Specification of Warm edge spacer for Insulating Glass

1. Material

   Warm edge spacer shall be co-extruded with two materials, plastic with a layer of thermal barrier foil. Plastic material shall be made of Polypropylene and thermal barrier foil shall be a thin layer of 0.09mm stainless steel bordering the plastic material.

   - The quality of warm edge spacer shall be Technoform Warm Edge Spacer SP 12/13 or equivalent.

2. Product Performance Requirements

   - No discoloration and glossiness on plastic surface of warm edge spacer identified upon 4,000 hours of UV exposure in accordance with EN ISO 4892-2.
   - Warm edge spacer shall be Restriction of Hazardous Substance (RoHS) compliant.
   - Warm edge spacer shall be Passive House certified with efficiency class of B and better.
   - Warm edge spacer shall have a volatile loss of <0.05% in accordance with EN 1279-6.
   - Warm edge spacer shall have a two-box characteristic value, $\lambda eq,2B$ of ≤ 0.31 W/mK.

3. Sealed insulating glass unit with warm edge spacer

   - Warm edge spacer used for sealed insulating glass unit shall be bent on all 4 corners by a mechanical bending process commonly adopted by glazing fabricators.
   - Sealed insulating glass unit with warm edge spacer shall pass moisture penetration test, average ≤ 20%, in accordance to EN 1279-2.
   - Sealed insulating glass unit with warm edge spacer shall pass air leakage test, < 1% annually, in accordance to EN 1279-3.
   - Representative linear heat transfer coefficient, Ψ of the edge of glass in the following sealed insulating glass shall meet or exceed the following values:
     - a. Windows
       i. Double sheet insulating glass ≤ 0.049
       ii. Triple sheet insulating glass ≤ 0.044
     - Façade
       i. Double sheet insulating glass ≤ 0.068
       ii. Triple sheet insulating glass ≤ 0.063

4. Submission of Certificate of Quality (COQ) for Warm edge spacer is required.

   Product conformity tests shall be conducted for each production batch. Test results shall be included in a COQ and attached to the goods delivered.

5. Submission of green product certification is required. Warm edge spacer used in the insulating glass shall have the following certifications:

   - Environmental Product Declaration (EPD)
   - Singapore Green Building Product (SGBP)

6. Submission of relevant Quality Management System (QMS) certifications is required.

   Warm edge spacer suppliers must have a third-party accredited QMS. Relevant certifications, including but not limited to ISO 9001, ISO 14001 and ISO 45001, shall be submitted.

7. Global Warranty

The contractor shall obtain from the warm edge spacer supplier a product warranty which shall be valid for a period of ten (10) years against material defects in the warm edge spacer which are caused by non-compliance with the terms specified in this specification sheet.

Annex

Certificate of Quality (COQ)

TECHNOFORM

Certificate of Conformity

Doc. Number	COC-20230023	**Reference Number**	5368EX-MT-ATB | SO-20230006 | SI-20230005 | PL-20230003 | DO-20230002
Product Code	SP14-14-558-8	**Description**	SP14, Warm edge spacer, 14 mm, RAL 9005 (Black), 5.8m, Manufactured in Singapore
Batch Number	BN-20230006		
Crate No.	TEBSS1892, TEBSS1893, TEBSS1894, TEBSS1895		

	Test	Specification	Measuring Instrument	Result (Pass/Fail)
	Width	13.45 mm +0.15/-0.15 mm	Digital Caliper	Pass
	Length	5,800 mm +10/-0 mm	Measurement Gauge	Pass
	Height	6.85 mm +/- 0.15 mm	Digital Caliper	Pass
	Roof Sag	0.20 mm + 0.15/-0.1 mm	Digital Caliper	Pass
	Extraction Force	≥ 8 kg	Universal Testing Machine	Pass
	Permability	2 - 4 bars	Outlet Pressure Gauge	Pass
	Colour	Pass / Fail	Spectrophotometer	Pass
	Cut Surface	Pass / Fail	Visual	Pass

The above tests were performed on the referred batch and meet the inspection procedures and results of Technoform Edge Bond Solutions Singapore Pte. Ltd

Date of Certificate	18 January 2023	**Management Extrusion Singnature**	
Management Extrusion	Benjamin Teoh		

Figure 1: Sample of Certificate of Quality (COQ) from Technoform

Green Product Certifications

SINGAPORE GREEN BUILDING COUNCIL

SINGAPORE GREEN BUILDING PRODUCT CERTIFICATE

AWARDED TO

Technoform Glass Insulation Asia Pacific Pte Ltd

6 Temasek Boulevard
#28-06 Suntec Tower Four
Singapore 038986

FOR THE PRODUCT

Warm Edge Spacer

PRODUCT BRAND

Technoform

PRODUCT MODEL

Technoform Warm Edge Spacer, SP12

THE PRODUCT HAS BEEN ASSESSED ACCORDING TO THE ASSESSMENT CRITERIA OF SINGAPORE GREEN BUILDING PRODUCT CERTIFICATION SCHEME. IT HAS BEEN AWARDED THE RATING:

SINGAPORE GREEN BUILDING PRODUCT SGBC ✓✓✓ EXCELLENT

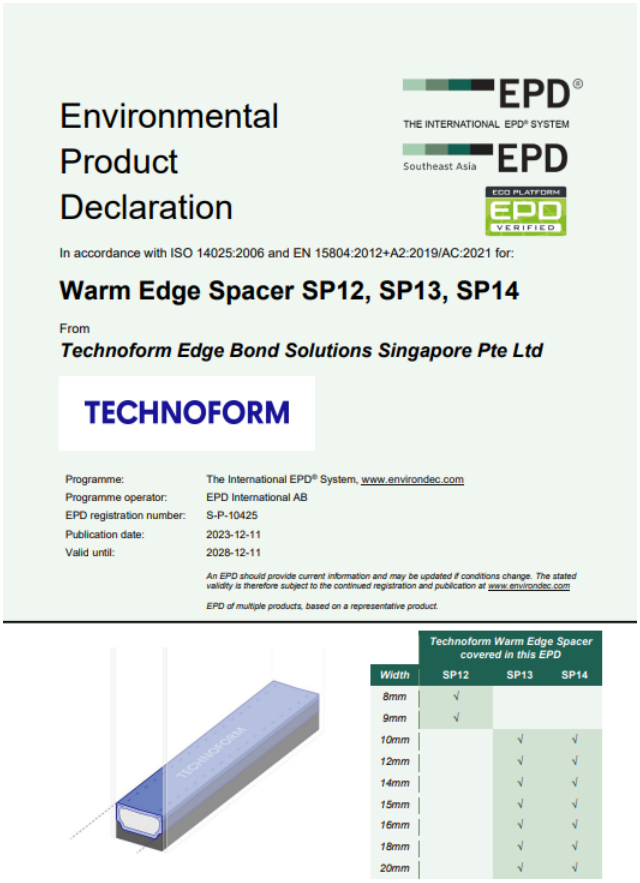
Director
SGBC Pte Ltd

Certificate Number	Original Issue Date	Revised Date	Valid Till
SGBP 3793/1	05 September 2024	28 June 2024	04 September 2026

✓Good ✓✓Very Good ✓✓✓Excellent ✓✓✓✓Leader

The use and reliance on this certificate is subject to the terms and conditions of the Singapore Green Building Product Certification Scheme. Revised certificates may also be issued at the discretion of the Council. The certification status may be verified at the Singapore Green Building Council website (www.sgbc.sg).

Figure 2: Sample of Singapore Green Building Product (SGBP) – 3 ticks certification from Technoform



Environmental Product Declaration

EPD® THE INTERNATIONAL EPD® SYSTEM

Southeast Asia EPD

ECO PLATFORM EPD VERIFIED

In accordance with ISO 14025:2006 and EN 15804:2012+A2:2019/AC:2021 for:

Warm Edge Spacer SP12, SP13, SP14

From

Technoform Edge Bond Solutions Singapore Pte Ltd

TECHNOFORM

Programme:	The International EPD® System, www.environdec.com
Programme operator:	EPD International AB
EPD registration number:	S-P-10425
Publication date:	2023-12-11
Valid until:	2028-12-11

An EPD should provide current information and may be updated if conditions change. The stated validity is therefore subject to the continued registration and publication at www.environdec.com

EPD of multiple products, based on a representative product.

	Technoform Warm Edge Spacer covered in this EPD		
Width	SP12	SP13	SP14
8mm	√		
9mm	√		
10mm		√	√
12mm		√	√
14mm		√	√
15mm		√	√
16mm		√	√
18mm		√	√
20mm		√	√

Figure 3: Sample of Environmental Product Declaration (EPD) from Technoform

Quality Management System (QMS)

PSB Singapore

CERTIFICATE

Certificate Registration No. **2022-0864**

The Certification Body
of TÜV SÜD PSB Pte Ltd
certifies that the organization

TECHNOFORM EDGE BOND SOLUTIONS SINGAPORE PTE LTD
32 Pioneer Crescent
West Park BizCentral #05-18/19
Singapore 628561

has established and applies an Environmental Management System for the scope of

Manufacture of Warm Edge Spacers and Thermal Edge Bond Products for Insulating Glass
(including the sites see enclosure)

Proof has been furnished that the requirements according to

ISO 14001 : 2015

are fulfilled.
The certificate is valid from **2024-12-23 to 2028-01-30**
Date of Print : **2024-12-23**

Manineth Pulido
Head of Certification Body
Management Systems
Business Assurance Division

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Please refer to www.tuvsud.com/en-sg for current certificate status in the "Directory of Management System Certified Companies".

Figure 4: Sample of ISO 14001:2015 certification from Technoform