

Panasonic Group
Chemical Substances Management Rank Guidelines
(For Factories) Ver. 7.3

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Environmental Management Department
Quality & Environment Division
Panasonic Operational Excellence Co., Ltd.

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Attachment

Attachment 1: Chemical Substance List

Attachment 2: M-number List

Detailed Rules:

Detailed Rules for Internal Operation of the Panasonic Group Chemical Substances Management Rank Guidelines (For Factories)

1. Purpose of these Guidelines

The purpose of this document, "Chemical Substances Management Rank Guidelines (for Factories)," is to communicate to all business units belonging to the Panasonic Group on a global basis the chemical substances that must be identified and controlled relative to the substances used in the respective business unit. This document also clarifies the substances that are prohibited, that must be reduced for emission/transfer, that require identification of the quantity of consumption as well as emission/transfer, thereby promoting preservation of the global environment, reducing risks for the business units, improving the nearby environment of each business unit as well as improving the staff's occupational health and safety environment.

2. The Aim of Establishing the "Chemical Substances Management Rank Guidelines (For Factories)"

- (1) To securely control chemical substances in a factory, it is essential to consider an approach not only from an environmental point of view, but also from the perspective of occupational health and safety. In order to make these guidelines globally applicable, a ranking has been determined by taking note of the major laws and regulations and adding hazard information such as carcinogenicity. The guidelines are intended for use in the appropriate risk assessment of the chemical substances used in business activities, and to reduce the impact of these substances on humans and the environment.
- (2) Fields affecting humans and the environment, and applicable laws and regulations

Table 1: Fields affecting humans and the environment, and applicable laws and regulations

1	Field of Chemical Substance Management	
	Law concerning the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. (hereinafter referred to as the Chemical Substances Control Law)	Japan
	Law Concerning Reporting, etc. of Releases to the Environment of Specific Chemical Substances and Promoting Improvements in Their Management (hereinafter referred to as the PRTR Law)	Japan
	Poisonous and Deleterious Substances Control Law (hereinafter referred to as the Poisonous/toxic Substances Law)	Japan
	Toxic Release Inventory (hereinafter referred to as the TRI)	U.S.
	CLP rules: (EC) No.1272/2008	E.U.
	REACH regulation : (EC) No.1907/2006	E.U.
2	Field of Environmental Preservation	
	The Basic Environmental Law	Japan
	Water Pollution Control Law (hereinafter referred to as the Water Pollution Law)	Japan
	Air Pollution Control Law (hereinafter referred to as the Air Pollution Law)	Japan
	The Law Concerning the Protection of the Ozone Layer through the Control of Specified Substances and Other Measures (hereinafter referred to as the Ozone Layer Protection Law)	Japan
	Law Concerning Special Measures against Dioxins (hereinafter referred to as the Dioxin Special Measures Law)	Japan

	Law Concerning the Promotion of the Measures to Cope with Global Warming (hereinafter referred to as the Global Warming Prevention Law)	Japan
	Substances causing ozone layer depletion	
	Substances causing global warming	
	Substances causing photochemical oxidants	
3	Field of Occupational Safety and Hygiene	
	Industrial Safety and Health Act (hereinafter referred to as the Industrial Safety Law)	Japan
	Occupational Safety and Health Act (hereinafter referred to as OSHA)	U.S.
	Globally Harmonized System of Classification and Labeling of Chemicals (hereinafter referred to as GHS)	International
4	Field of International Treaties	
	Stockholm Convention	International

Purpose of the regulations listed above

Chemical Substances Control Law (Japan):

In order to prevent environmental pollution by chemical substances that do not decompose readily and which may threaten human health or existence and the growth of animals and plants, the law seeks to apply compulsory controls on the manufacture, import and use etc. of these substances.

PRTR Law (Japan):

Based on scientific knowledge about chemical substances and their manufacture, use and other aspects of their handling status, the law requires that procedures be adopted to identify the emission quantity of specific chemical substance released into the environment, and that information be made available concerning the properties and handling requirements of these chemical substances, thereby promoting improvements in voluntary management by the business operators involved and avoiding, in advance, any obstacles to environmental preservation.

Poisonous/toxic Substances Law (Japan):

The law seeks to apply the necessary controls to poisonous and deleterious substances, addressed from the viewpoint of health and hygiene.

TRI (U.S.):

The U.S. regulations require information disclosure regarding the emission quantity of all chemical substances handled by business operators.

CLP rules: (EC) No.1272/2008 (E.U.):

This rule is mainly for hazard communication, and it relates to the classification, labeling and packaging of chemicals in the EU based on GHS.

The aim is to ensure high levels of human health and environmental protection, as well as the free flow of substances, mixtures and certain articles.

REACH regulation : (EC) No.1907/2006 (E.U.):

These are the regulations on registration, evaluation, authorization and restriction of chemicals in the EU. Substances listed in Annex XVII will generally be restricted and their production, import or use will be restricted. In addition, if a substance subject to authorization is listed in Annex XIV, it cannot be used in the EU without authorization.

The Basic Environmental Law (Japan):

The law specifies the basic philosophy as well as the principal measures used for environmental conservation, and promotes these measures in a comprehensive and planned

manner in order to ensure healthy and civilized living conditions for the nation, today and in the future, thereby contributing to the welfare of human beings.

Water Pollution Law (Japan):

The law seeks to protect the nation's health and preserve its living environment by regulating emissions into public water bodies from factories and businesses, and regulating water penetration into the ground, while also promoting various measures focusing on household waste water, thereby preventing the pollution of public water bodies and ground water.

Air Pollution Law (Japan):

The law seeks to protect the nation's health and preserve its living environment by regulating the emission of soot, volatile organic compounds and dust generated by business activities and the dismantling of commercial buildings and factories, promoting the implementation of measures to combat hazardous air pollutants and setting allowable limits for automotive gas emissions.

Ozone Layer Protection Law (Japan):

In order to protect the ozone layer, as part of a collaborative international initiative, and to ensure the successful and unimpeded implementation of the Vienna Treaty for ozone layer protection and the Montreal Protocol on ozone-depleting substances, the law regulates the manufacture of specified substances, rationalizing their use and restricting emissions, thereby protecting human health and preserving the living environment.

Dioxin Special Measures Law (Japan):

Recognizing that dioxins may have a serious impact on human life and health, the law seeks to protect the nation's health by preventing environmental pollution by dioxins and facilitating their elimination.

Global Warming Prevention Law (Japan):

Because global warming has a serious impact on the entire planet, a shared concern affecting all human beings is the need to stabilize the concentration of greenhouse gases in the atmosphere at a safe level that does not cause dangerous human intervention in the global climate system. Recognizing the importance of shared, voluntary and active participation in this undertaking, the law seeks to develop a target achievement plan for the Kyoto Protocol, promoting global warming prevention measures and thereby contributing to human welfare. In December 2022, a notice was issued regarding carcinogenic substances, for which work records, etc. need to be stored for 30 years in accordance with the Ordinance on Industrial Safety and Health.

Industrial Safety and Health Law (Japan):

The law seeks to ensure workers' safety and health and to promote development of a comfortable work environment by establishing a hazard prevention standard to prevent work-related disasters, clarifying a responsibility structure and promoting comprehensive and planned measures for voluntary activities.

OSHA (U.S.):

The law seeks to provide all employees in the United States with a work environment that is free from the threat of known hazards (danger elements) that may contribute to serious health problems.

GHS (International):

The system provides an international hazard/toxicity classification standard and indication method relating to the danger (danger/toxicity) of chemical substances. The system seeks to

prevent work-related accidents by notifying all parties of the relevant information on transferring or offering of those chemical substances that may pose a health hazard to workers, and by promoting chemical substance management in the workplace.

Stockholm Treaty (International treaty):

In order to reduce the risks posed by persistent organic pollutants (POPs) that require prompt corrective measures to be implemented, the treaty restricts the manufacture, use and import/export of the specified substances.

3. Definition of Terms

The terms used in these guidelines are defined as follows.

- (1) Panasonic Group
As a rule, includes companies for which Panasonic Corporation has voting rights of more than 50%.
- (2) "Chemical Substances Management Rank Guidelines (For Factories)"
The guidelines clarify "prohibited" rank substances by ranking those substances that are highly carcinogenic and whose use and manufacture are prohibited by law. In addition, the guidelines define "reduced" rank substances as those substances that are hazardous to humans and the environment. These guidelines are only applied to the chemical substances used in manufacturing operations.
- (3) "Prohibited" rank substances
Substances whose use must be stopped immediately, if they are still being used. "Prohibited" substances have been defined in accordance with the following laws and environmental notices in Japan and currently available information on highly carcinogenic substances. However, application of the "prohibited" rank to chemical substances that are carcinogenic to humans will only be determined after appropriate discussion. (Details are described in Chapter 5).

Requirements for a "Prohibited" substance ranking
Proven to be carcinogenic to humans
Ozone-depleting substance
Substance defined as "prohibited" by an environmental notice
Class 1 specified chemical substance, as specified by the Chemical Substance Control Law (manufacturing and import-prohibited substance)
Manufacturing-prohibited hazardous substance, as specified by Chapter 55 of the Industrial Safety and Health Law
Substance whose use or manufacture is prohibited by an international treaty

- (4) "Reduced" rank substances
Of the substances listed in the laws and regulations related to the field specified in Table 1, those considered to be hazardous to humans and the environment (other than "prohibited" rank substances) are defined as "reduced" rank substances.

The quantities of these substances used and the quantities emitted and transferred must be identified and the emitted/transferred quantities must be reduced.

(5) M-number List (M-No.)

The control number assigned by the Panasonic Group for substances whose CAS Registry Number™ cannot directly be assigned, or given to a general name or substance group.

(6) Toxicity

The rank guidelines based on the toxicity affecting human health and the environment are specified as shown below. The substances possessing the toxicity class shown in the table are considered managed substances in the rank guideline.

Toxicity affecting human health	
Carcinogenicity	The ability to change normal cells into cancer cells
Mutagenicity	Ability to cause a change in the genetic information of an organism. The majority of cancer-causing substances are mutagenic substances.
Reproductive toxicity	Exposure to the chemical substance has a harmful effect on reproductive capability (morphological or functional defect).
Acute toxicity	Toxicity appears immediately after administration, or within several days. (The dose or concentration that causes half of the test subjects to die after receiving the same dose is often used to measure toxicity)
Toxicity affecting the environment	
Ecotoxicity	Toxicity to fish, Daphnia, and algae
Ozone layer depletion	Depletion of the ozone layer increases the quantity of solar ultra-violet radiation reaching the ground and may have an adverse effect on human health
Global warming	Global warming causes a greenhouse effect
Photochemical oxidants	Air pollution substances that cause oxidation and pose a health hazard, as well as contributing to the generation of photochemical smog.

(7) Risk assessment

$\text{Risk assessment} = \text{Toxicity} \times \text{Exposed quantity (in general)}$
--

Risk assessment evaluates the toxicity of each chemical substance combined with the exposed quantity. Chemical substances need to be managed appropriately to reduce their risk.

Toxicity assessment: Each chemical substance has a unique toxicity. The toxicity assessment within the Panasonic Group is described in detail in Chapter 5.

Exposure assessment: Exposure is estimated by the concentration in the environment and the amount of exposure (dose) impacting on people or the environment. Because emissions or transfers from a business unit increase the environmental impact and lead to greater exposure for humans and the environment, the Panasonic Group uses the “emission quantity” and “transferred quantity” to assess the amount of exposure.

The risk assessment approach by the Panasonic Group is as follows.

$$\text{Human Environment Impact (HEI)} = \text{Toxicity factor} \times \text{Release/Transfer amount}$$

4. Scope of Application

- (1) These guidelines apply to the substances included in the "Chemical Substance List and M-number List" (Chapter 7) and used in the Panasonic Group's manufacturing business units. However, the application is exempted if any of the following conditions applies.
 - i) Chemical substances that do not assume the state of powder, liquid or gas during their handling process
 - ii) Chemical substances handled in a sealed condition with zero possibility of exposure during the process
 - iii) Products used for general consumers' daily lives (anti-insect spray, etc.)
 - iv) Chemical substances contained in the parts and materials used for production equipment/facilities, building/facility materials, and refrigeration/air-conditioning products. However, materials required for periodic maintenance such as lubricants, refrigerants, paints, boiler fuel, etc. are excluded.
 - v) Chemical substances contained in electrical products, instrumentation equipment, fire-extinguishing equipment and measuring instruments.
- (2) The chemical substances used for R&D, quality failure analysis (operation confirmation of older products), repair of the products manufactured/sold in the past, health management, etc. require that data be collected on their usage, emission/transfer, etc. for appropriate management, but are exempted from ranks such as "Prohibition," "Reduction" in the guidelines.
- (3) The guidelines require compliance with the relevant laws, ordinances, industry guidelines or other requirements, but do not prevent any voluntary activities of a higher standard in a business unit.
- (4) Substances with a concentration rate of 1% or greater (0.1% for a PRTR law class 1 specified chemical substance) require SDS (Material Safety Data Sheet). However, if available from a supplier, the collection of more detailed data is recommended.

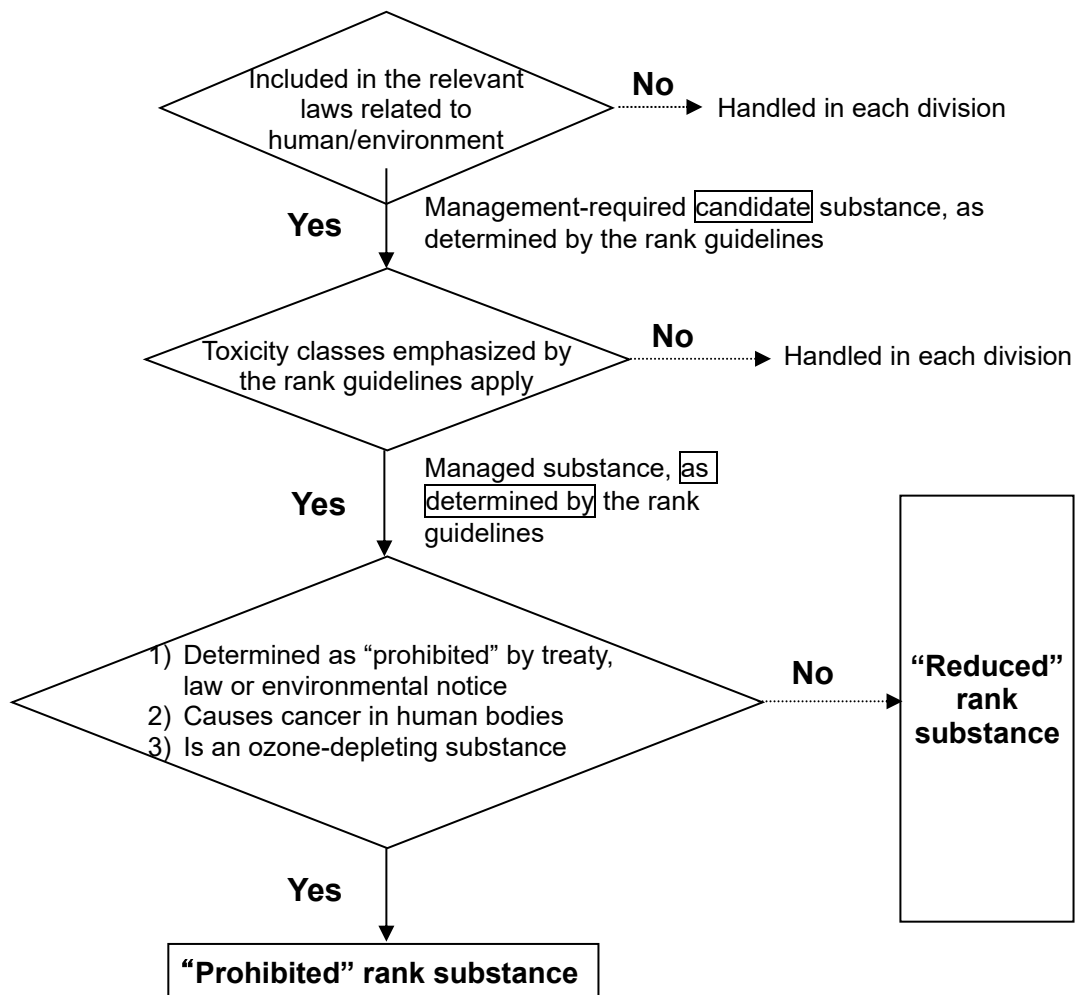
5. Determination of a Rank Category

The definitions of a rank category and rank category approaches are shown below.

(1) Definition of a rank category

Rank category	Definition
"Prohibited" rank	Usage prohibited
"Reduced" rank	Reduction of emission/transfer quantity

(2) Rank category approaches



The details of 5. (2) 1) in the flow chart are shown below.

1) Environment Notice

Environment Notice 93-1	CFC, 1,1,1 trichloroethane, HCFC (new use for cleansing), carbon tetrachloride, specific halon	Prohibition
Environment Notice 93-20	1,1,1 trichloroethane, carbon tetrachloride, dichloromethane, 1,2-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, 1,1,2-trichloroethane, trichloroethylene, tetrachloroethylene, 1,3-dichloropropen	
Environment Notice 93-11	PBBOs (decabromine base), PBBs (prohibited for European market)	Reduction
Environment Notice 03-15	Cadmium, lead, hexavalent chromium, mercury	Prohibition
Environment Notice 07-20	Perfluorooctane sulfonate (PFOS) and its salts	Prohibition

2) Toxicity assessment

Toxicity assessment is performed as follows:

- Divide toxicity classes into 5 groups (A~E) [High toxicity "A"~low toxicity "E"]
- Classify substances causing cancer in humans and ozone-depleting substances (excluding HCFCs) as "A".

Outline of applicable rank and toxicity classification

Applicable Rank	Relationship with the toxicity classification			Toxicity factor
	Toxicity class	Toxicity to humans	Toxicity to the environment	
"Prohibited" rank (Use prohibited)	A	Carcinogen	Ozone-depleting substance	10000 times
"Reduced" rank (Reduce emission/transfer quantity)	B	Impact: large (direct)		1000 times
	C	Impact: medium		100 times
	D	Impact: small or indirect		10 times
	E	Impact: minimal or not assessed		1 time

The above toxicity factor is adopted for clarifying the impact of substances on humans and the environment based on toxicity assessment.

Details of each classification are described in <Reference Material>.

■ Toxicity to human health

(i) Carcinogen

Toxicity class	IARC	ACGIH	EPA			EU CLP regulations	Japan Society for Occupational Health	NTP	GHS
			1986	1996	1999, 2005				
A	1	A1	A		CaH	1A	1	K	1A
B	2A	A2	B1	K/L	L	1B	2A	R	1B
C	2B	A3	B2		S	2	2B		2
D	3	A4	C, D	CBD	I				
E	4	A5	E	NL	NL				

How to apply the “prohibited” ranking when adding a substance newly evaluated as carcinogenic or when newly adding a carcinogenic substance

When classifying a substance not in use as "prohibited", based on the existing rank guidelines

Procedure 1: Classify it in the toxicity class “A”

Procedure 2: Rank it as "prohibited" when the rank guidelines are revised.

When classifying a substance already in use, based on the existing rank guidelines, or ranking a newly added substance as "prohibited"

Procedure 1: Classify it in the toxicity class “A”

Procedure 2: The business unit using the substance is to ensure the management or promote enhancement so that reduction of exposure to employees, release into the environment, etc. during use are properly controlled.

Procedure 3: For the time being, treat the substance with "reduced" rank in the rank guidelines.

[Mark a symbol (*) in the chemical substance list of the rank guidelines to indicate that it is the "reduced" rank]

(ii) Mutagenicity, (iii) Reproductive toxicity, (iv) Acute toxicity

Toxicity class	(ii) Mutagenicity	(iii) Reproductive toxicity	(iv) Acute toxicity	
	EU (CLP regulations), GHS classification		EU (CLP regulations)	GHS classification
A				
B	1A	1A	1, 2	1, 2
C	1B	1B	3	3
D	2	2	4	4
E				5

■ Toxicity affecting the environment

(v) Ecotoxicity

Toxicity class	(v) Ecotoxicity (Toxicity to aquatic organisms)			
	EU (CLP regulations)		GHS classification	
	Acute	Chronic	Acute	Chronic
A				
B	1	1	1	1
C		2	2	2
D		3	3	3
E		4		4

(vi) Ozone layer depletion, (vii) Global warming, (viii) Photochemical oxidants

Toxicity class	(vi) Substances causing ozone-layer depletion	(vii) Substances causing global warming (Global warming factor)	(viii) Substances causing photochemical oxidant (*1)
A	Ozone-depleting substance (excluding HCFCs)		
B	HCFCs	≥ 1000	
C		≥ 100	VOC
D		> 1	
E		≤ 1	

*1: VOCs are regarded as one of the contributing causes to the generation of photochemical oxidants. While photochemical oxidants irritate human tissues such as eyes and respiratory organs, VOCs affect human health indirectly. In addition, photochemical oxidants are known to affect plants (the ecosystem) by changing the color of leaves and suppressing growth. Although the direct impact of VOCs on the environment is still unclear, their toxicity classification is set at "C" due to their indirect but negative impact on the environment caused by the generation of photochemical oxidants.

6. Establishment and Abolition

- (1) The matters in these guidelines shall be appropriately discussed by representatives from Companies/affiliated companies and experts from respective divisions, and approved by the General Manager of the Environmental Management Department.
- (2) The contents of these guidelines are periodically (once a year) reviewed. A company-wide survey is conducted prior to a review via an Environmental Notice, and representatives from Operating Company/affiliated companies and experts from respective divisions will then discuss the draft revision, the finalized version of which will be approved by the General Manager of the Environmental Management Department.
However, the guidelines will be appropriately reviewed in line with amendments to the law, changes in social trends, technological progress (substitute technology, assessment technology), the increased availability of toxicity information, and requests for revisions submitted by product divisions, and will be amended with the approval by the General Manager of the Environmental Management Department.
- (3) Version number assignment after amendment
Indication method: Ver. 4. 0 0
i) ii) iii)
 - i) When the applicable regulation field is expanded or the applicable regulations are expanded, or when the operation is changed
 - ii) When revising the rank guidelines in response to a revision of the substance included in the applicable regulations
 - iii) When adding a revision to the current rank guidelines

7. Chemical Substance List and M-number List

Chemical substance list must comply with the latest version of the separately distributed "Chemical Substances Management Rank Guidelines (For Factories) Chemical Substance List"

* "Chemical Substances Management Rank Guidelines (For Factories) Chemical Substance List" URL:

(Intranet access: Japanese, English, Chinese version)

<https://iweb.is.jp.panasonic.com/cont/env/eng/factory/chemical/rank/index.html>

M-number List will be posted on the above company intranet (from V7.2).

8. Changes in Ranking

When a "prohibited" rank substance listed in Attachment 1: Chemical Substance List is a chemical substance used to manufacture products in the production process and cannot be changed due to the lack of a safer substitute material (given the current state of technology), operation is to be in accordance with "Detailed Rules for Internal Operation of the Panasonic Group Chemical Substances Management Rank Guidelines (For Factories)". Limited to specific applications approved in line with the Detailed Rules, the substance is to be treated as "reduced" rank even if it is in "prohibited" rank. As soon as a substitute material is found, this rank shall be removed and the normal rank shall again be applied. Such change shall apply to all material uses that previously received similar handling.

In case of any use of prohibited-rank substance, implement followings

- Continuously examine / explore processes or substances that do not involve prohibited-rank substances.
- If the use of prohibited-rank substance is unavoidable, use such substances in a manner that will minimize environmental release and exposure on workers

<Reference Materials>

■ Toxicity information regarding human health

(i) Evaluation of Carcinogenicity

- 1) IARC (International Agency for Research on Cancer)
 - 1: Substance carcinogenic to humans.
 - 2: Substance maybe carcinogenic to humans
 - 2A: Probably carcinogenic to humans
 - 2B: Possibly carcinogenic to humans
 - 3: Substance unclassifiable as to carcinogenicity in humans without sufficient evidence
 - 4: Substance Probably not carcinogenic to humans

- 2) EPA (the U.S. Environmental Protection Agency)

【1986 Guidelines】

- A: Substance carcinogenic to humans having enough epidemiological evidence
- B: Substance probably carcinogenic to humans
 - B1: Substance having limited epidemiological evidence
 - B2: Substance having enough evidence based on experiments on animals but insufficient epidemiological evidence
- C: Substance with only limited evidence by experiments on animals and possibly carcinogenic to humans
- D: Substance for which carcinogenicity to humans cannot be judged as the existing evidence about humans and experiments on animals is not enough.
- E: Proof exists that the substance does not cause cancer in humans

【1996 Guidelines】

- K/L: Known/likely human carcinogen
CBD: Carcinogenic potential cannot be determined
NL: Not likely to be carcinogenic to humans

【1999 Guidelines】

- CaH: Carcinogenic to humans
L: Likely to be carcinogenic to humans
S: Suggestive evidence of carcinogenicity, but not sufficient to assess human carcinogenic potential
I: Data are inadequate for an assessment of human carcinogenic potential
NL: Not likely to be carcinogenic to humans

【2005 Guidelines】

- CaH: Carcinogenic to humans
L: Likely to be carcinogenic to humans
S: Suggestive evidence of carcinogenic potential
I: Inadequate information to assess carcinogenic potential
NL: Not likely to be carcinogenic to humans

- 3) ACGIH (American Conference of Governmental Industrial Hygienists)

- A1: Substance carcinogenic to humans
- A2: Substance possibly carcinogenic based on the results of experiments on animals
- A3: Substance carcinogenic to animals
- A4: Substance without evidence data on carcinogenicity to humans
- A5: Substance not carcinogenic to humans

- 4) EU (Europe Union) CLP Regulation
 - 1A: Past onset cases show cancer-causing properties in humans
 - 1B: Animal-based tests show the possibility of cancer-causing properties in humans
 - 2: Cancer-causing properties are suspected in humans

CLP Regulation "EU Regulation on Classification, Labeling and Packaging of Substances and Mixtures" (issued on Jan. 20, 2009)

- 5) Japan Society for Occupational Health
 - 1: Substance carcinogenic to humans
 - 2: Substance possibly carcinogenic to humans
 - 2A: Substance for which evidence is enough
 - 2B: Substance for which evidence is comparatively not enough
- 6) NTP
 - K: Known to be a carcinogenic factor to humans
 - R: Rationally predicted to be a carcinogenic factor to humans
- 7) GHS classification
 - 1B: Possibly carcinogenic to humans (evidence in animals)
 - 2: Suspected to be carcinogenic to humans

(ii) Mutagenicity, (iii) Reproductive toxicity

- 1) EU (Europe Union) CLP regulation
 - 1A: Mutagenicity/reproductive toxicity in humans
 - 1B: Possible mutagenicity/reproductive toxicity in humans
 - 2: Suspected Mutagenicity/reproductive toxicity in humans
- 2) GHS classification
 - (ii) Mutagenesis
 - 1A: Substance known to induce heritable mutations in human germ cells
 - 1B: Substances considered to induce heritable mutations in human germ cells
 - 2: Substances which should be regarded as inducing heritable mutations in human germ cells
 - (iii) Reproductive toxicity
 - 1A: Substance known to have reproductive toxicity to humans
 - 1B: Substance presumed to have reproductive toxicity to humans
 - 2: Substances suspected to have reproductive toxicity to humans

(iv) Acute toxicity

- 1) EU (Europe Union) CLP regulation
 - 1: Oral toxicity \leq 5mg/kg
 - 2: Oral toxicity \leq 50mg/kg
 - 3: Oral toxicity \leq 300mg/kg
 - 4: Oral toxicity \leq 2000mg/kg
 - * Other acute toxicity caused by inhalation, gas, steam, dust and mist.
- 2) GHS classification
 - 1: LD50 < 5mg/kg
 - 2: LD50 < 50mg/kg
 - 3: LD50 < 300mg/kg

4: LD50 < 2000mg/kg

5: LD50 < 5000mg/kg

* LD50 (Lethal Dose): The dose that results in half of the test subjects dying when all are given the same dose

■ Toxicity information on environmental effects

(v) Ecotoxicity (Acute)

1) EU (Europe Union) CLP regulation

1: 96 hours LC50 ≤ 1mg/l or

48 hours EC50 ≤ 1mg/l or

72 or 96 hours Er50 (against other aquatic plants) ≤ 1mg/l

* LC50 (Lethal Concentration): The concentration that results in half of the test subjects dying when all are given the same dose

* EC50 (Effective Concentration): The concentration that causes 50% of the test subjects to react

2) GHS classification

1: 96 hours LC50 ≤ 1mg/l

2: 96 hours LC50 ≤ 10mg/l

3: 96 hours LC50 ≤ 100mg/l

96 hours LC50...against fish

48 hours EC50...against crustacea (shellfish)

72 or 96 hours Er50...against other aquatic plants

* Er50 (Effective Rate): The rate that causes 50% of the test subjects to react

(v) Ecotoxicity (Chronic)

1) EU (Europe Union) CLP regulation

1: 96 hours LC50 ≤ 1mg/l or

48 hours EC50 ≤ 1mg/l or

72 or 96 hours Er50 (against other aquatic plants) ≤ 1mg/l

And no degradability

2: 96 hours LC50 ≤ 10mg/l or

48 hours EC50 ≤ 10mg/l or

72 or 96 hours Er50 (against other aquatic plants) ≤ 10mg/l

And no degradability

3: 96 hours LC50 ≤ 100mg/l or

48 hours EC50 ≤ 100mg/l or

72 or 96 hours Er50 (against other aquatic plants) ≤ 100mg/l

And no degradability

4: No degradability

2) GHS classification

1: Acute class 1 and no degradability

2: Acute class 2 and no degradability

3: Acute class 3 and no degradability

4: No degradability

*No degradability: When the degree of degradation in 28 days is 70% or less, logKow ≥ 4

Toxicity Information Source

1. European CLP Regulations (carcinogenicity, mutagenicity, reproductive toxicity, acute toxicity, acute/chronic ecotoxicity)
2. IARC, ACGIH, USEPA, Japan Society for Occupational Health (carcinogenicity)
3. GHS classification (acute toxicity, acute/chronic ecotoxicity)
4. IPCC, Japan's Global Warming Prevention Law, USEPA (global warming factor)
5. Montreal Protocol, IPCC, USEPA, European Union (ozone-depleting substances)
6. Ministry of the Environment (volatile organic compounds)

Revision History

April 2025: P8, P12 EPA (1996, 1999, 2005) added

April 2026:

- P11: Deleted the statement of an external website regarding the substance list
- P15: Deleted an old statement on the source of toxicity information

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