

GUIDANCE

Polyethylene water pipe squeeze off procedure

Pipe diameters up to and including 180mm

Introduction

Squeeze off is a method of reducing the flow of a fluid through a polyethylene pipe by 'squeezing' (compressing) the pipe, using industry best practice procedures, approved equipment and techniques. Squeeze off is commonly used for both emergency and routine flow stopping operations.

The technique requires that the pipe is squeezed in a controlled manner between 2 horizontal circular bars, until a predefined level of pipe wall compression is reached. Adherence to this technique is recommended to ensure that the pipe wall is not over-compressed, which may lead to premature or unplanned failure of the pipeline. Squeeze off should only be applied to those materials and pipes that meet the performance requirements of and are approved to BS EN 12201.

This guidance document has been prepared for Radius Systems' ProFuse peelable pipe and solid wall SC80 and SC100 pipes in diameters up to and including 180 mm.



Minimum personal protective equipment

Risk assessment considerations

- Squeezing off a pipeline with internal pressure may result in unbalanced forces which may need to be resolved.
- Where a pressurised pipe is squeezed off and a section of pipe removed, an unbalanced force will occur at either side of the squeeze off unit. Depending on the magnitude of the force, the squeeze off unit may need to be restrained.
- Squeeze off should not be used as a permanent end of line closure in place of a valve or end cap.
- Do not pressure test a pipeline whilst the squeeze off tool is applied.

Equipment

Equipment used for the squeeze off of polyethylene pipes must be purpose made, approved and capable of adequately demonstrating its ability to effect a squeeze off without causing damage to the pipe, which could ultimately lead to its premature failure.



Fig 1.
Typical 180 mm
squeeze off
equipment

Pipe preparation prior to squeeze off

Before carrying out a squeeze off procedure, the following considerations and preparatory steps must be observed:

- 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 will increase resulting in higher compressive forces required to effect the squeeze off. At low temperatures, the application and release of the pipe squeeze off should be 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 a period in excess of 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. Where fittings or joints are present within 3 pipe diameters of the squeeze off position, then an alternative squeeze off location must be selected (see Fig. 2).

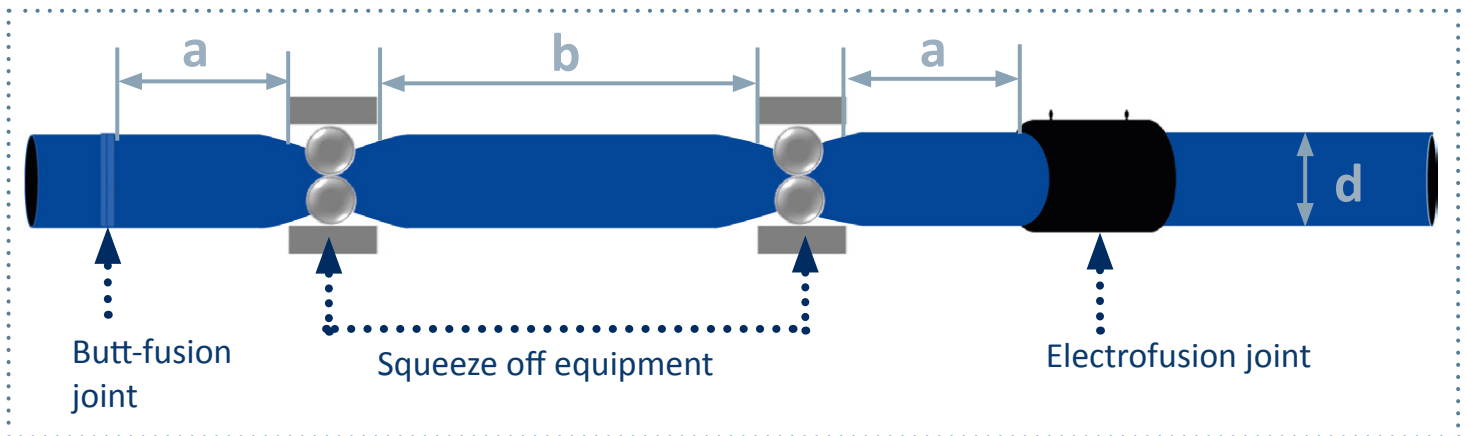


Fig 2.

3) If there is a requirement 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 tool used is suitable for the pipe diameter and wall thickness and is fitted with the correct sized stops to ensure over compression of the pipe wall cannot occur.

Note: if there are concerns over the quality of a joint at the minimum separation distances, do not proceed with the squeeze off at this position. This should be reported to the asset owner.

5) The pipe must be thoroughly cleaned around its entire circumference to remove all 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, the skin must be removed for a length of at least 200 mm (longitudinal distance), 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) When using the ProFuse PET™ to remove the skin, the longitudinal cut should be made at the mid point where the squeeze off bar is going to be in contact with the pipe (Fig 3.)

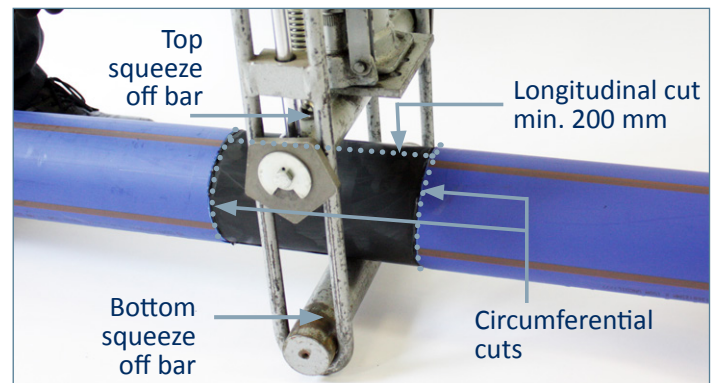


Fig 3.
Position of the longitudinal cut, relative to the squeeze off bars

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 shall be paid to the 'critical areas', these are the points of maximum tensile stress in the pipe wall, when the squeeze off tool is fully deployed. Where there is evidence of pipe damage or pipe surface damage, the pipe should not be squeezed off at this location. An alternative damage free location must be found.



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.

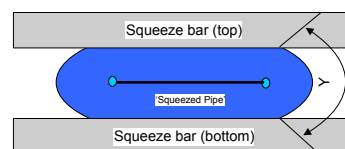


Fig 5.
Sectional view through a squeezed off pipe
Y = 4 x pipe wall thickness.

- 9) If there is no evidence of pipe damage, proceed to the next stage, 'Applying the tool'.

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.
- 11) Set the tool's squeeze off stops to the pipe's diameter and SDR. Failure to ensure that the correct squeeze off stops are used will result in an incorrect level of compression being applied to the pipe. For ProFuse® pipes, the squeeze off stop settings are based on the ProFuse® core pipe with its external skin removed.
- 12) Assemble the squeeze off tool onto the pipe, ensuring that the pipe is positioned at the squeeze bar mid point.

For pipe diameters 180 mm and below, 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 mm	Pipe SDR	Minimum pipe wall thickness mm	Minimum squeeze bar separation distance 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 positioned centrally to the length of the removed ProFuse® skin (Fig 3.).
- 14) Ensure that the squeeze off tool is adequately supported when positioned on the main.
- 15) Make a final inspection of the pipe to ensure that there is no pipe damage, dirt or debris on the pipe surface at the squeeze off position.
- 16) Operate the squeeze off tooling in accordance with the manufacturer's instructions. Compress the pipe until the squeeze off stops prevent further pipe compression.

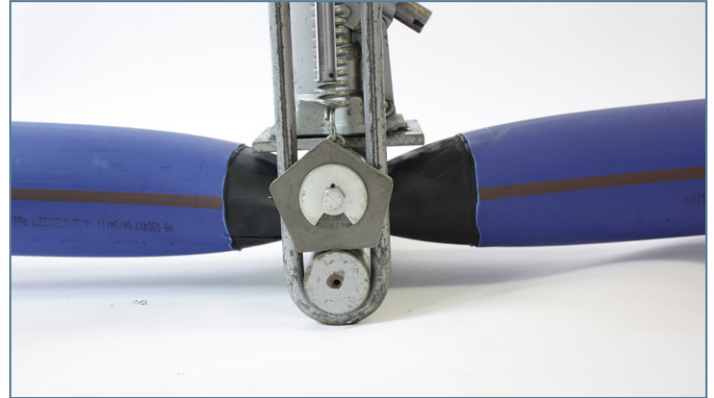


Fig 6.
Pipe in the fully squeezed position

- 17) If the squeeze off does not control the flow of water to the desired level, do not apply further compression beyond that recommended for the pipe diameter and SDR, failure to comply with this requirement 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.) that are visible at the sides of the squeeze bars. If there is any evidence of pipe splitting then this should be reported immediately to the asset owner and the damage treated as an emergency procedure.
- 20) Squeeze off should only be applied for a relatively short duration to enable remedial works to be undertaken. It is not recommended to leave the squeeze off unit applied to the compressed pipe for unattended or extended periods of time. Pipe squeeze off may not result in complete stoppage of the flow of water. Do not over compress the pipe as this may lead to premature failure of the pipeline.

Removal of the squeeze off tool

- 21) When the squeeze off procedure is complete, remove the tool by releasing the interlocks and the pressure within the tool. This should be undertaken in a slow, safe and controlled manner, following the tooling manufacturer's instructions.
- 22) With the tool in its fully open position, remove from the pipe and store for future use.
- 23) Inspect the pipe for signs of damage.

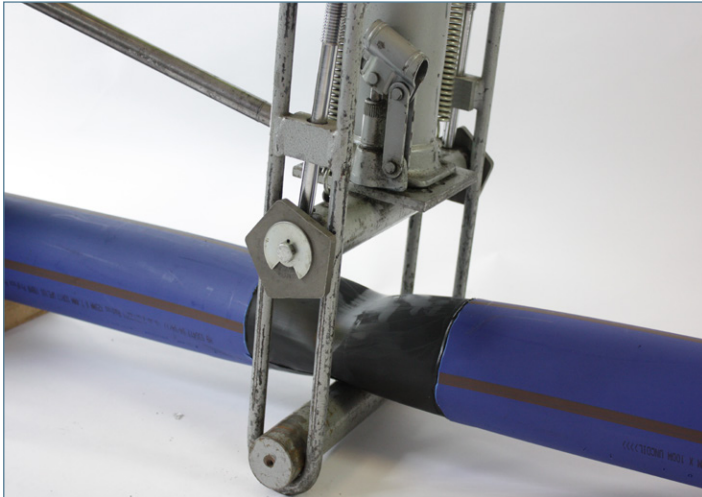


Fig 8.
Tool fully open ready for removal

Re-rounding of the polyethylene pipe

- 24) The pipe should now be re-rounded to restore its structural integrity and flow characteristics.
- 25) For pipe diameters up to and including 180 mm, mechanical re-rounding clamps can be used to restore the pipe to its circular shape. The re-rounding clamp should be held in its fully closed position for a minimum period of 10 minutes before removal.

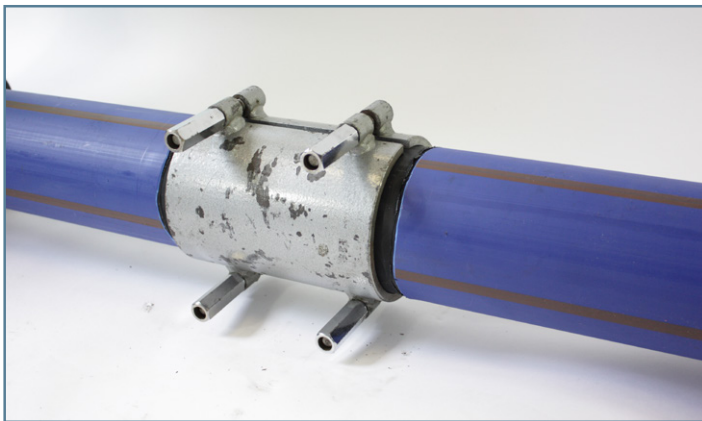


Fig 9.
Mechanical re-rounding clamp in position on the pipe over the squeeze off location

- 26) Once the clamp has been removed, the pipe should be permanently marked using an approved indelible marker pen and 'squeeze off applied' tape, to indicate that a pipe squeeze off has been applied at this position.
- 27) Do not undertake a repeat 'squeeze off' of a pipe 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. 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
- Gas Industry Specification – GIS:PL2:7 – Specification for Polyethylene pipes and fittings for natural gas and suitable manufactured gases – Part 7 squeeze off tools and equipment.