

**TEST REPORT No. VVAW/DT/TB/18/1122/2/EN**

Date of issue: **23.12.2020**

Copy No. **1**

Table 1

<b>TEST OBJECT</b>	<i>Casing joint, shrinkable with mastic</i>
<b>CLASSIFICATION OF JOINTS according to EN 489-1 Annex A</b>	<i>Type 1.1 PE Shrink joint casing, single sealed with adhesive</i>
<b>ORDERED BY</b>	BELMAFLEX Polska Sp. z o.o. ul. Handlowa 12, 41-807 Zabrze
<b>MANUFACTURER</b>	BELMAFLEX
<b>MARKING OF TEST OBJECT</b>	LB/59/2018; LB/60/2018, LB/16/2019

Table 2

SCOPE OF THE TEST	REQUIREMENTS		TEST METHODS	
	EN 489:2009	EN 489-1:2019	EN 489:2009	EN 489-1:2019
1. Polyurethane (PUR) foam thermal insulation	4.2.3	4.3.3	5.4	-
• Foam density	4.2.3.3.	4.3.3.2	5.4.6	5.6
• Compressive strength	4.4.3 acc. to EN 253:2009	4.3.3.3	5.3.3 acc. to EN 253:2009	5.6
• Cell size	4.2.3.2	4.3.3.4	5.4.5.1	5.6
• Water absorption at elevated temperature	4.2.3.4	4.3.3.5	5.4.7	5.6
• Closed cell content	4.2.3.2	-	5.4.5.2	-
2. Soil stress test	4.2.2	4.3.4	5.1	5.2
3. Water tightness	4.2.1	4.3.5	5.2	5.3
4. Bending test of the welded plugs	-	4.3.7.3	-	5.7
5. Melt mass-flow rate (MFR) of welded plug	-	4.3.8	-	5.5

Table 2

INFORMATION ABOUT TEST OBJECTS AND OTHER INFORMATION	
Installation method of thermal insulation	<i>Foamed in the joint casing</i>
List of components of joint (product/manufacturer)	PE shrink joint casing (Fig. 1, No.1 ) made by Belmaflex with integrated mastic made by AIB Sp. z o.o. ul. Przemysłowa 22, 44-190 Knurów Venting plug (FIG. 1, No 2, weld plug (PICTURE 1, No 3) made by Poliamid Plastics, ul. Zajęcza 3, 57-300 Kłodzko

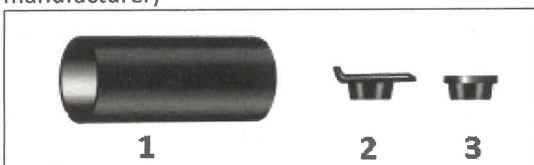


Figure1

INFORMATION ABOUT TEST OBJECTS AND OTHER INFORMATION				
Information about installation	Marking	LB/59/2018	LB/60/2018	LB/16/2019
	Test object description	Casing joint, shrinkable with mastic		
	Date/place	05.12.2018, 14.01.2019/ BELMAFLEX Polska Sp. z o.o. ul. Handlowa 12, 41-807 Zabrze		
	Confirmation	Video recording		
Product data sheets	Product catalogue card. Casing joint, shrinkable with mastic.			
Installation instruction	Installation manual ver. 1.1 Belmafex casing joint, shrinkable with mastic.			

Table 4

TEST OBJECTS INFORMATION			
Length of test object, m	2,5 ± 0,01		
Marking	LB/59/2018	LB/60/2018	LB/16/2019
DN	80	80	150
Nominal diameter of casing De, mm	160	160	250
Length of joint casing, m	0,7	0,7	0,7
Material casing / wall thickness, mm	PE/ 3,0	PE/ 3,0	PE/ 3,6

Table 5

DATE	Marking of test object		
	LB/59/2018	LB/60/2018	LB/16/2019
OBJECT RECEIVING	07.12.2018		21.02.2019
SOIL STRESS TESTS	11.12 ÷ 13.12.2018	14.12 ÷ 18.12.2018	22.02 ÷ 25.02.2019
WATER TIGHTNESS TESTS	13.12 ÷ 14.12.2018	18.12 ÷ 19.12.2018	25.02 ÷ 26.02.2019
JOINT THERMAL INSULATION	-	01.03.2019	01.03.2019
BENDING TEST OF THE WELDED PLUGS	-	14.12.2020	14.12.2020

Table 6

AMBIENT CONDITION		Marking of test object		
		LB/59/2018	LB/60/2018	LB/16/2019
CONDITIONING	Ambient temperature, °C	23 ± 2		
	Relative humidity, %	20,0 ÷ 40,0		
	Conditioning duration, h	96	144	24
SOIL STRESS TEST	Ambient temperature, °C	20,9 ÷ 21,8	21,4 ÷ 22,1	22,1 ÷ 22,3
	Relative humidity, %	33,8 ÷ 35,0	29,8 ÷ 31,1	25,4 ÷ 27,2
WATER TIGHTNESS TEST	Ambient temperature, °C	21,5 ÷ 22,3	22,2 ÷ 22,4	22,2 ÷ 22,5
	Relative humidity, %	28,1 ÷ 30,9	27,6 ÷ 30,6	29,7 ÷ 31,0

AMBIENT CONDITION		Marking of test object		
		LB/59/2018	LB/60/2018	LB/16/2019
JOINT THERMAL INSULATION TESTS	Ambient temperature, °C	-	21,1 ÷ 21,6	21,1 ÷ 21,4
	Relative humidity, %	-	39,7 ÷ 41,2	35,9 ÷ 41,3
BENDING TEST OF THE WELDED PLUGS	Ambient temperature, °C	-	21,1	21,1
	Relative humidity, %	-	41,3	41,3

Table 7

TEST CONDITIONS			Marking of test object				Requirements EN 489:2009 EN 489-1:2019	
			LB/59/2018	LB/60/2018	LB/16/2019			
MAINTENANCE BEFORE TESTING	Service pipe temperature	°C	120 ± 2	120 ± 2	120 ± 2		120 ± 2	
	Heating duration	h	24	24	24		24	
SOIL STRESS TEST (SAND BOX TEST)	Sand box outside dimensions	m	1,8 x 1,0 x 1,8			acc. to 5.2.2		
	Sand	-	Natural sand in air-dried condition			standard grain distribution		
	Sand temperature	°C	22,0 ÷ 22,4	21,4 ÷ 22,1	22,1 ÷ 22,3		23 ± 2	
	Moisture content	%	0,03			max. 0,5		
	Effective vertical soils stress	kPa	~18			18 ± 1		
	Sand overfill before test	m	0,3			300 <sup>+100</sup> <sub>0</sub>		
	Service pipe temperature	°C	120 ± 2	120 ± 2	120 ± 2		120 ± 2	
	Displacement	mm	75 ± 0,1	75 ± 0,1	75 ± 0,1		75 ± 2	
	Forward speed	mm/min	10 ± 0,1	10 ± 0,1	10 ± 0,1		10 ± 1	
	Backward speed	mm/min	50 ± 0,1	50 ± 0,1	50 ± 0,1		50 ± 1	
Number of cycles	-	100	100	100		min. 100		
WATER TIGHTNESS TEST	Temperature in water tank	°C	21,9 ÷ 22,3	21,4 ÷ 21,7	22,3 ÷ 22,5		23 ± 2	
	External pressure on test object	kPa	30	30	30		30	
	Test duration	h	24	24	25		min 24	
BENDING TEST ON WELDED PLUGS	Bending angle α	°	-	sample 1	sample 2	sample 1	sample 2	160
			-	160	160	160	160	

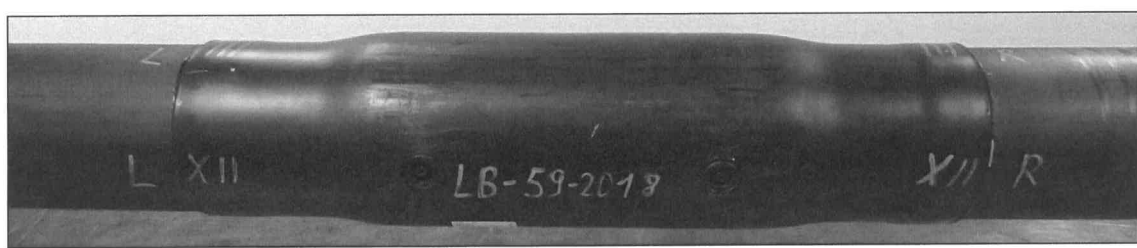
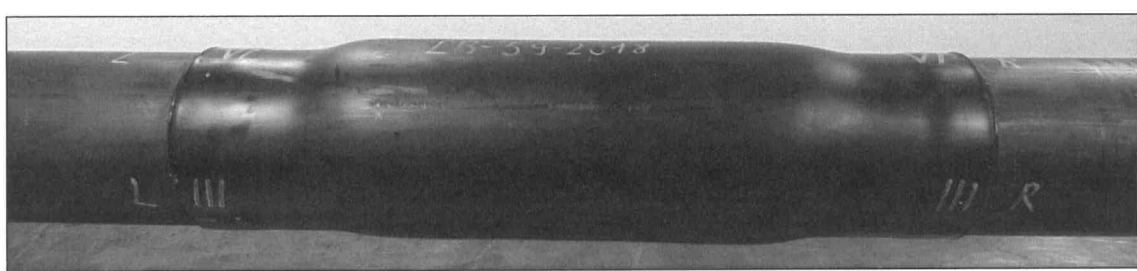
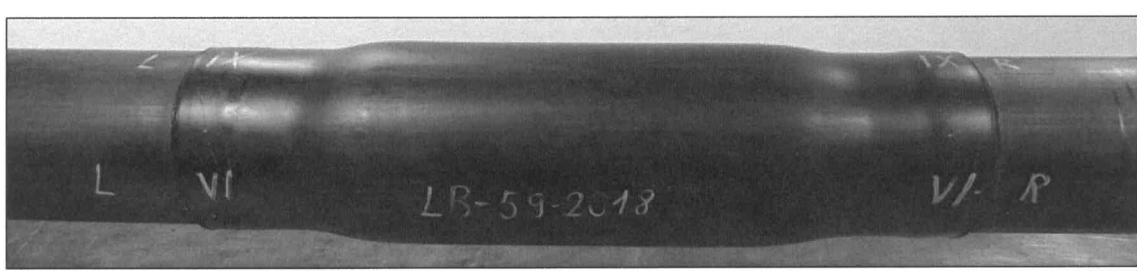
Table 8

TEST RESULTS				General requirements for the joint according to EN 489:2009 item 4.1.1. EN 489-1:2019 item 4.2.2
Marking of test object	LB/59/2018	LB/60/2018	LB/16/2019	The joint shall be: <ul style="list-style-type: none"> <li>• watertight;</li> <li>• able to withstand longitudinal forces initiated by longitudinal movements of the pipe in the ground;</li> <li>• able to withstand radial forces and bending moments;</li> <li>• able to withstand effects of temperature and temperature variations</li> </ul>
SOIL STRESS TEST	Law deformation of ends of objects			
WATER TIGHTNESS TEST	No moisture penetration observed inside the joint			

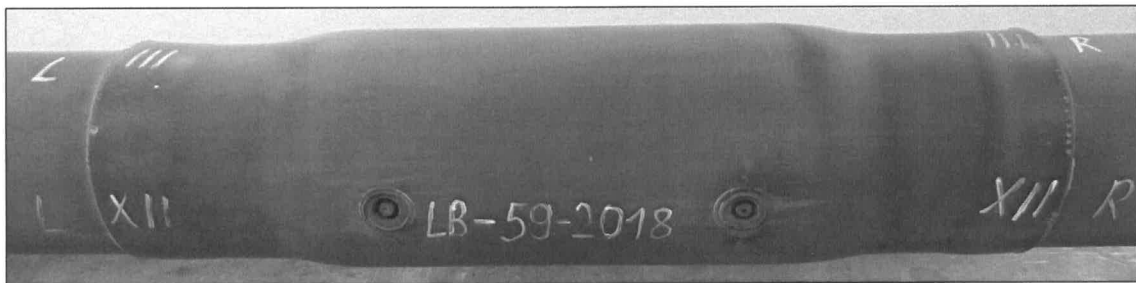
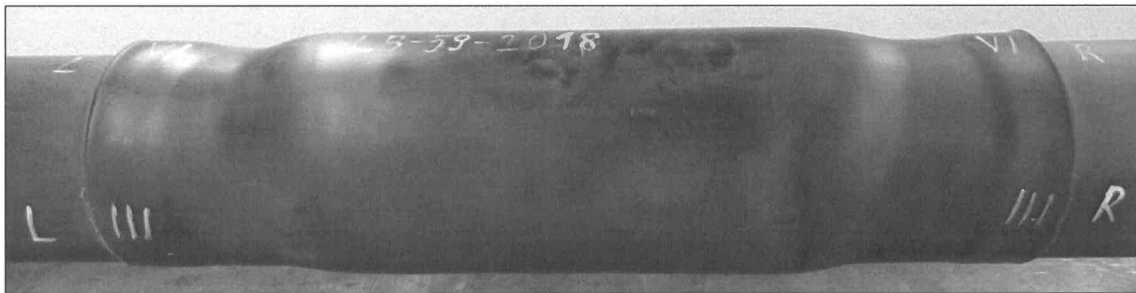
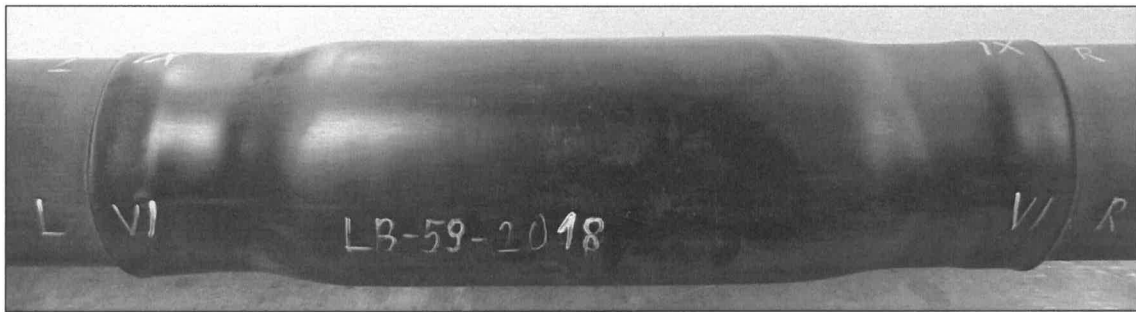
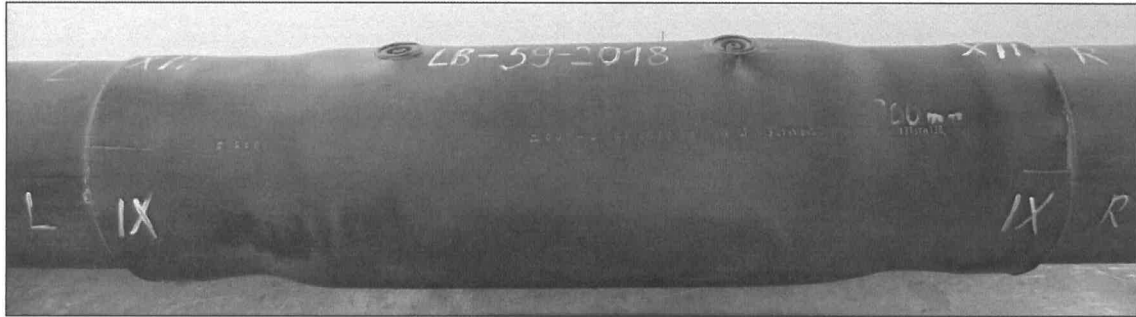
Table 9

TEST RESULTS		Marking				Requirements EN 489-1:2019
		LB/60/2018		LB/16/2019		
PUR insulation test in account with item 5.6	Density, kg/m <sup>3</sup>	62,2 ± 0,1		58,5 ± 0,2		item 4.3.3.2 min. 55
	Compressive strength in a radial direction, MPa	0,32 ± 0,23 %		0,31 ± 0,25 %		item 4.3.3.3 min. 0,3
	Water absorption, % (m/m)	7,3 ± 0,3 %		8,4 ± 0,3 %		item 4.3.3.4 max. 10
	Corrected closed cell content, %	96,4 ± 1,0		97,7 ± 1,2		-
	Size of the cells, mm	0,40 ± 0,03		0,45 ± 0,03		item 4.3.3.5 max. 0,5
Visual inspection after bending test in account with item 5.7		sample 1	sample 2	sample 1	sample 2	item 5.7 cracks detectable with visual inspection shall not arise in the weld seam before the minimum bending angle (160 °) is reached
		no cracks		no cracks		

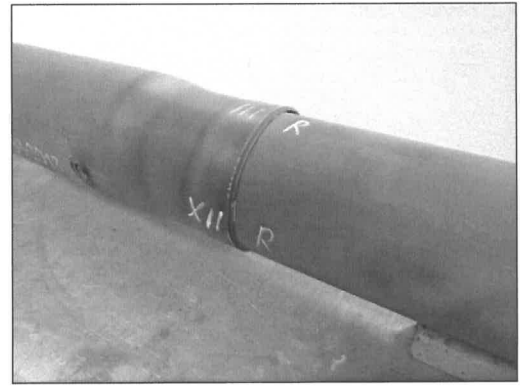
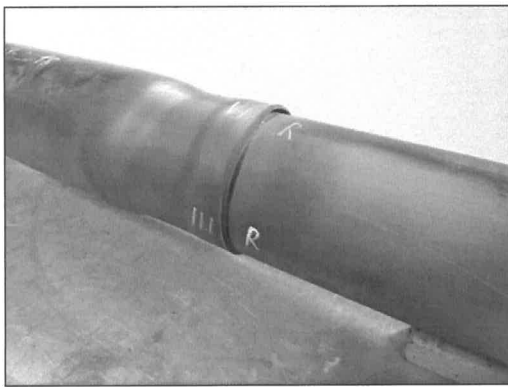
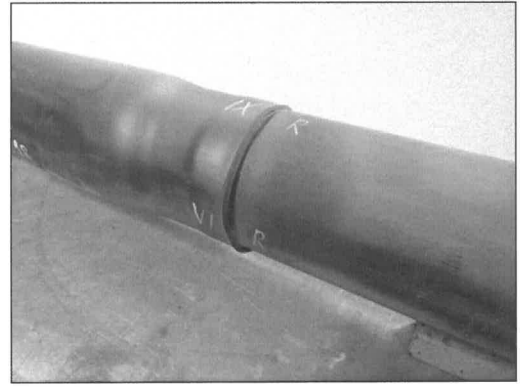
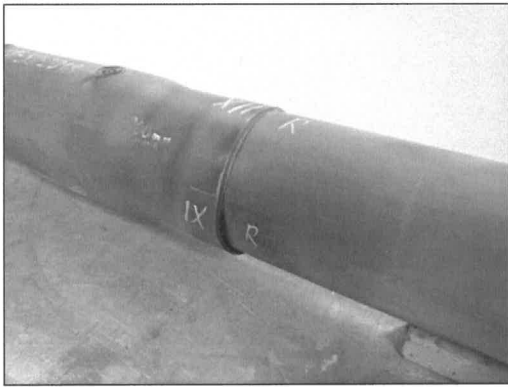
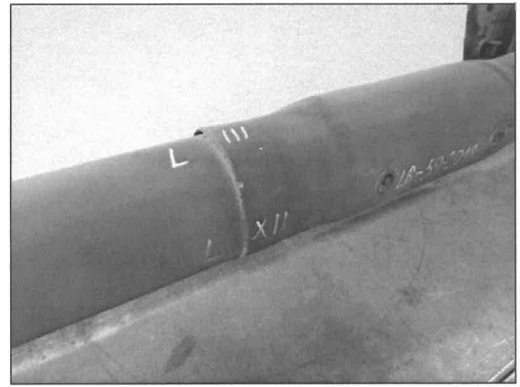
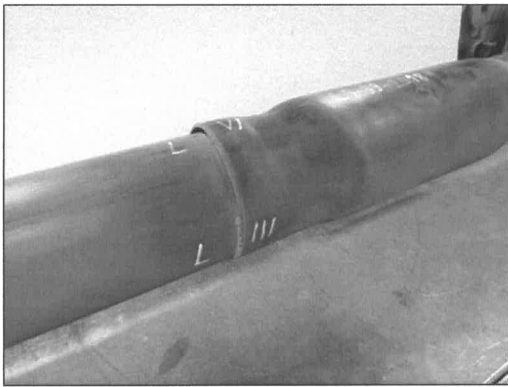
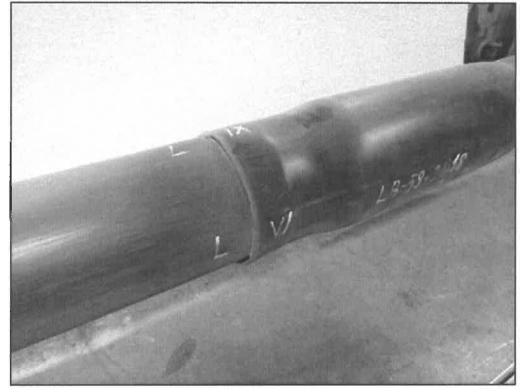
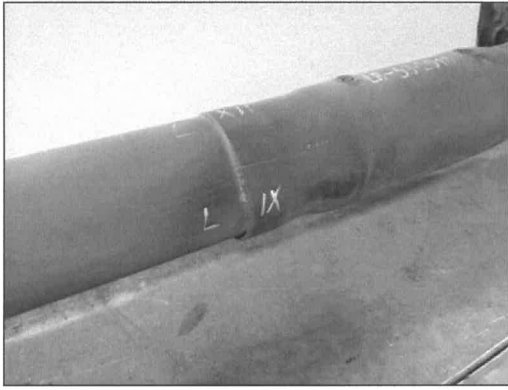
PHOTOGRAPHICAL DOCUMENTATION



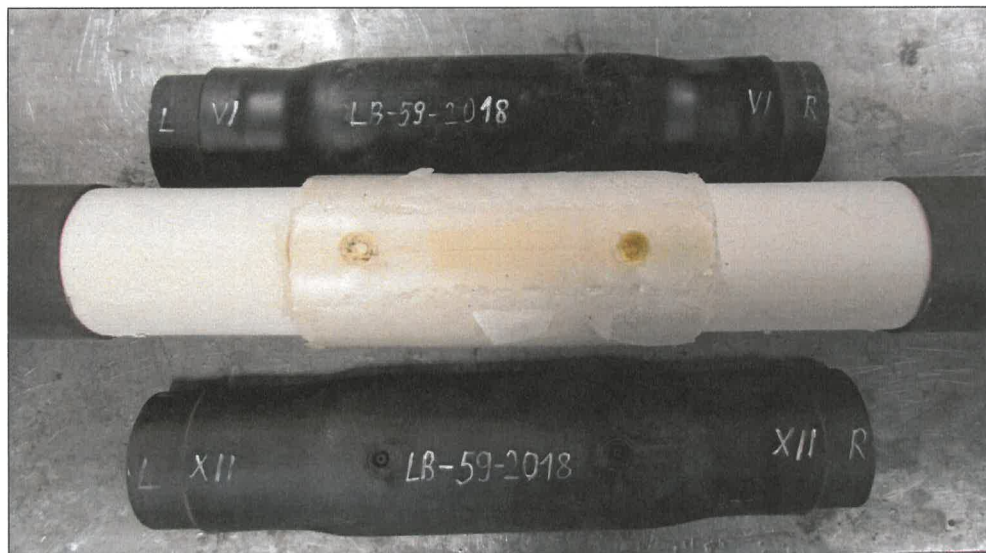
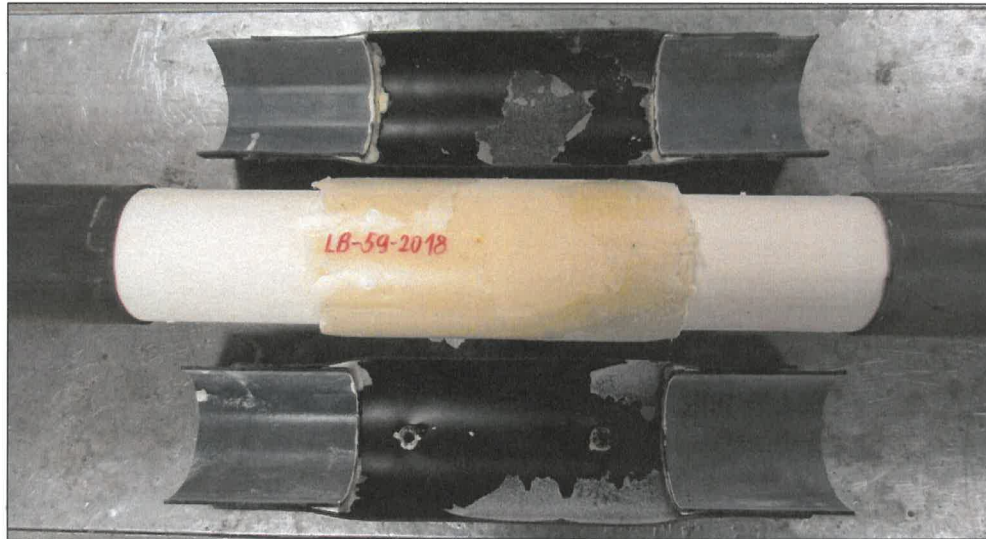
Photos 1÷4 Object LB/59/2018 before sandbox test



*Photos 5÷8 Object LB/59/2018 after sand box test*

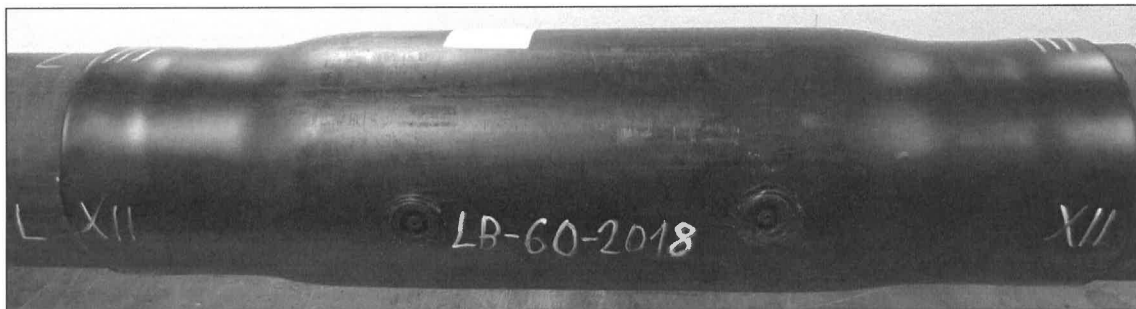
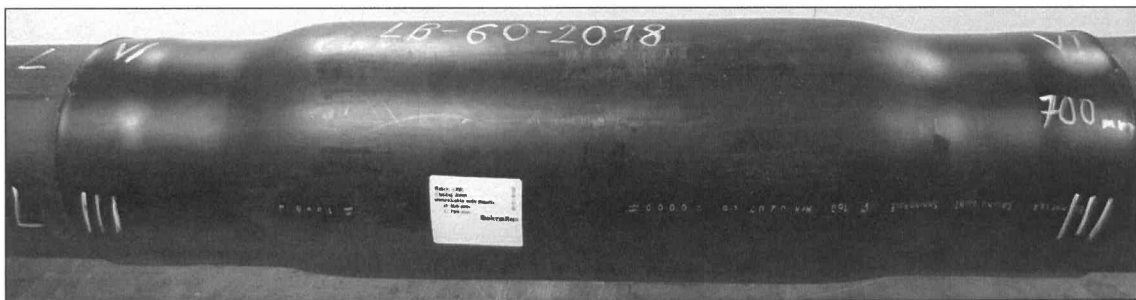


Photos 9 ÷ 16 Object LB/59/2018 after sand box test

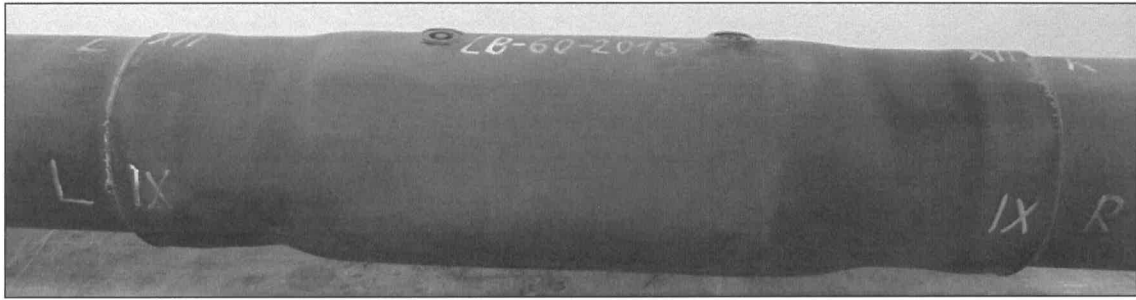


*Photos 17, 18 Object LB/59/2018 after water impermeability test*

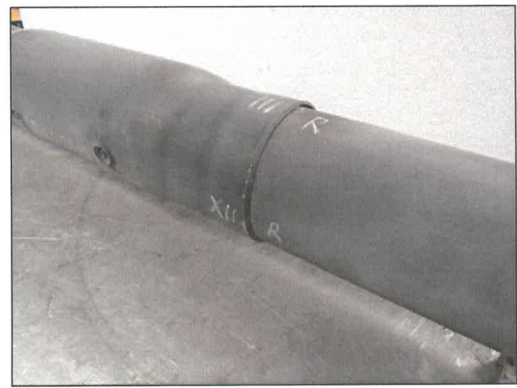
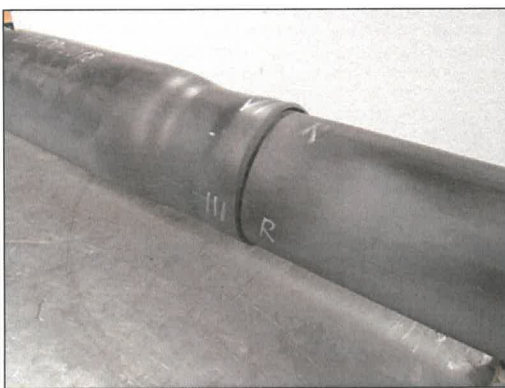
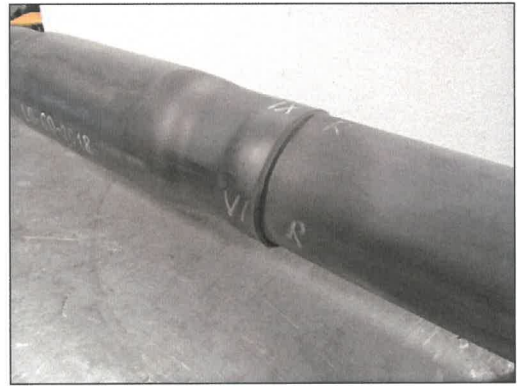
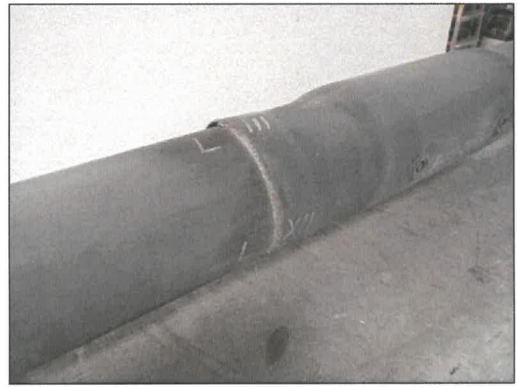
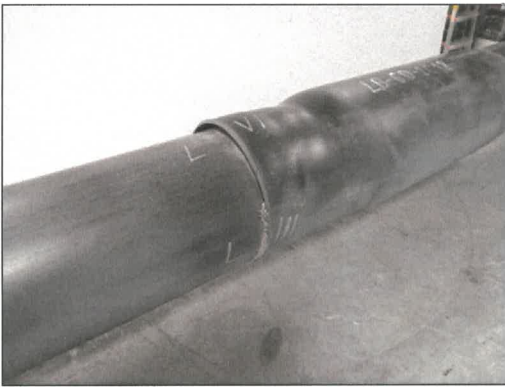
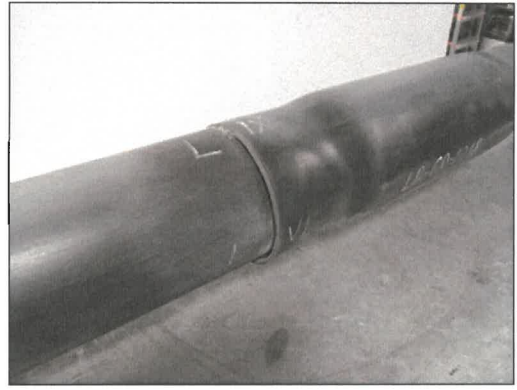
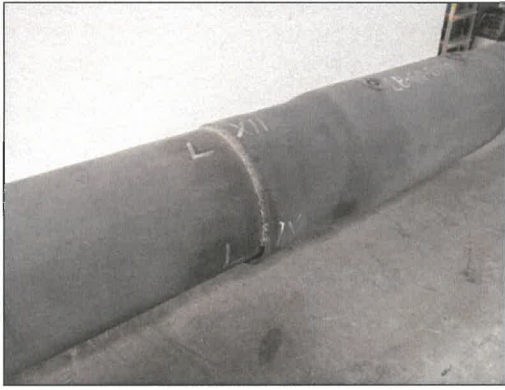




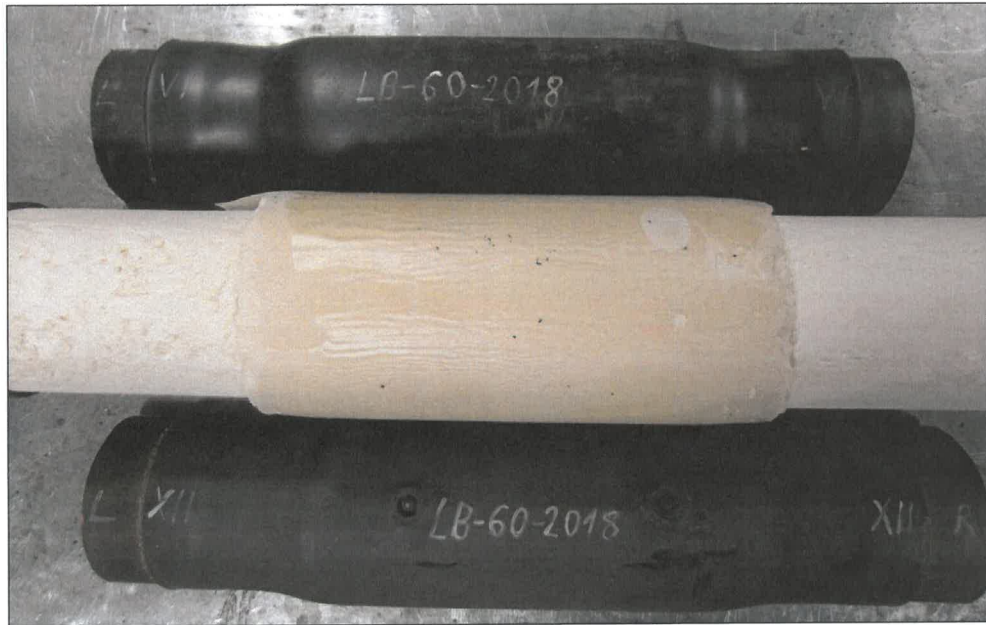
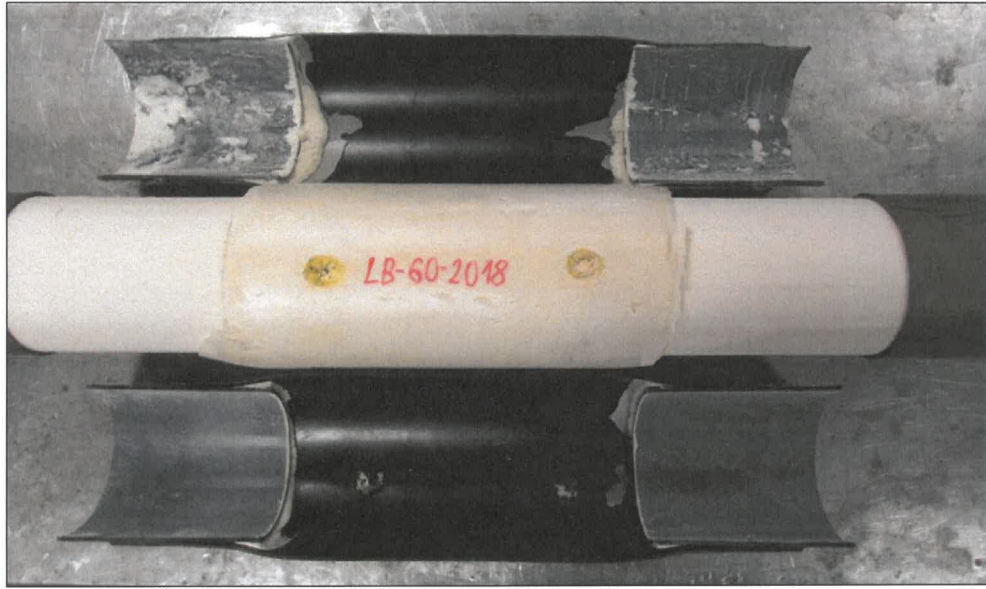
Photos 19÷22 Object LB/60/2018 before tests



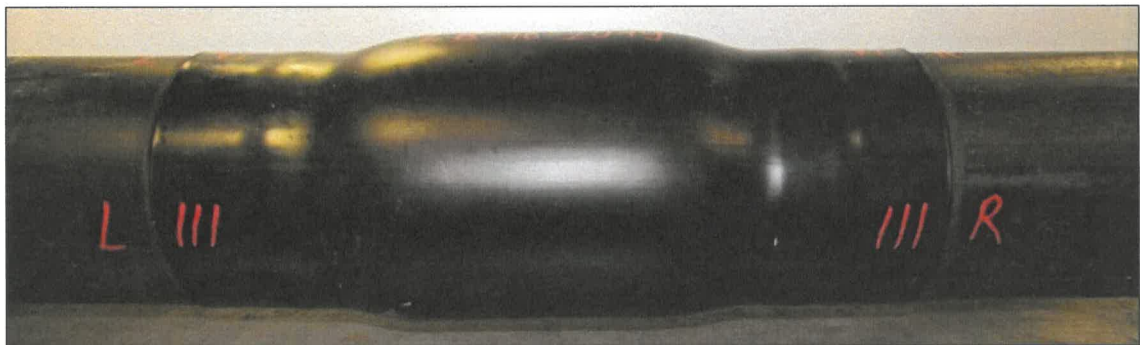
*Photos 23÷26 Object LB/60/2018 after sand box test*



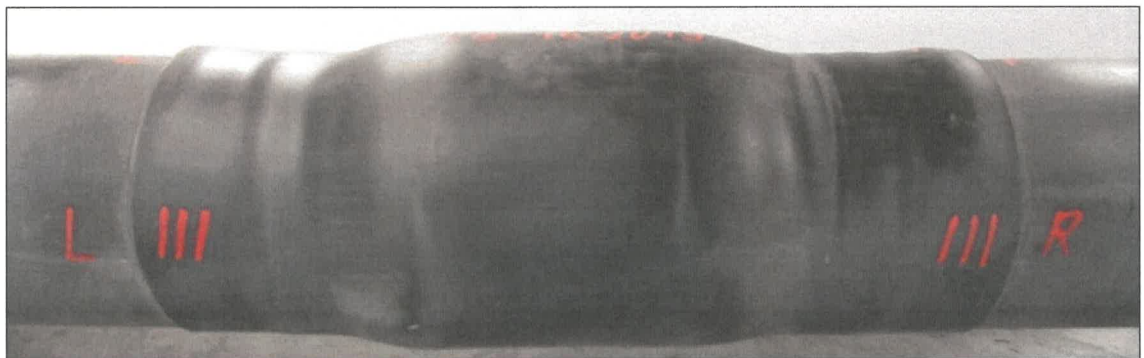
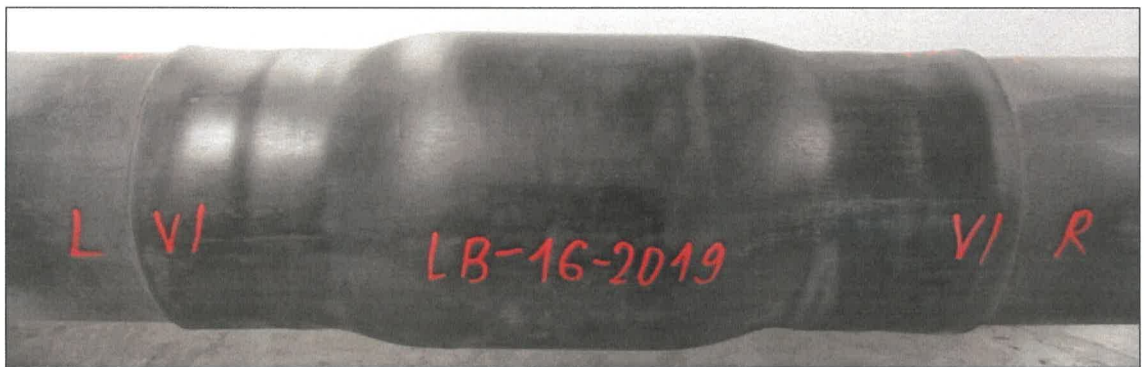
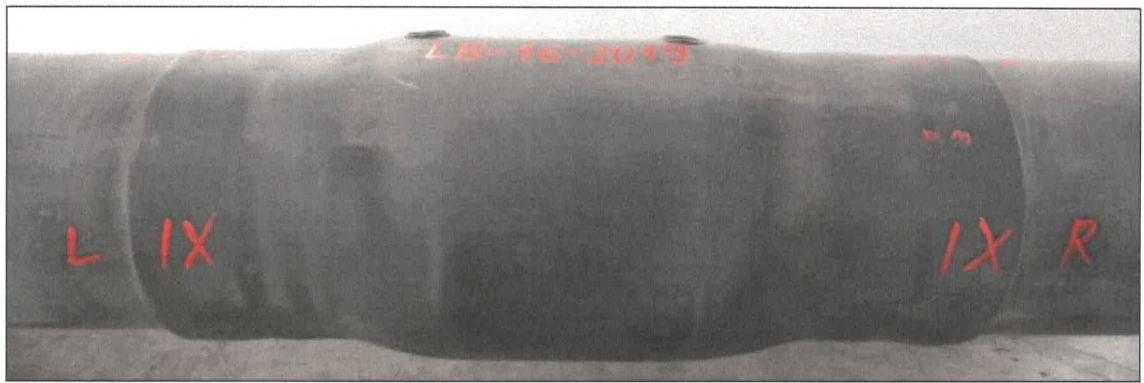
Photos 27 ÷ 34 Object LB/60/2018 after sand box test



*Photo 35, 36 Object LB/60/2018 after water impermeability test*



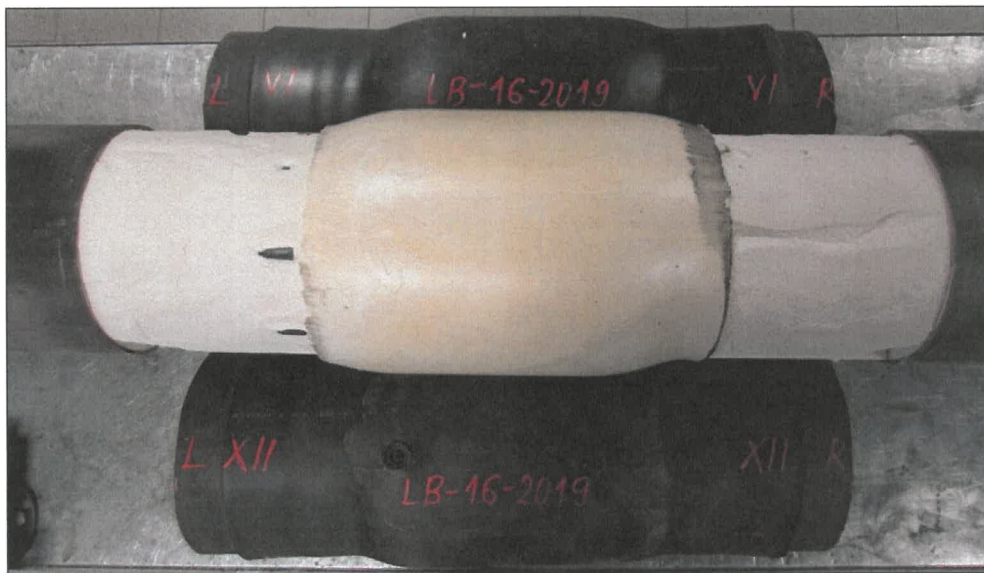
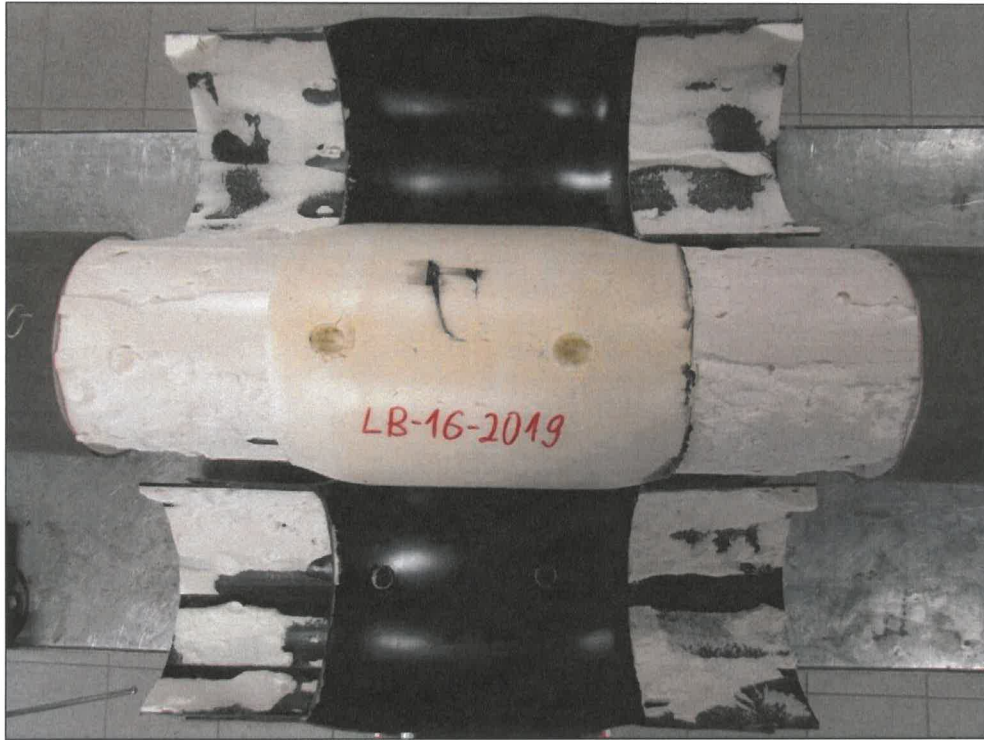
Photos 37÷40 Object LB/16/2019 before tests



Photos 41÷ 44 Object LB/16/2019 after sand box test

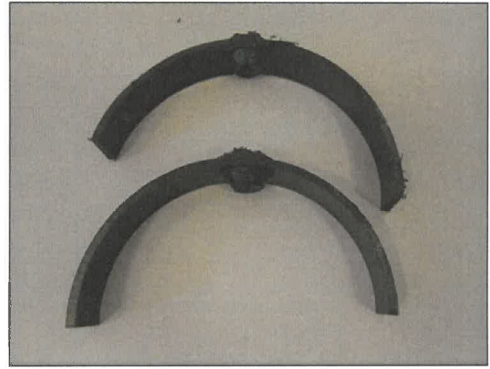


Photos 45÷ 52 Object LB/16/2019 after sand box test

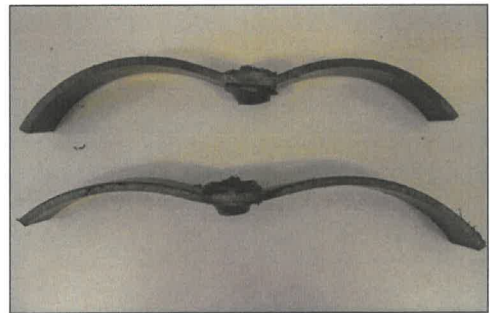
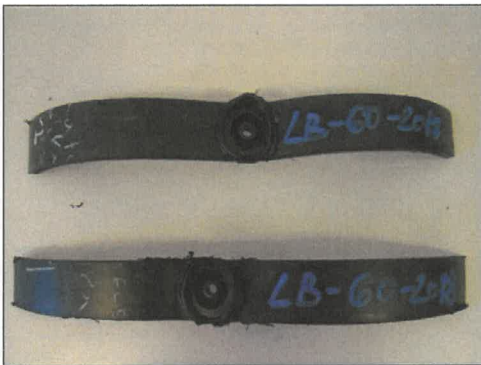


*Photos 53, 54 Object LB/16/2019 after water impermeability test*





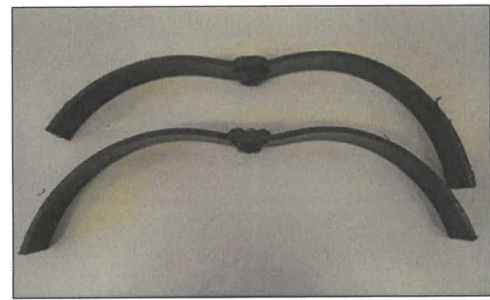
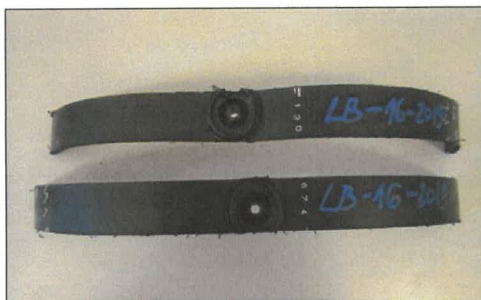
*Photos 55, 56 Samples LB/60/2018 before bending test on welded plugs*



*Photos 57, 58 Samples LB/60/2018 after bending test on welded plugs*



*Photos 59, 60 Samples LB/16/2019 before bending test on welded plugs*



*Photos 61, 62 Samples LB/16/2019 after bending test on welded plugs*

## STATEMENT OF THE TYPE TEST RESULT

The tests results confirm that the joint casing system:

*Belmaflex casing joint, shrinkable with mastic*

is in compliance with the standard EN 489-1:2019

Type 1.1 "PE Shrink joint casing, single sealed with adhesive"  
according to Annex A Table A.1.

**Notice:**

- 1) *The result refers only to the tested objects.*
- 2) *The objects were delivered to Lab by the Customer.*
- 3) *Without a written permission from LB, this report cannot be copied otherwise than in full version*
- 4) *In the tables there are the expanded measurement uncertainties for a 95% level of confidence and  $k=2$*
- 5) *When assessing compliance with the specified requirements, the Laboratory applies the evaluation principle based on the method of simple acceptance of the test result, taking into account the expanded uncertainty of measurement at the 95% confidence level*
- 6) *The results of the MFR test of welding plugs are available in Test report No. GT/185/2020 date of issue 14.07.2020 issued by Sieć Badawcza Łukasiewicz Instytut Inżynierii Materiałów Polimerowych i Barwników, 87-100 Toruń, ul. M. Skłodowskiej-Curie 55, Oddział Farb i Tworzyw 44-100 Gliwice, ul. Chorzowska 50A Zakład Badawczo-Analityczny Laboratorium Badań Tworzyw Polimerowych*

=====THE END OF THE REPORT=====

Authorization:

Kierownik Laboratorium  
Badawczego

*Ewa Kręcielewska*

**Ewa Kręcielewska**