

PE Pipe Repair Methods – Butt Fusion Repair Sleeves (BFRS) and Variable Length Repair Sleeves (VLRS)

Description: A permanent repair technique for damaged, non-leaking PE pipe.

Status: PE pipe sizes of 1 1/4 inch through 12 inch are commercially available

BENEFITS

Permanent and safe PE pipe repair methods can avoid cut-outs and potential customer interruptions. NYSEARCH's development of butt fusion repair sleeves (BFRS) and variable length repair sleeves (VLRS) for Medium Density and High Density PE piping, operating within gas distribution pressures of 125 psig, provide repair options for damaged, non-leaking PE pipelines. Repairs are performed in-service without stopping or by-pass of normal operating gas pipelines.

BACKGROUND

NYSEARCH has completed an extensive development and test program for a range of gas industry PE pipe diameters repairable with BFRS and VLRS fittings. That program and the commercial release of associated tooling led to funding member availability of BFRS and VLRS repair fittings for 1 1/4", 2", 4", 6", 8" and 12" diameters.

There are clear economic and safety advantages inherent in the ability to repair in-service PE pipe without the need to squeeze-off, build a by-pass or excavate to access the pipe. The designed repair approach of the BFRS and VLRS provides a full circumference enclosure around damage from gouges or scratches.

TECHNICAL APPROACH

The project objective was to develop butt fusion repair sleeves (BFRS) and variable length repair sleeves (VLRS) for distribution gas PE piping (up to 125 psig). The repair technique using these

fittings are for non-leaking damaged pipe with gouges and scratches between 10-50% of the wall thickness.

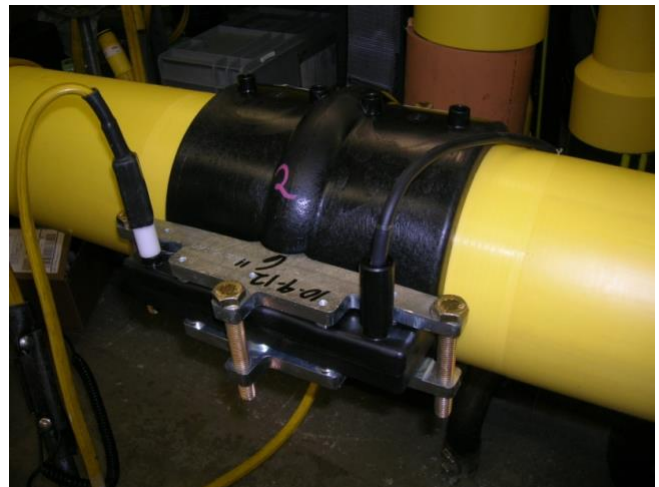


Figure 1: BFRS being installed and encircling an existing butt fusion. ElectroFusion process is similar to industry standard practices.

The basis for the BFRS and VLRS was in response to the federal regulation CFR49 Part 192.311 which states each imperfection or damage that would impair the serviceability of plastic pipe must be repaired with a suitable electrofusion sleeve or the damaged pipe must be replaced.

The BFRS is designed to fully encircle a damaged or suspect butt fusion. The repair is achieved by installing the fitting around the butt fusion with traditional electrofusion (EF) processes, fully recovering pressure retention capability. Figure 1 illustrates the BFRS installation using standard

EF processes.

The VLRS is also designed to encircle a damaged or suspect section of pipe with the added capability to interlock end-to-end for extending lateral distance along the pipe to repair any length of damaged section on the PE pipe.

The design and test basis for the BFRS and VLRS are compliant with industry standards, including:

- ASTM D2513, Standard Specification for Polyethylene (PE) Gas Pressure Pipe, Tubing, and Fittings;
- ASTM F1055, Standard Specification for Electrofusion Type Polyethylene Fittings for Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing;
- ASTM D638, Standard Test Method for Tensile Properties of Plastic.

During the project development process, participating NYSEARCH members verified application by testing the BFRS and VLRS in laboratories and by completing field installations, Figure 2 illustrates use of the 12” BFRS to permanently repair a damaged, non-leaking HDPE gas pipe.

PROGRAM STATUS

NYSEARCH has finalized the members’ needs for PE pipe repairs with the BFRS and VLRS fitting applications. The sizes that were developed reflect the needs for operational use. Table 3 illustrates the available PE pipe size repair fittings.

| PE Pipe Size Inch | BFRS | VLRS | NYSEARCH | | NUPI | | | | NYSEARCH | NUPI |
|----------------------|------|------|----------|---------|--------|---------|---------|-----------|----------|------------|
| | | | Concept | Project | Design | Tooling | Testing | ASTM Cert | Demo | Commercial |
| 11/4 | X | X | 2017 | 2018 | | | | | | 2020 |
| 2 | X | X | 2015 | | | | | | | 2018 |
| 4 | X | X | 2000 | | | | | | | 2012 |
| 6 | X | X | 2000 | | | | | | | 2014 |
| 8 | X | | 2015 | | | | | | | 2018 |
| 12 | X | | 2015 | | | | | | | 2018 |

Table 3: Size range to repair PE pipe with BFRS and VLRS

NYSEARCH contracted with NUPI in Italy for the design and development of the BFRS and

M2000-001, M2015-003, M2015-004, M2015-005, M2018-004

VLRS application. Manufacturing is also performed in Italy with distribution through NUPI Americas (with a product line of ‘Elofit’) at two locations domestically- Texas and South Carolina.



Figure 2: Field installation of a 12” BFRS on a HDPE low-pressure gas pipeline.

Highlights

Applying permanent PE pipe repairs with BFRS and VLRS provides:

- Operational repair options to improve safety
- Cost effective PE pipe system maintenance and integrity
- Reduction of potential customer gas interruptions

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