

[Appendix 2]

**Voluntary Design Guidelines for Designated PET Bottles**

**Evaluation Criteria for Labels  
(including Printing, Adhesives and other Components)**

Revised on  
March 31, 2023

**The Council for PET Bottle Recycling (JAPAN)**

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## **1. Introduction --- Objective and Background**

This document is prepared as an appendix to “Voluntary Design Guidelines for Designated PET Bottles” (these “Guidelines”) by The Council for PET Bottle Recycling (the Council). It prescribes properties (including hygienic safety) of labels required from the viewpoint of recycling and methods for evaluating recyclability of bottles attached with the labels used with the designated PET bottles for soft drinks, alcoholic beverages and specified seasonings which are sold in Japan. The companies such as manufacturers, dealers and importers that are planning to use the designated PET bottles with newly developed labels are responsible for conducting the evaluation in accordance with these “Criteria”.

In this revision, the former “Evaluation Criteria for Labels Printing and other Components” are revised to a large extent in consideration of recent increase of glued labels and improvement in recyclability of the adhesives and are retitled “Evaluation Criteria for Labels (including Printing, Adhesives and other Components)”

These “Criteria” may evolve with the progress and change in recycling technologies and also with changes in the social circumstances.

## **2. Definition of “Labels” --- Scope of Application**

The term “Labels” in these “Criteria” includes labels, label printing and adhesives for gluing the labels on the bottles. Direct printing on the bottle is excluded from these “Criteria” because that is not allowed and is regarded as attachment to the bottle as described in the Attached Table in the main part of these “Guidelines”. Handles are also regarded as a non-detachable attachment to the bottle.

The companies\* that are planning to use newly developed labels for their PET bottles for soft drinks, alcoholic beverages and specified seasonings are requested to evaluate the recyclability in accordance with these “Criteria”. Submission of a report on the evaluation results to The Council prior to putting on the market is requested.

\* The companies include manufacturers of the resins, the additives and the bottles, bottle users such as beverage, food and filling companies, the dealers and the importers.

It is recommended to perform the evaluation for currently used labels in case such data are not available.

## **3. Current Situation of Recycling Collection and Reclamation**

### **--- Characteristics desired to the Labels for Designated PET bottles**

Since post consumer PET bottles are collected with attached labels in many cases, visual inspection and manual sorting are essential for reclaimers and are a part of reason for increasing the recycling cost and lowering the quality of the recycled material. Therefore the labels used with designated PET bottles are desired to be improved in their detaching\*\* and separation\*\*\* characteristics.

\*\* Detaching characteristics: Labels should be able to be removed easily by hand with no residual label fragments or adhesives remaining on the bottle surface.

\*\*\* Separation characteristics: Labels should be able to be separated from PET flakes in the reclaiming system such as sink/float, wind separation and washing processes, as they cannot be removed perfectly in the manual sorting process.

## 4. Basic Requirements

The labels used for the designated PET bottles should meet the basic requirements below. The basic requirements consist of the essential terms that must be fulfilled and the recommended terms that should be followed to the maximum extent possible.

### 4-A Materials

- (1) Label materials should not contain PVC. **<essential>**
- (2) Material and the thickness should be selected so as to be able to be separated from PET flakes by means such as sink/float, wind separation and washing processes. **<essential>** (See Attached Table 2)
- (3) The inks used for label printing should not migrate to the bottle surface. **<essential>**
- (4) The labels laminated with aluminum foil should not be used. **<essential>**
- (5) Metalized labels are not preferable. **<recommended>**

### 4-B Food Contact Compliance

- (1) The plastics material for the labels should be compliant with the “Standards and Criteria for Foods and Additives (Ministry of Health and Welfare Notification No. 370)” set forth in accordance with the “Food Sanitation Act”. The additives, if used, should be compliant with the voluntary standards (Positive List Restriction) set by the Food Contact Material Safety Center of Japan Chemical Innovation and Inspection Institute. **<essential>**
- (2) The printing inks should meet the requirements of the “Voluntary Restriction for Printing Inks for Food Packaging (Negative List Restriction)” set by the Japan Printing Ink Makers Association. **<essential>**
- (3) The adhesives should meet the requirements of the “NL Voluntary Restriction for Adhesives for Food Packaging” set by Japan Adhesive Industry Association. **<essential>**

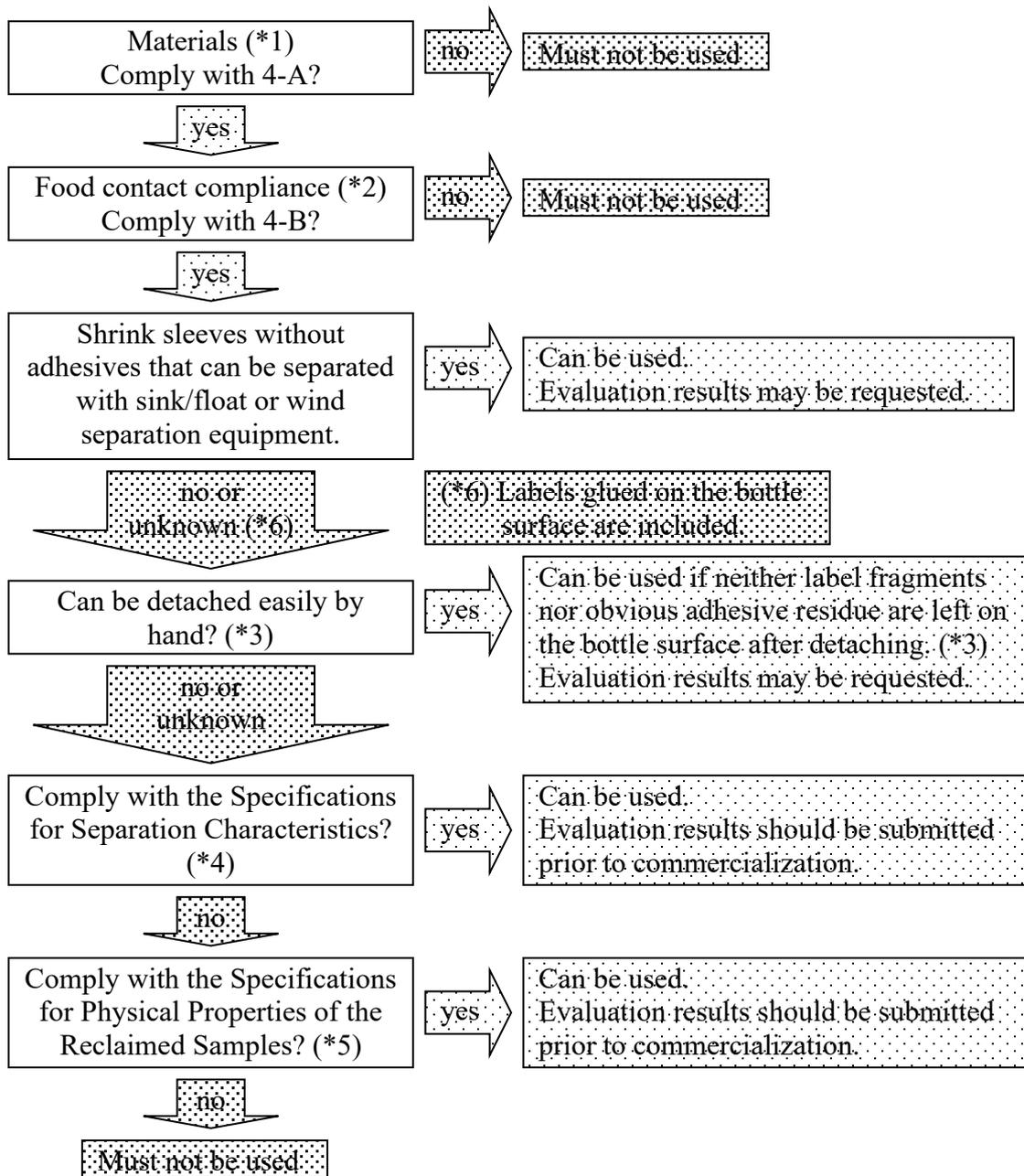
### 4-C Detaching and Separation Characteristics

- (1) Shrink sleeves are recommended to be perforated. **<recommended>**
- (2) For the labels glued on the bottle surface such as roll- and sheet-labels, adhesive usage and area covered with the adhesive should be minimized for easier detaching. Labels that can be detached easily by hand leaving no fragment or adhesive on the bottle surface are preferable. **<recommended>**

Labels other than those described above such as full surface glued labels, which may impose a burden on reclaimers not being easily detached and not being able to be separated from the PET flakes, are strongly recommended to be converted to those meeting (1) or (2) above.

## 5. Evaluation Flowchart

The following chart is for evaluating newly developed labels that are planned to use. It is recommended to perform the evaluation for currently used labels in case such data are not available. Labels judged not comply with these “Guidelines” or “Criteria” should not be used.



- (\*1) Materials: In case new materials are employed, the manufacturer, the dealer or the importer should confirm the compliance with the essential terms of 4-A of the Basic Requirements. The evaluation results may be requested.
- (\*2) Food contact compliance: In case new materials are employed, the manufacturer, the dealer or the importer should confirm the compliance with the essential terms of 4-B of the Basic Requirements by checking the documents from the manufacture of the label (or the inks or the adhesives) such as certificates. The evaluation results may be requested.
- (\*3) Notes to detaching characteristics: Check if the label can be detached easily by hand with the same bottles, labels and labeling equipment as those used in commercial production. Dummy labels and/or testing equipment can also be used. The number of the samples and the panel for the evaluation should be selected adequately.

- (\*4) Separation Characteristics: If it is not certain whether the shrink sleeve can be separated with equipment such as sink/float and wind separator, or if the glued label and the adhesives used cannot be detached easily by hand, conduct evaluation following Attached Table 2 – Procedure and Specifications for Evaluating Separation Characteristics. Labels that comply with the specifications can be used.
- (\*5) Physical Properties of the Reclaimed Samples: If the labels do not comply with the specifications of Attached Table 2, conduct the evaluation following Attached Table 3 – Procedure and Specifications for Evaluating Physical Properties of the Reclaimed Samples. Labels that comply with the specifications can be used.

## 6. Making a Report

It is essential to gain a correct understanding of the labels used with designated PET bottles in order to ensure smooth recycling.

Submission of a report on the evaluation results to The Council is requested prior to putting the bottles applied with newly developed labels on the market. The report should include the information listed below:

- 1 Submit to: The Council For PET Bottle Recycling  
7-16 Nihonbashi-Kodemma-cho, Chuo-ku, Tokyo 103-0001, Japan  
Tel: +81-3-3662-7591 Fax: +81-3-5623-2885
- 2 Format: A4 size, stapled lengthwise on the left
- 3 Information to be included
  - (1) Submitter and the date of submission
  - (2) a) Type of the label, the material name and the thickness  
b) Adhesive name and the material, if used
  - (3) The manufacturer(s) of a) the label and b) the adhesive, if used
  - (4) The weight of the adhesive used and the area covered, if used
  - (5) Hygiene and Safety
    - a) Analytical reports on migration tests of the label material according to the “Food Sanitation Act” and the certificate for additives, if used, issued by the Japan Hygienic Olefin and Styrene Plastics Association.
    - b) Documents for the printing inks verifying compliance with the “Voluntary Restriction for Printing Inks for Food Packaging (Negative List Restriction)” set by the Japan Printing Ink Makers Association.
    - c) Documents for the adhesives verifying compliance with the “NL Voluntary Restriction for Adhesives for Food Packaging” set by Japan Adhesive Industry Association.
  - (6) Detaching and separation characteristics: Testing conditions and the results
  - (7) Physical properties of reclaimed samples: Testing conditions and the results

Material names (2) and/or the manufacturer (3) are not always required to be specified, as it may result in disclosure of intellectual properties. The terms (6) and (7) above can be omitted when the evaluation is not required.

## **Attached Table 1 – Quality Standards for Recycled Products**

Extracted from the “Guidelines for PET Bottle Recycling Facilities” issued by the Japan Container and Package Recycling Association

### (1) Flakes

1)	Cut size	8 mm diameter screen
2)	Moisture content	≦ 0.6 %
3)	IV	0.65 ~ 0.75 dl/g
4)	Metal	≦ 30 ppm
5)	Black particles after reheating (PVC)	≦ 40 ppm
6)	Colored flakes	≦ 450 ppm
7)	Polyolefin	≦ 30 ppm
8)	Yellow substances before heating	≦ 400 ppm
9)	Flakes contaminated with yellow substances	≦ 1200 ppm
10)	Flakes contaminated with paper labels	≦ 300 ppm
11)	Label fragments	≦ 20 ppm
12)	Flakes contaminated with inks	≦ 150 ppm
13)	Others	≦ 280 ppm
14)	Total amount of foreign substances [ 7) to 13)]	≦ 1300 ppm
15)	Fine particles ( <500 μ m)	≦ 0.5 %
16)	Contamination Levels:	Flakes whose contamination level is equivalent to Class 1 or 2 of the boundary samples are acceptable, while those whose contamination level is equivalent to Class 3 are not acceptable.

### (2) Pellets

1)	Size	2.5 ~ 3.0 mm φ x 2.5 ~ 3.0 mm L
2)	Moisture content	≦ 0.4 %
3)	IV retention	95% or higher (97% or higher, preferably) It is not realistic to define the limit value of IV, as the values of the flakes are not stable. (Note: IV values would be required to be higher than 0.67)
4)	Color	Control standards shall be on voluntary basis of the production data of L, a and b values.
5)	Foreign particles	To be passed with a filter of 400-mesh or finer. (Since it is difficult to quantify the amount of foreign particles involved in the pellets, quality of the flakes and filter gauge shall be controlled, instead.)
6)	Contaminants	Prevent contaminants being mixed into the product. (Contaminants refer to substances other than PET pellets.)

Note: See JIS K7390 “Testing methods for reclaimed poly(ethylene terephthalate) (PET) molding materials from PET bottles” for testing the flakes and the pellets.

**Attached Table 2 – Procedure and Specifications for Evaluating Separation Characteristics**

Evaluation Steps		Details	Specifications
1	Bottle molding	The bottles and the labels used for the evaluation should be the same as the actual products to be commercialized. Dummy labels and/or testing equipment can also be used.	-----
2	Labeling		-----
3	Compression	Use a bailing machine. Or press the bottles simulating compression at bailing.	-----
4	Shredding	Shred the bottles into an 8 mm mesh flakes.	-----
5	Wind separation	Separate the label fragments using testing equipment.	Residual label fragments: $\leq 20$ ppm  Flakes contaminated with paper labels: $\leq 300$ ppm  Calculate the amount of the residual label fragments by subtracting total dry weight of the separated label fragments from initial weight of the labels.
6	Hot water washing	Immerse the residual flakes in hot water at 85°C, stir thoroughly for 15 minutes. Leave them for 5 minutes, and then remove floating fragments of the labels.	
7	Caustic washing	Immerse the residual flakes in 1.5% hot caustic solution at 85 to 90°C and stir thoroughly for 15 minutes. Leave them for 5 minutes, and then remove floating fragments of the labels.	
8	Gravity separation (water washing)	Immerse the residual flakes in water at ambient temperature and stir thoroughly for 15 minutes. Leave them for 5 minutes, and then remove floating fragments of the labels.	
9	Wind separation (drying)	Remove the moisture from the residual flakes with hot air, and then separate the label fragments as step 5.	

<Judgment>

The labels that meet the Specifications in any of Evaluation Steps 5 through 9 can be used. Submission of the report to the Council prior to commercialization is requested.

Otherwise, conduct evaluation described in Attached Table 3.

### Attached Table 3 – Procedure and Specifications for Evaluating Physical Properties of the Reclaimed Samples

<Preparing Samples>

- (1) Reclaimed flakes: Use the flakes obtained at Evaluation Step 9 described in Attached Table 2.
- (2) Reference flakes: Use PET flakes containing no label fragments obtained at Evaluation Step 4 or 9 in Attached Table 2, skipping the step 2 (labeling).

Steps	
<u>Pelletizing</u> ↓	Process the flakes into pellets. Use a 200 mesh filter.
<u>Plate molding</u>	Mold plates of 3 mm thick using an injection molder. Conduct the evaluation below with these plates.

<Items to be evaluated with the plates>

Evaluation Items	Unit	Specification	Importance Level	Remarks
IV value		$0.6 \leq$	<b>Important</b>	
Color	L ( $\Delta L$ )	$5 \geq$	Reference	Defference from the reference material (PET)
	a ( $\Delta a$ )	$3 \geq$	Reference	
	b ( $\Delta b$ )	$0 \pm 2$	<b>Important</b>	
Haze	%	$5 \geq$	<b>Important</b>	At 3 mm thick
Appearance	Color	Equivalent to the reference material	<b>Important</b>	In visual comparison with the refernce material (PET)
	Flow marks	No flow marks	Reference	
	Sink	No sink	Reference	
DSC(*)	Tg	$70 \leq$	Reference	Glass transission temperature
	Tc1	$130 \leq$	Reference	Crystallization temperature at heating
	Tc2	$205 \geq$	Reference	Crystallaization temperature at cooling
	Tm	$230 \leq$	Reference	Melting point

(\*) DSC conditions:

Heating rate: 10°C /min (Tg, Tc1, Tm)

Keep at 300°C for three minutes

Cooling rate: 10°C /min (Tc2)

<Judgment>

All the four items classified as “Important” and at least four out of eight items classified as “Reference” have to meet the specification.

Submission of the report to the Council prior to commercialization is requested.