SAFETY INSTRUCTIONS FOR A2™ LINER PIPE

UNLOADING AND INSTALLING

CONTECH®
ENGINEERED SOLUTIONS

Preface

This instruction book is for your crews.Distribute it to help them install Contech® A2™ Liner Pipe correctly.

A2 is a PVC segmental liner pipe that is inserted (sliplined) into an existing deteriorated pipe or into a casing pipe as a carrier 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 in accordance with the project specifications. It will give you an early check that installation procedures are correct.

If you have any questions about these instructions, call your Contech Sales Engineer.

Contents

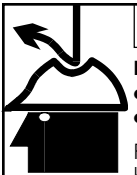
Terms You Should Know

⚠WARNING

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

SAFETY INSTRUCTIONS

Messages about procedures or actions that must be followed for safe handling and installation of A2™ Liner Pipe.



WARNING

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

Read and follow all safety instructions before unloading pipe.

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

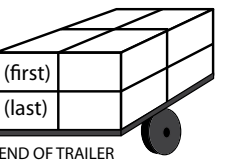
While industry studies, such as conducted by the PVC Pipe Association, have confirmed little or no deleterious effect resulting from UV exposure related to 2 years or longer of uncovered storage of PVC pipes Contech recommends best practices be followed to limit excessive exposure to sun and contaminants prior to installation including first in/first out rotation of inventories.

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.
7. Do not stand or ride on the load of pipe while it is 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 A2™ Liner Pipe across the ground.
12. Do not stack A2™ Liner Pipe over two pallets high. Stacks of three or more pallets can damage bottom pipes and can become unstable.
13. Handle A2™ Liner Pipe with extra care in freezing or cold weather. Plastic pipe is more brittle when cold.
14. Always follow all project, local,state, and OSHA rules and safety requirements.

Preparation for Sliplining

Follow all requirements of the project plans and specifications. Prior to sliplining, the following procedures should be performed to ensure satisfactory results are obtained.

1. The existing sewer line should be inspected to determine the condition of the line and identify problem areas or obstructions such as displaced joints, crushed pipe, protruding service laterals, roots, debris, out-of-roundness, or inside diameter reductions.
2. Verify and record the location, number, and size of all service laterals.
3. Where the pipe is to be pushed through existing manholes, check the alignment and clearance.
4. Remove any obstructions in the exiting line that will prevent insertion of, or cause damage to, the new pipe. Large joint offsets or severely deteriorated pipe may need to be removed or repaired prior to installing the pipe. These may be good locations for insertion pits or point repairs.
5. Thoroughly clean the exiting line as required (high-pressure water, buckets, reamers, or other mechanical methods). Not cleaning the line thoroughly can result in excessive jacking/pulling loads or liner pipe hang ups that may require additional insertion pits.
6. Verify adequate clearance for the liner pipe. Depending on the condition of the existing pipe and the obstructions present, it may be desirable to pull a trial liner or mandrel of the same outside diameter as the liner pipe (outside diameters are listed in Table 1 on Page 12). The

trial liner may be a short section of A2™ Liner Pipe or A-2000™ Pipe and should be attached to pulling cables at each end. Depending on the liner pipe size, it may be possible to lower the trial liner into the existing pipe through a manhole before any insertion pits are excavated. Otherwise, this procedure should be performed after insertion pits are excavated

Excavating Insertion Pits

A2™ Liner Pipe is installed from an excavated insertion pit or other location allowing access to the existing pipe (i.e. manholes, culvert ends).

When insertion pit locations have not been designated by the engineer or owner, the following conditions should be considered when selecting locations:

- Changes inline and grade
- Large joint offsets
- Severely deteriorated pipe sections
- Manholes being replaced
- Service laterals
- Pushing and pulling distances
- Accessibility (structures, traffic and existing utilities)
- Soil conditions

It is possible to reduce the number of insertion pits by sliplining in both directions from one location. Depending on the pipe diameter, the condition of the existing line and compressive/jacking loads, sliplining up to 3,000 feet or more from a single pit is possible.

After insertion pit locations have been designated or selected, the required size of the pit should be determined.

A2™ Liner Pipe comes in standard lengths of 10 feet or 20 feet (shorter lengths are available). The insertion pit length should allow for the longest length of pipe being used, clearance for joining pipe sections, adequate space for pushing/pulling equipment and trench sheeting or shoring. The width of the insertion pit should be sufficient to accommodate the new pipe diameter plus provide safe working room for the crew. The depth of the insertion pit should allow for exposing and removing the existing pipe's top down to the springline. The remaining bottom half of the existing pipe can serve as an open channel to maintain sewage flow. By-pass pumping is generally not required for segmental sliplining. A clean, level work area between the existing pipe and trench shoring will prevent dirt and debris from being washed back into the opened pipe.

If not previously checked, a trial liner/ mandrel may be pulled through the existing pipe to verify clearance once the insertion pit is completed.

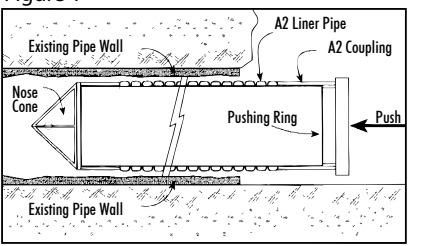
A2™ Liner Insertion

After the existing line has been properly prepared for liner pipe insertion and the insertion pit(s) have been excavated, liner insertion (installation) can begin. A2™ Liner Pipe can be either pushed or pulled through the existing line. The safe compressive/ jacking loads for A2™ Liner Pipe are listed in Table 1 on Page 12.

Pushing Method

1. A2™ Liner Pipe is placed spigot end first with the coupling end trailing. Typically, the leading pipe spigot end is protected by a tapered nose cone (available from Contech). The nose cone will help the liner pipe ride over small joint misalignments and other small obstructions and inconsistencies in the existing pipe. If liner passage is questionable, a steel cable can be threaded through the liner pipe during installation and attached to the nose cone. This allows the liner pipe to be retracted (pulled backward) if the liner pipe gets caught on an obstruction. A pushing ring (or plate) should be used on the coupling end to distribute the load from the pushing equipment (see Figure 1).

Figure 1



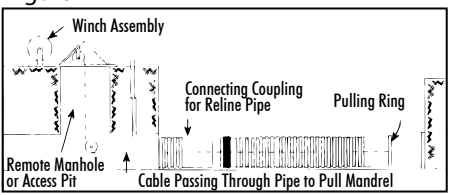
2. Both the gasket on the A2™ Liner spigot and the inside of the coupling should be lubricated prior to lowering the pipe into the existing (host) pipe and prior to joining. See the Assembling Gasketed Joints section on Page 13 for more information on joining pipe sections.
3. Set the first pipe into the existing pipe and push until only 2 to 3 feet remain in the insertion pit. The pipe should be restrained in preparation for joint assembly with inflatable air bags, wedges, or other devices. After several pipes are installed, a restraining device may not be necessary.
4. Lubricate and lower the next piece of pipe into position for joining. The spigot end is joined into the previously placed pipe's coupling. Pipe sections can be joined using pushing/pulling equipment or come alongs.
5. Repeat steps 3 and 4 until the liner installation is complete.
6. When liner pipe has been installed in both directions from a single insertion pit, the terminal ends are joined with closure couplings or a new manhole. See the Installing Closure Couplings section on Page 18 for more information.
7. Where A2™ Liner Pipe has been installed continuously through manholes, cut and remove the pipe from within the manholes as required.

8. Bulkheads should be formed to seal the annular space between the liner pipe and the existing pipe at all manhole and insertion pit entries and exits as required. If the entire annular space between bulkheads is to be filled with grout, then bulkheads should be constructed to provide adequate resistance to grouting pressures and to provide appropriate vent and drainage tubes. When service and lateral connections are to be connected, it may be desirable to complete downstream bulkheads for the line segment after connections have been reinstated to provide an outlet for sewage/drainage between the pipes.

Pulling Method

The pulling method is similar to the pushing method. A steel cable is threaded through the existing pipe and attached to a pulling ring (plate) positioned against the liner coupling (see Figure 2).

Figure 2



The cable is attached to a winch assembly to facilitate pulling the liner through the existing pipe section. After each pull, the steel cable is disconnected from the pulling ring and threaded through the next liner pipe section to be joined. After the pulling ring is reconnected to the cable, the process is repeated. A nose cone should be used on the leading spigot end.

Do not attempt to pull the leading spigot end. Doing so will disjoin the liner sections.

Table 1. Safe compressive/jacking loads for A2™ Liner Pipe*

Diameter (in)		Safe Compressive/Jacking Loads (lbs)
Nominal	Average OD	
12	12.8	3,200
15	15.7	9,100
18	19.2	12,300
21	22.6	18,000
24	25.6	23,800
30	32.2	30,900
36	38.7	37,000

**For "straight pushing" of A2™ Liner Pipe*

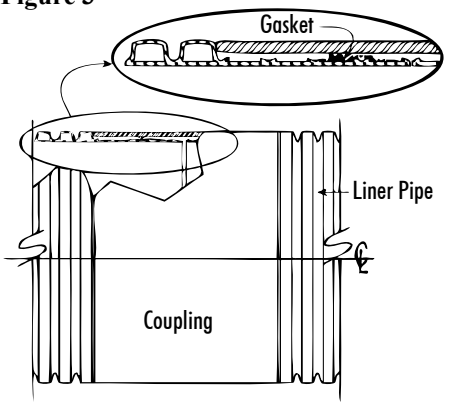
The pipe pushing/pulling loads should be monitored. Excessive force can "telescope" pipe joints and/or damage the liner pipe.

On some installations, it may be feasible to inject a bentonite slurry ahead of the liner or swab the exterior surface of the liner pipe with lubricant to provide a lower friction factor. This is commonly done from the receiving end of the run.

Assembling Gasketed Joints

A2 gaskets are fitted over the machined "corrugation ribs" on the spigot end of the pipe at the factory.

Figure 3



Follow these steps:

1. Remove the protective plastic wrap from the gasket.
2. Thoroughly clean the bell and spigot ends, making sure they are free of mud and grit.
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 coupling.
4. Align the joint, and push or pull the pipe from the trailing end until the first full corrugation on the spigot end contacts the coupling (see Figure 3 above). Maintain joining pressure on the joint

momentarily to ensure that the joint does not separate. Use either a pushing ring, pulling ring, or other appropriate device to distribute the load on the coupling to prevent damage. When pushing the joint home, make sure that debris or dirt is not pulled into the coupling by the spigot. Material such as small stones or sand pulled into the coupling as the pipe is stabbed can impair gasket sealing and cause leaks.

5. On field-cut ends, refer to the section Installing Closure Couplings on Page 18 for proper placement of gaskets.

Service and Lateral Connections

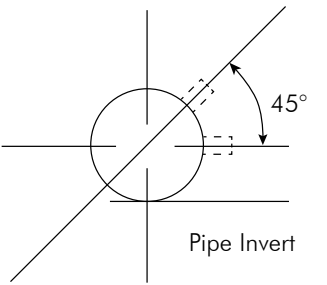
After the liner pipe has been installed in the existing pipe and before grouting of the annulus begins, service laterals (if any) should be reconnected to the new liner pipe.

Service laterals are normally installed by point excavations. When breaking or cutting through the existing pipe to expose the liner pipe for reconnection of service laterals, care should be taken so that the liner pipe is not damaged.

Standard PVC tapping saddles are available from CONTECH. See the Installing Saddle Fittings section on Page 16 for instructions on attaching tapping saddles to A2™ Liner Pipe. In addition to tapping saddles, other methods of reconnecting service laterals, including INSERTA TEES® and possibly remote control systems, can be used.

After connection to the liner pipe, the lateral pipe should be backfilled or encased as required.

When laterals, deep laterals or risers 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 (saddle or other connection) at a 90 degree angle from the pipe's horizontal centerline should not be allowed.

Installing Saddle Fittings

When attaching saddle fittings to A2™ Liner Pipe, follow these steps. The required steps vary depending on the liner pipe diameter and/or attachment method.

For 12"-18" saddle attachment with adhesive and screws: Follow the procedures described in steps 1,2,3,4,5,6 and 8.

For 12"-36" saddle attachment with a gasketed saddle and screws: Follow the procedures described in steps 1,2,3,5,6,7 and 8.

1. Stick a template on the pipe to mark the outline of the hole. Stick-on templates are marked for proper orientation. Take care to properly line up the template with the corrugation valley. Instructions are on the template.
2. Use a 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 surfaces (use MEK as a cleaner). 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 the pipe to be covered by the saddle. Use only the special adhesive provided (adhesive is in a caulking tube that uses a standard caulking gun).
4. 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.

5. 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 1/2-inch apart. The final ring should be just inside the area to be covered by the saddle skirt.
6. Apply adhesive to the underside of the saddle skirt in a similar fashion. A bead of adhesive can be applied to the cut edge of the pipe wall to seal the profile if desired.
7. Place the saddle gasket on the pipe, making sure that the hole is centered over the cut hole in the pipe. Firmly press the gasket into place.
8. Place the saddle in position on the pipe (or gasket) and fasten in place with the stainless steel screws provided (do not overtighten the screws). Holes are predrilled in saddles for location of screws. Holes are to be centered over corrugation crests. The number of screws varies with the type of saddle and pipe diameter.
9. Wipe off excess adhesive in the lateral tap opening. Smooth out the excess around the saddle skirt.
10. Allow a minimum of 48 hours cure time before air testing.
11. The above steps ensure proper installation. Do not use substitute adhesives. Allow a minimum of one hour cure time before subjecting the saddle to significant groundwater head.

Field Cutting Pipe

If there is a need for field modifications of A2™ Liner Pipe, cut through a corrugation valley using a hand or power saw to create a standard A-2000 spigot end. Once the A2™ Liner Pipe is field modified, the new spigot end is no longer compatible with the A2™ Liner coupling.

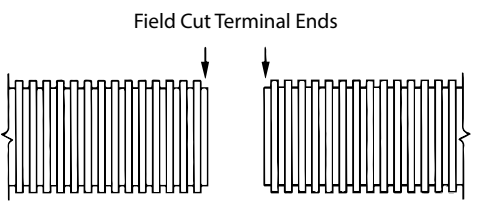
Refer to the section Installing Closure Couplings below for proper gasket placement on field cut ends.

Installing Closure Couplings

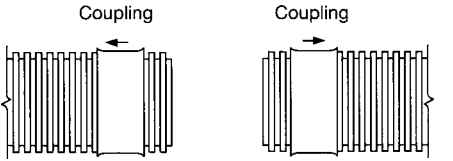
After sliplining in both directions from a single insertion pit, the terminal ends can be connected using closure (centerstopless) couplings on field cut pipe ends. Fabricated elbows are available for installation in the pit where there is a change in line direction.

Closure couplings fit over the pipe's external corrugations and require A-2000 gaskets. Two loose A-2000 gaskets are supplied with each closure coupling. Use two closure couplings, and follow these steps:

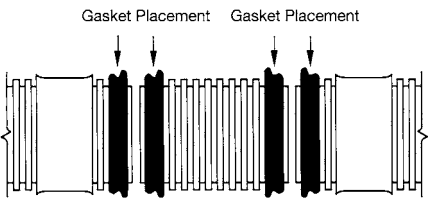
1. Cut the terminal pipe ends, leaving ends as shown below:



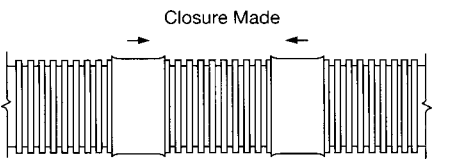
2. Slide a closure coupling over each terminal end.



3. Measure and cut a length of pipe to closely fit between the terminal ends. Each end of the pipe requires a field cut end. Place an A-2000 gasket on each spigot end with the lower leading edge of the gasket facing the closure coupling. The leading (lower) edge of the gasket is marked with the Contech logo and wording to distinguish it from the seating (higher) edge.



4. Draw homemarks a half-coupling length from each spigot end. Liberally lube all gaskets and inside of couplings.



5. Align the measured length with terminal ends, and push closure couplings to homemarks. In addition to standard closure couplings, flexible rubber adapters, gasketed stainless steel clamps and manholes can also be used to connect terminal ends.

Annular Space Grouting

Most sliplining installations require the annular space between the existing (host) pipe and the liner pipe to be grouted. Grouting of the annular space fixes the position of the new liner pipe, provides uniform support, increases allowable external hydrostatic pressure on the liner pipe and inhibits further failure of the host pipe. Introducing the grout into the annulus is accomplished by gravity flow or by pumping. Properly controlled grouting is essential to prevent liner pipe flotation, deformation, or even collapse.

Placement

There are many acceptable grouting methods, and they usually fall under two general categories: monolithic grouting and stage grouting.

1. Monolithic grouting (in one step) involves filling the entire annular space with one lift. Grout is injected, under pressure, from the upstream end of the pipe run from manhole to manhole, or from an insertion pit to manhole. The grout moves down the annulus in a wave-like fashion pushing water or sewage ahead of the grout.

2. Staged grouting involves placement of the grout in lifts. The liner pipe is grouted into a cradle in the first stage. After the first lift of grout has cured, the remaining lift(s) of grout is placed. Since the liner pipe is in a cradle after the first lift, and further deformation is limited, it may be possible to increase grout injection pressures, if needed, to ensure complete grouting of the annular space.

Other grout placement methods include grouting from the surface through drilled holes and slick-line grouting from a tube, within the annulus, that is retracted while grout is pumped through it.

For all placement methods, the annular space should be uniformly and completely filled on both sides of the liner simultaneously. Unbalanced or uneven grouting can affect liner shape, line and grade.

Flotation
When project plans and specifications require the liner pipe to be positioned on the invert of the existing pipe, flotation of the liner pipe resulting from grouting operations should be addressed. Depending on the type of grout and the grouting method being used, it may be necessary to perform one or more of the following to offset buoyant forces on the pipe:

1. Fill the liner pipe with water, partially or fully, depending on the grout density and grout lift thickness. When full of water, A2™ Liner Pipe has an averagedensity of approximately

57 lbs./c.f. For monolithic grouting, the liner pipe should be full of water, and the grout density must be lower than 57 lbs./c.f.

2. Stage grout with a suitable lift thickness, depending on grout density.
3. Attach blocking or spacers to the pipe exterior with strapping.

Maximum Pressure

The recommended maximum grouting pressure on A2™ Liner Pipe is 5 psi, although this limitation can vary when specific site conditions are clearly identified. Appropriate gauges should be used to monitor external pressures on the liner pipe. Bulkhead designs should provide adequate venting and draining tubes.

Hydrostatic head pressure resulting from the slope and/or diameter of the pipe, elevation change between the gauge and the pipe, etc. should be considered in addition to the grouting pressure on the gauge. The hydrostatic head pressure combined with the pressure on the gauge should not exceed the recommended maximum.

Heat of Hydration

During the grout curing process, heat is generated which can affect a thermoplastic liner pipe. A safe operating temperature for PVC pipe is approximately 140°F. Several factors can determine the amount of heat generated: the cement content, the cement type, and the volume of grout in the annular space. Heat build up can be controlled by staged grouting, by filling the liner pipe with water, and by selecting suitable grout mixtures.

Installation Tips

1. Handle the pipe more gently in cold weather. PVC becomes more brittle when cold.
2. When point excavations are required to reconnect services or laterals and grouting of the annular space is required, minimizing the size of the cut in the existing pipe may simplify grouting operations. A small opening that can be temporarily resealed to prevent backfill material or soil from entering the annular space will allow grout to flow past the point repair area. Otherwise, backfill material or soil may fill the annular space and restrict grout flow requiring more grout pumping locations.
3. For curved sewers or severely misaligned sewers, using short A2™ Liner sections may reduce pushing or pulling forces and prevent hang ups. For large diameter sewers, individual pipe lengths can be pulled through the line and joined within the line when necessary. When pulling individual pipe lengths, care should be taken to prevent damage to the spigot ends.
4. When the annular space between the liner pipe and the exiting pipe is to be filled with grout, estimating the required grout volume before grout placement begins may be helpful. The estimate may include grout volume requirements for filling voids or sink holes outside the existing (host) pipe.

Curved Sewers

Curved sewers may be built by cocking the joint to a maximum of 5 degrees. Table 2 provides necessary installation data:

Table 1. Joint Angularity

Minimum Radius of Curvature	
Pipe Length (ft)	Minimum Radius (ft)
10	115
20	230

NOTE: The allowable pushing/pulling loads shown in Table 1 on Page 12 will be reduced when joints are cocked.

NOTES:

NOTES:

NOTES:

For additional safety information, visit www.ContechES.com/safety.

CONTECH®
ENGINEERED SOLUTIONS

2/22 PDF