

## 2. Procedure of calculating the released/transferred quantity and making notifications (→ pII-39)

The procedure of calculating/notifying the released/transferred quantity is described in the following sections.

Procedure of calculating the quantity released/transferred from a facility other than a specific requirement facility (2-1 → pII-41)

Procedure of calculating the quantity released/transferred from a specific requirement facility (2-2 → pII-82)

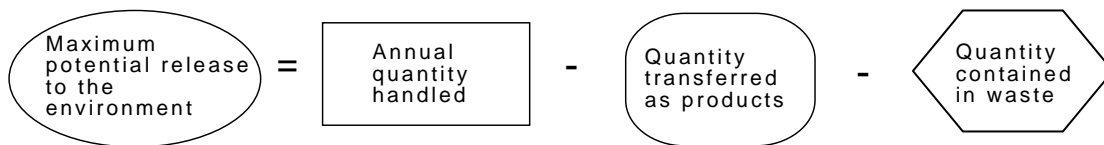
Procedure of notifying the quantity released/transferred (2-3 → pII-94)

Refer to pI-33 to I-38 in Part I for the type of data to be notified under the PRTR system according to the Law and basic method of calculating the quantity released/transferred.

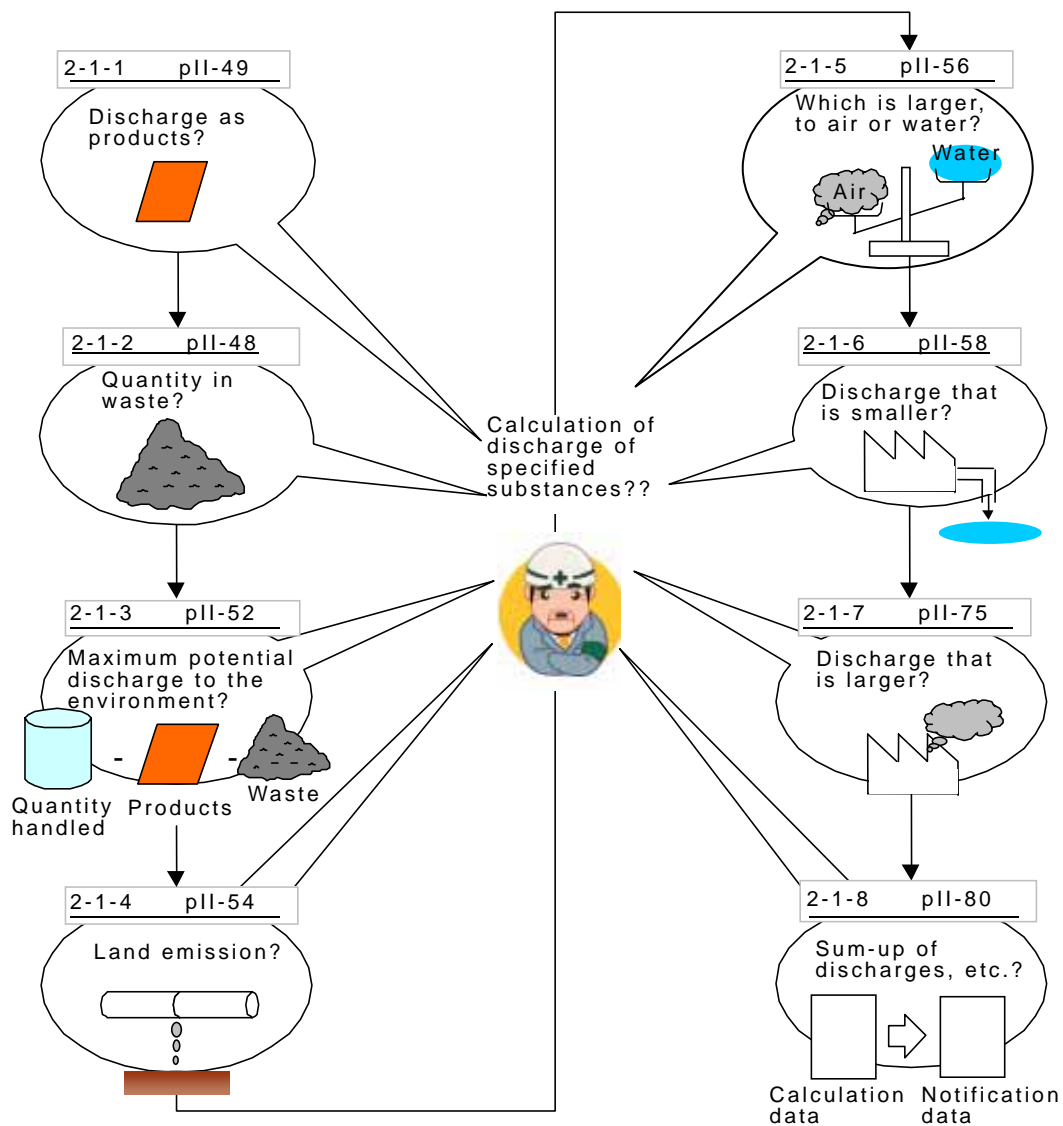
### 2-1 Procedure of calculating the quantity released/transferred from those other than specific requirement facilities

The procedure of calculating the quantity of a specified substance released/transferred is described based on Mass Balance. Figure 2-1 indicates the flow of the calculation.

The maximum potential release to the environment in the figure is the annual quantity handled minus the quantity transferred as products and the quantity contained in waste, as shown in the following formula.



Calculate the maximum potential release to the environment by using the above formula first, and then divide it into the quantities released to air, water and land.



**Fig. 2-1 Calculation procedure of releases and transfers**

- \* If the waste generated in the business establishment is recycled and reused within the business establishment, you do not have to calculate the quantity in waste.  
If the waste generated in the business establishment is sold to an external contractor, you must calculate the quantity in waste, but do not have to notify the quantity as “Quantity transferred to outside the pertinent business establishment.”  
Refer to 2-1-2 (→ pII-48) for details.

Reference page

- Part I 2-2-3 (1) Basic procedure of calculating released/transferred quantity ( pI-39)

## 2-1-1 Calculate the discharge as products

The quantity of specified substances discharged as products (hereafter referred to as “manufactured goods”), which are manufactured in a process where specified substances are handled, is calculated using the following formula.

$$\text{Discharge of specified substance as manufactured goods} = \text{Annual quantity of manufactured goods} \times \text{Content of specified substance in manufactured goods, or other values obtained through experience} \div 100$$

\* Specify 0 if no specified substances are contained in manufactured goods.

### (NOTE)

When a specified substance is consumed in the process by chemical reaction, calculate the consumed quantity by using the reaction rate. (Refer to pIII-2 for the calculation of the released or transferred quantity in the reaction process.)

$$\text{Consumed quantity by chemical reaction Kg/year} = \text{Annual quantity of specified substance handled kg/year} \times \text{reaction rate of specified substance \%} \div 100$$

If it is difficult to assess the quantity of specified substances attached to individual products in a plating process, etc., calculate the quantity brought out as products by using the average coating quantity per 1t of products.

### Reference page

- Part I 2-2-3 (1) Step1-1 Calculate the discharge as products ( pI-40)
- Part III 2. Q&A Q91 ( pIII-148),
  - 4-3-3 Emission factors listed in manuals of each industry ( pIII-249),
  - 4-3-4 Painting method and painting adhesion efficiency ( pIII-281),
  - 4-3-5 Current efficiency and electrochemical equivalent of metal precipitated in plating process ( pIII-282)

**(Example of calculation 1) When the content of a specified substance in products is known**

When a paint that contains toluene is manufactured

- Quantity of the paint manufactured and toluene content

Quantity of paint manufactured	15 t/year (= 15,000 kg/year)
Toluene content in paint	70%

- Calculation of the quantity discharged as products

$$\begin{aligned}
 & \text{Quantity of toluene discharged as products (kg/year)} = \text{Quantity of paint manufactured (15,000 kg/year)} \times \text{Toluene content in paint (70\%)} \div 100 \\
 & = 10,500 \text{ kg/year}
 \end{aligned}$$

**Filling out the worksheet2**

Name of the products manufactured in this process      Quantity of the products manufactured      Content of the subject substance      Quantity of the subject substance transferred per product  $2L \times 2M \div 100$       Sum of the quantities of subject substance transferred as products, Sum of 2N

Calculation of the quantity of the subject substance transferred as products				
When the content of the subject substance in the products is known				
Name of the product containing 2B manufactured in 2A	Manufactured quantity of 2K	Content of 2B (2M) in 2K	Quantity of 2B in 2K transferred as products	Sum of the quantities of 2B transferred as products
2K	kg/year 2L	% 2M	kg/year 2N $= 2L \times 2M \div 100$	kg/year 2R (Sum of 2N and 2Q)
Paint A	15,000	70	10,500	12,000
Paint B	5,000	30	1,500	

**(Example of calculation 2) When the content of a specified substance in products is not known**

When pigment component is coated on products in a coating process Calculate the quantity discharged as products by using the annual quantity handled and the adherence efficiency.

- Annual quantity of pigment component handled and adherence efficiency

Annual quantity of pigment handled	15 t/year ( = 15,000 kg/year)
Content of pigment component in paint	5%
Adherence efficiency of paint	80%

- Calculation of the quantity of pigment component discharged as products

$$\begin{aligned}
 & \text{Quantity of pigment component discharged as products (kg/year)} = \left( \frac{\text{Annual quantity of pigment component handled (15,000 kg/year)} \times 5\%}{100} \right) \times 80\% \div 100 \\
 & = 600 \text{ kg/year}
 \end{aligned}$$

**Filling out the worksheet2**

Name of the product manufactured in this process	Formula used to calculate the quantity of the substance transferred as products	Quantity of the subject substance transferred per product
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When the content of the subject substance in the product is not known		
Name of the product containing 2B manufactured in 2A	Formula used to calculate the quantity of 2B transferred as products 2O	Quantity of 2B transferred as products 2O kg/year
2O	2P	2Q
Painted board	$15,000 \times 5 \div 100 \times 80 \div 100$	600

Enter the sum in 2R.

**(Example of calculation 3) When a specified substance is consumed or decomposed by reaction**

When cyclohexane is manufactured using benzene as raw material Calculate the quantity of benzene consumed by the reaction of benzene by using the annual quantity of benzene handled and reaction rate. (When a specified substance is decomposed within the process, use the decomposition rate.)

- Annual quantity of benzene handled and reaction rate

Annual quantity of benzene handled	1.2 t/year (= 1,200 kg/year)
Reaction rate of benzene	99%

- Calculation of the quantity consumed by the reaction of benzene

$$\begin{aligned}
 &\text{Quantity consumed by reaction (kg/year)} = \frac{\text{Annual quantity of specified substance handled (1,200 kg/year)} \times \text{Reaction rate of a specified substance (99\%)}{\div 100} \\
 &= 1,188 \text{ kg/year}
 \end{aligned}$$

Filling out the worksheet2

Enter "Consumed by reaction"      Formula used to calculate the consumed quantity      Quantity of the subject substance consumed

When the content of the subject substance in the product is not known

Name of the product containing 2B manufactured in 2A	Formula used to calculate the quantity of 2B transferred as products 2O	Quantity of 2B transferred as the products 2O kg/year
2O	2P	2Q
(Consumed by reaction)	1,200×99÷100	1,188

**(Example of calculation 4) When a specified substance is not contained in products**

When metallic parts are washed using trichloroethylene  
Since trichloroethylene used for washing is not contained in metallic parts, 0 is assumed for the quantity discharged as products.

$$\begin{array}{c} \text{Quantity of} \\ \text{trichloroethylene} \\ \text{discharged as products} \\ \text{kg/year} \end{array} = \text{0 kg/year}$$

Filling out the worksheet2

Sum of the quantities of 2B transferred as products kg/year 2R
0

**2-1-2 Calculate the quantity of the specified substance in waste**

Calculate the quantity of specified substance in waste by using the following formula.

$$\begin{array}{c} \text{Quantity of} \\ \text{specified} \\ \text{substance} \\ \text{in waste} \\ \text{kg/year} \end{array} = \begin{array}{c} \text{Quantity of} \\ \text{waste} \\ \text{generated} \\ \text{kg/year} \end{array} \times \begin{array}{c} \text{Content of specified} \\ \text{substance in waste or} \\ \text{other values obtained} \\ \text{through experience} \\ \% \end{array} \div 100$$

If no other discharge is observed, you can use the following formula to calculate the quantity.

$$\begin{array}{c} \text{Quantity of} \\ \text{specified} \\ \text{substance in} \\ \text{waste} \\ \text{kg/year} \end{array} = \begin{array}{c} \text{Annual} \\ \text{quantity of} \\ \text{specified} \\ \text{substance} \\ \text{handled} \\ \text{t/year} \end{array} \times 1000 \text{ kg/t} \begin{array}{c} \text{Quantity of specified} \\ \text{substance discharged} \\ \text{as manufactured} \\ \text{goods} \\ \text{kg/year} \end{array}$$

\* Waste such as collected dust and sludge generated as a result of exhaust gas/effluent treatment is ignored here. They are calculated in 2-1-6 ( pII-58) and 2-1-7 ( pII-75).

**(NOTE)**

Notify the quantity contained in waste based on the classification of treatment methods and other factors as shown below.

Type of Treatment of Waste * <sup>1</sup>	Classification of Notification	Remarks
Treated or disposed of outside the premises of the establishment * <sup>2</sup>	Off-site transfer in waste	
Waste of no value or minus value is recycled outside the premises of the establishment * <sup>2</sup>	Off-site transfer in waste	
Sold to external recycling service company * <sup>3</sup>	Notification not required	Calculate as the quantity transferred as products (2-1-1 pII-43)
Recycled of inside the establishment	Notification not required	
Landfill disposed of inside the establishment	Landfills in the business establishment	Notify the type of landfill site (least controlled, controlled, or strictly controlled)

(For references)

Disposal such as incineration inside the establishment	Releases and Transfers	
Discharge of effluent to sewage works	Transfer to sewage	Calculate as the transfer to water



- \*1: When there are two or more transfer classifications, make the calculation, add up, and submit notifications as per the classification.
- \*2: When metal chips are handed over to another business for treatment and the treatment fee is paid in addition to the transportation fee, it is regarded as the “waste” designated by the Waste Disposal and Public Cleaning law. Therefore, notify the transferred quantity as “off-site transfer in waste” in principle.
- \*3: Include the waste sold to an external recycling manufacturer in the quantity discharged as products; you do not have to submit notifications as “off-site transfer in waste.”

**Example:** When spent solvent generated in a business establishment is sold to a recycling manufacturer, it does not fall under the category of “waste” in the Waste Disposal and Public Cleaning Law. Therefore, you do not have to submit notifications as “off-site transfer in waste.”  
When spent solvent is handed over to an external recycling manufacturer at no charge or by receiving money, submit notifications as “off-site transfer in waste” as in the case of \*2.

When waste is discharged from business establishment A to business establishment B of the same corporation that is not located within the same premises, the quantity in waste is classified as “off-site transfer in waste” transferred from business establishment A.

The elution test is used for measuring the quantity of heavy metals that elute from incineration ash into sample solution set at a certain pH (5.8 or higher and 6.3 or lower in the case of landfill waste). The value obtained through the elution test is different from the quantity of heavy metals actually contained in incineration ash. Therefore, it is not appropriate to use the result of the test for calculating the quantity contained in incineration ash.

#### Reference page

- Part I 2-2-3 (1) Step1-2 Calculate the quantity of the specified substance in waste ( [pI-41](#))
- Part III 2. Q&A Q63 ( [pIII-138](#)), Q78–Q82 ( [pIII-141–145](#)), Q86–Q87 ( [pIII-146–147](#)), Q93 ( [pIII-149](#)),  
4-3-3 Emission factors listed in manuals of each industry ( [pIII-249](#))

**(Example of calculation 1) When content of a specified substance in waste is known**

When spent paint containing toluene is generated

- Quantity of spent paint generated and toluene content

Quantity of spent paint	100 kg/year	Handed over to an industrial waste management contractor
Toluene content in spent paint	15%	

- Calculation of the quantity of toluene in waste

$$\begin{aligned}
 &\text{Quantity of toluene in waste (kg/year)} = \frac{\text{Quantity of spent paint generated (100 kg/year)} \times \text{Toluene content in spent paint (15\%)}{100} \\
 &= 15 \text{ kg/year}
 \end{aligned}$$

Filling out the worksheet2

Name of the waste generated in this process	Quantity of waste generated	Content of the subject substance	Type of transfer per waste	Quantity of the subject substance contained per waste $2T \times 2U \div 100$	Sum of the quantities of the subject substance contained in the waste, Sum of 2W
Calculation of the quantity of the subject substance contained in waste					
When the content of the subject substance in waste is known					
Name of the waste containing 2B generated in 2A	Quantity of 2S generated	Content of 2B (2B') contained in 2S	Type of transfer of 2S	Quantity of 2B contained in 2S	Sum of the quantities of 2B contained in 2S
2S	kg/year 2T	% 2U	2V	kg/year 2W $= 2T \times 2U \div 100$	kg/year 2AB (Sum of 2W and 2AA)
Waste paint	100	15	Transfer to outside the establishment	15	15

**(Example of calculation 2) When the content of a specified substance in waste is not known**

When spent paint containing toluene is generated  
Calculate the quantity in waste by using the quantity of spent paint generated and the toluene content in the paint used as raw material.

- Quantity of spent paint generated and toluene content in the paint used as raw material

Quantity of spent paint generated	100 kg/year	Handed over to an industrial waste management contractor
Toluene content in paint	30%	

- Calculation of the quantity of toluene in waste

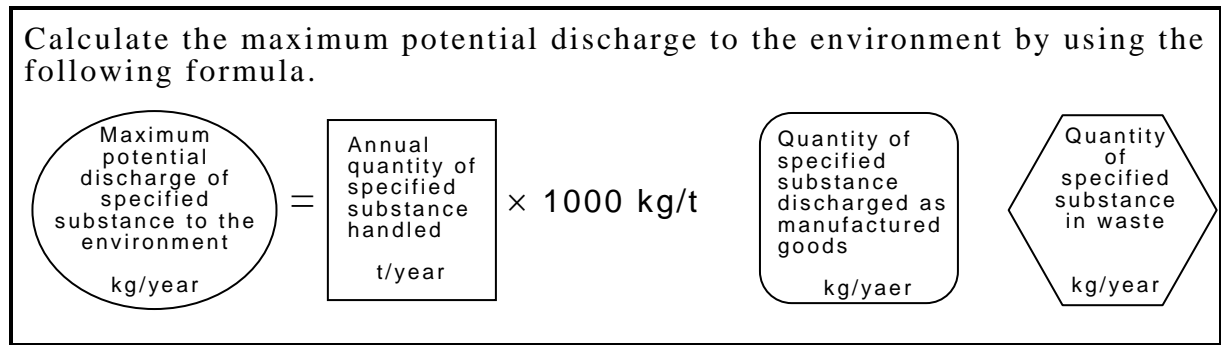
$$\begin{aligned}
 \text{Quantity of toluene in waste (kg/year)} &= \text{Quantity of spent paint generated (100 kg/year)} \times \text{Toluene content in paint (30\%)} \div 100 \\
 &= 30 \text{ kg/year}
 \end{aligned}$$

**Filling out the worksheet2**

Name of the waste generated in this process	Formula used to calculate the quantity contained in the waste	Type of transfer per waste	Quantity of the subject substance contained in each waste
When the content of the subject substance in the waste is not known			
Name of the waste containing 2B generated in 2A	Formula to calculate the quantity of 2B contained in 2X	Type of transfer of 2X	Quantity of 2B contained in 2X
2X	2Y	2Z	2AA
Paint	100×30÷100	Transfer to outside the establishment	30

} Enter the sum in 2AB.

### 2-1-3 Calculate the maximum potential discharge to the environment



\* "The maximum potential discharge to the environment," which is calculated using the above formula, is the maximum quantity that could be discharged to the environment.

Reference page

- Part I 2-2-3 (1) Step1-3 Calculate the maximum potential discharge to the environment ( pI-44)

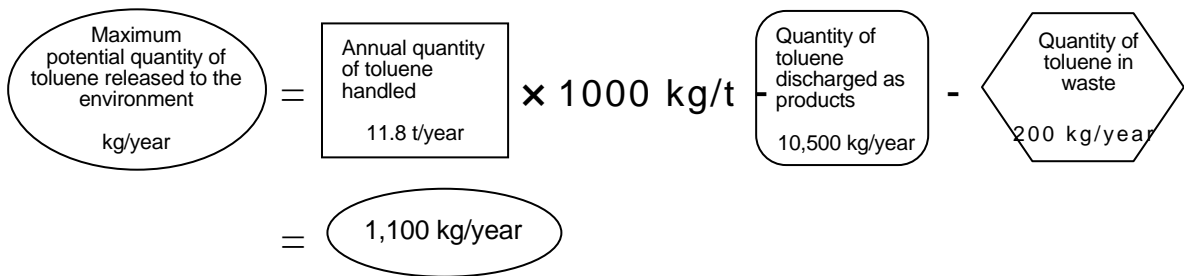
**(Example of calculation)**

In paint manufacturing process

- Annual quantity of toluene handled in the paint manufactured

Annual quantity of toluene handled	11.8 t/year
Quantity of toluene discharged as product (paint)	10,500 kg/year
Quantity of toluene in waste (waste liquid)	200 kg/year

- Calculation of the maximum potential quantity of toluene released to the environment



Filling out the worksheet2

Maximum latent quantity released to the environment  
2J-2R-2AB

	...	...	
Annual quantity of 2B handled	Sum of the quantities of 2B transferred as products	Sum of the quantities of 2B contained in waste	Calculation of the maximum potential quantity of the subject substance released to the environment
kg/year 2J =2C+ 2I	kg/year 2R (Sum of 2N and 2Q)	kg/year 2AB (Sum of 2W and 2AA)	Maximum potential quantity of 2B released to the environment kg/year 2AC =2J-2R-2AB
11,800	10,500	200	1,100

#### 2-1-4 Calculate the land emission of the specified substance

Calculate the land emission of specified substance by using the following formula.

$$\begin{array}{c} \text{Land emission} \\ \text{of specified} \\ \text{substance} \\ \text{kg/year} \end{array} = \begin{array}{c} \text{Quantity of raw} \\ \text{materials or} \\ \text{materials} \\ \text{discharged to} \\ \text{land} \\ \text{kg/year} \end{array} \times \begin{array}{c} \text{Content of} \\ \text{specified} \\ \text{substance in} \\ \text{raw materials} \\ \text{or materials} \\ \% \end{array} \div 100$$

\* If there is no leakage to land, land emission can be regarded as 0.

#### (NOTE)

The land emission includes the leakage of liquid from ground or underground storage facilities in the handling process, spilling of liquid or solid material at the time of moving from one container to another, and penetration of effluent containing specified substance.

When waste is disposed in a landfill site (least controlled, controlled or strictly controlled landfill site), make notifications not as the land emission but as "landfills in the business establishment."

Strictly speaking, it is assumed that metal fumes released when welding is performed and metallic compounds released from combustion facilities are released to air first and then fall on land. However, the whole quantity can be regarded as release to air, and need not be classified as release to land.

#### Reference page

- Part I 2-2-3 (1) Step1-4 Calculate the land emission of the specified substance ( [pI-46](#) )
- Part III 2. Q&A Q84–Q85 ( [pIII-146](#) )

**(Example of calculation)**

When solvent is spilt while being transferred within the premises of business establishment

- Quantity of solvent that spilt and toluene content in solvent

Quantity of solvent that spilt	150 kg/year
Toluene content in solvent	40%

- Calculation of the quantity of toluene released to land

$$\begin{aligned}
 & \text{Quantity of toluene released to land (kg/year)} = \text{Quantity of solvent that spilt to land (150 kg/year)} \times \text{Toluene content in solvent (40\%)} \div 100 \\
 & = 60 \text{ kg/year}
 \end{aligned}$$

**Filling out the worksheet3**

Quantity of raw materials or materials leaked

Content of the subject substance

Quantity released to soil  
 $3E \times 3F \div 100$

Calculation of the quantity released to soil		
Quantity of raw materials or materials containing 3B leaked to soil	Content of 3B (3B') in raw materials or materials	Quantity of 3B released to soil
kg/year 3E	% 3F	kg/year 3G = $3E \times 3F \div 100$
150	40	60