PRTR Estimation Manual

08. Cement Fiberboard Industry

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Cement Fiberboard Industries Association

Contents

1. Chemical substances of PRTR law

1.1. Class I Designated Chemical Substances (PRTR Chemicals)

Following PRTR chemicals are cited which are used in the manufacturing and processing processes in the facilities of member companies of this Industrial Association. (Refer to Table 1.)

1.1.1. Sheet making process (basic board manufacturing)

(Cabinet Order No. 26) asbestos (raw material)
(Cabinet Order No. 307) poly(oxyethylene)alkyl ether (antifoaming agent)
(Cabinet Order No. 2) acryl amide (polymer coagulant)
(Cabinet Order No. 309) poly(oxyethylene)nonylphenyl ether (mold releasing agent)

1.1.2. Painting process (decorated board manufacturing)

(Cabinet Order No. 227) toluene (urethane and acrylic paints and thinner)
(Cabinet Order No. 63) xylene (urethane and acrylic paints and thinner)

- When paints are used in the painting process, PRTR chemicals might be contained in the pigments and dyestuffs. Content of PRTR chemicals should be confirmed by MSDS of the paints from the paint maker or the distributor. (Refer to Table 2.)

1.1.3. Laminate process (decorated board manufacturing)

(Cabinet Order No. 227) toluene (adhesive)
(Cabinet Order No.63) xylene (adhesive)
(Cabinet Order No. 273) n-butyl benzyl phthalate (adhesive)
(Cabinet Order No. 270) di-n-butyl phthalate (adhesive)
(Cabinet Order No. 269) di-n-octyl phthalate (adhesive)

1.1.4. Others

The above PRTR chemicals are used in the facilities of member companies as raw materials or materials cited in response sheet for the questionnaire by this Industrial Association. Since there are other possibilities, however, of using PRTR chemicals in the manufacturing processes in the facility, content of PRTR chemicals in other chemical products should be checked by the MSDS of chemical products.

Table 1 Examples of PRTR chemicals

(related to the facilities of member companies of the Cement Fiberboard Industrial Association)

Cabinet Order No.	CAS	Name of substance	Application	Molecular formula	Molecular weight	Melting point [°C]	Boiling point [°C]	Vapor pressure [mm HG] (°C)	Aqueous solubility (°C)	Specific gravity (°C)
2	79-06-1	Acrylamide	Coagulating agent	C_3H_5NO	71.1	84.5	125 (25mmHg)	70×10^{-3} (20)	2155 g/l (30)	1.122 (30)
26	1332-21-4	Asbestos	Raw materials Inorganic fiber	$Mg_3Si_2O_5(OH)_4$		Asbestos is denatured at a temperature of 400 °C or higher				
63	1330-20-7	Xylene	Paint Solvent	C_8H_{10}	106.2	-13 ～ -48	137 ～ 140	7.99 (25)	130 mg/l (25)	0.864 (20)
227	108-88-3	Toluene	Paint Solvent	C_7H_8	92.1	-95	111	36.7 (30)	0.54 ～ 0.58 g/l (25)	0.866 (20)
269	117-84-0	Di-n-octyl phthalate	Paint Solvent	$C_{24}H_{38}O_4$	390.6	-25	220 (4torr)	0.2 (150)	3 mg/l (25)	0.978 (20)
270	84-74-2	Di-n-butyl phthalate	Paint Solvent	$C_{16}H_{22}O_4$	278.3	-35	340	9.7×10^{-3} pa (20)	11.2 mg/l	1.0465 (20)
273	85-68-7	N-butyl benzyl phthalate	Paint Solvent	$C_{19}H_{20}O_4$	312.4	-35	370	8.6×10^{-6} (20)	0.71 mg/l	1.113 (25)
307		Poly(oxyethylene) alkyl ether (alkyl C=12-15)	Antifoaming agent	$RO(CH_2CH_2O)_nH$		-10 or lower			Insoluble	1.0 (20)
309	9016-45-9	Poly(oxyethylene) nonyl phenylether	Mold releasing agent							
	Data from Japan Paint Manufacturers Association indicates that the following Class I Designated Chemical Substances are sometimes used as pigment for paint. (1) Water-soluble zinc compounds, (25) antimony and its compounds, (60) cadmium and its compounds, (68) chromium and trivalent chromium compounds, (100) cobalt and its compounds, (207) copper water-soluble salt, (230) lead and its compounds, (232) nickel compounds, (243) barium and its water-soluble compounds, (304) boron and its compounds, (311) manganic compounds, (346) molybdenum and its compounds, etc. *It is necessary to obtain MSDS for paint used and confirm whether the above mentioned chemical substances are contained or not.									

Table 2 Examples of PRTR chemicals used for pigments for paint
(examples of chemical substances which consist of groups of substances)

Cabinet Order No.	Class I Substances	CAS No.	Example of individual substance	Molecular formula	Molecular weight	Total atomic weight of metal, etc. (M)	Conversion factor (M / Molecular weight)
1-1	Water-soluble zinc compounds	7646-85-7	Zinc chloride	$ZnCl_2$	136.3	65.4	0.480
		7733-02-0	Zinc sulfate (7 hydrate)	$ZnSO_4 \cdot 7H_2O$	287.5	65.4	0.227
1-25	Antimony and its compounds	10025-91-9	Antimony chloride (antimony trichloride)	$SbCl_3$	228.1	121.8	0.534
		1314-60-9	Diantimony pentoxide	Sb_2O_5	323.5	243.5	0.753
		1309-64-4	Antimony chloride (diantimony trioxide)	Sb_2O_3	291.5	243.5	0.835
1-60	Cadmium and its compounds	1306-23-6	Cadmium sulfide	CdS	144.5	112.4	0.778
1-64	Silver and its water-soluble compounds	7440-22-4	Silver	Ag	107.9	107.9	1.000
1-68	Chromium and trivalent chromium compounds	1308-38-9	Chromic oxide (III)	Cr_2O_3	152.0	104.0	0.684
1-69	Hexavalent chromium compounds	13530-65-9	Zinc chromate	$ZnCrO_4$	181.4	52.0	0.287
		7789-00-6	Potassium chromate	K_2CrO_4	194.2	52.0	0.268
		13765-19-0	Calcic chromate (2 hydrate)	$CaCrO_4 \cdot 2H_2O$	192.1	52.0	0.271
		7789-06-2	Strontium chromate	$SrCrO_4$	203.6	52.0	0.255
		7758-97-6	Lead chromate	$PbCrO_4$	323.2	52.0	0.161
		10294-40-3	Barium chromate	$BaCrO_4$	253.3	52.0	0.205
		1333-82-0	Chromium trioxide (anhydrous chromate)	CrO_3	100.0	52.0	0.520
		7778-50-9	Potassium dichromate	$K_2Cr_2O_7$	294.3	104.0	0.353
1-100	Cobalt and its compounds	1307-96-6	Cobalt oxide (II)	CoO	74.9	58.9	0.786
1-176	Organic tin compounds	818-08-6	Dibutyl tin oxide	$(C_4Hg)_2SnO$	249.0	118.7	0.477
1-230	Lead and its compounds	7758-97-6	Lead Chromate (II)	$PbCrO_4$	323.2	207.2	0.641
		301-04-2	Lead (II) acetate (anhydride)	$Pb(CH_3COO)_2$	325.3	207.2	0.637
		1314-41-6	Trilead tetraoxide	Pb_3O_4	685.6	621.6	0.907
		1317-36-8	Lead oxide (II)	PbO	223.2	207.2	0.928
		20837-86-9	Lead cyanamide	$PbCN_2$	247.2	207.2	0.838

Cabinet Order No.	Class I Substances	CAS No.	Example of individual substance	Molecular formula	Molecular weight	Total atomic weight of metal, etc. (M)	Conversion factor (M / Molecular weight)
1-232	Nickel compounds	1313-99-1	Nickel oxide (II)	NiO	74.7	58.7	0.786
		1314-06-3	Nickel oxide (III)	Ni_2O_3	165.4	117.4	0.71
		13138-45-9	Nickel nitrate (II) (anhydride)	$Ni(NO_3)_2$	182.7	58.7	0.321
		3333-67-3	Nickel carbonate (II) (anhydride)	$NiCO_3$	118.7	58.7	0.494
		10381-36-9	Nickel phosphoric acid (II)	$Ni_3(PO_4)_2$	366.1	176.1	0.481
1-243	Barium and its water-soluble compounds	17194-00-2	Barium hydroxide	$Ba(OH)_2$	171.3	137.3	0.801
1-283	Hydrogen fluoride and its water-soluble salt	7664-39-3	Hydrofluoric acid (hydrogen fluoride)	HF	20	19	0.95
1-304	Boron and its compounds	10043-35-3	Boric acid	H_3BO_3	61.8	10.8	0.175
		7632-04-4	Sodium perboric acid	$NaBO_3$	81.8	10.8	0.132
		1330-43-4	Sodium tetraperboric acid	$Na_2B_4O_7$	201.2	43.2	0.215
		1303-96-4	Sodium tetraperboric acid (10 hydrate)	$Na_2B_4O_7 \cdot 10H_2O$	381.2	43.2	0.113
		16872-11-0	Fluoboric acid	HBF_4	87.8	10.8	0.123
		13755-29-8	Fluoboric sodium	$NaBF_4$	109.8	10.8	0.098
1-311	Manganese and its compounds	7722-64-7	Potassium permanganate	$KMnO_4$	158	54.9	0.348
		638-38-0	Manganese acetate (II)	$Mn(CH_3COO)_2$	173	54.9	0.318
		1313-13-9	Manganese dioxide	MnO_2	86.9	54.9	0.632
		10377-66-9	Manganese nitrate (II)	$Mn(NO_3)_2$	178.9	54.9	0.307
		598-62-9	Manganese carbonate (II)	$MnCO_3$	114.9	54.9	0.478
		10124-54-6	Manganese phosphoric acid	Mn_xPO_4 [to be calculated as $Mn_3(PO_4)_2$]	354.8	164.8	0.465
1-346	Molybdenum and its compounds	12027-67-7	Ammonium molybdate	$(NH_4)_6Mo_7O_{24}$	1163.8	671.6	0.577
		7631-95-0	Sodium molybdate	Na_2MoO_4	205.9	95.9	0.466

2. The release and transfer points of subject PRTR chemicals

PRTR chemicals are considered to be released to air, water bodies and land, and waste generated is considered as the amount of transfer. The PRTR chemicals handled in the facilities of member companies of this Industrial Association are as follows.

2.1. Asbestos

(The import and the use of amosite and crocidolite of amphibole series are prohibited. Therefore, Asbestos here is chrysotile of serpentinite series.)

2.1.1. Releases to air

Subject material is the material that is released to air escaping from the dust collectors in the following manufacturing and processing processes of:

① Opening the package of raw asbestos
② Finish cutting at a drying process
③ Crushing of trimming wastes
④ Cutting by panel saw or manufacturing of the board with holes
⑤ Finish processing by surface sander

2.1.2. Releases to water bodies

No release to water bodies takes place when the utility water of a facility is circulated (closed system). For the case where the utility water containing asbestos is treated and released to water bodies, reporting is required.

2.1.3. Releases to land

Because there is no possibility that asbestos or the raw materials containing asbestos are released to land in the manufacturing process at facilities, releases to land is usually zero. However, when the raw materials or wastes containing asbestos are disposed on land within the facility, the amount is to be reported.

2.1.4. Transfers as waste

When the sludge containing asbestos from the manufacturing process or the trimming waste at the finish cutting process is consigned to industrial waste disposal dealers, the amount is to be reported.

*As to the calculation of asbestos, refer to the “Estimation Manual” edited by Japan Asbestos Association participated in the project of The Society of Chemical Engineers, Japan.

2.2. PRTR chemicals contained in antifoaming agents, polymer coagulants and mold releasing agents used in the sheet making process

① Poly(oxyethylene) alkyl ether (PRTR chemical contained in antifoaming agent)
② Acrylamide (PRTR chemical contained in polymer coagulant)
③ Poly(oxyethylene) nonylphenyl ether (PRTR chemical contained in mold releasing agent)

*Above PRTR chemicals used in the sheet making process are subject materials for reporting only when the amount handled and the content are equal to or more the amount designated in Chapter 1.

2.2.1. Releases to air

The above-listed PRTR chemicals contained in antifoaming agent, polymer coagulant and mold releasing agent are nonvolatile, therefore release to air is considered to be zero

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2.2.2. Releases to water bodies

PRTR chemicals contained in antifoaming agent, polymer coagulant and mold releasing agent used in the sheet making process are the subject substances. No release to water bodies is expected when the utility water of a facility is circulated (closed system). However, when the utility water is treated and released to public water bodies such as rivers, the releases to water bodies should be estimated.

When the utility water is released to sewerage, the amount should be estimated and reported as transfer.

2.2.3. Releases to land

There is no possibility of releases to land in the manufacturing process. However, when the sludge (solidified sludge) containing PRTR chemicals in antifoaming agent, polymer coagulant and mold releasing agent, or wastes are disposed on land within facilities, the amounts are to be calculated as releases to land.

2.2.4. Transfers as waste

When the sludge (solidified sludge) containing PRTR chemicals contained in antifoaming agent, polymer coagulant or mold releasing agent, or wastes are consigned to industrial waste disposal dealers, the amount of transfer should be estimated.

2.3. PRTR chemicals contained in paints and adhesives used in the painting and laminating processes

① Toluene
② Xylene
③ N-butyl benzyl phthalate
④ Di-n-butyl phthalate
⑤ Di-n-octyl phthalate
⑥ PRTR chemicals contained in pigment and dyestuff

2.3.1. Releases to air

All the amounts of toluene and xylene contained in undiluted paint, thinner and adhesive are considered to be released to air from the processes of painting/drying and laminating/drying, they are supposed to be released to air for the calculation work. PRTR chemicals of phthalic acid ester used in the laminating process are nonvolatile, release to air is expected to be zero.

2.3.2. Releases to water bodies

When toluene and xylene contained in paints used in the painting process are recovered through the wet paint booth and are released contained in wastewater to the water bodies, these amounts should be estimated as releases to water bodies. However, when those chemicals are released to sewerage, the amounts are to be calculated and reported as transfers. In the laminating process, there is no release of those chemicals to water bodies.

2.3.3. Releases to land

No release to land is considered during the painting and laminating processes of the member companies' facilities.

2.3.4. Transfers as waste

When toluene and xylene contained in waste paint or waste adhesive during the painting/laminating process are consigned to industrial waste disposal dealers, the amounts should be calculated as transfers as waste. The PRTR chemicals of phthalic acid esters used in the laminating process should be treated likewise.

* PRTR chemicals are often contained in the pigment or the dyestuff of paints irrespective of aqueous or solvent type paints. The facility should procure MSDSs from manufacturers or dealers of paints, and check whether or not PRTR chemicals are contained in pigments or dyestuffs.

If any PRTR chemicals are contained 1% or more (0.1 % or more for the Specified PRTR chemicals) in these materials and the chemicals and the annual amount of the chemical handled in the facility is equal to 1 ton or more (0.5 ton or more for the Specified PRTR chemicals), the amount of releases and transfers of these chemicals should be estimated and reported.

3. Procedures of estimating releases and transfers of PRTR chemicals

3.1. Estimation procedures for asbestos released and transferred

(Refer to the manufacturing processes of Figure-1, Slag gypsum board (product containing asbestos), and Figure-3, Pulp cement board.)

3.1.1. Estimation procedure for annual amount of releases and transfers

Total releases and transfers of asbestos

= releases to (air + water bodies + land) + transfers in waste

3.1.2. Estimation procedure for releases to water bodies

Since closed systems are introduced in the member companies' facilities of this Industrial Association, no release to water bodies is expected. Therefore, no calculation is required. In cases where some facilities release the treated utility water to water bodies, refer to "Estimation Manual" edited by Japan Asbestos Association in November 2000.

3.1.3. Estimation procedure for releases to land

No release to land is expected from the member companies' facilities of this Industrial Association judging from the manufacturing processes, no calculation is required. However, when sludge (solid sludge) containing asbestos or wastes are disposed on land within the facilities, the amounts are to be calculated as releases to land.

3.1.4. Estimation procedure for releases to air

Releases of asbestos to air (kg/year) = $T \times Q \times Ai \times 10^{-6}$

- T: annual operation hours of dust collector (hrs) [only for products containing asbestos]
- Q: amount of exaust gas through a dust collector (m^3/hr)
- Ai: emission factor (mg/m^3)

  In case of a dust collector for the process of defiberizing and mixing asbestos: 0.001 mg/m^3

  In case of a dust collector for the process other than defiberizing and mixing asbestos: 0.002 mg/m^3

  (The data are based on the "Estimation Manual" compiled by Japan Asbestos Association in November 2000)

* Calculation example: the following table shows the amount released from each dust collector in the manufacturing process of Company A.

Application of dust collector		Releases from each dust collector (operation hour (hr) x amount of wind (m^3/hr)
X1	Asbestos opening equipment	2,120 hr×1,800 m^3/hr×0.001 mg/m^3×10^{-6} = 0.0038 kg
X2	Mixing equipment	2,120 hr×1,620 m^3/hr×0.001 mg/m^3×10^{-6} = 0.0034 kg
X3	Mill	800 hr×1,800 m^3/hr×0.001 mg/m^3×10^{-6} = 0.0014 kg
X4	Silo of recycled powder	800 hr×1,500 m^3/hr×0.002 mg/m^3×10^{-6} = 0.0024 kg
X5	Recycled powder measuring instrument	400 hr×1,500 m^3/hr×0.002 mg/m^3×10^{-6} = 0.0012 kg
X6	No. 1 cutter/sander/panel saw, and punching	1,200 hr×16,800 m^3/hr×0.002 mg/m^3×10^{-6} = 0.0403 kg
X7	No. 2 cutter	2,800 hr×10,800 m^3/hr×0.002 mg/m^3×10^{-6} = 0.0605 kg
X8	Tenoner/rooter	200 hr×30,000 m^3/hr×0.002 mg/m^3×10^{-6} = 0.0120 kg
X9	Cutter/groover	300 hr×13,800 m^3/hr×0.002 mg/m^3×10^{-6} = 0.0083 kg

* The total annual releases to air: X1 + X2 + ----- + X9 = 0.1333 kg

3.1.5. Estimation procedure for transfers as waste

1) Estimation method for the amount of asbestos transferred in waste container bags of asbestos

There is no need to calculate the transfers because it can be assumed that there is no transfer if the container bags are recycled or incinerated at a temperature of 400 ℃ or higher in the facility.

In case where the bags are disposed of through industrial waste disposal dealers, the following figure should be used.

The amount of asbestos transferred in one 50-kg waste container bag of asbestos: 0.4 g/bag

(The data are based on the “Estimation Manual” compiled by Japan Asbestos Association in November 2000)

* Calculation example:

If the annual amount of asbestos used is 200 tons, the number of container bags disposed of is 4,000.

4,000 bags / year × 0.4 g / bag = 1.6 kg /year

<u>The transfers of asbestos contained in container bags of raw asbestos are 1.6 kg per year</u> ···①

2) Estimation method for the amount of asbestos in case where sludge generated from the sheet making process is disposed of (refer to Z2 of Figure-1 and Figure-3)

Annual amounts of the following items shown below should be grasped by using data maintained by facilities.

- Annual amount of asbestos used:
- Annual amount of raw materials used
- Annual amount of sludge disposed of (dry weight excluding water content)

The content of asbestos in the sludge disposed of:
= (content of asbestos in mixed raw materials) × 0.15
(This is based on the data measured in the member companies' facilities of the Cement Fiberboard Industries Association.)

Annual transfers of asbestos in sludge disposed of
= annual amount of asbestos used /annual amount of raw materials used
× annual amount of sludge disposed of ×0.15

* Calculation example:
Company A annually uses 200,000 kg of asbestos and 4,000,000 kg of raw materials, and annually disposes of 8,000 kg of sludge.
200,000 kg/year ÷ 4,000,000 kg/year × 8,000 kg/year × 0.15
= 60 kg/year
The annual transfer of asbestos contained in sludge disposed of is 60 kg ·······②

3) Estimation method for the amount of asbestos in case where defective products such as trimming scraps generated during the finish cutting after the drying process are disposed of (Refer to Z3 of Figure-1 and Figure-3)

The annual amount of defective products disposed of should be identified using data maintained by the facilities.

Annual transfers of asbestos in waste materials such as defective products disposed of
= (annual amount of asbestos used
– annual transfers of asbestos in sludge disposed of)
÷ (annual amount of raw materials used

– annual amount of sludge disposed of)

× annual amount of waste materials such as defective products disposed of

* Calculation example:

Company A mills trimming scraps and defective products and reuses them as raw materials. Some defective products which cannot be recycled, are disposed of through industrial waste disposal dealers.

The maintained data indicate that the annual amount of waste materials such as defective products disposed of was 3,000 kg.

(200,000 – 60) kg/year ÷ (4,000,000 – 8,000) kg/year × 3,000 kg/year

= 150.26 kg/year

The annual transfers of asbestos contained in waste materials such as defective products disposed of are150.26 kg ··③

*Company A's annual transfers of asbestos (disposed of): ① + ② + ③

= 211.86 kg

3.2. Estimation procedure for releases and transfers of PRTR chemicals contained in antifoaming agents, polymer coagulants and mold releasing agents used in sheet making process

[Refer to Figure-1: Slag gypsum board (containing asbestos), Figure-2: Slag gypsum board (non-asbestos), Figure-3: Pulp cement board]

The questionnaire survey of member companies' facilities showed that following PRTR chemicals are contained in raw materials.

① poly(oxyethylene) alkyl ether in antifoaming agent

② acrylamide in polymer coagulant

③ poly(oxyethylene) nonylphenyl ether in mold releasing agent

In most of the member companies' facilities, the content and the amount handled per year of these PRTR chemicals contained in the chemical products are so small that the reporting may not be required. For your reference, the estimation procedures are given below.

3.2.1. Estimation procedure for releases and transfers of polyoxyethlenealkylether (antifoaming agent) released and transferred

(1) Estimation procedure for releases to air

There is no need to calculate the releases to air because it can be assumed that no poly(oxyethylene) alkyl ether is released to air, under the usual use condition in this industry.

(2) Estimation procedure for releases to water bodies

There is no need to calculate the amount released to water bodies, because no release to water bodies can be assumed, as the manufacturing processes in the respective facilities of member companies of this Industry Association adopted the closed system for water used .

(3) Estimation procedure for releases to land

There is no need to calculate the amount released to land because no release to land through the manufacturing processes can be assumed in the facilities of member companies of this Industry Association. However, when the sludge or wastes are disposed on land within facilities, the amounts are to be calculated as releases to the land.

(4) Estimation procedure for transfers in waste

It is necessary to calculate the transfers of poly(oxyethylene) alkyl ether in waste by using the data maintained by facilities for the case where waste materials from defective products, such as sludge generated through the manufacturing processes and trimming scraps generated during the finish cutting of the drying process, are disposed of through industrial waste disposal dealers.

1) Estimation method for the transfers of poly(oxyethylene) alkyl ether for the case where sludge is disposed of (refer to Z2 of Figure-1, 2, and 3)

The amounts of the individual items shown below should be grasped by using data maintained by facilities:

- Annual amount of antifoaming agent used
- Annual amount of raw materials used
- Annual amount of sludge disposed of (the weight of sludge is converted to dry weight)
- Content of poly(oxyethylene) alkyl ether

The annual transfers of poly(oxyethylene) alkyl ether in sludge disposed of
= annual amount of antifoaming agent used
× annual amount of sludge disposed of
÷ annual amount of raw materials used × content

* Calculation example:

Company A uses 3,000 kg of antifoaming agent per year. The content of poly(oxyethylene) alkyl ether in antifoaming agent is 7 percent. The annual amount of sludge disposed of is 8,000 kg and the annual amount of raw materials used is 4,000 tons.

3,000 kg/year × 8,000 kg/year ÷ 4,000,000 kg/year × 7%

= 0.42 kg/year

<u>The annual transfers of poly(oxyethylene) alkyl ether in sludge disposed of are 0.42 kg</u> ··①

2) Estimation method for the transfers of poly(oxyethylene) alkyl ether for the case where defective products such as trimming scraps generated during the drying process are disposed of

The annual amount of waste materials including defective products disposed of should be grasped using the data maintained by the facilities.

The annual transfers of poly(oxyethylene) alkyl ether disposed of in waste materials such as defective products

= annual amount of antifoaming agent used

× annual amount of waste materials disposed of

÷ annual amount of raw materials used × content

* Calculation example:

Company A disposes of 3,000 kg of waste materials per year through industrial waste disposal dealers.

3,000 kg/year × 3,000 kg/year ÷ 4,000,000 kg/year × 7%

= 0.158 kg/year

<u>The annual amount of poly(oxyethylene) alkyl ether disposed of in waste materials such as defective products is 0.158 kg</u> ···②

<u>* Therefore, the Company A's annual transfers of poly(oxyethylene) alkyl ether (disposed of) is as follows:</u>

<u>① + ② = 0.578 kg</u>

3.2.2. Estimation procedure for acrylamide (polymer coagulant) releases and transfers

(1) Estimation procedure for releases to air

There is no need to calculate the releases to air because it can be assumed that no acrylamide contained in polymer coagulant is released to air, under the usual use condition in this industry.

(2) Estimation procedure for releases to water bodies

There is no need to calculate the amount released to bodies of water because facilities of member companies of this industrial association apply the closed system to water used through the manufacturing processes and there is no release to bodies of water.

(3) Estimation procedure for releases to land

There is no need to calculate the amount released to land because it can be assumed that there is no release to land during the manufacturing processes in the member companies' facilities of this Industrial Association. However, when the sludge or wastes are disposed on land within the facility, releases to the land should be estimated.

(4) Estimation procedure for transfers in waste

It is necessary to estimate the amount of acrylamide transferred in waste by using the data maintained by facilities for the case where waste materials, such as defective products, sludge generated through the sheet making process, and trimming scraps generated during the finish cutting after the drying process, are disposed of through industrial waste disposal dealers.

1) Estimation method for the transfers for the case where sludge is disposed of the amount of each item shown below should be identified using the data maintained by the facilities. (refer to Z2 of Figure-1, 2, and 3)

- Annual amount of polymer coagulant used
- Annual amount of raw materials used
- Annual amount of sludge disposed of (the weight of sludge is converted to dry weight)
- Content of acrylamide

Annual transfers of acrylamide in sludge disposed of
= annual amount of polymer coagulant used
× annual amount of sludge disposed of
÷ annual amount of raw materials used × content

* Calculation example:

Company A uses 1,000 kg of polymer coagulant per year as powdery raw materials. The content of acrylamide in polymer coagulant is 0.12 percent. The annual amount of sludge disposed of is 8,000 kg and the annual amount of raw materials used is 4,000 tons.

1,000 kg/year × 8,000 kg/year ÷ 4,000,000 kg/year × 0.12%

= 0.0024 kg/year

The annual transfers of acrylamide in sludge disposed of are 0.0024 kg.········①

Note: As content of acrylamide is less than 1 percent, reporting is not required.

2) Estimation method for transfers for the case where waste materials such as defective products and trimming scraps generated during the drying process are disposed of (refer to Z3 of Figure-1, 2, and 3)

The annual amount of waste materials including defective products disposed of should be grasped by using data maintained by facilities.

The annual transfers of acrylamide disposed of in waste materials such as defective products

= annual amount of polymer coagulant used

× annual amount of waste materials disposed of

÷ annual amount of raw materials used × content

* Calculation example:

Company A disposes of 3,000 kg of waste materials per year through industrial waste disposal dealers. The amount of acrylamide disposed of in waste materials is:

1,000 kg/year × 3,000 kg/year ÷ 4,000,000 kg/year × 0.12%

= 0.0009 kg/year

The annual transfers of acrylamide in waste materials disposed of are 0.0009 kg

··②

* Company A's annual transfers of acrylamide (disposed of): ① + ② = 0.0033 kg

3.2.3. Estimation procedure for poly(oxyethylene) nonylphenyl ether (mold releasing agent)

(1) Estimation procedure for releases to air

There is no need to calculate the releases to air because no poly(oxyethylene) nonylphenyl ether contained in mold releasing agent is released to air, under the usual use condition in this industry.

(2) Estimation procedure for releases to water bodies

There is no need to calculate the releases to water bodies because the closed system has been adopted and semi-finished goods or residual materials of products to which mold releasing agent is applied are not contacted to water in the facilities of member companies of this Industry Association.

(3) Estimation procedure for releases to land

There is no need to calculate the releases to land because it can be assumed that there is no release to land during manufacturing processes in the facilities of member companies of this Industry Association.

(4) Estimation procedure for transfers contained in waste

It is necessary to identify amounts of the individual items shown below and estimate the transfers of poly(oxyethylene) nonylphenyl ether by using data maintained by the facilities. The estimation will be required in cases where waste materials, such as defective products and trimming scraps generated during the finish cutting after the drying process, are disposed of through industrial waste disposal dealers.

- Annual amount of mold releasing agent used
- Annual amount of raw materials used
- Annual amount of waste materials disposed of (the weight of waste materials is converted to dry weight)
- Content of poly(oxyethylene) nonylphenyl ether

The annual transfers of poly(oxyethylene) nonylphenyl ether in waste materials such as defective products disposed of

= annual amount of mold releasing agent used

× annual amount of waste materials disposed of

÷ annual amount of raw materials used × content

* Calculation example:

Company A uses 1,500 kg of mold releasing agent per year and disposes of 3,000 kg of waste materials per year through industrial waste disposal dealers. The content of poly(oxyethylene) nonylphenyl ether in mold releasing agent is 1 percent. The annual amount of raw materials used is 4,000 tons.

1,500 kg/year × 3,000 kg/year ÷ 4,000,000 kg/year × 1%

= 0.0112 kg/year

<u>The annual transfers of poly(oxyethylene) nonylphenyl ether in waste materials such as defective products disposed of are 0.0112 kg.</u>

3.3. Estimation procedure for releases and transfers of toluene and xylene in painting process

Estimation procedure: [refer to Figure-4 Surface coating (painting)]

Shown below is calculation method for the case with no solvent recovery system.

3.3.1. Estimation procedure for annual amount of releases and transfers of toluene (procedure for xylene is the same as that for toluene)

The amount of toluene handled per year is calculated from the amount of paint used and the content of toluene in the paint.

The amount of toluene handled per year (kg/y)

= the amount of paint used (kg/y) × content toluene in the paint

* Calculation example:

Company A uses two types of paint and thinner of 12 tons per year, and the amounts of toluene handled are as follows, respectively.

Paint for sealer 7,500 kg/y × 25% = 1,875 kg/y

Paint for final coating 1,300 kg/y × 23% = 299 kg/y

Thinner 3,200 kg/y × 50% = 1,600 kg/y

(Total 1,875 + 299 + 1,600 = 3,774 kg/y)

The total amount of toluene handled per year is 3,774 kg ······························①

3.3.2. Estimation procedure for releases to water bodies

No release to water bodies is expected usually in the painting process of the member companies' facilities. However, in case there is a release of waste water from a wet paint booth, the amount of toluene in the waste water from the wet paint booth is calculated as follows.

Annual releases to water bodies (kg/y)

= solubility of toluene in water (kg/m^3) × volume of waste water (m^3/y)

* Calculation example:

Company A using a wet painting booth has no data on the concentration of toluene in waste water, but A can calculate the amount of releases to water bodies using the solubility of toluene in water, 580 mg/L (= 0.58 kg/m^3). If the amount of waste water is $1m^3$ per day, and the number of working days per year is 200 days,

0.58 kg/m^3 × $1m^3$/day × 200 days/y = 116 kg/y

The amount of releases to water bodies of toluene is 116 kg/y ······················②

3.3.3. Estimation procedure for releases to land

There is no need to calculate the amount released to land because no release of toluene to land in the painting process is assumed.

3.3.4. Estimation procedure for transfers as waste

The estimation procedure for transfers as waste when waste paints are consigned to industrial waste disposal dealers is as follows.

The amount of transfer as waste of toluene in waste paint per year (kg/y)

= the amount consigned to waste disposal dealers (kg/y) × content in waste paint

* Calculation example:

Company A consigned 150kg per year of waste paint to industrial waste disposal dealers. The average content of toluene in waste paints is calculated from the total amount of paint and thinner used per year by the company A (12 tons) and the total amount of toluene contained in paint and thinner (3,774 kg).

3,774 (kg/y) ÷ 12,000 (kg/y) × 100

= 31.45% (average content of toluene in waste paint)

The amount of transfers of toluene as waste per year

150 kg/y × 31.45% = 47.175 kg/y

The amount of transfers of toluene as waste per year is 47.175 kg ················③

3.3.5. Estimation procedure for releases to air (with no solvent recovery system)

Toluene and xylene contained in paint and thinner are all released to air during the setting and drying stages of painting processes. The amount of releases to air is calculated by subtracting the releases to water bodies and transfers as waste from the total amount of toluene handled.

* The amount of releases of toluene to air per year

= total amount of toluene handled per year

– releases to water bodies – transfers as waste

= ① – ② – ③

3,774 kg/y – 116 kg/y – 47.175 kg/y = 3,610.825 kg/y

The amount of releases of toluene to air is 3,611 kg/y.

Notes: In the future when activated charcoal treatment device is equipped in the member companies' facilities, the releases of toluene (xylene) to air after the treatment should be calculated by adsorption rate of the activated charcoal. When the waste activated charcoal is transferred as waste, the amount of toluene (xylene) adsorbed should be calculated as transfers.

3.4. Estimation procedure for releases and transfers when PRTR chemicals are contained in the pigments of paints

An example when a lead compound (lead nitrate) is contained in the pigment of paints is shown below.

3.4.1. Estimation procedure for total releases and transfers of lead compounds

Total releases and transfers of lead compound per year
= lead compound handled per year
– the amount of lead compound shipped as products per year

3.4.2. Estimation procedure for the annual amount of lead compounds handled

(Notes: If a PRTR chemical is a metallic compound, the content as metal element should be calculated by a conversion factor. Refer to Table-2 for the conversion factor.)

Total amount of lead compounds handled per year is calculated from the amount of paints used, the content of lead nitrate and the conversion factor of lead nitrate to lead metal.

Total amount of lead compounds handled per year as lead
= amount of paints used × content of lead nitrate × conversion factor
= amount of lead in lead nitrate handled per year

* Calculation example:

Company A uses 5 tons of paints containing lead nitrate with content of 20%. The conversion factor of lead nitrate to lead is 0.626.

5 ton/y × 20% × 0.626 = 626 kg/y

<u>The total amount of lead compound handled as lead per year is 626 kg</u>··········①

3.4.3. Estimation procedure for the amount shipped as products

The amount of lead compound shipped is calculated by the total amount of handled multiplied by painting efficiency, supposing that the lead compounds are coated according to the painting efficiency on products and shipped out.

Notes: Painting efficiency differs according to the process of painting, that a proper efficiency should be selected from the data of Japan Paint Manufacturers Association.

The amount shipped as products
= amount of lead compounds handled per year × painting efficiency

* Calculation example:

Company A painted products by air spray process. The painting efficiency is 70% in this case.

626 kg/y × 70% = 438.2 kg/y

The amount shipped as product is 438.2 kg per year······································②

3.4.4. Estimation procedure for releases to air

Lead compounds are non-volatile, so no release to air is assumed and no need to calculate it.

3.4.5. Estimation procedure for releases to land

There is no release to land of paints in painting process usually, so no calculation of releases is needed.

3.4.6. Estimation procedure for transfers as waste

1) The estimation procedure for transfers as waste when the residual paint in a can is consigned to an industrial waste disposal dealer.

The amount of waste of lead compounds is calculated by the content in paint and the amount of waste consigned to the dealer.

The amount of transfer of lead compound contained in waste paint

= the amount of waste paint × content in paint × conversion factor

* Calculation example:

Company A consigned 100 kg of waste paint containing lead compound to industrial waste disposal dealers. The content of lead nitrate is 20%, and the conversion factor for lead metal is 0.626.

100 kg × 20% × 0.626 = 12.52 kg/y

The transfer of lead compounds contained in waste paint per year is 12.52 kg.

··③

2) The estimation procedure for transfer, in waste paint when waste paint of painting loss in a painting booth, solidified or in solution, is consigned to an industrial waste disposal dealer.

The transfer as waste of lead compounds by painting loss per year

= the annual amount of lead compounds used

− the amount shipped as products − transfer of residual paint in a can

* The transfers of lead in painting loss per year are ① – ② – ③.

626 kg/y – 438.2 kg/y – 12.52 kg/y = 175.28 kg/y

The transfers of lead in painting loss per year are 175.28 kg.

3.4.7. Estimation procedure for releases to water bodies

When the waste paint from painting loss is all disposed of as waste, no release to water bodies is assumed, so no calculation is needed.

3.5. Estimation procedure for releases and transfers of PRTR chemicals contained in adhesives in the laminating process

[Refer to Figure 5, Surface decoration (lamination)]

From the questionnaire survey of member companies' facilities, following PRTR chemicals are listed as the chemical substances contained in adhesives.

① Toluene
② Xylene
③ n-Butyl benzyl phthalate
④ Di-n-butyl phthalate
⑤ Di-n-octyl phthalate

* ① Toluene and ② xylene are volatile and are all released to air, so they are supposed not to be shipped out in products. ③ n-Butyl benzyl phthalate, ④ di-n-butyl phthalate and ⑤ di-n-octyl phthalate are supposed to be all shipped in products, and there is no release to air.

3.5.1. Estimation procedure for releases to water bodies

Considering there is no release to water bodies during the laminating process, because of no water contacting process, so releases to water bodies need not to be calculated.

3.5.2. Estimation procedure for releases to land

Considering the there is no releases during the laminating process to land, there is no need to calculate releases.

3.5.3. Estimation procedure for transfer as waste

The three cases, 1), 2), and 3) below are considered as transfers in waste.

1) Calculation procedure for residual adhesives in containers disposed of

When residual adhesives in containers are consigned to industrial waste disposal dealers, the following value can be used as the emission factor.

The residual amount of adhesive in 20 kg bag ・・・・・ 240 g

(Averaged value of measurement by the member companies' facilities of Cement Fiberboard Industries Association)

* Calculation example:

Company A used 10,000 kg of adhesives per year, and 500 bags were disposed of. The content of toluene in adhesives was 5 % and the content of di-n-butyl phthalate was 3 %.

500 bags/y × 240 g/bag

= 120 kg/y (the amount of adhesive remained in waste bags)

The amount of transfer of toluene in waste bags per year

= 120 kg/y × 5% = 6 kg/y ···①

The amount of transfer of di-n-butyl phthalate in waste bags per year

= 120 kg/y × 3% = 3.6 kg/y ··②

2) Calculation procedure for transfers when waste adhesives are consigned to industrial waste disposal dealers

The annual transfers as waste of toluene and di-n-butyl phthalate in waste adhesive

= the amount consigned to dealers × content in the adhesives

* Calculation example:

Company A consigned 50 kg of waste adhesive to industrial waste disposal dealers. The content of toluene in adhesive was 5% and that of di-n-butyl phthalate was 3%.

The amount of transfer per year of toluene disposed of in waste adhesive

= 50 kg/y × 5% = 2.5 kg/y ···③

The amount of transfer per year of di-n-butyl phthalate disposed of in waste adhesive

= 50 kg/y × 3% = 1.5 kg/y ···④

3) Calculation procedure for transfers when the cutoff scraps of adhesive sheets from the adhesive process are consigned to industrial waste disposal dealers

Notes: The followings calculation procedure is for the process where adhesive is coated onto a sheet, no calculation is required for the process where the base material is directly coated with adhesive.

The amount of transfers per year of di-n-butyl phthalate contained in cutoff scraps of sheets

= The annual amount of adhesives used × content in adhesives
× cutting rate of sheets

* Calculation example:

Company A cut off 2% of adhesive sheets in adhesive process and consigned them to industrial waste disposal dealers. In this case toluene is released to air, and only di-n-butyl phthalate is transferred as waste in the cutoff scraps.

The amount of adhesives used was 10,000 kg.

The amount of transfers per year of di-n-butyl phthalate disposed of contained in the cutoff scraps of sheets
= 10,000 kg/y × 3% × 2% = 6 kg/y ···⑤

- The total amount of transfers in waste:

The total amount of transfers of toluene in waste per year is ① + ③ equals 8.5 kg.
The total amount of transfers of di-n-butyl phthalate as waste per year is ② + ④ + ⑤ equals 11.1 kg.

3.5.4. Estimation procedure for releases to air (without solvent recovery system)

As for toluene (xylene), the total amount subtracted by the amount transferred is the release to air.

The annual amount of toluene (xylene) handled
= the amount of adhesive used × content in adhesive

The release to air
= the annual amount of toluene (xylene) handled – the amount transferred

* Calculation example:

The annual amount of toluene handled = 10,000 kg/y × 5% = 500 kg/y ·········⑥
The releases of toluene to air per year are ⑥ – ① – ③ equals 491.5 kg.

Figure-1: Slag gypsum board (products containing asbestos)

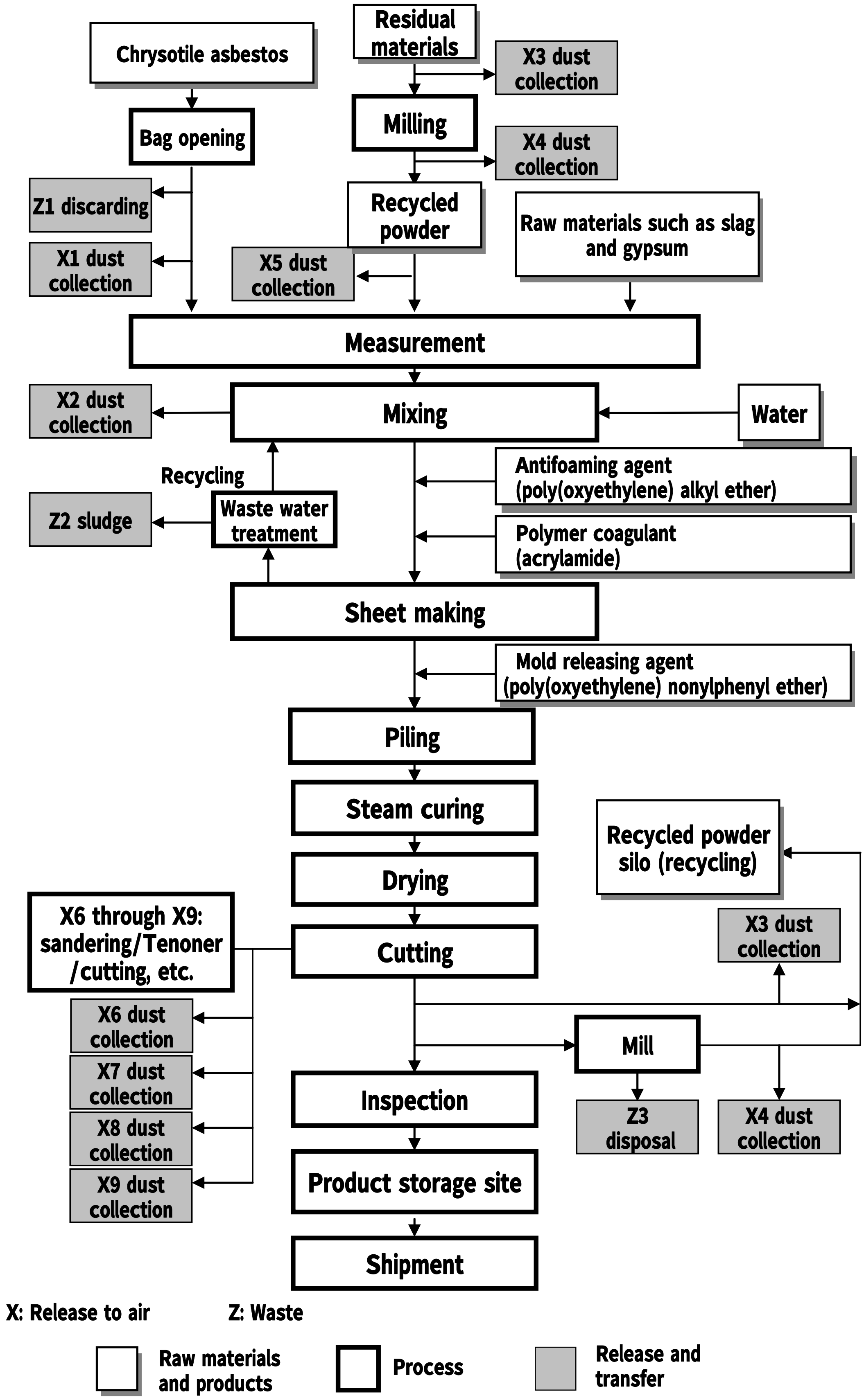

Figure-2: Slag gypsum board (non-asbestos containing products)

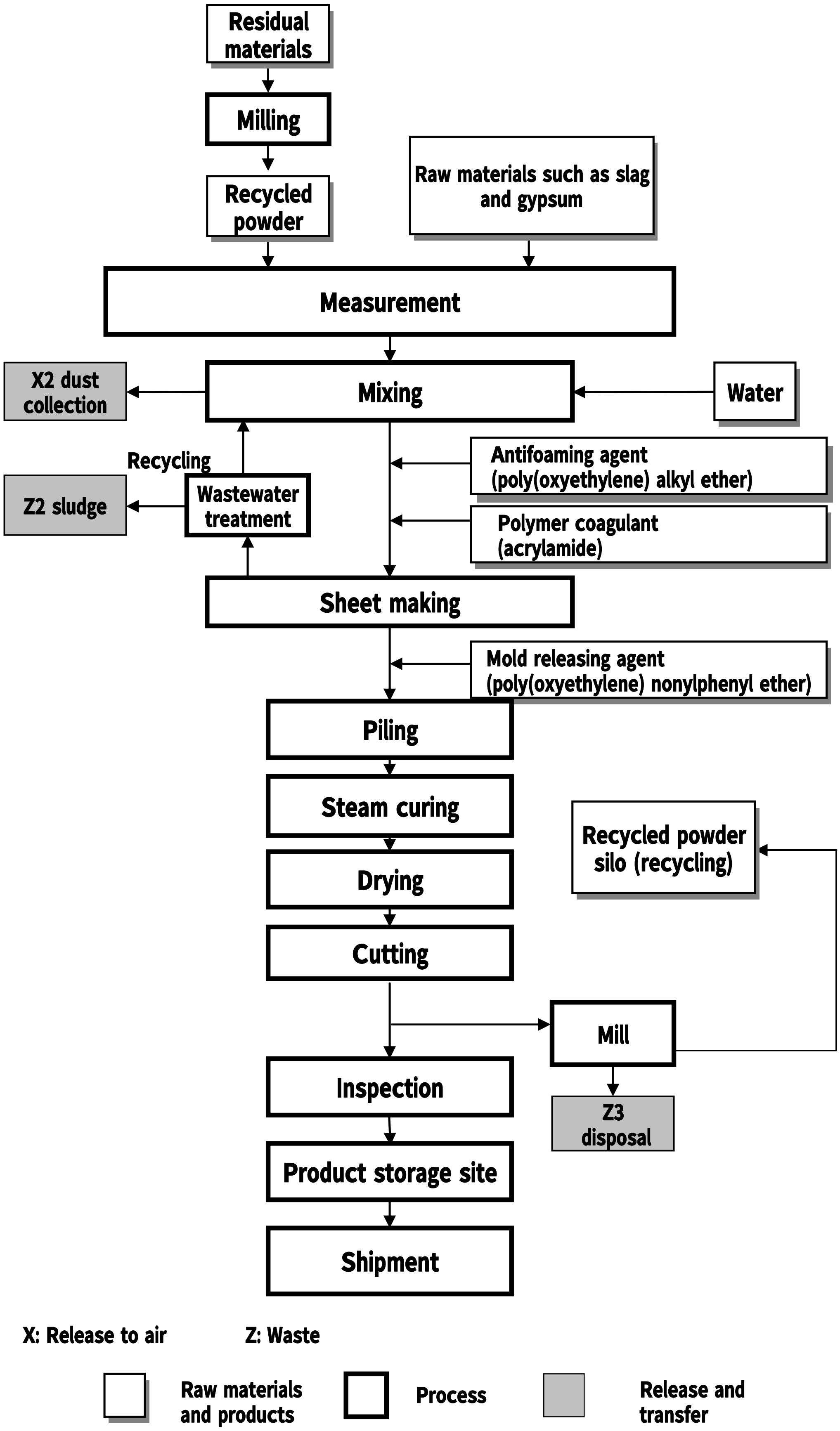

Figure-3: Pulp cement board

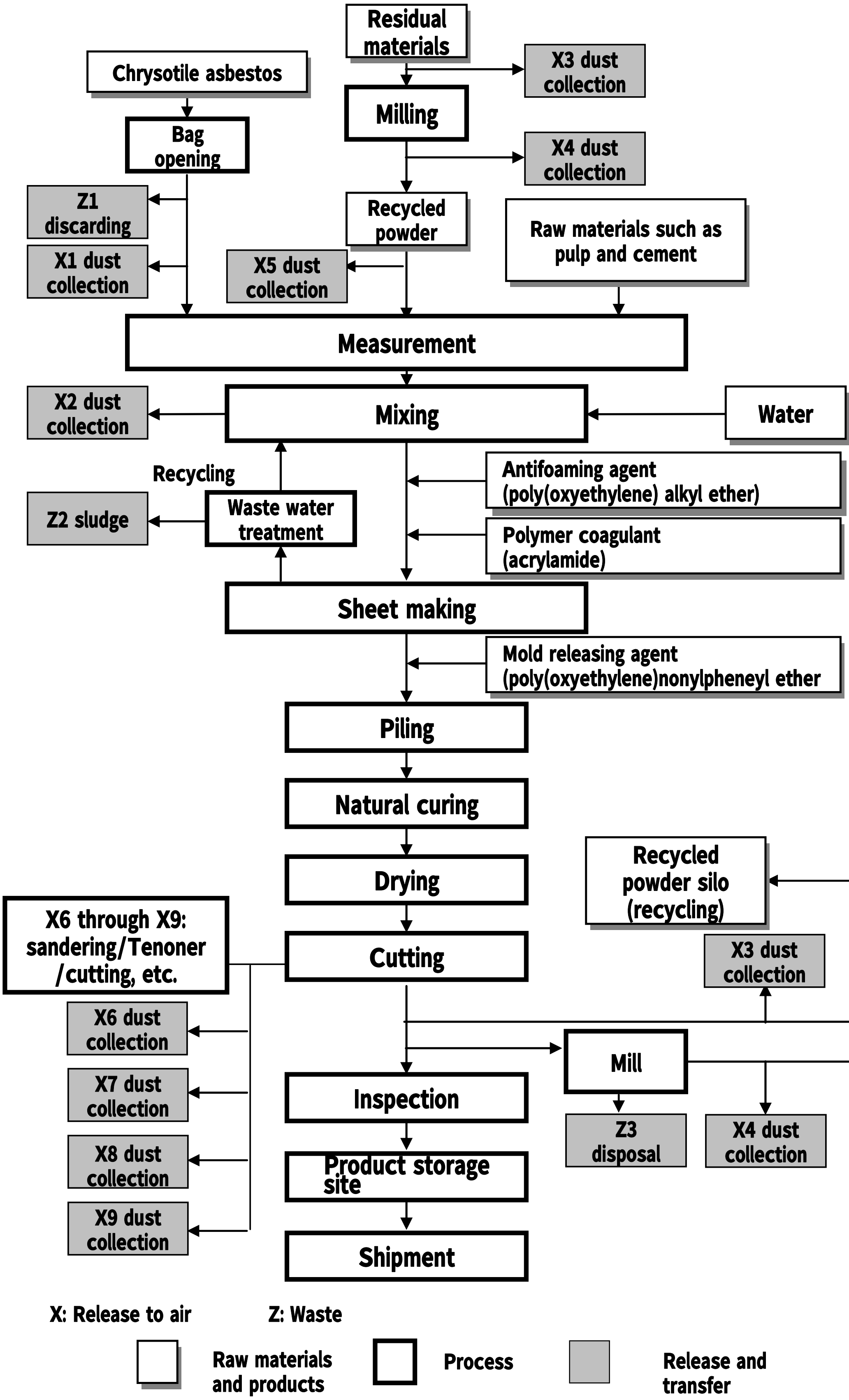

Figure-4: Surface coating (painting)

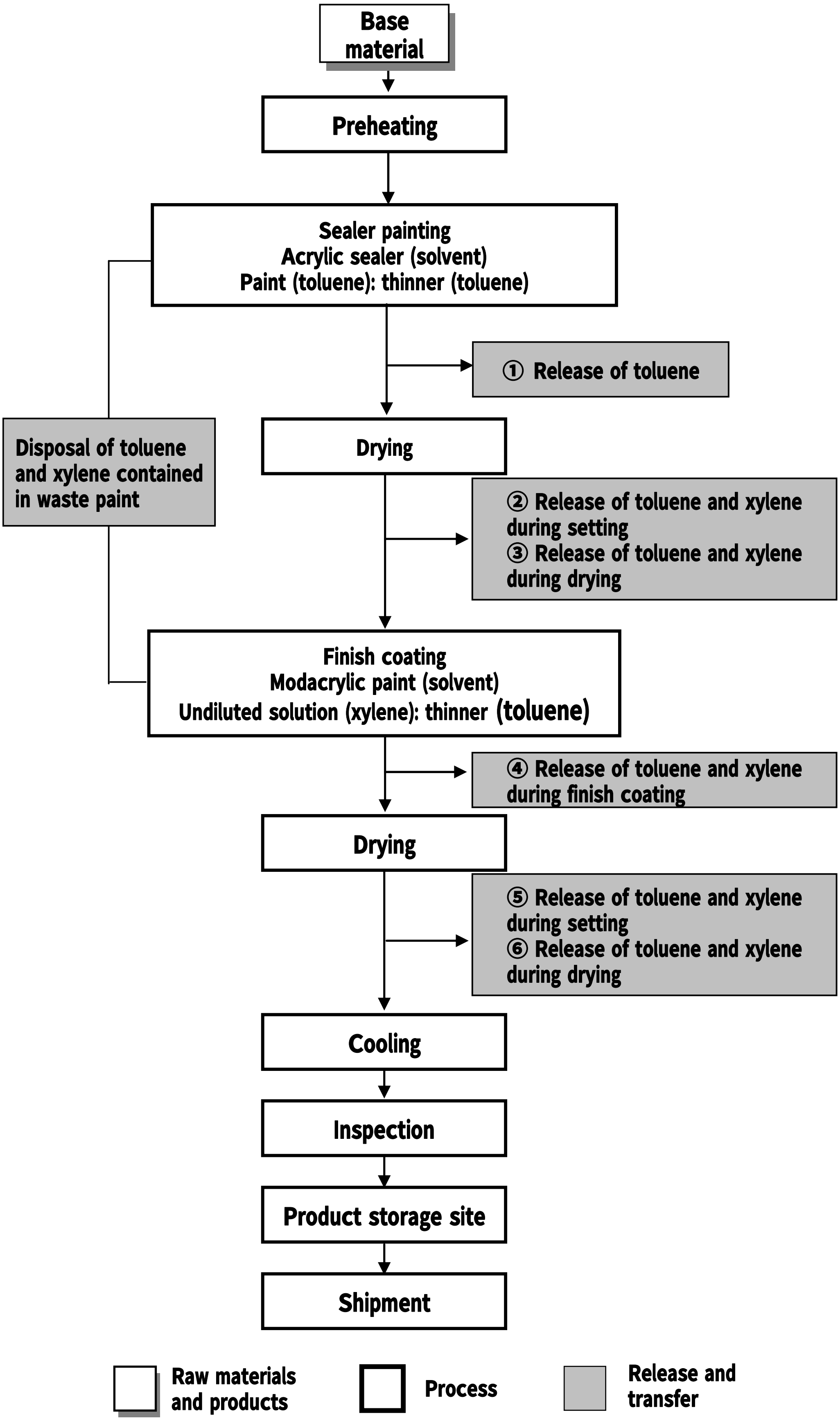

Figure-5: Surface coating (laminating)