PVC 4 PIPES

Standardisation, a catalyst for recycling PVC in piping systems

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Today's programme

- Recycling : definitions and challenges
- Voluntary initiatives and EC/Standardisation Request
- Understanding the standardisation work programme with reference to the value chain of PVC (recyclates)
- Recent developments, current situation and next steps

Definitions and challenges

- **Mechanical recycling** : processing of plastics products into recyclate without significantly changing the chemical structure of the material
- **Recyclate** : plastics material resulting from the recycling of pre-consumer and post-consumer plastics products
- Review and revise **product standards in force** to give producers more flexibility for using recycled materials
- **New standards** : valorisation of plastics (PVC) waste, as support to emerging EC regulations
- Focus : **materials**, from waste → pipe or fittings ingredients
- Expansion of the **value chain** perimeter
- Do not impact the **quality** and **performance** of the products

Voluntary initiatives

- **Today's focus** : PVC pipes and fittings sector
- **CEN TC 155** : Plastics piping systems and ducting systems
- **CEN TC 155 WG 25** : Recycling of PVC-U, PE and PP materials
- **CEN TC 155 WG 13** : Buried thermoplastics piping systems for surface-water and foul-water drains and sewers
- **CEN TC 155 WG33** : Thermoplastics piping systems for non-pressure soil and waste and rainwater discharge within the building structure

- → non-pressure piping systems

EC Standardisation Request M/584

EUROPEAN
COMMISSION

M/584

Brussels, 1.8.2022
C(2022) 5372 final

COMMISSION IMPLEMENTING DECISION

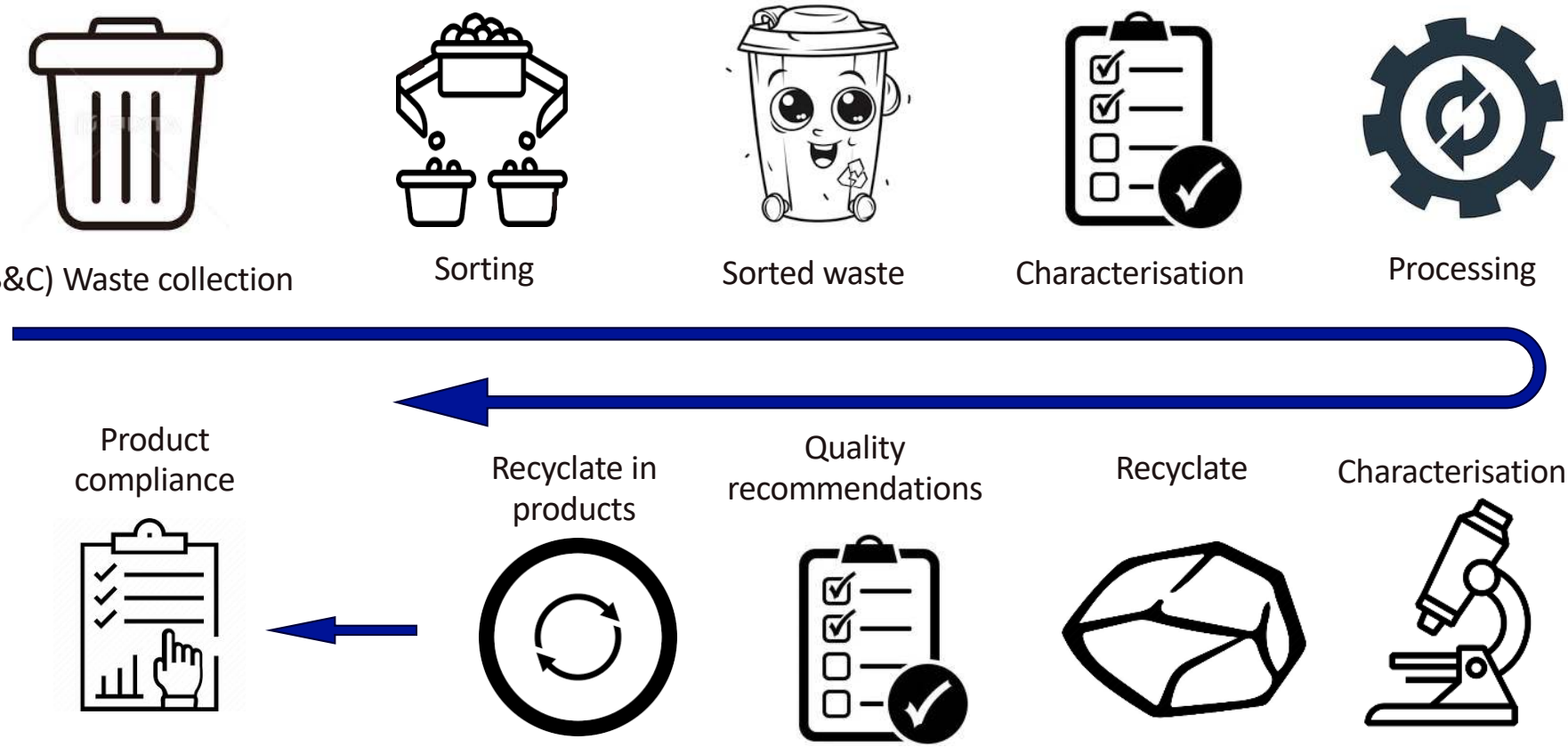
of 1.8.2022

on a standardisation request to the European Committee for Standardisation and the European Committee for Electrotechnical Standardisation as regards plastics recycling and recycled plastics in support of the European Strategy for Plastics in a Circular Economy

EC Standardisation Request M/584

- **Short title**: Standardisation on plastics recycling and recycled plastics
- **Purpose**: Support of the EU strategy for plastics in a circular economy
- **Initiator**: EC/DG Grow
- **Primary partner** : CPA (Circular Plastics Alliance)
- **Targets** : Huge work programme and short deadline, i.e. 2025-08-02
- **9 CEN/CLC Techical committees** directly involved
- **Scope** (packaging and E&E excluded) :
  - Quality grades for **sorted plastics wastes**
  - Quality assessment of **plastics recyclates** for use in products
  - **Design for recycling** guidelines for B&C products

Value chain (simplified theoretical scheme)



Current situation – CEN TC 155

- **WG25 (recycling)**
  - **EN 14541-1** : Utilisation of plastics recyclates – Vocabulary
  - **CEN/TS 14541-2** : Utilisation of plastics recyclates – Recommendations for relevant characteristics

  - **FprCEN/TS 18116** : Thermoplastics pipes and fittings – Design for recycling guidelines *(enquiry → 2024-10-31)*
    - Material selection (ref. to recycling)
    - Hazardous substances (e.g. ref. to legislation, SVHC)
    - Marking (e.g. identification, legibility, large scraps)
    - Documentation (e.g. installation, dismantling, collection)

Current situation – CEN TC 155

- **WG13 (drains and sewers) – Opening standards to recyclates**
  - **EN 13476** series : Plastics piping systems for non-pressure underground drainage and sewerage - Structured-wall piping systems of PVC-U, PP and PE
    - Part 1 : General requirements and performance characteristics
    - Part 2 : Specifications for pipes and fittings, Type A
    - Part 3 : Specifications for pipes and fittings, Type B
    - Part 4 : Assessment of conformity

    All 4 parts finalized in Septembre 2024 for formal vote (not started yet)
  - **EN 1401-1** and **CEN/TS 1401-2** (non-pressure PVC drains and sewers)
    - Revision process to start

Current situation – CEN TC 155

- **WG33 (non-pressure pipes within buildings) – Opening standards to recyclates**
  - **EN 1329-1 and CEN/TS 1329-2** : PVC-U piping systems for soil and waste discharge (low and high temperature) within the building structure
    - Part 1 : Specifications for pipes, fittings and the system

      Enquiry → 2024-10-17
    - Part 2 : Assessment of conformity

      Under CIB to collect comments, before the formal vote.

Recent situation – CEN TC 249 *(Plastics)*

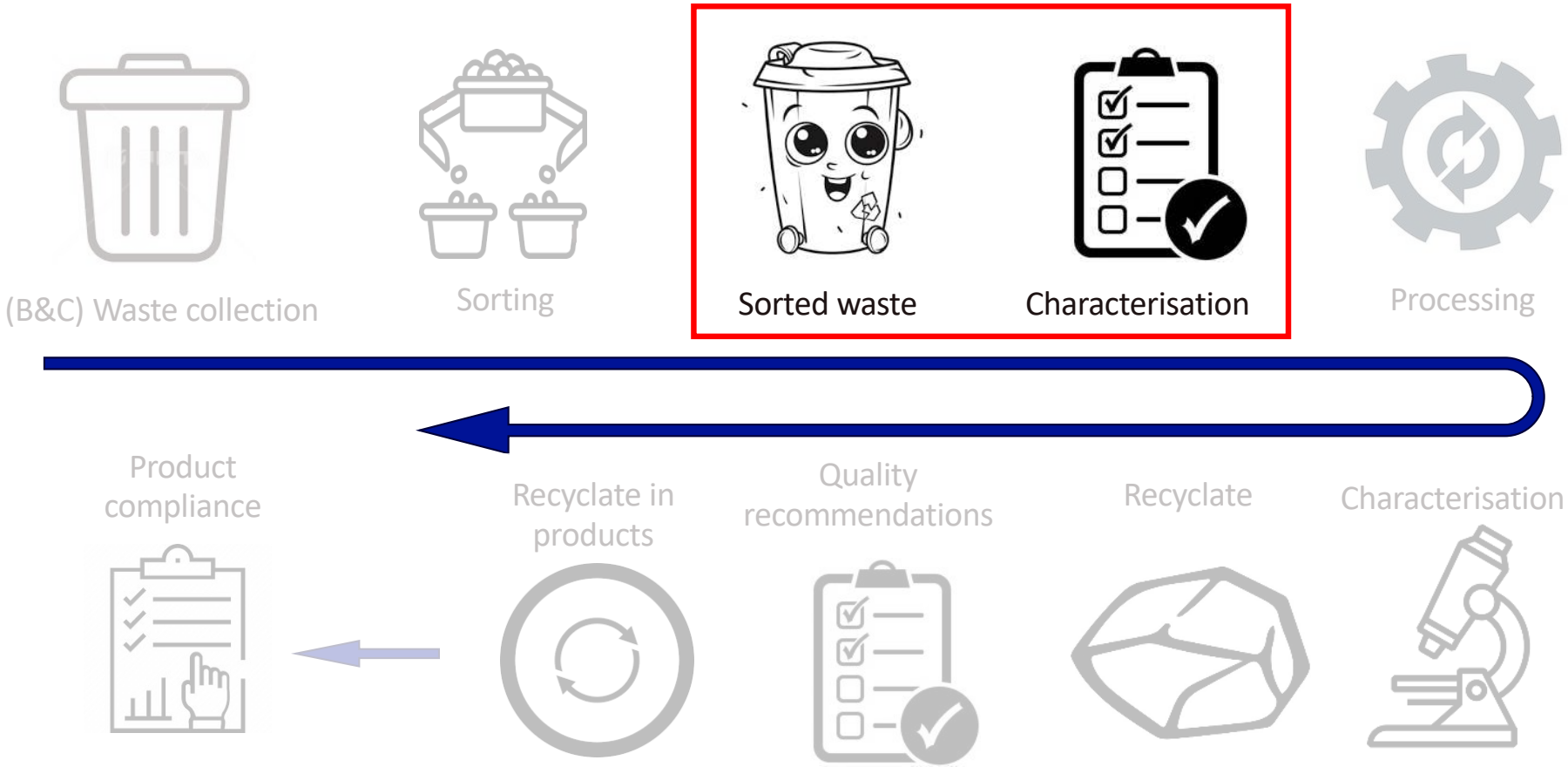
- **WG11 (Recycling)**
  - **EN 15347 :** Characterisation of sorted plastics wastes
  - **EN 15346** : Characterisation of PVC recyclates
    - Also EN 15342 (PS), EN 15344 (PE), EN 15345 (PP), EN 15348 (PET)
  - **EN 15343** : Plastics recycling traceability and assessment of conformity and recycled content
  - **Expansion of its work programme** to answer to the SReq M/584 :
    - Revision in parts of EN 15347 (→ new standards)
    - Revision of the EN 1534x series
    - New : quality recommendations and basis for specifications for application of plastics recyclates in products
    - New : classification by data quality levels for use in trading

Current situation – Other TCs

- **CLC TC 213 (Cable management systems)**
  → design for recycling guidelines
- **CEN TC 249 WG26 (**Agricultural plastic products - Design-for-recycling, use, removal, collection and recycling**)**
  → design for recycling guidelines

- **ISO TC 61 SC14 (Plastics – Environmental aspects)**
  →**WG1** : terminology et al.
  →**WG5** : mechanical and chemical recycling
- **ISO TC 61 SC9 (Thermoplastics)**
  →**WG27** : template on new designation system

Current situation (ref. SReq M/584 et al.)



Current situation – CEN TC 249 WG11

- **Characterisation of plastics wastes** *(7 parts)*
  - **EN 15347-1 :** Sorted plastics wastes – Part 1 : General characterisation

    → approved (as revision of the past EN 15347)
  - **EN 15347-2 to 7** : final drafts to be ready by mid-october for launching the FV before mid-November
  - **EN 15347-5 :** Plastics – Sorted plastics wastes – Part 5 : Quality grades of sorted PVC wastes and specific test methods
    - Only B&C
    - 4 tables : rigid or flexible X required or optional characteristics
    - Sections listed : general information, colour, composition, impurities and supplier's information

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EN 15347-1

(excerpt)

Table 1 — Mandatory characteristics of sorted plastic wastes

Characteristics	Suitable statements/ Comments	Methods/references
Main polymer present	Indicate the main polymer present in the waste stream and its minimum percentage by weight.	Annex A
Articles contained	Indicate the articles contained, which are composing the sorted material and their percentage by weight (for example, as film, bottles, profiles, etc.).	Annex A
Waste category	Indicate the six-digit code.	See footnote [a]
Pre-/Post-consumer	Indicate if pre-consumer or post-consumer. If the batch contains a mix of both, provide their percentages.	EN 17615
Country of origin	Indicate the country of origin.	-
Origin	Indicate the origin, e.g. Household, Commercial, Industrial, municipal.	-
Sector of origin	Indicate the sector, e.g. Agriculture, Building	-

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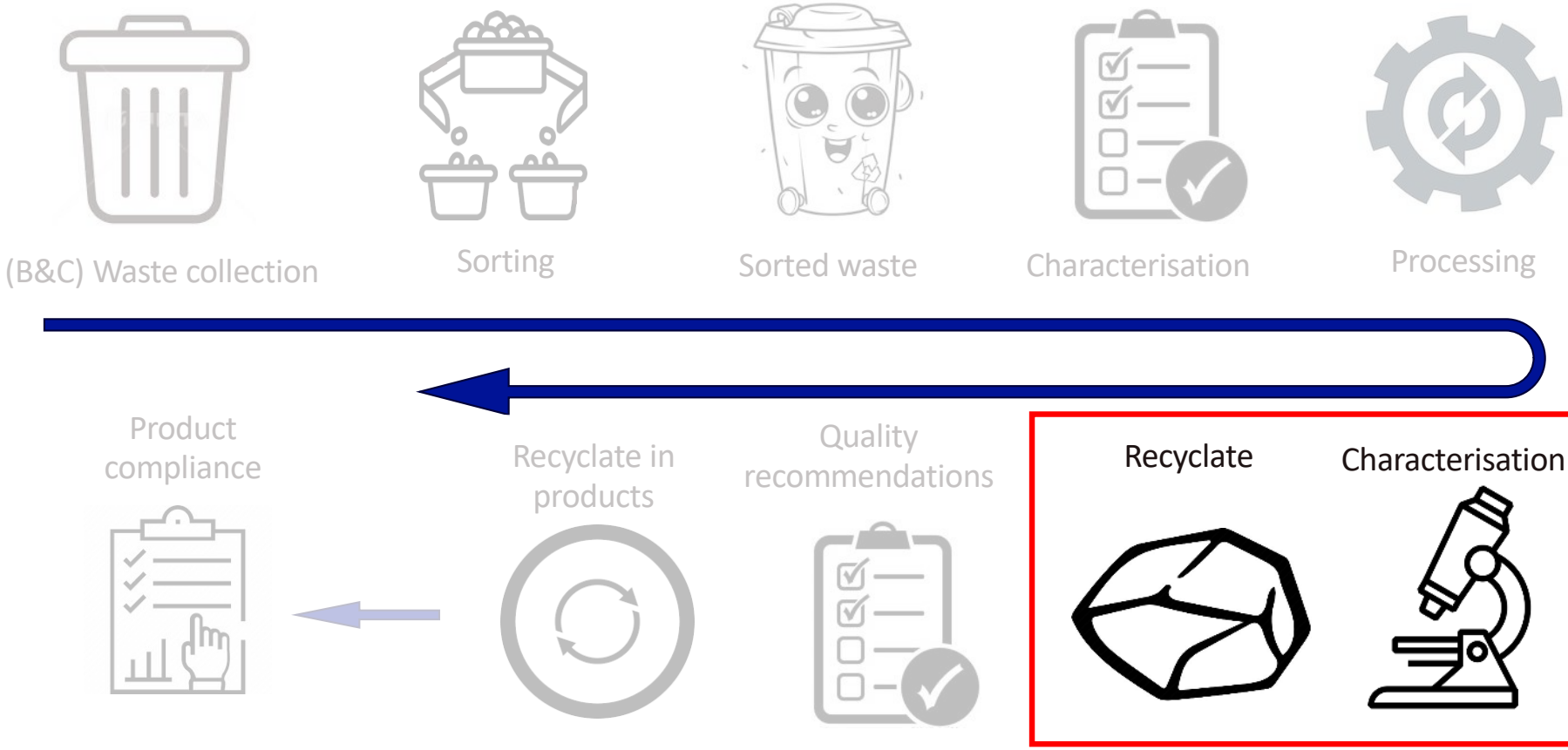
prEN 15347-5

(excerpt)

Table 1 — Required characteristics of sorted plastic wastes – PVC Building and Construction (rigid)

Characteristics	Suitable statements/comments	Methods/references
General information		
Origin	Construction and demolition waste	-
Sector of origin	Indicate the sector where the material is coming from.	-
Pre-/Post-consumer	Indicate the types of sorted plastics waste. If the batch contains a mix of both, provide their percentages.	EN 17615
Colour		
Colour	Indicate the dominating colour.	Visual inspection
Composition		
Articles	Indicate the type of articles present in the input waste (profiles, sheets, pipes, multilayer pipes, fittings).	EN 15347-1:2024[1], Annex A
Content of PVC rigid article	Indicate the main polymer present in the waste stream at object level and its minimum percentage by weight.	EN 15347-1:2024[1], Annex A
Other polymers present	Indicate the presence of any other polymers known and the maximum percentage by weight.	EN 15347-1:2024[1], Annex A
Impurities		
Flexible PVC	Indicate the maximum percentage by weight of medical waste.	EN 15347-1:2024[1], Annex A
Metals	Indicate the maximum percentage by weight of	Spectroscopy for

Current situation (ref. SReq M/584 et al.)



Current situation – CEN TC 249 WG11

- **Characterisation of recyclates** *(6 standards)*
  - **EN 15346 :** Recycled plastics – Characterisation of PVC recyclates
  - → revision approved (summer 2024)
    - 1 table listing mandatory (M) and optional (O) characteristics to declare for 4 categories of materials :

      rigid or flexible X non-micronized or micronized
    - Sections listed : general information, density and particle size, colour, composition, water/volatiles, mechanical properties, thermal properties, processeability

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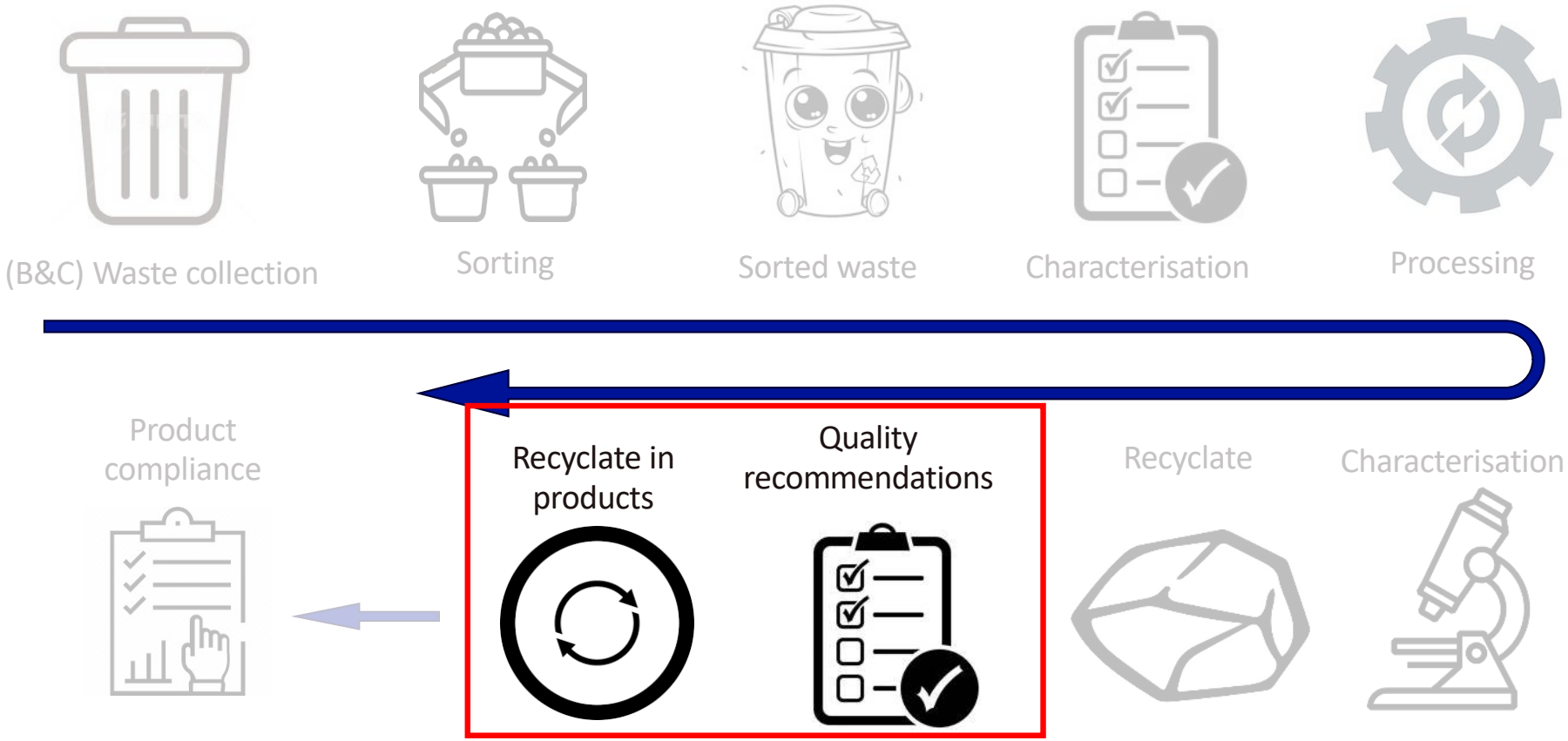
EN 15346

(excerpt)

Characteristic	Units	Test method	PVC-U		PVC-P		Comments
			Non micro-nized **	Micro-nized	Non micro-nized **	Micro-nized	
Mechanical properties							
Tensile stress at yield	MPa	EN ISO 527-1 EN ISO 527-2 EN ISO 21306-2	O	O	M	O	
Tensile strain at break	%	EN ISO 527-1 EN ISO 527-2 EN ISO 21306-2	O	O	O	O	Elongation
Tensile modulus	MPa	EN ISO 527-1 EN ISO 527-2 EN ISO 21306-2	O	O	O	O	
Flexural modulus	MPa	EN ISO 178 EN ISO 21306 -2	M *	O	O	O	
Charpy impact Strength	kJ/m^2	EN ISO 179–1 EN ISO 179-2 EN ISO 21306-2	O	O	O	O	
Hardness		EN ISO 868	-	-	M	M	For calendering stiffness may be evaluated instead of hardness. See Annex E.
Thermal properties							
Vicat softening temperature	°C	EN ISO 306 Method B50	M *	O	O	O	

Current situation (ref. SReq M/584 et al.)



Current situation – CEN TC 249 WG11

- **"Demand Driven Standards"** *(7 standards)*
  - **EN 18064 series** : Plastics — Quality recommendations and basis for specifications for application of plastic recyclates in products
    - Most difficult set of documents
    - Mix of a normative section on designation of recyclates and an annex supposed to give guidance for potential usages of recyclates
    - Several negative votes at prEN stage, but too late for reconsidering the drafts and structure with the EN 1534x series
    - Formal votes expected to start in November 2024
  - **EN 18064-5** : (…) Part 5 : PVC
    - Same as above…

prEN 18064-5 (*excerpt*)

Table A.3 — An example of designation of a polyvinylchloride thermoplastic material

Designation										
Description block (optional)	Identity block									
	ISO Standard	Individual-item block								
		Data Block 1		Data Block 2[b]			Data Block 3		Data Block 4	Data Block 5
		Polymer	DQL[a]				Application and processing		Properties	Additional informa-tion
		Type	Level				Processing	Characteris tics		
Thermoplastic s	ISO 21306-1	PVC-U	2				E	GLN	082–05-T33	

[a] This is the desired DQL level to be declared by the converter: In this example, all requested characteristics under DQL 2 have to be provided by the recycler. The definition of the DQL (data quality level) is given in prEN 18064-1.

[b] Data block 2 is empty in EN ISO 21306-1. For other polymers this block contains the following information: "Fillers or reinforcing materials and their nominal content". Possibility to add relevant characteristics for rPVC.

Designation: (Thermoplastics) EN ISO 21306-1 PVC-U-2*, EGLN, 082-05-T33

prEN 18064-5 (*excerpt*)

Varieties				U-PVC (rigid)				Soft PVC (flex)		
Conversion technology				**Injection moulding**	**extrusion**			**Calendering**	**Extrusion**	**DQL Information or property**
Product family				**thick walled**	**thick walled**		**thin walled**	**membranes**	**thin walled**	**Level 1,2,3 or 4**
Applications				**e.g. building (pipes connector, ancillaries)**	**Pipes**	**Construction Profiles**	**e.g. film, sheet**	**Flooring**	**e.g. hoses, sheet (for blister pac-kaging), byous, inflatables**	
Property	**Unit**	**Generic Test method**	**Test conditions and specimen preparation**							
Tensile modulus	MPa	EN ISO 527-1 EN ISO 527-2	EN ISO 21306-2 Table 3 or extruded samples	"Optional Typical value 2–4"	not relevant	not relevant	not relevant	not relevant	4–7	4
Tensile strain at break	%	EN ISO 527-1 EN ISO 527-2	EN ISO 21306-2 Table 3 or extruded samples	no indicative value	no indicative value	no target value for recyclate (55–60 kJ/mm² for profile; EN 12608)	no indicative value	no indicative value	no indicative value	4
charpy impact strength	kJ/m2	EN ISO 179-1 or EN ISO 179-2 optional parameter in EN 15346	EN ISO 21306-2 Table 3 or extruded samples	no indicative value	no indicative value	no target value for recyclate (55–60 kJ/mm² for profile; EN 12608)	no indicative value	no indicative value	no indicative value	NOT in the DQL
Hardness (shore)	N/mm²	EN ISO 868	-	not relevant	not relevant	not relevant	not relevant	not relevant	not relevant	optional
Vicat softening temperature	°C	EN ISO 306	EN ISO 21306-2 Table 3 or extruded samples	> 75	> 75	> 75 (EN 12608)	> 65	> 65	> 50	optional

Current situation – CEN TC 249 WG11

Data Quality Levels

- **prEN 18065** : Recycled plastics — Classification of recycled plastics based on Data Quality Levels for use and (digital) trading
  - Linked to the EN 18064 series *(→ same FV timing)*
  - System for Digital Product Passport for recyclates and plastic waste
  - 4 levels are specified, which list requested numbers of data, i.e. :

Table 1 — DQLs and numbers of I, P and O (overview)

Characteristics	DQL 1	DQL 2	DQL 3	DQL 4
Information (I)	3	10	14	16
Properties (P)	1	4	5	8
Optional characteristics (O)	21			

prEN 18065 (*excerpt*)

Table A.2 — Properties (P)

Property	Examples for standards	DQL 1	DQL 2	DQL 3	DQL 4
Viscosity (MVR/MFR, IV, VN)[b]	EN ISO 1133 series, EN ISO 307, EN ISO 1628 series	X	X	X	X
Ash content[b]	EN ISO 3451 series, EN ISO 1172		X	X	X
Residual humidity[b]	EN ISO 15512, EN 13267, calibrated IR scale		X	X	X
Density[c]	EN ISO 1183 series		X	X	X
Bulk density[b]	EN ISO 60			X	X
Particle size distribution[b]	DIN 53477 or average grain size and shape of the granulate				X
Tensile properties[a]	EN ISO 527-1, EN ISO 527-2				X
Material identification (FTIR or DSC)[c]	IR (database comparison), DSC (EN ISO 11357-1, EN ISO 11357-2, EN ISO 11357-3)				X

[a] Category Plastic product requirement (see prEN 18064-1)

[b] Category Processing requirement (see prEN 18064-1)

[c] Category Additional polymer data (see prEN 18064-1)

At the end of the day…

- Recycling is a matter of environmental responsibility
- Construction products are concerned as well, and construction sectors work hard to offer tools for addressing and solving environmental challenges
- Economy and profitability are of course essential aspects, but they cannot develop without a set of sound foundations brought by standards
- There are still some challenges to overcome, e.g. the assessment of long-term properties for non-pressure piping systems
- We are on the way to more performance-based standards incorporating recyclates as materials sources

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Thank you!

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