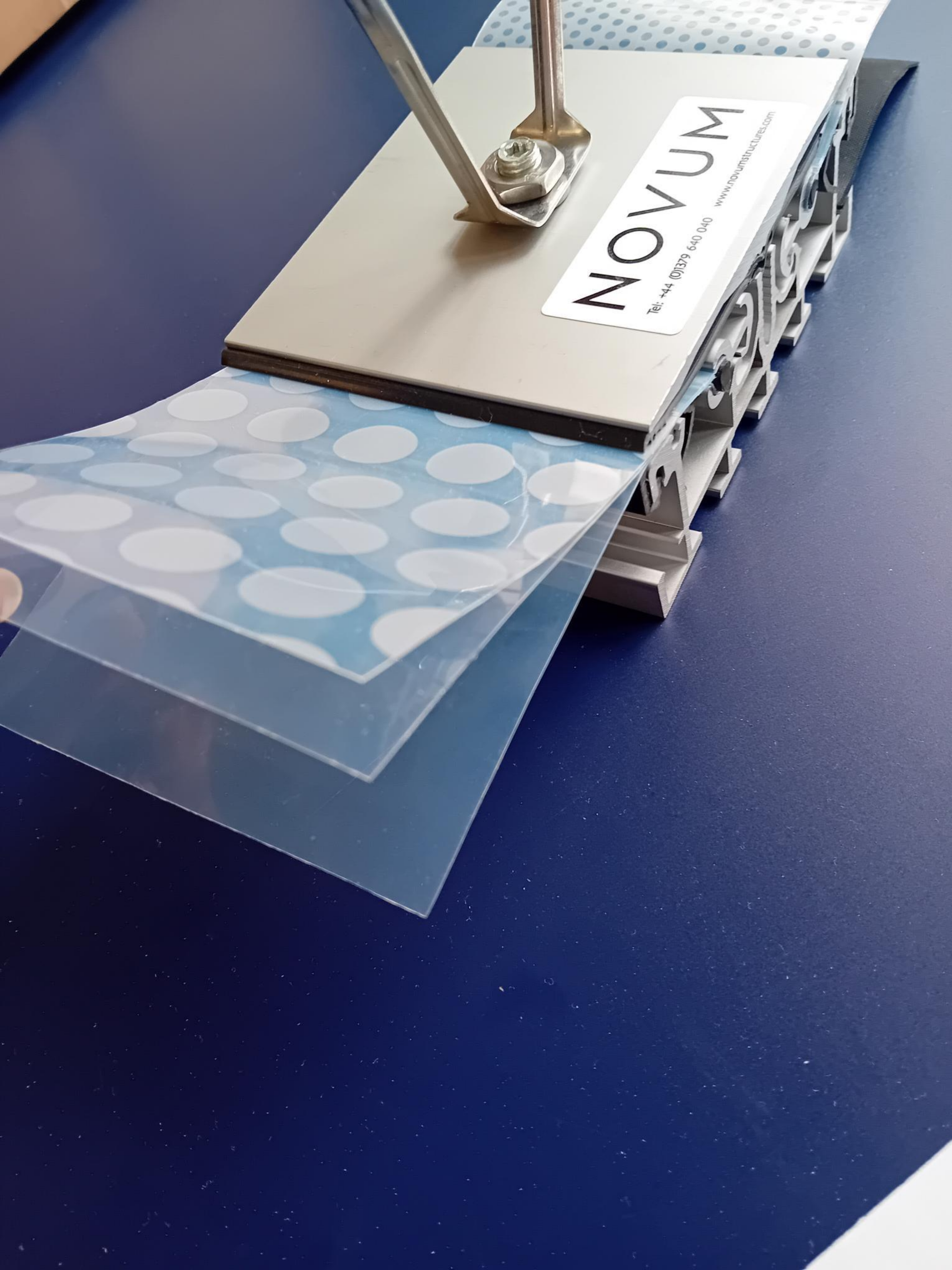
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NO
Tel: +44 (0)1379 64

= Ø75 ABS GREY
MAIN AIRLINE PIPE

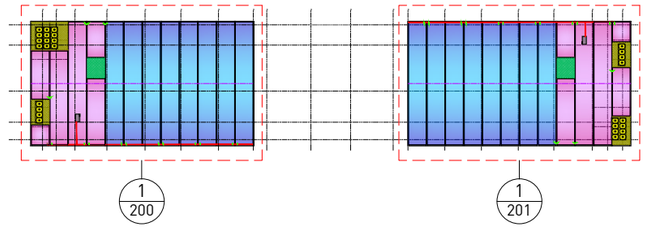
= Ø50 GREY/ CLEAR FLEXI
PILLOW FEED

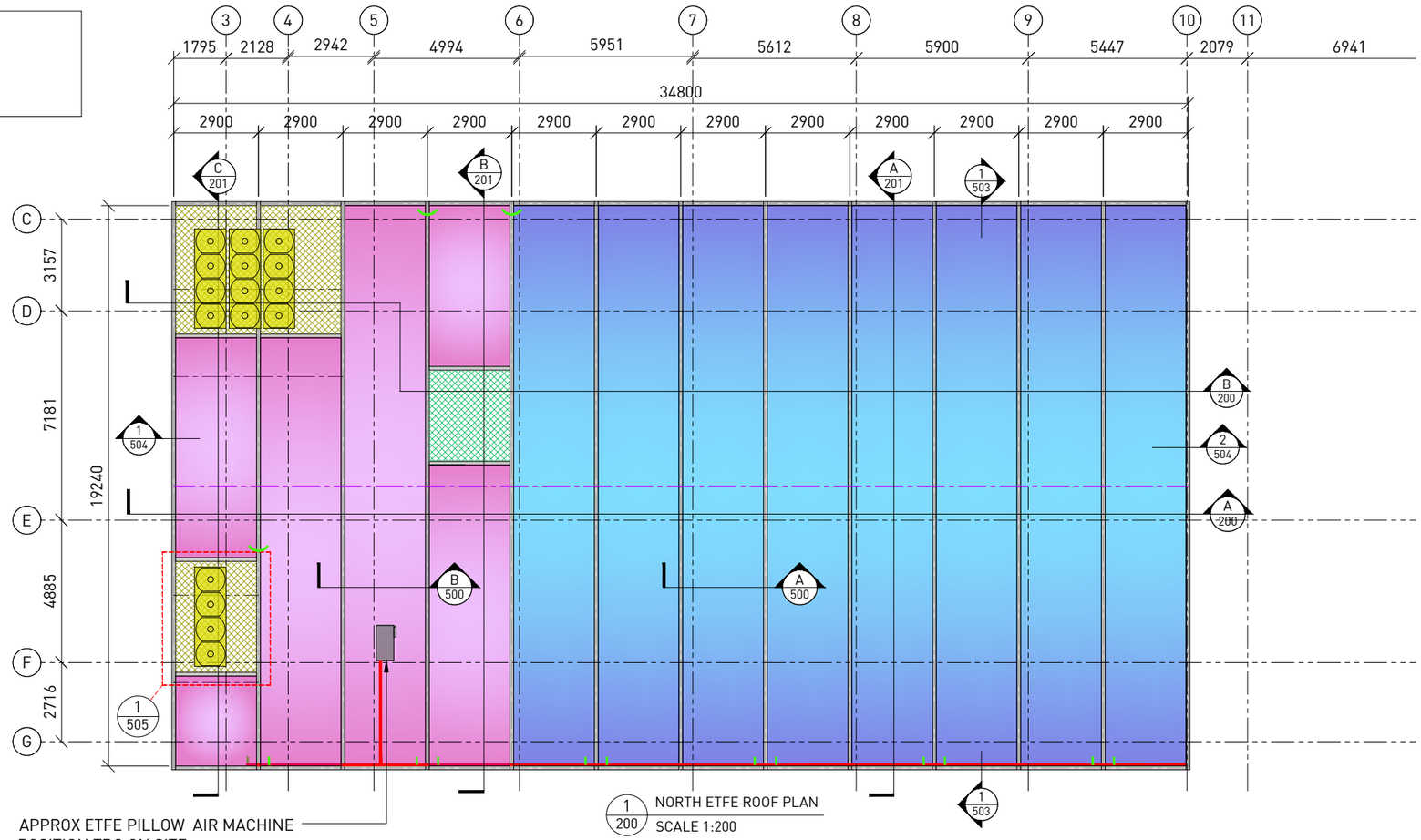
NEW OPENINGS IN ETFE ROOF
WITH WOVEN MESH SCREENS

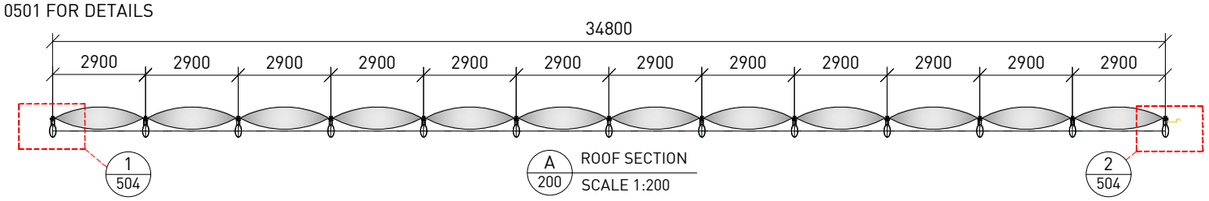
EXISTING OPENING IN ETFE ROOF

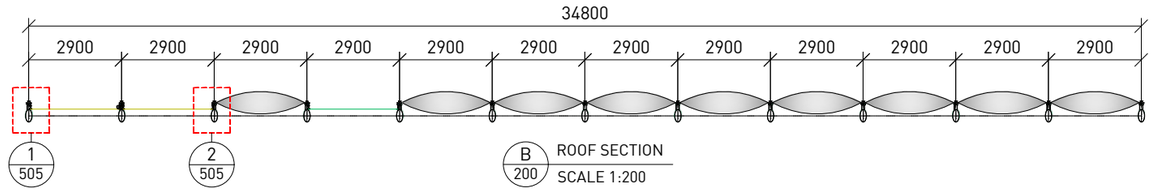
4 LAYER PILLOW
U-VALUE = 1.4 W/m²k

3 LAYER PILLOW
U-VALUE = 2.0 W/m²k









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P02	14.05.24	TOD	RC
UPDATED TO DESIGN TEAM COMMENTS			
P01	08.03.24	TOD	RC
INITIAL ISSUE			

Novum Structures UK Ltd
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SUITABILITY CODE :
S4-FOR REVIEW BY MC

PROJECT:
VICTORIA HOUSE
ETFE ROOF

LONDON , UK

DRAWING DESCRIPTION:
NORTH ETFE ROOF GA

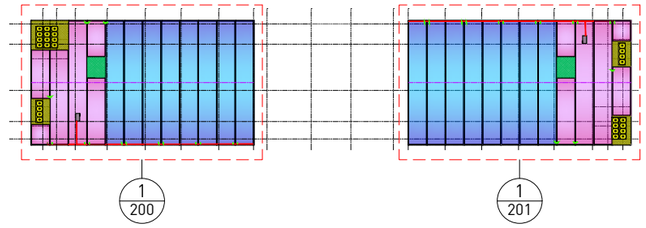
DRAWN BY:	DATE:
TOD	MARCH 24
CHECKED BY:	ENGINEER:
RC	-
SCALE:	PROJECT MANAGER:
AS NOTED	RC

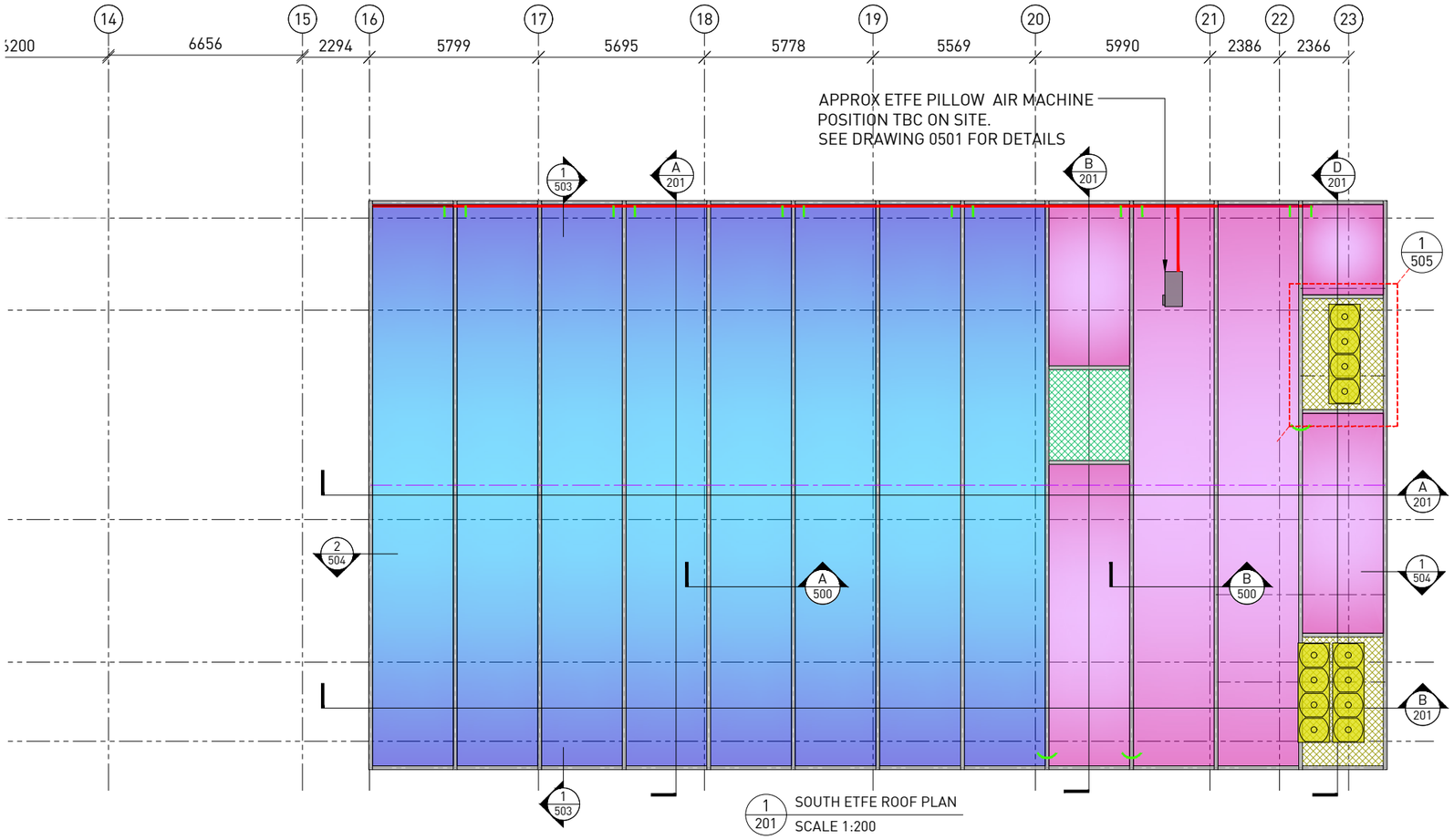
PROJECT NUMBER:
2022-6219

SHEET NUMBER:
VTH-NOV-XX-RF-DR-X-00200

REV:
P02

A3–UK. 400mm x 280mm





1/201 SOUTH ETFE ROOF PLAN
SCALE 1:200

= Ø75 ABS GREY MAIN AIRLINE PIPE

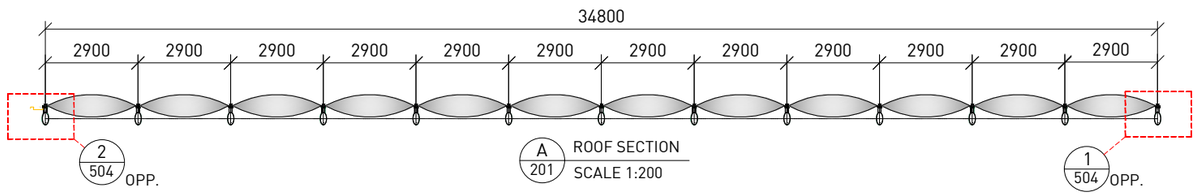
= Ø50 GREY/ CLEAR FLEXI PILLOW FEED

NEW OPENINGS IN ETFE ROOF WITH WOVEN MESH SCREENS

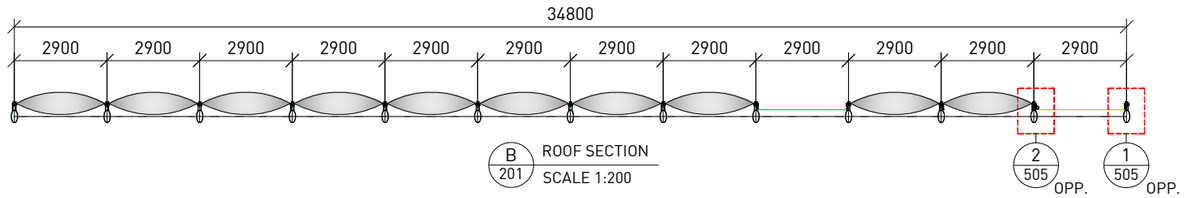
EXISTING OPENING IN ETFE ROOF

4 LAYER PILLOW
U-VALUE = 1.4 W/m²k

3 LAYER PILLOW
U-VALUE = 2.0 W/m²k



A/201 ROOF SECTION
SCALE 1:200



B/201 ROOF SECTION
SCALE 1:200

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SUITABILITY CODE :
S4-FOR REVIEW BY MC

PROJECT:
VICTORIA HOUSE
ETFE ROOF

LONDON , UK

DRAWING DESCRIPTION:
SOUTH ETFE ROOF GA

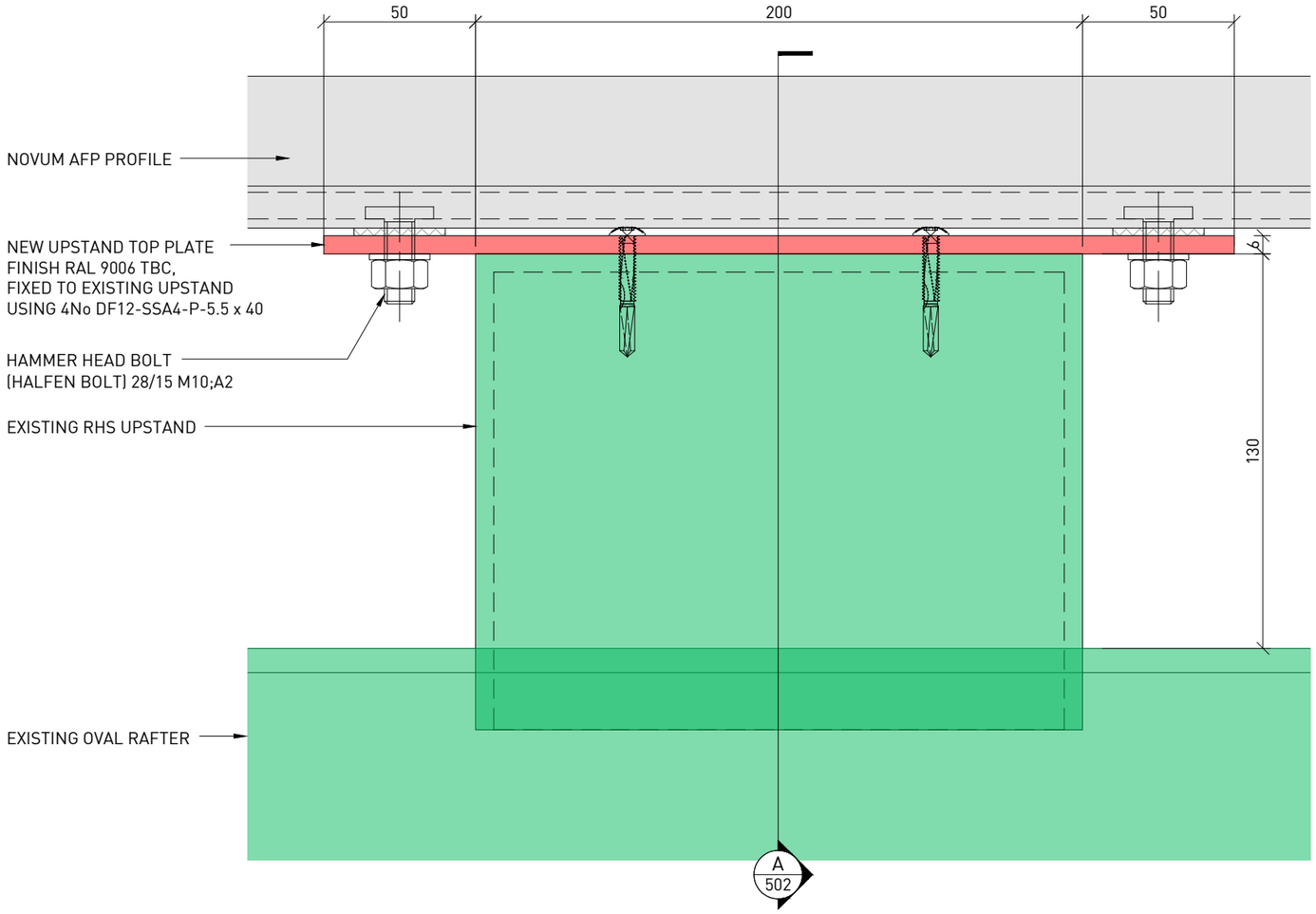
DRAWN BY:	DATE:
TOD	MARCH 24
CHECKED BY:	ENGINEER:
RC	-
SCALE:	PROJECT MANAGER:
AS NOTED	RC

PROJECT NUMBER:
2022-6219

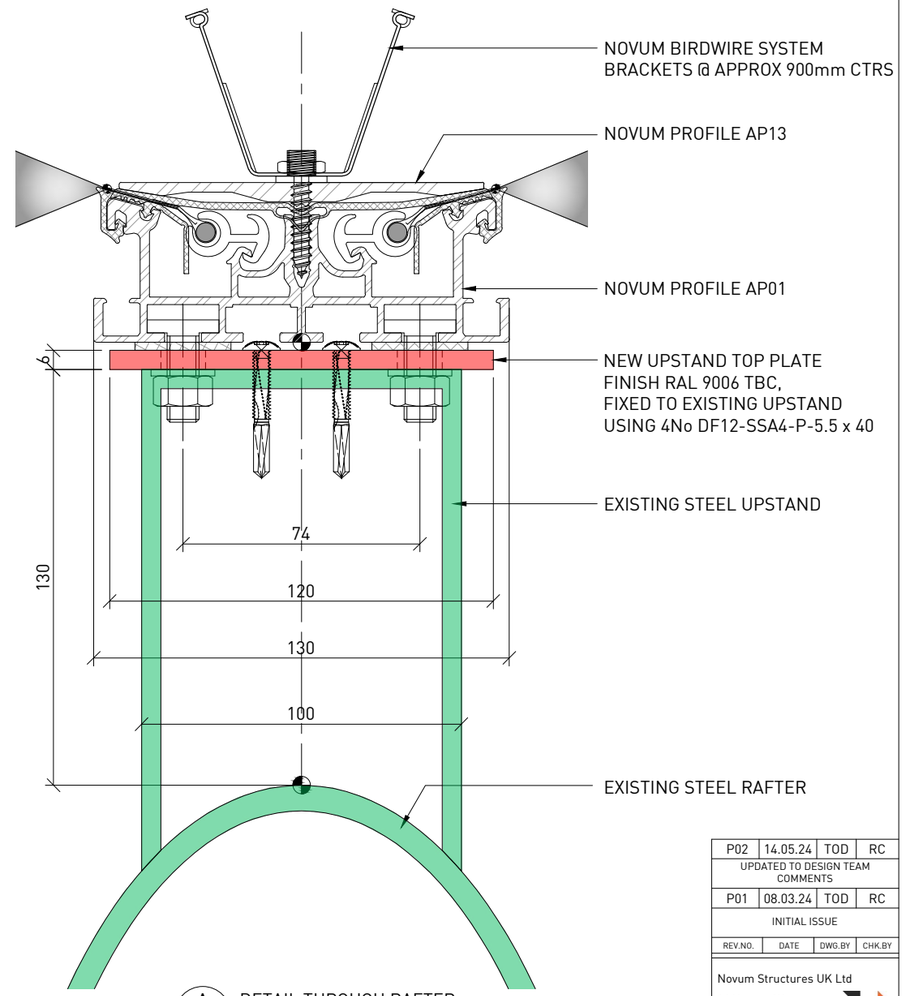
SHEET NUMBER:
VTH-NOV-XX-RF-DR-X-00201

REV:
P02

A3–UK. 400mm x 280mm



1/502 NEW PROFILE FIXING DETAIL
SCALE 1:2



A/502 DETAIL THROUGH RAFTER
SCALE 1:2

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SUITABILITY CODE :
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PROJECT:
VICTORIA HOUSE
ETFE ROOF

LONDON , UK

DRAWING DESCRIPTION:
ETFE PROFILE
CONNECTION DETAIL

DRAWN BY:	DATE:
TOD	MARCH 24
CHECKED BY:	ENGINEER:
RC	-
SCALE:	PROJECT MANAGER:
AS NOTED	RC

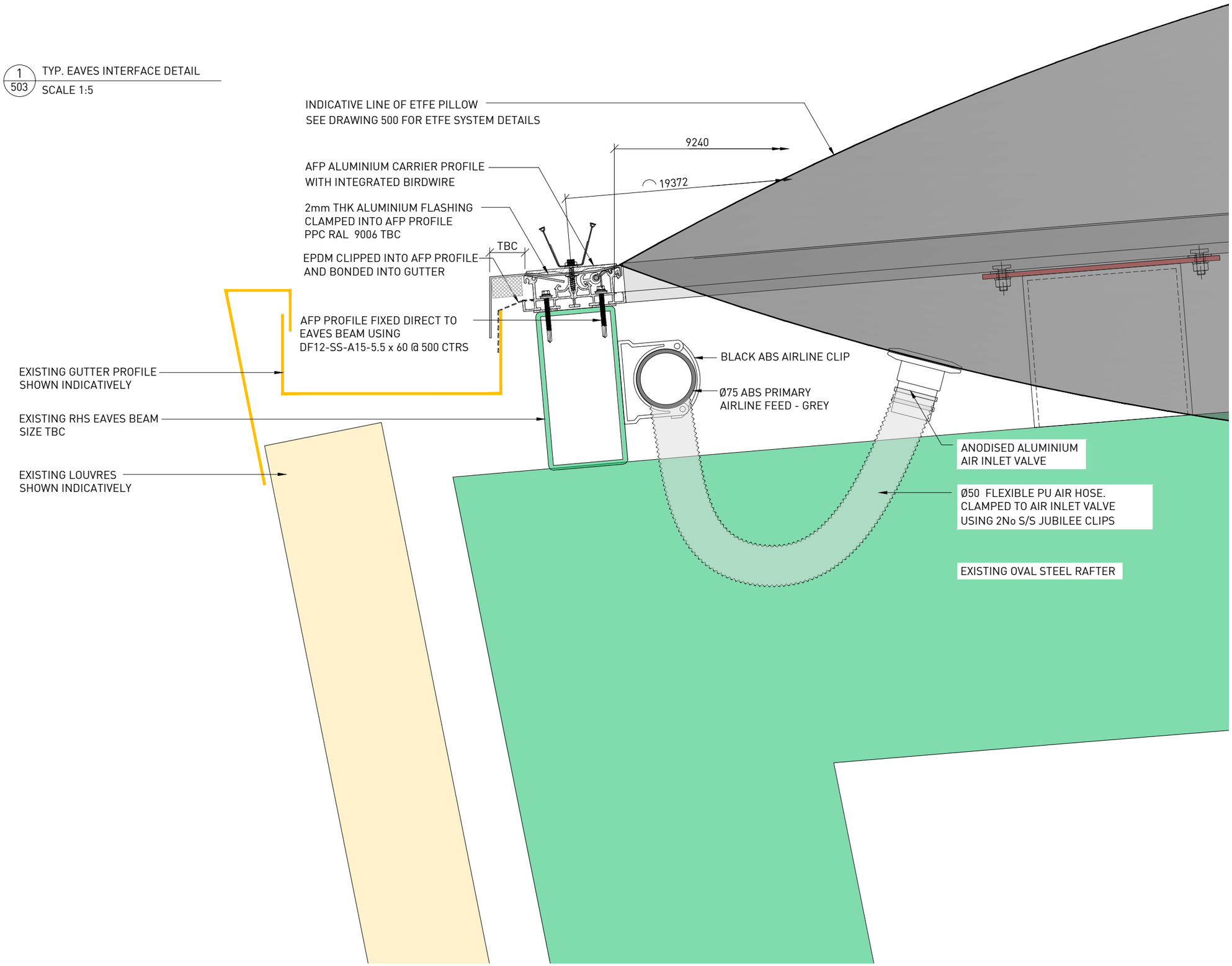
PROJECT NUMBER:
2022-6219

SHEET NUMBER: VTH-NOV-XX-RF-DR-X-00502
REV: P02

A3–UK. 400mm x 280mm

1/503 TYP. EAVES INTERFACE DETAIL

SCALE 1:5



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PROJECT:
VICTORIA HOUSE
ETFE ROOF

LONDON , UK

DRAWING DESCRIPTION:
ETFE EAVES DETAIL

DRAWN BY: TOD	DATE: MARCH 24
CHECKED BY: RC	ENGINEER: -
SCALE: AS NOTED	PROJECT MANAGER: RC

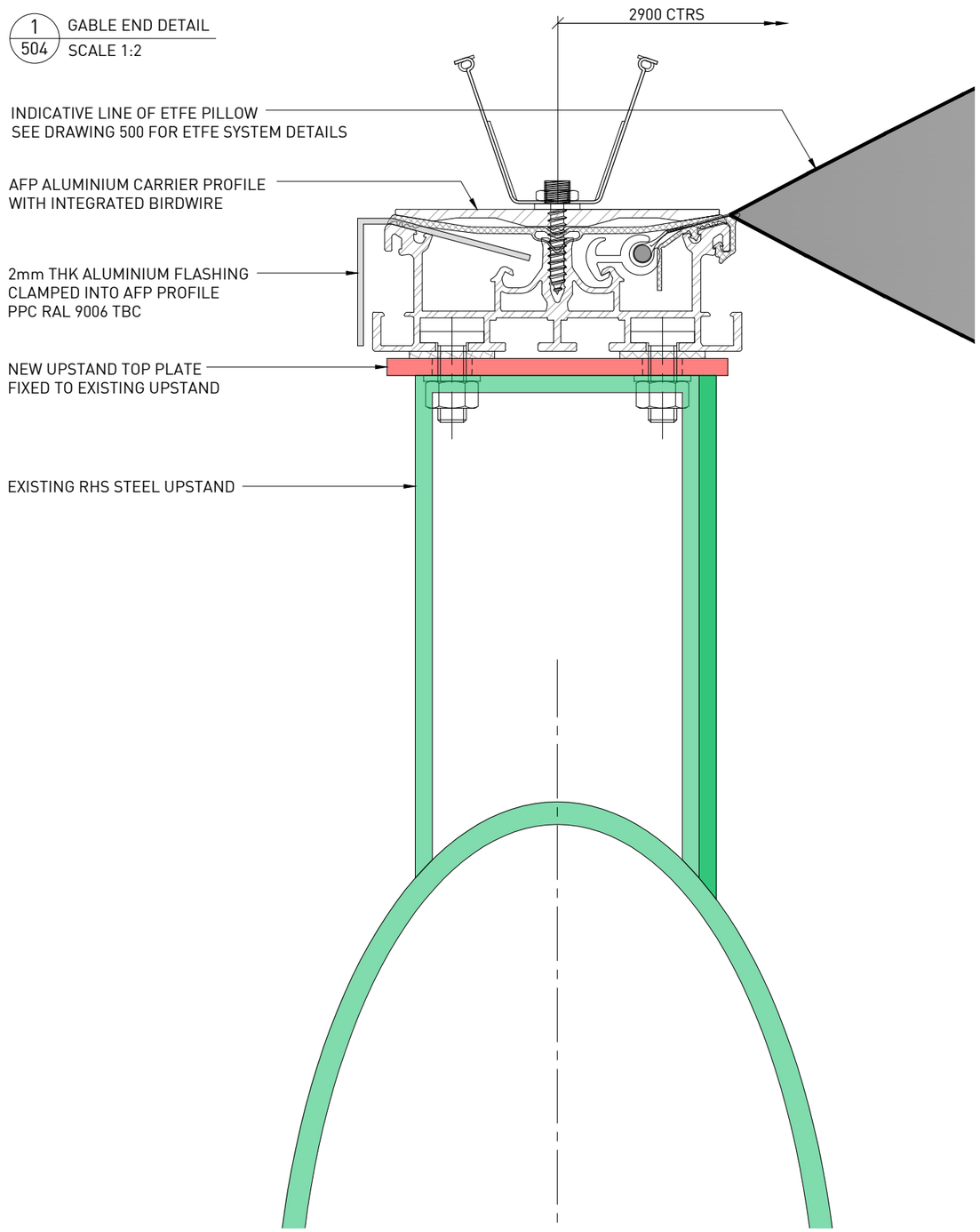
PROJECT NUMBER:
2022-6219

SHEET NUMBER:
VTH-NOV-XX-RF-DR-X-00503

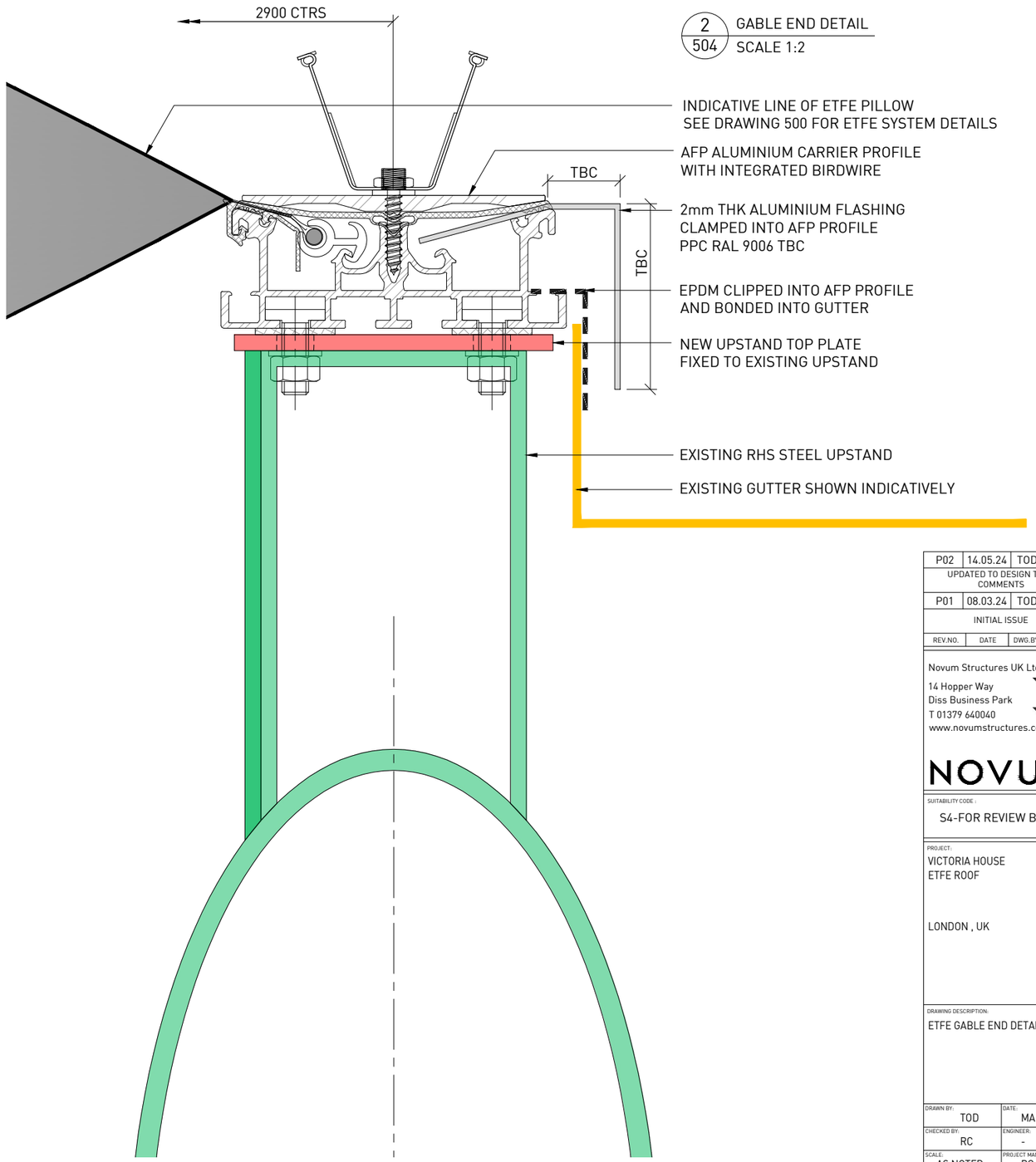
REV:
P02

A3–UK. 400mm x 280mm

1/504 GABLE END DETAIL
SCALE 1:2



2/504 GABLE END DETAIL
SCALE 1:2



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SUITABILITY CODE :
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PROJECT:
VICTORIA HOUSE
ETFE ROOF

LONDON , UK

DRAWING DESCRIPTION:
ETFE GABLE END DETAILS

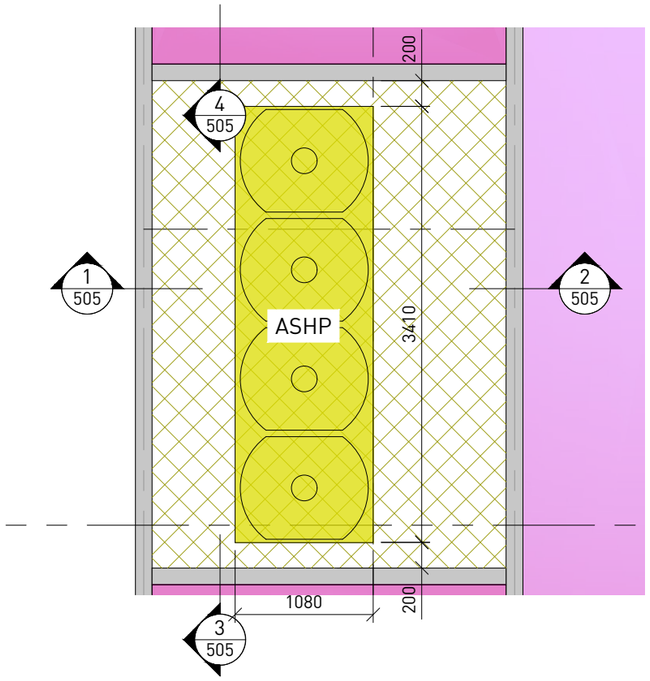
DRAWN BY:	DATE:
TOD	MARCH 24
CHECKED BY:	ENGINEER:
RC	-
SCALE:	PROJECT MANAGER:
AS NOTED	RC

PROJECT NUMBER:
2022-6219

SHEET NUMBER:
VTH-NOV-XX-RF-DR-X-00504

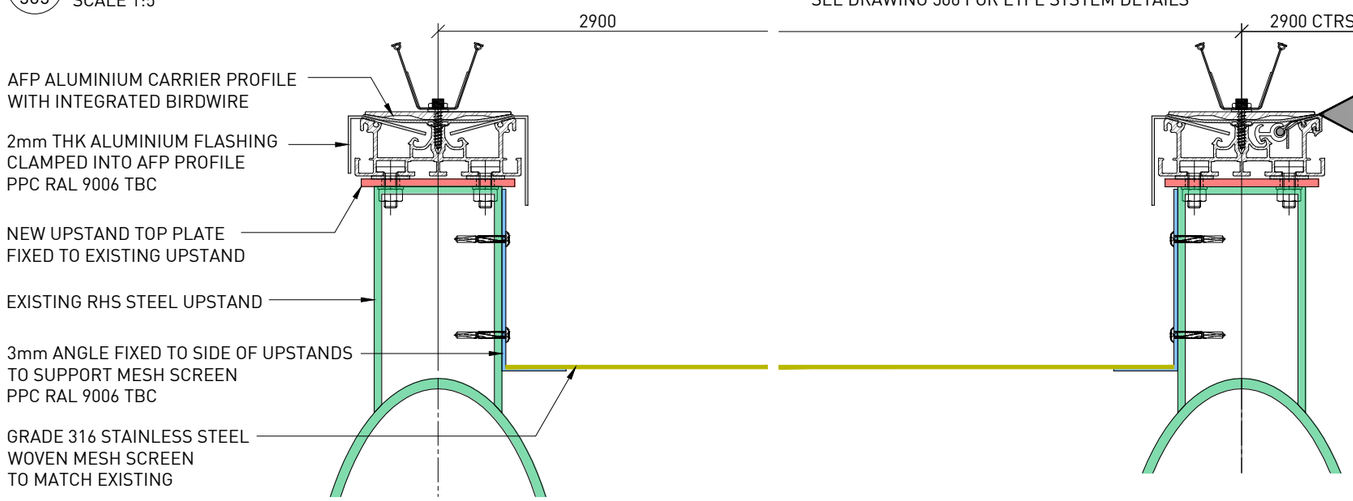
REV:
P02

A3–UK. 400mm x 280mm

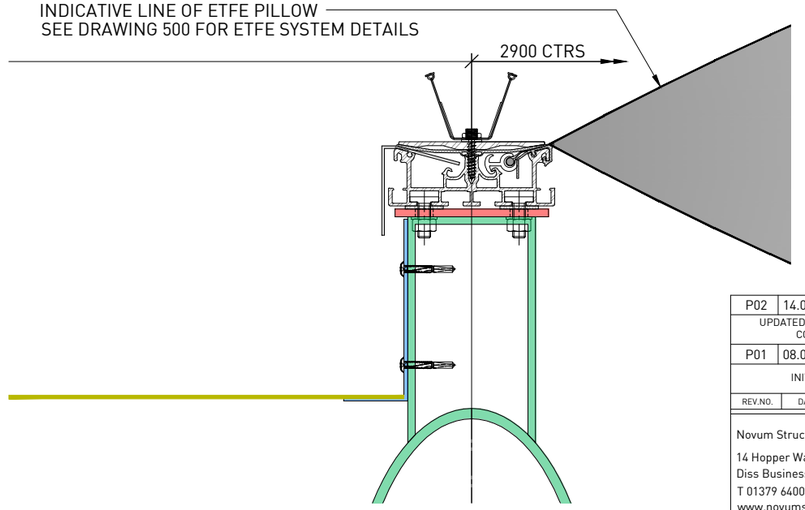


1 505 ROOF MESH OPENING - PLAN
SCALE 1:50

1 505 VENT DETAIL
SCALE 1:5



2 505 VENT DETAIL
SCALE 1:5



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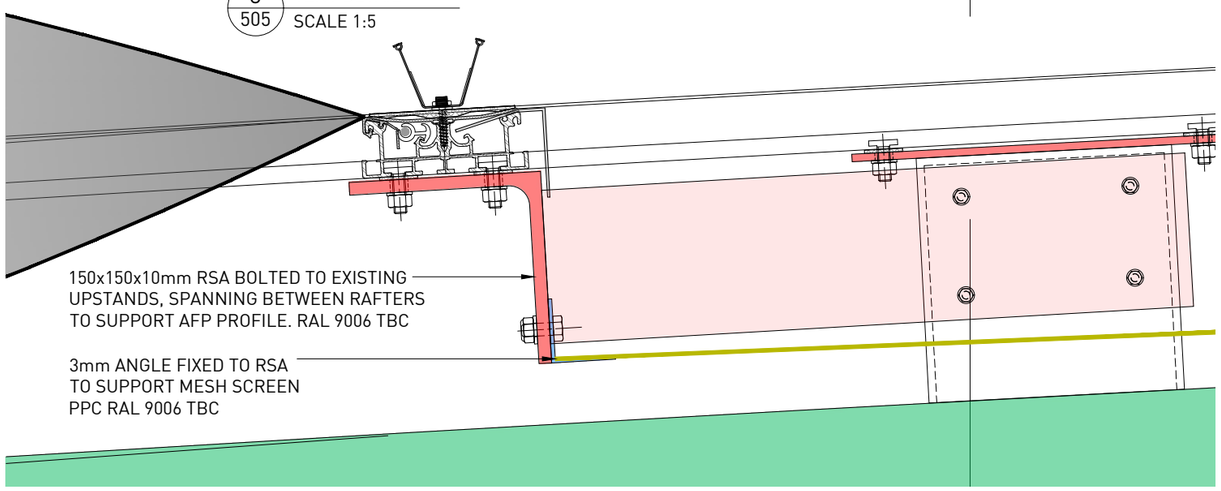
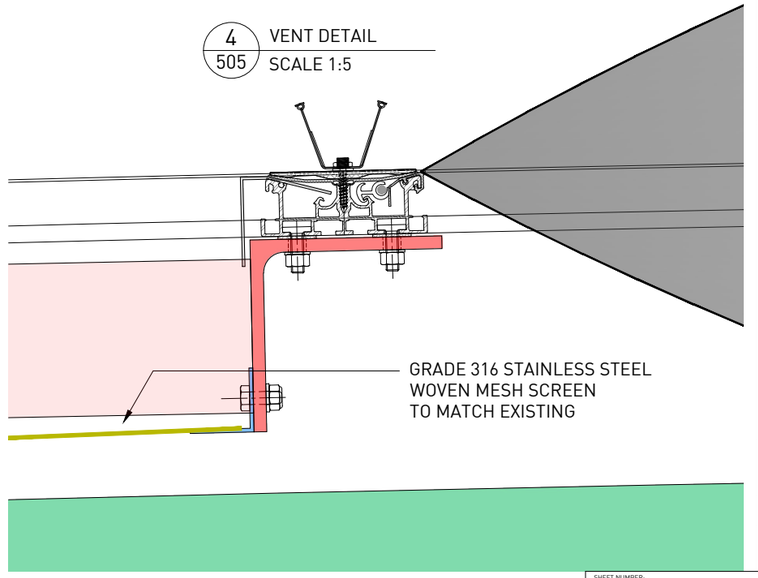
SCALE 1:5



4 505 VENT DETAIL
SCALE 1:5



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SUITABILITY CODE :
S4-FOR REVIEW BY MC

PROJECT:
VICTORIA HOUSE
ETFE ROOF

LONDON , UK

DRAWING DESCRIPTION:
ETFE ROOF MESH DETAILS

DRAWN BY:	DATE:
TOD	MARCH 24
CHECKED BY:	ENGINEER:
RC	-
SCALE:	PROJECT MANAGER:
AS NOTED	RC

PROJECT NUMBER:
2022-6219

SHEET NUMBER:
VTH-NOV-XX-RF-DR-X-00505

REV:
P02

A3–UK. 400mm x 280mm

NOVUM STRUCTURES UK LIMITED

Victoria House, Holborn

Technical Product Data Submittal
ETFE – Membrane

Document Ref: VTH-NOV-XX-RF-TS-X-00005
Date: 10/04/2024
Status: S4- For Review by MC
Revision: P01

Revision	Date	Description	Prepared By
P01	10/04/2024	Issue for Review	TOD

1 4-Layer Pillow with 70% Coverage HD Print

1.1 Setup

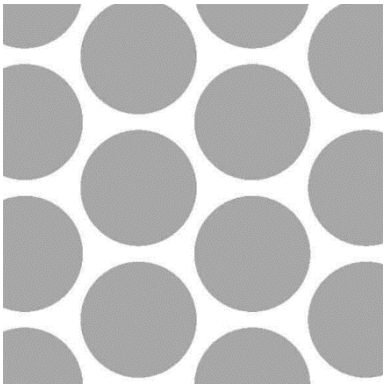
Layer A: 300 µm, Print 70 % Coverage, High-Density Ink 78185
Layer B: 150 µm
Layer C: 100 µm
Layer D: 200 µm

1.2 Calculation

```
BERKELEY LAB WINDOW v7.8.71.0 Glazing System Thermal and Optical Properties
04/16/24 11:38:00

Name    : 2022-6219 P
Tilt    :  0.0
Glazings: 4
Width   : 480.750 [mm]
Uvalue  : 1.4 [W/m2-K] (manually adjusted)
SHGCc   : 0.311 (G-value)
SCc     : 0.357
Tvis    : 0.297 (light transmission )
Tdw-ISO:  0.263

Layer Data for Glazing System '261 2022-6219 P'

ID     Name              D(mm) Tsol  1 Rsol 2 Tvis  1 Rvis 2  Tir  1 Emis 2 Keff
------ ---------------- ----- ---- ---- ---- ---- ---- ---- ---- ---- ---- ----
Outside
 24570 185_70_300.nov #  0.3 .361 .381 .398 .352 .389 .409 .000 .877 .611 .250
       5 Air for ETFE p300.0                                                .828
 20200 ETFE_150.nov   #  0.2 .922 .068 .068 .913 .079 .079 .000 .800 .800 .250
       5 Air for ETFE p 90.0                                                .326
 20100 ETFE_100.nov   #  0.1 .931 .063 .063 .925 .070 .070 .000 .750 .750 .250
       5 Air for ETFE p 90.0                                                .348
 20300 ETFE_200.nov   #  0.2 .913 .073 .073 .901 .088 .088 .000 .830 .830 .250
Inside

Environmental Conditions: 6 EN 13363-2 summer conditions
```

Notes:
(1) All values given are preliminary. The final foil setup may change depending on structural requirements.
(2) Foils have fabrication tolerances of up to 10 % thickness and transmission per layer.
(3) Printed patterns have tolerances of up to 10 % transmission and reflection per printed face.
(4) U-Value is given for winter case. Applicable for outside temperature is 15 K colder than inside. Also applicable for sloped cladding elements.

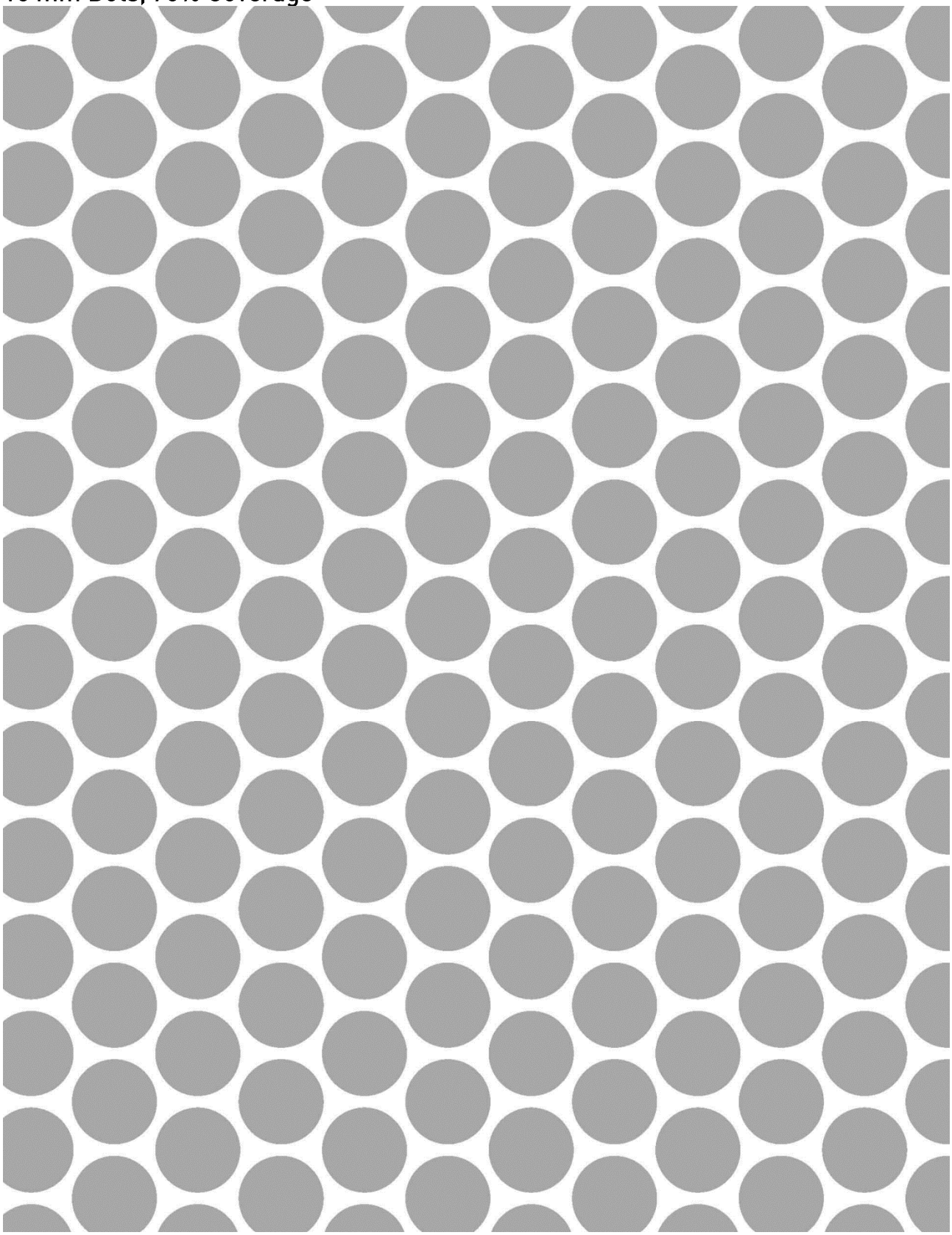
1.3 Used Decors



16mm Dots 70% (921785)

Appendix – Proposed Decors in Scale 1:1

16 mm Dots, 70% Coverage



ENVIRONMENTAL-PRODUCT DECLARATION

In accordance with /ISO 14025/ and /EN 15804/

Owner of the Declaration	Novum Membranes GmbH
Publisher	Institut Bauen und Umwelt e.V. (IBU)
Programme holder	Institut Bauen und Umwelt e.V. (IBU)
Declaration number	EPD-NMG-20170152-IBC1-DE
Issue Date	18/10/2017
Valid to	17/10/2022

Novum AFP System

Novum Membranes GmbH

Institut Bauen und Umwelt e.V.

www.bau-umwelt.com / https://epd-online.com

1. General Information

Novum Membranes GmbH

Programme holder
IBU - Institut Bauen und Umwelt e.V.
Panoramastrasse 1
10178 Berlin
Deutschland

Declaration number
EPD-NMG-20170152-IBC1-DE

This declaration is based on the Product Category Rules:
ETFE construction element, 07.2014
(PCR tested and approved by the independent Council of Experts (SVR))

Issue date
18.10.2017

Valid to
17.10.2022

Prof. Dr.-Ing. Horst J. Bossenmayer
(President of the Institut Bauen und Umwelt e.V.)

Dr. Burkhart Lehmann
(Managing Director IBU)

Novum AFP-System

Owner of the Declaration
Novum Membranes GmbH
Im Voigtstedter Feld 6
06528 Edersleben

Declared product/declared unit
The declared unit is one (1) representative square metre (m^2) of Novum AFP cushion system including the proportionate framing and packaging materials

Scope:
This EPD refers to individual elements of building envelopes which are made of ethylene tetrafluoro-ethylene (ETFE) material. It is valid for the production location of Edersleben. The building elements are marketed by the Novum Membranes GmbH company.

Foil cushions are planned and made project-specifically. Thus EPD calculates the lifecycle analysis (LCA) for a representative product.

The owner of the declaration is liable for the underlying information and evidence; IBU shall not be liable with respect to manufacturer information, lifecycle assessment data and evidence.

Verification

CEN standard /EN 15804/ serves as the core PCR
Verification of the EPD by an independent third party in accordance with /ISO 14025/
☐ internal ☒ external

Matthias Schulz,
Independent verifier appointed by Council of Experts (SVR)

2. Product

2.1 Product description /product definition

The Novum AFP-System (Air Filled Pillow Membrane System) is based on the following principle: pneumatically stabilised foil elements are attached to a substructure by means of a special aluminium section system. Depending on physical, structural or creative requirements and specification, the systems can be formed from 2 to 4 layers of foil made of ethylene tetrafluoroethylene (ETFE). The U-values (heat transmission coefficient) and g-values (energy transmittance) of the Novum system are specified by the number of layers used and the type of colouring and printing. The ETFE foil thicknesses vary between 100 µm and 500 µm depending on structural constructive requirements. The individual layers are welded together at the edges and stabilised by a low-pressure support air system at approximately 250 Pa (250 N/m^2).
This EPD is based on a typical three-layer system with the following structure:

- Upper foil: 250 µm
- Middle foil: 100 µm
- Lower foil: 200 µm

The LCA for a representative product is calculated in this EPD.

The product is not subject to any EU harmonisation legislation. The respective national regulations at the location of use apply to the use of the product.

2.2 Application

Novum cushions are building elements used both for the cladding of roofs and complete facades. The Novum system is suitable for both new buildings and refurbishment projects. Well-known examples are:

- Entertainment Centre: National Arena Scotland Glasgow, Great Britain
- Artificial biospheres: Eden Project in Cornwall, Great Britain
- Zoological gardens: London Zoo, Chester Zoo, Great Britain
- Atria: Marr College Troon, Great Britain
- Passage: Mall of Africa, Randburg, South Africa

- Railway stations: Crystal Palace Station, London, Great Britain
- Hospitals: Edinburgh Royal Hospital, Edinburgh, Great Britain
- Hotels: Center Parcs Longleat Wiltshire Great Britain

2.3 Technical Data

Constructional data

Name	Value	Unit
Melting range in accordance with /ASTM D 4591-07/	265±10	°C
Grammage (ETFE foil)	0,4375	kg/m^2
Tensile strength in accordance with /DIN EN ISO 527-1/ (ETFE foil)	> 55	N/mm^2
Tensile stress at 10 % strain in accordance with /DIN EN ISO 527-1/ (ETFE foil)	> 23	N/mm^2
Failure strain in accordance with /DIN EN ISO 527-1/ (ETFE foil)	> 55	%
Tear resistance in accordance with /DIN 53363/ (ETFE foil)	> 400	N/mm
Weld strength in accordance with /DIN 527-1/ (ETFE foil)	> 33	N/mm^2
Minimum total energy transmittance on accordance with /ISO 15099/	< 80	%
Minimum total energy transmittance Novum AFP 3-layer /ISO15099/	> 10	%
Weathering resistance in accordance with /ISO 4892-1/ and /ISO 4892-2/	No change in mechanical values	-

The product is not subject to any EU harmonisation legislation. The respective national regulations at the location of use apply to the use of the product.

2.4 Delivery status

The Novum AFP system is dimensioned for specific projects. From an economic and technical perspective a length of 50 m and a width of 4 m should generally not be exceeded. The cushion area should not exceed 200 m².

2.5 Base materials /Ancillary materials

The main base products are ETFE foil, aluminium frame, sealing materials and air pipes. The supporting air blower system is not part of the EPD.
The accumulated rounded mass % of the input materials for 1m² of a representative Novum AFP system is shown below.

Materials	Share in mass %
Aluminium	54
ETFE	25
EPDM	4
Steel	7
PVC	2
Silicone	3
Cardboard	2
PE foil	4

The four largest (mass-based) input materials are explained in more detail below:

ETFE: ETFE foil
ETFE foils are highly flexible, high-strength partly fluorinated copolymer foils. The foils are permeable for a large part of the solar spectrum. They can be transparent, printed or coloured.
Aluminium: Aluminium section system
The aluminium section system consists of an extruded base element, a cover profile and two support rails for the cord edging.
Aluminium: Aluminium connectors
The connectors to attach the air hoses are small aluminium parts.
EPDM: EPDM seal (ethylene propylene dien rubber)
The profile system has extruded EPDM sealing elements to seal the ETFE.
EPDM: Keder
The foil cushion is joined form-fitted to the profile system with a cord edging. The cord edging consists of a flexible round EPDM cord. It normally has a diameter of 6 mm.
Steel: Stainless steel screws
Stainless steel screws are used to connect the individual parts of the AFP profile system and to attach the substructure.

2.6 Manufacture

Manufacture of ETFE granulate

Raw materials and monomers
Mineral fluorspar and natural gas are used to manufacture R22 (chlorine difluoromethane) via interim steps which is delivered by road tankers. This is used to manufacture perfluorated monomers such as tetrafluoroethylene (TFE), hexafluoropropylene (HFP) and perfluoro (propyl vinyl ether) by thermal conversion which are in turn freed of ancillary products by means of distillation.
Polymerisation: Together with ethene, these monomers are converted in water into a thermoplastic dispersion. Monomers which are not converted and polymerisation auxiliaries such emulsifiers are returned to the monomer plant and re-used after distillation.

Recycling (Reprocessing):
The degassed thermoplastic dispersion is precipitated and the ensuing powder is dried. Since this is difficult to process due to its low flowability, it is melted to granulate before shipping. This is followed by quality control which determines whether the product meets customer requirements.

Manufacture of ETFE foil:
ETFE foils are manufactured via cast film extrusion. The granulate is fed into the extruder through a funnel. In the extruder itself, the granulate is melted and the melt homogenised. The plastic melt is then extruded out on a chill roll and detached via a downstream extrusion tool, a sheet extrusion die. This is followed by a thickness check of the foil using an inline process and edge trimming. These trimmings are directly ground down and returned to the extrusion process via the funnel using the inline process. The last step of the foil extrusion process is the rolling up of the foil on a cardboard roll.

Foil waste which cannot be re-used directly passes through a second stage on a regeneration machine before also being reprocessed into foil. The application of the recycling material is always subjected to a downcycling process.
The foils are produced in 1550 mm widths and cut to length in consultation with the customer. Depending on

the foil thickness, a roll contains approximately 200 metres of foil.

Fabrication of the foil cushions:
The individual cushion pieces are cut to size on a CNC cutter.
At the same time, the positions of all further components to be installed, such as valves, are also drawn. Individual sheets are welded together to produce larger areas (area welding) and the valves are fitted. The welded foil sheets are placed on top of one another in two or more layers and welded together with an ultrasonic stapler (tacking). Keder (rope) is then welded along the edges of the foil in order to close the cushions (keder welding).
The large cushion is folded into a sheet approximately 30 cm wide and 2.5 m long and wrapped in protective polyethylene foil. The foil package is then prepared for shipping in a cardboard box together with three other cushions. The remaining project components (aluminium sections, keder, gaskets, screws and supporting air blower system) are packaged separately for shipping.

2.7 Environment and health during manufacturing

The appropriate measures according to the current state of technology are taken for manufacturing.
To date, no environmental pollution is known to be caused by processing the declared products in accordance with the generally recognised rules of technology.
The Novum Membranes GmbH quality management system was set up with the purpose of internal monitoring. It fulfils the requirements of /DIN EN ISO 9001/:2015.
In addition to safety-related supervision and education and also risk assessment by the employers' liability insurance association, Novum Membranes GmbH commissions an external consultant to train and educate employees on safety and occupational health and safety issues.
Measurements of hazardous substances in the atmosphere in work areas on 07/05/2014 taken by the German statutory accident insurance authority's Institute for Occupational Safety as part of prevention measures confirmed compliance with limits for hazardous substances and found that protective measures were adequate.
Novum Membranes GmbH is aiming for certification with the EMAS quality seal for a sustainable environmental management system.
At Nowofol, the main health protection focus during the manufacture of fluoropolymer foil is on assessing gases and vapours, for which reason TÜV SÜD was commissioned to determine the concentration of smoke, fluorides and fluorocarbons and volatile organic compounds at the workplace during the extrusion of fluoropolymers in line with the workplace exposure limits specified in /TRGS 900/ in 2011. The exposure measurements confirmed that protective measures (extraction for the purpose of air purification) are sufficient.
Dyneon is certified under register number 0900015 in accordance with /OHRIS 2009/ under the Occupational Health and Risk Management System (Ohris).

No substances are used to manufacture Novum cushions which appear on the SVHC candidate list or in Appendix XIV of the /REACH/ directive (as of 13/06/2017) (EU Directive No. 143/2011: Appendix XIV of the /REACH/ directive of 17th February 2011 and the amendment to this directive of 24/02/2011 (Official Legal Gazette L 49/52), EU Directive No. 125/2012: Amendment to Appendix XIV of the /REACH/ directive of 14th February 2012, EU Directive No. 348/2013 of 17/04/2013, EU Directive No. 895/2014 of 14/08/2014 or EU Directive No. 2017/999 of 13/06/2017).
No flame retardants, softening agents or biocides are used.

2.8 Product processing/Installation

Before roof surfaces are installed, a risk assessment must be drawn up in accordance with Section 5 of the German Occupational Safety Act (/ArbSchG/*):*
a Environment-related risks

- Mechanical hazards
- Electrical hazards
- Hazardous substances
- Biological hazards
- Fire and explosion hazards
- Thermal hazards
- Hazards due to specific physical influences
- Hazard/exposure due to work-environment conditions
- Physical strain
- Other hazards/exposure
- Psychological strain

b Planning access technology

c Site-related instruction
In areas where there is a risk of falling, trained personnel is equipped with personal protective equipment (PPE) and working and safety ropes. Hazard areas below the installation site are secured against falling tools or materials.
The Novum AFP system is transported to the site from Edersleben and screwed and fitted together there. The cushion is then inflated with a compressor.

2.9 Packaging

Packaging materials (cardboard boxes and PE foil) are thermally recycled. The waste incurred can be allocated to the following waste codes (/AVV 2016/):

- /15 01 01/: Paper and cardboard
- /15 01 02/: Plastic packaging
- /15 01 06/: Mixed packaging
- /17 09 04/: Mixed construction and demolition waste with the exception of waste covered by /17 09 01/ to /17 09 03/
- /20 03 01/: Mixed municipal waste

The wooden Euro pallets used for delivery are re-used.

2.10 Condition of use

No significant changes in the product's characteristics are expected during its design life. In order to compensate for fluctuations in cushion pressure due to changing external conditions (temperature, wind pressure or wind suction loads) the cushions are continuously supplied by one or more inflation units depending on the size of the roof. The inflation units are controlled by a pressure sensor. The cushion inner

pressure is maintained within the range of 180 Pa and 250 Pa. An average output of approximately 19 kWh is required for a roof area of 1 m² across the entire service life of 25 years.

2.11 Environment and health during use

In accordance with the evidence outlined in Section 7, emissions to air during the use phase are below the limit values in accordance with the /AgBB/ scheme.

2.12 Reference service life

The guaranteed service life is 25 years on average (up to 50 years are possible)

2.13 Extraordinary effects

Fire

EFTE foil is specified as follows in accordance with /EN 13501 – 1/:

Fire protection

Name	Value
Building material class	B
Burning droplets	d0
Smoke gas development	s1

Water

The ETFE cushion is not affected by water.

Mechanical destruction

Due to their extraordinary stretch properties, foils and foil cushions are extremely resistant to external pressure and tensile loads.
In case of fire, explosions or even extreme hailstones the system is extremely fault-tolerant and resistant to consequential damage. However, the cushions can be damaged by direct mechanical influences with sharp or pointed objects. Even complete destruction of the exterior foil layer of a three-layer system does not lead to system failure since a two-layer system still remains and inner spaces are still protected against environmental influences.
Minor damage can be easily repaired with ETFE adhesive tape.

2.14 Re-use phase

Generally, the aluminium frames and base sections as well as the air piping systems can be re-used for new buildings and/or refurbishment projects with the Novum AFP system.
These components are usually recycled (statistical value for buildings: 85 %).
Like the EFTE cuttings, ETFE foils are recycled by an external company into valves and other small parts. This recycling is currently carried out within Europe. An extension is planned in future. Waste is thermally recycled in other countries

2.15 Disposal

The waste accrued can be allocated to the following waste codes:

- /17 02 03/: Plastic
- /17 04 02/: Aluminium
- /17 09 04/: Mixed construction and demolition waste with the exception of waste covered by /17 09 01/, /17 09 02/ and /17 09 03/.

Silicone seals, EPDM and PVC are thermally recycled. Alternative recycling possibilities are currently being examined.
(Steel) screws are recycled.
Packaging materials (polyethylene and cardboard) are recyclable but are generally also recycled thermally.

2.16 Further information

Further information is available from the Novum Membranes GmbH home page (www.novummembranes.de), Nowofol Produktions GmbH (www.nowofol.de) and Elnic GmbH (www.elnic.de).

3. LCA: Calculation rules

3.1 Declared unit

This declaration refers to the production of 1 m² of a representative foil cushion (3-layer ETFE foil) complete with framing and packaging materials.

Declared unit

Name	Value	Unit
Declared unit	1	m^2
Product weight	4.82	kg
Packaging material	0.38	kg
Conversion factor to 1 kg	0.19	-
Total weight	5.20	kg

3.2 System boundary

In addition to production, this LCA also considers installation and energy consumption during use and disposal and thus includes the cradle to plant gate with options.
The ETFE foil is also recycled like the aluminium and the steel used.
The remaining materials are recycled thermally
the lifecycle sections are explained in more detail below:

- Production (A1 - A3) including the upstream chain for producing the pre-products used, their transport to the respective works and expenses involved the manufacture of granulate, foil and foil cushions.
- Transport to the construction site (A4): average distances by truck and ship.
- Installation on the construction site (A5): disposal of packaging and the initial inflation of the foil.
- Energy consumption during use (B6): power requirements to maintain the interior cushion pressure.
- Transport to disposal (C2): average distances by truck.
- Waste treatment for recycling (C3): processing of materials for recycling and incineration of other materials.
- Credits (D): from energy from treatment of packaging waste (A5) and thermally recycled materials in C3. Credits also from the reprocessing value of the recycled materials

(a value report based on the selling price of fresh and recycled ETFE was used as a basis here).

3.3 Estimates and assumptions

- When recycling ETFE foils, 60 % of the incoming mass in Module D is regained as fresh ETFE. The reduced quantity is based on an evaluation report in accordance with the different market prices for fresh and recycled ETFE. Recycled ETFE costs approximately 40 % less than fresh ETFE.
- The aluminium frame contributes a secondary material share of 48.3 % based on existing certificates.
- A secondary material share of 13.5% in accordance with worldsteel data was applied for steel screws and clamps.
- The composition of the solvent-based varnish for the ETFE foil is estimated (the mass portion for this is significantly below 1 %).

3.4 Cut-off criteria

All operational data collected for the base materials used has been included.
Transport is recorded for all major pre-products including transport of the products to the building site and in the end-of-life scenario.
The LCA considers production waste which accumulates directly during production and the necessary electrical and thermal energy and packaging materials.

Machinery, plant and infrastructure and also transport of the packaging materials are ignored.
The pallets used for transport in A4 are not included in the LCA as they have a negligible influence and are re-used up to 25 times.

With the exception of the pallets, all materials and energy flows are included, including those with a share of less than 1 %).

3.5 Background data

The GaBi 7.3 software system was used to model the lifecycle for the production of ETFE building components. The basic data in the GaBi database was used for energy, transport and auxiliary materials and also for pre-products.
Since the company's headquarters are in Edersleben, the LCA was prepared with reference data for Germany. The only exception is the production of the aluminium frame which is made in England and is therefore modelled with European aluminium data.
Transport to the building site is modelled globally.
The power consumption for installation and use relate to Europe. Disposal and the formation of credits are also produced with European data.

3.6 Data quality

The data collected on the manufacture of ETFE building components originates from data collections from the three companies responsible for ETFE foil cushions and foil granulate. Information from external manufacturers was collected for estimates for the colouring and printing process and also for the remaining materials.
All the data used originates from the GaBi database and apart from the data for the cardboard packaging (2002) is not more than 10 years old.
The data quality can therefore be classified as being extremely good.

3.7 Period under review

The data for this lifecycle assessment is based on records from 2016.

3.8 Allocation

For incineration processes, the credits for electrical and thermal energy (in Modules A5 and C3) are evaluated by taking the elementary composition and calorific value into account.

For ETFE recycling, economic allocation is carried out in line with market prices.
Aluminium and steel recycling can be 100% recycled (after deduction of the secondary material) and credited in Module D as values for potentials and loads avoided.

3.9 Comparability

Basically, comparison or an evaluation of EPD data is only possible if all data sets to be compared were produced in accordance with /EN 15804/ and the building context or the product-specific performance characteristics are taken into account.

4. LCA: Scenarios and additional technical information

Transport to building site (A4)

Name	Value	Unit
Truck		
Total kg diesel	0.09	kg
Transport distance	522	km
Capacity utilisation (including empty runs)	50	%
Train		
Total kg diesel	0.002	kg
Electricity	0.14	MJ
Transport distance	357	km
Capacity utilisation (including empty runs)	80	%

Installation process (A5)

Name	Value	Unit
Auxiliary material	0	kg
Water consumption	0	m^3
Other resources	0	kg
Power consumption	0.0005	kWh
Other energy carriers	0	MJ
Material loss	0	kg
Output substances as a result of waste treatment on the building site	0	kg
Dust in the air	0	kg
VOC in the air	0	kg

Reference service life

The guaranteed service life is on average 25 years, although 50 years are possible

Name	Value	Unit
Reference service life (according to BBSR) Code no. 353.414	25	a
Service life according to manufacturer specifications	25 - 50	a

Operational energy (B6) and use of water (B7)

The power consumption in B6 relates to a period of one year.

Name	Value	Unit
Power consumption	0.756	kWh

End of life (C1-C4)

Name	value	Unit
Overall product collected separately	4.82	kg
To recycling	4.34	kg
To energy recovery	0.48	kg

re-use, recovery and recycling potential (D), relevant scenario information

Module D contains credits from incineration processes of packaging waste (A5), seals, hoses and EPDM keder rope as well as credits for recycling of foil cushions, aluminium and steel (C3). A waste incineration plant with an R1 value > 0.6 is assumed.

5. LCA: Results

The following table shows the results of the indicators concerning the estimated impact, use of resources and waste and other output flows in relation to 1m² of a representative Novum AFP system from Novum Membranes.

DESCRIPTION OF THE SYSTEM BOUNDARY (X = INCLUDED IN LCA; MND = MODULE NOT DECLARED)

Production stage			Construction progress stage		Use stage							End of life stage				Credits and loads beyond the system boundaries
Raw material supply	Transport	Manufacturing	Transport from the gate to the site	Assembly	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	deconstruction/ Demolition	Transport	Waste processing	Disposal	Re-use / Recovery / Recycling potential
A1	**A2**	**A3**	**A4**	**A5**	**B1**	**B2**	**B3**	**B4**	**B5**	**B6**	**B7**	**C1**	**C2**	**C3**	**C4**	**D**
X	X	X	X	X	MND	MND	MND	MND	MND	X	MND	MND	X	X	MND	X

RESULTS OF THE LCA – ENVIRONMENTAL IMPACT: 1m² Novum AFP system

Parameter	Unit	A1-A3	A4	A5	B6	C2	C3	D
GWP	[kg CO_2-eq.]	6.34E+1	3.24E-1	9.65E-1	3.35E-1	7.45E-2	2.59E+0	-1.87E+1
ODP	[kg CFC11-eq.]	7.47E-7	4.10E-14	7.48E-14	1.49E-11	9.44E-15	9.99E-9	-2.30E-7
AP	[kg SO_2-eq.]	2.70E-1	8.06E-4	1.01E-4	9.60E-4	3.11E-4	2.74E-3	-8.11E-2
EP	[kg $(PO_4)^{3-}$-eq.]	1.74E-2	1.92E-4	2.16E-5	8.68E-5	7.71E-5	2.77E-4	-5.02E-3
POCP	[kg Ethen-eq.]	1.63E-2	-2.48E-4	4.80E-7	6.12E-5	-1.28E-4	2.08E-4	-5.01E-3
ADPE	[kg Sb-eq.]	2.10E-3	3.36E-8	9.47E-9	1.34E-7	7.74E-9	1.42E-6	-6.49E-4
ADPF	[MJ]	8.23E+2	4.39E+0	1.68E-1	3.58E+0	1.01E+0	1.65E+1	-2.39E+2

Key	GWP = Global warming potential; ODP = Depletion potential of the stratospheric ozone layer; AP = Acidification potential of land and water; EP = Eutrophication potential; POCP = Formation potential for tropospheric ozone; ADPE = Abiotic depletion potential for non-fossil resources; ADPF = Abiotic depletion potential for fossil resources

RESULTS OF THE LCA – USE OF RESOURCES: 1m² Novum AFP system

Parameter	Unit	A1-A3	A4	A5	B6	C2	C3	D
PERE	[MJ]	2.72E+2	2.90E-1	2.11E+0	2.01E+0	6.68E-2	2.02E+0	-8.05E+1
PERM	[MJ]	2.08E+0	0.00E+0	-2.08E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
PERT	[MJ]	2.74E+2	2.90E-1	2.96E-2	2.01E+0	6.68E-2	2.02E+0	-8.05E+1
PENRE	[MJ]	9.20E+2	4.40E+0	1.09E+1	5.89E+0	1.01E+0	3.21E+1	-2.68E+2
PENRM	[MJ]	2.80E+1	0.00E+0	-1.08E+1	0.00E+0	0.00E+0	-1.29E+1	-4.37E+0
PENRT	[MJ]	9.48E+2	4.40E+0	1.88E-1	5.89E+0	1.01E+0	1.91E+1	-2.72E+2
SM	[kg]	1.30E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	2.27E+0
RSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
NRSF	[MJ]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
FW	[m^3]	7.16E-1	3.38E-4	2.21E-3	2.86E-3	7.79E-5	6.69E-3	-2.21E-1

Key	PERE = Use of renewable primary energy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials; PENRM = Use of non-renewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy resources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water

RESULTS OF THE LCA – OUTPUT FLOWS AND WASTE CATEGORIES: 1m² Novum AFP system

Parameter	Unit	A1-A3	A4	A5	B6	C2	C3	D
HWD	[kg]	1.05E-6	2.77E-7	2.38E-9	2.39E-9	6.39E-8	8.71E-9	-2.00E-7
NHWD	[kg]	1.22E+1	3.21E-4	5.47E-3	3.88E-3	7.39E-5	5.38E-1	-3.58E+0
RWD	[kg]	4.96E-2	5.06E-6	7.74E-6	9.16E-4	1.16E-6	1.08E-3	-1.32E-2
CRU	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
MFR	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	4.34E+0	0.00E+0
MER	[kg]	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0	0.00E+0
EEE	[MJ]	0.00E+0	0.00E+0	1.68E+0	0.00E+0	0.00E+0	1.17E+0	0.00E+0
EET	[MJ]	0.00E+0	0.00E+0	4.05E+0	0.00E+0	0.00E+0	2.72E+0	0.00E+0

Key	HWD = Hazardous waste disposed; NHWD = Non-hazardous waste disposed; RWD = Radioactive waste disposed; CRU = Components for re-use; MFR = Materials for energy recovery; MER = Materials for energy recovery; EEE = Exported electrical energy; EET = Exported thermal energy

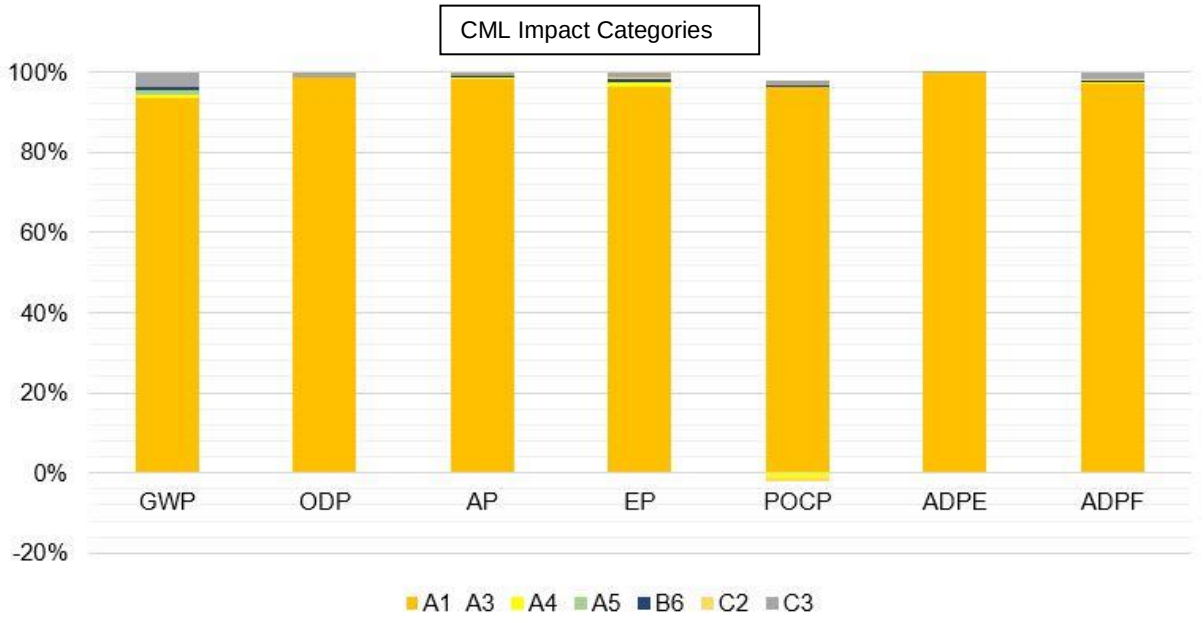
Note: the values in Module B6 relate to a use period of one year.

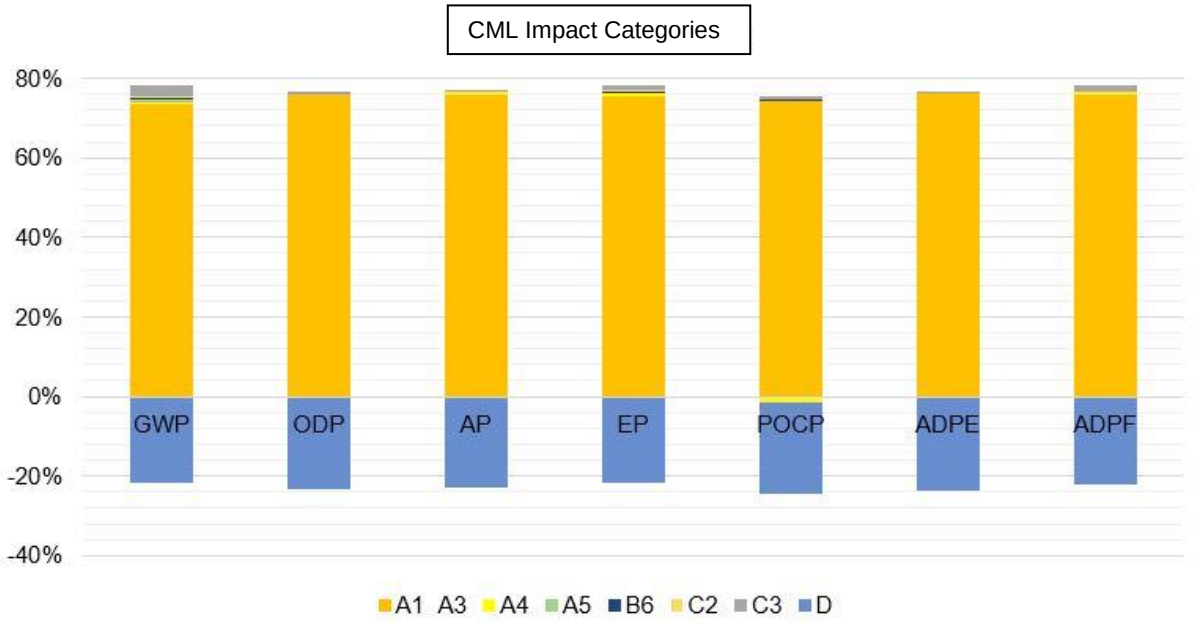
6. LCA: Interpretation

All CML indicators are significantly dominated by the production stage and its material and energy-related upstream chains (Module A1-A3). The main causes of environmental impacts lie in ETFE foil and aluminium production. These also represent the largest share of the overall product.

The disposal phase (Module C3) has no significant influence as the largest material flows as regards quantities are recycled in an energy-saving manner instead of being incinerated.

The environmental impact from transport (Modules A4 and C2) and installation (A5) are not significant in any of the categories. The use phase (in relation to one year) is also negligible. If the entire use period of 25 years is regarded, B6 represents approximately 10 % of the overall emissions in the categories of GWP, AP, EP, POCP and ADPF. Nitrogen monoxide emissions produced during transport have a negative influence on the **POCP** (formation potential for tropospheric ozone), which leads to credits.





If Module D is included in the LCA it is discernable that the values for potentials and avoided impacts outside of the system boundary across all environmental impact categories amount to approximately 25-30 % of the total emissions in A1-C3.

7. Requisite evidence

VOC emissions

Testing of the Nowoflon ETFE foil for VOC emissions in accordance with the AgBB scheme /AgBB 2010/ was carried out in December 2009 by the Bremen-based Umweltinstitut - Gesellschaft für Schadstoffanalysen und Begutachtung mbH.

Measurement conditions:

Temperature:	23°C
Area-specific air flow rate:	0,5m³/(m²h)
Loading:	2 m²/m³

AgBB result overview (28 days)

Name	Value	Unit
TVOC (C6 - C16)	27	µg/m³
Total SVOC (C16 - C22)	< 5	µg/m³
R (dimensionless)	0	-
VOC without NIK	27	µg/m³
Carcinogens	ND	µg/m³

8. References

General Principles for the EPD programme of the Institut Bauen und Umwelt e.V. (IBU), 2013--04.

Product category rules for building products Part A:
calculation rules for LCAs and requirements of the background report, 2016--08.

PCR instructions for building-related products and services Part B:
Requirements of the EPD for ETFE building components, 2014--07.

GaBi 7.3: Software & documentation database for integrated accounting. LBP, University of Stuttgart and thinkstep AG, documentation of the GaBi 7.3. data http://documentation.gabi-software.com/, 2016.

DIN EN ISO 9001:2015 12: Quality management systems - Requirements.

EN 13501-1:2017-08, Fire classification of construction products and building elements
– Part 1: Classification using data from reaction to fire tests.

AgBB 2015: Procedure for the health-related assessment of emissions of volatile organic compounds (VOC and SVOC) from construction products, Committee for the health-related assessment of construction products, Dessau-Rosslau, Germany.

Occupational Health and Safety Act Section 5: Assessment of working conditions, in the Law on the Implementation of Occupational Health and Safety Measures to Improve the Safety and Health Protection of Employees at Work.

AVV 2017: Directive on the European Waste Catalogue in the Waste Catalogue Directive of 10th December 2001 (Federal Legal Gazette I p. 3379), last modified by Article 5 Paragraph 22 of the law of 24th February 2012 (Federal Legal Gazette I p. 212).

REACH: Registration, Evaluation and Authorisation and Restriction of Chemicals.

EN ISO 527-1: 2012: Plastics – Determination of tensile properties – Part 1: General Principles.

ISO-2286-2:2016-09 Rubber or plastics coated fabrics -
Determination of roll characteristics Part 2: Methods for determination of total mass per unit area, mass per unit area of coating and mass per unit area of Substrate.

DIN 53363:2003-10 Testing of plastic films. Tear test using
trapezoidal test specimen with incision.

ASTM D4591-07(2012): Standard Test Method for Determining Temperatures and Heats of Transitions of Fluoropolymers by Differential Scanning Calorimetry.

DIN EN ISO 4892-1:2016-10 Plastics – Methods of exposure to laboratory light sources – Part1: General guidance (ISO 4892-1: 1999).

DIN EN ISO 4892-2:2013-06: Plastics - Methods of exposure to laboratory light sources - Part 2: Xenon-arc lamps (ISO 4892-2:2013); German version EN ISO 4892-2:2013.

ISO 15099:2003: Thermal performance of windows, doors and shading devices - Detailed calculations.

OHRIS 2009: Registrar of the Regional Institute for Occupational and Product Safety (AP) of the Bavarian Regional Authority for Health and Food Safety (LGL), Munich, www.lgl.bayern.de/arbeitsschutz.

TRGS 900: Technical Rules for Hazardous Substances 900, Workplace Limit Values, January 2006 edition, last modified and supplemented on 06/04/2017.

Institut Bauen und Umwelt e.V., Berlin (Hrsg.): Production of Environmental Product Declarations (EPDs);

/ISO 14025/
DIN EN /ISO 14025:2011-10/, Environmental labels and declarations — Type III environmental declarations — Principles and procedures.

/EN 15804/
/EN 15804:2012-04+A1 2013/, Sustainability of construction works — Environmental product declarations — Core rules for the product category of construction products.

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SAFETY DATA SHEET **According to EU Regulations 1907/2006 and CPL 1272/2008**

NOWOFLON ET colour: natural 03/19

1 Identification of substance

1.1	Identification	:	**NOWOFLON** ET
1.2	Use	:	Technical Film for architectural applications and Release Liners
1.3	Company	:	NOWOFOL Kunststoffprodukte GmbH & Co. KG, Breslauer Strasse 15, 83313 Siegsdorf, Germany
	Contact Person	:	Alexander Behamer, Andreas Freutsmiedl
	Phone No.	:	+49-8662-6602-54, -36
	Fax No.	:	+49-8662-6602-50
	E-Mail	:	a.behamer@nowofol.de, a.freutsmiedl@nowofol.de
1.4	Emergency Telephone	:	+49-8662-6602-0 (During office hours only!)

2 Hazards identification

No specific danger is associated to the normal industrial utilisation of the product. However, it is to be considered that the plastic film left of the ground of working areas are slippery (see 6.), and that during converting of film rolls electrostatic discharges can be generated. This product is, according to EEC directives 1999/45, 67/548, 1907/2006 and following amendments, not classified as hazardous.

3 Composition

3.1	Characterization	:	Film out of a Copolymer based on Ethylene / Polyfluor(C_4-C_7)Alkene.
3.2	CAS-No.	:	Convidential.
3.3	Confidentiality	:	The identity of the composition is to be kept confidential

4 First aid measures

4.1	Skin contact	:	Non-irritant. In case of skin contact by molten material, the patient should be referred for immediate medical attention and under no circumstances should any attempt be made to peel the solified polymer off the skin.
4.2	Eye contact	:	Non-irritant. In the event of exposure to dust or irritation caused by fumes, flush with destilled water for at least 10min. Get in medical assistance.
4.3	Inhalation/ingestion	:	Considering the physical form of the product, inhalation and/or ingestion are not likely to be possible during normal use. In case of inhalation of fumes, the affected person should be removed to fresh air as soon as possible, kept warm and artificial respiration applied as necessary. Medical attention should be obtained immediatel Fumes of decomposition products are known to cause influenca like symptoms like chest pain or tightness, shortness of breath, increased heart rate, fever an chills.

5 Fire fighting measures

5.1	Suitable extinguishing agents:		Non combustible, choose agents suitable for surrounding fire like water fog, foam, CO_2 dry chemicals
5.2	Unsuitable extinguishing Agents	:	Full water jet
5.3.	Specific hazards arising from the chemical, combus-tion products or smoke	:	In case of fire toxic gases emerge due to decomposition of the material. Carbonmonoxide (CO), Carbondioxide (CO_2) Hydrofluric Acid (HF), Carbonyl Fluoride Perfluoroisobutylene, Hexafluoropropylene
5.4.	Special protective equip-ment and precautions for fire fighters	:	Wear full protective clothing, including helmet, self containd, positive pressure or pressure demand breathing apparatus, bunker coat and pants, bands around arms, waist and legs, face mask and protective covering for exposed areas of the head.

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6 Accidental release measures

6.1	Person-related safety precautions	:	Collect the film in order to avoid possible slipping of personnel on the floor.

7 Handling and storage

7.1	Information for handling and storage	:	Avoid skin contact with hot material. For Industrial or professional use only. Store work cloths separately from other clothing, food and tobacco products. Keep the product away from ignition sources. No smoking – rever to section 5.
7.2	Additional information	:	Be aware of hazardous heat decomposition products.

8 Exposure controls and personal protection

8.1	Control Parameters	:	Use with appropriate local exhaust ventilation especially when the product is heated. For those situations where the material might be exposed to extreme overheating due to misuse or equipment failure, use with appropriate local exhaust ventilation, sufficient to maintain levels of thermal decomposition products below their exposure guidelines. For emerging decomposition products refer to section 10.
8.2	Personal Protective Equipment (PPE)	:	- Avoid eye contact. Safety glasses with side shields are recommended. - Avoid skin contact with hot material. Wear appropriate gloves when handling this material to prevent thermal burns. - Avoid breathing of dust – wear a dust mask. - During heating: Avoid breathing of fumes. Use a positive pressure supplied-air respirator if there is a potential for exposure from uncontrolled release, exposure levels are not known, or under any circumstances where air-purifying respirators may not provide adequate protection. - Wash hands after handling and befor eating. Do not eat, drink or smoke when using this product.

9 Physical and chemical properties

9.1	Form	:	Film
9.1.1	Colour	:	transparent
9.1.2	Smell	:	Odourless
9.1.3	Phsysical Form	:	Solid
9.2	Melting point (°C)	:	210 - 280°C
9.3	Flash point (°C)	:	not applicable
9.4	Ignition temperature (°C)	:	not applicable
9.5	Density (20°C)	:	1,7 – 1,9 g/cm³
9.6	Decomposition Temperature:		> 340 °C
9.7	Solubility in water	:	Insoluble
9,8.	Solubility in solvents	:	Conditionally resistant against tetrahydrofuran

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10 Stability and reactivity

10.1	Stability	:	Stable
10.2	Conditions to avoid	:	Temperatures > 340°C
10.3	Materials to avoid	:	Alkali and alkaline earth metals, Reactions with metals in powder form occur from 370°C onwards.
10.4.1	Hazardous decomposition products	:	Carbonly Fluoride, Carbon Monoxid, Carbon Dioxide, Hydrogen Fluoride, Perfluoroisobutylene
10.4.2	By combustion	:	refer to 10.4.1

11 Toxological information

According to experience, the product is considered to be harmless to health if handled in the correct manner. Fumes of Decomposition products are known to cause influenca like symptoms like chest pain or tightness, shortness of breath, cough, malaise, muscle aches, increased heart rate, fever, chills, sweats, nausea and headache. In general these symptoms ease after 36 – 48 h.

12 Ecological information

12.1	Ozonosphere	:	According to 2000/2037/EC no ozone depleting potential.
12.2	Aquatic	:	Not soluable in water.
12.3	Degradability	:	The product ist not bio-degradable but persistant in the environment.
12.4.	Environmental impact	:	No negative environmental impacts known.

13 Disposal considerations

13.1	Recycling	:	Clean material can be recycled.
13.2	Product	:	In accordance with the necessary technical regulations may be dumped or incinerated with household waste, after consultation with site operator and with the responsible authority. Combustion products will include HF. Facility must be capable of handling halogenated materials.
13.3	Waste code (Germany)	:	57126
13.4	Name of waste	:	Plastic wastes containing fluoride compounds.
13.5.	EPA hazardous waste Number (RCRA)	:	Not regulated

14 Transport information

14.1	GGVS (ADR) / GGVE (RID)	:	Not regulated
14.2	UN-No.	:	Not regulated
14.3	GGV See / IMDG-Code	:	Not regulated
14.4	ICAO / IATA-DGR	:	Not regulated

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15 Regulatory information

15.1	Designation according to EC-guidelines	:	No subject to EC-Directive 67/548/EWG and 88/379/EWG 'relating to the classification, packaging and labelling of dangerous substances and preparations. Labelling, EEC classification, risk and safety phrases are not necessary. **S**ubstances of **V**ery **H**igh **C**oncern (SVHC) according to article 57 of the ECregu-lation 1907/2006 and described in the ECHA candidate list (https://echa.europa.eu(candidate-list-table) are not used in the manufacturing process. The concentration of these substances, if there are any, do not exceed the concentration limit of 0,1 % and do not have to be reported.
15.2	German Regulations	:	Product (Film) is a plastic preparation. The film is no subject to the Federal German Regulations on Dangerous Chemical Substances (GeffStoffVO of 25.09.1991)
15.3	EC-regulations	:	The product meets the requirements of the RoHS directive **2011/65/EC** on the restriction of the use of certain hazardous substances in electrical and electronic equipment. NFPA Rating: Health:1 Flammability: 0 Reactivity:0 Special Hazards: none

16 Other information

16.1	Issue No.	:	1 (03/2019)
16.2	Publisher	:	NOWOFOL Kunststoffprodukte, GmbH & Co. KG, Breslauer Straße 15, 83313 Siegsdorf, Germany Telefon: (0049) 08662 / 6602-0 Telefax: (0049) 08662 / 660250

SUSTAINABILITY CONTRIBUTION DECLARATION

BREEAM® - Building Research Establishment Environmental Assessment Method, NEW CONSTRUCTION 2014

NOWOFOL® Kunststoffprodukte GmbH & Co. KG

Nowoflon®-ET film

NOWOFLON® ET film is a flexible and strong film, made of a fluorinated copolymer. NOWOFLON® ET films are characterized by a number of positive properties, e.g.:

- Excellent mechanical strength, particularly tear strength and tensile strength,
- Excellent weather resistance,
- High transparency to both visible and UV light,
- Due to its anti-adhesive surface the film has got anti-graffiti and self-cleaning properties,
- The film can be coloured or tinted in different shades to meet each customer's specifications,
- Film can be printed with different designs,
- Available as a heat absorbing film (IRcut),
- Flame resistant and self-extinguishing.

This allows them to be used for applications for which only a highly -capable hardwearing and durable material can be used.

SUSTAINABILITY CONTRIBUTION DECLARATION

Management

Man 02: Life cycle cost and service life planning
→ To deliver whole life value from investment and promote economic sustainability by recognising and encouraging the use and sharing of life cycle costing and service life planning.

Product information

Specific information	Evidence (quality)
Construction process stage	-
Use stage	**Reference service life** (RSL): 30 years
End of life stage	-

Health and Wellbeing

HEA 01: Visual comfort
→ To ensure daylighting, artificial lighting and occupant controls are considered at the design stage to ensure best practice in visual performance and comfort for building occupants.

Product information

Specific information	Evidence (quality)
Daylighting	Thanks to the transparency of the film, relevant building areas can meet good practice daylight factors and good practice average and minimum point daylight illuminance criteria.
View out	Thanks to the possibility of large-area application, a good view out can be realised in a building.

SUSTAINABILITY CONTRIBUTION DECLARATION

HEA 02: Indoor air quality
→ To recognise and encourage a healthy internal environment through the specification and installation of appropriate ventilation, equipment and finishes.

Product information

Minimising sources of air pollution

Item	Value
Test institute / organization	Environmental Institute „*Bremer Umweltinstitut – Gesellschaft für Schadstoffanalysen und Begutachtung mbH*“ (commissioned by Vector Foiltec GmbH)
Test method applied	At 23 °C and a surface specific air throughput rate of 0.5 $m^3/(m^2h)$ and load of 2 m^2/m^3.
SVOC (C16 – C22)	< 5 µg/m^3
TVOC (C6 – C16, 28 days)	27 µg/m^3 (no formaldehyde, as the film doesn't contain any; CAS nr. is 74499-71-1)
Criteria	Committee for Health-related evaluation of Building Products (AgBB) 2010

Energy

Not relevant for this product (only for products that use energy).
- Variant IRcut film absorbs heat into the film whilst providing high transparency, so that heat gain in the interior is reduced. Therefore considerable savings in air-conditioning are possible
- Similar savings in air-conditioning are possible due to pigmentation or printing.

Water

Not relevant for this product (only for products that use water).

Materials

Mat 01: Life cycle impacts
→ To recognise and encourage the use of construction materials with a low environmental impact (including embodied carbon) over the full life cycle of the building.

Product information

Description	Value
EPD Program Operator	-
Author of the LCA	thinkstep AG, Hauptstraße 111-113, 70771 Leinfelden-Echterdingen, Germany
System boundaries	Cradle-to-gate (A1-A3)
Declared unit	1 m^2 (90 µm; 0.157 kg/m^2)*
Green guide rating	No generic Green guide rating available.

SUSTAINABILITY CONTRIBUTION DECLARATION

Declared modules (EN 15804)	A1 - A3 (Product stage)
Results of the LCA – ENVIRONMENTAL IMPACTS	
GWP [kg CO_2-eq.]	1.88E+00
ODP [kg CFC11-eq.]	2.90E-07
AP [kg SO2- eq.]	6.14E-03
EP [kg PO43- eq.]	4.83E-04
POCP [kg Ethen eq.]	4.57E-04
ADPE [kg Sb- eq.]	5.66E-06
ADPF [MJ]	3.28E+01
Results of the LCA – RESOURCE USE	
PERE [MJ]	3.12E+00
PERM [MJ]	0
PERT [MJ]	3.12E+00
PENRE [MJ]	1.87E+01
PENRM [MJ]	1.44E+01
PENRT [MJ]	3.31E+01
SM [MJ]	0
RSF [MJ]	0
NRSF [MJ]	0
FW [MJ]	1.25E-02
Results of the LCA – OUTPUT FLOWS AND WASTE CATEGORIES	
HWD [kg]	6.01E-03
NHWD [kg]	3.19E-02
RWD [kg]	1.66E-03
CRU [kg]	0
MFR [kg]	0
MER [kg]	0
EEE [MJ]	0
EET [MJ]	0

Note: *Detailed names of the given abbreviations can be found in the Glossary.*
**The LCA results can be scaled as an approximation on a linear basis according to the thickness or surface weight (e.g. for results for the thickness of 100 µm all results have to be multiplied by 1.11 (=100/90)).*

Materials

Mat 05: Designing for durability and resilience
→ To recognise and encourage adequate protection of exposed elements of the building and landscape, therefore minimising the frequency of replacement and maximising materials.

Product information

Item	Description
Durability improvement	Maintenance is recommended in order to guarantee the longevity of the material; it is a very durable product. It is self-cleaning if rain falls on it; otherwise maintenance instructions are provided upon request. Reference service life: 30 years.

Mat 06: Material efficiency
→ To recognise and encourage measures to optimise material efficiency in order to minimise environmental impact of material use and waste-optimisation.

Product information

Specific information	Evidence (quality)
Adoption of alternative means of design/construction that result in lower materials usage and lower wastage levels including off-site:	Thanks to the extremely lightweight film, less supporting substructure is requiredrelative to normal glazing. This leads to a higher material efficiency for the whole building.

SUSTAINABILITY CONTRIBUTION DECLARATION

Waste

Wst 01: Construction waste management
→ To promote resource efficiency via the effective management and reduction of construction waste.

Product information

Specific information	Evidence (quality)
Reduction of construction waste	Construction waste is reduced to nearly zero as the film is cut exactly into the required sizes at the factory.

Wst 06: Functional adaptability
→ To recognise and encourage measures taken to accommodate future changes of use of the building over its lifespan.

Product information

Specific information	Evidence (quality)
Functional adaptability	The film can easily be reused if e.g. the façade shall be remodelled; the same films can be put again on different frames or structures.

Pollution

Not relevant for this product, because the film does not emit any substances.

SUSTAINABILITY CONTRIBUTION DECLARATION

General Information

Company name:	NOWOFOL® Kunststoffprodukte GmbH & Co. KG
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Date:	0902.2016

Technical data

Following technical data at delivery state are relevant for the declared product:

Name	Thickness [µm]	Surface weight [kg/m²]
Nowoflon®-ET film	12-400*	21-700*
Composition	100 % ETFE	(CAS number 74499-71-1)

**The LCA results can be scaled on a linear basis according to the thickness or surface weight.*

Structural data for an exemplary thickness of 200 microns and a base weight of 350 g/m²:

Name	Value	Unit
Melting range (ASTM D 4591-07)	265±10	°C
Tensile strength (DIN EN ISO 527-1)	> 40	N/mm²
Strain at 10 % elongation (DIN EN ISO 527-1)	> 18	N/mm²
Elongation at rupture (DIN EN ISO 527-1)	> 300	%
Tear growth resistance (DIN 53363)	> 300	N/mm
Weld seam strength (DIN 527-1)	≥ 33	N/mm²
Weatherability (ISO 4892-1)	No change of mechanical values.	

Glossary

GWP	Global warming potential
ODP	Depletion potential of the stratospheric ozone layer
AP	Acidification potential of land and water
EP	Eutrophication potential
POCP	Formation potential of tropospheric ozone photochemical oxidants
ADPE	Abiotic depletion potential for non-fossil resources
ADPF	Abiotic depletion potential for fossil resources
PERE	Use of renewable primary energy excluding renewable primary energy resources used as raw materials
PERM	Use of renewable primary energy resources used as raw materials
PERT	Total use of renewable primary energy resources
PENRE	Use of non-renewable primary energy excluding non-renewable primary energy resources used as raw materials
PENRM	Use of non-renewable primary energy resources used as raw materials
PENRT	Total use of non-renewable primary energy resources
SM	Use of secondary material
RSF	Use of renewable secondary fuels
NRSF	Use of non-renewable secondary fuels
FW	Use of net fresh water
HWD	Hazardous waste disposed
NHWD	Non-hazardous waste disposed
RWD	Radioactive waste disposed
CRU	Components for re-use
MFR	Materials for recycling
MER	Materials for energy recovery
EEE	Exported energy per energy carrier (electric)
EET	Exported energy per energy carrier (thermal)

Produktdatenblatt • Product Data Sheet

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Physikalische Eigenschaften
Physical Properties

Folientype Film Type	**NOWOFLON ET**	Folienstärke Thickness	**300 µm**
Farbe Colour	**natur** **natural**	Datum Date	**06.04.2022**

Nr. No	Merkmal Property	Prüfrichtung Test direction	Mittelwerte Mean value	Einheit Unit	Prüfmethode Test method
1	Flächengewicht Mass per unit area		**525,0**	g/m²	DIN EN ISO 536
2	Dichte Density		**1,75**	g/cm³	DIN EN ISO 1183
3	Spannung bei 10% Dehnung Tensile stress at 10% strain	M.D.	**20**	MPa	DIN EN ISO 527
4	Spannung bei 10% Dehnung Tensile stress at 10% strain	T.D.	**20**	MPa	DIN EN ISO 527
5	Zugfestigkeit Tensile strength	M.D.	**55**	MPa	DIN EN ISO 527
6	Zugfestigkeit Tensile strength	T.D.	**55**	MPa	DIN EN ISO 527
7	Bruchdehnung Tensile strain at break	M.D.	**500**	%	DIN EN ISO 527
8	Bruchdehnung Tensile strain at break	T.D.	**500**	%	DIN EN ISO 527
9	Weiterreißwiderstand Tear restistance	M.D.	**400**	N/mm	DIN 53363
10	Weiterreißwiderstand Tear restistance	T.D.	**400**	N/mm	DIN 53363

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These values reflect current knowledge and state of the art. They are intended to provide information on our products and are not to be understood as a guarantee of any specific product characteristic or suitability of any product for a particular application purpose. Colour, treatment and thickness can be varied. For this purpose, please get in contact with our sales and marketing department.