COVENANT

Covenant
K99355/01

Issued *2018-10-01*

Replaces

Page *1 of 21*

Sealing systems for pipe penetrations in watertight fire divisions

STATEMENT BY KIWA
With this Covenant, issued in accordance with the Kiwa Regulations for Certification, Kiwa declares that legitimate confidence exists that the products supplied by

Beele Engineering

as specified in this product certificate and marked with the Kiwa®-mark in the manner as indicated in this product certificate may, on delivery, be relied upon to comply with Kiwa Covenant manual K15013 dated 01-01-2016.

Luc Leroy
Kiwa

Publication of this certificate is allowed.
Advice: consult www.kiwa.nl in order to ensure that this certificate is still valid.

561/180711

Kiwa Nederland B.V.
Sir Winston Churchilllaan 273
Postbus 70
2280 AB RIJSWIJK
The Netherlands
Tel. +31 88 998 44 00
Fax +31 88 998 44 20
info@kiwa.nl
www.kiwa.nl

Supplier
Beele Engineering B.V.
Beunkdijk 11
7122 AZ Aalten
Tel. +31 543 461629
Fax +31 543 461786
info@beele.com
www.beele.com

Preface

This Kiwa Covenant has been prepared by the Technical Committee “Sealing products” of Kiwa Nederland B.V. and accepted by the Kiwa Committee of Covenant (KCC). The KCC also supervises the certification activities and where necessary requires the Kiwa Covenant to be revised.

This Kiwa Covenant will be used by Kiwa in conjunction with the Kiwa-Regulations for Certification. This regulation details the method employed by Kiwa for conducting the necessary investigations prior to issuing the product certificate and the method of external control. The inspection frequency is determined by the above mentioned Technical Committee and Kiwa Committee of Covenant.

Scope of the Covenant

Fire safe and watertight penetration sealing systems for “A” and “B” class bulkheads below deck on passenger ships and SPS vessels.

The penetration sealing systems are acceptable for use in watertight fire divisions on passenger ships and SPS vessels in accordance with SOLAS Chapter II-1, Regulation 13.2.3 (2014) and IMO MSC/Circular 736, Part B, Regulation 15, Paragraph 2.1, provided acceptance by Flag Administration in each case. If the Flag Administration has specific requirements these will prevail.

1.1 Description of the sealing systems

SLIPSIL/DYNATITE sealing system

The sealing system consists of SLIPSIL and DYNATITE rubber sealing plugs. The rubber sealing plugs consist of two or more segments that are jointed together during installation to form one plug for the sealing of the penetration of pipes through a circular steel conduit in a bulkhead. The inner side wall of the plugs has a waved surface; during installation the wave tops are in close contact with the penetrated pipe which enables the sealing between pipe and plug. The outer side wall of the plugs has lips that are being bended and compressed during installation which enables the sealing between plug and conduit wall. The lips should prevent the plugs from moving while installed. The plug consists of two or more segments for installation reasons. The flat contact surfaces of the plug segments are pressed together while installed, enabling sealing between the segments.

SLIPSIL XL-120 sealing system

The sealing system consists of SLIPSIL XL-120 rubber sealing plugs with additional length. The rubber sealing plugs consist of two or more segments that are jointed together during installation to form one plug for the sealing of the penetration of pipes through a circular steel conduit in a bulkhead. The inner side wall of the plugs has a waved surface; during installation the wave tops are in close contact with the penetrated pipe which enables the sealing between pipe and plug. The outer side wall of the plugs has lips that are being bended and compressed during installation which enables the sealing between plug and conduit wall. The lips should prevent the plugs from moving while installed. The plug consists of two or more segments for installation reasons. The flat contact surfaces of the plug segments are pressed together while installed, enabling sealing between the segments.

SLIPSIL/CRUSHER and DYNATITE/CRUSHER sealing system

The sealing system consists of a combination of SLIPSIL and CRUSHER rubber sealing plugs or DYNATITE and CRUSHER rubber sealing plugs. The SLIPSIL and DYNATITE plugs consist of two or more segments that are jointed together during installation to form one plug for the sealing of the penetration of thermoplastic pipes through a circular steel conduit in a bulkhead. The CRUSHER plugs are split lengthwise to make installation possible after ducting the thermoplastic pipe. In the SLIPSIL/CRUSHER sealing system the CRUSHER plug is positioned between two SLIPSIL plugs. In the DYNATITE/CRUSHER sealing system the CRUSHER plug is positioned in a circular split steel casing in front of the steel conduit.
The inner side wall of the plugs has a waved surface; during installation the wave tops are in close contact with the penetrated pipe which enables the sealing between pipe and plug. The outer side wall of the SLIPSIL and DYNATITE plugs has lips that are being bended and compressed during installation which enables the sealing between plug and conduit wall. The lips should prevent the plugs from moving while installed. The outer side walls of the CRUSHER plugs have a waved surface; during installation the wave tops are being compressed between the penetrated pipe and the conduit wall, which enables a firm fixation of

the pipe in the penetration. The SLIPSIL and DYNATIE plug consists of two or more segments for installation reasons. The flat contact surfaces of the plug segments are pressed together while installed, enabling sealing between the segments.

NOFIRNO sealing system

The NOFIRNO sealing system consists of a combination of NOFIRNO rubber filler sleeves and NOFIRNO sealant. The aperture between penetrating pipes and the inner wall of the transit frame is filled with filler sleeves and on both sides the transit frame opening is sealed with a sealant. The thickness of the sealant is minimum 20 mm.

NOFIRNO/CRUSHER sealing system

The NOFIRNO/CRUSHER sealing system consists of a combination of CRUSHER sealing plugs, NOFIRNO rubber filler sleeves and NOFIRNO sealant. A CRUSHER plug is installed around the penetrating thermoplastic pipe in the centre of the conduit or in a split steel casing in front of the conduit. The remaining aperture between penetrating thermoplastic pipes and the inner wall of the transit frame is filled with filler sleeves and on both sides the transit frame opening is sealed with a sealant. The thickness of the sealant is minimum 20 mm.

1.2 Field of application

The field of application for the penetrations and sealing systems are specified in table 1.
In Annex C the detailed drawings are presented.

Table 1. Pipe penetrations

Sealing system	Drawing (Annex C)	Type of pipes and dimensions
SLIPSIL/CRUSHER Coaming length L = 250 mm CRUSHER between SLIPSIL plugs	SOLAS 01	Thermoplastic pipes PE, PVC-U, ABS, SAN/PVC-U, PVC-C, PP Maximum OD 75 mm
DYNATITE/CRUSHER Coaming length L = 250 mm Coaming with 3 DYNATITE plugs CRUSHER in 150 mm split steel casing in front of coaming	SOLAS 02	Thermoplastic pipes PE, PVC-U, ABS, SAN/PVC-U, PVC-C, PP Maximum OD 110 mm
SLIPSIL/DYNATITE Coaming length L = 250 or 236 mm 2 DYNATITE plugs between 2 SLIPSIL plugs	SOLAS 03 SOLAS 03/1	Steel, stainless steel and CuNi Maximum NPS 6" / DN 150 mm / OD 168,3 mm
SLIPSIL XL-120 Coaming length L = 250 or 236 mm 2 SLIPSIL XL-120 plugs	SOLAS 04 SOLAS 05	Steel, stainless steel and CuNi Maximum NPS 6" / DN 150 mm / OD 168,3 mm
NOFIRNO/CRUSHER Coaming length L = 250 mm CRUSHER in centre of NOFIRNO sealing system	SOLAS 06	Thermoplastic pipes PE, PVC-U, ABS, SAN/PVC-U, PVC-C, PP Maximum OD 75 mm
NOFIRNO/CRUSHER Coaming length L = 250 mm NOFIRNO sealing system CRUSHER in 150 mm split steel casing in front of coaming	SOLAS 07	Thermoplastic pipes PE, PVC-U, ABS, SAN/PVC-U, PVC-C, PP Maximum OD 110 mm
NOFIRNO Coaming length L = 250 mm NOFIRNO sealing system	SOLAS 08	Steel, stainless steel and CuNi Maximum NPS 6" / DN 150 mm / OD 168,3 mm
NOFIRNO Coaming length L = 180 mm Maximum aperture 600 x 300 mm (1800 cm^2) in 4 sections NOFIRNO sealing system	SOLAS 09	None (blind)

Note:
OD outer diameter
NPS Nominal Pipe Size
DN Nominal Diameter

1.3 Approved water tightness after fire

The described and specified penetrations are watertight without leakage. The maximum allowed water pressure is 2,5 bar.

The penetration sealing systems are acceptable for use in watertight divisions on passenger ships and SPS vessels in accordance with SOLAS Chapter II-1, Regulation 13.2.3 (2014) and IMO MSC/Circular 736, Part B, Regulation 15, Paragraph 2.1, provided acceptance by Flag Administration in each case. If the Flag Administration has specific requirements these will prevail.

The sealing systems are evaluated for water tightness based on water tightness tests conducted as shortly as possible after fire tests of pipe penetrations in non-insulated A-0 bulkheads. All tested pipe penetrations met the requirements for the maximum temperature rise of 180 °C above the initial temperature after the 60 minutes fire tests.

The fire tests were conducted according to IMO Resolution MSC.307(88) – (FTP Code 2010) – Part 3.
The water tightness tests have been carried out according to the test methods as described in Kiwa test protocols – Water tightness Version 2015-10-16 – Protocol A.
The test methods comply with the principles of the test methods according to DNVGL-CP-0165 Edition February 2016 (Section 2, chapter 4).

2 Initial product assessment

2.1 Fire resistance

Fire tests were conducted on the pipe penetrations in non-insulated A-0 bulkheads according to IMO Resolution MSC.307(88) – (FTP Code 2010) – Part 3.
All tested penetrations met the requirements on integrity and on insulation after the 60 minutes fire tests.

2.2 Water tightness after fire

The water tightness was evaluated based on water tightness tests conducted as shortly as possible after fire tests of pipe penetrations in non-insulated A-0 bulkheads.
The water tightness tests have been carried out according to the test methods as described in Kiwa test protocols – Water tightness Version 2015-10-16 – Protocol A.
The test methods comply with the principles of the test methods according to DNVGL-CP-0165 Edition February 2016 (Section 2, chapter 4).
All tested penetrations were watertight without leakage.

3 Quality system requirements

3.1 General

This chapter contains the requirements that have to be fulfilled by the manufacturer's quality system.

3.2 Manager of the quality system

Within the manufacturer's organizational structure an employee must be appointed who is in charge of managing the quality system.

3.3 Internal quality control/quality plan

As part of the quality system the manufacturer must implement an internal quality control schedule (IQC-scheme).
In this IQC-scheme the following must be demonstrably recorded:

- which aspects are inspected by the manufacturer;
- according to which methods these inspections are carried out;
- how often these inspections are carried out;
- how the inspection results are registered and stored.

The ICQ-schedule must be detailed in such a way that it provides Kiwa sufficient confidence that requirements will be continuously fulfilled.

3.4 Procedures and work instructions

The manufacturer must be able to submit:

- procedures for:
    - the handling of non-conforming products;
    - corrective actions in case non-conformities are found;
    - the handling of complaints regarding the products and / or services supplied;
- the work instructions and inspection sheets in use.
- instructions for packaging and closing off of products during storage and transport.

3.5 External inspection

The manufacturer's quality system shall be assessed by Kiwa with regard to at least the aspects mentioned in the Kiwa-Regulations for Product Certification.
The Kiwa Committee Covenant will determine the inspection frequency. At the time of validation of this Covenant this frequency has been fixed at 2 inspection visits per year.

3.6 Quality control of products

3.6.1 Rubber sealing products

The following routine tests shall be carried out according to the test methods mentioned in this covenant or otherwise mentioned:
a. dimensions – internal method
b. surface imperfections, appearance and colour – internal method
c. hardness
d. compression set
e. air tightness of plugs

The product control tests shall be carried out on lots of finished products.

3.6.2 Sealants

The following routine tests shall be carried out according to the test methods mentioned in this covenant or otherwise mentioned.

Non cured material:
a. film structure – internal method
b. viscosity – internal method
c. curing - internal method

Cured material:
a. hardness
b. appearance and colour – internal method
c. density

The product control tests shall be carried out on lots of finished products (filled cartridges).

4 Marking

The following marks and indications must be provided on each product or product packaging in a clear, legible and indelible way:
the name of manufacturer or the deposited trade mark;
Kiwa Covenant mark “Water tight and air tight sealing systems” and Kiwa Covenant number;
the batch number and the expiry date.

5 Recommendations for customers

Check at the time of deliver whether:

- the supplier has delivered in accordance with the agreement;
- the mark and the marking method are correct:
- the products show no visible defects as a result of transport etc.

If you should reject a product on the basis of the above, please contact:
Beele Engineering B.V.

And, if necessary,
Kiwa Nederland B.V.

Consult the suppliers processing guidelines for the proper storage and transport methods.
Consult the suppliers installation guidelines.

Annex A. Components and material compositions used for the sealing systems

A.1. NOFIRNO filler sleeves, SLIPSIL and DYNATITE plugs

These components are made of NOFIRNO rubber. The colour of the compound is terracotta. The rubber compound is manufactured and converted into products by Beele Engineering.

A.2. NOFIRNO sealant

The material of the sealant is a room temperature curing sealant. For the polymer base two different types are used. The colour of the compound is terracotta. The sealant is also available in blue, black and white. Other colours are admitted on the condition that only the pigment is exchanged in the composition. The sealant compound is manufactured by Beele Engineering and packed in 310 ml plastic cartridges.

A.3. CRUSHER plugs

These components are made of RISE/ULTRA rubber. The colour of the compound is grey-black. The rubber compound is manufactured and converted into products by Beele Engineering.

Annex B. Material and product properties

B.1. Physical-mechanical material properties

NOFIRNO rubber filler sleeves

Hardness (ISO 7619-1)	65 – 85 Shore A
Density (ISO 2781)	1,55 – 1,65 Mg/m^3
Tensile strength (ISO 37)	min 2,0 MPa
Elongation at break (ISO 37)	min 100 %
Limited oxygen index (ASTM D2863)	min 40 %
Volume change in water (ISO 1817) after 7 days at 70 °C	max +8 / -1 %

SLIPSIL and DYNATITE rubber sealing plugs

Hardness (ISO 7619-1)	65 – 85 Shore A
Density (ISO 2781)	1,55 – 1,65 Mg/m^3
Tensile strength (ISO 37)	min 2,0 MPa
Elongation at break (ISO 37)	min 100 %
Limited oxygen index (ASTM D2863)	min 40 %
Volume change in water (ISO 1817) after 7 days at 70 °C	max +8 / -1 %
Stress relaxation (ISO 3384) after 7 days at 23 °C	max 19 %
Stress relaxation (ISO 3384) after 100 days at 23 °C	max 28 %
Compression set (ISO 815) after 72 hours at 23 °C	max 15 %
Compression set (ISO 815) after 24 hours at 70 °C	max 20 %

NOFIRNO sealant (cured)

Hardness (ISO 7619-1)	35 – 55 Shore A
Density (ISO 2781)	1,42 – 1,52 Mg/m^3
Elongation at break (ISO 37)	min 50 %
Limited oxygen index (ASTM D2863)	min 37 %
Volume change in water (ISO 1817) after 7 days at 70 °C	max +8 / -1 %

CRUSHER rubber sealing plugs

Density (ISO 2781)	1,45 – 1,55 Mg/m^3
Limited oxygen index (ASTM D2863)	min 45 %
Expansion ratio (internal test)	min. 2,5
Expansion pressure (internal test)	min. 190 hPa

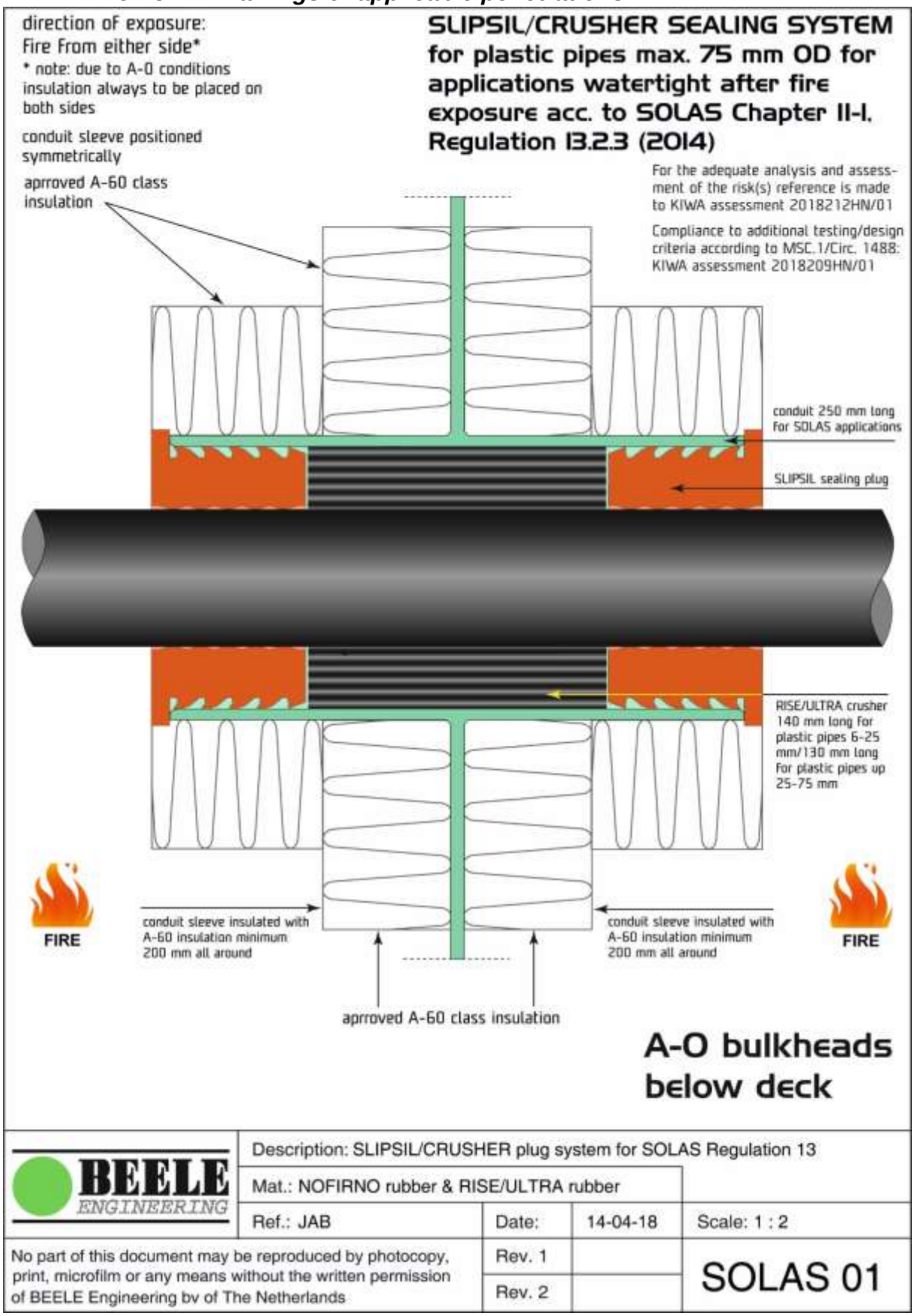
B.2. Durability and Serviceability

The use category of the sealing systems is:
Category type X : intended for use at conditions exposed to weathering.
This includes use at external and internal conditions, high temperatures in summer, frost and frost-thaw in winter, exposure to UV and exposure to rain.

B.3. Components and materials compatibility

The materials of the NOFIRNO rubber filler sleeves, SLIPSIL, DYNATITE and CRUSHER rubber sealing plugs and the NOFIRNO sealant are compatible with metal parts, unplasticised plastic parts and polymeric cable sheaths.

Annex C. Drawings of applicable penetrations

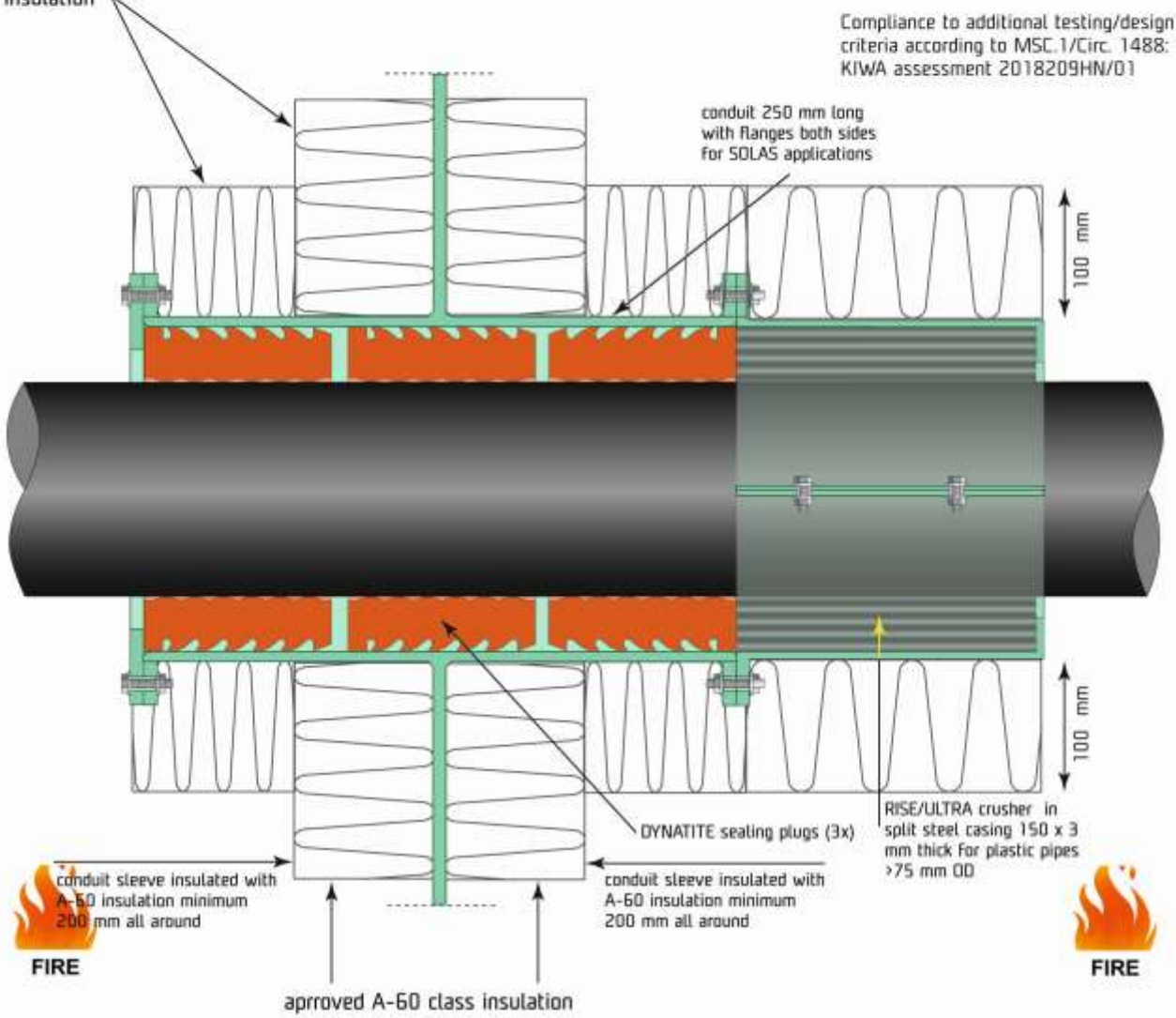


direction of exposure:
Fire from either side*
* note: Fire either side only when RISE/ULTRA is placed on both sides
* note: due to A-0 conditions insulation always to be placed on both sides

DYNATITE/CRUSHER SEALING SYSTEM for plastic pipes max. 110 mm OD for applications watertight after fire exposure acc. to SOLAS Chapter II-I, Regulation 13.2.3 (2014)

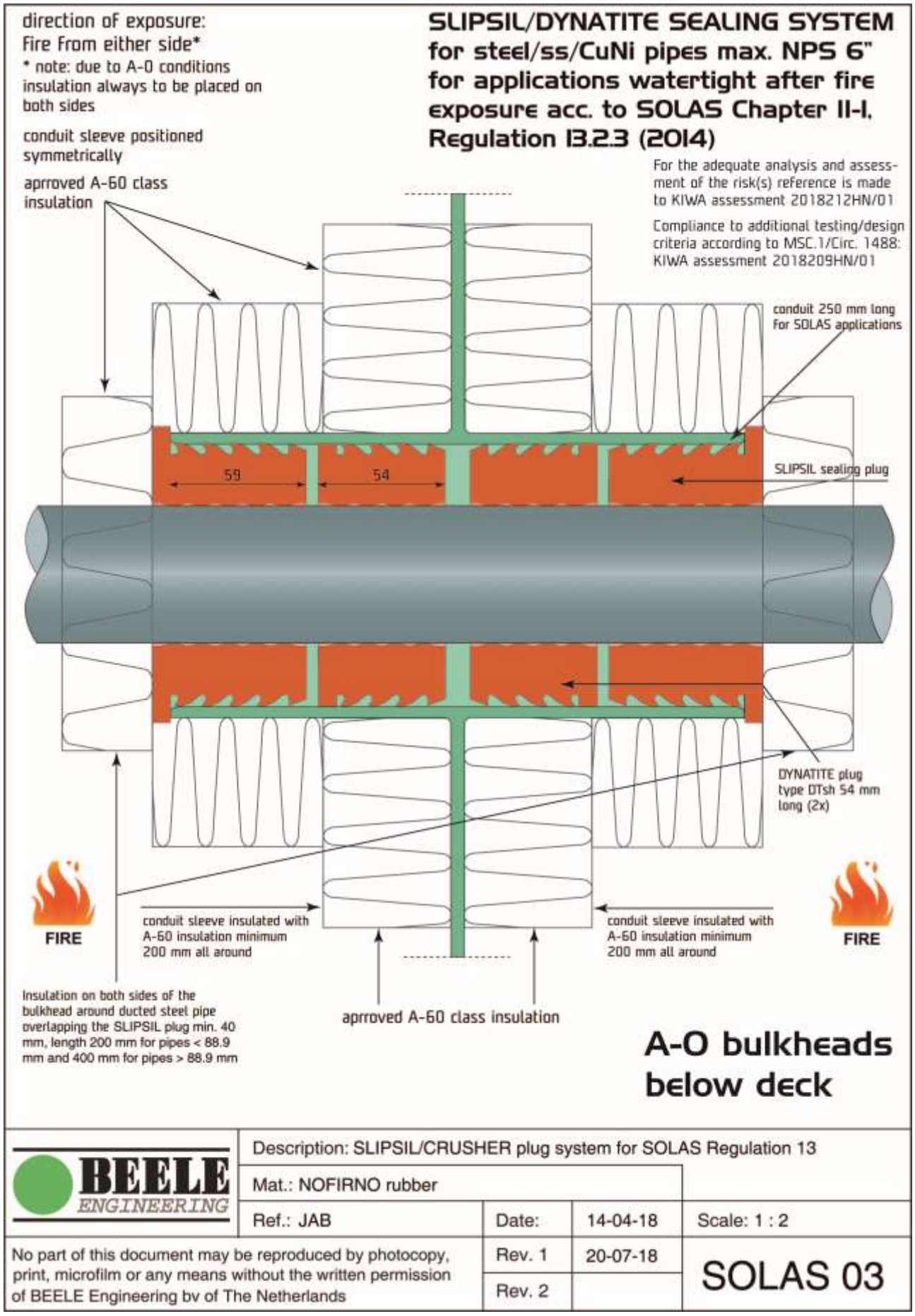
For the adequate analysis and assessment of the risk(s) reference is made to KIWA assessment 2018212HN/01

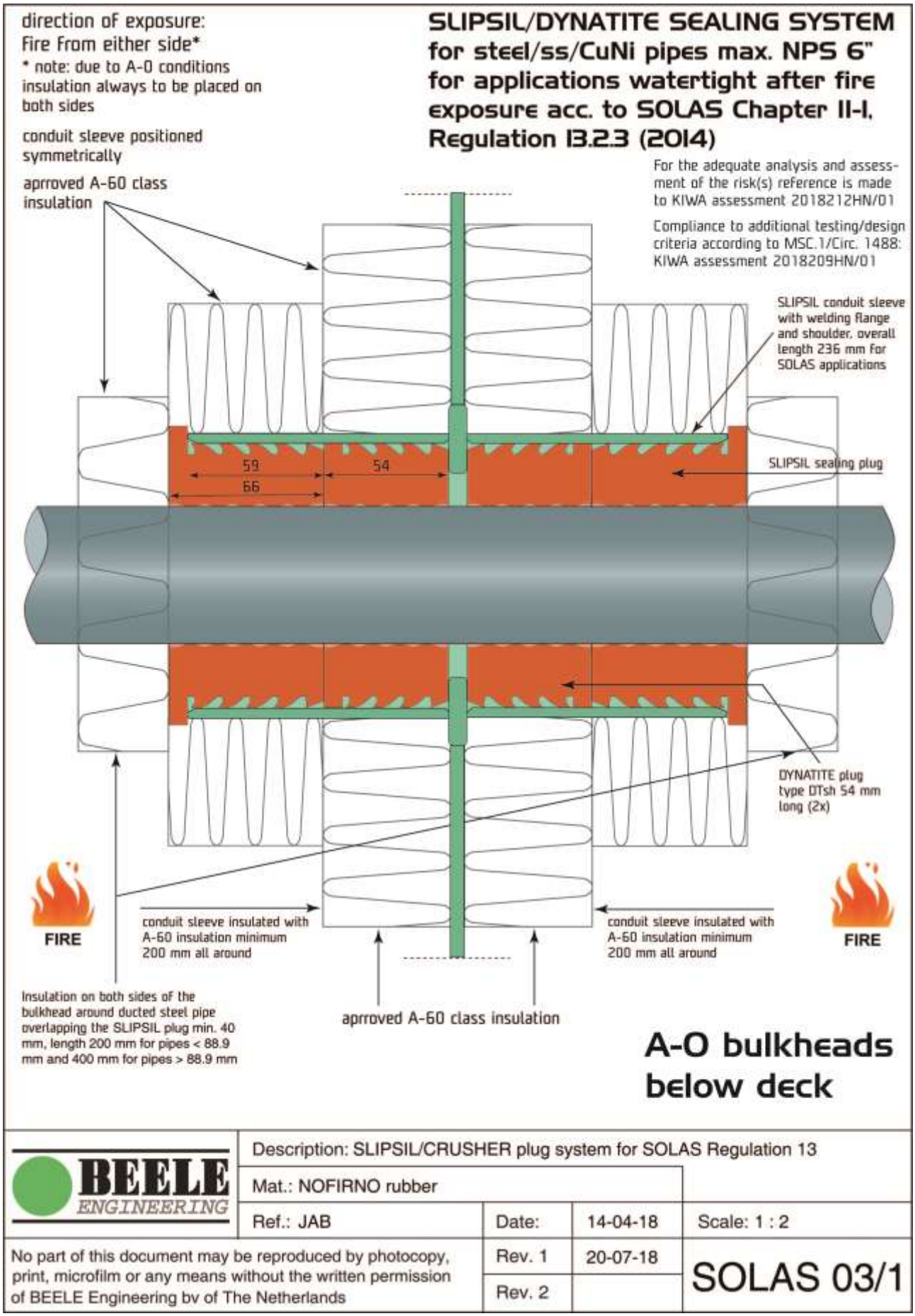
Compliance to additional testing/design criteria according to MSC.1/Circ. 1488: KIWA assessment 2018209HN/01

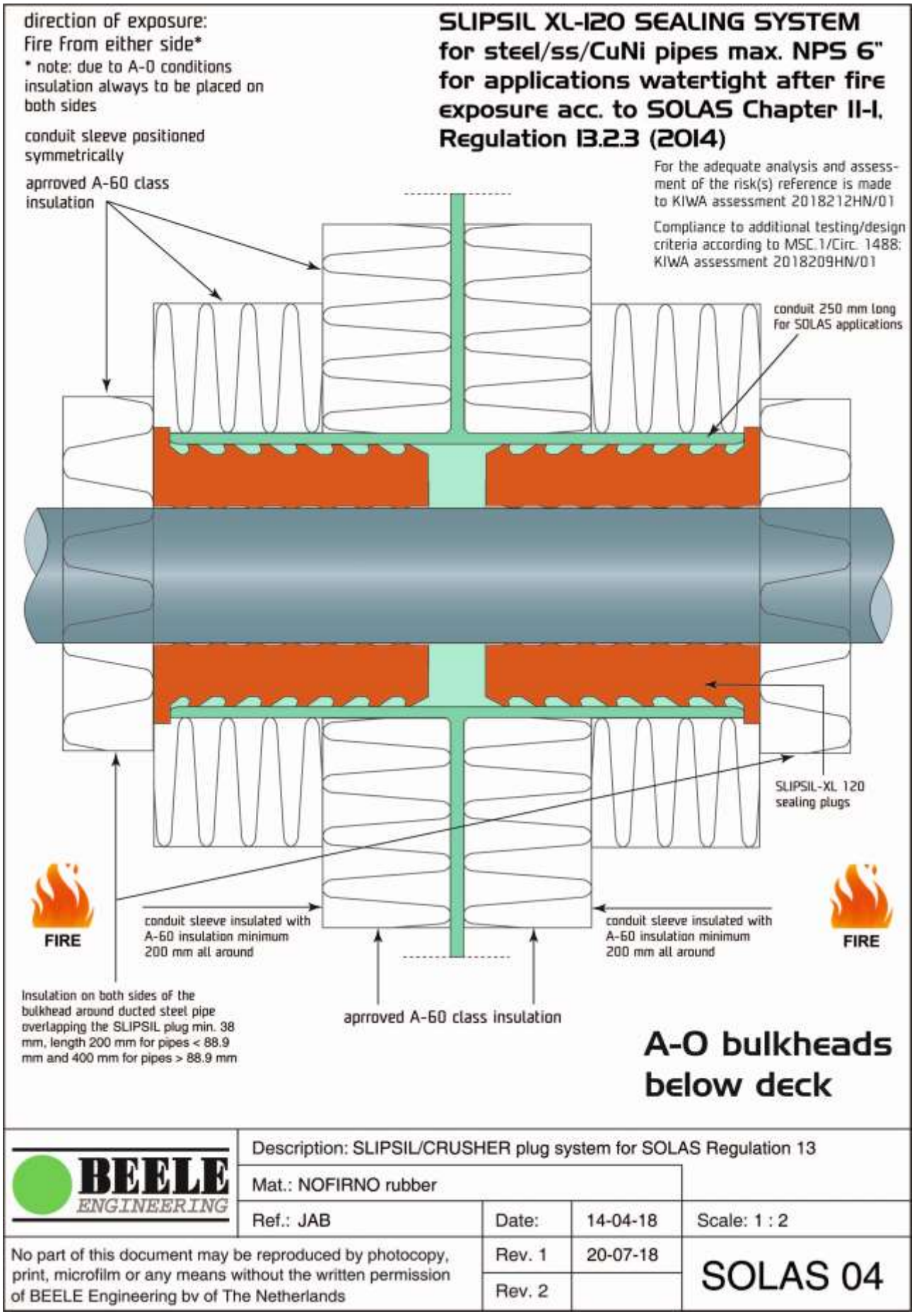


A-0 bulkheads below deck

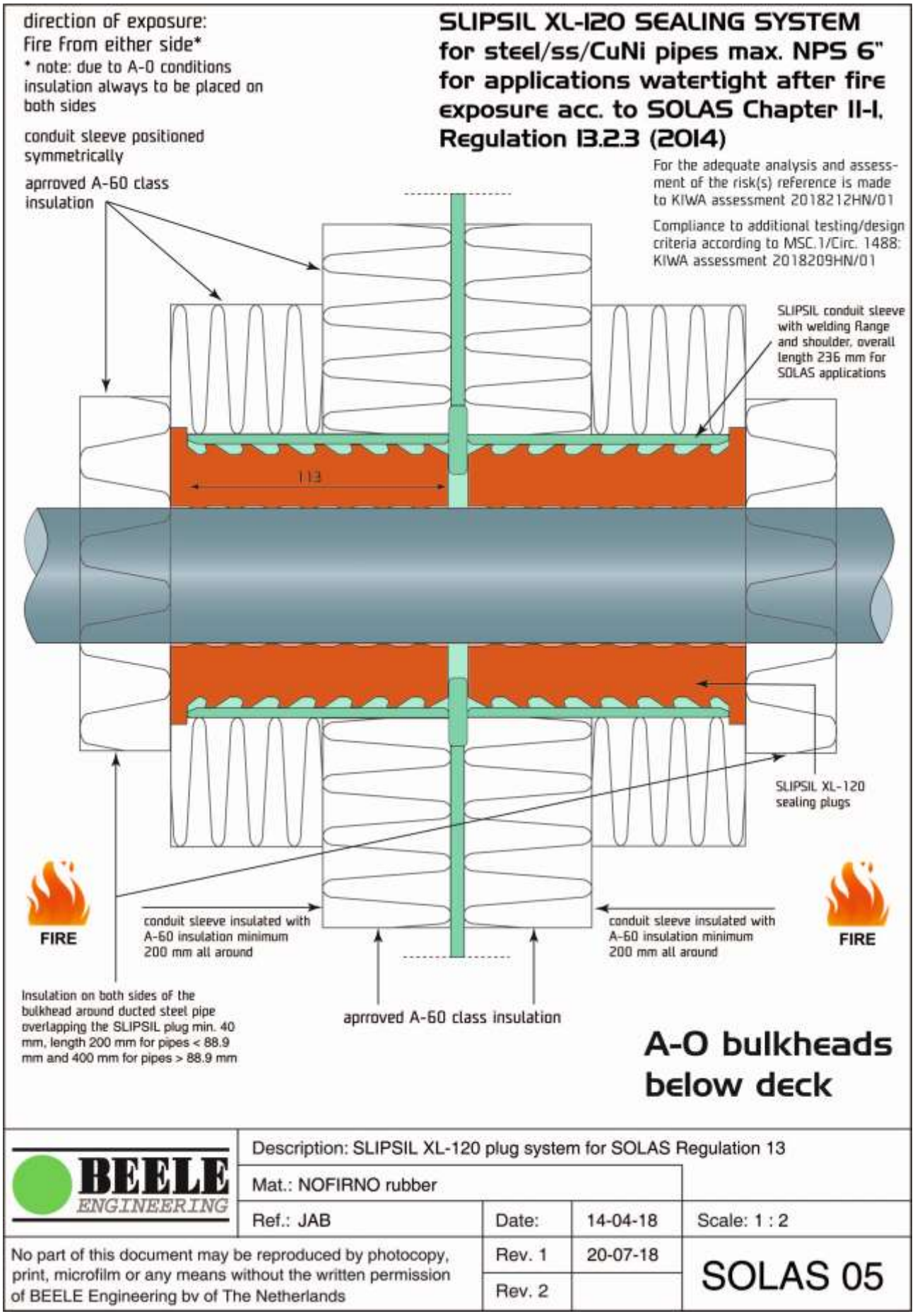
BEELE ENGINEERING	Description: SLIPSIL/CRUSHER plug system for SOLAS Regulation 13			
	Mat.: NOFIRNO rubber & RISE/ULTRA rubber			
	Ref.: JAB	Date:	14-04-18	Scale:
No part of this document may be reproduced by photocopy, print, microfilm or any means without the written permission of BEELE Engineering bv of The Netherlands		Rev. 1		SOLAS 02
		Rev. 2		

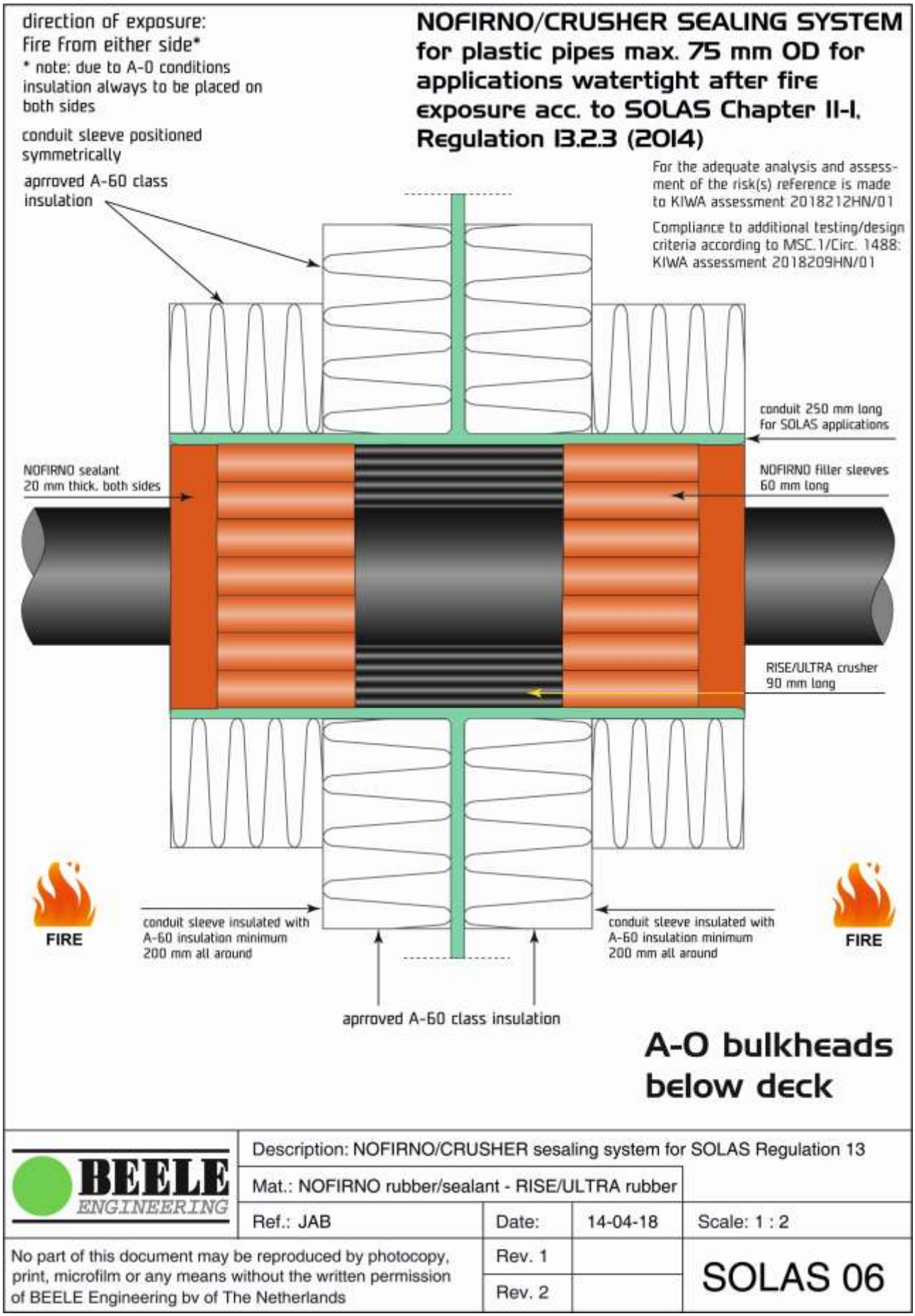

direction of exposure:
Fire from either side*
* note: due to A-0 conditions insulation always to be placed on both sides
conduit sleeve positioned symmetrically
aprroved A-60 class insulation
SLIPSIL/DYNATITE SEALING SYSTEM for steel/ss/CuNi pipes max. NPS 6" for applications watertight after fire exposure acc. to SOLAS Chapter II-I, Regulation 13.2.3 (2014)
For the adequate analysis and assessment of the risk(s) reference is made to KIWA assessment 2018212HN/01
Compliance to additional testing/design criteria according to MSC.1/Circ. 1488: KIWA assessment 2018209HN/01
conduit 250 mm long For SOLAS applications
59
54
SLIPSIL sealing plug
DYNATITE plug type DTsh 54 mm long (2x)
FIRE
FIRE
conduit sleeve insulated with A-60 insulation minimum 200 mm all around
conduit sleeve insulated with A-60 insulation minimum 200 mm all around
Insulation on both sides of the bulkhead around ducted steel pipe overlapping the SLIPSIL plug min. 40 mm, length 200 mm for pipes < 88.9 mm and 400 mm for pipes > 88.9 mm
aprroved A-60 class insulation
A-0 bulkheads below deck
BEELE ENGINEERING
Description: SLIPSIL/CRUSHER plug system for SOLAS Regulation 13
Mat.: NOFIRNO rubber
Ref.: JAB
Date: 14-04-18
Scale: 1 : 2
No part of this document may be reproduced by photocopy, print, microfilm or any means without the written permission of BEELE Engineering bv of The Netherlands
Rev. 1 20-07-18
Rev. 2
SOLAS 03





BEELE ENGINEERING	Description: SLIPSIL/CRUSHER plug system for SOLAS Regulation 13			
	Mat.: NOFIRNO rubber			
	Ref.: JAB	Date:	14-04-18	Scale: 1 : 2
No part of this document may be reproduced by photocopy, print, microfilm or any means without the written permission of BEELE Engineering bv of The Netherlands		Rev. 1	20-07-18	SOLAS 04
		Rev. 2		



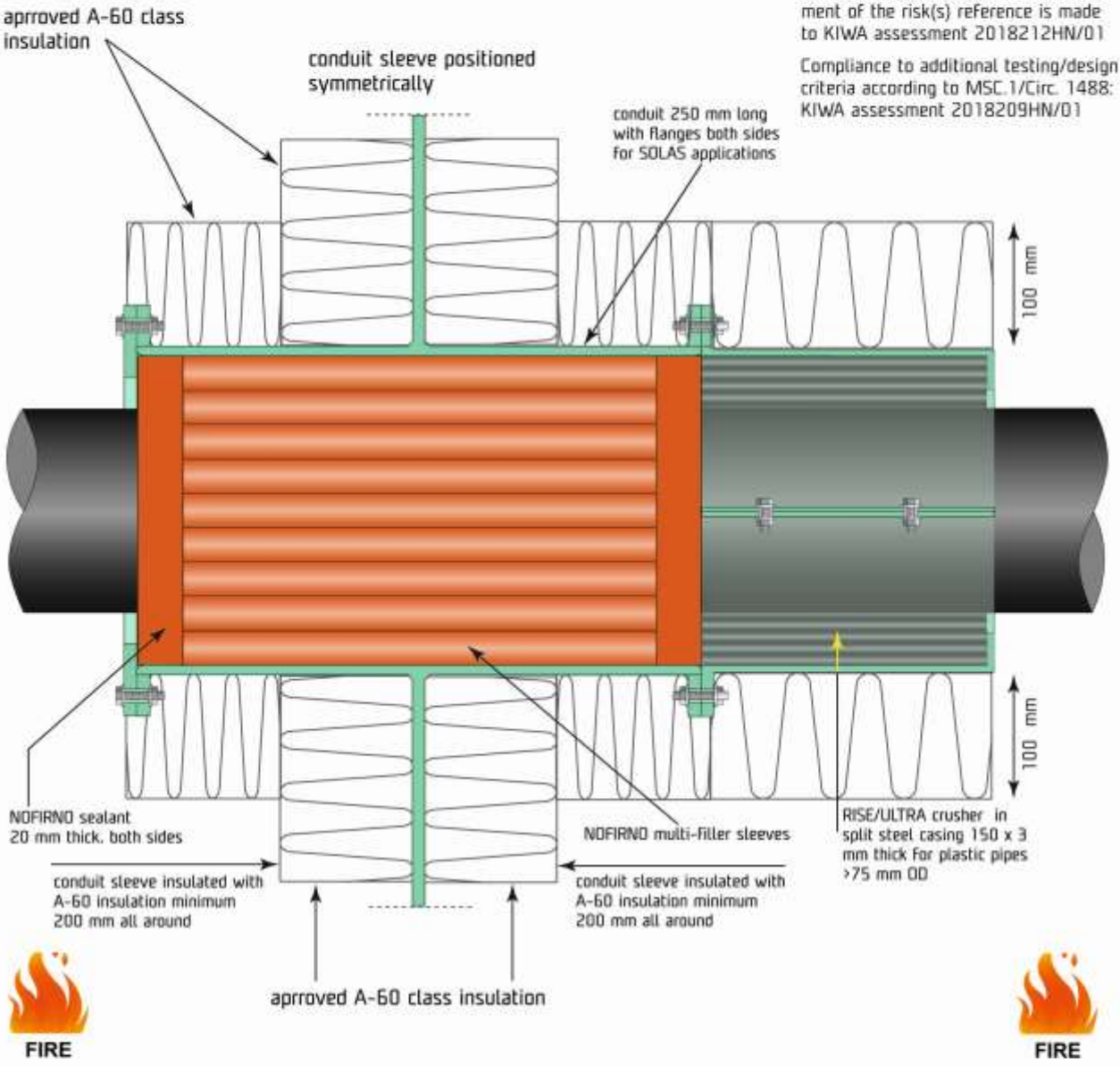


direction of exposure:
fire from either side*
* note: fire either side only when RISE/ULTRA is placed on both sides
* note: due to A-0 conditions insulation always to be placed on both sides

NOFIRNO SEALING SYSTEM for plastic pipes max. 110 mm OD for applications watertight after fire exposure acc. to SOLAS Chapter II-I, Regulation 13.2.3 (2014)

For the adequate analysis and assessment of the risk(s) reference is made to KIWA assessment 2018212HN/01

Compliance to additional testing/design criteria according to MSC.1/Circ. 1488: KIWA assessment 2018209HN/01

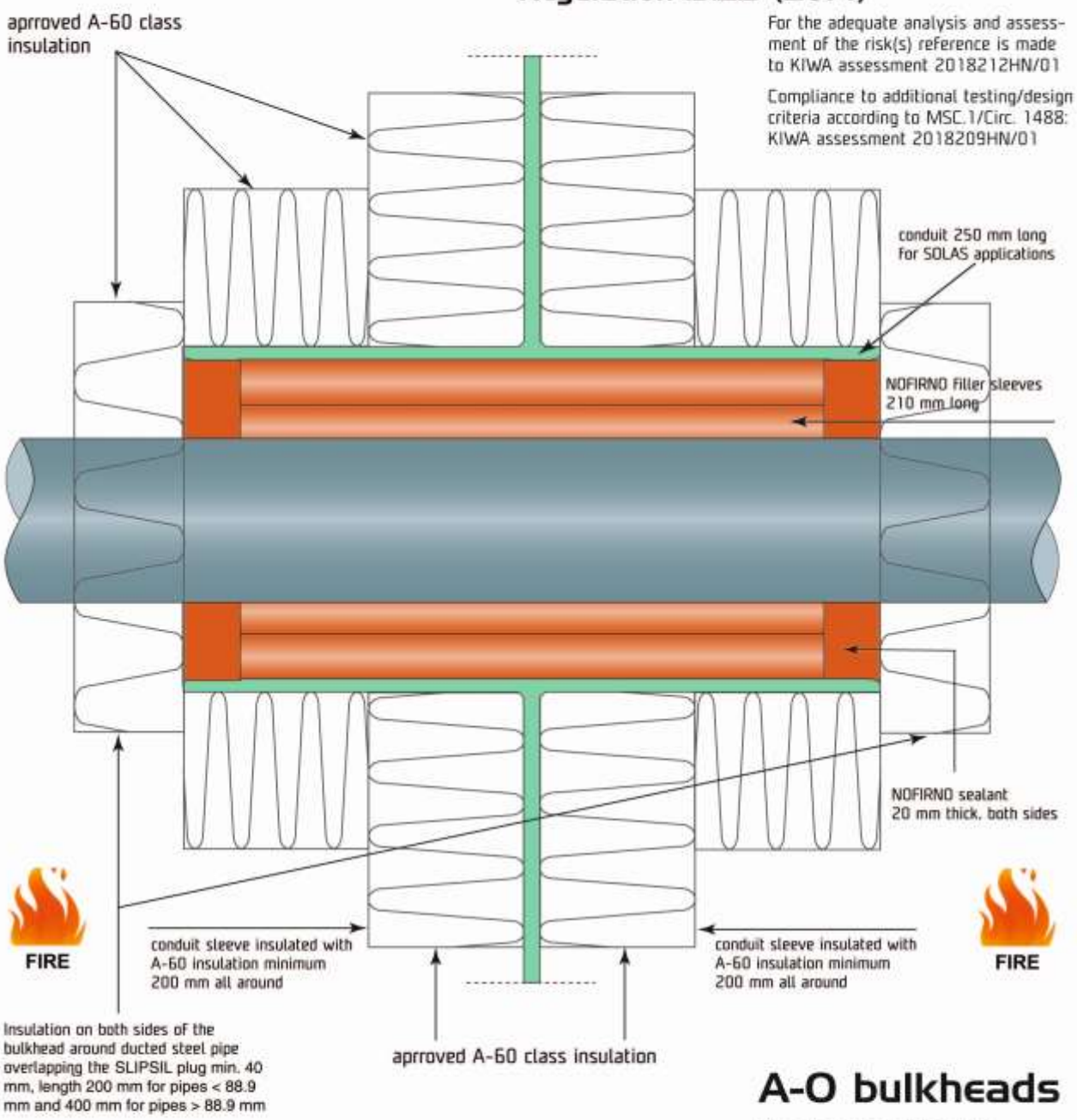


A-0 bulkheads below deck

BEELE ENGINEERING	Description: NOFIRNO sealing system for SOLAS Regulation 13			
	Mat.: NOFIRNO rubber & RISE/ULTRA rubber			
	Ref.: JAB	Date:	14-04-18	Scale:
No part of this document may be reproduced by photocopy, print, microfilm or any means without the written permission of BEELE Engineering bv of The Netherlands		Rev. 1		SOLAS 07
		Rev. 2		

direction of exposure:
Fire from either side*
* note: due to A-0 conditions insulation always to be placed on both sides

NOFIRNO SEALING SYSTEM for for steel/ss/CuNi pipes max. NPS 6" for applications watertight after fire exposure acc. to SOLAS Chapter II-I, Regulation 13.2.3 (2014)



A-0 bulkheads below deck

BEELE ENGINEERING	Description: NOFIRNO sesaling system for SOLAS Regulation 13			
	Mat.: NOFIRNO rubber and sealant			
	Ref.: JAB	Date:	14-04-18	Scale: 1 : 2
No part of this document may be reproduced by photocopy, print, microfilm or any means without the written permission of BEELE Engineering bv of The Netherlands		Rev. 1	20-07-18	SOLAS 08
		Rev. 2		

direction of exposure:
fire from either side*
* note: fire either side only when insulation is placed on both sides

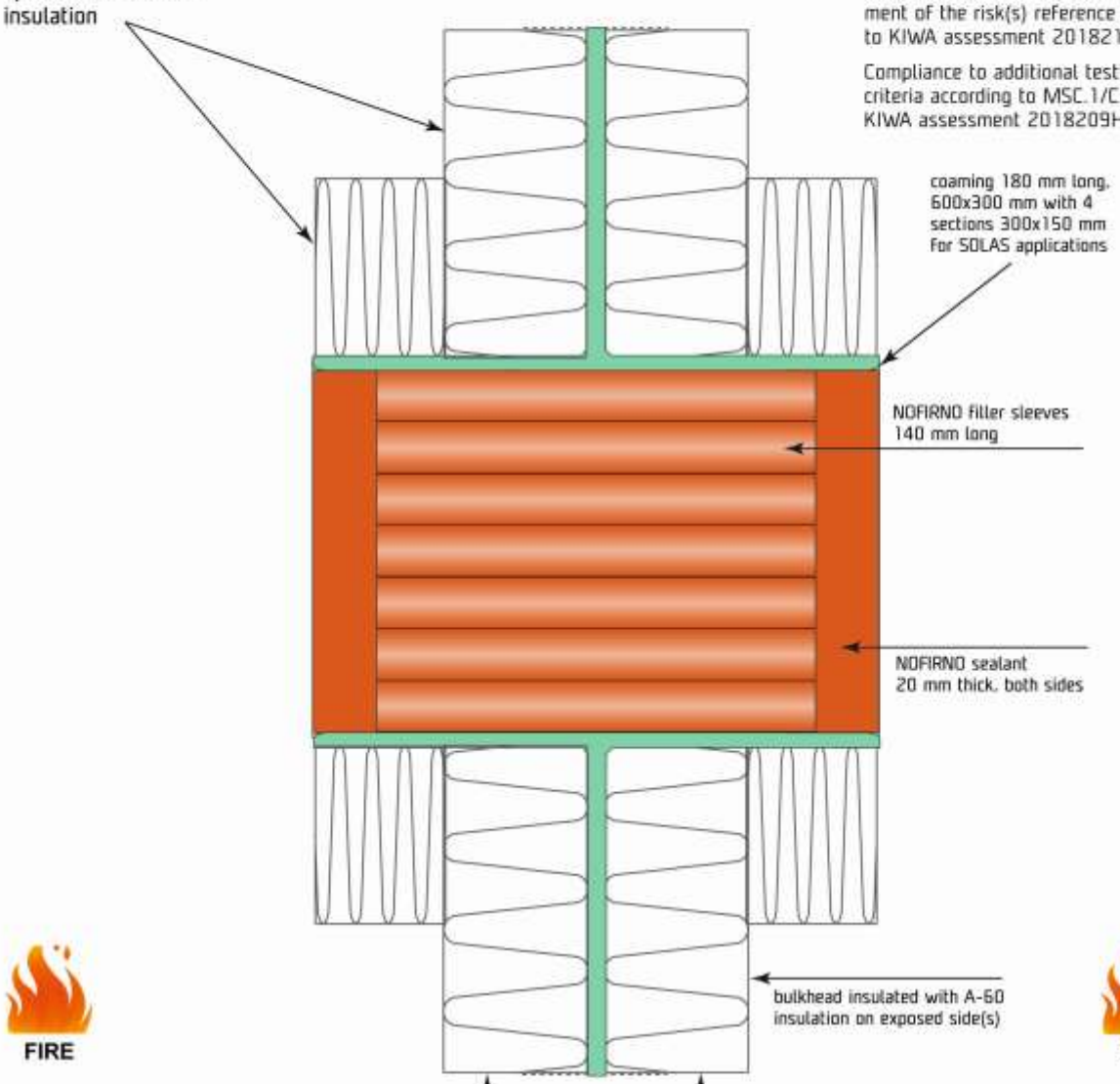
conduit sleeve positioned symmetrically

aprroved A-60 class insulation

NOFIRNO SEALING SYSTEM for blind penetrations 600x300 mm for applications watertight after fire exposure acc. to SOLAS Chapter II-I, Regulation 13.2.3 (2014)

For the adequate analysis and assessment of the risk(s) reference is made to KIWA assessment 2018212HN/01

Compliance to additional testing/design criteria according to MSC.1/Circ. 1488: KIWA assessment 2018209HN/01



aprroved A-60 class insulation for fire exposure both sides or in case fire from one side insulation at the exposed side only

A-60 bulkheads below deck

BEELE ENGINEERING	Description: NOFIRNO sesaling system for SOLAS Regulation 13			
	Mat.: NOFIRNO rubber and sealant			
	Ref.: JAB	Date:	14-04-18	Scale: 1 : 2
No part of this document may be reproduced by photocopy, print, microfilm or any means without the written permission of BEELE Engineering bv of The Netherlands		Rev. 1		SOLAS 09
		Rev. 2		