



HOUSELINER[®] SYSTEM



USER MANUAL HOUSELINER SYSTEM

SACPRO
RELINING INNOVATORS

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Products included in the Houseliner System

- Houseliner Liner
- Houseliner Resin
- Sacparts Branch Pipes
- Sacparts Relining Connection
- Sacparts Branching Connection

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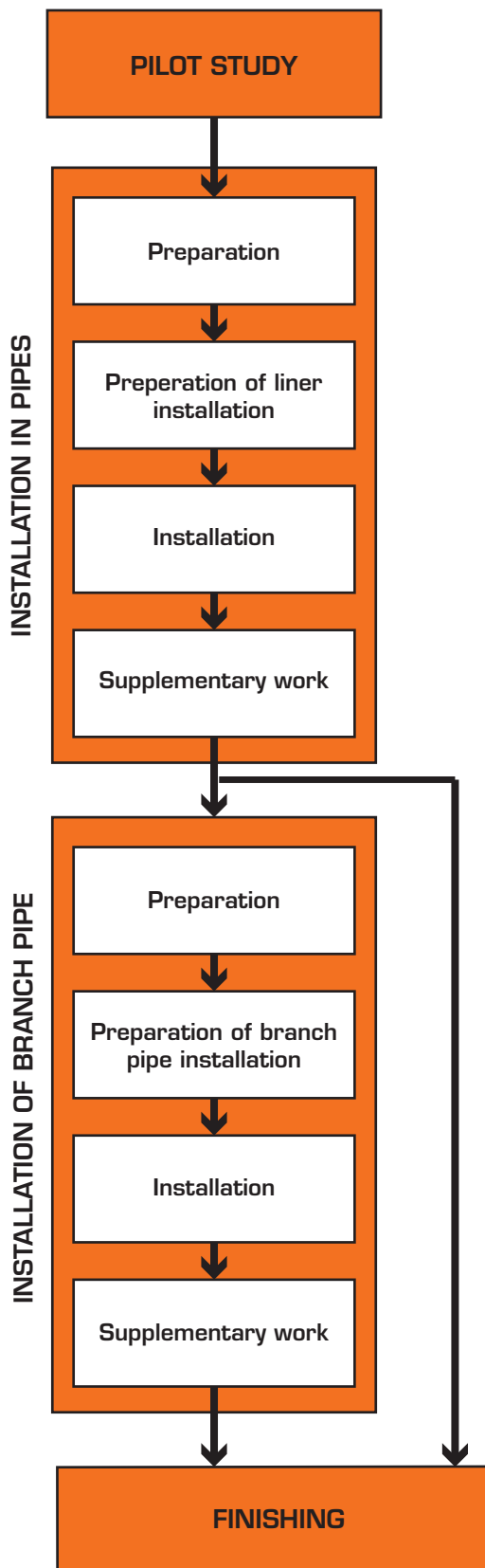
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1. PROCESS DESCRIPTION



PILOT STUDY

- Inspection
- Documentation
- Planning

INSTALLATION IN PIPES

PREPARATION

- Establishment
- Cleaning
- Inspection
- Documentation
- Protection and expose
- Preparation of installation equipment
- Installation of Branching Connection

PREPARATION OF LINER INSTALLATION

- Mixing of Epoxy
- Impregnation of liner
- Rolling
- Cutting of liner
- Winding of the liner into the Extruder

INSTALLATION

- Inversion
- Curing

SUPPLEMENTARY WORK

- Disassembly
- Inspection
- Opening for branch pipes
- Opening for Branching Connection

INSTALLATION OF BRANCH PIPE

PREPARATION

- Inspection
- Documentation
- Planning

PREPARATION OF BRANCH PIPE INSTALLATION

- Preparation of branch pipe tool
- Impregnation of branch pipe
- Fitting of branch pipe on branch pipe tool

INSTALLATION

- Installation of branch pipe

SUPPLEMENTARY WORK

- Disassembly
- Inspection
- Installation of overlapping liner

FINISHING

- Installation of Relining Connection
- Inspection
- Interconnection
- Documentation
- Cleaning
- Handover

2. INTRODUCTION

Focus on the final result! Relining restores the pipe system to like-new condition. Service life is estimated to be at least 50 years, and thereby is fully comparable to a new pipe system. Relining waste water and surface water pipe systems is an alternative to traditional pipe replacement. In many cases, pipe renovation using relining will reduce total costs. All products in the Houseliner System are documented in respect of environmental impact, life cycle and waste management. The system includes liner and epoxy from the same manufacturer and products are developed together in order to achieve optimal functionality and durability.

A properly executed installation ensures a genuine final result. Installation of epoxy-impregnated liner requires knowledge and understanding of the task. This instruction for Houseliner System is also a review and presentation on how installations are to be carried out, with a focus on safety, quality and final results. The instruction cannot replace training, but instead is part of training.

Sacpro AB trains installers, project managers and sales representatives in all aspects of the Houseliner System. Contact us for more information about our training program.

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3. SAFETY

Be careful with safety, both your own and of others. Loss of vision or damaged hearing as the result of prescribed protective equipment not being used can never be repaired. Therefore, follow the prompts in the installation manual and ensure that you always use full coverage clothing, protective gloves, visors or goggles and hearing protection. For installations in industries or at construction sites, the local safety regulations must always be observed. Contact the site manager or local safety representative before starting work.

3.1. APPROPRIATE USE

The products are intended to be used for the relining of depressurised waste water and surface water pipes. If used for any other purpose, we, as the supplier, take no

responsibility for any personal injury or damage to equipment or buildings unless written consent has been granted for non-conformant use.

Always study the manual for each equipment prior to use. Always replace damaged or missing components with original spare parts from Sacpro AB. Equipment and installation materials may only be used by trained staff.

3.2. SAFE WORKING ENVIRONMENT

The installation must be carried out under the best possible conditions so that no one is subjected to the impact of hazardous products without the necessary protective equipment.



HANDLING OF EPOXY

- Epoxy irritates eyes and skin. Always wear protective goggles and gloves.
- Do not eat, drink or smoke whilst working with epoxy.
- Avoid inhaling fumes! Make sure there is adequate ventilation when mixing. Mix in a fume cabinet designed for the purpose



SAFETY GOGGLES

Epoxy is corrosive.
Wear protective goggles!



FACE PROTECTION

Epoxy is corrosive.
Use face protection!



PROTECTIVE GLOVES

Epoxy is corrosive. Use welded laminate or butyl gloves.



FULL COVERAGE CLOTHING

Epoxy is corrosive. Use full coverage clothing.

3.2.1 Safety equipment for users

Installers who work with epoxy must use full coverage clothing, safety goggles or visors and welded laminate gloves or butyl gloves. For greater comfort and longevity of laminate gloves, wear one or several layers of nitrile gloves over them. If thin gloves are used, it is advisable to use multiple layers. In the event of spillage on the gloves, remove the outermost layer in order to avoid the spill being transferred to you or around you.

Equipment to allow immediate rinsing of epoxy splashes from the eyes must be provided in the workplace. Seek medical assistance and keep rinsing until the affected person has been attended.

In the event of skin contact with uncured epoxy, the affected area of skin must be thoroughly cleaned immediately. See safety data sheet.

If epoxy is spilled on clothing, this clothing must be changed.

3.2.2. Curing fumes

When epoxy cures, heat and fumes are produced. Curing fumes are extremely irritating to the eyes and respiratory system. Therefore, it is important that all residues that contain epoxy that has not yet cured, mixing buckets, cleaning cloths, etc., are kept separate until all residues have cured. The best procedure is to have a fume cabinet with a tight fitting lid. All material that can produce curing fumes is to be placed in this cabinet. The fume cabinet should be big enough to accommodate an agitation machine, a few mixing buckets and a waste bag.

3.2.3. Staff at the workplace

The employer is responsible for installers who work with epoxy. We recommend all staff who come in contact with epoxy must have undergone thermosetting plastics training. Make sure to follow local regulations. We also recommend that all installers should have undergone basic training in Houseliner System at Sacpro AB.

4. PILOT STUDY

A well performed pilot study is a prerequisite for effective project planning. Good planning is essential for the final result, both financially and in terms of quality.

All pipes that are to be renovated must be inspected with camera equipment. The condition of the pipes is to be documented, and steps must also be taken to ensure that the actual pipe routing corresponds to drawings. Lengths, dimensions, directional deviations and lateral movements, as well as branch pipes and their siting. Note deviations from the drawing with a custom sketch and note the dimensions. Decide where the liner should start and stop so that you can plan the number of exposures of the pipe.

5. INSTALLATION IN PIPES

5.1. PREPARATIONS

5.1.1. Notification and shut-off

When renovating the main pipes in apartment buildings, work will have an impact on the residents. In order to minimise disruption, notification should be given that the waste water pipe will be shut-off in good time before work begins. The project manager should inform residents before starting work. Direct notifications to the residents must be given in good time and in direct proximity to the shut-off of the waste water pipes. Current information about the progress of the project should be communicated to the residents, as well as to the client or its agent.

5.1.2. Inspection

The route to be installed must be inspected with camera equipment to ensure that it is consistent with the documentation from the pilot study. If necessary, the pipelines may be subjected to high pressure flushing in order to facilitate inspection.

5.1.3. Cleaning and milling

All types of pipe must be cleaned before relining begins. Any foreign objects must be removed. Cast iron pipes must be milled before relining in order to restore the original dimension and to obtain a clean and smooth surface. The cleaning tool must be adapted to the particular pipe dimension.

Whether pipes are to be milled with or without a water flow shall be determined on a case by case basis. The advantage of milling using a water flow is that deposits are flushed away during the process. When milling using water flow, water is supplied with an outflow in the waste water pipe that shall be milled. Milling begins downstream in the pipe and continues upstream. Otherwise, there is a great risk that the deposits will accumulate and block the pipe.

If the pipes are in excessively poor condition, they must be dry milled using a "shark tooth scraper". A cleaning chain may risk destroying the pipe wall. Dry milling should begin upstream and continue downstream in the pipe. Cleaning must be carried out immediately before relining. If the waste water pipe is put into use between flushing and relining, leakage may occur from any cracks or holes in the flushed pipe.

Plastic pipes, concrete pipes and ceramic pipes must be flushed under high pressure to remove contaminants and to ensure a clean surface prior to relining. Once the main pipe has been cleaned, a flush/suction vehicle should be used to clean the pipe.

5.1.4. Measurement of pipeline length

The pipe is to be measured using the inspection camera push cable by making a mark on the push cable and manually measuring from the camera head to the mark. The meter-in-picture camera is usually not sufficiently accurate to precisely determine length.

5.1.5. Protection with cover paper

Carefully cover with cover paper or plastic around the work site and at installations. Once the work is completed, everything must be uncovered and the workplace cleaned before work is completed.

5.1.6. Expose of start and end points

The pipe must be exposed and cut at points where relining is to begin and, in certain instances end. In order to obtain the correct angle end and standardised dimension on the pipe, an end pipe must be fitted to the cut pipe. Use a pipe clamp to fit the end pipe.

5.1.7. Preparation of the Extruder

Adjust the separator wheels inside the Extruder

Set the distance between the separator wheels to correspond to the width of the liner to be installed. The liner must be rolled in straight to have the ability to roll back the entire length if problems occur during installation.

Attach the pull strap in the Extruder

Measure and cut the pull strap. It must be at least the same length as the pipe that is to be renovated, plus the distance from the access point to the centre of the Extruder. Attach the pull strap by tying it together with the piece of pull strap that is already in the Extruder. **FIG 5.1.7.** Wind the pull strap into the Extruder and keep it under tension. The pull strap must be winded in on the top side of the shaft. It must be distributed evenly over the shaft. Leave a piece of strap outside the Extruder in order to allow the pull strap that is attached to the end of the liner to be securely tied at a later stage.

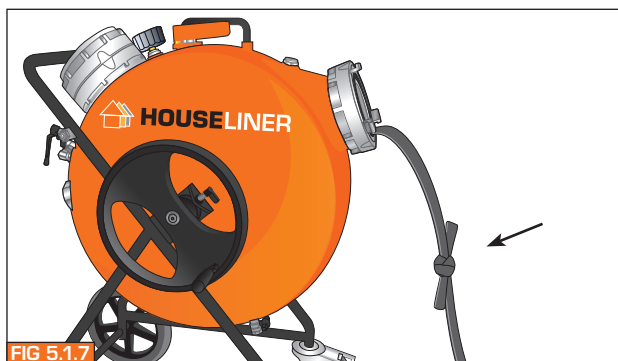


FIG 5.1.7

Connect the precision regulator

Connect the regulator to the Extruder. Select the connection to which it is easiest to connect the regulator. In order to avoid accidental pressurisation of the Extruder, close the valve to which the regulator is connected and open the other valve. Connect compressed air to the regulator. Use only dry and filtered compressed air to prevent contaminated air from destroying the regulator.

5.1.8. Setting of roller gap

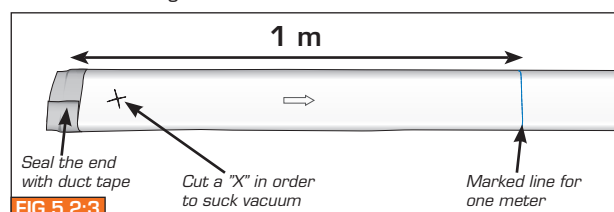
Set the roller gap on the roller mill. The recommended roller gaps can be found in the roller gap table, see "Roller gap and epoxy access" on page 19. Updated roller gaps in the event of changes in the product range are available from our website www.sacpro.se. If you use a roller without a scale for roller gap reading, use a gauge with the correct measurement in order to set the roller gap.

5.2. LINER PREPARATION

For standard installation, i.e. where it is possible to cut the sealed end after installation, a sealed end is to be used on the liner. For installation with open end, see chapter "Installation with open end".

The direction of the liner is determined and marked with an arrow indicating the direction of the inversion. The arrow should point into the pipe during installation, which means that the arrow is backed into the Extruder.

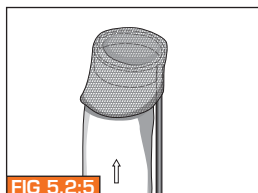
1. The liner must be cut to the correct length. The total length of the liner must be the length of the pipe section which shall be renovated, plus that used from the Extruder to the access point plus an additional meter.
2. Mark out one meter using a marker from the end that will eventually be tied together with the pull strap. **FIG 5.2:3** That part must later be cut off after the liner has been impregnated. The last metre of liner takes care of any excess epoxy and must be cut away after rolling.



3. Seal the end with duct tape and cut a "X" in the liner of about 20 x 20 mm in order to suck vacuum. **FIG 5.2:3** The "X" must be cut about 100 mm in from the tape. There must be enough tape to wrap at least once around the liner with an overlap. The suction cup must then be placed on the cut "X".

4. For easier handling of longer lengths, the liner may be suspended on hangers on a roof rail. First hang the end of the liner that will be rolled last.

5. Fold a collar on the end that is to be attached to the inversion. The collar is to be suspended on the liner holder **FIG 5.2:5**, which facilitate filling epoxy in the liner.



6. To vacuum the liner, the end of the liner must be sealed. An easy way to do this is to fold the liner about 1 metre from the end and compress it in between the rollers in rolling mill.

7. Press the suction cup securely over the cut cross of the liner and start vacuuming. After a brief period, the suction cup will be held securely by the vacuum. Leave the vacuum activated for the remainder of the impregnation process. The liner is now ready to be impregnated.

If new connections are required on the stretch that is to be relined, e.g. for new kitchen connections, a Sacparts Branching Connection must be installed before the pipe is relined. See chapter "Installation of Sacparts Branching Connection" on page 13.

5.2.1. Mixing of epoxy



When mixing epoxy, you need the following protective equipment: safety goggles, protective gloves, full cover clothing and respiratory protection. Make sure that the room in which mixing is done is well ventilated.

Important information regarding thermosetting epoxy



We recommend all staff who come in contact with epoxy must have undergone thermosetting plastics training. Make sure to follow local regulations. Liquid epoxy is corrosive and sensitising, which means it can break down the body's defences and induce future allergies. During a curing process in which high temperatures, curing fumes are produced. These fumes are extremely irritating to the eyes and respiratory system. Therefore, it is important to always use full cover clothing, protective gloves, respiration protection and safety goggles or a visor when working with uncured epoxy. All waste and residue from the preparation must be placed in a fume cabinet fitted with an extraction device.

8. The epoxy is supplied in separable buckets. The upper larger bucket contains the base component. The lower smaller bucket contains the hardener. Separate the buckets by tapping lightly with a hammer on the lip of the lower bucket.

9. Open both buckets.

10. Pour the contents from the small bucket into the big bucket. All contents must be used in order to get the correct mixing ratio. If only a small amount of epoxy shall be used, see "Mixing table for epoxy" on page 18.

11. Mix thoroughly using a slow-speed agitator for about 5 minutes. The mixing process must be slow in order to avoid air getting mixed into the epoxy. To facilitate pouring, a spout may be bent into the edge of the bucket.

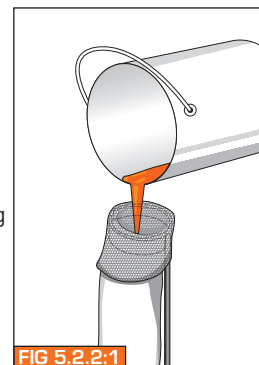


The liner and epoxy in the Houseliner System are designed to work together. All documentation and testing of the final product is based on the fact that they are used together. Always use liner and epoxy are from the same manufacturer.

5.2.2. Impregnation of liner

Fill epoxy in the middle of the opening of the liner so that the end of the liner is kept dry.

FIG 5.2.2:1 This helps when the liner is to be handled, and particularly when the end shall be attached to the inversion coupling sleeve, see "Winding of liner into the Extruder" on page 8. The liner must be filled with epoxy up to where the fold of the liner is pinched between the rollers in rolling mill. Release the liner from the rolling mill and fill up with the remaining epoxy. The vacuum must be connected to the liner during the entire process.



5.2.3. Rolling

Take care to ensure that the roller gap is correctly set, see "Roller gaps and epoxy access" on page 19.

If you use a liner from Brawoliner, the loose-fitting longitudinal surfaces of the coating on both sides of the liner must be turned upwards and downwards during rolling. This ensures that the loose part of the coating is not stretched during rolling.

Roll the liner and ensure that the liner is completely im-

pregnated. Remove the suction cup to avoid epoxy being sucked into the vacuum pump. The rolled liner is to be placed in cold soapy water in order to extend working time and lubricate the liner. Do not place the open start and end sections in the soapy water.

FIG 5.2.3

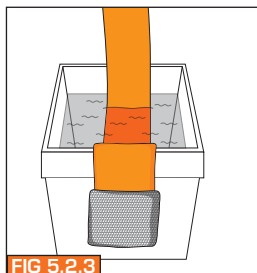


FIG 5.2.3

5.2.4. Attaching the pull strap (also known as the fish)

Squeeze off excess epoxy using a rolling pin, approx. 100 mm before and after the drawn line where the liner is to be cut. The excess epoxy is to be pressed out into the extra piece of one metre that was previously added to the total length of the liner. FIG 5.2.4:1

FIG 5.2.4:1

1. Tie a knot to the end of the pull strap. Place the pull strap in the middle of the lining so that the knot is approx. 200 mm before the line. FIG 5.2.4:2 The pull strap must be approx. 700 mm in total.
2. Fold the liner so that a cross section of the liner would look like an M with the pull strap in the centre. FIG 5.2.4:3
3. Attach two hose clamps before the line around the liner in order to squeeze the liner together around the pull strap. Tighten the hose clamps loosely.
4. Pull out the knot on the pull strap to the first hose clamp so that the knot sits rigid. FIG 5.2.4:4
5. Tighten the hose clamps. Fold in the end of the hose clamps.

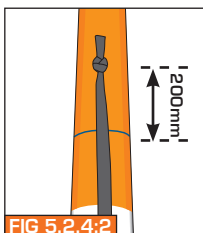


FIG 5.2.4:2

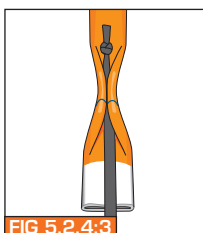


FIG 5.2.4:3

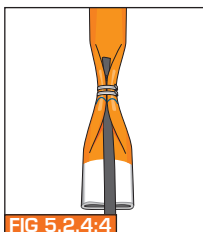


FIG 5.2.4:4

6. Lift away the pull strap and then cut off the liner along the line. Place the cut off piece of liner in a fume cabinet to ventilate fumes.

FIG 5.2.4:5

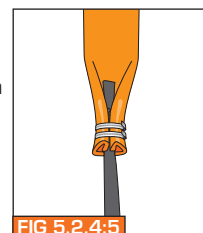


FIG 5.2.4:5

7. In order not to damage the coating during inversion, the hose clamps must be taped using duct tape. Start by winding the tape loosely from the hose clamps to a bit out on the pull strap. Then wind the tape more tightly and press it tighter on the way back.

FIG 5.2.4:6

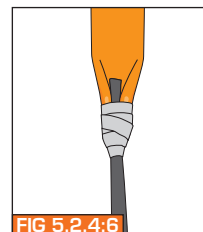


FIG 5.2.4:6

5.2.5. Winding of the liner into the Extruder

Tie the pull strap that is secured on the liner to the pull strap that is rolled into the Extruder. Keep the liner under tension when winding in. FIG 5.2.5:1 This improves control during the inversion process. Leave approx. one half metre of the liner outside the Extruder and thread the end through the inversion sleeve coupling before fitting it to the Extruder. Thread the end of the liner around the edge of the inversion coupling sleeve to the extent that it can be firmly secured using double hose clamps. FIG 5.2.5:2 Tighten the clamps and, using the wheel, ensure that the liner is stretched inside the Extruder.

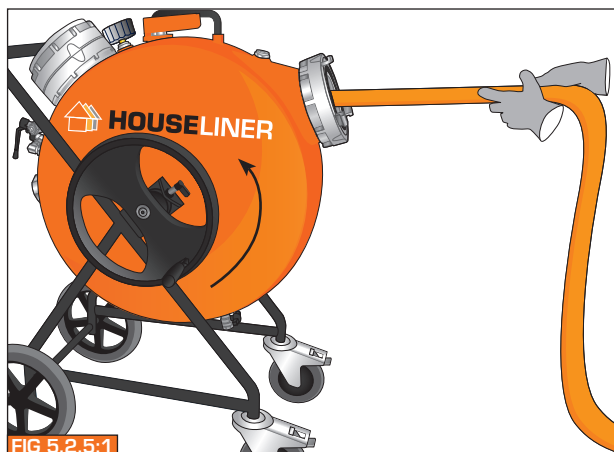


FIG 5.2.5:1

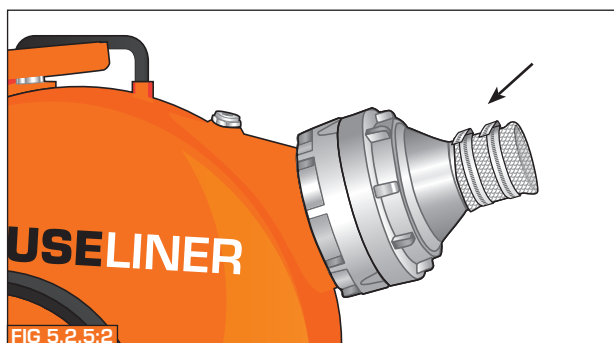


FIG 5.2.5:2

5.3. INSTALLATION

5.3.1. Inversion

1. Position the Extruder so that the end opening of the inversion coupling sleeve lines up with the opening of the pipe with a gap of approx. 30-40 mm. Use a piece of LDPE hose, which will function as protection between the pipe and the inversion coupling sleeve to avoid spillage and more easily guide the liner into the pipe. **FIG 5.3.1:5**

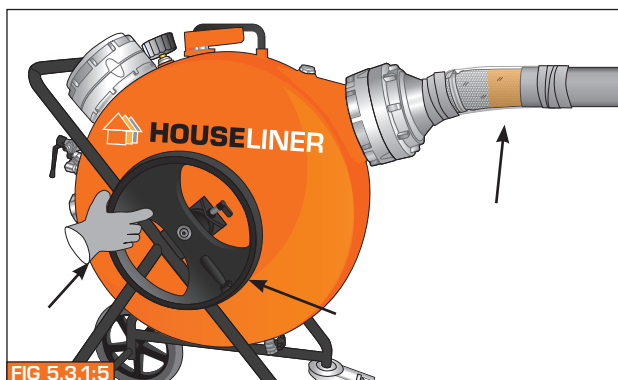
2. Close the air outlet valve on the Extruder.



Note! Maximum working pressure in the Sactools Extruder is 1 Bar manometer pressure. Therefore, the compressed air supply must be reduced to a very low pressure, preferably approx. 0.2 Bar, before it is connected to the Extruder. Use a precision regulator in good condition. Use only dry and filtered compressed air.

Note! Fold the handle of the wheel away to avoid injury during inversion. **FIG 5.3.1:5**

3. Keep one hand on the wheel at all time when the compressed air valve is opened and compressed air starts to fill into the Extruder. **FIG 5.3.1:5** The liner will want to wander into the pipe as soon as the pressure begins to increase.
4. Raise the pressure in the Extruder using the regulator. Check the pressure on the pressure gauge located on the Extruder, not the regulator. Normally the installation pressure is 0.2-0.4 Bar during installation of a flexible liner.
5. During inversion the liner must not be cranked out. The wheel shall be used to slow the speed at which the liner goes into the pipe. When installing the liner, the pressure must be kept as low as possible. Only high enough to allow the liner to inflate into the pipe slowly and in



small increments to fit against the walls of the pipe. Feed the liner out slowly and allow the liner to swell out into the bends. **FIG 5.3.1:5**



Note! Pressure must be maintained for the duration of the entire installation and curing process. Otherwise, there is a risk that the liner will collapse and come loose from the pipe wall.

6. För att säkerställa installationen kan vrängningen i röret övervakas med en kamera från motsatt håll. På så sätt säkerställs att fodret har gått rätt väg och att hela fodret har vrängts ut.

Possible problems in the event of a stoppage in the inversion process:

- Pull strap is too short
- Liner is poorly wound into the Extruder
- The separating wheels in the Extruder are incorrectly set or not attached to the shaft
- Loss of compressed air supply
- The pipe is inadequately clean, blockage in the pipe
- Installation pressure too low
- Installation pressure too high
- Leakage in the liner
- Wrong dimension of the liner relative to the pipe
- The liner has gone the wrong way, out in a hole or in a branch
- Lining poorly lubricated
- The liner does not get into position in time and starts to cure
- Too many bends – excessive friction inside the liner

5.3.2. Curing of liner

The installation must be kept under pressure for the duration of the curing period. The length of the curing period depends on the type of epoxy used and the ambient temperature of the installation. See "Epoxy curing times" on page 18. The curing period can be calculated more precisely by placing a temperature sensor inside the pipe.

Curing times may be shortened by applying heat such as water or steam, see the "Heat Curing" section on page 15.

Curing must be monitored to ensure that pressure is maintained for the duration of the process. In the event of a loss of pressure, the liner will collapse inside the pipe, causing major problems and additional costs. Monitoring is to be carried out by an on-site installer who monitors pressure. A more cost effective way of monitoring is to install a Sactools Pressure Guard. The alarm unit sends a text message if pressure is too low or power to the compressor is lost.

5.4. SUPPLEMENTARY WORKS

5.4.1. Remove installation equipment

Once the liner has cured, the Extruder must be removed. Start by disconnecting the compressed air supply from the Extruder and bleed the air. Using the Extruder pressure gauge, check that the installation has been depressurised. Cut the liner on the opposite side of the pipe from the Extruder and cut off the pull strap. When installing with an open end, pull the plug off by winding the pull strap into the Extruder. Then cut off the liner between the pipe and the Extruder flush with the pipe end.

5.4.2. Inspection of the installation

Check the result of the installation by inspecting the pipe and connections with an inspection camera.

5.4.3. Opening for branch pipes

If there are branch connections on the installed pipe, they must be opened using a milling robot or tool.

6. INSTALLATION OF BRANCH PIPES

6.1. PREPARATIONS BEFORE INSTALLATION OF BRANCH PIPES

The dimension of the pipe and branch pipe must be determined. The angle on the branch pipe must also be determined. If there are several connections on the same branch pipe, the angle between the various branches must also be determined. Use only branch pipes and assembly tools that fully correspond to the branch pipe to be renovated. During the entire installation, from impregnation to installation, two installers must work together.

6.2. PREPARATION OF BRANCH PIPE INSTALLATION

6.2.1. Preparation of branch pipe tool

Start by hanging the branch pipe tool in the ceiling mount and connect a precision regulator to regulate the compressed air supply. A vacuum ejector will also be needed during the process. A Sactools pressure/vacuum box is an excellent tool when working with branch pipes. This enables you to easily alternate between pressure and vacuum using a single lever.

1. Fill the branch pipe tool only with enough pressure to keep the branch pipe packer under tension.

2. Lubricate the branch pipe packer with grease so that the entire surface is covered. Best results are achieved using Hydro Gliss Gel. Smooth out the grease layer with your hands. Use thin nitrile gloves. If you use a packer with a surface of silicone there is no need to lubricate the surface.
3. Spray silicone spray Rivolta into the branch pipe tool via the compressed air connection to lubricate the inside.
4. Lower the pressure in the tool and pull the branch section into the tool using the string.
5. Suck out all the air from the tool using the vacuum ejector. The tool is now ready for the next step; threading the impregnated branch pipe on the tool.

6.2.2. Impregnation of branch pipe

1. Place the branch pipe on a sheet of transparent protection foil and draw the outline of the branch pipe on the foil. **FIG 6.2.2:1** Remove the branch pipe.

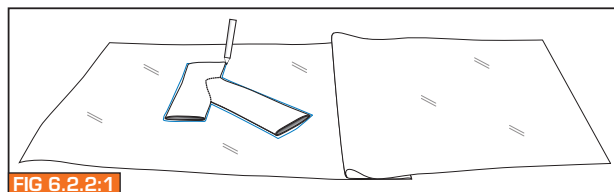


FIG 6.2.2:1

2. Mix epoxy (see the section Mixing epoxy). A single branch pipe for a 100 mm main pipe and 100 mm branch connection requires approximately 0.8 kg of mixed epoxy. Pour about half of the mixed epoxy inside the established contour. **FIG 6.2.2:2**

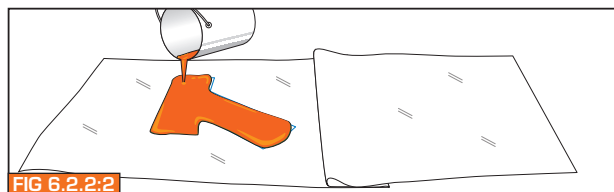


FIG 6.2.2:2

3. Place the branch pipe inside the contours and pour the remainder of the epoxy on the branch pipe. **FIG 6.2.2:3**

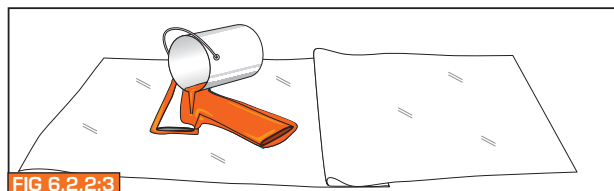
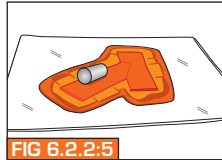


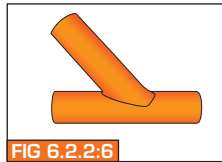
FIG 6.2.2:3

4. Fold the protection foil so that it covers the entire branch pipe with a good margin and rub the epoxy into the branch pipe. Remove the protection foil and check that the branch pipe is completely impregnated.

5. Fold the foil back and roll out the epoxy from the centre of the branch pipe and out over the edge so that the excess lands between the plastic layers. **FIG 6.2.2:5**

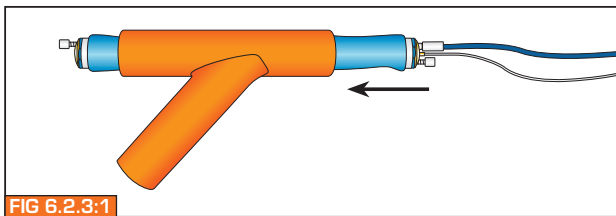


6. Once an even and full coverage result has been obtained, lift the impregnated branch pipe and wipe away the excess using a lint-free cloth. **FIG 6.2.2:6**

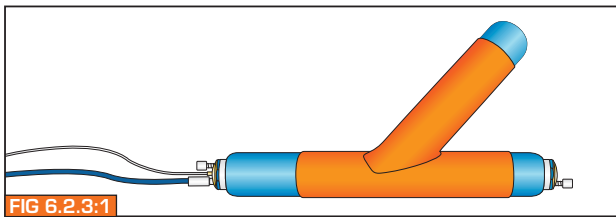


6.2.3. Fitting of branch pipe on branch pipe tool

1. One installer holds and opens the impregnated branch pipe so that it is possible to insert the tool. Hold the branch section down. The other installer inserts the prepared and vacuumed tool with the branch section down. **FIG 6.2.3:1**

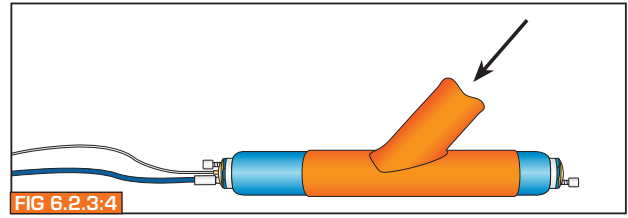


2. Once the branch section of the tool is in the exact centre of the branch section of the branch pipe, turn the package so that the branch section points upwards. Slowly fill the tool with regulated compressed air, let branch pipe fixture expand and the branch section to run into the branch pipe branch section. **FIG 6.2.3:1** Once the entire branch pipe packer is inflated and the branch pipe sits nicely and without folds on the tool, pressure must be reduced in the tool.

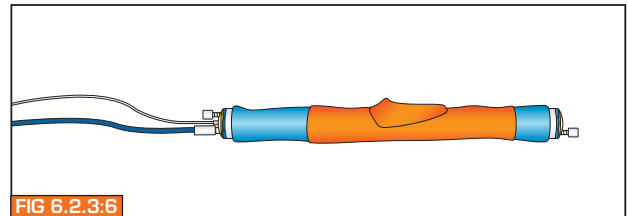


3. Set the tool down on the workbench that is covered with protection foil. The branch section should be pointing upwards. Control the pressure in the branch pipe packer. The pressure must be low, just enough so that it is kept under tension.

4. The installer handling the tool is to hold the pull string and keep it taut. Using their hands, the installer handling the branch pipe rolls the branch section of the branch pipe into the branch pipe tool. **FIG 6.2.3:4**



5. Switch to vacuum and exhaust almost all air out of the tool.
6. The installer handling the branch pipe now rolls the now released branch pipe in between the rods inside the branch pipe tool. Hold steady and turn the vacuum back on. **FIG 6.2.3:6** Once all the air has been exhausted, fix the branch pipe against the tool and the package is ready to be installed.

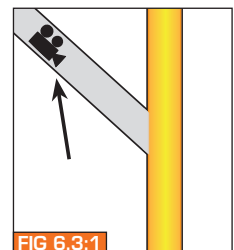


7. Protect the impregnated branch pipe with plastic when transporting it to the installation site.

6.3. BRANCH PIPE INSTALLATION

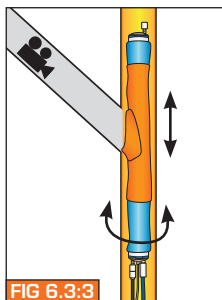
The process of installing a branch pipe requires two installers to work together and communicate with each other, as they usually are in different parts of the property. Compressed air, precision regulator, vacuum ejector, push rods and pull straps are required during installation. A Sactools pressure/vacuum kit significantly simplifies the installation process.

1. One installer places an inspection camera in the branch pipe where the branch pipe is to be installed. It is advantageous if the picture from the inspection camera can also be monitored from the installation site. If this is not possible, communication between the installers must be ensured. **FIG 6.3:1**

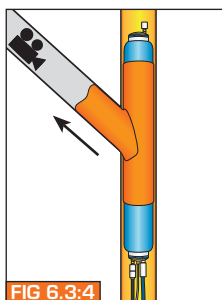


2. Insert the camera as far as to the point where the main pipe is clearly visible.

3. The other installer inserts the prepared branch pipe tool into the main pipe once the protective plastic has been removed. If the length of the pull string will be insufficient, it can be extended by attaching a pull strap. The branch pipe is pushed and rotated into the correct position using push rods. **FIG 6.3:3**



4. Fill the tool with regulated compressed air and allow the branch section to slowly expand into the branch pipe, slowing the process using the draw string. If the branch pipe goes askew, release the pressure and pull the branch section back into the tool using the pull string and adjust the tool.. **FIG 6.3:4**



5. Once the branch pipe is in position, adjust the pressure to 0.5 bar. Pressure must be maintained throughout the curing process.



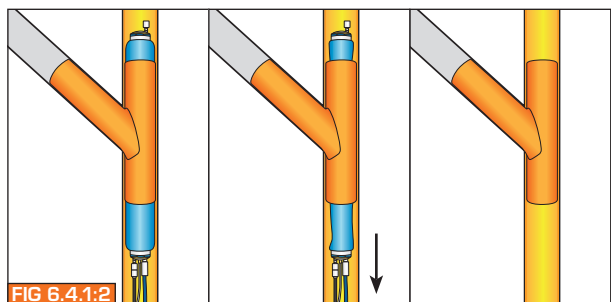
WE ALWAYS RECOMEND TO TAKE OUT THE STEAM FROM THE EXISTING PIPE TO MINIMIZE THE RISK OF HOTSPOTS WICH POTENTIALLY COULD DAMAGE THE PREVIOUSLY INSTALLED LINER.

6.4. SUPPLEMENTARY WORK

6.4.1. Removal of branch pipe tool after installation

Once the branch pipe has cured, the tool must be removed.

1. Start by sucking out the air from the tool using vacuum. This is to enable the tool to be released from the



epoxy surface.

2. Then increase the pressure until the branch section can be pulled back into the tool. Pull back the branch section using the pull string. Then suck out the air again and remove the tool. **FIG 6.4.1:2**
3. Cover the tool using protection foil to avoid spillage onto the property and work clothes when it is transported back to the work site.

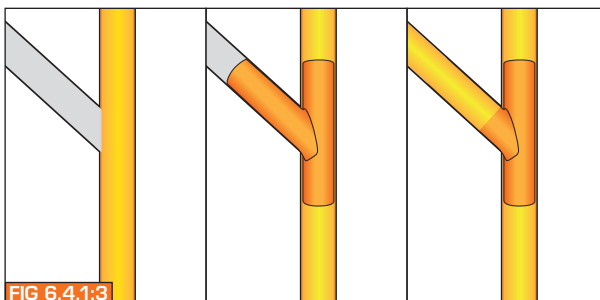
6.4.2. Cleaning of branch pipe tool

Suspend the branch pipe tool in the ceiling mount and fully inflate it with regulated compressed air. Wipe clean using a cloth and remove any epoxy residues. If it is to be used again, prepare it in accordance with the instructions given in the "Preparation of branch pipe tool" section on page 10. If it is not to be used again, compress the tool and place it in the storage tube.

6.4.3. Installation of overlapping liner

Overlapping liner

If an overlapping liner is to be installed from the side connection, it must be done in accordance with an open end **FIG 6.4.1:3** (Installation with open end" on page 14) and with an



overlap on the branch pipe.

The main liner is installed, the manifold connection must be opened, the manifold must be assembled and then the connecting liner to the manifold must be installed. This procedure produces all "joints" in the direction of flow.

Overlapping branch pipe

Since on several occasions you can profit by installing the liner from the connecting side before the branch pipe. This process starts with installing the main line, the manifold connection must be opened, then installing the connecting line and finally the branch pipe.

FIG 6.4.1:4

Sacpro has reviewed the possibility of doing so.

The tests that have been carried out show that as long as the lining overlaps the lining, a laminate of these layers is formed. So in the sense of joint, there is no joint except ocular.

The only important thing to keep in mind in this is to use materials that have been tested together and to ensure that all surfaces are clean of any installation lubricant before the next layer is installed.

This has also been discussed between Sacpro (Jockum Brodén) and BRIF during one of their training for inspections of relined pipe systems. All participants on this occasion agreed that if the manufacturer can certify tightness, then it should not be considered a joint.

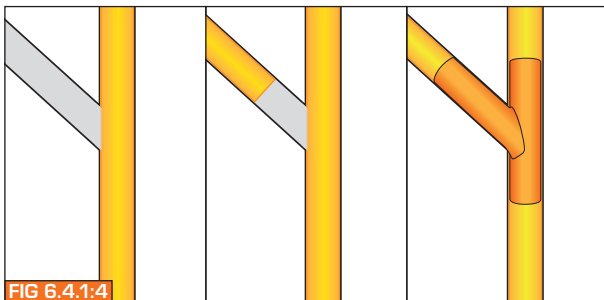


FIG 6.4.1:4

7. COMPLETION

Once all installations are complete and documented, the pipes are to be connected at the exposed connection points. In order to ensure that future leakage does not occur, it is very important that the work is carried out carefully and with approved products specifically designed for the purpose. Sacparts Relining Connection must always be installed in upstream interconnections in order to ensure that water cannot penetrate between the new liner and the old pipe. Sacparts Relining Connection is included in Houseliner System and available in dimensions of 75 mm and 110 mm. Sacparts Relining Connection is supplied with a type-approved jet connection and installation instructions. See "Installation of Sacparts Relining Connection" on page 16.

Once the water supply has been turned back on, all taps and toilets must be flushed in order to visually inspect for leaks on waste water pipes before the work site is vacated.

When the entire project has been completed, it shall be handed over to the client, together with copies of self-checks and other documentation. Operating and maintenance instructions shall also be submitted and the client shall sign and approve the handover.

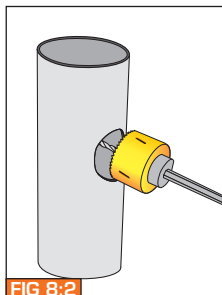
Waste and residual materials consisting of hardened epoxy are to be treated as combustible waste. Other building waste is to be sorted into their respective receptacles, see local regulations.

8. INSTALLATION OF SACPARTS BRANCHING CONNECTION

Sacparts Branching Connection is used to install new connections on the main pipe, e.g. new kitchen connections. Sacparts Branching Connection must be installed before the pipe is relined. Use Sactools Hole Saw Kit to make holes.

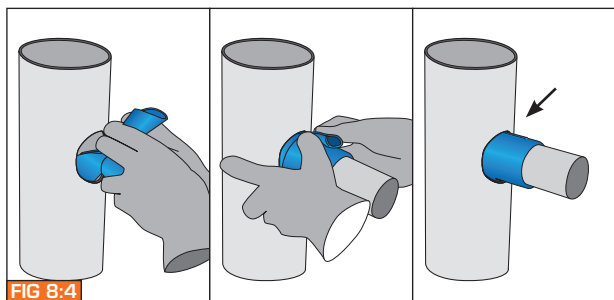
1. Check that the main pipe is gutted and cleaned.

2. Mark and drill connection holes using the larger hole saw. Clean and deburr the edge of the hole if necessary. **FIG 8:2**

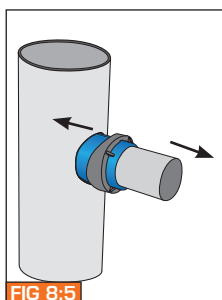


3. Degrease the connection cap using Methylated Spirits.

4. Fold in the brim on the sides, hold these together while you insert the lower section into the connection hole, fold in the upper section in the hole. Please note, guide groove must be centred upwards on the pipe. **FIG 8:4**

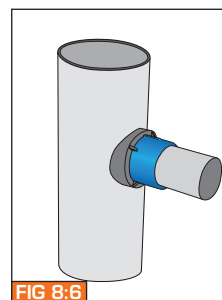


5. Pull the branch pipe outwards and press the assembly ring until it bottoms against the main pipe. The assembly ring must be held on the Branching Connection in the correct position when installing the main pipe. The ring must be left in position after installation and act as a support. **FIG 8:5**



Note! The black ring is for DN 75/80 and the blue ring is for DN 110 on main pipe.

6. Check the angle of the Branching Connection before the liner has cured in order to avoid back-wash. **FIG 8:6**



7. Install liner in the main pipe. Once the main pipe has cured, the core is to be cut using the smaller hole saw. **FIG 8:7** Connect to the water trap using standard pipe fittings. **FIG 8:8**

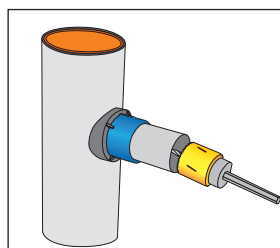


FIG 8:7

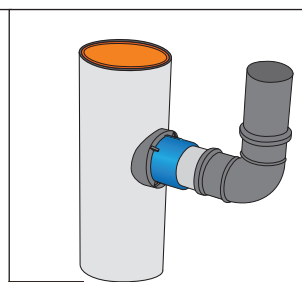


FIG 8:8

9. INSTALLATION WITH AN OPEN END

When installing using an "open end", i.e. where the liner ends inside the main pipe and it is not possible to cut a sealed end, use the technique with a glued end on the liner. The glue end replaces the sealed end - the fish - which terminates the liner in a standard installation. Attach the pull strap in the glue end. Therefore, when the glue end is pulled away after curing, an open end is left on the liner inside the main pipe.

The glue end must be made from a strong hose material of the same dimensions as the liner and which can adhere to the coating of the liner. The glue used is a thermosetting contact adhesive. For best results, use Sacparts Omaplata hose material and Steam Glue adhesive from Sacpro AB. The glue end must be attached to the end of the liner that will end up inside the pipe. To fit the glue end on the liner, a free workspace at a comfortable standing height is required.

1. Roll out a piece of Omaplata measuring approx. 500 mm and fold it 90°. Press into the fold so a crisp 45° mark is formed to cut along. Fold back the Omaplata and begin to cut perpendicular in approx. 10 mm at the mark. Cut in a circular direction towards the fold

mark and then cut along the mark until approx. 10 mm remains. Make another circular cut and finish by cutting perpendicular out. The section now has the shape of a long, extended S. **FIG 9:2**

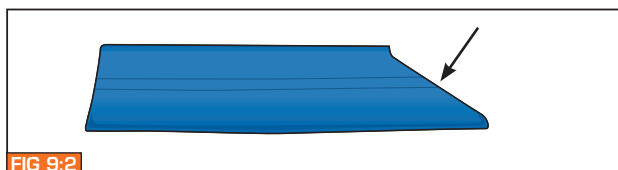


FIG 9:2

2. Measure 1000 mm from the end of the liner and draw a line across the entire liner. This is the mark that shows where the liner is to be cut after impregnation. Also see section "Impregnation of liner". **FIG 9:3**

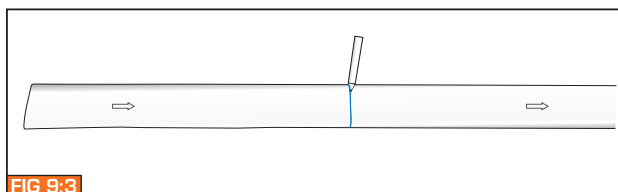


FIG 9:3

3. Make a small mark on the edge of the liner 1050 mm from end of the liner. Thread the cut Omaplata outside the liner with the curved section facing towards the long section of the liner. Pull the Omaplata until the short end of the section touches the smaller mark. **FIG 9:4**

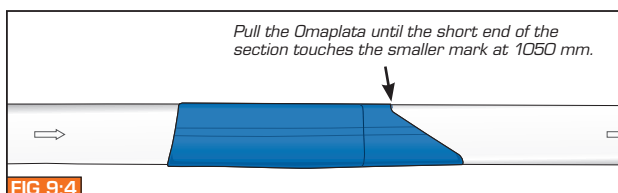


FIG 9:4

4. Take the mounting fixture and fold it longitudinally so that it is easier to insert it into the liner. Connect the mounting fixture to the pressure/vacuum kit, but without filling it with compressed air.
5. Exhaust air from the mounting fixture using vacuum and insert it all the way into the liner so that it reaches a bit past the section on the Omaplata hose. Switch from vacuum to pressurize and inflate the installation fixture. Fill only to the point where the Omaplata is fixed tightly against the liner.
6. On the liner, draw the outline of the trimmed section of the Omaplata using an ink pen. **FIG 9:7**

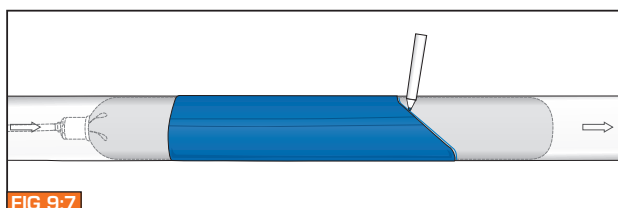


FIG 9:7

7. Take hold of the cut piece of Omaplata and fold it back. Pull it back as far as that the short section is approximately 15-20 mm from the line. Then lower the pressure in the installation fixture a little and put on protective gloves. **FIG 9:8**

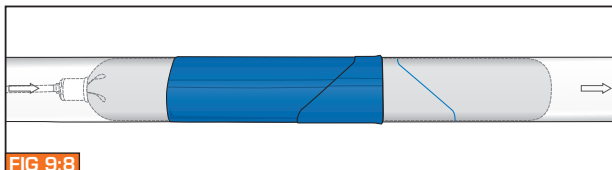


FIG 9:8

8. Soak a piece of clean cloth or strong wet paper towels with Methylated Spirits and clean the surfaces that are to be glued. Only use Methylated Spirits. Acetone or similar solvents will destroy both the Omaplata and the coating of the liner.
9. Coat both surfaces that are to be joined with thermosetting contact adhesive. The glue joint must be about 15 mm wide and fit around the entire liner and Omaplata. The surfaces must be completely dry to the touch before being placed together, which usually takes about 15 minutes. **FIG 9:10**

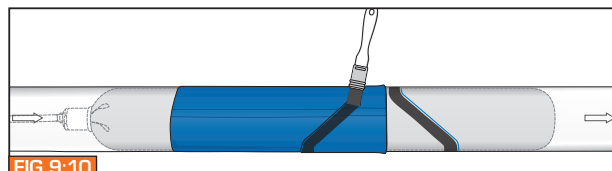


FIG 9:10

10. Insert your fingers under the folded back Omaplata and twist it back on so that the glued surfaces are joined together. Press the glue joint together with your fingers and increase the pressure in the installation fixture so that the liner is fully taut against the Omaplata. **FIG 9:11**

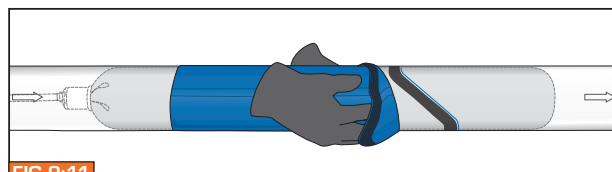


FIG 9:11

11. Heat the glue joint using a hot-air gun, and at the same time press the joint together using a hard tool with no sharp edges. **FIG 9:12** The hot air gun must be set at 60° C to ensure that the glue cures without the coating being destroyed. Press the glue joint from the centre out towards the line on the coating.

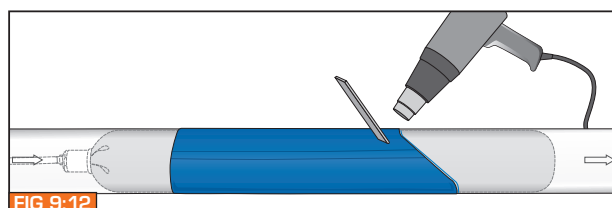


FIG 9:12

Work methodically around the whole liner, heating and pressing together. Using a finger, feel all around the glue joint edge to ensure that the Omaplata is securely adhered to the coating. If not, add more glue and repeat the procedure.

12. Allow the liner to cool to room temperature before releasing pressure in the installation fixture. Then empty the air out of the fixture and remove it from the liner.
13. The Omaplata must now be folded back as far as that the first line becomes visible. **FIG 9:14**. Seal the ends of the liner with duct tape and cut a cross in the liner and apply the vacuum suction cup, also see the section "Impregnation of liner". Impregnate and roll the liner as described. Roll out excess epoxy in the extra metre of liner and cut at the mark.

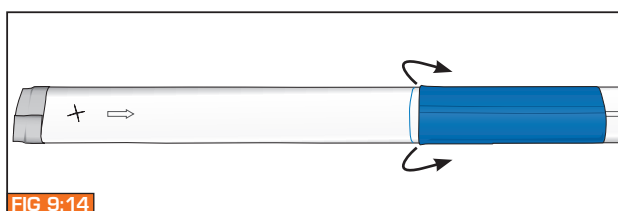


FIG 9:14

14. Fold back the Omaplata so that it is sealed on the liner. The pull strap is to be attached to the end of the Omaplata using hose clamps as during a standard liner installation. See the section "Cutting of liner" on page 8.
15. Install using the Extruder and allow the liner to cure as during a standard liner installation. See the section "Installation" on page 9. Release the pressure once curing is complete and pull the glued end with the pull strap that is attached to the shaft in the Extruder. Turn the wheel back on the extruder until glue end comes loose and then wind the pull strap back into the Extruder. Once the pull strap has been wound up, remove the glue end from pull strap and discard it.

10. HEAT CURING

In order to shorten the curing time, heat may be applied to the installed liner or branch pipe. In order to ensure adequate effect in the heating process, hot water or steam must be used. Only heating with a flow of hot air does not provide enough heat energy to adequately raise the temperature to affect curing time to any significant extent. For every 10 degrees the temperature can be raised, curing times are cut in half. Examples: Relining in a main pipe under a concrete foundation takes approx. 12 hours to cure at + 10° C. If the temperature is raised to + 20° C, the curing time is reduced to 6 hours, and so on. All in accordance with the Arrhenius equation.

However, because it requires additional equipment and installation of that equipment, it is not always possible to reduce the total installation time of a project using thermosetting. This must be decided on a case by case basis. Careful planning of installations is the most important aspect in shortening installation times.

10.1. HOT WATER CURING

Heat may be applied using horizontal main pipes, which allow hot water to flow through the liner after it has been installed. The decision to use hot water curing must be taken and preparations made prior to installation. The equipment required is an Extruder that is prepared for hot water circulation, a hose assembly and a hot water boiler fitted with a circulation pump.

Once the liner is inverted into the pipe, a hose follows inside the liner. The hose is connected to a fitting on the centre shaft inside the Extruder, whilst the other end of the hose exits through the end of the liner. It is at this point that the hot water flows out and runs back into the liner and the Extruder. A hose is to be connected to the Extruder's bottom plug, where the return water is pumped back to the boiler. The water is heated in the boiler and is channelled via a hose to the fitting on the Extruder's centre shaft. The water is continually heated and circulated.

10.2. STEAM CURING

Vertical main pipes, shorter horizontal main pipes and branch pipes are best suited for heat treatment using steam. In order to monitor temperature during work and thus be able to calculate the curing time with certainty, a temperature sensor must be used. The decision to steam cure pipes must be made and preparations made prior to installation. Steam curing branch pipes requires the use of a branch pipe tool that is equipped with connections for steam. Steam curing requires a steam generator that generates sufficient steam to raise the temperature to the desired level. A hose assembly to channel the steam from the steam generator to the liner or branch pipe tool is also required. The hoses must be adapted for the heat and pressure in the steam. If a hose is used that cannot handle steam, there is a considerable risk of personal injury and damage to the property and equipment.

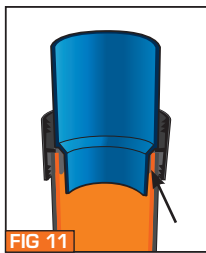
When steam curing a liner installation, an inversion coupling sleeve with a steam connection must be used. As with hot water curing, the steam may not be connected to the centre shaft of the Extruder as the Extruder will get very hot. An end plug must be fitted in the end of the liner. The pull strap is to be attached to the end plug, in which there is also a nozzle that releases the steam, either directly or further via a hose. The steam is introduced

into the liner by connecting the hose from the steam unit to the connection on the inversion coupling sleeve that is specifically designed for steam curing.

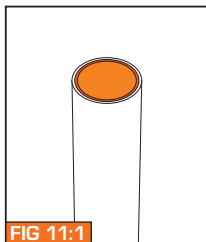
When steam curing branch pipes, the steam generator is to be connected to the branch pipe tool via a twin hose. One hose channels a mix of steam and compressed air into the tool. The other hose channels the condensate back, which is released at the unit.

11. INSTALLATION OF RELINING CONNECTION

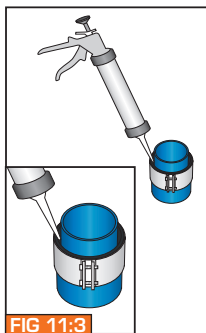
Sacparts Relining Connection is used upstream to connect a traditional waste water pipe to a relined pipe. Relining Connection must be installed so that it overlaps the relining inside the old pipe. If the old pipe is longer than the cured liner inside the pipe, the pipe must be cut where the relining begins. **FIG 11**



1. Cut the relined pipe perpendicular to the direction of the pipe. Any unevenness and coatings that prevent Relining Connection from fitting correctly in the pipe must be cleaned/ground away. Make sure that Relining Connection can be pressed to the edge where the external dimension begins. **FIG 11:1**



2. Fit the type-approved jet connection to Relining Connection. Do not tighten it yet. If the pipe is to be cast or placed in the ground, a stainless steel coupling must be used instead.



3. Apply joint compound (e.g. Sikaflex-521 FC) in the gap between the blue pipe section and the jet connection rubber seal. **FIG 11:3**

FIG 11:3

4. Push the Relining Connection and jet coupling securely on the cut pipe. Screw the jet coupling together so that the rubber gasket is fully compressed and sits firmly against the pipe. You can now connect new standard pipes to the Relining Connection. **FIG 11:4**

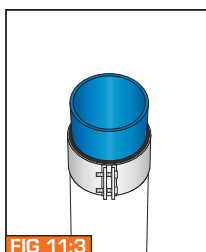


FIG 11:3

12. SERVICE AND MAINTENANCE

The pipe system from Houseliner System is to be maintained in the same way as waste water pipes in PP. Kitchen stacks should be flushed on a cycle of 3-5 years, depending on the load to which they are exposed. Users who pour a lot of food grease into their kitchen drains must flush their pipes more frequently than users who separate grease.

Bathroom main pipes should be flushed approximately once every 10 years.

In case of a relined pipe being removed, the materials must be treated as combustible waste.

Instructions for Houseliner System are produced by:

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www.sacpro.se



Sacpro AB is a member of **VVS Fabrikanternas Råd** (The Swedish association for manufacturers of heating, plumbing, sanitation and metering products and equipment.)



Sacpro AB is a member of **BRiF** (Industry Association for Relining in Real Estate)

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Technical description for liner renovation of vertical and horizontal sewer and stormwater pipes with the HOUSELINER system

TRAINING

Company

Creates the conditions and time needed for the installers to follow the instruction process and create installations with high quality and communication to property owners.

Personnel qualifications

Installers must have an approved training certificate for the Houseliner System.

Installers (in Sweden) must have thermoset training according to AFS 2011:19

WORKING ENVIRONMENT

All epoxy work, such as preparation and impregnation must be carried out in a room / vehicle intended for the activity. Personnel must use the required protective equipment adapted to the work tasks.

ENVIRONMENT

The company must have a documented environmental policy.

Leftover, uncured material is to be reused.

Hardened material is classified as non-hazardous waste and is sorted according to current regulations.

MAPPING OF THE EXISTING PIPELINE SYSTEM

Examination of existing record drawings and/or video inspection and probing.

Document and/or create drawings with notes before installation.

INFORMATION

Information to residents about and when the pipes are not usable is of the utmost importance. The information must be clear and accessible to all concerned.

Always carefully read the installation description for each product before starting installation.

Ensure that everything is ready for installation and that you are ready for installation.

CLEANING

Kitchen and toilet drains should be high-pressure flushed with hot water, then mechanically cleaned / descaled with a cleaning chain or equivalent until the pipes original diameter is obtained. Rainwater pipes usually does not require pre-flushing.

All sediment after cleaning must be removed before installation.

It should be noted that the existing line may have minor damage, it does not need to be completely dry for a satisfactory result.

INSTALLATION SHAFT

Shafts in, for example, basement levels must always be marked and covered.

INSPECTION

Inspection with a camera is always carried out directly in connection with the installation to ensure that it is ready for installation.

INSTALLATION

Houseliner liners

Protective covering of sensitive surfaces and spaces in the work area must be carried out.

Start and end pieces are assembled. Installation is carried out with Extruder and compressed air controlled with precision regulator. A monitoring system such as an alarm during the curing process is highly recommended.

Check installation using camera and document.

Reassemble and ensure function of the relined pipe.

Houseliner Manifold

Branch pipes must always be installed where there is a branch on the pipe.

Milling of the connecting branch is carried out with suitable equipment that is monitored by camera.

Thorough cleaning where manifolds are mounted must be ensured.

Installation takes place using a camera.

Check installation using camera and document.

Reassemble and ensure function of the relined pipe.

Houseliner Branching connection

A tap branch is a good option for mounting a new connection to, for example, a kitchen.

After cleaning the pipe, a hole is drilled in the pipe where the tapping branch is mounted, with a support ring according to the dimension of the pipe.

Check the pipe and assembly of the tapping branch before installing the liner.

After the liner has cured, use a hole saw to cut out the center of the branching connection and check visually and with the aid of a camera before reassembly.

Reassemble and ensure function of the relined pipe.

Houseliner Relining connection

The relining connection must always be mounted on a vertical pipe, to ensure that water does not penetrate between the original pipe and the relined pipe.

New drain on the roof

Roof drains should be changed, where applicable, instead of a relining connection being mounted, a new gasket is mounted between the lined pipe and roof drain.

MATERIALS AND GOODS REQUIREMENTS

Liner and epoxy must be made by Houseliner, Houseliner branching connections and relining connection.

Liner and components must be P marked according to CR-072, VTT/Eurofins or other approval institute to be used together.

Mixing of components such as liner and epoxy from different manufacturers must never occur.

SELF-MONITORING AND DOCUMENTATION

Information about installation methods, times, material selection (batches), who has done what, etc. must be recorded continuously in direct connection with the installations.

The self-monitoring documents must always be available for inspection.

13. WORD LIST

Branching Connection	Used for new connections on the main pipe, e.g. new kitchen connections.
Branch pipe	Prefabricated branch pipes in different sizes and angles made from polyester felt.
Branch pipe bladder	The bladder on the branch pipe tool that fixes the branch pipe to the old pipe during curing.
Branch section	The part of the branch pipe/branch pipe tool that goes out into the slot from the main pipe at a branching.
Camera inspection	Internal inspection of pipes using a camera.
Coating	The film on the liner that becomes the inside of the pipe after relining. The coating holds the epoxy in position and the liner can be pressurised before it has cured.
Collar	The part of the liner that is folded over and attached to the inversion coupling sleeve of the Extruder during an installation.
End pipe	A short pipe section used to obtain a perpendicular angle termination when relining capped waste water pipes.
Epoxy	Two-component thermosetting plastic that, after curing, becomes very strong and resistant to chemicals and abrasion.
Extruder	Installation tool for inversion of liners consisting of a pressurised drum. Designed for indoor use. Available in different sizes.
Fish	Attachment point between liner and pull strap that is called Fish due to the resemblance of a fishtail when performed correctly.
Flushing	Flushing of waste water pipes with hot water under high pressure.
Glue end	Installation using an "open end", i.e. where the liner ends inside the pipe and it is not possible to cut open a sealed end. The glue end replaces the sealed end that terminates the liner in a standard installation.
Inversion sleeve	Fitting on which to attach the collar of the liner to the Extruder during installations. Available in various dimensions and angles.
LDPE hose	Hose used as a splash guard between the extruder and the mouth of the pipe to be renovated.
Liner	Tube shaped textile made of felted or knitted polyester, coated on one side. To be impregnated with epoxy before relining
Liner holder	Rack on which liner is suspended to facilitate the process of filling with thermoplastic epoxy.
Mounting fixture	A bladder which is used when preparing a glue end.
Omaplata	Material used for the glue end.
Overlapping liner	Lining that is installed via the branch pipe with an overlap against the installed branch pipe.
Pipe clamp	Jet clamp for splicing pipes or use in conjunction with Relining Connection.
Precision regulator	High precision regulator that, for example, is connected to an Extruder to check and control pressure during installation and curing.

Pressure guard	Alarm unit that monitors and issues an alert via text message if the pressure falls or power fails during an installation.
Pressure/vacuum box	A device to easily switch between pressure and vacuum with a single lever.
Protection foil	Protective plastic foil that is used to protect the surroundings from thermosetting plastic.
PU	Polyurethane plastic
Pull strap	The strap that is used during the inversion process using the Extruder. Slows the liner installation in a controlled manner during inversion and is used to wind the liner back in case of a stoppage.
Relining	Pipe renovation using epoxy-impregnated liner.
Relining Connection	A reliable solution for transition from a standard pipe to a relined pipe. Complete with sleeve, jet clamp and jointing compound.
Roller gap	The gap between the rolls when rolling liner. Rolling evenly distributes thermosetting plastic along the liner.
Rolling mill	Roller used to roll liner. Manual or electronic.
Sacparts	Brand name used for all the individual parts in the Houseliner System.
Houseliner	Houseliner System is a complete system for relining in properties
Sacpro AB	Company that develops and sells tools and materials for relining.
Sactools	Trademark for a series of relining tools.
Separator wheel	The wheels inside the Extruder that are adjusted based on the width of the liner and allows the liner to run smoothly during inversion.
Shark tooth scraper	Cleaning tool designed to remove coatings in waste water pipes.
Suction cup	A suction device that fits tightly to the liner so that it can be placed under vacuum during impregnation.
Thermosetting plastic	Plastic that hardens using a hardener, e.g. epoxy.
Waste water	Sewage
Vinstick	Thermosetting contact adhesive used when fitting glue end.

14. APPENDICES

14.1. EPOXY MIXING TABLE

To mix Houseliner SLOW, MEDIUM and FAST epoxy, mix five parts base (component A) with two parts hardener (component B)

See examples in the table below:

Total	Houseliner BASE (Component A)	Houseliner HARDENER (Component B)
1 KG	0,72 KG	0,29 KG
2 KG	1,43 KG	0,58 KG
3 KG	2,15 KG	0,86 KG
4 KG	2,86 KG	1,15 KG
5 KG	3,58 KG	1,43 KG
6 KG	4,29 KG	1,72 KG
7 KG	5 KG	2 KG
8 KG	5,72 KG	2,29 KG
9 KG	6,43 KG	2,58 KG
10 KG	7,15 KG	2,86 KG
11 KG	7,86 KG	3,15 KG
12 KG	8,58 KG	3,43 KG
13 KG	9,29 KG	3,72 KG
14 KG	10 KG	4 KG
15 KG	10,72 KG	4,29 KG
16 KG	11,43 KG	4,58 KG
17 KG	12,15 KG	4,86 KG
18 KG	12,86 KG	5,15 KG
19 KG	13,58 KG	5,43 KG
20 KG	14,29 KG	5,72 KG

14.2. CURING TIMES FOR EPOXY

Average curing times for Houseliner Epoxy

Temperature in the pipe:	10°C	20°C	30°C	40°C	50°C	60°C
Houseliner FAST	6 h	3 h	90 min	50 min	30 min	30 min
Houseliner MEDIUM	12 h	6 h	3 h	90 min	50 min	30 min
Houseliner SLOW	24 h	12 h	6 h	3,5 h	2 h	75 min
Houseliner HOT CURE	36 h	18 h	9 h	5 h	3 h	2 h



Note! These are approximate times. When heat is applied during curing, the liner/epoxy must cool down to 20°C according to the curing times stated above. An installation shall never be carried out if the temperature in the pipe is below 10°C until heat is applied. Sacpro cannot guarantee that the epoxy will cure at temperatures below 10°C.

14.3. ROLLER GAP AND EPOXY ACCESS

Applies liner and epoxy from Houseliner

Article	HOUSELINER FL 2,5 mm	DN 30-50	DN 40-60	DN 45-70	DN 50-70	DN 63-75	DN 70-100	DN 100-150	DN 110-160	
Resin consumption Houseliner Ultra, Fast, Medium & Slow per linear meter:		0,27 kg	0,35 kg	0,40 kg	0,40 kg	0,55 kg	0,62 kg	0,85 kg	0,93 kg	
Resin consumption Houseliner Hot Cure & UV Epoxy per linear meter:		0,26 kg	0,35 kg	0,39 kg	0,39 kg	0,55 kg	0,61 kg	0,84 kg	0,92 kg	
Resin consumption all resins in Litre per linear meter:		0,25 l	0,33 l	0,38 l	0,38 l	0,52 l	0,58 l	0,80 l	0,88 l	
Roller distance of the impregnation plant:							5,5 mm			
Article	HOUSELINER FL 3 mm	DN 30-50	DN 45-70	DN 50-70	DN 60-75	DN 63-75	DN 63-100	DN 70-100	DN 100-120	DN 100-150
Resin consumption Houseliner Ultra, Fast, Medium & Slow per linear meter:		0,30 kg	0,49 kg	0,49 kg	0,55 kg	0,57 kg	0,62 kg	0,71 kg	1,02 kg	1,02 kg
Resin consumption Houseliner Hot Cure & UV Epoxy per linear meter:		0,30 kg	0,48 kg	0,49 kg	0,54 kg	0,57 kg	0,61 kg	0,70 kg	1,01 kg	1,01 kg
Resin consumption all resins in Litre per linear meter:		0,28 l	0,46 l	0,46 l	0,52 l	0,54 l	0,58 l	0,67 l	0,96 l	0,96 l
Roller distance of the impregnation plant:							6,5 mm			
Article	HOUSELINER FL 4 mm				DN 63-100	DN 70-100	DN 80-110	DN 100-150	DN 120-150	DN 150-225
Resin consumption Houseliner Ultra, Fast, Medium & Slow per linear meter:					0,84 kg	0,93 kg	1,10 kg	1,33 kg	1,55 kg	2,03 kg
Resin consumption Houseliner Hot Cure & UV Epoxy per linear meter:					0,83 kg	0,92 kg	1,09 kg	1,31 kg	1,53 kg	2,01 kg
Resin consumption all resins in Litre per linear meter:					0,79 l	0,88 l	1,04 l	1,25 l	1,46 l	1,92 l
Roller distance of the impregnation plant:							8,5 mm			
Article	HOUSELINER FL 5 mm					DN 150-225	DN 200-250	DN 225-300	DN 300-400	
Resin consumption Houseliner Ultra, Fast, Medium & Slow per linear meter:						2,59 kg	3,46 kg	3,89 kg	5,19 kg	
Resin consumption Houseliner Hot Cure & UV Epoxy per linear meter:						2,56 kg	3,42 kg	3,84 kg	5,13 kg	
Resin consumption all resins in Litre per linear meter:						2,44 l	3,26 l	3,66 l	4,89 l	
Roller distance of the impregnation plant:							10,5 mm			
Article	HOUSELINER FIX 3 mm				DN 75	DN 100	DN 150			
Resin consumption Houseliner Ultra, Fast, Medium & Slow per linear meter:					0,66 kg	0,84 kg	1,33 kg			
Resin consumption Houseliner Hot Cure & UV Epoxy per linear meter:					0,66 kg	0,83kg	1,31 kg			
Resin consumption all resins in Litre per linear meter:					0,63 l	0,79 l	1,25 l			
Roller distance of the impregnation plant:							6,5 mm			
Article	HOUSELINER FLT			DN 50-70	DN 60-90	DN 70-100	DN 90-125	DN 100-150		
Resin consumption Houseliner Ultra, Fast, Medium & Slow per linear meter:				0,43 kg	0,49	0,62 kg	0,74	0,82 kg		
Resin consumption Houseliner Hot Cure & UV Epoxy per linear meter:				0,42 kg	0,49	0,61kg	0,73	0,81 kg		
Resin consumption all resins in Litre per linear meter:				0,4 l	0,46	0,58 l	0,7	0,77 l		
Roller distance of the impregnation plant:							7 mm			

DOWNLOAD THE HOUSELINER APP

- ✓ **SUPPORT**
- ✓ **LATEST NEWS**
- ✓ **RESIN CALCULATOR**
- ✓ **TECHNICAL DOCUMENTATION**

