

Bulletin Name:	<b>Flowtite Pipe Tapping</b>
Bulletin Description:	<b>Tapping Procedure for Flowtite GRP Pipe</b>
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## Flowtite GRP Tapping Procedures

### 1 SCOPE

This procedure outlines the tapping procedure to be used with Flowtite Fiberglass Pipe.

### 2 TAPPING WATER PIPELINES UNDER PRESSURE

- a. The surface of the exposed main pipe where the tapping is to be done should be clean. An approved flexible gunmetal tapping saddle should be placed at the designated place. Usually these saddles are two half circles connected with bolts. The minimum distance between two saddles is 20 inches and the maximum torque on the bolts should not exceed 10 Nm.

As a standard, the diameter of the outlet will vary from 2 to 4 inches. However other sizes are also available.

- b. Tapping machines vary from one manufacturer to another. Below is a general description of the tapping method.

- 1 Screw the main cock into the saddle after removing the plug.
- 2 Install the hole-cutting tool into the tapping machine. The tool should be long enough to cut throughout the pipe.
- 3 Start drilling. These machines could be operated manually, pneumatically or electrically.
- 4 The drill is then raised and the plug closed.
- 5 Unscrew the drilling machine.

### 3 SADDLE MATERIAL

Any flexible gunmetal tapping saddles can be used. Plastic saddles (polyethylene type) are also recommended.

### 4 DETAILED TAPPING PROCEDURE

A procedure for hot and cold tapping of GRP pipes is presented in this document. The strength and flexibility of GRP pipes make them well suited for tapping. The structural integrity and sealing performance of tapped GRP pipes has been verified through extensive research and development work. The procedure presented herein covers general aspects as well as specifics for GRP pipes, such as choice and mounting of the tapping sleeve and cutting the hole in the GRP pipe.



#### 4.1 INTRODUCTORY INFORMATION

This procedure is intended to assist the installer and owner of GRP pipe systems in understanding the requirements and the procedures for successful mounting of tapping sleeves on existing pipelines. Tapping is convenient for fitting a branch pipe or valve to an already existing pipeline where it is not practical to use a standard GRP nozzle or tee fitting. The procedure covers both hot and cold tapping.

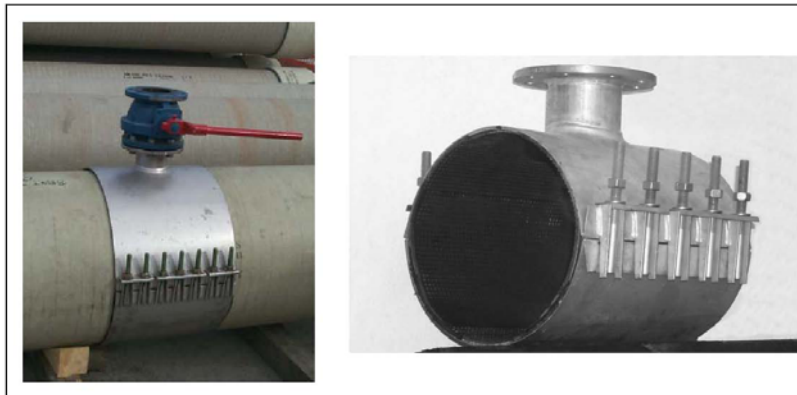
This tapping procedure is founded on extensive research and development work. A series of short and long term pressure tests as well as FEM analysis was performed for qualification of a tapping sleeve for use on a GRP pipe. Stainless steel material is selected as the material for the tapping sleeves to get a service life similar to that of the GRP pipe system. Not all types of tapping sleeves are suitable for this service.

This tapping procedure applies for all properly installed standard GRP pipes carrying water or water based fluids. The tapping sleeve shall be placed in an area with low local axial pipe stresses. Extra support may be needed for above ground pipes.

The following definitions apply:

- Hot tapping: Installation of a nozzle or branch pipe on an existing pressurized or fluid filled GRP pipeline using a steel sleeve.
- Cold tapping: Installation of a nozzle or branch pipe on an existing empty and non-pressurized GRP pipeline using a steel sleeve.

Flexible stainless steel sleeves (see *Figure 1*) are recommended for tapping into GRP pipes. Approved tapping sleeves suitable for GRP pipes are given in Table 1.



*Figure 1: Recommended tapping sleeves for GRP pipes*

It is recommended to engage tapping experts for both hot and cold tapping jobs. The tools for performing the hot and cold tapping may vary.

For hot tapping, the sleeve is mounted on the pressurized pipe. A valve and a tapping machine containing the cutter are mounted on the sleeve. The valve is opened and a hole drilled. The cutting device is then retracted, the valve closed and the tapping equipment is removed leaving the sleeve and the closed valve. A branch pipe can then be fitted on the valve and the valve opened.

For cold tapping, a branch pipe hole is drilled in a non-pressurized pipe. The tapping sleeve is then mounted around the pipe with the branch aligned with the hole. A branch pipe or valve can

then be fitted to the tapping sleeve. – The procedure for hot tapping can also be used for cold tapping.

#### 4.2 SELECTION AND USE OF TAPPING SLEEVES

GRP approved tapping sleeves are given in Table 1.

Table 1: Approved Tapping Sleeves and Gasket Type

Sleeve Type	Dimensions Pressure Class	Gasket Type	Supplier
Romacon SST (Stainless-steel tapping sleeve)	Up to DN30" Up to 250 psi working pressure.	SBR Rubber gasket	Romacon Pipeline Products B.V. <a href="http://www.romacon.nl">www.romacon.nl</a> Tel: +31 77 3549116

The maximum tapping branch pipe diameter shall be limited to:

- 20 % of header pipe diameter for SN18 pipe.
- 25 % of header pipe diameter for SN36 pipe.
- 30 % of header pipe diameter for SN72 pipe.

Maximum surge (water hammer) pressure that can arise in the pipeline must be accounted for in the selection of tapping sleeve pressure rating.

The tapped system is qualified for vacuum corresponding to the pipe stiffness.

The tapping sleeves are designed to closely fit the outer diameter of the pipe. The tapping sleeve will therefore need to match the outer diameter of the GRP pipe.

Thrust that the tapped system may generate must be balanced.

The location of the sleeve shall at a minimum be:

- A length of not less than one pipe diameter away from the nearest coupling and/or fitting.
- The tapping sleeve shall be placed in an area with low local axial pipe stresses. Extra support may be needed for above ground pipes.

#### 4.3 TAPPING PROCEDURES

Care must always be exercised when working with pressurized systems. This is especially true for hot tapping, where pressurized media is irreversibly exposed. Expert advice and proficiency should always be sought in such cases.

When working in trenches, precautions should be taken to prevent objects from falling into the trench, or its collapse caused by instability or the position or movements of adjacent machinery or equipment.

This procedure covers preparation, mounting, bolt torques, cutting, inspection, and testing.



#### 4.3.1 Preparations

Adequate access for mounting the tapping sleeve and the tapping machine must be provided. The pipe must be uncovered if buried. The pipe shall be cleaned thoroughly prior to mounting the tapping sleeve. Loose particles, dust, sand, and grease, etc. shall be removed. Normally, no further surface preparation is necessary.

The pipe surface shall be inspected for damage in the area underneath and adjacent to the tapping sleeve after cleaning. No damage to the pipe is acceptable in this area.

#### 4.3.2 Tapping

Hot and cold tapping procedures are covered below.

##### 4.3.2.1 Hot Tapping

For hot tapping, a specialized tapping machine is always required. In addition to the tapping sleeve and machine, the assembly consists of a branch valve (gate or ball) and the cutting device (see *Figure 3*). The pressure rating of the branch valve and the tapping equipment shall be at least equal to the pressure rating of the pipeline.

For hot tapping the following procedure shall be followed:

1. The tapping sleeve shall be located and oriented according to the plans and/or drawing.
2. Mount the tapping sleeve on the pipe. The installation instructions issued by the tapping sleeve manufacturer for the tapping sleeve shall be used except for the bolt torque. Bolt torques applicable for GRP pipes, are given in Section 4.3.2.3.
3. Mount the valve on the tapping sleeve. Follow the instructions for the valve or flange assembly with respect to bolt torque, seal type, etc.
4. Pressure test to verify sealing of tapping sleeve and valve is recommended prior to tapping. It should be noted that a test with overpressure between sleeve and pipe is more demanding on the rubber seal than a pressure test of the tapped pipe.
  - If the tapping sleeve is equipped with a test plug, this test can be conducted with the branch valve closed. Otherwise a blind flange with test plug can be mounted on the valve and the test conducted with open valve. Some tapping machines are equipped with a test plug rendering the blind flange superfluous.
  - Fill the space between the pipe and the tapping sleeve with water, see *Figure 2*, evacuate entrapped air and pressurise to test the integrity of the seals between the sleeve and the pipe and between the sleeve and the valve. The test pressure need not exceed the actual internal pressure of the pipe to be tapped by more than 3 bars. (If a leak occurs, dismount and inspect for dirt or damage. Do not increase the bolt torque on the sleeve). – The test pressure shall also neither exceed the maximum test pressure rating of the tapping sleeve nor the pipe, see Section 4.3.3.
5. Mount the tapping machine on the valve. Follow the instructions for the tapping machine or flange assembly with respect to bolt torque, seal type, etc.
6. Make sure that the valve is open and perform the cutting operation, see *Figure 3*. Detailed instructions for cutters and cutting are given in Section 4.3.2.4.
7. After cutting, the cutting device with the coupon is retrieved through the valve. The tapping machine with the cutting tool along with the pipe coupon can be removed once the valve is closed (see *Figure 4*).
8. Inspection and hydrostatic test of the assembly can be performed upon completion of installation. See details in Section 4.3.3.





Figure 2: Pressure testing of sleeve and valve assembly

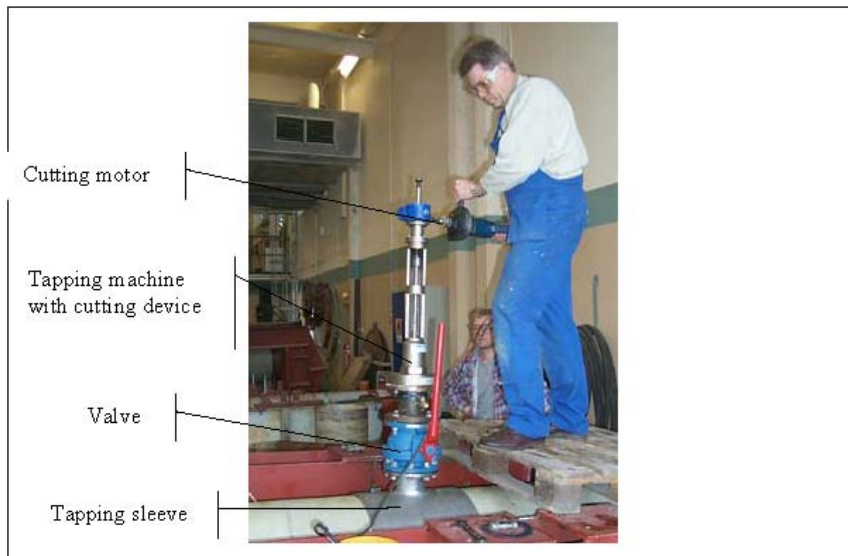


Figure 3: Tapping assembly and hot tapping cutting

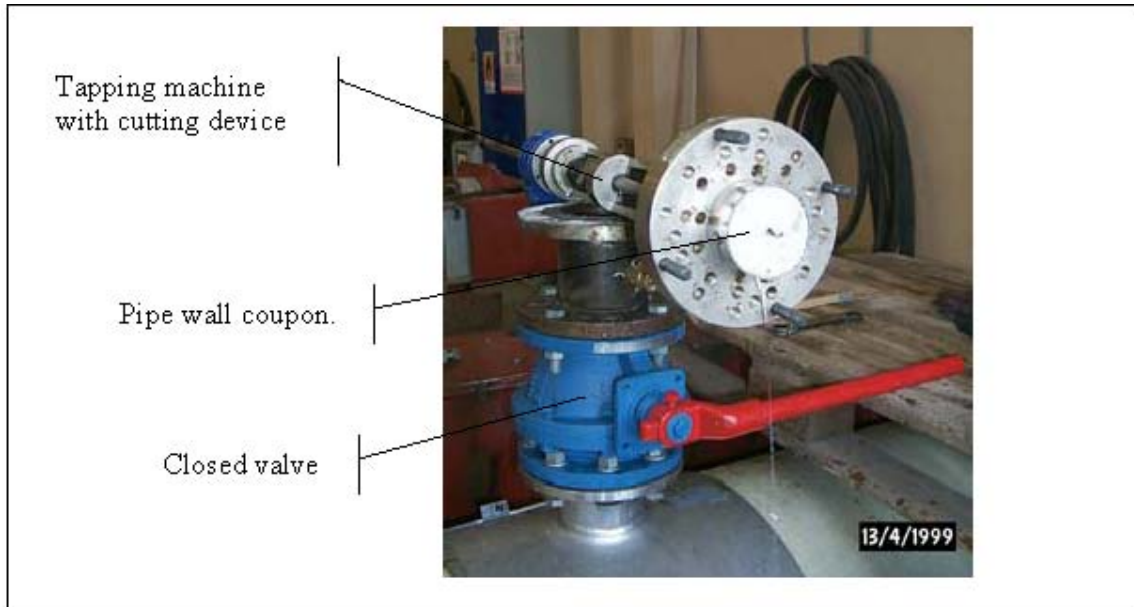


Figure 4: Tapping machine, valve and retrieved coupon

Tapping machine with cutting device  
Closed valve  
Cutting motor  
Tapping machine with cutting device  
Pipe wall coupon.  
Valve  
Tapping sleeve

#### 4.3.2.2 Cold Tapping

For cold tapping the following procedure shall be followed.

1. The tapping sleeve shall be located and oriented according to the plans and/or drawing.
2. The hole may be cut in advance or after mounting the tapping sleeve for cold tapping. Detailed instructions for cutting are given in Section 4.3.2.4.
3. The steel sleeve shall be mounted around the existing pipe such that the sleeve branch tapping hole is aligned with the hole in pipe.
4. The procedure issued by the tapping sleeve manufacturer for mounting of the tapping sleeve shall be followed except for the bolt torque. Bolt torques applicable for GRP pipes are given in Section 4.3.2.3.
5. The sealing between the tapping sleeve and the pipe wall may be tested prior to cutting the hole. Follow the pressure test procedure for hot tapping given in Section 4.3.2.1.
6. The valve or branch pipe can be installed after cutting and assembly of the sleeve for the cold tapping.
7. Inspection and hydrostatic test of the assembly can be performed upon completion of installation. See details in Section 4.3.3.

#### 4.3.2.3 Bolt Torque

The flexibility and pressure expansion of GRP pipes significantly enhances the sealing performance of a tapping sleeve compared to mounting on rigid pipes like steel or ductile iron. The bolt torque required for mounting of tapping sleeves on GRP pipes is thus lower than for inflexible materials, and high torques may indeed be harmful for the system. The recommended bolt torque for tapping of GRP pipes are given in Table 2. Higher bolt torques are not recommended.

Table 2: Bolt torque for hot and cold tapping of GRP pipes.

Sleeve Type	Bolt Dimensions (mm)	Torque (Nm)	Comment
Romacon SST (Stainless steel tapping sleeve)	M16	70	The bolt torque is lower for GRP pipes than for steel pipes.

#### 4.3.2.4 Cutting

Cutting tools suitable for cutting of GRP pipe shall be used for cutting the tapping holes. The cutting tool must give a clean cut without tearing or breaking the pipe wall. This is especially important when the cutting device penetrates the inner surface of the GRP pipe to avoid peeling.

The following shall be observed with respect to cutting the tapping hole:

- A special diamond coated cutting device for glass fibre laminates is recommended (see *Figure 5*). A closely spaced thin-walled fine tooth steel cutting device may also be used (see *Figure 6*); however, this type of device tends to wear out fast.
- Advancement rate of the cutter during drilling must be limited to avoid damage and peeling of the inner surface. A test cut on a pipe wall sample is recommended for operators and tools not previously exposed to GRP pipes (see *Figure 8*).
- The cut surface may be left as it is after cutting without further surface preparations.

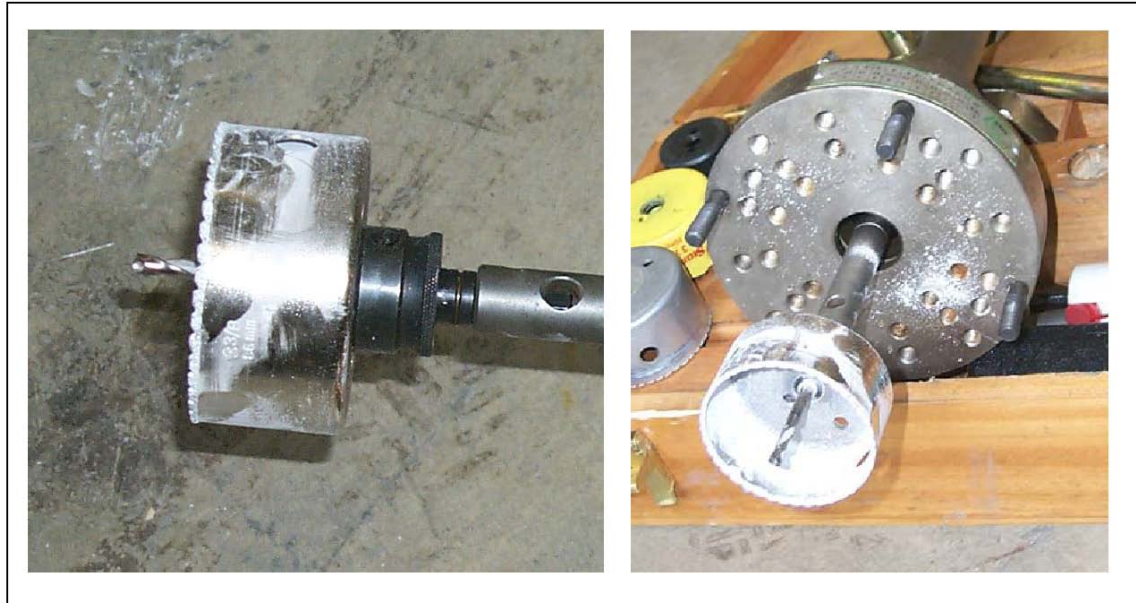


Figure 5: Recommended diamond coated cutting device

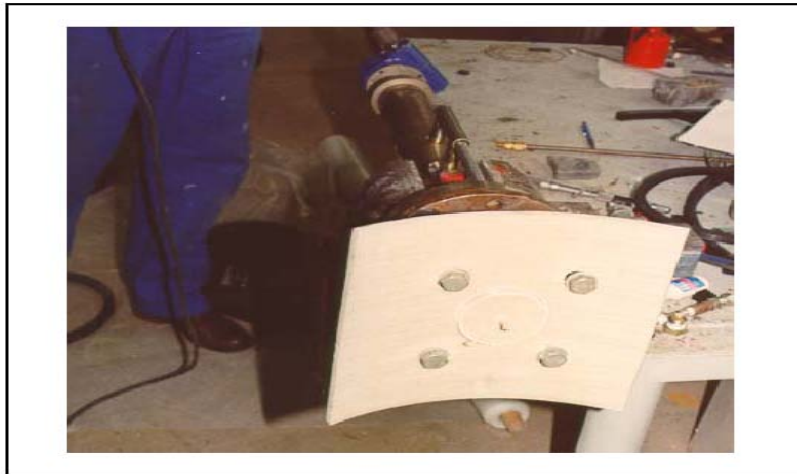


Figure 6: Alternative cutter with closely spaced teeth





*Figure 7: Unsuitable cutter with widely spaced teeth. This cutter has few widely spaced teeth and tears glass fibers from the laminate.*



*Figure 8: Test cut on pipe wall sample to adjust cutting speed and advance rate*

#### 4.4 INSPECTION AND TESTING

Checking, hydrostatic testing, and inspection of the installed pipe assembly shall be performed according to GRP installation instructions.

For inspection, the following shall be observed:

- The tapping sleeve shall not be bulged, deformed or otherwise damaged.
- Proper support and thrust restraint is provided.

Hydrostatic testing of the sleeve assembly should be performed after installation according to GRP installation instructions

The test pressure shall not exceed the lowest of the following:

- 1.5 times the design pressure or pressure rating of the pipeline system as defined in GRP Installation Instructions, or
- Maximum test pressure for the sleeve system as defined for the tapping sleeve.

The buried pipe section can be backfilled according to GRP installation instructions after inspection and acceptance.