

ANNEX DOCUMENTS

PART III – PAPER MILL WITH SPECIALISED RECYCLING PRO- CESS (LPC)

APRIL 2025 - UPDATED EDITION (JUNE 2026)
TO ALIGN TERMINOLOGY WITH PPWR

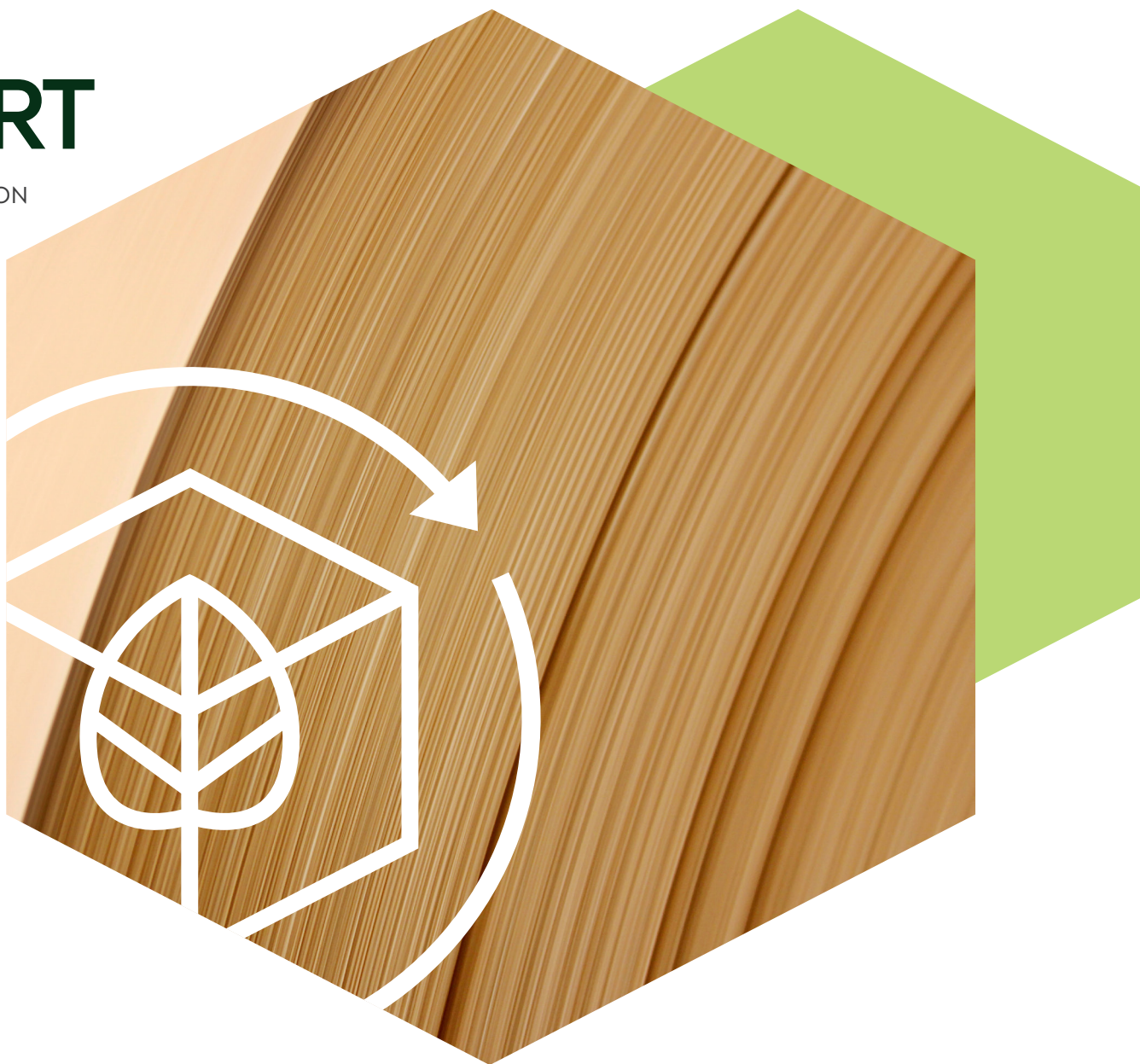


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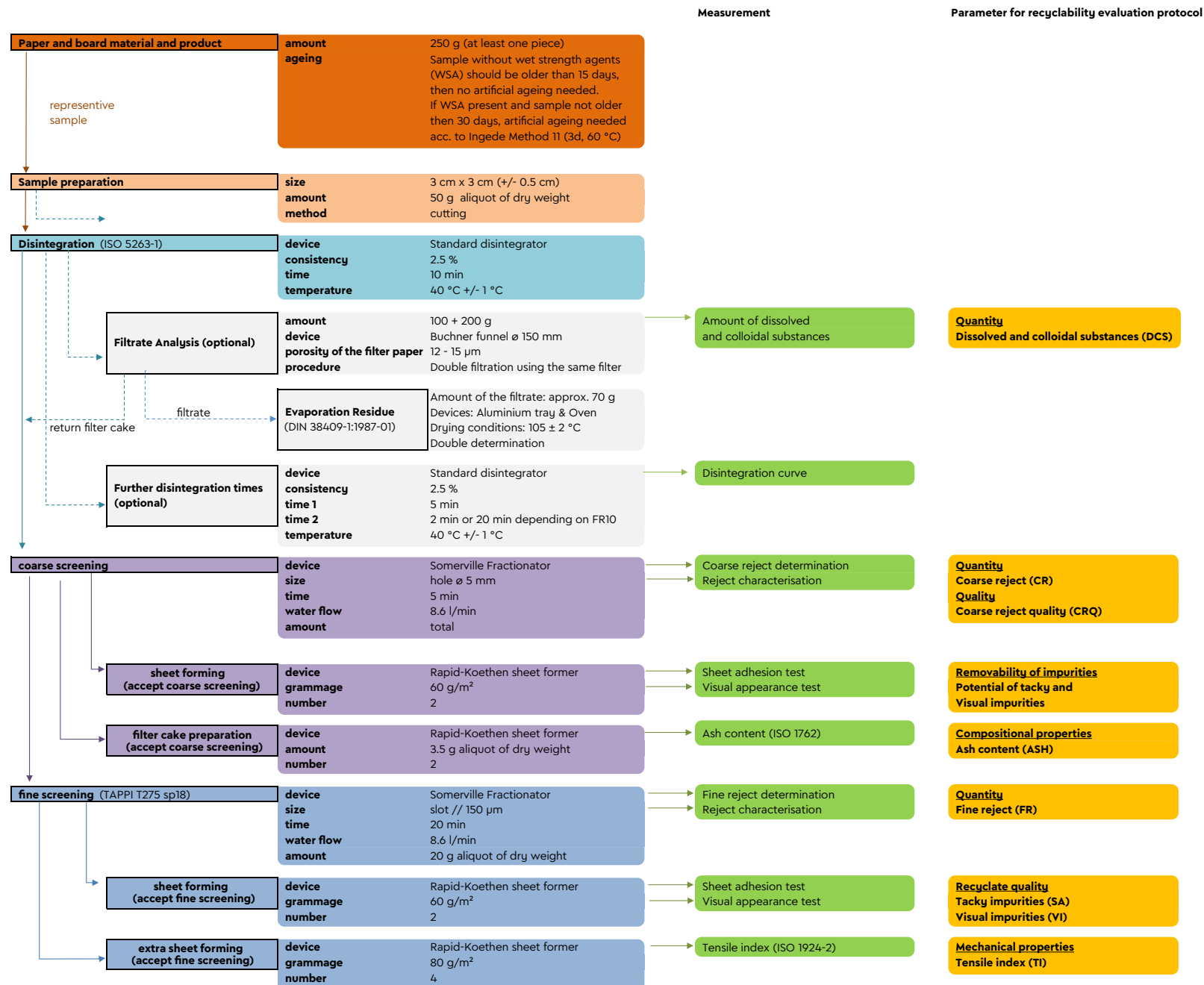
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1. ANNEX PART III METHOD FLOWCHART

VERSION 1, JANUARY 2025 - UPDATED EDITION
(JUNE 2026)



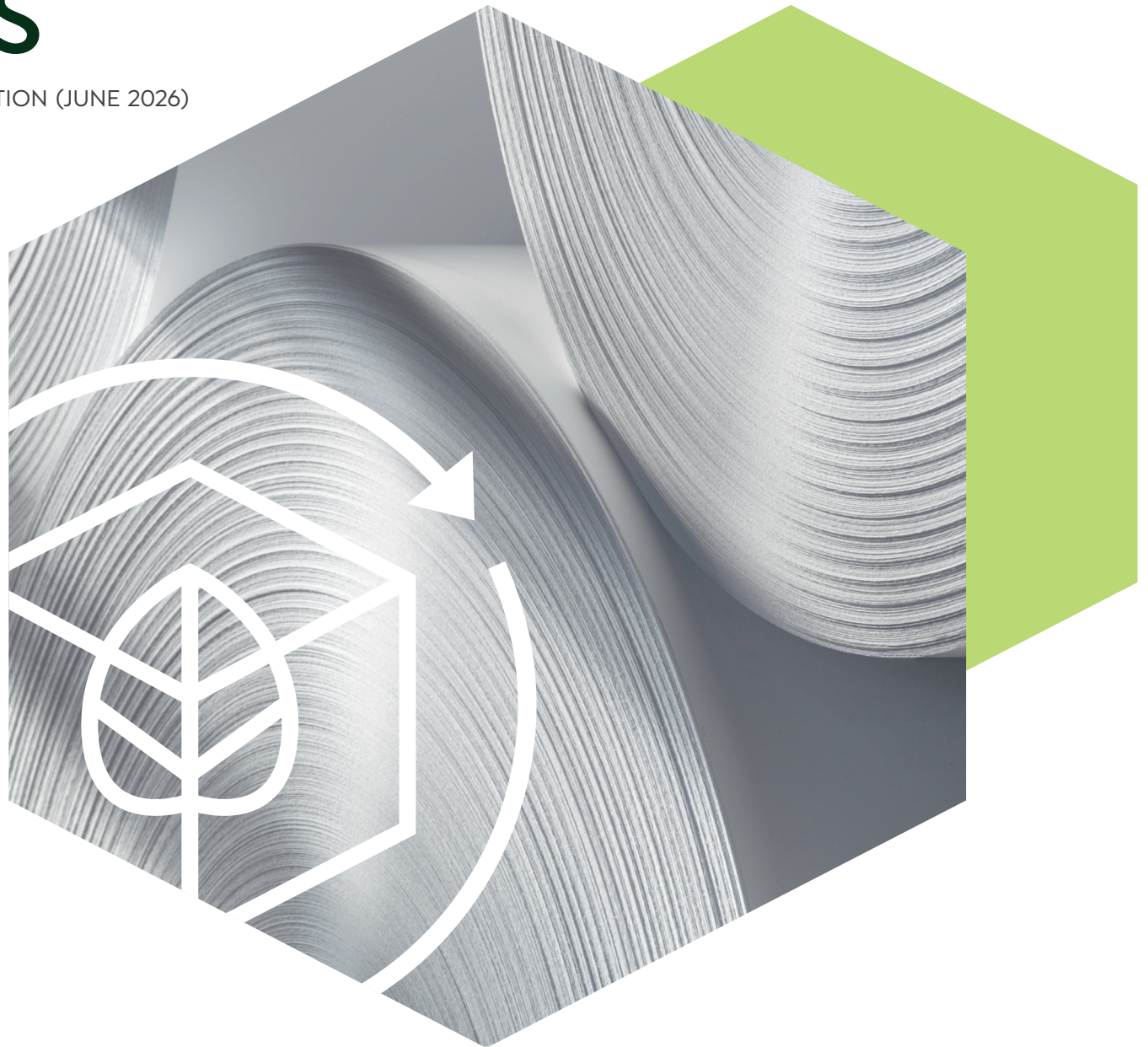
Recyclability laboratory test method – Part III Paper mill with specialised recycling process (LPC)



2. ANNEX VISUAL IMPURITIES

VERSION FEBURARY 2025 - UPDATED EDITION (JUNE 2026)

This Annex is relevant
for Part I and Part III



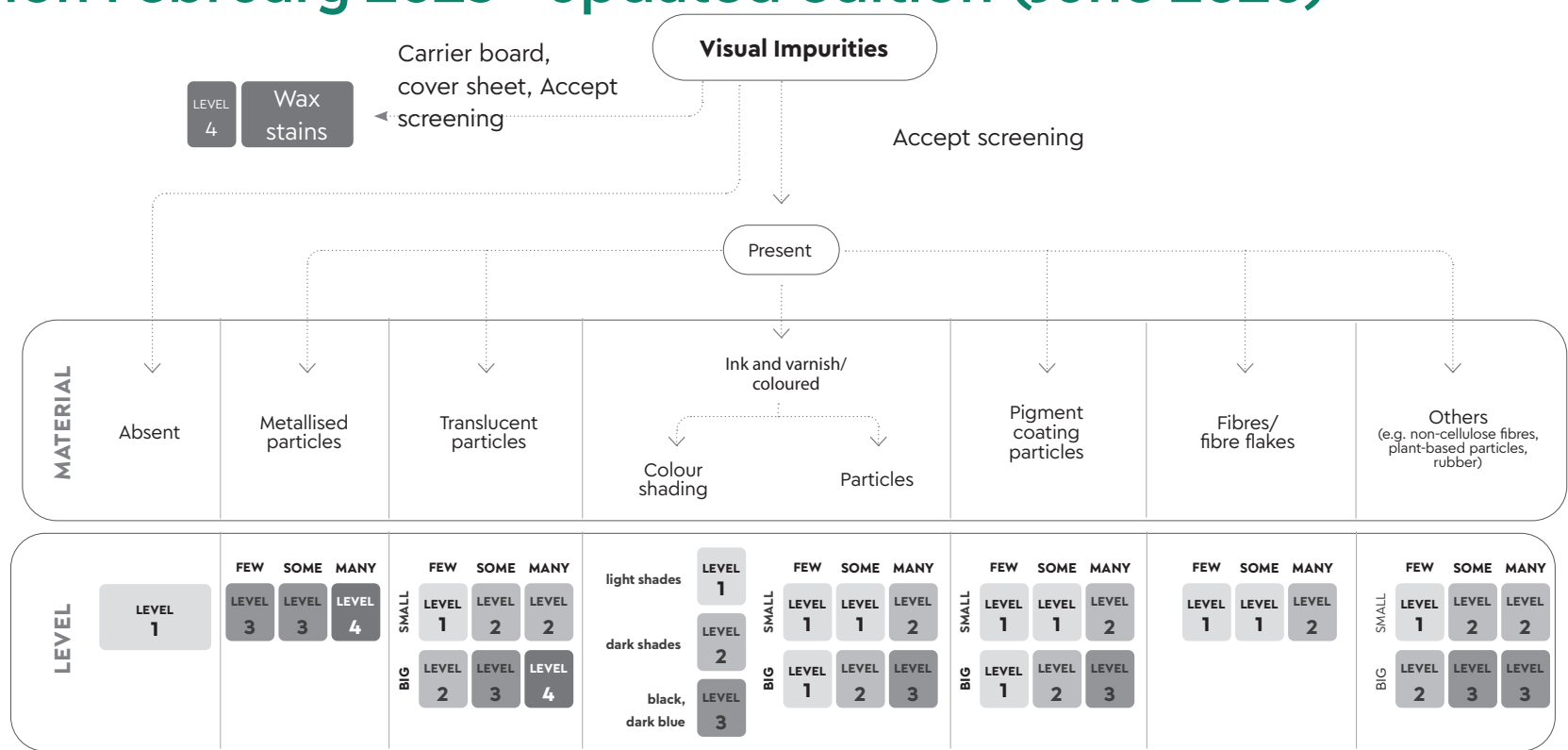
Annex Visual Impurities

User guide and purpose

- > The visual impurities decision tree has to be used for assessing the lab sheets formed with the accept of coarse- (AC) and fine screening (AF) in Part I, II and III methods. The assessment of visual impurities should be done visually with and without the aid of a source of transmitted light (e.g. a LED panel).
- > The visual impurities levels given in the decision tree might reflect in minus score points in the recyclability evaluation protocols.

Visual Impurities decision tree

– Version February 2025 - updated edition (June 2026)



NOTE: All applicable columns should be evaluated. Worst case level allocation applies.

Visual impurities per hand sheet			
Average Amount/ Handsheet	Few	Some	Many
	<10	10 - 100	>100
Size (1 dimension)	Small	Big	Combination
	≤1 mm	>1 mm	Consider the worst case level

LEVEL 1
No visual quality issues

LEVEL 2
Minor visual quality issues

LEVEL 3
Some visual quality issues

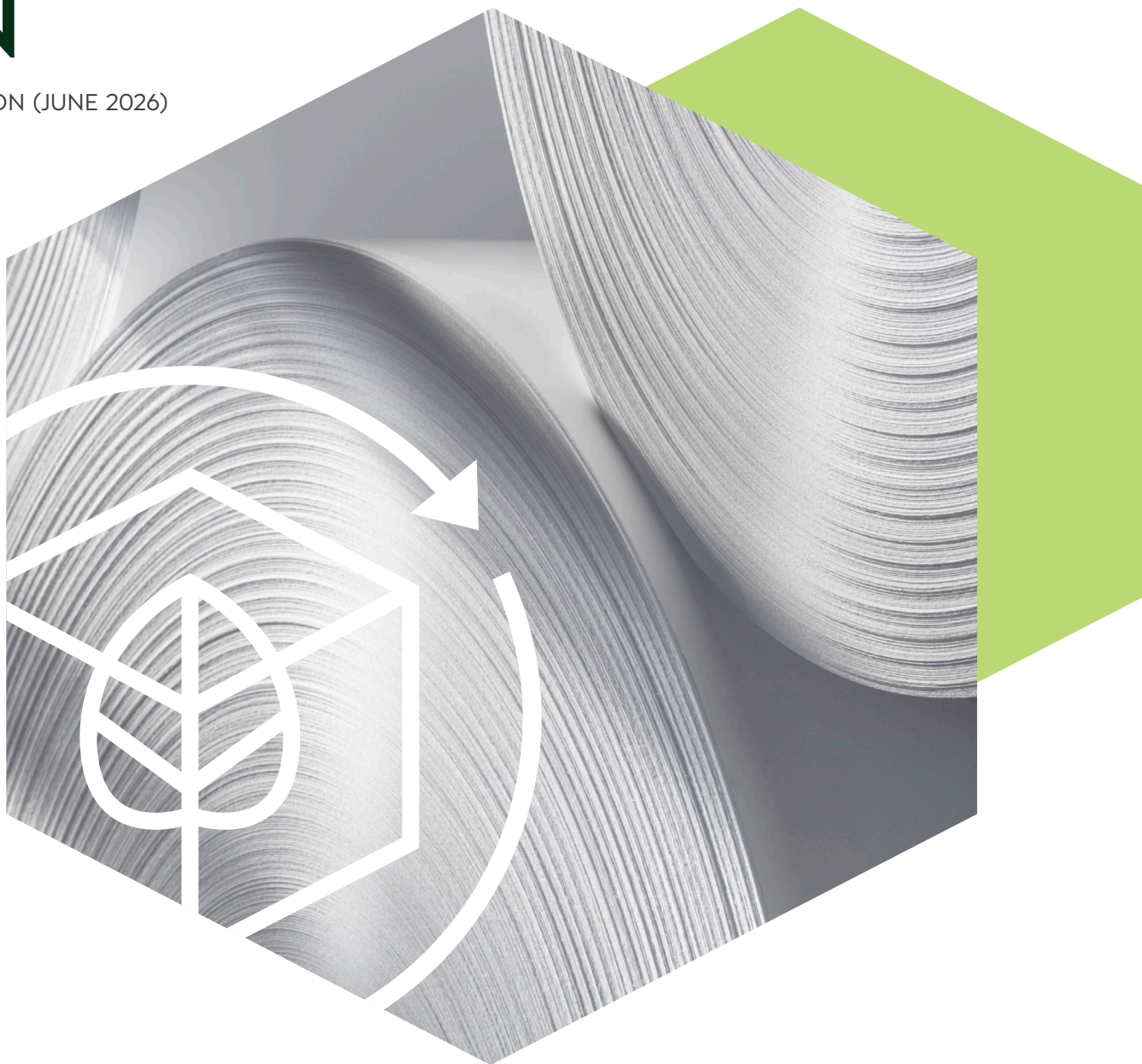
LEVEL 4
Significant visual quality issues

The Visual Impurities decision tree has been corrected in the February 2025 revision of this document.

3. ANNEX SHEET ADHESION

VERSION JANUARY 2025 - UPDATED EDITION (JUNE 2026)

This Annex is relevant for Part I,
Part II and Part III



Annex sheet adhesion

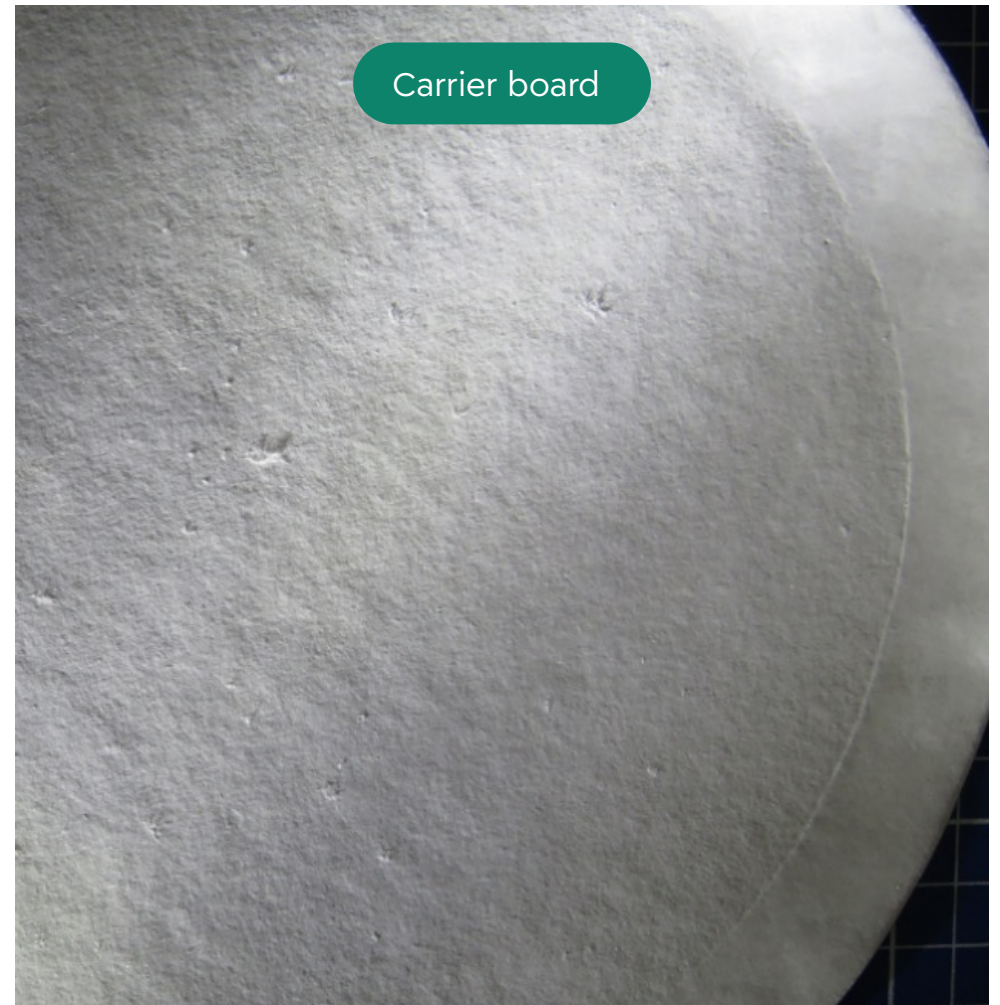
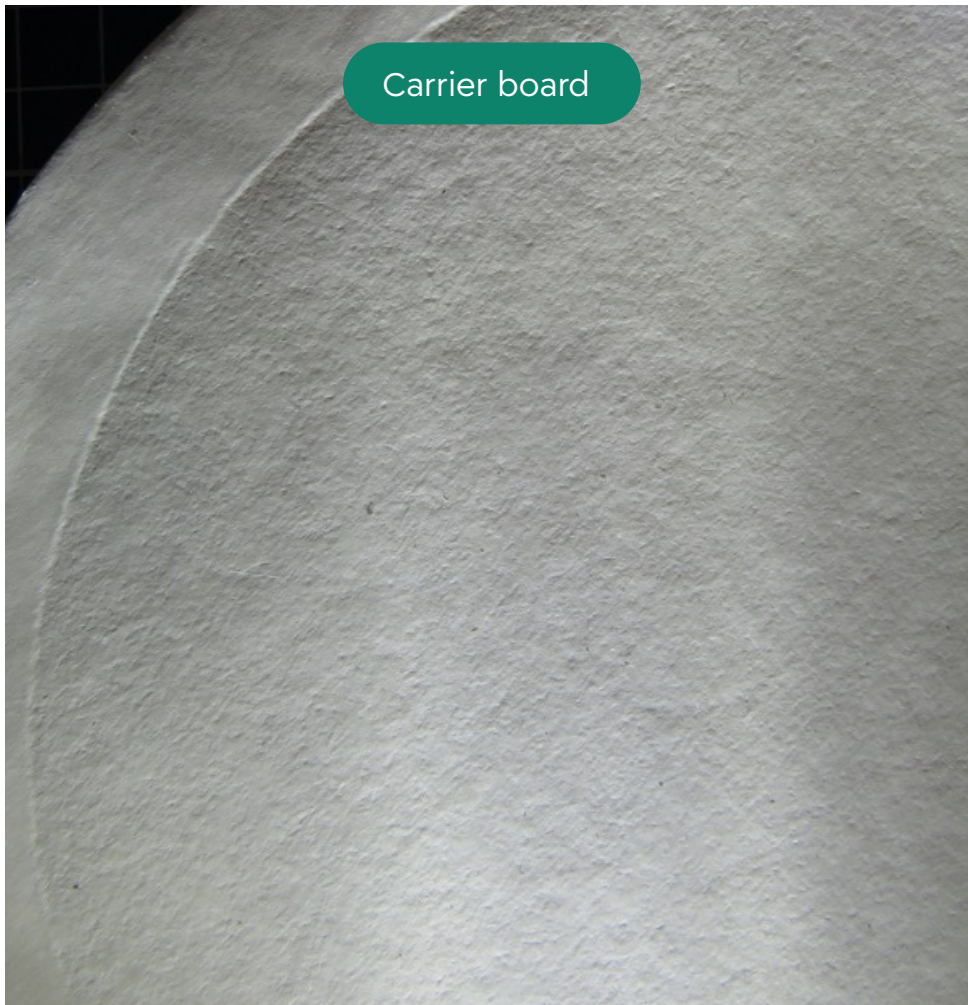
1 Performance video of the sheet adhesion test



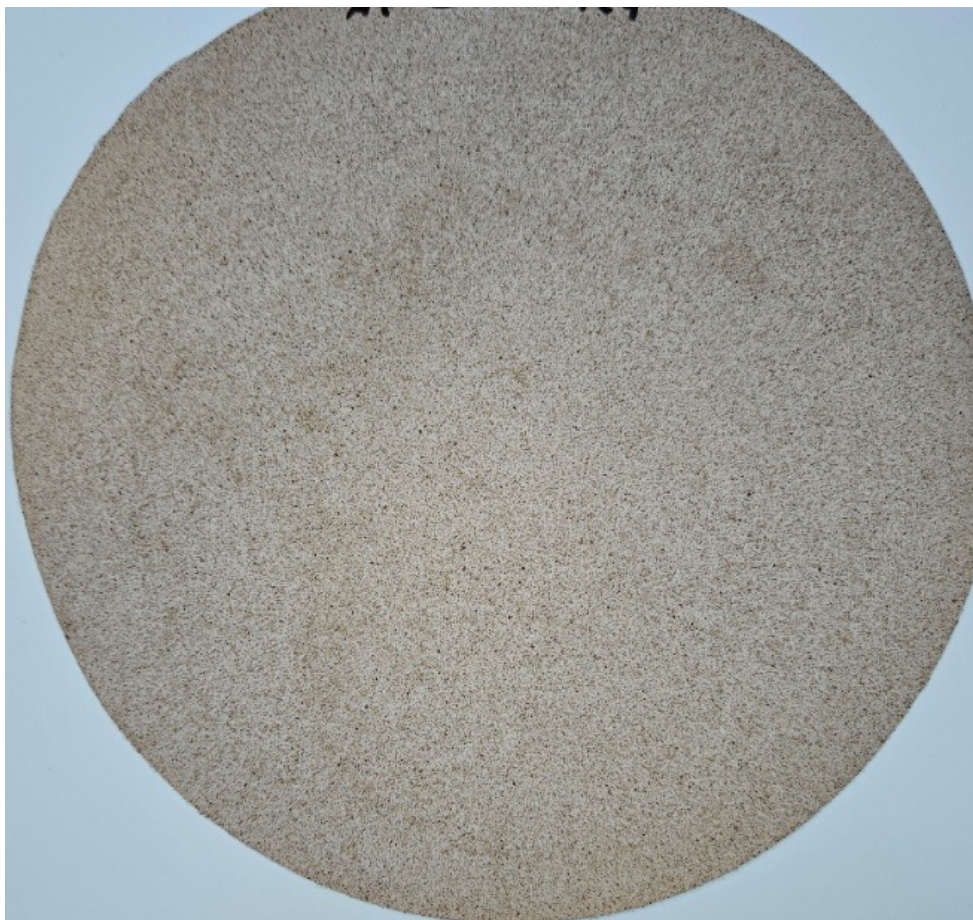
<https://youtu.be/c3n76YMfnkU>

2 Reference pictures for the sheet adhesion levels

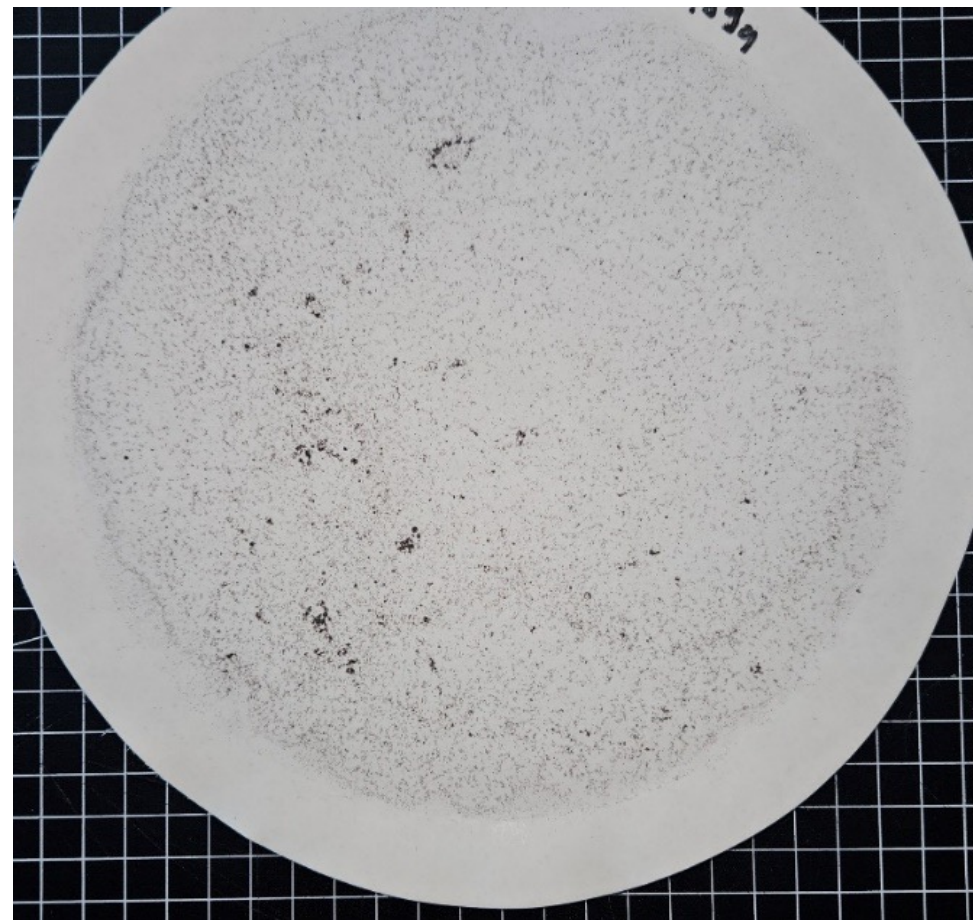
Level 1 Tackiness absent: the handsheet can be separated completely from the carrier board and cover sheet without any damage or breakages. A few single fibre pickups can be present on the carrier board and cover sheet. Visible damage to the handsheets and fragments of paper on the carrier board and cover sheet are not permitted.



Examples of attached particles, such as ink or varnish, not leading to tackiness and therefore not affecting the sheet adhesion test

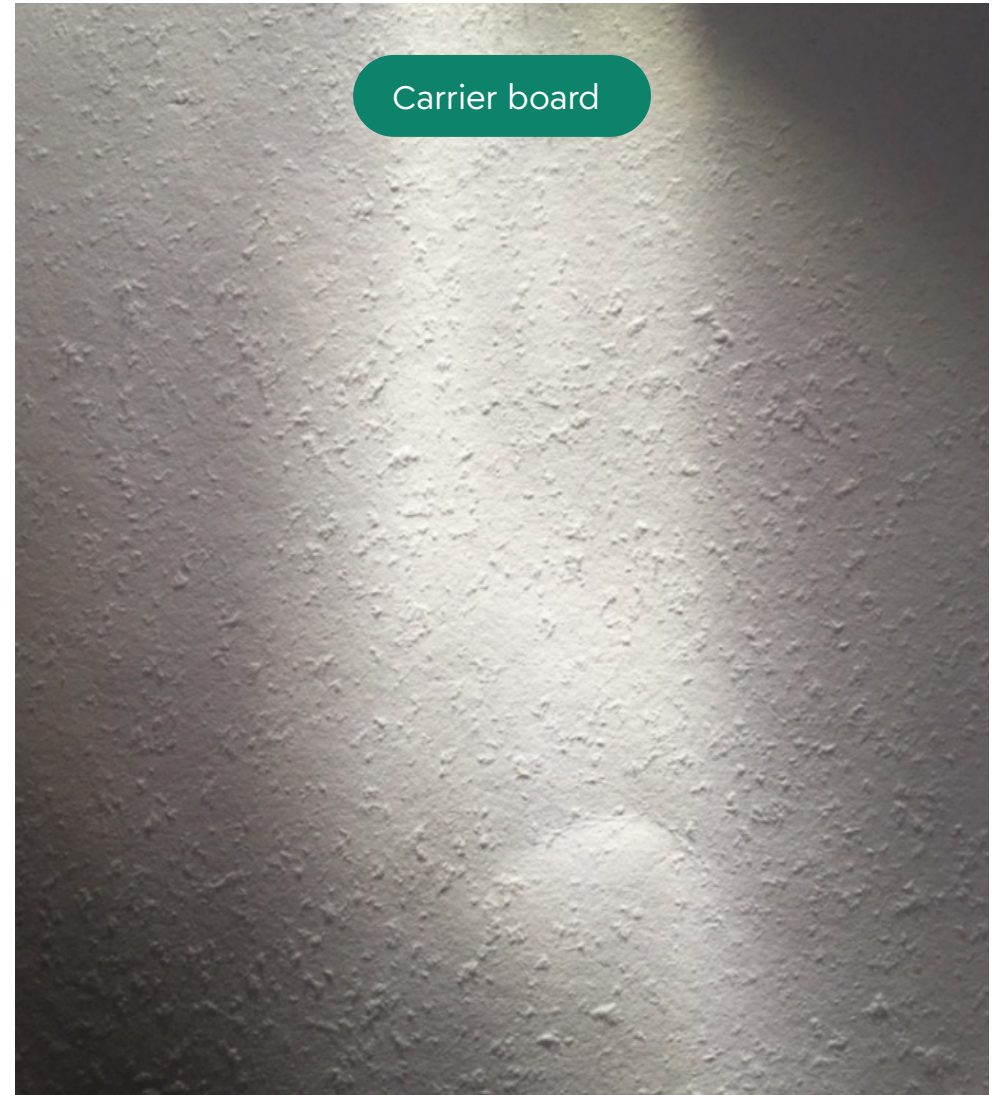
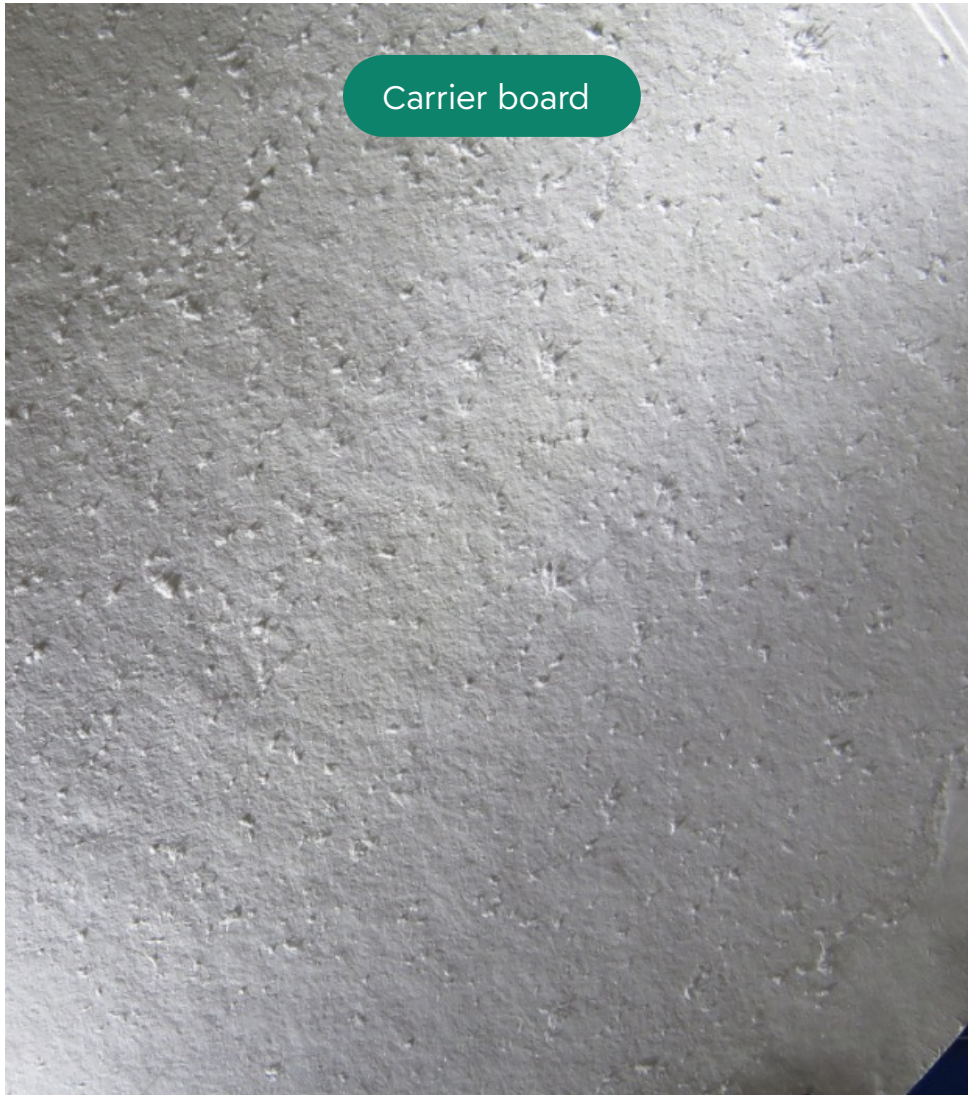


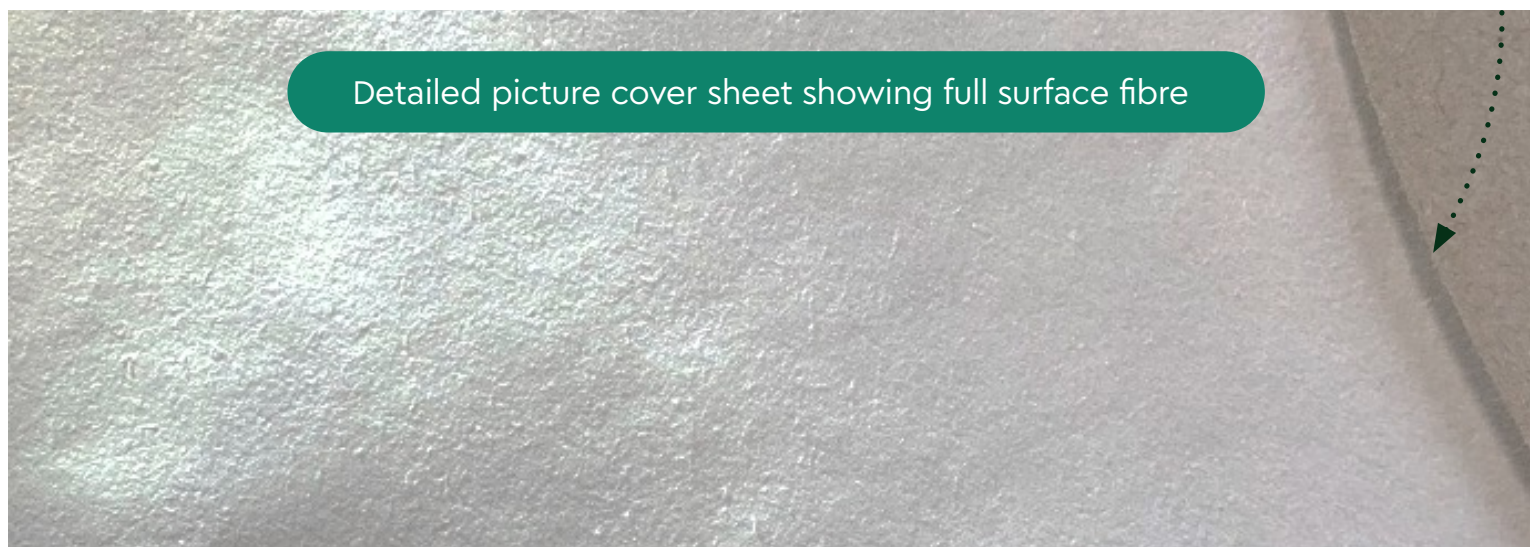
Handsheet on transmitted light with ink and varnish particles.



Carrier board from sheet adhesion test without tear-outs. Ink and varnish particles are attached to the carrier board but don't affect the sheet adhesion test rating.

Level 2 Tackiness partly present: the handsheet can be separated completely from the carrier board and cover sheet. Fibre tears and particles occur on the carrier board, the cover sheet and the handsheet itself.

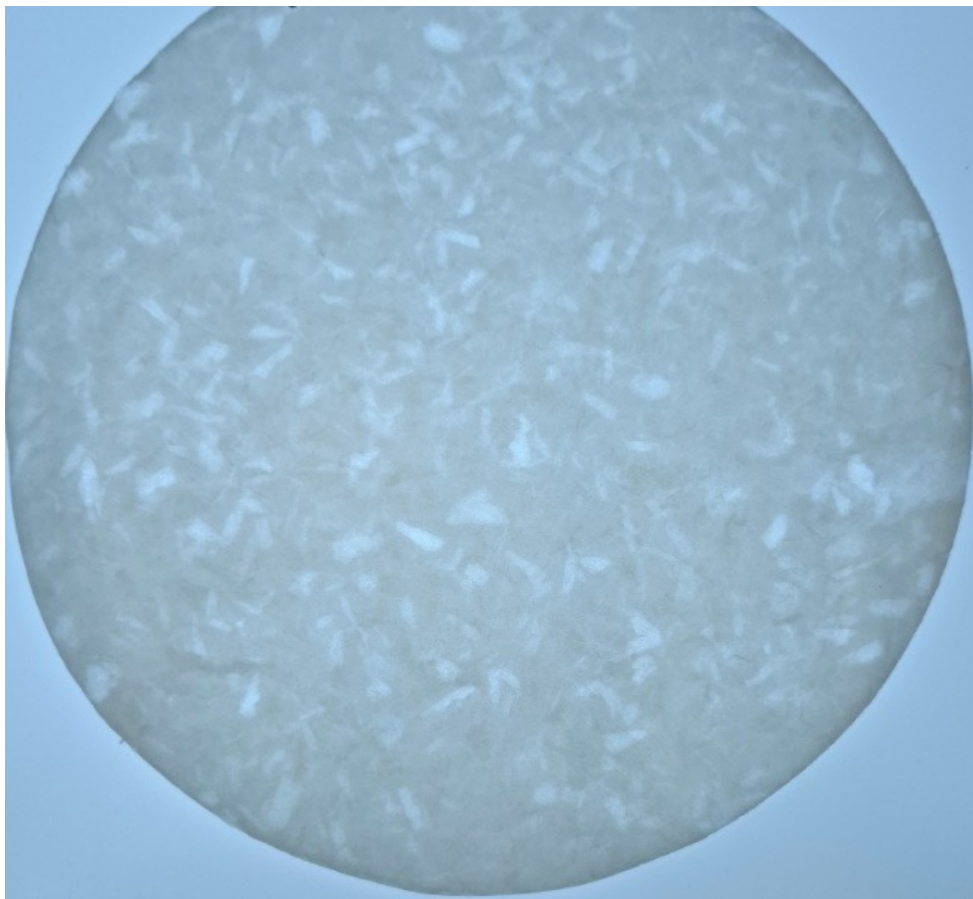




Further examples of carrier boards with Level 2



Further examples of carrier boards with Level 2



Handsheet on transmitted light.



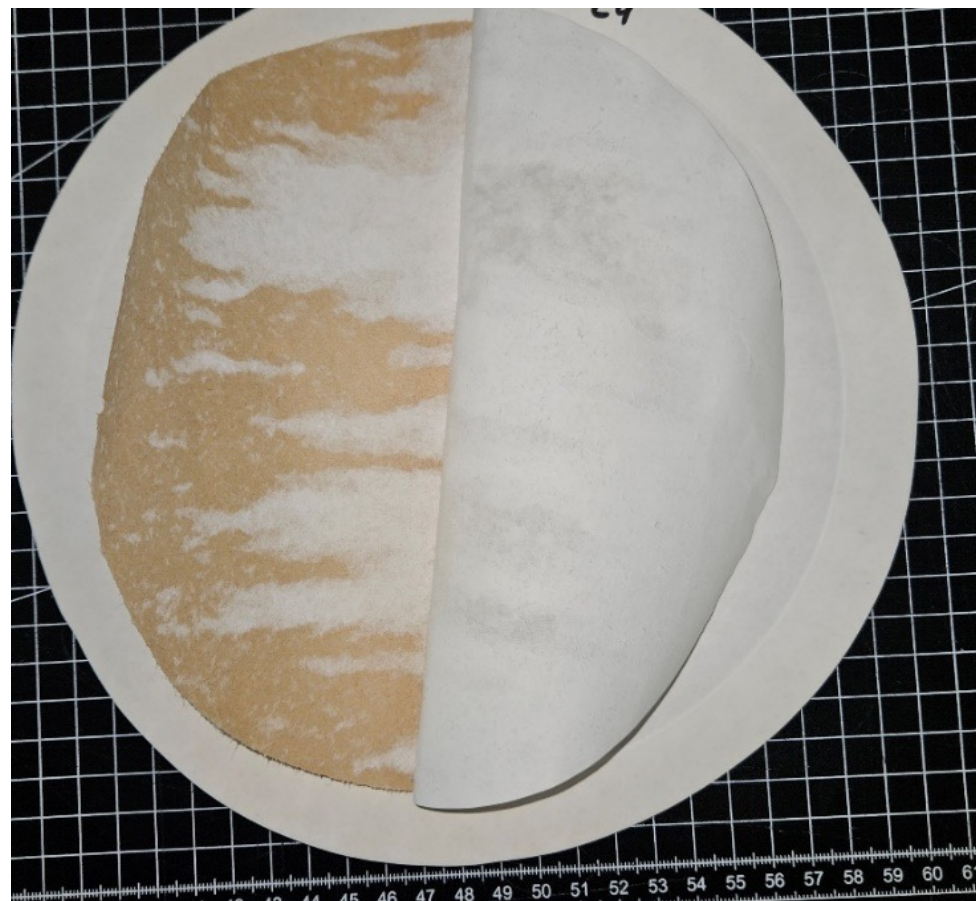
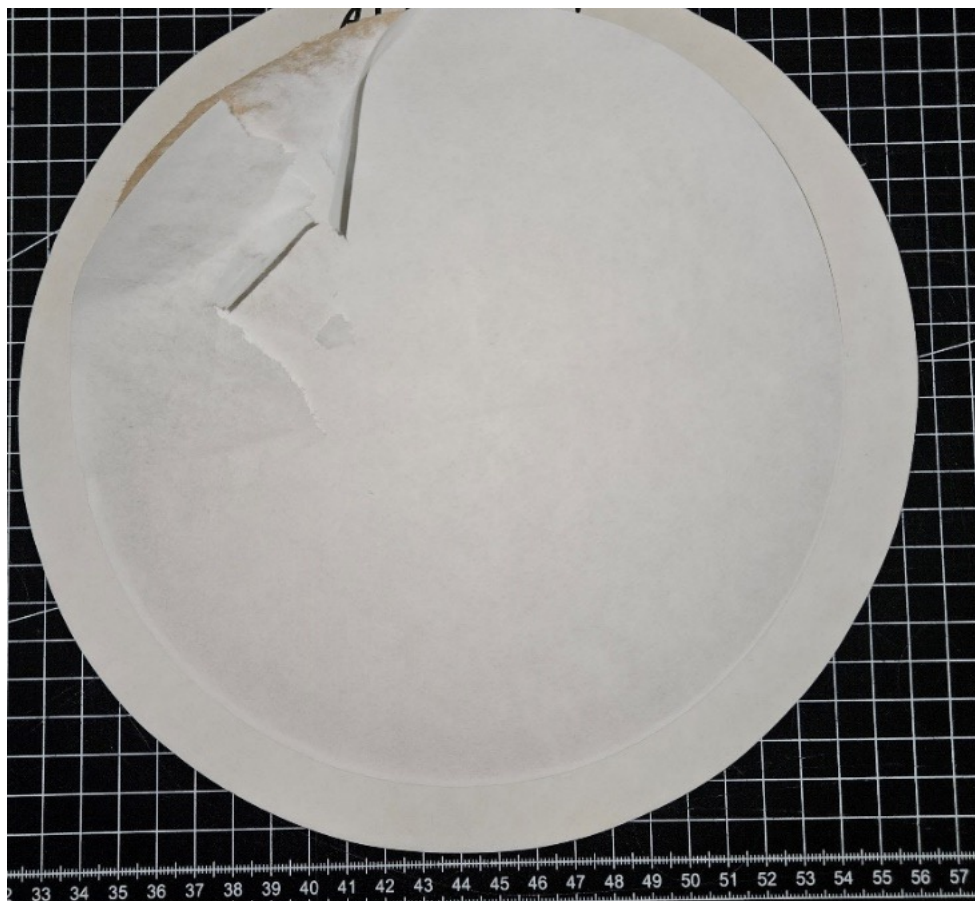
Carrier board from sheet adhesion test with tear-outs over a large area (where polymer particles in the handsheet are observed). Still no breaking of the handsheet is observed.

Level 3 Tackiness present: the handsheet cannot be separated from its carrier board and the cover sheet without visible damage to the handsheet itself. A breaking of the handsheet or holes ($> 1\text{mm}$ [in two dimensions]) occur.



The rating must reflect all sheet adhesion tests conducted, and provide an accurate representation of overall performance. A single occurrence of a defect may be disregarded if it is limited to an isolated hole and does not exhibit any fibre tears.

Further examples of sheet adhesion Level 3



The rating must reflect all sheet adhesion tests conducted, and provide an accurate representation of overall performance. A single occurrence of a defect may be disregarded if it is limited to an isolated hole and does not exhibit any fibre tears.

4. ANNEX REJECT CHARACTERISATION

VERSION JUNE 2026

This Annex is relevant for Part I,
Part II and Part III



Reject characterisation

User guide and purpose

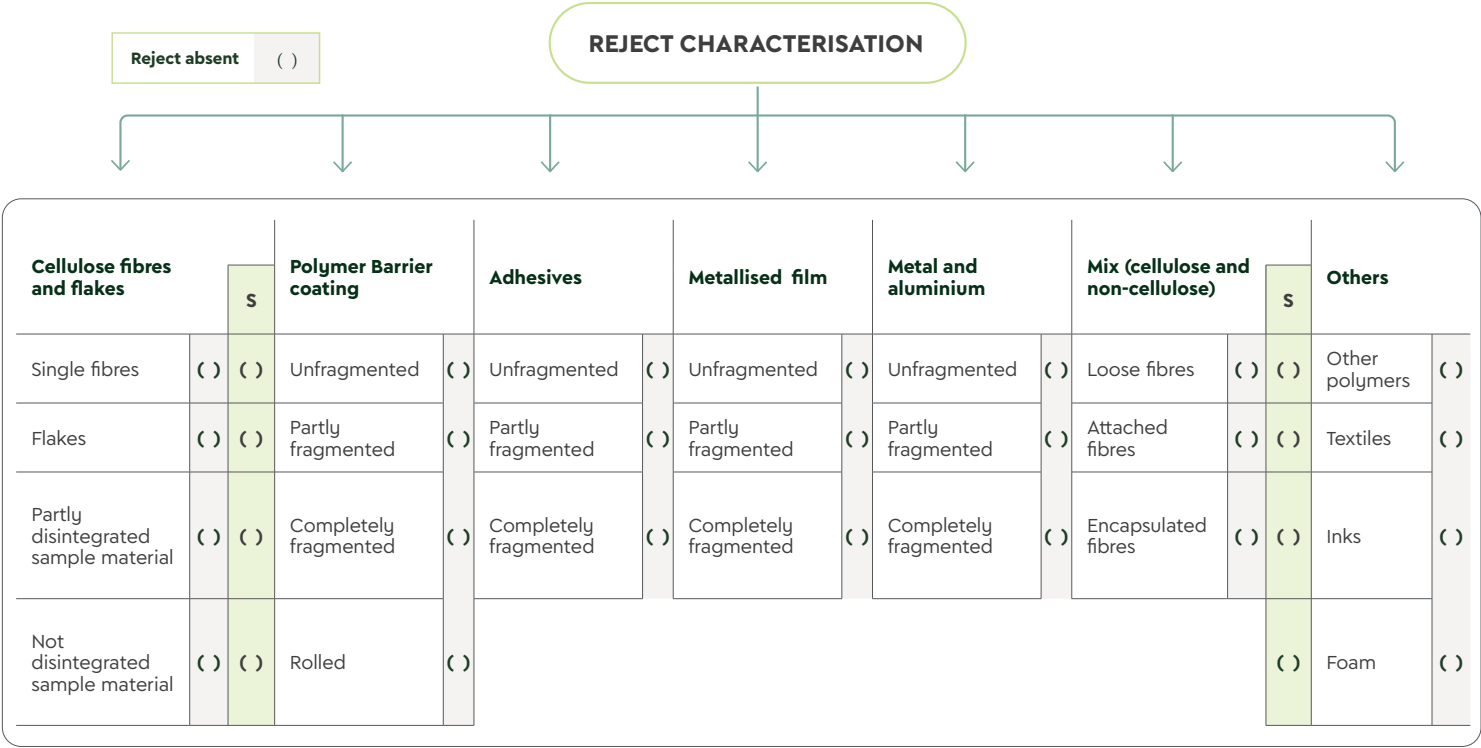
- > The Reject characterisation tree has to be filled for the coarse and fine rejects (separately) in Part I, II and III assessments. This should be done while the rejects are still on the screening plates, before drying, so that the different reject components can be better visualised.
- > The reject characterisation supports decisions on:
 - Part I: Characterisation of coarse and fine reject is needed for assessing “significant amount of fibres” (20 min disintegration option).
 - Part III: Characterisation of the coarse reject is needed for assessing the coarse reject quality CRQ levels.
- > The reject characterisation does not directly impact the calculation of score points in the recyclability evaluation protocol.



Remark: It is planned to incorporate more example pictures in the future versions of this annex.

Reject characterisation tree - Version January 2025 - updated edition (June 2026)

Disintegration	Not disintegrated material Fibrous based pieces with original cut size and /or encapsulated fibres	Partly disintegrated material Fibrous based pieces with sharp edges, smaller than original cut size, not broken down into flakes	
Fragmentation	Unfragmented Original cut size pieces	Partly fragmented Medium pieces (size > 1 cm in one dimension), sharp edges	Completely fragmented Granular pieces (size ≤ 1 cm in one dimension), no sharp edges.
Amount (optional)	Significant (S) Extensive quantity, relevant in Part I and III	Field S is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III)	



Additional comments: _____

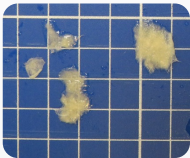
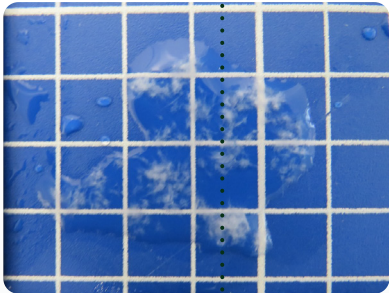
Reject characterisation examples

Cellulose fibres and flakes		S
Single fibres	() ()	
Flakes	() ()	
Partly disintegrated sample material	() ()	
Not disintegrated sample material	() ()	

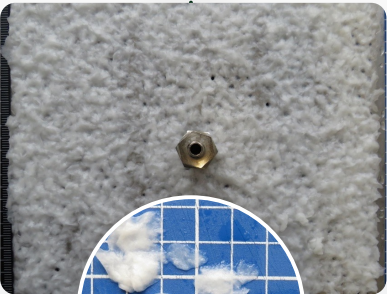
Amount (optional)	Significant (S) Extensive quantity, relevant in Part I and III
Field S is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III)	

Disintegration	Partly disintegrated material	Not disintegrated material
	Fibrous based pieces with sharp edges, smaller than original cut size, not broken down into flakes	Fibrous based pieces with original cut size and/or encapsulated fibres

Single fibres



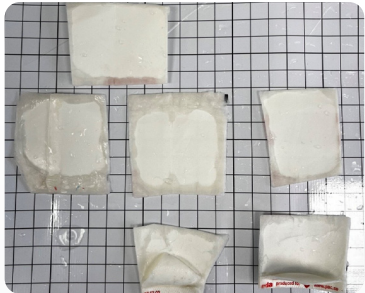
Flakes



Partly disintegrated



Not disintegrated/
original size

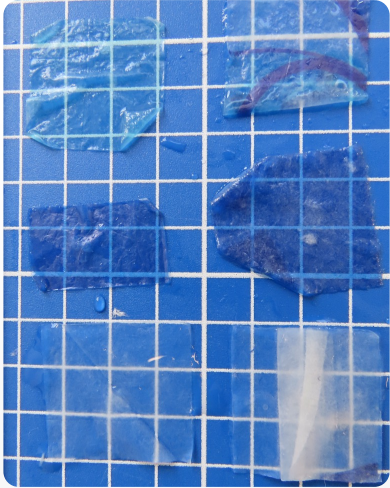


Reject characterisation examples

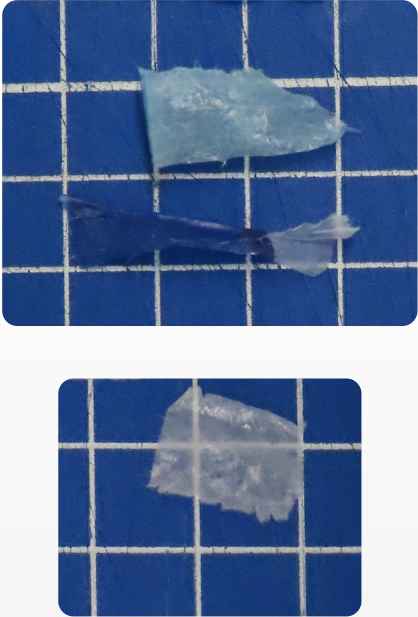
Fragmentation	Unfragmented Original cut size pieces	Partly fragmented Medium pieces (size > 1 cm in one dimension), sharp edges	Completely fragmented Granular pieces (size ≤ 1 cm in one dimension), no sharp edges
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Polymer Barrier coating	
Unfragmented	()
Partly fragmented	()
Completely fragmented	()
Rolled	()

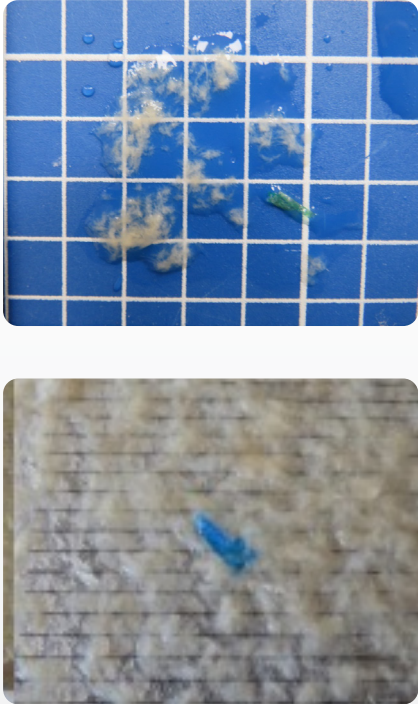
Unfragmented



Partly fragmented



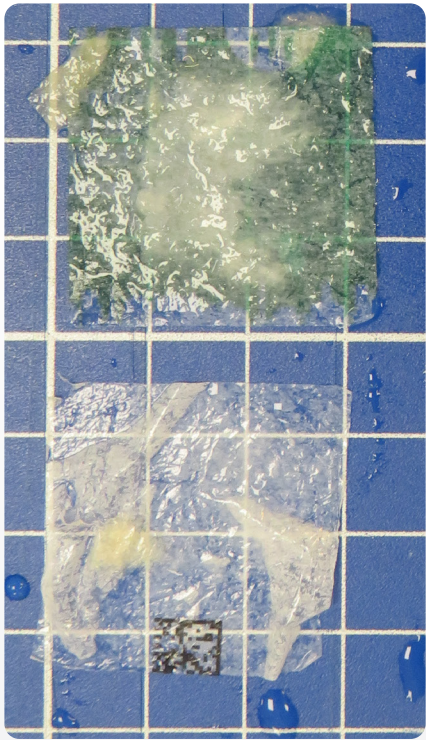
Completely fragmented



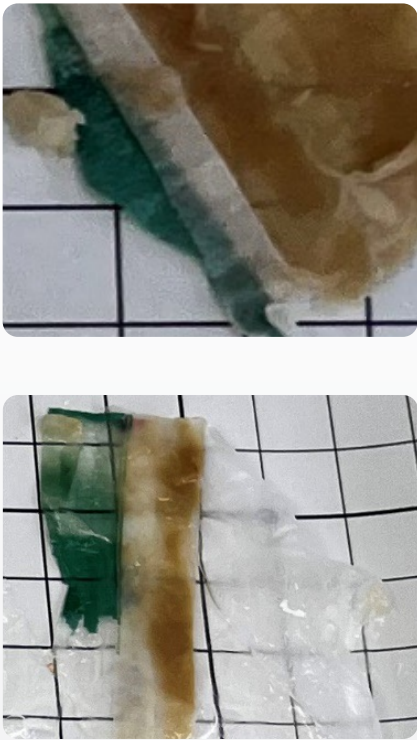
Reject characterisation examples

Mix (cellulose and non-cellulose)		S
Loose fibres	() ()	
Attached fibres	() ()	
Encapsulated fibres	() ()	

Loose fibres



Attached fibres



Encapsulated fibres

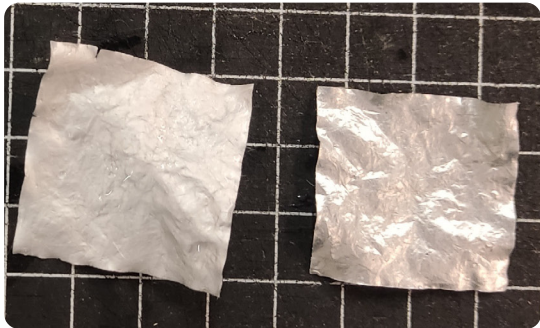


Amount (optional)	Significant (S) Extensive quantity, relevant in Part I and III
Field S is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III)	

Reject characterisation examples

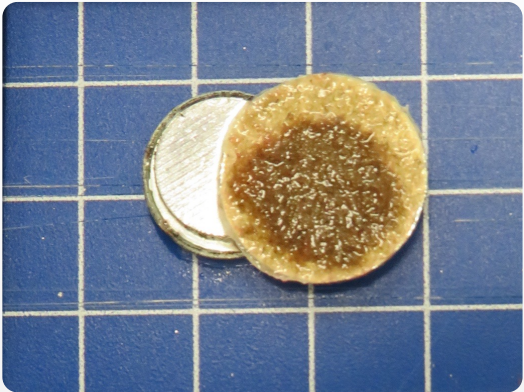
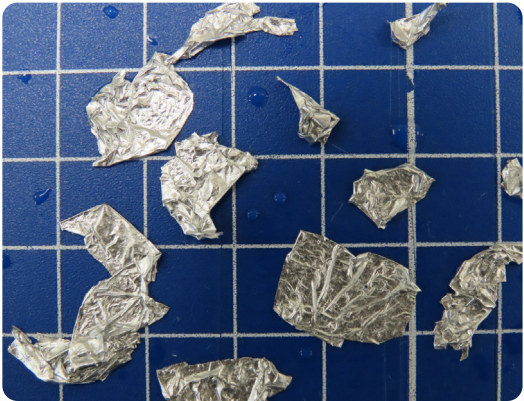
Metallised film

Unfragmented	()
Partly fragmented	()
Completely fragmented	()



Metal and aluminium

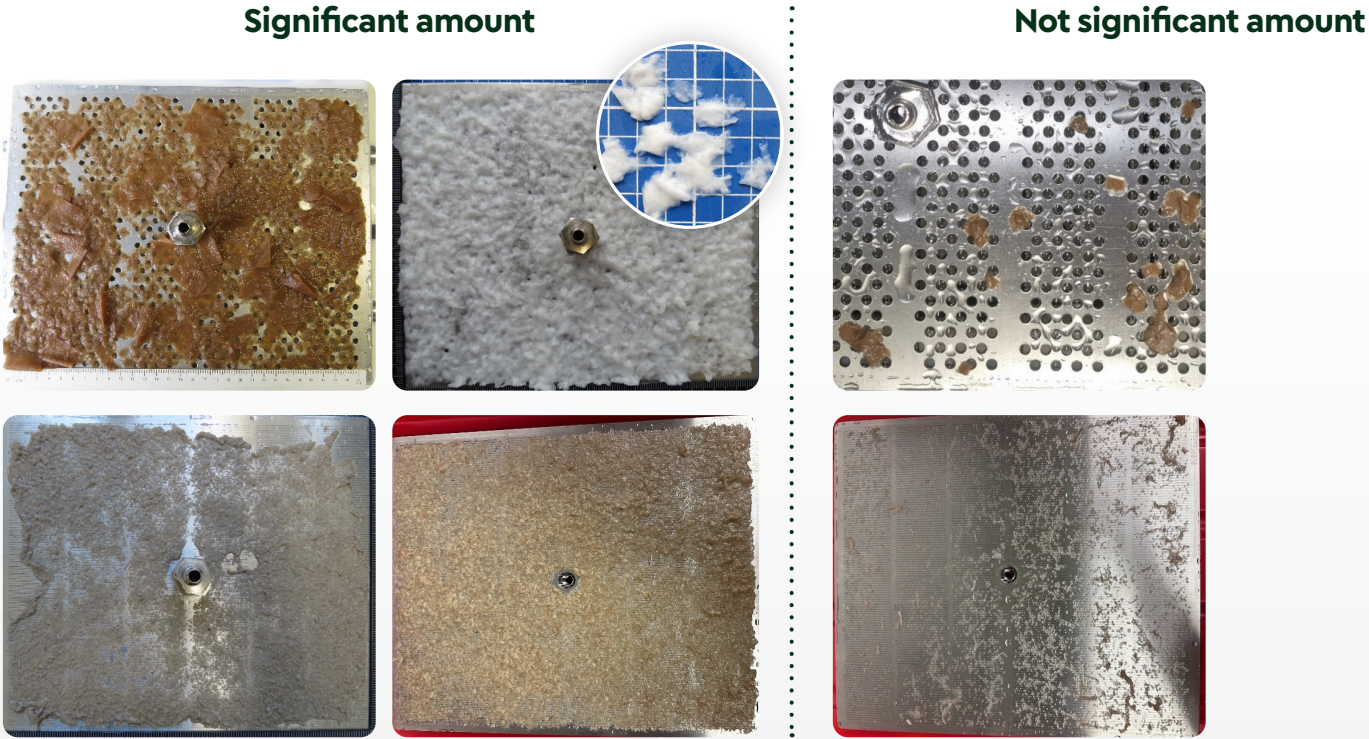
Unfragmented	()
Partly fragmented	()
Completely fragmented	()



Reject characterisation examples

Cellulose fibres and flakes		S
Single fibres	() ()	
Flakes	() ()	
Partly disintegrated sample material	() ()	
Not disintegrated sample material	() ()	

Amount (optional)	Significant (S) Extensive quantity, relevant in Part I and III
Field S is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III)	

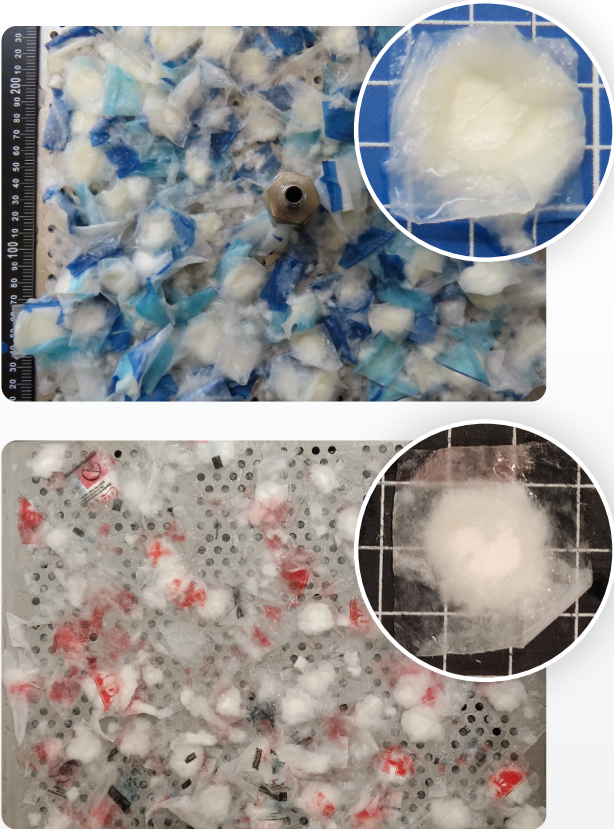


Remark: The 20 min disintegration option in Part I method requires a total screening reject of at least 15% and a significant amount of fibres in the coarse and/or fine reject.

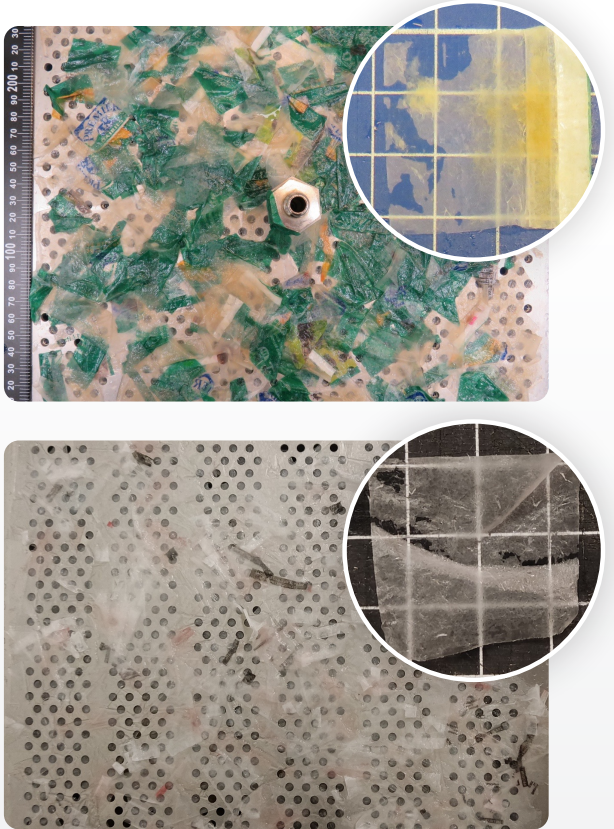
Reject characterisation examples

Mix (cellulose and non-cellulose)		S
Loose fibres	()	()
Attached fibres	()	()
Encapsulated fibres	()	()

Significant amount



Not significant amount



Amount (optional)	Significant (S)
Extensive quantity, relevant in Part I and III	
Field S is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III)	



Remark: The assessment of significant amount of fibres and flakes in the category mix will be further developed in the future versions of this annex.

5. ANNEX COARSE REJECT QUALITY

VERSION JANUARY 2026 - UPDATED EDITION (JUNE 2026)



Annex Coarse reject quality

User guide and purpose

- > The examples given in this annex can be used as a guide for assessing the coarse reject quality in the Part III method with polyAl recycling.
- > The coarse reject quality describes the PolyAl barrier coatings based on the presence of fibres, because fibres are not recyclable in the PolyAl stream.

Coarse reject quality levels description

Level 1 (no deduction) Loose fibres and flakes easy to wash away. Encapsulated fibres in sealed seams are allowed

Level 2 (deduction of 15% *CR) Single fibre layers and flakes attached to polymers (such as barrier coatings, metallised films and others)

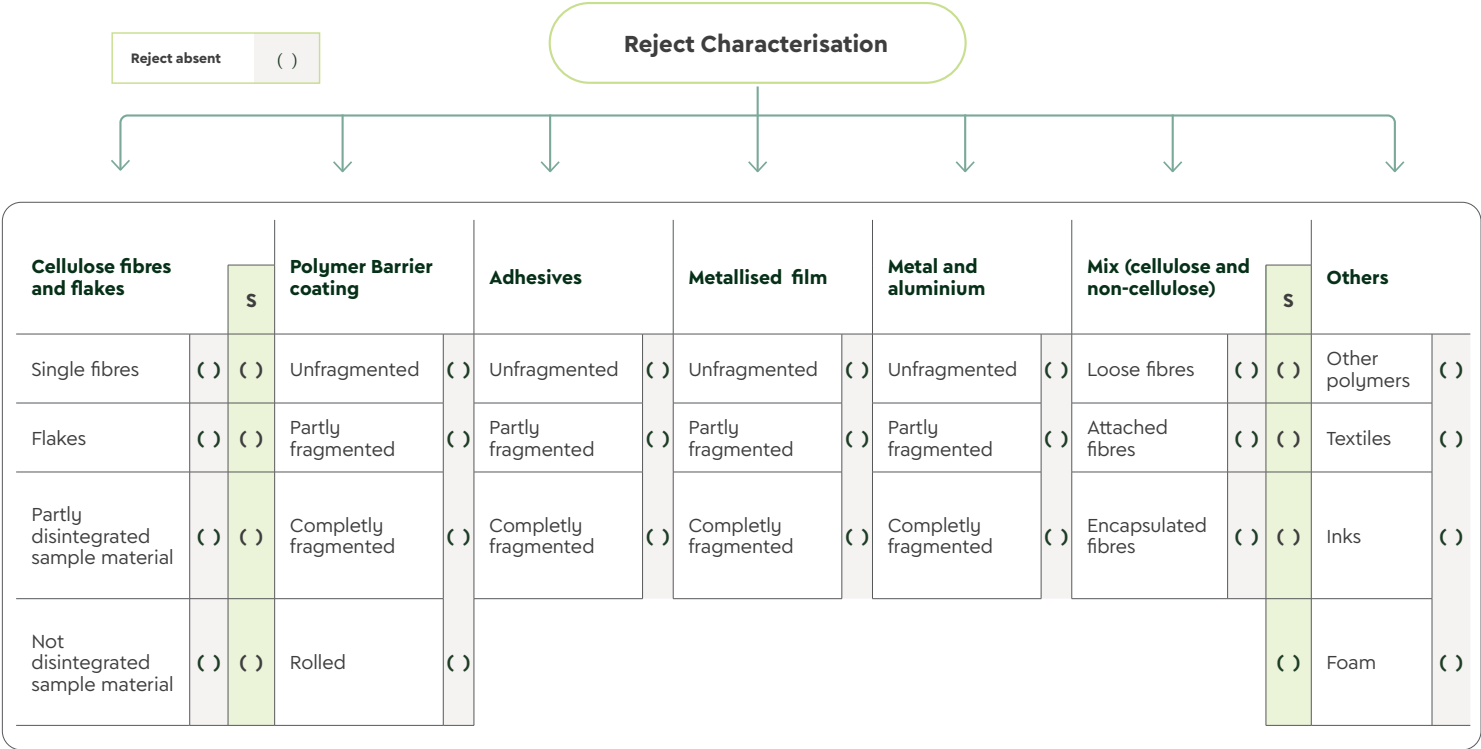
Level 3 (deduction of 30% *CR) Sample material only partly disintegrated, significant amount of fibres and flakes still attached to polymers (such as barrier coatings, metallised films and others)

Level 4 (KO) Sample material not disintegrated

The terms **partly disintegrated**, **not disintegrated** and **significant amount** are defined in the Annex Reject characterisation.

Reject characterisation tree - Version January 2025 - updated edition (June 2026)

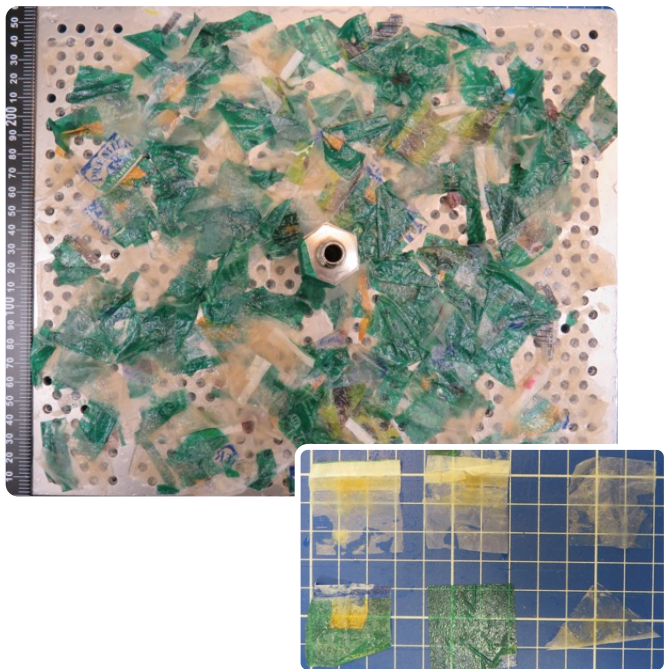
Disintegration	Not disintegrated material Fibrous based pieces with original cut size and /or encapsulated fibres	Partly disintegrated material Fibrous based pieces with sharp edges, smaller than original cut size, not broken down into flakes	
Fragmentation	Unfragmented Original cut size pieces	Partly fragmented Medium pieces (size > 1 cm in one dimension), sharp edges	Completly fragmented Granular pieces (size ≤ 1 cm in one dimension), no sharp edges.
Amount (optional)	Significant (S) Extensive quantity, relevant in Part I and III	Field S is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III)	



Additional comments: _____

Coarse reject quality - Level 1

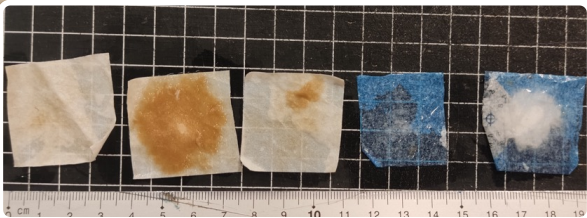
Level 1 (no deduction): Loose fibres and flakes easy to wash away. Encapsulated fibres in sealed seams are allowed.



Cellulose fibres and flakes			Mix (cellulose and non-cellulose)		
		S			S
Single fibres	()	()	Loose fibres	()	()
Flakes	()	()	Attached fibres	()	()
Partly disintegrated sample material	()	()	Encapsulated fibres	()	()
Not disintegrated sample material	()	()			

Coarse reject quality - Level 2

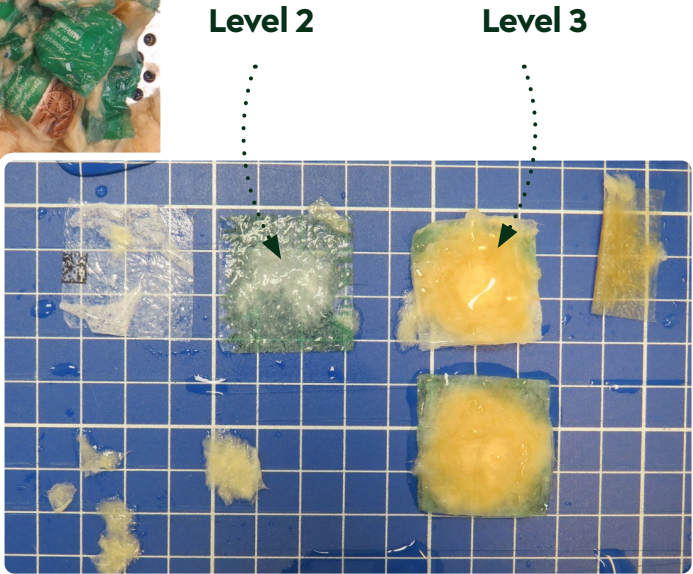
Level 2 (deduction of 15% *CR) Single fibre layers and flakes attached to polymers (such as barrier coatings, metallised films and others).



Cellulose fibres and flakes			Mix (cellulose and non-cellulose)		
		S			S
Single fibres	()	()	Loose fibres	()	()
Flakes	()	()	Attached fibres	()	()
Partly disintegrated sample material	()	()	Encapsulated fibres	()	()
Not disintegrated sample material	()	()			

Coarse reject quality - Level 3

Level 3 (deduction of 30% *CR) partly disintegrated sample material, significant amount of fibres and flakes still attached to polymers (such as barrier coatings, metallised films and others).



Cellulose fibres and flakes			Mix (cellulose and non-cellulose)		
		S			S
Single fibres	()	()	Loose fibres	()	()
Flakes	()	()	Attached fibres	()	()
Partly disintegrated sample material	()	()	Encapsulated fibres	()	()
Not disintegrated sample material	()	()			

Coarse reject quality - Level 4

Level 4 (KO) not disintegrated sample material.



Cellulose fibres and flakes			Mix (cellulose and non-cellulose)		
		S			S
Single fibres	()	()	Loose fibres	()	()
Flakes	()	()	Attached fibres	()	()
Partly disintegrated sample material	()	()	Encapsulated fibres	()	()
Not disintegrated sample material	()	()			

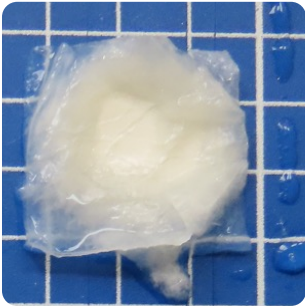
Further examples of coarse reject quality

Level 1

Level 2

Level 3

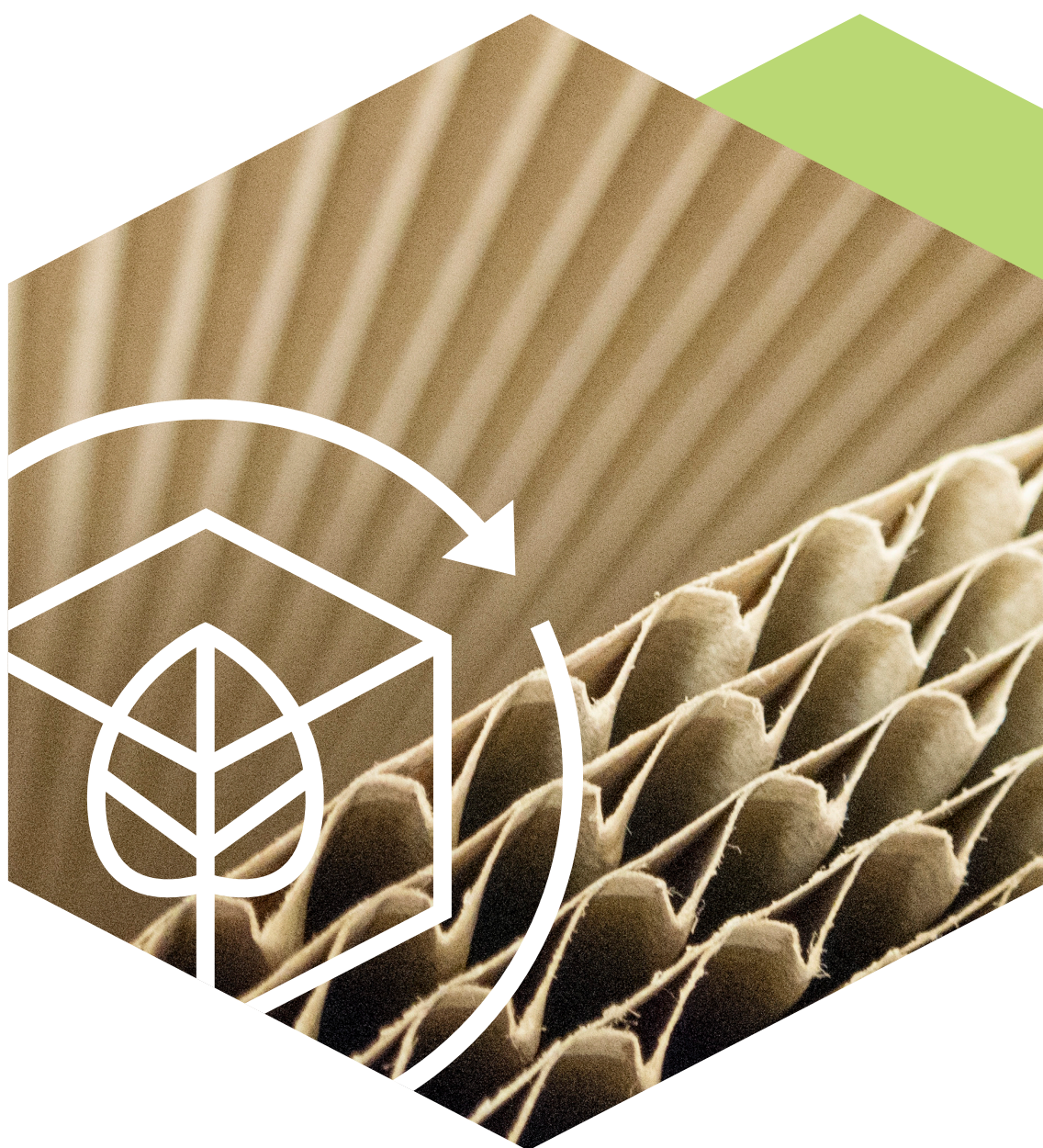
Level 4



6. ANNEX DETAILED WORK DESCRIPTION FOR SAMPLE PREPARATION

VERSION 1, JANUARY 2025 - UPDATED EDITION (JUNE 2026)

This Annex is relevant for Part I,
Part II and Part III



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Figure 8: Paper sample positioned on the cutting mat, with detailed cutting map lines 51

List of abbreviations and symbols

OD	Oven Dry
PPWR	Packaging and Packaging Waste Regulation
WSA	Wet Strength Agents

1 Purpose and scope

This document describes the necessary laboratory procedures for the preparation of sample material to be analysed according to the following recyclability methods:

- > Paper and Board – Recyclability
Laboratory Test Method – Part I: Paper mill with conventional recycling process, Version 3
- > Paper and Board – Recyclability
Laboratory Test Method – Part II: Paper mill with flotation-deinking recycling process, Version 1

- > Paper and Board – Recyclability
Laboratory Test Method – Part III: Paper mill with specialised recycling process (LPC), Version 1

Please note that certain details and differences must be considered depending on the method applied, such as the amount of sample material needed for disintegration. Also note, that this is a living document, where further work will be implemented in the future, such as more or detailed requirements coming from the EU Packaging and Packaging Waste Regulation (PPWR).

2 Sample preparation

2.1 Simple sample preparation for Part I and Part III methods

This topic provides a detailed procedure for preparing simple sample materials, meaning semi-finished products that are flat and do not have different components.

Step Nr.	Notes	Description
1	Material amount	> A minimum amount of 250 g air-dried material is needed to carry out all following measurements.
2	Dry content determination	> Place the sample in the oven at $(105 \pm 2) ^\circ\text{C}$ until it reaches a constant mass to determine the moisture content according to ISO 638-1. The sample must be cooled for around 30 min. in a desiccator before every weighing. > If the packaging sample is too large to fit in the oven, cut it beforehand placing it in the oven and then in the vacuum desiccator. > If the sample contains dry-removed parts (e.g. metal clips), do not count their weight within the 50 g oven dry (OD) material for disintegration. Instead, include it in the reject amount calculation.
3	Cutting the specimen	> If the specimen has the form of a roll, cut it to A4 size. > Put the A4 format sample into a cutting machine or punch and cut/punch it to $(3 \times 3 \pm 0.5) \text{ cm}$. > If cutting the sample in $(3 \times 3 \pm 0.5) \text{ cm}$ pieces is not possible because parts of the sample are already smaller than that (e.g.: the edges of a cup), do it as close as possible to specification (with as little deviation as possible), and note it accordingly in the spreadsheet. > At least 65 g air dry sample has to be cut/ punched.
4	Ageing	> If the sample contains wet strength agents (WSA) and was produced less than 30 days ago, store it for the time needed to complete this ageing and then proceed with the test. > Another option is to perform accelerated ageing by placing the sample in the oven at $(60 \pm 1) ^\circ\text{C}$ for 72 hours. > In case of samples without WSA, make sure the sample is at least 15 days old from the date of production, and therefore no ageing is necessary.
5	Documentation in Excel	> Enter the dry content of the sample in the Excel spreadsheet. > Calculate the sample weight equivalent to 50 g OD. > Enter the experiment date and processor abbreviation in the Excel spreadsheet.

2.2 Complex sample preparation for Part I and Part III methods

2.2.1 Example 1: paper cup

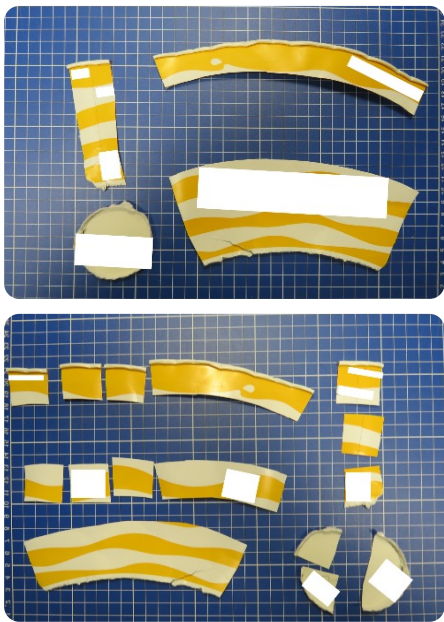
Step Nr.	Notes/Pictures	Description
1	Dry content determination	> Place the sample, or at least each different part of the sample (sealing, gluing, paper, etc.) in the oven at $(105 \pm 2)^{\circ}\text{C}$ to determine the moisture content according to ISO 638-1. > If the packaging sample is too large to fit in the oven, cut it beforehand placing it in the oven and then in the vacuum desiccator. > If the sample contains dry-removed parts (e.g. metal clips or rigid plastic) that can harm the disintegrator, it is allowed to separate them before the disintegration step (dry removal). For that, do not count their weight within the 50 g OD material for disintegration, but instead, include them in the coarse reject calculation. > The use of electronic equipment instead of the oven method mentioned in the standard needs to be reported. Some rejects can behave differently when electronic devices are used in the dry content determination.
2	Cutting the specimen  © 2024 PTS	> Cut the cup along the side gluing all the way to the bottom. > Remove the bottom section by hand. > Cut off the side gluing seam. > Cut off the rolled edge. > Weigh all parts individually and enter their weights in the Excel spreadsheet. > Weigh out sample portions corresponding to 50 g OD and cut it to $(3 \times 3 \pm 0.5)$ cm pieces. > If there is a sample where this is not possible because pieces are smaller than $(3 \times 3 \pm 0.5)$, perform the sample preparation with as little deviation as possible, and note it accordingly in the spreadsheet.
3	Documentation in Excel	> Enter the dry content in Excel spreadsheet. > Enter the weight of each sample components in Excel spreadsheet. > Enter the date and abbreviation of the processor in the Excel spreadsheet.

Figure 1. Example of cutting preparation for cup sample

2.2.2 Example 2: Shopping bag

Step Nr.	Notes/Pictures	Description
1	Dry content determination	> Perform it as in topic 2.1.
2	Cutting the specimen  Figure 2. Example of cutting preparation for shopping bag sample	> Cut the bag along the side gluing all the way to the bottom. > Cut off the bottom. > Cut off the side gluing seam. > Cut off the handle including adhesives. > Metal parts that are not shredded are marked as dry removed. > Weigh all parts individually and enter their weights in the Excel spreadsheet. > Weigh out sample portions corresponding to 50 g OD and cut it into $(3 \times 3 \pm 0.5)$ cm pieces. > If this preparation is not possible because the sample pieces are smaller than $(3 \times 3 \pm 0.5)$ cm, do it as close as possible to specification (with as little deviation as possible), and note it accordingly in the spreadsheet.
3	Documentation in Excel	> Perform it as in topic 2.2.1.

2.2.3 Example 3: Multicomponent packaging

Step Nr.	Notes/Pictures	Description
	If a sample contains several different components, such as polymer and metal components or a user instruction booklet, special care is needed for the sample preparation and testing.	
1	Dry content determination	> Perform it as in topic 2.1.
2	Cutting the specimen  © 2023 CTP	> Cut the folding box along the side gluing all the way to the bottom. > Cut off the bottom. > Cut off the side gluing seam. > Cut off the plastic hanger and mark as dry removed. > Cut off the metal part and mark as dry removed. > Cut off the polymer window including adhesives. > Weigh out the user instructions booklet and establish whether it will be included in the test or not. This should be discussed with the customer beforehand. > Weigh all parts individually and enter their weights in the Excel spreadsheet. > Weigh out sample portions corresponding to 50 g OD and cut into $(3 \times 3 \pm 0.5)$ cm pieces. > If this preparation is not possible because the sample pieces are smaller than $(3 \times 3 \pm 0.5)$ cm, do it as close as possible to specification (with as little deviation as possible), and note it accordingly in the spreadsheet. > The dry removed non-paper components will normally be added to the coarse reject. Only components significantly smaller than 5 mm will be added to the fine reject. > Ensure that the right calculations are used for the total reject with dry-removed components factored in. > Integrated components should only be dry removed when they could cause harm to the disintegration device or heavily influence its behaviour (e.g. big ridged plastic parts or metal). > When the sample is then tested, observe whether the different components plausibly appear during testing.

Figure 3. Example of cutting preparation for multicomponent sample

Overview of the components

Component	Procedure	Explanation
Bottom gluing	> Determine mass share and dry matter content > Include in the disintegration	> Paper part of the sample which can be disintegrated
Side gluing	> Determine mass share and dry matter content > Include in the disintegration	> Paper part of the sample which can be disintegrated
Remaining folding box	> Determine mass share and dry matter content > Include in the disintegration	> Paper part of the sample which can be disintegrated
Plastic hanger (two green pieces)	> Determine mass share and the size of the component > Include in the disintegration	> Non-paper component of the sample, which can be included into the disintegration as there is no harm expected for the disintegration device
Second plastic part	> Determine mass share and the size of the component > If the component is significant smaller than 5 mm it will be added to the coarse reject	> Dry-removed non-paper component of the sample with no adhesive application
Metal closure	> Determine mass share and the size of the component > If the component is significant smaller than 5 mm it will be added to the coarse reject	> Dry-removed non-paper component of the sample with no adhesive application
Polymer window with adhesive application	> Determine mass share of the component	> Non-paper component of the sample with adhesive application has to be included in the disintegration > The possible tacky influence of the adhesive application needs to be observed
User instruction	> Determine mass share of the component > Discuss with the customer the purpose of testing and explain different disposal options for graphic components	> As this is a separatable component, the recommendation is to not include it in the disintegration, because it would be disposed with graphic products

3	Documentation in Excel	> Perform it as in topic 2.2.1.
---	------------------------	---------------------------------

2.2.4 Example 4: Beverage cartons (Focus of the Part III method)

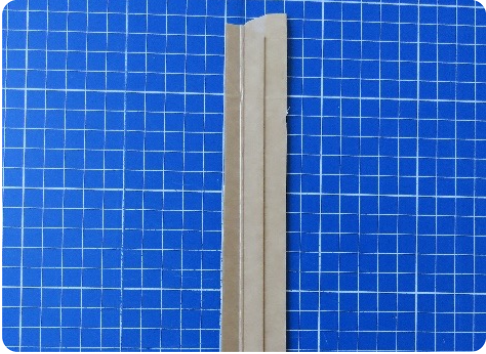
Step Nr.	Notes/Pictures	Description
1	Dry content determination	> Perform it as in topic 2.1.
2	Cutting the specimen Sealed or glued pieces  © 2024 PTS	> Be careful with the cutting size of the sealed or glued pieces of the packaging sample. The two parts tend to separate during the disintegration, and when they are smaller than $(3 \times 3 \text{ cm} \pm 0.5) \text{ cm}$, they might give a false impression of fragmentation in the reject characterisation. Smaller parts can also go through the screening steps. Hence, the whole glue seam component should be ideally cut in a way that the single parts measure at least $2.5 \times 2.5 \text{ cm}$. If this is not possible, keep in mind that smaller pieces might appear in the results. During sample preparation, do not detach glued pieces that would not otherwise be detached by the consumer (e.g. the lateral glue in the picture).
3	Documentation in Excel	> Perform it as in topic 2.2.1.
4	Plastic closures	> If plastic closures can damage the disintegrator, they can be dry removed from the sample before the disintegration, but in this case their weight should be added to the coarse reject. > Sample parts removed before the disintegration should be documented with photos in the test report. Disclaimer: Further deviations and examples on how to handle different components are planned. For example, the handling of the glue used in attached closures.
5	Straws and plastic wrappings  © 2024 PTS	> Sample components that are usually not separated by the end-consumer before disposal, such as a wrapped paper straw from a portion pack, should be tested together. > Use the PPWR as a guide for taking decisions in this regard. > The customer can also be consulted on this matter.

Figure 5. Wrapped straw attached to portion pack

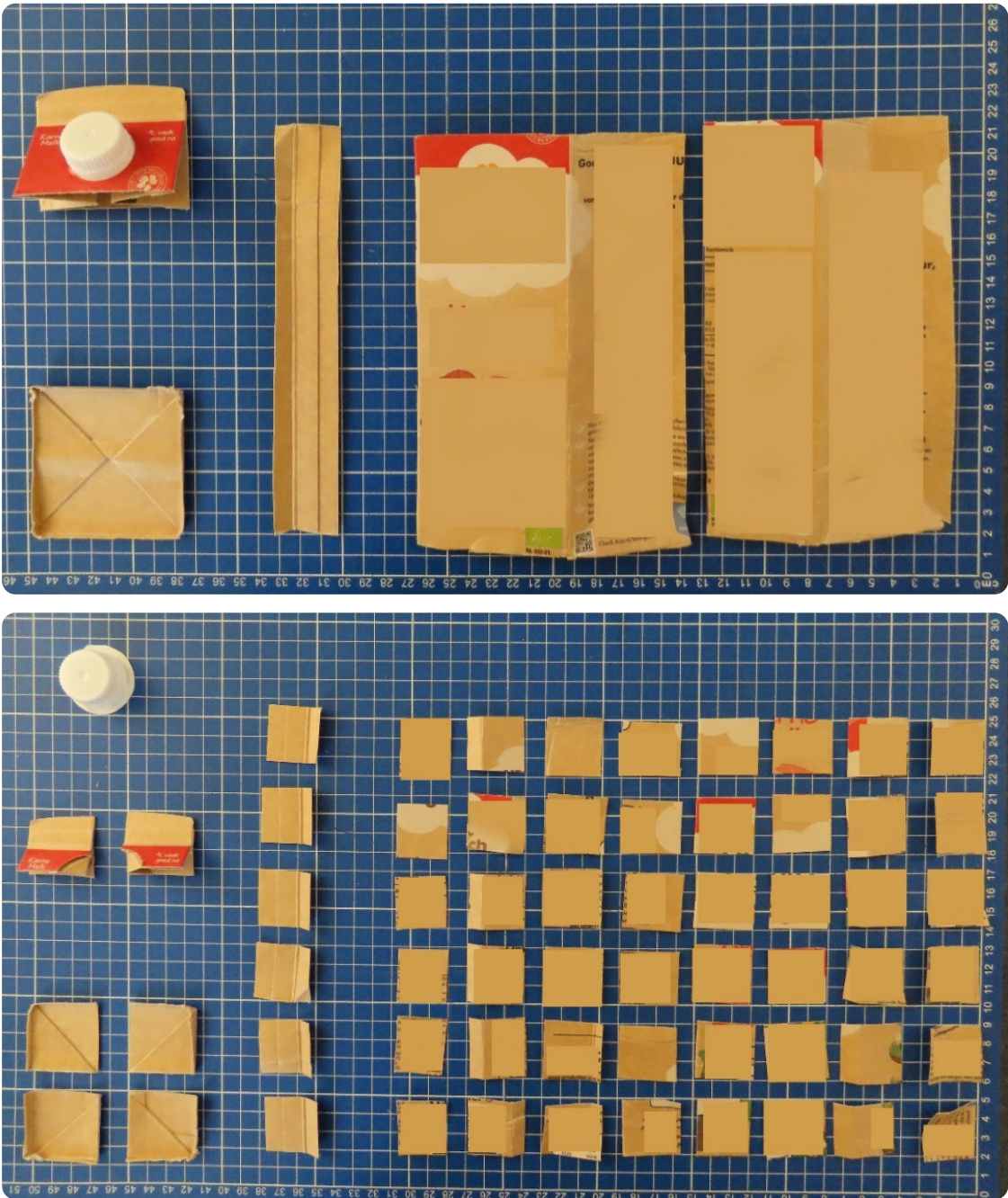
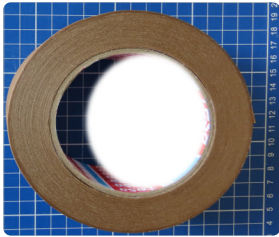
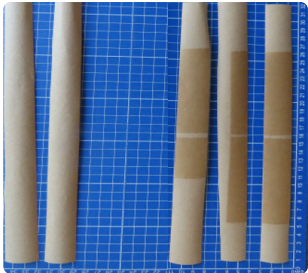
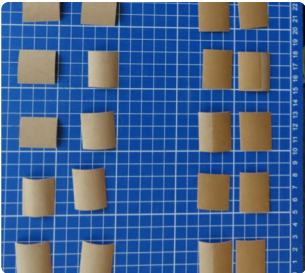
Step Nr.	Notes/Pictures	Description
6	Photo documentation	> Take photographs of how the beverage carton sample was cut using a sense of scale like a cutting matt. If possible, place the cut pieces in a way that gives an impression of how the total beverage carton looked before cutting. Also take pictures of parts that were for some reason not included in the test (e.g. narrow edges). This gives important insights for the reject characterisation (pieces with round or pointy corners, different dimensions, etc.).
7		© 2024 PTS © 2024 PTS

Figure 6. Preparation of beverage carton sample with sealed closure, closures not included in the disintegration step

2.2.5 Packaging aid sample preparation

Step Nr.	Notes/Pictures	Description
1	General information	> The following packaging aid products should be analysed: - Paper-based adhesive tape - Labels - RFID-tags - Others Disclaimer: More examples and pictures will be added in a later version of these guidelines. > They are typically used for the following applications: - E-commerce shipping - Closing of a folding box - Security label - Others Disclaimer: In a later version more application examples could be collected. > The typical base material for packaging aid products are: - Testliner for corrugated board - Pigment coated or non-pigment coated carton board - Paper for flexible packaging - Others > Volume or mass of packaging aid products should be established from the 'typical mass share' identified from collected market data. > It is suggested to have a mass ratio of 5% packaging aid to 95% base substrate.
2	Preparation steps	> Apply adhesive tape or other packaging aid on the selected base material (defined mass share) with constant pressure/compacting, e.g. using a final roll or couching roll. > With regards to the age and the dry matter content of the individual components, weigh out sample portions corresponding to 50 g OD and cut it into $(3 \times 3 \pm 0.5)$ cm pieces. > If this preparation is not possible because the sample or components of the sample are than $(3 \times 3 \pm 0.5)$ cm, do it as close as possible to specification (with as little deviation as possible), and note it accordingly in the spreadsheet.

Step Nr.	Notes/Pictures	Description
3	1. Initial sample Adhesive tape  2. Adhesive tape applied to test liner with defined mass share    3. Sample material cut into 3 x 3 cm   © 2024 PTS	
4	Documentation in Excel	> Perform it as in topic 2.2.1.

3 Sample preparation for Part II method

3.1 Sample preparation and dilution water and chemical preparation

This topic describes the necessary procedures for the Part II sample preparation. In the event of a complex sample, please see chapter 2.2 for the appropriate preparation and adjust the procedure to the specific needs of Part II, as described below.

Step Nr.	Notes	Description
1	Required sample amount	> For the disintegration of Batch 1 and 2, around 1500 g in total of the sample material is needed. - For Batch 1 the amount of chemicals needed depends on the ash and the dry matter content of the sample material. The amount of chemicals corresponds to the sample needed, calculated in the Laboratory Excel Spreadsheet. - The amount of chemicals needed for Batch 2, depends on the pH value obtained in Batch 1.
2	Ageing	> The sample material needed for Batch 1 is not subject to accelerated ageing. But if the sample contains WSA and was produced less than 30 days prior to testing, store it for the time needed to complete the ageing process before proceeding with the test. For samples without WSA, make sure the material is at least 15 days' old from the date of production, and therefore no ageing is necessary. > For Batch 2, place the samples in a drying oven for accelerated ageing at $(60 \pm 3) ^\circ\text{C}$ for 72 h. Individual stacks should not contain more than 100 g per A4 equivalent.
3	Determination of dry matter content	> Place a representative amount of the sample in the oven at $(105 \pm 2) ^\circ\text{C}$ until it reaches a constant mass value to determine the moisture content according to ISO 638-2. The sample must be cooled for around 10 min. in a desiccator before weighing. > If the sample is too large to fit in the oven, cut it before placing in the oven and then to the vacuum desiccator. > If the sample contains dry-removable parts (e.g. metal clips), do not count their weight within the required sample amount for disintegration. Instead, include it in the reject amount calculation.
4	Determination of ash content	> Muffle furnace according to ISO 1762.

Step Nr.	Notes	Description								
5	Cutting the specimen	> Cut the samples into pieces of about (3 x 3 ± 0.5) cm. > If there is a sample where this is not possible, then perform the preparation with as little deviation as possible, and note it accordingly in the spreadsheet. > At least 600 g air dry sample has to be cut/punched.								
6	Documentation in Excel	> Enter the dry content of the sample in the Excel spreadsheet. > After adding the dry matter and ash content of the sample to the Excel Lab Result sheet, the sample weight equivalent to 200 g oven-dry fibres is calculated automatically. > Enter the experiment date and processor abbreviation in the Excel spreadsheet.								
7	Preparation of dilution water	> During the laboratory process only use deionised water adjusted to a calcium hardness of 3.21 mmol/l, equivalent to 128 mg Ca²⁺/l. > To obtain the requested water hardness, add 472 mg/l calcium chloride dihydrate (CaCl₂ · 2 H₂O) to deionised water. This is equivalent to 128 mg Ca²⁺/l. > The dilution water should be stored in a temperature-controlled water bath to maintain a constant temperature (45 ± 2) °C. > It is also possible to heat part of the dilution water to a considerably higher temperature by means of a water heater, and successively adding cold dilution water until the desired temperature has been reached.								
8	Preparation of chemicals	> It is advisable to prepare the chemicals by mass as volume is affected by temperature. The standard deinking recipe is as follows:<table><tr><td>Sodium hydroxide</td><td>0.6% (100 %)</td></tr><tr><td>Sodium silicate</td><td>1.8% (1,3–1,4 g/cm³)</td></tr><tr><td>Hydrogen peroxide</td><td>0.7% (related to a H₂O₂ concentration of 100 %)</td></tr><tr><td>Oleic acid</td><td>0.8% (extra pure)</td></tr></table> > Prepare a total amount of 2000 g of deinking solution which will be sufficient for several tests. > Dissolve 6 g of sodium hydroxide in approximately 600 g of deionised water, heat slowly to approximately 60 °C, and proceed by adding 8 g of oleic acid. > Mix until the solution is clear, then add 18 g of sodium silicate, and fill up with deionised water to 2000 g. > The formation of soap reduces the alkalinity (0.114% sodium hydroxide is needed to neutralise the oleic acid. > In addition, prepare 100 g of hydrogen peroxide solution for each test, using deionised cold water. > The required amount of deinking solution and of hydrogen peroxide is dependent on the sample amount used for pulping and shall be calculated individually. > Do not use a deinking solution which is older than one week.	Sodium hydroxide	0.6% (100 %)	Sodium silicate	1.8% (1,3–1,4 g/cm ³)	Hydrogen peroxide	0.7% (related to a H ₂ O ₂ concentration of 100 %)	Oleic acid	0.8% (extra pure)
Sodium hydroxide	0.6% (100 %)									
Sodium silicate	1.8% (1,3–1,4 g/cm ³)									
Hydrogen peroxide	0.7% (related to a H ₂ O ₂ concentration of 100 %)									
Oleic acid	0.8% (extra pure)									

4 Photo documentation

Step Nr.	Notes	Description
1	 Figure 8. Paper sample positioned on the cutting mat, with detailed cutting map lines	> Photograph the front and back side, and all individual parts/ components of the specimen on the cutting mat (if available) so that the scale of the mat can be seen. > If possible, place the specimen so that it lies against a mat line. Additionally a ruler can be placed near to the sample. > The photo should be made as straight as possible (use the cutting mat or ruler as an aid). > Photographs of specific sample portions are recommended for complex specimens.

5 Further documentation

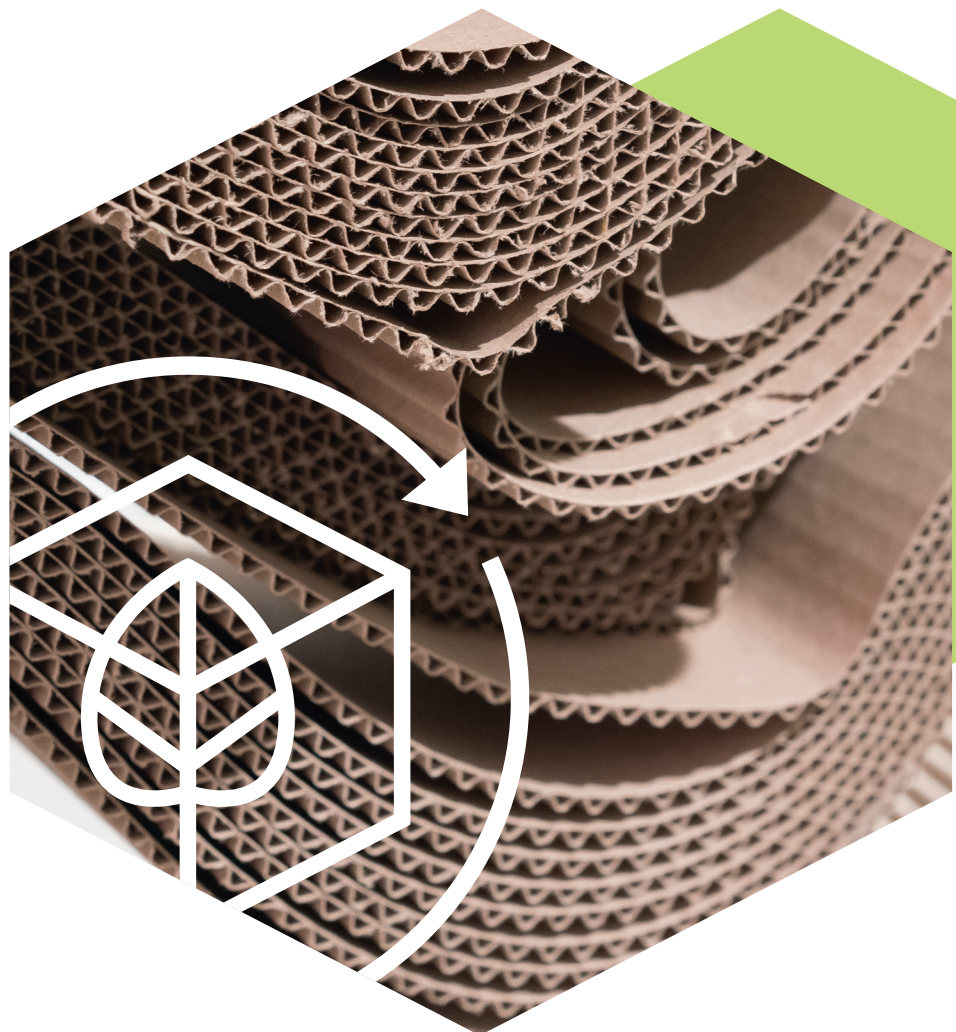
Please use corresponding laboratory report template for further documentation.

List of changes

Rev.	Valid from	Author	Change(s)
01/2023-03-27	March 2023	Marie Geißler	First version of the detailed work description
01/2023-09-18	September 2023	Marie Geißler	Adding multicomponent sample
01/2024-10-30	October 2024	Vanessa Wortmann	Preparation of beverage carton samples added
01/2025-01-01	January 2025	Marie Geißler	Adding Part II needs into document, restructuring of the document

7. ANNEX DETAILED WORK DESCRIPTION: RECYCLABILITY LABORATORY TEST METHOD – PART III PAPER MILL WITH SPECIALISED RECYCLING PROCESS (LPC)

VERSION 2.1, APRIL 2025 - UPDATED EDITION (JUNE 2026)



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List of abbreviations and symbols

AC	Accept from coarse screening
ASH	Ash content
AF	Accept from fine screening
AC/AF X	Accept from coarse/fine screening after a X min disintegration
CR	Coarse reject
CRQ	Coarse reject quality
FR	Fine reject
RC	Reject characterisation
RR	Recyclable reject
OD	Oven dry
PolyAl	Polymer and Aluminium
SA	Sheet adhesion
TI	Tensile index
LPC	Liquid packaging cartons
VI	Visual impurities

1 Purpose and scope

This work instruction specifies the procedure for the **determination of the technical recyclability according to the Paper and Board – Recyclability Laboratory Test Method – Part III – specialised recycling process (LPC) Version 3, January 2025 - updated edition (June 2026)**.

This document aims to address difficulties and/or issues with clarity in the method implementation.

This document includes references to the: Paper and Board – Recyclability Laboratory Test Method – Part I – Paper mill with conventional recycling process Version 3, January 2025 - updated edition (June 2026) and Detailed work description: Recyclability Laboratory Test Method – Part I: Paper mill with conventional recycling process. Changes in these documents also apply to this one.

2 Sample preparation

This step should be carried out as described in the detailed work description for sample preparation Rev. 01/2025-01-01 - updated edition (June 2026)

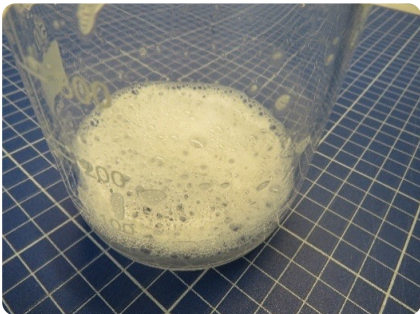
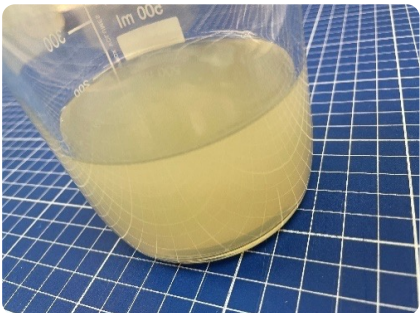
3 Disintegration

This step should be performed as explained in the detailed work description: Recyclability Laboratory Test Method – Part I: Paper mill with conventional recycling process Rev. 09/2025-01-01 - updated edition (June 2026). Especially for this method, it is very important to avoid the soaking effect during disintegration.

Step Nr.	Notes/Pictures	Description
Standard disintegrator following the ISO 5263-1		
1	Disintegrator check	> Check the disintegrator regularly to ensure the following conditions: - The rotor shaft must run smoothly and be always positioned centrally in the vessel. - The rotor must run at a specified speed. - The rotor blades must be correctly adjusted (this can be checked with the help of a gauge). - The rotor blades must have specified dimensions (see Annex Standard 5263-1) and cannot be damaged. > If the device is used properly, the other dimensions of the impact device should not change. However, they must be checked at regular intervals.
2	Dilution 	> Weigh 50 g OD pulp based on the dry content. > Note down the real sample amount weighed in; considering that they may be a little less or more than the sample amount equivalent to 50 g OD may be used due to 3 x 3 cm pieces.
3	Disintegration 	> Transfer the sample to the standard disintegrator container. > Dilute the sample in the disintegrator using tap water at $(40 \pm 1)^\circ\text{C}$ and with a mildly alkaline pH (7-8) until reaching a stock consistency of 2.5%. > The dilution water is important for the determination of the evaporation residue. If possible, already take extra 200 g of the water and save it for the optional determination of the evaporation residue. > The diluted sample should be disintegrated immediately after the dilution to avoid soaking. Do not take longer than 30 s to do this. > Set the revolution counter to 30,000, which is equivalent to 10 min. of disintegration time. > After completion of the disintegration process, transfer the sample to a beaker, without adding any water to it. > Homogenise the sample in the beaker using a spoon or ladle and take the amount needed for the filtration analysis, approximately 300 g. > Only after the previous step a spray bottle with tap water can be used to recover the sample attached to the disintegrator and place it into the beaker with the rest of the sample. > If there are undisintegrated pieces attached to the walls of the disintegrator vessel, they should not be added in the screening step. Instead, they need to be photographed and weighed separately, and their dry weight then added to the coarse reject amount.

4 Filtrate analysis (optional)

If the filtrate analysis is carried out, it should follow the steps described in the detailed work description: Recyclability Laboratory Test Method – Part I: Paper mill with conventional recycling process Rev. 09/2025-01-01 - updated edition (June 2026)

Step Nr.	Notes/Pictures	Description
1	Sampling  © 2022 PTS Figure 3. Total stock in a beaker	> Perform the filtration immediately after the disintegration step. > Homogenise the total stock in the beaker using a spoon or ladle. > Weigh out approximately 300 g of the total stock using the analytical balance.
2	Filtration  © 2024 PTS Figure 4. Filtration using Buchner filter  © 2024 PTS Figure 5. Filtrate presenting foam  © 2024 PTS Figure 6. Filtrate presenting colouration	> Use the suction flask and the Büchner funnel exclusively for water analysis tests. > Place a filter paper (150 mm grade 388, basis weight 84 g/m², filtration speed 10 s/10 ml, deposition range 12-15 µm) onto the Büchner funnel (150 mm). > Attach the vacuum hose and turn the vacuum pump on. > Filter 100 g of the total stock through the Büchner funnel, if possible, without wetting the filter paper. To prevent the sample from reaching the flask without passing through the filter, first pour a few drops of the sample to set the filter firmly on the funnel and then proceed with the rest. > Use the filtrate to rinse the suction flask and discard it. > Separate the filter cake from the filter paper and return it to the total stock in the beaker. > Place another filter paper (150 mm grade 388, basis weight 84 g/m², filtration speed 10 s/10 ml, deposition range 12-15 µm) onto the Büchner funnel (150 mm). > Filter another 200 g of the total stock via a Büchner funnel. To produce a filter cake as homogeneous as possible, first pour the sample over the filter and then turn the pump on. > Retrieve the filtrate from the suction flask and filter it via the Büchner funnel again using the same paper filter. Pour the loop sample very carefully to do not cause big holes on the filter cake. > Pour the filtrate into a clean glass bottle and label it. > Photograph the paper filter with the filter cake in transmitted light. > Photograph the filtrate using a suitable background, especially if it presents some colouration. > Return the filter cake to the pulp stock as described above. > After use, wash the funnel and the flask with deionised water.

4.1 Evaporation residue

Step Nr.	Notes/Pictures	Description
1	Evaporation residue  © 2022 PTS Figure 7. Evaporation residue (white stain) left on the aluminium tray	> You can decide to prepare the evaporation residue test right after the filtration or at the end of the whole test. The second option is preferable because the disintegrated sample does not have to stand as long before the screening steps. If you decide for the second option leave the filtrate in the bottle at room temperature. > Pour a known amount (e.g. 70 g) of filtrate on a previously weighed aluminium tray. > The size of aluminium tray must be compatible with the amount of liquid poured on it and the size of the oven. > Note down the mass of the empty aluminium tray 'm1' and the mass of the filtrate that was taken in 'm2'. > Repeat the procedure to have a double determination of the evaporation residue. > Place the trays with the filtrate and the water in the drying oven at $(105 \pm 2)^{\circ}\text{C}$ to remove the solvent. > Determine the residue in line with DIN 38409-1:1987-01. > When there is visibly no more solvent in the tray, take it out of the oven for the first time. > In order to control the residue mass, cool the tray in the desiccator for approximately 30 min. before weighing it. > Repeat the process until the residue reaches a constant mass value 'm3', and note it down. > As the packaging sample is disintegrated with tap water, it is necessary to consider its influence on the evaporation residue. > Measure the evaporation residue of the tap water, performing the procedures described above. The water does not need to be filtrated. > Enter all values in the Excel spreadsheet.
2	Calculation	> The evaporation residue (ER) of the sample is calculated as follows: $ER \text{ filtrate } (g \text{ residue}/g \text{ filtrate}) = \frac{m3 (g) - m1 (g)}{m2 (g)}$ $ER \text{ sample } (g \text{ residue}/g \text{ filtrate}) = ER \text{ filtrate } (g/g) - ER \text{ tap water } (g/g)$ m₁ = mass of the empty aluminium tray m₂ = mass of the filtrate that was taken in m₃ = mass of tray after drying the filtrate The evaporation residue can be calculated in relation to the used stock suspension. As approximately 50 g of sample were disintegrated in 2 L of water, the packaging mass is 25 g pulp /L. Thus, the evaporation residue in percentage is calculated as follows: $\frac{ER \text{ sample } (\frac{g}{g})}{Packaging \text{ mass } (\frac{g}{L})} \times 1000 (\frac{g}{L}) \times 100\% = ER \text{ sample } (\%)$ The results must be given with one decimal place.

5 Screening

5.1 Reject characterisation

This step should be performed as described the detailed work description: Recyclability Laboratory Test Method – Part I: Paper mill with conventional recycling process Rev. 09/2025-01-01 - updated edition (June 2026), including the remarks about the reject quality levels found in this document.

Step Nr. Notes/Pictures

Description

1

Disintegration	Not disintegrated material Fibrous based pieces with original cut size and /or encapsulated fibres	Partly disintegrated material Fibrous based pieces with sharp edges, smaller than original cut size, not broken down into flakes	
Fragmentation	Unfragmented Original cut size pieces	Partly fragmented Medium pieces (size > 1 cm in one dimension), sharp edges	Completely fragmented Granular pieces (size ≤ 1 cm in one dimension), no sharp edges.
Amount (optional)	Significant (S) Extensive quantity, relevant in Part I and III	Field S is optional, but crucial for decisions on 20 min disintegration (Part I) and coarse reject quality levels (Part III)	

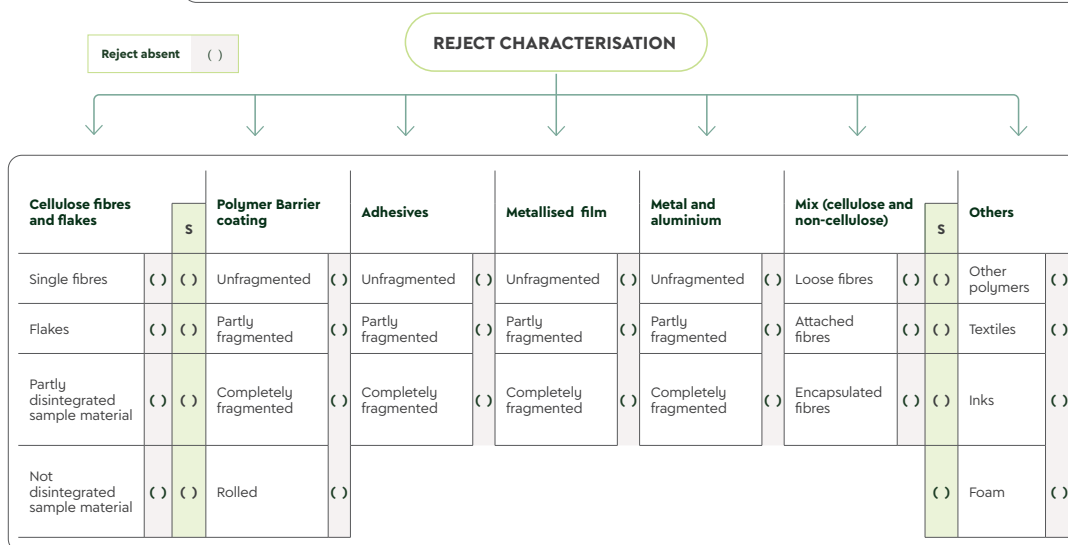


Figure 8. Reject characterisation tree Version 2025 - updated edition (June 2026)

2

Intructions to fill the reject characterisation tree

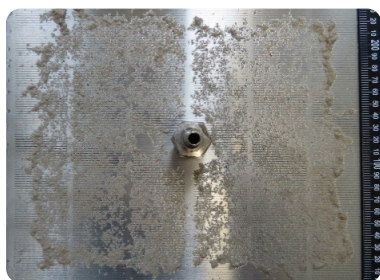


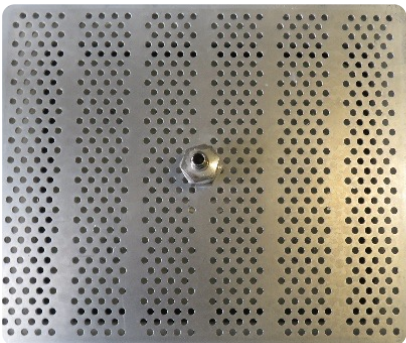
Figure 9. Coarse (above) and fine (below) rejects on the screening plates

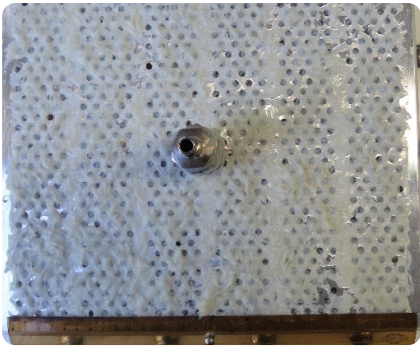
- > The reject characterisation should be carried out after coarse and fine reject screening. Please do it while the rejects are still on the screening plate, so the different reject components can be better visualised.
- > Fill the reject characterisation tree for the coarse and fine reject separately. There is space for that in the excel spreadsheet.
- > Check the definitions covering the degree of disintegration (partly, not disintegrated) and the degree of fragmentation (completely, partly, unfragmented) on the top right of the tree. If not clear, check the example pictures in the Annex Reject Characterisation.
- > If there is no reject left on the plate, tick the box 'reject absent'.
- > If there is reject material left on the plate, check to which category it belongs and its degree of fragmentation or disintegration (if cellulose fibres and flakes). Tick the grey boxes accordingly to what you have observed. You can tick as many boxes as you need.

Step Nr.	Notes/Pictures	Description
2	Intructions to fill the reject characterisation tree  Figure 10. Washing step	> The category mix (cellulose and non-cellulose) should only be selected if there are fibres and/or flakes combined with polymer barrier coating, metallised films, metal/aluminium, and/or others. Example pictures can be found in the Annex Reject Characterisation. > To differentiate loose and attached fibres and flakes, insert 1-2 reject pieces into a beaker with tap water at room temperature. Then, manually stir the reject pieces in the water to release as much entangled fibres and flakes as possible. Do not physically delaminate structures or rub the pieces. Check if the reject pieces still contain fibre and flakes attached to them, or if they were washed out. > If a large amount of fibres and flakes were washed out in the washing step, try to recover them using a pre-weighted filter paper and include their weight in the reject determination. > Exclusively for categories: 'cellulose fibres and flakes' and 'mix', there is an extra optional ticking column in green for significant amounts of fibres and flakes. > The overall impression of the test should be considered. For example: if there is only one single polymer piece with a significant amount of fibres attached to it, the 'S' field should not be selected, because it does not represent the overall impression of the test. > The S field is relevant for the 20 min. disintegration option in Part I and the reject quality levels in Part III. > If you have additional information about the reject characterisation that was not covered by the tree (e.g. a type of reject that is not mentioned) write it down in the 'additional comments'.
3	Reject quality levels	> The characterisation of coarse reject is needed for assessing the reject quality levels. > This is meant to assess the polyAl recycling quality, and it is only needed if there is information about the polyAl share in the sample. > The following categories are important for the reject quality levels: mix, polymer barrier coatings, metallised films, metal/aluminium and cellulose fibres and flakes if partly and/or not disintegrated. > The description of the coarse reject quality levels and pictures from each level can be found in the Annex Coarse Reject Quality levels.

5.2 Determination of the 5 mm hole residue (coarse reject)

This step should be performed as described in the detailed work description: Recyclability Laboratory Test Method – Part I: Paper mill with conventional recycling process Rev. 09/2025-01-01 - updated edition (June 2026)

Step Nr.	Notes/Pictures	Description
1	Somerville check	> Check the Somerville Fractionator regularly to ensure the following conditions: - The space below the screening plates should be clean, some adhesives and fibres can be stuck on it and be carried over to next sample. - The plates should be clean, especially the fine-screening plate, where fibres tend to get attached. - The spray nozzle should follow the TAPPI T 275 sp-12 specifications. - The slots of the fine-screening plate cannot be obstructed by the structure of the screen box. - The water flow should be 8.6 l/min. It might be affected by the type of screening plate used.
2	Sampling	> Take the total amount of the sample suspension for the coarse screening (including the filter cake recovered from the filtration analysis).
3	Sampling procedure  Figure 11. Perforated plate (5 mm hole) UNI 11743  Figure 12. Coarse screening in the Somerville fractionator  Figure 13. Coarse reject after the water draining	> Place the 5 mm perforated plate into the Somerville fractionator. > Attach the instrument screen box tightly. > Attach the instrument hose onto the plate nozzle. > Place the glass protection cover over the screen box. > Assure that the weir is positioned in the bottom of the weir box. > Start the water flow and wait until the water level in the screening box is approximately 2.5 cm to start pouring the sample onto the screening plate. > When the sample starts to overflow through the weir, start counting the screening time using a timer. > During the screening process, the sorted suspension (AC) is collected in a barrel. > After 5 min, turn off the motor and the water supply. > Pull the weir out the weir box, so the water can be drained. > Open the unit when the water has completely drained off. > Carefully open the screening box. > Transfer the materials stuck below the screening plate and in the weir box of the Somerville into the barrel, where the 'accept' material is collected.

Step Nr.	Notes/Pictures	Description
4	Photo documentation  Figure 14. Coarse reject after the coarse screening  Figure 15. Detailed picture of reject components	> Photograph the residue on the perforated plate using a ruler as a sense of scale. > Photograph the perforated plate again, zooming in on the reject. > If applicable, separate the different components in the coarse reject and photograph them on a dark background using a sense of scale. > Stretch the reject components to show their size clearly in the picture. This is important to evaluate the reject fragmentation. > If applicable, show in the picture fibres attached to non-paper components. > Characterise the rejects acc. to the reject characterisation tree explained in chapter 5.1.
5	Measurement of the coarse reject  Figure 16. Büchner funnel used for the residue filtration  Figure 17. Filter papers cooling in desiccator  Figure 18. Coarse reject dried in the aluminium tray	> Carefully transfer the residue to a vessel using a dough scraper or squeeze bottle. Be sure that all fragments trapped on the plate are also recovered. > Place a weighed filter paper (125 mm grade 388, basis weight 84 g/m², filtration speed 10 s/10ml, deposition range 12-15 µm) on the Büchner funnel and pour the residue over it. > Place the filter paper in the oven at (105 ± 2) °C, until the mass becomes constant. > Allow the filter paper to cool in desiccator. > Weigh the paper filter on the analytical balance. > If the reject amount is too high to fit on the filter paper described above (125 mm), place it in a weighed aluminium tray or in a larger filter paper (240 mm grade 1289, basis weight 84 g/m², filtration speed 20 s/10ml, deposition range 8-12 µm) using the Rapid-Köthen sheet former and dry it directly in the oven at (105 ± 2) °C until reaching a consistent mass. > Transfer the results to the Excel spread-sheet, and calculate the coarse reject (dry-weight) in respect to the starting sample. > Round the coarse reject to the first decimal place.

5.3 Determination of the stock concentration after the coarse screening

This step should be performed as described in the detailed work description: Recyclability Laboratory Test Method – Part I: Paper mill with conventional recycling process Rev. 09/2025-01-01 - updated edition (June 2026).

Step Nr.	Notes/Pictures	Description
1	Determination of the consistency	> The determination of the stock concentration is carried out according to ISO 4119 (i.e. between 0.05% and 0.3%). > Carefully homogenise the screened stock collected in the AC barrel. > Place the sampling vessel on the analytical balance and set it to zero before weighing. > Transfer approximately 1000 g of suspension into the vessel. > Weigh the mass of the sample taken ('m1'). > Place a pre-weighted filter paper (125 mm grade 388, basis weight 84 g/m², filtration speed 10 s/10ml, deposition range 12-15 µm) on the Büchner funnel (diameter 125 mm) and moisten it with water using a spray bottle. > Make sure that all pores in the Büchner funnel are covered by the filter paper. > Apply negative pressure by means of a vacuum pump. > Place the sample over the paper filter into the Büchner funnel. > Rinse the sample vessel with water and pour the liquid into the funnel being careful not to lose any sample residue. > Wait until there is no more water in suspension in the Büchner funnel. > Remove the filter paper containing the pulp cake from the funnel. > Return any material remaining on the funnel wand to the paper filter. > Place the filter paper between two cover sheets and dry it in the dryer of the sheet former for 7 min. at (93 ± 4) °C. > Turn around the filter paper and dry it again in the dryer of the sheet former for 7 min. at (93 ± 4) °C. > Transfer the filter paper to a desiccator to cool it down. > Determine the dry mass of the filter cake on the analytical balance and document as 'm3'. > The stock concentration should be used to determine the sample amount needed for the fine screening.
2	Calculation of the consistency	$c (\%) = \frac{m_3 (g) - m_2 (g)}{m_1 (g)} \times 100$ m₁ = mass of sample before drying m₂ = mass of filter paper without sample m₃ = mass of sample with filter paper after drying The results must be given with two decimal places.

5.3.1 Correction of the stock consistency after the coarse screening

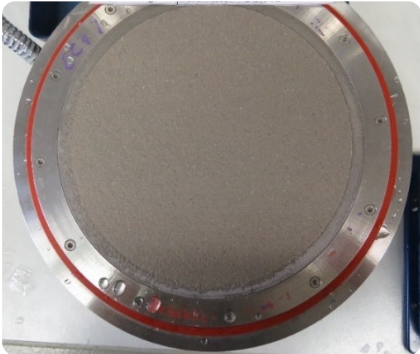
Step Nr.	Notes/Pictures	Description
1	Consistency drying in the oven	> The stock consistency determination of the coarse screening 'accept' should be used for the further steps of the method. > After the whole Part III method is concluded, the paper filter used for determining the consistency should be dried in the oven at 105° C overnight. > On the following day, the paper filter should be first laid into the desiccator for at least 10 min. and then weighed. > Correct the stock consistency measured the day before using the paper filter weight after the oven drying. > If the stock consistency has changed after the oven drying, the input for the fine screening should also be corrected. This can be done automatically in the Excel spreadsheet. > Drying the consistency paper filter in the oven is especially important for disintegration times lower than 10 min., but should always be performed.

5.4 Filter cake preparation for determining the ash content

Step Nr.	Notes/Pictures	Description
1	Filter cake preparation	> Based on the results of the consistency test (5.3), reserve two fractions of 3.5 g of the oven-dried 'accept' fraction from the coarse screening (AC accept). > The sample amount needed for the filter cake preparation needs further discussion and might be revised in future releases of this document. > Pre-weigh and label two filter papers (240 mm grade 1289, basis weight 84 g/m², filtration speed 20 s/10ml, deposition range 12-15 µm using a pencil. > Place the filter paper on Rapid-Köthen (RK) sheet former, moisten it using a squeeze bottle, smooth it by hand, and close the sheet former. > The use of other devices for the filter cake preparation (besides the RK) needs further discussion and might be revised in future releases. > Fill the sheet former with approximately 2 l of water, pour 3.5 g of oven dry AC accept, and drain it. > Repeat the same procedure with the other 3.5 g to have a double determination of the filter cake production. > Dry the paper filters with filter cakes in the oven at 105° C overnight and use them for determining the ash content (ASH) according to ISO 1762.

5.5 Sheet formation after coarse screening including quality assessment

This step should be performed as described the detailed work description: Recyclability Laboratory Test Method – Part I: Paper mill with conventional recycling process Rev. 09/2025-01-01 - updated edition (June 2026)

Step Nr.	Notes/Pictures	Description
1	Photo documentation  © 2022 PTS Figure 19. Lab sheet AC	> Photograph each lab sheet.
2	Sheet adhesion test  © 2022 PTS Figure 20. Drying oven used for the sheet adhesion test.  © 2022 PTS Figure 21. Lab sheet with carrier board and cover sheet placed between metal plates into the oven	> Place the lab sheet between a carrier board (bottom side) and a cover sheet (top side) and dry it in the dryer of the sheet former for 7 min. at $(93 \pm 4)^\circ\text{C}$. > Place the lab sheet with carrier board and cover sheet flat between two preheated metal plates (pressure of 1.18 kPa or 3.7 kg) into the drying oven and dry it at $(130 \pm 2)^\circ\text{C}$ for 2 min. > Place the lab sheet with carrier board and cover sheet in the desiccator for 10 min. to cool it down (use a stop-watch). > After taking it out of the desiccator, perform both sheet adhesion tests immediately by separating the carrier board first and then the cover sheet in a fluent motion from the lab sheet. The separation of the carrier board and cover sheet should not take longer than 1-3 sec. each. > Weigh the lab sheet on the analytical balance. > Observe the carrier boards, handsheets and cover sheets in incident light and check for the presence of fibre pickups, paper fragments, and any damage to them. > For more information on the evaluation of the sheet adhesion check the Annex Sheet Adhesion Test. > Record the observations in the laboratory Excel spreadsheet.
4	Visual impurities	> Use the handsheets from the sheet adhesion test to assess the visual impurities according to the Annex Visual Impurities. > Check for visual impurities on the handsheets visually with and without the aid of a source of transmitted light. > The handsheets can be placed on a LED panel for the visualisation in transmitted light.

Step Nr.	Notes/Pictures	Description
5	Labelling	> Label all sheets with their number and sample number. > The cover sheet and the carrier board must be labelled in the same way as the lab sheets. > Regarding the carrier board, the side that was in touch with the lab sheet must be labelled. > Regarding the cover sheet, the side that was not in touch with the lab sheet must be labelled.
6	Photo documentation	> Photograph the sheets on the cutting map, using the auxiliary lines to align the photo. > Place the carrier board on the right-hand side and at the lowest line. > Place the lab sheet in the middle and two lines above the carrier board. > Place the cover sheet on the left-hand side and one line above the carrier board. > Photograph the lab sheets on the LED panel, showing the measurement scale.

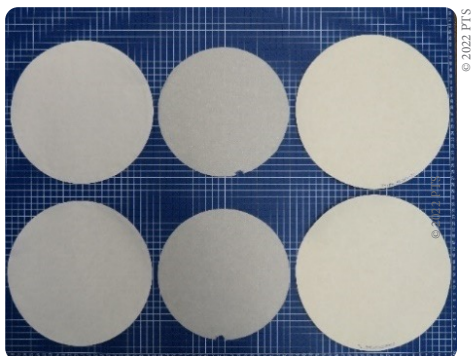


Figure 22. Handsheets analysed in the sheet adhesion test AC with incident light

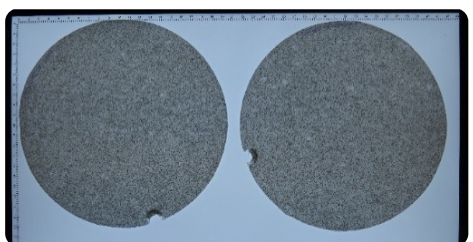


Figure 23. Lab sheets AC on the LED panel with transmitted light

5.6 Determination of the 150 µm slot residue (fine reject)

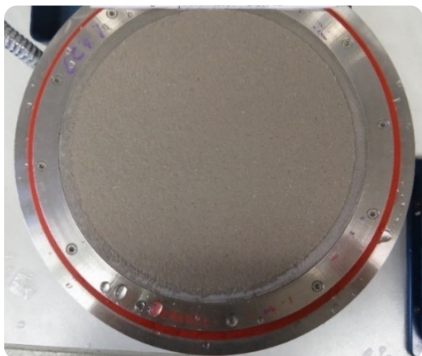
This step should be performed as described the detailed work description: Recyclability Laboratory Test Method – Part I: Paper mill with conventional recycling process Rev. 09/2025-01-01- updated edition (June 2026), except for the use of the thickener after the fine screening that is not allowed in this method.

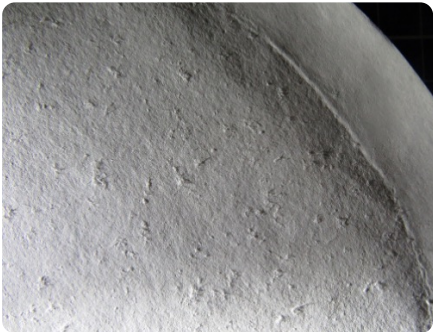
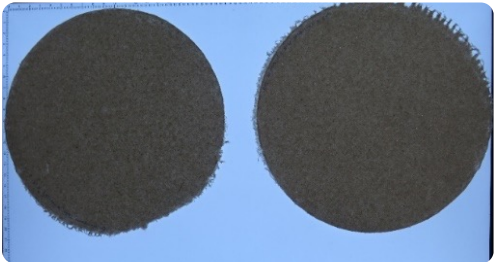
Step Nr.	Notes/Pictures	Description
Somerville fractionator according to TAPPI T275 sp18		
1	Sampling	> Homogenise the total amount of the sample carefully before sampling. > Take 20 g OD from the AC barrel for the fine screening. > Please note, even a high volume must be filled in a relatively short time, a thickening of the 'accept' after coarse screening is not allowed according to the method.
2	Screening procedure  © 2022 PTS Figure 24. Slotted plate (150 µm slots)  © 2022 PTS Figure 25. Fine screening in the Somerville fractionator  © 2022 PTS Figure 26. Fine reject after water draining	> Place the 150 µm slotted plate into the Somerville fractionator. > Set the Somerville as described in chapter 5.2. > Start the water flow and wait until the water level in the screening box is approximately 2.5 cm to start pouring the sample onto the screening plate. When the overflow through the weir starts, commence the 20 min. screening time using a stopwatch. > The pouring time should be as short as possible and not be longer than 4 min. > Record the time needed to pour the sample. > No thickener is allowed in this method, so collect at least the first 50 l of AF in a barrel and proceed with the sheet adhesion test and the assessment of visual impurities. > After 20 min. turn off the motor and then the water supply. > Pull the weir out of the weir box, so the water can be drained. > Open the unit when the water has completely drained off. > Carefully open the screening box and perform the photo documentation. > Transfer the fibres stuck on the screening box of the Somerville into the barrel, where the sorted material is collected.

Step Nr.	Notes/Pictures	Description
3	Photo documentation  Figure 27. Fine reject on the 150 µm plate  Figure 28. Fine reject in detail	> Photograph the fine-screening residue on the slotted plate using a sense of scale. > Make a detailed picture of the residues, if necessary. > Characterise the rejects according to the reject characterisation described in chapter 5.1.
4	Measurement of fine reject	> Carefully transfer the residue into a vessel using a dough scraper or squeeze bottle. Be sure that all fragments trapped on plate are also recovered. > Place a weighed filter paper (125 mm grade 388, basis weight 84 g/m², filtration speed 10 s/10 ml deposition range 12-15 µm) on the Büchner funnel and pour the residue over it. > Place the paper filter in the oven at (105 ± 2) °C, until the mass consistent becomes constant. > Allow the paper filter to cool in the desiccator. > Weigh the paper filter on the analytical balance. > Transfer the results to the Excel spreadsheet.

5.7 Sheet formation after fine screening, incl. quality assessment

This step should be performed as described in the detailed work description: Recyclability Laboratory Test Method – Part I: Paper mill with conventional recycling process Rev. 09/2025-01-01- updated edition (June 2026), including the remarks about extra lab sheets found in this document.

Step Nr.	Notes/Pictures	Description
1	Sheet formation	> Homogenise the total amount of the sample carefully before sampling. > Take approximately 9,000 g of pulp from the AF barrel. > Form one sample sheet using the sheet former as in chapter 5.4. > The target weight is (60 ± 2) g/m², if it is not reached, adjust the amount of pulp required for sheet formation.
2	Photo documentation  Figure 29. Lab sheet AF	> Photograph each lab sheet.
3	Sheet adhesion test	> Perform it as in chapter 5.5.
4	Visual impurities	> Perform it as in chapter 5.5.
5	Labelling	> Perform it as in chapter 5.5.

Step Nr.	Notes/Pictures	Description
6	Photo documentation  Figure 30. Handsheets analysed in the sheet adhesion test with incident light   Figure 31. Individual pictures of the cover sheet, lab sheet and carrier board with incident light  Figure 32. Lab sheets AF on the LED panel with transmitted light	> Photograph the sheets on the cutting map, using the auxiliary lines to align the photo as in chapter 5.5. > Photograph each sheet individually with a source of incident light. > Photograph the lab sheets on the LED panel, showing the measurement scale.

5.7.1 Extra sheet formation for the assessment of recycle quality

Step Nr.	Notes/Pictures	Description
1	Extra sheet formation	> Four extra sheets (80 gsm) should be formed after the fine screening for determining the tensile index. > If the accept material is not sufficient for producing four extra sheets (80 gsm), another disintegration step is needed (20 min.).

6 Mechanical and compositional properties

Step Nr.	Notes	Description
1	Available data after 20 min. of disintegration	If ash content data and tensile index have been obtained during the 20 min. disintegration, this can be used in the evaluation protocol. There is no need to repeat the tests after the 10 min. disintegration.
2	Measurement of the tensile index on the extra AF sheets	Tensile-Index (TI) in [Nm/g] according to ISO 1924-2 > The sheets must to be prepared according to ISO 187 before the test and not be touched with bare hands. > The grammage of the test sheets must be determined according to ISO 536 in order to calculate the tensile index. > It is recommended to cut at least three pieces from each lab sheet, which means 12 pieces in total. Discard the lowest and highest measurement and keep the other 10 values. The tensile index [Nm/g] is obtained by dividing the mean tensile strength [N/m] by the grammage [g/m²].
3	Measured on the AC filter cake (5.4)	Ash content (AC) at 525° C according to ISO 1762 in [%]: > Determine the dry matter content of the filter cakes according to the ISO 638-1. > Heat the empty crucible to (525 +- 25)° C for 30-60 min. in the muffle oven. > After cooling it to room temperature in a desiccator, weigh the empty crucible. > Add each test piece to one crucible to have a double determination, and then weigh them. > Place the crucibles with the test pieces in the oven and bring them gradually (200° C/h) to 525° C. > Maintain the temperature for at least two hours. The test pieces should be completely burned away. > After cooling at room temperature in a desiccator, weigh the crucibles. > The ash content is obtained as the residual mass [g] after calcination divided by the dry mass [g] of the test piece before calcination.

7 PolyAl recycling

Step Nr.	Notes	Description
1	PolyAl compliant with DfR guidelines	> The polyAl composition should be provided by the sample producer or distributor when filling the Part III datasheet (white box approach). > If no datasheet is available (black box approach), the polyAl composition can be obtained by Raman or FT-IR analysis. > If the polyAl composition is not available and cannot be tested in the laboratory; the score is given without polyAl recycling.
2	Calculation of Recyclable Rejects	> The recyclable rejects (RR) are calculated based on polyAl composition given in the Part III datasheet. > $RR = 100\% - \text{share of all repulpable sample part(s) (related to the total sample unit weight)}$. An example calculation of the RR is given in the Part III datasheet file.

8 Evaluation

Step Nr.	Notes/Pictures	Description
1	The evaluation scheme for this method is published separately.	

9 Disintegration behaviour curve (optional test)

Step Nr.	Notes	Description
The 10 min. disintegration time is the only one receiving a score in Version 1 of the Recyclability Evaluation Protocol of January 2025 - updated edition (June 2026). However, it is expected that the disintegration behaviour curve approach (k-factor) will be implemented in future releases, which means that further disintegration times may become necessary. Therefore, it is recommended to run the optional test described below.		
1	Sample amount	> The sample amount should be enough for testing the sample using three different disintegration times (3 x 50 g of oven dry material). > It does not matter if the samples for the three tests are prepared together or separately, as long as all the samples are prepared in a representative way.
2	Disintegration	> The sample should be tested three times using different disintegration times. > The first disintegration time is always 10 min. > The second disintegration time is always 5 min. > The third disintegration time depends on the results of 10 min. disintegration test. > If the fine reject amount determined using 10 min. of disintegration (FR10) < 3 g of oven dry material, the third disintegration time should be 2 min. (Option 1), if not it should be 20 min. (Option 2). > A decision tree to improve understanding of the criteria used to define the disintegration times may be implemented in future release of this document.

9.1 Option 1

Step Nr.	Notes	Description
FR10 amount < 3 g of oven dry material, the further disintegration times should be 5 min. and 2 min.		
1	Disintegration time 5 min.	> Possible reduced test programme: sheet adhesion test and the extra sheets depend on the 10 min. results. > The following steps should be conducted: - Disintegration 5 min. - Coarse- and fine-reject screening - Evaporation residue (optional) Using the AC5 to produce: - 1 x test sheet approximately 60 gsm - If sheet adhesion test AF10 = level 2 or level 3, produce 2 x 60 gsm sheets using AC5 for sheet adhesion test; if not, skip the sheet adhesion test
2	Disintegration	> The following steps should be conducted in this reduced test programme: - Coarse and fine screening - Evaporation residue (optional) Using the AF2 to produce: - 1 x sheet approximately 60 gsm

9.2 Option 2

Step Nr.	Notes	Description
FR10 amount $\geq$ 3 g of oven dry material, the further disintegration times should be 5 min. and 20 min.		
1	Disintegration time 5 min.	> Reduced test programme: decision on the sheet adhesion test depends on 10 min. results. > The following steps should be conducted: - Coarse and fine reject - Evaporation residue Using the AC5 to produce: - 1 x test sheet approximately 60 gsm - If sheet adhesion test AF10 = level 2 or level 3, produce 2 x 60 gsm sheets using AC5 for sheet adhesion test; if not, skip the sheet adhesion test Using the AF5 to produce: - 1 x test sheet 60 gsm - If sheet adhesion test AF10 = level 2 or level 3, produce 2 x 60 gsm sheets using AF5 for sheet adhesion test; if not, skip the sheet adhesion test
2	Disintegration	> Possibly reduced test programme: sheet adhesion test and the extra hand sheets depend on 10 min. results. > The following steps should be conducted: - Coarse and fine reject - Evaporation residue Using the AC20 to produce: - 1 x test sheet approximately 60 gsm - 2 x 3.5 g oven dry filter cake using the sheet former for the determination of ash content (optional) - If sheet adhesion test AC10 = level 2 or level 3, produce 2 x 60 gsm sheets using AC20 for sheet adhesion test; if not, skip the sheet adhesion test. Using the AF20 to produce: - 1 x test sheet approximately 60 gsm - If sheet adhesion test AF10 = level 2 or level 3, produce 2 x 60 gsm sheets using AF20 for sheet adhesion; if not, skip the sheet adhesion test - If the number of extra sheets formed using AF10 < 4 pieces, produce 4 x 80 gsm extra sheets using AF20 (or as many sheets as possible); if not, skip it

List of changes

Rev.	Valid from	Author	Change(s)
01/2024-05-01	May 2024	Vanessa Wortmann	Draft version of the detailed description for Part III method for data production
02/2025-01-01	January 2025	Vanessa Wortmann	Updated draft version of the detailed description for Part III method based on version 1 recyclability evaluation protocol and feedback round

ABOUT 4EVERGREEN

[4evergreen](#) is a cross-industry alliance perfecting the circularity of paper-based packaging to contribute to a climate-neutral and sustainable society. Our goal is to raise the overall recycling rate of paper-based packaging to 90% by 2030. We bring a particular focus on packaging with a lower circularity performance today, namely the types used for household, out-of-home and on-the-go consumption.

The alliance brings together industry representatives from across the paper-based packaging value-chain, from pulp, paper and board manufacturers and recyclers to packaging producers and converters, including brand owners, retailers and waste management companies. It also comprises non-fibre material suppliers (e.g. adhesives, inks, coatings), technology providers (e.g. machinery, collection, and recycling solutions), and leading research institutes.



For general enquiries please contact 4evergreen@cepi.org