

## VINYL COMPOUNDS AND THEIR MANUFACTURE FOR PVC WINDOW PROFILES

# Technical document 34-02

Inspection during production of the  
vinyl compound

Inspection of the vinyl compound

Technical document 34.02 rev. 02  
01/09/2021

CSTB (Centre Scientifique et Technique du Bâtiment), a public establishment supporting innovation in construction, has four key activities: research, expertise, assessment and dissemination of knowledge, organised to meet the challenges of ecological and energy transition in the construction sector. Its field of competence covers construction materials, buildings and their integration into districts and towns.

With over 900 employees and its subsidiaries and networks of national, European and international partners, the CSTB group works for all stakeholders in the construction sector to advance building quality and safety.

All reproduction or representation, complete or partial, by whatever means, of the pages published in this technical document and executed without the authorisation of CSTB is illegal and constitutes an act of forgery. The only authorised exceptions are 1) reproductions strictly reserved for the use of the typist and not intended for any collective use, or 2) analyses and short quotations required due to the scientific or informational nature of the work in which they appear (article L.122-5 of the French Intellectual Property Code). This document has been drawn up under the initiative and direction of CSTB, which has brought together the opinions of all interested parties.

© CSTB

## MODIFICATION HISTORY

Parts modified	Revision No.	Effective date	Modifications made
-	00	13/11/2018	Creation of the document
	01	18/05/2020	Conditions for use of internally reprocessed material with plasticiser (page 10)
	02	01/09/2021	Inspection of the final vinyl compound § C (page 5 to 8)

*"This document has been drawn up under the initiative and direction of CSTB, which has gathered the opinions of all interested parties.*

*Any reproduction or representation of this document in whole or in part, and any use of all or part of this document for the purpose of assessments, certification or tests performed without CSTB's prior written consent, are prohibited".*

## **INSPECTION DURING PRODUCTION AND ON THE FINISHED PRODUCT**

The applicant/holder is required to complete an inspection upon receipt.

These inspections, the content of which may vary according to the applicant/holder's internal inspection structure and the guarantees of regularity provided by the suppliers, generally include:

- incoming checks enabling the delivery to be accepted;
- quality assurance operations, making it possible to assess the compliance and/or regularity of the product's components when compared with the expected characteristics.

The methods, frequencies and results of the inspections will be verified during the admission visit and will be monitored by CSTB.

### ***I Manufacturer and possessor of their certified vinyl compound/extruder or manufacturer of a certified vinyl compound (Case B - Case C)***

Manufacturers are routinely monitored by CSTB. They are required to carry out an inspection of all components used in the manufacture of their vinyl compound upon receipt and in all cases prior to use. They must prove product quality according to the following provisions, concerning:

- A) raw materials;
- B) process monitoring;
- C) inspection of the final vinyl compound.

**A) Raw materials**

Certificates of compliance for the manufacturer's raw materials are provided for:

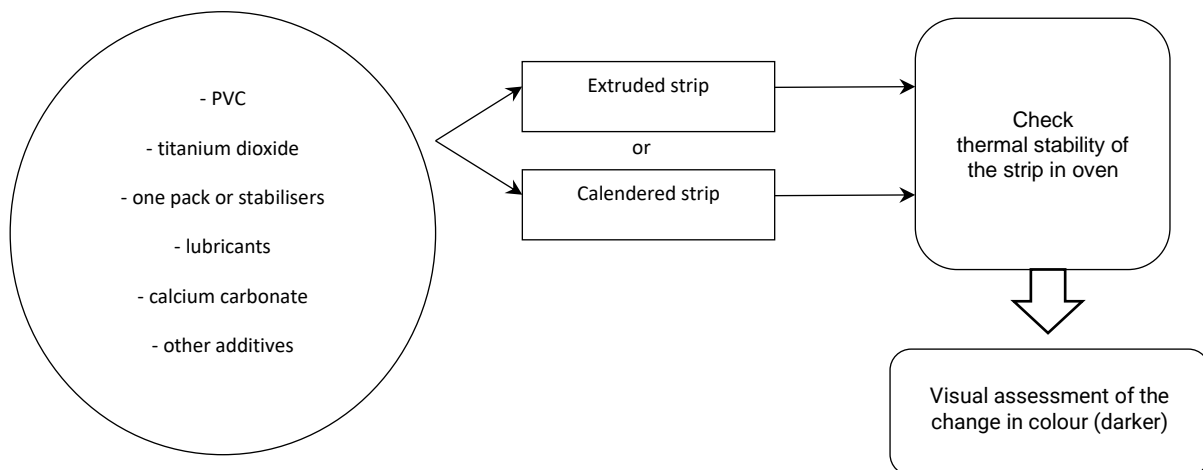
- PVC;
- titanium dioxide;
- loads;
- stabilisers or one packs (mixture of stabilisers);
- additives for utilisation.

These certificates are kept in the laboratory.

NF EN ISO 9001 certified raw material supplier	raw material supplier without NF EN ISO 9001 certification (inspection upon receipt of each batch)
Note of analysis for each batch delivered: It does not have to be provided with each batch if specifications have been established with the extruder (these notes must remain available)	PVC complies with the specifications: <ul style="list-style-type: none"> <li>- moisture</li> <li>- sieving</li> <li>- black spots</li> <li>- flow rate</li> </ul>
	other constituent materials: see chart below

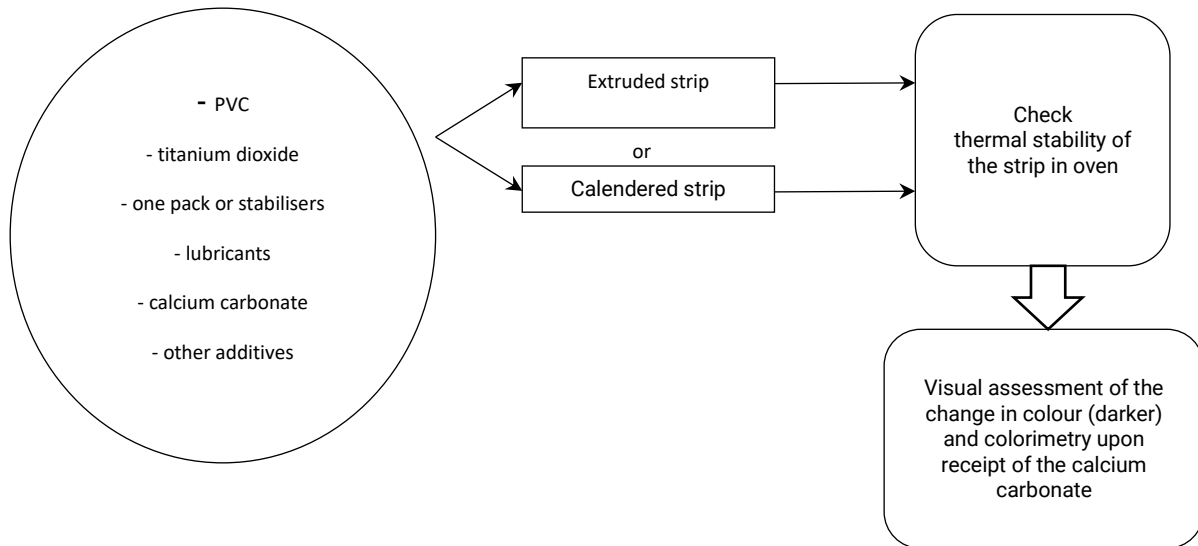
**Step 1:**

benchmark vinyl compound



**Step 2:**

Vinyl compound incorporating the new batch of one of the constituent materials delivered



**Step 3:**

The results of the visual measurements are compared: the change in colour occurring in step 2 must not be greater than the change occurring in the benchmark vinyl compound in step 1.

**B) *Process monitoring***

Traceability procedures must be established for each of the following operations:

- weighing
- mixture
- sieving
- homogenisation
- storage

**C) *Inspection of the final vinyl compound.***

A trial extrusion is carried out (laboratory extruder or extrusion on a designated production line) and the following identification characteristics are verified for each vinyl compound:

- DHC
- ash content
- density
- Vicat needle test point temperature<sup>(1)</sup>
- colorimetry

### Manufacture using a blending silo

- When forming a uniform batch, identification characteristics are verified according to the quantity produced:

<b>production</b>	<b>quantity checked</b>	<b>control programme*</b>
< 10,000 tonnes/year	20% of production declared	to be provided depending on batches manufactured
between 10,000 and 50,000 tonnes/year	10% of production declared	
≥ 50,000 tonnes/year	5% of production declared	

***\*The control programme must be provided to CSTB for approval and updated, if needed***

### Manufacture without using a blending silo

Verification of identification characteristics takes place every 10 tonnes.

*(1) In order to confirm the initially stated specification, the Vicat needle test point temperature is measured on 20 different batches during industrial manufacture of a new vinyl compound. Once this period is over, the test results are given to CSTB. The Vicat needle test point temperature is checked for one (1) year only for new production sites.*

*In the context of subcontracting, this test can be conducted by another manufacturing unit with NF 126 marking. The holder shall have at their disposal installations, equipment and personnel to make it possible to conduct this test. A contract shall be signed with someone who has the necessary competencies.*

*The holder shall calibrate or verify and maintain in good operating state the equipment for inspecting, measuring and testing, whether this equipment belongs to them or not, to demonstrate the compliance of the product with the specifications. The equipment shall be used in accordance with the testing standard.*

Irrespective of the process (silo or not):

For new production sites, the frequency set for determining the identification characteristics will be once every 100 tonnes for the first year following admission.

For non-UV-resistant compounds, only density is verified.

*When manufacturing vinyl compositions certified beige or grey:*

### Manufacture using a blending silo

- When forming a uniform batch, identification characteristics are verified according to the quantity produced:

<b>production</b>	<b>quantity checked</b>	<b>control programme*</b>
< 10,000 tonnes/year	20% of production declared	to be provided depending on batches manufactured
between 10,000 and 50,000 tonnes/year	10% of production declared	
≥ 50,000 tonnes/year	5% of production declared	

***\*The control programme must be provided to CSTB for approval and updated, if needed***

*(1) In order to confirm the initially stated specification, the Vicat needle test point temperature is measured on 20 different batches during industrial manufacture of a new vinyl compound. Once this period is over, the test results are given to CSTB. The Vicat needle test point temperature is taken for one (1) year only for new production sites.*

*In the context of subcontracting, this test can be conducted by another manufacturing unit with NF 126 marking. The holder shall have at their disposal installations, equipment and personnel to make it possible to conduct this test. A contract shall be signed with someone who has the necessary competencies. The holder shall calibrate or verify and maintain in good operating state the equipment for inspecting, measuring and testing, whether this equipment belongs to them or not, to demonstrate the compliance of the product with the specifications. The equipment shall be used in accordance with the testing standard.*

#### Manufacture without using a blending silo

Verification of identification characteristics takes place every 10 tonnes.

#### Manufacture using pigmentation on the production line

Should pigmentation be used on the production line to manufacture a material that is certified beige or grey from a certified white composition, irrespective of it is produced in a blending silo, the identification characteristics (ash content, DHC, density) are verified either according to the defined inspection plan or every 10 tonnes; the colorimetry characteristics will be checked once per colour campaign, on each production line.

This provision only applies to formulations and specifications relating to ash content, DHC and density identical to the three compositions: white, beige and grey.



When manufacturing L\* $\leq$ 82 certified products intended only for the manufacture of profiles coated using acrylic film

Manufacture using a blending silo

- When forming a uniform batch, the density and colorimetry characteristics are verified according to the quantity produced:

<b>production</b>	<b>quantity checked</b>	<b>control programme*</b>
< 10,000 tonnes/year	20% of production declared	to be provided depending on batches manufactured
between 10,000 and 50,000 tonnes/year	10% of production declared	
$\geq$ 50,000 tonnes/year	5% of production declared	

\*The control programme must be provided to CSTB for approval and updated, if needed

Manufacture without using a blending silo

Verification of the density and colorimetry characteristics takes place every 10 tonnes –

Manufacture using pigmentation on the production line

Should pigmentation be used on the production line for L\* $\leq$ 82 certified materials intended only for manufacturing profiles coated using acrylic film (or coated using another technique), the density and colorimetry characteristics are checked once per campaign colour, across all profile production lines.

**II Manufacturer and possessor of the certified vinyl compound (Case A)**

This case is equally valid for a company that, at the extruder’s request, creates a mixture to order.

The vinyl compound production unit is routinely monitored by CSTB. It is required to carry out an inspection of all components used in the manufacture of the vinyl compound upon receipt and in all cases prior to use. It must prove product quality according to the following provisions, concerning:

- A) raw materials;
- B) process monitoring;
- C) inspection of the final vinyl compound.

For each delivery, the vinyl compound producer or the company making the mixture to order is required to issue a certificate of conformity to their extruder clients indicating compliance with the specifications established between them. Furthermore, each batch may be accompanied by a sheet restating the results of verification tests for identification characteristics conducted on the samples corresponding to this delivery.

The vinyl compound production unit may carry out a trial extrusion on a laboratory extruder. If so, extrusion units do not need to conduct this test. The analysis sheet submitted with each batch delivered must include deviations in colorimetric characteristics (set out in the specifications to which each of the parties agreed).

**A) Raw materials**

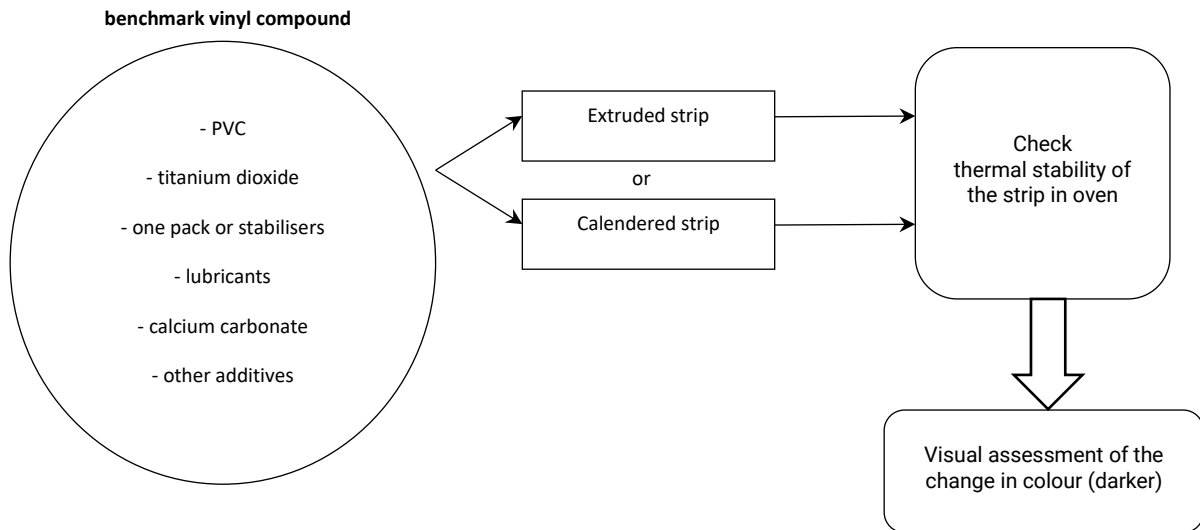
Certificates of compliance for the manufacturer’s raw materials are provided for:

- PVC;
- titanium dioxide;
- loads;
- stabilisers or one packs (mixture of stabilisers);
- additives for utilisation.

These certificates are kept in the laboratory.

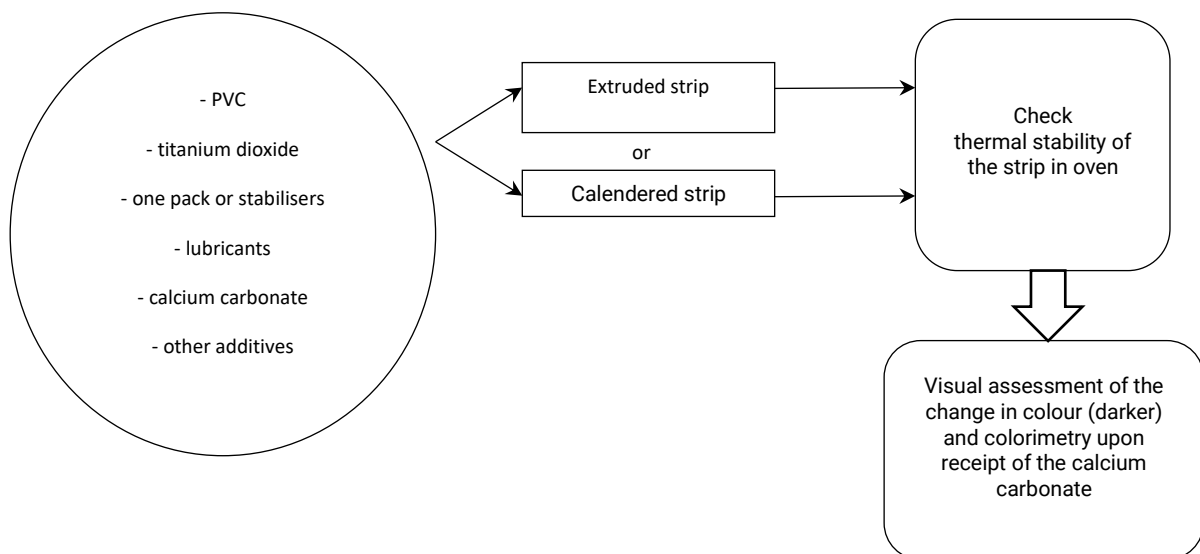
<b>NF EN ISO 9001 certified raw material supplier</b>	<b>raw material supplier without NF EN ISO 9001 certification</b> (inspection upon receipt of each batch)
Note of analysis for each batch delivered: It does not have to be provided with each batch if specifications have been established with the extruder (these notes must remain available)	PVC complies with the specifications: <ul style="list-style-type: none"> <li>- moisture</li> <li>- sieving</li> <li>- black spots</li> <li>- flow rate</li> </ul>
	other constituent materials: see chart below

**Step 1:**



**Step 2:**

**Vinyl compound incorporating the new batch of one of the constituent materials delivered**



**Step 3:**

The results of the darkening measurements are compared: the change in colour occurring in step 2 must not be greater than the change occurring in the benchmark vinyl compound in step 1.

**B) Process monitoring**

Traceability procedures must be established for each of the following operations:

- weighing
- mixture

- sieving
- homogenisation
- storage

**C) Inspection of the final vinyl compound.**

Extrudate is produced and the following identification characteristics are verified for each vinyl compound:

- DHC
- ash content
- density
- Vicat needle test point temperature<sup>(1)</sup>
- colorimetry

**Manufacture using a blending silo**

When forming a uniform batch, identification characteristics are verified according to the quantity produced. For non-UV-resistant compounds, only density is verified.

The results of these analyses per manufactured batch may be submitted with the certificate of compliance to the receiving extruder.

<b>production</b>	<b>quantity checked</b>	<b>control programme*</b>
< 10,000 tonnes/year	20% of production declared	to be provided depending on batches manufactured
between 10,000 and 50,000 tonnes/year	10% of production declared	
≥ 50,000 tonnes/year	5% of production declared	

\*The control programme must be provided to CSTB for approval and updated, if needed.

For companies manufacturing quantities ≤ 5 tonnes, the characteristics must be verified at least once per month.

For new production sites, the frequency set for determining the identification characteristics will be once every 100 tonnes for the first year following admission.

**Manufacture without using a blending silo**

Verification of identification characteristics takes place every 10 tonnes.

For non-UV-resistant compounds, only density is verified.

The results of these analyses per manufactured batch may be submitted with the certificate of compliance to the receiving extruder.

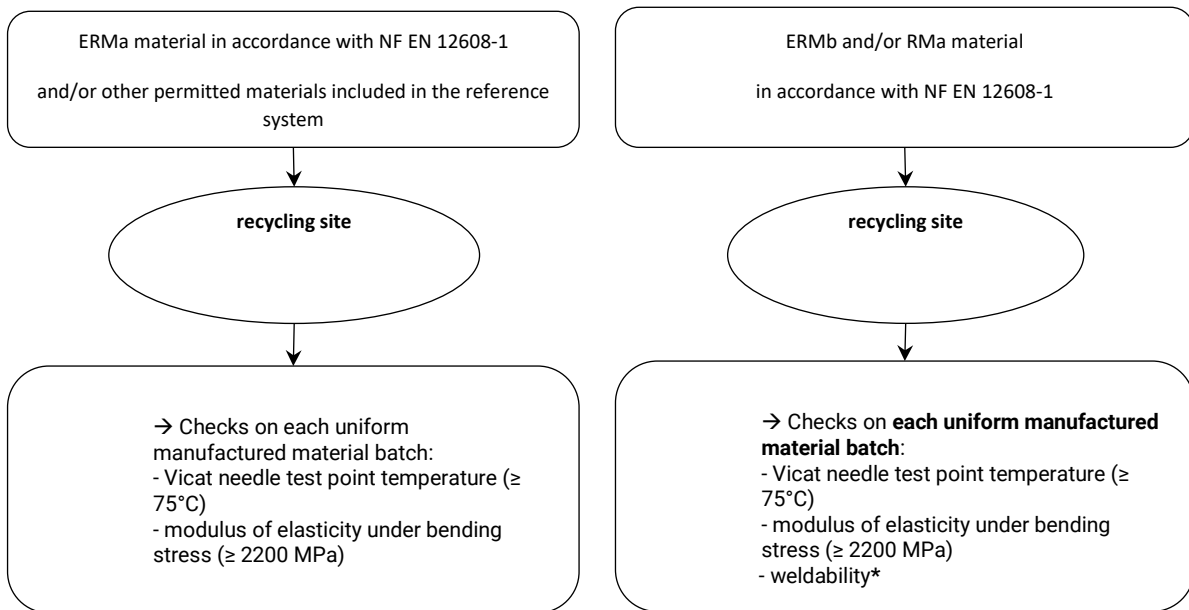
For companies manufacturing quantities ≤ 10 tonnes, these characteristics must be verified once per month.

*(1) In order to confirm the initially stated specification, the Vicat needle test point temperature is measured on 20 different batches during industrial manufacture of a new vinyl compound. Once this period is over, the test results are given to CSTB. The Vicat needle test point temperature is checked for one (1) year only for new production sites.*

*In the context of subcontracting, this test can be conducted by another manufacturing unit with NF 126 marking. The holder shall have at their disposal installations, equipment and personnel to make it possible to conduct this test. A contract shall be signed with someone who has the necessary competencies. The holder shall calibrate or verify and maintain in good operating state the equipment for inspecting, measuring and testing, whether this equipment belongs to them or not, to demonstrate the compliance of the product with the specifications. The equipment shall be used in accordance with the testing standard.*

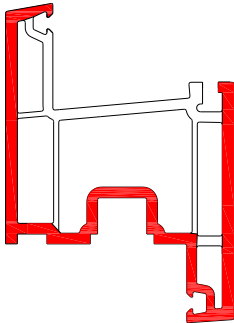
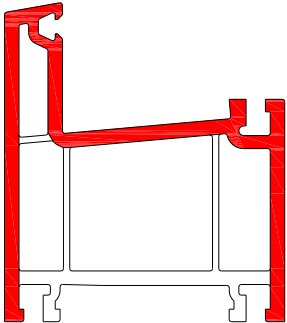
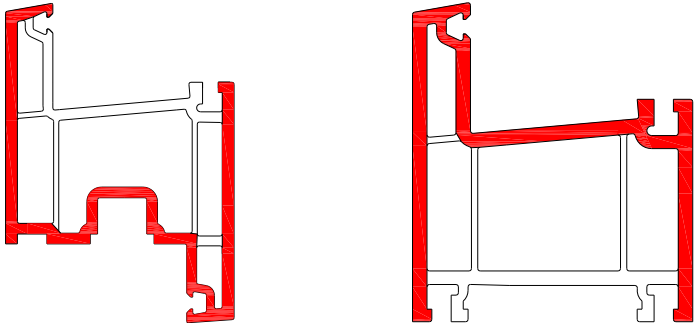
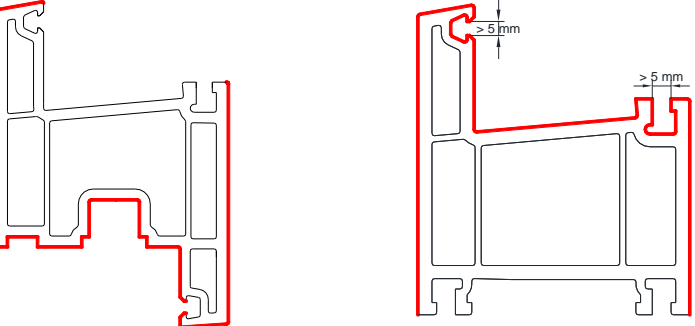
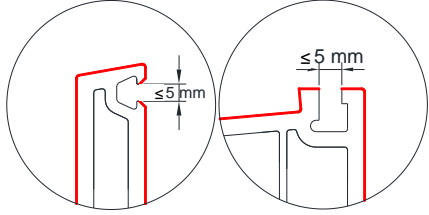
**III Manufacturer of reprocessed or recycled vinyl compound intended for non-visible parts of window profiles (Case D - recycling site)**

The applicant must declare which of the two cases below is applicable (the type of chute must be specified).



*\*Weldability test in accordance with NF EN 514, the results of which satisfy the requirements in § 5.10 of standard NF EN 12608-1. Although this test may be outsourced, it remains the responsibility of the recycler. A contract must be drawn up with an NF mark holder unit having the equipment and personnel needed to carry out this test. This test can be carried out using an extruded profile containing 100% reprocessed or recycled material or using a co-extruded profile as per configuration 2 below.*

➤ **Examples of co-extruded profile configurations**

	virgin material and/or internally reprocessed material
	<ul style="list-style-type: none"> <li>➤ Non-UV-resistant virgin and/or reprocessed and/or recycled material defined in standard NF EN 12608-1</li> <li>➤ Other permitted materials included in the reference system: <ul style="list-style-type: none"> <li>- Certified material intended for profiles that will be coated</li> <li>- Certified vinyl compound containing plasticised PVC or another type of co-extruded seal material (1)</li> <li>- Certified vinyl compound where <math>L^* &lt; 82</math></li> </ul> </li> </ul>
	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p><b>LEAVES</b></p>  </div> <div style="text-align: center;"> <p><b>FRAMES</b></p>  </div> </div>
configuration 1	
configuration 2	 <div style="text-align: center; margin-top: 10px;">  <p>variations if the width of the seal carrier recess and/or glazing bead groove is <math>\leq 5</math> mm</p> </div>

(1) two options:

- Material from an internal grinder containing no more than 5% by weight of plasticised PVC or another type of co-extruded joint material:

Compatibility must be corroborated on a case-by-case basis and validated.

Process control must be effective, documented and verified during follow-up audits.

- The percentage of plasticised PVC material is not controlled

It will be determined by the extruder in their laboratory: Vicat needle test point temperature, modulus of elasticity under bending stress, weldability

On each uniform manufactured batch.