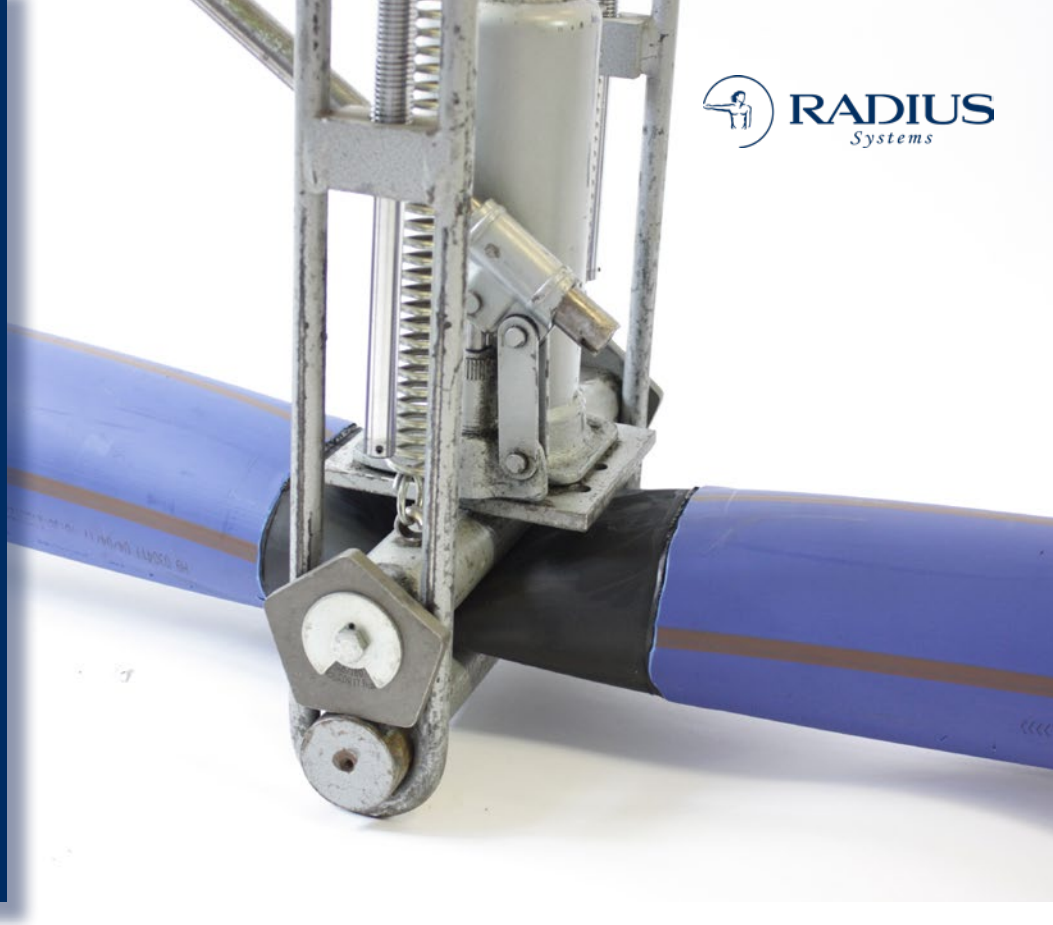
GUIDANCE

Squeeze off procedure for polyethylene water pipes.

For pipe diameters up to 180mm



Minimum personal protective equipment

Important notes

- Only apply squeeze off for a relatively short duration to carry out remedial works. Do not leave the squeeze off unit unattended while in operation.
- Squeeze off should not be used as a permanent end of line closure instead of a valve or end cap.
- Do not pressure test a pipeline while the squeeze off tool is applied.
- When a pressurised pipe is squeezed off and a section of pipe removed, an unbalanced force occurs at either side of the squeeze off unit. Depending on the magnitude of the force, the squeeze off unit may need to be restrained.

What is squeeze off?

Squeeze off is one of the flow stop techniques carried out on a polyethylene (PE) pipe to reduce the flow of fluid by 'squeezing' (compressing) the pipe.

When can I use squeeze off?

Squeeze off is commonly used for repair and connection operations on polyethylene pipelines, when these operations cannot be carried out while the pipeline is under-pressure.

What do I need to carry out squeeze off?

Specialist squeeze off equipment, approved and designed for the correct pipe diameter is used for squeeze off procedures (see Fig. 1).

What happens during a squeeze off operation?

The PE pipe is squeezed in a controlled manner between 2 horizontal circular bars, until the pipe walls are compressed to a predefined level which is dependent on the pipe's diameter and SDR. It is important that the pipe wall is not over-compressed, as it may lead to premature or unplanned failure of the pipeline. Adherence to this technique is therefore paramount.

Squeeze off should only be applied to those materials and pipes that meet the performance requirements of and are approved to BS EN 12201.

The following guidance covers Radius Systems' ProFuse peelable pipe and solid wall PE80 and PE100 pipes in diameters up to and including 180 mm.

Equipment

Equipment used for the squeeze off of PE pipes must be purpose made, approved and capable of adequately demonstrating its ability to effect a squeeze off without causing damage to the pipe.

Fig 1. Typical 180 mm squeeze off equipment

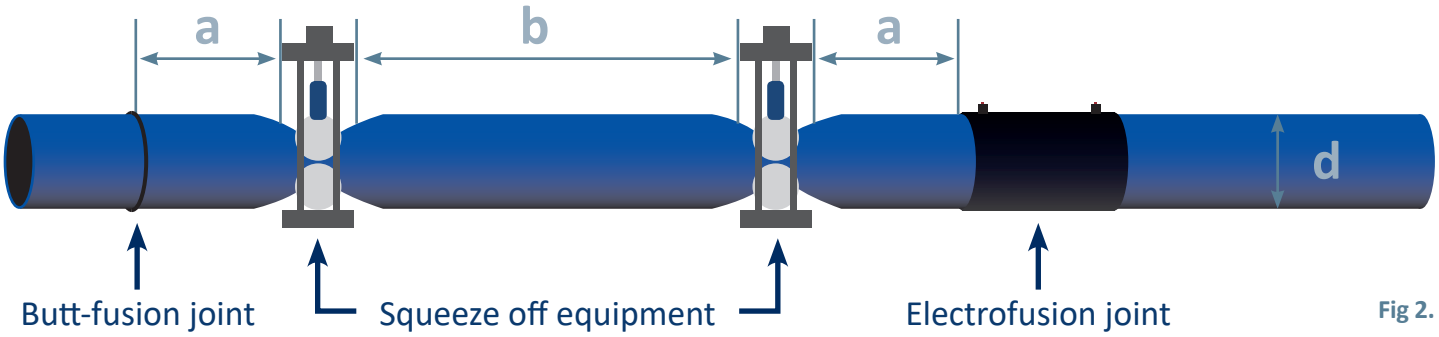


Fig 2.

Pipe preparation

The following considereations must be observed before carrying out a squeeze off procedure:

1) Polyethylene pipes must not be squeezed off if the temperature of the pipe is less than 0°C. At these low temperatures, the pipe material stiffness increases, higher compressive forces are therefore required to effect the squeeze off. At low temperatures, the application and release of the pipe squeeze off should be carried out at a reduced rate. **Polyethylene pipe must only be squeezed off when the temperature of the pipe has been at or above 0°C for more than 2 hours.**

2) Inspect the pipeline, ensure that there are no joints or fittings within a minimum of 3 pipe diameters either side of the position of the squeeze off tool: this includes electrofusion, butt fusion and mechanical joints. If fittings or joints are present within 3 pipe diameters of the squeeze off position, an alternative squeeze off location must be selected (see Fig. 2).

5) The pipe must be thoroughly cleaned around its entire circumference to remove any dirt and debris, over a minimum length of 100 mm either side of the squeeze off position. This is to ensure that dirt or debris will not be pressed into the pipe's surface during the squeeze off procedure.

6) **For Radius Systems' ProFuse® pipe with its external peelable skin, a skin length of at least 200 mm (longitudinal distance)must be removed, 100 mm either side of the squeeze off position**. The only approved equipment for the removal of the ProFuse® skin is the ProFuse PET™ (Pipe Exposure Tool). No other tools are approved or recommended for this purpose. DO NOT use open bladed knives.

7) To remove the skin, make the longitudinal cut at the top squeeze off bar position (Fig 3.)

3) If there is a need to use 2 squeeze off units, the separation distance (b) between the squeeze off units should be a minimum of 6 times the pipe diameter (see Fig. 2).

Whereby
- **d = pipe external diameter**
- **a = (minimum) 3 x d (from the edge of the fitting)**
- **b = (minimum) 6 x d**

4) Ensure that the tool used is suitable for the pipe diameter and wall thickness and is fitted with the correct sized stops, which are diameter and SDR dependent and ensure the pipe is not over compressed.

8) Before mounting the squeeze off tool, examine the pipe for signs of damage around its full circumference, 100 mm either side of the proposed squeeze off position. Particular attention must be paid to the 'critical areas' (Fig 4 and Fig 5.): these are the points of maximum tensile stress in the pipe wall. If there is evidence of pipe or pipe surface damage, the pipe should not be squeezed off at this location. An alternative location, free of damage, must be found.

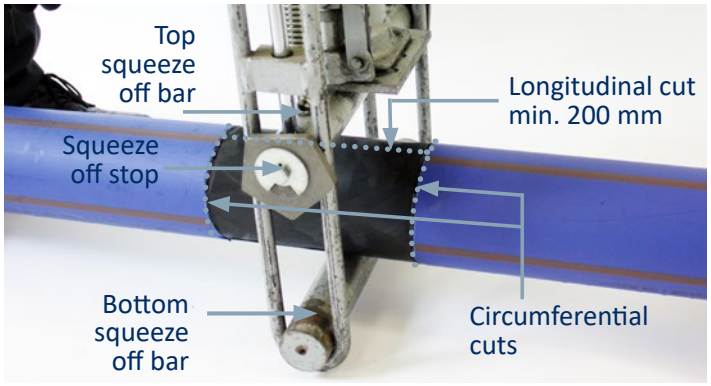


Fig 3. Position of the longitudinal cut, relative to the squeeze off bars

Applying the tool

10) The squeeze off tool must be operated in accordance with the manufacturer's instructions, taking into account all safe lifting and handling recommendations and personal protective equipment.

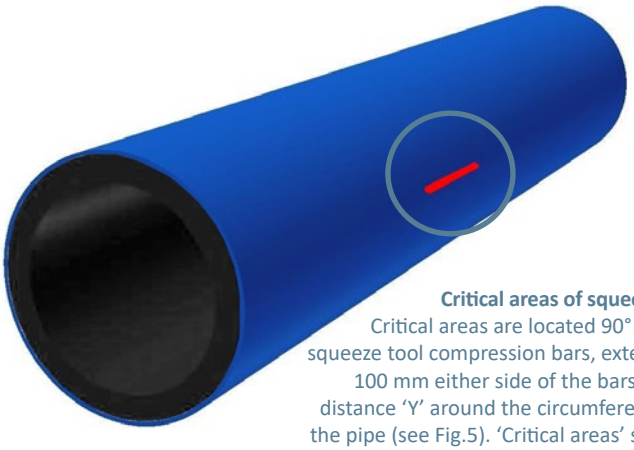


Fig 4.
Critical areas of squeeze off
Critical areas are located 90° to the squeeze tool compression bars, extending 100 mm either side of the bars and a distance 'Y' around the circumference of the pipe (see Fig.5). 'Critical areas' should be free from pipe damage or pipe surface damage.

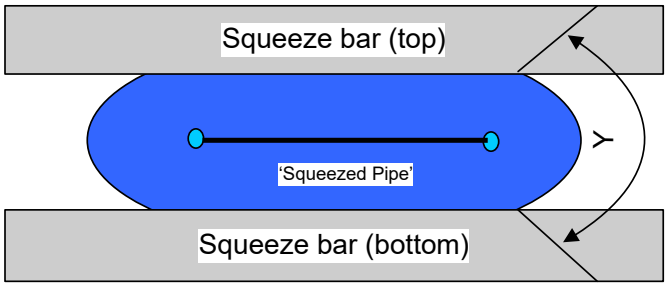


Fig 5.
Sectional view through a squeezed pipe
Y = 4 x pipe wall thickness.

11) Set both squeeze off tool stops to match the pipe diameter and SDR. For ProFuse® pipe, the squeeze off stop settings are based on the ProFuse® core pipe (external skin removed) as shown in Fig 3.

12) Assemble the squeeze off tool onto the pipe, ensuring that the pipe is positioned at the mid point of the squeeze bars.

The minimum squeeze bar separation distance (gap) must be equal to 80% of 2 times the minimum pipe wall thickness (see table below).

Nominal diameter	Pipe SDR	Minimum pipe wall thickness	Minimum squeeze bar separation distance
mm		mm	mm
25	11	2.3	3.7
32	11	3.0	4.8
50	11	4.6	7.4
63	11	5.8	9.3
75	11	6.8	10.9
90	11	8.2	13.2
90	17	5.4	8.7
110	11	10.0	16.0
110	17	6.6	10.6
125	11	11.4	18.3
125	17	7.4	11.9
160	11	14.6	23.4
160	17	9.5	15.2
180	11	16.4	26.3
180	17	10.7	17.2

13) For ProFuse® pipe, the squeeze off tool must be centrally positioned to the area where the skin has been removed (Fig 3.).

14) Ensure that the squeeze off tool is adequately supported when positioned on the main.

16) Operate the squeeze off tooling in accordance with the manufacturer's instructions until the squeeze off stops reach the bottom horizontal bar. The squeeze off procedure may not fully stop the flow of water. **Do not apply further compression**. Failure to comply may result in over compression of the pipe wall and premature failure of the pipeline.

18) Actuate the mechanical interlocks to hold the tool in the squeezed position to prevent movement of the squeeze bars.

19) Inspect the pipe, paying particular attention to the 'critical areas' ('Y' in Fig 5.). If there is any evidence of pipe splitting, treat the pipe with caution as failure may occur. Report immediately to the asset owner and treat the damage as an emergency procedure.

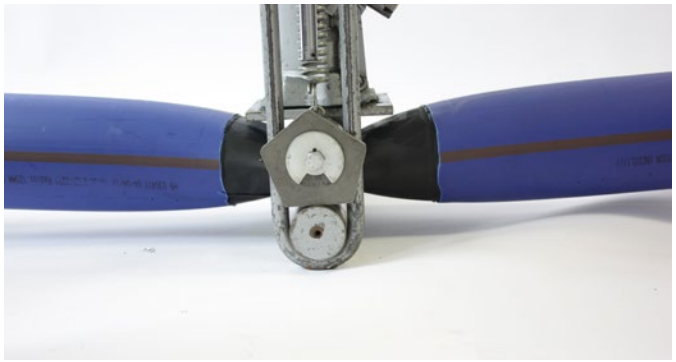


Fig 6.
Pipe in the fully squeezed position.

Removal of the squeeze off tool

20) When the remedial works are complete, release the interlocks and de-pressurise the tool. This should be undertaken in a slow, safe and controlled manner, following the tooling manufacturer's instructions.

21) With the tool in its fully open position, remove from the pipe and store for future use.

22) Inspect the pipe for signs of damage at the critical areas (Fig 4 and 5). Where evident, replace the damaged pipe section.

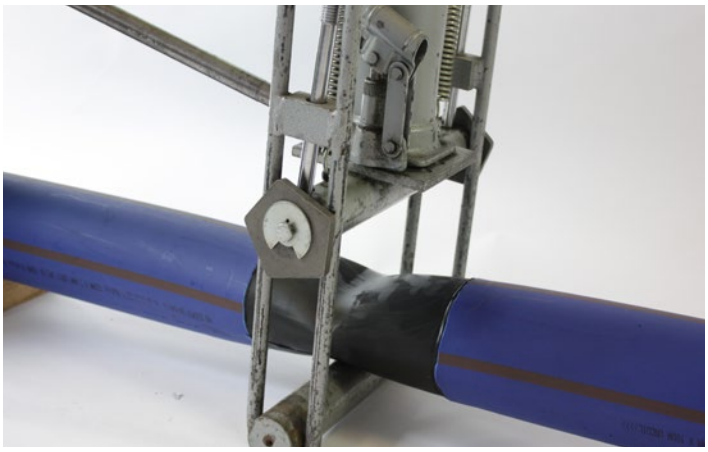


Fig 8.
Tool fully open ready for removal

Re-rounding the polyethylene pipe

23) The pipe should now be re-rounded to restore its structural integrity and flow characteristics.

24) Use mechanical re-rounding clamps to restore the pipe to its circular shape. Hold the re-rounding clamps in the fully closed position for a minimum of 10 minutes before removal.

25) Once the clamps are removed, apply the *'squeeze off applied'* tape, to indicate that a pipe squeeze off was carried out at this position.

To retain the pipe's circular shape, stainless steel reinforcement bands can be applied.

26) Do not undertake a repeat squeeze off at the same position as a previous squeeze off. Repeat squeeze off may result in progressive damage to the pipe material which may lead to premature failure.

Fig 9.
Mechanical re-rounding clamp in position on the pipe over the squeeze off location

Fig. 10
'Squeeze off applied' tape on pipe following squeeze off and re-rounding

Reference documentation

- BS EN 12201, Plastic piping systems for water supply, and for drainage and sewerage under pressure - Polyethylene (PE).
- Water Research Centre - Polyethylene Pipe Systems.
- BS EN 12106, Plastic piping systems - Polyethylene (PE) pipes - Test method for the resistance to internal pressure after application of squeeze off.

Radius Systems Ltd
Radius House, Berristow Lane, South Normanton, Alfreton, Derbyshire, DE55 2JJ, UK
t: +44(0)1773 811112 | **e:** sales@radius-systems.com | **w:** www.radius-systems.com