



UNEP IE - UNITED NATIONS ENVIRONMENT PROGRAMME
INDUSTRY AND ENVIRONMENT

INDUSTRY & ENVIRONMENT
EMISSION STANDARDS & GUIDELINES
INFORMATION CLEARINGHOUSE
(IE-ESGIC)

Volume IIIb

IRON & STEEL INDUSTRY
EFFLUENT DISCHARGE STANDARDS

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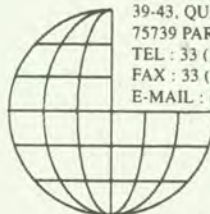


UNEP

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INTRODUCTION

What is the purpose of this document?

Establishing environmental standards and guidelines for potentially polluting industrial wastes: liquid effluents, air emissions and solid wastes, is an important first step for countries concerned about regulating industrial activities as part of their environmental pollution control strategies. UNEP IE has confirmed the need for information on such guidelines from the fact that more than 10 percent of the technical/scientific inquiries handled by the UNEP IE Query-Response Service concern air emission standards, effluent standards and other regulatory requirements for industrial activities.

To help in responding to these frequent requests, UNEP IE has set up an in-house database called *Industry and Environment Emission Standards and Guidelines Information Clearinghouse (IE-ESGIC)*.

UNEP IE feels that this information, even if not exhaustive, could be useful to its partners, and has therefore decided to publish *IE-ESGIC Compendiums* covering a range of industrial sectors.

This compendium for the iron and steel industry has been prepared to provide helpful information to governments, industry, international organizations and non-governmental organizations, trade unions, research institutes and individuals that are interested in countries' effluent discharge standards for the industry.

How was the information collected, reviewed and compiled?

The initial information set was prepared by reviewing references available at UNEP IE, for a selection of countries. These data were reviewed by relevant experts or INFOTERRA national focal points in the countries covered, who provided comments and further material for inclusion.

How is the compendium structured?

The compendium consists of three parts. The first chapter give an overview of the various approaches to the regulation of industrial releases, other regulatory mechanisms for industrial activities, and major pollutants in effluents discharged from the iron and steel industry. The second chapter describes ways in which countries have dealt with the problem, including examples of existing standards and guidelines in a number of countries. The last part provides some standards or guidelines developed by international organizations or conferences.

How should this compendium be used?

The extracts presented here should be treated as a preliminary source of information on countries' environmental regulations. They are summaries of raw data extracted from documents available at UNEP IE or from additional reference material provided by experts or national focal point in each country, without further evaluation or interpretation.

The numerical standards need to be interpreted with care, taking into account the way in which each regulation is actually applied. Direct comparisons of national standards are not always possible. For example, some standards may be applied directly to the effluents from industrial plants, while others may be general government guidelines, on the basis of which an inspectorate decides allowable limits for industrial discharges.

Due to space constraints and complexity of data coverage, the IE-ESGIC mainly presents national regulations. However, in some countries local administrations

have considerable powers in the field of pollution control and often impose different or more stringent requirements than those established at national level.

Due to the development of environmental technologies and policies, regulations continue to evolve. Therefore each extract may not necessarily reflect the current situation of each country at the time of reading.

Bearing the above in mind, users in need of complete information are recommended to contact the authoritative organizations of each country. For reference, the list of national focal points used for this compendium is presented in Appendix 1.

Finally, this report should be regarded as a working paper, reproduced without official editing. If articles are quoted from this document, the data source should be based on the document or publisher provided in the citation part of each article rather than this compendium, or UNEP IE.

How can we improve this document?

The IE-ESGIC is updated periodically to reflect changes in legislation. UNEP IE welcomes any information for such updates, as well as comments on contents (please see Appendix 2: Input sheet for additional inclusion). The exchange of data on industrial discharge standards between UNEP IE and its partners will provide fresh and useful information to those who require it, while enabling UNEP IE to keep its database up-to-date.

**Overview of environmental discharge standards
for the iron and steel industry**

OVERVIEW OF ENVIRONMENTAL DISCHARGE STANDARDS FOR THE IRON AND STEEL INDUSTRY

i. Approaches to the regulation of industrial releases

Control mechanisms for industrial releases vary greatly between countries, reflecting the specific historical, administrative and legal traditions of each. No international environmental standards can apply around the world, though there are some guidelines set up by international organizations and some international conventions dealing with transboundary environmental issues. Each region and country has its own needs and must set its own standards accordingly.

Industrial releases are normally regulated by media-specific standards under laws for the protection environmental quality or human health. There are two main approaches to the regulation of industrial releases.

The most common way is through the setting and enforcement of environmental discharge standards. Governments set limits to be achieved and it is left to industry to find the most effective way of achieving them. In its simplest form, a uniform standard will apply to all industries throughout the country. Occasionally separate sets of limits for specific industries/processes/sub-processes may be introduced.

The other approach is to specify the level or type of technology that must be installed to meet the legal objectives. Usually industry is required to install "best available" or "best practicable technology." This approach put more emphasis on the availability of suitable technology rather than on assessment of the assimilative capacity of the local environment. The competent authorities may publish information on a number of industries as a guide to the means by which they would determine whether adequate technological controls have been employed. Such information often includes guidelines on industrial discharges.

In a few countries, limits are defined for the quality of the receiving environment (i.e. ambient quality) rather than the discharges. In practice however, plant permits will use a combination of the two.

There may be separate sets of standards for different types of receptors. Standards for effluents may vary depending on whether they are discharged to inland or coastal waters. When wastewater is discharged into a public sewage system, the authorities usually specify the effluent standards necessary to protect the sewer and sewage treatment system.

Also, a distinction is often made between new and existing plants. Where this distinction is made, existing plants are usually granted a more lenient standard, or are allowed a period of grace before being required to comply with stricter standards. New plants are usually required to comply with the latest standard from the start.

In many countries, environmental responsibilities are divided between local or regional and central governments. While some regulations may be set at national level, local administrations often have considerable powers in the field of pollution control and can often impose different or more stringent requirements than those established at national level.

Industry, often through its trade associations, can also assist in establishing best practices for their members, and publish codes of practice. These codes may even be adopted by policy-makers to be used as legal guidance in setting standards for compliance.

Environmental legislation is only effective when it is supported by effective compliance and enforcement measures. Most countries now have environmental standards in place. But in order to ensure that all companies equally comply with them, governments also need to establish institutional procedures such as environmental permitting, inspection and enforcement. For these administrative

mechanisms to work effectively, adequate staff and resources are required.

From the technical and economic viewpoints, if standards are too ambitious or unrealistic, their implementation will be unworkable. Setting up the discharge standards is a gradual process requiring continuous evaluation and modifications, taking into account the technical or economic conditions of the region. Thus the final standards "evolve" rather than being "created".

Regarding the expression of discharge standards, most countries adopt one of the following approaches:

- in terms of the concentration of pollutants in effluents or air emission streams; or
- in terms of the allowable quantity of pollutants discharged, usually per certain period, unit of raw material input or product output.

The concentration of pollutants is theoretically determinable at a single instant but in practice is taken as the average concentration of a number of samples. On the other hand, the quantity measure, being flow dependent, must be determined by a series of analyses of concentrations and flow rates over a specified time period.

ii. Other regulatory provisions for industrial activities

Discharge standards can only a part of the wider framework of environmental regulation for industrial activities. While the regulation of environmental releases retains a vital role, other control instruments are also indispensable to minimize environmental impacts of industrial plants, including the following:

- Environmental impact assessment;

Environmental impact assessment contributes to the decision-making process by focusing on the environmental issues surrounding industrial and other projects before, during and after they are implemented. A systematic consideration of environmental impacts often leads to the identification of alternative process options, and of mitigation measures for pollution, and as a result can have a major influence on the design of a project.

- Land-use planning and zoning for industries;

Where an external impact is expected from a plant, correct siting is one of the most important environmental decisions to be made. The environmental impact assessment process provides valuable information for zoning or siting decisions. However, siting criteria or regulations may also exist under planning laws.

- Ambient environmental quality standards;

In addition to regulating actual discharges, some countries also apply ambient environmental standards. In such cases, allowed discharge limits must be consistent with these standards. Some countries do not have discharge standards, but instead specify the desired quality of the receiving environment, which may not be exceeded.

- Waste disposal;

When solid wastes are generated, it is necessary to ensure that such wastes, including contaminated sludges, are kept in special areas and containers and are disposed of in a safe manner, taking their characteristics into consideration.

- Standards for storage, transport, labelling and packaging of certain chemicals;

The Code of Practice prepared by UN Committee on the Transport of Dangerous

Goods is often used as the basic document for national legislation.

- Ban on the use of certain chemicals;

The use of certain chemicals is now banned in some countries due to their hazardous nature. The UN also publishes the Consolidated List of Products whose Consumption and/or Sale Have Been Banned, Withdrawn, Severely Restricted or Not Approved by Governments.

- Product and process standards;

In some instances, pollution control has been achieved by the use of product or process standards (e.g. the problem of sulphur oxides emissions from the burning of fuel-oil has sometimes been confronted by specifying maximum concentrations of sulphur in the fuel-oil).

- Limits for occupational health and safety;

This problem is likely to be addressed in most countries under general industrial safety regulations. International organizations such as ILO (International Labour Office) and WHO (World Health Organization) also publish guidelines, mostly for exposure to airborne pollutants, noise and radiation.

- Emergency planning;

Some operations have the possibility to generate major accidents which endanger local populations. In such cases, it is recommended to establish emergency plans complementary to general emergency planning. UNEP IE has developed the *APELL - Awareness and Preparedness for Emergencies at Local Level - Programme*, including the publication of handbooks and other documents.

- Site remediation and liability;

Many governments are now requiring by law that companies clean up sites that have been contaminated by leakage of chemicals.

- Environmental auditing;

Auditing is a periodic review of environmental performance and is not confined to verifying compliance to regulations. Full environmental auditing is still not required under law, and is regarded as an internal tool.

- International conventions;

Through signature and ratification, members of a convention signify their commitment to the convention's goals, which are implemented through national legislation. Important conventions for industry include:

- * UN Framework Convention on Climate Change
- * Montreal Protocol on Substances that Deplete the Ozone Layer
- * London Convention on the Dumping of Waste at Sea
- * Basel Convention on the Transboundary Movement of Hazardous Wastes
- * London Guidelines on International Trade in Chemicals

iii. Main pollutants in effluents from the iron and steel industry

For many operations within the steelmaking complex, water is used in direct contact with toxic or foul materials. For example, cooling and purification of coke oven gas can cause pollutants, such as tar oils, ammonia, phenols, cyanides, thiocyanides and thiosulphates, to enter the water system. The water requires extensive purification before it can be recycled or discharged to the environment or to local sewage treatment stations.

Cooling and cleaning waters in contact with gases from the blast furnace can

become laden with cyanides, fluorides, lead and zinc compounds and dust particles. Water from fume cooling and cleaning in steelmaking furnaces may carry particulates, fluorides and zinc compounds.

In continuous casting, scale and lubricating oil and hydraulic fluids can contaminate the water. Similar materials are problems found in the effluents from rolling mills and from scarfing operations.

Direct cooling waters require treatment to prevent fungal or bacterial growths, and corrosion in water circuits. The chemicals used must be removed before the water is released to the environment.

**National environmental standards
for the iron and steel industry**

Headline: Federal effluent standards in Brazil

1. Descriptors

- 1.1. Country: Brazil
- 1.2. Industry: All industries including iron and steel industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, temperature, settleable matter, mineral oil, vegetable oil, floating matter, ammonium, total arsenic, barium, boron, cadmium, cyanide, lead, copper, chromium (VI), chromium (III), stannum, phenol index, soluble iron, fluorine, soluble manganese, mercury, nickel, silver, selenium, sulphate, sulphite, zinc, organo-phosphoric and total carbonates, carbon sulphate, trichloroethane, chloroform, tetrachlorocarbon, dichloroethane, organo-chloric compounds not listed above

2. Legal reference

- 2.1. Title of the law/regulations: Conselho Nacional do Meio Ambiente. Resolução No. 20, 18 June 1986, Article 21
- 2.2. Date issued: 18 June 1986
- 2.3. Date amended: -

3. Summary

parameter	limit	unit
pH	5-9	-
temperature	40	°C
settleable matter	1	ml/l
mineral oil	20	mg/l
vegetable oil	50	mg/l
floating matter	absent	-
ammonium	5.0	mg/l
total arsenic	0.5	mg/l
barium	5.0	mg/l
boron	5.0	mg/l
cadmium	0.2	mg/l
cyanide	0.2	mg/l
lead	0.5	mg/l
copper	1.0	mg/l
chromium (VI)	0.5	mg/l
chromium (III)	2.0	mg/l
stannum	4.0	mg/l
phenol index	0.5	mg/l
soluble iron	15.0	mg/l
fluorine	10.0	mg/l
soluble manganese	1.0	mg/l
mercury	0.01	mg/l
nickel	2.0	mg/l
silver	0.1	mg/l
selenium	0.05	mg/l
sulphate	1.0	mg/l
sulphite	1.0	mg/l
zinc	5.0	mg/l

organo-phosphoric compounds and total carbonates	1.0	mg/l
carbon sulphate	1.0	mg/l
trichloroethane	1.0	mg/l
chloroform	1.0	mg/l
tetrachlorocarbon	1.0	mg/l
dichloroethane	1.0	mg/l
organo-chloric compounds	0.05	mg/l
not listed above		

4. Citation

- 4.1. Title of document: "Legislação Federal Controle da poluição ambiental"
- 4.2. Publisher: CETESB - Companhia de Tecnologia de Saneamento Ambiental
- 4.3. Date published: 1993
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Legislation/regulation in Canada

1. Descriptors

- 1.1. Country: Canada
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: -

2. Legal reference

- 2.1. Title of the law/regulations: -
2.2. Date issued: -
2.3. Date amended: -

3. Summary

In Canada the responsibility for environmental protection is shared between the Federal Government and the Provinces. The Federal Government has legislation for the protection of fish and for the control of air emissions significantly hazardous to human health.

On the water pollution side, with regard to the iron and steel industry, there are no Federal regulations to control wastewater discharges and Provincial environmental protection agencies have not developed specific regulatory packages for the industry. However, depending upon the Provincial agency involved, Canadian mills may be under general requirements based on water quality criteria and may also be subject to specific conditions as part of an operating permit or license. These operating permits or licenses are site specific, are drafted to comply with local objectives for water quality and are renewable after a certain period.

4. Citation

- 4.1. Title of document: "Brief Overview of Canadian Iron and Steel Industry", UNEP Environmental Consultative Committee on the Iron and Steel Industry, Geneva 28-29 March 1985
4.2. Publisher: Industry and Environment Office, United Nations Environment Programme
4.3. Date published: 1985
4.4. Publisher reference code: -
4.5. IEO library code: 50.2/CCIS

Headline: Effluent standards for surface treatment in France

1. Descriptors

- 1.1. Country: France
- 1.2. Industry: Iron and steel industry (surface treatment)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, total iron, chromium (VI), chromium (III), nickel, zinc, cadmium, copper

2. Legal reference

- 2.1. Title of the law/regulations: Circulaire du 4 juillet 1972 relative aux traitements de surface
- 2.2. Date issued: 1972
- 2.3. Date amended: -

3. Summary

parameter	standard (*1)				unit
	1A	1B	2	3	
pH	6.5-8.5	6.5-8.5	6.5-8.5	5.5-9.5	-
total iron	0.5	0.5-1	1-1.5	-	mg/l
chromium (VI)	0.7-0.9(*2)	0.7-0.9(*2)	0.7-0.9(*2)	0.1	mg/l
chromium	-	-	-	1	mg/l
nickel	0.02-0.15	0.02-0.15	0.02-0.15	1	mg/l
zinc	0.05-0.15	0.05-0.15	0.05-0.15	1	mg/l
cadmium	0.02-0.05	0.02-0.05	0.02-0.05	1	mg/l
copper	0.05-0.1	0.05-0.1	0.05-0.1	1	mg/l

- *1) Depending on the quality standard of recipient:
 - Quality 1A - Water of special quality.
 - Quality 1B - Water appropriate for fish life and reproduction, usage as drinking water after mechanical treatment (sedimentation, filtration).
 - Quality 2 - Water appropriate for fish life and usage as drinking water after a more expansive treatment.
 - Quality 3 - Water appropriate for fish life, but not for the usage as drinking water.
- *2) Coefficient of charge.
- *3) According to the "Circulaire du 4 juillet 1972 relative aux traitements de surface".

4. Citation

- 4.1. Title of document: "Environmental Control Technology in the Steel Industry - Seminar Proceedings Rio de Janeiro, June 1985"

4.2. Publisher: Committee on Environmental Affairs,
International Iron and Steel Institute

4.3. Date published: 1986

4.4. Publisher reference code: -

4.5. IEO library code: 50.2/SOSP

Headline: Wastewater emission limits in Germany

1. Descriptors

- 1.1. Country: Germany
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: COD, lead, hydrocarbon

2. Legal reference

- 2.1. Title of the law/regulations: -
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

parameter	limit	unit
COD	100	mg/l
lead	0.5	mg/l
hydrocarbon	10	mg/l

4. Citation

- 4.1. Title of document: "Water - Resource and Opportunity"
- 4.2. Publisher: Centre for Exploitation of Science and Technology
- 4.3. Date published: 1992
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: Standards and regulations for iron and steel industry in Hong Kong

1. Descriptors

- 1.1. Country: Hong Kong
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: -

2. Legal reference

- 2.1. Title of the law/regulations: Water Pollution Control Ordinance
2.2. Date issued: -
2.3. Date amended: -

3. Summary

In the water aspect, under the Water Pollution Control Ordinance, the iron and steel basic industry is one of the trades that have to be licenced if the owners of these processes wish to discharge trade effluents into areas designated as Water Control Zones. Similar to the air pollution side, the Authority in granting licence, will lay down certain terms or conditions so as to ensure that the water quality objective will not be exceeded and that the beneficial uses for the receiving waters will be protected.

4. Citation

- 4.1. Title of document: "Present Situation and Future Prospects of Environmental Management in the Iron and Steel Industry in Hong Kong", from the proceedings of "United Nations Environment Programme (UNEP) / The Japan Iron and Steel Federation (JISF) Regional (Asia and Pacific) Training Workshop on Environmental Management in the Iron and Steel Industry in Co-operation with MITI, AOTS and IISI, 14-18 December 1987"
- 4.2. Publisher: Industry and Environment Office, United Nations Environment Programme
- 4.3. Date published: 1988
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/UJPR

Headline: The tolerance limits for discharge of treated effluents into inland water courses in India

1. Descriptors

- 1.1. Country: India, local (Visakhapatnam Steel Project)
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: TSS, pH, temperature, BOD, oil & grease, phenolic compounds, cyanides, thiocyanates, sulphides, COD, fluorides, cadmium, arsenic, chromium (VI), copper, lead, mercury, nickel, zinc, free ammonia, ammoniacal nitrogen

2. Legal reference

- 2.1. Title of the law/regulations: Environment Protection Act
- 2.2. Date issued: 1986
- 2.3. Date amended: -

3. Summary

The typical tolerance limits for discharge of treated effluents into inland water courses stipulated by the State Pollution Control Board of Andhra Pradesh for Visakhapatnam Steel Project are given in the following table:

parameter	limit	unit
TSS	100	mg/l
pH	5.5-9.0	-
temperature	40	°C
BOD	30	mg/l
oil and grease	10	mg/l
phenolic compounds	1.0	mg/l
cyanides (as CN)	0.2	mg/l
thiocyanates	1.0	mg/l
sulphides	2.0	mg/l
COD	250	mg/l
fluorides (as F)	2.0	mg/l
cadmium (as Cd)	2.0	mg/l
arsenic (as As)	0.2	mg/l
chromium (VI) (as Cr)	0.1	mg/l
copper (as Cu)	3.0	mg/l
lead (as Pb)	0.1	mg/l
mercury (as Hg)	0.01	mg/l
nickel (as Ni)	3.0	mg/l
zinc (as Zn)	5.0	mg/l
free ammonia	1.5	mg/l
ammoniacal nitrogen	50	mg/l

4. Citation

- 4.1. Title of document: "Environmental Management in the Iron and Steel Industry - Present Situation and Future Prospects in India", from the proceedings of "United Nations Environment

Programme (UNEP) / The Japan Iron and Steel Federation (JISF) Regional (Asia and Pacific) Training Workshop on Environmental Management in the Iron and Steel Industry in Co-operation with MITI, AOTS and IISI, 14-18 December 1987"

4.2. Publisher:

Industry and Environment Office, United Nations Environment Programme

4.3. Date published:

1988

4.4. Publisher reference code:

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4.5. IEO library code:

50.2/UJPR

Headline: Effluent quality standard for iron and steel industry in Indonesia

1. Descriptors

- 1.1. Country: Indonesia
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameter: Temperature, TDS, TSS, pH, dissolved iron, dissolved manganese, barium, copper, zinc, chromium (VI), total chromium, cadmium, mercury, lead, tin, arsenic, selenium, nickel, cobalt, cyanide, sulphide, fluoride, free chlorine, free ammonia, nitrate, nitrite, BOD, COD, MBAS, phenol, organic oil, mineral oil, radioactivity, pesticide including PCB

2. Legal reference

- 2.1. Title of the law/regulations: Decree of the State Minister for Population and Environment, Number: KEP-03/MENKLH/II/1991
- 2.2. Date issued: 1990
- 2.3. Date amended: -

3. Summary

Though aforementioned decree does not yet contain the effluent quality standard for the iron and steel industry, the governor shall stipulate alternative standards guided by the following;

parameter	standard category				unit
	I	II	III	IV	
temperature	35	38	40	45	°C
TDS	1500	2000	4000	5000	mg/l
TSS	100	200	400	500	mg/l
pH	6-9	6-9	6-9	5-9	-
dissolved iron	1	5	10	20	mg/l
dissolved manganese	0.5	2	5	10	mg/l
barium	1	2	3	5	mg/l
copper	1	2	3	5	mg/l
zinc	2	5	10	15	mg/l
chromium (VI)	0.05	0.1	0.5	1	mg/l
total chromium	0.1	0.5	1	2	mg/l
cadmium	0.01	0.05	0.1	0.5	mg/l
mercury	0.001	0.002	0.005	0.01	mg/l
lead	0.03	0.1	1	2	mg/l
tin	1	2	3	5	mg/l
arsenic	0.05	0.1	0.5	1	mg/l
selenium	0.01	0.05	0.5	1	mg/l
nickel	0.1	0.2	0.5	1	mg/l
cobalt	0.2	0.4	0.6	1	mg/l
cyanide	0.02	0.05	0.5	1	mg/l
sulphide (H ₂ S)	0.01	0.05	0.1	1	mg/l
fluoride	1.5	2	3	5	mg/l

free chlorine	0.5	1	2	5	mg/l
free ammonia (NH ₃ -N)	0.02	1	5	20	mg/l
nitrate (NO ₃ -N)	10	20	30	50	mg/l
nitrite	0.06	1	3	5	mg/l
BOD	20	50	150	300	mg/l
COD	40	100	300	600	mg/l
MBAS	0.5	5	10	15	mg/l
phenol	0.01	0.5	1	2	mg/l
organic oil	1	5	10	20	mg/l
mineral oil	1	10	50	100	mg/l
radioactivity (*2)					
pesticide including PCB (*3)					

- *1) It is not allowable to dilute the effluent with water from a water source in order to meet the maximum waste water quality standard requirement.
The waste concentration is the allowable maximum, except pH which also includes the minimum concentration.
- *2) Radioactivity content according to the prevailing regulations.
- *3) Pesticide waste originating from formulating or producing industries, and consumers using them for agricultural and other purposes, shall not pollute water.

4. Citation

- 4.1. Title of document: "Decree of the State Minister for Population and Environment, Number: KEP-03/MENKLH/II/1991, RE: Effluent Quality Standards for Existing Operations"
- 4.2. Publisher: BAPEDAL: Environmental Impact Management Agency, with EMDI: Environmental Management Development in Indonesia
- 4.3. Date published: 1990
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Effluent regulations for iron and steel industry in West Java Province in Indonesia

1. Descriptors

- 1.1. Country: Indonesia, local (West Java)
1.2. Industry: All industries including Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: Temperature, soluble solid, SS, pH, ferro content, manganese, copper, zinc, chromium (VI), cadmium, total mercury, arsenic, selenium, cyanide, sulphide, fluoride, chlorine, chloride, sulphate, free ammonia, nitrate, nitrite, BOD, COD, methylene blue active compounds, phenol, vegetable oil, mineral oil, radioactivity

2. Legal reference

- 2.1. Title of the law/regulations: Decree of the Governor of West Java No. 660.31/SK/694-BPKMD/82
2.2. Date issued: -
2.3. Date amended: -

3. Summary

West Java is the Province where P.T Krakatau Steel is located and the governor issued the following criteria list on condition of waste water.

parameter	limit			unit
	I	II	III	
I. physical				
temperature	35	38	40	°C
soluble solid	1000	3000	4000	mg/l
SS	100	200	400	mg/l
II. chemical				
pH	6-9	5-9	4.5-9.5	-
ferro content (as Fe)	5	7	9	mg/l
manganese (as Mn)	0.5	1	3	mg/l
copper (as Cu)	0.5	2	3	mg/l
zinc (as Zn)	5	7	10	mg/l
chromium (VI) (as Cr)	0.1	1	3	mg/l
cadmium (as Cd)	0.01	0.1	0.5	mg/l
total mercury (as Hg)	0.005	0.01	0.05	mg/l
lead (as Pb)	0.1	0.5	1	mg/l
arsenic (as As)		0.05	0.3	0.7 mg/l
selenium (as Se)	0.01	0.05	0.5	mg/l
cyanide (as CN)	0.02	0.05	0.5	mg/l
sulphide (as S)	0.01	0.05	0.1	mg/l
fluoride (as F)	1.5	2	3	mg/l
chlorine (as Cl ₂)	1	2	3	mg/l
chloride	600	1000	1500	mg/l
sulphate (as SO ₄)	400	600	800	mg/l

free ammonia (as NH ₃ -N)	0.5	1	2	mg/l
nitrate (as NO ₃ -N)	10	20	30	mg/l
nitrite (as NO ₂ -N)	1	.2	3	mg/l
BOD	20	100	300	mg/l
COD	40	200	500	mg/l
methylene blue active compounds	0.5	1	3	mg/l
phenol	0.002	0.05	0.5	mg/l
vegetable oil	10	30	70	mg/l
mineral oil	10	30	70	mg/L
radioactivity (*1)	-	-	-	-

*1) According to the prevailing regulations.

4. Citation

- 4.1. Title of document: Direct Communications with PT Krakatau Steel on the Environmental Effluent Standards in Indonesia.
- 4.2. Publisher: -
- 4.3. Date published: Sep. 1994
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: Legislation for water pollution in Italy.

1. Descriptors

- 1.1. Country: Italy
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: -

2. Legal reference

- 2.1. Title of the law/regulations: The Law No.319 of May 13, 1976, The Law No.650 of December 24, 1979
2.2. Date issued: -
2.3. Date amended: -

3. Summary

The general law of May 13, 1976 - No.319 - provides for water pollution control with defined standards for waste waters.

Subsequent minor modifications occurred as per law No. 650 of December 24, 1979.

The law involves all waste water discharges outcoming from private or public installations, both residential or industrial.

According to the law, different standards are established with reference to the destination of waste waters, whether in artificial sewers or into lakes, rivers, streams, sea.

Two detailed technical tables, respectively related to the above possible discharge alternatives, list the maximum allowable concentrations (in general mg/l) of some fifty parameters to the receiving bodies.

The industry in general, and the iron and steel industry particularly, must refer to the general law such defined.

4. Citation

- 4.1. Title of document: "Work on Environmental Matters Undertaken by Italian Authorities", UNEP Environmental Consultative Committee on the Iron and Steel Industry, Geneva 28-29 March 1985
4.2. Publisher: Industry and Environment Office, United Nations Environment Programme
4.3. Date published: 1985
4.4. Publisher reference code: -
4.5. IEO library code: 50.2/CCIS

Headline: Effluent standards in Italy

1. Descriptors

- 1.1. Country: Italy
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: pH, settleable matter, arsenic, cadmium, chromium (III), chromium (VI), iron, manganese, mercury, nickel, lead, copper, tin, zinc

2. Legal reference

- 2.1. Title of the law/regulations: Norme per la tutela della acqua dal'inquinamento.
2.2. Date issued: -
2.3. Date amended: -

3. Summary

Standards from the regulations for effluent waters.

parameter	standard	unit
pH	5.5-9.5	-
settleable matter	0.5	mg/l
arsenic	0.5	mg/l
cadmium	0.02	mg/l
chromium (III)	2	mg/l
chromium (IV)	0.2	mg/l
iron	2	mg/l
manganese	2	mg/l
mercury	0.005	mg/l
nickel	2	mg/l
lead	0.2	mg/l
copper	0.1	mg/l
tin	10	mg/l
zinc	0.5	mg/l

4. Citation

- 4.1. Title of document: "Environmental Control Technology in the Steel Industry - Seminar Proceedings Rio de Janeiro, June 1985"
4.2. Publisher: Committee on Environmental Affairs, International Iron and Steel Institute
4.3. Date published: 1986
4.4. Publisher reference code: -
4.5. IEO library code: 50.2/SOSP

Headline: National effluent standards for substances related to the protection of human health

1. Descriptors

- 1.1. Country: Japan
- 1.2. Industry: All industries including iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Cadmium and its compounds, cyanide compounds, organic phosphorus compounds, lead and its compounds, chromium (VI) compounds, arsenic and its compounds, total mercury, alkyl mercury compounds, PCB, dichloromethane, carbontetrachloride, 1,2-dichloroethane, 1,1-dichloroethylene, cis-1,2-dichloroethylene, 1,1,1-trichloroethane, 1,1,2-trichloroethane, trichloroethylene, tetrachloroethylene, 1,3-dichloropropylene, thiram (TMTD), simazine (CAT), thiobencarb, benzene, selenium

2. Legal reference

- 2.1. Title of the law/regulations: Water Pollution Control Law, Cabinet Order for Establishment of the Effluent Standard (No.54-1993)
- 2.2. Date issued: 21 June 1971
- 2.3. Date amended: 1974, 1975, 1976, 1977, 1981, 1985, 1986, 1993

3. Summary

category	parameter	limit	unit
-	cadmium and its compounds	0.1	mg/l
-	cyanide compounds	1	mg/l
-	org. phosphorus compounds (*1)	1	mg/l
-	lead and its compounds	0.1	mg/l
-	chromium (VI) compounds	0.5	mg/l
-	arsenic and its compounds	0.1	mg/l
-	total mercury	0.005	mg/l
-	alkyl mercury compounds	Not detectable (*2)	
-	PCB	0.003	mg/l
-	dichloromethane	0.2	mg/l
-	carbontetrachloride	0.02	mg/l
-	1,2-dichloroethane	0.04	mg/l
-	1,1-dichloroethylene	0.2	mg/l
-	cis-1,2-dichloroethylene	0.4	mg/l
-	1,1,1-trichloroethane	3	mg/l
-	1,1,2-trichloroethane	0.06	mg/l
-	trichloroethylene	0.3	mg/l
-	tetrachloroethylene	0.1	mg/l
-	1,3-dichloropropylene	0.02	mg/l
-	thiram (TMTD)	0.06	mg/l
-	simazine (CAT)	0.03	mg/l
-	thiobencarb	0.2	mg/l
-	benzene	0.1	mg/l
-	selenium	0.1	mg/l

*1) Organic phosphorus compounds; parathion, methyl parathion,

methyldimethon and EPN only.

- *2) Not detectable; the substance must be below the level detectable by the method designed by the Director General of the Environment Agency.
- *3) Prefectures may set more stringent standards.

4. Citation

<u>4.1. Title of document:</u>	Cabinet Order for Establishment of the Effluent Standard (No.54-1993)
<u>4.2. Publisher:</u>	Environment Agency, Government of Japan
<u>4.3. Date published:</u>	27 Dec. 1993
<u>4.4. Publisher Reference Code:</u>	-
<u>4.5. IEO Library Code:</u>	-

Headline: National effluent standards for substances related to the protection of living environment

1. Descriptors

- 1.1. Country: Japan
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, BOD, COD, SS, oil and fat, phenols, copper, zinc, iron, manganese, chromium, fluorine, coliform, nitrogen, phosphorus

2. Legal reference

- 2.1. Title of the law/regulations: Water Pollution Control Law
- 2.2. Date issued: 21 June 1971
- 2.3. Date amended: 1974, 1975, 1976, 1977, 1981, 1985, 1986

3. Summary

category	parameter	limit	unit	
all industries	pH	5.8 - 8.6 (*3)		
	pH	5.0 - 9.0 (*4)		
	BOD (*5)	160	mg/l	
		120	mg/l (daily average)	
	COD	160 (*6)	mg/l	
		120 (*6)	mg/l (daily average)	
	SS	200	mg/l	
		150	mg/l (daily average)	
	N-hexan extracts	5	mg/l (mineral oil)	
	N-hexan extracts	30	mg/l (animal fat and vegetal oil)	
	phenols	5	mg/l	
	copper	3	mg/l	
	zinc	5	mg/l	
	dissolved iron	10	mg/l	
	dissolved manganese	10	mg/l	
	chromium	2	mg/l	
	fluorine	15	mg/l	
	coliform	3000	/ml (daily average)	
	nitrogen (*8)		120	mg/l
			60	mg/l (daily average)
phosphorus (*8)		16	mg/l	
iron and steel industry	COD	8	mg/l (daily average)	
		10-40 (*7)	mg/l	

- *1) The above standards are applied to the effluents from industrial plants whose volume of effluents is not less than 50 m³ per day.
- *2) Prefectures may set more stringent standards.
- *3) For effluents discharged into public water bodies other than coastal

seas.

- *4) For effluents discharged into coastal seas.
- *5) The BOD value is applied effluents discharged to public waters other than coastal seas and lakes.
- *6) The COD(Mn) value is applied only to effluents discharged into coastal waters and lakes.
- *7) This COD value is applied only to effluents which can affect the water qualities in Tokyo Bay, Ise Bay or Seto Inland Sea areas currently under 'areawide total pollutant load control'.
- *8) The phosphorus and nitrogen standards are applicable to lakes and reservoirs in which problems due to eutrophication may occur. Also covered are rivers flowing into the lakes and reservoirs.

4. Citation

- | | |
|---------------------------------------|--|
| <u>4.1. Title of document:</u> | "Quality of the Environment in Japan 1989" |
| <u>4.2. Publisher:</u> | Environment Agency, Government of Japan |
| <u>4.3. Date published:</u> | 1991 |
| <u>4.4. Publisher Reference Code:</u> | - |
| <u>4.5. IEO Library Code:</u> | - |

Headline: Recommendations on effluent standards for Nitrogen and Phosphorus in Japan

1. Descriptors

- 1.1. Country: Japan
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Nitrogen, Phosphorus

2. Legal reference

- 2.1. Title of the law/regulations: Water Pollution Control Law (1971), The Recommendations on the Environmental Quality Standards and So Forth Regarding Nitrogen and Phosphorus in the Coastal Seas Returned by the Central Council on Environmental Pollution Control (1993.5.6.)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

category	parameter	standard		unit
		maximum	daily ave.	
all industries	nitrogen	120	60	mg/l
	phosphorus	16	8	mg/l
steel making and steel rolling with stainless nitric acid pickling, and steel manufacturing with stainless nitric acid pickling (without steel making)	nitrogen	700 (*2)	400 (*2)	mg/l
	phosphorus	16	8	mg/l

*1) The above effluent standards are applicable to the bays or inland seas in danger of eutrophication problems, including Public Water Areas flowing into them. The bay or inland sea is in principal considered as in danger of eutrophication problems when its 'Closeness Index' is more than 1. The 'Closeness Index' is defined as below:

$$\text{Closeness Index} = rS \cdot Db / We \cdot De$$

where rS : square root of the area
 Db : maximum depth of the bay
 We : width of the bay entrance
 De : maximum depth of the bay entrance

*2) Interim standards for specific industries, at most for 5 years.

4. Citation

- 4.1. Title of document: The Recommendations on the Environmental Quality Standards and So Forth Regarding Nitrogen and Phosphorus in the Coastal Seas
- 4.2. Publisher: The Central Council on Environmental Pollution Control, Government of Japan
- 4.3. Date published: May 6, 1993
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Industrial effluent standards in Korea

1. Descriptors

- 1.1. Country: Korea
- 1.2. Industry: All industries including iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, temperature, colour, BOD, COD, SS, oil & grease, phenols, cyanide, arsenic, cadmium, copper, organic phosphorus compounds, lead, chromium, chromium (VI), mercury, dissolved manganese, zinc, fluoride, PCB, E. coli., dissolved iron, trichloroethylene, tetrachloroethylene, total nitrogen, total phosphorus, anionic surfactant

2. Legal reference

- 2.1. Title of the law/regulations: Environmental Protection Act
- 2.2. Date issued: -
- 2.3. Date amended: 1986

3. Summary

The industrial effluent regulations in Korea are classified mainly by the area to which industrial facilities discharge their effluents. Moreover, the important control parameters such as BOD, COD and SS are further sub-classified by the daily maximum discharge rate as can be seen in the footnote.

1) Effluent standard for all industries in Korea till the end of 1995.

parameter	limit				unit
	(*1)	(*2)	(*3)	(*4)	
pH	5.8-8.6	5.8-8.6	5.8-8.6	5.8-8.6	-
temperature	40	40	40	40	°C
colour (*9)	200	300	400	400	unit
BOD (*5)	50	80	100	30	mg/l
BOD (*6)	50	100	150	30	mg/l
COD (*5)	50	80	100	50	mg/l
COD (*6)	50	100	150	50	mg/l
SS (*5)	50	80	100	70	mg/l
SS (*6)	50	100	150	70	mg/l
oil & grease (N-hexan extracts)					
- mineral oil	1	5	5	5	mg/l
- animal fat/ vegetal oil	5	30	30	30	mg/l
phenols	1	3	3	3	mg/l
arsenic	0.1	0.5	0.5	0.5	mg/l
cyanide	0.2	1	1	1	mg/l
cadmium	0.02	0.1	0.1	0.1	mg/l
chromium(total)	0.5	2	2	2	mg/l
chromium (VI)	0.1	0.5	0.5	0.5	mg/l
copper	0.5	3	3	3	mg/l
lead	0.2	1	1	1	mg/l

dissolved manganese	2	10	10	10	mg/l
mercury	ND(*7)	0.005	0.005	0.005	mg/l
zinc	1	5	5	5	mg/l
fluoride	3	15	15	15	mg/l
organic phosphorus compounds	0.2	1	1	1	mg/l
PCB	ND	0.003	0.003	0.003	mg/l
E. coli.	100	3000	3000	3000	(*8)
dissolved iron	2	10	10	10	mg/l
trichloroethylene	0.06	0.3	0.3	0.3	mg/l
tetrachloroethylene	0.02	0.1	0.1	0.1	mg/l

2) Announced to be revised from the first January of 1996.

parameter	limit				unit
	(*1)	(*2)	(*3)	(*4)	
BOD (*5)	30	60	80	30	mg/l
BOD (*6)	40	80	120	30	mg/l
COD (*5)	40	70	90	40	mg/l
COD (*6)	50	90	130	40	mg/l
SS (*5)	30	60	80	30	mg/l
SS (*6)	40	80	120	30	mg/l
total nitrogen	30	60	60	60	mg/l
total phosphorus	4	8	8	8	mg/l
anionic surfactant	3	5	5	5	mg/l

- *1) For Clean Area (protected area).
- *2) For Area I (for potable use after filtration).
- *3) For Area II (for potable use after advanced treatment).
- *4) For Special Area (the final treatment facilities of industrial combinat).
- *5) For facilities with total waste water discharge rates higher than 3000 m³/day.
- *6) For facilities with total waste water discharge rates lower than 3000 m³/day.
- *7) Not detectable; the substance must be below the level detectable.
- *8) MPH/100ml.
- *9) Only for textile industry.

4. Citation

- 4.1. Title of document: Direct communication with Korea Research Institute of Chemical Technology on the environmental effluent standard for industrial facilities in Korea.
- 4.2. Publisher: -
- 4.3. Date published: June 1994
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: The standards of Kwangyang Steel Works in Korea

1. Descriptors

- 1.1. Country: Korea Local (Kwangyang Steel Works)
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: COD, SS, oil, lead, phenol, CN, zinc, copper, cadmium, chromium (VI)

2. Legal reference

- 2.1. Title of the law/regulations: The Ordinance of the Ministry of Health and Social Affairs, Environment Conservation Law (1991), The Enforcement Regulation of Environment Conservation Law (1992)
2.2. Date issued: -
2.3. Date amended: -

3. Summary

The Kwangyang Works are sited in a coastal area but face a gulf so that some water pollution is expected, according to Environmental Impact Assessment.

Therefore, Kwangyang Steel Works operate due to the self-imposed emission standards more stringent than the national standards and installed Environmental Monitoring System to secure the ability to control the environment quality.

parameter	national std.	company std.	unit
COD	100	25	mg/l
SS	100	25	mg/l
oil	5	2	mg/l
lead	5	1	mg/l
phenol	5	1	mg/l
CN	1	0.5	mg/l
zinc	5	5	mg/l
copper	3	3	mg/l
cadmium	0.1	0.1	mg/l
chromium (VI)	0.5	0.5	mg/l

4. Citation

- 4.1. Title of document: "Country Report of the Republic of Korea", from the proceedings of "United Nations Environment Programme (UNEP) / The Japan Iron and Steel Federation (JISF) Regional (Asia and Pacific) Training Workshop on Environmental Management in the Iron and Steel Industry in Co-operation with MITI, AOTS and IISI, 14-18 December 1987"
4.2. Publisher: Industry and Environment Office, United

4.3. Date published: 1988
4.4. Publisher reference code: -
4.5. IEO library code: 50.2/UJPR

Headline: Sewage and industrial effluent regulations in Malaysia

1. Descriptors

- 1.1. Country: Malaysia
- 1.2. Industry: All industries including iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: pH, temperature, BOD, COD, SS, oil & grease, phenols, cyanide, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, zinc, boron, chloride, sulphide.

2. Legal reference

- 2.1. Title of the law/regulations: Environmental Quality Act 1974
 Environmental Quality (Sewage and Industrial Effluents) Regulations 1978
- 2.2. Date issued: 1978
- 2.3. Date amended: -

3. Summary

category	parameter	limit			unit
		(*1)	(*2)	(*3)	
all industries	pH	6.0-9.0	5.5-9.0	5.0-9.0	-
	temperature	40	40	45	°C
	BOD	20	50	400	mg/l
	COD	50	100	1000	mg/l
	SS	50	100	400	mg/l
	oil & grease	ND (*4)	10	100	mg/l
	phenols	0.001	1	5	mg/l
	cyanide	0.05	0.1	2	mg/l
	arsenic	0.05	0.1	2	mg/l
	cadmium	0.01	0.02	1	mg/l
	chromium(III)	0.2	1	10	mg/l
	chromium (VI)	0.05	0.05	2	mg/l
	copper	0.2	1	10	mg/l
	iron	1	5	50	mg/l
	lead	0.1	0.5	2	mg/l
	manganese	0.2	1	10	mg/l
	mercury	0.005	0.05	0.1	mg/l
	nickel	0.2	1	10	mg/l
	tin	0.2	1	10	mg/l
	zinc	1	1	10	mg/l
boron	1	4	-	mg/l	
free chlorine	1	2	-	mg/l	
sulphide	0.50	0.50	2	mg/l	

- *1) For discharge into any inland waters within the catchment areas.
- *2) For discharge into any other inland waters.
- *3) For discharge other than (*1) or (*2).

*4) Not detectable; the substance must be below the level detectable.

4. Citation

<u>4.1. Title of document:</u>	Direct Communication with Malaysian Director-General of Environment on Environmental Quality Standards in Malaysia
<u>4.2. Publisher:</u>	Ministry of Science, Technology and Environment, Malaysia
<u>4.3. Date published:</u>	April 1990
<u>4.4. Publisher Reference Code:</u>	-
<u>4.5. IEO Library Code:</u>	-

Headline: Effluent regulations related to Hoogovens Group in the Netherlands

1. Descriptors

- 1.1. Country: The Netherlands, local (Hoogovens Group)
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: Zinc, lead, cadmium, mercury, chromium, dust

2. Legal reference

- 2.1. Title of the law/regulations: The Pollution of the Surface Waters Act
2.2. Date issued: -
2.3. Date amended: -

3. Summary

The Pollution of the Surface Waters Act lays down general guidelines for emissions in water. Norms governing these emissions are contained in the policy program prepared by the Minister of Transport and Waterways. This program states that there should be a relation between the purpose for which the receiving water is used and the standards concerned.

As regards the water into which Hoogovens Group are discharging (i.e. part of the North Sea) the required standard is equal to the so-called basic quality standard. This means that the following figures apply:

parameter	standard	unit
zinc	200	µg/l
lead	50	µg/l
cadmium	2.5	µg/l
mercury	0.5	µg/l
chromium	50	µg/l

Hoogovens have a permit for discharging wastewater. In addition to the general conditions, this permit also contains regulations for each part of the manufacturing activities. The emissions are subject to marginal values (see the following table, figures are stated in kgs/day).

category	parameter	standard
blast furnace	zinc	40
	lead	10
	chromium	-
	dust	-
BOF 1	zinc	14
	lead	-
	chromium	-
	dust	720
BOF 2	zinc	35
	lead	-
	chromium	-

	dust	2100
cooling water (seven systems)	zinc	-
	lead	-
	chromium	20
	dust	-

Moreover, the permit stipulates that a sanitation scheme has to be prepared and introduced for all the waste water; all this in relation to the quality of the receiving water. In regard to the so-called black-listed compounds or compounds that are accepted as such, like mercury, cadmium and chromium (VI), there is an emission policy whilst applying BTM. The further cleaning up will therefore also now apply to mercury and chromium.

4. Citation

- 4.1. Title of document: "Control of Heavy Metals", from
"Environmental Control Technology in the
Steel Industry - Seminar Proceedings Rio
de Janeiro, June 1985"
- 4.2. Publisher: Committee on Environmental Affairs,
International Iron and Steel Institute
- 4.3. Date published: 1986
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/SOSP

Headline: National environmental quality standards for municipal and liquid industrial effluents in Pakistan

1. Descriptors

- 1.1. Country: Pakistan
- 1.2. Industry: All industries including iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Temperature, pH, BOD, COD, TSS, TDS, oil & grease, phenol compounds, chloride, fluoride, cyanide, anionic detergents, sulphate, sulphide, ammonia, pesticides, herbicides, fungicides and insecticides, cadmium, chromium, copper, lead, mercury, selenium, nickel, total toxic metals, zinc, arsenic, barium, iron, manganese, boron, chlorine

2. Legal reference

- 2.1. Title of the law/regulations: Notification of National Environmental Quality Standards for Municipal and Liquid Industrial Effluents, 1993; Environmental Protection Ordinance, 1983
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

parameter	standard	unit
temperature	40	°C
pH	6.0-10.0	-
BOD	80	mg/l
COD	150	mg/l
TSS	150	mg/l
TDS	3500	mg/l
oil & grease	10	mg/l
phenol compounds (as phenol)	0.1	mg/l
chloride (as Cl)	1000	mg/l
fluoride (as F)	20	mg/l
cyanide (as CN)	2	mg/l
anionic detergents (as MBAS) (*2)	20	mg/l
sulphate (SO ₄)	600	mg/l
sulphide (S)	1.0	mg/l
ammonia (NH ₃)	40	mg/l
pesticides, herbicides fungicides and insecticides	0.15	mg/l
cadmium (*3)	0.1	mg/l
chromium (III & VI) (*3)	1.0	mg/l
copper (*3)	1.0	mg/l
lead (*3)	0.5	mg/l
mercury (*3)	0.01	mg/l
selenium (*3)	0.5	mg/l
nickel (*3)	1.0	mg/l
silver	1.0	mg/l
total toxic metals	2.0	mg/l

zinc	5	mg/l
arsenic	1.0	mg/l
barium	1.5	mg/l
iron	2.0	mg/l
manganese	1.5	mg/l
boron	6.0	mg/l
chlorine	1.0	mg/l

- *1) Assuming minimum dilution 1:10 on discharge, Lower ratio would attract progressively stringent standards to be determined by the Federal Environmental Protection Agency.
- *2) Assuming surfactant as biodegradable. MBAS means Modified Benzene Alkyl Sulphates.
- *3) Subject to total toxic metals discharge.

4. Citation

- 4.1. Title of document: The Gazette of Pakistan, Extra, Aug. 29, 1993 Part II
- 4.2. Publisher: Environment and Urban Affair Division, Government of Pakistan
- 4.3. Date published: 1993
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: Standards and regulations for iron and steel industry in the Philippines

1. Descriptors

- 1.1. Country: The Philippines
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Barium, cadmium, copper, chromium (VI), dissolved iron, lead, lithium, dissolved manganese, total mercury, molybdenum, nickel, selenium, silver, zinc, arsenic, boron, beryllium, free chlorine, cyanide, fluoride, polychlorinated biphenyl, color, pH, temperature, SS, phenol, BOD, oil & grease, detergent

2. Legal reference

- 2.1. Title of the law/regulations: -
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

The following table presents the effluent standards as implemented.

parameter	standard	unit
I. metal and toxic substances		
barium	5	mg/l
cadmium	0.1	mg/l
copper	1	mg/l
chromium (VI)	0.1	mg/l
dissolved iron	20	mg/l
lead	0.5	mg/l
lithium	1	mg/l
dissolved manganese	5	mg/l
total mercury	0.002	mg/l
molybdenum	0.5	mg/l
nickel	1	mg/l
selenium	1	mg/l
silver	1	mg/l
zinc	10	mg/l
arsenic	0.5	mg/l
boron	-	-
beryllium	1	mg/l
free chloride	1	mg/l
cyanide	0.5	mg/l
fluoride	10	mg/l
polychlorinated biphenyl	0.003	mg/l
II chemical parameters		
colour	200	platinum cobalt unit
pH	5-9	-
temperature	40	°C
SS	200	mg/l

phenols	1	mg/l
BOD	250	mg/l
oil & grease	15	mg/l
detergent	10	mg/l

4. Citation

- 4.1. Title of document: "Iron and Steel Industry in the Republic of the Philippine", from the proceedings of "United Nations Environment Programme (UNEP) / The Japan Iron and Steel Federation (JISF) Regional (Asia and Pacific) Training Workshop on Environmental Management in the Iron and Steel Industry in Co-operation with MITI, AOTS and IISI, 14-18 December 1987"
- 4.2. Publisher: Industry and Environment Office, United Nations Environment Programme
- 4.3. Date published: 1988
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/UJPR

Headline: Allowable limits for trade effluent discharge to sewer, watercourse and controlled watercourse in Singapore

1. Descriptors

- 1.1. Country: Singapore
- 1.2. Industry: All industries including iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Temperature, colour, pH, BOD, COD, TSS, TDS, chloride, sulphate, sulphide, cyanide, detergents, oil & grease, arsenic, barium, tin, iron, beryllium, boron, manganese, phenolic compounds, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, zinc, total metals, chlorine, phosphate, calcium, magnesium, nitrate

2. Legal reference

- 2.1. Title of the law/regulations: The Water Pollution Control and Drainage Act; Trade Effluent Regulations (TER), 1976
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

parameter	limits (*1)			unit
	I	II	III	
temperature	45	45	45	°C
colour	-	7	7	(*2)
pH	6-9	6-9	6-9	-
BOD	400	50	20	mg/l
COD	600	100	60	mg/l
TSS	400	50	30	mg/l
TDS	3000	2000	1000	mg/l
chloride (as chloride ion)	1000	600	400	mg/l
sulphate (as SO ₄)	1000	500	200	mg/l
sulphide (as sulphur)	1	0.2	0.2	mg/l
cyanide (as CN)	2	0.1	0.1	mg/l
detergents (*3)	30	15	5	mg/l
oil & grease	60	10	5	mg/l
arsenic	5	1	0.05	mg/l
barium	10	5	5	mg/l
tin	10	10	5	mg/l
iron (as Fe)	50	20	1	mg/l
beryllium	5	0.5	0.5	mg/l
boron	5	5	0.5	mg/l
manganese	10	5	0.5	mg/l
phenolic compounds (as phenol)	0.5	0.2	nil	mg/l
toxic metals				
cadmium	1	0.1	0.01	mg/l
chromium (III and VI)	5	1	0.05	mg/l
copper	5	0.1	0.1	mg/l
lead	5	0.1	0.1	mg/l
mercury	0.5	0.05	0.001	mg/l

nickel	10	1	0.1	mg/l
selenium	10	0.5	0.01	mg/l
silver	5	0.1	0.1	mg/l
zinc	10	1	0.5	mg/l
metals in total (*4)	10	1	0.5	mg/l
chlorine (free)	-	1	1	mg/l
phosphate (as PO ₄)	-	5	2	mg/l
calcium (as Ca)	-	200	150	mg/l
magnesium (as Mg)	-	200	150	mg/l
nitrate (as NO ₃)	-	-	20	mg/l

- *1) I : Sewer.
 II : Watercourse.
 III: Controlled Watercourse; it means a water course from which potable water supplied by PUB under the Public Utilities Act is obtained but does not include a water course from which water is pumped into a main of the PUB.
- *2) Lovibond units.
- *3) Linear alkylate sulphonate as methylene blue active substances.
- *4) The concentration of toxic metal shall not exceed the limits as shown, individually or in total.

4. Citation

- 4.1. Title of document: "Annual Report 1993"
- 4.2. Publisher: Pollution Control Department, Ministry of Environment, Singapore
- 4.3. Date published: 1994
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Emission standards for industrial effluents in South Africa

1. Descriptors

- 1.1. Country: South Africa, local
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: pH, mineral content, SS, natrium, arsenic, lead, chromium, zinc, copper, iron, manganese, cadmium, mercury, selenium, heavy metals (total)

2. Legal reference

- 2.1. Title of the law/regulations: -
2.2. Date issued: -
2.3. Date amended: -

3. Summary

Regional standards for industrial effluents - 5 April 1962.

parameter	standard		unit
	catchment areas (*1) draining into rivers	other rivers	
pH	5.5-7.5	5.5-9.5	-
mineral content	< 15% (*2,3)	< 75 mSm ⁻¹ (25°C) (*2,3) < 300 mSm ⁻¹ (25°C)	-
SS	10		mg/l
natrium	< 50		mg/l
arsenic	0.1		mg/l
lead	0.1		mg/l
chromium	0.1		mg/l
zinc	0.3		mg/l
copper	0.02		mg/l
iron	0.3		mg/l
manganese	0.4		mg/l
cadmium		0.05	mg/l
mercury		0.02	mg/l
selenium		0.05	mg/l
heavy metals (*4) (total)		1	mg/l

- *1) Also rivers and portion of rivers described in the Schedule.
 *2) Additional to the water intake.
 *3) Limited also by usage requirements.
 *4) Excluded Zn-content.

4. Citation

- 4.1. Title of document: "Environmental Control Technology in the Steel Industry - Seminar Proceedings Rio de Janeiro, June 1985"
- 4.2. Publisher: Committee on Environmental Affairs, International Iron and Steel Institute
- 4.3. Date published: 1986
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/SOSP

Headline: Effluent conditions in the latest permits in Sweden.

1. Descriptors

- 1.1. Country: Sweden
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Recycling rate of waters, zinc, lead, total cyanide, free cyanide, SS, filtration, flotation, oil

2. Legal reference

- 2.1. Title of the law/regulations: -
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

The conditions in the latest permits issued by the National Licencing Board:

category	limitation		
blast furnace	> 95 % recycling dewatering of the sludge effluent: floatation		
	zinc	0.5	mg/l
	lead	0.2	mg/l
	total cyanide	1.0	mg/l
	free cyanide	0.1	mg/l
	SS	10	mg/l
hot rolling mills, waste water	> 95 % recycling effluent: filtration/flotation		
	oil	5	mg/l
	SS	10	mg/l
cold rolling mills	> 95 % recycling effluent: ultra-filtration		
	oil	5	mg/l
LD plant gascleaning water	effluent: SS	3	kg/day
continuous casting	>95 % recycling effluent: filtration/flotation		
	SS	10	mg/l
pickling plant	acid regeneration neutralization and filtration of rinsing water and used pickling acids		

4. Citation

- 4.1. Title of document: Direct Communications with the Swedish Environmental Protection Agency on

Environmental Discharge Standards for Iron
and Steel Industry in Sweden

4.2. Publisher: -
4.3. Date published: Oct. 1994
4.4. Publisher reference code: -
4.5. IEO library code: -

Headline: Effluent standards in Sweden.

1. Descriptors

- 1.1. Country: Sweden
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Recirculation degree, zinc, lead, cyanides, SS, oils, chromium, chromium (VI), nickel, copper, cadmium, iron, lead, zinc, mineral oil

2. Legal reference

- 2.1. Title of the law/regulations: The Environmental Protection Act
- 2.2. Date issued: 1969
- 2.3. Date amended: 1994

3. Summary

There are no general guidelines for the emission from the steel industry. For new or major changes in existing plants the recommendations from Paris Commission are considered.

category	emission limit or guideline		
all plants	the recirculation degree must be 90-100 %		
blast furnace, gas cleaning water system	zinc	0.5	mg/l
	lead	0.2	mg/l
	cyanides	1.0	mg/l or kg/day
	SS	10	mg/l
rolling mill	SS	5-10	mg/l
	oils	3-5	mg/l
pickling lines	chromium	0.2-1.0	mg/l
	chromium (VI)	0.1-0.3	mg/l
	nickel	0.2-1.0	mg/l
	copper	0.2-0.5	mg/l
	cadmium	0.005	mg/l
	iron	0.5-1.0	mg/l
	lead	0.2-0.5	mg/l
	zinc	0.5	mg/l
	SS	10	mg/l
	mineral oil	5	mg/l

4. Citation

- 4.1. Title of document: Direct Communications with Jernkontoret on Environmental Discharge Standards for Iron and Steel Industry in Sweden
- 4.2. Publisher: -

4.3. Date published: Jan. 1995

4.4. Publisher reference code: -

4.5. IEO library code: -

Headline: Effluent standards in Taiwan

1. Descriptors

- 1.1. Country: Taiwan
- 1.2. Industry: Iron and steel industry (metal industry)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Temperature, pH, BOD, COD, TSS, transparency, nitrate-N, oil & grease, anion active agent, arsenic, cadmium, chromium, copper, iron, lead, manganese, mercury, nickel, selenium, silver, zinc, boron, sulphide, fluoride, formaldehyde, phenols, cyanide, PCB, organic phosphorus compounds, amino-formate compounds, aldrin, dieldrin, endrin, lindane, DDT isomers, herbicides, endosulfan, toxaphene, pentachlorophenol and its compounds, pentachloronitrobenzene

2. Legal reference

- 2.1. Title of the law/regulations: Effluent Standards (1987) under the Water Pollution Control Law (1974)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

category	parameter	standard	unit
all industries	temperature	35 (*3)	°C
	pH	5.0-9.0	-
	nitrate-N	100	mg/l
	oil & grease (N-hexan extracts)	10	mg/l (mineral oil)
		30	mg/l (animal fat and vegetal oil)
	fluoride	15.0	mg/l
	phenols	5.0	mg/l
	anion active agent	10.0	mg/l
	cyanide	1.0	mg/l
	arsenic	0.5	mg/l
	cadmium	0.1	mg/l
	total chromium	2.0	mg/l
	chromium (VI)	0.5	mg/l
	copper	3.0	mg/l
	dissolved iron	10.0	mg/l
	dissolved manganese	10.0	mg/l
	lead	1.0	mg/l
	mercury (total)	0.005	mg/l
	mercury (organic)	not detectable	-
	nickel	1.0	mg/l
	selenium	0.5	mg/l
	silver	0.5	mg/l
	zinc	5.0	mg/l
	boron	1.0	mg/l
	sulphide	1.0	mg/l
	formaldehyde	3.0	mg/l
	PCB	not detectable	-
	total organic		

	phosphorus compounds	0.5	mg/l
	total amino-formate compounds	0.5	mg/l
	aldrin, dieldrin	not detectable	-
	endrin	not detectable	-
	lindane	not detectable	-
	heptachlor isomers	not detectable	-
	DDT isomers	not detectable	-
	herbicides	1.0	mg/l
	endosulfan	0.03	mg/l
	toxaphene	0.005	mg/l
	pentachlorophenol and its compounds	not detectable	
	pentachloro-nitrobenzene	0.05	mg/l
metal industry	COD	200	mg/l
	TSS	200	mg/l

- *1) Regional authorities may set more stringent standards depending on local conditions.
- *2) Not detectable; the substance must be below the level detectable by the method designed by the government.
- *3) When effluent is discharged directly into coastal water, the surface temperature difference between the effluent and the receiving water should not exceed 4 °C in the area within 500 m from the outlet.

4. Citation

- 4.1. Title of document: Environmental Protection Laws in Taiwan
- 4.2. Publisher: Japan Environmental Management Association for Industry (JEMAI)
- 4.3. Date published: 1991
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Industrial effluent standards in Thailand

1. Descriptors

- 1.1. Country: Thailand
- 1.2. Industry: All industries including iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: BOD, SS, dissolved solids, temperature, colour & odour, pH, permaganate value, sulphide, cyanide, tar, oil & grease, formaldehyde, phenol and cresols, free chlorine, insecticides, radioactivity, zinc, chromium, arsenic, copper, mercury, cadmium, barium, selenium, lead, nickel, manganese, silver

2. Legal reference

- 2.1. Title of the law/regulations: Notification of the Ministry of Industry No. 12, B.E. 2525 (1982) issued under the Factory Act B.E. 2521 (1978), published in the Royal Government Gazette, Vol. 99, Part 33, dated March 5, B.E. 2525 (1982); Notification of the Ministry of Industry No. 10, B.E. 2521 (1978) issued under the Factory Act B.E. 2521, published in the Royal Government Gazette, Vol. 95, Part 132, dated November 28, B.E. 2521 (1978).
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

parameter	standard	unit	remark
BOD	20-60	mg/l	
SS	depend on dilution ratios of wastewater ratio and receiving water		
	30	mg/l	ratio 1/8 to 1/150
	60	mg/l	1/151 to 1/300
	150	mg/l	1/301 to 1/500
dissolved solids	max. 2000 or under office's consideration but not more than 5000	mg/l	not higher than receiving water dissolved solids. 5000 mg/l if salinity of receiving water is higher than 2000 mg/l
temperature	40.0	°C	
colour & odour	not objectionable	-	
pH	5-9	-	
permaganate value	60	mg/l	
sulphide as H ₂ S	1.0	mg/l	
cyanide as HCN	0.2	mg/l	
tar	none	mg/l	
oil & grease	5.0	mg/l	

formaldehyde	1.0	mg/l
phenol and cresols	1.0	mg/l
free chlorine	1.0	mg/l
insecticides	none	mg/l
radioactivity	none	Becquerel/l
heavy metals		
zinc	5.0	mg/l
chromium	0.5	mg/l
arsenic	0.25	mg/l
copper	1.0	mg/l
mercury	0.005	mg/l
cadmium	0.03	mg/l
barium	1.0	mg/l
selenium	0.2	mg/l
lead	0.2	mg/l
nickel	0.2	mg/l
manganese	5.0	mg/l
silver	-	mg/l

- *1) A licensee for operation of a factory who does not comply with this notification shall be punished by fine not exceeding ten thousand baht.

4. Citation

- 4.1. Title of document: Direct communication with Asian Institute of Technology on the Effluent Standards in Thailand
- 4.2. Publisher: -
- 4.3. Date published: July 1994
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: Water pollution control regulation in Turkey

1. Descriptors

- 1.1. Country: Turkey
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameter: COD, oil & grease, settleable solids, lead, iron, zinc, pH, SS, cadmium, mercury, copper, total chromium, chromium (VI), arsenic, aluminium, nickel, total cyanide

2. Legal reference

- 2.1. Title of the law/regulations: Water Pollution Control Regulation
- 2.2. Date issued: 1988
- 2.3. Date amended: -

3. Summary

The purpose of the regulation is to lay down the legal and technical foundations required for defining the principles of water pollution control in order to protect Turkey's groundwater potential for all kinds of use, to ensure its optimum use, and to prevent water pollution in harmony with the targets of economic and social development. For industrial waste water discharge standards, industries have been grouped into 16 sectors according to their type of production. These standards do not apply to plants in those sectors which operate on an entirely dry base. Waste water discharge standards in the iron and steel industry are given in the following tables.

1) Waste water standards for general iron and steel production

parameter	standard		unit
	instant sample	composite sample (2hr)	
COD	-	100	mg/l t
oil & grease	-	20	mg/l t
settleable solids	0.5	-	mg/l t
lead	-	0.5	mg/l t
iron	-	20	mg/l t
zinc	-	4	mg/l t
pH	6-9	6-9	-

2) Waste water standards for iron and steel processing plants

parameter	processing unit	standard		unit
		instant sample	composite sample (2hr)	
COD	foundries	-	200	mg/l t
	pipe production	-	200	mg/l t
	can/canister	-	200	mg/l t
	production	-	200	mg/l t

settleable solids	foundries	0.8	-	mg/l t
lead	lead treatment and pickling units	-	2	mg/l t

3) Metal industry (ferrous and non-ferrous metal foundries and casting plants)

parameter	standard		unit
	composite sample (2hr)	composite sample (24hr)	
COD	200	150	mg/l t
SS	150	100	mg/l t
oil & grease	20	10	mg/l t
cadmium	1	-	mg/l t
mercury	-	0.5	mg/l t
zinc	5	-	mg/l t
lead	2	-	mg/l t
copper	2	-	mg/l t
iron	10	-	mg/l t
total chromium	2	-	mg/l t
chromium (VI)	0.5	-	mg/l t
arsenic	0.1	-	mg/l t
aluminium	3	2	mg/l t
nickel	3	-	mg/l t
total cyanide (CN ⁻)	0.1	-	mg/l t
pH	6-9	6-9	-

Effluent water quality and fulfillment of the other conditions requested by the administration for each discharge within the framework of the regulations must be ensured. The major offices of the metropolitan municipalities within the boundaries of the large cities and the local representation of the central government outside such boundaries are authorised to grant permission for waste water discharges of all types into a receiving water body in line with the decisions and opinions of the local environment boards. Permission for direct discharges into a receiving water body in areas in which such media are grossly polluted shall be granted only upon the consent of the Prime Ministry Under-secretariat for Environment.

4. Citation

- 4.1. Title of document: "Organization and Management of environmental Policies and Strategies for the Iron and Steel Industry in Turkey", from the Publication of "Environmental Control in the Steel Industry - Papers Prepared for the 1991 ENCOSTEEL World Conference"
- 4.2. Publisher: International Iron and Steel Institute
- 4.3. Date published: 1992
- 4.4. Publisher reference code: ISBN 3-514-00456-0
- 4.5. IEO library code: -

Headline: Water release levels in UK

1. Descriptors

- 1.1. Country: UK
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: Cadmium

2. Legal reference

- 2.1. Title of the law/regulations: The Environmental Protection Act (1990), Chief Inspector's Sector guidance Note IRP 2, the Metal Industry Sector (1991).
2.2. Date issued: -
2.3. Date amended: -

3. Summary

<u>category</u>	<u>parameter</u>	<u>limit</u>	<u>unit</u>	<u>remark</u>
iron and steel	total cadmium and its compounds as cadmium	0.05	mg/l	monthly average

4. Citation

- 4.1. Title of document: "Chief Inspector's Guidance to Inspectors", Environmental Protection Act 1990, Industry Sector Guidance Note IPR 2, Metal Industry Sector
4.2. Publisher: HMSO
4.3. Date published: 1991
4.4. Publisher reference code: -
4.5. IEO library code: -

Headline: BPT effluent limitations for iron and steel industry in USA

1. Descriptors

- 1.1. Country: USA
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: TSS, oil & grease, ammonia-N, cyanide, phenol (4AAP), pH, chromium, nickel, lead, zinc, naphthalene, tetrachloroethylene

2. Legal reference

- 2.1. Title of the law/regulations: The Clean Water Act (1977)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

Effluent limitations representing the degree of effluent reduction attainable by the application of the best practicable control technology currently available (BPT).

category	parameter	limitation (Kg/kg of product)	
		max. 1 day	30 day ave. (*5)

A. cokemaking

a. by-product cokemaking - iron and steel	TSS	0.253	0.131
	O&G	0.0327	0.0109
	ammonia-N	0.274	0.0912
	cyanide	0.0657	0.0219
	phenol(4AAP)	0.00451	0.00150
	pH	6.0-9.0	6.0-9.0

1. Increased loadings, not to exceed 11 percent of the above limitations are allowed for by-product coke plants which have wet desulfurization systems but only to the extent such systems generate an increased effluent volume.

2. Increased loadings, not to exceed 27 percent of the above limitations, are allowed for by-product coke plants which include indirect ammonia recovery systems but only to the extent that such systems generate an increased effluent volume.

b. by-product cokemaking - merchant	TSS	0.270	0.140
	O&G	0.0349	0.0116
	ammonia-N	0.292	0.0973
	cyanide	0.0701	0.0234
	phenol(4AAP)	0.00481	0.00160
	pH	6.0-9.0	6.0-9.0

1. Increased loadings, not to exceed 10 percent of the above limitations are allowed for by-product coke plants which have wet desulfurization systems but only to the extent such systems generate an increased effluent volume.

2. Increased loadings, not to exceed 25 percent of the above limitations, are allowed for by-product coke plants which include indirect ammonia recovery systems but only to the extent that such systems generate an increased effluent volume.

B. sintering	TSS	0.0751	0.0250
	O&G	0.0150	0.00501
	pH	6.0-9.0	6.0-9.0
C. iron-making			
a. iron blast furnace	TSS	0.0782	0.0260
	ammonia-N	0.161	0.0537
	cyanide	0.0234	0.00782
	phenol(4AAP)	0.00626	0.00210
	pH	6.0-9.0	6.0-9.0
b. ferromanganese blast furnace	TSS	0.313	0.104
	ammonia-N	1.29	0.429
	cyanide	0.469	0.156
	phenol(4AAP)	0.0624	0.0208
	pH	6.0-9.0	6.0-9.0
D. steelmaking			
a. basic oxygen furnace steelmaking - semi-wet; electric arc furnace steelmaking - semi-wet	(no discharge of wastewater pollutants to navigable waters)		
b. basic oxygen furnace steelmaking - wet- suppressed combustion	TSS	0.0312	0.0104
	pH	6.0-9.0	6.0-9.0
c. basic oxygen furnace steelmaking - wet open combustion open hearth furnace steelmaking - wet; electric arc furnace steelmaking - wet	TSS	0.0687	0.0229
	pH	6.0-9.0	6.0-9.0
E. vacuum degassing	TSS	0.0156	0.00521
	pH	6.0-9.0	6.0-9.0
F. continuous casting	TSS	0.0780	0.0260
	O&G	0.0234	0.0078
	pH	6.0-9.0	6.0-9.0
G. hot forming			
a. primary mills, carbon and specialty			
1. without scarfing	TSS	0.150	0.0561
	O&G	0.0374	-
	pH	6.0-9.0	6.0-9.0
2. with scarfing	TSS	0.221	0.0830
	O&G	0.0553	-
	pH	6.0-9.0	6.0-9.0
b. section mills			
1. carbon	TSS	0.357	0.134
	O&G	0.0894	-
	pH	6.0-9.0	6.0-9.0
2. specialty	TSS	0.224	0.0841
	O&G	0.0561	-
	pH	6.0-9.0	6.0-9.0
c. flat mills			

1. hot strip and sheet mills, carbon and specialty	TSS O&G pH	0.427 0.107 6.0-9.0	0.160 - 6.0-9.0
2. carbon plate mills	TSS O&G pH	0.227 0.0568 6.0-9.0	0.0851 - 6.0-9.0
3. specialty plate mills	TSS O&G pH	0.100 0.0250 6.0-9.0	0.0376 - 6.0-9.0
d. pipe and tube mills, carbon and specialty	TSS O&G pH	0.212 0.0530 6.0-9.0	0.0795 - 6.0-9.0
H. salt bath descaling			
a. salt bath descaling, oxidizing			
1. batch, sheet and plate	TSS chromium nickel pH	0.204 0.00292 0.00263 6.0-9.0	0.0876 0.00117 0.000876 6.0-9.0
2. batch, rod and wire	TSS chromium nickel pH	0.123 0.00175 0.00158 6.0-9.0	0.0526 0.000701 0.000526 6.0-9.0
3. batch, pipe and tube	TSS chromium nickel pH	0.496 0.00709 0.00638 6.0-9.0	0.213 0.00284 0.00213 6.0-9.0
4. continuous	TSS chromium nickel pH	0.0964 0.00138 0.00124 6.0-9.0	0.0413 0.000551 0.000413 6.0-9.0
b. salt bath descaling, reducing			
1. batch	TSS cyanide chromium nickel pH	0.0949 0.00102 0.00136 0.00122 6.0-9.0	0.0407 0.000339 0.000542 0.000407 6.0-9.0
2. continuous	TSS cyanide chromium nickel pH	0.532 0.00569 0.00759 0.00683 6.0-9.0	0.228 0.00190 0.00304 0.00228 6.0-9.0
I. acid pickling			
a. sulfuric acid pickling (spent acid solutions and rinse waters)			
1. rod, wire and coil	TSS O&G (*1) lead zinc pH	0.0818 0.0350 0.000526 0.000701 6.0-9.0	0.0350 0.0117 0.000175 0.000234 6.0-9.0
2. bar, billet and bloom	TSS O&G (*1) lead zinc pH	0.0263 0.0113 0.000169 0.000225 6.0-9.0	0.0113 0.00375 0.0000563 0.0000751 6.0-9.0

3. strip, sheet and plate	TSS	0.0526	0.0225
	O&G (*1)	0.0225	0.00751
	lead	0.000338	0.000113
	zinc	0.000451	0.000150
	pH	6.0-9.0	6.0-9.0
4. pipe, tube and other products	TSS	0.146	0.0626
	O&G (*1)	0.0626	0.0209
	lead	0.000939	0.000313
	zinc	0.00125	0.000417
	pH	6.0-9.0	6.0-9.0
5. fume scrubbers	TSS	5.72 (*2)	2.45 (*2)
	O&G (*1)	2.45 (*2)	0.819 (*2)
	lead	0.0368 (*2)	0.0123 (*2)
	zinc	0.0491 (*2)	0.0164 (*2)
	pH	6.0-9.0	6.0-9.0

The above limitations shall be applicable to each fume scrubber associated with a sulfuric acid pickling operation.

b. hydrochloric acid pickling (spent acid solutions and rinse waters)

1. rod, wire and coil	TSS	0.0143	0.0613
	O&G (*1)	0.0613	0.0204
	lead	0.000920	0.000307
	zinc	0.00123	0.000409
	pH	6.0-9.0	6.0-9.0
2. strip, sheet and plate	TSS	0.0818	0.0350
	O&G (*1)	0.0350	0.0117
	lead	0.000526	0.000175
	zinc	0.000701	0.000234
	pH	6.0-9.0	6.0-9.0
3. pipe, tube and other products	TSS	0.298	0.128
	O&G (*1)	0.128	0.0426
	lead	0.00192	0.000638
	zinc	0.00255	0.000851
	pH	6.0-9.0	6.0-9.0
4. fume scrubbers	TSS	5.72 (*2)	2.45 (*2)
	O&G (*1)	2.45 (*2)	0.819 (*2)
	lead	0.0368 (*2)	0.0123 (*2)
	zinc	0.0491 (*2)	0.0164 (*2)
	pH	6.0-9.0	6.0-9.0

The above limitations shall be applicable to each fume scrubber associated with a hydrochloric acid pickling operation.

5. acid regeneration (absorber vent scrubber)	TSS	38.2 (*2)	16.3 (*2)
	O&G (*1)	16.3 (*2)	5.45 (*2)
	lead	0.245 (*2)	0.0819 (*2)
	zinc	0.327 (*2)	0.109 (*2)
	pH	6.0-9.0	6.0-9.0

The above limitations shall be applicable to the absorber vent scrubber wastewater associated with a hydrochloric acid regeneration plants.

c. combination acid pickling (spent acid solution and rinse waters)

1. rod, wire and coil	TSS	0.149	0.0638
	O&G (*1)	0.0638	0.0213
	chromium	0.00213	0.000852
	nickel	0.00192	0.000638
	pH	6.0-9.0	6.0-9.0

2. bar, billet and bloom	TSS	0.0672	0.0288
	O&G (*1)	0.0288	0.0960
	chromium	0.000960	0.000384
	nickel	0.000864	0.000288
	pH	6.0-9.0	6.0-9.0
3. strip, sheet and plate - continuous	TSS	0.438	0.188
	O&G (*1)	0.188	0.0626
	chromium	0.00626	0.00250
	nickel	0.00563	0.00188
	pH	6.0-9.0	6.0-9.0
4. strip, sheet and plate - batch	TSS	0.134	0.0576
	O&G (*1)	0.0576	0.0192
	chromium	0.00192	0.000768
	nickel	0.00173	0.000576
	pH	6.0-9.0	6.0-9.0
5. pipe, tube and other products	TSS	0.225	0.0964
	O&G (*1)	0.0964	0.0322
	chromium	0.00322	0.00129
	nickel	0.00289	0.000964
	pH	6.0-9.0	6.0-9.0
6. fume scrubber	TSS	5.72(*2)	2.45(*2)
	O&G (*1)	2.45(*2)	0.819(*2)
	chromium	0.0819(*2)	0.0327(*2)
	nickel	0.0735(*2)	0.0245(*2)
	pH	6.0-9.0	6.0-9.0

The above limitations shall be applicable to each fume scrubber associated with a combination acid pickling operation.

J. cold forming

a. cold rolling mills

1. recirculation - single stand	TSS	0.00125	0.000626	
	O&G	0.000522	0.000209	
	chromium (*3)	0.0000209	0.0000084	
	lead	0.0000094	0.0000031	
	nickel (*3)	0.0000188	0.0000063	
	zinc	0.0000063	0.0000021	
	naphthalene	0.0000021	-	
	tetrachloro-ethylene	0.0000031	-	
	pH	6.0-9.0	6.0-9.0	
	2. recirculation - multiple stands	TSS	0.00626	0.00313
		O&G	0.00261	0.00104
chromium (*3)		0.000104	0.0000418	
lead		0.0000469	0.0000156	
nickel (*3)		0.0000939	0.0000313	
zinc		0.0000313	0.0000104	
naphthalene		0.0000104	-	
tetrachloro-ethylene		0.0000156	-	
pH		6.0-9.0	6.0-9.0	
3. combination		TSS	0.0751	0.0376
		O&G	0.0313	0.0125
	chromium (*3)	0.00125	0.000501	
	lead	0.000563	0.000188	
	nickel (*3)	0.00113	0.000376	
	zinc	0.000376	0.000125	
	naphthalene	0.000125	-	
	tetrachloro-ethylene	0.000188	-	
	pH	6.0-9.0	6.0-9.0	
	4. direct application - single stand	TSS	0.0225	0.0113
		O&G	0.00939	0.00376
chromium (*3)		0.000376	0.000150	

	lead	0.000169	0.0000563
	nickel (*3)	0.000338	0.000113
	zinc	0.000113	0.0000376
	naphthalene	0.0000376	-
	tetrachloro- ethylene	0.0000563	-
	pH	6.0-9.0	6.0-9.0
5. direct application - multiple stands	TSS	0.100	0.0501
	O&G	0.0417	0.0167
	chromium (*3)	0.00167	0.000668
	lead	0.000751	0.000250
	nickel (*3)	0.00150	0.000501
	zinc	0.000501	0.000167
	naphthalene	0.000167	-
	tetrachloro- ethylene	0.000250	-
	pH	6.0-9.0	6.0-9.0
b. cold worked pipe and tube			
1. using water	TSS	0.00125	0.000626
	O&G	0.000522	0.000209
	chromium (*3)	0.0000209	0.0000084
	lead	0.0000094	0.0000031
	nickel (*3)	0.0000188	0.0000063
	zinc	0.0000063	0.0000021
	pH	6.0-9.0	6.0-9.0
2. using oil solutions	TSS	0.00125	0.000626
	O&G	0.000522	0.000209
	chromium (*3)	0.0000209	0.0000084
	lead	0.0000094	0.0000031
	nickel (*3)	0.0000188	0.0000063
	zinc	0.0000063	0.0000021
	naphthalene	0.0000021	-
	tetrachloro- ethylene	0.0000031	-
	pH	6.0-9.0	6.0-9.0
K. alkaline cleaning			
a. batch	TSS	0.0730	0.0313
	O&G	0.0313	0.0104
	pH	6.0-9.0	6.0-9.0
b. continuous	TSS	0.102	0.0438
	O&G	0.0438	0.0146
	pH	6.0-9.0	6.0-9.0
L. hot coating			
a. galvanizing, terne coating, and other coatings			
1. strip, sheet and miscellaneous products	TSS	0.175	0.0175
	O&G	0.0751	0.0250
	lead	0.00113	0.000376
	zinc	0.00150	0.000500
	chromium ⁶⁺ (*4)	0.000150	0.0000501
	pH	6.0-9.0	6.0-9.0
b. galvanizing and other coatings			
1. wire products and fasteners	TSS	0.701	0.300
	O&G	0.300	0.100
	lead	0.00451	0.00150
	zinc	0.00601	0.00200
	chromium ⁶⁺ (*4)	0.000600	0.000200
	pH	6.0-9.0	6.0-9.0
c. fume scrubbers	TSS	38.1(*2)	16.3(*2)
	O&G	16.3(*2)	5.45(*2)

lead	0.245(*2)	0.0819(*2)
zinc	0.327(*2)	0.109(*2)
chromium ⁶⁺ (*4)	0.0327(*2)	0.0109(*2)
pH	6.0-9.0	6.0-9.0

The above limitations shall be applicable to each fume scrubber associated with any of the coating operations specified.

-
- *1) The limitations for oil and grease shall be applicable when acid pickling wastewaters are treated with cold rolling wastewaters.
 - *2) Kilograms per day.
 - *3) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.
 - *4) The limitations for hexavalent chromium shall apply only to galvanizing operations which discharge wastewaters from the chromate rinse step.
 - *5) max. 1 day : maximum for any 1 day.
30 day ave. : average of daily values for 30 consecutive days.

4. Citation

- 4.1. Title of document: "Code of Federal Regulations, Parts 400 to 424; Revised as of July 1, 1992
- 4.2. Publisher: The Office of the Federal Register, National Archives and Records Administration, USA
- 4.3. Date published: 1992
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: BAT effluent limitations for iron and steel industry in USA

1. Descriptors

- 1.1. Country: USA
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Ammonia-N, cyanide, phenol (4AAP), chromium, nickel, lead, zinc, naphthalene, tetrachloroethylene, benzene, benzo(a)pyrene, TRC

2. Legal reference

- 2.1. Title of the law/regulations: The Clean Water Act (1977)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

Effluent limitations representing the degree of effluent reduction attainable by the application of the best available technology economically achievable (BAT).

category	parameter	limitation (Kg/kg of product)	
		max. 1 day	30 day ave. (*6)

A. cokemaking

a. by-product cokemaking	ammonia-N	0.0543	0.0160
- iron and steel	cyanide	0.00638	0.00351
	phenol(4AAP)	0.0000638	0.0000319
	benzene	0.0000319	-
	naphthalene	0.0000319	-
	benzo(a)pyrene	0.0000319	-

1. Increased loadings, not to exceed 16 percent of the above limitations are allowed for by-product coke plants which have wet desulfurization systems but only to the extent such systems generate an increased effluent volume.
2. Increased loadings, not to exceed 39 percent of the above limitations, are allowed for by-product coke plants which include indirect ammonia recovery systems but only to the extent that such systems generate an increased effluent volume.
3. The following BAT effluent limitations shall be applicable to by-product coke plants with physical chemical treatment systems.

ammonia-N	0.0645	0.0322
phenol(4AAP)	0.0000859	0.0000430
benzene	0.0000215	-
naphthalene	0.0000215	-
benzo(a)pyrene	0.0000215	-

Increased loadings, not to exceed 24 percent of the above limitations, are allowed for by-product coke plants with physical

chemical treatment systems which have wet desulfurization systems but only to the extent that such systems generate an increased effluent volume.

b. by-product cokemaking	ammonia-N	0.0603	0.0177
- merchant	cyanide	0.00709	0.00390
	phenol(4AAP)	0.0000709	0.0000355
	benzene	0.0000355	-
	naphthalene	0.0000355	-
	benzo(a)pyrene	0.0000355	-

1. Increased loadings, not to exceed 15 percent of the above limitations are allowed for by-product coke plants which have wet desulfurization systems but only to the extent such systems generate an increased effluent volume.
2. Increased loadings, not to exceed 35 percent of the above limitations, are allowed for by-product coke plants which include indirect ammonia recovery systems but only to the extent that such systems generate an increased effluent volume.
3. The following BAT effluent limitations shall be applicable to by-product coke plants with physical chemical treatment systems.

	ammonia-N	0.0751	0.0375
	phenol(4AAP)	0.000100	0.0000501
	benzene	0.0000250	-
	naphthalene	0.0000250	-
	benzo(a)pyrene	0.0000250	-

Increased loadings, not to exceed 21 percent of the above limitations, are allowed for by-product coke plants with physical chemical treatment systems which have wet desulfurization systems but only to the extent that such systems generate an increased effluent volume.

c. beehive cokemaking (no discharge of wastewater pollutants to navigable waters)

B. sintering	ammonia-N (*1)	0.0150	0.00501
	cyanide (*1)	0.00300	0.00150
	phenols(4AAP) (*1)	0.000100	0.0000501
	TRC (*1)	0.000250	-
	lead	0.000451	0.000150
	zinc	0.000676	0.000225

C. iron-making

a. iron blast furnace	ammonia-N	0.00876	0.00292
	cyanide	0.00175	0.000876
	phenols(4AAP)	0.0000584	0.0000292
	TRC (*2)	0.000146	-
	lead	0.000263	0.0000876
	zinc	0.000394	0.000131

b. ferromanganese blast furnace [reserved]

D. steelmaking

a. basic oxygen furnace steelmaking - semi-wet; electric arc furnace steelmaking - semi-wet (no discharge of wastewater pollutants to navigable waters)

b. basic oxygen furnace steelmaking - wet-suppressed combustion	lead	0.000188	0.0000626
	zinc	0.000282	0.0000939

c. basic oxygen furnace steelmaking - wet open combustion;	lead	0.000413	0.000138
open hearth furnace	zinc	0.000620	0.000207

steelmaking - wet;
 electric arc furnace
 steelmaking - wet

E. vacuum degassing	lead	0.0000939	0.0000313
	zinc	0.000141	0.0000469
F. continuous casting	lead	0.0000939	0.0000313
	zinc	0.000141	0.0000469

G. hot forming

The Agency has determined that there are not significant quantities of toxic pollutants in hot forming wastewaters after compliance with applicable BPT limitations. Accordingly, since the BPT level of treatment provides adequate control, the Agency is not promulgating more stringent BAT limitations.

H. salt bath descaling

a. salt bath descaling,
 oxidizing

1. batch, sheet and plate	chromium	0.00292	0.00117
	nickel	0.00263	0.000876
2. batch, rod and wire	chromium	0.00175	0.000701
	nickel	0.00158	0.000526
3. batch, pipe and tube	chromium	0.00709	0.00284
	nickel	0.00638	0.00213
4. continuous	chromium	0.00138	0.000551
	nickel	0.00124	0.000413

b. salt bath descaling,
 reducing

1. batch	cyanide	0.00102	0.000339
	chromium	0.00136	0.000542
	nickel	0.00122	0.000407
2. continuous	cyanide	0.00569	0.00190
	chromium	0.00759	0.00304
	nickel	0.00683	0.00228

I. acid pickling

a. sulfuric acid pickling
 (spent acid solutions
 and rinse waters)

1. rod, wire and coil	lead	0.000526	0.000175
	zinc	0.000701	0.000234
2. bar, billet and bloom	lead	0.000169	0.0000563
	zinc	0.000225	0.0000751
3. strip, sheet and plate	lead	0.000338	0.000113
	zinc	0.000451	0.000150
4. pipe, tube and other products	lead	0.000939	0.000313
	zinc	0.00125	0.000417
5. fume scrubbers	lead	0.0368(*3)	0.0123(*3)
	zinc	0.0491(*3)	0.0164(*3)

The above limitations shall be applicable to each fume scrubber associated with a sulfuric acid pickling operation.

b. hydrochloric acid
 pickling (spent acid
 solutions and rinse
 waters)

1. rod, wire and coil	lead	0.000920	0.000307
	zinc	0.00123	0.000409
2. strip, sheet and plate	lead	0.000526	0.000175
	zinc	0.000701	0.000234
3. pipe, tube and other products	lead	0.00192	0.000638
	zinc	0.00255	0.000851
4. fume scrubbers	lead	0.0368(*3)	0.0123(*3)
	zinc	0.0491(*3)	0.0164(*3)

The above limitations shall be applicable to each fume scrubber associated with a hydrochloric acid pickling operation.

5. acid regeneration (absorber vent scrubber)	lead	0.245(*3)	0.0819(*3)
	zinc	0.327(*3)	0.109(*3)

The above limitations shall be applicable to the absorber vent scrubber wastewater associated with a hydrochloric acid regeneration plants.

c. combination acid pickling (spent acid solution and rinse waters)

1. rod, wire and coil	chromium	0.00213	0.000852
	nickel	0.00192	0.000638
2. bar, billet and bloom	chromium	0.000960	0.000384
	nickel	0.000864	0.000288
3. strip, sheet and plate - continuous	chromium	0.00626	0.00250
	nickel	0.00563	0.00188
4. strip, sheet and plate - batch	chromium	0.00192	0.000768
	nickel	0.00173	0.000576
5. pipe, tube and other - products	chromium	0.00322	0.00129
	nickel	0.00289	0.000964
6. fume scrubber	chromium	0.0819(*3)	0.0327(*3)
	nickel	0.0735(*3)	0.0245(*3)

The above limitations shall be applicable to each fume scrubber associated with a combination acid pickling operation.

J. cold forming

a. cold rolling mills

1. recirculation - single stands	chromium (*4)	0.0000209	0.0000084
	lead	0.0000094	0.0000031
	nickel (*4)	0.0000188	0.0000063
	zinc	0.0000063	0.0000021
	naphthalene	0.0000021	-
	tetrachloro-ethylene	0.0000031	-
	2. recirculation - multiple stands	chromium (*4)	0.000104
lead		0.0000469	0.0000156
nickel (*4)		0.0000939	0.0000313
zinc		0.0000313	0.0000104
naphthalene		0.0000104	-
tetrachloro-ethylene		0.0000156	-
3. combination		chromium (*4)	0.00125
	lead	0.000563	0.000188
	nickel (*4)	0.00113	0.000376
	zinc	0.000376	0.000125
	naphthalene	0.000125	-
	tetrachloro-	0.000188	-

ethylene

4. direct application - single stands	chromium (*4)	0.000376	0.000150
	lead	0.000169	0.0000563
	nickel (*4)	0.000338	0.000113
	zinc	0.000113	0.0000376
	naphthalene	0.0000376	-
	tetrachloro-ethylene	0.0000563	-
	ethylene		
5. direct application - multiple stands	chromium (*4)	0.00167	0.000668
	lead	0.000751	0.000250
	nickel (*4)	0.00150	0.000501
	zinc	0.000501	0.000167
	naphthalene	0.000167	-
	tetrachloro-ethylene	0.000250	-
	ethylene		
b. cold worked pipe and tube			
1. using water	chromium (*4)	0.0000209	0.0000084
	lead	0.0000094	0.0000031
	nickel (*4)	0.0000188	0.0000063
	zinc	0.0000063	0.0000021
2. using oil solutions	chromium (*4)	0.0000209	0.0000084
	lead	0.0000094	0.0000031
	nickel (*4)	0.0000188	0.0000063
	zinc	0.0000063	0.0000021
	naphthalene	0.0000021	-
	tetrachloro-ethylene	0.0000031	-
	ethylene		

K. alkaline cleaning

The Agency has determined that there are not significant quantities of toxic pollutants in alkaline cleaning wastewaters after compliance with applicable BPT limitations. Accordingly, since the BPT level of treatment provides adequate control, the Agency is not promulgating more stringent BAT limitations.

L. hot coating

a. galvanizing, terne coating, and other coatings

1. strip, sheet and miscellaneous products scrubbers	lead	0.00113	0.000376
	zinc	0.00150	0.000500
	chromium ⁶⁺ (*5)	0.000150	0.0000501

b. galvanizing and other coatings

1. wire products and fasteners	lead	0.00451	0.00150
	zinc	0.00601	0.00200
	chromium ⁶⁺ (*5)	0.000601	0.000200

c. fume scrubbers

lead	0.0368(*3)	0.0123(*3)
zinc	0.0491(*3)	0.0164(*3)
chromium ⁶⁺ (*5)	0.00490(*3)	0.00163(*3)

The above limitations shall be applicable to each fume scrubber associated with any of the coating operations specified.

-
- *1) The limitations for ammonia-N, cyanide, phenols(4AAP), and TRC shall be applicable only when sintering wastewaters are treated with ironmaking wastewaters.
 - *2) The limitation for TRC shall be applicable only when chlorination of ironmaking wastewater is practiced.
 - *3) Kilograms per day.
 - *4) The limitations for chromium and nickel shall be applicable in lieu

of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.

- *5) The limitations for hexavalent chromium shall apply only to galvanizing operations which discharge wastewaters from the chromate rinse step.
- *6) max. 1 day : maximum for any 1 day.
30 day ave. : average of daily values for 30 consecutive days.

4. Citation

- 4.1. Title of document: "Code of Federal Regulations, Parts 400 to 424, Revised as of July 1, 1992
- 4.2. Publisher: The Office of the Federal Register,
National Archives and Records
Administration, USA
- 4.3. Date published: 1992
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: NSPS effluent limitations for iron and steel industry in USA

1. Descriptors

- 1.1. Country: USA
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: TSS, oil & grease, ammonia-N, cyanide, phenol (4AAP), pH, chromium, nickel, lead, zinc, naphthalene, tetrachloroethylene, benzene, benzo(a)pyrene, TRC

2. Legal reference

- 2.1. Title of the law/regulations: The Clean Water Act (1977)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

New source performance standards (NSPS).

category	parameter	limitation (Kg/kkg of product)	
		max. 1 day	30 day ave. (*7)

A. cokemaking			
a. by-product cokemaking - iron and steel	TSS	0.172	0.0894
	O&G	0.00638	-
	ammonia-N	0.0543	0.0160
	cyanide	0.00638	0.00351
	phenol(4AAP)	0.0000638	0.0000319
	benzene	0.0000319	-
	naphthalene	0.0000319	-
	benzo(a)pyrene	0.0000319	-
	pH	6.0-9.0	6.0-9.0
1. Increased loadings, not to exceed 16 percent of the above limitations are allowed for by-product coke plants which have wet desulfurization systems but only to the extent such systems generate an increased effluent volume.			
2. Increased loadings, not to exceed 39 percent of the above limitations, are allowed for by-product coke plants which include indirect ammonia recovery systems but only to the extent that such systems generate an increased effluent volume.			
b. by-product cokemaking - merchant	TSS	0.192	0.0993
	O&G	0.00709	-
	ammonia-N	0.0603	0.0177
	cyanide	0.00709	0.00390
	phenol(4AAP)	0.0000709	0.0000355
	benzene	0.0000355	-
	naphthalene	0.0000355	-
	benzo(a)pyrene	0.0000355	-
	pH	6.0-9.0	6.0-9.0

1. Increased loadings, not to exceed 15 percent of the above limitations are allowed for by-product coke plants which have wet desulfurization systems but only to the extent such systems generate an increased effluent volume.
2. Increased loadings, not to exceed 35 percent of the above limitations, are allowed for by-product coke plants which include indirect ammonia recovery systems but only to the extent that such systems generate an increased effluent volume.

c. beehive cokemaking	(no discharge of wastewater pollutants to navigable waters)		
B. sintering	TSS	0.0200	0.00751
	O&G	0.00501	-
	ammonia-N (*1)	0.0150	0.00501
	cyanide (*1)	0.00100	0.000501
	phenols(4AAP) (*1)	0.000100	0.0000501
	TRC (*1)	0.000250	-
	lead	0.000451	0.000150
	zinc	0.000676	0.000225
	pH	6.0-9.0	6.0-9.0
C. iron-making			
a. iron blast furnace	TSS	0.0117	0.00438
	O&G	0.00292	-
	ammonia-N	0.00876	0.00292
	cyanide	0.000584	0.000292
	phenols(4AAP)	0.0000584	0.0000292
	TRC (*2)	0.000146	-
	lead	0.000263	0.0000876
	zinc	0.000394	0.000131
	pH	6.0-9.0	6.0-9.0
b. ferromanganese blast furnace	[reserved]		
D. steelmaking			
a. basic oxygen furnace steelmaking - semi-wet; electric arc furnace steelmaking - semi-wet	[reserved]		
b. basic oxygen furnace steelmaking - wet-suppressed combustion	TSS	0.0146	0.00522
	lead	0.000188	0.0000626
	zinc	0.000282	0.0000939
	pH	6.0-9.0	6.0-9.0
c. basic oxygen furnace steelmaking - wet open combustion; electric arc furnace steelmaking - wet	TSS	0.0321	0.0115
	lead	0.000413	0.000138
	zinc	0.000620	0.000207
	pH	6.0-9.0	6.0-9.0
d. open hearth furnace steelmaking - wet	[reserved]		
E. vacuum degassing	TSS	0.00730	0.00261
	lead	0.0000939	0.0000313
	zinc	0.000141	0.0000469
	pH	6.0-9.0	6.0-9.0
F. continuous casting	TSS	0.00730	0.00261
	O&G	0.00313	0.00104
	lead	0.0000939	0.0000313
	zinc	0.000141	0.0000469
	pH	6.0-9.0	6.0-9.0
G. hot forming			
a. primary mills,			

carbon and specialty			
1. without scarfing	TSS	0.0150	0.00563
	O&G	0.00373	-
	pH	6.0-9.0	6.0-9.0
2. with scarfing	TSS	0.0234	0.00876
	O&G	0.00584	-
	pH	6.0-9.0	6.0-9.0
b. section mills			
1. carbon	TSS	0.0334	0.0125
	O&G	0.00834	-
	pH	6.0-9.0	6.0-9.0
2. specialty	TSS	0.0217	0.00813
	O&G	0.00542	-
	pH	6.0-9.0	6.0-9.0
c. flat mills			
1. hot strip and sheet mills, carbon and specialty	TSS	0.0435	0.0163
	O&G	0.0109	-
	pH	6.0-9.0	6.0-9.0
2. carbon plate mills	TSS	0.0234	0.00876
	O&G	0.00584	-
	pH	6.0-9.0	6.0-9.0
3. specialty plate mills	TSS	0.0100	0.00375
	O&G	0.00250	-
	pH	6.0-9.0	6.0-9.0
d. pipe and tube mills, carbon and specialty	TSS	0.0369	0.0138
	O&G	0.00917	-
	pH	6.0-9.0	6.0-9.0
H. salt bath descaling			
a. salt bath descaling, oxidizing			
1. batch, sheet and plate	TSS	0.204	0.0876
	chromium	0.00292	0.00117
	nickel	0.00263	0.000876
	pH	6.0-9.0	6.0-9.0
2. batch, rod and wire	TSS	0.123	0.0526
	chromium	0.00175	0.000701
	nickel	0.00158	0.000526
	pH	6.0-9.0	6.0-9.0
3. batch, pipe and tube	TSS	0.496	0.213
	chromium	0.00709	0.00284
	nickel	0.00638	0.00213
	pH	6.0-9.0	6.0-9.0
4. continuous	TSS	0.0964	0.0413
	chromium	0.00138	0.000551
	nickel	0.00124	0.000413
	pH	6.0-9.0	6.0-9.0
b. salt bath descaling, reducing			
1. batch	TSS	0.0949	0.0407
	cyanide	0.00102	0.000339
	chromium	0.00136	0.000542
	nickel	0.00122	0.000407
	pH	6.0-9.0	6.0-9.0
2. continuous	TSS	0.532	0.228
	cyanide	0.00569	0.00190

chromium	0.00759	0.00304
nickel	0.00683	0.00228
pH	6.0-9.0	6.0-9.0

I. acid pickling

a. sulfuric acid pickling
(spent acid solutions
and rinse waters)

1. rod, wire and coil	TSS	0.0146	0.00626
	O&G (*3)	0.00626	0.00209
	lead	0.0000939	0.0000313
	zinc	0.000125	0.0000417
	pH	6.0-9.0	6.0-9.0
2. bar, billet and bloom	TSS	0.00876	0.00376
	O&G (*3)	0.00376	0.00125
	lead	0.0000563	0.0000188
	zinc	0.0000751	0.0000250
	pH	6.0-9.0	6.0-9.0
3. strip, sheet and plate	TSS	0.0117	0.00501
	O&G (*3)	0.00501	0.00167
	lead	0.0000751	0.0000250
	zinc	0.000100	0.0000334
	pH	6.0-9.0	6.0-9.0
4. pipe, tube and other	TSS	0.0204	0.00876
	O&G (*3)	0.00876	0.00292
	lead	0.000131	0.0000438
	zinc	0.000175	0.0000584
	pH	6.0-9.0	6.0-9.0
5. fume scrubbers	TSS	5.72(*4)	2.45(*4)
	O&G (*3)	2.45(*4)	0.819(*4)
	lead	0.0368(*4)	0.0123(*4)
	zinc	0.0491(*4)	0.0164(*4)
	pH	6.0-9.0	6.0-9.0

The above limitations shall be applicable to each fume scrubber associated with a sulfuric acid pickling operation.

b. hydrochloric acid
pickling (spent acid
solutions and rinse
waters)

1. rod, wire and coil	TSS	0.0175	0.00751
	O&G (*3)	0.00751	0.00250
	lead	0.000113	0.0000376
	zinc	0.000150	0.0000501
	pH	6.0-9.0	6.0-9.0
2. strip, sheet and plate	TSS	0.0117	0.00501
	O&G (*3)	0.00501	0.00167
	lead	0.0000751	0.0000250
	zinc	0.000100	0.0000334
	pH	6.0-9.0	6.0-9.0
3. pipe, tube and other products	TSS	0.0321	0.0138
	O&G (*3)	0.0138	0.00459
	lead	0.000206	0.0000688
	zinc	0.000275	0.0000918
	pH	6.0-9.0	6.0-9.0
4. fume scrubbers	TSS	5.72(*4)	2.45(*4)
	O&G (*3)	2.45(*4)	0.819(*4)
	lead	0.0368(*4)	0.0123(*4)
	zinc	0.0491(*4)	0.0164(*4)
	pH	6.0-9.0	6.0-9.0

The above limitations shall be applicable to each fume scrubber associated with a hydrochloric acid pickling operation.

c. combination acid pickling
(spent acid solution and
rinse waters)

1. rod, wire and coil	TSS	0.0204	0.00876
	O&G (*3)	0.00876	0.00292
	chromium	0.000292	0.000117
	nickel	0.000263	0.0000876
	pH	6.0-9.0	6.0-9.0
2. bar, billet and bloom	TSS	0.0117	0.00501
	O&G (*3)	0.00501	0.00167
	chromium	0.000167	0.0000667
	nickel	0.000150	0.0000501
	pH	6.0-9.0	6.0-9.0
3. strip, sheet and plate - continuous	TSS	0.0496	0.0213
	O&G (*3)	0.0213	0.00710
	chromium	0.000710	0.000284
	nickel	0.000638	0.000213
	pH	6.0-9.0	6.0-9.0
4. strip, sheet and plate - batch	TSS	0.0175	0.00751
	O&G (*3)	0.00751	0.00250
	chromium	0.000250	0.000100
	nickel	0.000225	0.0000751
	pH	6.0-9.0	6.0-9.0
5. pipe, tube and other products	TSS	0.0292	0.00125
	O&G (*3)	0.0125	0.00418
	chromium	0.000418	0.000167
	nickel	0.000376	0.000125
	pH	6.0-9.0	6.0-9.0
6. fume scrubber	TSS	5.72(*4)	2.45(*4)
	O&G (*3)	2.45(*4)	0.819(*4)
	chromium	0.0819(*4)	0.0327(*4)
	nickel	0.0735(*4)	0.0245(*4)
	pH	6.0-9.0	6.0-9.0

The above limitations shall be applicable to each fume scrubber associated with a combination acid pickling operation.

J. cold forming

a. cold rolling mills

1. recirculation - single stands	TSS	0.00125	0.000626
	O&G	0.000522	0.000209
	chromium (*5)	0.0000209	0.0000084
	lead	0.0000094	0.0000031
	nickel (*5)	0.0000188	0.0000063
	zinc	0.0000063	0.0000021
	naphthalene	0.0000021	-
	tetrachloro- ethylene	0.0000031	-
	pH	6.0-9.0	6.0-9.0
	2. recirculation - multiple stands	TSS	0.00250
O&G		0.00104	0.000417
chromium (*5)		0.0000418	0.0000167
lead		0.0000188	0.0000063
nickel (*5)		0.0000376	0.0000125
zinc		0.0000125	0.0000042
naphthalene		0.0000042	-
tetrachloro- ethylene		0.0000063	-
pH		6.0-9.0	6.0-9.0
3. combination		TSS	0.0326
	O&G	0.0136	0.00543
	chromium (*5)	0.000543	0.000217
	lead	0.000244	0.0000814
	nickel (*5)	0.000488	0.000163

	zinc	0.000163	0.0000542
	naphthalene	0.0000542	-
	tetrachloro-ethylene	0.0000813	-
	pH	6.0-9.0	6.0-9.0
4. direct application - single stand	TSS	0.00626	0.00313
	O&G	0.00261	0.00104
	chromium (*5)	0.000104	0.0000418
	lead	0.0000469	0.0000156
	nickel (*5)	0.0000939	0.0000313
	zinc	0.0000313	0.0000104
	naphthalene	0.0000104	-
	tetrachloro-ethylene	0.0000156	-
	pH	6.0-9.0	6.0-9.0
5. direct application - multiple stands	TSS	0.0726	0.0363
	O&G	0.0302	0.0121
	chromium (*5)	0.00121	0.000484
	lead	0.000545	0.000182
	nickel (*5)	0.00109	0.000363
	zinc	0.000363	0.000121
	naphthalene	0.000121	-
	tetrachloro-ethylene	0.000182	-
	pH	6.0-9.0	6.0-9.0
b. cold worked pipe and tube			
1. using water	TSS	0.00125	0.000626
	O&G	0.000522	0.000209
	chromium (*4)	0.0000209	0.0000084
	lead	0.0000094	0.0000031
	nickel (*4)	0.0000188	0.0000063
	zinc	0.0000063	0.0000021
	pH	6.0-9.0	6.0-9.0
2. using oil solutions	TSS	0.00125	0.000626
	O&G	0.000522	0.000209
	chromium (*4)	0.0000209	0.0000084
	lead	0.0000094	0.0000031
	nickel (*4)	0.0000188	0.0000063
	zinc	0.0000063	0.0000021
	naphthalene	0.0000021	-
	tetrachloro-ethylene	0.0000031	-
	pH	6.0-9.0	6.0-9.0
K. alkaline cleaning			
a. batch and continuous	TSS	0.0146	0.00626
	O&G	0.00626	0.00209
	pH	6.0-9.0	6.0-9.0
L. hot coating			
a. galvanizing, terne coating, and other coatings			
1. strip, sheet and miscellaneous products	TSS	0.0438	0.0188
	O&G	0.0188	0.00626
	lead	0.000282	0.0000939
	zinc	0.000376	0.000125
	chromium ⁶⁺ (*6)	0.0000376	0.0000125
	pH	6.0-9.0	6.0-9.0
b. galvanizing and other coatings			
1. wire products and fasteners	TSS	0.175	0.0751
	O&G	0.0751	0.0250
	lead	0.00113	0.000376
	zinc	0.00150	0.000500
	chromium ⁶⁺ (*6)	0.000150	0.0000501

	pH	6.0-9.0	6.0-9.0
c. fume scrubbers	TSS	5.72(*3)	2.45(*3)
	O&G	2.45(*3)	0.819(*3)
	lead	0.0368(*3)	0.0123(*3)
	zinc	0.0491(*3)	0.0164(*3)
	chromium ⁶⁺ (*6)	0.00490(*3)	0.00163(*3)
	pH	6.0-9.0	6.0-9.0

The above limitations shall be applicable to each fume scrubber associated with any of the coating operations specified.

- *1) The limitations for ammonia-N, cyanide, phenols(4AAP), and TRC shall be applicable only when sintering wastewaters are treated with ironmaking wastewaters.
- *2) The limitation for TRC shall be applicable only when chlorination of ironmaking wastewater is practiced.
- *3) The limitations for oil and grease shall be applicable when acid pickling wastewaters are treated with cold rolling wastewaters.
- *4) Kilograms per day.
- *5) The limitations for chromium and nickel shall be applicable in lieu of those for lead and zinc when cold rolling wastewaters are treated with descaling or combination acid pickling wastewaters.
- *6) The limitations for hexavalent chromium shall apply only to galvanizing operations which discharge wastewaters from the chromate rinse step.
- *7) max. 1 day : maximum for any 1 day.
30 day ave. : average of daily values for 30 consecutive days.

4. Citation

- 4.1. Title of document: "Code of Federal Regulations, Parts 400 to 424, Revised as of July 1, 1992
- 4.2. Publisher: The Office of the Federal Register, National Archives and Records Administration, USA
- 4.3. Date published: 1992
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

**International agreements and guidelines
for the iron and steel industry**

Headline: PARCOM Recommendation concerning limitation of pollution from new secondary steel production and rolling mills

1. Descriptors

- 1.1. Country: International (PARCOM)
- 1.2. Industry: Iron and steel industry (new secondary steel production and rolling mills)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Water/Effluent
- 1.5. Parameters: Nitrogen, Phosphorus

2. Legal reference

- 2.1. Title of the law/regulations: PARCOM Recommendation
- 2.2. Date issued: Feb. 1992
- 2.3. Date amended: -

3. Summary

- At least 95 % process water (ie., water from direct cooling) should be recirculated from hot rolling and continuous casting machine.
- The discharges of SS and oil in bleed from process water systems should not exceed the following values.

process	parameter	limit	unit
continuous casting	SS	10	g/tonne processed steel
	oil	5	g/tonne processed steel
hot rolling	SS	50	g/tonne processed steel
	oil	10	g/tonne processed steel

Before discharging spent oil emulsions from cold rolling, treatment by eg., ultra-filtration should be carried out. The discharges should not exceed the following values.

process	parameter	limit	unit
cold rolling	SS	10	g/tonne processed steel
	oil	5	g/tonne processed steel

For plants with integrated wastewater systems the total annual discharges should not exceed the sum of the annual production multiplied with the values above for each process.

- Wastewater flow from pickling and plating should be reduced as far as possible. Discharges of metals from pickling plants should be limited as follows:

parameter	limit	unit
nickel	1	mg/l
total chromium	1	mg/l
chromium (VI)	0.1	mg/l

zinc	2	mg/l
cadmium	0.2	mg/l

- In pickling plants using more than 20 tonnes of nitric acid per year, measures should be taken in order to reduce the nitrate discharges by applying acid regeneration, or equally efficient method.

4. Citation

- 4.1. Title of document: The Recommendations on the Environmental Quality Standards and So Forth Regarding Nitrogen and Phosphorus in the Coastal Seas
- 4.2. Publisher: The Central Council on Environmental Pollution Control, Government of Japan
- 4.3. Date published: May 6, 1993
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: The World Bank Environmental Guidelines for iron and steel industry

1. Descriptors

- 1.1. Country: International (The World Bank)
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Water/Effluent
1.5. Parameters: Flow, SS, TSS, sulphide, fluoride, phenol, phenolic compounds, cyanide, ammonia-N, ammonia-NH₃, pH, oil & grease, zinc, copper, nickel, lead, silver, dissolved iron, chromium, cadmium, phosphorous, tin

2. Legal reference

- 2.1. Title of the law/regulations: Environmental guidelines
2.2. Date issued: 1983
2.3. Date amended: -

3. Summary

(1) blast furnace (pig iron), direct reduction

parameter	limitation	unit
flow (*1)	520	l/megagram of iron
SS	26	g/megagram of iron
sulphide	3.1	g/megagram of iron
fluoride	21	g/megagram of iron
phenol	2.1	g/megagram of iron
cyanide	7.8	g/megagram of iron
ammonia-N	65	g/megagram of iron
pH	6.0-9.0	-

*1) Excluding all non-contact cooling water.

(2) byproduct coke plant

parameter	limitation	unit
total cyanide	22	g/megagram of coke
phenolic compounds	1.5	g/megagram of coke
ammonia-NH ₃	91	g/megagram of coke
oil & grease	11	g/megagram of coke
SS	37-94	g/megagram of coke
pH	6.0-9.0	-
flow (*1)	730-940	l/megagram of coke

*1) Excluding non-contact cooling water.

(3) sintering and pelletizing

parameter	limitation	unit
oil & greases	4.2	g/megagram of sinter produced

SS	21	g/megagram of sinter produced
pH	6.0-9.0	-
flow (*1)	416	l/megagram of sinter produced

*1) Excluding non-contact cooling water.

Various toxic pollutants, depending upon the raw materials used, are also generally present. These include cyanides, zinc, copper, nickel, lead, silver, and others. Limitations for these substances should be as follows:

parameter	limitation	unit
cyanides	0.01	mg/l
zinc	1	mg/l
copper	1	mg/l
nickel	1	mg/l
lead	0.1	mg/l
silver	0.1	mg/l

(4) steel rolling and finishing

source	parameter	limitation	unit

pipe and tube mill			
hot rolling	flow	6700	l/Mg steel (*8)
	SS	67	g/Mg steel
	oil & grease	100	g/Mg steel
	diss.Fe	-	-
	pH	6-9	-
cold rolling (water)	(no wastewater discharges)		
cold rolling (oils)	(no wastewater discharges)		
cold rolling mill			
recirculated	flow	104	l/Mg steel
	SS	3	g/Mg steel
	oil & grease	0.14	g/Mg steel
	diss.Fe	0.10	g/Mg steel
	pH	6-9	-
dir.application	flow	1668	l/Mg steel
	SS	104	g/Mg steel
	oil & grease	42	g/Mg steel
	diss.Fe	4	g/Mg steel
	pH	6-9	-
combination	flow	1043	l/Mg steel
	SS	26	g/Mg steel
	oil & grease	10	g/Mg steel
	diss.Fe	1	g/Mg steel
	pH	6-9	-
pickling			
SO ₄ -batch (*1)	(no wastewater discharges)		
SO ₄ -batch (*2)	flow	2500	l/Mg steel
	SS	125	g/Mg steel
	oil & grease	25	g/Mg steel
	diss.Fe	3	g/Mg steel
	pH	6-9	-
SO ₄ -continuous (*1)	(no wastewater discharges)		
SO ₄ -continuous (*2)	flow	1042	l/Mg steel
	SS	52	g/Mg steel
	oil & grease	10	g/Mg steel
	diss.Fe	1	g/Mg steel
	pH	6-9	-

HCl-batch & cont. (*3)	flow	(*4)	l/Mg steel
	SS	200	g/Mg steel
	oil & grease	40	g/Mg steel
	diss.Fe	4	g/Mg steel
	pH	6-9	-
HCl-batch & cont. (*5)	flow	(*6)	l/Mg steel
	SS	18	g/Mg steel
	oil & grease	35	g/Mg steel
	diss.Fe	4	g/Mg steel
	pH	6-9	-
hot coatings (*7)	flow	5000	l/Mg steel
	SS	250	g/Mg steel
	oil & grease	75	g/Mg steel
	diss.Fe	-	g/Mg steel
	pH	6-9	-

-
- *1) Concentrates + rinses, acid recovery.
 - *2) Concentrates + rinses, acid neutralization.
 - *3) Liquor regen. + rinse neut. + fume scrubbing.
 - *4) Flow = 4047 L for batch, 2774 L for continuous.
 - *5) Neut. liquor & rinses + fume scrubbing.
 - *6) flow = 3524 L for batch, 2252 L for continuous.
 - *7) With fume scrubbing.
 - *8) Per megagrams of steel processed.

(5) electroplating

source	parameter	limitation	unit
non-water supply sources	copper	80	mg/m ³ (*1)
	nickel	80	mg/m ³
	total chromium	80	mg/m ³
	chromium (VI)	8	mg/m ³
	zinc	80	mg/m ³
	total CN	80	mg/m ³
	fluoride	3200	mg/m ³
	cadmium	48	mg/m ³
	lead	80	mg/m ³
	iron	160	mg/m ³
	tin	160	mg/m ³
	phosphorous	160	mg/m ³
	TSS	3200	mg/m ³
	pH	6.0-9.5	-
	flow	145	l
water-supply sources and fish life	copper	75	mg/m ³
	nickel	4	mg/m ³
	total chromium	15	mg/m ³
	chromium (VI)	1.5	mg/m ³
	zinc	-	-
	total CN	1.5	mg/m ³
	fluoride	30	mg/m ³
	cadmium	2.9	mg/m ³
	lead	4.4	mg/m ³
	iron	45	mg/m ³

-
- *1) Maximum of average daily values in any 30-day period. Maximum daily value not to exceed 2 times 30-day average.

(6) open hearth furnace

source	parameter	limitation	unit
semi-wet system	SS	15	g/megagram of steel produced
	flow (*1)	293	l/megagram of steel produced
	pH	6.0-9.0	-
wet system	SS	23	g/megagram of steel produced
	flow (*1)	460	l/megagram of steel produced
	pH	6.0-9.0	-

*1) Excluding all non-contact cooling water.

(7) basic oxygen furnace

source	parameter	limitation	unit
semi-wet	(no wastewater discharges)		
wet-open comb.	flow	630	l/megagram
	fluoride	-	g/megagram
	SS	31	g/megagram
	pH	6-9	-
wet-suppr. comb.	flow	210	l/megagram
	fluoride	-	g/megagram
	SS	5	g/megagram
	pH	6-9	-

(8) electric arc furnace

source	parameter	limitation	unit
semi-wet	(no wastewater discharges)		
wet system	SS	26	g/megagram
		50	mg/l
	pH	6-9	-

4. Citation

- 4.1. Title of document: "Environmental Guidelines"
- 4.2. Publisher: Office of Environmental Affairs, The World Bank
- 4.3. Date published: July 1984
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 250.1/EGWC

Appendix

APPENDIX 1: LIST OF INFOTERRA NATIONAL FOCAL POINTS

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- Correction/update of article(s) No. _____
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Country _____

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- 3) Promote the use of safe and clean technologies;
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- Volume II *Pulp & Paper Industry Effluent Discharge Standards*
100 p., 1996. Price FF 150/US\$ 30
- Volume IIIa *Iron & Steel Industry Air Emission Standards*
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Price: FF 175/US\$ 35

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ISBN 92 807 1342 X, 62 p., 1992. Price: FF 200/US\$ 40

Environmental Aspects of Selected Non-Ferrous Metals (Cu, Ni, Pb, Zn, Au) Ore Mining - Technical Report
n° 5. ISBN 92 807 1295 X, 1992. Price: FF 250/US\$ 50

Tanneries and the Environment - Technical Report n°4. ISBN 92 807 1276 4, 119 p., 1991.
Price: FF 200/US\$ 40



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