

Consultation Document

**Revision of the Code of Practice on Energy Labelling of Products (CoP)
for the Upgrading of Existing Energy Efficiency Grading Standards for Refrigerating Appliances, Washing Machines and Storage Type Electric Water Heaters under the Mandatory Energy Efficiency Labelling Scheme**

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Table of Content

Chapter 1	Introduction	2
Chapter 2	Energy Efficiency Labelling for Refrigerating Appliances	4
Chapter 3	Energy Efficiency Labelling for Washing Machines	22
Chapter 4	Energy Efficiency Labelling for Storage Type Electric Water Heaters.....	32
Chapter 5	Collection of Views	35

Chapter 1 Introduction

- 1 The purpose of this consultation document is to invite your views on the revision of the Code of Practice on Energy Labelling of Products for the upgrading of existing energy efficiency grading standards for refrigerating appliances, washing machines and storage type electric water heaters under the Mandatory Energy Efficiency Labelling Scheme (MEELS).
- 2 The Mandatory Energy Efficiency Labelling Scheme (MEELS) was introduced through the Energy Efficiency (Labelling of Products) Ordinance (Cap. 598) (the Ordinance) since 2008 and currently covers eight types of prescribed products, namely room air conditioners, refrigerating appliances, compact fluorescent lamps, washing machines, dehumidifiers, televisions, storage type electric water heaters and induction cookers¹. Under the Ordinance, energy labels are required to be shown on all prescribed products for supply in Hong Kong to inform consumers of their energy efficiency performance.
- 3 A Code of Practice on Energy Labelling of Products (CoP) is approved and issued under section 42 of the Ordinance. The CoP provides practical guidance and technical details in respect of the requirements under the Ordinance. The 2020 Edition of the CoP is available at the website of the Electrical and Mechanical Services Department (EMSD) with the following link²:
[https://www.emsd.gov.hk/energylabel/en/doc/Code%20of%20Practice%202020_Eng%20\(Effective%20on%2031.12.2020\).pdf](https://www.emsd.gov.hk/energylabel/en/doc/Code%20of%20Practice%202020_Eng%20(Effective%20on%2031.12.2020).pdf)
- 4 Since the implementation of the MEELS, more and more prescribed products have obtained Grades 1 and 2 energy labels. The scope and grading standards of MEELS are therefore kept under regular reviews to cope with technological advancements or the latest developments in international and national standards. Tightening of the energy efficiency grading standards of **refrigerating appliances, washing machines** and **storage type electric water heaters**³ was proposed since December 2021 to further encourage suppliers to introduce more energy efficient products for consumers.
- 5 Technical studies were conducted and views were collected from stakeholders in 2022 and 2023. Draft revisions on Sections 8, 10 & 13 and Appendices 2A, 4A & 7A of the CoP stipulating the

¹ The fourth phase of the MEELS will commence in September 2023. From then on, the MEELS will be expended to cover LED lamps, gas cookers and gas instantaneous water heaters.

² Following the expansion of scope of the MEELS in September 2023, a new edition of the CoP (2023 Edition) will take effect on 1 September 2023. The 2023 Edition of the CoP is available at the website of the EMSD with the following link: [https://www.emsd.gov.hk/energylabel/en/doc/CoP%202023%20\(Eng\).pdf](https://www.emsd.gov.hk/energylabel/en/doc/CoP%202023%20(Eng).pdf)

³ As of July 2023, 70%, 96% and 73% of listed models of refrigerating appliances, washing machines and storage type electric water heaters respectively have obtained Grade 1 (models which are not supplied in the market are not included).

requirements on the three types of prescribed products under review, which constitute the updates of the new Edition (2024 Edition), have been prepared. Views and comments on these sections are being invited.

- 6 Chapters 2, 3 and 4 of this document summarize the updates of the technical requirements and outline the requirement of “Energy Efficiency Labelling for Refrigerating Appliances” in section 8, “Energy Efficiency Labelling for Washing Machines” in section 10 and “Energy Efficiency Labelling for Washing Machines” in section 13 of the proposed CoP (2024 Edition).
- 7 Chapter 5 of this document invites views on the proposed draft revision of Sections 8, 10 & 13 and Appendices 2A, 4A & 7A of the CoP (2024 Edition) on or before 19 September 2023.
- 8 This proposal document shall be read in conjunction with the CoP and relevant international standards for energy efficiency tests.

Chapter 2 Energy Efficiency Labelling for Refrigerating Appliances

Proposed Major Updates to Existing Labelling Requirements

- 9 At present, under the MEELS, the energy efficiency performance of refrigerating appliances is measured and evaluated in accordance with IEC 62552 ed. 1.0 (2007). It is proposed to adopt IEC 62552:2015/AMD1:2020 series for testing of refrigerating appliances for the MEELS.
- 10 To cope with the change of testing standard, revisions on the definitions for storage compartments, their respective compartment temperatures and freezing capacities are proposed. From energy efficiency perspective, in addition to the upgrades of the energy efficiency grading standards, updates on the requirements on energy consumption measurement and the introduction of load processing efficiency test are proposed.
- 11 The revised Section 8 “Energy Efficiency Labelling for Refrigerating Appliances” and Appendix 2A “Example of Calculating the Energy Efficiency Grade for Refrigerating Appliances”, of the CoP (2024 Edition) is proposed as follows:

<p>8. Energy Efficiency Labelling for Refrigerating Appliances</p> <p>8.1. <u>Scope</u></p> <p>8.1.1. Clause 8 of the Code, unless the Director provides otherwise, applies to a refrigerating appliance defined in the Ordinance, that is, the products specified in clauses 8.1.2 and 8.1.3.</p> <p>8.1.2. “Refrigerating appliance”, subject to clause 8.1.3 of the Code, means a product—</p> <ul style="list-style-type: none">(a) that is a factory-assembled insulated cabinet with one or more compartments and of suitable volume and equipment for household use, cooled by internal natural convection or a frost-free system where the cooling is obtained by one or more energy-consuming means;(b) that is a refrigerator, frozen food storage cabinet or food freezer (or a combination of any of them); and(c) that—<ul style="list-style-type: none">(i) uses mains electricity as the only power source;(ii) operates by using the vapour compression cycle; and(iii) has a rated total storage volume not exceeding 500 litres. <p>8.1.3. “Refrigerating appliance” does not include refrigerating appliances that operate by using absorption refrigerating system.</p> <p>8.2. <u>Definitions</u></p> <p>This clause provides definitions of terms used in clause 8 of the Code. Unless otherwise specified, the definitions adopted in the clause 8 follow those</p>

stipulated in the Ordinance, if any.

<i>absorption</i>	means a system—
<i>refrigerating system</i>	(a) by which refrigeration effect is produced through the use of two fluids and some quantity of heat input; and (b) in which a secondary fluid or absorbent, rather than a mechanical compressor, is used to circulate the refrigerant.
<i>adjusted volume</i>	means the volume for the storage of foodstuff corrected for the relative contribution to the total energy consumption according to the different temperatures of the storage compartments.
<i>cellar compartment</i>	means a compartment for the storage of foodstuff at a temperature that is warmer than that of a fresh food compartment.
<i>chill compartment</i>	means a compartment for the storage of highly perishable foodstuff.
<i>food freezer</i>	means a refrigerating appliance with only frozen compartments, at least one of which is a freezer compartment.
<i>freezer compartment</i>	means a compartment that meets “3-star” or “4-star” requirements.
<i>fresh food compartment</i>	means a compartment for the storage and preservation of unfrozen foodstuff.
<i>frozen food storage cabinet</i>	means a refrigerating appliance having one or more compartments suitable for the storage of frozen food.
<i>frozen compartment</i>	means any of the following compartment types: “1-star”, “2-star”, “3-star”, “4-star”.
<i>ice-making compartment</i>	means a compartment specifically for the making and storage of ice.
<i>IEC</i>	means International Electrotechnical Commission.
<i>pantry compartment</i>	means a compartment for the storage of foodstuff at a temperature that is warmer than that of a cellar compartment.

<i>rated energy consumption</i>	means the energy consumption of a refrigerating appliance as determined and declared by the manufacturer or importer of the refrigerating appliance in accordance with the standard and requirements specified in the Code.
<i>rated freezing capacity</i>	means the freezing capacity of a refrigerating appliance as determined and declared by the manufacturer or importer of the refrigerating appliance in accordance with the standard and requirements specified in the Code.
<i>rated total storage volume</i>	means the total storage volume of a refrigerating appliance as determined and declared by the manufacturer or importer of the refrigerating appliance in accordance with the standard and requirements specified in the Code.
<i>refrigerator</i>	means a refrigerating appliance intended for the storage of foodstuff, with at least one fresh food compartment.
<i>refrigerator-freezer</i>	means a refrigerating appliance having at least one fresh food compartment and at least one freezer compartment.
<i>unfrozen compartment</i>	means any of the following compartment types: “0-star”, chill, fresh food, cellar or pantry
<i>vapour compression cycle</i>	means a mechanism employed by a refrigerating appliance throughout which the refrigerant undergoes alternate compression and expansion to achieve the cooling function.
<i>volume</i>	means the space within the inside liner of the refrigerating appliance, or a compartment or sub-compartment as determined in the standard.
<i>“0-star” compartment</i>	means a compartment in which the temperature is not warmer than 0 °C that can be used for the making and storage of ice but is not suitable for the preservation of highly perishable foodstuff
<i>“1-star” compartment</i>	means a compartment where the storage temperature measured as described in clause 8.3 of the Code, is not warmer than -6 °C

“2-star” compartment means a compartment where the storage temperature measured as described in clause 8.3 of the Code, is not warmer than -12 °C

“3-star” compartment means a compartment where the storage temperature measured as described in clause 8.3 of the Code, is not warmer than -18 °C

“4-star” compartment means a compartment where the storage temperature meets “3-star” conditions and where the minimum freezing capacity meets the requirements of Clause 8 of the standard.

8.3. Classification of Refrigerating Appliances

8.3.1. Basic Classification

All refrigerating appliances regulated under the Ordinance are classified as below—

(a) Climate Class

The classification used in the Code follows the requirements of subtropical climate class ‘ST’ of the IEC 62552 series as shown in Table 8.1

Therefore all the tests required according to the Code shall be carried out under the conditions of measured ambient temperature for climate class ‘ST’ stipulated in the above standard.

Table 8.1 – Climate class

Description	Class	Ambient temperature range (°C)
Subtropical	ST	+16 to +38

(b) Storage Compartment(s)

The refrigerating appliance shall maintain simultaneously, the required storage temperatures in the different compartments (and the permitted temperature deviations during the defrost and recovery period) as stipulated in Table 8.2

Table 8.2 – Storage compartment temperature

°C								
Compartment Type								
Fresh Food		Three-star and four-star	Two-star	One-star	Zero-star	Chill	Cellar	Pantry
T_{1m}, T_{2m}, T_{3m}	T_{ma}^a	$T^{*** a}$	$T^{** a}$	$T^* a$	T_{zma}^a	T_{cci}^a	T_{cma}^a	T_{pma}^a
$0 \leq T_{1m}, T_{2m}, T_{3m} \leq +8$	$\leq +4$	$\leq -18^b$	$\leq -12^b$	≤ -6	≤ 0	$-3 \leq T_{cci} \leq +3$	$+2 \leq T_{cma} \leq +14$	$+14 \leq T_{pma} \leq +20$
average	average	maximum	maximum	maximum	average	instantaneous	average	average
^a For definitions of symbols, see clause 3.7 in IEC 62552-1:2015 ^b During a defrost and recovery period, these storage temperatures of frost-free refrigerating appliances are permitted to rise by no more than 3°C								

(IEC 62552 “Copyright © 2015 IEC Geneva, Switzerland.www.iec.ch”)

(c) Freezing Capacity

A compartment where the storage temperature meets “3-star” conditions and where the minimum freezing capacity (rate of heat extraction by the refrigeration system from a load in a freezer or freezer compartment) meets the requirements of 3.5 kg/100 litres of the total volume of all compartments operating at -18°C in 24 hours, is defined as a “4-star” compartment. The calculated light load shall be rounded up to the nearest 0.5 kg, except that in no case shall it be less than 2.0 kg.

8.3.2. Overall Classification

All refrigerating appliances shall be classified in accordance with Table 8.3, which also incorporates the various parameters involved in the classification—

Table 8.3 – Overall classification

Types	Category No.	Functional Classification		
		Fresh food compartment temp. in °C	Frozen food compartment temp. in °C	Description
Refrigerator	Category 1	+4	Nil	A refrigerator without a frozen compartment
	Category 2	+4	≤ -6	A refrigerator with a 1-star frozen compartment
	Category 3	+4	≤ -12	A refrigerator with a 2-star frozen compartment
	Category 4	+4	≤ -18	A refrigerator with a 3-star frozen compartment
Refrigerator -freezer	Category 5	+4	≤ -18	A refrigerator with a 4-star frozen compartment
	Category 6	+4	≤ -18	A Category 5 refrigerator incorporating means to prevent the formation of frost on contents
Food Freezer	Category 7	Nil	≤ -18	A refrigerating appliance in which the entire storage volume is intended for freezing food.
	Category 8	Nil	≤ -18	A Category 7 refrigerating appliance incorporating means to prevent the formation of frost.

8.4. Tests Required to be Carried Out

The tests specified in this clause are required to be carried out, in accordance with IEC 62552 series, or other equivalent international standards approved by the Director, in order to find out the energy efficiency and performance characteristics of a refrigerating appliance. A test report required to be submitted to the Director under section 6 of the Ordinance shall contain the results of these tests:

- (a) Measurement of storage temperatures of compartments.
- (b) Measurement of storage volumes of compartments.
- (c) Energy consumption test.
- (d) Load processing efficiency test (for only refrigerator-freezer).
- (e) Freezing test (for only food freezer or refrigerator-freezer).

The refrigerating appliance shall be tested at a voltage and frequency of mains electricity in Hong Kong with tolerances as specified in the relevant standard.

8.5. Test Methodology and Energy Efficiency Grading

8.5.1. Measurement of Energy Consumption and/or Load Processing Efficiency

The methodology for measuring energy consumption (kWh/24hour), and/or the load processing efficiency, shall be based on:

- (a) IEC 62552 series; or
- (b) other equivalent international standards approved by the Director.

The specified international standard shall be referred to for actual performance requirements and procedural descriptions. The importer or manufacturer shall clearly indicate which test standard(s) they follow in testing their refrigerating appliances.

8.5.2. Calculation of Adjusted Volume

The storage volumes of different compartments in litres shall be measured in accordance with the standard specified in clause 8 of the Code. The respective adjusted volume of the refrigerating appliance shall then be the sum of the measured storage volumes of the different compartments weighted by the difference in temperatures between the interior of the compartments and the ambient temperature. The adjusted volume V_{adj} is calculated as follows—

$$V_{adj} = \sum V_i \times \Omega \dots\dots\dots (eq. 1)$$

where V_i = the measured storage volume of an individual compartment
 Ω = the weighting factor given by the following equation:

$$\Omega = \frac{T_a - T_i}{T_a - T_r} \dots\dots\dots (eq. 2)$$

where T_a = test room ambient temperature which is taken as 23.4 °C^(note)
 T_i = the rated temperature in the individual compartment concerned
 T_r = the rated temperature in the fresh food compartment which is taken as 4°C

Note: The annual days operating at ambient temperatures of 16 °C and 32 °C equivalent are taken as 196 days and 169 days respectively, resulting as a weighted ambient temperature of 23.4 °C for calculating the weighting factor Ω .

A summary of eight simple equations for calculating the adjusted volume of each refrigerating appliance category is shown in Table 8.4.

Table 8.4 – Adjusted volume (V_{adj}) calculation for all categories of the refrigerating appliances

Refrigerating Appliance Category	Adjusted Volume (in litre)	Equation No. ^(Note)
Category 1	V_r	3
Category 2	$V_r + 1.515 \times V_{ffc}$	4
Category 3	$V_r + 1.825 \times V_{ffc}$	5
Category 4	$V_r + 2.134 \times V_{ffc}$	6
Category 5	$V_r + 2.134 \times V_{ffc}$	7
Category 6	$V_r + 2.134 \times V_{ffc}$	8
Category 7	$2.134 \times V_{ffc}$	9
Category 8	$2.134 \times V_{ffc}$	10

where V_r = Storage volume of fresh food compartment

V_{ffc} = Storage volume of frozen food compartment

Note: These equations are used for those refrigerating appliances with fresh food compartment and frozen food compartment only. For refrigerating appliances with additional 0-star compartment, chill compartment, cellar compartment and/or pantry compartment, additional terms obtained by calculating equation 2 shall be added to these equations. For illustration, please refer to Appendix 2A.

Explanatory note for sample calculation of adjusted volume:

To illustrate how Equation 6 is derived for a category 4 refrigerating appliance:

Category 4 is defined as a refrigerator comprising one fresh food compartment (V_r) and one 3-star frozen food compartment (V_{ffc}).

By equation 1: $V_{adj} = \Sigma V_i \times \Omega$.

Total adjusted Volume = (Storage volume of fresh food compartment V_r) + (Storage volume of weighted 3-star frozen compartment V_{ffc})

From equation 2:

$$V_{adj} = V_r \times \left(\frac{T_a - T_r}{T_a - T_r} \right) + V_{ffc} \times \left(\frac{T_a - T_{ffc}}{T_a - T_r} \right) \dots\dots\dots(\text{eq. 11})$$

Since temperature of a 3-star compartment is $T_i = T_{ffc} = -18 \text{ }^\circ\text{C}$, and temperature of a fresh food compartment is $T_r = 4 \text{ }^\circ\text{C}$,

$$\text{Hence } V_{adj} = V_r \times \left(\frac{23.4 - 4}{23.4 - 4} \right) + V_{ffc} \times \left(\frac{23.4 - (-18)}{23.4 - 4} \right)$$

$$V_{adj} = V_r + 2.134 \times V_{ffc}$$

8.5.3. Energy Efficiency Definition of Refrigerating Appliances

- (a) The energy efficiency performance of a refrigerating appliance is defined as the maximum allowable energy consumed per unit storage volume for the storage of food stuff adjusted for the relative contribution to the total energy consumption according to the different temperatures of its compartments with the fresh food storage temperature $4 \text{ }^\circ\text{C}$ taken as the reference. For a refrigerating appliance with more than just the fresh food compartment, the energy consumption is not only a function of the refrigerating appliance storage volumes but also the relative sizes of the fresh food and other compartment storage volumes.
- (b) The energy consumption test measures the energy consumption of the refrigerating appliance by estimating the energy over a period of 24 hours at ambient temperatures of $16 \text{ }^\circ\text{C}$ and $32 \text{ }^\circ\text{C}$. The annual energy consumption in kWh/year (E) is calculated as follows—

$$E = f\{E_{\text{daily}16\text{C}}, E_{\text{daily}32\text{C}}\}$$

$$E = 196 \times E_{\text{daily}16\text{C}} + 169 \times E_{\text{daily}32\text{C}} \dots\dots\dots(\text{eq. 12})$$

where

- f is a function to give the annual energy based on daily energy at 16°C and 32°C . Annual days operating at an ambient temperatures of 16°C and 32°C equivalent are taken as 196 and 169 days respectively.
- $E_{\text{daily}16\text{C}}$ and $E_{\text{daily}32\text{C}}$ are the daily energy consumption measured in kWh/day at ambient temperatures of 16°C and 32°C respectively
- (c) For refrigerator-freezer, the load processing efficiency test measures the additional daily energy consumption of user-related aspects of the refrigerating appliance for producing a total energy consumption that more closely represents actual use. The total annual energy consumption in kWh/year (E_{total}) is calculated as follows—

$$E_{\text{total}} = f\{E_{\text{daily}16\text{C}}, E_{\text{daily}32\text{C}}\} + f\{E_{\text{processing}16\text{C}}, E_{\text{processing}32\text{C}}\}$$

$$E_{\text{total}} = (196 \times E_{\text{daily}16\text{C}} + 169 \times E_{\text{daily}32\text{C}}) + (196 \times E_{\text{processing}16\text{C}} + 169 \times E_{\text{processing}32\text{C}}) \dots \dots \dots (\text{eq. 13})$$

where

- $E_{\text{processing}16\text{C}}$ and $E_{\text{processing}32\text{C}}$ are the additional daily energy consumption of the refrigerating appliance to process the specified load in the load processing efficiency test (kWh/day)
- (d) The energy efficiency of a refrigerating appliance is inversely related to the refrigerating appliance energy efficiency ratio which is expressed in the unit of kWh/year/litre.

Refrigerating Appliance Energy Efficiency Ratio =

$$\frac{\text{Annual Energy Consumption}}{\text{Adjusted Volume}} \text{ kWh/yr/litre} \dots \dots \dots (\text{eq. 14})$$

(i.e. the lower the ratio the better is the energy efficiency)

8.5.4. Average Appliance Energy Consumption

- (a) The Average Appliance Energy Consumption line equations developed from equation (14) represent the average annual energy consumption for refrigerating appliances in Hong Kong.
- (b) The Average Annual Energy Consumption of a refrigerating appliance shall be determined in accordance with Table 8.5.

Table 8.5 – Average appliance energy consumption

Refrigerating Appliance Category	Average Annual Energy Consumption (kWh/yr)	Equation No.
Category 1	$V_{adj} \times 0.233 + 245$	15
Category 2	$V_{adj} \times 0.643 + 191$	16
Category 3	$V_{adj} \times 0.450 + 245$	17
Category 4	$V_{adj} \times 0.657 + 235$	18
Category 5	$V_{adj} \times 0.777 + 303$	19
Category 6	$1.35 \times (V_{adj} \times 0.777 + 303)^{(Note)}$	20
Category 7	Chest freezer: $V_{adj} \times 0.446 + 181$	21
	Upright freezer: $V_{adj} \times 0.472 + 286$	22
Category 8	Chest freezer: $1.35 \times (V_{adj} \times 0.446 + 181)^{(Note)}$	23
	Upright freezer: $1.35 \times (V_{adj} \times 0.472 + 286)^{(Note)}$	24

Note: The figure 1.35 in these equations is the correction factor for no-frost models.

8.5.5. Energy Efficiency Grading

(a) Energy Consumption Index (I_e)

The energy consumption index (I_e) of a refrigerating appliance is defined as the ratio of the actual energy consumption of the refrigerating appliance to the Average Appliance Energy Consumption (as found from the associated average annual energy consumption equations in clause 8.5.4 of the Code). The indices are expressed in percentages. Thus, within a category, a refrigerating appliance with a lower energy consumption index (i.e. a lower percentage) consumes less energy than a refrigerating appliance with a higher energy consumption index (i.e. a higher percentage). The energy consumption index is calculated as follows—

$$\text{Energy Consumption Index } (I_e) = \frac{E}{E_{av}} \times 100\% \dots \dots \dots (\text{eq. 25})$$

where

- E is the actual annual energy consumption in kWh/year of the refrigerating appliance measured in energy consumption test

- E_{av} is the average annual energy consumption in kWh/year as determined from Table 8.5

(b) Total Energy Consumption Index (I_t)

For refrigerator-freezer, the total energy consumption index (I_t) is defined as the ratio of the total annual energy consumption (taken into account the additional daily energy consumption of user-related aspects of the refrigerating appliance) to the Average Appliance Energy Consumption (as found from the associated average annual energy consumption equations in clause 8.5.4 of the Code). The indices are expressed in percentages. Thus, within a category, a refrigerating appliance with a lower total energy consumption index (i.e. a lower percentage) consumes less energy than a refrigerating appliance with a higher total energy consumption index (i.e. a higher percentage). The total energy consumption index is calculated as follows—

$$\text{Total Energy Consumption Index } (I_t) = \frac{E_{total}}{E_{av}} \times 100\% \dots \dots \dots (\text{eq. 26})$$

where

- E_{total} is the total annual energy consumption in kWh/year of the refrigerating appliance measured in energy consumption and load processing efficiency tests
- E_{av} is the average annual energy consumption in kWh/year as determined from Table 8.5

(c) Energy Efficiency Grading

The energy efficiency grading of a refrigerating appliance shall be determined as shown in Table 8.6, with Grade 1 having the best performance and Grade 5 having the worst performance.

Table 8.6 – Derivation of energy efficiency grades

Energy Consumption Index I_e (%)	Total Energy Consumption Index I_t (%) <i>(Note)</i>	Energy Efficiency Grade
$I_e \leq 26$	$I_t \leq 52$	1
$26 < I_e \leq 31$	$52 < I_t \leq 54$	2
$31 < I_e \leq 36$	$54 < I_t \leq 56$	3
$36 < I_e \leq 43$	$56 < I_t \leq 58$	4
$43 < I_e$	$58 < I_t$	5

Note:

For refrigerator-freezer, when both I_e and I_t attain the same grade, the respective energy efficiency grading will be assigned to the refrigerating appliance correspondingly. When I_e and I_t attain different grades, the lower

energy efficiency grading will be assigned to the refrigerating appliance correspondingly; For refrigerating appliance other than refrigerator-freezer, the energy efficiency grading shall be determined by I_e only.

An example illustrating the method on how to determine the energy efficiency grade of a refrigerating appliance is shown in Appendix 2A.

8.6. Performance Requirements

8.6.1 In the test report submitted to the Director under section 6 of the Ordinance, the results of the test carried out in accordance with IEC 62552 series, or other equivalent international standards approved by the Director shall show that the concerned model of the refrigerating appliance conforms with the following performance requirements—

(a) Measurement of Storage Temperature

The measured storage temperatures of fresh food compartment, frozen compartment, chill compartment, cellar compartment and pantry compartment where applicable, shall comply with the requirements of Table 8.2. (Note: This measurement test shall be carried out before the energy consumption test is performed.)

(b) Measurement of Storage Volume

The measured storage volume for each of the compartments shall not be less than the rated storage volume by more than 3% or 1 litre, whichever is the greater value. Where the volumes of the cellar compartment and fresh food storage compartment are adjustable relative to one another by the user, this requirement applies when the cellar compartment is adjusted to its minimum volume.

(c) Energy Consumption Test

The measured energy consumption (kWh/24hour) in the energy consumption test shall not be greater than the rated energy consumption by more than 15%.

(d) Freezing Test

(For only food freezer or refrigerating appliance having food freezer compartment)

The freezing capacity shall meet the requirements of at least 3.5 kg/100 litres of the total volume of all compartments operating at -18°C in 24 hours, and in no case less than 2 kg. For food freezer, it shall have one or more compartments meets “3-star” conditions.

8.6.2 The rated storage volume, the rated energy consumption and the rated freezing

capacity as declared by the manufacturer or importer shall meet the requirements in clause 8.6.1 of the Code. The rated total storage volume shall be the sum of the rated storage volumes of all the compartments of the refrigerating appliance.

8.7. Safety Requirements

In addition to the energy efficiency performance requirements, all refrigerating appliances shall comply with the Electrical Products (Safety) Regulation, Chapter 406G of the Laws of Hong Kong, and the safety standards specified under the Regulation, and all other legislations concerning the safety of the refrigerating appliance, e.g. the Gas Safety Ordinance and its subsidiary legislations, as appropriate.

8.8. Number of Samples to be Tested

For submission of product information of a model under section 6 of the Ordinance, a test report on one sample of the model shall be submitted.

8.9. Energy Label

8.9.1 The specification of the energy label for refrigerating appliance is shown in Appendix 2B. After a reference number has been assigned to a product model in the name of a specified person and included in the Director's record, the specified person shall produce the energy label for his/her products of the listed model showing the energy efficiency grade and associated information in strict accordance with the requirements in Appendix 2B.

8.9.2. (a) Subject to clause 10.8.2(c), the energy label is to be attached or affixed to the top front door or a prominent position of the refrigerating appliance and is to be clearly visible.

(b) For the avoidance of doubt, if only part of the refrigerating appliance is being exhibited, the energy label is to be attached or affixed to a prominent position of that part and is to be clearly visible.

(c) The energy label may be attached to the refrigerating appliance or its packaging in a manner specified by the Director where the Director has approved its being so attached.

8.9.3. The energy label shall be of cardboard, if it is to be attached as a swing tag, or be self-adhesive and shall be cut to the outline shown in Appendix 2B or otherwise approved by the Director. A trim or die cut margin of up to 2 mm around the energy label is acceptable.

8.9.4. The paper used for the energy label shall be durable with good wear and tear

characteristics.

8.10. Compliance

8.10.1. During the compliance monitoring testing carried out by the Director, a listed model of refrigerating appliance will be accepted as conformance if the test results of a single sample of the listed model meet the following criteria:

- (a) The tested storage temperatures of the compartments complying with the requirements of Table 8.2 of the Code, using the testing standard specified in the test report submitted to the Director by the specified person;
- (b) The tested storage volume for each of the compartments being not less than the rated storage volume by more than 3% or 1 litre, whichever is the greater value. Where the volumes of the pantry and/or cellar compartment and fresh food storage compartment are adjustable relative to one another by the user, this requirement applies when the pantry and/or cellar compartment is adjusted to its minimum volume;
- (c) The tested energy consumption (kWh/24hour) being not greater than the rated energy consumption by more than 15%;
- (d) (For only food freezer or refrigerating appliance having food freezer compartment) The tested freezing capacity meeting the requirements of at least 3.5 kg/100 litres of the total volume of all compartments operating at -18°C in 24 hours, and in no case less than 2 kg. The tested freezing capacity being not less than the rated freezing capacity by more than 15% of the latter. For food freezer, it having one or more compartments meets “3-star” conditions; and
- (e) The tested energy efficiency grade meeting either one of the following:
 - (i) The energy efficiency grade calculated in the compliance monitoring testing being equal to or better than the energy efficiency grade determined by the test results submitted to the Director by the specified person; or
 - (ii) If the energy efficiency grade calculated in the compliance monitoring testing being not equal to nor better than the energy efficiency grade determined by the test results submitted to the Director, the tested energy consumption index (and tested total energy consumption index for refrigerator-freezer) calculated in the compliance monitoring testing being not greater than 115% of the measured energy consumption index (and measured total energy consumption index for refrigerator-freezer) calculated by the test results submitted to the Director, and in any cases not greater than the highest energy consumption index (and total energy

consumption index for refrigerator-freezer) allowed in the next lower energy efficiency grade.

8.10.2. The Director may remove from the record the reference number of a listed model of refrigerating appliance, if he has reasonable grounds to believe that the refrigerating appliance does not conform with the specified information or a specified document, or their updates if any, submitted to the Director. The specified person may provide explanation on the failure of a product to pass the compliance monitoring testing stipulated in clause 8.10.1 above and apply for further testing of the concerned model for the Director's consideration.

8.10.3. If further testing is approved to be carried out, three samples of the same model shall be tested at the specified person's own costs. A listed model of refrigerating appliance will be accepted as conformance if the results of further testing meet the following criteria:

- (a) The tested storage temperatures of the compartments of each sample complying with the requirements of Table 8.2 of the Code, using the testing standard specified in the test report submitted to the Director by the specified person;
- (b) The average of the tested storage volumes for each of the compartments of all the samples being not less than the rated storage volume by more than 3% or 1 litre, whichever is the greater value. Where the volumes of the pantry and/or cellar compartment and fresh food storage compartment are adjustable relative to one another by the user, this requirement applies when the pantry and/or cellar compartment is adjusted to its minimum volume;
- (c) The tested energy consumption (kWh/24hour) of each sample being not greater than the rated energy consumption by more than 15%;
- (d) (For only food freezer or refrigerating appliance having food freezer compartment) The average of the tested freezing capacities of all the samples meeting the requirements of at least 3.5 kg/100 litres of the total volume of all compartments operating at -18°C in 24 hours, and in no case less than 2 kg. The tested freezing capacity of each sample being not less than the rated freezing capacity by more than 15% of the latter. For food freezer, it having one or more compartments meets "3-star" conditions; and
- (e) The tested energy efficiency grade meeting either one of the following:
 - (i) The energy efficiency grade of each sample calculated in the further testing being equal to or better than the energy efficiency grade determined by the test results submitted to the Director by the

specified person; or

- (ii) If the energy efficiency grade of any sample calculated in the further testing being not equal to nor better than the energy efficiency grade determined by the test results submitted to the Director, the tested energy consumption index (and tested total energy consumption index for refrigerator-freezer) of that sample calculated in the further testing being not greater than 115% of the measured energy consumption index (and measured total energy consumption index for refrigerator-freezer) calculated by the test results submitted to the Director, and in any cases not greater than the highest energy consumption index (and total energy consumption index for refrigerator-freezer) allowed in the next lower energy efficiency grade.

(Remark: The specified person can choose to accept the results of further testing undertaken on fewer than three samples if the results of each sample subsequently tested also do not meet the acceptance criteria as stated above.)

Appendix 2A

Example of Calculating the Energy Efficiency Grade for Refrigerating Appliance

The given refrigerating appliance is a Category 6 no-frost refrigerator-freezer with a fresh food storage compartment at +4 °C, a 4-star freezer compartment at -18 °C and a chill compartment at 0 °C.

	<u>Measured</u> <u>Storage</u> <u>Volume</u> <u>(litre)</u>	<u>Weighting</u> <u>Factor Ω</u> <u>(given by</u> <u>eq.2)</u>	<u>Adjusted Volume (litre)</u> <u>(V_{adj} given by eq. 1)</u>
Fresh food storage (V_r)	174	$\Omega_r = 1.000$	$V_r \times \Omega_r = 174$
Frozen food storage (V_{ffc})	100	$\Omega_{ffc} = 2.134$	$V_{ffc} \times \Omega_{ffc} = 213.4$
Chill storage (V_c)	67	$\Omega_c = 1.206$	$V_c \times \Omega_c = 80.802$
Total:	<u>341</u>		<u>$\Sigma V \times \Omega = 468.202$</u>

From energy consumption tests at 16 °C and 32 °C

Energy consumption measured at 16 °C: $E_{\text{daily}16^{\circ}\text{C}} = 0.587 \text{ kWh/day}$

Energy consumption measured at 32 °C: $E_{\text{daily}32^{\circ}\text{C}} = 0.921 \text{ kWh/day}$

Annual energy consumption: $E = 196 \times 0.587 + 169 \times 0.921 = 270.70 \text{ kWh/year}$

From load processing efficiency tests at 16 °C and 32 °C

Additional daily energy consumption at 16 °C: $E_{\text{preprocessing}16^{\circ}\text{C}} = 0.272 \text{ kWh/day}$

Additional daily energy consumption at 32 °C: $E_{\text{preprocessing}32^{\circ}\text{C}} = 0.459 \text{ kWh/day}$

Total annual energy consumption: $E = 196 \times 0.587 + 169 \times 0.921 +$
 $196 \times 0.272 + 169 \times 0.459 = 401.58 \text{ kWh/year}$

The adjusted volume for the refrigerating appliance is calculated according to the equations 1, 2 and 11 in clause 8 of the Code.

$$\begin{aligned} V_{\text{adj}} &= \Sigma V \times \Omega = V_r \times \Omega_r + V_{\text{ffc}} \times \Omega_{\text{ffc}} + V_c \times \Omega_c \\ &= 174 + 213.4 + 80.802 \\ &= 468.202 \text{ litres} \end{aligned}$$

From the Table 8.5, the Average Appliance Energy Consumption for Category 6 refrigerating appliance is:

$$\begin{aligned} &= V_{\text{adj}} \times 0.777 + 303 \\ &= 468.802 \times 0.777 + 303 \\ &= 666.793 \text{ kWh/year} \end{aligned}$$

Considering it is a no-frost model, the Average Appliance Energy Consumption is multiplied by a factor of 1.35.

Therefore, it is $1.35 \times 666.793 = 900.171 \text{ kWh/year}$

$$\text{Energy Consumption Index } I_e = \frac{\text{Annual Energy Consumption}}{\text{Average Appliance Energy Consumption}}$$

$$I_e = \frac{270.70}{900.171}$$

$$I_e = 30.07\%$$

$$\text{Total Energy Consumption Index } I_t = \frac{\text{Total Annual Energy Consumption}}{\text{Average Appliance Energy Consumption}}$$

$$I_t = \frac{401.58}{900.171}$$

$$I_t = 44.61\%$$

As $26 < I_e < 31$ and $I_t < 52$, according to Table 8.6 in clause 8 of the Code, the refrigerating appliance is rated as a **Grade 2** refrigerating appliance.

Chapter 3 Energy Efficiency Labelling for Washing Machines

Proposed Major Updates to Existing Labelling Requirements

12 At present, under the MEELS, the energy efficiency performance of washing machines is measured and evaluated in accordance with the following standards:

- IEC 60456 ed.5.0 (2010) for horizontal axis type washing machine (Category 1); or
- JIS C 9606:1993 for vertical axis type washing machine (Category 2).

It is proposed to adopt IEC 60456 for testing of both types of washing machines (horizontal axis type and vertical axis type) for the MEELS.

13 To cope with the change of testing standard, requirements on washing performance and water extraction performance for vertical axis type washing machines are proposed to be revised accordingly. From energy efficiency perspective, in addition to the upgrades of the energy efficiency grading standards, update on the requirements on washing programme selection is proposed.

14 The revised section 10, “Energy Efficiency Labelling for Refrigerating Appliances”, of the CoP (2024 Edition) is proposed as follows:

<p>10. Energy Efficiency Labelling for Washing Machines</p> <p>10.1. <u>Scope</u></p> <p>10.1.1. Clause 10 of the Code, unless the Director provides otherwise, applies to a washing machine defined in the Ordinance, that is, the products specified in clauses 10.1.2 and 10.1.3.</p> <p>10.1.2. “Washing machine”, subject to clause 10.1.3 of the Code, means a product—</p> <ul style="list-style-type: none">(a) that is a household appliance for cleaning and rinsing of textiles using water with or without a means of extracting excess water from the textiles; and(b) that—<ul style="list-style-type: none">(i) uses mains electricity as the only power source; and(ii) has a rated washing capacity not exceeding 10 kilograms, whether or not having built-in dryers for drying textiles by means of heating. <p>10.1.3. “Washing machine” does not include washing machines that have no spin extraction capability.</p> <p>10.2. <u>Definitions</u></p> <p>This clause provides definitions of terms used in clause 10 of the Code. Unless otherwise specified, the definitions adopted in the clause 10 follow those stipulated in the Ordinance, if any.</p>

<i>Cycle</i>	means complete washing process, as defined by the programme selected, consisting of a series of different operations (wash, rinse, spin, etc.) and including any operations that occur after the completion of the programme.
<i>horizontal axis washing machine</i>	means washing machine in which the load is placed in a drum which rotates around an axis which is horizontal or close to horizontal. Horizontal axis is where the angle of the axis of rotation is less than or equal to 45 degrees to horizontal.
<i>IEC</i>	means International Electrotechnical Commission (the latest edition of the standard shall be followed for test methodology).
<i>rated washing capacity</i>	means the washing capacity of a washing machine as determined and declared by the manufacturer or importer of the washing machine in accordance with the standard and requirements specified in the Code.
<i>spin extraction</i>	means water-extracting function by which water is removed from textiles by centrifugal action. This is included as a function (built in operation) of an automatic washing machine but may also be performed in a spin extractor.
<i>spin extractor</i>	means separate water-extracting appliance in which water is removed from textiles by centrifugal action.
<i>vertical axis washing machine</i>	means washing machine in which the load is placed in a drum which rotates around an axis which is vertical or close to vertical. Vertical axis is where the angle of the axis of rotation is more than 45 degrees to horizontal. Where the drum does not rotate, the washing machine shall be classified as a vertical axis washing machine.

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10.3. Classification of Washing Machines

All washing machines regulated under the Ordinance are classified in

accordance with Table 10.1—

Table 10.1 – Classification of washing machines

Category	Description
1	Horizontal axis washing machine
2	Vertical axis washing machine

Note: In each category, it also includes washing machines operating with similar working principle.

10.4. Tests Required to be Carried Out

The tests specified in this clause are required to be carried out, in accordance with IEC 60456 or other equivalent international standards approved by the Director, in order to find out the energy efficiency and performance characteristics of a washing machine. A test report required to be submitted to the Director under section 6 of the Ordinance shall contain the results of these tests:

- (a) Energy consumption;
- (b) Water consumption;
- (c) Washing performance; and
- (d) Water extraction performance.

10.5. Test Methodology and Energy Efficiency Grading

10.5.1. Test Conditions

In carrying out the tests as specified in clause 10.4 of the Code, the washing machine shall be tested at a voltage and frequency of mains electricity in Hong Kong with tolerances as specified in the relevant IEC standards. Moreover, unless the Director approves otherwise, a washing programme intended for washing cotton shall be used without pre-wash in accordance with the manufacturer's instruction. For horizontal axis washing machines (category 1), a 60 ± 2 °C cotton programme shall be used. For vertical axis washing machines (category 2), the temperature of water shall be 20 ± 2 °C. In cases of washing machines without any programmes, the recommended times for washing, rinsing, and spin extracting operations shall be in accordance with the manufacturer's instructions for the rated washing capacity to be tested. The washing programme used for the testing shall be documented in the test report.

10.5.2. Measurement of Energy Consumption

The methodology for measuring energy consumption (kWh) shall be based on IEC 60456 or other equivalent international standards approved by the Director. IEC 60456 shall be referred to for actual performance requirements and

procedural descriptions. The energy consumption shall be measured as follows:

- (i) For horizontal axis washing machine with built-in water heating device, the measured energy consumption (E) of the washing machine shall include the energy consumptions of both the washing function (including washing, rinsing and spin extraction processes) and the built-in water heating device for heating water. This measured energy consumption (E) shall be shown on the energy label after it is calculated to annual energy consumption based on 260 washes / year operation.
- (ii) For horizontal axis washing machine without built-in water heating device, only the measured energy consumption (E) of the washing machine shall be shown on the energy label after it is calculated to annual energy consumption based on 260 washes / year operation.
- (iii) For vertical axis washing machine, only the measured energy consumption (E) of the washing function (including washing, rinsing and spin extraction processes) shall be shown on the energy label after it is calculated to annual energy consumption based on 260 washes / year operation.

In cases of washing machines combined with built-in dryers for drying textiles by means of heating, only the energy consumption (E) of the washing machine shall be measured and the drying function is excluded.

10.5.3. Measurement of Water Consumption

The water consumption (litres/cycle) shall be measured during the energy consumption test in accordance with IEC 60456 or other equivalent international standards approved by the Director.

10.5.4. Measurement of Washing Performance and Water Extraction Performance

The washing performance and water extraction performance shall be measured and evaluated during the test period in accordance with IEC 60456 or other equivalent international standards approved by the Director.

10.5.5. Calculation of Specific Energy Consumption

The specific energy consumption of a washing machine shall be calculated as follows:

- (a) For horizontal axis washing machine with built-in water heating device and vertical axis washing machine, the specific energy consumption is calculated as follows:

$$\text{Specific Energy Consumption } (E_{sp}) = \frac{E}{W_r} \dots\dots\dots(\text{eq. 1})$$

where $E = \text{measured energy consumption per cycle (kWh/cycle)}$
 $W_r = \text{rated washing capacity (kg)}$

(b) For horizontal axis washing machine without built-in water heating device, the specific energy consumption is calculated as follows:

$$\text{Specific Energy Consumption (E}_{sp}\text{)} = \frac{E + W_h}{W_r} \dots\dots\dots(\text{eq. 2})$$

where E = measured energy consumption per cycle (kWh/cycle)

W_r = rated washing capacity (kg)

W_h = calculated hot water energy (kWh/cycle)

The calculated hot water energy is the theoretical energy requirement for heating water from 15 °C to 60 °C and shall be calculated as follows:

$$W_h = \frac{(V_h \times (t_h - 15))}{860} \dots\dots\dots(\text{eq. 3})$$

where W_h = the calculated hot water energy in kWh for the operation

V_h = the volume of external hot water used in litres during the operation

t_h = the hot water inlet temperature in °C, i.e. 60 °C

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10.5.6. Energy Efficiency Grading

The energy efficiency grading of a washing machine shall be determined as shown in Table 10.2, with Grade 1 having the best performance and Grade 5 having the worst performance.

Table 10.2 – Derivation of energy efficiency grades

Specific Energy Consumption, E _{sp} (kWh/kg/cycle)		Energy Efficiency Grade ^(Note)
Horizontal Axis Type Category 1	Vertical Axis Type Category 2	
E _{sp} ≤ 0.065	E _{sp} ≤ 0.0100	1
0.065 < E _{sp} ≤ 0.085	0.0100 < E _{sp} ≤ 0.0130	2
0.085 < E _{sp} ≤ 0.105	0.0130 < E _{sp} ≤ 0.0145	3
0.105 < E _{sp} ≤ 0.130	0.0145 < E _{sp} ≤ 0.0160	4
0.130 < E _{sp}	0.0160 < E _{sp}	5

Note:

In order to obtain Grade 1 to 4, the washing machine concerned shall also meet all the performance requirements as stipulated in clause 10.6.1(c), i.e. washing performance and water extraction performance. Only Grade 5 will be accorded if the washing machine does not meet any one of these performance requirements or E_{sp} > 0.130 for horizontal axis washing machine or E_{sp} > 0.0160 for vertical axis washing machine.

An example illustrating the method on how to determine the energy efficiency grade of a washing machine is shown in Appendix 4A.

10.6. Performance Requirements

10.6.1. In the test report submitted to the Director under section 6 of the Ordinance, the results of the tests carried out in accordance with IEC 60456 or other equivalent international standards approved by the Director shall show that the concerned model conforms with the following performance requirements—

- (a) The measured energy consumption (kWh/cycle) shall not be greater than the rated energy consumption by more than 15%.
- (b) The measured water consumption (litres/cycle) shall not be greater than the rated water consumption by more than 15%.
- (c) The measured washing performance and measured water extraction performance shall conform with the minimum requirements as shown in Table 10.3 for Grade 1 to 4:

Table 10.3 – Performance requirements

Washing Performance ^{Note (1)}	$q \geq 0.7$
Water Extraction Performance ^{Note (2)}	$RM \leq 1.1$

Note:

(1) *The washing performance shall be determined in accordance with the following equation:*

$$q = \frac{\bar{C}_{test}}{\bar{C}_{ref}}$$

where q = ratio of the average sum of the reflectance values

\bar{C}_{test} = average sum of the reflectance values for the
washing machine under test

\bar{C}_{ref} = average sum of the reflectance values for the
reference washing machine

(2) *The water extraction performance shall be determined in accordance with the following equation:*

$$RM = \frac{M_r - M}{M}$$

where RM = remaining moisture

M = the mass of the conditioned base load

M_r = the mass of the base load after spin extraction

(3) For details on the definitions of the parameters and their calculation, IEC 60456 shall be referred to.

(4) IEC 60456 ed. 5.0 "Copyright © 2010 IEC Geneva, Switzerland. www.iec.ch"

(5) In order to obtain Grade 1 to 4, the washing machine concerned shall also meet all the above performance requirements, i.e. washing performance and water extraction performance. Only Grade 5 will be accorded if the washing machine does not meet any one of the above performance requirements or $E_{sp} > 0.130$ for horizontal axis washing machine or $E_{sp} > 0.0160$ for vertical axis washing machine.

10.6.2. The rated energy consumption and rated water consumption as declared by the manufacturer or importer shall meet the requirements specified in clause 10.6.1 of the Code.

10.7. Safety Requirements

In addition to the energy efficiency performance requirements, all washing machines shall comply with the Electrical Products (Safety) Regulation, Chapter 406G of the Laws of Hong Kong, and the safety standards specified under the Regulation, and all other legislations concerning the safety of the washing machines.

10.8. Number of Samples to be Tested

10.8.1. For submission of product information of a model under section 6 of the Ordinance, subject to clause 10.8.2 of the Code, a test report on one sample of the model shall be submitted.

10.8.2. However, if the test results of one sample indicate that the measured energy consumption is greater than the rated energy consumption by more than 10%, the test report shall include the tests of two samples of the same model. In such case, each individual sample shall meet all the performance requirements in clause 10.6 of the Code. Also, the information on the energy label shall be based on the test results of the tested sample with a higher specific energy consumption (E_{sp}).

10.9. Energy Label

10.9.1. The specification of the energy label for washing machines is shown in Appendix 4B. After a reference number has been assigned to a product model in the name of a specified person and included in the Director's record, the specified person shall produce the energy label for his/her products of the listed

model showing the energy efficiency grade and associated information in accordance with the requirements in Appendix 4B.

- 10.9.2. (a) Subject to clause 10.9.2(c), the energy label is to be attached or affixed to a prominent position of the washing machine and is to be clearly visible.
- (b) To avoid doubt, if only part of the washing machine is being exhibited, the energy label is to be attached or affixed to a prominent position of that part and is to be clearly visible.
- (c) The energy label may be attached to the washing machine or its packaging in a manner specified by the Director where the Director has approved its being so attached.

10.9.3. The energy label shall be of cardboard, if it is to be attached as a swing tag, or be self-adhesive and shall be cut to the outline shown in Appendix 4B or otherwise approved by the Director. A trim or die cut margin of up to 2 mm around the energy label is acceptable.

10.9.4. The paper used for the energy label shall be durable with good wear and tear characteristics.

10.10. Compliance

10.10.1. During the compliance monitoring testing carried out by the Director, a listed model of washing machine will be accepted as conformance if the test results of a single sample of the listed model meet the following criteria:

- (a) The tested energy consumption (kWh/cycle) being not greater than the rated energy consumption by more than 15%.
- (b) The tested water consumption (litres/cycle) being not greater than the rated water consumption by more than 15%.
- (c) The tested washing performance and tested water extraction performance conforming with the minimum requirements in accordance with the respective test standards as shown in Table 10.3 for Grade 1 to 4.
- (d) The tested energy efficiency grade meeting either one of the following:
- (i) The energy efficiency grade calculated in the compliance monitoring testing being equal to or better than the energy efficiency grade determined by the test results submitted to the Director by the specified person; or
- (ii) If the energy efficiency grade calculated in the compliance monitoring testing being not equal to nor better than the energy efficiency grade determined by the test results submitted to the Director, the tested specific energy consumption calculated in the

compliance monitoring testing being not greater than 115% of the measured specific energy consumption calculated by the test results submitted to the Director, and in any cases not greater than the highest specific energy consumption allowed in the next lower energy efficiency grade.

10.10.2 The Director may remove from the record the reference number of a listed model of washing machine, if he has reasonable grounds to believe that the washing machine does not conform with the specified information or a specified document, or their updates if any, submitted to the Director. The specified person may provide explanation on the failure of a product to pass the compliance monitoring testing stipulated in clause 10.10.1 above and apply for further testing of the concerned model for the Director's consideration.

10.10.3 If further testing is approved to be carried out, three samples of the same model shall be tested at the specified person's own costs. A listed model of washing machine will be accepted as conformance if the results of further testing meet the following criteria:

- (a) The tested energy consumption (kWh/cycle) of each sample being not greater than the rated energy consumption by more than 15%.
- (b) The tested water consumption (litres/cycle) of each sample being not greater than the rated water consumption by more than 15%.
- (c) The tested washing performance and tested water extraction performance of each sample conforming with the minimum requirements in accordance with the respective test standards as shown in Table 10.3 for Grade 1 to 4.
- (d) The tested energy efficiency grade meeting either one of the following:
 - (i) The energy efficiency grade of each sample calculated in the further testing being equal to or better than the energy efficiency grade determined by the test results submitted to the Director by the specified person; or
 - (ii) If the energy efficiency grade of any sample calculated in the further testing being not equal to nor better than the energy efficiency grade determined by the test results submitted to the Director, the tested specific energy consumption of that sample calculated in the further testing being not greater than 115% of the measured specific energy consumption calculated by the test results submitted to the Director, and in any cases not greater than the highest specific energy consumption allowed in the next lower energy efficiency grade.

(Remark: The specified person can choose to accept the results of further

testing undertaken on fewer than three samples if the results of each sample subsequently tested also do not meet the acceptance criteria as stated above.)

Appendix 4A

Example of Calculating the Energy Efficiency Grade for Washing Machine

The given washing machine is of Category 1 (i.e. horizontal axis washing machine) with built-in water heating device.

Rated washing capacity (W_r)	5 kg
Measured energy consumption (E)	0.4 kWh/cycle
Measured water consumption	72 litres
Measured washing performance (q)	1.1
Measured spin extraction performance (RM)	0.8
Annual energy consumption = E x 260	104 kWh
Specific energy consumption (E_{sp}) = E / W_r	0.08 kWh/kg/cycle

Also the washing performance and spin extraction performance meet the requirements in Table 10.3 in clause 10.6.1(c) of the Code.

$$0.065 \leq E_{sp} \leq 0.085$$

According to Table 10.2 in clause 10 of the Code, the washing machine is rated as a **Grade 2** washing machine.

Chapter 4 Energy Efficiency Labelling for Storage Type Electric Water Heaters

Proposed Updates to Existing Labelling Requirements

- 15 No update on the existing referenced standard (i.e. IEC 60379 ed. 3.0 (1987)) is proposed for storage type electric water heaters under the MEELS. All the calculation methods specified in the CoP will remain unchanged, only the energy consumption index (I_e) for determination of energy efficiency grade is proposed to be upgraded and revised.
- 16 The revised Section 13, “Energy Efficiency Labelling for Storage Type Electric Water Heaters” and Appendix 7A “Example for Calculating the Energy Efficiency Grade for Storage Type Electric Water Heater”, of the CoP (2024 Edition) is proposed as follows:

13. Energy Efficiency Labelling for Storage Type Electric Water Heaters

13.1. Scope

13.1.1. Clause 13 of the Code, unless the Director provides otherwise, applies to a storage type electric water heater defined in the Ordinance, that is, the products specified in clauses 13.1.2 and 13.1.3.

13.1.2. “Storage type electric water heater”, subject to clause 13.1.3 of the Code, means a product—

(a) that is a household appliance –

(i) designed for heating water in a thermally well-insulated container and for the storage of heated water; and

(ii) having a device to control the water temperature; and

(b) that –

(i) uses mains electricity as the only power source; and

(ii) has a rated water storage capacity not exceeding 50 litres.

13.1.3. “Storage type electric water heater” does not include a product that—

(a) is designed for making hot drinks or food only; or

(b) has more than one heated volume.

13.2. Definitions

This clause provides definitions of terms used in clause 13 of the Code. Unless otherwise specified, the definitions adopted in the clause 13 follow those stipulated in the Ordinance, if any.

fixed loss ($E_{st,fix}$) means average energy consumption due to heat loss of a storage type electric water heater per 24 hours (kWh/24h) caused by heat bridges such as water and pipe connections.

<i>local factor</i> ($E_{st,loc}$)	means additional energy consumption due to heat loss of a storage type electric water heaters per 24 hours (kWh/24h) caused by the requirements for the installation of safety valves at the water heater.
<i>IEC</i>	means International Electrotechnical Commission (the latest edition of the standard shall be followed for test methodology).
<i>mains electricity</i>	means the electricity that is supplied in Hong Kong at a voltage of 380/220V and a frequency of 50 Hz.
<i>mean water temperature</i> (θ_M)	means the average of the mean water temperature after a thermostat cut-out (θ_A) and the mean water temperature after a thermostat cut-in (θ_E).
<i>mean water temperature after a thermostat cut-in</i> (θ_E)	means average value of n number of temperatures recorded after each cut-in of the thermostat of a storage type electric water heater.
<i>mean water temperature after a thermostat cut-out</i> (θ_A)	means average value of n number of temperatures recorded after each cut-out of the thermostat of a storage type electric water heater.
<i>measured standing loss</i> ($E_{st,meas}$)	means the standing loss per 24 hours of a storage type electric water heater measured in accordance to IEC 60379 standard.
<i>open outlet or vented water heater</i>	means a storage type electric water heater in which the pressure due to the expanded water can be released through the overflow or vent pipe and the flow of water is generally controlled by a valve in the inlet pipe.
<i>rated standing loss</i>	means the standing loss per 24 hours of a storage type electric water heater as determined and declared by the manufacturer or importer of the storage type electric water heater in accordance with the standard and requirements specified in the Code.

<i>rated water storage capacity (V)</i>	means the water storage capacity as determined and declared by the manufacturer or importer of the storage type electric water heater in accordance with the standard and requirements specified in the Code.
<i>standing loss</i>	means the electrical energy consumption of a filled storage type electric water-heater, after steady-state conditions have been reached, when connected to the electrical supply, during any 24 hours when no water is withdrawn.
<i>unvented water heater</i>	means a storage type electric water heater designed to work under the pressure of the water supply mains and the flow of water being controlled by one or more valves in the outlet system.
<i>variable standing loss (E_{st,var})</i>	means the result of fixed loss and local factor subtracted from the standing loss.

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13.3. Classification of Storage Type Electric Water Heaters

All storage type electric water heaters regulated under the Ordinance are classified in accordance with Table 13.1 into the following two categories: -

Table 13.1 – Classification of storage type electric water heaters

Category	Description
1	Unvented storage type electric water heaters
2	Open outlet or vented storage type electric water heaters

13.4. Tests Required to be Carried Out

The tests specified in this clause are required to be carried out, in accordance with IEC 60379, or other equivalent international standards approved by the Director, in order to find out the energy efficiency and performance characteristics of a storage type electric water heater. A test report required to be submitted to the Director under section 6 of the Ordinance shall contain the results of these tests:

- (a) Water storage capacity test;
- (b) Energy consumption test for the measurement of standing loss per 24 hours;

- (c) Hot water output test; and
- (d) Reheating time test.

13.5. Test Methodology and Energy Efficiency Grading

13.5.1. Test Conditions

- (a) In carrying out the tests as specified in clause 13.4 of the Code, the storage type electric water heater shall be tested at a voltage and frequency of mains electricity in Hong Kong i.e. at a voltage of 380/220 V and a frequency of 50 Hz. Measurements shall not be carried out if, in warm conditions, the voltage needed to provide the rated input deviates more than 5% from the rated voltage. Moreover, unless the Director approves otherwise, the requirements of IEC 60379 standard test conditions shall be followed:
 - (i) The measurements shall be carried out in a substantially draught-free room.
 - (ii) The ambient room temperature shall be $20 \pm 2^\circ\text{C}$.
 - (iii) The relative humidity in the test room shall not exceed 85%.
 - (iv) The water supplied to the water heater shall be maintained at a cold water temperature (θ_c) of $15 \pm 2^\circ\text{C}$ and provided from a source having a substantially steady pressure.
 - (v) The tested storage type electric water heater shall be installed according to the manufacturer's instruction.
- (b) The thermostat of storage type electric water heaters where adjustment is provided shall be set so that the mean water temperature (θ_M), as measured in accordance with IEC60379, is $65 \pm 3^\circ\text{C}$. The thermostat setting shall remain unchanged throughout the test measurements. For storage type electric water heaters where regulation of the water heater thermostat is not provided for the user, no adjustment to the thermostat setting shall be made.

13.5.2. Measurement of Water Storage Capacity

The water storage capacity of a storage type electric water heater shall be determined by using the test results of the test as measured in accordance with the relevant clause of IEC 60379.

13.5.3. Measurement of Stored Water Temperature

- (a) Measurements of water temperature without withdrawal of water shall be made with a thermocouple placed inside the upper section of the container. However, for metal containers the thermocouple may be placed on the outer surface of the container.

(i) The mean water temperature after a thermostat cut-out (θ_A) shall be the average value of n number of temperatures (θ_{Ai}) recorded after each cut-out of the thermostat and is given by:

$$\theta_A = \left(\sum_{i=1}^{i=n} \theta_{Ai}\right) / n \dots \dots \dots (eq. 1)$$

(ii) The mean water temperature after a thermostat cut-in (θ_E) shall be the average value of n number of temperatures (θ_{Ei}) recorded after each cut-in of the thermostat and is given by:

$$\theta_E = \left(\sum_{i=1}^{i=n} \theta_{Ei}\right) / n \dots \dots \dots (eq. 2)$$

(b) Measurements of temperature of withdrawn water shall be measured by using the test results of the test as measured in accordance with the relevant clause of IEC 60379. It shall be made in the outflow which is to be continuous. The temperature shall be measured to an accuracy of $\pm 0.5K$ and, if a thermometer is used, it shall be a type that records quickly and accurately in any position.

13.5.4. Measurement of Standing Loss and Calculation of Annual Standby Loss Energy Consumption

(a) The methodology for measuring standing loss expressed in kilowatt-hour per 24 hours (kWh/24h) shall be based on IEC 60379 or other equivalent international standards approved by the Director.

(b) The storage type electric water heater shall first be filled with cold water at the temperature θ_c for the measurement. The electrical supply shall then be switched on for a few cycles of operation of the thermostat until steady conditions have been reached. Starting and ending at a cut-out of the thermostat, the energy (E_1) consumed during time (t_1) in hours shall be measured over a period of not less than 48 hours. The water temperatures (θ_{Ei}) at each thermostat cut-in and (θ_{Ai}) at each thermostat cut-out shall be measured by means of a thermocouple positioned as described in clause 13.5.3(a) of the Code.

The energy consumption (E) per 24 hours shall be calculated according to the following formula:

$$E = (E_1 \times 24) / t_1 \dots \dots \dots (eq. 3)$$

The mean water temperature θ_M shall be calculated by the formula

$$\theta_M = (\theta_A + \theta_E) / 2 \dots \dots \dots (eq. 4)$$

where θ_A and θ_E being calculated as indicated in clause 13.5.3(a) of the Code.

- (c) Measured standing loss ($E_{st,meas}$) that is related to a temperature rise of 45K and expressed in kilowatt-hours per 24 hours shall be calculated according to the formula:

$$E_{st,meas} = \left[\frac{45}{\theta_M - \theta_{amb}} \right] \times E \dots \dots \dots (eq.5)$$

where θ_{amb} is the ambient temperature during the test.

The measured standing loss ($E_{st,meas}$) of a storage type electric water heater shall be shown on the energy label after it is calculated to annual standby loss energy consumption by multiplying the kWh figure over the 24-hour period by 75, assuming an annual standby hours of 1,800 hours.

13.5.5. Calculation of Variable Standing Loss

The measured standing loss of a storage type electric water heater is composed of two components: the variable standing loss ($E_{st,var}$) which varies with a series of physical parameters of the storage type electric water heater itself, and the fixed loss ($E_{st,fix}$) caused by heat bridges such as water and pipe connections. While the variable standing loss differs from heater to heater, the fixed loss is more or less the same for all heaters of the same category. To better compare the energy efficiency of the water heater, it is necessary to eliminate the fixed loss, and compare just the variable standing loss. The value of the fixed loss refers to given in Table 13.2.

Table 13.2 – Fixed loss per 24 hours

Category	Fixed Loss per 24 hours $E_{st,fix}$ (kWh/24h)
1 (unvented) and 2 (open outlet or vented)	$E_{st,fix} = 0.072$

To reflect the effect of the requirements for installing safety valves and local conditions at the water heater, a local factor ($E_{st,loc}$) as shown in Table 13.3 is to be subtracted from the measured standing loss with respect to the different categories.

Table 13.3 – Local factor to be subtracted from the measured standing loss

Category	Local factor per 24 hours $E_{st,loc}$ (kWh/24h)
1 (unvented)	0.2
2 (open outlet or vented)	0.1

(ii) The index is expressed in percentages, and calculated as follows:

$$\text{Energy Consumption Index } (I_{\varepsilon}) = \frac{E_{\text{st,var}}}{E_{\text{st,av,var}}} \times 100\% \dots \dots (eq. 8)$$

where

- $E_{\text{st,var}}$ = variable standing loss per 24 hours (kWh/24h), as given by clause 13.5.5.
- $E_{\text{st,av,var}}$ = average appliance energy consumption per 24 hours (kWh/24h), as given by clause 13.5.6.

Thus, within a category, a storage type electric water heater with a lower energy consumption index (i.e. a lower percentage) consumes less energy than a storage type electric water heater with a higher energy consumption index (i.e. a higher percentage).

(b) Storage Type Electric Water Heater Energy Efficiency Grading

The energy efficiency grading of a storage type electric water heater shall be determined from Energy Consumption Index as shown in Table 13.5, with Grade 1 being the most energy efficient and Grade 5 the least.

Table 13.5 – Derivation of energy efficiency grades

Energy Consumption Index : I_{ε} (%)	Energy Efficiency Grade
$I_{\varepsilon} \leq 55$	1
$55 < I_{\varepsilon} \leq 65$	2
$65 < I_{\varepsilon} \leq 75$	3
$75 < I_{\varepsilon} \leq 85$	4
$85 < I_{\varepsilon}$	5

An example illustrating the method on how to determine the energy efficiency grade of a storage type electric water heater is shown in Appendix 7A.

13.5.8. Measurement of Hot Water Output

Immediately following the measurement of the standing loss according to clause 13.5.4 of the Code, the water heater shall be switched off after a cut-out of the thermostat. Then, a quantity of water equal to the rated water storage capacity shall be withdrawn through the outlet at a constant rate of flow by supplying cold water at the temperature θ_c ; the flow of water from open outlet water or vented heaters shall be controlled by the inlet valve if applicable. The flow in other type of water heater shall be kept constant by means of a valve fitted in the outlet if applicable. The rate of flow shall be adjusted:

- to 2 litre/min. for water heaters with a rated water storage capacity less than 10 litre;

- to 5 litre/min. for water heaters with a rated water storage capacity of 10 litre up to 50 litre;

The temperature of the withdrawn water shall be measured in the manner described in clause 13.5.3(b) of the Code and the average temperature of withdrawn water (θ'_p) established. The mean water temperature (θ_p) shall be calculated from the following formula:

$$\theta_p = 50 \times \frac{\theta'_p - \theta_c}{\theta_A - \theta_c} + 15 \dots \dots \dots (eq.9)$$

where

- θ_c = temperature of cold water within $15 \pm 2^\circ\text{C}$.
- θ_A = mean water temperature after a thermostat cut-out

The hot water output shall be recorded as the rated water storage capacity at θ_p (\dots litres at $\dots^\circ\text{C}$).

13.5.9. Measurement of Reheating Time

Immediately following determination of θ_p according to the precedent clause:

- the electrical supply shall be switched on;
- the heating time (t_R) from switch-on until the first cut-out of the thermostat when the temperature of the water (θ_R) as measured according to clause 13.5.3 of the Code shall be within 10K of (θ_A).

The reheating time required for heating up the water from 15°C to 65°C shall be calculated from the following formula and expressed in hours and minutes:

$$t_{R,50} = t_R \times \frac{50}{\theta_R - \theta_c} \dots \dots \dots (eq. 10)$$

where

- θ_R = water temperature after reheating;
- θ_c = temperature of cold water within $15 \pm 2^\circ\text{C}$.

13.6. Performance Requirements

13.6.1. In the test report submitted to the Director under section 6 of the Ordinance, the results of the test carried out in accordance with the relevant clauses of IEC 60379, or other equivalent international standards approved by the Director shall show that the concerned model of the storage type electric water heater conforms with the following performance requirements—

- (a) The measured standing loss shall not be greater than 105% of the rated standing loss.
- (b) The measured water storage capacity shall not be lower than 98% of the rated water storage capacity.

- (c) The measured hot water output shall not be lower than 90% of the rated hot water output.
- (d) The measured reheating time shall not be longer than 110% of the rated reheating time.
- 13.6.2. The rated standing loss, rated water storage capacity, rated hot water output and rated reheating time as declared by the manufacturer or importer shall meet the requirements specified in clause 13.6.1 of the Code.
- 13.7. Safety Requirements
In addition to the energy efficiency performance requirements, all storage type electric water heaters shall comply with the Electrical Products (Safety) Regulation, Chapter 406G of the Laws of Hong Kong, and the safety standards specified under the Regulation, and all other legislations concerning the safety of the storage type electric water heater.
- 13.8. Number of Samples to be Tested
For submission of product information of a model under section 6 of the Ordinance, a test report on one sample of the model shall be submitted.
- 13.9. Energy Label
- 13.9.1. The specification of the energy label for storage type electric water heater is shown in Appendix 7B. After a reference number has been assigned to a product model in the name of a specified person and included in the Director's record, the specified person shall produce the energy label for his/her products of the listed model showing the energy efficiency grade and associated information in strict accordance with the requirements in Appendix 7B.
- 13.9.2. (a) Subject to clause 13.9.2(c), the energy label is to be attached or affixed to a prominent position of the storage type electric water heater and is to be clearly visible.
- (b) For the avoidance of doubt, if only part of the storage type electric water heater is being exhibited, the energy label is to be attached or affixed to a prominent position of that part and is to be clearly visible.
- (c) The energy label may be attached to the storage type electric water heater or its packaging in a manner specified by the Director where the Director has approved its being so attached.
- 13.9.3. The energy label shall be of cardboard, if it is to be attached as a swing tag, or be self-adhesive and shall be cut to the outline shown in Appendix 7B or

otherwise approved by the Director. A trim or die cut margin of up to 2 mm around the energy label is acceptable.

13.9.4. The paper used for the energy label shall be durable with good wear and tear characteristics.

13.10. Compliance

13.10.1. During the compliance monitoring testing carried out by the Director, a listed model of storage type electric water heater will be accepted as conformance if the test results of a single sample of the listed model meet the following criteria:

- (a) The tested standing loss shall not be greater than 105% of the rated standing loss.
- (b) The tested water storage capacity shall not be lower than 98% of the rated water storage capacity.
- (c) The tested hot water output shall not be lower than 90% of the rated hot water output.
- (d) The tested reheating time shall not be longer than 110% of the rated reheating time.
- (e) The tested energy efficiency grade meeting either one of the following:
 - (i) The energy efficiency grade calculated in the compliance monitoring testing being equal to or better than the energy efficiency grade determined by the test results submitted to the Director by the specified person; or
 - (ii) If the energy efficiency grade calculated in the compliance monitoring testing being not equal to nor better than the energy efficiency grade determined by the test results submitted to the Director by the specified person, the tested energy consumption index calculated in the compliance monitoring testing being not greater than 105% of the measured energy consumption index calculated by the test results submitted to the Director, and in any cases not greater than the highest energy consumption index allowed in the next lower energy efficiency grade.

13.10.2. The Director may remove from the record the reference number of a listed model of storage type electric water heater, if he has reasonable grounds to believe that the storage type electric water heater does not conform with the specified information or a specified document, or their updates if any, submitted to the Director. The specified person may provide explanation on the failure of a product to pass the compliance monitoring testing stipulated in

clause 13.10.1 above and apply for further testing of the concerned model for the Director's consideration.

13.10.3. If further testing is approved to be carried out, three samples of the same model shall be tested at the specified person's own costs. A listed model of storage type electric water heater will be accepted as conformance if the results of further testing meet the following criteria:

- (a) The average of the tested standing loss of all the samples shall not be greater than 105% of the rated standing loss.
- (b) The average of the tested water storage capacity of all the samples shall not be lower than 98% of the rated water storage capacity.
- (c) The average of the tested hot water output of all the samples shall not be lower than 90% of the rated hot water output.
- (d) The average of the tested reheating time of all the samples shall not be longer than 110% of the rated reheating time.
- (e) The tested energy efficiency grade meeting either one of the following:
 - (i) The energy efficiency grade determined by the average of the tested energy consumption index of all the samples calculated in the further testing being equal to or better than the energy efficiency grade determined by the test results submitted to the Director by the specified person; or
 - (ii) If the energy efficiency grade determined by the average of the tested energy consumption index of all the samples calculated in the further testing being not equal to nor better than the energy efficiency grade determined by the test results submitted to the Director by the specified person, the average of the tested energy consumption index of all the sample calculated in the further testing being not greater than 105% of the measured energy consumption index calculated by the test results submitted to the Director, and in any cases not greater than the highest energy consumption index allowed in the next lower energy efficiency grade.

(Remark: The specified person can choose to accept the results of further testing undertaken on fewer than three samples if the results of each sample subsequently tested also do not meet the acceptance criteria as stated above.)

Appendix 7A

Example of Calculating the Energy Efficiency Grade for Storage Type Electric Water Heater

The given appliance is of Category 1 (i.e. unvented storage type electric water heaters).
The following data are measured according to the required standard:

Rated water storage capacity (V)35 litres
Measured standing loss per 24 hours ($E_{st,meas}$)0.683 kWh/24h

According to Table 13.4 in clause 13.5.6, for Category 1 appliance, average energy consumption due to standing loss per 24 hours,

$$E_{st,av} = 0.13 + 0.0553V^{2/3} = 0.72170308 \text{ kWh/24h}$$

Fixed Loss per 24 hour, for category 1 heater,

$$E_{st,fix} = 0.072 \text{ kWh/24h}$$

According to Table 13.3 in clause 13.5.5, local factor per 24 hour for category 1 heater,

$$E_{st,loc} = 0.2 \text{ kWh/24h}$$

According to equations 6 in clause 13.5.5, equation 7 in clause 13.5.6 and equation 8 in clause 13.5.7, Energy Consumption Index of the appliance,

$$\begin{aligned} I_{\epsilon} &= \frac{E_{st,var}}{E_{st,av,var}} \times 100\% \\ &= \frac{E_{st,meas} - E_{st,fix} - E_{st,loc}}{E_{st,av} - E_{st,fix}} \times 100\% \\ &= \frac{0.683 - 0.072 - 0.2}{0.72170308 - 0.072} \times 100\% \\ &= 63.2597\% \\ 55\% &< I_{\epsilon} \leq 65\% \end{aligned}$$

The value of Energy Consumption Index of the appliance is 63.2597% which is between 55% and 60%.

According to Table 13.5 in clause 13.5.7, the appliance shall be rated as Grade 2 storage type electric water heater.

Chapter 5 Collection of Views

- 17 We invite your views and comments on the proposed draft revision of Sections 8, 10 & 13 and Appendices 2A, 4A & 7A of the CoP (2024 Edition). Please send in your comments by mail, email or facsimile to the following –

Address:	Energy Efficiency Office Electrical and Mechanical Services Department 3 Kai Shing Street Kowloon
Email address:	meels_u3_review@emsd.gov.hk
Facsimile:	(852) 2890 6081

- 18 Please note that the Government would wish, either in discussion with others or in any subsequent report, whether privately or publicly, to be able to refer to and attribute views submitted in response to this document. Any request to treat all or part of a response in confidence will be respected. If no such request is made, it will be assumed that the response is not intended to be confidential.