protects pipe from falling boulders, eliminates possibility of lifting the pipe due to flooding of open trench, avoids shifting pipe out of line by cave-ins, and, in cold weather, lessens possibility of backfill material becoming frozen.

Keep in mind that the purpose of backfilling is not only to protect the pipe by covering it, but to provide *firm, continuous support* that will prevent the pipe settling or resting on the couplings. The essentials of a first class backfilling job can be summarized as follows:

1. Provide a continuous bed by carefully consolidating selected material under pipe and couplings and between the run of pipe and the trench walls.

2. Provide a cushion on top by hand-placing selected material to at least 12″ over the pipe—the balance can then be backfilled by machine.

INITIAL BACKFILL AND TAMPING

The first step in providing firm, continuous support for the pipe line is to tamp soil solidly *under* the pipe and couplings.

Choice of Methods

Tamping can be done either with tamping bars or by using water to consolidate the backfill material. Hand tamping is best accomplished with damp loamy earth or sand. Water tamping should be used only in trenches that are excavated in soils from which water drains away quickly and at the same time compacts the backfill material.

OBTAINING PROPER BACKFILL MATERIAL

The backfill material used should be free of stones, dry lumps and, in cold weather, free of frozen lumps. (Dry or frozen lumps will slump down when they become wet or thaw out—leaving the pipe with insufficient support or

causing dangerous settlement. Generally a material that is slightly damp will pack more solidly under the pipe.)

Even in fairly stony areas, suitable material for initial backfill can often be shaved from the sides of the trench.

Where the type of clay soil condition described on page 23 is encountered the pipe should be enveloped in a minimum of four inches of sand—then the initial backfill completed to at least 12″ above the pipe with selected material (see 2, above).

In cold weather, unfrozen material can often be found below the frozen crust of the excavated earth. If the exposed material becomes completely frozen—then dry sand or other unfrozen material should be hauled in.

In bogs and marshes, the excavated material is usually little more than vegetable matter—and should not be used for bedding purposes. In such cases gravel or crushed stone should be hauled in.

HAND TAMPING

About Tamping Bars

Two types of tamping bars are required for a complete job. First a bar with a narrow head, or blade, is used to tamp *under* the pipe and couplings. Then a bar with a flat head is used to compact soil at the *sides*.

For packing soil under pipe and couplings, tamping bars should not be improvised from two-by-fours, shovel-blades, pick-handles and the like. A good tamping bar should be long enough to handle easily, heavy enough to do the work but not wear out the man, and the right size and shape to pack soil properly. The tamping bars illustrated in Fig. 74 (next page) will do a good job, can be handled easily and are quickly made up in the shop.

Flat tampers are standard equipment. Either hand or pneumatic tampers may be used.

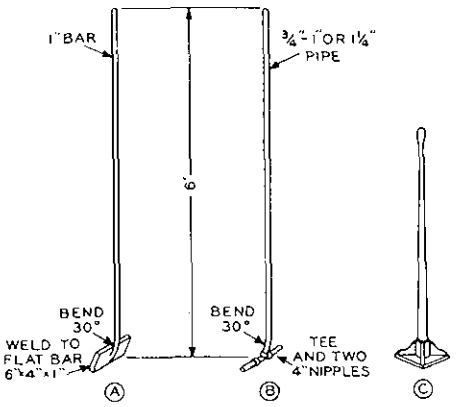


FIG. 74 — Tamping bars of the type shown at "A" and "B" are used for tamping under pipe and couplings. The flat tamper "C" is used at the sides, between pipe and wall of trench. (Do not attempt to use the flat tamper in place of A or B—it will not do the work properly)

Placing and Tamping under the Pipe

A good tamping job can be done more easily than a poor job. The key to it is in the *amount* of soil that is thrown in—to be tamped under.

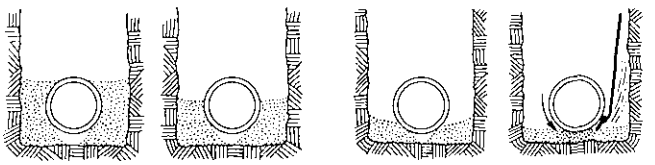


FIG. 75 (A)—WRONG! Too much soil. Tamp bar cannot compact it properly—and leaves a void under the pipe

(B) — RIGHT—4" layers of soil—which tamp bar can force under pipe—thus getting a firm bed

This initial backfill is always placed by hand. It should be shoveled in evenly along both sides of the pipe, making a layer about 4" thick—NOT MORE. Then the tamping bar is used to tamp this soil firmly under the pipe. If more than 4" of soil is shoveled in before tamping, the soil can bridge and fail to go *under* the pipe (Fig. 75A). This may

look all right from the surface, but it is easy to see that, when it occurs, support under the pipe is not provided.

Next, another 4" layer is shoveled in and tamped. This is repeated until the pipe is firmly bedded in compact soil—see Fig. 75B.

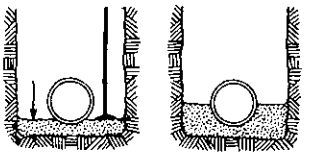


FIG. 76 — When pipe firmly bedded—use flat tamper at sides. Continue flat tamping, in 4" layers, halfway up pipe.

Using the Flat Tamper

The next step is to provide lateral support by tamping soil firmly between trench-walls and the pipe. This, too, is done in 4" layers but a *flat* tamper is used. (The tamper used under the pipe will not work properly at the sides.)

Hand-placing and flat-tamping is continued to a point halfway up the pipe-wall, see Fig. 76. When this point is reached, the tamping can be stopped.

WATER TAMPING

NOTE: *Water tamping should be used only in trenches that are excavated in soils from which water drains away quickly and at the same time compacts the backfill material.*

If water tamping is used the selected backfill material is first hand placed, filling all voids, under and along both sides of the pipe and couplings up to (but never higher than) the top of the pipe as shown in Fig. 77A.

Water is then flushed into the trench. The action of the water seeping through the backfill will tend to compact the soil, providing continuous support around the pipe and couplings. Care should be taken not to put too much water into the trench. If trench is flooded, the excess water may float the pipe.

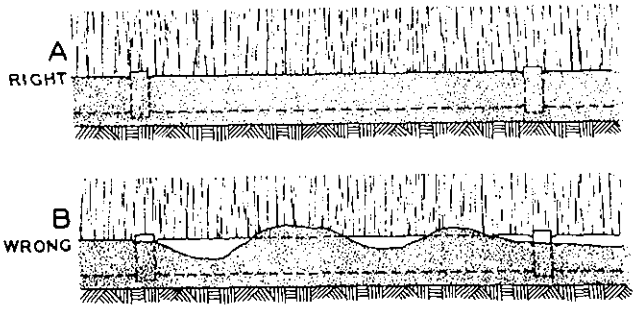


FIG. 77 — (A) Backfill correctly placed by hand filling all voids before water tamping. (B) *Wrong*—Backfill is not placed evenly up to, but not higher than, top of pipe.

If the trench bottom is flat or is on a slight grade, the water may be put in at central points where it will reach and seep through all backfill material. If the trench bottom is on a fairly steep grade, mounds should be made at intervals forming pockets along the line of trench to assure that the water does not run off before seeping through and consolidating the backfill material.

In Sheeted Trenches

If sheeting is pulled *after* tamping, a hollow space will be left. This robs the pipe of the benefit of support given by tamping.

When hand-tamping—if sheeting is pulled, do it progressively while flat-tamping is being done.

When water-tamping—pull sheeting progressively while backfill is being hand placed so that it is at the top of the pipe when the water is flushed into the trench.

COMPLETING THE INITIAL BACKFILL

Backfilling the selected material is continued, *by hand*, until there is a protective cushion of at least 12" of cover over the pipe. This completes what is called the "initial" backfill—the thoroughly tamped soil which provides a continuous, supporting bed for the pipe-line.

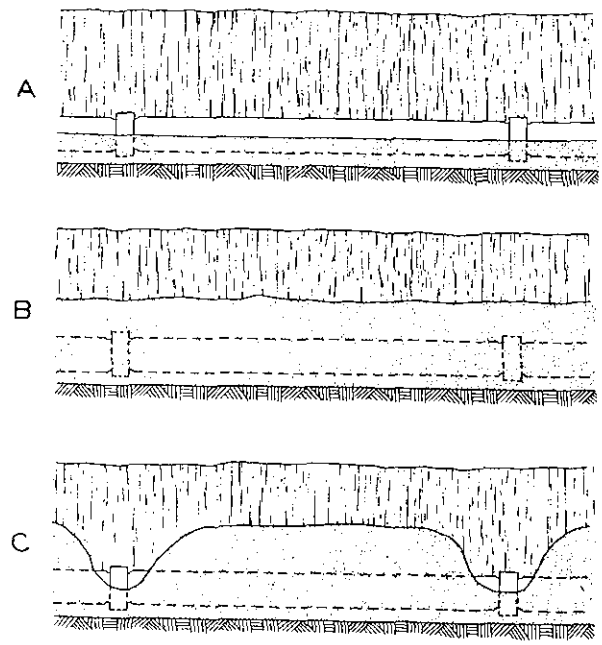


FIG. 78 — (A) Soil tamped in 4" layers or water tamped to the horizontal diameter of the pipe. (B) Hand-placed backfill completed to at least 12" over the pipe—ready for machine backfill. (C) Couplings can be left exposed for visual inspection during test, if required. (See note below.) *Entire lower half of the pipe-line is thoroughly tamped as at "A". Sufficient weight of soil is placed over pipe to prevent movement under test pressure.*

NOTE: *If it is necessary to observe or inspect couplings during a test, only the top half of the couplings need be exposed. It is essential that the* complete *line, including the couplings, be tamped as described—up to the horizontal diameter. Then the pipe is backfilled by hand so as to resist movement due to pressure, leaving the top half of couplings uncovered as shown at "C" in Fig. 78. Even though no deflection is apparent, pipe should be weighted down with good soil at the rate of 1 ft. depth of soil for each 100 lbs. of water pressure. (See table on page 66 for thrusts at deflected couplings.)*

COMPLETING THE BACKFILL

The balance of the backfill, which is usually placed by machine, need not be as carefully selected as the initial material. Care should be taken, however, to avoid the backfilling of too large stones which might damage the pipe in dropping in or by being forced down onto the pipe later. This is particularly important if couplings are left exposed (see "C", Fig. 78). Such lines should be inspected, before backfilling, to detect and remove stones which may have fallen in.

The possibility of frost penetration should be considered wherever backfill is extremely stony.

PIPE ON SLOPES

Pipe in trenches on a slope should have extra attention to make certain that the new-placed backfill will not become a "blind-drain," in effect. Until backfill becomes completely consolidated there is a tendency for ground or surface water to move along this looser soil. If this happens to concentrate at one or more places, soil may be washed out from under the pipe, resulting in loss of support and, perhaps, a break. To reduce this possibility the backfill, for pipe on slopes, should be tamped with extra care—and the tamping continued in 4" layers right up to the top ground-line of the trench.

Testing

It is good practice, to pressure test portions of a line as it is installed before the entire line is completed. In this way any errors of workmanship will be found immediately and can be corrected at a minimum of expense.

All parts of the pipe-line must be backfilled and braced sufficiently to prevent movement under pressure. There are three parts of the line to consider:

1. The run of pipe itself.
2. Thrust-blocks at fittings.
3. Test-ends, used where the pipe-line does not connect into an existing line or structure.

HOLDING THE RUN OF PIPE

When the line is under pressure there is an outward or upward thrust at each deflected coupling. Good soil, properly tamped, is usually sufficient to hold pipe from side movement on horizontal curves. Where couplings are deflected vertically (as at the crest of hills) there must be enough weight of backfill on the pipe to resist *upward* thrusts. The weight needed can be determined from Table K on page 66 which shows the amount of thrust at 100 lb. pressure per degree deflection.

If the top half of couplings are left exposed for visual inspection, note that the entire bottom half should be backfilled and tamped as described on page 85. If the bottom of any coupling is left exposed, all loose stones that may roll in under must be removed and the bottom half of the coupling area backfilled and tamped with good soil before final backfill is begun.

AT THRUST BLOCKS

Since the purpose of testing is to test all parts of a pipeline, thrust-blocks at fittings are also subjected to the test pressure. Therefore, all thrust blocks forming part of the finished line should be *permanent* and constructed to withstand test pressure—and temporary bracing must not be resorted to.

Do not test against freshly poured concrete thrust-blocks —allow enough time for concrete to set before subjecting them to test pressure.

AT TEST ENDS

The open end can be sealed temporarily with a mechanical line cap (blind end coupling) shown in Fig. 79. Line caps are available in all sizes and can be used repeatedly merely by assembling on the last installed pipe length. Line caps are provided with an outlet to serve as an air relief vent or for filling the line—as may be required.

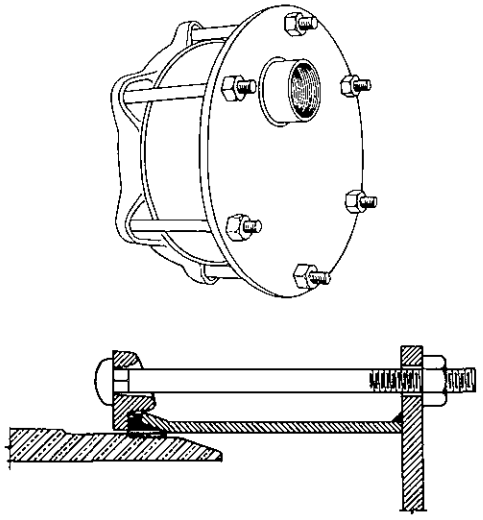


FIG. 79 — Typical end cap.

Bracing Test-Ends

The end of the pipe-line must always be braced to withstand the relatively powerful end-thrust that develops under pressure. A temporary thrust-block can be used for that purpose. Table P shows that this force may amount to many tons of thrust.

The first step is to establish the temporary thrust-block. This can be a timber mat against the end of undug trench, or—if the trench has been opened beyond the point of test —heavy timber can be notched into the sides of the trench, close to the bottom, see Fig. 80. In either case, the soil must be firm and there must be plenty of bearing surface

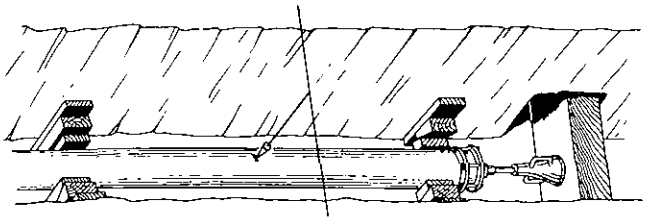


FIG. 80 — Wedge pipe solidly to prevent kicking out—Using a plumb bob over point on pipe will check creeping when pressure is built up

against it, to resist the thrust. (See table on page 65 for Bearing Power of Soils.)

The next step is to "fill in" between the end of the pipe line and the mat, or timber. This "fill-in" should be adjustable so that the last pipe length can be forced back to its original position if it starts to move out of the last coupling during the test. Short timbers and wedges can be used, but one or more jacks serve the purpose much better since they are so easily adjusted both before and during the test. (See Fig. 80).

The last full length laid should be firmly wedged and braced to prevent kicking out under pressure. (All exposed pipe must be wedged or backfilled, so as to hold it securely in line.)

Thrusts* at Test-Ends (Dead Ends) for 100 psi pressure

Transite Pipe Size and Class	Thrust (lbs.)	Transite Pipe Size and Class	Thrust (lbs.)
3"—100	1,220	10"—100	9,660
150	1,280	150	11,040
200	1,280	200	11,040
4"—100	1,840	12"—100	13,660
150	1,970	150	15,650
200	1,970	200	15,650
6"—100	3,970	14"—100	18,300
150	3,970	150	21,170
200	3,970	200	21,170
8"—100	6,800	16"—100	23,630
150	6,800	150	27,330
200	6,800	200	27,330

*The thrusts shown have been increased to allow for some makes of end caps which seal on the larger, second, machined area.

TABLE P

FILLING THE LINE WITH WATER

Filling for Both Pressure-Strength and Leakage Tests

The line can be filled from any available low-pressure source. The water can be introduced from lines in service directly through valved connections or by temporary connections to hydrants or to taps made in the new line or at the connection in the line cap.

Filling for Leakage Tests

Dry Transite Pipe will absorb some water. Therefore, the line must be filled with water at least 24 hours before accurate leakage tests can be made.

Volume of Water Required for Testing

In some cases water for pressure and leakage tests may be difficult to obtain prior to connecting the pipe line to the source of supply. In these cases, Table Q indicates the approximate amount of water per 100 ft. of pipe line which must be obtained from other sources to conduct the tests.

VOLUME OF WATER REQUIRED
in gallons per 100 feet

Pipe Size	Gallons* Per 100 Ft
3	47
4	82
6	184
8	326
10	510
12	740
14	1000
16	1310

*Approximate—includes an allowance for absorption and wastage.

TABLE Q

Relieving Air from the Pipe-Line

Air should be vented from all high spots in the pipe-line before making either pressure-strength or leakage tests.

Compressed entrapped air causes difficulty in pumping up to the required pressure for strength tests. Furthermore, a pipe-line may leak compressed air when it is actually water-tight—and if this occurs during a leakage test it will cause erroneous results.

In pipe sizes 8″ and smaller, hydrants can be used for venting if air-valves have not yet been installed. In the larger sizes air pockets can form along the top of the main and not be vented by hydrants unless the "blow-off" type of branch-tee is used. If ordinary tees are used, air should be vented by tapping corporation stops into the pipe at high spots in the line. If the line is filled from a test-end located at a high point, an additional outlet should be made there so as to relieve air at that point.

MAKING PRESSURE-STRENGTH TESTS

The purpose of a pressure-strength test is to make certain that the line will withstand normal working pressure plus reasonable excesses that may occur. In a properly designed line, excess pressures will be kept to a minimum by the use of automatic relief valves, slow closing and opening of valves, slow pump starting, and other controls. A test pressure of 50% above the normal operating pressure should, generally, be sufficient, unless the specification calls for greater pressure.

The test pressure is built up by using a hand pump or a small power pump. Do not build up pressures greater than specified. This can happen if the pressure is read from a gauge located at a high point in the line. In such cases the *actual* pressure at low points will be *greater*.

For Converting Ft. Head of Water into Pressure per Sq. In.

Feet Head	Lbs. per Sq. Inch	Feet Head	Lbs. per Sq. Inch	Feet Head	Lbs. per Sq. Inch	Feet Head	Lbs. per Sq. Inch
1	.43	20	8.66	75	32.48	160	69.29
2	.87	25	10.83	80	34.65	170	73.63
3	1.30	30	12.99	85	36.81	180	77.96
4	1.73	35	15.16	90	38.98	190	82.29
5	2.17	40	17.32	95	41.14	200	86.62
6	2.60	45	19.40	100	43.31	225	97.45
7	3.03	50	21.65	110	47.64	250	108.27
8	3.40	55	23.82	120	51.97	275	119.10
9	3.90	60	25.99	130	56.30	300	129.93
10	4.33	65	28.15	140	60.63	325	140.75
15	6.50	70	30.32	150	64.96	350	151.58

TABLE R

MAKING LEAKAGE TESTS

The purpose of leakage tests is to verify the water-tightness of the section of pipe-line under test and includes its joints and all fittings.

Transite Pipe will absorb some water, therefore the line must be filled with water at least 24 hours before accurate leakage tests can be made.

Normal operating pressure is applied for leakage tests, and this should be maintained as *constant* as possible all during the test. In every case, the pressure at the *beginning* and at the *end* of the test should be the same, because, if there is any air trapped in the line, a higher pressure at the end of the test will show *more* than actual leakage because the air will compress, while a lower pressure will show *less* than actual leakage because the air will expand.

Generally, the engineer will establish allowable leakage and indicate methods and procedures for testing. If not, Table S should be used in establishing whether a satisfactory degree of water tightness has been attained.

LEAKAGE ALLOWANCE
Gallons Per 100 Couplings Per Hour

Pipe Dia. (inches)	Test Pressure (psi) 50	75	100	125	150	200	225
3	1.15	1.40	1.63	1.81	1.99	2.30	2.44
4	1.54	1.87	2.16	2.42	2.65	3.07	3.25
6	2.30	2.80	3.25	3.63	3.98	4.60	4.88
8	3.07	3.73	4.33	4.83	5.30	6.13	6.50
10	3.83	4.66	5.41	6.04	6.63	7.66	8.12
12	4.60	5.59	6.50	7.25	7.95	9.20	9.75
14	5.37	6.52	7.58	8.46	9.28	10.73	11.38
16	6.13	7.45	8.66	9.66	10.60	12.27	13.00

**Evaluated on basis of 150 psi, this leakage is approximately equal to 65 U. S. gallons per 24 hrs. per mile of pipe, per inch of pipe diameter for pipe in 13-foot lengths.*

TABLE S

To determine total loss for a given length of pipe line;—against pipe size and under test pressure, find gallons per 100 couplings per hour. Multiply this by actual number of couplings per hour. Multiply this by actual number of couplings (each fitting bell equals ½ coupling) and then by hours of test duration: For example, one mile of 10" pipe at 150 lbs. for 2 hours = 6.63 gals per 100 couplings per hour. Since there are about 407 couplings in one mile multiply 6.63 by 4.07 giving 27 gals per hour, times 2 = 54 gals allowable leakage in 2 hours.

Repairs to Damaged Pipe

Get permission from the agent before moving damaged materials to the job site, because salvageable material must be allowed for in any claim made against the carrier.

Both the illustrations and the suggestions which follow should be referred to in making repairs. The paragraphs are numbered so as to make it easy to include all the suggestions that may apply to any drawing.

1. Bruises are caused by heavy impact against such things as timber and iron edges, rocks, other pipes and fittings. This can result in a breakdown by crushing of the pipe-wall under the bruise. The weakened spot may blow out under high pressure or may cause seepage through the pipe and a blow-out at some future time. This condition is usually indicated by bulging and broken structure on the inside surface of the pipe or by cracks. (See paragraph 4.)

2. Whether the blow results in a bruise or in a hole through the pipe-wall, some or all of the pipe will still be useable. As shown in Fig. 81, bruises and punctures can be repaired with repair-clamps.

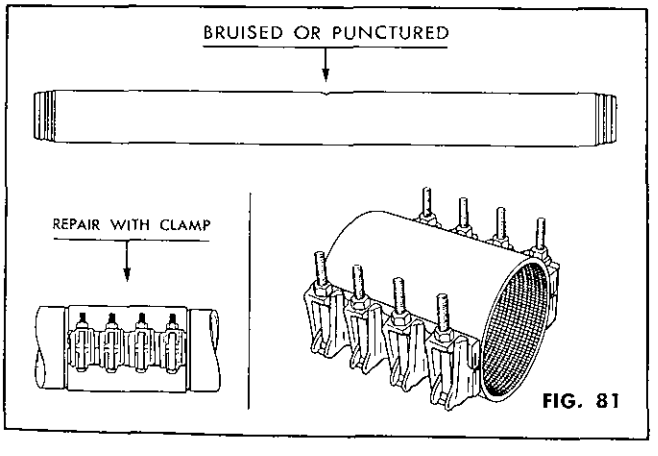


FIG. 81

About Repair Clamps

If a repair clamp is to be used the full circle type with opposed bolt-line flanges is recommended (see Fig. 81) and should be installed in accordance with the manufacturer's instructions. When using a repair clamp the area on the pipe barrel around which clamp will be placed should first be cleaned with a wire brush. Apply Ring-Tite lubricant to the cleaned area—(to help seat the rubber lining smoothly during final adjustments). The two halves of the clamp are then put around the pipe with the nut position on top for easy access. After the nuts have been tightened lightly the clamp should be rotated slightly in the same direction as the overlap of the rubber lining to assure its smoothness. The nuts are then tightened so as to distribute the pull evenly on all the bolts and the repair is completed.

3. If the pipe has been broken cleanly into two pieces the ends can be joined together with a repair clamp—or they can be squared and used at poured bell fittings (see page 56 for pipe requirements at poured bell fittings.)

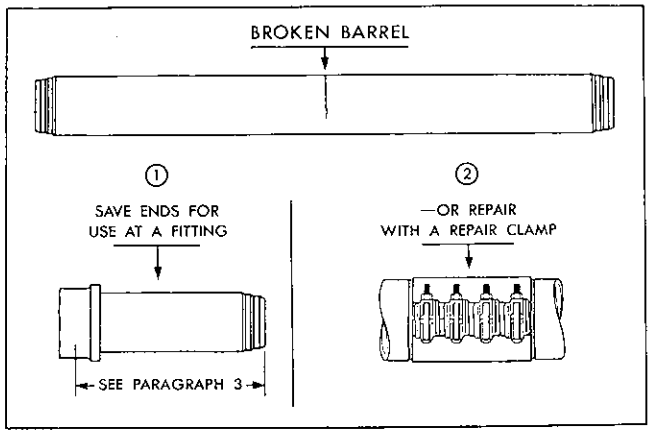


FIG. 82

4. Chips that extend more than ½" in as shown in figure 84 should be trimmed off and the end re-machined with a field machining tool as described on page 52. Test with

a knife point to make certain that pipe is sound beyond the chip—or wet the area with water and, as the pipe dries, a crack will become visible because it remains wet longer. It is advisable, before field-machining, to trim an extra inch off to be certain of reaching undamaged material.

5. Cutting, or abrading, the pipe is another type of abuse that may require repair. This takes the form of gouging, scratching, chipping and scraping actions which cut or wear away some part of the pipe surface. Such damage is caused by carelessly dragging pipe across sharp objects; by dragging heavy, rough objects across the pipe; or by constant friction against protruding bolt-heads, rubbing action of wires, etc.

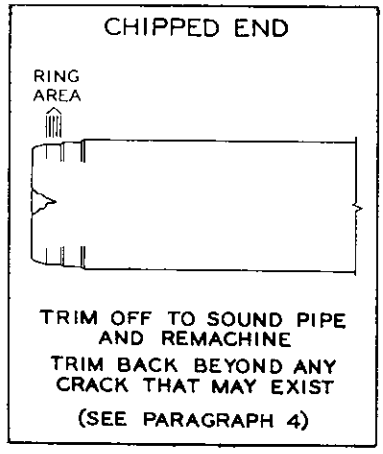


FIG. 83

6. On the machined end of the pipe (where water-tightness is attained by sealing with rubber rings) grooves and scratches that run lengthwise, and would be in the rubber ring area, will have to be repaired or trimmed off and remachined. Refer to Fig. 83. Slight scratches (not over $^1/_{16}$" deep and no wider than ¼") can be repaired by sanding the sharp edges so that the rubber rings will seat properly on the pipe. Wider or deeper scratches will prevent the ring from sealing properly and should be trimmed off.

7. Scratches that run around the pipe will not cause trouble if the rubber ring will fully cover the scratch (see Fig. 84)—but, if the ring will cross it at an angle, it would cause leakage and should be repaired or trimmed off as described in paragraph 6.

8. At other points along the barrel of the pipe (where the Ring-Tite Coupling and rubber rings are not used) a cut or abrasion that is larger than ¼" deep, ½" wide and 2" long should be repaired with a clamp.

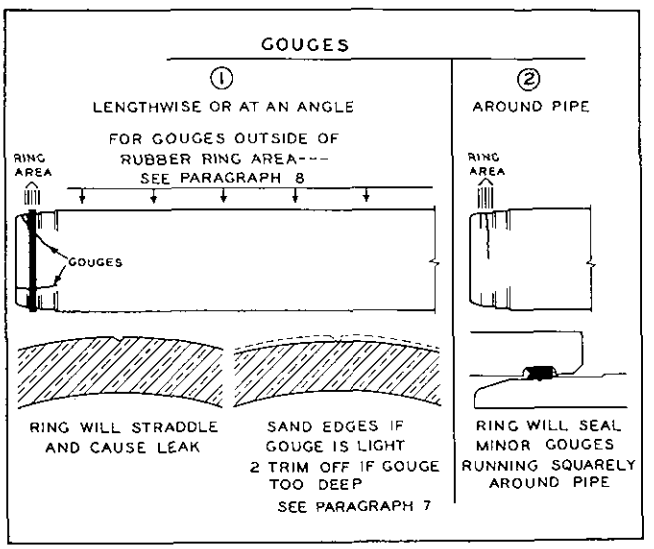


FIG. 84

Pulling Pipe Through Casings

When Transite Pipe is to be installed in casings under highways and railroad tracks, skids are used under the pipe to make the pull easier; to prevent the pipe and couplings from snagging on the inside of the casing; and to keep the installed line from resting on the couplings.

About Skids

Skids should be 24 to 30 inches long and thick enough to allow for clearance between the couplings and the casing bottom. (See Fig. 85.)

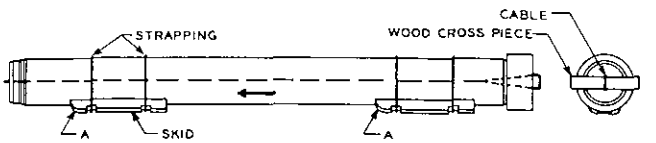


FIG. 85

The leading ends of each pair of skids should be rounded as at A in Fig. 85. The center of the skids should be at points approximately ⅕ the distance from each pipe end. Fasten skids with heavy strapping or wire to the bottom of the pipe approximately 20° off center. Notch the skids as shown for the strapping or wire to pass through.

Pulling the Pipe

A cable is then passed through the casing and the first pipe length and is fastened to a suitable wood crosspiece at the end of the pipe as shown. The cable is then pulled steadily (don't jerk) by a truck winch, tractor or other method until about 2 feet of pipe is left projecting out of the casing for assembly of the next length. (If cable is pulled at an angle make sure that the leading pipe end is protected from damage.)

The cable is then passed through the next pipe and the two pipes are assembled.

Check Rings Carefully

Extra care should be taken in checking the field assembled ring location immediately following each assembly as a misplaced ring would be difficult to correct once the pipe has entered the casing.

Pulling Pipe Through Casings

These assembled sections are then pulled into the casing leaving about 2′ out for assembly of the third length. This operation is continued until the Transite Pipe is through the casing.

Minimum Size Casing Required With Transite Pipe (In Inches)

Pipe Size	Casing Size (inside diameter)
3	9
4	10
6	12
8	16
10	18
12	20
14	24
16	26

TABLE T

Greasing the casing or the skids, especially when installing larger pipe sizes, will make the sliding easier. The casing can be greased by depositing a low grade grease at the end of the casing. Then attach rags to the cable and pull them through so that they act as swabs or spreaders. A rope attached to the cable will make it easy to retrieve.

After the line is through the casing it will be necessary to make a closure at one end (see page 44) to tie-in to the pipe already installed.

Backfilling

When the Transite Pipe is completely through the casing, the space in the casing under and around the pipe (three quarters of the distance to the casing top) should be filled with sand. This will prevent movement when pipe is under pressure. The sand can be forced into the casing with water, under pressure from a hose line. Care must be taken that not too much water is forced into the casing as there is the possibility that the pipe could float resulting in uneven support of the completed line. Under no conditions should wedges be used between the top of the pipe and the underside top of the casing to keep the pipe from moving under pressure.

Using Transite Pipe at Bridge Crossings

When Transite Pipe is used at bridge crossings care must be taken to follow the plans of the design engineer. The following information is general and should be of assistance in following engineering specifications.

Pipe at bridge crossings should be supported by hangers or supports—two to each pipe length—at points approximately ⅕ of the pipe length in from each pipe end. The method shown in Fig. 86 is typical of those used in bridge crossings.

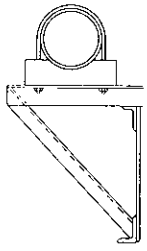


FIG. 86 — Typical method of supporting pipe at a bridge crossing

Whenever thrusts are expected in a line (at changes in direction, at reducers or at valves) bracing must be used to counteract the thrust. If at the point where the line comes from the ground to the bridge (or where it goes back into the ground) there are vertical changes of direction, thrust blocks or anchorage must be used as described in section beginning on page 62. Fig. 87 shows one method of using thrust blocks at vertical changes of direction.

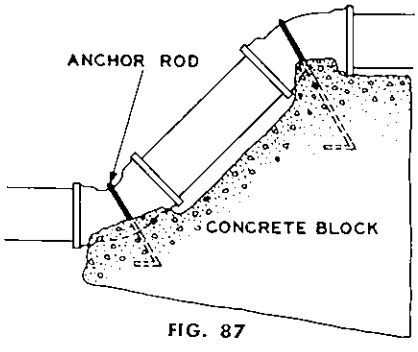


FIG. 87

EXPANSION & CONTRACTION

On bridges, allowance for thermal expansion and contraction of the structure is taken care of by expansion joints or gaps. Since the pipe is attached to the bridge (and will expand and contract with it) there must also be provision for expansion and contraction in the pipe line where it crosses expansion joints or gaps in the bridge. For this purpose the Ring-Tite expansion coupling is used.

As shown in Fig. 88 the Ring-Tite expansion coupling has one end machined for standard Ring-Tite assembly. The other end (without the groove) is machined for a rolling action to permit free longitudinal movement of the pipe within the coupling.

☛ NOTE: *The expansion coupling requires the use of an "end-trimmed" MOA length in the rolling end. Cut off the tapered portion of the pipe end to allow greater travel distance on the pipe barrel.*

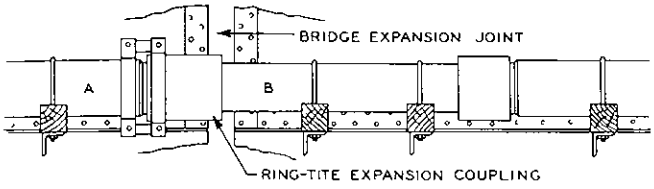
Assembly of The Ring-Tite Expansion Coupling

Select an un-belled length for use at A (Fig. 88). Bell the Ring-Tite end of the expansion coupling on to it, in the usual way. Check ring position. Next anchor the coupling to the pipe with the clamp—Fig. 88 to assure that all movement will occur at the rolling end of the coupling.

☛ NOTE: *With the standard expansion coupling a total movement of three inches is allowable. If the total movement at an expansion joint (from fully contracted to fully expanded) exceeds 3" a special coupling must be ordered.*

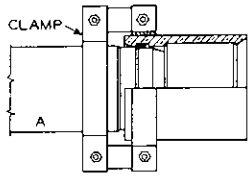
The expansion coupling must be set to the same relative position of expansion or contraction as the corresponding expansion joint in the bridge at the time of assembly. The "midpoint", referred to in Table U, can often be found by examination of the bridge expansion plate which will show evidence of the total movement. If the bridge is in a contracted position the coupling must also be in a contracted position. To do this stop marks are used on the MOA pipe to assure that the pipe end is set to the cor-

Location of Expansion Coupling

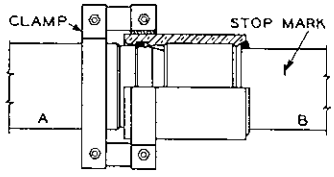


Schematic sketch showing location of Ring-Tite Expansion Coupling in relation to expansion joint in bridge. Pipe B is machined-over-all and with end trimmed to remove taper. (It could also be a standard length if one end can be long machined on job to provide for movement as indicated in sketches below.)

Assembly of Expansion Coupling

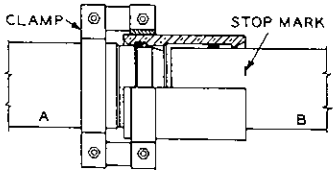


Standard-machined pipe (A) is first belled and clamp attached to coupling and pipe

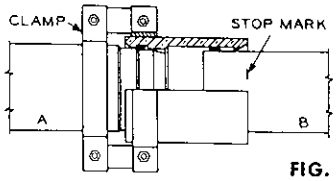


Stop mark location (on pipe B) varies with position of bridge. Refer to Table T for stop mark location

Setting of Expansion Coupling



When bridge is expanded—pipe (B) must be assembled to same relative position



When bridge is contracted—pipe (B) must be assembled to same relative position

(Sketches show maximum settings—usually the bridge will be at some "in between" point)

FIG. 88

rect position. Table U gives stop mark locations and correct position of rubber rings after assembly. After the stop mark has been made the rubber ring must then be put on the pipe end.

RING-TITE EXPANSION COUPLING
Settings for Stop Mark and for Final Position of Rubber Ring (in inches)

	Pipe Size (inches)	CONTRACTED (Bridge Joint Open)			Mid Point	EXPANDED (Bridge Joint Closed)		
1. Check bridge position (inches contracted or expanded from mid-point)		1½	1	½	0	½	1	1½
2. Under that measurement find STOP MARK LOCATION (see also Fig. 88)	3 thru 12	3½	4	4½	5	5½	6	6½
	14-16	4	4½	5	5½	6	6½	7
3. Final ring position should check to this distance from coupling face (±⅛")	3 thru 12	1¾	2	2¼	2½	2¾	3	3¼
	14-16	2	2¼	2½	2¾	3	3¼	3½

Example: assume 10" pipe and, at time of installation, bridge contracted 1½" from midpoint. Under the 1½" contracted column read 3½" for 4" thru 12" pipe. Mark this STOP MARK LOCATION on pipe B. Immediately below, against 4" thru 12" pipe find 1¾" which is the correct ring distance from face of coupling after assembly.

TABLE U

Placing Rubber Ring For Rolling Assembly

To place a rubber ring for the rolling assembly first catch the rubber ring around the bottom of the pipe—about ½" from the end. Snap it on to the pipe by pulling outward and upward as shown in Fig. 89. Let the fingers slide

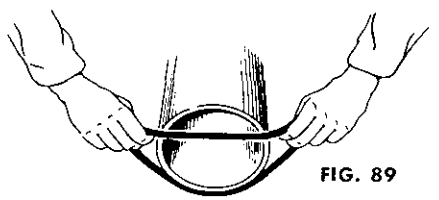


FIG. 89

along the ring—and pull outward just enough to keep knuckles clear of the pipe.

Set the ring at the end of the pipe by sliding it with the fingers (Fig. 90). Leave it at the end of the pipe for assembly.

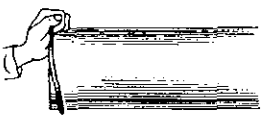


FIG. 90

The MOA length, with the ring and stop mark in place is then pulled into the expansion coupling with a friction puller until the edge of the coupling is even with the stop mark.

NOTE: *Tighten hangers on the MOA length before assembling the next length so that the position of the MOA length in the expansion coupling is not changed.*

To check the ring position in the rolling end of an expansion coupling first determine the correct assembled position of the ring in relation to the edge of the coupling—see Table U. Then insert the end of a steel measuring tape under the coupling until it touches the ring. The figure on the tape at the edge of the coupling will tell if the ring is correctly placed. Slide the tape all around the pipe barrel—do not jab as ring may be knuckled out in a small area. If it is, take it apart and re-assemble.

In Cold Climates

In cold climates where freezing may be a problem, lines at bridge crossings should be insulated, not only on the bridge itself but also where they enter or leave the ground and until they are below the depth of frost penetration.

TABLE OF DIMENSIONS TRANSITE RING-TITE PRESSURE PIPE AND COUPLINGS

All Dimensions Are In Inches

PIPE SIZE	D	D2(D4)	D3	Angle A°	D9*	D10	D5	D6	D7*	D8	ALL CLASSES N	ALL CLASSES Q	ALL CLASSES C	ALL CLASSES E
						CLASS 100								
3	3.00	3.74	3.90	12°	4.00	3.00	4.03	4.48	5.48	3.86	7.00	.92	2.40	3.90
4	4.00	4.64	4.80	12°	4.90	4.00	4.93	5.38	6.38	4.76	7.00	.92	2.40	3.90
6	6.00	6.91	7.07	15°	7.17	6.00	7.20	7.65	8.85	7.03	7.00	.92	2.40	3.90
8	8.00	9.11	9.27	15°	9.37	8.00	9.40	9.85	11.05	9.23	7.00	.92	2.40	3.90
10	9.85	10.89	11.05	15°	11.23	9.85	11.18	11.63	12.83	11.01	7.00	.92	2.40	3.90
12	11.70	12.99	13.15	15°	13.30	11.70	13.28	13.73	15.13	13.11	8.00	.92	2.90	4.40
14	13.59	15.07	15.23	18°	15.33	13.59	15.39	15.95	17.59	15.20	9.00	1.00	3.25	4.75
16	15.50	17.15	17.31	18°	17.41	15.50	17.47	18.03	19.86	17.28	9.00	1.00	3.25	4.75
						CLASS 150								
3	3.00	3.84	4.00	15°	4.10	3.00	4.13	4.58	5.58	3.96				
4	4.00	4.81	4.97	15°	5.07	4.00	5.10	5.55	6.55	4.93				
6	5.85	6.91	7.07	15°	7.17	5.85	7.20	7.65	8.85	7.03				
8	7.85	9.11	9.27	15°	9.37	7.85	9.40	9.85	11.25	9.23				
10	10.00	11.66	11.82	15°	11.92	10.00	11.95	12.40	14.14	11.78				
12	12.00	13.92	14.08	15°	14.18	12.00	14.21	14.66	16.79	14.04				
14	14.00	16.22	16.38	22°	16.48	14.00	16.54	17.10	19.62	16.35				
16	16.00	18.46	18.62	22°	18.72	16.00	18.78	19.34	22.14	18.59				
						CLASS 200								
3	3.00	3.84	4.00	15°	4.23	3.00	4.13	4.58	5.59	3.96				
4	4.00	4.81	4.97	15°	5.33	4.00	5.10	5.55	6.67	4.93				
6	5.70	6.91	7.07	15°	7.32	5.60	7.20	7.65	9.10	7.03				
8	7.60	9.11	9.27	15°	9.50	7.50	9.40	9.85	11.66	9.23				
10	9.63	11.66	11.82	15°	11.92	9.63	11.95	12.40	14.69	11.78				
12	11.56	13.92	14.08	15°	14.18	11.56	14.21	14.66	17.48	14.04				
14	13.59	16.22	16.38	22°	16.59	13.46	16.54	17.10	20.42	16.35				
16	15.50	18.46	18.62	22°	18.90	15.32	18.78	19.34	23.11	18.59				

*Subject to Manufacturing Tolerances.

LENGTH OF PIPE

STANDARD

Size 3" and 4".....10 ft.
(3" also available in 6'6" lgths.)
(4" also available in 13' lgths.)
Size 6" thru 16".....13 ft.
(6" also available in 10' lgths.)

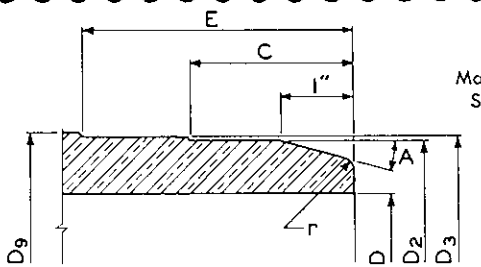
SHORT LENGTHS

Size 3", 4" & 6" in 10 ft. lengths: 3'-3" MOA and 6'-9" MEE (6'-6" MEE available on order to be cut in two for poured bell fittings.)
See Page 56, Table H.

Size 4" & 6" in 13 ft. lengths: 3'-3" MOA and 6'-6" MEE and MOA

Size 8" thru 16" (13 ft. lengths): 6'-6" MEE and MOA





Machining Detail of Standard Length

TOLERANCES
TRANSITE PRESSURE PIPE
AND RING-TITE COUPLINGS

ALL DIMENSIONS ARE IN INCHES

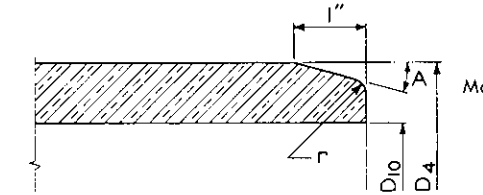
PIPE SIZE	CLASS 100 D_2, D_3, D_4	CLASSES 150-200 D_2	CLASSES 150-200 D_3, D_4	ALL CLASSES D_5, D_8	ALL CLASSES D_6
3-4-6-8	+.04-.03	±.02	+.04-.03	+.04-.02	±.02
10-12	+.04-.03	+.02-.03	+.04-.03	+.04-.02	±.02
14-16	+.04-.04	+.04-.04	+.04-.04	+.04-.03	±.03

N = ±.26
Q = ±.03
r = Radium Maximum ¼"
Minimum ⅛"

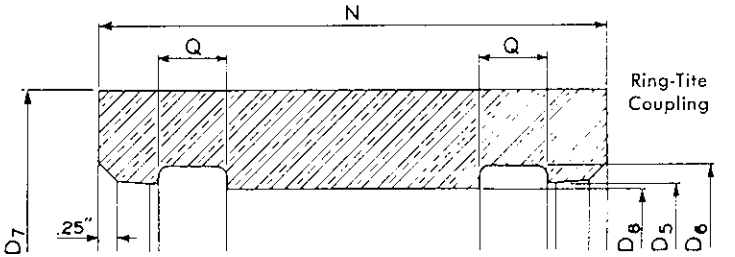
C = +.03-.09
E = +.03-.09
Angle A° = ±2°

LENGTH OF PIPE

13' and 10' lgths.....+0.0" −1.0"
6'-9" – 6'-6" and 3'-3" lgths.....±⅜"



Machined-Over-All Short Length



Ring-Tite Coupling

NOTE: RUBBER RING IDENTIFICATION
Rings are mold marked to indicate size and class of pipe with which they are to be used. Exception: For 6" & 8" Cl. 100 pipe use 6" & 8" rings marked Class 150-200.



APPENDIX

1. ASSEMBLY USING ROUND CROSS-SECTION RUBBER RINGS

2. ADDITIONAL INSTRUCTIONS AND DATA FOR PIPE SIZES 18" THROUGH 36"

1. ASSEMBLY WITH ROUND CROSS-SECTION RUBBER RINGS

(Applies to any pipe size with which round cross-section rings may be used)

First clean and lubricate pipe end as described on page 31 and clean the coupling groove.

The methods of assembly are the same as outlined in the section starting page 33 with the following special instructions when using round cross-section rings:

LUBRICATE RUBBER RINGS

Lubricate the ring before inserting it in the groove

A thin coating is sufficient and is easily applied by hand, cloth, etc., just after lubricating the pipe end. See illustration.

When inserting the lubricated ring, smooth it evenly, all around, against the back of the groove.



LUBRICATE RUBBER RING THOROUGHLY

CHECK RING POSITION

After assembly check rings to verify that they are in the grooves all the way around. Insert feeler gage as in Fig. 1A. Note that there is clearance between gage and sleeve (see arrow) proving gage is touching ring.

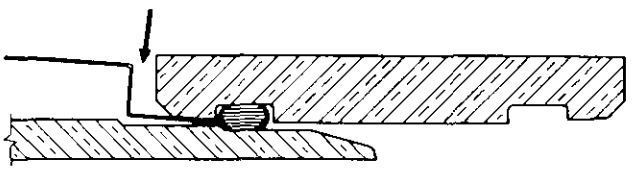
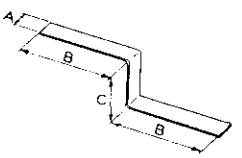


FIG. 1A



A	.25"
B	1.50"
C	.75"

Material: .016 x ¼"
Tempered Spring Steel

FIG. 2A

Now *slide* the gage all the way around. DON'T JAB AT INTERVALS. Ring may be displaced or knuckled out in a small area and could be skipped by jabbing. If gage fails to touch ring at any point (Fig. 3A-A) the ring is out of position and sleeve must be taken apart and reassembled.

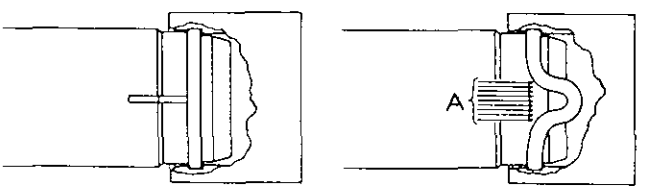


FIG. 3A

2. ADDITIONAL INSTRUCTIONS & DATA PIPE SIZES 18" THROUGH 36"

LUBRICANT REQUIREMENTS

Number of belled pipe lengths that can be lubricated from a 1½ quart can of lubricant.

Pipe Size	Belled Pipe Lengths per Can
18	15
20	14
24	12
30	8
36	7

TABLE AA

ASSEMBLY

Using the Lever Puller

In addition to the instructions given on page 34, the following practices are recommended when assembling the larger pipe sizes:

1. During the assembly take the weight of the pipe by the cable used for lowering. Then the assembly effort will be easier because the puller will not have to move the full weight of the pipe.

2. While pulling, have one man swing the free end slightly right and left. This "walking in" also reduces the assembly effort.

DO NOT USE THE LEVER PULLER FOR BELLING THESE LARGER SIZES OF PIPE—use the friction puller.

Using the Friction Puller

With the friction puller more force can be applied than with the lever puller. The friction puller will move the pipe and assemble it. It is not necessary to lift the pipe

as the pressure is applied. Use the friction puller for belling pipe on the job and for making closures. Use of the friction puller is described under Assembly, page 35, Belling, page 41 and Closures, page 46.

WEIGHT* OF PIPE AND COUPLING AND NUMBER* OF 13 FT. LGTHS. PER TRUCKLOAD

Size	Weight Lbs. Pipe Only per 13 ft Section	Coupling Each	Pipe and Coupling	Number of Lengths Per Truckload (including couplings) 5 Ton	10 Ton
			Class 100		
18	757	69	826	12	24
20	914	82	996	10	20
24	1269	113	1382	7	14
30	1922	187	2109	4	9
36	2723	261	2984	3	6
			Class 150		
18	1078	106	1184	8	16
20	1324	125	1449	6	13
24	1893	177	2070	4	9
30	2948	291	3239	3	6
36	4237	411	4648	2	4
			Class 200		
18	1541	147	1688	5	11
20	1898	169	2067	4	9
24	2720	236	2956	3	6
30	4231	393	4624	2	4
36	6090	565	6655	1	3

Rounded to nearest pound or number.

TABLE BA

Maximum Recommended Deflection at Ring-Tite Couplings

Pipe Size	18"-20"-24"	30"-36"
Deflection (Degrees)	During Assembly (Belled pipe only)	
	1½°	1°
	After Assembly	
	3½°	3°

TABLE CA

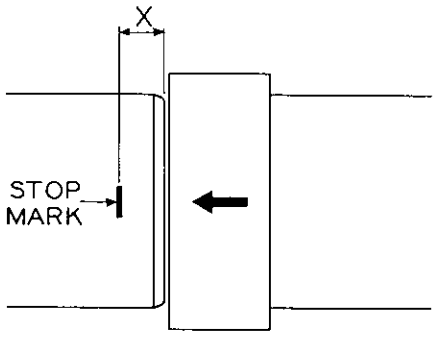
TRENCH WIDTH

Refer also to page 19 for importance of maintaining these widths at TOP LEVEL OF PIPE to provide working space and to avoid extra earth loads.

Pipe Size inches	Trench Width* (in inches) Minimum	Maximum
18-20	33	45
24	36	48
30	47	60
36	54	66

Widths should be maintained within these limits. Wherever it seems necessary to exceed them, provision should be made for the additional earth load imposed on the pipe.

TABLE DA



CLOSURES

STOP MARK LOCATIONS FOR ASSEMBLY TO M.O.A. PIPE

(See also Page 45)

Pipe Size (inches)	Stop Mark Position—X (inches from pipe end)
18-20-24	4½
30-36	5

TABLE EA

ADAPTORS

As described on page 55 the MJ-B adaptor is used for connecting to Mechanical Joint or Poured Bell Fittings. The class-to-class adaptor, in these larger sizes, is 6'6" long (see drawing) and is used to change from class 100 to 150 and from 150 to 200.

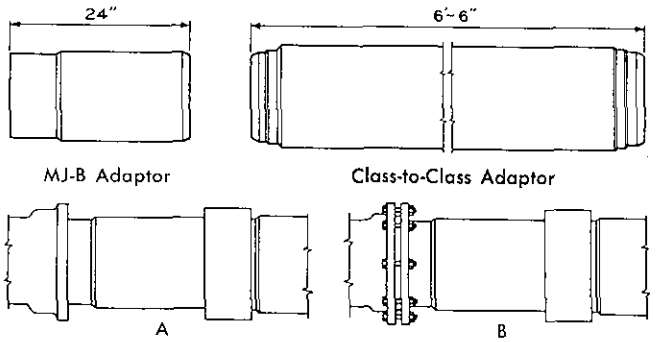


FIG. 4A – MJ-B Adaptor at —
A — Poured Bell Fitting
B — Mechanical Joint Fitting

STEEL TO RING-TITE ADAPTOR

The socket end of this adaptor is machined for a *rolling* assembly, using a round cross-section rubber ring, on to the steel pipe. (See Table GA for correct ring to use.) The other end of the adaptor is a standard machined end for assembly into a Ring-Tite Coupling.

To assemble:

1. Put a round rubber ring on the end of the steel pipe. (See page 102 for Placing Rubber Rings.)
2. Roll it back one turn so it can't be accidentally knocked off.
3. Put a stop mark on the steel pipe—see X in Table FA.
4. Line up a belled pipe in approximate position. (Pipe can be double-belled or coupling can be belled on to other end later, as preferred.)
5. Place a timber across the end of the steel pipe (set it

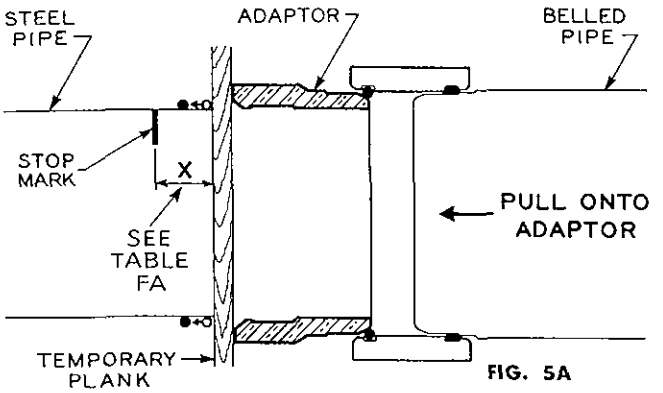


FIG. 5A

vertically so it will not interfere with puller). Hold adaptor in temporary position and use friction puller to pull belled pipe on to adaptor. (Lubricate adaptor end and ring as described under Lubrication, page 31)

6. Check ring position, release puller and remove timber.
7. Roll rubber ring to end of steel pipe, operate puller and pull pipe and adaptor on to the steel pipe until face of adaptor reaches stop mark.

☞ NOTE: *This is a* rolling *rubber ring assembly— DO NOT LUBRICATE.*

8. Check location of rubber ring, using gage shown in Fig. FA. Gage must touch ring all the way around to make certain it is not too far in. Hook the shoulder of the adaptor with the hooked end of the gage to make certain ring is not too far out.

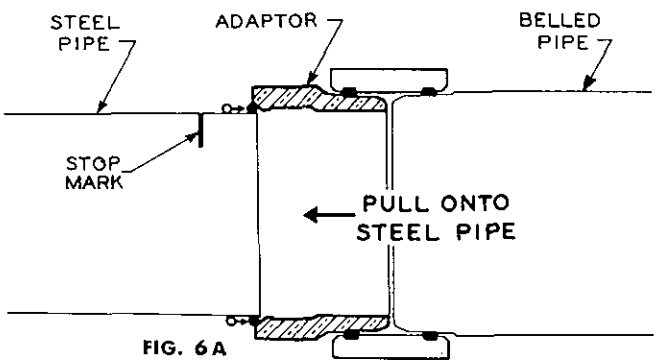


FIG. 6A

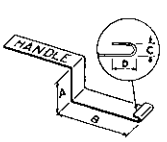
Pipe Size	Stop Mark Position (X) From end of Steel Pipe		Ring Gage for Rolling Assembly A	B	C	D
18"-20"	5"		1½"	2½"	¼"	⅛"
24"	5½"		2"	2¾"	¼"	⅛"
30"-36"	6"		2½"	3"	¼"	⅛"

TABLE FA

Ring Size
Steel to Transite Adaptor
(inches)

Steel Pipe Size	Ring Size to use
18	16
20	18
24	24
30	30
36	36

TABLE GA

Thrust at Fittings in Pounds
At 100 Pounds Per Square Inch of Water Pressure

Transite Pipe Size & Class	Tees	90 Deg Bend	45 Deg Bend	22½ Deg Bend
18"—100	31,100	44,200	23,850	11,950
150	34,400	48,500	26,400	13,400
200	38,600	54,400	29,650	14,900
20"—100	38,400	54,200	29,500	14,700
150	42,600	60,000	32,600	16,500
200	47,800	67,400	36,700	18,600
24"—100	55,000	78,000	42,200	21,100
150	61,500	86,700	47,200	23,900
200	69,000	97,200	52,900	26,800
30"—100	86,300	122,500	66,300	33,100
150	96,300	135,800	74,000	37,500
200	108,000	152,500	82,900	42,000
36"—100	124,500	176,800	95,500	47,700
150	139,000	196,000	116,600	54,000
200	156,000	220,000	119,600	60,700

TABLE HA

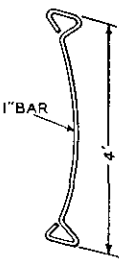
Side Thrust at Deflected Couplings
Per Degree Deflection
At 100 lb per sq in. Water Pressure

Pipe Size	Side Thrust (lbs)	Pipe Size	Side Thrust (lbs)
18	665	30	1880
20	790	36	2660
24	1150		

TABLE IA

TAMPING UNDER PIPE

Use a *curved* tamp bar, see illustration, to tamp soil in under the pipe. In all other respects follow the procedure outlined in the section starting page 80.



In the larger sizes, use a curved tamp bar. It enables men to stand on trench bottom and work soil in under pipe and couplings more efficiently than a straight bar.
Follow with flat tamper at sides as described on page 83.

BRACING TEST ENDS

In the larger pipe sizes, testing is often done between line valves which have been permanently anchored. The thrust created, either during a test or at any time when valve is closed is of considerable magnitude (see Table JA) and the design of the valve anchorage should be done by the Engineer, taking into account the local soil conditions.

Line caps, for testing in shorter sections, are also available. See page 88 for general comments on blocking, but provide heavier construction for these greater thrusts.

Thrusts at Test Ends (Dead Ends) for 100 psi Pressure

Pipe Size & Class	Thrust (lbs)	Pipe Size & Class	Thrust (lbs)
18"—100	31,800	30"—100	87,000
150	34,800	150	97,100
200	39,100	200	108,600
20"—100	38,900	36"—100	125,100
150	43,200	150	138,600
200	48,400	200	156,800
24"—100	55,600		
150	62,000		
200	69,700		

TABLE JA

VOLUME OF WATER REQUIRED FOR TESTING
in gallons per 100 feet

Pipe Size (Inches)	Gallons* *Per 100 Ft.*
18	1650
20	2040
24	2940
30	4580
36	6600

**Approximate—includes an allowance for absorption and wastage.*

TABLE KA

LEAKAGE ALLOWANCE
Gallons Per 100 Couplings Per Hour

Nom. Pipe *Dia.* (inches)	Test Pressure (psi) 50	75	100	125	150	200	225
18	6.90	8.38	9.75	10.87	11.93	13.80	14.62
20	7.66	9.31	10.83	12.08	13.26	15.33	16.25
24	9.20	11.17	13.00	14.50	15.90	18.40	19.50
30	11.50	13.98	16.25	18.13	19.88	23.00	24.37
36	13.80	16.80	19.50	21.75	23.85	27.60	29.24

**Evaluated on basis of 150 psi, this leakage is approximately equal to 65 U. S. gallons per 24 hrs. per mile of pipe, per inch of pipe diameter for pipe in 13-foot lengths.*

To determine total loss for a given length of pipe line;—against pipe size and under test pressure, find gallons per *100 couplings per hour.* Multiply this by actual number of couplings (each fitting bell equals one half coupling) and then by hours of test duration: For example, one mile of 20" pipe at 150 lbs. for 2 hours = 13.26 gals. per 100 couplings per hour. Since there are about *407 couplings per mile,* multiply 13.26 by 4.07 giving 54 gals. per hour, times 2 = 108 gals. allowable leakage in 2 hours.

TABLE LA

***Minimum* Size Casing Required with Transite Pipe**
(in inches)
Refer to Page 97 for "Pulling Pipe Through Casings"

Pipe Size	Casing Size (inside diameter)
18	32
20	35
24	40
30	50
36	58

TABLE MA

RING-TITE EXPANSION COUPLING
(See page 100 for how to assemble)
Settings for Stop Mark and for Final Position of Rubber Ring (in inches)

	Pipe Size (inches)	CONTRACTED (Bridge Joint Open)			Mid Point	EXPANDED (Bridge Joint Closed)		
1. Check bridge position (inches contracted or expanded *from* mid-point)		1½	1	½	0	½	1	1½
2. Under that measurement find STOP MARK LOCATION (see also Fig. 88)	18-20	4	4½	5	5½	6	6½	7
	24	4½	5	5½	6	6½	7	7½
	30-36	5	5½	6	6½	7	7½	8
3. Final ring position should check to *this* distance from coupling face (±⅛")	18-20	2	2¼	2½	2¾	3	3¼	3½
	24	2¼	2½	2¾	3	3¼	3½	3¾
	30-36	2½	2¾	3	3¼	3½	3¾	4

TABLE NA

TABLE OF DIMENSIONS TRANSITE RING-TITE PRESSURE PIPE AND COUPLINGS

All Dimensions Are In Inches

PIPE SIZE	D(D10)	D2(D4)	D3	D9*	D5	D6	D7*	D8	N	Q	C	E	Angle A°
						CLASS 100			**ALL CLASSES**				
18	18.00	19.90	20.06	20.26	20.22	20.78	23.01	20.03	10.00	1.00	3.75	5.25	22°
20	20.00	22.12	22.28	22.48	22.44	23.00	25.32	22.25	10.00	1.00	3.75	5.25	22°
24	24.00	26.48	26.64	26.84	26.80	27.36	30.10	26.61	10.00	1.00	3.75	5.25	22°
30	30.00	33.12	33.28	33.54	33.46	34.02	37.63	33.27	11.00	1.00	4.25	5.75	22°
36	36.00	39.78	39.94	40.20	40.12	40.68	44.92	39.93	11.00	1.00	4.25	5.75	22°
						CLASS 150							
18	18.00	20.94	21.10	21.30	21.26	21.82	25.12	21.07					
20	20.00	23.28	23.44	23.64	23.60	24.16	27.65	23.41					
24	24.00	27.96	28.12	28.32	28.28	28.84	32.92	28.09					
30	30.00	35.00	35.16	35.42	35.34	35.90	41.20	35.15					
36	36.00	42.04	42.20	42.46	42.38	42.94	49.28	42.19					
						CLASS 200							
18	18.00	22.18	22.34	22.54	22.50	23.06	27.73	22.31					
20	20.00	24.66	24.82	25.02	24.98	25.54	30.71	24.79					
24	24.00	29.62	29.78	29.98	29.94	30.50	36.71	29.75					
30	30.00	37.06	37.22	37.48	37.40	37.96	45.92	37.21					
36	36.00	44.52	44.68	44.94	44.86	45.42	54.94	44.67					

LENGTH OF PIPE
Standard: 13'0" MEE
Short Length: 6'6" MEE or MOA
(See also page 43)

NOTE: RUBBER RING IDENTIFICATION
Rings are marked to indicate size and class of pipe with which they are to be used.

*Subject to Manufacturing Tolerances.



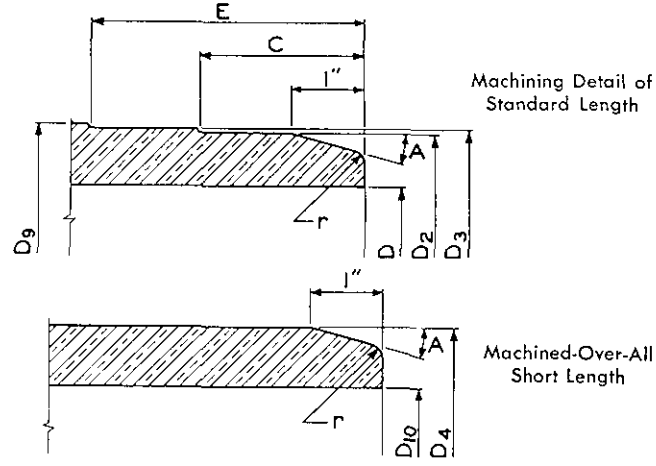
TOLERANCES
PIPE AND COUPLINGS

PIPE SIZE	ALL CLASSES D_2, D_3, D_4	ALL SIZES & CLASSES D_5, D_6, D_8	+.04, —.03
18	+.045, —.04		
20	+.045, —.04		
24	+.045, —.04		
30	±.05		
36	±.05		

N = ±.26
Q = ±.06
r = radius max. ¼" min. ⅛"
C&E = +.03, —.09
A° = ±2°

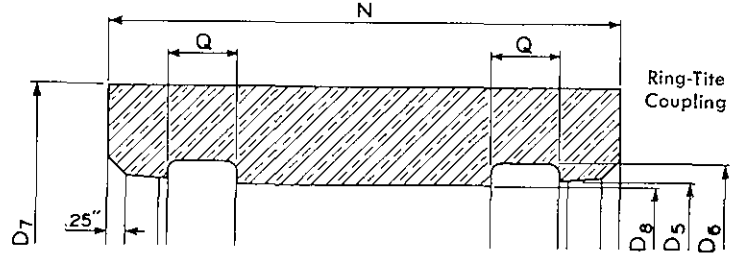
Length of Pipe
Standard: 13'0" +0.0" —1.0"
Short Length: 6'6" ±⅜"

Note: 3'3" Lengths not available in these pipe sizes



Machining Detail of Standard Length

Machined-Over-All Short Length



Ring-Tite Coupling

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