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INDUSTRY AND ENVIRONMENT

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

Volume IIIa

IRON & STEEL INDUSTRY
AIR EMISSION STANDARDS

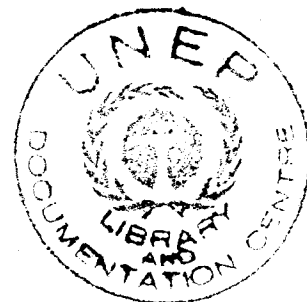
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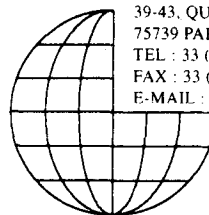
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INTRODUCTION

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' air emission 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 air emissions released 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 air emissions 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 air emissions may vary depending on whether they are released to industrial or residential area.

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 air emissions from the iron and steel industry

- Dust, fume and steam

Granular particulates are generated in mining, crushing and screening operations. They are spread during transportation, released at points of belt transfer, or blown by winds from storage heaps and blending beds.

The high temperatures generated, for instance in high-intensity oxygen steel refining processes or in electric arc discharges in electric steel making, create very large quantities of fume which can only be controlled effectively by well engineered facilities.

The wet quenching of coke leads to high emissions of steam to atmosphere. Unless efficient grit arrestors are placed in the quench tower the operation is also accompanied by dispersal of relatively coarse dusts.

The presence of oil in scrap in electric arc furnaces and in mill scale returned in sinter plants can result in heavy visible emissions. Dust loadings in gases passing to the sinter plant exhaust stacks cannot be ignored.

- Acid emissions

Substances such as nitrogen oxides, sulphur oxides fluorides and chlorides may appear as air pollutants, since they are present in materials being heated or burnt, or in the air used in high temperature combustion. As the iron and steel industry is a significant user of energy, considerable quantities of such substances can be emitted.

- Fugitive emissions

In steelmaking, while primary collection systems handle about 99 percent or more of the total fume and dust generated, small proportions escape as fugitive emissions particularly during intermittent operations such as charging and tapping. Pouring and alloying operations for molten iron, steel and slags also lead to releases of fume, which mainly consists of iron oxides but may contain graphite (kish), soot and silica.

Another major source is the coke oven. In charging, dust can escape, and on pushing coke coarse grit can be emitted to the atmosphere. If the charge is not fully coked, high quantities of dense smoke may be generated.

Emissions from ovens being coked and certain emissions from coke ovens by-product plants may cause health problems. In particular, benzo-alpha-pyrene (BaP) is a polynuclear aromatic hydrocarbon representative of a group known to be carcinogenic. Analysis of these materials in the neighbourhood of coke ovens and monitoring of benzene emissions are advisable and should be a continuing concern of plant managements.

- Toxic gases

Large quantities of toxic carbon monoxide are produced in the processes of combusting carbon with oxygen to refine pig iron into steel. Carbon monoxide also comes from the blast furnace, and can sometimes be found in gases from sinter plants in low concentration. CO is recovered for its energy value (except from sintering) or is burnt to CO₂. By-product coke ovens gas contains CO and H₂. Care must be taken in its distribution and use.

Products of combustion can asphyxiate and must be vented. Similarly care is required in ventilation when N₂, Ar or natural gas is used.

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

Headline: Emission standards for sinter plants, pelletisation plants and blast furnaces in Belgium

1. Descriptors

- 1.1. Country: Belgium (Local)
- 1.2. Industry: Iron and steel industry (sinter plants, pelletisation plants and blast furnaces)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: -

2. Legal reference

- 2.1. Title of the law/regulations: General Regulation for the Protection of Labour (1946), 'VLAREM' (1991)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

The laws of institutional reform in Belgium (ie reform towards federalism) have transferred environmental responsibilities to the regions (ie Flanders, Wallonia and the Brussels-Capital Region). These regions have the responsibility to implement European Directives in the field of the environment. In addition, they have a statutory role to evaluate licence applications, to enforce licence conditions and to organise inspection and control activities.

(1) Wallonia and Brussels-Capital Region

In the Wallonia and Brussels-Capital Region, a 'List and Classification of Dangerous, Unhealthy and Inconvenient Industries' (établissements classés) is given in the General Regulation for the Protection of Labour, Chapter II, Title I (Regent order of 11.02.1946). All installations mentioned must be subject to licence procedure according to Chapter 1 of the same regulation, prior to construction, conversion, relocation, and consequently, operation. According to the danger resulting from the being and operation of these installations, they are divided into two classes:

- * Class 1 - source of important hazard, approval at provincial government level;
- * Class 2 - less important hazard, small installations, approval at local government level.

Sinter plants and blast furnaces are part of the first class list and classification.

(2) Flanders

In Flanders, a comparable new regulation exists called the 'VLAREM' (Flander Community order 06.02.1991). It prescribes a more integrated and comprehensive 'Environmental Licence' and divides the concerned installations into three classes, according to the danger resulting from their presence and operation:

- * Class 1 - source of important hazard, approval at provincial government level;
- * Class 2 - less important small installations, approval at local government level;
- * Class 3 - notifiable installations which, by virtue of their inferior importance, do not require any formal approval.

According to number 20.2m of the list and classification of the installations enclosed in the 'VLAREM', pellet plants and sinter plants are part of;

- * the second class if their annual production goes from 1,000 to 100,000 tonnes;
- * the first class if their annual production is greater or equal to 100,000 tonnes.

Blast furnaces are part of the first class.

At present, no emission limits or guidelines are fixed for the plants under consideration, but the licence procedure enables the authority of the three Belgian regions, responsible for granting licences, to prescribe emission limits or guidelines after consulting the competent official of the Belgian Regional Agencies. Generally, this official proposes to the authority (for new installations) emission limits based upon the German TA-Luft standards. These limits are adapted, if necessary, to the particular situations.

4. Citation

- | | |
|---------------------------------------|---|
| <u>4.1. Title of document:</u> | "Preparation of Technical Notes on Best Available Technologies for Prevention of Air Pollution Emissions from Sinter Plants, Pelletisation Plants and Blast Furnaces" |
| <u>4.2. Publisher:</u> | Environmental Resources Limited |
| <u>4.3. Date published:</u> | October 1992 |
| <u>4.4. Publisher reference code:</u> | 1067 |
| <u>4.5. IEO library code:</u> | - |

Headline: Emission limits for iron-foundry sector in Belgium

1. Descriptors

- 1.1. Country: Belgium (local)
- 1.2. Industry: Iron and steel industry (foundry)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Total particulate, SO_x, NO_x, CO, heavy metals

2. Legal reference

- 2.1. Title of the law/regulations: General Regulation for the Protection of Labour (1946), 'VLAREM' (1991)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

(1) Wallonne region

Emission limits are:

parameter	limit	unit
total particulate	50	mg/m ³ N
SO _x	150	mg/m ³ N
NO _x	200	mg/m ³ N
CO	250	mg/m ³ N
heavy metals	1	mg/m ³ N

(2) Flanders

Presently, no emission limits but the licence procedure enables the authority responsible for granting licence to prescribe emission limits or guidelines after consulting the competent official of the Flemish Region. Generally, this official proposes to the authority, for new installations, emission limits based upon the German TA Luft standards adapted, if necessary, to the particular situation.

For the existing plants, emission limits may have been imposed by the provincial authorities on the moment of granting the licence or later, e.g. due to complaints of neighbours.

However, a second part of the VLAREM regulation is prepared for the moment. This legislation will contain new sectorial standards for water, air and soil pollution for different types of activities (for new and existing installation). Best available technology not entailing excessive cost will be one of the main principles of these sectorial standards.

4. Citation

- 4.1. Title of document: "ETUDE CONCERNANT LES MTD POUR LA PREVENTION DE LA POLLUTION DE L'AIR DANS LES FONDRIES DE METAUX FERREUX. DRAFT

FINAL REPORT"

4.2. Publisher:

CENTRE INTERPROFESSIONNEL TECHNIQUE
D'ÉTUDES DE LA POLLUTION ATMOSPHERIQUE

4.3. Date published:

September 1992

4.4. Publisher reference code:

-

4.5. IEO library code:

-

Headline: Emission limits for pollutants emitted by electric arc steel production plants in Belgium

1. Descriptors

- 1.1. Country: Belgium (local)
1.2. Industry: Iron and steel industry (electric arc furnace)
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Dust, cadmium, nickel, chromium, lead, copper, zinc, fluorine

2. Legal reference

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

3. Summary

(1) Wallonne region

There exist two electric arc steel plants in Wallonia, under licences that impose less than 150 mg dust/m³N.

For the two new installations under construction, the administration got the commitment from the constructors that emissions will not be more than 20 mg dust/m³N.

(2) Flanders

The only electric arc steel plant in the Flemish region got a licence for its new installation in 1988. German T.A.Luft emission standards have been imposed in this licence.

parameter	limit	unit
dust	20	mg/m ³ N
cadmium	0.2	mg/m ³ N
nickel	1	mg/m ³ N
chromium, lead, copper, zinc	5	mg/m ³ N
fluorine (as HF)	5	mg/m ³ N

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emissions of Pollutants into the Air from Electric Arc Steel Production Plants - Final Report"
4.2. Publisher: Commission of European Communities DG XI A3
4.3. Date published: April 1994
4.4. Publisher reference code: -

Headline: Emission limits for pollutants emitted by rolling mills in Belgium

1. Descriptors

- 1.1. Country: Belgium (local)
1.2. Industry: Iron and steel industry (hot and cold rolling mills)
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Dust, SO_x, NO_x, fluorine, HCl, chlorine

2. Legal reference

- 2.1. Title of the law/regulations: VLAREM II
2.2. Date issued: 1993
2.3. Date amended: -

3. Summary

(1) Wallonne region

In the frame of individual permits limitations are fixed referring to EEC or non-EEC legislation, in particular to German standards (TA Luft).

(2) Flanders

A new regulation, called "VLAREM II" (Flemish Community Order of 01/01/1993) defines emission standards for different substances and monitoring strategy and practice (art. 81-82). The "environmental licence" may impose more stringent requirements. Examples for some substances:

parameter	limit	unit	remark
Dust	150	mg/Nm ³	mass flow < 0.5 kg/h
	50	mg/Nm ³	mass flow > 0.5 kg/h
SO _x	500	mg/Nm ³	mass flow > 5 kg/h
NO _x	500	mg/Nm ³	mass flow > 5 kg/h
fluorine	5	mg/Nm ³	mass flow > 50 g/h
HCl	30	mg/Nm ³	mass flow > 300 g/h
chlorine	5	mg/Nm ³	mass flow > 50 g/h

*1) Reference conditions: 0°C, 101.3 kPa, dry gas.

4. Citation

- 4.1. Title of document: "Technical Notes on Best Available Technologies to Reduce Emission of Pollutants into the Air from Hot and Cold Rolling Mills in Iron and Steel Industry"
4.2. Publisher: CITEPA (CENTRE INTERPROFESSIONNEL TECHNIQUE D'ETUDES DE LA POLLUTION ATMOSPHERIQUE)
4.3. Date published: August 1994
4.4. Publisher reference code: -

4.5. IEO library code:

50.2/CITM

Headline: Emission standards for iron and steel plant in some States in Brazil

1. Descriptors

- 1.1. Country: Brazil (local)
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Opacity, dust

2. Legal reference

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

3. Summary

The emission standards are only referred in the legislation of some States. Up to now, four States have set up emission standards for the steel industry process, which are shown as below:

process	parameter	standards				unit
		(*1)	(*2)	(*3)	(*4)	
sintering	dust	100	100	100	-	mg/Nm ³
	opacity	20	20	-	-	%
blast furnace	dust	50	100	100	-	mg/Nm ³
	opacity	20	20	-	-	%
BOF shops	dust	50	50	(*5)	100	mg/Nm ³
	opacity	20	-	-	-	%
EAF	dust	50	50	-	-	mg/Nm ³
	opacity	(*6)	-	-	-	%
lime plant	dust	80	-	50	-	mg/Nm ³
foundries	dust	100	-	100	50	mg/Nm ³
coke plant						
charging	opacity	(*7)	-	(*8)	-	%
pushing	dust	100	-	(*9)	-	mg/Nm ³
heating	dust	70	-	70	-	mg/Nm ³
	opacity	20	-	-	-	%
leaks	opacity	(*10)	-	(*10)	-	%

*1) Rio de Janeiro.

*2) Minas Gerais.

- *3) Espírito Santo.
- *4) São Paulo.
- *5) Primary : 100 mg/Nm³, secondary : 50 mg/Nm³.
- *6) During the cycle : 0, charging : 20, casting : 40.
- *7) 60 % up to 2 min., 40 % in the rest of the time.
- *8) Visible emission : up to 84 seconds in 7 consecutive charges.
- *9) 15 kg/t coke.
- *10) 5 % of ascension pipes, 2 % of lids, 10 % of doors.

4. Citation

- | | |
|---------------------------------------|---|
| <u>4.1. Title of document:</u> | "The Brazilian Environmental Legislation",
24th Regular Meeting of the Committee on
Environmental Affairs of the International
Iron and Steel Institute, Melbourne,
Australia, 1987 |
| <u>4.2. Publisher:</u> | INSTITUTO BRASILEIRO DE SIDERURGIA |
| <u>4.3. Date published:</u> | 1987 |
| <u>4.4. Publisher reference code:</u> | - |
| <u>4.5. IEO library code:</u> | - |

Headline: Air emission standards for the new steel plant of CST in Brazil

1. Descriptors

- 1.1. Country: Brazil, local (CST)
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Visible emission, dust

2. Legal reference

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

3. Summary

There are no standards related to air emission at the Federal level, although some States are starting to define them. One example is the emission standards defined for the new steel plant of CST (Companhia Siderurgia de Tubarão) located in Espírito Santo State, as shown in the following table.

source	emission limit
1) coal yard	visible emissions: 20% opacity
2) coal preparation	dust: 100 mg/Nm ³ visible emissions: 20% opacity
3) coke plant	
a) ovens heating	dust: 70 mg/Nm ³
b) charging	visible emissions: less than 84 sec in the charging of 7 ovens dust: 15 g/tons of coke
c) puching	
d) leaks	
- doors	visible emissions: in 10% of the doors
- charging holes	visible emissions: in 2% of the charging holes
- ascension pipes	visible emissions: in 5% of the ascension pipes
e) quenching	-
4) coke treatment plant	dust: 100 mg/Nm ³
- screening and bricketing	
5) by products plant	-
6) ore yard	visible emissions: 20% opacity
7) sinter plant	
a) sinter strand	dust: 100 mg/Nm ³
b) raw materials handling and discharge end	dust: 100 mg/Nm ³
c) sinter cooling	dust: 100 mg/Nm ³
8) blast furnace	

a) stock-house	dust: 100 mg/Nm ³
b) charging	dust: 100 mg/Nm ³
c) gas cleaning	-
d) cast house	dust: 100 mg/Nm ³
e) regenerators	-
9) BOF plant	
a) flux handling	-
b) gas cleaning	dust: 100 mg/Nm ³
c) slag skimming, hot metal transfer	dust: 50 mg/Nm ³
d) desulphurization	dust: 50 mg/Nm ³
10) slabbing mill	
a) scarfing	dust: 50 mg/Nm ³
11) calcining plant	
a) furnace	dust: 50 mg/Nm ³
b) lime handling	visible emissions: 20% opacity
12) foundry - sand reclamation	dust: 100 mg/Nm ³

4. Citation

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

Headline: National Emission Guidelines for the metallurgical coke manufacturing industry in Canada

1. Descriptors

- 1.1. Country: Canada
1.2. Industry: Iron and steel industry (metallurgical coke process)
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: SO₂

2. Legal reference

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

3. Summary

The Department of the Environment issued National Emission Guidelines for the metallurgical coke manufacturing industry in 1975 as shown below:

source	emission guideline
charging	100 g/tonne of dry coke
pushing	0.46 g/Nm ³
quenching	50 g/metric tonne of dry coke
crushing and screening	0.046 g/Nm ³ (downstream of gas cleaning equipment)
battery stacks	0.069 g/Nm ³ (in exhaust gases)
burning of coke oven gas	1300 g SO ₂ /tonne of dry coke

4. Citation

- 4.1. Title of document: "Environmental Aspects of Iron and Steel Production. A Technical review"
4.2. Publisher: Industry and Environment Office, United Nations Environment Programme
4.3. Date published: 1986
4.4. Publisher reference code: -
4.5. IEO library code: 50.2/UNEA

Headline: Air emission standards in China

1. Descriptors

- 1.1. Country: China.
- 1.2. Industry: Metallurgic industries including iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: SO₂, fluoride, chlorine, HCL, CO, lead

2. Legal reference

- 2.1. Title of the law/regulations: Environmental Protection Law (1979)
Air Emission Standards (1973)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

parameter	standards		
	stack height (m)	quantity (kg/h)	concentration(mg/m ³)
SO ₂	30< <120 (6 levels)	52< <670	-
fluoride (as F)	120	24	-
Chlorine	80, 100 (2 levels)	27, 41	-
HCl	80, 100 (2 levels)	14, 20	-
CO	30-100 (3 levels)	160-1700	-
lead	100, 200 (2 levels)	-	34, 47

4. Citation

- 4.1. Title of document: "Air Environmental Legislation Survey in Foreign countries", The Working Group of Air Environmental Legislation, Air Division, Environmental Issue Study Group
- 4.2. Publisher: Japan Environmental Management Association for Industry (JEMAI)
- 4.3. Date published: June 1992
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: Recommended emission limits for steelworks in Denmark

1. Descriptors

- 1.1. Country: Denmark
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Dust, SO₂, NO_x, VOC_s, lead, cadmium, copper, zinc, mercury, dioxins, PAH

2. Legal reference

- 2.1. Title of the law/regulations: Environmental Protection Act
- 2.2. Date issued: 1974
- 2.3. Date amended: 1986,1987,1991

3. Summary

The legal basis for the issue of an environmental permit is the Environmental Protection Act, along with the 1991 Statutory Order 794 concerning licensing of Heavily Polluting Enterprises and the guideline number 6/1990 for the prevention of Air Pollution.

Among others the Environmental Protection Act lists steelworks as plant requiring an environmental permit.

Listed factory types must be approved before construction, expansion or modification. Approval of a factory which emits substances into the air or water will normally include emission limit conditions, maximum air flows, in mission limits and/or for air, chimney height.

The guidelines n.r. 6/1990 and 6/1974 give some recommended emission limits, but it is the local authority who gives the environmental permit. In case of complaint, the permit can later be discussed with the Danish Environmental Protection Agency.

The recommended emission limits in guidelines 6/1990 and 6/1974, and the recommended immission values in guideline 6/1990 are:

parameter	emission limit (mg/Nm ³)	immission limit (mg/Nm ³)	comment
dust	20-40	0.08	mass flow > 5 kg/h
SO ₂	500	0.25	mass flow > 5 kg/h
NO _x	500	0.125	mass flow > 5 kg/h
VOC _s	5	0.0002-1	mass flow > 0.1 kg/h
	100		mass flow > 2 kg/h
	300		mass flow > 6.25kg/h
lead	1-5	0.0004	mass flow > 5 g/h
cadmium	0.1-0.5	0.00001	mass flow > 0.5 g/h
copper	5	0.01	mass flow >25 g/h
zinc	5	0.06	mass flow >25 g/h
mercury	0.1		mass flow > 1 g/h
dioxins (*1)	0.001		
PAH (*2)	0.001		

-
- *1) 2378-tetrachlorodibenzodioxin equivalent.
- *2) Poly Aromatic Hydrocarbons Include the following compounds that appear in significant amounts in coal tar, cresote and coal tar pitch; acenaphthene, benzo(a) anthracene, benzo(b) fluoranthene, benzo(j) fluoranthene, benzo(k) fluoranthene, benzo(b) fluorene, benzo(a) pyrene, chrysene, dibenzo(a,h) anthracene, and indene(1,2,3-c,d) pyrene.

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emissions of Pollutants into the Air from Electric Arc Steel Production Plants - Final Report"
- 4.2. Publisher: Commission of European Communities DG XI A3
- 4.3. Date published: April 1994
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/EETN

Headline: Air emission standards for iron ore sinter plants and steel works using oxygen lancing in France

1. Descriptors

- 1.1. Country: France
- 1.2. Industry: Iron and steel industry (iron ore sinter plants and steel works using oxygen lancing)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Particulate

2. Legal reference

- 2.1. Title of the law/regulations: Circular on iron ore sinter plants issued by the Minister for the Protection of Nature and the Environment (July 24, 1972), Circular on steel works using oxygen lancing issued by the Minister for the Protection of Nature and the Environment (March 8, 1973)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

Circulars on iron ore sinter plants and steel works using oxygen lancing were issued by the Minister for the Protection of Nature and the Environment on 24 July 1972 and 8 March 1973 respectively. They apply to all new plants and to existing plants undergoing major modifications. In addition, they are intended to serve as models for existing plants about which complaints have been made. They were drawn up by working parties consisting of representatives of Government, industry, manufacturers of pollution-control equipment, etc.

(1) Iron ore sinter plants

Under normal conditions, the particulate content of the gases discharged to the atmosphere must not exceed 0.150 g/Nm³. To allow for exceptional circumstances, the particulate content of the gases up to 0.5 g/Nm³ is permitted, but not more than 200 hours per year.

(2) Steel works using oxygen lancing

The gases discharged must not show any marked coloration, and the particulate content must not exceed 0.120 g/Nm³. Where for some reason the particulate content cannot be reduced to this level, no new batch of metal may be refined until the gas-cleaning equipment is again operating with the required efficiency. Exceptionally, however, refining may be allowed to continue for a limited period if the plant upstream of the process cannot be stopped without danger to the equipment or the operating personnel.

4. Citation

- 4.1. Title of document: "Environmental Aspects of Iron and Steel Production. A Technical review"

<u>4.2. Publisher:</u>	Industry and Environment Office, United Nations Environment Programme
<u>4.3. Date published:</u>	1986
<u>4.4. Publisher reference code:</u>	-
<u>4.5. IEO library code:</u>	50.2/UNEA

Headline: Air emission limits for pollutants emitted by electric arc steel production plants in France

1. Descriptors

- 1.1. Country: France
1.2. Industry: Iron and steel industry (electric arc furnace)
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: particulate

2. Legal reference

- 2.1. Title of the law/regulations: The Law of 19 July on the Protection of the Environment (76-663); the Arrêté of 20 June 1975
2.2. Date issued: 1976
2.3. Date amended: -

3. Summary

The national government is responsible for air pollution control, but implementation is done mainly through the Préfets (regionally-based government officials) who grant licences to classified installations. Control of air pollution is based on the principle of "use of best techniques not entailing excessive costs" and licences can include emission limits for particulates. The emission limit in recent "Arrêtés Préfectoraux d'Autorisation" is generally set to 10 mg/m³N.

The "arrêté" of 1 March 1993 concerns new installations or changes in existing installations leading to an increase in emission of more than 10 %. In such a case Article 30 para. 9.3 sets the following limits for particulates emitted by secondary steel making:

- simultaneously 20 mg/m³N and 150 g/tonne steel

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emissions of Pollutants into the Air from Electric Arc Steel Production Plants - Final Report"
4.2. Publisher: Commission of European Communities DG XI A3
4.3. Date published: April 1994
4.4. Publisher reference code: -
4.5. IEO library code: 50.2/EETN

Headline: Air emission limits for pollutants emitted by pickling in France

1. Descriptors

- 1.1. Country: France
1.2. Industry: Iron and steel industry (pickling)
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Total acidity, HF, chromium, CN, alkalinity, NO_x

2. Legal reference

- 2.1. Title of the law/regulations: Arrêté du 1er mars 1993; arrêté du 26 septembre 1985
2.2. Date issued: -
2.3. Date amended: -

3. Summary

No specific emission limitation for rolling mills exist. Nevertheless, these installations are regulated under integrated pollution control "Arrêté du 1er mars 1993 relatif aux prélèvements et à la consommation d'eau ainsi qu'aux rejets de toute nature des Installations Classées pour la protection de l'Environnement soumises à autorisation". Only emissions from pickling are regulated under a specific regulation (arrêté du 26 septembre 85). Emission limit values for pickling baths are the following:

parameter	limit	unit
Total acidity (H ⁺)	0.5	mg/Nm ³
HF (F)	5	mg/Nm ³
total chromium	1	mg/Nm ³
of which chromium (VI)	0.1	mg/Nm ³
CN	1	mg/Nm ³
alkalinity (OH ⁻)	10	mg/Nm ³
NO _x (NO ₂)	205	mg/Nm ³

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emission of Pollutants into the Air from Hot and Cold Rolling Mills in Iron and Steel Industry"
4.2. Publisher: CITEPA (CENTRE INTERPROFESSIONNEL TECHNIQUE D'ETUDES DE LA POLLUTION ATMOSPHERIQUE)
4.3. Date published: August 1994
4.4. Publisher reference code: -
4.5. IEO library code: 50.2/CITM

Headline: General emission control requirements of the French regulation.

1. Descriptors

- 1.1. Country: France
- 1.2. Industry: All industries including iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Particulate matter, SO_x, NO_x, HCl, HF, phosphine, phosgene, hydrocyanic acid, bromine, chlorine, hydrogen sulphide, NH₃, asbestos, other fibers, VOC_s, cadmium, mercury, thallium, arsenic, selenium, tellurium, antimony, chromium, cobalt, copper, tin, manganese, nickel, lead, vanadium, zinc

2. Legal reference

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

3. Summary

The following table lists the general emission control requirements of the French regulation:

parameter	limit (*1)	mass flow (kg/h)	remark
particulate matter	100	< 1	-
	50	> 1	-
SO _x	300	> 25	as SO ₂
NO _x	500	> 25	NO + NO ₂ expressed as NO ₂
HCl (*2)	50	> 1	-
HF (*3)	5	> 0.5	gazeous phase
	5	> 0.5	solid phase
phosphine, phosgene	1	> 0.01	-
hydrocyanic acid	5	> 0.05	as HCN
bromine (*4)	5	> 0.05	-
chlorine	5	> 0.05	as HCl
hydrogen sulphide	5	> 0.05	-
NH ₃	50	> 0.1	-
asbestos (*5)	0.1	> (*10)	asbestos
	0.5	> (*10)	total particulates
other fibers (*6)	1	> (*10)	fibers
	50	> (*10)	total particulates
VOC _s excepted methane	150	> 2	-
	50	-	if incineration as total carbon
VOC _s listed in annex III	20	> 0.1	-
mixture of VOC _s	20	> 0.1	VOC _s listed in annex III
	150	> 0.1	for mixture
Cd + Hg + Tl (*7)	0.2	> 0.001	-
As + Se + Te (*8)	1	> 0.005	-
Sb + Cr + Co + Cu + Sn +	5	> 0.025	-
Mn + Ni + Pb + V + Zn (*9)			

- *1) mg/Nm³ dry. O₂ fixed by Prefects.
- *2) Hydrogen chloride and other inorganic gaseous chlorine compounds expressed as HCl.
- *3) Fluorine and other inorganic fluorine compounds (gas, vesicles, particulates) expressed as HF.
- *4) Bromine and inorganic gaseous bromine compounds expressed as HBr.
- *5) Quantity of raw asbestos used.
- *6) Quantity of fibers other than asbestos used.
- *7) cadmium, mercury, thallium and their compounds.
- *8) arsenic, selenium, tellurium and their compounds.
- *9) antimony, chromium, cobalt, copper, tin, manganese, nickel, lead, vanadium, zinc and their compounds.
- *10) 100 kg/year.

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emission of Pollutants into the Air from Hot and Cold Rolling Mills in Iron and Steel Industry"
- 4.2. Publisher: CITEPA (CENTRE INTERPROFESSIONNEL TECHNIQUE D'ETUDES DE LA POLLUTION ATMOSPHERIQUE)
- 4.3. Date published: August 1994
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/CITM

Headline: TA Luft (1986) emission standards in Germany

1. Descriptors

- 1.1. Country: Germany
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Total dust, dustlike inorganic substances, carcinogenic substances, gaseous inorganic substances, organic substances

2. Legal reference

- 2.1. Title of the law/regulations: Federal Pollution Protection Law - BImSchG (1974, 1990), Technical Guidelines for Air Quality - TA Luft (1986)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

(1) General emission limits

pollutants	mass flow (g/h)	limit (mg/l)
<u>total dust</u>	500 <	50
	500 >	150

Inorganic dust particles

The inorganic dust particles listed below shall altogether not exceed the following mass concentrations contained in the waste gas, even if several substances of the same class are present:

class I	cadmium, mercury, thallium and their compounds	1 <	0.2
class II	arsenic, cobalt, nickel, selenium, tellurium and their compounds	5 <	1
class III	antimony, lead, chromium, cyanides, fluorides, copper, manganese, platinum, palladium, rhodium, vanadium, tin and their compounds	25 <	5

If substances of class I and II coincide, the mass concentration in the waste gas must not exceed a total of 1 mg/m³. If substances of class I and III or class II and III coincide, the mass concentration in the waste gas must not exceed a total of 5 mg/m³.

Carcinogenic substances

The carcinogenic materials listed below must not exceed the following concentrations in the waste gas, also if several materials of the same class are present:

class I	asbestos (chrysotile, crocidolite, amosite, anthophyllite, actinolite, tremolite) as fine dust, benzo(a)pyrene, beryllium and its compounds in respirable form, dibenz(a,h)anthracen, 2-naphtalamine	0.5 <	0.1
class II	arsenic trioxide and pentoxide, arsenious acid and its salts, arsenic acids and its salts (in respirable form), chromium (VI) compounds (in respirable form), as far as calcium chromate, chromium (III) chromate, strontium chromate and zinc chromate, cobalt (in form of respirable dusts/aerosols of cobalt metal and cobalt salts of low solubility), 3,3'-dichlorobenzidine, dimethyl sulphate, ethyleneimine, nickel (in form of respirable dusts/aerosols of nickel metal, nickel sulphide and pyritiferous ores, nickel oxide and nickel carbonate, nickel tetracarbonyl)	5 <	1
class III	acrylonitril, benzene, 1,3-butadiene, 1-chloro-2,3-epoxypropane, 1,2-dibromomethane, 1,2-epoxypropane, ethylen oxide, hydrazine, vinyl chloride	25 <	5

If substances of class I and II coincide, the mass concentration in the waste gas must not exceed a total of 1 mg/m³. If substances of class I and III or class II and III coincide, the mass concentration in the waste gas must not exceed a total of 5 mg/m³.

Vaporous and gaseous inorganic substances

The following vaporous or gaseous inorganic substances shall not exceed the respective mass concentrations in the waste gas:

class I	arsine, cyanogen chloride, phosgene, hydrogen phosphide	10 <	1
class II	bromine, fluorine and their vaporous or gaseous compounds, chlorine, hydrocyanic acid, hydrogen sulphide	50 <	5
class III	vaporous or gaseous inorganic chlorine compounds, if not in class I	300 <	30
class IV	sulphur oxides, nitrogen oxides	5000 <	500

Organic substances

Organic substances, which are classified into class I through III in Annex E (omitted), shall not exceed the following mass concentrations, even if several substances of the same class are present:

class I	100 <	20
class II	2000 <	100
class III	3000 <	150

If organic substances in several classes are present, mass concentration in the waste gas shall not exceed a total of 0.15 g/m³ at a total mass flow of 3 kg/h or more.

(2) Specific emission limits for iron and steel industry

category	parameter	limit
sintering	particles NO _x (as NO ₂)	collected and fed to a deduster 400 mg/m ³
pig iron producing	particles	collected and fed to a deduster
Steel producing in converters, electric arc furnaces and vacuum melting systems smelting steel or cast iron	particles CO	20 mg/m ³ (electric furnaces, induction furnaces or cupola furnaces with upper blast furnace gas offtake) 50 mg/m ³ (cupola furnaces with lower blast furnace gas offtake) 1000 mg/m ³ (hot-blast cupola furnaces) shall be utilized or burned as far as possible in other cases.
rolling metals, heating furnaces and heat-treatment furnaces	NO _x (as NO ₂) SO _x (as SO ₂)	500-1300 mg/m ³ (*1) 200-800 mg/m ³ (*2)
iron, malleable-iron, and steel foundries	particles organic substances	collected and fed to a deduster 20 mg/m ³ (in case of utilizing filter dedusters at a mass flow of 0.5 kg/h or more) collected and fed to a deduster
galvanizing	particles chlorine	10 mg/m ³ 20 mg/m ³ (as HCl)
surface treatment of metals by utilizing nitric acids (pickling plants)	NO _x (as NO ₂)	1500 mg/m ³

*1) O₂ in the waste gas is 5 % and preheated combustion air is more than 200°C.

*2) O₂ in the waste gas is 3 %. In case utilizing fuel gases in joint operations between steel works and coking plants.

4. Citation

4.1. Title of document:

"Technical Instructions on Air Quality Control"

4.2. Publisher:

Federal Ministry for Environment, Nature Conservation and Reactor Safety

4.3. Date published:

1986

4.4. Publisher reference code:

-

4.5. IEO library code:

100.6/DETI

Headline: Dust emission limit for electric arc furnace in Greece

1. Descriptors

- 1.1. Country: Greece
- 1.2. Industry: Iron and steel industry (electric arc furnace)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Dust

2. Legal reference

- 2.1. Title of the law/regulations: The President Decree 118.81
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

The national government is responsible for air pollution control in Greece. Control of emissions from industrial plant is the responsibility of the Directorate for Protection of the Environment within the Ministry of Industry, with enforcement carried out by this directorate (for large installations) and the regional services of the Ministry.

All industrial production installations in Greece are subject to the regulations and emission limits stipulated by the President Decree 118.81. Regarding electric arc furnace, the dust emission limit is 100 mg/m³N, according to the decree.

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emissions of Pollutants into the Air from Electric Arc Steel Production Plants - Final Report"
- 4.2. Publisher: Commission of European Communities DG XI A3
- 4.3. Date published: April 1994
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/EETN

Headline: Standards and regulations for the iron and steel works 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: Air/Emission
1.5. Parameters: -

2. Legal reference

- 2.1. Title of the law/regulations: Air Pollution Control Ordinance
2.2. Date issued: 1983
2.3. Date amended: -

3. Summary

In the air pollution aspect, the iron and steel works are classified under the Air Control Ordinance as one of the 23 specified processes which have high air pollution potential. Under the Ordinance, any new operation started from 2 October 1987 will be required to be licensed if the installed furnace capacity exceeds 1 tonne or, if the most of operation is continuous, 1 tonne per hour. Owners of existing premises used for the conduct of the process will be exempt from licensing. This exemption will however be withdrawn if the owner alters, renews or adds any relevant plant in connection with the existing specified process. A license to operate the process will then be required.

Like other specified processes, under the Ordinance, the owner of any iron and steel works is required to use the best practicable means to prevent the emission or discharge of any noxious or offensive emissions from his premises and to render such emissions where discharged harmless and inoffensive. The expression "best practicable means" where used with respect to the emission from a premise of an air pollutant, has reference not only to the provision and the efficient maintenance of appliances adequate for preventing such emission, but also to the manner in which such appliances are used and to the proper supervision by the owner of the premises of any operation in which such an air pollutant is evolved. The term "noxious or offensive emissions" is also statutorily defined. Those particularly relevant to iron and steel works include the metal or metallic oxide fumes, carbon monoxide, nitrogen oxides, sulphur dioxide, smoke, soot, grit and dust.

In granting the licence to conduct a specified process, the Authority will consider the following aspect:

- a) whether or not the owner is capable to provide and maintain the best practicable means for the prevention of the emission of any air pollutant;
- b) whether or not the operation of the premises will inhibit the attainment or maintenance of any relevant air quality objective; and
- c) whether or not the emission of noxious or offensive emissions will be, or likely to be, prejudicial to health.

The licence granted will be subject to certain licensing conditions including the limitation of emission of pollutants, monitoring and

measurement requirements, restriction of use of certain material or fuel and operation control.

All iron and steel works, whether they are licensed or exempted, are also required to comply with the other provisions of the Air Pollution Control Ordinance as well as the four sets of subsidiary regulations which are:

- the Air Pollution Control (Smoke) Regulations,
- the Air Pollution Control (Furnaces, Ovens and Chimneys) (Installation and Alteration) Regulations,
- the Air Pollution Control (Restriction and Measurement of Smoke Emission) Regulations,
- the Air Pollution Control (Specified Processes) Regulations.

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: Air emission standards for Visakhapatnam Steel Project 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: Air/Emission
- 1.5. Parameters: Particulate matter, sulphur dioxide, carbon monoxide, oxides of nitrogen, hydrogen sulphide, ammonia, benzol, phenol, hydrogen cyanide, naphthalene, naphtha, 3,4 benzpyrene, toluene, xylene, anthracene, chrasene, manganese, sulphuric acid, iron dust, oil vapour, kerosene vapour

2. Legal reference

- 2.1. Title of the law/regulations: Air (Prevention and Control of Pollution) Act (1981)
Environment Protection Act (1986)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

Typical emission standards for discharge of gaseous pollutants from Visakhapatnam Steel Project stipulated by State Pollution Control Board, ANDHRA PRADESH, are as below:

parameter	stack height (meters)	emission rate recommended for adoption (gm/sec)
particulate matter	10	0.27
	15	0.30
	20	0.35
	25	0.40
	30	1.50
	35	10.00
	40	30.00
	45	30.00
	50	35.00
	65	40.00
	80	45.00
sulphur dioxide	12	1.00
	30	2.00
	50	3.00
	80	10.00
	100	15.00
carbon monoxide	12	5.00
	35	10.00
	80	45.00
	100	50.00
	120	65.00

oxides of nitrogen	30	0.50
	45	1.00
	50	3.00
	80	5.00
	120	10.00
	150	15.00
hydrogen sulphide	10	0.10
	15	0.25
	25	0.50
	80	1.00
	100	1.50
ammonia	10	0.25
	15	0.50
	25	1.00
benzol	10	0.50
	15	1.50
	20	2.00
phenol	10	0.001
	15	0.002
	25	0.003
hydrogen cyanide	10	0.003
	15	0.0035
naphthalene	15	0.034
naphtha	15	0.004
3,4 benzpyrene	15	0.09
toluene	15	0.0095
xylene	15	0.0055
anthracene	15	0.03
chrasene	15	0.65
manganese dioxide	35	0.035
	100	1.00
sulphuric acid	100	0.15
iron dust	100	0.05
oil vapour	25	0.03
kerosene vapour	25	0.02

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:

-

4.5. IEO library code:

50.2/UJPR

Headline: Air emission regulations for integrated iron and steel operation in India

1. Descriptors

- 1.1. Country: India
- 1.2. Industry: Iron and steel industry (integrated)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Particulate matter, carbon monoxide

2. Legal reference

- 2.1. Title of the law/regulations: Environment (Protection) Act (1986); the Environment (Protection) Fourth Amendment Rules (1987)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

process	parameter	limit	unit
sintering plant	particulate matter	150	mg/Nm ³
steel making			
during normal operation	particulate matter	150	mg/Nm ³
during oxygen lancing	particulate matter	400	mg/Nm ³
rolling mill	particulate matter	150	mg/Nm ³
coke oven	carbon monoxide	3	(*1)

*1) kg/tonne of coke produced.

4. Citation

- 4.1. Title of document: "Pollution Control Legislation"
- 4.2. Publisher: Tamil Nadu Pollution Control Board, Madras
- 4.3. Date published: 1989
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: Guidelines for minimum stack height in India

1. Descriptors

- 1.1. Country: India
1.2. Industry: All plants except thermal power plant
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Stack height

2. Legal reference

- 2.1. Title of the law/regulations: Air (Prevention and Control of Pollution) Act
2.2. Date issued: 1981
2.3. Date amended: -

3. Summary

1. Guidelines for minimum stack height.

plant type	stack height
for all plants except thermal power plant	30 m

2. For plants where the sulphur dioxide emission is estimated as Q (kg/hr), the stack height , H in metres is given by;

$$H = 14 (Q)^{0.3}$$

3. For plants where the particulate matter emission is estimated as Q (tonne/hr), the stack height , H in metres is given by;

$$H = 74 (Q)^{0.27}$$

4. If by using the formula given in 2 or 3 above, the stack height arrived at is more than 30 m then this higher stack height should be used.

In no case should the height of the stack be less than 30 m.

4. Citation

- 4.1. Title of document: "Emission Regulations" part one
4.2. Publisher: Central Board for the Prevention and Control of Water Pollution, New Delhi
4.3. Date published: July 1984
4.4. Publisher reference code: COINDS/17/1983-84
4.5. IEO library code: 100.6/CBER

Headline: Air emission standards in Indonesia

1. Descriptors

- 1.1. Country: Indonesia
- 1.2. Industry: All Industries including iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Sulphuric acid mist and sulphur trioxide, nitric oxide, carbon monoxide, dust, hydrogen sulphide, ammonia, chlorine gas, hydrogen chloride, hydrogen fluoride and its compound, lead, acid gas, zinc, mercury, cadmium, arsenic, antimony, radioactive matter, smoke

2. Legal reference

- 2.1. Title of the law/regulations: The Basic Provisions for the Management of the Environment
- 2.2. Date issued: 1982
- 2.3. Date amended: -

3. Summary

parameter	standard			unit
	A	B	C	
sulphuric acid mist and sulphur trioxide	0.20	0.25	0.30	g/Nm ³ as SO ₃
nitric oxide	1.70	4.60	4.60	g/Nm ³
carbon monoxide	1.00	1.00	1.00	g/Nm ³
dust	0.40	0.50	0.60	g/Nm ³
hydrogen sulphide	5.00	5.00	6.25	ppm
ammonia	1	-	5	ppm
chlorine gas	0.20	0.25	0.30	g/Nm ³ as HCl
hydrogen chloride	0.40	0.50	0.60	g/Nm ³ as HCl
hydrogen fluoride and its compound	0.02	0.02	0.02	g/Nm ³ as HF
lead	0.025	0.025	0.04	g/Nm ³
acid gas	3.50	6.00	7.50	g/Nm ³ as SO ₃
zinc	0.10	0.10	0.15	g/Nm ³
mercury	0.01	0.01	0.02	g/Nm ³
cadmium	0.015	0.015	0.025	g/Nm ³
arsenic	0.025	0.025	0.04	g/Nm ³
antimony	0.025	0.025	0.04	g/Nm ³
radioactive matter	-	-	-	-
smoke	Ringelmann Chart NO.2			-

4. Citation

- 4.1. Title of document: Direct communication with PT KRAKATAU STEEL on Air Emission Standards from Iron

and Steel Industry in Indonesia.

4.2. Publisher:

-

4.3. Date published:

Sep. 1994

4.4. Publisher reference code:

-

4.5. IEO library code:

-

Headline: Air emission limit for steel industry in Ireland

1. Descriptors

- 1.1. Country: Ireland
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: -

2. Legal reference

- 2.1. Title of the law/regulations: The Air Pollution Act
2.2. Date issued: 1987
2.3. Date amended: -

3. Summary

In Ireland no nationally binding limit values are laid down for emissions from the steel industry. The Air Pollution Act, 1987, requires the application of "best practical means" to reduce emissions. Legally binding emission limit values are applied at a local level by licencing authorities, having regard to TA Luft and other international standards.

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emissions of Pollutants into the Air from Electric Arc Steel Production Plants - Final Report"
4.2. Publisher: Commission of European Communities DG XI A3
4.3. Date published: April 1994
4.4. Publisher reference code: -
4.5. IEO library code: 50.2/EETN

Headline: Air emission limits in Italy

1. Descriptors

- 1.1. Country: Italy
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Cancerogene, teratogene and mutagene substances, toxic substances, inorganic substances as dust form, inorganic substances as gas or vapour form, organic substances, total dust, nitrogen oxides

2. Legal reference

- 2.1. Title of the law/regulations: D.P.R. No.203 (24/5/1988), D.M. (12/7/1990)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

(1) General emission limits

The national law for existing plants sets out a maximum and minimum emission limits for each pollutant of concern, as shown in the following table;

parameter	class	mass flow	min.limit (mg/Nm ³)	max.limit (mg/Nm ³)
cancerogene, teratogene and mutagene substances	I	> 0.5 g/h	0.1	0.2
	II	> 5 g/h	1	2
	III	> 25 g/h	5	10
toxic substances	I	> 0.02 g/h	0.01	0.02
	II	> 0.5 g/h	0.5	1
inorganic substances as dust form	I	> 1 g/h	0.2	0.4
	II	> 5 g/h	1	2
	III	> 25 g/h	5	10
inorganic substances as gas or vapour form	I	> 10 g/h	1	2
	II	> 50 g/h	5	10
	III	> 0.3 kg/h	30	60
	IV	> 2 kg/h	250	500
	V	> 5 kg/h	500	1000
organic substances	I	> 25 g/h	5	10
	II	> 0.1 kg/h	20	40
	III	> 2 kg/h	150	300
	IV	> 3 kg/h	300	600
	V	> 4 kg/h	600	1200
total dust		0.5 kg/h	50	100
		0.1 kg/h	150	300

*1) For complete explanation of the substances and classes refer to the

regulations issued by the Ministero dell'Industria, Roma.

(2) Specific emission limits for existing sinter plants and furnaces

The relevant authority defines individual emission limits, taking into account the maximum and minimum levels outlined in the above table. Where certain areas are heavily polluted, the authorities can define more stringent levels than those minimum ones stipulated at a national level.

category	parameter	emission limit (mg/Nm ³)	comment
sinter plant	dust	100	
	inorganic substances as dust	0.4	class I
		2	class II
		10	class III
nitrogen oxides	400		
blast furnace	dust	150 (*1)	

*1) As far as the blast furnaces remaking.

*2) For a complete explanation of the 'class' system of categories refer to the regulations issued by the Ministero dell'Industria, Roma.

4. Citation

- 4.1. Title of document: Direct Communication with the Italian Ministry of the Environment on Emission Limits for Iron and Steel Industry in Italy.
- 4.2. Publisher: -
- 4.3. Date published: Oct. 1993
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: Air emission limit for electric arc furnace in Italy

1. Descriptors

- 1.1. Country: Italy
- 1.2. Industry: Iron and steel industry (electric arc furnace)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Dust

2. Legal reference

- 2.1. Title of the law/regulations: D.P.R. No.203 (24/5/1988), D.M. (12/7/1990)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

The relevant authority defines the emission limits taking into account the minimum and maximum emission limits respectively 25 and 100 mg dust/m³N for electric furnace.

For specific polluted areas, the relevant authority can define an emission limit more stringent than that of the above minimum values defined at national levels.

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emissions of Pollutants into the Air from Electric Arc Steel Production Plants - Final Report"
- 4.2. Publisher: Commission of European Communities DG XI A3
- 4.3. Date published: April 1994
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/EETN

Headline: Sulphur oxides emission standards in Japan

1. Descriptors

- 1.1. Country: Japan
1.2. Industry: All Industries including iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Sulphur oxides

2. Legal reference

- 2.1. Title of the law/regulations: Air Pollution Control Law
2.2. Date issued: 1968
2.3. Date amended: 1970, 1971, 1972, 1974, 1989

3. Summary

(1) general standards

The emission standards for sulphur oxides are set based on a national formula, called "K-value control standards", which determines the emission limits under the following formula:

$$\text{emission limits (Nm}^3/\text{h)} = K \cdot 10^{-3} \cdot \text{He}^2$$

where

- K = constant, determined for 100 areas by the national government based on air quality ($3.0 < K < 17.5$, 16 levels).
He = effective stack height in metres (the effective stack height is the sum of the actual stack height plus the average plume rise height).

(2) Special standards

The special standards are applied only to new plants in the polluted areas. (under the above formula, $1.17 < K < 2.34$, 3 levels)

(3) Areawide total pollutant load control

Within particularly polluted regions, 24 regions of 15 prefectures designated by the decree, the 'areawide total pollutant load control' standards for sulphur oxides are applied to the larger installations. There are also limits on the total mass emissions from each regions. Emission limits for individual plants are determined through use of nationally-set formulae, which incorporate constants determined by the prefectural governor. Thus prefectures have a role in determining how the total emissions permitted from the region are distributed.

The following formulae are applied to polluted regions:

- existing facilities:
emission limit (Nm³/h) = $a \cdot W^b$ or $C_m/C_{m_0} \cdot Q_0$
- new facilities and extensions:
emission limit (Nm³/h) = $a \cdot W^b + r \cdot a [(W + W_i)^b - W^b]$ or
 $r \cdot C_m/C_{m_i} \cdot Q_i$ or $r \cdot C_m / (C_{m_0} + C_{m_i}) \cdot (Q_0 + Q_i)$

where

a, b, r = constants determined by prefectural governors
W = heavy oil equivalent fuel consumption (kl/h)
W_i = heavy oil equivalent fuel consumption at new facilities
and extensions (kl/h)
Q_i = total volume of sulphur oxides emitted from new
facilities
Q_o = total volume of sulphur oxides emitted from whole
facilities
C_m = maximum combined ground concentration (ppm by volume;
determined by prefectural governor to achieve the
emission reduction target)
C_{mi} = maximum combined ground concentration related to Q_i (ppm
by volume)
C_{mo} = maximum combined ground concentration related to Q_o (ppm
by volume)

4. Citation

4.1. Title of document: "Quality of the Environment in Japan 1988"
4.2. Publisher: Environment Agency Government of Japan
4.3. Date published: Sep. 1988
4.4. Publisher reference code: -
4.5. IEO library code: -

Headline: Soot and dust emission standards for iron and steel industry in Japan

1. Descriptors

- 1.1. Country: Japan
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Soot and dust

2. Legal reference

- 2.1. Title of the law/regulations: Air Pollution Control Law
- 2.2. Date issued: 1968
- 2.3. Date amended: 1970, 1971, 1972, 1974, 1989

3. Summary

(1) general and special standard

facility	gas emission rate (Nm ³ /h)	standard (g/Nm ³)	
		general	special
boiler, gas (On=5)	40,000<	0.05	0.03
	< 40,000	0.10	0.05
boiler, oil (On=4)	200,000<	0.05	0.04
	40,000< <200,000	0.15	0.05
	10,000< < 40,000	0.25	0.15
	< 10,000	0.30	0.15
boiler, coal (On=6)	200,000<	0.10	0.05
	40,000< <200,000	0.20	0.10
	< 40,000	0.30	0.15
gas generator (On=7)		0.05	0.03
heating furnace (On=7)		0.10	0.03
sintering furnace (On=0s)		0.15	0.10
calcination furnace (On=0s).	40.000<	0.20	0.10
	<40,000	0.25	0.15
blast furnace (On=0s)		0.05	0.03
convertor (On=0s)		0.10	0.08
openhearth furnace (On=0s)	40.000<	0.10	0.05
	<40,000	0.20	0.10

metal smelting furnace (On=Os)	40,000< < 40,000	0.10 0.20	0.05 0.10
metal heating furnace (On=11)	40,000< < 40,000	0.10 0.20	0.08 0.10
drying furnace (On=16, Os)	40,000< < 40,000	0.15 0.20	0.08 0.10
electric furnace (On=Os)		0.10	0.05
coke oven (On=7)		0.15	0.10

*1) The special standards are applied only to new plants in the polluted areas.

*2) The emission concentration shall be converted through the following equation (except in case of On=Os).

$$C = (21 - O_n) / (21 - O_s) \times C_s$$

where

C : soot and dust emission concentration
 On : oxygen concentration in flue gas (set values in the above table)
 Os : actual oxygen concentration in flue gas
 Cs : actual soot and dust emission concentration

(2) additional standard

Prefectural governments have the authority to establish their own prefectural ordinances which may prescribe more stringent standards than the national standards while taking ambient air quality standards into account.

4. Citation

- 4.1. Title of document: "Measures for Environmental Pollution Control in the Japanese Steel Industry"
- 4.2. Publisher: Committee of Industrial Location and Environmental Pollution of the Japan Iron and Steel Federation
- 4.3. Date published: Oct. 1989
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/JIME

Headline: Nitrogen oxides emission standards for iron and steel industry in Japan

1. Descriptors

- 1.1. Country: Japan
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Nitrogen oxides

2. Legal reference

- 2.1. Title of the law/regulations: Air Pollution Control Law
2.2. Date issued: 1968
2.3. Date amended: 1970, 1971, 1972, 1974, 1989

3. Summary

(1) general standards

a) boiler, gas firing

stack gas volume (unit:1000Nm ³ /h)	standard (*1) (unit:ppm), On=5%						
	A	B	C	D	E	F	G
500<	130	130	100	60	60	60	60
100< <500	130	130	100	100	100	100	100
40< <100	130	130	130	100	100	100	100
10< < 40	150	150	130	130	130	130	130
5< < 10	150	150	150	150	150	150	150
< 5	150	150	150	150	150	150	150

b) boiler, solid material (including coal) firing

stack gas volume (unit:1000Nm ³ /h)	standard (*1) (unit:ppm), On=6%						
	A	B	C	D	E	F	G
700<	400	300	300	300	300	300	200
500< <700	420	300	300	300	300	300	250
200< <500	420	350	300	300	300	300	250
40< <200	450	350	300	300	300	300	250
5< < 40	450	380	350	350	350	350	350
< 5	480	480	480	380	380	350	350

c) boiler, liquid firing

stack gas volume (unit:1000Nm ³ /h)	standard (*1) (unit:ppm), On=4%						
	A	B	C	D	E	F	G
500<	180	180	150	130	130	130	130
100< <500	190	180	150	150	150	150	150
40< <100	190	180	150	150	150	150	150
10< < 40	230	230	150	150	150	150	150
5< < 10	250	250	250	180	180	180	180
< 5	250	250	250	180	180	180	180

d) gas generator, heating furnace

stack gas volume (unit:1000Nm ³ /h)	standard (*1) (unit:ppm), On=7%						
	A	B	C	D	E	F	G
-	170	170	170	170	150	150	150

e) sintering furnace (excluding pellet baking furnace)

stack gas volume (unit:1000Nm ³ /h)	standard (*1) (unit:ppm), On=15%						
	A	B	C	D	E	F	G
100<	260	260	260	220	220	220	220
10< <100	270	270	270	220	220	220	220
< 10	300	300	300	300	220	220	220

f) calcination furnace

stack gas volume (unit:1000Nm ³ /h)	standard (*1) (unit:ppm), On=10%						
	A	B	C	D	E	F	G
-	200	200	200	200	200	200	200

g) blast furnace

stack gas volume (unit:1000Nm ³ /h)	standard (*1) (unit:ppm), On=15%						
	A	B	C	D	E	F	G
-	120	120	120	120	100	100	100

h) metal melting furnace

stack gas volume (unit:1000Nm ³ /h)	standard (*1) (unit:ppm), On=12%						
	A	B	C	D	E	F	G
-	200	200	200	200	180	180	180

i) metal heating furnace

stack gas volume (unit:1000Nm ³ /h)	standard (*1) (unit:ppm), On=11%						
	A	B	C	D	E	F	G
100<	160	160	100	100	100	100	100
10< <100	170	170	150	130	130	130	130
5< < 10	170	170	170	150	150	150	150
< 5	200	200	200	180	180	180	180

j) drying furnace

stack gas volume (unit:1000Nm ³ /h)	standard (*1) (unit:ppm), On=16%						
	A	B	C	D	E	F	G
-	250	250	250	250	230	230	230

k) coke oven (excluding Otto type)

stack gas volume (unit:1000Nm ³ /h)	standard (*1) (unit:ppm), On=7%						
	A	B	C	D	E	F	G
100<	350	350	200	170	170	170	170
<100	350	350	350	170	170	170	170

- *1) A is for plants installed before 8. 9, 1973.
 B is for plants installed after 8.10, 1973 before 12. 9, 1975.
 C is for plants installed after 12.10, 1975 before 6.17, 1977.
 D is for plants installed after 6.18, 1977 before 8. 9, 1979.
 E is for plants installed after 8.10, 1979 before 9. 9, 1983.
 F is for plants installed after 9.10, 1983 before 3.31, 1987
 G is for plants installed after 4. 1, 1987.

- *2) NO_x emission concentration shall be converted through the following equation.

$$C = (21 - O_n) / (21 - O_s) \times C_s$$

where

- C : nitrogen oxides emission concentration
 O_n : oxygen concentration in flue gas (set values in the above tables)
 O_s : actual oxygen concentration in flue gas
 C_s : actual nitrogen oxides emission concentration

(2) additional standard

Prefectural governments have the authority to establish their own prefectural ordinances which may prescribe more stringent standards than the national standards while taking ambient air quality standards into account.

(3) Areawide total pollutant load control

Within particularly polluted regions, 3 regions (Tokyo, Kanagawa and Osaka) designated by the decree, the 'areawide total pollutant load control' standards for nitrogen oxides are applied to the larger installations. There are also limits on the total mass emissions from each regions. Emission limits for individual plants are determined through use of nationally-set formulae, which incorporate constants determined by the prefectural governor. Thus prefectures have a role in determining how the total emissions permitted from the region are distributed.

The following formulae are applied to polluted regions:

existing facilities;

$$\text{emission limit (Nm}^3/\text{h)} = a \cdot W^b \text{ or } K \cdot [\Sigma(C \cdot V)]^L$$

new facilities and extension;

$$\text{emission limit (Nm}^3/\text{h)} = a \cdot W^b + r \cdot a [(W + W_i)^b - W^b] \text{ or } K \cdot [\Sigma(C \cdot V) + \Sigma(C_i \cdot V_i)]^L$$

where

a, b, r, L	=	constants determined by prefectural governors
W	=	heavy oil equivalent fuel consumption (kl/h)
W _i	=	heavy oil equivalent fuel consumption at new facilities and extensions (kl/h)
C	=	facility coefficient (determined by prefectural governor)
C _i	=	facility coefficient of new facilities and extensions (determined by prefectural governor)
V	=	exhaust gas volume (10 ⁴ m ³ /h)
V _i	=	exhaust gas volume of new facilities (10 ⁴ m ³ /h)
K	=	reduction constant determined by prefectural governor

4. Citation

4.1. Title of document:

"Measures for Environmental Pollution Control in the Japanese Steel Industry"

4.2. Publisher:

Committee of Industrial Location and Environmental Pollution of The Japan Iron and Steel Federation

4.3. Date published:

Oct. 1989

4.4. Publisher reference code:

-

4.5. IEO library code:

50.2/JIME

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: Air/Emission
- 1.5. Parameters: Dust, NH₃, CO, SO_x, NO_x, HCl, Cl₂

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 is located in coastal area but because of the close vicinity to the Yochon Petroleum Industry Complex, the air pollution problem is expected, according to Environmental Impact Assessment.

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

parameter	national std.	company std.	unit
dust	30-200	20	mg/Nm ³
NH ₃	200	200	ppm
CO	600-700	400	ppm
SO _x	300-1200	300	ppm
NO _x	200-400	200	ppm
HCl	80	80	ppm
Cl ₂	80	80	ppm

4. Citation

- 4.1. Title of document: Direct communication with Pohan Iron and Steel Co. Ltd. on the air emission standards for iron and steel industry in Korea.
- 4.2. Publisher: -
- 4.3. Date published: July 1993
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: Emission standards for sinter plants, pellets plants and blast furnaces in Luxembourg

1. Descriptors

- 1.1. Country: Luxembourg
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: -

2. Legal reference

- 2.1. Title of the law/regulations: The law of May 9, 1990
2.2. Date issued: -
2.3. Date amended: -

3. Summary

The authorisation of sinter plants, pellets plants and blast furnaces is regulated through the law of May 9, 1990 relative to dangerous, un healthy and inconvenient plants. Authorised installation must conform to the state of the art.

At the moment, there are no existing general emission limits in Luxembourg for sinter plants, pellet plants and blast furnaces. Emission limits are fixed on a case by case basis referring to German standards (TA Luft). Introduction of the national emission limitation is planned at some stage during 1992.

4. Citation

- 4.1. Title of document: "Preparation of Technical Notes on Best Available Technologies for Prevention of Air Pollution Emissions from Sinter Plants, Pelletisation Plants and Blast Furnaces"
4.2. Publisher: Environmental Resources Limited
4.3. Date published: October 1992
4.4. Publisher reference code: 1067
4.5. IEO library code: -

Headline: Air emission limit for electric arc furnace in Luxembourg

1. Descriptors

- 1.1. Country: Luxembourg
1.2. Industry: Iron and steel industry (electric arc furnace)
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Dust, cadmium, mercury, cobalt, nickel, chromium, manganese, lead, dioxins

2. Legal reference

- 2.1. Title of the law/regulations: The Law of May 9, 1990
2.2. Date issued: -
2.3. Date amended: -

3. Summary

At the moment there exist no general emission limits in Luxembourg for the electric arc steel industry. Emission limits are fixed on a case by case. The emission limits in a recent permit are as follows:

parameter	limit	unit	remark
dust	5	mg/m ³ N	all dust must be captured and conducted to a bag filter
cadmium, mercury	0.05	mg/m ³ N	
cobalt, nickel	0.25	mg/m ³ N	
chromium, manganese, lead	1.25	mg/m ³ N	
dioxins	0.1	ng/m ³ N	from 1.1.1997

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emissions of Pollutants into the Air from Electric Arc Steel Production Plants - Final Report"
4.2. Publisher: Commission of European Communities DG XI A3
4.3. Date published: April 1994
4.4. Publisher reference code: -
4.5. IEO library code: 50.2/EETN

Headline: Emission standards for air impurities 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: Air/Emission
- 1.5. Parameters: Smoke, solid particles, mercury, cadmium, lead, antimony, arsenic, zinc, copper, acid gases, sulphuric acid mist or sulphur trioxide or both, chlorine gas, hydrogen chloride, fluorine hydrofluoric acid or fluorine compound, hydrogen sulphide, oxides of nitrogen, dust and solid particles, asbestos and silica

2. Legal reference

- 2.1. Title of the law/regulations: Environmental Quality Act (1974)
 Environmental Quality (Clean Air) Regulation (1978)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

Smoke emissions from new industrial installations should not be darker than shade No.1 of Ringelmann Chart for fuel burning equipment utilizing liquid fuel and should not be darker than No.2 for equipment utilizing solid fuel. However, smoke emissions of darker than the specified shades are allowed for a period of less than 5 minutes in an hour or 15 minutes in any period of 24 hours during starting-up operations and soot-blowing.

The regulations also prescribe standards for the emission of impurities as shown below. Three types of emission standards are prescribed:

Standard C is to be complied by all new facilities established after 1st October 1978;

Standard B is the ultimate standard for existing facilities (established before 1st October 1978);

Standard A is the intermediate standard which has by existing facilities before 1st October 1980.

Emissions of noxious or offensive substances (including odour) must be prevented by the use of the best practicable means and to render harmless and inoffensive those substances necessarily discharged.

parameter	source	standards			unit
		A	B	C	
solid particles	the heating of metals	0.3	0.25	0.2	gm/Nm ³
	other operations	0.6	0.5	0.4	gm/Nm ³
metals and metallic compounds					

mercury		0.02	0.01	0.01	gm/Nm ³
cadmium		0.025	0.015	0.015	gm/Nm ³
lead		0.04	0.025	0.025	gm/Nm ³
antimony		0.04	0.025	0.025	gm/Nm ³
arsenic		0.04	0.025	0.025	gm/Nm ³
zinc		0.15	0.1	0.1	gm/Nm ³
copper		0.15	0.1	0.1	gm/Nm ³
acid gases	manufacture of sulphuric acid	7.5	6.0	3.5	gm/Nm ³ (as SO ₃) effluent gas should be free from persistent mist
sulphuric acid mist or sulphur trioxide or both	any source other than combustion process and plant for sulphuric acid	0.3	0.25	0.2	gm/Nm ³ (as SO ₃) effluent gas should be free from persistent mist
chlorine gas	any source	0.3	0.25	0.2	gm/Nm ³ (as HCl)
hydrogen chloride	any source	0.6	0.5	0.4	gm/Nm ³ (as HCl)
fluorine, hydrofluoric acid, or fluorine compound	manufacture of aluminium from alumina	-	-	0.02	gm/Nm ³ (as hydrofluoric acid)
	any source other than manufacture of aluminium from alumina	0.15	0.125	0.100	gm/Nm ³ (as hydrofluoric acid)
hydrogen sulphide	any source	6.25	5.00	5.00	ppm (*1)
oxides of nitrogen	manufacture of nitric acid	4.60	4.60	1.7	gm/Nm ³ (as NO ₂) effluent gas should be substantially colourless
	any source other than combustion processes and manufacture of nitric acid	3.0	2.5	2.0	gm/Nm ³ (as NO ₂)
dust and solid particles	asphalt concrete plant stationary	0.5	0.4	0.3	gm/Nm ³
	mobile	0.7	0.7	0.4	gm/Nm ³
	portland cement plant kiln	0.4	0.2	0.2	gm/Nm ³
	clinker, cooler finish grinding and others	0.4	0.2	0.2	gm/Nm ³
asbestos and free silica		0.4	0.2	0.12	gm/Nm ³

*1) Parts per million volume for volume.

4. Citation

4.1. Title of document:

"Environment Management in the Iron and Steel Industry in Malaysia", 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"

<u>4.2. Publisher:</u>	Industry and Environment Office, United Nations Environment Programme
<u>4.3. Date published:</u>	1988
<u>4.4. Publisher reference code:</u>	-
<u>4.5. IEO library code:</u>	50.2/UJPR

Headline: Emission standards for iron-foundry sector in the Netherlands

1. Descriptors

- 1.1. Country: The Netherlands
- 1.2. Industry: Iron and steel industry (foundry)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Particulate matter, amines, dioxins, Pb, Cd, Cu, Zn, Hg, SO₂, NO_x, CO, VOC, phenol, benzene

2. Legal reference

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

3. Summary

process	parameter	limit	unit (mg/m ³ N)
casting	particulate matter (bag filter)	10	
	amines	5	
melting	particulate matter:		
	new installations (bag filter)	10	
	existing installations	50	
	dioxin	-	
	heavy metals		
	Pb	1.0	
	Cd	0.2	
	Cu	5.0	
	Zn	-	
	Hg	0.2	
	other pollutants		
	SO ₂	200.0	
	NO _x	200.0	
CO	-		
VOC	-		
amines	5.0		
phenol	20.0		
benzene	5.0		

4. Citation

- 4.1. Title of document: "ETUDE CONCERNANT LES MTD POUR LA PREVENTION DE LA POLLUTION DE L'AIR DANS LES FONDRIES DE METAUX FERREUX. DRAFT FINAL REPORT"
- 4.2. Publisher: CENTRE INTERPROFESSIONNEL TECHNIQUE D'ÉTUDES DE LA POLLUTION ATMOSPHERIQUE

4.3. Date published: September 1992

4.4. Publisher reference code: -

4.5. IEO library code: -

Headline: Air emission limit for electric arc furnace in the Netherlands

1. Descriptors

- 1.1. Country: The Netherlands
1.2. Industry: Iron and steel industry (electric arc furnace)
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Dust, cadmium, copper, nickel, lead, chromium, manganese, tin, zinc, dioxins

2. Legal reference

- 2.1. Title of the law/regulations: Air Pollution Act, 1970; Dutch Emission Regulations
2.2. Date issued: -
2.3. Date amended: -

3. Summary

National government (the Ministry of Housing, Physical Planning and Environment) is responsible for determining and introducing emission standards.

The basis framework for licencing was set out in the 1970 Air Pollution Act. In the Dutch Emission Regulations (NER) there are emission limits for a lot of substances. There is also specific regulation for processes.

Local government (the Province) is responsible for enforcing emission limits through the licencing of the industrial plants, and may also choose to set more stringent limits.

In the Netherlands there is a specific regulation for the electric arc steel industry:

parameter	limit	unit	remark
dust	10	mg/m ³ N	(*1)
cadmium	0.2	mg/m ³ N	-
copper, nickel, lead	1	mg/m ³ N	-
chromium, manganese, tin	5	mg/m ³ N	-
zinc	10	mg/m ³ N	-
dioxins	the raw material must be free of chlorine-substances.		

*1) In installation of hoods, 90% of all dust must be captured. In installation of a fourth hole, all gases have to be extracted to a bag filter.

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emissions of Pollutants into the Air from Electric Arc Steel Production Plants - Final Report"

4.2. Publisher: . Commission of European Communities DG XI
A3

4.3. Date published: April 1994

4.4. Publisher reference code: -

4.5. IEO library code: 50.2/EETN

Headline: National environmental emission standards for industrial gaseous emissions 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: Air/Emission
- 1.5. Parameters: Smoke, particulate matter, hydrogen chloride, chlorine hydrogen fluoride, hydrogen sulphide, sulphur oxides, carbon monoxide, lead, mercury, cadmium, arsenic, copper, antimony, zinc, nitrogen oxides

2. Legal reference

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

3. Summary

parameter	limit	unit	remark
smoke	40 or 2	%; Ringelmann scale	-
particulate matter (*1)	300 500 200 500	mg/m ³ mg/m ³ mg/m ³ mg/m ³	(boilers or furnaces using oil) (boilers or furnaces using coal) (boilers or furnaces in cement kilns) (grinding, crushing, clinker coolers and related processes, metallurgical processes, convertors, blast furnaces and cupolas)
hydrogen chloride	400	mg/m ³	any sources
chlorine	150	mg/m ³	any sources
hydrogen fluoride	150	mg/m ³	any sources
hydrogen sulphide	10	mg/m ³	any sources
sulphur oxides	400	mg/m ³	any sources
carbon monoxide	800	mg/m ³	any sources
lead	50	mg/m ³	any sources
mercury	10	mg/m ³	any sources
cadmium	20	mg/m ³	any sources
arsenic	20	mg/m ³	any sources
copper	50	mg/m ³	any sources
antimony	20	mg/m ³	any sources
zinc	200	mg/m ³	any sources
nitrogen oxides	400	mg/m ³	any sources

*1) Based on the assumption that the size of the particles is 10 microns or more.

4. Citation

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

Headline: Maximum permissible emission standards for specific air pollution from stationary sources in the Philippines

1. Descriptors

- 1.1. Country: The Philippines
- 1.2. Industry: All industries including iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Ammonia, carbon monoxide, sulphuric acid and sulphur dioxide and sulphur trioxide, nitrogen oxides, hydrogen sulphide gas, chlorine and chlorine gas

2. Legal reference

- 2.1. Title of the law/regulations: Sec.59 of 1978 NPCC (national pollution control commission) Rules and Regulations
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

parameter	source	standard	unit
ammonia	any source	400	mg/scm
carbon monoxide	any industrial source	500	mg/scm
H ₂ SO ₄ , SO ₂ and SO ₃	any trade industry or process excluding sulphuric acid manufacture	1500	mg/scm (as SO ₂)
nitrogen oxides	any source	2000	mg/scm (as NO ₂)
H ₂ S gas	any source	15	mg/scm
Cl and Cl ₂	any source	60	mg/scm

4. Citation

- 4.1. Title of document: "Iron and Steel Industry in the Republic of Philippines", 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: Emission standards for sinter plants, pelletisation plants and blast furnaces in Portugal

1. Descriptors

- 1.1. Country: Portugal
- 1.2. Industry: Iron and steel industry (sinter plants, pelletisation plants and blast furnaces)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: -

2. Legal reference

- 2.1. Title of the law/regulations: The Ordinance on Air Pollution Control, Decreto Lei No.352/90
- 2.2. Date issued: November 1990
- 2.3. Date amended: -

3. Summary

National air pollution control policy in Portugal has been established by the Ordinance on Air Pollution Control, Decreto Lei No.352/90, in November 1990. This law determines the organisations which are responsible for air pollution control.

- General Directorate for Environmental Quality at national level.
- Regional Coordination Commissions and Air Management Commissions at regional and local levels.

According to this law the emission standards of air pollutants from stationary sources are established jointly by the Ministry of the Environment and Natural Resources and by the Ministry of Industry and Energy. They will be applied to new plants, with existing plants having to be retrofitted within a timeframe of 5 years. The emission standards are to be published in the near future.

New plants, or modifications to existing plants, are subject to a procedure of authorisation which is regulated along the directions of Decreto-Lei No.109/9 and Decreto Regulamentar No.10.19. Activities that are sources of air pollutants must have the statement of the legal authorities responsible for the air quality management. This statement must be included in the procedure of authorisation.

4. Citation

- 4.1. Title of document: "Preparation of Technical Notes on Best Available Technologies for Prevention of Air Pollution Emissions from Sinter Plants, Pelletisation Plants and Blast Furnaces"
- 4.2. Publisher: Environmental Resources Limited
- 4.3. Date published: October 1992

4.4. Publisher reference code: 1067

4.5. IEO library code: -

Headline: Air emission limit for electric arc furnace in Portugal

1. Descriptors

- 1.1. Country: Portugal
- 1.2. Industry: Iron and steel industry (electric arc furnace)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Particulates

2. Legal reference

- 2.1. Title of the law/regulations: Decree-Law No. 352/90 of November 1990
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

New standards were set in the Portaria n° 286/93 of 12 March, 1993.
Concerning electric arc plants limit for particulates is 1000 mg/m³N.

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emissions of Pollutants into the Air from Electric Arc Steel Production Plants - Final Report"
- 4.2. Publisher: Commission of European Communities DG XI A3
- 4.3. Date published: April 1994
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/EETN

Headline: Industrial emission standards 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: Air/Emission
- 1.5. Parameters: Smoke, dust, sulphuric acid mist or SO₃, acid gas, fluoride, HCL, Cl, H₂S, nitric acid or nitric oxide, CO, copper and its compound, lead and its compound, arsenic and its compound, antimony and its compound, cadmium and its compound, mercury and its compound

2. Legal reference

- 2.1. Title of the law/regulations: Clean Air Act (1971)
Clean Air (Standards) Regulations (1972)
- 2.2. Date effective: Jan. 1972
- 2.3. Date last amended: 1980

3. Summary

The following emission regulations are only applied to stationary sources.

parameter	category	standard	unit
smoke	all plants	shall not exceed opacity of Ringelmann 2 for 5 min. in any one hour; such emissions shall not exceed three times in any one day.	
dust	all plants	0.20	g/Nm ³ (provided that dust contains 12% of CO ₂)
sulphuric acid mist or SO ₃	all plants except H ₂ SO ₄ manufacturing plant	0.10	g/Nm ³ (as SO ₃)
acid gas	H ₂ SO ₄ manufacturing plant	3.00	g/Nm ³ (as SO ₃)
fluorine	plants emitting fluorine, hydrofluoric acid or any inorganic fluorine compounds	0.10	g/Nm ³ (as hydrofluoric acid)
HCL	all plants	0.20	g/Nm ³ (as HCL)
Cl	all plants	0.10	g/Nm ³ (as Cl)
H ₂ S	all plants	5	ppm (as H ₂ S gas)
nitric acid or nitric oxide	HNO ₃ manufacturing plant	2.00	g/Nm ³ (as NO ₂)
	other plants	1.00	g/Nm ³ (as NO ₂)
CO	all plants	1.00	g/Nm ³ (as CO)
copper and	all plants	0.02	g/Nm ³ (as Cu)

its compound			
lead and its compound	all plants	0.02	g/Nm ³ (as Pb)
arsenic and its compound	all plants	0.02	g/Nm ³ (as As)
antimony and its compound	all plants	0.01	g/Nm ³ (as Sb)
cadmium and its compound	all plants	0.01	g/Nm ³ (as Cd)
mercury and its compound	all plants	0.01	g/Nm ³ (as Hg)

4. Citation

- 4.1. Title of document: Direct Communication with Singaporean
Ministry of Environment on the Industrial
Emission Standards in Singapore
- 4.2. Publisher: -
- 4.3. Date published: Oct. 1994
- 4.4. Publisher Reference Code: -
- 4.5. IEO Library Code: -

Headline: Emission limits for sinter plants, pelletisation plants and blast furnaces industry in Spain

1. Descriptors

- 1.1. Country: Spain
- 1.2. Industry: Iron and steel industry (sinter plants, pelletisation plants and blast furnaces)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Particulate, SO₂

2. Legal reference

- 2.1. Title of the law/regulations: The Law 38/72 for Protection of the Environment, Decrees 838/75,1613/85 and 717/85
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

Responsibility for air pollution control is shared between national and regional authorities. Emission levels are determined nationally but local authorities may establish stricter limits in special areas. The Law 38/72 for Protection of the Environment, followed by Decrees 838/75,1613/85 and 717/85 are the legal basis. The two latter Decrees deal specially with limits on SO₂ and particulate emissions as well as NO_x and Pb levels in the atmosphere.

According to the Decree 833/75 the erection of the new plants or units, as well as alteration, enlargement or change of place of potentially polluting installations are subject to official approval under definite conditions. The operation of the plants, emissions, water discharges and waste disposal are controlled.

Specific emission limits for sinter plants, pellet plants and blast furnaces are summarised in the following tables. It should be noted that the regulations are currently being revised and will be updated by 1993.

(1) Sinter and pellet plants - preparation/agglomeration of minerals

process	particulate emission limits (mg/Nm ³)		
	existing installations	new installations	provision 1980
mineral agglomeration (sintering and pelletising)	400	250	150
preparation of coal (grinding etc.)	200	150	120

*1) In mineral agglomeration operations, new installations will be allowed to reach emission levels of 500 mg/Nm³ during brief period that must not exceed 200 hrs/yr.

- *2) Recommendations:
- Diminish height of fall of minerals from charging and discharging operations.
 - Protect conveyor belt from wind whipping.
 - Install water sprinklers, using products to increase surface tension.

(2) Blast furnaces - cast iron manufacture in blast furnace

parameter	emission limits (mg/Nm ³)		
	existing installations	new installations	provision 1980
particulate	200	100	100
SO ₂	the same levels as for industrial combustion installations will be used.		

- *1) Blast furnace gas not used as fuel needs disposal and will be burned in one or more flares designed to burn a peak volume of blast furnace gas.

4. Citation

- 4.1. Title of document: "Preparation of Technical Notes on Best Available Technologies for Prevention of Air Pollution Emissions from Sinter Plants, Pelletisation Plants and Blast Furnaces"
- 4.2. Publisher: Environmental Resources Limited
- 4.3. Date published: October 1992
- 4.4. Publisher reference code: 1067
- 4.5. IEO library code: -

Headline: Air emission limit for electric arc furnace in Spain

1. Descriptors

- 1.1. Country: Spain
1.2. Industry: Iron and steel industry (electric arc furnace)
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Particulates

2. Legal reference

- 2.1. Title of the law/regulations: The Law 38/72 for Protection of the Environment, Decrees 838/75,1613/85 and 717/87
2.2. Date issued: -
2.3. Date amended: -

3. Summary

SOFRES Conseil's database on regulation provides specific limits for particulates concerning electric arc plants, based on standard of June 2, 1975:

<u>category</u>	<u>standard (mg/m³N)</u>

with the capacity < 5 t	
installations before 1975	500
installations after 1975	350
installations after 1980	250
with the capacity > 5 t	
installations before 1975	200
installations after 1975	150
installations after 1980	120

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emissions of Pollutants into the Air from Electric Arc Steel Production Plants - Final Report"
4.2. Publisher: Commission of European Communities DG XI A3
4.3. Date published: April 1994
4.4. Publisher reference code: -
4.5. IEO library code: 50.2/EETN

Headline: Guidelines for particulate emissions in iron and steel manufacture
in Sweden

1. Descriptors

- 1.1. Country: Sweden
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Particulate

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:

type of plant	limit	unit
blast furnaces	0.07	kg/tonne
basic oxygen furnaces	0.20	kg/tonne
electric arc furnace: existing	0.20	kg/tonne
miscellaneous operation	5-10	mg/Nm ³ dry gas

4. Citation

- 4.1. Title of document: Direct Communication with the Metal and Engineering Industries Section of the Swedish Environmental Protection Agency on the Environmental Discharge Standards for Iron and Steel Industry
- 4.2. Publisher: -
- 4.3. Date published: Oct. 1994
- 4.4. Publisher reference code: -
- 4.5. IEO library code: -

Headline: Guidelines for particulate emissions in iron and steel manufacture in Sweden

1. Descriptors

- 1.1. Country: Sweden
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Particulate

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 the Paris Commission are considered.

Recently decided emission limits or guidelines for individual existing plants are:

type of plant	limit	unit
blast furnaces	0.07	kg/tonne hot metal
basic oxygen furnaces	0.15	kg/tonne crude steel
sinter plants	during 1995 the last sinter plant will be closed.	
electric arc furnace	0.1-0.2	kg/tonne
miscellaneous operation	5-20	mg/Nm ³

4. Citation

- 4.1. Title of document: Direct Communication with Jernkontoret in Sweden on the Environmental Discharge Standards for Iron and Steel Industry
4.2. Publisher: -
4.3. Date published: Jan. 1995
4.4. Publisher reference code: -
4.5. IEO library code: -

Headline: Discharge standards for air pollutants emitted from stationary sources in Taiwan

1. Descriptors

- 1.1. Country: Taiwan
- 1.2. Industry: All industries including iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Black smoke, particulate pollutants, particulates, SO_x, sulphuric acid mist, NO_x, CO, total fluoride, HCl, Cl₂, H₂S, lead, cadmium, asbestos, vinyl chloride monomer, NH₃, H₂S, CH₃SH, (CH₃)₂S, (CH₃)₂S₂, CH₃NH₂, (CH₃)₂NH, (CH₃)₂N, CS₂, HCHO, C₆H₆, C₆H₅CH₃, C₆H₄(CH₃)₂, stack height

2. Legal reference

- 2.1. Title of the law/regulations: Air Pollution Control Law (1982); Discharge Standards for Air Pollutants Emitted from Stationary Sources (1986)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

The following is the emission limits at the outlet of emission pipes. There is also the limits at the fence but omitted in this article.

parameter	limit	unit	remarks
black smoke	20	%(opacity)	or Ringelmann 1 (*1)
particulate pollutants	10	%(opacity)	industrial waste incinerator (treatment > 400 kg/h) (*2)
	20	%(opacity)	industrial waste incinerator (treatment < 400 kg/h) (*3)
	20	%(opacity)	other plants (*3)
particulates	129-500	mg/Nm ³	emission rate < 1000 Nm ³ /min.
	53-99	mg/Nm ³	emission rate < 10000 Nm ³ /min.
	29-41	mg/Nm ³	emission rate < 70000 Nm ³ /min.
	25	mg/Nm ³	emission rate > 70000 Nm ³ /min.
	100	mg/Nm ³	industrial waste incinerator (treatment > 400 kg/h)
	250	mg/Nm ³	industrial waste incinerator (treatment < 400 kg/h)
SO _x (as SO ₂)	500	ppm	new combustion plants (S=1%, (*4))
	750	ppm	combustion plants (S=1.5%, (*4))
	1100	ppm	combustion plants (S=2%, (*4))
	1400	ppm	combustion plants (domestic coal, S=2%, (*4))
	650	ppm	non-combustion plants
sulphuric acid mist (as H ₂ SO ₄)	100	mg/Nm ³	sulphuric acid plants
	200	mg/Nm ³	other plants
NO _x (as NO _x)	150	ppm	combustion plants (gas fuel)

	250	ppm	combustion plants (liquid fuel)
	350	ppm	combustion plants (solid fuel)
	250	ppm	non-combustion plants
CO	2000	ppm	-
total fluoride	10	mg/Nm ³	as F ⁻
HCl	80	ppm	or 1.8 kg/h
Cl ₂	30	ppm	-
H ₂ S	100	ppm	in emitted gas
lead	10	mg/Nm ³	-
cadmium	1	mg/Nm ³	-
asbestos	invisible		
vinyl chloride monomer	10	ppm	-

-
- *1) In case of lighting up, opacity can reach 40% or Ringelmann 2, but shall not exceed 20% or Ringelmann 1 for more than 3 minutes per an hour.
- *2) In case of starting up or shutting down, opacity can reach 20%, but shall not exceed 10% for more than 3 minutes per an hour.
- *3) In case of starting up or shutting down, opacity can reach 40%, but shall not exceed 20% for more than 3 minutes per an hour.
- *4) In terms of fuel oil.
- *5) With regard to the following pollutants, which are not yet included in the above list, maximum emission limits are determined by the use of nationally-set formula (omitted):
- NH₃, CH₃SH, (CH₃)₂S, (CH₃)₂S₂, CH₃NH₂, (CH₃)₂NH, (CH₃)₂N, CS₂, HCHO, C₆H₆, C₆H₅CH₃, C₆H₄(CH₃)₂.
- *6) Concerning new sources, if they emit the pollutants with which emission limits are set, the height of stack are determined by the use of the following formula according to the emitted pollutants.

$$q = a \cdot K \cdot h^{2.2}$$

where a: constant determined for each pollutant.
 K: constant for 5 areas.
 h: effective stack height.

4. Citation

- 4.1. Title of document: "Environmental Laws and Regulations 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 emission standards and guidelines 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: Air/Emission
- 1.5. Parameters: Smoke, particulate matter, smoke, Al, alcohol, aldehyde, ammonia, Sb, aromatic compound, asbestos, As, Be, carbonyl, chlorine, ethylene, ester, fluorine, HCl, fluorine chloride, H₂S, Cd, Cu, Pb, Hg, CO, SO₂, NO_x, nitric acid, organic compound, phosphoric acid, SO₃, H₂SO₄

2. Legal reference

- 2.1. Title of the law/regulations: Factory Act
- 2.2. Date issued: 1969
- 2.3. Date amended: 1979

3. Summary

According to the Notification of the Ministry of Industry No.4, B.E.2514 (1971), the intensity of smoke at the mouth of the stack shall not exceed 40 percent of total blackness by the Ringelmann scale except for the short periods of time during starting of operation, soot blowing, or other malfunctions of the soot control system.

There is also the emission guidelines as below;

parameter	standard	unit	plants subject to standard
particulate matter	300	mg/Nm ³	furnace and boiler using fuel oil
	500	mg/Nm ³	furnace and boiler using coal
	400	mg/Nm ³	steel, cement, carbide, aggregate (more than 50000 t/year)
	500	mg/Nm ³	other plants
smoke	40	%	furnace and boiler, by the Ringelmann scale
Al	300	mg/Nm ³	furnace and melting furnace, as dust
	50	mg/Nm ³	furnace and melting furnace, as Al
alcohol	0.05	lb/min	all plants
aldehyde	0.05	lb/min	all plants
ammonia	25	ppm	gas plant
Sb	25	mg/Nm ³	all plants
aromatic compound	0.05	lb/min	all plants
asbestos	27	µg/Nm ³	all plants
As	20	mg/Nm ³	all plants
Be	10	µg/Nm ³	all plants
carbonyl	25	ppm	garbage incinerator
chlorine	20	mg/Nm ³	all plants

ethylene	0.03	lb/min	manufacturer or user plants
ester	0.05	lb/min	all plants
fluorine	0.3	lb/ton	all plants
HCl	200	mg/Nm ³	all plants
fluorine chloride	10	mg/Nm ³	all plants
H ₂ S	100	ppm	all plants
Cd	1.0	mg/Nm ³	all plants
Cu	300	mg/Nm ³	all plants, as particulate
	20	mg/Nm ³	all plants, as Cu
Pb	100	mg/Nm ³	all plants, as particulate
	30	mg/Nm ³	all plants, as Pb
Hg	0.1	mg/Nm ³	all plants
CO	1000	mg/Nm ³	all plants
SO ₂	500	ppm	sulphuric acid manufacturing plants
	400	ppm	other plants located in Bangkok and its suburb
	700	ppm	other plants located other areas
NO _x	1000	mg/Nm ³	combustion plants
	2000	mg/Nm ³	nitric acid manufacturing plants
nitric acid	70	mg/Nm ³	all plants
organic compounds	0.01	lb/min	all plants
phosphoric acid	3	mg/Nm ³	all plants
SO ₃	35	mg/Nm ³	all plants
H ₂ SO ₄	35	mg/Nm ³	all plants

4. Citation

<u>4.1. Title of document:</u>	"Air Environmental Legislation Survey in Foreign countries", The Working Group of Air Environmental Legislation, Air Division, Environmental Issue Study Group
<u>4.2. Publisher:</u>	Japan Environmental Management Association for Industry (JEMAI)
<u>4.3. Date published:</u>	June 1992
<u>4.4. Publisher reference code:</u>	-
<u>4.5. IEO library code:</u>	-

Headline: Air emission regulations for iron and steel industry in Turkey

1. Descriptors

- 1.1. Country: Turkey
1.2. Industry: Iron and steel industry
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Dust, gaseous inorganic fluorine compounds, carbon monoxide

2. Legal reference

- 2.1. Title of the law/regulations: The Environmental Law (code 2872) and Related Regulations
2.2. Date effective: 1983
2.3. Date amended: -

3. Summary

Under the regulation, industries which have significant adverse effects on human health and the environment have been classified into two categories labelled Group A and B.

The iron and steel industry has been included in Group A. Consequently, permission to build and operate plants is granted in accordance with the provision of Public Health Law by taking into account the opinions of the Prime Ministry Under-secretariat for Environment.

Special emission limits for iron and steel plants given below shall take priority over the emission limits given in other parts of this regulation.

(1) Blast furnace

Blast furnaces in the preparation of pig iron comply with the following principles:

- Dust emission in waste gases must not exceed a limit of 30 mg/m³. If the blast furnace gas is burned outside and above the stack, the dust emission must not exceed a limit of 75 mg/m³.
- High sulphur fuels may be used if the sulphur contained in the fuel can be retained in the slag and if this is not objectionable from the viewpoint of pig iron quality.
- Compliance with the relevant standards issued by the Turkish Standards Institute is mandatory in connection with all technological applications and the reduction of dust emissions.

(2) Iron sintering plant

Sintering plants comply with the following principles:

- Emission of gaseous inorganic fluorine compounds (given as F⁻) must not exceed 5 mg/m³
- Fine ore may be stored in the open if a smaller amount of moisture is

required for other processes in terms of the production method, and if dust emission can be prevented during storing and loading, provided that the external surface moisture is below 10 %.

- Compliance with the relevant standards issued by the Turkish Standards Institute is mandatory in plant technologies and in applications relating to the reduction of sulphur dioxide emissions.

Cupola furnaces where pig iron is melted to obtain cast iron must comply with the following principles:

- The waste gases that escape when the furnace is in operation must be collected and sent to a dust extraction plant.
- Cupola furnaces with a melting capacity up to 20 t/h must collect the waste gases produced during the melting process and send them to a dust extraction plant. Cupola furnaces with a melting capacity of over 20 t/h, gases must be collected and purified.

(3) Dust emission limits

For furnaces with a melting capacity of up to 14 t/h, dust emission must not exceed the following limits.

cupola furnace annual working hours	limit (*)	unit
6000	0.3 < <1.5	kg/t iron
4000	0.5 < <1.5	
3000	0.6 < <1.5	
2000	0.8 < <1.5	
1500	1.1 < <1.5	

*1) Emission limits decrease as quantities of cupola furnace production increase.

For Cupola furnaces with a melting capacity of over 14 t/h, the amount of dust discharged from the stack must not exceed 0.250 kg/t of cast iron produced.

The carbon monoxide contained in the stack gas must be re-used and burned or, if it cannot be burned with a combustion efficiency of 90% or higher, it must be discharged into the atmosphere by re-determining the stack height. Compliance with the relevant Turkish Standards is mandatory in all applications involving system technology and the reduction of dust emissions.

(4) Converters, electric arc furnaces and vacuum smelters for processing steel

Electric furnaces, converters and vacuum smelters for processing comply with the following principles.

- Waste gases must be collected under all operating conditions (loading, mixing, sulphur extraction, etc..) and sent to a dust extractor facility.
- Dust emission in waste gases must not exceed a limit of 200 mg/m³
- Carbon monoxide emission must be re-used or burned if they cannot be burned with a combustion efficiency of 90% or higher, they must be discharged into the atmosphere by re-determining the stack height.
- Compliance with Turkish standards is mandatory in all technology concerned with blower converters and in all studies concerning the reduction of dust emissions.

In reverberatory furnaces where the steel is processed by flame, dust emissions in waste gases must not exceed 20 mg/m³.

(5) Foundries

Foundries for casting iron, steel and other non-ferrous metals comply with the following principles:

- Dust containing waste gases shall be collected and sent to a dust extraction system.
- Dust emissions in waste gases must not exceed 150 mg/m³
- Emissions from foundries where magnesium and its compounds are cast using sulphur additives must be released into the atmosphere by re-determining the stack height.
- Gaseous organic compounds formed during the production, casting and cooling of core iron must be collected and if possible sent to a processing and purifying plant.

4. Citation

- | | |
|---------------------------------------|---|
| <u>4.1. Title of document:</u> | "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" |
| <u>4.2. Publisher:</u> | International Iron and Steel Institute |
| <u>4.3. Date published:</u> | 1992 |
| <u>4.4. Publisher reference code:</u> | ISBN 3-514-00456-0 |
| <u>4.5. IEO library code:</u> | - |

Headline: General limits for iron and steel process in UK

1. Descriptors

- 1.1. Country: UK
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Particulate mater, lead and its compounds, cadmium and its compounds, fluoride

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

The Environmental Protection Act was enacted in 1990 and the relevant regulations came into force on 1 April 1991. Those types of processes with the greatest pollution potential or the most scope for cross-media control are subject to a system of Integrated Pollution Control (IPC) which covers release to air, water and land.

Operations of processes scheduled for IPC require an Authorisation issued by the national pollution inspectorates specifying the use of Best Available Techniques Not Entailing Excessive Cost (BATNEEC) to prevent the emission or discharge of pollutants where required by UK or EC legislation. For processes where there is potential to release pollutants to more than one environmental medium the operator must satisfy the national inspectorate that he is employing the Best Practicable Option and that pollution to the environment taken as a whole is minimised.

Emission limits are set for individual plants for national pollution inspectorates under IPC. Guidance notes detailing the emission limits achievable by BATNEEC are being issued for all categories of processes coming under IPC. A Guidance Note containing general limits for the metals industry sector has already been published; process-specific guidance for iron-making process such as ore handling and blending, and sinter plant and blast furnace operation will be published by 1 July 1994.

All new and substantially modified scheduled processes are immediately subject to IPC; existing processes will be brought under IPC in a phased programme.

Existing processes for making iron and steel come under IPC from 1 April 1995. The IPC authorisations will supersede the requirements of the earlier BPM legislation.

As mentioned above, general limits for iron and steel process are available through a metals industry sector Guideline Note. These limits serve as indicative levels until process-specific guidance for sinter plants and blast furnaces are issued in 1994, and are outlined as below;

(1) Non-combustion gases (no correction for vapour content or oxygen content, temperature 0°C, pressure 100kPa).

parameter	limits (mg/Nm ³)	comment
particulate mater	100	electric arc furnace direct extraction, sinter plant fume, AOD and desulphurisation
	50	BOS direct extraction, sinter de-dusting, scarfing, hygiene extraction, general dusts and auxiliary foundry operations
	25	combined collection systems, roof extraction systems
lead and its compounds	2	(as lead)
cadmium and its compounds	1	(as cadmium)
fluoride	10	(as hydrogen fluoride)

(2) Combustion gases

For additional guidance on combustion gases for example sulphur dioxide and oxides of nitrogen, the Inspector should consult the Combustion Process section (1.3) of the Fuel and Power Industry sector Guidance Note IPR 1.

4. Citation

<u>4.1. Title of document:</u>	"Preparation of Technical Notes on Best Available Technologies for Prevention of Air Pollution Emissions from Sinter Plants, Pelletisation Plants and Blast Furnaces"
<u>4.2. Publisher:</u>	Environmental Resources Limited
<u>4.3. Date published:</u>	October 1992
<u>4.4. Publisher reference code:</u>	1067
<u>4.5. IEO library code:</u>	-

Headline: Air emission limits for reheat furnace and pickling in UK

1. Descriptors

- 1.1. Country: UK
- 1.2. Industry: Iron and steel industry (reheat furnace and pickling)
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: Particulate matter, SO₂, NO_x, total acid-forming oxides of nitrogen, hydrogen chloride, hydrogen fluoride

2. Legal reference

- 2.1. Title of the law/regulations: The Environmental Protection Act (1990); The Chief Inspector's Guidance Note on Reheat and Heat Treatment Furnaces (IPR 1/17)
- 2.2. Date issued: -
- 2.3. Date amended: -

3. Summary

(1) Reheat furnace

Reheat and annealing furnaces which meet the following conditions are regulated under Integrated Pollution Control (IPC):

- The net rated thermal input of a furnace is 50 MW or more, or
- the aggregate net rated thermal input of two or more furnaces (of 3 MW or more) which are operated at the same site by same person is 50 MW or more.

The Chief Inspector's Guidance Note on Reheat and Heat Treatment Furnaces (IPR 1/17) giving the emission levels achievable by the use of Best Available Techniques Not Entailing Excessive Cost (BATNEEC) was published in January 1992.

parameter	limit	unit	remark

particulate matter:			
new plant	50	mg/m ³ N	monthly ave.
	55	mg/m ³ N	no more than 3% of all 48 hour averages in a year.
existing plant	90	mg/m ³ N	average over 2 hours continuous operation.
	140	mg/m ³ N	average over 2 hours continuous operation.
SO ₂ :			
new plant	1700	mg/m ³ N	liquid fuel.
	35	mg/m ³ N	natural gas or other gas not given below.
	5	mg/m ³ N	liquefied gas.
	250	mg/m ³ N	coke oven gas, blast furnace gas and other gases from steel industry.
existing plant	1700	mg/m ³ N	liquid fuel.
	35	mg/m ³ N	natural gas or other gas not given below.
	5	mg/m ³ N	liquefied gas.
	800	mg/m ³ N	coke oven gas, blast furnace gas and other

gases from steel industry.

NO_x:

new plant	400	mg/m ³ N	monthly ave. air preheat =	nil.
	500	mg/m ³ N	monthly ave. air preheat =	400 °C.
	600	mg/m ³ N	monthly ave. air preheat =	600 °C.
	900	mg/m ³ N	monthly ave. air preheat =	1000 °C.
existing plant	650	mg/m ³ N	monthly ave. air preheat =	nil.
	900	mg/m ³ N	monthly ave. air preheat =	400 °C.
	1800	mg/m ³ N	monthly ave. air preheat =	600 °C.
	3000	mg/m ³ N	air preheat =	1000 °C.

-
- *1) Reference conditions: oxygen content 3% by volume, dry.
 - *2) New plant includes plant which came into existence on or after 1 April 1991.

(2) Pickling

All pickling processes which are associated with processes for coating metals which generate 1000 tonnes or more of 'Special Waste' each year are prescribed for IPC. According to the Chief Inspector's Guidance Note on processes for the manufacture or recovery of nitric acid and processes involving the manufacture or release of acid-forming oxides of nitrogen (IPR 4/11), the release levels which apply to emissions from new processes which cannot be prevented using BATNEEC and which have been minimised are as below:

parameter	limit	unit	remark
total acid-forming oxides of nitrogen	300	mg/m ³ N	as NO ₂
hydrogen chloride	10	mg/m ³ N	-
hydrogen fluoride	5	mg/m ³ N	-

-
- *1) Reference conditions: no correction for oxygen or water content.

4. Citation

- 4.1. Title of document: "Technical Notes on Best Available Technologies to Reduce Emission of Pollutants into the Air from Hot and Cold Rolling Mills in Iron and Steel Industry"
- 4.2. Publisher: CITEPA (CENTRE INTERPROFESSIONNEL TECHNIQUE D'ETUDES DE LA POLLUTION ATMOSPHERIQUE)
- 4.3. Date published: August 1994
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/CITM

Headline: Performance standards for new iron and steel plants in USA

1. Descriptors

- 1.1. Country: USA
 1.2. Industry: Iron and steel industry
 1.3. Mode: Discharge Standards
 1.4. Medium: Air/Emission
 1.5. Parameters: Particulate, opacity

2. Legal reference

- 2.1. Title of the law/regulations: The Clean Air Act
 2.2. Date issued: -
 2.3. Date amended: -

3. Summary

Under the Clean Air Amendments, the Federal Government was empowered to issue performance standards for new stationary sources. The standards listed in the following table have been promulgated by the US Environmental Protection Agency for new iron and steel plants.

source	parameter	emission level
basic oxygen process furnace	particulate	50 mg/Nm ³
	opacity	10% (20% exception/cycle)
electric arc furnace	particulate	12 mg/Nm ³
	opacity:	
	a) control device	3%
	b) shop roof	0% except 20%-charging (capture food) 40%-charging (DSE system)
dust handling equipment	opacity	10%

4. Citation

- 4.1. Title of document: "Environmental Aspects of Iron and Steel Production. A Technical review"
 4.2. Publisher: Industry and Environment Office, United Nations Environment Programme
 4.3. Date published: 1986
 4.4. Publisher reference code: -
 4.5. IEO library code: 50.2/UNEA

Headline: Minimum sanitary protective distance for iron and steel plants in Vietnam

1. Descriptors

- 1.1. Country: Vietnam
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Protective interval
- 1.4. Medium: -
- 1.5. Parameters: -

2. Legal reference

- 2.1. Title of the law/regulations: Provisional Environmental Criteria
- 2.2. Date issued: Jan. 1993
- 2.3. Date amended: -

3. Summary

In Vietnam, the environmental standard system and environmental law are being set up at present. According to the Provisional Environmental Criteria, minimum sanitary protective distance for iron and steel plants are as below:

<u>category</u>	<u>protective interval</u>
cast-iron smelting with total capacity of blast-furnace more than 1500 m ³	1000 m
cast-iron smelting with total capacity of blast-furnace from 500 to 1500 m ³	500 m
cast-iron smelting with total capacity of blast-furnace less than 500 m ³	300 m
steel smelting by Martin furnace and rotary roasters with a capacity of more than 1000000 tons/year	1000 m
steel smelting by Martin furnace and rotary roasters with a capacity of less than 1000000 tons/year	500 m
cast-iron pipe production with a capacity of from 10000 to 20000 tons/year	300 m

4. Citation

- 4.1. Title of document: "Provisional Environmental Criteria", Ministry for Science, Technology, and Environment
- 4.2. Publisher: Science and Technology Publishing House
- 4.3. Date published: 1993
- 4.4. Publisher reference code: -

4.5. IEO library code:

-

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

Headline: OECD proposed standard emission factors

1. Descriptors

- 1.1. Country: International (OECD)
- 1.2. Industry: Iron and steel industry
- 1.3. Mode: Discharge Standards
- 1.4. Medium: Air/Emission
- 1.5. Parameters: CO, SO₂, NO₂

2. Legal reference

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

3. Summary

category	standards			unit
	CO	SO ₂	NO ₂	
sinter plant	30	2	0.3	kg/t sinter
coke oven	1	0.5-2	0.65	kg/t coke
hot metal production	10	0.2	0.5	kg/t pig iron
steel production converter	15	-	0.3	kg/t steel
electric arc furnace	10	-	-	
rolling mills	-	-	1.1	kg/t product

Source: Emission inventory requirements and the use of standard emission factors in OECD Europe, OECD Environment Committee, Air Management Policy Group, September 1983, 8 p.

4. Citation

- 4.1. Title of document: "Environmental Aspects of Iron and Steel Production. A Technical review"
- 4.2. Publisher: Industry and Environment Office, United Nations Environment Programme
- 4.3. Date published: 1986
- 4.4. Publisher reference code: -
- 4.5. IEO library code: 50.2/UNEA

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 (secondary steel production and rolling mills)
1.3. Mode: Discharge Standards
1.4. Medium: Air/Emission
1.5. Parameters: Particulates

2. Legal reference

- 2.1. Title of the law/regulations: PARCOM Recommendation 92/3
2.2. Date issued: 1992
2.3. Date amended: -

3. Summary

1. As much dust as possible, including fugitive dust, should be collected from process gases.

Dust concentration less than 20 mg/m³ (ndg) after filtration should be achieved by using fabric filters, or equally efficient arrestment system, for dust cleaning. If dust contains hazardous substances, like heavy metals, lower standards should be achieved (10 mg/m³ could be achieved with fabric filters).
2. Electric arc furnace shops should be constructed and maintained in such a way that total dust emission, including dust escaping through skylight etc., should not exceed 150 g/tonne produced steel of each steel plant.
3. Measures should be taken to reduce NO_x emissions at pickling plants where nitric acid is used and NO_x emissions (as NO₂) exceed 5 tonne/year. The measures should aim at a reduction rate of at least 70 percent.

4. Citation

- 4.1. Title of document: "Technical Notes on the Best Available Technologies to Reduce Emissions of Pollutants into the Air from Electric Arc Steel Production Plants - Final Report"
4.2. Publisher: Commission of European Communities DG XI A3
4.3. Date published: April 1994
4.4. Publisher reference code: -
4.5. IEO library code: 50.2/EETN

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: Air/Emission
1.5. Parameters: Sulphur dioxide, hydrogen sulphide, particulate matter, Nitrogen oxides, fluoride

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, direct reduction

Parameter	standard		unit	
SO ₂	Inside Plant Fence	100	µg/m ³	Ann. Arith. Mean
		1000	µg/m ³	Max. 24-hour Peak
	Outside Plant Fence	100	µg/m ³	Ann. Arith. Mean
		500	µg/m ³	Max. 24-hour Peak
H ₂ S		8	µg/m ³	Average 24-hour
Particulate matter		75	µg/m ³	Ann. Geom. Mean
		260	µg/m ³	Max. 24-hour Peak not over once a year

(2) sintering and pelletizing

Parameter	standard		unit	
SO ₂	Inside Plant Fence	100	µg/m ³	Ann. Arith. Mean
		1000	µg/m ³	Max. 24-hour Peak
	Outside Plant Fence	100	µg/m ³	Ann. Arith. Mean
		500	µg/m ³	Max. 24-hour Peak
NO ₂		100	µg/m ³	Ann. Arith. Mean
Particulate matter		75	µg/m ³	Ann. Geom. Mean
		260	µg/m ³	Max. 24-hour Peak not over once a year

(3) open hearth furnace, electric arc furnace

Parameter	standard		unit	
SO ₂	Inside Plant Fence	100	µg/m ³	Ann. Arith. Mean
		1000	µg/m ³	Max. 24-hour Peak
	Outside Plant Fence	100	µg/m ³	Ann. Arith. Mean
		500	µg/m ³	Max. 24-hour Peak
NO _x (as NO ₂)		100	µg/m ³	Ann. Arith. Mean
fluoride (as HF)		10	µg/m ³	Ann. Arith. Mean
		100	µg/m ³	8-hour peak
Particulate matter		75	µg/m ³	Ann. Geom. Mean
		260	µg/m ³	Max. 24-hour

(4) byproduct coke ovens

Coke making may result in discharge of gaseous ammonia, hydrogen sulphide, and hydrogen cyanide to the atmosphere if collectors, ductwork, and piping are not carefully monitored and controlled. Particulates may also escape to the atmosphere. With effective controls, little or none of these substances should be discharged. Odors can be a problem if not carefully controlled.

(5) basic oxygen furnace

Gas and fume emissions can be adequately removed from the system, and hence there should be no discharge of air pollutants from a basic oxygen furnace operation. Stack discharge of particulates should be maintained at 50 mg/m³ or less.

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

Belgium

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APPENDIX 2: INPUT SHEET FOR ADDITIONAL INCLUSION

The UNEP IE welcomes any comments or information for additional inclusion in this Compendium, IE-ESGIC database.

Please fill the following form and send back to UNEP IE. Attachment of legal text and/or any relevant materials (preferably in English) would be most welcome.

1. Your name, title and address

2. type of comment

- Correction/update of article(s) No. _____
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3. Your input

Country _____

Title of the law/regulations: _____

industry covered _____

brief summary _____

title(s) of attached document(s) _____

comments _____

ABOUT UNEP INDUSTRY AND ENVIRONMENT CENTRE

The Industry and Environment centre was established by UNEP in 1975 to bring industry and government together to promote environmentally sound industrial development. UNEP IE is located in Paris and its goals are to:

- 1) Encourage the incorporation of environmental criteria in industrial development plans;
- 2) Facilitate the implementation of procedures and principles for the protection of the environment;
- 3) Promote the use of safe and clean technologies;
- 4) Stimulate the exchange of information and experience throughout the world.

UNEP IE provides access to practical information and develops co-operative on-site action and information exchange backed by regular follow-up and assessment. To promote the transfer of information and the sharing of knowledge and experience, UNEP IE has developed three complementary tools: technical reviews and guidelines; *Industry and Environment* - a quarterly review; and a technical query-response service. In keeping with its emphasis on technical co-operation, UNEP IE facilitates technology transfer and the implementation of practices to safeguard the environment through promoting awareness and interaction, training and diagnostic studies.

Some recent UNEP IE Publications

Industry & Environment (quarterly) deals with issues relevant to industrial development, such as auditing, waste management, industry-specific problems, environmental news.

Industry and Environment Emission Standards and Guidelines Information Clearinghouse (IE/ESGIC) Compendiums

- Volume I *Textile Industry Effluent Discharge Standards*
88 p., 1996. Price FF 150/US\$ 30
- Volume II *Pulp & Paper Industry Effluent Discharge Standards*
100 p., 1996. Price FF 150/US\$ 30
- Volume IIIb *Iron & Steel Industry Effluent Discharge Standards*
106 p., 1996. Price FF 150/US\$ 30

Technical Report Series

Environmental Management in the Electronics Industry: Semiconductor Manufacture and Assembly - Technical Report n°23. ISBN 92 807 1410 3, 161 p., 1995. Price FF 175/US\$ 35

The Textile Industry and the Environment - Technical Report n°16. ISBN 92 807 1367 1, 120 p., 1994.
Price: FF 175/US\$ 35

Environmental Aspect of Industrial Wood Preservation - Technical Report n°20. ISBN 92 807 1403 1, 150 p., 1994. Price: FF 150/US\$ 30

Environmental Management of Nickel Production - Technical Report n°15. ISBN 92 807 1366 3, 90 p., 1993. Price: FF 200/US\$ 40

From Regulation to Industry Compliance: Building Institutional Capabilities - Technical Report n°11.
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

Environmental Aspects of the Metal Finishing Industry - Technical Report n°1. ISBN
92 807 1216 0, 91 p., 1989. Price: FF 200/US\$ 40



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