Pipe cracking (Bursting)

When is it used and what are the benefits?

Pipe cracking (bursting) is a trenchless installation process that replaces the old pipe with a new PE pipe that is drawn along behind the cracking device, leaving the old pipe fragments surrounding the newly installed pipe. Pipe cracking is applied to a wide range of old pipe materials, such as cast iron, ductile iron cement lined, vitrified clay and concrete. Pipe cracking is used where access may be difficult for other techniques and exhumation of the old pipe is difficult or not necessary. The technique offers minimal disruption to above ground activities, especially in urban areas, and enables size for size or even upsizing, in replacement.

What are the concerns?

The process of pipe cracking exposes the new pipe to potential damage arising from contact with fragments of the pipe being replaced, particularly for cast iron pipe, vitrified clay or reinforced concrete pipe. Contact with these fragments can potentially lead to scratches of depth greater than the conventional allowance of 10% of the thickness of the pipe wall.

ASTT has published guidelines for trenchless construction (ASTT, 2009) in which it is stated in relation to pipe bursting; *"Exterior pipe damage assessment is difficult to carry out and detect once installation is completed. Inspection for exterior damage should be carried out prior to installation to ensure the integrity of the pipe. Hydrostatic testing should also be performed prior to installing the pipe to ensure any defects are addressed. One of the common practice testing techniques is to pull out 2 – 7m of pipe and examine it after installation from the receiving chamber. This front section of the pipe tends to receive the most impact and damage from the installation process and is used as a guide for determining the general condition of the rest of the pipe."*

These guidelines, whist useful and widely adopted in practice, only partially address the potential for damage. The proposition that "The front section of the pipe tends to receive the most impact and damage" is not necessarily the case. In addition, hydrostatic testing is unlikely to detect even severe damage to PE100 pipe as the failure mode linked to slow crack growth is usually a long term process.

The resultant scratches can become localised areas of stress concentration that may lead to eventual failure arising from slow crack growth. It is common practice to examine the leading end of the inserted pipe as it exits. While this provides a degree of confidence, the examination does not ensure that there is no other damage.

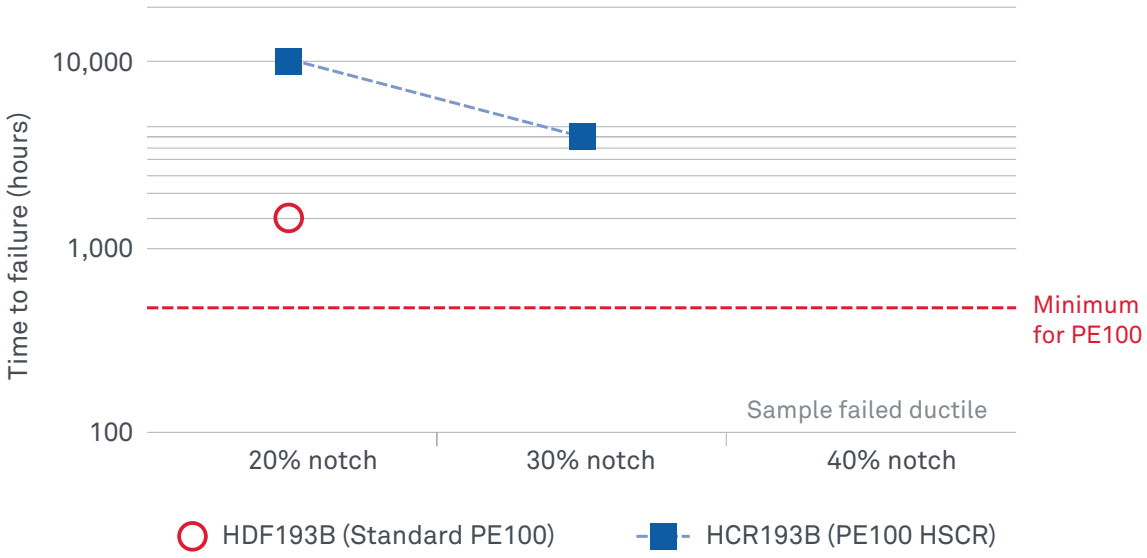
Sacrificial pipe jackets are sometimes installed as a form of protection to address concerns regarding the effects of surface damage. This is an expensive and complicated approach.

How can the use of Alkadyne® HCR193B address these concerns?

Alkadyne® HCR193B is a PE100 HSCR grade that has been specifically developed to achieve stress crack resistance that is greatly superior to standard PE100 resins. Alkadyne® HCR193B complies with AS/NZS 4131 and meets the requirements of POP016 for High Stress Crack Resistant PE100. The use of Alkadyne® HCR193B reduces the risk of brittle failure due to slow crack growth arising from surface damage and in the case of pipe cracking (bursting) provides designers with an alternative to expensive features like sacrificial pipe jackets.

When installing pipe using the pipe cracking (bursting) method, there is an increased risk of surface damage. The depth of any surface damage on the installed pipe cannot be accurately determined in the field, and may possibly be greater than the 10% of the wall thickness that is allowed by the installation standard. Testing has shown that Alkadyne® HCR193B meets the slow crack growth resistance specification for PE100 pipe even with notches deeper than 10% of the wall thickness as shown in the chart below.

Notched Pipe Test (ISO 13479)



NOTE: Test covered 110mm pipes with varied notch depth tested in hydrostatic pressure test at 920kPa/80°C

Figure 8: Notched Pipe Test ISO 13479 with varying notch depth