VINYL COMPOUNDS AND THEIR MANUFACTURE
FOR PVC WINDOW PROFILES

Technical document 34-01

Modifying characteristics/components

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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 expertise includes construction materials, buildings and their integration into districts and towns. With over 900 employees, its subsidiaries and networks of national, European and international partners, the CSTB group works for all the stakeholders in the construction sector to advance building quality and safety.
MODIFICATION HISTORY

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1. Changing shades

**CHANGING THE SHADE OF THE CERTIFIED VINYL COMPOUND**

Using an initial certified vinyl compound for which a change in shade is planned (colour shading by adjusting the ratio and/or nature of the tinting pigments), particularly beige or light grey, the following tests are conducted, as the case may be.

- **Case 1**
  
  if $\Delta L^* \leq 2$
  and $\Delta a^* \leq 1$
  and $\Delta b^* \leq 1.6$
  
  no ageing tests need to be carried out.

- **Case 2**
  
  if $2 < \Delta L^* \leq 5$
  and/or $\Delta a^* \geq 1$
  and/or $\Delta b^* \geq 1.6$
  
  4000 hours of artificial ageing are to be completed.

In this case, welding factor tests will not need to be carried out. The values determined for the initially certified vinyl compound will be taken into account.

- **Case 3**
  
  If $\Delta L^* \geq 5$, 4000 hours of artificial ageing and 2 years of natural ageing are to be completed (in accordance with documents no. 1A and 1B).
2 Changing one of the components in the certified vinyl compound

Firstly, the identification characteristics (identical to those supplied at the time of initial certification) must be retained.

The code that was assigned to the initially certified composition will remain the same.

2.1 Thermal stabiliser one pack

If the one pack product reference changes (whether defined by a supplier or belonging to the owner of the formula and prepared to order), artificial ageing and two years of natural ageing will be completed according to technical documents no. 1 and no. 2.

For light shades, as provided for in the field of application covered by standard EN 12608.1 and in the case of pigmentation on the production line, modification of the one pack stabiliser’s reference may be extended to all qualified formulations with different colorimetry characteristics having the same declared DHC value, ash content, density and Vicat needle test point temperature.

2.2 Acrylic impact modifier

A) Substitution of one impact modifier for another in the table provided at http://evaluation.cstb.fr/ and with identical identification characteristics

No ageing tests need to be carried out.

Three scenarios are possible:
1) the impact modifier content stays the same: no testing is required, only a CSTB declaration;
2) the impact modifier content is reduced by a maximum of 10%:
   a double-notch Charpy impact test on a new extruded profile with the declared reduced impact modifier content will be performed by the CSTB laboratory;
   the results of the test must comply with the specifications of certification reference system NF 126;
3) the impact modifier content is increased by a maximum of 10%: no testing is required, only a CSTB declaration.

B) Modification of the content of the same impact modifier with identical identification characteristics in the composition of a qualified vinyl compound.

The content can be reduced or increased by up to 10% without the need for ageing tests. Two scenarios are possible:
1) the impact modifier content is reduced by a maximum of 10%:
   a double-notch Charpy impact test on a new extruded profile formulated with the reduced content will be performed by the CSTB laboratory;
   the results of the test must comply with the specifications of reference system NF 126.
   The reduced content is validated for the applicant’s other formulations with identical identification characteristics but different colours.
   If the content is reduced by more than 10%, the qualification procedure for a new vinyl compound will apply.
2) the impact modifier content is increased by a maximum of 10%: no testing is required, only a CSTB declaration.

These provisions concern impact modifiers with identical chemical compositions.

**C) Admission procedure for a new acrylic impact modifier reference in the equivalence table**

An impact modifier supplier wishes to introduce a new product reference on the market or a certified vinyl compound holder wishes to adopt a new impact modifier product reference.

An artificial ageing test with the new impact modifier product reference from a previously-qualified formulation with a listed impact modifier will be performed at the CSTB laboratory.

If the results comply with the provisions of reference system NF 126, the new product reference will be added to the list.

### 2.3 CPE impact modifier

1) New CPE product reference

With identical identification characteristics to the qualified material:

For acceptance of a new CPE impact modifier product reference in a previously qualified vinyl compound. The below process is followed:

- The holder of the vinyl compound qualification shall complete the application and conduct testing.
- These tests will be run on one of their previously qualified compounds with either a 100% CPE modifier content or a blend of CPE and Acrylic modifiers. In this latter case, the total modifier content will remain unchanged, the ratio will remain the same (e.g. if there are 6 phr in total in a formulation, i.e. 2 phr of acrylic modifier + 4 phr of CPE modifier, then substitute 4 phr of the new CPE in the initially qualified compound).

When results are satisfactory, the option to use this new CPE will be provided to all of this holder’s formulations (formulations with identical or lower CPE contents).

The tests are: determination of identification characteristics and artificial ageing in accordance with the reference system.

The name of the producer and the production site of the CPE modifier will be provided at the time of the application.

2) A new CPE product reference was validated in a “clean” formulation.

Use of this new product reference can be extended to all the qualified formulations with different colorimetry characteristics (under EN 12608.1) but the same declared DHC value, ash content, density and Vicat needle test point temperature.
2.4 TiO₂

1) If the TiO₂ product reference is substituted with an identical content compared to that submitted when the vinyl compound was qualified, a 2-year natural ageing test as well as an artificial ageing test will be performed in accordance with technical documents no. 1 and no. 2.

Modification of the TiO₂ product reference can be extended to all the qualified formulations with different colorimetry characteristics (under EN 12608.1) but the same declared DHC value, ash content, density and Vicat needle test point temperature.

2) If the quantity of TiO₂ is decreased compared to the quantity submitted during the vinyl compound qualification, a new qualification application must be submitted.

3) A qualification is indicated for a formulation with a reference A TiO₂ content;

   This same formulation is also qualified with a reference B TiO₂ content (same level).

If the qualification application for this formula is for overseas departments and territories, this formula must be qualified for each TiO₂ product reference.

4) In a formulation qualified using a 100% reference A TiO₂ content and this same formula is qualified with a 100% reference B TiO₂ content, the holder may adjust the portion of reference A TiO₂ and that of reference B TiO₂ in the formula without further experimental verification.

2.5 Calcium carbonate

1) If a ground product is replaced with a precipitated product (or vice versa) with identical identification characteristics and identical content compared to that submitted when the vinyl compound was qualified, a 2-year natural ageing test as well as an artificial ageing test will be performed in accordance with technical documents no. 1 and no. 2.

2) If the product reference is changed but the identification characteristics, content and chemical nature are identical to the values submitted during vinyl compound qualification: no testing is required, only a CSTB declaration.

2.6 Additives

_Lubricants, processing aids_

The qualified vinyl compound lubrication and processing aid content with identical identification characteristics can be increased or reduced without requiring tests.

2.7 Pigments

_For white shades where L* ≥ 90 and b* ≤ 5_

If identification characteristics are identical, testing is not required when changing pigment suppliers or changing product references.
2.8 **PVC resin**

1) If identification characteristics are identical, changing the PVC product reference to one with an identical Kwert value (min. Kwert: 63) is possible without conducting ageing tests. A simple CSTB declaration will suffice.

2) Grafted PVC/Rigid PVC + impact modifier

A qualified vinyl compound based on 50% grafted PVC + 50% PVC resin can be substituted with a 70% grafted PVC + 30% PVC resin or 30% grafted PVC + 70% PVC resin without testing, on the condition that impact modifier content remains the same throughout the formulation.

A qualified vinyl compound with grafted PVC (100%) can be substituted with a 100% PVC resin formula and impact modifier after an artificial ageing test (4000 hours), on the condition that the qualified vinyl compound’s identification characteristics remain unchanged.

A qualified vinyl compound with 50% grafted PVC + 50% PVC resin with impact modifier can be substituted with a 100% PVC resin formula with impact modifier after an artificial ageing test (4000 hours), on the condition that the qualified vinyl compound’s identification characteristics remain unchanged.