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BSI Standards Publication

Document management — Environmental and work place safety regulations affecting microfilm processors

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National foreword

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TECHNICAL REPORT

ISO/TR 18159

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Document management — Environmental and work place safety regulations affecting microfilm processors

Gestion des documents — Réglementations relatives à la sécurité environnementale et du lieu de travail affectant les processeurs de microfilms

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Foreword

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ISO/TR 18159 was prepared by Technical Committee ISO/TC 171, *Document Management Applications*, Subcommittee SC 1, *Quality*.

Introduction

This Technical Report was developed to help microfilm processing laboratories understand characteristics of effluent resulting from film processing, regulations, comply with regulations, and report on regulation compliance. The intended audience of this technical report includes those people responsible for maintaining an organization's awareness of environmental regulations and those people responsible for implementing procedures for compliance (such as training and record keeping) and reporting their implementations.

TECHNICAL REPORT **ISO/TR 18159:2015(E)**

Document management — Environmental and work place safety regulations affecting microfilm processors

1 Scope

This Technical Report provides information about environmental laws and regulations that can affect microfilm processing laboratories. These laws and regulations control the following microfilm processing activities:

— storage and disposal of effluents;

— storage and disposal of hazardous waste, employee safety training;

— notification of the public regarding hazardous waste incidents.

NOTE This Technical Report includes in an Annex, for information purposes, a discussion of The United States Environmental Protection Agency (EPA) Guidance Manual on the Development and Implementation of Local Discharge Limitations Under Pretreatment Programme and that guidance manual's relationship with state and local requirements in the United States. Also included in this Technical Report are examples of typical discharge limitations.

2 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

2.1
bath
chemical solution in water used in wet processing

2.2
bleaching
converting the reduced silver of an image to soluble silver sulphate salts, in black-and-white reversal processing, that will be removed by clearing in colour processing (reversal or negative)

Note 1 to entry: This is the step that converts the reduced silver of an image to silver halide that will be removed by fixing and washing.

2.3
bleaching/fixing
combining, in a single bath, the bleaching and fixing steps

Note 1 to entry: This is a step in colour processing.

2.4
clearing
<bath> removing the soluble silver sulphate salts and the stains, in black-and-white reversal processing, resulting from bleaching action in colour processing (reversal or negative)

Note 1 to entry: This is the step that removes the stains resulting from bleaching action.

2.5
coupler
<coupling agent> chemical compound (e.g. phenols, naphthols, pyrazolones) that combines during colour development with the oxidation products of the developing agent to form a dye

2.6
coupler
<diazo film> compound that combines with the unexposed diazonium salts to form dyes

2.7
developing agent
active agent of the developer

2.8
development
processing step in which the latent image is made visible

2.9
developer
chemical solution used in the development process

2.10
diazo film
photographic film containing one or more photosensitive layers composed of diazonium salts in a polymeric material which react with coupler(s), contained either in photosensitive layer(s) or in the processing solution, to form an azo dye image after film processing

2.11
drying
removing unwanted moisture from photographic materials

Note 1 to entry: This is a step in processing.

2.12
effluent
fluid discharged from a given source into the external environment

[SOURCE: ISO 29464:2011, 3.2.32]

2.13
fixer
chemical used in fixing

2.14
fixing
converting the residual light sensitive silver halides into soluble salts removed by washing to make the developed image stable

Note 1 to entry: This is a step in processing.

2.15
International Standard Industrial Classification
ISIC
International Standard Industrial Classification of all economic activities

Note 1 to entry: ISIC is the international reference classification of productive activities. Its main purpose is to provide a set of activity categories that can be utilized for the collection and reporting of statistics according to such activities (United Nations Statistics Division).

2.16
leach field
leaching field
filter that consists of layers of coarse gravel, fine gravel, coarse sand, and fine sand arranged over one another so that a liquid flowing through one material does not carry it into the next to clog it

[SOURCE: ISO 6707-1:2014, 5.4.45, modified.]

2.17
micrographics
techniques associated with the production, handling, and use of microforms

2.18.1
microfilm processing
treatment of exposed photographic material by chemical or physical means to make the latent image clearly visible and ultimately usable

2.18.2
conventional processing
processing, including development, fixing, washing, and drying of silver film in which the polarity of the original is reversed in the image

2.18.3
reversal processing
processing of silver film in which the polarity of the original is maintained in the image

2.18.4
full reversal processing
reversal processing that requires secondary exposure and development, or a secondary development using fogging agents

2.18.5
colour processing
processing in which the oxidation products of the developing agent react with a coupler incorporated in the developer or film to produce a dye close to each silver grain

2.18.6
dry processing
processing in which chemicals incorporated in the film react to heat or gas or both

2.18.7
wet processing
processing using chemicals in liquid form

2.18.8
deep-tank processor
deep-tank microfilm photoprocessor
developing machine containing 30 litres to 60 litres of liquid in each bath, wherein the chemicals are automatically replenished, and with a built-in hot air dryer

2.19
replenishment
replacing exhausted chemistry, in photographic film and paper processing, in a continuous or per-batch fashion using fresh chemistry

Note 1 to entry: This is a process used in chemical processing.

2.20
sludge
accumulated settled solids separated from various types of water as a result of natural or artificial processes

[SOURCE: ISO 6707-1:2014, 10.27]

2.21
squeegee
device for scraping the excess water from the film, consisting e.g. of a holder and a blade

2.22
toxicity characteristic leaching procedure
TCLP
soil sample extraction method for chemical analysis employed as an analytical method to simulate leaching through a landfill

2.23
TSDF
Treatment, Storage, and Disposal Facility
facility that is permitted to treat, store, and/or dispose hazardous waste in special units

Note 1 to entry: These units are commonly called hazardous waste management units. A facility may be permitted to accept hazardous wastes for treatment, storage, and/or disposal from outside generators (a commercial TSDF) or be permitted to treat, store, or dispose of its own hazardous waste (a private TSDF).

2.24
UN number
UN ID four-digit number that identifies hazardous substances and articles (such as explosives, flammable liquids, toxic substances, etc.) in the framework of international transport

Note 1 to entry: Some hazardous substances have their own UN numbers (e.g. acrylamide has UN2074), while sometimes groups of chemicals or products with similar properties receive a common UN number (e.g. flammable liquids, not otherwise specified, have UN1993). A chemical in its solid state may receive a different UN number than the liquid phase if their hazardous properties differ significantly; substances with different levels of purity (or concentration in solution) may also receive different UN numbers.

Note 2 to entry: UN numbers range from UN0001 to about UN3506 and are assigned by the United Nations Committee of Experts on the Transport of Dangerous Goods. They are published as part of their Recommendations on the Transport of Dangerous Goods, also known as the Orange Book. These recommendations are adopted by the regulatory organization responsible for the different modes of transport.

Note 3 to entry: There is no UN number allocated to non-hazardous substances. These will simply not have a UN number.

2.25
washing
removing unwanted soluble chemicals from photographic materials using water

Note 1 to entry: This is a step in processing.

3 International standard industrial classification

Microfilm processing falls under International Standard Industrial Classification, Rev. Four (ISIC) M 7420 — Photographic activities. This ISIC number is often requested for permits and survey forms.

4 Effluent pretreatment requirements

Although microfilm processing laboratories may not be specifically regulated, guidelines exist for water discharge. The applicable regulation is for silver and affects those microfilm processing laboratories that directly discharge to a receiving body of water. One can determine the amount of silver discharged from a specific microfilm processing laboratory by collecting a representative sample of the photo processing waste water and having it analysed by a certified analytical laboratory. Because most microfilm processing laboratories do not discharge directly to surface water but discharge to a municipal treatment system instead, they are not directly affected by these limits.

Microfilm processing laboratories which discharge to receiving bodies of water may be required to have a permit. If the microfilm processing laboratory discharges directly to a surface stream, contact the local water pollution control agency.

5 Stream standards

Discharge permits are required by regulatory agencies. Water quality standards regulate direct discharges into receiving bodies of water. These standards are usually stricter than sewer codes because they reflect the quality of water after treatment. Nearly all standards include a clause that prohibits discharging any substance that will injure fish or other aquatic life.

6 Disposal of photo processing effluents using septic tanks and leach fields

Most locations specifically prohibit the use of septic tanks for anything other than domestic waste, and most manufacturers of photographic materials and chemistries do not recommend discharge to a septic system. Septic tanks are used for the disposal of domestic waste primarily in areas where municipal sewers are unavailable. Septic tanks operate with anaerobic biological action; that is, the wastes are broken down by living organisms in the absence of an adequate oxygen supply.

One of the concerns about using a septic tank/leach field system is that, photographic effluents can adversely affect the anaerobic digestion system unless the effluents are heavily diluted with domestic wastes. Another concern is that, the soil may not have adequate capacity to absorb the leach field runoff. With a septic tank/leach field system, care needs to be taken to prevent contamination of ground water.

Most governments have regulations governing industrial discharges (for example, photo processing effluent) to ground waters. In addition, many governments have regulations on the design, installation, and testing of septic tank systems.

Microfilm processing laboratories using septic tank/leach field systems or spray irrigation systems should be aware of permit requirements and potential limitations on discharges from such systems. Contact the appropriate environmental regulatory agency for additional information.

7 Trade effluents consents

A permit to discharge photo processing waste to a municipal sewer system can be required. Trade effluent consents to discharge can specify limits for concentrations of some parameters, such as the following:

— biochemical oxygen demand (BOD);

— chemical oxygen demand (COD);

— suspended solids;

— metals.

Because most microfilm processing laboratories are located in urban areas and discharge their effluent directly to public sewers, municipal sewer code regulations are of high concern. Pollutants most frequently regulated and their typical limits are shown in Table 1. The consent issued will set limits for pollutants likely to be in the discharge and the limits will be set to prevent adverse impacts on the sewers and treatment processes and the people operating them. The rate of discharge and maximum volume discharged per day is also likely to be specified in the consent.

Table 1 — Typical trade effluent limits

Parameter	Range of regulations
pH	6 to 10
Temperature (Maximum)	43 °C
Biochemical oxygen demand (BOD) (Maximum)	1 000
Chemical oxygen demand (COD)	2 000
Total suspended solids (TSS)	1 000
Total dissolved solids (TDS)	2 000
Phenols	10
Total cyanide	2
Oil and grease	200
Chromium	3
Iron	50
Silver	1
Zinc	3
NOTE All units except temperature and pH are specified in mg/L (ppm).	

8 Photographic processing effluent characteristics

8.1 General

Photographic processing effluents vary in composition among microfilm processing laboratories because of the different processes available and the laboratories' operating differences, such as

— daily operating time of each process,

— number of processes,

— chemical replenishment rates,

— amount of wash water used,

— volume of effluent,

— ratio of processing wastes to non-processing wastes, and

— recycling, reuse, and regeneration.

The general characteristics that are typical of conventional processing effluents are shown in Table 2. Table 3 to Table 4 show effluent characteristics for conventional process deep-tank microfilm photo processing, replenishment rates for conventional process deep-tank microfilm photo processing, effluent characteristics for full-reversal deep-tank microfilm photo processing, and replenishment rates for full-reversal deep-tank microfilm photo processing.

Table 2 — General characteristics of microfilm effluent

Characteristic	Typical concentrations
Temperature	27 °C to 43 °C
Biochemical oxygen demand (BOD_5)	200 to 3 000
Chemical oxygen demand (COD)	400 to 5 000
Suspended solids (Total)	<50
pH	6,5 to 9,0
Flammable; explosive	None
Detergents	Minimal
Oils and grease	0 to 50
Phenol	0 to 10
Odour	Scarcely detectable
Silver[a]	0,5 to 100
Cadmium	<0,02
Chromium[b]	<0,5 to 50
Copper	<0,5
Iron	<0,5
Lead	<0,05
Lithium	<0,5
Mercury	<0,002
Nickel	<0,5
Zinc	<0,5
Barium	<0,5
TKN - nitrogen	200 - 500
NH_3 - nitrogen	150 - 400
Total phosphorus	<0,5

NOTE All units expressed in mg/L unless otherwise noted.

[a] A notification requirement exists for discharge of hazardous waste down the sewer, e.g. greater than 5,0 parts per million (ppm) of silver. Silver content depends upon processing system and silver recovery technique.

[b] Depends upon process solutions used.

Table 3 — Conventional process deep-tank microfilm photo processing effluent characteristics

Parameter	Concentration
pH	7,6
Temperature	30 °C
Biochemical oxygen demand (BOD_5)	350

NOTE All units are in mg/L unless otherwise specified.

[a] ND = Not detected (detection limit).

[b] Before silver recovery.

[c] Estimated concentration mg/L after silver recovery.

Table 3 *(continued)*

Parameter	Concentration
Chemical oxygen demand (COD)	1 900
Total suspended solids	<2
Total dissolved solids (TDS)	1 660
Ammonia - nitrogen	380
Total Kjeldahl Nitrogen (TKN)	410
Sulphite	250
Thiosulphite	1 600
Sulfate	135
Phenol	None
Colour	25 Hazen units
Flammable; explosive	None
Detergents	Minimal
Odour	Scarcely detectable
Chloride demand	940 to 1100
Total phosphorous	<0,03
Total metals	
Aluminium	11
Boron	ND[a] < 0,1
Barium	ND[a] < 0,2
Cadmium	ND[a] < 0,4
Chromium	ND[a] < 0,5
Copper	ND[a] < 0,5
Iron	ND[a] < 0,5
Lead	ND[a] < 2
Lithium	ND[a] < 0,5
Manganese	0,18
Magnesium	9,4
Mercury	ND[a] < 0,2 ng/L
Nickel	< 1
Selenium	ND[a] < 50 ng/L
Silver	72[b] < 5[c]
Sodium	110
Tin	ND[a] < 4
Zinc	ND[a] < 0,5

NOTE All units are in mg/L unless otherwise specified.

[a] ND = Not detected (detection limit).

[b] Before silver recovery.

[c] Estimated concentration mg/L after silver recovery.

Table 4 — Conventional process deep-tank microfilm photo processing effluent characteristics — Replenishment rates

Product	Replenishment rate (metric equivalents)
Microfilm developer	187,3 mLs/m^2
Microfilm fixer	233,6 mLs/m^2
Wash rate	12,9 L/m^2
Machine speed	7,7 M/min

8.2 Temperature

The temperature of some of the most widely used photographic processes is in the 26,7 °C to 43,3 °C range. This temperature range from a microfilm processing laboratory is unlikely to present a problem to a municipal sewer system.

8.3 Oxygen demand

8.3.1 General

BOD_5 and COD are procedures used to determine the amount of oxygen that will be consumed by effluent.

8.3.2 BOD_5

The BOD_5 test measures the quantity of oxygen that the effluent, chemical, or solution will consume over a five-day period through biological degradation. It is important to know the oxygen demand of discharged waste because the waste can overload the aeration capacity of a municipal secondary waste water treatment plant if the waste demands too much oxygen. Discharging improperly treated wastes could deplete the amount of dissolved oxygen in a receiving body of water.

Normally, water contains 7 mg/L to 9 mg/L of dissolved oxygen at 21 °C. (This concentration decreases as the temperature increases.) Most fish and other aquatic life require 5 mg/L to 7 mg/L of dissolved oxygen for survival. Amounts of dissolved oxygen below these levels can affect aquatic life and can also result in the production of strong smelling gases. A BOD_5 of 400 mg/L or 400 parts per million (ppm) means that 1 l of the effluent would consume 400 mg of oxygen in five days in a natural body of water.

The BOD_5 analysis attempts to duplicate in the laboratory the environmental conditions in a receiving body of water and to measure the oxygen demand that the discharged material places on the body of water. The test is highly dependent on several variables, including the following:

— temperature;

— appropriate microorganisms being present;

— sample dilution;

— storage condition for the sample;

— toxicity;

— length of time between sampling and analysis.

Despite the dependency on these variables, a BOD_5 analysis can be included as a consent requirement. The oxygen demand of photographic effluent, as measured by a BOD_5 test, will also vary widely depending on the amount of wash water used, the composition of the processing solutions, and the varying combinations of processing and non-processing waste. The BOD_5 of effluent from various

photographic processing laboratories typically has been found to be in the range of 300 mg/L to 3 000 mg/L.

8.3.3 COD

In the Chemical Oxygen Demand (COD) test, the photographic effluent in question is subjected to a strong oxidizing chemical which oxidizes not only the biodegradable organic material but also non-biodegradable material.

The COD value will be larger or similar to the BOD_5; the ratio of the two values gives an indication of the biodegradability of the sample. The COD test does not suffer from the many variables of the BOD, so it is more reproducible, hence, it is generally used for trade effluent consents.

8.4 Suspended solids

Suspended solids are undissolved matter carried in effluent. These solids are removed during primary and secondary waste water treatment. Left untreated, they can build up sufficient sediment over a period of time to fill stream channels and reservoirs, erode power turbines and pumping equipment, plug water filters, and reduce available sunlight to aquatic plants. Photographic processing effluent is typically very low in suspended solids (less than 50 mg/L) and therefore should not present a problem to municipal treatment plants.

8.5 Chlorine demand

One operation a sewage treatment plant may perform is to chlorinate the effluent after the other treatment stages used in the plant. Chlorination can be used to destroy any pathogenic organisms and disinfect the effluent after treatment, thus, providing an additional measure of health protection.

Chlorine demand is the amount of chlorine needed to provide a certain residual chlorine content (usually 0,5 mg/L) after a specific time (often 15 min). The chlorine demand test is no longer widely used because water-quality experts have begun to recognize that excessive chlorination can produce chloramines and other harmful, persistent products from wastes that were originally less harmful by themselves.

8.6 pH

The pH level is an indication of how acidic or alkaline (basic) the solution is. It is a measurement of the hydrogen ion concentration and is expressed as the negative logarithm of the hydrogen ion concentration. The pH values run from 0 to 14,0, with the lower numbers indicating acidic materials, higher numbers indicating basic materials, and 7,0 representing neutrality. Almost every sewer code contains restrictions on the minimum and maximum pH of mixed effluent discharge. Most are in the range of 6 to 10. The pH of photographic effluent does not present a problem to waste treatment systems because it is generally in the range of 6 to 10.

8.7 Heavy metals

8.7.1 General

Materials classified as heavy metals are commonly regulated by local sewer authorities. These metals include cadmium, chromium, cobalt, copper, gold, iron, lead, manganese, mercury, molybdenum, nickel, silver, and zinc.

The concentration of heavy metals in the effluent is regulated because of the toxicity of these metals or their compounds. The toxicity can vary with the particular metal or compound and with the form in which the metal exists (for example, as a free ion, a complex, or a precipitate). Some photosensitive photographic products do contain small amounts of metals that may appear in the effluent. Heavy

metals frequently found in photographic processing effluent and commonly regulated include the following:

— silver;

— iron complexes, zinc.

8.7.2 Silver

Silver compounds are the light-sensitive material used in most of today's photographic films and papers. Neither elemental silver nor silver compounds are packaged components of processing solutions. Many silver compounds are toxic to some extent.

During processing, primarily in the fixing bath, silver is removed from the film or paper and is carried out in the solution or wash overflow, usually in the form of a silver thiosulphate complex.

Recovering the silver before discharge is recommended as a practice that is sound both environmentally and economically. Not only does silver recovery have environmental benefits and conserve a natural resource, but selling the recovered silver becomes a source of revenue to a microfilm processing laboratories.

Local sewer authorities regulate the compound because they cannot distinguish between toxic and non-toxic forms of silver. In some locations, the discharge standards for silver can be lower than conventional silver recovery equipment can achieve.

8.7.3 Chromium compound

Some process systems cleaners contain chromium compounds. However, many microfilm processing laboratories do not use any products that contain chromium. Hexavalent chromium (Cr^{+6}) as present in chromates, etc., can be harmful to treatment systems and requires tight control. Some municipal sewer codes have specific limits for Cr^{+6}, Cr^{+3} (trivalent chromium), and total chromium. Non-chromium systems cleaners are quite prevalent in today's market, thus, the use of chromium containing solutions is avoidable.

Cr^{+6} can be reduced to Cr^{+3}, which is less hazardous. When a dichromate bleach is mixed with other alkaline processing solutions and with solutions that contain reducing agents, such as thiosulphate, the $Cr^{\pm 6}$ is reduced to Cr^{+3} and precipitated as chromium hydroxide. Chromium hydroxide would be removed during primary or secondary clarification at the waste water treatment plant in sludge; since sludge is often intended to go to agriculture, sewage treatment plants limits the amount of chromium allowed in trade effluent. Remove chromium before discharge by collecting the chromium-bearing liquid in tanks and reducing the hexavalent chromium to the trivalent form by adding bisulphate. By adding an alkaline material to adjust the solution to pH 8, the chromium can be precipitated as chromium hydroxide. This chromium hydroxide sludge may have to be managed as a hazardous waste under local government regulations. Microfilm processing laboratories currently using a bleach containing chromium should check with their supplier for an alternative non-chromium process.

8.7.4 Iron complexes

Iron complexes are commonly used in colour photographic processing bleaches or bleach-fixers. Also, the use of cartridges (steel wool metallic replacement cartridges) for silver recovery results in photographic effluents containing iron. Iron is not a typical component of processing solutions for microfilm processing.

Iron concentration in effluent is commonly regulated because it affects the appearance and taste of water and it readily oxidizes to the reddish ferric (Fe^{+3}) form, which precipitates and causes rust stains. Iron can also clog the gills of fish. The iron in photographic effluent is not generally a problem because it is usually present only in the form of stable iron complexes.

8.7.5 Zinc

Zinc is present in the effluent of a few photographic colour processes. Zinc is seldom found in public water supplies at concentration over 1 mg/L. Because it tends to impart an astringent taste, its concentration is usually regulated by local sewer authorities. At certain concentrations, zinc can be highly toxic and harmful to treatment plants and receiving bodies of water as can other heavy metals (e.g. cadmium, chromium, cobalt, copper, gold, iron, and lead). The toxicity of these metals varies with the particular metal and form in which the metal exists.

8.7.6 Cadmium

Cadmium is toxic and therefore regulated at low levels in many sewer codes. Cadmium has been removed from most films and is present in only a few black-and-white films. Small amounts of cadmium can leach out during processing and can be detected in processing effluents. Contact the manufacturer if this occurs. Cadmium and mercury compounds are classified as Priority Hazardous Substances under European Union (EU) legislation.

8.7.7 Other heavy metals

Trace amounts of other heavy metals might be present in photographic effluents. Although very small amounts are sometimes used in photographic emulsions, the more likely source of these heavy metals can be the processing or mixing equipment, the plumbing, the impurities in processing chemicals, or even the incoming water supply (e.g. lead from soldered joints). Any present should be at very low levels.

Silver recovery canisters contains some form of iron, usually either as a steel wool or iron impregnated onto a supporting material. The source and purity of the iron dictates whether other metals such as lead, zinc, or chromium could be present; these can be replaced or discharged to the sewer.

8.8 Phenols

From a chemical perspective, the definition of a phenol is an aromatic hydroxyl compound. The most common ones, including the first in the series, which is called “phenol” or “carbolic acid,” generally exhibit strong biocide activity and, in fact, are used as disinfectants. The concern for them in an effluent and the reason for their regulation is that, as a biocide, they can damage the operation of a waste treatment plant.

From a regulatory perspective, the content of a material in an effluent is defined by the test for it, regardless of the chemical composition. Many developing agents, e.g. hydroquinone, contain the aromatic hydroxyl functionality, so chemically, they are defined as phenols. However, these are not detected by the test method for phenols so, from a regulatory point of view, they should not be considered as phenols. (The test is based on colour formation by producing a para-substituted derivative. Developing agents, however, are normally already substituted in the para-position and as such do not respond to the phenol test.) These developing agents normally do not exhibit strong biocide activity.

If the waste water sample shows high phenols, contact the supplier and ask the supplier to talk with the analytical laboratory about the procedure the microfilm processing laboratory is using as it might be using an incorrect analytical procedure.

8.9 Cyano complexes

Cyano complexes are not typically found in microfilm-processing chemicals. Bleaches containing hexacyanoferrates (complexes of iron and cyanide) are used in only a few photographic processes. These bleaches contain both ferrocyanide and ferricyanide, but the action of hypo and other chemicals in the effluent reduces most of the ferricyanide to ferrocyanide. A “total cyanide” analysis measures both of these ions. Unlike free cyanide, ferrocyanide and ferricyanide ions have a low level of toxicity and usually do not pose any problem for treatment plants. However, these ions can, under certain circumstances, break down to generate cyanide. Cyanide is a regulated compound because of the health and safety risks.

8.10 Thiocyanate

Thiocyanate is used in a few photographic processes, but it is typically not regulated. Thiocyanate should not be confused with cyanide, they are different chemical substances with different properties. Under normal use and disposal conditions, thiocyanate will not form cyanide; however, it can break down into cyanide in sunlight. Thiocyanate biologically degrades in a secondary waste water treatment plant. Note that thiocyanate does have a low level of human toxicity.

8.11 Hydroquinone

Hydroquinone is regulated by some sewer authorities. Hydroquinone is commonly used in photographic developers as a reducing agent for silver. Hydroquinone can be toxic to some organisms at relatively low concentrations. However, when hydroquinone is present in photographic processing solutions, it is in low concentrations and is readily biodegraded or oxidized to innocuous products by biological treatment. Hydroquinone can be detected as phenol if an analytical laboratory runs an incorrect test procedure. If this occurs, call the supplier and ask the supplier to talk with the analytical laboratory about the procedure the laboratory is using. (See 8.8).

8.12 Ammonium

Relatively high concentrations of ammonium ion can result from the use of ammonium fixers. Although some of the nitrogen-containing ions can be oxidized in a waste treatment plant, some of them can be carried through the plant and into the receiving body of water. If the waste has a pH greater than 8, some of the ammonium ion will be converted to free ammonia which is toxic to microorganisms used in sewage treatment and to aquatic fauna. Some watercourse standards and trade effluent consents have limits on ammonia content. Ammonium ions can be oxidized to nitrate and nitrite by nitrifying bacteria.

Do not add household bleach (hypochlorite bleach) to photo processing solutions containing ammonia (i.e. ammonium thiosulphate, ammonium thiocyanate, ammonium hydroxide, etc.) as this can liberate potentially fatal and/or irritating and toxic gases. A label to identify thiocyanate tanks can also be used on working solution processor tanks that contain an ammonium compound or for tanks that might contain significant carryover from such tanks.

8.13 Phosphates and nitrates

Metaphosphates are used as sequestering agents in some processing solutions to minimize sludging. A few processing solutions contain trisodium phosphate or other phosphates as buffers. Nitrates are present in only a few processing solutions and at levels that are not significant for treatment plants.

8.14 Detergents, oils, and tars

Although detergents can be commonly used for cleaning purposes in microfilm processing laboratories, they are rarely used in processing solutions. Oils and tars are commonly regulated by local sewer authorities but are not found in photographic processing solutions.

8.15 Colour and odour

Mixed processing wastes will generally have a very slight colour and a scarcely detectable odour and, therefore, are not affected by effluent discharge regulations.

8.16 Flammable and explosive materials

Conventional photographic processing solutions or effluent are not flammable or explosive.

8.17 Volatile organic compounds (VOC)

These types of compounds are of concern because they can be readily ignited and, if they discharge their vapours in sufficient concentrations in an enclosed area, they can present a hazard as irritants to the skin, eyes, lungs, and other mucous membranes. With the exception of small amounts of chemicals used in some film lubricants, soundtrack applicators, film cleaners, and lacquers, most solutions and chemicals used in photographic processing laboratories are not considered volatile. Information is available from manufacturers on the VOC content in micrographic chemicals.

Some solutions do contain chemicals, such as acetic acid, formaldehyde, or ammonia, that are slightly volatile. Formaldehyde emissions may be regulated by a local government formaldehyde standard. At a pH above 8,0, solutions containing ammonium compounds can give off ammonia. Where chemicals such as these are used, adequate ventilation is needed.

Local governments may have codes that restrict the amount of volatile organic emissions that can be discharged to the air. If the process exhausts fumes to the outside air, it may be a requirement to obtain an air pollutant source emission permit.

If the microfilm processing laboratory is using large amounts of lacquers, lubricants, or cleaners, check with the appropriate local government agency to determine what limitations are imposed and what safeguards are required.

9 Effluent sampling

9.1 General

Sampling and flow-measurement methods are designed to provide microfilm processing laboratories and treatment authorities with samples that accurately represent the composition of the effluent discharged from a particular laboratory. For sampling results to be meaningful, sampling needs to be conducted in accordance with prescribed standard protocols, and the samples need to be handled properly and analysed with standard methods.

Sampling programmes may be initiated by treatment authorities to

— determine if a laboratory's effluent is in compliance with local sewer codes,

— evaluate conditions for a discharge permit, and

— establish treatment charges (surcharges).

Any microfilm processing laboratory that initiates a sampling programme will derive benefits from information that will allow the laboratory to

a) monitor silver recovery,

b) detect wasteful and inefficient photographic operations such as chemical over replenishment,

c) determine when chemical recovery units are approaching their exhaustion points, and

d) determine how process changes affect material loss or material gain.

If the local sewer authority initiates a sampling programme, obtain a copy of the local sewer code and work with the authority to learn how the samples are taken and how their personnel arrive at any recommendations for treatment.

An important consideration in sampling for sewer code compliance is that the sample collected needs to be representative of the entire photographic process or total building effluent. The municipality will normally determine the sampling point. (It should be clearly defined in the sewer permit.) The representativeness of the sample and how it is analysed are very important because the data will be used to enforce the sewer code regulations and to determine treatment charges.

9.2 Sampling techniques

9.2.1 General

The local sewer authority may use many different techniques to obtain samples. Three types of samples are

— grab samples,

— composite samples, and

— continuous samples.

Regardless of what kind of sampling is used, sampling accuracy needs to be ensured so that the composition of the effluent stream is known and proper protocols are followed. Regulatory authorities have the right to define how sampling is to be done. However, whether samples are taken manually or mechanically, they will be most representative if the following is done:

a) Take samples where the stream is well mixed, and where no solids are settling.

b) If at all possible, take flow-proportional samples. Flow-proportional samples are those samples (taken over a time period) that take into consideration the volume of the discharge, that is, make the sample size smaller when the flow is low and larger when the flow is high. If flow-proportional samples are not possible, take time-proportional samples.

c) Take frequent small samples rather than a few large ones if the composition of the effluent changes often. If an average concentration is desired, these samples can be blended or composited.

d) Make sure that the effluent stream is uniform. Avoid floating solids and surface growth as well as bottom debris by taking samples from below the surface and in the middle third of the stream.

e) Label the jars containing samples with the

   1) date,

   2) time,

   3) place,

   4) contents,

   5) storage conditions,

   6) safety considerations, and

   7) kind of analysis needed.

Have them analysed as soon after they are taken as possible. If they cannot be analysed on the same day they are taken, refrigerate them at 4 °C.

9.2.2 Grab sampling

A grab or spot sample is one that comes from “grabbing” a small quantity of effluent with a dipper or a small container at a particular time. The sample will not be representative of average conditions unless the effluent does not change much over a period of time.

A grab sample can indicate what is in a batch dump, and a series of grab samples can indicate significant changes in an effluent over a period of time. A grab sample might also show extreme conditions that might not be detected by other methods.

A grab sample is usually the first type of sample taken and it can be used to determine whether automated equipment and more sophisticated procedures are needed or whether a basic sampling programme will satisfy local code enforcement authorities.

The size and frequency of grab samples will vary, depending on code enforcement needs. Let the sewer authority or analytical laboratory determine how large a sample to take and how often. Some government protocols state that a grab sample is not a representative sample unless the sample is taken from a batch discharge (tanks) or a minimum of four grab samples are composited.

9.2.3 Composite sampling

A composite sample consists of taking a number of small samples over a period of time and combining them into one sample. A composite sample is a good method for determining average conditions.

Most manual and automatic sample composites consist of sample collections taken one to four times per hour, depending on effluent changes. The composite samples are collected to be representative of the operation, e.g. 8 h operation or 24 h operation.

When discharge characteristics vary widely and it is important to come up with an average composite that is representative, use holding tanks to mix all solutions and increase the frequency of the sampling. Again, proportional sampling is important.

9.2.4 Continuous sampling

Continuous sampling means taking a sample continuously, always collecting a small part of the effluent, instead of dipping into it periodically. Continuous sampling is a sophisticated and expensive method, and something to be considered only when the local sewer authority indicates that real-time effluent analysis is needed.

10 Handling samples for analysis

Only clean sample containers should be used, and each container, before it is filled, ought to be rinsed several times with the waste water being sampled. The container and screw cap need to be constructed of materials that will not react with the waste water. Some materials (such as metals) can add substances to the sample, while others (some glass, plastics, quartz, etc.) absorb some of the constituents. In general, borosilicate glass and inert plastics, such as polyethylene, are satisfactory materials.

After a sample is collected, try to keep it as representative as possible until it is analysed. To do this, analyse the sample on the same day that it is taken, if possible. If samples cannot be analysed on the day they are taken, either refrigerate them at 4 °C, or freeze them to retard biological activity. Keep storage time to a minimum because important chemical changes can still occur during this time. Measure pH, temperature, and dissolved oxygen before storing the sample. Note that testing for different parameters may require separate samples to be preserved in different ways.

11 Pollution prevention

11.1 General

Chemicals in photographic processing effluents can be controlled in a number of ways. One is to minimize the amount of photographic chemicals discharged. Minimize discharge by using any conservation, recovery (or regeneration), and/or reuse methods that are practical.

Conservation, recovery, and reuse methods achieve the greatest initial impact for reducing photographic chemical discharge. In most cases, they use techniques that are

— readily available,

— simple to install,

— easy to use, and

— widely used in the industry.

Other important benefits of their use include chemical savings and the conservation of valuable resources.

11.2 Squeegees

11.2.1 General

Squeegees are a simple and effective way of reducing chemical loss by reducing the carry-out of processing solutions and wash waters. Properly installed squeegees can reduce solution or wash water carry-out by 75 % or more. Install squeegees following all washes and processing solutions on continuous processing machines. There can, however, be situations on continuous processors where squeegees are not recommended because the carry-out adds needed dilution to the next solution. Check the specifications for each specific process for recommended placement of squeegees.

11.2.2 Types of squeegees

Types of squeegees include the following:

— wiper blades;

— air squeegees;

— vacuum squeegees;

— wringer-sling squeegees ("The wringer-sling squeegee is operated by the movement of the film as it passes between two rollers. One flangeless roller wrings the liquid back down the film strand and displaces it to the large flanges of the other roller which then slings it away by centrifugal force. The liquid is collected by two cups and directed back into the tank. The efficiency of the wringer-sling squeegee improves as the speed of the film increases. The practical minimum speed for 16 mm film is about 18 m/min." *Processing KODAK Motion Picture Films, Module 2, Equipment and Procedures*, p. 2-5, http://motion.kodak.com/motion/uploadedFiles/US_plugins_acrobat_en_motion_support_processing_h242_h2402.pdf);

— rotary buffer squeegees.

Factors to consider when choosing a squeegee type include the following:

a) efficiency with which the squeegee removes liquid;

b) machine speed;

c) reliability, potential risk of physical damage to the photographic material (e.g. scratches);

d) maintenance.

These factors will vary with the design of the squeegee, the material used, and the quality and reliability of the manufactured assembly.

Squeegees need to be wiped or cleaned regularly to obtain full benefit of their use.

11.3 Replenishment rates

Replenishment rates are determined by factors including the following:

— type and amount of the photographic material being processed;

— exposure level of the material;

— processor speed;

— solution carry-in and carry-out;

— concentrations of the reaction and decomposition products;

— maintenance of process control.

Usually, the recommended rates are more than adequate to maintain solution level and results in some overflow that is either discharged to the drain or collected for treatment and possible reuse. Too high a rate wastes chemicals and money, can result in surcharges on effluent, and places an unnecessary burden on sewage treatment facilities.

It pays in both chemical cost savings and good conservation to monitor replenishment rates to be sure that the proper rate is being used. This means ensuring that the proper process specifications are being used and replenisher delivery systems are operating properly.

11.4 Good housekeeping

Common-sense safeguards, such as keeping the mixing area clean, avoiding mixing of dry chemicals where airborne particles can cause contamination of other solutions, and use of separate mixing tanks for developers will minimize contamination or errors in mixing. Unnecessary discharge of processing solutions is costly and results in an increased environmental impact. Information is available from manufacturers on low flow washes and counter current rinses, which can save microfilm users' money.

12 Dilution (equalization)

12.1 General

Most sewer codes regulate chemical discharges according to the concentration of the discharge. Although diluting photographic waste would reduce the concentration, local government guidelines and sewer codes may specifically prohibit dilution of the waste for the sole purpose of meeting the code limits. However, the concentration of a chemical in the effluent of one processor can be lowered when it is mixed with another processor's effluent, if the second machine contains a lower concentration of that same chemical. Therefore, the more diverse the processing, the greater the likelihood that the microfilm processing laboratory will meet any required sewer codes. The processing waste stream can be further equalized if total building effluent is to be considered, when it is combined with normal building waste water (cafeteria, rest rooms, showers, etc.).

If the code is written to restrict the total daily load of a particular chemical (usually expressed in kilograms per day), then concentration is not a factor and equalization has no effect on meeting those code limits.

12.2 Holding tank

A rapid discharge of large amounts of some photo processing chemicals or chemical concentrates can have a harmful effect on the bacteria in a treatment plant, particularly if the discharge represents a large proportion of the inflow to the plant. However, a steady normal flow of these effluents will not be harmful to the treatment plant. If it is necessary to discharge large amounts of chemicals, use a holding tank to minimize the effect of a large and sudden chemical release. When using a holding tank, the chemical batch can be equalized with other solutions being discharged and the waste can be trickled to the sewer in small amounts over a longer period of time.

13 Silver recovery

13.1 General

For many years, attention has been given to the recovery, purification, and reuse of silver in the photographic processing industry. While there have been many other examples of the reuse of materials within the processing industry (bleaches, fixers, bleach fixers, and colour developers), the material that has been recovered in most laboratories has been silver. Silver should be recovered from photographic processing solutions for three main reasons:

— to conserve a valuable resource;

— to attain regulatory compliance;

— to enhance economic return.

13.2 Regulatory compliance

Public awareness of the consequences of polluting our environment has given rise to environmental legislation and stricter enforcement of existing codes governing the use and discharge of many materials.

Heavy metals, including silver, are some of the materials that are controlled by government regulations.

For many years, free silver ion has been recognized as an excellent bactericide and, as such, could adversely affect a biological treatment system. Because of this effect on treatment systems, strict water quality criteria limitations on silver use and discharge have been enacted. However, in the vast majority of photographic processes, any silver present in the effluent will not be in the form of free silver ion, but rather as stable silver thiosulphate complexes, which have a very low order of toxicity for both biological treatment systems and aquatic organisms.

Several studies have reported the low toxicity of both silver thiosulphate complex and the insoluble silver sulphide. In a 1973 study sponsored by the American trade association National Association of Photographic Manufacturers, Hydro-science, Inc. found that silver thiosulphate did not adversely affect microorganisms in a Warburg respirometer. Some studies have shown that concentrations of silver as high as 10 mg/L in the form of a silver thiosulphate complex did not adversely affect a biological treatment system. The report pointed out that BOD removals in excess of 90 % were attained with an activated sludge unit containing silver levels as high as 250 mg/L.

These experiments indicate that the processing effluents containing silver thiosulphate complex are compatible with a secondary biological treatment plant and that the treatment plant will convert the silver thiosulphate complex to insoluble silver sulphide, which will be removed by the solids removal operation of a treatment plant. The concentration and form of the silver leaving the secondary treatment plant will not be harmful to fish in a receiving body of water.

Nevertheless, governmental codes governing the discharge of silver may be applied to the total amount of silver without regard to the form in which it is present. Some reduction in the amount of silver discharge in photographic effluent is often required to achieve compliance with many code limits. Achieving this reduction usually means using a silver recovery system to recover silver from the fixer and sometimes even from wash water.

Many municipal sewer codes contain limits on the amount of silver discharged. The majority of the silver concentration limits in these codes are somewhere in the range of 0,05 mg/L to 5,0 mg/L (parts per million). A copy of a municipality's sewer code is available from the local sewer authority. In most cases, use of a silver recovery system will make it possible to meet government discharge limitations for silver.

13.3 Silver recovery techniques

The most common silver recovery techniques include the following:

— electrolytic silver recovery;

— metallic replacement;

— ion-exchange;

— chemical precipitation.

14 Commercial disposal services

Waste disposal companies collect waste from a customer, recover and recycle whatever chemicals they can, and dispose of any unrecoverable waste in accordance with existing government regulations. For the small user who does not want to be bothered with the inconvenience and expense of treating small amounts of chemicals, a waste disposal service can be a good way to dispose of photographic waste effluent and of solutions that contain regulated components that may be difficult to treat. Use of a cool temperature or vacuum evaporator, or of a cold vaporization unit can reduce the waste volume by as much as 80 % to 95 %.

If a disposal service is used, machine plumbing can require modification so that microfilm-processing effluent (developers, fixers) to be collected for disposal is kept separate from wash water. Mixing used developer and fixer should be avoided as it can release significant amounts of ammonia gas. Check with the disposal service to determine the most desirable arrangement. A list of local disposal services can be found by consulting supplier or looking in the telephone directory under headings such as “waste reduction,” “disposal,” and “recycling services.”

Off-site disposal of photo processing effluents may require compliance with government requirements. Liability for the waste may remain with the generator, not the disposal service. Therefore, careful selection of the disposal company is very important. Contact the government environmental office for additional information about hazardous waste requirements.

15 Current issues in environmental and work place safety regulations affecting microfilm processing laboratories

Manufacturers, service bureaus, and others who process photographic film are normally required to meet regulations by national or local government authorities.

Because the microfilm processing industry will undoubtedly be impacted by new, more stringent regulations, many users are increasing their awareness of how regulations affect them and implementing plans for efficient ways to report on their compliance. The responsibility of the user varies with geographic location. Failure to comply with regulations can result in any of the following:

— fines;

— shut-downs;

— increased capital expenditures;

— higher disposal costs;

— negative publicity.

Microfilm processing facilities need to establish environmental programmes and prepare for compliance with applicable regulations. Environmental personnel from microfilm manufacturers and distributors can be called upon for advice, programmes, compliance, etc. Also available are industry documents that can be used as guidelines. Call the vendor for more information about microfilm manufacturer assistance.

The components of micrographic processing that are affected by environmental, health, or safety regulations include constituents of the following:

a) developers;

b) fixers;

c) replenishers;

d) clearing baths;

e) system cleaners;

f) film cleaners.

Most municipal treatment plants consider microfilm processing effluent to be biodegradable and process it accordingly, while others do not consider the biodegradability of effluent in the decision process and do not allow the release of photo processing chemistries into the treatment plants. The reasons for different positions on the topic include the following:

— the nature of the receiving stream to which the sewage treatment works (STW) discharges;

— the chemical content of the sludge which the STW needs to dispose;

— worker safety concerns;

— STW air quality requirements;

— national or local government regulations, such as water quality, and sediment and wetland endangerment criteria.

16 Hazardous waste resulting from photo processing

Microfilm processing solutions directly discharged to municipal sewers or to waste water treatment plans are subject only to sewer-use codes unless they are mentioned in the regulations. Effluent or wastes would be considered a hazardous waste if they either possess a characteristic of a hazardous waste or are on the hazardous waste list. If photo processing waste meets the definition of hazardous waste, usually it is because it possesses a characteristic of a hazardous waste. Examples of hazardous waste characteristics include having silver or chromium at or above 5mg/l or being corrosive, ignitable, or reactive.

Solutions that contain leachable silver or chromium with a concentration at or above 5 mg/1 should be hauled away for recovery or treated on-site. Examples of such solutions include photographic fixer or reversal bleach. These solutions are classified as waste materials that are “characteristic” hazardous waste when analysed according to the Toxic Characteristic Leachate Procedure (TCLP). Microfilm processing solutions discharged after recovery operations are regulated by the municipal sewer-use codes unless mentioned by superseding governmental regulations.

Microfilm developers generally are not classified as a hazardous waste unless the pH exceeds 12,5 pH units (which would classify them as corrosive) or the spent or waste developer becomes contaminated with a TCLP toxic metal such as silver at 5 mg/L or greater concentration.

Micrographic films destined for silver recovery are not hazardous wastes.

Recovered silver from silver recovery cartridges, electrolytic flakes, ion-exchange resins or silver sulphide can exceed the 5 mg/L silver level for TCLP toxicity test if not washed properly. Properly washed recovered silver flake typically would not be classified as hazardous waste under regulations. Some regulations, however, can be more stringent.

17 Container storage requirements and labelling

A hazardous waste generator may not treat, store, dispose of, or offer for transportation any hazardous waste without an identification number. Transporters and TSDFs (Treatment, Storage, and Disposal Facilities) also need environmental protection agency numbers. A generator needs to not offer any hazardous waste to any transporter or TSDF without an identification number.

Generators who store hazardous waste in containers or tanks for 90 d or less can qualify for exemption from the TSDF permit if the following conditions are met:

a) Containers and tanks at a generator's site need to be clearly labelled or marked with the words "Hazardous Waste."

b) The date when on-site storage or accumulation began needs to be clearly marked on each container.

c) Generators need to also comply with all standards governing the use and management of containers as outlined below:

    1) All containers need to be in good condition with no leaks. If a container begins to leak, the owner/operator needs to transfer the hazardous waste to a container in good condition.

    2) Containers need to be made of, or lined with, material that will not react with the material stored.

    3) During storage, a container needs to remain closed except when adding or removing waste.

    4) Containers with hazardous waste need to be handled in a manner which will not cause rupture or leakage.

    5) Owners/operators need to conduct weekly inspections of all hazardous waste containers for leaks and deterioration.

    6) Containers of ignitable or reactive wastes need to be stored at least 15 m from the facility's property line (other special requirements need to be taken when storing containers of incompatible wastes).

All drums should be labelled as soon as any accumulation of waste takes place. The label should include the following:

— proper shipping name of the waste (including the hazard class and the UN number);

— facility generator identification number (when one exists);

— date of accumulation;

— generator's name and address;

— hazardous waste number.

An example of a hazardous waste label and instructions on how to complete a label are available from manufacturers.

18 Emergency contingency plans and procedures

Each facility needs to have a Contingency Plan designed to prepare for and minimize any accidents that could occur. The plan contains the following information:

a) a detail of actions that facility personnel need to take in case of a sudden or anticipated release, fire, explosion, or other emergency;

b) a list of the location and description of emergency equipment;

c) an outline of evacuation procedures;

d) a detailed map of the facility (optional).

Copies of the Contingency Plan need to be submitted to the following agencies:

— local police;

— sewer authority;

— fire department;

— hospital;

— emergency response team.

A designated on-site or on-call Emergency Coordinator needs to be appointed to ensure that emergency procedures will be followed in case of any emergency situation. The Emergency Coordinator needs to be on-site or on-call 24 h a day.

Details required for emergency contingency plans can vary.

19 Land disposal criteria

Generators need to determine if their waste is restricted from land disposal by the generators' knowledge of the waste or by test analysis of the waste. These test results need to be documented and kept on file for at least five years.

Microfilm processing wastes that contain silver above 5mg/L, contain chromium above 5mg/L (D007), or are corrosive (D002) are subject to land disposal restrictions as a non-waste water restricted waste requiring treatment.

Generators who ship land disposal restricted hazardous waste off-site for treatment, storage, and disposal are required to submit written notification to the TSDF (Treatment, Storage, and Disposal Facilities) of the land disposal restrictions on the waste and any appropriate treatment standards. The notification should accompany every shipment of restricted waste and should include the following information:

— Hazardous Waste Number;

— appropriate treatment standards/specified technologies;

— manifest number associated with the waste shipment;

— waste analysis data, if available.

Some TSDFs provide their own land disposal notification forms. These notification forms need to be kept on file for at least five years from the date the hazardous waste was last sent to treatment, storage, and disposal.

20 Storm water regulations

Currently, microfilm processing laboratories are not included in storm water regulations unless chemicals are stored outside the building and are exposed to rain or snow.

21 Air pollution considerations

Standards were established for the following:

— sulfur dioxide;

— particulate matter;

— carbon monoxide;

— nitrogen oxides;

— ozone;

— lead.

Air pollution control is primarily the responsibility of local governments. Governments are required to develop plans known as implementation plans to achieve and maintain Ambient Air Quality Standards. Included in these plans are provisions for governments to require pre-construction reviews. The government has the authority to review details on a source of air pollution and its potential impact before the source owner actually constructs or installs the source. This review may require a lead time of several months before construction can begin.

Some photographic processing solutions liberate vapours or gases such as the following:

a) acetic acid;

b) benzyl alcohol;

c) ammonia;

d) sulfur dioxide;

e) aldehydes.

These gases and vapours can be irritating to the eyes and respiratory tract. For comfort and health considerations, the concentration of these gases and vapours should be controlled by tank covers, machine enclosures, and proper exhaust.

22 General guidelines for ventilating photographic processing areas

22.1 General

Some photographic processing solutions release vapours such as acetic acid and benzyl alcohol or gases such as ammonia, formaldehyde, and sulfur dioxide. These chemicals can be irritating to the eyes and respiratory tract and have unpleasant odours. High temperature processing increases the release of these chemicals. For comfort and good health practices, minimize the airborne concentrations of these chemicals by controlling ventilation and by using tank covers or enclosures.

22.2 Ventilation guidelines

Respirator Selection Criteria provides basic information to assist in selecting the proper type of respirator. Inhalation is one of the primary routes of entry into the body for chemicals, or “airborne contaminants,” such as dust, mists, fumes, and/or gas/vapour. The preferred method to keep airborne contaminants within acceptable levels is to use proper ventilation. This is done by using a good general ventilation system and, where necessary, by using additional engineering controls (such as direct exhaust).

Based on industrial hygiene studies, vapours and gases in most processing areas can be kept at acceptable levels through good general room ventilation. In some cases, exhaust ventilation from enclosed tanks is recommended. The following list provides general ventilation guidelines:

a) Automated equipment for processing

   1) Supply tempered fresh air to the darkroom from above the feed (head) end of the machine at a minimum rate of 4 m^3/min per machine. Position the supply air inlet so that it will not

affect the capture of vapours or gases by the exhaust opening. If a machine extends through a barrier into another room, ventilate both rooms. (4 m^3/min to 5 m^3/min is equivalent to 10 room volumes per hour in a room 3 m × 3 m × 3 m).

2) Exhaust the room air from the tank area to the outdoors at a minimum rate of 5 m^3/min per machine. An exhaust rate higher than the supply rate produces a negative pressure and reduces the chance of vapours or gases escaping to adjoining rooms. Do not recirculate this air without consulting an industrial hygienist.

3) If the tanks are enclosed and have an exhaust, the minimum room air-supply rate can be reduced to 3 m^3/min and the air removal rate to 3 m^3/min per machine.

4) Follow the manufacturer's equipment specifications for venting the dryer. Adjust the room temperature to 18 °C to 24 °C, and the humidity to 45 % to 65 % relative humidity. In some cases, this may require more air flow than the minimum specified for controlling vapours and gases. Some automated processors are equipped with exhaust fans that can be connected to an exhaust duct.

5) Control the concentrations of vapours and gases by reducing their generation rate with tank covers. In addition to covering the solution tanks, keep solution temperatures, machine speeds, and agitation at minimum suitable levels.

b) Chemical mixing areas — Provide good general room ventilation in all mixing and storage areas. Also, use split-tank covers with local exhaust attached to the stationary portion on mix tanks to supplement general room ventilation. Local exhaust should provide a capture velocity of 30 m^3/min at weighing and dispensing locations. Minimize evaporation by covering the storage tanks. Floating covers are also effective.

c) Community air pollution considerations — Air emissions from processing may be subject to national or local government air regulations.

d) Photographic laboratory design — When planning or designing a photographic laboratory, consult a ventilation and air conditioning engineer or an industrial hygienist as early as possible.

If a respirator is worn by an employee, the employer may be required to have a "Respiratory Protection Programme," including the following:

— Written Standard Operating Procedures (SOP);

— Medical Evaluation and Surveillance;

— Hazard Evaluation and Respirator Selection;

— Respirator Fitting and Training.

Other necessary items include the following:

— supervision of respirator use;

— respirator inspection and maintenance;

— use of approved respirators;

— periodic air sampling if air-purifying respirators are used.

Use of respirators is a serious matter because improper use is not only illegal but can contribute to serious health hazards to the wearer. Respiratory standards are designed to make certain that individuals designated as respiratory wearers meet the following requirements:

— are medically capable of wearing a respirator (medical evaluation requirement);

— choose a respirator that will help rather than harm (hazard evaluation, respirator selection, and training);

— know how to use, inspect, and maintain the respirator (SOP, maintenance, and training requirements).

23 Regulation of photographic processing air emissions

In some countries or local jurisdictions, microfilm processing laboratories may be exempt from air emission permitting requirements. However, the government agency responsible for air pollution regulations should be contacted to determine if permitting is required.

Annex A
(informative)

Assistance from manufacturers

This annex gives information about assistance from manufacturers[1)].

Eastman Park Micrographics offers technical support to customers of Imagelink microfilm and chemistry. Technical information on use of products, processing recommendations, and effluent guidelines can be found under support at the company website (www.epminc.com).

It also provides MSDS on the various photo processing chemistries that are aqueous mixtures, including the following:

— microfilm conventional developer;

— microfilm fixer and replenisher;

— microfilm conventional developer and developer replenisher.

Fuji Photo Film, Inc. distributes numerous user pamphlets on the topic of waste disposal, including the following:

— Criteria for Fuji Graphics Repress Waste Disposal (Fuji Environmental Data Sheet: 8/91);

— Fuji Environmental Data Sheet: (1/92);

— Fuji Environmental Data Sheet: (2/93);

— Indoor Air Study and Ventilation Guidelines: (2/91);

— Respirator Selection Criteria: (6/92);

— Chemical Waste Management: A Silver Recovery/Waste Disposal Guide for the Photo Imaging Industry (1993).

For further information on these Fuji Environmental Data Sheets, contact the local branch or distributor of Fuji Photo Film, Inc., (Global URL: http://self-fulfilment/).

Fuji also has a video loan library, designed to encourage customers to develop training programmes and to assist Fuji customers in improving their knowledge and understanding of environmental and safety concerns, including chemical handling and government regulations. The library offers videos on such topics as the following:

— following decontamination procedures;

— handling hazardous waste;

— handling hazardous chemicals.

The library offers these videos, and others, for a 20-day loan period. For further information, please contact the local branch or distributor of Fuji Photo Film, Inc., (Global URL: http://self-fulfilment/).

Other companies, including Bureau Veritas (http://www.bureauveritas.com), also offer compliance information.

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1) This information is given for the convenience of users of this document and does not constitute an endorsement by ISO of these manufacturers' products.

Annex B
(informative)

Sample written Hazard Communication Programme in the United States of America(Provided by U.S. Department of Labour/OSHA)

1. Company Policy

To ensure that information about the danger of all hazardous chemicals used by are known by all affected employees, the following hazardous information programme has been established.

All work units of the company will participate in the hazard communication programme. This written programme will be available in the _____ for review by any interested employee.

2. Container labelling

The _____ will verify that all containers received for use will be clearly labelled as to the contents, the appropriate hazard warning, and list the name and address of the manufacturer.

The _____ in each section will ensure that all secondary containers are labelled with either an extra copy of the original manufacturer's label or with labels that have the identity and the appropriate hazard warning. For help with labelling, see _____.

NOTE If written alternatives to in-plant container labelling are used, add a description to the system used.

The _____ will review the company labelling procedures every _____ and update as required.

3. Material Safety Data Sheets (MSDS)

The _____ is responsible for establishing and monitoring the company MSDS programme. He/she will make sure procedures are developed to obtain the MSDS and will review incoming MSDS for new or significant health safety information. He/she will see that any new information is passed on to affected employees.

Copies of MSDS for all hazardous chemicals in use will be kept in _____.

MSDS will be available to all employees during each work shift. If any MSDS is not available, immediately contact _____.

NOTE If an alternative to material safety data sheets is used, provide a description of the format.

4. Employee Training and Information

The _____ is responsible for the company employee training programme. He/she will ensure that all programme elements specified below are carried out.

Prior to starting work, each new employee of will attend a health and safety orientation that includes the following information and training:

— An overview of the requirements contained in the hazard communication standard.

— Hazardous chemicals present at his/her workplaces.

— Physical and health risks of the hazardous chemicals.

— The symptoms of overexposure.

— How to determine the presence or release of hazardous chemicals in his/her work area.

— How to reduce or prevent exposure to hazardous chemicals through use of control procedures, work practices, and personal protective equipment.

— Steps the company has taken to reduce or prevent exposure to hazardous chemicals.

— Procedures to follow if employees are over exposed to hazardous chemicals.

— How to read labels and review MSDS to obtain hazard information.

— Location of the MSDS file and written hazard communication programme.

Prior to introducing a new chemical hazard into any section of this company, each employee in that section will be given information and training as outlined above for the new chemical hazard.

5. Hazardous Non-routine Tasks

Periodically employees are required to perform hazardous non routine tasks. Some examples of non-routine tasks are: confined space entry, tank cleaning, and painting reactor vessels. Prior to starting work on such projects, each affected employee will be given information by the _____ about the hazardous chemicals he or she may encounter during such activity. This information will include specific chemical hazards, protective and safety measures the employee can use, and steps the company is using to reduce the hazards, including ventilation, respirators, presence of another employee, and emergency procedures.

6. Informing Contractors

It is the responsibility of _____ to provide contractors with information about hazardous chemicals their employees may be exposed to on a job site and suggest precautions for the contractor's employees.

The following option is recommended for programme: Contractors will be contacted before work is started to gather and distribute information concerning any chemical hazard that they may bring to our workplace.

7. List of Hazardous Chemicals

The following is a list of all known hazardous chemicals used by our employees. Further information on each chemical may be obtained by reviewing MSDS located at _____.

8. MSDS Identity

(Insert a chemical list developed during the inventory. Arrange this list so that are able to cross-reference it with MSDS file and the labels on containers.)

Annex C
(informative)

References, statutes, and regulations applicable to the United States of America

C.1 References

AIIM/TR 18-1989, Technical Report for Information and Image Management — Equipment Safety.

California Permit by Rule for Photoprocessors, An Interpretation by the Photo Marketing Association, International, 1992.

Federal Register, Vol. 57, No. 95, Friday, May 15, 1991.

Federal Register, Thursday, April 2, 1992.

Notice of Special Fee, Industrial Discharge Control Programme, State of Maryland, Montgomery County, 1992.

OSHA Compliance for Photo Imaging Operation, Fuji Environmental Data Sheet: ENV: (2/93).

OSHA 3112, Air Contaminants—Permissible Exposure Limits.

Plumbing and Gasfitting Regulations of the Washington Suburban Sanitary District, Chapter 9, Industrial Waste Regulations, Effective November 14, 1988.

Resource Conservation and Recovery Act, Subtitle C, Hazardous Waste Management, Photo Marketing Association International, January 1993.

Resource Conservation and Recovery Act (RCRA) Overview, Fuji Environmental Data Sheet: ENV: (B-2 1/92).

Training, Subpart H 172.700 of 49 CFR Parts 100-177.

U.S. EPA General Pretreatment Standards (for wastewater) Part 403—General Pretreatment Standards for Existing and New Sources of Pollution of the Code of Federal Regulations (40 CFR Part 403) (1990).

U.S. EPA Pretreatment Standards (for wastewater) Part 459 of 40 CFR Ch. One Photography Point Source Category (7-1-89 Edition).

U.S. EPA Guidance Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Programme, 1987.

U.S. EPA Notification of Regulated Water Activity, 1990.

U.S. EPA Guides to Pollution Prevention: Municipal Pretreatment Programmes, EPA/625/R-93/006, October 1993.

U.S. EPA Supplemental Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Programme, 1991.

AIIM TR4-1989, Technical Report for Information and Image Management—Silver Recovery Techniques.

C.2 Statutes and regulations

C.2.1 United States Environmental Protection Agency (EPA) guidance on local discharge limitations

The U.S. EPA's Guidance Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Programme, published in 1987, is still in effect. This manual provides guidance to municipalities about the development and implementation of local limitations to control conventional, unconventional, and toxic pollutant discharges from non-domestic industrial users to publicly-owned treatment works. It is principally directed toward publicly-owned treatment works personnel who are responsible for local pretreatment programme implementation. In addition, it is intended to assist the treatment facilities that are not required to develop local programmes, but needs to develop local limits to prevent recurrence of problems and to ensure compliance with federal, state, and local requirements.

The EPA Supplemental Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Programme, published in 1991, is intended to supplement the 1987 EPA local limits specified in the 1987 EPA Guidance Manual on the Development and Implementation of Local Discharge Limitations Under the Pretreatment Programme. The 1991 supplement assumes that the reader has a thorough understanding of local limits development. It builds on information contained in the 1987 local limits guidance. A two-part document, this manual provides information on toxic pollutant loadings from residential and commercial sources (Part 1) and calculation of removal efficiencies achieved by municipal waste water treatment plants (Part 2).

C.3 Resource conservation and recovery act (RCRA)

C.3.1 General

RCRA is a comprehensive programme for federal and state regulations of hazardous waste management, including the following:

a) generation;

b) storage;

c) transportation;

d) treatment;

e) disposal.

Known as a "cradle-to-grave" programme, RCRA's objective is to regulate potentially hazardous waste from its initial generation to its ultimate disposal. Waste is classified in 40 CFR Part 261 as hazardous if it is on the list of hazardous wastes or if it possesses any of the following characteristics:

— ignitability;

— corrosivity;

— reactivity;

— toxicity.

Solutions (such as photographic fixers or bleaches) that contain silver or chromium in concentrations greater than or equal to 5 mg/I are classified as hazardous waste. Recovered silver flake and sludge is also a hazardous waste in some states.

The recovery (or recycling) of silver from photographic processing effluent and the management of film processing waste, in general, are regulated under RCRA. In addition, permissible silver concentration limits in effluent will vary from location to location. Environmental conscience and the market value of

recovered silver both add to the desirability of implementing silver recovery approaches. (See Clause 13 for more information about silver recovery.)

When photographic processing laboratory effluent exceeds silver or chromium concentration limits and is not processed correctly, the facility may be fined, or in some cases, shut-down. At the very least, if the effluent silver or chromium concentrations exceed specified 5 mg/L limits , laboratories are required to notify environmental authorities. Exceeding limits can lead to citations, time-consuming investigations, and capital expenditures. If a photographic processing laboratory's silver or chromium discharge exceeds 5 ppm, then a one-time notification needs to go to the federal, state, and local authority to communicate the discharge of hazardous waste to the sewer. Photographic processors need to meet the 5 ppm discharge notification requirement even if the local sewer does not restrict silver and/or chromium.

The U.S. EPA has published a Notification of Regulated Waste Activity designed to help users determine if they are subject to regulations under the RCRA.

C.3.2 Hazardous waste resulting from photo processing (as defined by RCRA)

Photo processing solutions directly discharged to municipal sewers or to waste water treatment plants are subject only to municipal sewer-use codes unless they are mentioned in state regulations. Effluent or wastes would be considered a hazardous waste under EPA RCRA if they either possess a characteristic of a hazardous waste or are on the hazardous waste list. If photo processing waste meets the definition of hazardous waste, usually it is because it possesses a characteristic of a hazardous waste. Examples of hazardous waste characteristics include having silver or chromium at or above 5 mg/1 or being corrosive, ignitable, or reactive.

Solutions that contain leachable silver or chromium with a concentration at or above 5 mg/1 should be hauled away for recovery or treated on-site. Examples of such solutions include photographic fixer or reversal bleach. These solutions are classified as waste materials that are "characteristic" hazardous waste when analysed according to the Toxic Characteristics Leachate Procedure (TCLP). Photo processing solutions discharged after recovery operations are regulated by the municipal sewer-use codes unless mentioned by state regulations.

Photographic developers generally are not classified as a hazardous waste unless the pH exceeds 12,5 pH units (which would classify them as corrosive) or the spent or waste developer becomes contaminated with a TCLP toxic metal such as silver at 5 mg/L or greater concentration.

Under federal regulations, photographic films or papers destined for silver recovery under federal regulations are not hazardous wastes.

Recovered silver from silver recovery cartridges, electrolytic flakes, ion-exchange resins or silver sulphide can exceed the 5 mg/L silver level for TCLP toxicity test if not washed properly. (See AIIM TR4, *Silver Recovery Techniques*, for handling instructions.) Properly washed recovered silver flake typically would not be classified as hazardous waste under federal regulations. State RCRA regulations, however, can be more stringent.

C.3.3 Container storage requirements and labelling

Under RCRA, a hazardous waste generator may not treat, store, dispose of, or offer for transportation any hazardous waste without an EPA Identification Number. The U.S. EPA ID Number is a 12-character identification number used by EPA and states. The U.S. EPA ID number is included in the state and federal database on hazardous waste activities. Transporters and TSDFs (Treatment, Storage, and Disposal Facilities) also need EPA ID Numbers. A generator needs to not offer any hazardous waste to any transporter or TSDF without an EPA ID Number.

Generators who store hazardous waste in containers or tanks for 90 d or less can qualify for exemption from the TSDF permit if the following conditions are met:

a) Containers and tanks at a generator's site need to be clearly labelled or marked with the words "Hazardous Waste."

b) The date when on-site storage or accumulation began needs to be clearly marked on each container.

c) Generators need to also comply with all standards governing the use and management of containers as outlined below (40 CFR 265, Subpart I, Standards for containers):

   1) All containers need to be in good condition with no leaks. If a container begins to leak, the owner/operator needs to transfer the hazardous waste to a container in good condition.

   2) Containers need to be made of, or lined with, material that will not react with the material stored.

   3) During storage, a container needs to remain closed except when adding or removing waste.

   4) Containers with hazardous waste need to be handled in a manner which will not cause rupture or leakage.

   5) Owners/operators need to conduct weekly inspections of all hazardous waste containers for leaks and deterioration.

   6) Containers of ignitable or reactive wastes need to be stored at least 15 m from the facility's property line (other special requirements need to be taken when storing containers of incompatible wastes).

If generators store hazardous waste in tanks, then, they need to be in compliance with all standards governing the use and management of tanks as in 40 CFR 265 Subpart J, Standards for Tanks.

All drums should be labelled as soon as any accumulation of waste takes place. The label should include the following:

— proper DOT shipping name of the waste (including the hazard class and the UN/NA number);

— facility EPA generator number;

— date of accumulation;

— generator's name and address;

— EPA hazardous waste number.

An example of a hazardous waste label and instructions on how to complete a label are available from manufacturers.

C.3.4 Emergency contingency plans and procedures

As outlined in 40 CFR 265 Subpart D, each facility needs to have a Contingency Plan designed to prepare for and minimize any accidents that could occur. The plan contains the following information:

a) detail of actions that facility personnel need to take in case of a sudden or anticipated release, fire, explosion, or other emergency;

b) list of the location and description of emergency equipment;

c) outline of evacuation procedures;

d) detailed map of the facility (optional).

Copies of the Contingency Plan need to be submitted to the following agencies:

— local police;

— sewer authority;

— fire department;

— hospital;

— emergency response team.

A designated on-site or on-call Emergency Coordinator needs to be appointed to ensure that emergency procedures will be followed in case of any emergency situation. The Emergency Coordinator needs to be on-site or on-call 24 h a day.

Details required for Emergency Contingency Plans can vary from state to state.

C.3.5 RCRA applications for hazardous waste

Compliance with **RCRA** regulations requires conscientious investigation. See Figure 1, RCRA Applications for Hazardous Waste (Federal), for a simplified decision chart of the **RCRA** regulations and responsibilities.

Hazardous waste generators who dispose of waste by having it hauled off-site for treatment and/or disposal need to comply with the federal and state hazardous waste regulations applicable to the generator's status. Those who discharge any hazardous waste to a POTW in amounts greater than 15 kg per calendar month need to provide written notification to the local sewer authority, state hazardous waste agency, and the **EPA** regional office. If a silver recovery unit is used to remove the silver from photo processing waste before discharge to a POTW, it is possible to obtain an exemption from the regulations that require permits for hazardous waste treatment facilities and treatment units. For instance, a silver recovery treatment unit is exempted on the federal level if the unit is hard plumbed from the processor to the sewer (40 CFR 264.1 exemption for "totally enclosed treatment facility"). However, some states may not accept this exemption. Check with state or federal hazardous waste regulatory agencies for the responsibilities or exemptions applicable to particular photo processing operations.

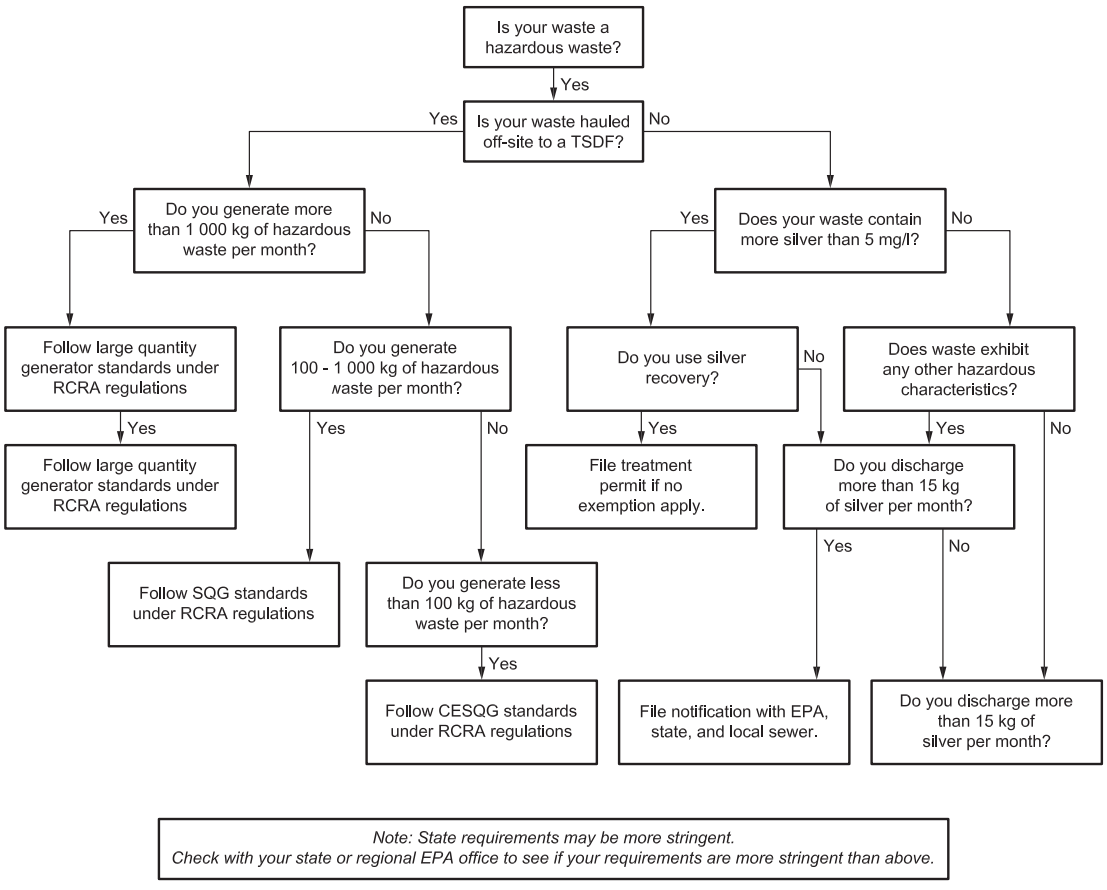

Figure 1 — RCRA applications for hazardous waste (Federal)

C.4 Land disposal criteria

Under 40 CFR 268, all hazardous wastes are restricted from land disposal by May 8, 1990, unless treated to specific treatment standards given in 40 CFR 268 Subpart D. Generators need to determine if their waste is restricted from land disposal by the generators' knowledge of the waste or by test analysis of the waste. These test results need to be documented and kept on file for at least five years. Exceptions to this restriction are given in 40 CFR 268.1 (e).

Photo processing wastes that contain silver above 5mg/L (EPA Waste Number D011), contain chromium above 5mg/L (D007), or are corrosive (D002) are subject to land disposal restrictions as a non-waste water restricted waste requiring treatment (under Third Land Disposal Restrictions in effect since May 8, 1990). Treatment standards for silver or chromium bearing wastes (D011 and D007) are located in 40 CFR 268.53, Table CCW. Wastes that are corrosive (D002) are subject to the treatment standard of Deactivation (DEACT), 40 CFR 268.42, Table 2.

Generators who ship land disposal restricted hazardous waste off-site for treatment, storage, and disposal are required to submit written notification to the TSDF of the land disposal restrictions on the waste and any appropriate treatment standards. The notification should accompany every shipment of restricted waste and should include the following information:

— EPA Hazardous Waste Number;

— appropriate treatment standards/specified technologies;

— manifest number associated with the waste shipment;

— waste analysis data, if available.

Some TSDFs provide their own land disposal notification forms. These notification forms need to be kept on file for at least five years from the date the hazardous waste was last sent to treatment, storage, and disposal. (See Fuji Environmental Data Sheet: RCRA Overview, ENV-(B-2) 1/92.)

C.5 Training for safe transportation of hazardous materials

The Research and Special Programmes Administration (RSPA) is amending the Hazardous Materials Regulations (HMR) to enhance training requirements for persons involved in the transportation of hazardous materials.

These enhanced regulatory requirements will increase a hazmat employee's awareness of safety considerations involved in the following procedures:

— loading of hazardous materials;

— unloading of hazardous materials;

— handling of hazardous materials;

— storage of hazardous materials;

— transportation of hazardous materials.

The requirements will also improve hazmat employees' emergency preparedness for responding to accidents or incidents involving the transportation of hazardous materials. Thus, the requirements will aid in reducing hazardous materials incidents caused by human error and mitigate the effects of incidents when they occur.

49 CFR, Section 103 of the Hazardous Materials Transportation Act provides definitions for "hazmat employer" and "hazmat employee." A "hazmat employer" is a person who uses one or more of his or her employees in connection with the following:

— transporting hazardous materials in commerce or causing them to be transported;

— reconditioning or testing containers, drums, or packagings represented for use in the transportation of hazardous materials. This term includes an owner-operator of a motor vehicle who transports hazardous materials in commerce. This term also includes any department, agency, or instrumentality of the United States, a State, a political subdivision of a State, or an Indian tribe engaged in an activity described above.

A "hazmat employee" is an individual who is employed by a hazmat employer and who, in the course of employment, directly affects hazardous materials transportation safety.

The U.S. DOT training requirements for hazmat employees are contained in 49 CFR, 172.700 Subpart H, Training. In the subpart, training is described as "a systematic programme that ensures a hazmat employee... is able to... identify hazardous materials, has knowledge of emergency response information, self-protection measures and accident prevention...."

The subpart clearly states that a hazmat employer should train, or provide training through an outside vendor, any employee who will be considered a hazmat employee by the DOT's requirements.

Under section 172.704 of 49 CFR, Training Requirements, of Subpart H, Training, it states that a hazmat employees training "shall include" the following:

— general awareness/familiarization training (this training is to enable the employee to recognize and identify hazardous materials);

— function-specific training (this training is specifically applicable to the functions the employee performs);

— safety training (this training provides emergency response information, measures to protect the employee from hazards and methods and procedures for avoiding accidents).

Section 172.704 also addresses OSHA and EPA training. Training conducted to meet requirements of OSHA or EPA, provided it addresses the training specified (above), may be used, in order to avoid unnecessary duplication of training.

Section 172.704 then deals with initial and recurrent training. Under initial training, a hazmat employee employed on or before July 2, 1993 shall be trained prior to October 1, 1993. Training for a hazmat employee employed after that date shall be completed within 90 dof employment. A hazmat employee who changes jobs shall be trained in the new functions within 90 dof the change. Under recurrent training, the subpart states that the employee shall receive the training required at least once every two years. (Also listed is "relevant" training, where the subpart states that training received from a previous employer or other source may be used to satisfy DOT requirements if a current record of that training exists.)

Records management is an important part of the DOT requirements. DOT requirements state, "a record of current training, inclusive of the preceding two years,... shall be created and retained by each hazmat employer for each hazmat employee for as long as that employee is employed by that employer as a hazmat employee and for 90 days thereafter." The record shall include the following:

— hazmat employee's name;

— most recent training completion date of the hazmat employee's training;

— description, copy, or the location of the training materials used to meet the requirements of section 172.704;

— name and address of the person providing the training;

— certification that the hazmat employee has been trained and tested as required (by the DOT).

The Hazardous Materials Advisory Council (HMAC) is an international non-profit membership organization involved in promoting safety and regulatory compliance in the transportation of hazardous materials. HMAC offers the community a wide variety of publications and special reports.

The expertise of the HMAC and its members was used in the development of the DOT Hazardous Materials Transportation training modules. (See Federal Register, Vol. 57, No. 95, May 15, 1991.)

On December 21, 1990, the final rule for Performance-Oriented Packaging Standards (HM-181, HM181A-HM-181D, and HM-204) was published in the Federal Register. This final rule revises the Hazardous Materials Regulations (HMR; 49 CFR parts 171-180) with respect to hazard communication, classification, and packaging requirements. These changes are based on the United Nations Recommendations on the Transport of Dangerous Goods (U.N. Recommendations) and Research and Special Programmes Administration's (RSPA) own initiative. The changes will

— simplify and reduce the volume of the HMR,

— enhance safety through better classification and packaging,

— reduce the need for exemptions from the HMR,

— facilitate international commerce, and

— promote flexibility and technological innovation in packaging.

In contrast to the DOT system of detailed specifications for packaging, construction is a system of performance-oriented packaging standards that has been developed in the form of Recommendations by the United Nations Committee of Experts on the Transport of Dangerous Goods. These standards address the same type of non-bulk containers (drums, barrels, boxes, bags, carboys, and inside containers or receptacles) as the DOT specifications. Typically, these standards have general requirements for materials, construction, and a maximum capacity.

Significant changes have been made to the HMR with regard to format of the HMR, the classification of materials, the hazard communication provisions, and the bulk and non-bulk packaging requirements. The major features of the changes are summarized in a very broad manner and include the following:

— Format changes, such as consolidation of the hazardous materials tables into one table and elimination of approximately 100 packaging specifications, should substantially reduce the volume of the HMR.

— Standard International units (SI units) of measurement generally replace U.S. customary units of measurement.

— Hazard class definitions are aligned generally with the U.N. Recommendations and use the same numerical nomenclature.

(See Keller's Report: Hazardous Materials Transportation, Vol. 3, No. 1, January 1991.)

C.6 Title III SARA (Superfund Amendments and Reauthorization Act)

Photographic processing managers need to comply with other federal requirements, including the SARA Title III, also known as "The Emergency Planning and Community Right to Know Act." The objective of SARA Title III is to inform the public about the presence and/or release of hazardous, extremely hazardous, or toxic chemicals. It requires photographic processors, among others, to report inventories and releases of all hazardous chemicals that are above specified threshold levels. Under SARA Title III, state and smaller entities, i.e. communities, need to develop an emergency planning programme to enable their response to an accidental chemical release in the environment. In addition, those facilities that fall under SIC codes 20-39 may have to report annual releases of toxic chemicals into the environment if they exceed certain thresholds for manufacture, processing, or use. Microfilm processors do not fall within this SIC code range.

EPA has established threshold quantities for chemicals classified as extremely hazardous, hazardous under the OSHA hazard communication standard, or toxic. Consult the photographic film manufacturer if need assistance in calculating chemical thresholds for the purposes of reporting under SARA. Systems are available that simplify SARA's compliance evaluation and reporting process. One such system lists specific products and corresponding chemical threshold concentrations. Using the system, a simple

calculation enables laboratory managers to determine their compliance obligations and the appropriate actions.

Title III of SARA requirements are ongoing and should be an integral part of a business plan. Regulatory changes under SARA, such as chemical threshold reporting requirements, or changes in business activities (quantities and kinds of chemicals handled) could require a facility to comply at any time, even if it had been previously exempted.

The federal government has listed some specific chemicals that are used in photographic processing as extremely hazardous substances. Table C.1 lists some commonly occurring chemicals, their threshold planning quantities (TPQ), and their reportable quantities (RQ) if released without a permit.

These TPQ and RQ number are subject to change with new regulations.

Table C.1 — Threshold planning and reportable quantities of common hazardous substances

Chemical	CAS No. [a]	TPQ (lbs)	RQ (Ms)
Ammonium solution (<44 % Ammonia)		500	100
Ammonia	7664-41-7	500	100
Hydroquinone (in solution)	123-31-9	500	lb
(solid)		10 000	lb
Sulfuric acid	7664-03-0	1 000	100
Formaldehyde	50-00-0	500	1 000
Sodium selenite	10102-18-8	500	lb
Nitric acid	7697-37-2	1 000	1 000
Sodium hydroxide	1310-73-2	N.A.[c]	1 000
Sodium dichromate	10588-01-9	N.A.[c]	10
Potassium dichromate	7778-50-9	N.A.[c]	10

[a] CAS (Chemical Abstract Substance).

[b] Proposed increase of this RQ to 100 lbs (FR Oct 22, 1993).

[c] N.A. (Not Applicable).

Any facility that stores or has present an extremely hazardous substance at or in excess of a TPQ needs to notify their state emergency response commission within a particular time period.

For hazardous chemicals under the community right to know segment of SARA Title III, the reporting threshold is 10 000 pounds. For extremely hazardous substances, the reporting threshold is 500 pounds or the threshold planning quality (TPQ), whichever is lower.

For toxic chemical reporting, the facility needs to fall within certain SIC Codes (20-39), have a certain number of full-time employees, and meet a certain reporting threshold for manufacturing or processing toxic chemicals that is based on the weight (quantity) of chemicals produced.

Contact chemical suppliers for information on how to determine the threshold planning quantities of chemicals. Suppliers may have inventory forms on hand to assist customers in determining if the processing solutions used or stored contain a TPQ of an extremely hazardous substance. However, keep in mind that the minimum threshold planning quantities are 500 pounds or more of the chemical. Generally, only large photo processors or stock house dealers have chemical quantities exceeding threshold planning quantities. See Annex A for more information about assistance from manufacturers.

Note that any accidental spill to the environment at or above a reportable quantity needs to be reported to the local emergency planning committee, the state emergency response commission, and the fire department with jurisdiction over the facility. This type of spill needs to be reported even if the threshold quantity of an "extremely hazardous substance" is not stored or if information pertaining to an "extremely hazardous substance," "hazardous substance," or "toxic chemical" does not need to be reported. In addition, if the chemical spilled is regulated under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), the EPA National Response Center needs to be notified of the spill. The EPA National Response Center toll free telephone number is: 1-800-424-8802. In the Washington, DC metropolitan area, the number is: 1-202-426-2675.

For more information concerning SARA Title III, contact the Federal Emergency Preparedness Programme hotline at 1-800-535-0202 or the chemical supplier. See Annex A for information about manufacturer assistance.

C.7 Occupational safety and health administration (OSHA)

OSHA Hazard Communication Standard (HCS) went into effect for photo processors on May 23, 1988.

OSHA is a federal agency responsible for all aspects of workplace safety. OSHA issues regulations that cover items such as the following:

— container labels;

— warning signs;

— first aid;

— personal safety protection;

— a written hazard communication plan.

The OSHA Hazard Communication Standard (HCS) covers two broad areas: how to protect employees from hazards in the workplace and how to inform employees about hazards in the workplace. HCS requires that all employees receive training in the safe use and handling of chemicals and receive hazard information for each chemical or product that is introduced into their work area. The employee training programme needs to also include the following:

— the location of written programmes and Material Safety Data Sheets (MSDS);

— how to read and understand labels and MSDS;

— how to identify hazardous substances in the workplace;

— the hazards of the chemicals in the work area and their routes of entry (such as inhalation, ingestion, etc.);

— methods and observations that can be used to detect the presence or release of a hazardous chemical;

— chemical handling techniques, protective measures, and spill response methods;

— location of protective/response equipment;

— what to do in cases of overexposure and emergencies.

The HCS requires that each product containing potentially hazardous chemicals has a Material Safety Data Sheet (MSDS). The MSDS is supplied by the chemical manufacturer or distributor. Each MSDS contains information on the hazards related to the chemical's use, storage, and disposal.

OSHA requires that all employees who are exposed to potentially hazardous chemicals be trained in interpreting MSDS and that a collection of MSDS be readily accessible. An MSDS binder, displayed in clear view, is a convenient method of satisfying MSDS accessibility requirements. Because chemical

formulae can change periodically, OSHA has required photo processing laboratory management to update its MSDS file accordingly.

The facility needs to also be equipped with the appropriate personal safety gear, including the following:

— splash goggles;

— protective gloves;

— aprons;

— first-aid kits;

— quick-drench shower;

— eye baths.

Proper ventilation needs to always be provided as well.

The HCS also requires chemical containers such as chemical storage tanks, processing tanks, silver recovery units, and others to be clearly labelled because labels are often the first source of information on chemical safety that is visible to the employee. Furthermore, the employee needs to be trained in how to use the information on the label.

After completing the appropriate training, it is recommended that employees sign an "employee hazard communication acknowledgement," or an equivalent document, verifying that they have received training in the safe handling of potentially hazardous chemicals. If employees will be performing non-routine tasks using potentially hazardous chemicals, they need to receive training specific to this need. Many guidelines are available, i.e. "Hazard Communication Manual, A Model for Printing Plants," which is available from the Printing Industries of America (PIA). The PIA guidelines include the following:

— the OSHA Hazard Communication Standard;

— a suggested hazard communication programme;

— hints on developing a written training programme;

— recommendations on interpreting MSDSs;

— a glossary.

Other information is available on safety and employee protection, for example:

— "Play It Safe . . . Lockout/Tagout— Key to Safety";

— "Respirator Selection Criteria";

— "Loss Control Data Guide".

The lockout/tagout concept is an important safety consideration when the flow of the energy from a power source to a piece of equipment should be blocked out. A lockout device is usually a key or combination lock arrangement that secures a valve or lever in the "off" position.

Tagout refers to placing tags on power sources to warn employees not to turn the power on. Tags don't provide the physical restraint that locks provide, but they are just as important. One of the following can be written on a tag:

— DO NOT START;

— DO NOT OPEN OR CLOSE;

— DO NOT ENERGIZE;

— DO NOT OPERATE.

It is recommended that an organization analyse when lockout/tagout rules need to be followed when making repairs, performing routine maintenance, clearing a jammed or blocked machine, keeping people out of a dangerous area, and preventing the use of equipment by unauthorized persons.

Power lockout procedures for hazardous machinery and equipment, which cover guidelines for power switches not properly locked out, can prevent accidents that could cause serious injury. Failure to lockout equipment can be a primary cause of accidents.

A lockout programme may consist of a lock-tag-try procedure. Some of the key points that should be included in a company lockout programme include:

— procedures;

— facilities locks and tags;

— power sources;

— isolation;

— testing;

— removal of locks and tags.

An effective lockout programme is the responsibility of both management and employees. Management's responsibility is to do the following:

— provide effective facilities for locking and tagging power sources;

— provide employees with locks, hasps, and tags;

— train employees to ensure they know, understand, and follow locking and tagging rules and procedures;

— enforce all locking and tagging safety rules and procedures.

It is the employees' responsibility to do the following:

— know, understand, and follow established company locking and tagging safety rules and procedures;

— ensure that they do not expose fellow workers to the dangers of moving equipment and process systems by failing to lock and tagout the system.

OSHA also requires all employers to do the following:

— display the official OSHA poster listing employee rights and obligations;

— display a list of the hazardous chemicals in the workplace;

— maintain a written hazard communication programme (see Annex B for a sample form);

— maintain a written training programme;

— keep medical records on employee injuries;

— keep medical examination records;

— keep exposure monitoring records;

— keep employee chemical exposure records;

— report to OSHA within 8 h an accident that results in one or more fatalities or the hospitalization of three or more employees.

Employers with 11 or more employees need to also do the following:

— maintain Form 200 (the log that summarizes the year's recordable injuries and illnesses) and Form 101 (the illness/injury form available from OSHA);

— post Annual Record Summaries;

— provide all health and safety records to OSHA upon request.

C.8 OSHA ammonia rules

The OSHA-issued exposure standards for approximately four hundred substances used in the workplace (January 19, 1989) included some products used by micrographic, blueprint, and printing service organizations. For example, the regulation changes OSHA's standard for ammonia. The new standard is 35 parts per million (ppm) for a short-term exposure limit (STEL) over a 15 min period. The old rule was 50 ppm time weighted average (TWA) exposure for an eight hour period.

The compliance date for the new standard is September 1, 1989. However, it is not expected to have any significant effect on users of ammonia in diazo copying applications because both the new and the old standards are well above the ammonia levels normally found in micrographic environments. Normal operation and maintenance of diazo equipment will lead to levels of ammonia in the workplace that are well within the new OSHA standard. Average ammonia levels are typically below 10 ppm. Microfilm copying equipment generates even lower levels of ammonia in the air.

Users of ammonia micrographic or reprographic systems should update their training programme literature and hazard communication work plans by obtaining information from chemical manufacturers.

The new regulation is contained in Title 29 Code of Federal Regulations Part 1910.1000 of the OSHA code. For a complete list of substances and limits contained in the new rule, obtain the publication OSHA 3112, Air Contaminants—Permissible Exposure Limits.

C.9 Clean Water Act (CWA) and municipal use codes

Due to environmental and economic factors, silver recovery is integral to a comprehensive environmental compliance programme. (See Clause13 for more information about silver recovery.) The CWA and municipal sewer-use codes are primary sources of regulations for silver discharge requirements. Sewer-use codes are a result of the 1972 Federal Water Pollution Control Act, which is today commonly called the Clean Water Act (CWA). The CWA was designed to establish safety standards to protect the nation's waters.

Most water treatment takes place at a local level through publicly owned treatment works. Sewer codes, therefore, vary considerably from municipality to municipality, according to the effluent content that can be safely handled by a given treatment plant.

Wash water is the largest part of "wet" photographic processing effluent. To assess a laboratory's compliance with regulations and to provide historical documentation, the facility may be required to have a sample of waste water collected and analysed, on a regular basis, by a certified analytical photo processing laboratory. General EPA pretreatment standards (for waste water) are published in Part 403—General Pretreatment Regulations for Existing and New Sources of Pollution of the Code of Federal Regulations (40 CFR Part 403). Part 459 of 40 CFR Ch. 1, "Photo processing Point Source Category," covers the applicability of the regulation and effluent limitations guidelines.

C.10 Storm water regulations

Currently, photographic processors are not included in storm water regulations unless chemicals are stored outside the building and are exposed to rain or snow. At the time of the publication of this technical report, EPA is working on phase II of the storm water regulations that will apply to all light

industries, including photographic processing. If a storm water permit is required, there are three options: Group Permits, Individual Permits, and General Permits. These regulations could change, and a storm water facility permit could be required for operation.

C.11 Air pollution considerations

The Clean Air Act was enacted in 1970 to protect the general public from health effects related to air pollution emissions.

Health standards, known as the National Ambient Air Quality Standards (NAAQS), were set for major pollutants. Standards were established for the following:

— sulfur dioxide;

— particulate matter;

— carbon monoxide;

— nitrogen oxides;

— ozone;

— lead.

Air pollution control is primarily the responsibility of state and local governments. States were required to develop plans known as state implementation plans (SIPs) to achieve and maintain the Ambient Air Quality Standards. Included in these SIPs are provisions for the states to require pre-construction reviews. The state has the authority to review details on a source of air pollution and its potential impact before the source owner actually constructs or installs the source. This review may require a lead time of several months before construction can begin.

The current thrust in air regulations is the control of hazardous or toxic emissions. At the federal level, National Emission Standards for Hazardous Air Pollutants (NESHAPs) have been established for compounds including asbestos, beryllium, mercury, and vinyl chloride. A number of other compounds including benzene and arsenic are in various stages of review pending final development of standards. Many states either have or are developing detailed regulations for the control of emissions of toxic air pollutants as well.

Some photographic processing solutions liberate vapours or gases such as the following:

— acetic acid;

— benzyl alcohol;

— ammonia;

— sulfur dioxide;

— aldehydes.

These gases and vapours can be irritating to the eyes and respiratory tract. For comfort and health considerations, the concentration of these gases and vapours should be controlled by tank covers, machine enclosures, and proper exhaust.

Annex D
(informative)

General guidelines for ventilating photographic processing areas

D.1 General guidelines

Some photographic processing solutions release vapours such as acetic acid and benzyl alcohol or gases such as ammonia, formaldehyde, and sulfur dioxide. These chemicals can be irritating to the eyes and respiratory tract and have unpleasant odours. High temperature processing increases the release of these chemicals. For comfort and good health practices, minimize the airborne concentrations of these chemicals by controlling ventilation and by using tank covers or enclosures.

D.2 Ventilation guidelines

Respirator Selection Criteria provides basic information to assist in selecting the proper type of respirator. Inhalation is one of the primary routes of entry into the body for chemicals, or "airborne contaminants," such as dust, mists, fumes, and/or gas/vapour. The preferred method to keep airborne contaminants within acceptable levels is to use proper ventilation. This is done by using a good general ventilation system and, where necessary, by using additional engineering controls (such as direct exhaust).

Based on industrial hygiene studies, vapours and gases in most processing areas can be kept at acceptable levels through good general room ventilation. In some cases, exhaust ventilation from enclosed tanks is recommended. The following list provides general ventilation guidelines:

a) Automated equipment for processing

   1) Supply tempered fresh air to the darkroom from above the feed (head) end of the machine at a minimum rate of 4 m^3 per minute (m^3/min) per machine. Position the supply air inlet so that it will not affect the capture of vapours or gases by the exhaust opening. If a machine extends through a barrier into another room, ventilate both rooms. (4 m^3/min to 5 m^3/min is equivalent to 10 room volumes per hour in a room 3 m × 3 m × 3 m).

   2) Exhaust the room air from the tank area to the outdoors at a minimum rate of 5 m^3/min per machine. An exhaust rate higher than the supply rate produces a negative pressure and reduces the chance of vapours or gases escaping to adjoining rooms. Do not recirculate this air without consulting an industrial hygienist.

   3) If the tanks are enclosed and have an exhaust, the minimum room air-supply rate can be reduced to 2,5 m^3/min and the air removal rate to 3 m3/min per machine.

   4) Follow the manufacturer's equipment specifications for venting the dryer. Adjust the room temperature to 18 °C to 24 °C, and the humidity to 45 % to 65 % relative humidity. In some cases, this may require more air flow than the minimum specified for controlling vapours and gases. Some automated processors are equipped with exhaust fans that can be connected to an exhaust duct.

   5) Control the concentrations of vapours and gases by reducing their generation rate with tank covers. In addition to covering the solution tanks, keep solution temperatures, machine speeds, and agitation at minimum suitable levels.

b) Chemical mixing areas — Provide good general room ventilation in all mixing and storage areas. Also, use split-tank covers with local exhaust attached to the stationary portion on mix tanks to supplement general room ventilation. Local exhaust should provide a capture velocity of 30 m per

minute (mpm) at weighing and dispensing locations. Minimize evaporation by covering the storage tanks. Floating covers are also effective.

c) Community air pollution considerations — Air emissions from processing may be subject to local, state, or federal air regulations. Contact the nearest local, state, or federal authorities for further information.

d) Photographic laboratory design — When planning or designing a photographic laboratory, consult a ventilation and air conditioning engineer or an industrial hygienist as early as possible.

If a respirator is worn by an employee, the employer needs to have a "Respiratory Protection Programme," including the following:

— Written Standard Operating Procedures (SOP): ANSI Z88.2-1980, Sec. 3.5.1;

— Medical Evaluation and Surveillance: ANSI Z88.2-1980, Sec. 3.5.3;

— Hazard Evaluation and Respirator Selection: ANSI Z88.2, Sec. 3.5.5;

— Respirator Fitting and Training: ANSI 288.2-1980, Sec. 3.5.6, 3.5.8, 6.11, 7.2, and 7.4.

Other necessary items include the following:

— supervision of respirator use;

— respirator inspection and maintenance;

— use of approved respirators;

— periodic air sampling, if air-purifying respirators are used.

Use of respirators is a serious matter because improper use is not only illegal but can contribute to serious health hazards to the wearer. The ANSI respiratory standards were designed to make certain that individuals designated as respiratory wearers meet the following requirements:

— are medically capable of wearing a respirator (medical evaluation requirement);

— choose a respirator that will help rather than harm (hazard evaluation, respirator selection, and training);

— know how to use, inspect, and maintain the respirator (SOP, maintenance, and training requirements).

D.3 Regulation of photographic processing air emissions

In some states, photo processing operations may be exempt from air emission permitting requirements. However, the government agency responsible for air pollution regulations should be contacted to determine if permitting is required.

D.4 EPA's updated Form R

The Association of Reproduction Materials Manufacturers, Inc. (ARMM) recently reported in its newsletter that the EPA produced and updated Form R is to be used under the Toxic Release Inventory Programme.

Under Section 313 of the Emergency Planning and Right to Know Act, U.S. manufacturing companies are required to file TR1 reports on the environmental release of about 300 chemicals. Also, firms with 10 or more full-time employees are required to file the Updated Form R reports in SIC Code classifications 20 to 39 that manufacture, process, or use any of the 300 listed chemicals in quantities greater than the threshold values. Most micrographic operations would not fall into SIC 20 to 39.

Annex E
(informative)

Environmental protection in France

E.1 General

In France, the Environmental Code includes, legal texts relating on environmental law. It has seven books divided into titles, chapter, sections, sub-sections and paragraphs.

In France, under Article L511 of the Environmental Code, any facility whose activities may have an adverse impact on the environment needs to be reported and listed with the Prefect. These facilities are called Classified Installations for the Protection of the Environment (ICPE).

E.2 Legal Articles about photography in the environmental code

Article ANNEX(4) to Article R511-9

Article R521-42-3

Article ANNEX II to Article D523-8

Article ANNEX II from Article R541-8

In Europe, wastes are considered hazardous if they exhibit one or more of the following properties:

— explosive, oxidizing, flammable;

— irritability, harmful, toxic;

— carcinogenic;

— corrosive;

— infectious;

— reproductive toxicity, mutagenicity;

— ecotoxicity.

Radioactive wastes are subject to special legislation.

From a legislative point of view, in most countries, the word “pollution” refers to the contamination of environment by polluting beyond a standard threshold, law, or assumed level; this may be the presence of an element, or heat radiation in a medium or in a context where it is not normally found in nature.

In France, in the legal field, for products subject to standards or thresholds, it should theoretically address pollution in the case of exceeding thresholds or standards, these thresholds are themselves determined by reference to the impact of the biological substances under consideration. These are listed in a report from the National Institute for Industrial Environment and Risks **(INERIS).**

E.3 INERIS Haut du formulaire

E.3.1 Chemicals portal

For many years, steps have been taken by different countries and organizations (European Union, OECD, France, INERIS, etc.) to assess environmental risks posed by certain chemicals. The general principle of these evaluations is to compare exposure data with the data of effects of substances to characterize the risks they may pose to the environment. Together, these data (exposure and effects) are validated by expert committees. Records of risk assessment carried out in this context, whether completed or ongoing evaluation, are mostly available online as reports of risk assessments of existing substances (Regulation 793/93/EC) on the site of the former ECB (European Chemicals Bureau) report risk assessment of pesticides under Directive 91/414/EC available on the website of DG-SANCO, evaluation of chemicals high production volume (HPV Program) on the UNEP website (United Nations Programme for the Environment), etc.

This database gathers physico-chemical characteristics and eco-toxicological data from these files validated at European or international level, in order to publish them online.

E.3.2 Content of each file

For the test substance, each file contains the following:

— data for identification (CAS No., name and synonyms, molecular formula, etc.);

— information regarding any existing risk assessments as part of legislation (e.g. Regulation 793/93/EC on existing substances, Directive 91/414/EEC for the risk assessment of pesticides, HPV folder OECD, etc.), any classification (e.g. “Classification and Labelling” classification for carcinogenecity by IARC or properties endocrine disruption by the EU, etc.);

— information on the physico-chemical properties of the substance (water solubility, vapor pressure, partition coefficients, etc.). Particular to determine the chemical behaviour of the latter in the environment (solubility, evaporation, adsorption, bioaccumulation, etc.);

— acute and chronic ecotoxicity data (concentrations effects for 50 % of the population and concentrations with no observed effect) and, when they are available, eco-toxicological reference concentrations of the substance as the predicted no-effect concentrations or PNEC (Predicted No Effect Concentration), the Environmental Quality Standards or EQS.

Annex F
(informative)

Environmental protection in the United Kingdom

NOTE The URLs cited in this Annex were verified on 12.23.2014. If a URL is out of date, the publication may be found by a Web search.

F.1 UK Environmental Information Regulations

This regulation provides for access to environmental information from public bodies. It can be obtained by searching the Website http://www.legislation.gov.uk/.

Details of the UK Government responsibility for environmental regulations (under European legislation), including guidance on batteries, eco-design, vehicles, fluorinated greenhouse gases, packaging, electrical equipment and hazardous substances (RoHS) can be obtained by searching the Website https://www.gov.uk/.

F.1.1 Batteries and Accumulators and Waste Batteries and Accumulators Directive

"Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directive 91/157/EEC (Text with EEA relevance)", published in the Official Journal of the European Union 26.9.2006 can be obtained by searching the Website http://eur-lex.europa.eu/.

NOTE The corrigendum "Corrigendum to Directive 2006/66/EC of the European Parliament and of the Council of 6 September 2006 on batteries and accumulators and waste batteries and accumulators and repealing Directives 91/157/EEC (OJ L 266, 26.9.2006)", published in the Official Journal of the European Union 10.11.2006 can be obtained by searching the Website http://eur-lex.europa.eu/.

F.1.2 Eco-design Directive

"Directive 2009/125/EC of the European Parliament and of the Council of 21 October 2009 establishing a framework for the setting of ecodesign requirements for energy-related products (recast) (Text with EEA relevance)", published in the "Official Journal of the European Union" 31.10.2009 can be obtained by searching the Website http://eur-lex.europa.eu/.

F.1.3 End-of Life Vehicles Directive

"Directive 2000/53/EC of the European Parliament and of the Council of 18 September 2000 on end-of life vehicles — Commission Statements", published in the "Official Journal of the European Union" 21.10.2000 can be obtained by searching the Website http://eur-lex.europa.eu/.

F.1.4 Regulation on certain fluorinated gases

"Regulation (EC) No 842/2006 of the European Parliament and of the Council of 17 May 2006 on certain fluorinated greenhouse gases (Text with EEA relevance)", published in the "Official Journal of the European Union" 14.6.2006 can be obtained by searching the Website http://eur-lex.europa.eu/.

F.1.5 Packaging and Packaging Waste Directive

"European Parliament and Council Directive 94/62/EC of 20 December 1994 on packaging and packaging waste", published in the Official Journal of the European Communities, 31.12.1994 can be obtained by searching the Website http://eur-lex.europa.eu/.

F.1.6 Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (RoHS) Directive

"Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (Text with EEA relevance)", published in the Official Journal of the European Union 1.7.2011 can be obtained by searching the Website http://eur-lex.europa.eu/.

NOTE The corrigendum "Corrigendum to Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment (OJ L 174, 1.7.2011)", published in the Official Journal of the European Union 14.02.2014 can be obtained by searching the Website http://eur-lex.europa.eu/.

Bibliography

[1] Blue Line ARMM Association of Reproduction Materials Manufacturers, July 2, 1992

[2] Biocide for Photographic Solution Tanks and Wash Water. Kodak Publication CIS-3, Eastman Kodak Company, March 2000, http://www.kodak.com/global/en/consumer/products/techInfo/cis3/cis3.pdf (URL accurate as of 12.23. 2014)

[3] ISO 6196-1:1993, *Micrographics — Vocabulary — Part 1: General terms*

[4] ISO 6196-3:1997, *Micrographics — Vocabulary — Part 3: Film processing*

[5] ISO 6196-4:1998, *Micrographics — Vocabulary — Part 4: Materials and packaging*

[6] ISO 6707-1:2014, *Buildings and civil engineering works — Vocabulary — Part 1: General terms*

[7] ISO 6853:2001, *Photography — Processing waste — Determination of ammoniacal nitrogen (microdiffusion method)*

[8] ISO 29464:2011, *Cleaning equipment for air and other gases — Terminology*

[9] PIA hazard communication manual: a suggested model program for printing plants, Printing Industries of America (PIA). Printing Industries of America, Inc, Alexandria, VA, 1993

[10] Keller's Hazardous Materials Transportation Report, Vol. 3, No. 1, January 1991. ISSN1041-8296

[11] Play it safe, lockout/tagout– key to safety, Bureau of Business Practice, 1989, revised 1991

[12] Loss Control Data Guide, Great American, July 1981

[13] Respirator Selection Criteria, Fuji, June 1992

[14] Storm Water Bulletin

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