discussion briefly describes the full range of activities potentially employed by members of this industry. Despite the substantial diversity within the industry group, there are a number of general operations which characterize the majority of industrial processes.

Facilities in the primary metals industry are typically involved in one or more of the following general operations: raw material storage and handling; furnace and oven related processes; preparation of molds, casts, or dies; metal cleaning, treating and finishing; and waste handling and disposal.

a. Raw Material Storage and Handling Activities. Due to the nature of the primary metals industry, large quantities of raw materials are required for many operations. The extent to which these materials are stored outside exposed to precipitation will depend on the specific operations taking place at a facility, the size of the operation, as well as the storage space available that is covered. Some of the most common materials used are metals, fuels, fluxes, refractories, sand, and an assortment of solvents, acids, and other chemicals.

The primary raw material for all facilities in the industry is the source of metal to be used or processed. For steel works, smelters, and blast furnaces, the raw material could be metallic ores, scrap, dross, or foundry returns. Foundries may use scrap materials, borings, turnings, metal ingots, pigs or a mixture of these and other materials. Rolling mills, heat treaters, and metal finishing operations will generally use billets, slabs, blooms, bars, pigs or other cast metal pieces as their primary raw material. These may be produced at another part of the same facility, or purchased from another source. Some of these materials may arrive with protective or incidental coatings of oil, oxides, or other impurities. Due to the large size and volume of some of these materials they may be stored outside.

Energy sources for facilities within the industry are also quite varied. While steel mills with coking operations may use coal as the fuel for firing coke ovens, coal would also be the raw material that would be converted to coke. Some iron and steel foundries or mini-mills may use coke as a fuel only, or may use electric arc furnaces for melting. Smaller foundries (ferrous or nonferrous) may use gas-fired or electric induction furnaces.

A variety of fluxes are often added to the molten metal to allow impurities to be removed as slag or dross. In the iron and steel industry, limestone is probably the most common flux used. Others include dolomite, soda ash, fluorspar, and calcium carbide. Nonferrous operations may use other fluxing agents or none at all.

During the melting process, refractories are used to line and protect the furnaces. These refractories have limited lives and must be replaced periodically. The life of the refractory will depend on the type of furnace as well as the material being melted. Some large furnaces require almost constant patching of the refractory materials and thus large quantities may be stored for future use.

Another common material used in casting operations is sand. Many foundries will use sands of different types to produce the molds and cores for the production of castings. Although some facilities are able to recycle their sand, others must dispose of some or all of the used sand and thus require large amounts of fresh sand as a raw material. There are also a large number of sand additives and binders which may be used to control the properties of the mold produced. "Wet" sand may contain clay, seacoal, bentonite, wood flour, phenol, iron oxide, and numerous other acids and chemicals, some of which may be toxic.

Other processes related to finishing operations can require a wide variety of solvents, chemicals, and acids. Many facilities involved in cleaning, treating, painting, or other finishing operations may store these products in tanks or drums which may be exposed to precipitation.

b. Furnace, Rolling, and Finishing Operations. The majority of processes within the primary metals industry are conducted inside. These activities include all types of furnace operations, rolling operations, as well as all kinds of metal finishing activities. Many of these operations, however, generate significant quantities of particulate matter which, if not properly controlled, can result in exposure to precipitation.

There are many different types of furnaces. Each has advantages and limitations and are used for different types of metals. Facilities may use coal, coke, or gas fired furnaces as well as electric arc or induction furnaces.

Coke ovens, or batteries, generally use coal fired furnaces to heat coal in the absence of oxygen to drive off volatiles. The resultant product is coke which is subsequently used in other furnace operations. Blast furnaces are usually operated on a continuous basis with coke, iron ore, and fluxes charged at the top of a vertical shaft while molten pig iron and slag are tapped at different levels below.

Sintering plants burn coke breeze (particles too small to use for charging in cupola or blast furnaces) mixed with iron ore, flue dust, or other products to fuse them into materials that can then be charged with regular coke in a furnace. Cupola furnaces are used by ferrous foundries and operate in essentially the same manner as blast furnaces, allowing a range of scrap steel and iron to be charged with coke and fluxes at the top of the furnace.

Basic oxygen process furnaces use a mixture of molten iron and scrap as the charge. High-purity oxygen is injected into the furnace where it combines with impurities in the charge materials and provides heat to melt the charge of scrap.

There are two types of electric furnaces in use. Electric arc furnaces operate in a batch fashion and are often used by steel mini-mills. Scrap metal is placed in the furnace along with three electrodes which provide the energy to melt the charge. Electric induction furnaces are generally smaller than other types described above and require that cleaner metals be used.

Gas-fired furnaces are often used by nonferrous foundries. They are generally small and require relatively clean metals for melting.

One trait that all types of furnaces share is the generation of significant emissions, including particulate emissions. Blast furnaces, sintering plants, and cupola furnaces, all fired by coke, have particularly high particulate emissions. These furnaces are capable of handling a relatively "dirty" charge, with significant impurities which can lead to a variety of emissions problems. For these reasons, these types of furnaces will have emissions controls such as baghouses, wet scrubbers, or electrostatic precipitators. Electric arc furnaces are also able to melt fairly "dirty" scrap and can also have significant levels of particulate emissions.

At the other end of the spectrum are smaller electric induction and gas fired furnaces which generally require a very clean charge. Although this reduces the volume of emissions concerns significantly, they are also less likely to have as extensive pollution control and thus fugitive emissions of particulates may be significant.

The effectiveness of emissions control equipment in controlling particulate generation will depend on the furnace operation, the raw materials used, the type of control equipment in place, and the degree to which it is operating properly. Fugitive emissions, faulty or improperly maintained equipment, and "dirty" raw materials can all contribute to particulate emissions that may not be captured by pollution control