

TGL-3-R2-02

Refrigerator

Refrigerator is one of the most electricity consuming appliance used in household. Approximately in capital area, about twenty percent of electricity cost is from refrigerator and it could be more than thirty percent in rural area's case. In general, average energy consumption of refrigerator is about 500 kW-hours of electricity per year, approximately equal to 800 bath per year for electricity cost.

Electricity is generated from energy resources, such as oil, which is a non-renewable natural resource. As such, electricity generation not only results in consumption of non-renewable fuel resources, but also causes another environmental effects resulting from such things as ash disposal, dust and gas from combustion of lignite, loss of forest area from dam construction with resulting migration problems, and green house effects caused by carbon dioxide released from fossil fuel combustion.

Chlorofluorocarbons (CFCs) have been heavily used in refrigerators. CFC-12 has been used as refrigerant, while CFC-11 has been used as a foaming agent in insulation. When released to the atmosphere, these substances cause serious environmental problems. In recently the production of household refrigerators develop to use HFC-134a refrigerant because it doesn't destroy ozone layer and use HCFC-141b as a foaming agent (Ozone Depletion Potential : ODP is 0.11) or use Cyclopentane (ODP is zero).

Environmentally sound refrigerator criteria have been set based on energy efficiency, use of CFCs substitutes and labeling of plastic types for recycling. Environmentally sound refrigerators will save electric energy, energy resources, and reduce environmental impacts in Thailand.

Category Definition

This category includes compression-type household refrigerators.

Green Label Requirements

To be authorized to carry the Green Label, a product must meet both the general requirements and the specific requirements listed below:

A. General Requirements

The products must:

1. be certified to the Thai Industrial Standard TIS 455, *Household Refrigerators* or International Industrial Standard or Acceptable Industrial Standard if not certified, must have passed standardized tests of product quality; or must have passed product quality test in table1.
2. be manufactured, transported and disposed in a manner meeting requirements of all applicable governmental acts and regulations.

Table 1 Refrigerator quality test for carrying the Green Label

No.	Testing Topics	Testing Methodology	Required Document for the application for the Green Label
1.	Electricity safety <ul style="list-style-type: none">• Compressor	<ul style="list-style-type: none">• IEC 60335-2-24	<ul style="list-style-type: none">• Testing result from the standard governmental or private laboratories, or the certificate for the compressor which is approved by the CEO or the authority of the applying manufacturing company.
	<ul style="list-style-type: none">• Complete set	<ul style="list-style-type: none">• IEC 60335-2-24	<ul style="list-style-type: none">• Testing result from the standard governmental or private laboratories certified to the ISO 17025 , or other reliable laboratories.
2.	Internal volume	<ul style="list-style-type: none">• The applicants are required to follow the Thai Industrial Standard Testing Methodology in the project document of Electricity Generating Authority of Thailand.	<ul style="list-style-type: none">• Testing result from the governmental laboratories or private laboratories certified to the ISO 17025, or other reliable laboratories.
	Internal capacity		
	Volume of the refrigerator		
	Volume of the Ice cube maker		
Volume of the freezer			

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No.	Testing Topics	Testing Methodology	Required Document for the application for the Green Label
3.	Fridge door testing. (The testing of the rubber conjunction part of the door whether the door can be properly closed)	<ul style="list-style-type: none"> Refer to requirement No. 8.2.8 of TIS 455 or updated/revised version. 	<ul style="list-style-type: none"> Testing result gained from the factory that is approved by the CEO or the authority of the applying company.
4.	Force testing. The degree of the force required to open the fridge door.	<ul style="list-style-type: none"> Refer to requirement No. 8.2.9 of TIS 455 or updated/revised version. 	<ul style="list-style-type: none"> Testing result gained from the factory that is approved by the CEO or the authority of the applying company.
5.	Endurance testing of a fridge door, a handle and a door edge.	<ul style="list-style-type: none"> In the testing of the one door fridge, open and close the door wider than 45° not less than 100,000 times. In the testing of the two door s fridge, open and close the fridge door (door of the lower temperature part) wider than 45° not less than 100,000 times. 	<ul style="list-style-type: none"> Testing result gained from the factory that is approved by the CEO or the authority of the applying company.
6.	Tray, container, and the like.	Refer to requirement No. 8.2.11 of TIS 455 or updated/revised version.	<ul style="list-style-type: none"> Testing result from the governmental organisation or the private organisation certified to the ISO 17025 or other reliable organisation.
7.	Food preserve temperature testing.	<p>Refer to JIS C 9607 (1993), or</p> <ul style="list-style-type: none"> Keep the testing room at 30°C. Adjust the fridge temperature (t_3) in the range of $3\pm 1^\circ\text{C}$. After this test, the refrigerator must be able to maintain the temperature at the freezer part as follows; For one star refrigerator (t^*) = $-6\pm 1^\circ\text{C}$. For two stars refrigerator (t^{**}) = $-12\pm 1^\circ\text{C}$ For three stars refrigerator (t^{***}) = $-18\pm 1^\circ\text{C}$ 	<ul style="list-style-type: none"> Testing result from the governmental organisation or the private organisation certified to the ISO 17025 or other reliable organisation.

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8.	Vapor condensation test	Refer to requirement No. 8.2.13 of TIS 455 or updated/revised version.	<ul style="list-style-type: none"> Testing result from the governmental organisation or the private organisation certified to the ISO 17025 or other reliable organisation.
9.	Ice making capability test	Refer to to requirement No. 8.2.15 of TIS 455 or updated/revised version.	<ul style="list-style-type: none"> Testing result from the governmental organisation or the private organisation certified to the ISO 17025 or other reliable organisation.
10.	Odor test	Refer to to requirement No. 8.2.16 of TIS 455 or updated/revised version.	<ul style="list-style-type: none"> Testing result from the governmental organisation or the private organisation certified to the ISO 17025 or other reliable organisation.

B. Production Specific Requirements

1. The product shall be designated Energy-Saving by carrying the EGAT-certified Level 5 refrigerators efficiency label.
2. The product must use refrigerant with an Ozone Depletion Potential (OPD) of zero.
3. The product must use insulating foaming agent with an Ozone Depletion Potential (OPD) of zero.
4. The type and content of plastic material used in the product shall be marked, if the weight of the plastic material is greater than or equal to 50 gram, or if the surface area is greater than or equal to 50 square centimeter.
5. In case of using paper package, it has to be made from recycled pulp not less than 80% by the dry basis or as receive weight when the kraft liner board has to be made from recycled pulp not less than 80% by the dry basis or as receive weight, and not including ink, colorant, pigment or other additives which contain heavy metals such as lead, mercury, cadmium, chromium and the oxide of those substances. The concentration of combined contamination of heavy metal per colorant (dry basis) must be not more than 20ppm.
6. The pigment used in products must not contain all combined heavy metals and organic solvent not exceed than 5% by weight.
7. Noise level emission of products during operation must not exceed than 42 dB(A) and Information about the noise level of the appliance shall be provided in a way clearly visible to the consumer .

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8. Plastic parts heavier than 25 grams shall not contain the following flame retardants as stated in table 2 or as following codes of hazardous substances in preparation process of plastic parts :

- R45 (may cause carcinogenic)
- R46 (may cause heritable genetic damage)
- R50 (very toxic to aquatic organisms)
- R51 (toxic to aquatic organisms)
- R52 (harmful to aquatic organisms)
- R53 (may cause long-term adverse effects in the aquatic environment)
- R60 (may impair fertility)
- R61 (may cause harm to the unborn child)

Table 2 Type of flame retardant do not contain in plastic parts that have more than 25 gram.

Name	CAS no.
Decabromodiphenyl	13654-09-6
Mono bromodiphenyl ether	101-55-3
Dibromophenyl ether	2050-47-7
Tri bromodiphenyl ether	49690-94-0
Tetra bromodiphenyl ether	40088-47-9
Penta bromodiphenyl ether	32534-81-9
Hexa bromodiphenyl ether	36483-60-0
Hepta bromodiphenyl ether	68928-80-3
Octa bromodiphenyl ether	32563-52-1
Nona bromodiphenyl ether	6396-56-1
Deca bromodiphenyl ether	1163-19-5
Chloroparafin substance with chain length 10 to 13 C	85565-84-8
Substance have contain Chlorine more than 50% by weight	

9. The user manual shall provide instructions as follow ;
- 9.1 The following text in first page or cover “Further information on how to minimise environmental impacts is given in this manual”
 - 9.2 recommendations for optimal use of energy in the operation of the appliance, including:
 - 1) guidelines concerning the placing or installation on the appliance, amongst others, stating the minimum dimensions of free space around the appliance needed to ensure sufficient circulation of air, and also indicating that where the consumer has the possibility, significant energy saving can be achieved by placing the appliance in a cool location;

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- 2) advice that the consumer should avoid placing the appliance next to any heat source (such as ovens, radiators, etc) or in direct sunlight; advice that, where relevant, the consumer should consider insulating the appliance from wall or underfloor heating sources;
 - 3) advice that the thermostat setting is dependent on the ambient temperature and therefore, the temperature setting should be checked by using an appropriate thermometer (explanation on how to proceed should be provided);
 - 4) advice that the door or lid should not be opened more often than needed and no longer than necessary, especially with regard to upright freezers;
 - 5) advice that hot foodstuffs should be allowed to cool down before placing in the appliance, as the steam from the foodstuffs contributes to the icing up of the evaporator unit, but that the cooling period, however, should be as short as possible for health and hygiene reasons;
 - 6) advice that the evaporator unit should be kept clean from thick layers of ice and that frequent defrosting facilitates the removal of the ice cover;
 - 7) advice that the door seal should be replaced when not functioning properly;
 - 8) advice that when moving the appliance sufficient time should be allowed before switching it on again;
 - 9) advice that the condenser on the back of the appliance (where relevant) and the space underneath the appliance should be kept clean from dust and kitchen smoke;
 - 10) information that ignoring the issues mentioned above may lead to higher energy consumption;
- 9.3 advice to avoid any damage to the evaporator, condenser compressor and any parts leading to exposure of the refrigerant to the environment from sharp objects (such as knives, screwdrivers, etc.) should not be used for removing ice as they could damage the mentioned units because of potential environmental and health risks.

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