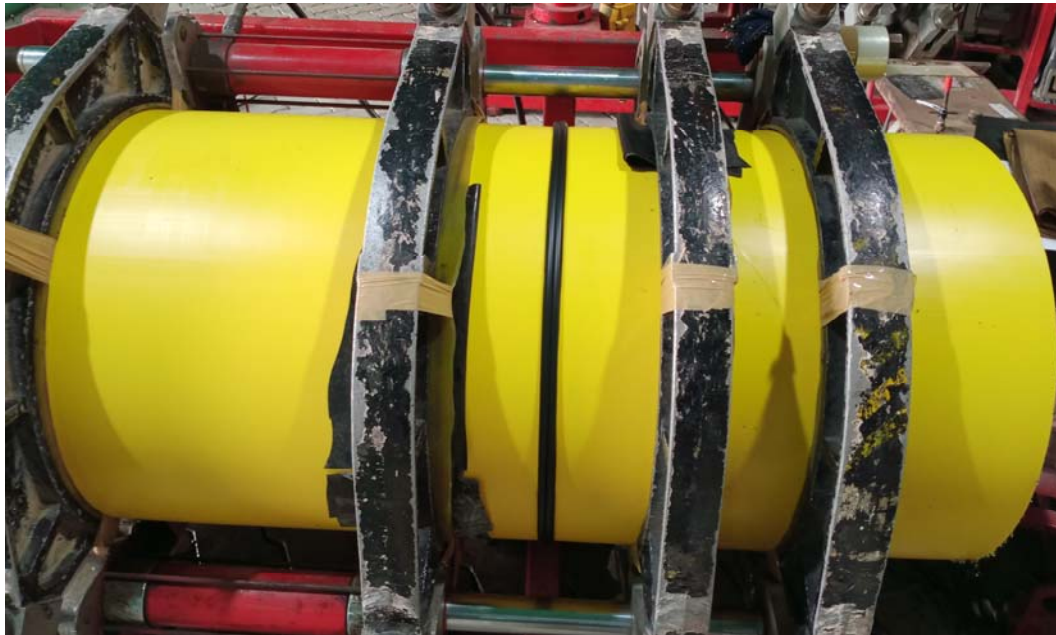


Tensile Strength comparison test of fused versus non-fused NOCX HDPE pipes colored

01. Order

Comparison of the tensile strength of colored NOCX HDPE pipes

- plain (non-welded)
- butt welded including weld seam
- butt fusion without weld seam (removed after welding)



Butt-fusion of the testing sample. (Remark, the beige tapes just fix protection foils inside the steel clamps to avoid surface scratches)

02. Requirements

Butt fusion to be executed acc. German DVS welding norm 2207-1 on HDPE pipes produced to latest norms, should reach min tensile strength of 80% of non-welded pipes. According PESTEC requirements tensile strength should reach 100% of non-welded pipes with a tolerance of +10%/-5%.

Higher values than 100% might be reached because of a material increase in the welding zone called welding bead or welding seam, giving a bigger strength than the pipe itself.

Test equipment to be suitable for the tensile strength tests acc. DIN EN ISO 13953.

03. Tested Material

Product	:	PESTEC NOFX Pipes Size 610 x 36,0 mm SDR 17 color including 4 mm coextrusion layer yellow
No. of Samples	:	3 welded with seams, 3 welded with removed inner and outer seam, 3 non-welded
Material	:	NOCX tow-layer HDPE
Color	:	Black/yellow

04. Test location

The test was carried out at PESTEC production laboratory at Sangir, Vapi.

05. Test setup

“International Equipment” testing equipment was used.

06. Sample preparation

Test specimen of a NOCX pipe 610 x 36,0 mm, SDR 17 have been cut out in shape according to ISO 13953 using a mechanical punch.

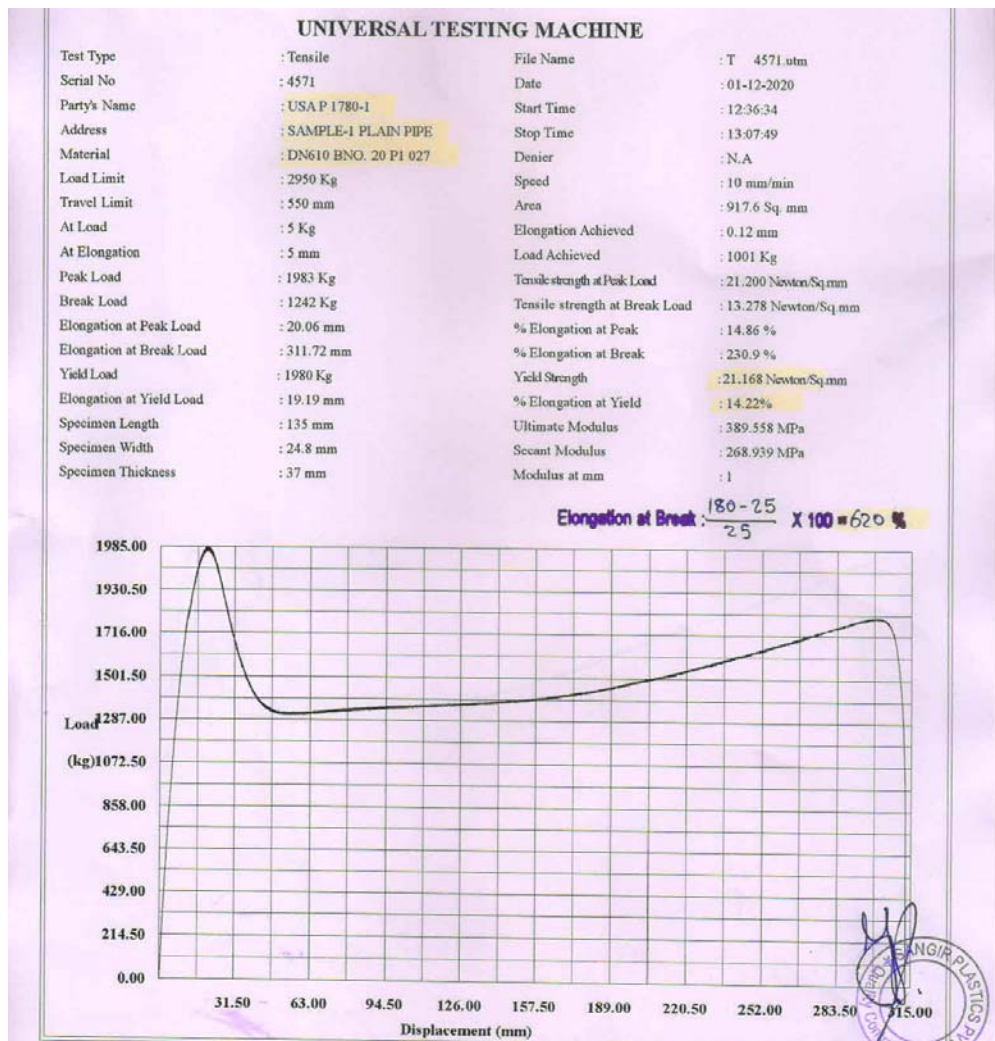
07. Test Description

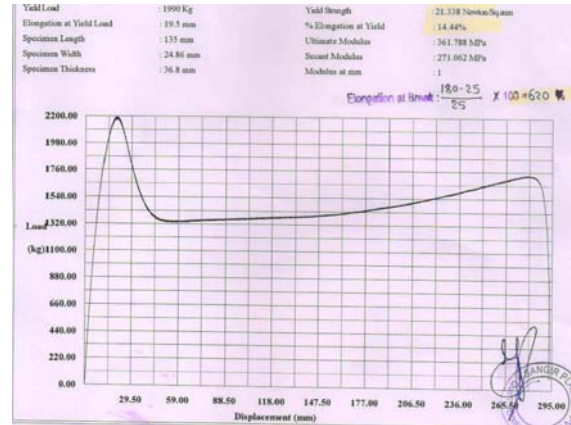
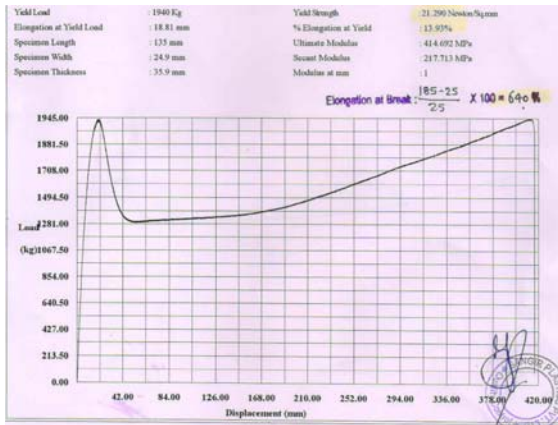
Test specimen has been clamped into the grips of the equipment and loaded with a test speed of 10 mm/min until the specimen collapsed. The test results have been recorded on a graphical recorder included in the test equipment.



08. Test results

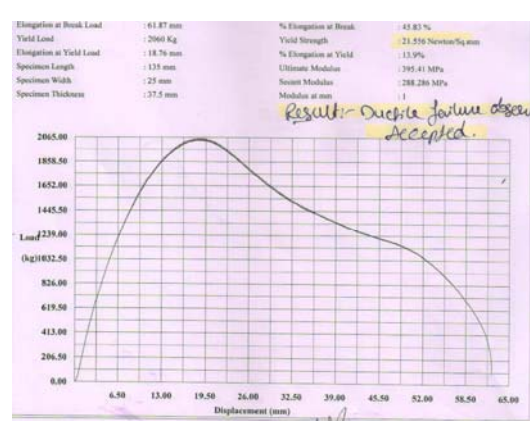
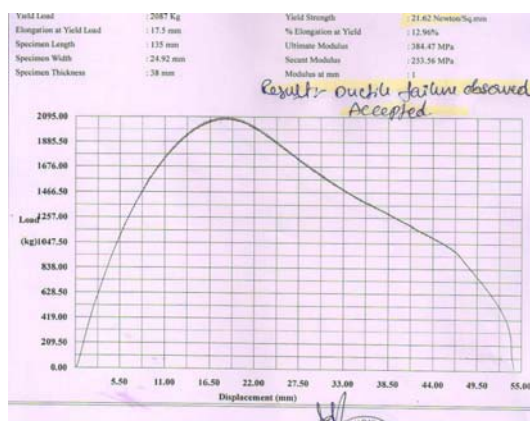
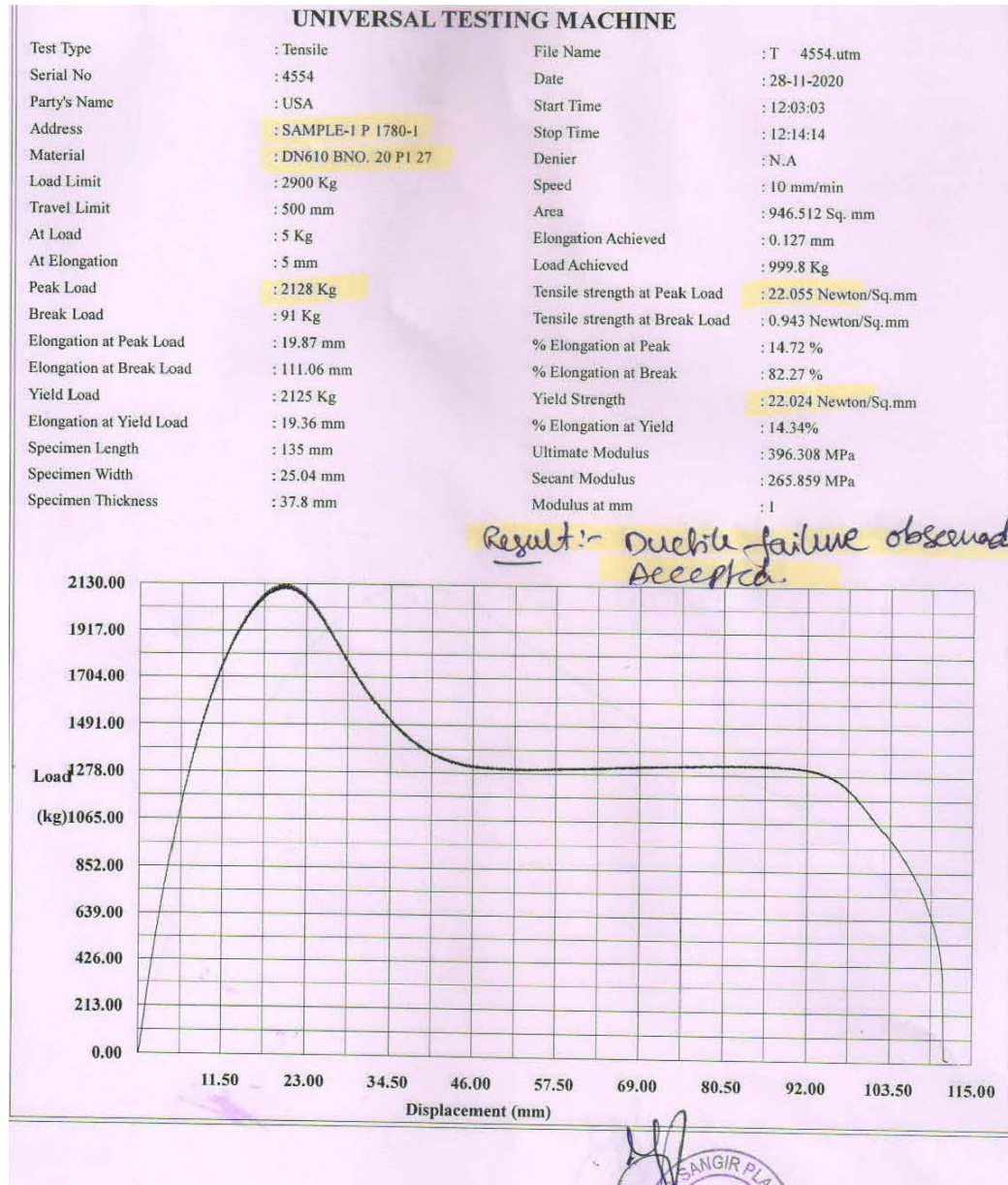
Non-fused NOCX pipe





Butt fused NOCX pipe with seam



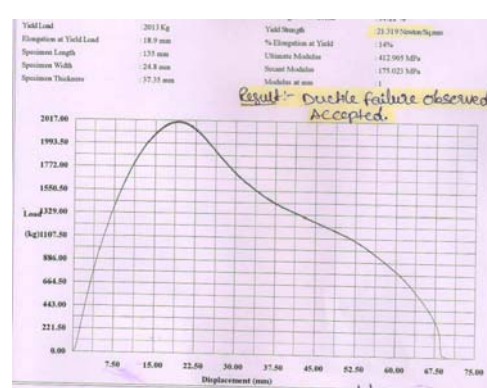
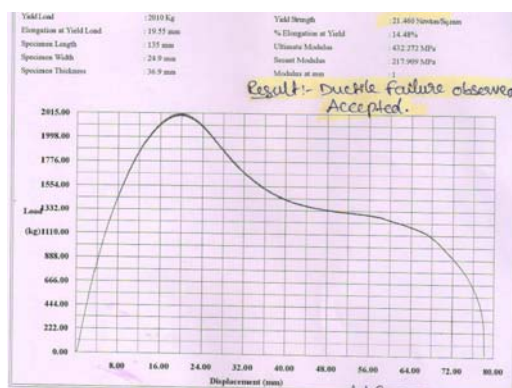
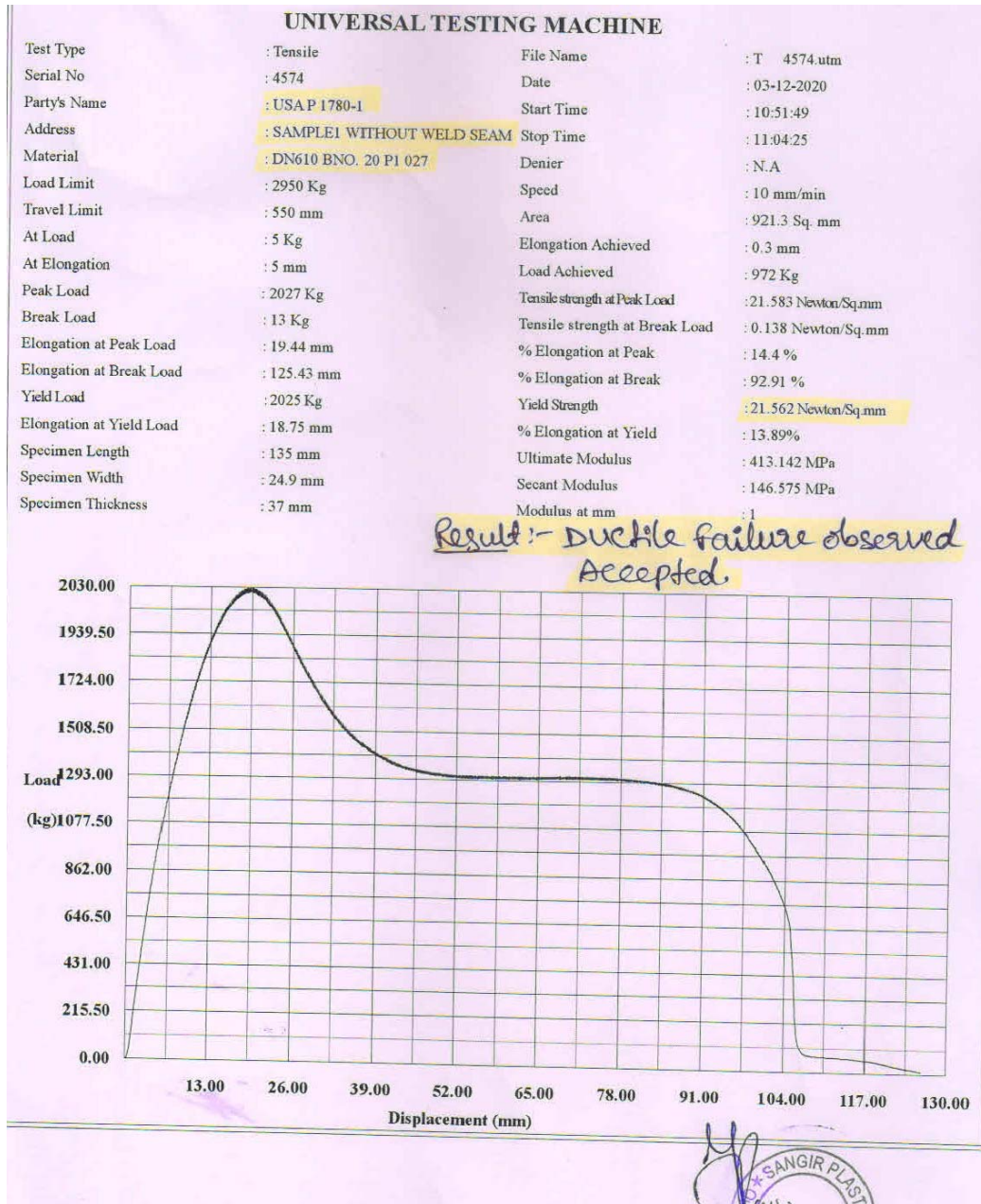


Bending test of butt fused NOCX pipe with seam



Butt-fused NOCX pipe without seam (removed after welding)





Test Results

Sample	NOCX pipe Type	Yield stress	Tensile strain at yield
		[N/mm ²]	[%]
		Min REQ 21,0	MIN REQ 8%
1	Non-welded	21,16	14,22
2	Non-welded	21,29	8,5413,93
3	Non-welded	21,33	14,44
	Average non-welded	21,27	14,20
1	Butt fusion with seam	22,24	14,34
2	Butt fusion with seam	21,62	12,96
3	Butt fusion with seam	21,55	13,90
	Average Butt-fusion with seam	21,73	13,73
1	Butt fusion without seam	21,56	13,89
2	Butt fusion without seam	21,46	14,48
3	Butt fusion without seam	21,32	14,00
	Average Butt-Fusion without seam	21,45	14,12

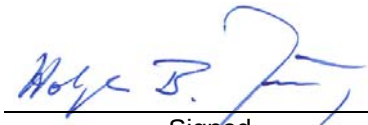
1. All test samples reach the minimum mechanical requirements of yield stress 21,0 N/mm² and 8% tensile strength at yield.
2. The bending test result is perfect.
3. The average non-fused results is 21,27 MPa, for butt fused with seam 21,73 MPa and for butt fused without seam 21,45 MPa
4. Considering non-fused pipe result as 100%, the butt fused with outer seam reached 102,16%, the butt-fused without seam 100,85%.
5. All butt fused results reach a little higher tensile strength than the pipe itself. This is a quite typical result and caused by the higher material accumulation in the welding zone. The still higher result for the specimen without seam can be expected as to avoid damages in the welding zone, the seam removal is just done by about 95%

09. Conclusion

Butt fused NOCX pipes reach the same tensile strength as non-welded NOCX pipes.
The results comply with PESTEC requirements and exceed the minimum norm tolerances.
For static and quality reasons it is to assume that the butt-fused NOCX pipe section is of
the same quality as the non-fused NOCX pipe section.

03.12.2020

Date



Signed
Holger Jung