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GUIDANCE MANUAL
FOR
BATTERY MANUFACTURING
PRETREATMENT STANDARDS

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1. INTRODUCTION

The National Pretreatment Program establishes an overall strategy for controlling the introduction of nondomestic wastes to publicly owned treatment works (POTWs) in accordance with the overall objectives of the Clean Water Act. Sections 307(b) and (c) of the Act authorize the Environmental Protection Agency to develop National Pretreatment Standards for new and existing dischargers to POTWs. The Act makes these pretreatment standards enforceable against dischargers to publicly owned treatment works.

The General Pretreatment Regulations (40 CFR Part 403) establish administrative mechanisms requiring nearly 1,500 POTWs to develop local pretreatment programs to enforce the general discharge prohibitions and specific categorical pretreatment standards. These categorical pretreatment standards are designed to prevent the discharge of pollutants which pass through, interfere with, or are otherwise incompatible with the operation of the POTW. The standards are technology-based for removal of toxic pollutants and contain specific numerical limitations based on an evaluation of specific treatment technologies for the particular industrial categories. As a result of a settlement agreement, EPA was required to develop categorical pretreatment standards for 34 industrial categories with a primary emphasis on 65 classes of toxic pollutants.

This manual provides guidance to POTWs on the application and enforcement of the categorical pretreatment standards for the battery manufacturing category. This document is based primarily on two sources: Federal Register notices, which include the official announcements of the categorical pretreatment standards, and the final development document for battery manufacturing which provides a summary of the technical support for the regulations. Additional information on the regulations, the manufacturing processes, and control technologies can be found in these sources. A listing of all references used in the development of this manual is provided at the end of this document. A Glossary of Terms is provided in Appendix A of this document to assist the reader in becoming familiar with the technical terms used in this document.

1.1 HISTORY OF THE BATTERY MANUFACTURING CATEGORY

Battery manufacturing originated in 1786 with the invention of the galvanic cell by Galvani. Electrochemical batteries and cells using silver and zinc electrodes in salt water were assembled as early as 1798 by Alessandro Volta as a result of Galvani's work. In 1868, Leclanche developed the forerunner of the modern dry cell in which he used an amalgamated zinc anode and a carbon cathode surrounded by manganese dioxide immersed in an ammonium chloride solution. Varying types of battery systems have been introduced, many of which have been displaced by newer and more advanced systems. In the last ten years lithium batteries have been developed for many applications, including heart pacemakers, and large programs have been funded for the

development of electric powered automobiles and stand-by power sources for utilities. Advancing technology of materials along with new applications requirements will result in development of newer systems and the redevelopment of some older systems.

It is estimated that there are 255 battery manufacturing plants in the United States. A substantial majority of these are located in California, Pennsylvania, North Carolina, and Texas. Of the 255 identified battery manufacturing plants, 22 are direct dischargers, 150 are indirect dischargers and 83 plants do not discharge wastewater.

Categorical pretreatment standards for the battery manufacturing category were promulgated on March 9, 1984 and became effective on April 23, 1984. EPA had not previously promulgated any pretreatment regulations for the battery manufacturing category. In response to a settlement agreement, (Battery Council International v. EPA, 4th Cir. No. 84-1507) an amendment to the regulations was proposed on January 28, 1986 and promulgated on August 28, 1986. The final compliance date for the battery manufacturing categorical pretreatment standards was March 9, 1987 for existing sources and upon commencement of discharge for new sources.

2. BATTERY MANUFACTURING CATEGORICAL PRETREATMENT STANDARDS

2.1 AFFECTED INDUSTRY

For the purpose of these categorical pretreatment standards, battery means a modular electric power source where part or all of the fuel is contained within the unit and electric power is generated directly from a chemical reaction rather than indirectly through a heat cycle engine. A unit or cell consists of an anode, a cathode, and an electrolyte, plus mechanical and conducting parts such as case, separator and contacts. Often several units or cells are assembled into one device. For these standards the term battery refers to a single cell or self-contained assemblage of cells.

The battery manufacturing categorical standards establish limitations and standards for those manufacturing plants at which battery manufacturing operations occur. These operations include all the specific processes used to produce a battery including anode and cathode manufacturing processes and various ancillary operations. Ancillary operations are primarily associated with battery assembly and chemical production of anode or cathode active materials. The categorical standards do not establish discharge standards for the manufacturing operations associated with the production of structural components such as cases, separators, contacts, and other small parts manufactured in other plants where other limitations and standards apply.

Battery manufacturing plants are included within Standard Industrial Classification (SIC) Codes 3691, Storage Batteries and 3692, Primary Batteries, Dry and Wet. However, SIC codes cannot

be used to make categorization determinations because the codes are based on end use of the product and not the manufacturing processes.

2.2 PROCESS OPERATIONS

Manufacturing operations vary widely, depending on the particular battery application and the type of battery produced. Battery manufacturing is typically comprised of production of anodes, production of cathodes, and associated ancillary operations necessary to produce a battery such as battery assembly. These process operations are briefly discussed below:

Anodes - Anodes, in their final or fully charged form in a battery are usually zerovalent metals. The active mass for anodes is prepared by directly cutting and drawing or stamping the pure metal or alloyed metal sheet, by mixing metal powders with or without electrolyte, by physically applying pastes of a compound of the anode metal to the support structure, or by precipitating a soluble salt of the metal onto a carrier or support structure. The final step in anode preparation for many types of batteries, especially rechargeable ones, is formation or charging of the active mass. Formation may be carried out on individual electrodes or on pairs of electrodes (anode and cathode) in a tank of suitable electrolyte. Most often the electrodes for a battery are formed in pairs and current is passed through the electrodes to charge them. For some battery types, charge-discharge cycling up to seven times is used for formation.

Cathode Manufacturing - Although usually designated by metal type cathode active materials often consist of oxidized metals, such as lead peroxide or nickel hydroxide. Non-metals such as iodine (used in lithium-iodine batteries) and meta-dinitrobenzene (used in magnesium-ammonia reserve batteries) are other kinds of cathode active materials. Cathode active materials are weak electrical conductors and usually possess little mechanical strength. Therefore, most cathodes have a metallic current conduction support structure and conducting material, often carbon or nickel, incorporated into the active mass. The active material may be applied to the support as a paste, deposited in a porous structure by precipitation from a solution,

fixed to the support as a compacted pellet, or may be dissolved in an electrolyte which has been immobilized in a porous inert structure. Formation processes for cathodes are similar to those used for anodes.

Ancillary Operations - Ancillary operations are those operations unique to the battery manufacturing category that are not specifically included under anode or cathode fabrication. Ancillary operations are primarily associated with cell and battery assembly and chemical production of anode and cathode active materials. Ancillary operations also include battery washing (both intermediate and final product), and washing of equipment, floors, and operating personnel as well as some dry operations.

The reactive materials in most modern batteries include one or more of the following toxic metals: cadmium, lead, mercury, nickel, and zinc. These toxic metals are often found in wastewater discharges and solid wastes from battery plants. Water is used throughout the manufacturing process, specifically in preparation of electrolytes and electrode active masses, in deposition of active materials on electrode supporting structures, in charging electrodes and removing impurities, and in washing finished batteries, production equipment, and manufacturing areas.

2.3 SUBCATEGORIZATION

The battery manufacturing category was subcategorized based on anode material and electrolyte composition. The rationale for this subcategorization is that many battery manufacturers produce batteries with different anode-cathode pairs but with a common anode material. The seven subcategories to which this regulation applies are:

- Cadmium
- Calcium
- Lead

- Leclanche (zinc anode with an acid electrolyte)
- Lithium
- Magnesium
- Zinc (with alkaline electrolyte)

These subcategories are represented by Subparts A-G of the categorical standards.

These subcategories are further subdivided into manufacturing process elements frequently referred to as "building blocks" specific to basic manufacturing operations within the subcategory. Promulgated standards are specific to these elements. At the element level water use and pollutant characteristics can be related to a specific measure of production. This factor is referred to as a production normalizing parameter (PNP). The PNP may be different in the different subcategories or even different for each element. For example, in the case of plants subject to the lead subcategory standards, the PNP for all process elements for which discharge allowances are provided (except for the truck wash process element) is the total lead weight used (consumed) in the type of battery manufactured. The PNP for truck wash is the weight of lead in batteries (not total weight of batteries) moved in trucks. This does not apply to truck washing at plants that have battery cracking or secondary lead smelting which is covered under nonferrous metals manufacturing.

The seven subcategories, their manufacturing operations and resulting wastewater characteristics are described briefly in this section. The application of the battery manufacturing categorical standards may be difficult for those unfamiliar with the processes and terminology used. As a general guide, the Control

Authority should ask the manufacturer the questions listed in Table 2.1 to determine the applicable subcategories and standards. If further technical assistance is needed the Control Authority is encouraged to contact the EPA Industrial Technology Division project officer (Mary L. Belefski at (202) 382-7153).

2.3.1 Cadmium Subcategory

The Cadmium Subcategory encompasses the manufacture of all batteries in which cadmium is the reactive anode material. Cadmium cells currently manufactured are based on nickel-cadmium, silver-cadmium, and mercury-cadmium couples. Three general methods for producing anodes are employed:

1) The manufacture of pasted and pressed powder anodes by physical application of the solids;

2) Electrodeposited anodes produced by means of electrochemical precipitation of cadmium hydroxide from a cadmium salt solution;

3) Impregnated anodes manufactured by impregnation of cadmium solutions into porous structures and subsequent precipitation of cadmium hydroxide.

Five cathode manufacturing process elements are employed in this subcategory, three of which are specifically for production of nickel cathodes and two are for production of silver and mercury cathodes. They include:

(1) Nickel pressed powder cathodes

(2) Nickel electrodeposited cathodes

(3) Nickel impregnated cathodes

(4) Silver powder pressed cathodes

(5) Mercuric oxide powder pressed

TABLE 2.1

BASIC DETERMINATIONS NEEDED TO APPLY
BATTERY MANUFACTURING REGULATION

I. DETERMINATION OF APPLICABLE SUBCATEGORY

A. What types of batteries do you manufacture?

B. What raw materials do you use for anode manufacture?

II. DETERMINATION OF APPLICABLE PROCESSES

A. How do you manufacture anodes?

B. How do you manufacture cathodes?

C. What ancillary operations do you perform?

III. DETERMINATION OF AN AVAILABLE PRODUCTION INFORMATION

A. Do you keep records on raw materials purchased?

B. Do you keep records on the weight of batteries produced or number of batteries produced?

C. Over what period is this information available?

IV. DETERMINATION OF AN APPROPRIATE PRODUCTION RATE

A. Review guidance for determining a reasonable representation for production as provided in the Guidance Manual for the Use of Production-Based Pretreatment Standards and the Combined Wastestream Formula (September, 1985) and in 40 CFR Part 122.63 (B)(2) .

B. Determine a reasonable representation of the actual production by reviewing the production data over a period of three to five years and determining the high months in each of these years. Divide the total production in these high months by the total number of production days in these high months to yield an average daily production rate (regulatory day) which is then used to determine the appropriate discharge allowances. The data should be carefully examined for consistency in production, and to insure that the highest production months are not an anomaly.

Assembly of all cells in this subcategory involves the assembly of one or more anodes with cathodes and separators to produce an active cell. One or more of these cells is then inserted in a battery case, electrical connections are made, and electrolyte is added, after which the case is covered and (if appropriate) sealed.

Ancillary operations include washing assembled cells; preparing electrolyte solutions; cleaning process areas and equipment; employee washing to remove process chemicals; and the production of active anode and cathode materials such as cadmium powder, silver powder, nickel hydroxide and cadmium hydroxide. Figure 2.1 is a schematic diagram of a generalized cadmium subcategory manufacturing process.

Table 2.2 is a summary of the wastewater sources for the cadmium subcategory. Process water use varies from plant to plant depending upon the specific manufacturing operations practiced. The most significant sources of process wastewater in cadmium anode battery manufacture are in the deposition of electrode active materials on supporting substrates and in subsequent electrode formation (charging) prior to assembly into cells. Additional points of process water use and discharge include wet scrubbers for air pollution control, electrolyte preparation, cell wash, floor wash, and employee showers and hand wash intended to remove process chemicals.

The most significant pollutants are the toxic metals cadmium, nickel, and silver. The waste streams are predominantly alkaline and frequently contain high levels of suspended solids including metal hydroxide precipitates.

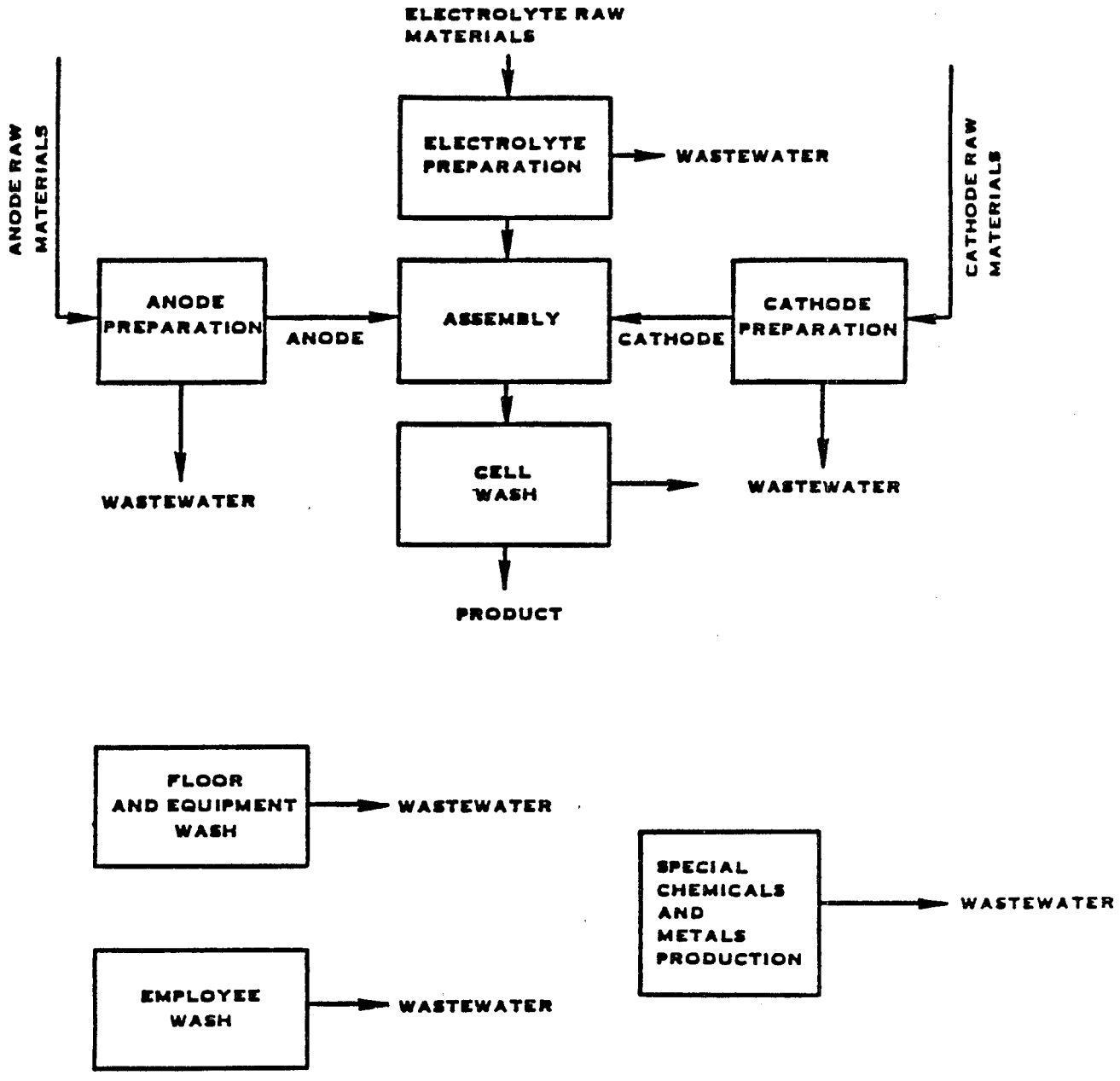

FIGURE 2.1

GENERALIZED CADMIUM SUBCATEGORY MANUFACTURING PROCESS

TABLE 2.2

CADMIUM SUBCATEGORY ANALYSIS

Grouping	Element	Specific Wastewater Sources (Subelement)
Anode Manufacture	Pasted and Pressed Powder	• Process Area Clean-up
	Electrodeposited	• Product Rinses • Spent Caustic • Scrubbers
	Impregnated	• Sintered Stock Preparation Clean-up • Impregnated Rinses • Spent Impregnation Caustic • Product Cleaning • Pre-formation Soak • Spent Formation Caustic • Post-formation Rinse
Cathode Manufacture	Silver Powder Pressed	• No Process Wastewater
	Nickel Pressed Powder	• No Process Wastewater
	Nickel Electrodeposited	• Spent Caustic • Post-formation Rinse
	Nickel Impregnated	• Sintered Stock Preparation Clean-up • Impregnation Rinses • Impregnation Scrubbers • Product Cleaning • Impregnated Plague Scrub • Pre-formation Soak • Spent Formation Caustic • Post Formation Rinses • Impregnation Equipment Wash • Nickel Recovery Filter Wash • Nickel Recovery Scrubber
	Mercuric Oxide Powder Pressed	• No Process Wastewater
Ancillary Operations	Cell Wash	• Cell Wash

TABLE 2.2 (continued)

CADMIUM SUBCATEGORY ANALYSIS

Grouping	Element	Specific Wastewater Sources (Subelements)
Ancillary Operations	Electrolyte Preparation	• Equipment Wash
	Floor and Equipment Wash	• Floor and Equipment Wash
	Employee Wash	• Employee Wash
	Cadmium Powder Production	• Product Rinses • Scrubber
	Silver Powder Production	• Product Rinses
	Nickel Hydroxide Production	• Product Rinses
	Cadmium Hydroxide Production	• Seal Cooling Water

2.3.2 Calcium Subcategory

The Calcium Subcategory includes batteries that use calcium as the reactive anode material. Currently, only thermal batteries for military applications are produced. These batteries are designed for long-term inactive storage followed by rapid activation and delivery of relatively high currents for short periods of time. These characteristics are achieved by the use of solid electrolytes (usually a fused mixture of lithium chloride-potassium chloride) which at the moment of use are heated to above the melting point to activate the cell. This heat is supplied by chemical reactants incorporated as a pyrotechnic device in the cell. Cell anodes, depolarizers, electrolytes, and cell activators (heating elements) are prepared in the manufacture of calcium anode thermal batteries. Calcium anode material is generally produced by vapor deposition of calcium on a substrate of metal, such as nickel or iron, which serves as a current collector and support for the calcium during cell operation. Cathodic depolarizers include calcium chromate, tungstic oxide, and potassium dichromate and are incorporated into cells by impregnation of fibrous media, pelletization of powders, and by glazing. The electrolyte usually consists of a lithium chloride-potassium chloride mixture and is incorporated into the cells in a similar manner as are the depolarizers. Figure 2.2 shows a generalized diagram for calcium battery manufacturing.

Table 2.3 shows a summary of the wastewater sources for each process in the subcategory. Since calcium, the cell anode material, reacts vigorously with water, water use is avoided as

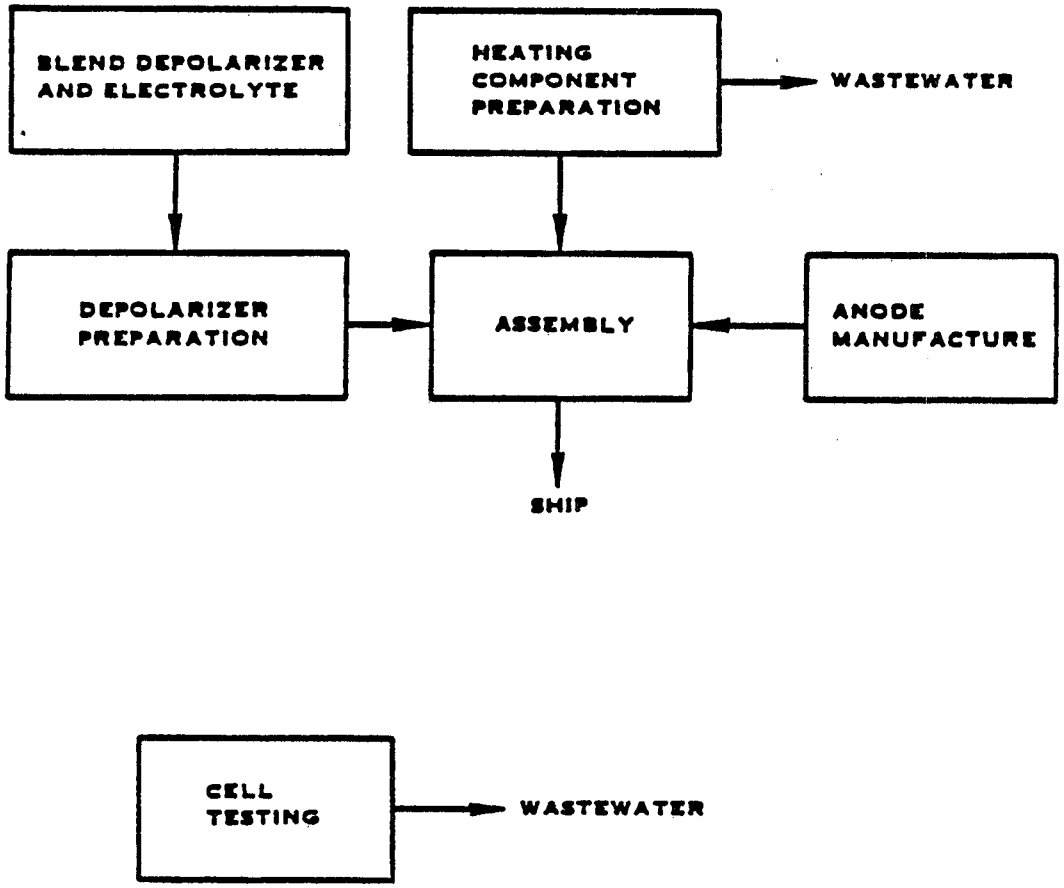

FIGURE 2.1

GENERALIZED CALCIUM SUBCATEGORY MANUFACTURING PROCESS

TABLE 2.3

CALCIUM SUBCATEGORY ANALYSIS

Grouping	Element	Specific Wastewater Sources (Subelements)
Anode Manufacture	Vapor Deposited	• No Process Wastewater
	Fabricated	• No Process Wastewater
Cathode Manufacture	Calcium Chromate	• No Process Wastewater
	Tungstic Oxide	• No Process Wastewater
	Potassium Dichromate	• No Process Wastewater
Ancillary	Heating Component Production:	
	Heat Paper	• Slurry Preparation • Filtrate Discharge
	Heat Pellet	• No Process Wastewater
	Cell Testing	• Leak Testing

much as possible. The most significant pollutants found in these wastewaters are chromium (especially hexavalent chromium from barium chromate) and asbestos. Both of these pollutants are from raw materials used in the manufacture of heating components.

2.3.3 Lead Subcategory

The Lead Subcategory, which is the subcategory with the largest number of plants and volume of production, includes batteries which use lead anodes, lead peroxide cathodes, and acid electrolytes. The subcategory includes lead acid reserve cells and the more familiar lead acid storage batteries. Lead acid batteries include cells with immobilized electrolytes for use in portable devices; batteries used for automotive starting, lighting, and ignition (SLI) applications; and a variety of batteries designed for industrial applications. Lead reserve batteries are similar to dehydrated plate lead batteries and are produced from lead electroformed on steel which is immersed in an acid electrolyte when placed in use.

SLI and industrial type batteries are manufactured and shipped as "dry-charged" (shipped without acid electrolyte) and "wet-charged" (shipped with acid electrolyte) units. Batteries shipped without electrolyte include damp-charged batteries (damp batteries) and dehydrated plate batteries (dehydrated batteries). Damp batteries are usually manufactured by charging the electrodes in the battery case after assembly (closed formation), and emptying the electrolyte before final assembly and shipping. Dehydrated batteries usually are manufactured by charging of the electrodes in open tanks (open formation) followed by rinsing and

dehydration prior to assembly in the battery case. Wet-charged batteries are usually manufactured by closed formation processes, but can also be produced by open formation processes. Significant differences in manufacturing processes and subsequent process wastewater generation correspond to these product variations.

The manufacture of lead batteries includes the following steps (see Figure 2.3):

1) Grid or plate support structure manufacture
2) Leady oxide production
3) Paste preparation and application to provide the plate with a highly porous surface
4) Curing to ensure adequate paste strength and adhesion to the plate
5) Assembly of plates into groups or elements
6) Electrolyte addition as appropriate
7) Formation or charging (including plate soaking) which further binds the paste to the grid and renders the plate electrochemically active
8) Final assembly
9) Testing and repair if needed
10) Washing
11) Final shipment

Process steps (1) through (7) are anode and cathode operations while assembly, battery testing and repair, and battery washing are ancillary operations. Additional ancillary operations involved in the manufacture of lead batteries include floor and truck washing, laboratory testing, and personal hygiene activities. Personal hygiene activities include mandatory employee

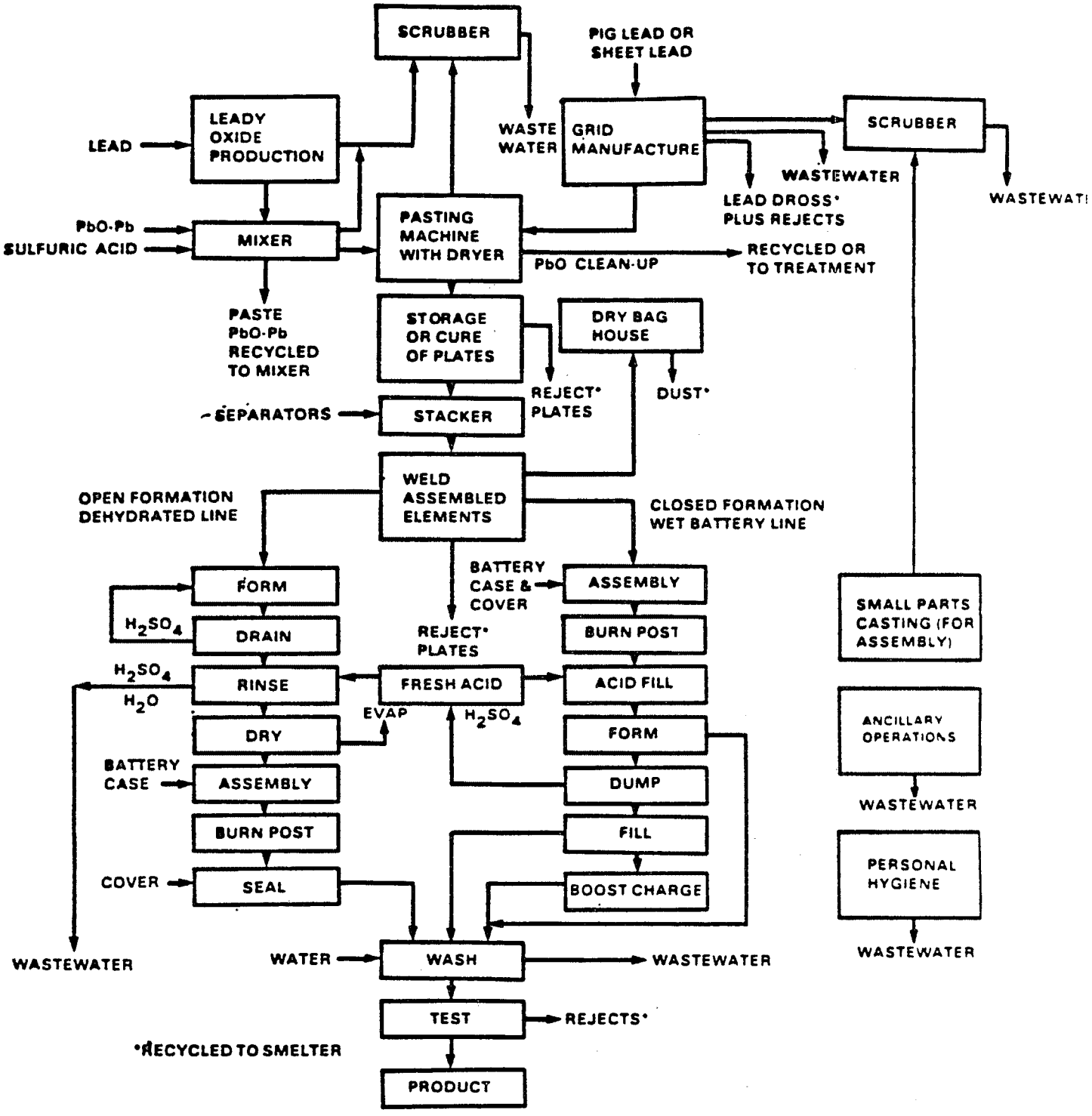

FIGURE 2.3

LEAD SUBCATEGORY GENERALIZED MANUFACTURING PROCESS

handwashing, respirator washing, and laundering of employee work uniforms.

In general, process wastewater discharges result from the preparation and application of electrode active materials (steps 1-6 above), formation and charging (step 7), washing finished batteries (step 10 above), and from the various ancillary operations (floor and truck washing, laboratory testing, and personal hygiene activities). Table 2.4 is a summary of wastewater sources for each process in the lead subcategory. Wastewater from the manufacture of lead batteries is acidic as a result of contamination with sulfuric acid electrolyte and generally contains dissolved lead and suspended particulates (including lead solids).

2.3.4 Leclanche Subcategory

The Leclanche Subcategory includes the manufacture of batteries that consist of a zinc anode, a carbon-manganese dioxide cathode, and an acid electrolyte (zinc chloride or zinc chloride-ammonium chloride). Batteries in this subcategory contain mercury which is used to amalgamate the zinc and reduce internal corrosion. The mercury is generally added to the cell electrolyte or separator. Types of batteries include the familiar conventional carbon-zinc Leclanche cells or "dry cells" (cylindrical, rectangular and flat), silver chloride-zinc cells (less than 0.01 percent of total production in the subcategory), carbon-zinc air cells, and foliar batteries. Carbon-zinc air depolarized batteries which use alkaline electrolytes are included in the Zinc Subcategory.

TABLE 2.4

LEAD SUBCATEGORY ANALYSIS

Grouping/Element	Specific Wastewater Sources (Subelements)
Anodes and Cathodes	
Leady Oxide Production	• Ball Mill Shell Cooling • Scrubber*
Grid Manufacture	
Grid Casting Mold Release Formulation Direct Chill Casting Lead Rolling	• Scrubber • Equipment Wash • Contact Cooling • Spent Emulsion Solution
Paste Preparation and Application	• Equipment and Floor Area Cleanup • Scrubber*
Curing	• Steam Curing • Humidity Curing
Closed Formation (In Case)	
Single Fill	• Contact Cooling • Formation Area Washdown • Scrubber*
Double Fill	• Contact Cooling • Scrubber • Product Rinse • Formation Area Washdown
Fill and Dump	• Contact Cooling • Scrubber* • Product Rinse • Formation Area Washdown
Open Formation (Out of Case)	
Wet	• Plate Rinse • Spent Formation Electrolyte • Formation Area Washdown • Scrubber*

TABLE 2.4 (continued)

LEAD SUBCATEGORY ANALYSIS

Grouping/Element	Specific Wastewater Sources (Subelements)
Dehydrated	• Formation Area Washdown • Plate Rinse • Vacuum Pump Seals • Scrubber*
Plate Soak	• Soaking Acid
Ancillary Operations	
Assembly - Small Parts Casting	• Scrubber*
Battery Wash	
With Detergent	• Detergent Battery Wash
Water Only	• Water Only Battery Wash
Floor Wash	• Floor Wash • Power Floor Scrubbers
Wet Air Pollution Control	• Blowdown From Scrubber Processes *'d
Battery Repair	• Battery Repair Area Wash
Laboratory	• Laboratory Sinks • Battery Electrolyte • Laboratory Wash • Scrubber Blowdown
Truck Wash	• Truck Wash
Personal Hygiene	
Hand Wash	• Hand Wash
Respirator Wash	• Respirator Wash and Rinse
Laundry	• Clothing Wash and Rinse

The manufacture of batteries in this subcategory is comprised of the anode preparation, cathode preparation,the preparation or application of a separator, assembly of components into cells and batteries, and ancillary operations performed in support of these basic manufacturing steps. Figure 2.4 is a schematic diagram of a generalized Leclanche Subcategory manufacturing process. Discharges from the manufacture of zinc cans formed from zinc sheet are not regulated under the battery manufacturing category. The flow allowance for all processes except foliar miscellaneous equipment wash is 0.0 l/kg cells produced.

Table 2.5 is a summary of the wastewater sources for this subcategory. Wastewater discharges in this subcategory are generally low and result only from separator production and from cleanup of miscellaneous equipment. The most significant pollutants in the wastestreams are mercury, zinc, ammonium chloride, manganese dioxide and carbon. Starch and flour may also be present from separator production. Recycle and reuse is performed where possible in this subcategory to eliminate the discharge of pollutants.

2.3.5 Lithium Subcategory

The Lithium Subcategory encompasses the manufacture of batteries that use lithium as the reactive anode material. Included are batteries for heart pacemakers, lanterns, watches, and special military applications (such as thermal batteries). A variety of cell cathode depolarizer materials are currently used with lithium anodes including iodine, sulfur dioxide, thionyl

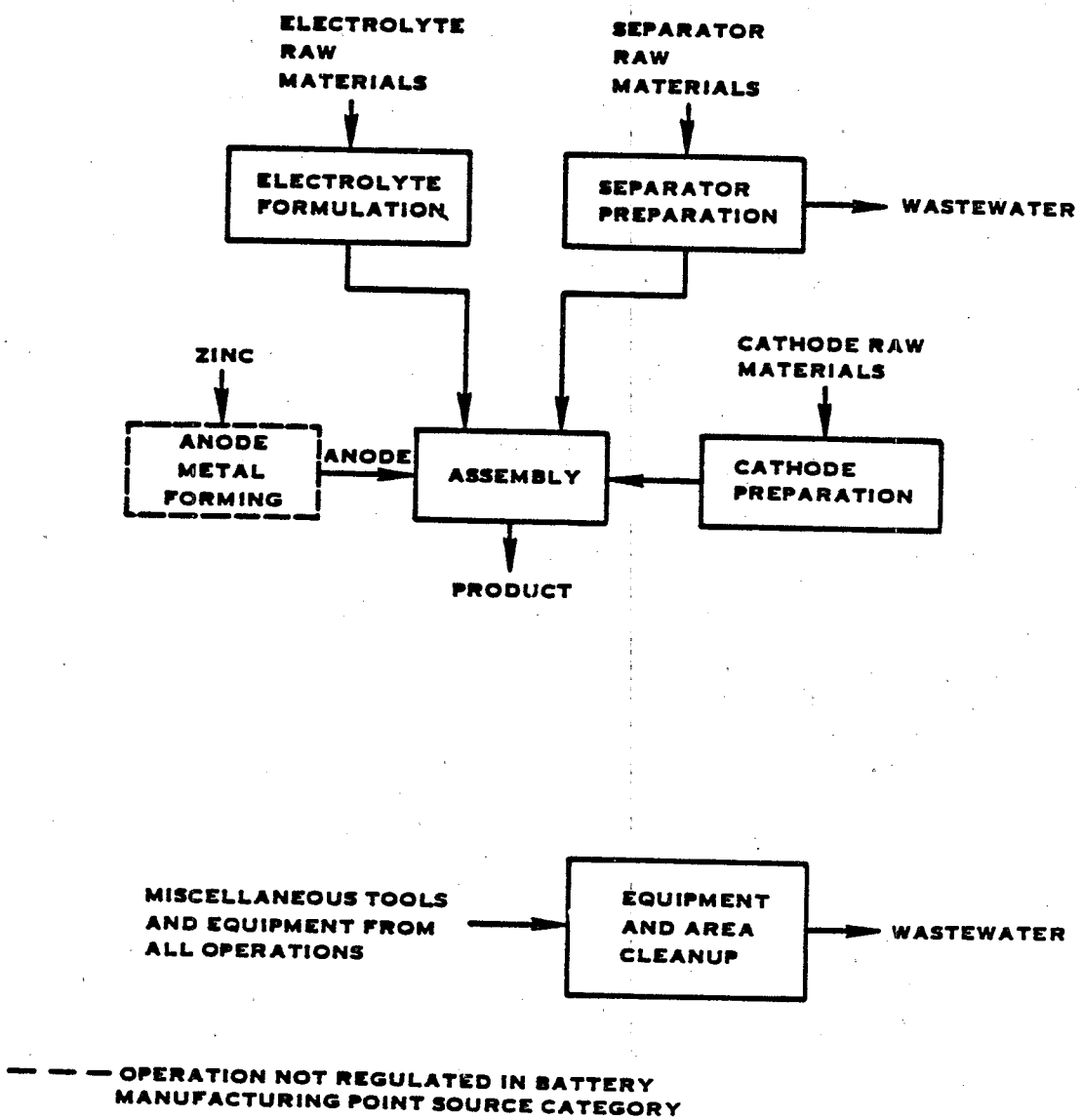

FIGURE 2.4

GENERALIZED SCHEMATIC FOR LECLANCHE CELL MANUFACTURE

TABLE 2.5

LECLANCHE SUBCATEGORY ANALYSIS

Grouping	Element	Specific Wastewater Sources (Subelements)
Anode Manufacture	Zinc Powder	o No Process Wastewater
Cathode	Manganese Dioxide-Pressed - Electrolyte with Mercury - Electrolyte without Mercury - Gelled Electrolyte with Mercury	o No Process Wastewater
	Carbon (Porous)	o No Process Wastewater
	Silver Chloride	o No Process Wastewater
	Manganese Dioxide-Pasted	o No Process Wastewater
Ancillary Operations	Separators	
	Cooked Paste Uncooked Paste Pasted Paper with Mercury	o Paste Setting o Equipment Wash o Equipment Wash
	Equipment and Area Cleanup	o Electrolyte Preparation o Assembly Equipment Wash o Employee Wash o Electrode Preparation Equipment Wash o Miscellaneous Equipment Wash
	Foliar Battery Miscellaneous Wash	o Miscellaneous Equipment and Area Wash

chloride, and iron disulfide. Because lithium reacts vigorously with water, electrolytes used in these batteries are generally organic liquids, solids, or, in the case of thermal batteries, solid inorganic salts which are fused during activation. The manufacture of lithium anodes (Figure 2.5) generally involves mechanical forming of metallic lithium to the desired configuration. Cell cathode depolarizers are frequently blended with or dissolved in the cell electrolyte. Thermal batteries manufactured in this subcategory include a heating component (activator) in addition to the anode, cathode depolarizer and electrolyte.

Due to lithium's high reactivity with water, anode processing and most cell assembly operations are performed without the use of process water. Most assembly is accomplished in areas of controlled low humidity. Process water is used in producing some cell cathodes (specifically, lead iodide, iron disulfide, sulfur dioxide, and thionyl chloride cathode production), either for washing reactive materials or for air pollution control and area cleanup.

The wastewaters from cathode operations, cell testing, lithium scrap disposal, air scrubbers, and floor and equipment wash contain metals and other pollutants. Pollutants found in lithium subcategory wastewaters include asbestos, chromium, lead, zinc, cobalt, iron, COD and TSS. Table 2.6 is a summary of the wastewater sources for the Lithium Subcategory.

2.3.6 Magnesium Subcategory

The Magnesium Subcategory includes manufacturing operations used to produce cells which pair magnesium anodes with various

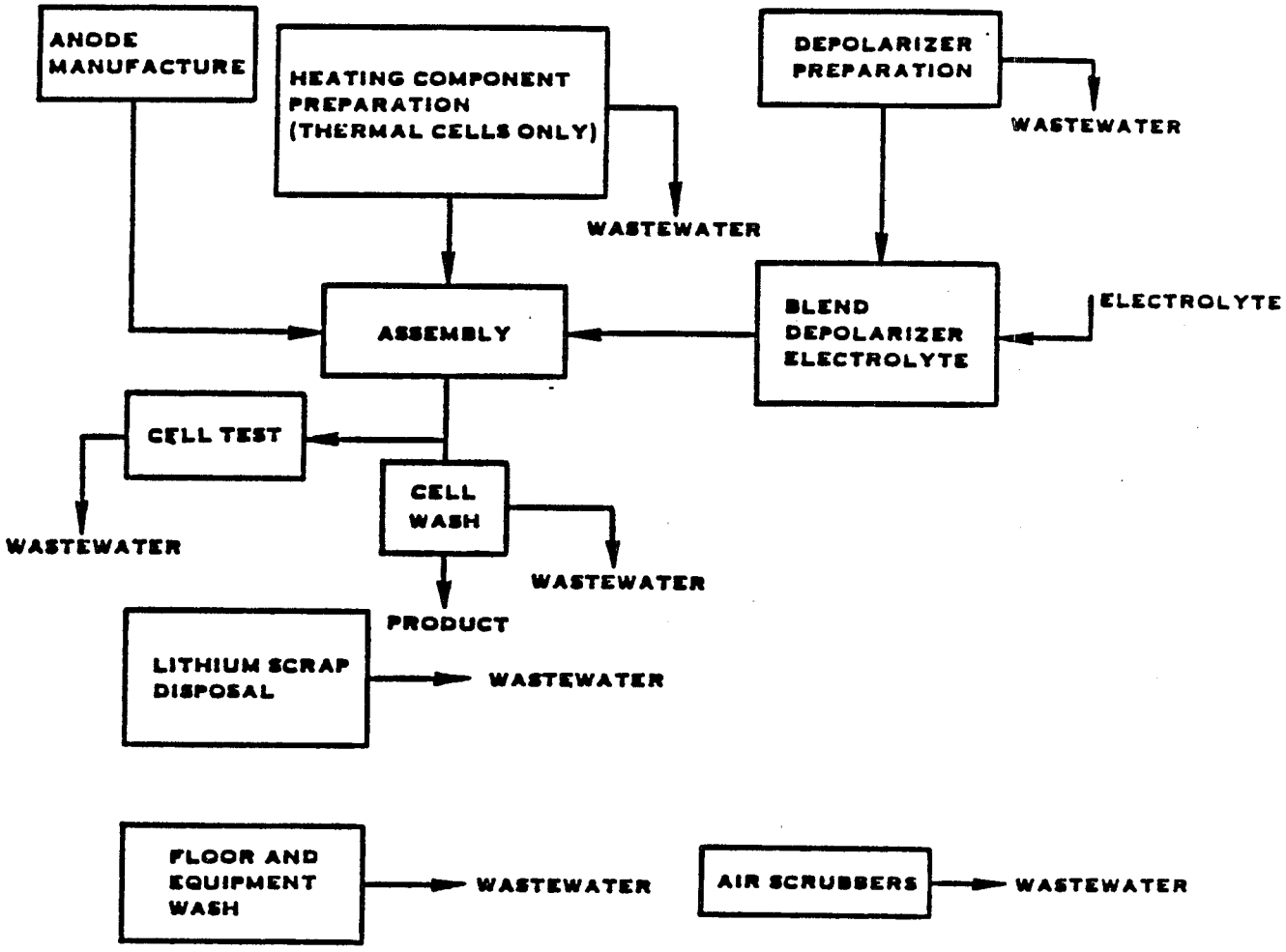

FIGURE 2.5

GENERALIZED LITHIUM SUBCATEGORY MANUFACTURING PROCESS

TABLE 2.6

LITHIUM SUBCATEGORY ANALYSIS

Grouping	Element	Specific Wastewater Sources (Subelements)
Anode Manufacture	Formed and Stamped	• No Process Wastewater
Cathode Manufacture	Iodine	• No Process Wastewater
	Iron Disulfide	• Product Treatment
	Lead Iodide	• Equipment Wash
	Lithium Perchlorate	• No Process Wastewater
	Sulfur Dioxide*	• Spills
	Thionyl Chloride*	• Spills
	Titanium Disulfide	• No Process Wastewater
Ancillary Operations	Heating Component Production:	
	Heat Paper	• Filtrate Discharge • Slurry Preparation
	Heat Pellets	• No Process Wastewater
	Lithium Scrap Disposal	• Scrap Disposal
	Cell Testing	• Leak Testing
	Floor and Equipment Wash	• Floor and Equipment Wash
	Air Scrubbers	• Blowdown from various production areas
	Cell Wash	• Cell Wash

* - Wastewater discharged from air scrubbers for the manufacture of these cathodes is included with ancillary operations.

cathode materials such as manganese dioxide, barium chromate, lithium chromate, magnesium hydroxide, and carbon. Carbon is used in magnesium-carbon batteries which constitute 85% of total subcategory production. Other cathode materials include: vanadium pentoxide for thermal batteries; copper chloride, lead chloride, silver, or silver chloride for magnesium reserve batteries; and m-dinitrobenzene for ammonia activated cells. Electrolyte materials consist of magnesium perchlorate, magnesium bromide, lithium chloride, potassium chloride, and ammonia. Anode manufacture generally requires mechanical forming and cutting of magnesium metal, and cleaning and chromating to protect against corrosion. Discharges from these mechanical and chromating operations are not regulated under the battery manufacturing categorical standards. Cathodes are prepared by several techniques including blending and pressing of powdered materials and chemical treatment operations. Heating components (activators) are manufactured for thermal batteries. Figure 2.6 is a schematic diagram of the magnesium battery manufacturing process.

Pollutants resulting from magnesium anode battery manufacture include asbestos, chromium (primarily hexavalent) from heat paper production, silver, lead, nickel, iron, COD and TSS. Table 2.7 is a summary of the wastewater sources for the subcategory.

2.3.7 Zinc Subcategory

The Zinc Subcategory includes batteries that have an amalgamated zinc anode and an aqueous alkaline electrolyte (usually potassium or sodium hydroxide). The zinc is amalgamated to

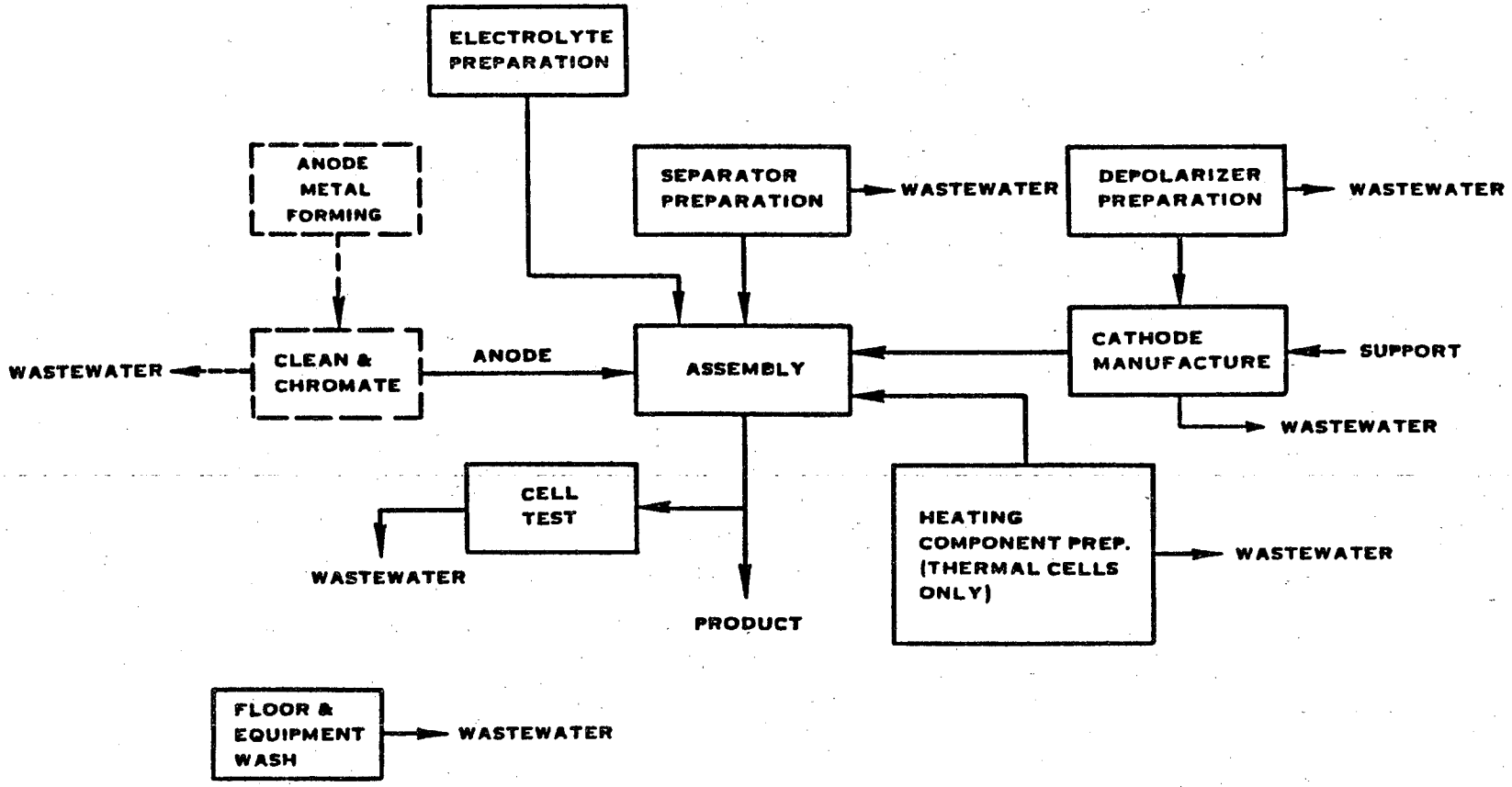

FIGURE 2.6

GENERALIZED MAGNESIUM SUBCATEGORY MANUFACTURING PROCESS

TABLE 2.7

MAGNESIUM SUBCATEGORY ANALYSIS

Grouping	Element	Specific Wastewater Source (Subelements)
Anode Manufacture	Magnesium Powder	• No Process Wasterwater
Cathode Manufacture	Carbon	• No Process Wastewater
	Copper Chloride	• No Process Wastewater
	Copper Iodide	• No Process Wastewater
	Lead Chloride	• No Process Wastewater
	M-Dinitrobenzene	• No Process Wastewater
	Silver Chloride-Chemically Reduced	• Product Rinsing
	Silver Chloride-Electrolytic	• Product Rinsing
	Silver Chloride	• No Process Wastewater
	Vanadium Pentoxide	• No Process Wastewater
Ancillary Operations	Heating Component Production:	
	Heat Paper	• Filtrate • Slurry Preparation
	Heat Pellets	• No Process Wastewater
	Cell Testing	• Activation of Sea-Water Reserve Batteries
	Separator Processing	• Etching Solution • Product Rinsing
	Floor and Equipment Wash	• Floor and Equipment Wash
	Air Scrubbers	• Blowdown from Various Production Areas

reduce anode corrosion and self-discharge of the cell. Batteries manufactured differ considerably in physical configuration and in production techniques depending upon the desired operational characteristics of the cells. Six different cathode systems are used to produce five types of batteries including alkaline manganese batteries (manganese dioxide cathode system); carbon zinc air batteries (porous carbon-atmospheric oxygen cathode system); silver oxide zinc batteries (monovalent or divalent silver oxide cathode system); mercury zinc batteries (mercuric oxide and mercuric oxide with cadmium oxide cathode system); and nickel zinc batteries (nickel hydroxide cathode system).

Manufacturing processes differ widely within the subcategory resulting in differences in process water use and wastewater discharge at each plant. There are seven distinct anode process operations, ten distinct cathode process operations and eight ancillary operations in various combinations at plants in the subcategory. Ancillary processes are associated with cell assembly, metal oxide production specific to battery manufacturing, and general plant production activity from which wastewater is generated and discharged. Figure 2.7 is a schematic diagram of generalized zinc subcategory manufacturing processes.

Table 2.8 is a summary of the wastewater sources for this subcategory. Pollutants found in zinc subcategory wastewater streams are primarily metals including zinc, mercury, silver and nickel; oil and grease; and TSS.

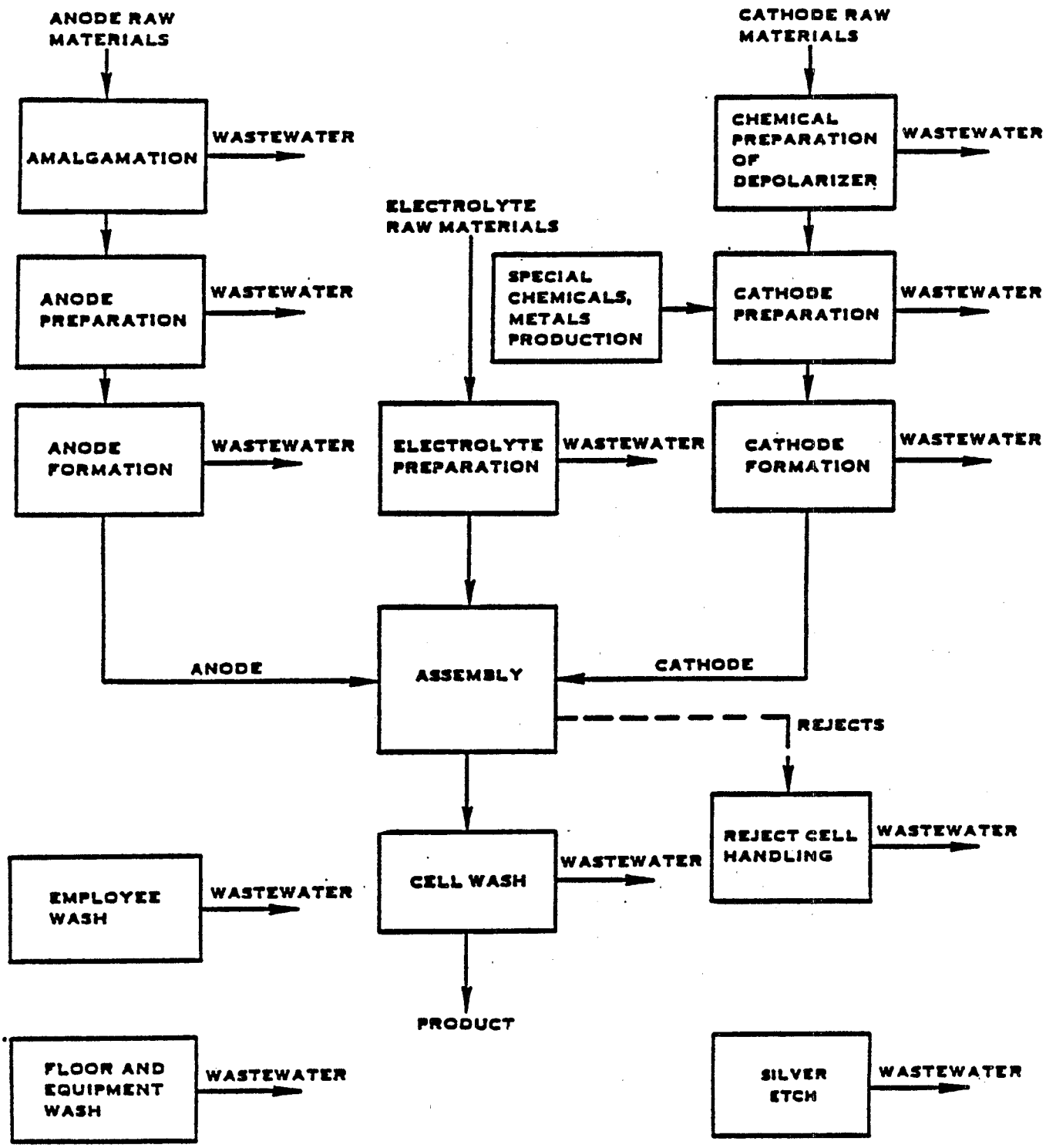

FIGURE 2.7

GENERALIZED ZINC SUBCATEGORY MANUFACTURING PROCESSES

TABLE 2.8

ZINC SUBCATEGORY ANALYSIS

Grouping	Element	Specific Wastewater Sources (Subelement)
Anode Manufacture	Cast or Fabricated	• No Process Wastewater
	Zinc Powder-Wet Amalgamated	• Floor Area and Equipment Cleanup • Spent Aqueous Solution • Amalgam Rinses • Reprocess Amalgam Rinses
	Zinc Powder-Gelled Amalgam	• Floor Area and Equipment Cleanup
	Zinc Powder-Dry Amalgamated	• No Process Wastewater
	Zinc Oxide Powder-Pasted or Pressed	• No Process Wastewater
	Zinc Oxide Powder-Pasted or Pressed, Reduced	• Post-formation Rinse
	Zinc Electrodeposited	• Post-electrodeposition Rinses • Spent Amalgamation Solution • Post-amalgamation Rinse
Cathode Manufacture	Porous Carbon	• No Process Wastewater
	Manganese Dioxide-Carbon	• No Process Wastewater
	Mercuric Oxide (and mercuric oxide - manganese dioxide carbon)	• No Process Wastewater
	Mercuric Oxide-Cadmium Oxide	• No Process Wastewater

TABLE 2.8 (continued)

ZINC SUBCATEGORY ANALYSIS

Grouping	Element	Specific Wastewater Sources (Subelement)
Cathode Manufacture (Cont'd.)	Silver Powder Pressed	• No Process Wastewater
	Silver Powder Pressed and Electrolytically Oxidized (Formed)	• Post-formation Rinse
	Silver Oxide (Ag_2O) Powder	• No Process Wastewater
	Silver Oxide (Ag_2O) Powder-Thermally Reduced or Sintered, Electrolytically Formed	• Slurry Paste Preparation • Spent Caustic Formation • Post-formation Rinse
	Silver Peroxide (AgO) Powder	• Utensil Wash • Spent Solution • Product Rinse • Product Soak
	Nickel Impregnated and Formed	Refer to Cadmium Subcategory Analysis (Table 2.2)
Ancillary Operations	Cell Wash	• Acetic Acid Cell Wash • Chromic Acid Containing Cell Wash • Methylene Chloride Cell Wash • Freon Cell Wash • Non-chemical Cell Wash
	Electrolyte Preparation	• Equipment Wash
	Silver Etch	• Product Rinse
	Mandatory Employee Wash	• Employee Wash
	Reject Cell Handling	• Reject Cell Handling

TABLE 2.8 (continued)

ZINC SUBCATEGORY ANALYSIS

Grouping	Element	Specific Wastewater Sources (Subelement)
Ancillary Operations (Cont'd.)	Floor Wash and Equipment Wash	• Floor and Equipment Wash
	Silver Powder Production	• Product Rinse
	Silver Peroxide Production	• Product Rinses • Spent Solution

2.4 OPERATIONS COVERED UNDER OTHER CATEGORIES

Battery manufacturers perform many process operations on site which are not unique to battery manufacturing. Many of these operations are addressed in categorical standards for other industrial categories. A partial list of these operations includes:

- Plastic and Rubber Battery Case Manufacture
- Cell Containers and Components:
  A. Forming
  B. Cleaning and Deburring
  C. Metal Surface Treatment
     (i.e., plating, chromating, etc.)
- Retorting, Smelting, and Alloying Metals
- Inorganic Chemical Production (not specific to Battery Manufacturing)
- Pasted Paper Manufacture (without mercury)

2.5 PRETREATMENT STANDARDS FOR THE BATTERY MANUFACTURING CATEGORY

The battery manufacturing categorical standards (40 CFR 461) establish pretreatment standards for existing and new sources (PSES and PSNS) that manufacture batteries. PSES are not promulgated for the calcium and lithium subcategories because the amount and toxicity of the existing discharges did not justify the development of National Standards. If the Control Authority encounters wastewater discharged from any processes in these subcategories, discharge allowances should be established using guidance contained in Volume I of the final development document for battery manufacturing.

Several unit processes that are associated with other industrial categories are frequently found at lead subcategory battery manufacturing plants and are covered by the battery

manufacturing categorical pretreatment standards. Grid casting, continuous (direct chill) casting of lead, and melting furnaces as applied to battery manufacturing are regulated here rather than under the metal molding and casting category.

Additionally, lead rolling performed at lead battery plants is addressed here rather than under the nonferrous metals forming category. Wastewater generated by battery manufacturers' lead rolling operations currently are not discharged but rather are hauled by licensed contractors. Although there are no promulgated standards for this unit process, a discharge allowance may be established on a case-by-case basis using guidance contained in Volume II of the final development document for battery manufacturing.

Production-based mass limitations only have been established for battery manufacturing because flow reduction is a significant part of the model technology for pretreatment. Categorical standards based on flow reduction cannot be meaningfully expressed on a concentration basis. Site specific concentration standards may, in some cases, be applied by the Control Authority in accordance with EPA's Guidance Manual for the Use of Production-Based Pretreatment Standards and the Combined Wastestream Formula.

The battery manufacturing standards include daily maximum and maximum monthly average mass standards. The pretreatment standards for existing sources (PSES) are presented in Table B-1 in Appendix B. The pretreatment standards for new sources (PSNS) apply to battery manufacturing plants which began their operation after November 10, 1982, the date of the proposed regulation.

The PSNS are presented in Table B-2 in Appendix B. There are no discharge allowances provided for process wastewater pollutants from any battery manufacturing operation other than those listed.

2.6 GUIDANCE FOR CONSIDERATION OF EMPLOYEE SHOWER WASTEWATER AT LEAD SUBCATEGORY PLANTS

When EPA promulgated the battery manufacturing categorical pretreatment standards on March 9, 1984, EPA determined that no discharge allowance should be provided for employee showers at lead subcategory plants. EPA reasoned that relatively few employees in lead battery plants are exposed to high lead dust levels and that adequate means are available for assuring that substantially all lead is removed prior to showering. Therefore, EPA concluded that there is no need for a plant to discharge employee shower wastewater as regulated process wastewater (i.e., as water that has become contaminated with substantial amounts of lead) and that employee shower wastewater can be discharged as sanitary wastewater.

Following promulgation of the battery manufacturing categorical standards, members of the lead battery manufacturing industry argued that, in some cases, employee shower wastewater may be significantly contaminated and require treatment. No data were submitted to demonstrate the actual concentrations of lead in shower wastewater and EPA continues to believe that shower wastewater should not be classified as process wastewater. However, showers are required by the Occupational Safety and Health Administration (OSHA) for battery plant employees working in areas with lead exposure in excess of 50 mg/m^3 (see 29 CFR

Section 1910.1025). This indicates a potential for contamination of some employee shower wastewater with some amount of lead. Therefore, EPA believes that individual plants should have the opportunity to demonstrate that their particular shower wastewaters are significantly contaminated and should be accounted for accordingly. As a result of a settlement agreement made between EPA and the lead battery manufacturers, EPA addressed this concern in an amendment promulgated on August 28, 1986 (see 51 FR 30814 to 30817).

The amendment modifies the way that contaminated shower wastewaters are considered in the combined wastestream formula. The combined wastestream formula (CWF), which is discussed in more detail in Section 4.4 of this manual, provides a means for determining final discharge limits for indirect industrial dischargers that combine different wastestreams prior to treatment and subsequently discharge the treated combined wastestream(s) to a POTW. The formula treats certain types of wastestreams, including sanitary wastestreams that are not regulated by a categorical pretreatment standard, as "dilution" streams. Thus, before the amendment battery shower wastewater was considered a dilution stream. As now amended, the Control Authority is authorized to exercise its discretion to classify shower wastewater as an "unregulated" stream rather than a dilution stream when the shower wastewater contains a significant amount of lead, and the discharger combines the shower wastewater with process wastestreams prior to treatment and discharge. Classification as an unregulated rather than dilution stream would result in the

consideration of shower wastewater as a contaminated stream that may be combined with regulated wastestreams for purpose of wastewater treatment. Unregulated wastestreams are afforded a pollutant discharge allowance in the combined wastestream formula while dilution streams are not.

EPA has selected 0.20 mg/1 as the concentration of lead that represents a significant contamination of battery employee shower wastewater. This is the lead concentration that was used by EPA as a basis for establishing the monthly average lead mass limitations in the regulation. EPA anticipates that a demonstration of significant contamination would be based on sampling and analysis data that show a lead concentration of 0.20 mg/1 or greater in the shower wastewater. If the lead concentration in the wastestream is below 0.20 mg/1, the wastestream remains a dilution stream.

The following discussion presents general information that is useful for addressing shower wastewater issues that arise during application and enforcement of the categorical pretreatment standards for the lead subcategory of the battery manufacturing category. When the Control Authority is requested to consider the shower wastewater from a lead battery plant as an unregulated wastestream, the Control Authority should:

- Request sampling and chemical analysis data to support the classification of shower wastewater as an unregulated wastestream.
- Determine an appropriate flow rate for the shower wastewater.
- Confirm that the shower wastewater is discharged to wastewater treatment prior to discharge to the POTW. This is a very important point because the amendment is only applicable to contaminated

shower wastewater discharged to wastewater treatment. Shower wastewater discharged directly to the POTW is classified as a sanitary wastestream.

The lead sampling and analysis data provided for the shower wastewater should be carefully reviewed by the Control Authority. Sample collection methods should be examined to determine whether the wastestream was sampled in a representative manner. EPA recommends the use of grab composite or automatic composite sampling techniques to determine the lead concentration in the shower wastewater. The composite grab sample(s) should be collected over the entire length of one or more shower periods. The use of one-time grab samples is not recommended to determine the lead concentration of this stream.

The justification for collection of composite samples rather than one-time grab samples is as follows. It is reasonable to assume that most of the lead on a battery employee will be washed away during the early stages of a shower and the wastewater generated from the final stages of the shower will probably contain very little lead. Since employees usually do not shower at exactly the same time during any given shower period the lead concentration of shower wastewater will vary significantly and irregularly over the course of the shower period. Therefore, a sample of the shower wastewater at one specific time (grab sample) almost never results in a representative sample. The determination of whether shower wastewater is "significantly contaminated" is based on a representative average and not an instantaneous high value, as might be obtained by a grab sample at the beginning of a shower period.

EPA also recommends that plant specific sampling data be required for employee shower wastewater since lead concentrations may vary from plant to plant. This recommendation is based on the premise that employees who work in areas with higher lead dust exposure levels carry more lead into the shower area than employees who work in areas with lower exposure levels. Since no two plants have exactly the same exposure levels for all employees, the amount of lead introduced into shower wastewater will vary from plant to plant. In addition, the OSHA standards only require battery employees working in areas with exposure levels in excess of 50 mg/m^3 of air to shower. However, at some battery plants, showers are also provided for employees exposed to less than 50 mg/m^3. The shower wastewater at these plants should contain lower lead concentrations than the wastewater from plants where showers are only provided for employees exposed to lead levels in excess of 50 mg/m^3. Therefore, plant specific sampling data should be used to demonstrate the contamination of shower wastewater.

The sample point location for the employee shower wastewater should also be reviewed by the Control Authority. The most desirable sample point location is the drain from the employee shower area. The sample should be collected directly from the drain pipe, if possible, or by partially blocking the drain to allow for sampling of the wastewater accumulated around the drain area.

The Control Authority must also determine an appropriate flow range for the shower wastewater. A reasonable flow range is

25 to 30 gallons of wastewater for each employee that showers.[1/] If a plant reports a flow greater than 25 to 30 gallons per employee, water use practices for the shower area should be carefully examined. One practice that leads to excessive water use in the shower area is failure to turn off the flow of water when employees are finished with their shower.

2.7 COMPLIANCE DATES

The compliance dates for new and existing facilities in the battery manufacturing category are as follows:

Pretreatment Standards for Existing Sources (PSES)	March 9, 1987
Pretreatment Standards for New Sources (PSNS) (applies to any "new" plant operating after November 10, 1982)	Upon commencement of discharge

[1/] References listed on page R1 of this manual.

3. TREATMENT TECHNOLOGIES

Wastewaters from battery manufacturing may be acid or alkaline, may contain substantial levels of particulate and dissolved metals, may contain small or trace amounts of toxic organics, and are generally free from strong chelating agents. In general, these pollutants are removed by chemical precipitation followed by sedimentation or by sedimentation and filtration (lime and settle, or lime, settle, and filter). The basis for the PSES regulating the cadmium, lead, and zinc subcategories is the model technology equivalent to BAT (best available technology) which consists of flow reduction, oil skimming, and lime and settle. The technology basis for PSES in the magnesium sub-category is settle/recycle for heat paper production and lime and settle for other wastewaters. The basis for PSES for the Leclanche subcategory is lime, settle, and filter and water reuse where possible. PSNS for all subcategories are based on the technology equivalent to new source performance standards (NSPS) which generally includes lime, settle, and filter. Treatment techniques available to remove or recover wastewater pollutants generated by battery manufacturing operations include individual end-of-pipe and in-process technologies. While these are the treatment technologies PSES and PSNS are based upon, individual plants may use other technologies that achieve the standards at their plants.

3.1 END-OF-PIPE TREATMENT TECHNOLOGIES

The major end-of-pipe technologies for treating battery manufacturing wastewaters are: oil skimming, chromium reduction, chemical precipitation of dissolved metals, settling of suspended solids, pressure filtration, and granular bed filtration. Although not considered a major treatment technology for the battery manufacturing category, membrane or polishing filtration is often used following precipitation and sedimentation for more consistent metals removal.

Skimming is used in battery manufacturing to remove free oil used as a preservative or forming lubricant for various metal battery parts and in lubricants used for drive mechanisms and other machinery. Skimming removes pollutants with a specific gravity less than water and is often found in conjunction with air flotation or clarification to increase its effectiveness. Common skimming mechanisms include the rotating drum type, a belt type skimmer (which pulls a belt vertically through the water thereby collecting oil), and API separators (which skim a floating oil layer from the surface of the wastewater).

Chemical reduction of chromium is used in battery manufacturing for treating chromium-bearing wastewater, primarily from heat paper production in the calcium, lithium and magnesium subcategories. The treatment of hexavalent chromium involves reducing the hexavalent chromium to its trivalent form and subsequent removal with a conventional precipitation-solids removal system. Reduced chromium is removed from solution in conjunction with other metallic salts by alkaline precipitation.

In most cases, gaseous sulfur dioxide is used as the reducing agent.

Chemical precipitation, followed by sedimentation, filtration, or centrifugation, is used in battery manufacturing for removal of dissolved metals. Chemical precipitation involves adding a reagent to wastewater that will transform dissolved metals to a non-dissolved state, permitting them to be removed by settling, filtration or centrifugation. Reagents commonly used are:

1) Alkaline compounds, such as lime or sodium hydroxide, precipitate metals as hydroxides;

2) Soluble sulfides, such as hydrogen sulfide or sodium sulfide, and insoluble sulfides such as ferrous sulfide, precipitate metals as sulfides;

3) Ferrous sulfate or zinc sulfate precipitate cyanide as a ferro or zinc ferricyanide complex;

4) Carbonates precipitate metals directly as carbonates,and carbon dioxide converts hydroxides to carbonates.

The performance of chemical precipitation depends on the following: maintenance of an appropriate pH (usually alkaline) throughout the precipitation reaction and subsequent settling; the addition of a sufficient excess of treatment ions to drive the precipitation reaction to completion; the addition of an adequate supply of sacrificial ions (such as aluminum or iron) to ensure precipitation and removal of specific target ions; and effective removal of the precipitated solids using appropriate solids removal technologies.

Settling and clarification are used in battery manufacturing to remove precipitated metals. Settling removes solid particles from a liquid matrix by gravitational force. Settling is

accomplished by reducing the velocity of the feed stream in a large volume tank or lagoon so that gravitational settling can occur. Settling is most often preceded by chemical precipitation which converts dissolved pollutants to a solid form and by coagulation of suspended precipitates into larger, faster settling particles (using coagulants or polyelectrolytic flocculants).

Pressure filtration is used in battery manufacturing for sludge dewatering and for direct removal of precipitated and other suspended solids from wastewater. Pressure filtration works by pumping the water through a filter material which is impenetrable to the solid phase thus separating the solids from the water.

Granular bed filtration using filter media such as silica sand, anthracite coal, and garnet supported by gravel are commonly used to remove suspended solids and colloidal particles. Wastewater treatment plants often use granular bed filters for polishing after clarification, sedimentation, or similar operations. The classic granular bed filter operates by gravity flow, although pressure filters are also widely used.

3.2 IN-PROCESS CONTROL TECHNOLOGIES

In-process control technologies are intended to reduce or eliminate the amount of pollutants or the volume of wastewater requiring end-of-pipe treatment thereby improving the quality of the effluent discharge. The in-process technologies which are applicable to most battery manufacturing subcategories discussed here are waste segregation, water recycle and reuse, water use

reduction, process modification, and plant maintenance and good housekeeping. Specific application of these techniques varies among the battery manufacturing subcategories and some apply only to specific processing steps. Additional details are in Section VII of the final technical development documents for battery manufacturing.

Waste segregation of multiple process wastewater streams having significantly different chemical characteristics may lead to reductions in treatment costs and pollutant discharges. Battery manufacturing commonly produces waste streams with high concentrations of toxic metals, containing primarily suspended solids, and others that are quite dilute. Separation of these individual process wastestreams may improve the quality of the effluent discharge since treatment of more concentrated wastestreams is usually more efficient than treatment of dilute streams. Similarly, separation of noncontact cooling water from process wastewater prevents dilution of the process wastes and maintains the purity of the noncontact stream for subsequent reuse or discharge.

Wastewater recycle and reuse are frequently possible without treatment or with minimum treatment of the wastewater, and therefore are effective in reducing pollutant discharges and overall treatment costs. Recycle applies to the return of process wastewater usually after treatment to the process or processes from which it originated, and reuse applies to the use of wastewater from one process into another process. The most frequently recycled wastestreams include air pollution control scrubber

discharges, and wastewater from equipment and area cleaning. In addition, wastewater from some product rinsing operations and contact cooling waters are available for recycle or reuse.

Water use reduction includes reducing the volume of wastewater discharge by simply eliminating excess flow and unnecessary water use. Often this can be accomplished by employing automatic shutoff valves or manual controls to turn off water flows when production units are inactive and by implementation of more effective water use in some process operations, particularly in rinsing operations and in equipment and area cleanup. Rinsing efficiency can be increased by the use of multi-stage and countercurrent cascade rinsing. Additional reduction in process wastewater discharge may also be achieved by the substitution of dry air pollution control devices such as baghouses for wet scrubbers where the emissions requiring control are amenable to these techniques.

Process modifications deal with process alternatives which significantly affect the quantity and quality of wastewater produced. In general, changes in electrolyte addition techniques and changes in electrode formation processes are process changes found most frequently in the battery manufacturing category. In addition, changes in amalgamation procedures and improvements in process control to reduce rework requirements are viable techniques to reduce wastewater discharges. Most process modifications to reduce pollutant discharges are specific to individual subcategories; however, one process modification applicable to several subcategories is the substitution of alternative formulations for cell wash materials containing chromate and cyanide.

This substitution reduces or eliminates these pollutants from the process wastewater.

Plant maintenance and good housekeeping practices can significantly reduce pollutant loadings at battery manufacturing plants due to the large quantities of toxic materials used as active materials in battery electrodes. These materials are handled at battery manufacturing plants and may be spilled in production areas. The water used in the cleaning of spills may contribute significantly to wastewater discharges. Good housekeeping includes floor maintenance and treatment, preventing leaks and spills, and cleaning up leaks and spills which cannot be avoided as soon as possible.

4. REQUIREMENTS OF THE GENERAL PRETREATMENT REGULATIONS

4.1 INTRODUCTION

This section provides a brief overview of the General Pretreatment Regulations for Existing and New Sources (40 CFR Part 403) and identifies those provisions of the regulations which have a direct bearing on the application and enforcement of categorical pretreatment standards for the battery manufacturing category.

The General Pretreatment Regulations (40 CFR 403) establish the framework and responsibilities for implementation of the National Pretreatment Program. The effect of these regulations is essentially three-fold. First, they establish general and specific discharge prohibitions as required by sections 307(b) and (c) of the Clean Water Act. The general and specific prohibitions are described in 40 CFR Section 403.5 of the General Pretreatment Regulations and apply to all nondomestic sources introducing pollutants into a POTW whether or not the source is subject to categorical pretreatment standards.

Second, these regulations establish an administrative mechanism to ensure that National Pretreatment Standards (prohibited discharge standards and categorical pretreatment standards) are applied and enforced upon industrial users. Approximately 1,500 POTWs are required to develop locally administered pretreatment programs to ensure that nondomestic users comply with applicable pretreatment standards and requirements.

Third, and most importantly for the purposes of this guidance manual, the General Pretreatment Regulations contain provisions relating directly to the implementation and enforcement of the categorical pretreatment standards. Provisions governing basic reporting requirements, local limits, compliance monitoring activities, and the procedures associated with categorical determinations are set out in the regulations. POTW representatives are referred to 40 CFR Part 403 for specific language and requirements.

EPA is considering making a number of changes to the General Pretreatment Regulations. These changes will affect some of the provisions of the pretreatment regulation discussed in this section including the following:

- Baseline monitoring reports
- Report on compliance
- Periodic reports on continued compliance

The anticipated changes could alter the guidance in this section. Therefore, the reader is advised to keep abreast of changes to the General Pretreatment Regulations.

4.2 CATEGORY DETERMINATION REQUEST

An existing industrial user (IU) or its POTW may request written certification from EPA or the delegated State specifying whether or not the industrial user falls within a particular industry subcategory and is therefore subject to a particular categorical pretreatment standard. Although the deadline for

submitting a categorical determination request by existing industrial users subject to the battery manufacturing categorical pretreatment standards has passed, a new industrial user may request this certification for a category determination anytime prior to commencing its discharge. Similarly, a POTW may request the certification on behalf of the IU. Requests should be directed to the EPA Regional Water Management Division Director or the State Director as appropriate using the procedures set out in 40 CFR 403.6(a). Additional assistance in determining the proper category for wastewaters from such operations may be obtained by contacting the Industrial Technology Division at U.S. EPA Headquarters.

4.3 MONITORING AND REPORTING REQUIREMENTS OF THE GENERAL PRETREATMENT REGULATIONS

In addition to the requirements contained in the battery manufacturing categorical pretreatment standards, battery manufacturers discharging to POTWs must fulfill the reporting requirements contained in 40 CFR Section 403.12 of the General Pretreatment Regulations. These requirements include the submission of a baseline monitoring report, compliance schedule progress reports (when necessary), periodic compliance reports and notices of slug loading, as well as a 3 year record-keeping requirement. Each of these reporting requirements is briefly summarized below.

4.3.1 Baseline Monitoring Reports

All industrial users subject to categorical pretreatment standards must submit a baseline monitoring report (BMR) to the

Control Authority. The purpose of the BMR is to provide information to the Control Authority to document the industrial user's current compliance status with a categorical pretreatment standard. The Control Authority is defined as the POTW if it has an approved pretreatment program, the state if the state has an approved state pretreatment program or the EPA regional office if neither the POTW or state have approved pretreatment programs. Additional guidance on BMR reporting is available from the state or EPA regional pretreatment coordinator (see the list of guidance manuals in the References section of this document). A complete listing of current EPA and state pretreatment coordinators is provided in Appendix C.

BMR Due Dates

Section 403.12(b) requires that BMRs be submitted to the Control Authority within 180 days after the effective date of a newly promulgated categorical pretreatment standard or 180 days after the final administrative decision made upon a categorical determination request (see section 4.2 above), whichever is later. The BMR due date for existing facilities in the battery manufacturing category was October 20, 1984.

BMR Content

A BMR must contain the following information as required by 403.12(b).

1. Name and address of the facility, including names of operator(s) and owner(s).

2. List of all environmental control permits held by or for the facility.

3. Brief description of the nature, average production rate and SIC code for each of the operation(s) conducted, including a schematic process diagram

which indicates points of discharge from the regulated processes to the POTW.

4. Average daily and maximum daily flow data (in gallons per day) for regulated process streams discharged to the municipal system. Flow measurements of other wastestreams will be necessary if application of the combined wastestream formula is anticipated (see section 4.4 below).

5. Identification of the applicable pretreatment standards for each regulated process wastestream and the results of measurements of flow rates and pollutant concentrations (or mass where required by the standard or the Control Authority). The mass of pollutants in the wastestreams must be expressed in terms of daily average and daily maximum values. Analytical methods used must be in accordance with the procedures contained in 40 CFR Part 136, or as otherwise directed and approved by EPA. Sampling is to be undertaken using a flow proportional composite method whenever possible. Otherwise, where composite sampling is not feasible, grab samples are appropriate. Samples must be representative of daily operations. Where the flow of the regulated stream being sampled is less than or equal to 250,000 gallons per day, the industrial user must take three samples within a two week period. Where the flow of the stream is greater than 250,000 gallons per day, the industrial user must take six samples within a two week period. If other wastewaters are mixed with wastewater from the regulated process, the industrial user should measure flows and concentrations of the appropriate wastestreams to allow use of the combined wastestream formula (see section 4.4 below). Proposed revisions to 40 CFR Part 403 may alter the number of samples required to be submitted in a BMR.

6. The BMR must include the dates, times and sampling locations and the analytical methods used to derive the testing results.

7. Finally, an authorized representative of the IU (see 40 CFR Section 403.12 (k)) must certify as to whether the facility is currently meeting the categorical pretreatment standards. In the event the standards are not being achieved, the certification must contain a compliance schedule which identifies the additional operation and maintenance measures and/or abatement technology necessary to bring the IU into compliance and the timetable for completing these actions. The final date for completing these actions and achieving compliance must not exceed the compliance deadline established by the standard. IUs are referred to 40

CFR Section 403.12(b)(7) and (c) for more specific instructions on preparing this compliance schedule.

4.3.2. Compliance Schedule Progress Report

In the event the IU certifies that it is not meeting the categorical standard on a consistent basis a compliance schedule must be submitted with the BMR that describes the actions the IU will take and a timetable for completing those actions to achieve compliance with the standard. The completion date in the schedule must not be later than the compliance date established for the particular categorical standard. The compliance schedule must contain increments of progress and dates for completion of each increment. Further, no increment shall exceed nine months.

Within 14 days of each date in the compliance schedule, the user must submit a progress report to the Control Authority. The compliance schedule progress report must indicate whether or not it complied with the increment of progress intended to be met. If the target date was not met, the report must indicate a revised date on which it expects to comply, the reasons for the delay and the steps to be taken to return to the schedule established in the BMR.

4.3.3 Report On Compliance

Within 90 days of the final compliance date for the battery manufacturing pretreatment standards, or in the case of a new source, following commencement of the introduction of wastewater into the POTW, any industrial user subject to these standards must submit to the Control Authority a compliance report that

indicates whether or not applicable pretreatment standards are being met on a consistent basis. The report must indicate the nature and concentration of all regulated pollutants in the facility's regulated process wastestreams; the average and maximum daily flows of the regulated streams; and contain a statement as to whether compliance is consistently being achieved, and if not, what additional operation and maintenance or pretreatment is necessary to achieve compliance (see 40 CFR Section 403.12(d)).

4.3.4 Periodic Reports On Continued Compliance

All industrial users subject to the battery manufacturing pretreatment standards must submit a biannual "periodic compliance report" during the months of June and December unless required more frequently by the Control Authority. The Control Authority may change the months during which the reports must be submitted. The report shall indicate the precise nature and mass (and concentration if required by the Control Authority) of the regulated pollutants in its discharge to the POTW during the reporting period and the average and maximum daily flow rates. The methods used to sample and analyze the data, and a certification that the methods conformed to those methods outlined in the regulations should be included in the report. (see 40 CFR Section 403.12(e)).

4.3.5 Notice Of Slug Loading

Section 403.12(f) requires industrial users to notify the POTW immediately of any slug loading (i.e. discharge of any pollutant, including oxygen demanding pollutants, to the POTW system at a flow rate or pollutant concentration which might

cause interference with the POTW.)

4.3.6 Monitoring And Analysis To Demonstrate Continued Compliance

Section 403.12(g) states that industrial user reports must contain the results of sampling and analysis of the user's discharge, but does not prescribe any particular frequency of monitoring. The battery manufacturing pretreatment standards also do not establish monitoring frequency. Therefore, the appropriate Control Authority must establish the monitoring frequency to adequately demonstrate that indirect dischargers subject to these pretreatment standards are in compliance with the applicable standards. EPA has issued guidance on suggested monitoring frequencies for the first year until sufficient baseline data are collected (see Pretreatment Compliance Monitoring and Enforcement Guidance, July 1986).

Sampling and analysis shall be in accordance with the procedures established in 40 CFR Part 136. When Part 136 techniques are not available or are inappropriate for any pollutant, sampling and analysis shall be conducted in accordance with procedures established by the Control Authority or using any validated procedure. However, all procedures for sampling and analysis not included in Part 136 must be approved in advance by EPA.

4.3.7 Signatory Requirements For Industrial User Reports

All reports submitted by industrial users (BMR, Initial Report on Compliance, and Periodic Reports, etc.) must be signed by an authorized representative in accordance with 40 CFR Section

403.12(k). Note that false statements or misrepresentations in the aforementioned reports are punishable by a fine of not more than $10,000 or by imprisonment for up to 2 years, or by both under Section 309(c)(4) of the CWA.

4.3.8 Recordkeeping Requirements

Records of all sampling activities required under the regulations above must include dates, exact place(s), methods and times as well as identifying the person(s) taking the sample. In addition, testing records must indicate the dates and person(s) performing the analysis as well as the analytical techniques used and the results thereof. These records shall be maintained for a minimum of three years (see 40 CFR Section 403.12(n)(2) and shall be available for inspection and copying by the Control Authority.

4.4 APPLICATION OF THE COMBINED WASTESTREAM FORMULA

The Combined Wastestream Formula (CWF) (40 CFR Section 403.6(e)) is a mechanism for calculating appropriate discharge limitations for combined wastestreams. The CWF was developed to account for the dilutional effect of mixing one regulated wastestream with other regulated, unregulated, or dilution streams prior to treatment. The following definitions and conditions are important to the proper use of the CWF.

Definitions

- Regulated Process Wastestream - an industrial process wastestream regulated by national categorical pretreatment standards.
- Unregulated Process Wastestream - an industrial process wastestream that is not regulated by a categorical pretreatment standard and is not a dilute wastestream (see below).

- Dilute Wastestream - Boiler blowdown, noncontact cooling water, and sanitary wastewater (unless regulated by the categorical pretreatment standard). The Control Authority has discretion to classify boiler blowdown and noncontact cooling water as unregulated wastestreams when these streams contain a significant amount of a regulated pollutant, and combining them with regulated process wastewaters will result in a substantial reduction of that pollutant (see 12 ERC 1833 and 40 CFR Part 403).

  Note: These definitions apply to individual pollutants. Therefore a wastestream from a process may be regulated for one pollutant and unregulated for another.

- Mass-based Production Related Standard - a standard setting forth the quantity (mass) of a pollutant allowed to be discharged per each defined unit of production. Usually for battery manufacturing expressed in mg/kilogram of metal used or applied (lb/million pounds of metal used or applied).

- Mass-based Limit - a limit setting forth the quantity (mass) of a particular pollutant which may be discharged in a specific wastestream. This is derived from the mass-based production related standard and is usually expressed in mg/day (lb/day).

- Concentration-based Limit - a limit based on the relative strength of a pollutant in a wastestream, usually expressed in mg/l (lb/gal).

CWF Conditions

The regulations specify that the following conditions must be met by a municipality and its industries when applying the CWF:

- Alternative discharge limits calculated in place of a categorical pretreatment standard must be enforced as categorical pretreatment standards themselves.

- Calculation of alternative limits must be performed by the Control Authority (generally the POTW) or by the industrial user with written permission from the Control Authority.

- Alternative limits must be established for all regulated pollutants in each of the regulated processes.

- The Control Authority should use mass limits, but may use equivalent concentration limits when only production based mass standards are provided by the applicable categorical pretreatment standard.

- Both daily maximum and long-term average (usually monthly) average alternative limits must be calculated for each regulated pollutant.

- An industrial user operating under an alternative limit derived from the CWF must immediately report any significant or material changes in the regulated, unregulated or dilution wastestreams or production rates to the Control Authority.

- If a facility institutes process changes or production rates change and these changes warrant, the Control Authority may recalculate the alternative limits at its discretion or at the request of the industrial user. The new alternative limits will be calculated within 30 days of receiving notice of the change(s).

- The Control Authority may impose stricter alternative limits, but may not impose alternative limits that are less stringent than the calculated alternative limits.

- A calculated alternative limit cannot be used if it results in a discharge limit below the analytical detection level for that pollutant. If a calculated limit is below the detection limit, the IU must either: 1) not combine the dilute streams before they reach the combined treatment facility, or 2) segregate all wastestreams entirely.

- The categorical pretreatment standards for the regulated wastestreams which are applied to the CWF must be consistent in terms of the number of samples on which the standard is based.

Monitoring Requirements for Industrial Users Using the CWF

Self-monitoring requirements by an industrial user are necessary to ensure compliance with the alternative discharge limit. Because battery manufacturing pretreatment standards do not include self-monitoring requirements, the Control Authority will establish minimum self-monitoring requirements.

Application of the CWF

The actual combined wastestream formulas used with the categorical pretreatment standards are presented in Table 4.1. It is important to remember that when two or more regulated wastestreams from different regulated categories are mixed prior to treatment, it is necessary to determine which pretreatment regulation applies to each separate regulated wastestream. All dilution and unregulated wastestreams need to be identified.

Table 4.2 presents an example of how the CWF is used to calculate alternative limits for specific battery manufacturing operations. The example applies to an integrated facility that has operations regulated by the battery manufacturing categorical pretreatment standards, as well as the metal finishing categorical pretreatment standards.

Flow Weighted Averaging

The CWF is applicable to situations where wastewater streams are combined prior to treatment. However, for facilities that combine regulated process wastewaters with waters that are not regulated after treatment but prior to monitoring by the Control Authority (usually at the discharge point to the sanitary sewer), a flow weighted average or more stringent approach must be used to adjust categorical pretreatment standards. The flow weighted averaging formula for use in these circumstances is set out in Table 4.3.

4.5 REMOVAL CREDITS

A removal credit allows a POTW to provide its industrial users with a credit (in the form of adjusted categorical pre-

TABLE 4.1

COMBINED WASTESTREAM FORMULAS

Alternative Mass Limit Formula

$$M_{cwf} = \left(\sum_{i=1}^{N} M_i \right) \times \left(\frac{F_T - F_D}{\sum_{i=1}^{N} F_i} \right)$$

M_{cwf} - alternative mass limit for the pollutant

M_i - Categorical Pretreatment Standard mass limit for the pollutant in regulated stream i

F_i - average daily flow (at least 30 day average) of regulated stream i

F_D - average daily flow (at least 30 day average) of dilute wastestream(s)

F_T - average daily flow (at least 30 day average) through the combined treatment facility (including regulated, unregulated and dilute wastestreams)

N - total number of regulated streams

TABLE 4.1

COMBINED WASTESTREAM FORMULAS (Continued)

Alternative Concentration Limit Formula:

$$C_{cwf} = \left(\frac{\sum_{i=1}^{N} C_i F_i}{\sum_{i=1}^{N} F_i} \right) \times \left(\frac{F_T - F_D}{F_T} \right)$$

C_{cwf} - alternative concentration limit for the pollutant

C_i - Categorical Pretreatment Standard concentration limit for the pollutant in regulated stream i

F_i - average daily flow (at least 30 day average) of regulated stream i

F_D - average daily flow (at least 30 day average) of dilute wastestream(s)

F_T - average daily flow (at least 30 day average) through the combined treatment facility (including regulated, unregulated and dilute wastesteams)

N - total number of regulated streams

TABLE 4-2

COMBINED WASTESTREAM FORMULA EXAMPLE CALCULATIONS

The following example provides calculations for determining alternate discharge limits for nickel using the combined wastestream formula. The following calculations assume combinations of various regulated and dilute wastestreams with the following characteristics. All wastestreams are combined prior to treatment.

Wastestream	Wastestream Type	Flow (gpd)
Battery Manufacturing (Cadmium Subcategory)		
Electrodeposited Anodes	regulated	2,000
Nickel Impregnated Cathodes	regulated	13,000
Metal Finishing (Nickel Plating)	regulated	15,000
Sanitary	dilute	50,000

The alternative discharge limit for nickel (daily maximum) at a cadmium battery manufacturing plant that also performs nickel plating and discharges sanitary wastewater is calculated as follows.

SOLUTION

Step 1: Determine the applicable nickel daily maximum limit for each wastestream.

TABLE 4-2

COMBINED WASTESTREAM FORMULA EXAMPLE CALCULATIONS (continued)

BATTERY MANUFACTURING

Cadmium Electrodeposited Anodes

Average Daily Production	= 260 kg/day of cadmium applied
Maximum Daily Limit for Nickel	= 67.49 mg/kg of cadmium applied
Average Daily Water Use	= 2,000 gpd
Allowable Nickel Mass = 260 (67.49)	= 17,547 mg/day

Nickel Impregnated Cathodes

Average Daily Production	= 230 kg/day of nickel applied
Daily Maximum Limit for Nickel	= 384 mg/kg of nickel applied
Average Daily Water Use	= 13,000 gpd
Allowable Nickel Mass = 230 (384)	= 88,320 mg/day

Total Battery Manufacturing

Total Allowable Nickel Mass for Battery Mfg.	= 105,867 mg/day
Average Daily Water Use for Battery Mfg.	= 15,000 gpd
Equivalent Concentration for Battery Mfg.	= 1.86 mg/l for Nickel

METAL FINISHING

Average Daily Production	= not required
Daily Maximum Limit for Nickel	= 3.98 mg/l
Average Daily Water Use	= 15,000 gpd
Allowable Nickel Limit = 3.98 (15,000 x 3.785)	= 225,965 mg/day

TABLE 4-2. COMBINED WASTESTREAM FORMULA EXAMPLE CALCULATIONS
(Continued)

Step 2: Draw a schematic showing processes, flows and applicable limits.

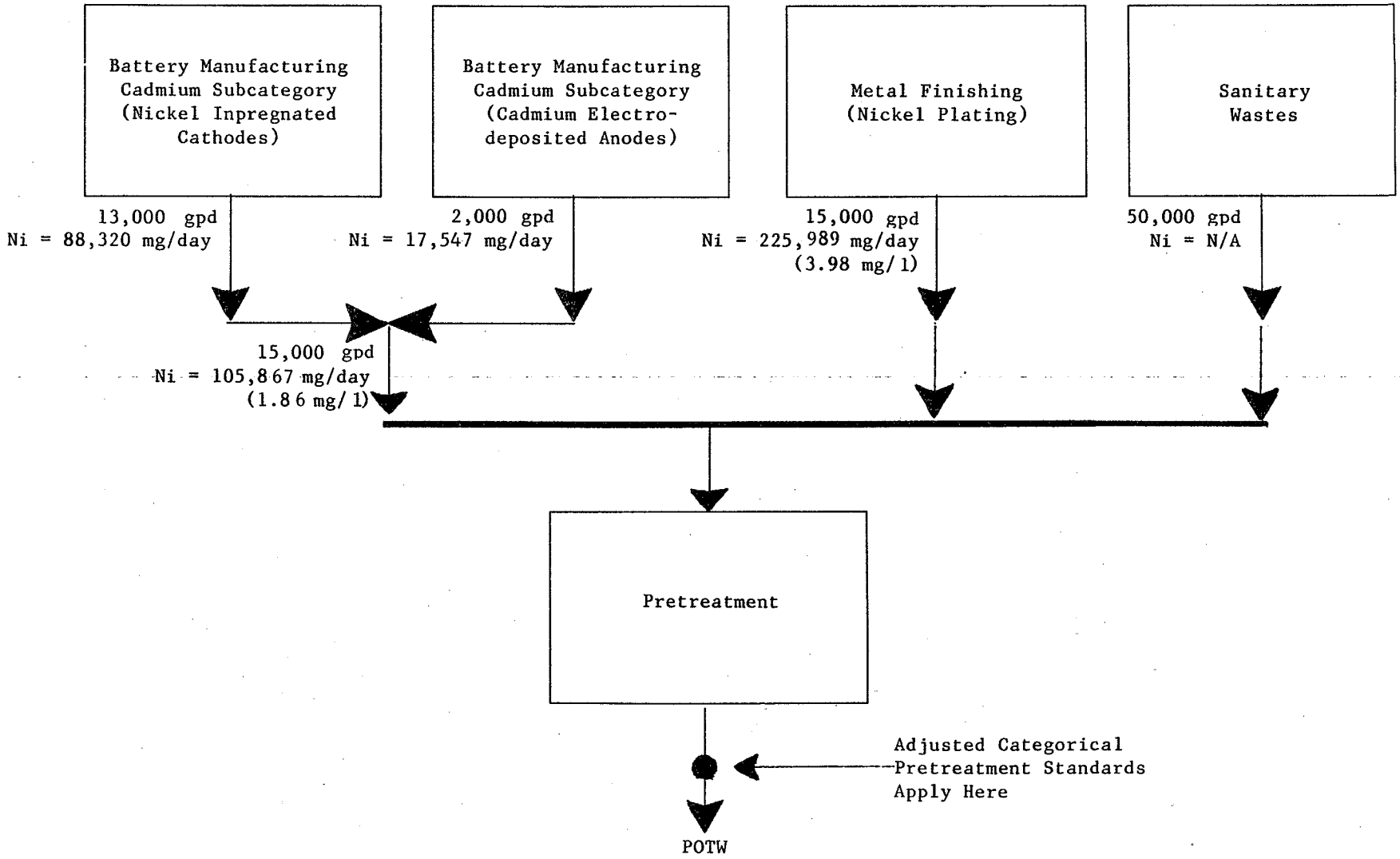

TABLE 4-2

COMBINED WASTESTREAM FORMULA EXAMPLE CALCULATIONS (continued)

Step 3: Using the combined wastestream formula (mass or concentration limit formula), substitute the appropriate values and calculate the adjusted limit.

a) Mass Limit Formula

$$M_{cwf} = \sum_{i=1}^{N} Mi \times \left(\frac{F_T - F_D}{\sum_{i=1}^{N} F_i} \right)$$

$$Ni_{cwf} = 105{,}867 \text{ mg/day} + 225{,}965 \text{ mg/day} \times \frac{15{,}000 + 15{,}000 + 50{,}000 - 50{,}000 \text{ gpd}}{15{,}000 + 15{,}000 \text{ gpd}}$$

$$Ni_{cwf} = 331{,}832 \text{ mg/day}$$

$$Ni_{cwf} = 0.332 \text{ kg/day}$$

b) Concentration Limit Formula

$$C_{cwf} = \left(\frac{\sum_{i=1}^{N} Ci\ Fi}{\sum_{i=1}^{N} Fi} \right) \times \left(\frac{F_T - F_D}{F_T} \right)$$

$$Ni_{cwf} = \left(\frac{1.86 \text{ mg/l} \times 15{,}000 \text{ gpd} + 3.98 \text{ mg/l} \times 15{,}000 \text{ gpd}}{15{,}000 \text{ gpd} + 15{,}000 \text{ gpd}} \right) \times \left(\frac{15{,}000 + 15{,}000 + 50{,}000 - 50{,}000 \text{ gpd}}{15{,}000 + 15{,}000 + 50{,}000 \text{ gpd}} \right)$$

TABLE 4-2

COMBINED WASTESTREAM FORMULA EXAMPLE CALCULATIONS (continued)

$Ni_{cwf} = 2.925 \times 0.375$

$Ni_{cwf} = 1.097$ mg/l

Step 4: Observe significant figures

$Ni_{cwf} = 332{,}000$ mg/day or 1.10 mg/l

Step 5: Calculate the adjusted long term average (maximum monthly average) for nickel.

Step 6: Calculate adjusted limits for other regulated pollutants.

TABLE 4.3

FLOW-WEIGHTED AVERAGING (FWA) FORMULAS

FWA FORMULA WITH ALGEBRAIC TERMS

$$(1) \qquad C_{fwa} = \frac{(C_{cwf} \; F_t) + \left(\sum_{i=1}^{N} C_{nri} \; F_{nri}\right)}{F'_t}$$

$$(2) \qquad M_{fwa} = M_{cwf} + M_{nr}$$

EQUATION 1

C_{fwa} - alternative pollutant concentration limit in combined wastestreams after treatment derived using FWA

C_{cwf} - alternative pollutant concentration limit in treatment unit effluent, derived using the CWF

F_t - average daily flow (at least 30 day average) through the combined treatment facility

C_{nri} - concentration of nonregulated waste stream i

F_{nri} - average daily flow (at least 30 day average) of non-regulated wastestream i

F'_t - average daily flow (at least 30 day average) into regulated monitoring point (generally point of discharge to sanitary sewer)

EQUATION 2

M_{fwa} - alternative pollutant limit in combined wastestreams after treatment derived using FWA

M_{cwf} - alternative pollutant mass limit in treatment unit effluent, derived using the CWF

M_{nr} - mass of the pollutant in nonregulated wastestreams

treatment standards) for consistent removal of pollutants by the POTW. Industrial users receiving such a credit are allowed to discharge to the POTW greater quantities of regulated pollutants than otherwise permitted by applicable categorical pretreatment standards. Section 403.7 of the General Pretreatment Regulations establishes the conditions under which a POTW can obtain authorization to grant removal credits. Removal credits are pollutant specific (i.e., may only be granted on a pollutant by pollutant basis).

In order to qualify for removal credit authority a POTW must satisfy the conditions set out in the regulations including a demonstration of the POTW's ability to "remove" the pollutant in question on a long term or consistent basis, that is, the removal is not subject to significant seasonal variations. Removal credits can only be granted for pollutants regulated by a categorical pretreatment standard.

Approval for removal credits may not be granted if it will cause the POTW to violate its NPDES permit. Other criteria including compliance with water quality criteria and standards and sludge disposal regulations must be satisfied as well. Even though the POTW may be located in an NPDES State which has an approved state pretreatment program, final approval of the POTW's request rests with EPA, unless EPA has granted or delegated final approval authority to the state through a State/EPA Memorandum of Agreement (MOA).

Note: The removal credits regulation promulgated on August 3, 1984 (49 FR 31212) was challenged as too lenient by an

environmental group, the Natural Resources Defense Council (NRDC). The United States Court of Appeals for the Third Circuit ruled in favor of NRDC, concluding that EPA's 1984 removal credit rule fails to meet the requirements mandated by Section 307 of the Clean Water Act (NRDC v. EPA, 790 F.2 d 289 (3rd Cir 1986). Although several parties petitioned the Supreme Court to review the Third Circuit ruling, the Court denied the requests. Thus, the Third Circuit decision became final.

In addition to the litigation described above, the amendments to the Clean Water Act contain a provision which would vacate one element of the Third Circuit's decision - the sludge question - as it effects POTWs currently authorized to grant removal credits (as of the date of enactment.) However, this congressional reprieve would lapse on August 31, 1987, the date the Agency is required to have final regulations addressing toxic pollutants in municipal sludge. As a result of these complications, no regulatory basis currently exists for the granting of removal credits.

4.6 FUNDAMENTALLY DIFFERENT FACTORS (FDF) VARIANCE

A request for a fundamentally different factors variance is a mechanism by which a categorical pretreatment standard may be adjusted, making it more or less stringent, on a case-by-case basis. If an industrial user, a POTW, or any interested person believes that the factors relating to a specific industrial user are fundamentally different from those factors considered during development of the relevant categorical pretreatment standard and that the existence of those factors justifies a different

discharge limit from that specified in the categorical pretreatment standard, then they may submit a request to EPA for such a variance within 180 days after the effective date of the standard (see 40 CFR Section 403.13).

Although EPA has no statutory basis for granting adjustments to categorical pretreatment standards because a source is "fundamentally different", the U.S. Supreme Court has previously recognized the FDF variance's legitimacy as an administrative tool to address concerns with both direct and indirect dischargers. In fact, in CMA v. NRDC, 53 LW 4193 (No. 83-1013, 2-27-85), the Court upheld EPA in a challenge to the Agency's determination that under the appropriate circumstances FDF variances could be granted for toxic pollutants, otherwise regulated by categorical pretreatment standards. For other court decisions on FDF variances the reader is referred to E.I. duPont de Nemours v. Train, 430 U.S. 112 (1977) and EPA v. National Crushed Stone Assoc. 449 U.S. 64 (1980).

4.7 LOCAL LIMITS

Local limits are numerical pollutant concentration or mass-based values that are developed by a POTW for controlling the discharge of conventional, non-conventional or toxic pollutants into its sewer systems. They differ from National Categorical Pretreatment Standards in that categorical pretreatment standards are developed by EPA and are based upon the demonstrated performance of available pollutant control technologies (for specific categorical industries). These national technology-based categorical standards do not consider local environmental criteria or

conditions, and are only developed to assure that each point source within a specified category meets a minimum discharge standard which is consistent across the United States for all POTWs.

Local limits, on the other hand, are developed to address specific localized impacts and factors that are unique to the POTW. Local limitations must be designed to protect the POTW from:

- Introduction of pollutants into the POTW which could interfere with its operation, including contamination of a POTW's sludge which would limit sludge uses or disposal practices.
- Pass-through of inadequately treated pollutants which could violate a POTW's NPDES permit or applicable water quality standards 1/

Local limits are required under 40 CFR Section 403.5 and must be developed when it is determined that categorical pretreatment standards are not sufficient to enable the POTW to prevent interference and pass-through. For more information on the minimum local limit requirements for POTWs with approved pretreatment programs and the relationship between local limits and categorical pretreatment standards, refer to the memorandum signed by Rebecca Hanmer on August 5, 1985 entitled Local Limit Requirements for POTW Pretreatment Programs. Copies of this memorandum can be obtained from the EPA regional pretreatment coordinators listed in Appendix C.

1/ The terms "pass through" and "interference" are defined more precisely in 40 CFR Section 403.3.

In addition to protecting against interference and pass-through, local limits must be developed to protect the POTW from discharges that may result in:

- Fire or explosion
- Corrosion
- Obstruction of flow in sewers
- Excessive discharge of conventional pollutants
- Heat that may cause interference

EPA encourages local limits for volatile toxic substances to protect worker health and safety as well.

To assist municipalities in developing defensible and technically sound numerical effluent limitations, EPA has prepared some general guidelines on limit development in its document Guidance Manual for POTW Pretreatment Program Development dated October 1983. Appendix L of this document lists the general methodology, required formulas and typical environmental criteria used to develop local limits. This manual is available from EPA regional offices and NPDES states and should be carefully followed when developing local limits. Although a detailed discussion of local limits development is beyond the scope of this document, the general methodology includes the following five steps:

Step 1 - Survey conditions of collection system and monitor sewer atmosphere to determine whether limits are necessary to prevent collection system hazards.

Step 2 - Determine the maximum raw waste loading to the headworks of the treatment plant (for each specific pollutant) that will assure that the POTW does not experience interference or pass-through

Step 3 - Calculate the allowable loading to the POTW by subtracting the uncontrollable portion of pollutant discharge to the POTW (from domestic and infiltration/inflow sources) from the total raw waste loading value.

Step 4 - Distribute the controllable loading to industrial users through an allocation process.

Step 5 - Derive specific local limits from the allocation results and from the survey of the collection system.

The above five-step process must be performed for each pollutant which the POTW determines may need a specific local limitation. As a general rule, the limit setting analysis should be performed for all pollutants which are discharged to the POTW in significant quantities. The POTW should identify pollutants of concern through an evaluation of the POTW's industrial waste survey. A procedure for evaluating industrial waste survey results is also included in the EPA guidance manual mentioned earlier.

In addition, EPA has developed a computer software program that incorporates the general methodology required to develop local limits and alleviates a substantial amount of the tedious calculations required to develop these limits. This computer program has the following capabilities to aid the POTW in limit development:

- Performs the four-step limit setting analysis on a microcomputer
- Supplements POTW data with "built-in" files containing data on industrial/municipal wastewater characteristics, POTW removal rates, and biological process inhibition data
- Allocates controllable pollutant loads using several different methodologies

POTWs may obtain information on this computer program by contacting any of the ten EPA regional offices. Instructions will be provided on how to use the computer program as well as how to access a computer system which supports it.

5. APPLICATION OF BATTERY MANUFACTURING CATEGORICAL PRETREATMENT STANDARDS

This section provides guidance to Control Authorities on how to apply production-based standards. Production-based standards are expressed in terms of allowable pollutant mass discharge per unit of production (mg/kg). Direct application of this standard would require the Control Authority to make direct measurements of the flow of the regulated wastestreams and the corresponding current production rate. Rather than measure the production rate each time compliance monitoring is performed, the Control Authority may use equivalent mass or equivalent concentration limits. A reasonable representation of the industrial facility's actual production and actual flows are used to derive these limits that are essentially equivalent to the production-based standards. EPA recommends that long-term average production and flow rates be determined based on the examination of several years (such as 5 years) of data. In some cases production may have specific seasonal fluctuations. The Control Authority may choose to issue a tiered permit (more than one standard based on different production levels) if significant change in the long-term average production is expected during the term of the permit. Further guidance can be found in EPA's Guidance Manual for the Use of Production Based Pretreatment Standards and the Combined Wastestream Formula.

An example of how to develop mass equivalent limits and use the combined wastestream formula (CWF) was presented in Section 4.4. Another example is provided to demonstrate the application

of production based standards to a lead subcategory battery plant, which many Control Authorities may encounter. Concepts used in this example can be applied to the other battery subcategories. If difficulties are encountered, the Control Authority is encouraged to contact the EPA Industrial Technology Division Project Officer for technical clarifications or the Permits Division for pretreatment or permit clarifications. The example demonstrates the development of equivalent concentration based limits and the use of the combined wastestream formula (CWF) to derive the alternative discharge standard for the total plant.

The plant used in this example is a lead battery manufacturing plant, producing automotive batteries, and a secondary lead smelter. The regulated wastestreams from battery manufacturing and smelting are combined with noncontact cooling water and sanitary wastes prior to treatment. The plant also discharges employee shower wastewater to treatment and plant management contends that the employee shower wastewater is contaminated with lead. They have requested that the Control Authority classify the stream as an unregulated wastestream instead of a dilution stream, and have provided sampling and analysis data. Documentation for the shower wastewater is:

- The sample collected was multiple grabs composited over the entire length of one shower period
- Twenty-five employees showered during the sample collection period
- The total volume of water used during the sample collection period was 625 gallons (25 gallons/employee) 1/

1/ Note: The usual volume of water per person per shower is 25-30 gallons. (See References on R-1).

- Analytical data showed a 0.25 mg/l lead concentration in the wastewater sample collected
- An average of 50 employees shower each day (50 employees/day).

Based on this information, the Control Authority classifies the employee shower wastewater as an unregulated stream with a 1,250 gpd flow (25 gallons/employee x 50 employees/day).

The alternative concentration limit for the total plant is developed through the following successive steps.

Step 1 - Draw a simple process flow diagram showing all regulated category (or subcategory) process wastestreams and other wastestreams that are combined prior to treatment (see Figure 5.1) Determine appropriate production rates and discharge flows for each regulated category.

Step 2 - Determine the mass limit for each regulated category that is combined for treatment using the following formula:

Mass limit = production-based standard (mg/kg) x regulatory production rate (average or other reasonable estimate) (kg/day).

For example, the maximum one day standard for lead for open formation is 0.71 mg/kg of lead used and the actual amount of lead used is 5000 kg/day. The mass limit for the example plant is 3550 mg/day (0.71 mg/kg x 5000 kg/day). Table 5-1 displays these calculations in a tabular format. Mass limits for the regulated battery plant wastestreams were calculated using the pretreatment standards shown in Appendix B of this

FIGURE 5.1

EXAMPLE PLANT PRODUCTION AND FLOW DATA

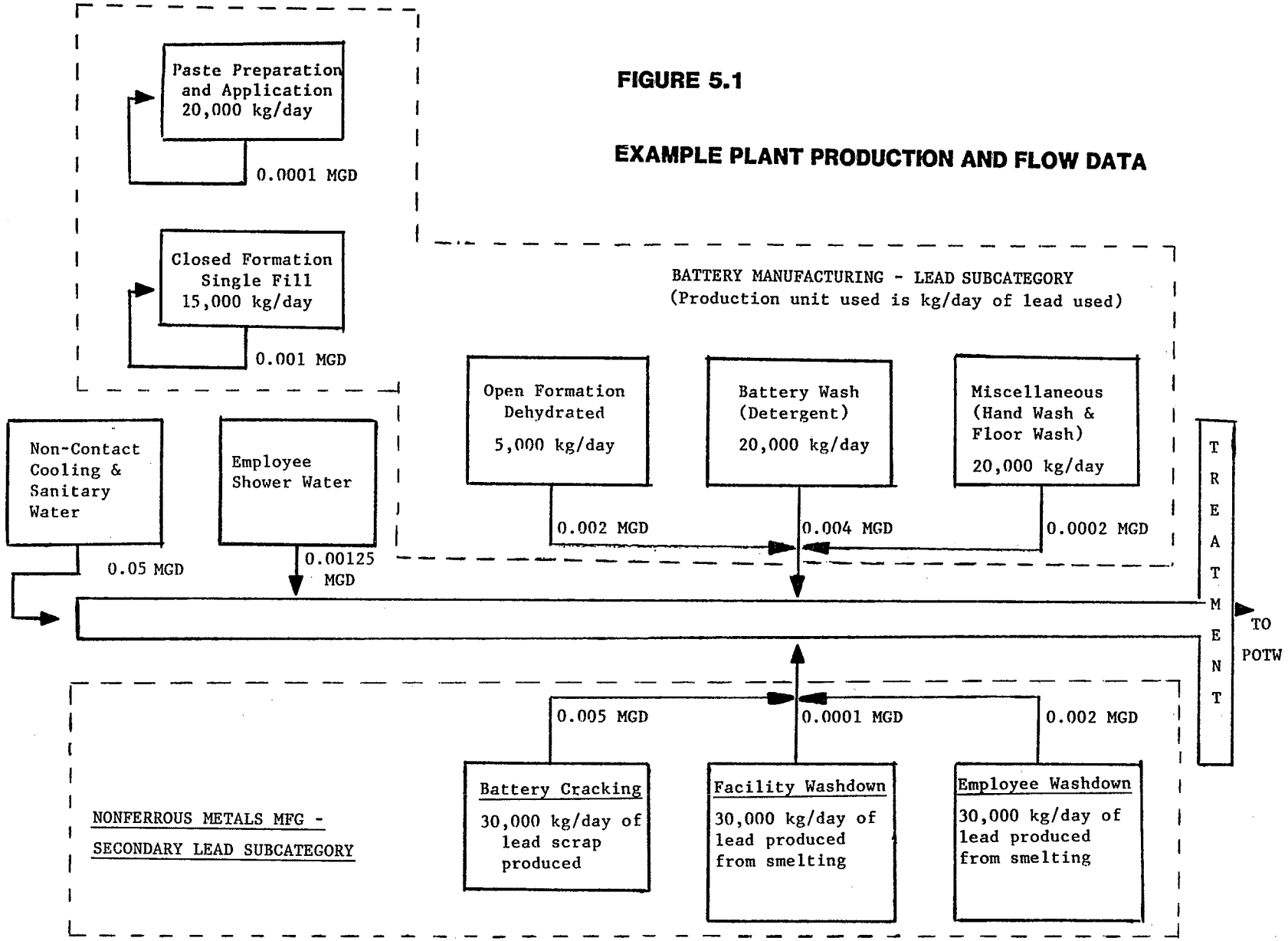

TABLE 5-1

ALLOWABLE MASS LOADINGS FROM PROCESS OPERATIONS REGULATED BY BATTERY MANUFACTURING CATEGORICAL PRETREATMENT STANDARDS

Regulated Wastestream	Production 1/ (kg/day)	Pb Limit 2/ Daily Max. and Monthly Average (mg/kg)	Discharge Allowance 3/ Daily Max. (mg/day)	Discharge Allowance 3/ Monthly Avg. (mg/day)
Paste Preparation & Application	20,000	0.0 4/ 0.0	0	0
Closed Formation Single Fill	15,000	0.0 4/ 0.0	0	0
Open Formation Dehydrated	5,000	0.71 0.34	3550	1700
Battery Wash (Detergent)	20,000	0.38 0.18	7600	3600
Miscellaneous	20,000	0.13 0.06	2600	1200
Total			13750	6500

NOTES:

1/ See Figure 5-1 for specific production parameter. The production number for lead used was estimated for the example plant based on the fact that the plant produces 1364 batteries per day. If the amount of lead used is difficult to obtain from a plant manufacturing standard automotive batteries, 22 pounds of lead per battery can be used for an estimate. This number was based on information supplied by battery manufacturers when the regulation was being developed. However, the actual amount used might currently be less because manufacturers have developed methods for producing lighter batteries using less lead. The production number used should be verified with the plant personnel.

2/ PSES from 40 CFR 461. See Appendix A in this manual.

3/ Limit multiplied by average daily production rate (e.g., (0.71 mg/kg) x (5,000 kg/day) = 3550 mg/day

4/ Paste preparation and application and closed formation-single fill have no discharge allowances.

manual for the lead subcategory (page B-2 and B-3) multiplied by the plant's regulatory production rate (average or other reasonable estimate). Note from Figure 5-1 that the paste preparation and application and closed formation - single fill operations should not receive a discharge allowance. Even if wastewaters from these operations were being discharged, the battery manufacturing pretreatment standard states "no discharge allowance for process wastewater pollutants" for these operations. This means that no discharge allowance for pollutants is allowed although a flow discharge may be allowed. The facility's smelter operations are regulated by the nonferrous metals manufacturing categorical pretreatment standards secondary lead subcategory. Three of the facility's process operations, battery cracking, facility washdown, and employee washdown, are regulated by the nonferrous standards.

Mass limits for the secondary lead smelter wastestreams were determined by using the standards provided in 40 CFR 421 for the secondary lead subcategory of the nonferrous metals manufacturing category (See 49 FR 8740 March 8, 1984) multiplied by the plant's regulatory production rate (Figure 5-1). Note that the facility washdown wastestream receives zero discharge allowance (the production-based standard is depicted as 0.000 mg/kg of lead produced from smelting). These equivalent mass limits are shown in Table 5-2. Once the allowable mass loadings, as derived in Tables 5-1 and

TABLE 5-2

ALLOWABLE MASS LOADINGS FROM PROCESS OPERATIONS REGULATED BY NONFERROUS METALS MANUFACTURING CATEGORICAL PRETREATMENT STANDARDS - SECONDARY LEAD SUBCATEGORY

Regulated Wastestream	Production (kg/day)	Pb Limit Daily Max. and Monthly Avg. (mg/kg)	Discharge Allow. Daily Max. (mg/day)	Discharge Allow. Monthly Avg. (mg/day)
Battery Cracking	30,000	0.189 0.087	5670	2610
Facility Washdown	30,000	0.0 0.0	0	0
Employee Handwash	30,000	0.008 0.004	240	120
	Totals		5910	2730

5-2, have been calculated, the combined wastestream formula can be applied. Since both the battery and nonferrous metals categorical pretreatment standards are mass limitations, the appropriate form of the combined wastestream formula is the alternative mass limit formula, previously presented in Table 4-1 of this manual (see CWF Conditions in the discussion of the CWF, Section 4.4).

Step 3 - Determine which wastestreams are regulated, unregulated or dilution wastestreams. This classification along with their respective flows is shown in Table 5-3.

Step 4 - Calculate a mass limit for the total plant using the alternative mass limit formula in Table 4.1. The application of the alternative mass limit formula to the example plant for the pollutant lead is presented in Table 5-3. The mass limit as derived in Table 5-3 applies to the combined industrial plant discharge to the POTW after wastewater treatment.

Step 5 - Calculate an equivalent concentration limit by dividing the alternative mass limit by the average total plant flow. (This step is shown in Table 5-3)

Step 6 - Follow the same procedure for calculating the monthly average limit for lead as well as the daily maximum and monthly average limits for all other regulated pollutants.

In some cases, the POTW may wish to regulate other pollutants not regulated by the battery manufacturing categorical

TABLE 5-3

DERIVATION OF ALTERNATIVE LIMITS

Regulated Wastestreams:

	Flow MGD (l/day)		Mass Based Limit One Day Max for Lead (mg/day) 1/
Battery Manufacturing			
1. Open Formation	0.002	(7570)	3550
2. Battery Wash (Detergent)	0.004	(15140)	7600
3. Miscellaneous	0.0002	(757)	2600
Total	0.0062	(23467)	13750
Nonferrous Metals Manufacturing			
1. Battery Cracking	0.0050	(18925)	5670
2. Employee Handwash	0.0020	(7570)	240
3. Facility Washdown	0.0001	(379)	0
Total	0.0071	(26874)	5910

Notes:

1/ See Figure 5-1 for specific production parameter. The production number for lead used was estimated for the example plant based on the fact that the plant produces 1364 batteries per day. If the amount of lead used is difficult to obtain from a plant manufacturing standard automotive batteries, 22 pounds of lead per battery can be used for a estimate. This number was based on information supplied by battery manufacturers when the regulation was being developed. However, the actual amount used might currently be less because manufacturers have developed methods for producing lighter batteries using less lead. The production number used should be verified with the plant personnel.

TABLE 5-3

DERIVATION OF ALTERNATIVE LIMITS (continued)

Unregulated Wastestreams:

1. Employee shower 0.00125 MGD = 4731 l/day

Dilution Wastestreams:

1. Noncontact Cooling and Sanitary 0.0500 MGD = 189,250 l/day

Using Table 4.1, Alternative Mass Limit Combined Wastestream Formula Calculate Alternative Mass Limit:

$$M_{Lead} = (13750 + 5910) \times \frac{(23467+26874+4731+189250-189250)}{(23467 + 26874)}$$

$$M_{Lead} = 19660 \times \frac{55072}{50341}$$

$$M_{Lead} = 19660 \times 1.094$$

$$M_{Lead} = 21508 \text{ mg}$$

Convert Alternative Mass Limit to the Equivalent Concentration Limit:

$$\text{Equivalent concentration limit} = \frac{21508 \text{ mg/day}}{244322 \text{ l/day}}$$

$$= 0.088 \text{ mg/l}$$

pretreatment standards. For example, in the lead subcategory, there were initially 12 toxic pollutant parameters considered for regulation. These pollutants were found in the lead subcategory raw wastestreams in significant concentrations. However, only copper and lead were selected for regulation. The other pollutants, not specifically regulated, would also be controlled by the removal of the selected regulated pollutants and the overall costs for monitoring and analysis would be reduced.

Should the POTW desire to regulate other pollutants found in a lead battery manufacturing plant's discharge, the POTW could apply local limits based on EPA's maximum allowable headworks loading methodology. The POTW could also calculate a local limit for the plant using EPA's technology - based methodology. The Development Document for Effluent Limitations Guidelines and Standards for Battery Manufacturing provides mass limits for the 12 toxic pollutant parameters based on the application of treatment and control options presented for Best Available Technology (BAT) and New Source Performance Standards (NSPS) for direct dischargers. The example in Table 5-4 illustrates how to calculate the mass discharge limits for lead, copper, and zinc for lead battery manufacturing at the plant previously described.

Should the POTW desire to regulate other pollutants found in the secondary lead smelter wastewater discharges (nonferrous metals manufacturing - secondary lead subcategory), the POTW could apply local limits or calculate a technology-based pretreatment standard. The Development Document for Effluent Limitations Guidelines and Standards for Nonferrous Metals Manufacturing - Phase I provides production normalized flows for

TABLE 5-4. BATTERY MANUFACTURING CALCULATION OF MASS DISCHARGE LIMITS

WASTEWATER STREAM	PRODUCTION 1/ (KG/DAY)	POLLUTANT	LIMIT 2/ DAILY MAX / MONTHLY AVG (MG/KG)	DISCHARGE ALLOWANCE 3/ Pb MAX (MG/DAY)	Pb AVG (MG/DAY)	Cu MAX (MG/DAY)	Cu AVG (MG/DAY)	Zn 4/ MAX (MG/DAY)	Zn 4/ AVG (MG/DAY)
Paste Preparation & Application	20,000	Pb	0.0	0					
			0.0		0				
		Cu	0.0			0			
			0.0				0		
		Zn	0.0					0	
			0.0						0
Closed Formation Single Fill	15,000	Pb	0.0	0					
			0.0		0				
		Cu	0.0			0			
			0.0				0		
		Zn	0.0					0	
			0.0						0
Open Formation Dehydrated	5,000	Pb	0.71	3,550					
			0.34		1,700				
		Cu	3.19			15,950			
			1.68				8,400		
		Zn	2.45					12,250	
			1.02						5,100
Battery Wash (Detergent)	20,000	Pb	0.38	7,600					
			0.18		3,600				
		Cu	1.71			34,200			
			0.90				18,000		
		Zn	1.32					26,400	
			0.54						10,800
Miscellaneous	20,000	Pb	0.13	2,600					
			0.06		1,200				
		Cu	0.58			11,600			
			0.31				6,200		
		Zn	0.45					9,000	
			0.19						3,800
Employee Showers 5/	4,731 L/day	Pb	0.42 mg/l	1,987					
			0.20		946				
		Cu	1.90			8,989			
			1.00				4,731		
		Zn	1.46					6,907	
			0.61						2,886
Total				15,737	7,446	70,739	37,331	54,557	22,586

NOTES:

1/ See Figure 5-1 for specific production parameter. The production number for lead used was estimated for the example plant based on the fact that the plant produces 1,364 batteries per day. If the amount of lead used is difficult to obtain from a plant manufacturing standard automotive batteries, 22 pounds of lead per battery can be used for an estimate. This number was based on information supplied by battery manufacturers when the regulation was being developed. However, the actual amount used might currently be less because manufacturers have developed methods for producing lighter batteries using less lead. The production number used should be verified with the plant personnel.

2/ PSES from 40 CFR 461. See Appendix B in this manual.

3/ Multiply production times daily maximum and monthly average limit.

4/ Zinc is not a regulated pollutant parameter for the lead subcategory of battery manufacturing and would be considered an unregulated pollutant in the CWF, however the calculations are shown if the POTW wants to apply technology-based standards for this pollutant. Zinc was detected and considered for regulation in lead battery manufacturing and although not regulated, mass limits are provided as guidance in the battery technical development document (Volume II, pages 642-649).

5/ Mass discharge limits calculated by multiplying flow (rather than production) times the treatment effectiveness concentrations (mg/l) for lime and settle technology in Table 5-6. These concentrations rather than daily maximum and monthly average limits are shown in the table. For example, lead one day max is 4731 l/day X 0.42 mg/l = 1987 mg/day.

each process operation and a treatment effectiveness concentration table for all pollutants of concern based on treatment systems used for BAT and NSPS for direct dischargers. The example in Table 5-5 illustrates how to calculate the mass discharge limits for lead, copper and zinc for the secondary lead smelter operations at the example plant. Table 5-5 also presents the production normalized flows needed to calculate mass limits for the secondary lead smelter operations, and Table 5-6 presents the treatment effectiveness concentrations used for the nonferrous metals manufacturing regulation.

TABLE 5-5. NONFERROUS METALS MANUFACTURING CALCULATION OF DISCHARGE LIMITS

WASTEWATER STREAM	PRODUCTION 1/ (KG/DAY)	POLLUTANT	LIMIT 2/ DAILY MAX / MONTHLY AVG (MG/KG)	DISCHARGE ALLOWANCE 3/ Pb MAX	Pb AVG	Cu4/ MAX	Cu AVG	Zn MAX	Zn AVG
				(MG/DAY)					
Battery Cracking	30,000 (0.673 l/kg)	Pb	0.189	5,670					
			0.087		2,610				
		Cu	0.861			25,830			
			0.410				12,300		
		Zn	0.687					20,610	
			0.283						8,490
Facility Washdown	30,000	Pb	0.0	0					
			0.0		0				
		Cu	0.0			0			
			0.0				0		
		Zn	0.0					0	
			0.0						0
Employee Handwash	30,000 (0.027 l/kg)	Pb	0.008	240					
			0.004		120				
		Cu	0.035			1,050			
			0.016				480		
		Zn	0.028					840	
			0.011						330
Total				5,910	2,730	26,880	12,780	21,450	8,820
Plant Total (Tables 5-4 and 5-5)				21,647	10,176	97,619	50,111	76,007	31,406

NOTES:

1/ See Figure 5-1 for specific production parameter.

2/ PSES from 40 CFR 421.

3/ Multiply production times daily maximum and monthly average limit.

4/ Copper is not a regulated pollutant parameter for the secondary lead subcategory and would be considered an unregulated pollutant in the CWF, however the calculations are shown if the POTW wants to apply technology-based standards for this pollutant. Copper, although not specifically considered for regulation, was quantifiable in wastestreams from nonferrous metals manufacturing. The additional calculation includes using the production normalized flow (PNF) for the particular process (l/kg of production) from the technical development document and multiplying this number by the treatment effectiveness concentration (mg/l) for the pollutant parameter and the treatment technology. (See Table 5-6; lime, settle and filter for nonferrous metals.)

For example:

Battery Cracking:

PNF is 0.673 l/kg of lead scrap produced (from nonferrous metals manufacturing technical development document).
Treatment effectiveness concentrations for copper are:
1.28 mg/l for the one day maximum and 0.61 mg/l for the monthly average.

One day maximum mass limit for copper is:
(0.673 l/kg x 1.28 mg/l) x 30,000 kg/day
0.861 mg/kg x 30,000 kg/day = 25,830 mg/day

TABLE 5-6. SUMMARY OF TREATMENT EFFECTIVENESS (mg/l) FOR THE NONFERROUS METALS MANUFACTURING REGULATION

Pollutant Parameter	L & S Technology System				L S & F Technology System				Sulfide & Filter Technology System			
	Mean	One-Day Max	10-Day Avg	30-Day Avg	Mean	One-Day Max	10-Day Avg	30-Day Avg	Mean	One-Day Max	10-Day Avg	30-Day Avg
114 Sb	.70	2.87	1.28	1.14	.47	1.93	.86	.76				
115 As	.51	2.09	.93	.83	.34	1.39	.62	.55				
117 Be	.30	1.23	.55	.49	.20	.82	.37	.32				
118 Cd	.08	.34	.15	.13	.05	.20	.08	.08	.01	.04	.02	.02
119 Cr	.08	.44	.18	.12	.07	.37	.15	.10	.08	.21	.09	.08
120 Cu	.58	1.90	1.00	.73	.39	1.28	.61	.49	.05	.21	.09	.08
121 Cn	.07	.29	.12	.11	.05	.20	.08	.08				
122 Pb	.12	.42	.20	.16	.08	.28	.13	.11	.01	.04	.02	.02
123 Hg	.06	.25	.10	.10	.04	.15	.06	.06	.03	.13	.06	.05
124 Ni	.74	1.92	1.27	1.00	.22	.55	.37	.29	.05	.21	.09	.08
125 Se	.30	1.23	.55	.49	.20	.82	.37	.33				
126 Ag	.10	.41	.17	.16	.07	.29	.12	.10	.05	.21	.09	.08
127 Tl	.50	2.05	.91	.81	.34	1.40	.61	.55				
128 Zn	.33	1.46	.61	.45	.23	1.02	.42	.31	.01	.04	.02	.02
Al	2.24	6.43	3.20	2.52	1.49	6.11	2.71	2.41				
Co	.05	.21	.09	.08	.03	.14	.07	.06				
F	14.50	35.00	19.90		14.50	35.00	19.90					
Fe	.41	1.20	.61	.50	.28	1.20	.61	.50				
Mn	.16	.68	.29	.21	.14	.30	.23	.19				
P	4.08	16.70	6.83	6.60	2.72	11.20	4.60	4.40				
O&G		20.00	12.00	10.00		10.00	10.00	10.00				
TSS	12.00	41.00	19.50	15.50	2.60	15.00	12.00	10.00				
Ammonia	32.20	133.30	58.60	52.10	32.20	133.30	58.60	52.10				
Barium	.42	5.55	2.54	NC	.28	1.15	.51	NC				
Boron	.36	1.84	.84	NC	.36	1.84	.84	NC				
Cesium	.12	.51	.23	NC	.12	.51	.23	NC				
Gallium	.08	.44	.18	.12	.07	.37	.15	.10				
Germanium	.08	.44	.18	.12	.07	.37	.15	.10				
Gold	**	*.10	**	**	**	*.10	**	**				
Hafnium	7.28	28.80	13.90	NC	4.81	19.70	9.01	NC				
Indium	.08	.44	.18	.12	.07	.37	.15	.10				
Molybdenum	1.83	6.61	3.42	NC	1.23	5.03	2.23	NC				
Palladium	**	*.10	**	**	**	*.10	**	**				
Platinum	**	*.10	**	**	**	*.10	**	**				
Radium***	6.17	30.00	11.23	10.00	4.13	20.00	7.25	6.67				
Rhenium	1.83	6.61	3.42	NC	1.23	5.03	2.23	NC				
Rubidium	.12	.51	.23	NC	.12	.51	.23	NC				
Tantalum	**	*.45	**	**	**	*.45	**	**				
Tin	.14	.38	.22	**	.14	.38	.22	**				
Titanium	.19	.94	.41	NC	.13	.53	.23	NC				
Tungsten	1.29	6.96	2.78	NC	.85	3.48	1.55	NC				
Uranium	4.00	6.50	4.73	NC	2.67	4.29	3.12	NC				
Vanadium	**	*.10	**	**	**	*.10	**	**				
Zirconium	7.28	28.80	13.90	NC	4.81	19.70	9.01	NC				

07/03/86

NC Not Calculated
*Limits of Detection
**None Established
***Isotope 226, Values in picocuries per liter

REFERENCES

Battery Manufacturing	Federal Register Notice And Documents	
Final Rule Promulgated	3/9/84	49 FR 9108
Correction Notice	4/9/84	49 FR 13879
Correction Notice	7/9/84	49 FR 27946
Proposed Amendment	1/28/86	51 FR 3477
Final Amendments Promulgated	8/28/86	51 FR 30814
Development Document for Effluent Limitations Guidelines and Standards for Battery Manufacturing Volume I and Volume II	9/84	EPA 440/1-84/067 Vol I NTIS #PB 85121507 Vol II NTIS #PB 85121515

Nonferrous Metals Manufacturing		
Final Rule (Phase I) Promulgated	03/08/84	49 FR 8742
Final Rule Correction	07/24/84	49 FR 29792
Final Rule Correction	07/28/85	50 FR 12252
Final Rule (Phase II) Promulgated	09/20/85	50 FR 38276

Metal Finishing		
Final Rule Promulgated	07/15/83	48 FR 32485

General Pretreatment Regulations		
40 CFR Part 403	01/28/81	46 FR 9404
40 CFR Part 403	05/17/84	49 FR 21037
40 CFR Part 403	07/10/84	49 FR 28058
40 CFR Part 403	08/03/84	49 FR 31212
40 CFR Part 403	09/25/85	50 FR 38809
40 CFR Part 403	06/04/86	51 FR 20426
40 CFR Part 403	07/01/86	51 FR 23759
40 CFR Part 403	10/09/86	51 FR 36368
40 CFR Part 403	01/14/87	52 FR 1586

REFERENCE FOR SHOWER FLOW, SECTION 2.6

Metcalf and Eddy, Inc., "Wastewater Engineering: Treatment, Disposal, Reuse." McGraw-Hill, Inc., N.Y., Page 17 (1979).

U.S. EPA, "Design Manual-Onsite Wastewater Treatment and Disposal Systems." EPA 625/1-80-012, Pages 54, 80 (October 1980).

GUIDANCE MANUALS

Guidance Manual for POTW Pretreatment Program Development	October 1983
Procedures Manual for Reviewing a POTW Pretreatment Pretreatment Program	October 1983
Guidance Manual for the Use of Production-Based Pretreatment Standards and the Combined Wastestream Formula	September 1985
Pretreatment Implementation Review Task Force (PIRT) Final Report	January 1985
Guidance Manual for Implementing Total Toxic Organics (TTO) Pretreatment Standards	September 1985
RCRA Information on Hazardous Wastes for Publicly Owned Treatment Works	September 1985
Guidance Manual Preparing and Reviewing Removal Credits Applications	September 1985
Compliance Monitoring and Enforcement Guidance	July 1986
PRELIM 3.0: EPA Computer Model for Development of Local Limits (user manual and computer disk for use on an IBM compatible microcomputer)	September 1986
Guidance Manual for Electroplating and Metal Finishing Pretreatment Standards	February 1984

Copies of the technical and economic documents may be obtained from the USEPA, Industrial Technology Division (WH-552), Washington, DC, (202) 382-7126, or from the National Technical Information Services (NTIS), Springfield, VA 22161, (703) 487-4650. Pretreatment Program Manuals may be obtained from USEPA, Permits Division (EN-336), Washington, D.C. 20460, 202-475-9526.

APPENDIX A

GLOSSARY OF TERMS

GLOSSARY OF TERMS

Active Material - Electrode material that reacts chemically to produce electrical energy when a cell discharges. Also, such material in its original composition, as applied to make an electrode.

Amalgamation - (1) Alloying a zinc anode with mercury to prevent internal corrosion and resultant gassing in a cell. (2) Treatment of wastewater by passing it through a bed of metal particles to alloy and thereby remove mercury from the water.

Anode - The electrode by which electrons leave a cell. The negative electrode in a cell during discharge.

Battery - A device that transforms chemical energy into electrical energy. This term usually applies to two or more cells connected in series, parallel or a combination of both. Common usage has blurred the distinction between the terms "cell" and "battery" and frequently the term battery is applied to any finished entity sold as a single unit, whether it contains one cell, as do most flashlight batteries, or several cells, as do automotive batteries.

Cathode - The electrode by which electrons enter a cell. The positive electrode in a cell during discharge.

Cell - The basic building block of a battery. It is an electrochemical device consisting of an anode and a cathode in a common electrolyte kept apart with a separator. This assembly may be used in its own container as a single cell battery or be combined and interconnected with other cells in a container to form a multicelled battery.

Charge - The conversion of electrical energy into chemical energy within a cell-battery. This restoration of active electronic materials is done by forcing a current through the cell-battery in the opposite direction to that during discharge. See "Formation."

Chemical Precipitation - The use of an alkaline chemical to remove dissolved metals from wastewater.

Closed Formation - Formation of lead battery plates done with the plates already in the battery case.

Countercurrent Cascade Rinsing - A method of rinsing or washing using a segmented tank system in which water flows from one tank segment to the next counter to the direction of movement of the material being washed.

Current Collector - The grid portion of the electrode which conducts the current to the terminal.

Depolarizer - A term often used to denote the cathode active material.

Dry Charge Process - A process for the manufacture of lead acid storage batteries in which the plates are charged by electrolysis in sulfuric acid, rinsed, and drained or dried prior to shipment of the battery. Charging of the plates usually occurs in separate containers before assembly of the battery but may be accomplished in the battery case. Batteries produced by the dry-charge process are shipped without acid electrolyte. Also referred to as dehydrated plate or dehydrated batteries.

Electrode - The positive (cathode) or negative (anode) element in a cell or battery, that enables it to provide electric power.

Electrodeposition - Electrochemical deposition of an active material from solution onto an electrode grid or plaque.

Electroforming - See (1) Electrodeposition, and (2) Formation.

Electrolyte - The liquid or material that permits conduction of ions between cell electrodes.

Electrolytic Precipitation - Generally refers to making powdered active material by electrodeposition and physical removal; e.g., silver powder from silver bars.

Electroplating - (1) Electrodeposition of a metal or alloy from a suitable electrolyte solution; the article to be plated is connected as the cathode in the electrolyte solution; direct current is introducted though the anode which consists of the metal to be deposited. (2) The Electroplating Point Source Category.

Element - A combination of negative and positive plates and separators to make a cell in a lead-acid storage battery.

End-of-Pipe Treatment - The reduction or removal of pollutants by treatment just prior to actual discharge to a point outside an industrial plant.

Filtration - Removal of solid particles from liquid or particles from air or gas stream through a permeable membrane or deep bed. The filter types include: gravity, pressure, microstraining, ultrafiltation, reverse osmosis (hyperfiltration).

Formation - An electrochemical process which converts the battery electrode material into the desired chemical condition. For example, in a silver-zinc battery the silver applied to the cathode is converted to silver oxide and the zinc oxide applied to the anode is converted to elemental zinc. "Formation" is generally used interchangeable with "charging", although it may involve a repeated charge-discharge cycle.

Grid - The support for the active materials and a means to conduct current from the active materials to the cell terminals; usually a metal screen, expanded metal mesh, or a perforated metal plate.

Impregnation - Method of making an electrode by precipitating active material on a sintered nickel plaque.

In-Process Control Technology - The regulation and conservation of chemicals and rinse water throughout the operations as opposed to end-of-pipe treatment.

Open Formation - Formation of lead battery plates done with the plates in open tanks of sulfuric acid. Following formation plates are placed in the battery cases.

Paste - Powdered active material mixed with a liquid to form a paste to facilitate application to a grid to make an electrode.

Plaque - A porous body of sintered metal on a metal grid used as a current collector and holder of electrode active materials, especially for nickel-cadmium batteries.

Plate - A positive or negative electrode used in a bettery, generally consisting of active material deposited on or in a current-collecting support.

Pressure Filtration - The process of solid-liquid phase separation effected by forcing the more permeable liquid phase through a mesh which is impenetrable to the solid phase.

Recycled Water - Process wastewater or treatment facility effluent which is recirculated to the same process.

Reserve Cell - A class of cells which are designated as "reserve", because they are supplied to the user in a non-activated state. Typical of this class of cell is the carbon-zinc air reserve cell, which is produced with all the components in a dry or non-activated state, and is activated with water when it is ready to be used.

Reused Water - Process wastewater or treatment facility effluent which is further used in a different manufacturing process. For example, the reuse of process wash water as noncontact cooling water.

Sedimentation - The gravity induced deposition of suspended matter carried by water, wastewater, or other liquids, by gravity. It is usually accomplished by reducing the velocity of the suspended material. Also called settling.

Separator - A porous material, in a battery system, used to keep plates of opposite polarity separated, yet allowing conduction of ions through the electrolyte.

Sinter - Heating a metal powder such as nickel to an elevated temperature below its melting point which causes it to agglomerate and adhere to the supporting grid.

Sintered-plate Electrode - The electrode formed by sintering metallic powders to form a porous structure, which serves as a current collector, and on which the active electrode material is deposited.

Storage Battery - A battery that can store chemical energy with the potential to change to electricity. This conversion of chemical energy to electricity can be reversed thus allowing the battery to be recharged.

Wet Charge Process - A process for the manufacture of lead acid storage batteries in which the plates are formed by electrolysis in sulfuric acid. The plate forming process is usually done with the plates inside the assembled battery case but may be done with the plates in open tanks. In the case of large industrial wet lead acid batteries, problems in formation associated with inhomogeneities in the large plates are alleviated by open tank formation. Wet charge process batteries are shipped with acid electrolyte inside the battery casing.

Wet Scrubber - A unit in which dust and fumes are removed from an air or gas stream to a liquid. Gas-liquid contact is promoted by jets, sprays, bubble chambers, etc.

APPENDIX B

PSES AND PSNS FOR BATTERY MANUFACTURING SUBCATEGORIES

TABLE B.1
PRETREATMENT STANDARDS FOR EXISTING
SOURCES FOR THE BATTERY
MANUFACTURING CATEGORY (40 CFR 461)

Subpart A: Cadmium	Pollutant	Daily Maximum	Maximum Monthly Avg.
1) Electrodeposited Anodes (mg/kg or lb/1,000,000 lb of cadmium)	Cadmium	11.95	5.27
	Nickel	67.49	44.64
	Zinc	51.32	21.44
	Cobalt	7.38	3.16
2) Impregnated Anodes (mg/kg or lb/1,000,000 lb of cadmium)	Cadmium	68.0	30.0
	Nickel	384.0	254.0
	Zinc	292.0	122.0
	Cobalt	42.0	18.0
3) Nickel Electro-deposited Cathodes (mg/kg or lb/1,000,000 lb of nickel applied)	Cadmium	11.22	4.95
	Nickel	63.36	41.91
	Zinc	48.18	20.13
	Cobalt	6.93	2.97
4) Nickel Impregnated Cathodes (mg/kg or lb/1,000,000 lb of nickel applied)	Cadmium	68.0	30.0
	Nickel	384.0	254.0
	Zinc	292.0	122.0
	Cobalt	42.0	18.0
5) Miscellaneous Wastewater Streams (1) (mg/kg or lb/1,000,000 lb of cells produced)	Cadmium	0.79	0.35
	Nickel	4.47	2.96
	Zinc	3.40	1.42
	Cobalt	0.49	0.21
6) Cadmium Powder Production (mg/kg or lb/1,000,000 lb of cadmium powder produced)	Cadmium	2.23	0.99
	Nickel	12.61	8.34
	Zinc	9.59	4.01
	Cobalt	1.38	0.59
7) Silver Powder Production (mg/kg or lb/1,000,000 lb of silver powder produced)	Cadmium	1.09	0.48
	Nickel	6.16	4.08
	Silver	1.32	0.55
	Zinc	4.69	1.96
	Cobalt	0.67	0.29
8) Cadmium Hydroxide Production (mg/kg or lb/1,000,000 lb of cadmium used)	Cadmium	0.05	0.02
	Nickel	0.27	0.18
	Zinc	0.20	0.09
	Cobalt	0.03	0.012

TABLE B.1
PRETREATMENT STANDARDS FOR EXISTING
SOURCES FOR THE BATTERY
MANUFACTURING CATEGORY (40 CFR 461) (continued)

Subpart A: Cadmium (cont'd)	Pollutant	Daily Maximum	Maximum Monthly Avg
9) Nickel Hydroxide Production (mg/kg or lb/1,000,000 lb of nickel used)	Cadmium	5.61	2.48
	Nickel	31.68	20.96
	Zinc	24.09	10.07
	Cobalt	3.47	1.49
Subpart C: Lead			
1) Open Formation-Dehydrated (mg/kg or lb/1,000,000 lb of lead used)	Copper	3.19	1.68
	Lead	0.71	0.34
2) Open Formation-Wet (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.100	0.053
	Lead	0.022	0.010
3) Plate Soak (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.039	0.021
	Lead	0.008	0.004
4) Battery Wash-Detergent (2) (mg/kg or lb/1,000,000 lb of lead used)	Copper	1.71	0.90
	Lead	0.38	0.18
5) Direct Chill Lead Casting (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.0004	0.0002
	Lead	0.00008	0.00004
6) Mold Release Formulation (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.011	0.006
	Lead	0.002	0.001
7) Truck Wash (mg/kg or lb/1,000,000 lb of lead in trucked batteries)	Copper	0.026	0.014
	Lead	0.005	0.002
8) Laundry (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.21	0.11
	Lead	0.05	0.02

TABLE B.1
PRETREATMENT STANDARDS FOR EXISTING
SOURCES FOR THE BATTERY
MANUFACTURING CATEGORY (40 CFR 461) (continued)

Subpart C: Lead (cont'd)	Pollutant	Daily Maximum	Maximum Monthly Avg
9) Miscellaneous Wastewater Streams (3) (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.58	0.31
	Lead	0.13	0.06
Subpart D: Leclanche			
1) Foliar Battery Misc. Wash (mg/kg or lb/1,000,000 lb of cells produced)	Mercury	0.010	0.004
	Zinc	0.067	0.030
	Manganese	0.019	0.015
Subpart F: Magnesium			
1) Silver Chloride Cathodes- Chemically Reduced (mg/kg or lb/1,000,000 lb of silver processed)	Lead	1,032.36	491.60
	Silver	1,007.78	417.86
2) Silver Chloride Cathodes- Electrolytic (mg/kg or lb/1,000,000 lb of silver processed)	Lead	60.9	29.0
	Silver	59.5	24.7
3) Cell Testing (mg/kg or lb/1,000,000 lb of cells produced)	Lead	22.1	10.5
	Silver	21.6	8.9
4) Floor and Equipment Wash (mg/kg or lb/1,000,000 lb of cells produced)	Lead	0.039	0.018
	Silver	0.038	0.015
Subpart G: Zinc			
1) Wet Amalgamated Powder Anode (mg/kg or lb/1,000,000 lb of zinc)	Chromium	0.24	0.099
	Mercury	0.14	0.055
	Silver	0.23	0.093
	Zinc	0.80	0.34
	Manganese	0.37	0.16

TABLE B.1
PRETREATMENT STANDARDS FOR EXISTING
SOURCES FOR THE BATTERY
MANUFACTURING CATEGORY (40 CFR 461) (continued)

Subpart G: Zinc (cont'd)	Pollutant	Daily Maximum	Maximum Monthly Avg
2) Gelled Amalgam Anodes (mg/kg or lb/1,000,000 lb of zinc)	Chromium	0.030	0.012
	Mercury	0.017	0.006
	Silver	0.028	0.012
	Zinc	0.099	0.042
	Manganese	0.046	0.020
3) Zinc Oxide Formed Anodes (mg/kg or lb/1,000,000 lb of zinc)	Chromium	9.53	3.90
	Mercury	5.42	2.17
	Silver	8.89	3.68
	Zinc	31.64	13.22
	Manganese	14.74	6.28
4) Electrodeposited Anodes (mg/kg or lb/1,000,000 lb of zinc deposited)	Chromium	94.47	38.65
	Mercury	53.68	21.47
	Silver	86.03	36.50
	Zinc	313.46	130.97
	Manganese	146.00	62.26
5) Silver Powder Formed Cathodes (mg/kg or lb/1,000,000 lb of silver applied)	Chromium	13.07	5.35
	Mercury	7.43	2.97
	Silver	12.18	5.05
	Zinc	43.36	18.12
	Manganese	20.20	8.61
6) Silver Oxide Powder Formed Cathodes (mg/kg or lb/1,000,000 lb of silver applied)	Chromium	8.73	3.57
	Mercury	4.96	1.99
	Silver	8.14	3.37
	Zinc	28.98	12.11
	Manganese	13.50	5.76
7) Silver Peroxide Cathodes (mg/kg or lb/1,000,000 lb of silver applied)	Chromium	2.09	0.87
	Mercury	1.19	0.48
	Silver	1.95	0.81
	Zinc	6.95	2.90
	Manganese	3.24	1.38
8) Nickel Impregnated Cathodes (mg/kg or lb/1,000,000 lb of nickel applied)	Chromium	88.0	36.0
	Mercury	50.0	20.0
	Nickel	384.0	254.0
	Silver	82.0	34.0
	Zinc	292.0	122.0
	Manganese	136.0	58.0

TABLE B.1
PRETREATMENT STANDARDS FOR EXISTING
SOURCES FOR THE BATTERY
MANUFACTURING CATEGORY (40 CFR 461) (continued)

Subpart G: Zinc (cont'd)	Pollutant	Daily Maximum	Maximum Monthly Avg
9) Miscellaneous Wastewater Streams (4) (mg/kg or lb/1,000,000 lb of cells produced)	Chromium	0.57	0.23
	Cyanide	0.38	0.16
	Mercury	0.32	0.13
	Nickel	2.48	1.64
	Silver	0.53	0.22
	Zinc	1.88	0.79
	Manganese	0.88	0.37
10) Silver Etch (mg/kg or lb/1,000,000 lb of silver processed)	Chromium	3.27	1.34
	Mercury	1.86	0.74
	Silver	3.05	1.26
	Zinc	10.86	4.54
	Manganese	5.06	2.16
11) Silver Peroxide Production (mg/kg or lb/1,000,000 lb of silver in silver peroxide produced)	Chromium	3.48	1.42
	Mercury	1.96	0.79
	Silver	3.24	1.34
	Zinc	11.55	4.83
	Manganese	5.38	2.29
12) Silver Powder Production (mg/kg or lb/1,000,000 lb of silver powder produced)	Chromium	1.41	0.58
	Mercury	0.80	0.32
	Silver	1.32	0.55
	Zinc	4.69	1.96
	Manganese	2.18	0.93

(1) Includes discharges from cell wash, electrolyte preparation, floor and equipment wash, and employee wash.

(2) Numbers reflect amendment as a result of a settlement agreement between EPA and lead battery manufacturers.

(3) Includes discharges from floor wash, wet air pollution control, battery repair, laboratory, hand wash, and respirator wash.

(4) Includes discharges from cell wash, electrolyte preparation, employee wash, reject cell handling, and floor and equipment wash.

TABLE B.2
PRETREATMENT STANDARDS FOR NEW SOURCES
FOR THE BATTERY MANUFACTURING
CATEGORY (40 CFR 461)

Subpart A: Cadmium	Pollutant	Daily Maximum	Maximum Monthly Avg
1) Electrodeposited Anodes (mg/kg or lb/1,000,000 lb of cadmium)	Cadmium	7.03	2.81
	Nickel	19.33	13.01
	Zinc	35.85	14.76
	Cobalt	4.92	2.46
2) Impregnated Anodes (mg/kg or lb/1,000,000 lb of cadmium)	Cadmium	40.0	16.0
	Nickel	110.0	74.0
	Zinc	204.0	84.0
	Cobalt	28.0	14.0
3) Nickel Electro-deposited Cathodes (mg/kg or lb/1,000,000 lb of nickel applied)	Cadmium	6.60	2.64
	Nickel	18.15	12.21
	Zinc	33.66	13.86
	Cobalt	4.62	2.31
4) Nickel Impregnated Cathodes (mg/kg or lb/1,000,000 lb of nickel applied)	Cadmium	40.0	16.0
	Nickel	110.0	74.0
	Zinc	204.0	84.0
	Cobalt	28.0	14.0
5) Miscellaneous Wastewater Streams (1) (mg/kg or lb/1,000,000 lb of cells produced)	Cadmium	0.47	0.19
	Nickel	1.28	0.86
	Zinc	2.38	0.98
	Cobalt	0.33	0.16
6) Cadmium Powder Production (mg/kg or lb/1,000,000 lb of cadmium powder produced)	Cadmium	1.31	0.53
	Nickel	3.61	2.43
	Zinc	6.70	2.76
	Cobalt	0.92	0.46
7) Silver Powder Production (mg/kg or lb/1,000,000 lb of silver powder produced)	Cadmium	0.64	0.26
	Nickel	1.77	1.19
	Silver	0.93	0.39
	Zinc	3.27	1.35
	Cobalt	0.45	0.22
8) Cadmium Hydroxide Production (mg/kg or lb/1,000,000 lb of cadmium used)	Cadmium	0.028	0.011
	Nickel	0.077	0.051
	Zinc	0.142	0.058
	Cobalt	0.019	0.009

TABLE B.2
PRETREATMENT STANDARDS FOR NEW SOURCES
FOR THE BATTERY MANUFACTURING
CATEGORY (40 CFR 461) (continued)

Subpart A: Cadmium (cont'd)	Pollutant	Daily Maximum	Maximum Monthly Avg
9) Nickel Hydroxide Production (mg/kg or lb/1,000,000 lb of nickel used)	Cadmium	3.30	1.32
	Nickel	9.08	6.11
	Zinc	16.83	6.93
	Cobalt	2.31	1.16
Subpart B: Calcium			
There shall be no discharge for process wastewater pollutants from any battery manufacturing operations in the calcium subcategory.			
Subpart C: Lead			
1) Open Formation-Dehydrated (mg/kg or lb/1,000,000 lb of lead used)	Copper	2.15	1.02
	Lead	0.47	0.21
2) Open Formation-Wet (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.067	0.032
	Lead	0.014	0.006
3) Plate Soak (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.026	0.012
	Lead	0.005	0.002
4) Battery Wash-Detergent (2) (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.576	0.274
	Lead	0.126	0.058
5) Direct Chill Lead Casting (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.000256	0.00012
	Lead	0.000056	0.00002
6) Mold Release Formulation (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.007	0.0037
	Lead	0.0017	0.0008
7) Truck Wash (mg/kg or lb/1,000,000 lb of lead in trucked batteries)	Copper	0.006	0.003
	Lead	0.001	0.0007
8) Laundry (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.14	0.07
	Lead	0.03	0.01

TABLE B.2
PRETREATMENT STANDARDS FOR NEW SOURCES
FOR THE BATTERY MANUFACTURING
CATEGORY (40 CFR 461) (continued)

Subpart C: Lead (cont'd)	Pollutant	Daily Maximum	Maximum Monthly Avg
9) Miscellaneous Wastewater Streams (3) (mg/kg or lb/1,000,000 lb of lead used)	Copper	0.39	0.19
	Lead	0.085	0.039
Subpart D: Leclanche			
1) Foliar Battery Misc. Wash (mg/kg or lb/1,000,000 lb of cells produced)	Mercury	0.010	0.004
	Zinc	0.067	0.030
	Manganese	0.019	0.015
Subpart E: Lithium			
1) Lead Iodide Cathodes (mg/kg or lb/1,000,000 lb of lead)	Chromium	23.34	9.46
	Lead	17.66	8.20
2) Iron Disulfide Cathodes (mg/kg or lb/1,000,000 lb of iron disulfide)	Chromium	2.79	1.13
	Lead	2.11	0.98
3) Miscellaneous Wastewater Streams (4) (mg/kg or lb/1,000,000 lb of cells produced)	Chromium	0.039	0.016
	Lead	0.030	0.014
Subpart F: Magnesium			
1) Silver Chloride Cathodes- Chemically Reduced (mg/kg or lb/1,000,000 lb of silver processed)	Lead	22.93	10.65
	Silver	23.75	9.83

TABLE B.2
PRETREATMENT STANDARDS FOR NEW SOURCES
FOR THE BATTERY MANUFACTURING
CATEGORY (40 CFR 461) (continued)

Subpart F: Magnesium (cont'd)	Pollutant	Daily Maximum	Maximum Monthly Avg
2) Silver Chloride Cathodes-Electrolytic (mg/kg or lb/1,000,000 lb of silver processed)	Lead	40.6	18.9
	Silver	42.1	17.4
3) Cell Testing (mg/kg or lb/1,000,000 lb of cells produced)	Lead	19.5	7.89
	Silver	15.3	6.31
4) Floor and Equipment Wash (mg/kg or lb/1,000,000 lb of cells produced)	Lead	0.026	0.012
	Silver	0.027	0.011
Subpart G: Zinc			
1) Zinc Oxide Formed Anodes (mg/kg or lb/1,000,000 lb of zinc)	Chromium	4.55	1.97
	Mercury	2.82	1.19
	Silver	4.55	1.97
	Zinc	0.87	0.39
	Manganese	6.50	4.98
2) Electrodeposited Anodes (mg/kg or lb/1,000,000 lb of zinc deposited)	Chromium	45.09	19.54
	Mercury	27.91	11.81
	Silver	45.09	19.54
	Zinc	8.59	3.86
	Manganese	64.41	49.38
3) Silver Powder Formed Cathodes (mg/kg or lb/1,000,000 lb of silver applied)	Chromium	6.24	2.70
	Mercury	3.86	1.63
	Silver	6.24	2.70
	Zinc	1.19	0.53
	Manganese	8.91	6.83
4) Silver Oxide Powder Formed Cathodes (mg/kg or lb/1,000,000 lb silver applied)	Chromium	4.17	1.81
	Mercury	2.58	1.09
	Silver	4.17	1.81
	Zinc	0.79	0.36
	Manganese	5.96	4.57

TABLE B.2
PRETREATMENT STANDARDS FOR NEW SOURCES
FOR THE BATTERY MANUFACTURING
CATEGORY (40 CFR 461) (continued)

Subpart G: Zinc (cont'd)	Pollutant	Daily Maximum	Maximum Monthly Avg
5) Silver Peroxide Cathodes (mg/kg or lb/1,000,000 lb of silver applied)	Chromium	1.00	0.43
	Mercury	0.62	0.26
	Silver	1.00	0.43
	Zinc	0.19	0.09
	Manganese	1.43	1.09
6) Nickel Impregnated Cathodes (mg/kg or lb/1,000,000 lb of nickel applied)	Chromium	42.0	18.2
	Mercury	26.0	11.0
	Nickel	42.0	18.2
	Silver	42.0	18.2
	Zinc	8.0	3.6
	Manganese	60.0	46.0
7) Miscellaneous Wastewater Streams (5) (mg/kg or lb/1,000,000 lb of cells produced)	Chromium	0.27	0.12
	Cyanide	0.039	0.016
	Mercury	0.17	0.07
	Nickel	0.27	0.12
	Silver	0.27	0.12
	Zinc	0.05	0.02
	Manganese	0.39	0.30
8) Silver Etch (mg/kg or lb/1,000,000 lb of silver processed)	Chromium	1.56	0.68
	Mercury	0.97	0.41
	Silver	1.56	0.68
	Zinc	0.30	0.13
	Manganese	2.23	1.71
9) Silver Peroxide Production (mg/kg or lb/1,000,000 lb of silver in silver peroxide produced)	Chromium	1.66	0.72
	Mercury	1.03	0.44
	Silver	1.66	0.72
	Zinc	0.32	0.14
	Manganese	2.37	1.82
10) Silver Powder Production (mg/kg or lb/1,000,000 lb of silver powder produced)	Chromium	0.67	0.29
	Mercury	0.42	0.18
	Silver	0.67	0.29
	Zinc	0.13	0.06
	Manganese	0.96	0.74

TABLE B.2
PRETREATMENT STANDARDS FOR NEW SOURCES
FOR THE BATTERY MANUFACTURING
CATEGORY (40 CFR 461) (continued)

(1) Includes discharges from cell wash, electrolyte preparations, floor and equipment wash, and employee wash.

(2) Numbers reflect amendment as a result of a settlement agreement between EPA and lead battery manufacturers.

(3) Includes discharges from floor wash, wet air pollution control, battery repair, laboratory, hand wash, and respirator wash.

(4) Includes discharges from floor and equipment wash, cell testing and lithium scrap disposal.

(5) Includes discharges from cell wash, electrolyte preparation, employee wash, reject cell handling, and floor and equipment wash.

APPENDIX C

EPA AND STATE PRETREATMENT COORDINATORS

APPENDIX C

PRETREATMENT COORDINATORS
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Region	Contact	Phone Numbers
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2	Mr. George Meyer Mr. Pat Durak U.S. EPA Region 2 26 Federal Plaza Room 845A New York, NY 10278	(212) 264-2676 (212) 264-9878
3	Ms. Charlene Harrison (Permits)(3WM-51) Mr. John Lovell (Enforcement)(3WM-52) U.S. EPA Region 3 841 Chestnut Building Philadelphia, PA 19107	(215) 597-9406 (215) 597-6279
4	Mr. Albert Herndon Water Management Division Facilities Performance Branch U.S. EPA Region 4 345 Courtland Street, N.E. Atlanta, GA 30365	(404) 347-2211
5	Mr. Dave Rankin (Permits)(WQP-TUB-8) Mr. Gary Amendola (WQC-TUB-8) U.S. EPA (Enforcement) Region 5 230 S. Dearborn Street Chicago, IL 60604 ALL FEDERAL EXPRESS 111 W. Jackson St. 8th Floor Chicago, IL 60604	(312) 886-6111 (312) 353-2105

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7	Mr. Lee Duvall (WACM) U.S. EPA Region 7 726 Minnesota Avenue Kansas City, KS 66101	(913) 236-2817
8	Mr. Marshall Fischer (8WM-C) Ms. Dana Allen U.S. EPA Region 8 1 Denver Place 999 18th St., Suite 500 Denver, CO 80202-2405	(303) 293-1592 (303) 293-1593
9	Mr. Keith Silva (Permits)(W-5-1) Ms. Christine Wright-Shacklett U.S. EPA (Enforcement)(W-5) Region 9 215 Fremont Street San Francisco, CA 94105	(415) 974-8298 (415) 974-8311
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