

SAFETY INSTRUCTIONS FOR A-2000™ PVC

UNLOADING AND INSTALLING



C  **NTECH**®
ENGINEERED SOLUTIONS

Preface

This instruction book is for your crews. Distribute it to help them install Contech® A-2000™ correctly. They are flexible pipes that must be installed following the trench construction, bedding, haunching, initial backfill, and other requirements of ASTM D 2321, "Standard Recommended Practice for Underground Installation of Flexible Thermoplastic Sewer Pipe."

Don't assume experienced workers know all the answers. Review these instructions with your supervisors and crews. It can mean a better job for you and your customer.

We suggest that you adopt a policy of performance testing the first few manhole runs. It will give you an early check that installation procedures are correct.

If you have any questions about these instructions, call your Contech Distributor or your Contech Sales Engineer, or carefully review the installation guide in the Contech A-2000 catalogs and ASTM D 2321.

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This safety alert symbol indicates important safety messages. When you see this symbol, be alert to the possibility of personal injury and be sure you understand the message that follows.

Terms You Should Know



Alerts you to hazards or unsafe practices that **CAN** result in severe personal injury or property damage.



Messages about procedures or actions that must be followed for safe handling and installation of A-2000 Pipe.



Falling or rolling pipe can cause severe personal injury or death.

Read and follow all safety instructions before unloading pipe.

Cold Weather Installation

1. Handle the pipe with more care in cold weather. PVC outer walls can become hardened as temperatures drop. When placing embedment materials in deep trenches and temperatures 0° - 32° F, it is required to use smaller aggregate (3/4- inch max.) and limit the height of dumping stone, not to exceed 20 feet.
2. Rubber gaskets become harder as the temperature decreases, gaskets tend to compress less, and when combined with PVC bells that become more installation sensitive, jointing becomes less forgiving. Proper bell-spigot alignment, adequate bell and spigot lubrication, and recommended joining procedures (-i.e. bar and block) all become more essential as temperature decreases. In addition, it is recommended to store the gaskets in a warm place prior to use.

Unloading and Handling

The following equipment is recommended for unloading pipe pallets:

- Forklift with full-length forks to engage entire pallet width, front-end loader or backhoe with fork adapters full length to engage entire pallet width.
- Nylon lifting slings of sufficient strength and length to safely handle entire pallet. Do not stand or ride on the pipe load during unloading.

NOTE: Pipes sizes 18" and less are palletized with steel straps around a wood frame. Full trailer width pallets (21" to 36") are not framed. Only forks of sufficient length to engage entire pallet width are recommended for unloading.

Table 1. A-2000 PVC Handling Weights

Diameter (in)	Weight (lbs/ft)
4	1.00
6	1.25
8	2.00
10	3.00
12	4.25
15	7.00
18	10.00
21	13.00
24	17.00
30	25.00
36	34.00

SAFETY INSTRUCTIONS

Failure to follow these instructions can result in serious injury or death and/or damage to pipe.

1. Only trained and authorized equipment operators are to be permitted to unload the trailer.
2. Wear approved safety hat and shoes, gloves, and eye protection.
3. Park the truck and trailer on level ground before you start unloading.
4. Keep all unauthorized persons clear of the area when the driver releases the binders from the trailer and during unloading.



5. Do not release steel strapping around the wood frame until the pallets have been placed on level ground and will not be moved again as a unit.

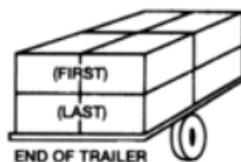
6. Know the capabilities and rated load capacities of your lifting equipment. Never exceed them.



WARNING

7. Do not stand or ride on the load of pipe while it is being unloaded. Do not stand beneath or near the pipe when it's being unloaded.

8. If unloading at multiple points, secure pallets between drop off points. For each unit of four pallets, always unload the top pallets first. (See diagram)



9. Never attach chains or wire rope to the pipe. They could damage the pipe.
10. Do not push pallets off the trailer or permit pipe to drop to the ground.
11. Do not drag A-2000 Pipe across the ground.
12. Do not stack A-2000 Pipe over two pallets high. Stacks of three or more pallets can damage bottom pipes and can become unstable.
13. Handle A-2000 Pipe with extra care in freezing or cold weather.

Trenching

Trenching practice and bedding materials shall be in accordance with ASTM D2321 and OSHA rules.

1.  The excavation needs to be wide enough and be supported adequately to allow a person to work safely.
2. Where trench walls are unstable, the contractor may elect to use sheeting, stay bracing, or a trench box for stabilization during pipe laying. If the conditions are severe, sheeting may be left in place.
3. Excessive groundwater may necessitate dewatering.
4. An unstable trench bottom must be stabilized at the engineer's direction. In such cases, install special foundation and bedding materials in 6-inch layers and compact.
5. Excavation from 6 inches to 12 inches below the pipe should be filled with acceptable bedding material and compacted to a minimum 90% Standard Proctor Density. Fill areas of over excavation beyond 12 inches with processed stone or gravel following standard bedding practices
6. Before installing the pipe, bring bedding material to grade along the entire length of the pipe.
7. When excavating in Class IV materials (silt, silty clays, and clays), provide a uniform, undisturbed foundation.

Installation Tips

1. At manholes, flexible manhole connections like rubber boots, A-Loks, etc. can be used. With rubber boot manhole connectors, install either a standard A-2000 double gasket (8"-10") or an A-2000 manhole gasket (12"-36") on the pipe spigot under the stainless steel strap (see manhole connection detail on page 12). Where manholes are manufactured with A-Lok connections, use a Contech PVC manhole sleeve.
2. Do not probe for the pipe with rods, shovels, or other sharp objects when excavating down to install laterals, etc. Instead, mark the elevation of the pipe with stakes or other markers to help locate it.
3. When haunching the pipe or digging down to install laterals, take care not to damage the pipe with shovels, or other construction equipment.
4. String only enough pipe to use during the day's laying operations.
5. A full line of adapters to other pipes is available. See Contech A-2000 Fittings Catalogs.
6. After proper assembly, the first load of backfill should be placed over the middle of the pipe. While the first load is being placed, the free bell end should be held safely on line by the pipe layer. This technique will minimize pipe movement during backfilling. Subsequent loads of backfill may be placed in a normal fashion.

Assembly of Pipe

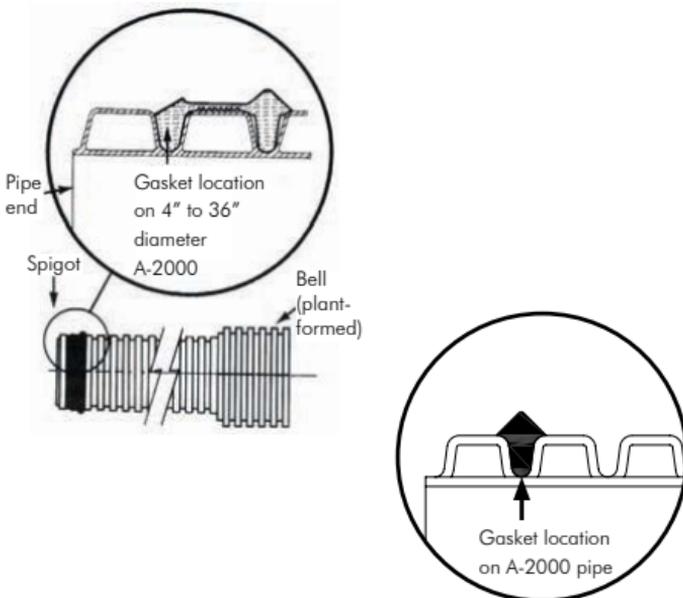
A. Gasket/Pipe Connection

1. The double sealing surface A-2000 gaskets are fitted to the first two full corrugations on the spigot end of the pipe as shown in the drawing.

The single sealing surface A-2000 Drainage gaskets are fitted in the first corrugation valley as shown in the drawing.

Gaskets are shipped loose and require field installation on the pipe spigot. The leading (lower) edge of the gasket is marked with the Contech logo and wording to distinguish it from the seating (higher) edge.

The low height seal is fitted into the first corrugation. The double sealing gasket is fitted into the first two full corrugation valleys.



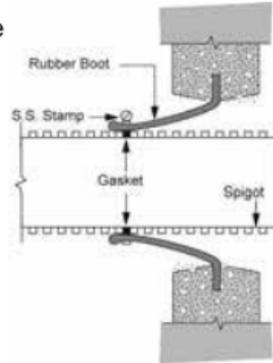
2. Thoroughly clean the bell and spigot ends, making sure they are free of mud and grit. If the gasket has been removed, make sure the gasket seat (the first two full corrugation valleys) is clean. Reinstall the gasket by stretching it over the spigot end and nesting it into the seat.
3. Use a Johnny mop or brush to apply a liberal amount of gasket lube to the gasket and to swab the inside of the bell. Take care to lube the chamfered (leading) edge of the bell. Keep lube and lubed surfaces free of debris.
4. Align the joint and push the spigot to the corrugation with the homemark. The total corrugation, with the homemark, should be visible when the pipe is properly "homed." When using a bar and wood block, make sure the block protects the pipe end from the bar. It is recommended to use a nylon sling to facilitate handling and joining 21" diameter and larger A-2000. When joining, NEVER use the backhoe bucket to push against the pipe bell. When pushing the joint home, make sure the bedding material is not pulled into the bell by the spigot. Material such as small stones or sand pulled into the bell as the pipe is stabbed can impair gasket sealing and cause leaks.

B. Manhole Connection

At manholes, flexible manhole connections like rubber boots, A-Loks, etc. can be used.

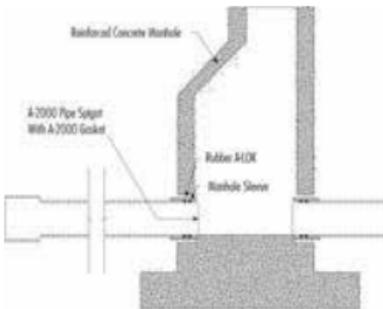
1. Boot: With rubber boot manhole connectors, install either a standard A-2000 double gasket (8" - 10") or an A-2000 manhole gasket (12' - 36") on the pipe spigot under the stainless steel strap (See manhole connection detail A.)
2. A-Lok: Where manholes are manufactured with A-Lok connections, use a Contech PVC manhole sleeve (See manhole connection detail B.)

If the manhole sleeves are not attached and the need arises in the field, follow the procedure below.



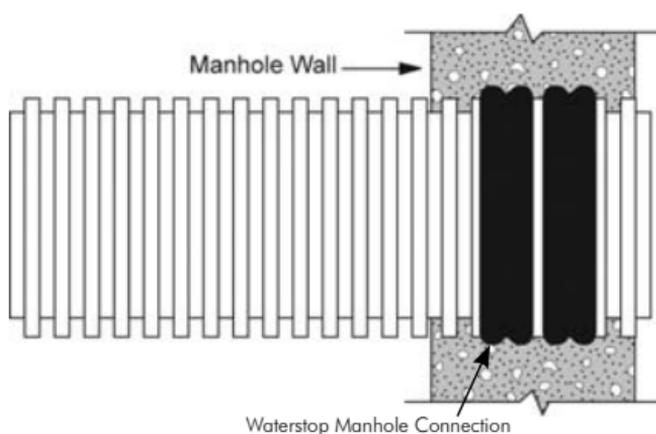
Manhole Detail A

- Place a standard gasket on the pipe about 6" from the end. Lube the gasket and the manhole sleeve and slide the manhole sleeve onto the pipe end. Restrict the coupling from sliding and push the unit (pipe and coupling) into the A-Lok connection (lube the A-Lok).



Manhole Detail B

3. Waterstop type manhole connections can be accomplished using A-2000 pipe gaskets. For cast-in-place concrete bottoms, precast bottoms with "mouse hole" or similar pipe-to-manhole entry that does not incorporate a flexible connection, use two standard A-2000 double gaskets for 8"-and 10"-diameter pipe, positioned on the pipe in the center of the manhole wall with the leading (the lower) edge of the gaskets in adjacent corrugations, then concrete grout or seal the pipe/manhole connections as required. For pipe with diameters of 12"-36" inches, use one standard A-2000 double gasket, positioned on the pipe in the center of the manhole wall, with the leading (lower) edge of the gasket closest to the inside of the manhole.



C. Field Cutting Pipe

A-2000 can be field cut to length. Cut through a corrugation valley using a hand or power saw. Fit the gasket following the procedure listed in "Gasket/Pipe Connection."

D. Installing Caps

Caps are installed the same way you make a gasketed joint. Caps need to be staked to make sure they are secure. Mark the lateral location and depth with a lath or other marker so that probing, etc. to locate the pipe is not required.

E. Installing Mechanical Plugs

Mechanical plugs may be used, but caps are recommended. (Mechanical plugs should not be used for air testing.)

Install mechanical plugs by following these steps:

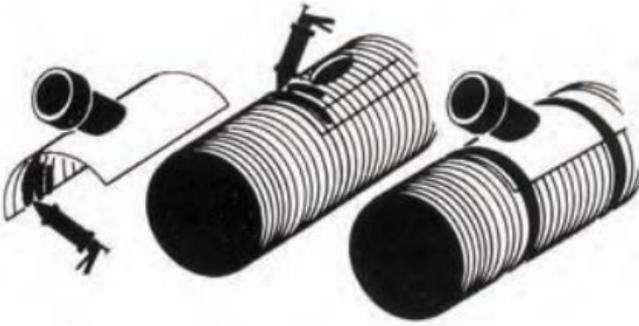
1. DO NOT USE LUBRICANT.
2. Insert into the pipe barrel, beyond the bell, until the back of the washer seats against the bell hub transition.
3. Hold and tighten the wing nut until firmly seated.
4. Stake the plug to keep safely secured during testing. Proper staking requires a spacer from the plug in the bell to a stake driven outside the bell.
5. Mark the lateral location and depth with a lath or other marker so the probing etc. to locate the pipe is not required.

F. Tapping/Saddle Connections

Saddle fittings are used for tapping in-service systems. Use inline fittings for new construction. Ribbed A-2000 saddles must line up with pipe corrugations. Stick-on templates are marked for proper orientation.

Follow these steps:

1. Place template on the pipe to mark the outline of the hole. Take care to line up the template with the corrugation valley properly. Instructions are located on the template.
2. Use keyhole or saber saw to cut the hole. Do not start the hole with a hammer or hatchet. Use a drill, awl, or other sharp cutting tool.
3. Thoroughly clean the pipe and saddle mating areas (e.g. MEK cleaner or other). Place the saddle in position on the pipe and draw a line around the outer edge of the saddle skirt to mark the area of pipe to be covered by the saddle. Use the recommended adhesive (Sikaflex® or similar) provided by others. Adhesive is in the caulking tube that uses a standard caulking gun. Proceed as described on the following page.



3.A. For saddles with ribbed skirt.

3.A.1. Place a 1/4 -inch bead around the cut opening in the pipe. Continue to make concentric rings with 1/4 -inch beads of adhesive about 1/4 -inch apart. The final ring should be just inside the area to be covered by the saddle skirt. Make certain when crossing corrugation valleys that the adhesive bead flows into the valley.

3.A.2. Apply adhesive to the underside of the saddle skirt in a similar fashion.

3.B. For saddle with smooth (underside) skirt.

3.B.1. Completely fill the corrugation valleys of the pipe with adhesive. The bead should completely fill the valleys and bulge above the corrugation crests throughout the area to be covered by the saddle.

3.B.2. Place a 1/4 -inch bead around the cut opening in the pipe. Continue to make concentric rings with 1/4 -inch apart. The final ring should be just inside the area to be covered by the saddle skirt.

3.B.3 Apply adhesive to the underside of the saddle skirt in a similar fashion.

With either type of skirt, a bead of adhesive can be applied to the cut edge of the pipe wall to seal the profile if desired.

NOTE: 8-inch to 36-inch saddle gaskets are also available to be used with smooth skirt saddles. Step 3.B.1. is not required for saddles with gaskets. In steps 3.B.2. and 3.B.3., adhesive may be applied to either the saddle or gasket surface.

4. Place saddle in position on the pipe and cinch in place with the two steel straps provided. Tighten straps uniformly by alternating back and forth between them, tapping the saddle lightly with a rubber mallet to aide in firmly seating the saddle in position (do not over-tighten the straps).
5. For attaching 21-inch to 36-inch (only) A-2000 saddle fittings with the smooth saddle skirt, follow the procedure described in Steps 1, 2, 3, and 3B above. In addition, place saddle in position on the pipe and fasten in place with the stainless steel screws provided. Holes are predrilled in saddles for location of screws.

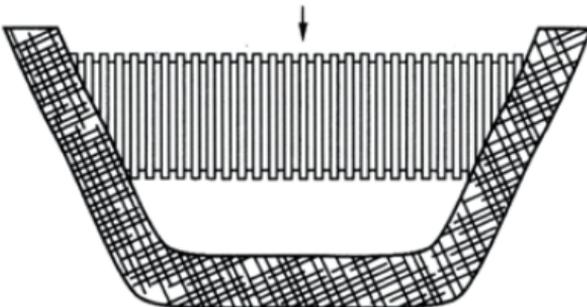
Repairs

Cut out damaged areas and cut a length of replacement pipe to fit. Use two flexible rubber couplings and follow these steps:

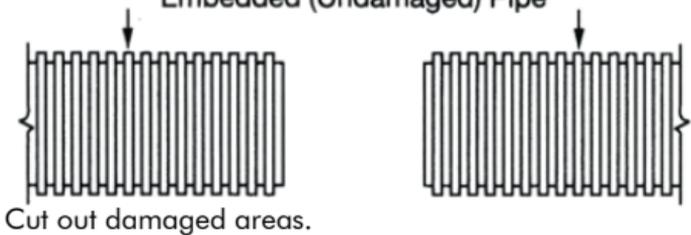
1. Expose the existing cut pipe ends to give working room under them.
2. Install a flexible rubber adapter on each end of the replacement section. Using gasket lube or vegetable oil as a lubricant, slide (or roll) the adapters back and position the replacement section.
3. Slide (or roll) the adapters over the joint at each end of the replacement section so they are centered over the joint. Use gasket lube or vegetable oil as a lubricant.
4. Tighten the two stainless steel bands, making certain they are properly positioned.
5. When optional shear stops are required, the split plastic ring is snapped around the repair coupling between the stainless steel bands (Steps 3 and 4). This ring is held in place by two additional stainless steel straps. The shear stop is installed prior to re-establishing bedding support.
6. Tamp bedding material under the points where it was disturbed. Replace haunching and initial backfill throughout the disturbed area.

Alternate Repair Procedure

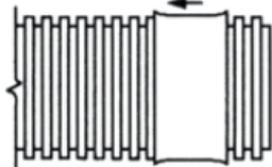
Location of Damaged Pipe



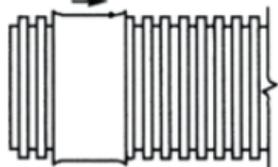
Embedded (Undamaged) Pipe



Coupling

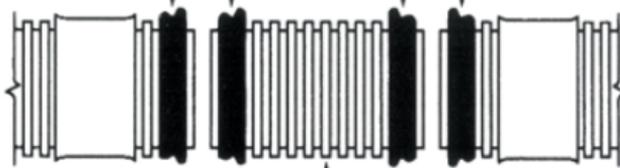


Coupling



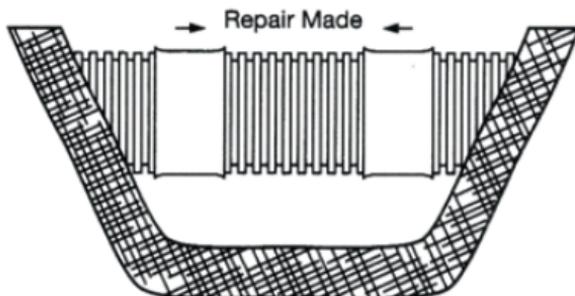
Place couplings over each spigot end of embedded pipe.

Gasket Placement



Cut to Fit

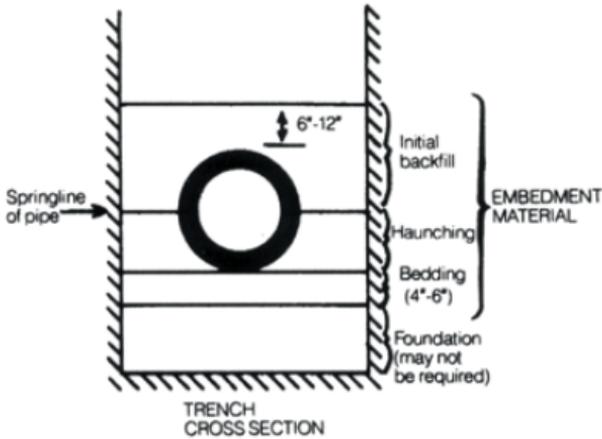
Place gaskets on each spigot end of the embedment pipe backwards (with the higher or seating edge of the gasket adjacent to the pipe cut.) Place gaskets on each end of the replacement piece in the recommended fashions. Draw homemarks a half coupling length from end of each spigot end on the replacement length. Liberally lube all gaskets and inside of couplings.



Align replacement length with existing spigots and push repair couplings to homemarks.

Installation of Pipe

A. Pipe Zone/Embedment Material



Embedment Materials

Embedment materials are those used for bedding, haunching, and initial backfill. All materials should be installed and compacted in 6-inch maximum lifts. ASTM D2321 classifies soil materials as:

Class IA Manufactured aggregates: Open graded clean, angular, crushed stone or rock, crushed gravel, broken coral, crushed slag, cinders or shells, large void content, with little or no fines. These materials compact with little or no mechanical effort.

Class IB Manufactured, processed aggregates: Dense, graded clean, angular, crushed stone (or other Class IA materials) and stone/sand mixtures with gradations selected to minimize migration of adjacent soils, containing little or no fines. Compact to 85% Standard Proctor Density with hand tampers or vibratory compaction.

Class II Clean, coarse-grained materials, such as gravel, coarse sands, and gravel/sand mixtures (1 1/2 inches maximum size). These materials are classified by the USC System as GW, GP, SW, SP, and GW-GC or SP-SM. Hand tamping or mechanical vibration is required to provide the necessary 85% Standard Proctor Density.

Class III Coarse-grained materials with fines including silty or clayey gravels or sands. Gravel or sand must comprise more than 50 percent of Class III materials (1 1/2 inches maximum size). Soils classified as GM, GC, SM, or SC meet these requirements. Hand tamping or mechanical vibration is required to provide the necessary 90% Standard Proctor Density.

Class IV Fine-grained materials, such as fine sands and soils, containing 50 percent or more clay or silt. Soils classified as Class IVA (ML or CL) have medium to low plasticity and the restrictive installation requirements may make their use prohibitive in the embedment zone. Soils classified as Class IVB (MH or CH) have high plasticity and are not allowed as embedment materials.

Class V These materials include organic silts and clays, peat, and other organic materials. They are not allowed as embedment materials.

1. Foundation

When the trench bottom is soft or unstable, overexcavate and replace with compacted embedment materials, as directed by the engineer.

2. Bedding

The bedding material provides uniform support to hold the pipe on line and grade. A 4-inch to 6-inch compacted bedding thickness is usually adequate. A flat shovel can be used to level the surface to grade. Bedding materials can be Class I, II, or III. It is recommended to use the same material for haunching as for bedding. However:

Class IA materials if used for bedding, must be used as haunching material to the spring line in a dry trench. To minimize the potential for migration, Class IA materials should be used to the top of the pipe in wet trenches or in trenches that will fall below the water table.

Class IB Install in 6-inch maximum lifts and compact to minimum 85% Standard Proctor Density.

Class II Install in 6-inch maximum lifts and compact to 85% Standard Proctor Density.

Class III materials are suitable only in dry conditions. Install in 6-inch maximum lifts and compact to 90% Standard Proctor Density.

Class IV and V materials are not allowed as bedding.

3. Haunching

Proper haunching provides a major portion of the pipe's strength and stability. Poor workmanship will lead to excessive pipe deflection and grade and alignment problems. Haunching materials can be Class I, II, or III.

Class I Materials

- Where the pipe will be below existing or future ground water levels or where the trench will be inundated, Class IA materials, when used, must be placed to the top of the pipe.
- Where conditions are dry and will remain dry, Class I materials need only be placed to the springline allowing Class II, III, or low plasticity Class IVA materials to be used as initial backfill. Class IA materials require less compactive effort than other haunching materials.
- Class IB materials should be placed in 6-inch maximum lifts and compacted to 85% Standard Proctor Density by hand tampers or vibratory compaction.
- Where Class I materials are used for bedding, Class I materials must be used for haunching materials to the springline in dry conditions and to the top of the pipe in wet conditions.

Class II Materials

- Need to be compacted to a minimum 85% Standard Proctor Density by hand tamping, mechanical vibrations, or where trench conditions allow, by flooding or puddling.
- Compaction by tamping or vibration must be done in 6-inch maximum lift thicknesses.

- Flooding or puddling requires a trench foundation capable of absorbing the water quickly so water movement down into the foundation consolidates the haunching materials.

Class III materials used as haunching materials must be compacted by hand or mechanical tamping.

- Place material under the lower haunch area of the pipe and compact to 90% Standard Proctor Density.

All Class IV and Class V materials should not be used as haunching material. They are difficult to compact and often don't supply continuing support.

NOTE: If care has been taken to shape the bedding material to the curvature of the pipe, only one stage of placement is required to bring the haunching material to the springline on smaller diameter pipe.

Haunching Tips

- Work enough material under the haunch of the pipe by hand to provide proper compaction and side support.
- Where trench walls are unstable, prevent the loss of side support by controlling sloughing, etc.
- Don't let the pipe move when placing material under the haunch of the pipe.
- Take care not to damage the pipe with shovels or tamping equipment.

4. Initial Backfill

Initial backfill materials extend from the springline to 6 inches to 12 inches above the pipe to provide the remainder of the pipe support and protect the pipe from stones or cobbles in the final backfill. Class I, II, III, or low plasticity Class IVA materials may be used. However:

Class IA materials must be used in wet trenches in Class IA bedding and haunching materials are used.

Class IB and Class II materials must be compacted in 6-inch lifts to 90% Standard Proctor Density.

Class III materials must be compacted in 6-inch lifts to 90% Standard Proctor Density.

Class IVA low plasticity materials (CL-ML) are not recommended since they must be compacted in thin lifts while they are at or near optimum moisture content to provide proper pipe support. These materials may be used only under the direction of the engineer.

High plasticity clays and silts (Class IVB), and all Class V materials are not to be used for initial backfill.

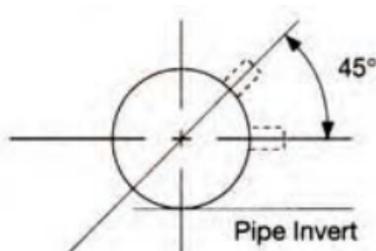
B. Deflection Control

- Embedment materials should be selected, placed, and compacted to minimize total deflections, and to maintain installed deflections within specified limits. Methods of placement, compaction, and moisture control should be selected based on soil types and installation recommendations.
- Lack of adequate compaction of embedment material in the haunch zone can result in excessive deflection, since it is this material that supports the vertical loads applied to the pipe. A key objective during installation of flexible thermoplastic pipe (or any pipe) is to work in and compact embedment material under pipe haunches, to ensure complete contact with the pipe bottom, and to fill voids below the pipe.

NOTE: Protect the pipe from stones or cobbles larger than 1 1/2 inches. When these materials are present in the final backfill, use initial backfill materials to a level of 12 inches above the pipe.

Deep Laterals, Laterals, Risers, and Drop Manholes

When laterals, deep lateral, risers, or drop manholes are required, the installation must be designed to ensure that the pipe and fittings are not damaged by loads generated due to soil settlement, dragdown, and/or poor installation practices. Generally, as sewer depths increase and/or soil quality declines, additional attention must be given to these loads to ensure a satisfactory installation.



In order to minimize lateral pipe “punch-through” potential, it is recommended to install wye or tee fittings at an angle no greater than 45 degrees from the horizontal centerline. Stacks (installing wyes or tees at a 90 degree angle from the pipe horizontal centerline) should not be allowed.

Special Notes

1. Excavate bell holes in bedding material to ease assembly. Keep bell holes as small as possible. After the joint is made, fill the bell hole with bedding or haunching material to provide uniform support throughout the pipe length.
2. Minimum cover:
 - a. For H20-Live loads, at least 12 inches of cover are required for Class IA embedment. Minimum cover shall be measured from the top of a rigid pavement or the bottom of a flexible pavement.
 - b. Before allowing construction equipment to cross the trench surface, a minimum of 24 inches or one pipe diameter (whichever is larger) is required for class I embedment. A cover of at least 36 inches is required for class II, III, and IVA embedment.
 - c. 48 inches of cover are required before using a hydrohammer during construction.
3. Recommended cover is limited to 30 feet. It should be noted that the deeper the pipe is installed, the greater the load applied to the pipe. Depending on specific job site conditions, A-2000 can be successfully installed deeper than 30 feet. Contact your Contech Sales Engineer for specific recommendations.

4. Compaction equipment:
 - a. Do not allow compaction equipment to contact pipe.
 - b. During haunching and initial backfill, do not use compaction equipment above the pipe until sufficient backfill is placed. This keeps compaction equipment from damaging the pipe.
5. When removing sheeting or other trench protection, don't disturb the embedment material. If sheeting or trench protection must be used below the top of the pipe, consider leaving it in place so as not to jeopardize side support for the pipe.
6. When trench box is being used, always stake the end of pipe prior to moving the box forward.
7. While industry studies, such as conducted by the PVC Pipe Association, have confirmed little or no deleterious effect resulting from UV exposure related to 2 years or longer of uncovered storage of PVC pipes – Contech recommends best practices be followed to limit excessive exposure to sun and contaminants prior to installation including first in/first out rotation of inventories.

Curved Sewers

Curved sewers may be built by cocking the joint to a maximum of 3 degrees for 4-inch to 10-inch diameters and to a maximum of 2 degrees for larger diameters. Table 1 below, provides necessary installation data:

Table 2. Joint Angularity

Minimum Radius of Curvature	
Pipe Diameter (in.)	Minimum Radius (ft.)*
4 - 10	238
12 - 18	358
21 - 36	372

* 12" - 36" diameters based on 14' laying lengths

Table 3. Standard Dimensions

A-2000 PVC Pipe			
(Standard Laying Lengths)			
(4"-10" diameters = 12'6"; 12"-36" diameters = 14' or 22')			
Nominal Diameters (in.)	Avg. O.D. Spigot (in.)	Avg. O.D. Bell (in.)	Avg. I.D. (in.)
4	4.3	4.8	3.9
6	6.4	7.0	5.9
8	8.6	9.4	7.9
10	10.8	11.7	9.8
12	12.8	13.9	11.7
15	15.7	16.9	14.3
18	19.2	20.6	17.6
21	22.6	24.6	20.7
24	25.6	27.9	23.5
30	32.2	35.1	29.5
36	38.7	42.3	35.5

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