**Factsheet & checklist**

**Sector: Iron & Steel production (Electric Arc Furnace)**

*Project MK-10-IB-EN-01*

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Prepared by:

Cees Braams

Dimitris Tsotsos

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**List of Acronyms**

|  |  |
| --- | --- |
| AOD  BATs  BAT-AEL | Argon Oxygen Decarburisation  Best Available Techniques  Best Available Techniques Associated Emission Limit |
| BREFs  CCM  DRI | Best Available Techniques Reference Document  Continuous Casting Machine  Direct Reduced Iron |
| EC  EAF  ELV  ETS  IED  IPPC  LCP  PCB  PCDD/Fs  VOD | European Commission  Electric Arc Furnace  Emission Limit Value  Emission Trading Scheme  Industrial Emissions Directive 2010/75/EU  Integrated Pollution Prevention and Control  Large Combustion Plant  Polychlorinated Biphenyls  Polychlorinated dibenzo dioxins  Vacuum Oxygen Decarburisation |
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# Introduction

This document contains a short description of the **Iron & Steel production** as it exists and operates in the Republic of Macedonia. It will be necessary to update this document if the situation in the sector evolves substantially.

For the time being only **Electric Arc Furnace steelmaking and casting** is operated in Macedonia, that’s why in this document no other steelmaking processes are described. As reference the BREF on BAT for iron and steel production is taken into consideration

To prepare and execute well the environmental inspection of facilities within this sector, this document provides information for inspectors about how this industry works, what are its main environmental impact and pollution abatement measures, and what are the key points for the inspection of these facilities, complemented by a practical inspection checklist. The goal is to facilitate the work of inspectors, ensuring a more uniform inspection approach and quality, and a level playing field for the operators.

Detailed information about production processes and Best Available Techniques (BATs) relevant for this sector can be found in the reference links and documents in Annex 1. This document provides a first introduction and is intended to be a practical tool for inspectors, and for that sake is kept brief.

# What is Electric Arc Furnace steelmaking and casting?



## Production process

The direct smelting of materials which contain iron, such as scrap, is usually performed in electric arc furnaces (EAF): steel is produced by melting the steel scrap with the help of graphite electrodes. After a subsequent refining process, liquid steel transferred from the ladle to the continuous casting machine is solidified and finally shaped in the desired size, as semi-finished products.

The major feedstock for the EAF is ferrous scrap, which may be comprised of scrap from inside the steelworks, cut-offs from steel product manufacturers (e.g. vehicle builders) and capital or post-consumer scrap (e.g. end-of-life products). Direct reduced iron (DRI) is also increasingly being used as a feedstock due to its low gangue content, variable scrap prices and lower content of undesirable metals (e.g. Cu). Ferroalloys may be used as additional feedstock in greater or lesser quantities to adjust the desired concentrations of non-ferrous metals in the finished steel.

For the production of carbon steel and low alloyed steels (the common case in most EAF processes), the following main operations are performed:

* Raw materials handling, pretreatment (if any) and storage
* Furnace charging
* EAF scrap melting
* Steel and slag tapping
* Ladle furnace treatment for quality adjustment (secondary metallurgy)
* Slag handling
* Casting

### Raw materials handling

Scrap metal is stored normally outside on large, uncovered and often unpaved ground. The ferrous scrap metal is loaded into baskets by magnets or grabs. Inhouse generated scrap can be cut into manageable sizes using oxygen lancing. The scrap may be loaded into charging baskets in the scrapyard or may be transferred to temporary scrap bays inside the melting shop. Other raw materials including iron fluxes in the form of lump and powder, powdered lime and carbon, alloying additions, deoxidants and refractories are normally stored under cover. Powdered materials can be stored in sealed silos (lime should be kept dry) and conveyed pneumatically or kept and handled in sealed bags.

### Scrap preheating

Over the past several years more and more new and existing EAFs have been equipped with a system for preheating the scrap by the off-gas in order to recover energy. Such preheating is performed either in the scrap charging baskets or in a charging shaft (shaft furnace) added to the EAF or in a specially designed scrap conveying system allowing continuous charging during the melting process.

### Furnace charging

The scrap is usually loaded into baskets together with lime or dolomitic lime which is used as a flux for the slag formation. Carbon-bearing materials are also charged for the needs of the metallurgical work to be performed in the furnace. At some plants, lump coal is also charged in order to adjust the carbon content. A commercially available system known as the shaft furnace allows part of the scrap to be charged into a vertical shaft integrated into the furnace roof and thus prevents the opening of the furnace roof halfway through the melting process. The scrap present in the shaft is preheated by the hot gases coming from the furnace.

### Electric arc furnace smelting and refining

During the initial period of melting, the applied power is kept low to prevent damage from radiation to the furnace walls and the roof whilst allowing the electrodes to bore into the scrap. Once the arcs have become shielded by the surrounding scrap, the power can be increased to complete the melting. Fuels include natural gas and oil.

Oxygen injection in electric furnace steelmaking has become increasingly considered and used over the last 30 years not only for metallurgical reasons but also for increasing productivity requirements.

### Steel and slag tapping

The furnace is tilted backwards towards the slagging door and the slag runs off or is raked into a pot or on the ground below the furnace resulting in dust and fume generation. For special steels, mainly alloyed steel, for metallurgic reason, the slag is tapped with the liquid steel into the ladle. Most of the slag is separated from the steel at a de slagging station into a slag pot. The fumes generated there should be captured by an exhaust system.

### Ladle furnace treatment for quality adjustment (secondary metallurgy)

**Carbon steel**

Secondary metallurgy is carried out on the molten steel after the tapping of the primary steelmaking furnace up to the point of casting. It is typically carried out at ladle treatment stations while the molten steel stays in the ladle. These treatment stations are generally comprised of an arc-heating unit (a ladle furnace) which allows an adjustment of the final temperature of the liquid steel for the casting operation. The treatment includes the addition of deoxidising agents and alloying elements in order to adjust the chemical composition of the finished steel. In some cases, vacuum treatment units are used for achieving special requirements regarding the concentration of elements such as hydrogen, nitrogen and oxygen of finished steel. In order to achieve a good homogenisation, inert gases (Ar or N2) are injected into the ladle for stirring purpose. Some minor ladle treatment stations are based on inert gas or powder injection equipment.

**Stainless steel**

The secondary metallurgy of stainless steel may be performed either under vacuum in the ladle (VOD process – vacuum oxygen decarburisation) or in a separate metallurgical vessel called an AOD (argon oxygen decarburisation) converter and a subsequent ladle treatment. Depending on the steel grades to be produced, some operators apply a combination of both AOD and VOD.

**Alloys steel**

The secondary metallurgy of alloy steels which contain (besides carbon) substantial quantities of alloying elements but do not rank in the stainless steel category consist generally of a ladle furnace and, if required, a vacuum treatment, depending on the steel grades produced. During most of the processes of secondary metallurgy, slags are used to capture the non-metallic compounds generated during the treatment.

### Slag handling and processing

If slag is collected in a slag pot at the EAF (or at secondary metallurgic plants like AOD or VOD) it needs to be poured into outside slag basins for solidification. The cooling of the slag may be enhanced by water sprays. Some sites operate a slag treatment during the liquid phase to improve the slag final quality and its dimensional stability, by adding silica, alumina, boron (colemanite or sodium borate) and checking the cooling duration. In some plants the slags from the different processes are mixed in the liquid phase to make them more suitable for further processing.

If the slag is poured on the floor, it is pre crushed after solidification using excavators or shovel loaders and brought to an outside storage area. After a certain period of time, the slag is processed in crushing and screening devices in order to give it the desired consistency for its further use in construction. During this operation, any metallic particles contained in the slag are separated magnetically, manually or using digging, crushing and sieving in order to be recycled into the steelmaking process.

### Casting

Once the final steel quality has been achieved, the steel is conveyed in a casting ladle to the casting machines. Some years ago, the standard method was to pour the molten steel into permanent moulds (permanent mould or ingot casting) by a discontinuous process. In ingot casting, the liquid steel is cast into casting moulds. Depending on the desired surface quality, degassing agents (such as NaF) can be added during casting in the ingot mould. After cooling, the ingots are taken out of the casting mould and transported to the rolling mills. Subsequently, after preheating, the ingots are rolled into slabs, blooms or billets.

Today, the method of choice is continuous casting, whereby the steel is cast in a continuous strand (i.e. slabs of different sizes, thin strip): it is a process which enables the casting of one or a sequence of ladles of liquid steel into a continuous strand of billet, bloom, slab, beam blank or strip.

The liquid steel is poured from the converter into a ladle which transports the steel after secondary metallurgy to the ‘tundish’ of the continuous casting machine (CCM). This is an intermediate ladle with a controllable outlet. The ladles are preheated prior to accepting a liquid steel charge in order to avoid temperature stratification in the tundish.

When the liquid steel has reached the desired temperature, it is poured into the tundish. From here, it passes to a short water-cooled copper mould where no air is present and which performs oscillating up and down movements to prevent the steel from sticking. The mould gives the metal the desired shape.

## Production scheme

The production scheme of EAF is presented in Figure 1.



Figure 1: Production scheme of EAF

# Sector description in the Republic of Macedonia



## Metal and steel sector

**The metal and electric industry** represents a complementary and complete technological sector in the national economy and is of particular importance for the development of the country. The products of the metal and electric industry have the character of durable consumer goods and are very important for investments, yet a part of the production is intended for consumption.

The Association of metal and electric industries has approximately 120 companies-representatives of the following activities: production of metal products in the metal phase, production of machinery and equipment, manufacture of electrical machinery and equipment, motor vehicles and manufacture of other transport means and transport equipment.

In these activities are installed more capacities for processing basic metals in higher level of finalization, such as, special machine tools, robots, various types of machinery, tools and parts, steel structures, bridges and parts thereof, under non-standard equipment for power plants, metallurgy, chemical industry, food industry and other industries, construction products (wire mesh, aluminum windows and doors, protective doors, wire products), household solid fuel and fireplaces, pumps liquid fluids and parts, household goods, hotels and restaurants, medical equipment and devices, energy equipment (various types of transformers, power cables, solar energy collectors, boards, blocks, counters and cabinets, contactors and relays), various types of water heaters galvanized, enameled by rostfrei parts for motor and rail vehicles, transport equipment, starter lead acid batteries, machinery and apparatus for filtering and purifying of liquid and gas, electronics and parts for the automobile industry , buses and upgrade vehicles.

In the phase of restructuring through privatization processes, as well as through foreign investments through Green field investments, significant foreign investments took place in the last years in the production of automotive parts, buses, brake equipment for rail vehicles, steel structures, standard and non-standard equipment, transformers, lead acid starter batteries in processing and confectioning of reinforcing iron and other products.

Over 80% of the production is exported in the EU, the ex-Yugoslav countries, Southeast Europe, USA and other countries, and the rest is placed in the domestic market.

**METALLURGY**

As an important base-raw complex, the extraction of metal ores and the production of base metals is of great importance for the Macedonian economy. Accounting for over 12% of GDP, 10% of total employment and over 30% in the export of Republic of Macedonia, the metallurgical sector – namely, the manufacture of basic metals is the engine of the Macedonian economy.

Some relevant figures about the manufacturing of basic metals and removal of metal ores:

• Participation in GDP - 7.8%

• Participation in the structure of industrial production - 12%

• Participation in the exports of RM - 30%

• Participation in the number of employees - 16%

In the production of base metals, as a specific branch base of strategic importance, are installed technical and technological systems that are equipped with modern equipment and technology of known manufacturers.

This sector generated significant foreign investments especially in the production of hot rolled, cold rolled and coated sheets, ferroalloys, profiles and pipes, concrete iron and other products.

Facilities are installed for the production of:

* thick hot-rolled sheet,
* hot-rolled strips,
* cold rolled sheet,
* galvanized and plastic sheets,
* welded tubes and profiles,
* nickel,
* ferro-silicón and ferro-silicón manganese,
* concrete-reinforcing iron,
* various types of castings, light rolled wire
* galvanized and patented wire.

Installed capacity for hot-rolled thick sheets - 520,000 tons, hot rolled strips -800,000 tons, cold rolled sheet - 600,000 tons, galvanized and plastic sheets -150.000 tons, welded tubes and profiles - 400,000 tons, fero-silicium 80,000 tons, ferro-manganese and silico 180,000 tons, nickel - 14,000 tons, concrete-reinforcing iron 100,000 tons, various kinds of castings- 12,000 tones, light rolled wire, patented wire -7000 tones.

Metallurgy as the main export branch in the 2007 (the year before the crisis) had exports of 1.62 billion US dollars or had a share of over 30% of total national exports and in 2014 the number was 970 million US dollars, or about 25% of total exports of the country. The production was managed by 10 companies, a manufacturers of steel and nonferrous metals industry.

The most important export products are the following: ferro-nickel, ferro-silicon, ferro-silico, hot rolled, cold rolled and coated products, sheets, pipes, profiles and molded products.

The largest metallurgical facilities are in the following locations: Skopje (MAKSTIL, Arcelor Mittal), Kavadarci (Feni), Tetovo (SILMAK-Jugohrom) Radovitch (Mine) and Macedonian Kamenica (SASA). This sector being one of the major polluters of the environment, large investment to update the equipment were taken to reduce the environmental impact.

## Applicable legislation

On the ‘Legislation’ section of the website of the State Environmental Inspection (SEI) (<http://www.sei.gov.mk/page_en.asp?ID=2>) there is relevant legislation available.

The relevant legislation includes the following main laws:

* Law on Environment
* Law on Inspection Supervision
* Law on Waters
* Law on Nature Protection
* Law on Protection from Environmental Noise
* Law on Ambient Air Quality
* Law on Waste Management
* Law on Management of Batteries and Accumulators and Waste Batteries and Accumulators
* Law on Management of Packaging and Packaging Waste
* Law on Management of Electrical and Electronic Equipment and Waste Electrical and Electronic Equipment
* Law on Genetically Modified Organisms
* Law on Control of Emissions of Volatile Organic Compounds Resulting from Use of Petrol
* Law on Administrative Procedure
* Law on Misdemeanor
* Criminal Code Law on Criminal Procedure
* Law establishing a State Commission for decisions in the second instance in the area of the inspection supervision and misdemeanor procedures

Additionally, on the website of the Ministry of Environment and Physical Planning (<http://www.moepp.gov.mk>) there are also links to relevant primary and secondary legislation provided. Information about secondary legislation like Rulebooks is available on the website of the Official Gazette ([www.slvesnik.com.mk](http://www.slvesnik.com.mk)).

# Key environmental issues of the sector



## Preliminary information about Iron and Steel BREF & applicable BATs

The general BAT conclusions in the Iron and Steel BREF (see Annex 1 for more information, Croatian & English versions available) are applicable for EAF installations. These are the BAT conclusions about:

* Environmental management systems (BAT 1)
* Energy management (BAT 2 and 3, partially, as there is no use of blast furnace gas, coke gas and BOF gas in EAF installations).

BAT 94 is a specific BAT for electric arc furnaces. BAT is to reduce energy consumption by using continuous near net shape strip casting, if the quality and the product mix of the produced steel grades justify it.

* Electrical energy consumption (BAT 5)
* Water and waste water management (BAT 12)
* Monitoring (BAT 13, 14, 15, 16)
* Decommissioning (BAT 17)
* Noise (BAT 18, BAT 95 see ch. Noise and vibrations)

## 4.2. Air

### 4.2.1. Dust

For dust abatement the following BAT are applicable:

* Material management (BAT 6 and 7)
* Management of process residues such as by products and waste (BAT 8, 9 and 10).
* Diffuse dust emissions from materials storage, handling and transport of raw materials and (intermediate) products (BAT 11).

**Specific BAT** for dust abatement in electric arc furnishes are the following ones:

BAT for the electric arc furnace (EAF) primary and secondary dedusting (including scrap preheating, charging, melting, tapping, ladle furnace and secondary metallurgy) is to achieve an efficient extraction of all emission sources by using one of the techniques listed below and to use subsequent dedusting by means of a bag filter.

1. A combination of direct off-gas extraction (4th and 2nd hole) and hood systems
2. Direct gas extraction and doghouse systems.
3. Direct gas extraction and total building evacuation (low-capacity EAFs may not rquire direct gas extraction to achieve the same extraction efficiency).

The overall average collection efficiency associated with BAT is> 98 %.

The BAT associated emission level for dust is < 5 mg/Nm3 , determined as a daily mean value

(part of BAT 88, BREF Iron and Steel).

BAT 90 for on site slag processing is to reduce dust emissions by using one or a combination of the following techniques :

1. Efficient extraction of the slag crusher and screening devices with subsequent off gas cleaning, if relevant
2. Transport of untreated slag by shovel loaders
3. Extraction or wetting of conveyer transfer points for broken material
4. Wetting of slag storage heaps
5. Use of water fogs when broken slag is loaded.

In the case of using BAT I the BAT associated emission level for dust is < 10-20 mg/Nm3, determined as the average over the sampling period (discontinuous measurement, spot samples for at least half an hour).



### Odor

BAT 69 of the Iron and Steel BREF for minimising slag treatment emissions (to condense fume if odor reduction is required) that is drawn up for blast furnaces might be applicable for EAF.

### Pollutant substances

BAT for the electric arc furnace process is to prevent mercury emissions by avoiding, as much as possible, raw materials and auxiliaries which contain mercury (BAT 87, also BAT 6 and 7).

BAT for the electric arc furnace (EAF) primary and secondary dedusting (including scrap preheating, charging, melting, tapping, ladle furnace and secondary metallurgy) is to prevent and reduce polychlorinated dibenzodioxins/furans (PCDD/F) and polychlorinated biphenyls (PCB) emissions by avoiding, as much as possible, raw materials that contain PCDD/F and PCB or their precursors (see BAT 6 and 7) and using one or a combination of the following techniques, in conjuction with an appropriate dust removal system:

1. Appropriate post-combustion
2. Appropriate rapid quenching
3. Injection of adequate absorption agents into the duct before dedusting

The BAT associated emission level for polychlorinated dibenzodioxins/furans (PCDD/F) is < 0,1 ng I-TEQ/Nm3 based on a 6-8 hours random sample during steady state conditions. In some cases the BAT-associated emission level can be achieved with primary measures only.

Applicability of BAT 89 part (appropriate (post combustion) I : in existing plants circumstances like available space, given off-gas duct system, etc, need to be taken into consideration for assessing the applicability (BAT 89).

### Greenhouse gases

The emission of greenhouse gases is not regulated in BREFs but in other relevant European policy instruments like the Emission Trading System (ETS). However, the general BAT 2 and 3 (Energy management) are partially applicable for EAF installations (partially as there is no production of blast furnace gas, coke gas and BOF gas in electric arc furnace installations).

## Noise and vibrations

See BAT 18 ( general BAT ) and BAT 95 (specific BAT for EAF).

BAT 18:

BAT is to reduce noise emissions from relevant sources in the iron and steel manufacturing processes by using one or more of the following techniques depending on and according to local conditions:

* Implementation of a noise reduction strategy
* Enclosure of the noisy operations/units
* Vibration insulation of operations/units
* Internal and external lining made of impact absorbent material
* Soundproofing buildings to shelter any noisy operations involving material transformation equipment
* Building noise protection walls,e.g. the construction of buildings or natural barriers, such as growing trees and bushes between the protected area and the noisy activity
* Outlet silencers on exhaust stacks
* Lagging ducts and final blowers which are situated in soundproof buildings
* Closing doors and windows of covered areas

BAT 95: BAT is to reduce noise emissions from electric arc furnace (EAF) installations and processes generating high sound energies by using a combination of the following constructional and operational techniques depending on and according to local conditions (in addition to using the techniques listed in BAT 18):

* I. Construct the electric arc furnace (EAF) building in such a way as to absorb noise from mechanical shocks resulting from the operation of the furnace
* II. Construct and install cranes destined to transport the charging baskets to prevent mechanical shocks
* III. Special use of acoustical insulation of the inside walls and roofs to prevent the airborne noise of the electric arc furnac building
* IV. Separation of the furnace and the outside wall to reduce the structure-borne noise from the electric arc furnace building
* V. Housing of processes generating high sound energies (i.e. electric arc furnace and decarburisation units) within the main building.

## Wastewater

Covered by the general BAT conclusion 12 (water and wastewater mangement) and by BAT 91 and BAT 92:

BAT is to minimise the water consumption from the electric arc furnace (EAF) process by the use of closed loop water cooling systems for the cooling of furnace devices as much as possible unless once-through cooling systems are used (BAT 91)

BAT 92: BAT is to minimise the wastewater discharge from continuous casting by using the following techniques in combination:

1. The removal of solids by flocculation, sedimentation and/or filtration
2. The removal of oil in skimming tanks or in any other effective device
3. The recirculation of cooling water and water from vacuum generation as much as possible

The BAT associated emission levels for waste water from continuous casting machines, based on a qualified random sample or a 24-hour composite sample, are

* Suspended solids < 20 mg/l
* Iron < 5 mg/l
* Zinc < 2 mg/l
* Nickel < 0,5 mg/l
* Total chromium < 0,5 mg/l
* Total hydrocarbons <5 mg/l

## Soil and groundwater

BAT 6 and BAT 11 are applicable.

BAT 6 : BAT is to optimise the management and control of internal material flows in order to prevent pollution, prevent deterioration, provide adequate input quality, allow reuse and recycling and to improve the process efficiency and optimisation of the metal yield.

Appropriate storage and handling of input materials and production residues can help to minimise the airborne dust emissions from stockyards and conveyer belts including transfer points and to avoid soil, groundwater and runoff water pollution.

BAT 11 describes a great number of BATs to prevent or reduce diffuse dust emissions from materials storage, handling and transport of raw materials and (intermediate) products. If abatement techniques are used, BAT is to optimise the capture efficiency and subsequent cleaning by appropriate techniques that are summarized in the BAT (some 50 techniques, that cover general techniques, techniques for handling and transport of bulk raw materials, for materials delivery, storage and reclamation activities, for delivery by sea transport, for train or truck unloading, for highly drift sensitive materials, for handling slag and scraps and during material transport.

## Waste

General BATs are described in BAT 8: BAT for solid residues is to use integrated techniques and operational techniques for waste minimisation by internal use or by application of specialised recycling processes (internally or externally). BAT 93 is a specific BAT for electrical arc furnaces.

BAT (93) is to prevent waste generation by using one or a combination of the following techniques:

1. Appropriate collection and storage to facilitate a specific treatment
2. Recovery and on-site recycling of refractory materials from the different processes and use internally, i.e. for the substitution of dolomite , magnesite and lime.
3. Use of filter dusts for the external recovery of non-ferrous metals such as zinc in the non –ferrous metals industry, if necessary, after the enrichment of filter dusts by recirculation to the electric arc furnace.
4. Separation of scale from continuous Casting in the water treatment process and recovery with subsequent recycling. E’g in the sinter/blast furnace or the cement industry.
5. External use of refractory materials and slag from the electric arc furnace process as a secondary raw material where market conditions allow for it.

BAT (93) is to manage in a controlled manner EAF process residues which can neither be avoided nor recycled.

## Storage of hazardous substances

See next subsection, 4.8.

## Safety

In the IED no conditions and prescriptions about safety aspects like storage of hazardous substances are given, so in the BREF documents BAT for these and other safety aspect will not be found. The Seveso-III Directive (2012/18/EU) about the prevention of major accidents involving dangerous substances is applicable in this case. The Directive covers establishments where dangerous substances may be present (e.g. during processes or in storage) in quantities above a certain threshold. The Directive describes the main obligations for member state authorities and operators. In the Republic of Macedonia until now only the Seveso-II Directive is transposed as a Chapter within the Law on Environment.

## Administrative organisation / Internal control



### Environmental management system

BAT 1 (in the section „General BAT conclusions”) describes all elements of the environmental management system for the sector. The Reference document on the general principles of monitoring must also be taken into account.1[[1]](#footnote-1) The scope (e.g. level of details) and nature of the EMS (standardised or non-standardised) will generally be related to the nature, scale and complexity of the installation and the range of environmental impacts it may have.

### Self-monitoring and reporting

BAT 1 part V under i and iii of the Iron and Steel BREF is applicable. The BAT that describe the monitoring obligations in detail are BAT 13, 14, 15 and 16 in chapter 9 .1.7 of the BAT conclusions of the BREF.

## Other environmental issues

### Energy consumption and efficency

BAT 2, 3 and 5 of chapter 9.1.2 of the BAT conclusions of the BREF describe the BATs and their applicability with regard to energy management. (BAT 4 is not applicable to EAF).

### Natural resources management

BAT 1 (VII,VIII), chapter 9.1.3 (BAT 6), chapter 1.1.4 (BAT 8 and 9), chapter 9.1.6 (BAT 12) and chapter 9.1.8 (BAT 17 about plant decommissioning) of the BAT conclusions document of the BREF are applicable and describe obligations in order to improve the natural resources management of the plant.

# The inspection



## Preparation before inspection



### Decide on type/duration of inspection

The inspection team shall decide on the type of inspection and on the resources, including staff and equipment, which will be assigned to the task. Examples of inspection types can be routine inspection of all production processes or targeted inspection of problematic areas on the basis of complaints or in case that there are indications that critical emission limit values (ELV) cannot be met.

The following aspects should be taken into account:

* Complexity and duration of the installation - the more complex it is the more inspectors that may be needed
* Time of inspection - for safety reasons it is recommended that at night two inspectors should conduct inspection;
* For non-routine inspection, especially conducted upon a complaint and problematic situation, it is advisable to direct two inspectors to it;
* Weather condition as well as the time of a year - some additional equipment might be needed (e.g. torches, protective clothes, etc.).
* The resources needed (man-power/equipment, safety precautions)
* In relation to the previous point, it is recommended to have a **check-list of the equipment** needed (including safety gear, sampling equipment in case sample taking is required, laptop if available and convenient…).

### Desk study

The collection and evaluation of existing information about the installation is critical for the success of the inspection since it allows the easier formulation of targeted questions for the interview of the operator and the concrete investigation of those unit operations which show the highest potential for not complying with the conditions set in the decision on the EIA or surpassing the set ELV in the environmental permit. **Examples of** **information to be collected** are listed below:

1. Reports of previous inspections of the site
2. Maps
3. Environmental Impact Assessment (decision, study, monitoring plan, monitoring reports)
4. Application for the permit
5. Environmental permit/s
6. Environmental reports submitted by operators, including monitoring reports
7. Complaints received about the installation
8. BREF for Iron and Steel production (chapter on EAF) and applicable BAT (chapter 4)
9. PRTR and other registers such as register of polluting substances into air, register of waste producers and managers
10. Information on installation to be inspected received from other competent authorities
11. Information available on the website of the operator

On the basis of the evaluation of the collected information **the following has to be prepared**:

* A comprehensive questionnaire which will be used for the operator’s interview
* A **check list** to facilitate the inspection (see next subsection).
* An outline of the “critical” ELV (i.e. those parameters which significantly contribute to the pollution load coming out of the installation)
* The list of BATs (according to the issued permit) which the operator should have installed and operated
* The list of documentation to be provided by the operator (e.g. self-monitoring records, annual reports submitted to the authorities)
* The inspection minutes and report templates (tailor-made for the installation) to be filled in at the end of the inspection
* **Agenda of the inspection** (see next subsection).

### Templates for agenda of the inspection and checklist

**You can use** as starting, **partially completed, checklist template** the one **in Annex 4**, which is **tailored to this sector**.

A **short agenda** can be a **very useful** tool that will help to conduct an inspection. Providing an operator with it in advance may result in more smooth coordination of the inspection from his/her side, simply because the operator will be aware of how many resources and people they will have to allocate to the inspection. Preparing such a document before an inspection is not time-consuming, you can **use the template of inspection agenda in Annex 2**.

### Prior operator notification

* Routine inspections. The operator shall be previously notified of routine inspections as provided in the Law on Inspection Supervision.
* Non-routine inspections. There is not an obligation to notify operators of non-routine inspections. Therefore, in case of inspections carried out to verify if the operator is in line with environmental regulations, as a consequence of complaints by citizens or for other reasons, it is not recommended to notify operators previously.

## On site inspection

### General considerations to take into account

The aim of the inspection will be to **check compliance** of the operator **with** the operating/environmental conditions set in the issued **permit**.

1. Identify yourself. Clearly introduce yourself and show your identification card at the beginning of each inspection.
2. Explain purpose of visit.
3. The operating/environmental conditions set in the issued **permit will be the „guidance”** throughout the inspection.
4. If necessary take **samples**, and/or define the samples that should be taken by a certified laboratory.
5. **Always record your inspection with photographs and/or videos**, they are fundamental as a proof in Court.

#### Best Available Techniques (BATs)

It must be checked that all BATs that are prescribed in the permit are present and that the corresponding Emission Limit Values are met. For installations falling under the scope of the IED, if a necessary BAT-Associated Emission Level (BAT-AEL) is not in the permit it must be checked if there is an explanation as prescribed by the article 15.4 in the IED[[2]](#footnote-2). If there is no (good) explanation, feedback to the permit writer and the operator must be given. If a BAT prescribed in the permit is present, works properly but the ELV is not met, possible alternatives can be discussed with the permit writer and the operator.

### Main questions for inspection

The major points of interest for inspection for the iron/steel production sector (EAF) are the following:

1. **Air emissions**
   1. Dust (see 4.1.1.)

* Check whether BAT 88 + 90, the BATs for the EAF primary and secondary de dusting (including scrap preheating, charging, smelting, tapping, ladle furnace and secondary metallurgy) and dust reduction for on-site slag processing have been installed and properly operated and the respective ELV are met
* Check whether diffuse dust emissions from materials storage, handling and transport of raw materials and (intermediate) products are minimised (BAT 11).
  1. Mercury (see 4.1.3.)
* Check to which extent the operator is using raw materials and auxiliaries which do not contain mercury. (BAT 87, also BAT 6 and 7)
  1. Polychlorinated dibenzodioxins/furans (PCDD/F) and polychlorinated biphenyls (PCB) (see 4.1.3.)
* Check to which extent the use of raw materials that contain PCDD/F and PCB or their precursors is avoided (see BAT 6 and 7)

1. **Noise – vibrations (see 4.2.)**

* Check whether elements of BAT 18 + 95 are applied. (Implemention of a noise reduction strategy, enclosure of noisy operations/units, vibration insulation of operations/units, internal and external lining made of impact-absorbent material, soundproofing buildings to shelter any noisy operations involving material transformation equipment, building noise protection walls, outlet silencers on exhaust stcks, lagging ducks and final blowers which are situated in soundproof buildings, closing doors and windows of covered areas and construction of the EAF building, equipment and insulation of walls and the positioning of the electric arc furnace and decarburisation units in the EAF building).

1. **Wastewater (see 4.3.)**

* Check to which extent closed loop water cooling systems for the cooling of furnace devices are applied (BAT 91)
* Check whether the wastewater discharge from continuous casting is minimised (BAT 92).

1. **Waste (see 4.5.)**

* Examine to which extent waste minimisation techniques are applied (BAT 93: appropriate collection and storage to facilitate a specific treatment, recovery and on-site recycling of refractory materials from the different processes and use internally, use of filter dust for the external recovery of non-ferrous metals such as zinc in the non-ferrous metal industry, separation of scale from continuous casting in the water treatment process and recovery with subsequent reycling, external use of refractory materials and slag from the electric arc furnace process as a secondary raw material).

1. **Energy efficiency**

* Check the application of BAT 2, 3 and 5 of chapter 1.1.2 of the BAT conclusions of the BREF (optimising energy consumption, online monitoring of the most important energy flows, reporting and analysing tools, carrying out energy audits as described in the Energy Efficiency BREF, eventually installation of steam boilers, preheating of combustion air in furnaces, insulation of steam pipes, power management systems, grinding, pumping, ventilation and conveying equipment and other electricity based equipmen with high energy efficiency).

### Obstruction by the operator

It may happen sometimes that an operator does not want to have an inspector in his/her factory and closes the door for him/her. If this is the case you are entitled to call a state administration body for assistance/police.

But this is not the only way an operator can obstruct your job. Other ways may include such things as:

* Not providing information explaining at the same time that all is confidential
* Trying to ask you for giving them a few additional days for preparation of information that is needed
* Trying to discourage inspectors from visiting "difficult" places such as for example areas where waste is improperly stored.

It must be kept in mind that an obstruction by an operator is considered to be a misdemeanor.

## After the inspection

### Inspection reporting

After the inspection, according to EU best practices, the inspector has to draft a final inspection report. A template for such report has been delivered within this Twinning project and is available at SEI’s website (see Annex 1 for more information). The main contents of such a report are the following:

1. Baseline of the inspection

* Inspection basis (permit, legal regulations)
* Competent inspection authority, cooperating inspection authorities
* Kind of installation (e. g. slaughterhouse, meat processing)
* Operator (Name of the company)
* Address
* Date of inspection
* Length of inspection time
* Scope of the inspection (e. g. integrated inspection, media that were inspected, parts of the installation that were inspected)
* Kind of inspection (regular, extraordinary, control)

1. Inspection’s results

* No or only minor non-compliances
* Significant or relevant non-compliances
* Serious or important non-compliances

1. Recommended corrective measures

* Minor corrective measures
* Significant or major corrective measures
* Serious or important corrective measures

### Inspection recording

The inspection report and any other additional material used for the preparation of the inspection should be stored and made accessible to any relevant authorities for their information.

# Annex 1: Useful references & links

|  |  |
| --- | --- |
| **Document / information** | **Link** |
| Website of the State Environmental Inspectorate, with useful materials, including inspection manual, factsheets and checklists | [www.sei.gov.mk](http://www.sei.gov.mk) |
| BAT Conclusions for Iron and Steel Production (Croatian version)  (English version) | <http://eur-lex.europa.eu/legal-content/HR/TXT/PDF/?uri=CELEX:32012D0135&from=EN>  <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.L_.2012.070.01.0063.01.ENG&toc=OJ:L:2012:070:FULL> |
| Best Available Techniques (BAT) Reference Document for Iron and Steel Production, 2013 | <http://eippcb.jrc.ec.europa.eu/reference/> |
| Reference Document on Best Available Techniques on Emissions from Storage, July 2006 | <http://eippcb.jrc.ec.europa.eu/reference/> |
| Reference Document on Best Available techniques for Energy Efficiency, February 2009 | <http://eippcb.jrc.ec.europa.eu/reference/> |
| Reference Document on Economics and Cross Media Effects July 2006 | <http://eippcb.jrc.ec.europa.eu/reference/> |
| Industrial Emissions Directive 2010/75/EU | <http://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex:32010L0075> |

# Annex 2: Template for an inspection agenda

**AGENDA FOR THE INSPECTION**

*Name of the company*

*Data of the inspection*

*n. of IPPC A/B permit*

This Agenda for the inspection defines and plans the in situ activities; it defines the type of investigations to be performed (identification of key environmental issues) and how to investigate the defined topics (administrative or technical check by means of direct inspection on the plant). The Agenda is delivered to members of the inspection team and the operator during the preliminary meeting .

***Composition of Inspection Group***

The Inspection Group (IG) is composed of the following technical officials :

*Name – Administration* (Leader of the IG)

*Name – Administration*

xxx

xxx

**Timing and execution of the inspection**

The inspection will be conducted according to the following program:

***Day/month/year***

|  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- |
|  | **Subject** | | **Activities** | **Time** | **Who / Staff needed** |
| Step 1 | Opening meeting | | Presentation of the Agenda and the inspection team  Presentation and current status of the plant (production capacity and planimetry to check differences with the authorized layout) by the Operator | 9.00 | IG Leader  Legal responsible of the plant  Representative of the plant in charge of environmental issues |
| Step 2 | Administrative inspection | | *xxxxx* | 11.00 | *xxx* |
| Step 3 | Site visit | | Check BAT Application | 12.00 | Representative of the plant in charge of environmental issues |
| Lunch 13.30 -14.30 | |
| Step 4 | Site visit | | Waste storage | 14.30 | Representative of the plant in charge of environmental issues |
| Step 5 | Site visit | | Water treatment plant | 15.00 | Representative of the plant in charge of environmental issues |
| *Step xxx* | *xxx* | | *xxx* | *xxx* | *xxx* |
| Step xx | Minutes of the inspection | | Drafting and projecting the minutes of the inspection. | 16.00 | Legal responsible of the plant |
| Step xx | Conclusive meeting | | Conclusions | 17.30 | Legal responsible of the plant  Representative of the plant in charge of environmental issues |

***Documents to be prepared by the operator***

* Updated planimetry of the plant, indicating:
* Water discharge points
* Air emissions points
* Waste storage areas
* *xxxxxx;*
* Environmental Management System certificate.
* Analysis certificate provided by certified laboratory of last monitoring analysis.
* Communication to Competent Authority related to Incidents.
* *xxxxx.*

# Annex 3: Sector terminology

A ladle is a big kind of spoon used to carry and poor molten metal

Secondary metallurgy: using modern technology, the process of making steel can be divided in two steps. All further steps required to produce high-grade steel take place exclusively in the ladle. Such ladle metallurgy is called secondary metallurgy.

# Annex 4: Inspection checklist for Iron & Steel production (Electric Arc Furnace)

1. http://eippcb.jrc.ec.europa.eu/reference/BREF/ROM\_FD\_10201 [↑](#footnote-ref-1)
2. Art.15.4 of the IED states the following:

   The competent authority may, in specific cases, set less strict emission limit values than BAT-AELs. Such a derogation may apply only where an assessment shows that the achievement of emission levels associated with the BATs as described in BAT conclusions would lead to disproportionately higher costs compared to the environmental benefits due to:

   (a) the geographical location or the local environmental conditions of the installation concerned; or

   (b) the technical characteristics of the installation concerned.

   The competent authority shall document in an annex to the permit conditions the reasons for the application of the derogation including the result of the assessment and the justification for the conditions imposed.

   The ELVs set in accordance with the derogation shall, however, not exceed the ELVs set out in the Annexes to the IED, where applicable.

   The competent authority shall in any case ensure that no significant pollution is caused and that a high level of protection of the environment as a whole is achieved.

   The competent authority shall re-assess the application of the derogation as part of each reconsideration of the permit conditions pursuant to Article 21 of the IED. [↑](#footnote-ref-2)