DPNS 396-2:2013
ICS 27.200

Household appliances – Energy efficiency factor (EEF) and labeling requirements – Part 2: Refrigerator and freezers

Foreword

This Philippine National Standard on energy efficiency and labeling requirements for refrigerators and freezers has been developed by the Bureau of Product Standards' Technical Committee on Household Appliances (BPS/TC 23/30).

This standard, second of a series of energy standards dealing with appliances, has been developed in support of the Department of Energy through Philippine Energy Efficiency Project (PEEP)'s program of promoting energy efficiency and conservation as one of the strategies to achieve energy self-sufficiency, to contribute to the reduction of greenhouse gas emission and to guide consumers in determining which household appliance model is less costly to operate.

This standard requires attachment of an energy label that would show the product's energy and performance characteristics.

It is hereby emphasized that under this standard, refrigerators and freezers are to be tested at 230 V 60 Hz, which is the nominal voltage system in the Philippines.

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1 Scope

This standard specifies the energy efficiency factor and labeling requirements for food-freezers, refrigerators and refrigerator-freezers for household use and similar purposes.

NOTE The term "similar purposes" pertains to appliances intended for normal household use but may be used in shops, in stores, and other commercial establishments.

2 Reference

PNS IEC 62552:2012 (IEC pub. 2007; ed. 1.0) – Household refrigerating appliances – Characteristics and test methods is indispensable for the application of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

3 Terms and definitions

For the purpose of this document, the definitions given in PNS IEC 62552:2012 and the following apply:

3.1
energy efficiency factor (EEF)
refers to the ratio of the total storage volume, in liters, to the energy consumption per 24 hours, in kilowatt hour

3.2
energy efficiency class
refers to the number of stars displayed on the energy guide, which is based on the rated EEF

NOTE 1 Energy efficiency class having more stars means higher efficiency.

NOTE 2 This is not equivalent to the identification of the frozen food compartment pertaining to the coldness as specified in IEC 62552 such as: one-star compartment at -6 °C, two-star compartment at -12 °C, three-star compartment at -18 °C.

3.3
minimum energy performance standard (MEPS)
refers to the minimum measured energy efficiency factor (EEF) value of the appliance set in the implementing guidelines

4 Requirements

4.1 Each refrigerator and freezer shall carry an energy label containing the following information:

4.1.1 Rated Energy efficiency factor in liters per kilowatt hour (ℓ /kWh);

4.1.2 Rated total storage volume in liters (**ℓ**);

4.1.3 Rated Energy consumption in kilowatt hour (kWh/24 h);

4.1.4 Name/Trademark of the company;

NOTE Company is a person or entity who placed the product in the market.

4.1.5 Brand and model;

4.1.6 Type: The types are the following:

4.1.6.1 food-freezer

4.1.6.2 refrigerator

4.1.6.3 refrigerator-freezer

4.1.6.4 frost-free food-freezer

4.1.6.5 frost-free refrigerator

4.1.6.6 frost-free refrigerator-freezer;

4.1.7 Freezing capacity, for items 4.1.6.1, 4.1.6.3, 4.1.6.4 and 4.1.6.6; and

4.1.8 The energy label shall be as specified in annex A and shall be attached on the upper front portion of the door. The attachment of energy label shall be done by appropriate means such that the label cannot be easily detached.

4.2 Minimum energy performance standard (MEPS)

4.2.1 All test samples shall have measured EEF not less than the MEPS specified in the implementing guidelines.

4.2.2 The measured EEF shall be rounded off to whole number. The decision shall be based on the rounded off value.

4.3 Storage volume

4.3.1 The measured storage volume shall not be less than 97 % of the rated value or 1 liter whichever is higher.

4.3.2 The measured percentage shall be rounded off to whole number. The decision shall be based on the rounded off value.

4.4 Storage temperature

4.4.1 The refrigerating appliances shall comply with the requirements specified in the implementing guidelines.

4.4.2 The measured storage temperature shall be rounded off to nearest 0.1 °C. The decision shall be based on the rounded off value.

4.5 Energy consumption

4.5.1 The measured energy consumption shall not be more than 110 % of the rated value.

4.5.2 The measured percentage shall be rounded off to whole number. The decision shall be based on the rounded off value.

4.6 Freezing capacity

4.6.1 The measured freezing capacity shall not be less than 85 % of the rated value.

4.6.2 The measured percentage shall be rounded off to whole number. The decision shall be based on the rounded off value.

5 Test methods

Test methods to verify the claimed energy efficiency factor (EEF) on the label shall be as specified in PNS IEC 62552:2012.

6 Computation and presentation of results

6.1 Computation of the energy efficiency factor shall be made using the following equation:

$$\text{Energy efficiency factor (EEF)} = \frac{\text{Total adjusted volume, in liters}}{\text{Energy consumption, in kWh/24h}}$$

where:

Total adjusted volume = $SV_{ff} + (K \times SV_{OC})$;

SV_{ff} = storage volume of fresh food compartment, in liters;

SV_{OC} = storage volume of other compartments, in liters; and

K = adjustment factor.

NOTE The resulting EEF is rounded off to the nearest 0.1 L/kWh. The decision will be based on the rounded-off value.

6.2 Computation of adjustment factor, K, shall be made using the following formula:

$$\mathbf{K} = \frac{T_1 - T_c}{T_1 - T_M}$$

where:

K = adjustment factor;

T_1 = ambient temperature, °C;

T_c = compartment temperatures. i.e. frozen food compartment, chiller compartment, etc., °C; and

T_M = fresh food compartment temperature, °C.

NOTE Actual temperatures of each compartment shall be used in the above formula

6.3 Computation of adjusted storage volumes

6.3.1 Computation of adjusted storage volume of frozen food compartment shall be made using the following equation:

$$\mathbf{FZAV} = SV_{mfz} \times K_{FZ}$$

where:

FZAV = adjusted storage volume of frozen food compartment, in liters;
SV_{mfz} = measured storage volume of frozen food compartment, in liters; and
K_{FZ} = adjustment factor as computed using Clause 6.2.

6.3.2 Computation of adjusted storage volume of chiller compartment shall be made using the following equation:

$$\mathbf{CCAV} = SV_{mcc} \times K_{CC}$$

where:

CCAV = adjusted storage volume of chiller compartment, in liters;
SV_{mcc} = measured storage volume of chiller compartment, in liters; and
K_{CC} = adjustment factor as computed using Clause 6. 2.

6.3.3 Computation of adjusted storage volume of cellar compartment shall be made using the following equation:

$$\mathbf{CAV} = SV_{mc} \times K_C$$

where:

CAV = adjusted storage volume of cellar compartment, in liters;
SV_{mc} = measured storage volume of cellar compartment, in liters; and
K_C = adjustment factor as computed using Clause 6.2.

NOTE 1 The rational for multiplying each compartment volume by an adjustment factor “K” is that, it takes “K” times as much energy to maintain a given insulated space at -18 °C than it does at +5 °C in a 32 °C ambient temperature.

NOTE 2 Typical refrigerator-freezer models have two temperature zones, a fresh food storage area that operates at about +5 °C and a frozen food storage area that operates at about -18 °C for a 3 star freezer compartment. In order to compare, on an equitable basis, a model with a large percentage of its total volume devoted to freezer space, to a model with small percentage of its total volume devoted to a freezer space, an adjustment factor “K” is applied to the freezer volume. This adjustment is the ratio of heat flow through freezer wall to heat flow through an equivalent fresh food wall, which is proportional to the ratio of the temperature difference.

7 Energy efficiency classification

7.1 Energy efficiency classification of the refrigerators and freezers shall be based on the rated EEF.

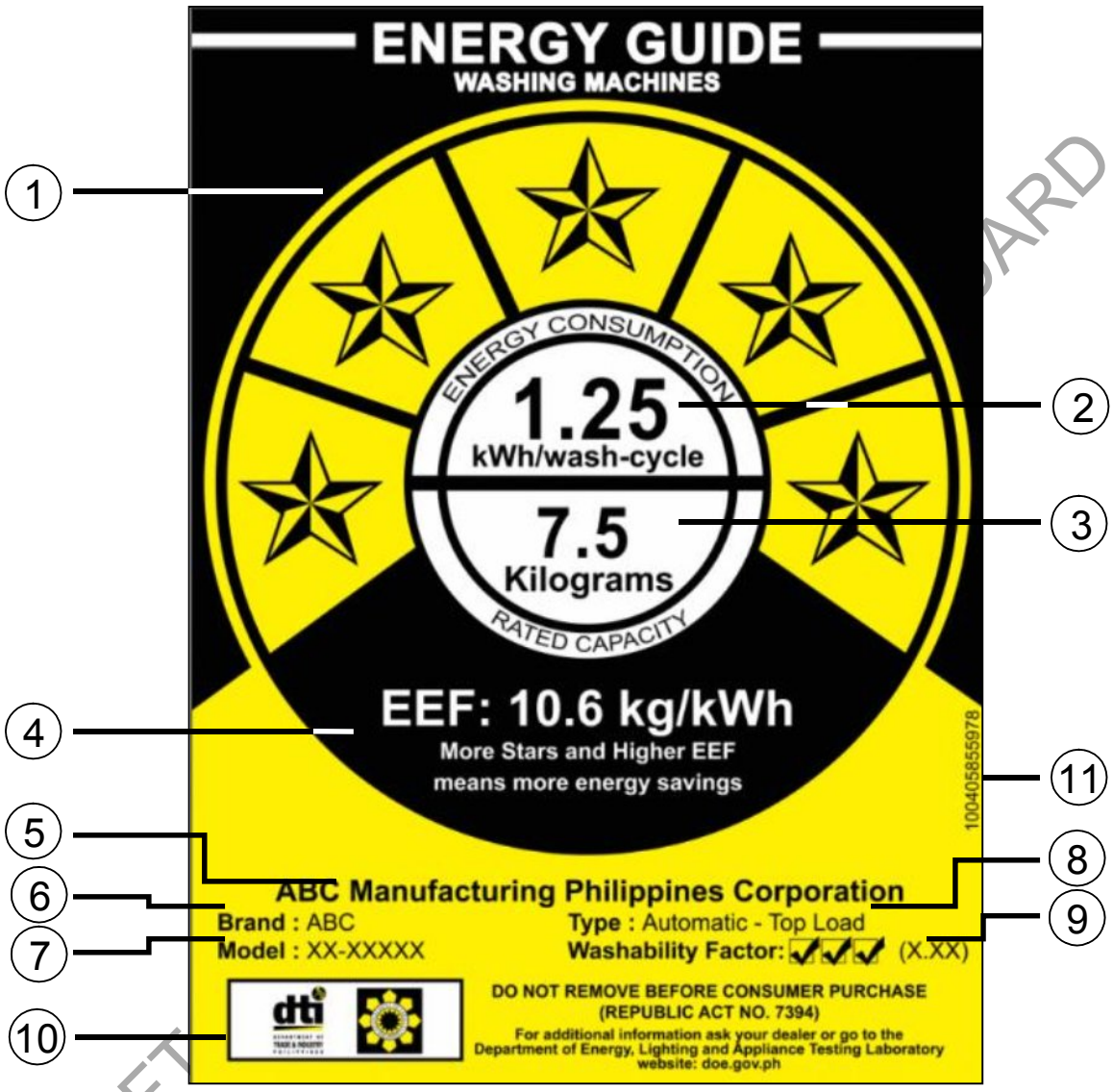
7.2 The system of classification shall be based on the procedure as agreed by the government and industry. This agreement shall form part of the implementing guidelines of this standard.

7.3 There shall be only one set of energy efficiency classification to represent each type of refrigerators and freezers.

7.4 The classification shall be represented by stars with one-star indicating the lowest range of EEF while five-star representing the highest range of EEF.

Annex A
Energy label design

A. Label

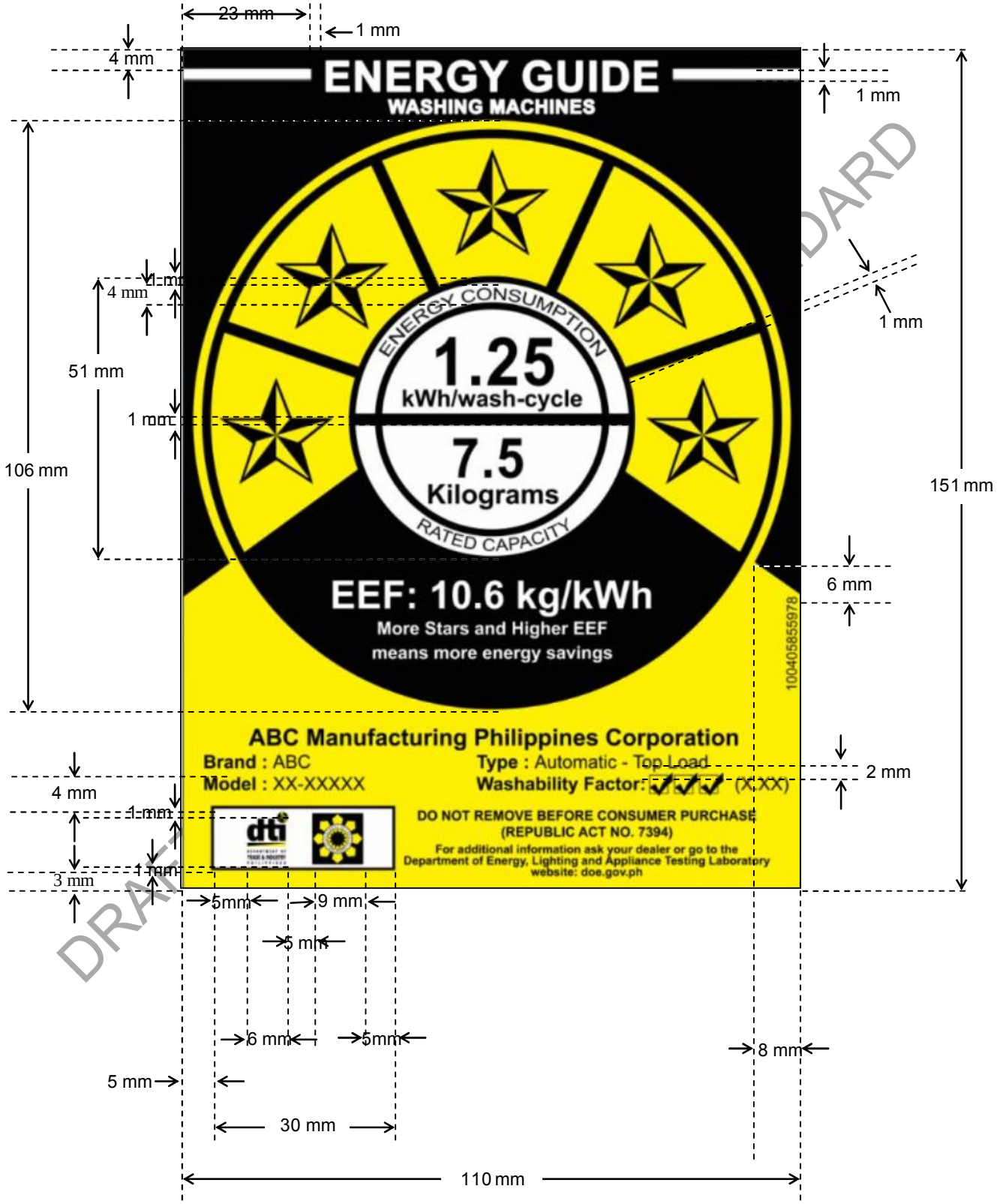


Legend:

1. Energy efficiency class;
2. Rated energy consumption per wash cycle, in kWh/wash-cycle;
3. Rated capacity, in kg;
4. Rated energy efficiency factor, in kg/kWh;
5. Name of company;
6. Brand;
7. Model;
8. Type;
9. Washability index;
10. DOE and DTI logo; and
11. Control number (issued by the DOE).

B. Label design

The design of the label shall be as in the figure below:



wherein:

a. The label must be 110 wide and 151 mm high. Where the label is printed in a larger format, its content must remain proportionate to the specification above.
b. The background shall be white (CMYK).
c. Colours shall be CMYK – following 70 percent yellow, 0 percent black.
d. **Energy efficiency class**: pictogram is as depicted.
e. **Energy consumption**: Arial bold, 30 pts.
f. **Rated capacity**: Arial bold, 30 pts.
g. **Energy efficiency factor**: Arial bold, 30 pts.
h. **Name of company**: Arial, 11.5 pts.
i. **Brand**: Arial, 9 pts.
j. **Model**: Arial, 9 pts.
k. **Type**: Arial, 9 pts.
l. **Washability index**:
    1. Box has dimension of 2 mm squared.
    2. Check is as depicted.
    3. Value is Arial, 9 pts.
m. **DOE Control Number**: Arial, 7 pts.