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Project number: 757848	Test conducted: May 2017	



Testing of door seal, type RAXIT® against rats

Testing report

Project number: 757848

Performed for:

Producer:
BarrierSteel IVS
Kongevej 345 A
2840 Holte
Denmark

Keywords: Door seal, testing, rats

Testing made by:

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Number of pages: 11

Number of appendices: 3

Taastrup, June 27th 2017



1. Testing

1.1. Test pieces

The 3 tested RAXIT® door seals were characterized by the following:

- They were opaque black
- They were 3 mm thick and 75 mm broad
- The length of the 3 door seals were:
 - 860 mm (horizontally mounted on active door panel)
 - 855 mm (horizontally mounted on passive door panel)
 - 500 mm (vertically mounted on active door panel)
- They were made of Santoprene™ 201-73 and 1 mm steel wires. The datasheets are attached as appendix 1
- They had been produced by simultaneous extrusion of the Santoprene™. The steel wires were, therefore, completely encapsulated by the Santoprene™ – except in the end pieces, where the cross section of the wires could be seen
- There were 10 steel wires in each door seal
- The distance between each steel wire and the neighboring steel wire was 5 mm
- There were 3 mm from one of the edges to the nearest steel wire
- From the other edge there were 17 mm to the nearest steel wire

1.2. Purpose and scope of the test

The test purpose was to test the door seal against rats.

The 3 RAXIT® door seals were tested on an old used double swing door of steel with each door panel mounted on 2 hinges. The door panels were 85 cm broad.

The astragal gap i.e. the distance between the 2 doors panels when closed was 8 mm.

The double door was mounted without any threshold. Under the double door there was mounted a 45 mm broad and 1½ mm high steel strip. The purpose of the steel strip was to make the test setup reflect the way double doors in real life are mounted in Denmark in order to comply with Danish fire regulations (BD 60/EI₂ 60-C). There was nothing between A) the bottom of the 2 door panels when closed and B) the underlying 1½ mm high steel strip.

The threshold gap i.e. the distance between the bottom of the 2 door panels when closed and the underlying steel strip was 45 mm.

1.3. Test implementation

The test was carried out at the Pipe Centre, Danish Technological Institute, Taastrup, Denmark from the 10th to 24th of May 2017.

The rat test has been according to the Danish test standard for rats in sewer systems with some adjustments where 2 rats has been in the system for 14 days with the product/sample. The first 7 days without the door seal (50 mm gap

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between door and floor of the test box) and the following 7 days with the door seal. There is a drawing of the test set up and textbox in appendix 2.

The bottom of the quadrangular test box, where the double door was mounted and the test was performed, was 1.8 meter by 1.5 meter. The test box was 0.6 meter high.

The bottom and the walls of the test box were made of 18 mm brown HUSKYFORM F/F plate. On top of the test box there was a plywood plate with 2 transparent Plexiglas windows, which made it possible to observe the rats without taking the top plate of.

Attached to one end of the test box there was a small steel cage where the 2 rats could sleep. Attached to the opposite end of the box there was another small steel cage, where their food was served during the first week of the two week test period.

1.4. Results

The results of the tests were as follows:

Product	Rat-test
Samples – door seal, type RAXIT® with metal wire (1 mm)	OK, bite marks from rats in the Santoprene but the rats has not passed the door seal

In appendix 3 there are shown pictures from the test.

1.5. Conclusion

The RAXIT® door seal passed the test as the test criteria was satisfied.

The conclusion of the tests of the product is that no rats has passed the door seal from BarrierSteel, type RAXIT®, but there were bite marks in the Santoprene from the rats after 14 days of testing.

Danish Technological Institute, Pipe Centre

June the 8th 2017

Stig Clausen


Consultant

Ulrik Hindsberger

Centre Manager



Appendix 1: Datasheets with material of the door seal

		Product Data Sheet		OK Autrod 16.32	
		G 'Gas-shielded metal-arc welding'			
Signed by Mats Linde	Approved by Mats Öhman/Barbro Karlström	Reg no END02142	Cancelling END01128	Reg date 2004-06-17	Page 1 (2)
REASON FOR ISSUE					
Chemical composition modified.					
GENERAL					
<p>A continuous solid corrosion resisting chromium-nickel-molybdenum wire for welding of austenitic stainless alloys of 18% Cr - 8% Ni and 18% Cr - 10% Ni - 3% Mo types.</p> <p>OK Autrod 16.32 has a good general corrosion resistance, in particular the alloy has very good resistance against corrosion in acid and chlorinated environments. The alloy has a low carbon content which makes it particularly recommended where there is a risk of intergranular corrosion. The higher silicon content improves the welding properties, such as wetting. The alloy is widely used in the chemical and food processing industries as well as in ship building and various types of architectural structures.</p>					
Shielding Gas: M12, M13 (EN439)			Alloy Type: Austenitic (with approx. 8 % ferrite) 19% Cr - 12% Ni - 3% Mo - Low C - High Si		
CLASSIFICATIONS Wire Electrode			APPROVALS		
EN 12072	G 19 12 3 LSi	Q	43.039/H		
SFA/AWS A5.9	ER316LSi	DB	43.039.05		
Werkstoffnummer	~1.4430	DNV	316L MS (-120 °C)		
		UDT	DIN 8556		
		VdTUV	04268		
CHEMICAL COMPOSITION					
	All Weld Metal (%)	Wire/Strip (%)			
Compound	Nom	Min	Max		
C	0.02		0.030		
Si	0.8	0.65	1.00		
Mn	1.8	1.0	2.5		
P	0.015		0.030		
S	0.015	0.005	0.020		
Cr	18.5	18.0	20.0		
Ni	12	11.0	14.0		
Mo	2.7	2.5	3.0		
Cu	0.1		0.3		
N			0.08		
Others total			0.50		



Appendix 1: Datasheets with material of the door seal



Product Data Sheet G 'Gas-shielded metal-arc welding'

OK Autrod 16.32

Signed by	Approved by	Reg no	Cancelling	Reg date	Page
Mats Linde	Mats Öhman/Barbro Karlström	EN002142	EN001128	2004-05-17	2 (2)

MECHANICAL PROPERTIES OF WELD METAL

All Weld Metal

Properties	As welded		SHT 1050°C 0.5h		Tested at 350°C.		Tested at 350°C.	
	Min	Typ	Typ		As welded	Typ	SHT 1050°C 0.5h	Typ
Rp0.2 (MPa)	320	440	350		340		250	
Rm (MPa)	510	620	590		440		430	
AA-AS (%)	25	37	42		25		31	
Charpy V at 20°C (J)		120	110					
Charpy V at -60°C (J)		95	90					
Charpy V at -196°C (J)		55	50					

ECONOMICS & CURRENT DATA

Dimension (mm)	Current (A)		W	1)	H		Feed		U	
	Min	Max	Nom	Nom	Min	Max	Min	Max	Min	Max
Ø										
0.6										
0.8	55	160	12		1.0	4.1	4.0	17.0	12	24
0.9	65	220	13		1.1	5.4	3.5	18.0	15	28
1.0	80	240	15		1.5	6.0	4.0	16.0	15	28
1.2	100	300	18		1.6	7.5	3.0	14.0	15	29
1.6	230	375	20		5.2	8.6	5.5	9.0	23	31

- W = Gas consumption (l / min)
 1) = Recovery, g weld metal / 100g wire (%)
 H = Deposit rate (kg weld metal / hour arc time)
 Feed = Feeding rate (m/min)
 U = Arc voltage (V)



Appendix 1: Datasheets with material of the door seal

Product Datasheet



Santoprene™ 201-73

Thermoplastic Vulcanizate

Product Description

A soft, colorable, versatile thermoplastic vulcanizate (TPV) in the thermoplastic elastomer (TPE) family. This material combines good physical properties and chemical resistance for use in a wide range of applications. This grade of Santoprene TPV is shear-dependent and can be processed on conventional thermoplastics equipment for injection molding, extrusion, blow molding, thermoforming or vacuum forming. It is polyolefin based and recyclable within the manufacturing stream.

Key Features

- UL listed: file #QMFZ2.E80017, Plastics - Component; file #QMFZ8.E80017, Plastics Certified For Canada - Component.
- Although not NSF certified, this product has a Material Supplier Form on file with NSF to facilitate its evaluation for use in applications requiring NSF certification.
- Recommended for applications requiring excellent flex fatigue resistance.
- Excellent ozone resistance.

General

Availability ¹	<ul style="list-style-type: none"> • Africa & Middle East • Asia Pacific 	<ul style="list-style-type: none"> • Europe • Latin America 	<ul style="list-style-type: none"> • North America
Applications	<ul style="list-style-type: none"> • Automotive - Plugs, Bumpers, Grommets, Clips • Automotive - Seals and Gaskets 	<ul style="list-style-type: none"> • Industrial - Seals and Gaskets • Soft Touch Grips 	<ul style="list-style-type: none"> • Tubing
Uses	<ul style="list-style-type: none"> • Appliance Components • Automotive Applications • Automotive Under the Hood 	<ul style="list-style-type: none"> • Consumer Applications • Diaphragms • Electrical Parts 	<ul style="list-style-type: none"> • Gaskets • Seals • Tubing
Agency Ratings	<ul style="list-style-type: none"> • UL QMFZ2 	<ul style="list-style-type: none"> • UL QMFZ8 	
RoHS Compliance	<ul style="list-style-type: none"> • RoHS Compliant 		
Automotive Specifications	<ul style="list-style-type: none"> • CHRYSLER MS-AR-100 CGN 	<ul style="list-style-type: none"> • FORD WSD-M2D380-A1 	<ul style="list-style-type: none"> • GM GMP.E/P.003
UL File Number	<ul style="list-style-type: none"> • E80017 		
Color	<ul style="list-style-type: none"> • Natural Color 		
Form(s)	<ul style="list-style-type: none"> • Pellets 		
Processing Method	<ul style="list-style-type: none"> • Blow Molding • Coextrusion • Extrusion • Extrusion Blow Molding 	<ul style="list-style-type: none"> • Injection Blow Molding • Injection Molding • Multi Injection Molding • Profile Extrusion 	<ul style="list-style-type: none"> • Sheet Extrusion • Thermoforming • Vacuum Forming
Revision Date	<ul style="list-style-type: none"> • 10/08/2014 		

Physical	Typical Value (English)	Typical Value (SI)	Test Based On
Specific Gravity	0.970	0.970	ASTM D792
Density	0.970 g/cm ³	0.970 g/cm ³	ISO 1183
Detergent Resistance	f3	f3	UL 749
Detergent Resistance	f4	f4	UL 2157
Hardness	Typical Value (English)	Typical Value (SI)	Test Based On
Shore Hardness			ISO 868
Shore A, 15 sec, 73°F (23°C)	78	78	



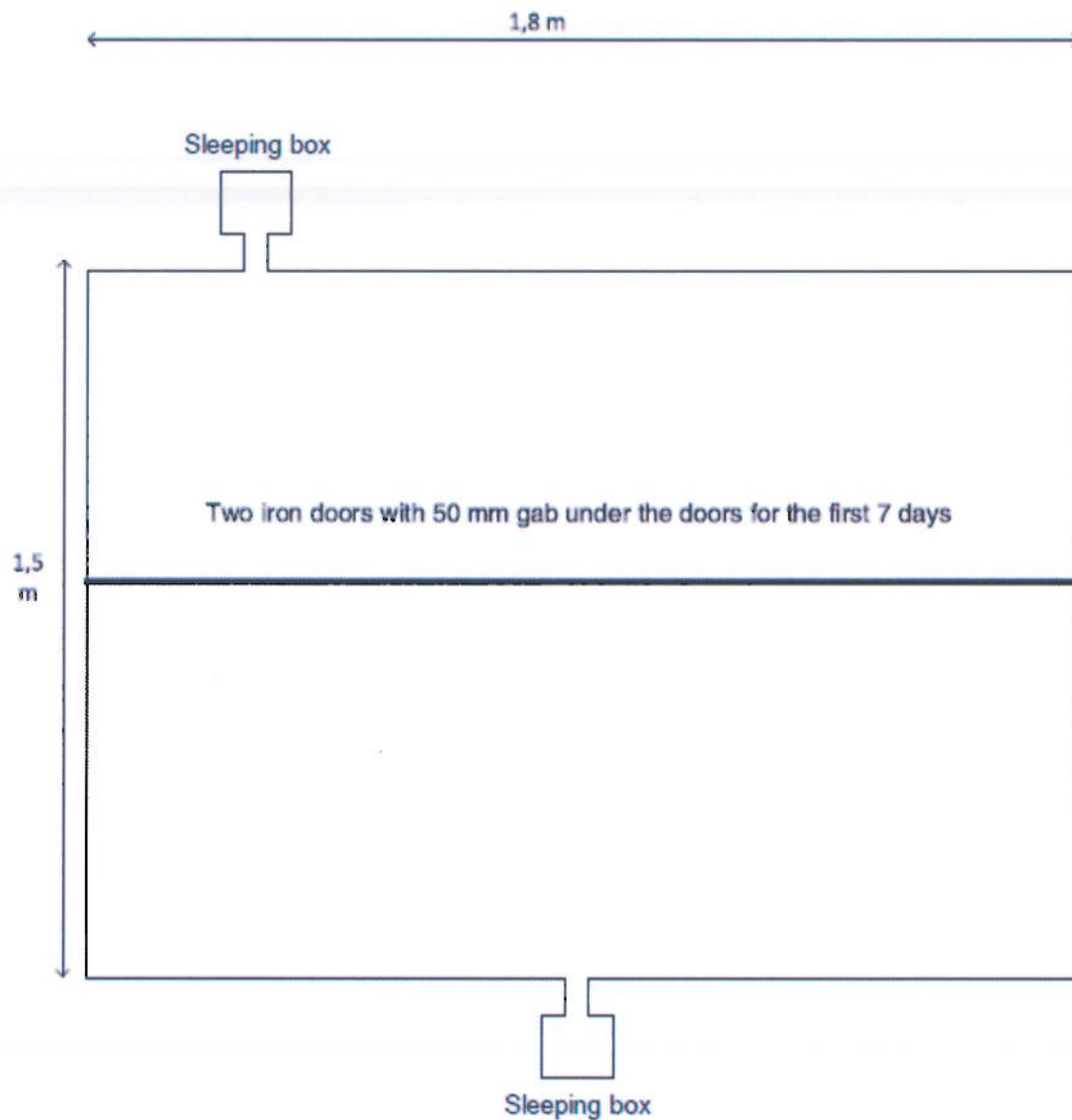
Appendix 1: Datasheets with material of the door seal

Santoprene™ 201-73									
Search Result: (1 Product)									
Property Set: <input type="radio"/> ASTM <input checked="" type="radio"/> ISO									
Units: <input checked="" type="radio"/> SI <input type="radio"/> English									
Action	Grade Name	Medium	Temp. (°C)	Time (hr)	Change in Hardness (ISO)	Change in Mass (ISO) (%)	Change in Tensile Strength (ISO) (%)	Change in Ultimate Elongation (ISO) (%)	Change in Volume (ISO) (%)
	Santoprene™ 201-73	IRM 903 Oil	125	70.0	★★★★ No Data Available	★★★★ No Data Available	★★★★ -31	★★★★ -47	★★★★ 72
	Santoprene™ 201-73	Sodium Hydroxide, 60%	23.0	168	★★★★ 0	★★★★ -0.20	★★★★ 3.0	★★★★ 2.0	★★★★ No Data Available
	Santoprene™ 201-73	Sodium Chloride, 15%	23.0	168	★★★★ 0	★★★★ 0.20	★★★★ 0.0	★★★★ -2.0	★★★★ No Data Available
	Santoprene™ 201-73	Cyclohexane	23.0	168	★★★★ -15	★★★★ -4.9	★★★★ 31	★★★★ 20	★★★★ No Data Available
	Santoprene™ 201-73	Detergent (Tide), 2.5%	23.0	168	★★★★ 0	★★★★ 0.60	★★★★ 3.0	★★★★ 2.0	★★★★ No Data Available
	Santoprene™ 201-73	Trichloroethylene	23.0	168	★★★★ -3	★★★★ -6.0	★★★★ 54	★★★★ 22	★★★★ No Data Available
	Santoprene™ 201-73	IRM 903 Oil	125	168	★★★★ -23	★★★★ 78	★★★★ -31	★★★★ -58	★★★★ No Data Available
	Santoprene™ 201-73	Ethanol, 95%	23.0	168	★★★★ 0	★★★★ -0.10	★★★★ -2.0	★★★★ 0.0	★★★★ No Data Available
	Santoprene™ 201-73	Acetic Acid	23.0	168	★★★★ -2	★★★★ 4.0	★★★★ -9.0	★★★★ -4.0	★★★★ No Data Available
	Santoprene™ 201-73	Deionized Water	100	168	★★★★ -2	★★★★ 3.6	★★★★ 1.0	★★★★ -7.0	★★★★ No Data Available
	Santoprene™ 201-73	Isopropyl Alcohol	23.0	168	★★★★ -1	★★★★ -13	★★★★ 31	★★★★ 20	★★★★ No Data Available
	Santoprene™ 201-73	Sulfuric Acid, 98%	23.0	168	★★★★ 0	★★★★ No Data Available	★★★★ No Data Available	★★★★ -27	★★★★ No Data Available
	Santoprene™ 201-73	Hydrochloric Acid, 10%	23.0	168	★★★★ -3	★★★★ 0.20	★★★★ 13	★★★★ 9.0	★★★★ No Data Available
	Santoprene™ 201-73	Methylethylketone	23.0	168	★★★★ 0	★★★★ -24	★★★★ 47	★★★★ 24	★★★★ No Data Available
	Santoprene™ 201-73	IRM 903 Oil	100	168	★★★★ -21	★★★★ 66	★★★★ -30	★★★★ -49	★★★★ No Data Available

The testing is only valid for the tested specimen. The test report may only be extracted, if the laboratory has approved the extract.



Appendix 2: Drawing of the test set up /test box





Appendix 3: Photos from the test/test box



The testing is only valid for the tested specimen. The test report may only be extracted, if the laboratory has approved the extract.

Appendix 3: Photos from the test/test box (continued)





Appendix 3: Photos from the test/test box (continued)

