PRELIMINARY INDUSTRY CHARACTERIZATION: MISCELLANEOUS METAL PARTS & PRODUCTS SURFACE COATING SOURCE CATEGORY

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September 30, 1998

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I. OVERVIEW OF THE DEVELOPMENT OF MACT STANDARDS

Under Section 112(d) of the Clean Air Act (the Act), the U.S. Environmental Protection Agency (EPA) is developing national emission standards for hazardous air pollutants (NESHAP) for the Miscellaneous Metal Parts and Products Surface Coating source category. The EPA is required to publish final emission standards for the Miscellaneous Metal Parts and Products source category by November 15, 2000. For this category, national volatile organic compound (VOC) rules or control techniques guidelines under Section 183(e) are being developed on a similar schedule.

The Act requires that the emission standards for new sources be no less stringent than the emission control achieved in practice by the best controlled similar source. For existing sources, the emission control can be less stringent than the emission control for new sources, but it must be no less stringent than the average emission limitation achieved by the best performing 12 percent of existing sources (for which the EPA has emissions information). In categories or subcategories with fewer than 30 sources, emission control for existing sources must be no less stringent than the average emission limitation achieved by the best performing 5 sources. The NESHAP are commonly known as maximum achievable control technology (MACT) standards.

The MACT standards development for the Miscellaneous Metal Parts and Products industry began with a Coating Regulations Workshop for representatives of EPA and interested stakeholders in April 1997 and continues as a coordinated effort to promote consistency and joint resolution of issues common across nine coating source categories.[1] The first phase was one in which EPA gathered readily available information about the industry with the help of representatives from the regulated industry, State and local air pollution agencies, small business assistance providers, and environmental groups. The goals of the first phase were to either fully or partially:

- Understand the coating process;
- Identify typical emission points and the relative emissions from each coating process;
- Identify the range(s) of emission reduction techniques and their effectiveness;
- Make an initial determination on the scope of each category;
- Determine the relationships and overlaps of the categories;
- Locate as many facilities as possible, particularly major sources;
- Identify and involve representatives for each industry segment;
- Complete informational site visits;

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[1] The workshop covered eight categories: fabric printing, coating and dyeing; large appliances; metal can; metal coil; metal furniture; miscellaneous metal parts; plastic parts; and wood building products. The automobile and light-duty truck project was started subsequently.

- Identify issues and data needs and develop a plan for addressing them;
- Develop questionnaire(s) for additional data gathering; and
- Document results of the first phase of regulatory development for each category.

The industry associations that have been identified as representatives of miscellaneous metal parts and products surface coaters are listed in Table 1.

TABLE 1. MISCELLANEOUS METAL PARTS AND PRODUCTS INDUSTRY ASSOCIATIONS

Trade Association	Active Stakeholders
Adhesive and Sealant Council	X
Aerospace Industries Association	X
Air-Conditioning and Refrigeration Institute	
Air Transport Association	
Aluminum Association	
Aluminum Extruders Council	X
Aluminum Foil Container Manufacturers Association	
American Automobile Manufacturers Association	X
American Electroplaters and Surface Finishers Society	X
American Foundrymens Society	
American Gear Manufacturers Association	
American Institute for International Steel	
American Institute of Steel Construction	X
American Iron and Steel Institute	
American Railway Car Institute	X
Association of Container Reconditioners	X
Association of Home Appliance Manufacturers	
Association of International Automobile Manufacturers	X
Automotive Parts and Accessories Association	X
Chemical Manufacturers Association	X
Cookware Manufacturers Association	
Copper and Brass Fabricators Council	
Ductile Iron Pipe Research Association	X
Electronic Industries Association	X
Equipment Manufacturers Institute	
Federation of Societies for Coating Technology	
Hearth Products Association	X
Industrial Heating Equipment Association	
International Fabricators and Manufacturers Association	

TABLE 1. (Continued)

Trade Association	Active Stakeholders
Iron and Steel Society	
Metal Building Manufacturers Association	
Metal Construction Association	
Metal Finishing Association	X
Metal Finishing Suppliers' Association	
Metal Powder Industries Federation	
Motor Equipment Manufacturers Association	
National Association of Chain Manufacturers	
National Association of Manufacturers	
National Association of Metal Finishers	X
National Electrical Manufacturers Association	X
National Paint and Coatings Association	X
National Screw Machine Products Association	
Powder Coating Institute	X
Precision Machined Products Association	
Precision Metalforming Association	
Recreational Vehicle Industry Association	
Rubber Manufacturers Association	X
Society For Protective Coatings	X
Specialty Steel Industry of North America	
Spring Manufacturers Institute	
Steel Deck Institute	
Steel Founders Society of America	
Steel Joist Institute	X
Steel Manufacturers Association	
Steel Plate Fabricators Association	
Steel Shipping Container Institute	X
Steel Structures Painting Council	
Steel Tank Institute	
Steel Tube Institute	
Suppliers of Advance Composite Materials Association	
Tube and Pipe Association International	
Valve Manufacturers Association	
Wire Association International	

The States that have participated in the stakeholder process are California, Florida,

Illinois, Wisconsin, Oklahoma, North Carolina, Nebraska, West Virginia, New York, Georgia, Alabama, Louisiana, Tennessee, Virginia, and Kentucky. The Air Pollution Control District of Jefferson County (KY) and the Ventura County Air Pollution Control District (CA) have also participated. The U.S. EPA has been represented by EPA Regions 4, 7, and 9, the EPA Office of Air Quality Planning and Standards (EPA/OAQPS), and the EPA Office of Research and Development.

The information summarized in this document can be used by States that may have to make case-by-case MACT determinations under Sections 112(g) or 112(j) of the Act. The initial phase of the regulatory development focused primarily on characterizing the Miscellaneous Metal Parts and Products industry and collecting preliminary emission information from facilities applicable to the category. This document represents the conclusion of that phase of rule development.

This document includes a description of the emission control technologies, identified by EPA, that are currently used in practice by the industry and that could serve as the basis of MACT. Within the short time-frame intended for this initial phase, however, only limited data were collected. The information summarized in this memorandum was collected prior to July 1, 1998. Additional information will be collected and considered before the Miscellaneous Metal Parts and Products standards are promulgated.

During the next phase, EPA will continue to build on the knowledge gained to date and proceed with more focused investigation and data analyses. We will also continue our efforts to coordinate cross-cutting issues. We will continue to identify technical and policy issues that need to be addressed in the rule making and enlist the help of the stakeholders in resolving those issues.

Questions or comments on this memorandum should be directed to Bruce Moore (EPA/OAQPS) at 919-541-5460 or at moore.bruce@epamail.epa.gov.

II. SUMMARY OF DATA SOURCES AND NEXT STEPS

Data sources considered in this analysis of the MMPP surface coating source category included:

- EPA's Source Test Information Retrieval System (STIRS) database (which includes test reports from facilities nationwide);
- EPA's Toxic Reporting Inventory (TRI) database;
- EPA's Aerometric Information Retrieval System (AIRS), which includes emission inventory data nationwide;
- Data from individual States which was specifically requested for use in this and the other 10-year MACT surface coating projects;
- Data provided by facilities at which site visits were conducted (including Title V permit applications); and
- Input from State and industry stakeholders at Stakeholder meetings and Conference Calls (Attachment 1).

EPA also considered coating emission limits included in current regulations for sources similar to MMPP surface coating. During the course of this effort, the "Regulatory Subgroup", consisting of the EPA project team and EPA Regional and State/Local Agency representatives, convened to discuss the process and the potential approaches to identify data gaps.

This document provides summary information, including a summary of existing State and Federal rules pertaining to this source category, that may be useful in making a 112(g) determination (Attachment 2). Information obtained by the EPA from site visits (aluminum extruders, defense contractors, magnet wire facilities, large truck manufacturers, railcar manufacturers, curtain wall manufacturers, and NASA) and information provided by industry associations is included in the Industry Sector Profiles. Future site visits are planned to facilities that coat automobile parts, recreational vehicles, rubber-to-metal bonded parts, steel joists, and structural metal parts.

The development of the final MACT standard for MMPP surface coating will require the gathering of additional information specific to all segments represented within this source category. In addition to the information gathering techniques outlined above, data has been collected via a Screening Survey, which was sent to approximately 3,000 facilities in June 1998, and will be collected from a subsequent Detailed Questionnaire, which is planned to be distributed in October 1998. This information will be used to further characterize and understand the coating operations from the various industry segments included in this source category. The information will then be used to calculate a precise MACT floor, and will enable EPA to develop pollution prevention alternatives that are directly applicable to industries within the MMPP Surface Coating source category.

III. SOURCE CATEGORY OVERVIEW

Applicability

The MMPP Surface Coating source category encompasses all industries that coat metal parts and products, but are not subject to other surface coating regulations. The Miscellaneous Metal Parts and Products source category includes thousands of small, medium, and large size facilities that apply coatings to a metal substrate to produce a wide range of parts and products generally found under Standard Industrial Classification (SIC) codes 33 through 39 and others. Coating is defined as a protective, decorative, or functional film applied as a thin layer to a substrate or surface which cures to form a continuous solid film. This term applies to paints such as lacquers or enamels, but also is used to refer to films applied to paper, plastics, or foil. Adhesives and caulks are also being treated as coatings. In general, this source category is broad and includes all those metal parts and products that are not covered by another coating source category, including original equipment manufacturers (OEM) and refurbishment shops. Careful attention has been and will continue to be placed on the potential for overlaps between this and other source categories including the following:

- Aerospace Surface Coating
- Architectural and Industrial Maintenance Coatings (VOC)
- Automobile and Light-Duty Truck Surface Coating
- Boat Manufacturing
- Iron and Steel Foundry
- Large Appliance Surface Coating
- Metal Can Surface Coating
- Metal Coil Surface Coating
- Metal Furniture Surface Coating
- Paint Stripping
- Plastic Parts and Products Surface Coating
- Ship Building and Repair

Other operations associated with surface coating (e.g. cleaning, mixing, surface preparation, storage, waste handling, etc.) are also being considered for regulation at facilities in the MMPP Surface Coating source category.

Many of the problems associated with developing regulations for the MMPP Surface Coating source category have been related to the many possible overlapping categories, and the uncertainty of defining the universe of MMPP facilities. A condensed list of the SIC codes that are potentially useful in identifying MMPP facilities for analysis are shown in Table 2. A more detailed list of individual SIC codes, and the industry segments in this document that they cover, is presented in Attachment 3. As of January 1, 1997, a new numerical coding system for classifying industries has been implemented by the U.S. Department of Commerce. This new

system is called the North American Industrial Classification System (NAICS). The MMPP project team intends to use the NAICS codes as well as SIC codes in identifying potential facilities within this source category for analysis, although using NAICS/SIC codes alone does not identify whether individual sources within that industry perform surface coating.

TABLE 2. LIST OF SIC CODES FOR MISCELLANEOUS METAL PARTS AND PRODUCTS

Major Group 33 - Primary Metal Industries
331x Steel Works, Blast Furnaces, and Rolling and Finishing Mills
332x Iron and Steel Foundries
335x Rolling, Drawing, and Extruding of Nonferrous Metals
336x Nonferrous Foundries (Castings)
3399 Primary Metal Products, Not Elsewhere Classified

Major Group 34 - Fabricated Metal Products, Except Machinery and Transportation Equipment
3412 Metal Shipping Barrels, Drums, Kegs, and Pails
342x Cutlery, Handtools, and General Hardware
343x Heating Equipment, Except Electric and Warm Air; and Plumbing Fixtures
344x Fabricated Structural Metal Products
345x Screw Machine Products, and Bolts, Nuts, Screws, Rivets, and Washers
346x Metal Forgings and Stampings
347x Coating, Engraving, and Allied Services, Not Elsewhere Classified
348x Ordnance and Accessories, Except Vehicles and Guided Missiles
349x Miscellaneous Fabricated Metal Products

Major Group 35 - Industrial and Commercial Machinery and Computer Equipment
351x Engines and Turbines
352x Farm and Garden Machinery and Equipment
353x Construction Machinery and Equipment
354x Metalworking Machinery and Equipment
355x Special Industry Machinery, Except Metalworking Machinery
356x General Industrial Machinery and Equipment
357x Computer and Office Equipment
358x Refrigeration and Service Industry Machinery
359x Miscellaneous Industrial and Commercial Machinery and Equipment

Major Group 36 - Electronic and Other Electrical Equipment and Components, Except Computer Equipment
361x Electric Transmission and Distribution Equipment
362x Electrical Industrial Apparatus

TABLE 2. LIST OF SIC CODES FOR MISCELLANEOUS METAL PARTS AND PRODUCTS (Continued)

3631 Household Cooking Equipment
3634 Electric Housewares and Fans
3635 Household Vacuum Cleaners
3639 Household Appliances, Not Elsewhere Classified
364x Electric Lighting and Wiring Equipment
3651 Household Audio and Video Equipment
366x Communications Equipment
367x Electronic Components and Accessories
369x Miscellaneous Electrical Machinery, Equipment, and Supplies

Major Group 37 - Transportation Equipment
371x Motor Vehicles and Motor Vehicle Equipment
3724 Aircraft Engines and Engine Parts
3728 Aircraft Parts and Auxiliary Equipment, Not Elsewhere Classified
374x Railroad Equipment
375x Motorcycles, Bicycles, and Parts
376x Guided Missiles and Space Vehicles and Parts
379x Miscellaneous Transport Equipment

Major Group 38 - Measuring, Analyzing, and Controlling Instruments; Photographic, Medical and Optical Goods; Watches and Clocks
(ENTIRE GROUP)

Major Group 39 - Miscellaneous Manufacturing Industries
3911 Jewelry, Precious Metal
3914 Silverware, Plated Ware, and Stainless Steel Ware
3931 Musical Instruments
3944 Games, Toys, and Children's Vehicles, Except Dolls and Bicycles
3949 Sporting and Athletic Goods, Not Elsewhere Classified
396x Costume Jewelry, Costume Novelties, Buttons, and Miscellaneous Notions, Except Precious Metal
399x Miscellaneous Manufacturing Industries

Major Group 97 - National Security and International Affairs
9711 National Security

Another approach that has proven useful in limiting MMPP sources identified by SIC/NAICS to those involved in surface coating is using the emissions inventory data that is stored in the EPA's Aerometric Information Retrieval System (AIRS). In that system, Source

Classification Codes (SCCs) specify the type of process that emits pollutants. A list of the SCCs used to identify facilities is cross-referenced with the SIC codes for the facilities identified in the analysis from the AIRS database and is shown in Attachment 4. Figure 1 shows the locations of the facilities that were identified from AIRS as being MMPP sources.

Emissions/Emission Reduction Techniques

Due to the broad scope of the Miscellaneous Metal Parts and Products category, there are a variety of products coated and application techniques used by the different industry sectors. Emissions from Miscellaneous Metal Parts and Products surface coating facilities typically come from surface preparation, coating application and flash-off, and curing.

Surface preparation is often performed to clean the substrate and improve adhesion. Types of chemicals for pretreatment include aqueous caustic solutions, phosphate, chromate rinse, and organic solvent cleansers. After cleaning, parts are usually dried in an oven prior to coating application steps. Surface preparation can also involve paint stripping, blasting (with sand, shot, or other blast media), and other methods to physically alter the surface prior to coating application.

There are several coating application techniques used in the different industry sectors. Variations in emissions from the application of solvent-based coatings are most commonly attributed to transfer efficiency, evaporation and flash-off. Possible emission reduction techniques for coating application include the use of waterborne coatings, high-solids coatings, powder coatings, and add-on control devices. Many sectors of the category, however, may have performance requirements for their coatings that would not allow the use of many of these more innovative technologies.

Current Industry Control Status

One of the most critical pieces of information that will be used for the determination of the MACT floor will be the analysis of the control level used in the top performing 12% of sources within the source category or within any yet-to-be identified subcategories. However, using the information that is available through AIRS, a summary of the control techniques used for the SCCs that have been identified as at least being potentially associated with the MMPP Surface Coating source category is presented in Attachment 5. Information on control techniques will be collected via the Screening and Detailed Questionnaires and will be used for further analysis of industries within the Miscellaneous Metal Parts and Products Surface Coating category.

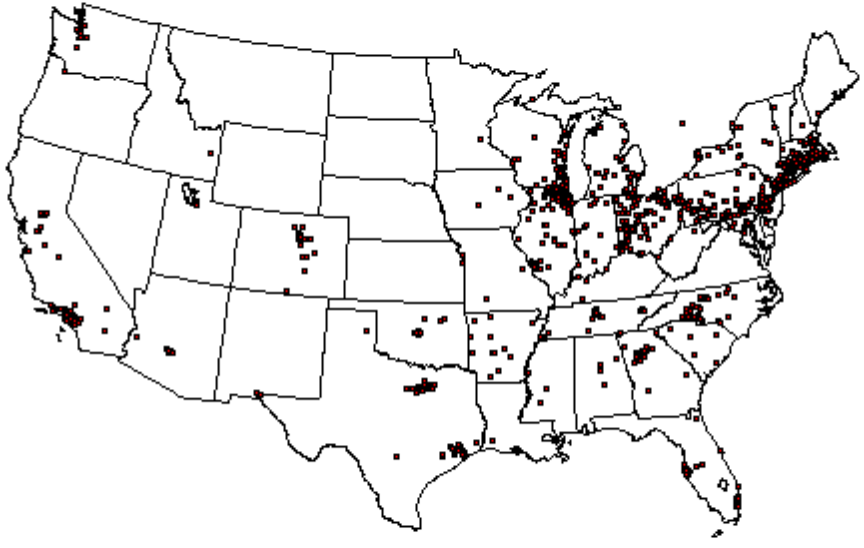

Figure 1. Locations of Facilities Identified in AIRS and Performing Surface Coating of Miscellaneous Metal Parts & Products

Industry Sector Profiles

The MMPP Surface Coating source category covers a wide variety of industry types; no single description could cover all of these different industry sectors. The industry sectors that have been individually studied thus far in the course of this project are listed below, followed by a description of each.

- Aerospace Ground Support Equipment
- Agricultural and Construction Machinery
- Aluminum Extrusion
- Automobile Parts
- Contract Coating Facilities
- Heavy-Duty Trucks and Buses
- Magnet Wire
- Metal Shipping Containers
- Pipe and Foundry
- Rail Transportation
- Recreational Vehicles
- Rubber-to-Metal Bonded Part Manufacturing
- Structural Steel

This list should not be misconstrued as being all-inclusive, and industries that may be subject to future regulations being developed for this source category may not be listed here. This document is for informational purposes only and an omission of an industry from the list does not mean it will not be regulated within this source category.

Additionally, the discussion of industry segments here should not be misconstrued as being a default subcategorization scheme. The purpose of identifying industry segments in this document is to provide some framework for presenting the information collected thus far in the process of regulatory development and to demonstrate the breadth of the source category.

The information provided in this document will be expanded upon as the project moves forward. Additional information (not included in this document) is expected to be included in the Background Information Document (BID) which will be developed as the project moves toward proposal and promulgation of regulations.

Aerospace Ground Support Equipment Industry

General. More than 12,000 part or equipment types can be considered ground support equipment (GSE) in the aerospace industry. GSE is classified by the function of the equipment and by the items the equipment is used to support. GSE is used for auxiliary purposes, testing

and checkout, handling of other equipment and cargo, mechanical site testing, packaging and transport, servicing, and other miscellaneous purposes.

Trade Associations. The following trade associations have been identified for this industry sector:

- Aerospace Industries Association
- Air Transport Association

Process Description. Detailed information is not available at this time.

Coatings. Detailed information is not available at this time.

Emission Control Techniques. Detailed information is not available at this time.

Agricultural and Construction Machinery Industry

General. The Agricultural and Construction Machinery Industry is covered by the 1997 North American Industry Classification System (NAICS) code series 3331 (Agricultural, Construction, and Mining Machinery Manufacturing) and series 33392 (Material Handling Equipment Manufacturing). This industry is also described using the 1987 Standard Industrial Classification (SIC) code series 352 (Farm and Garden Machinery and Equipment) and 353 (Construction, Mining, and Materials Handling Machinery and Equipment). The Agricultural and Construction Machinery Industry excludes corrals, stalls, and holding gates which are covered by SIC code 3523 (Farm Machinery and Equipment). These products are included with NAICS code 332323 (Ornamental and Architectural Metal Work Manufacturing) and are categorized within the Structural Metal Industry. Railway truck maintenance equipment, which is covered by SIC code 3531 (Construction Machinery and Equipment), is also excluded from this industry. These products are included with NAICS code 33651 (Railroad Rolling Stock Manufacturing) and are categorized in the Rail Transportation Industry. Hand-held clippers for shearing or grooming animals, covered by SIC 3523, are also excluded from the Agricultural and Construction Machinery Industry. A list of the NAICS codes that describe this industry and corresponding SIC codes is provided below [1].

333111	Farm Machinery and Equipment Manufacturing [includes SIC 3523 (Farm Machinery and Equipment), except corrals, stalls, and holding gates; farm conveyors and farm elevators, stackers and bale throwers; and hand hair clippers for animal use.]
333112	Lawn and Garden Tractor and Home Lawn and Garden Equipment Manufacturing [includes SIC 3524 (Lawn and Garden Tractors and Home Lawn and Garden Equipment), except nonpowered lawnmowers]
33312	Construction Machinery Manufacturing

[includes SIC 3531 (Construction Machinery and Equipment), except railway truck maintenance equipment; and winches, aerial work platforms and automotive wrecker hoists.]

333131 Mining Machinery and Equipment Manufacturing
[includes SIC 3532 (Mining Machinery and Equipment, Except Oil and Gas Field Machinery and Equipment)]

333132 Oil and Gas Field Machinery and Equipment Manufacturing
[includes SIC 3533 (Oil and Gas Field Machinery Equipment)]

333921 Elevator and Moving Stairway Manufacturing
[includes SIC 3534 (Elevator and Moving Stairways)]

333922 Conveyor and Conveying Equipment Manufacturing
[includes SIC 3535 (Conveyors and Conveying Equipment); and farm conveyors and farm elevators, stackers and bale throwers from SIC 3523 (Farm Machinery and Equipment)]

333923 Overhead Traveling Crane, Hoist, and Monorail System Manufacturing
[includes SIC 3536 (Overhead Traveling Cranes, Hoists, and Monorail Systems); and winches, aerial work platforms, and automotive wrecker hoists from SIC 3531 (Construction Machinery and Equipment)]

333924 Industrial Truck, Tractor, Trailer, and Stacker Machinery Manufacturing
[includes SIC 3537 (Industrial Trucks, Tractors, Trailers, and Stackers), except metal pallets, and metal air cargo containers]

Trade Associations. No trade associations have been identified for this industry sector.

Process Description. HAP and VOC emissions are expected from pretreatment processes (when organic solvents are involved in the pretreatment process), and in coating application (including flash-off areas and curing ovens). Detailed information, however, is not available at this time.

Coatings. Detailed information is not available at this time.

Emission Control Techniques. Detailed information is not available at this time.

Aluminum Extrusion Industry

General. The Aluminum Extrusion Industry is covered by the NAICS code 331316 (Aluminum Extruded Product Manufacturing), and by the SIC code 3354 (Aluminum Extruded Products). Under SIC 3354, the Aluminum Extrusion Industry is grouped with establishments primarily engaged in extruding aluminum and aluminum-based alloy basic shapes, such as rod and bar, pipe and tube, and tube blooms, including establishments producing tube by drawing [2].

The MMPP project team developed a census of aluminum extrusion facilities from the AIRS database and from information supplied by the Aluminum Extruders Council. A search of the AIRS database indicated 11 aluminum extrusion facilities with in-house coating capabilities [3]. The AEC's 1997 Buyers Guide gives a complete listing of all AEC members. This list showed 144 aluminum extrusion facilities nationwide and 43 facilities abroad. Only 50 of the U.S. AEC member facilities possess in-house coating capabilities [4]. These facilities are located in 25 States, with Ohio having the largest number of facilities.

One of the key reasons for the continuous growth in popularity of extrusion applications is the nominal cost of extrusion dies. Complex extruded shapes almost always cost less than they would if formed, rolled, or machined [5]. In addition, aluminum extrusions provide a high strength-to-weight ratio, close tolerances, ease of joining, good machinability, excellent corrosion resistance, and high electrical conductivity [6]. Aluminum extrusions also have remarkable thermal properties and are excellent for use in highly flammable atmospheres or with explosive materials [7]. Extruded aluminum will not burn, and does not emit any toxic, hazardous fumes when exposed to high temperatures. Aluminum extrusions have substantial scrap value and can be recycled. Recycling aluminum takes only five percent as much energy as producing new aluminum [6]. Aluminum extrusions have the capacity to accommodate a variety of coatings and finishes. Coatings such as powder paint or traditional enamel paints can be applied with a variety of finishes from rough to mirror smooth.

Aluminum extrusion manufacturers produce a wide array of products for several market sectors. The major market categories serviced by aluminum extruders and included in the MMPP source category are building and construction, transportation, and consumer durables. The building and construction market category consists of doors, windows and shutters, mobile homes, curtain walls, bridge rails and decks, street and highway construction, architectural shapes, patio and pool enclosures, light and flag poles, louvers and vents, and conduits. Included in the transportation category are aircrafts, trailers and semitrailers, passenger cars, trucks and buses, travel trailers, and recreational vehicles. The consumer durables market covers products such as refrigerators and freezers, major appliances, furniture, boats, outboard motors, sports and athletic equipment, and toys. Other major market categories serviced by the aluminum extrusion industry include electrical goods, machinery and equipment, distributors and jobbers, and exports. Most aluminum extruders produce products for multiple market sectors. Thirty-five percent of all extruded aluminum is produced for the building and construction industry [8].

Trade Associations. The following trade association has been identified for this industry sector:

- Aluminum Extruders Council

Process Description. HAP and VOC emissions are expected from pretreatment processes (when organic solvents are involved in the pretreatment process), in coating application (including flash-off areas and curing ovens), and in thermal filling of extruded aluminum products.

Pretreatment. The pretreatment of aluminum lays the foundation for the coating and allows the film to properly adhere to the substrate. Typically, pretreatment is a 5 to 7 stage process of either immersion or in-line spraying of the substrate with several cleaning solutions. After pretreatment, the aluminum part is dried in an oven before it is coated [9].

Cladding. To increase the natural corrosion resistance of extruded aluminum, a process known as cladding is used. In the cladding process, an additional layer of pure aluminum or an appropriate alloy is applied to the surface of a strong aluminum alloy to increase corrosion resistance [6]. No HAP or VOC emissions are known to be released from the cladding process.

Thermal Filling. Thermal filling is a common practice for aluminum extruders who manufacture windows and doors. In this process, the cavity of a window or door is filled with epoxy and allowed to dry. Then a portion of the metal and epoxy is removed creating a discontinuity of the surfaces, thereby providing greater insulation potential for the parts [10].

Coating Application. Aluminum extrusions are coated on two types of lines: vertical and horizontal. Both processes offer quality coated products and can handle a variety of shapes and sizes [9]. The vertical coating line can accommodate extruded profiles of more than 30 feet in length. Vertical coating processes can be customized based on the shape and length of a part. It is used for longer shapes such as pool edges. It produces less waste than the horizontal process. The horizontal coating line offers a higher efficiency than the vertical process, however, it coats extrusions up to 4 times slower than the vertical line. Both horizontal and vertical systems share the same basic stages for coating application: pretreatment, dry, coating application, curing, and unloading.

Electrostatic spray application is the most popular way to coat aluminum extrusions and is used for virtually all aluminum extrusion coating processes. Rotary atomization is a variation of the electrostatic coating method which is used to apply liquid enamels.

Coatings. Both organic solvent-borne liquid enamels and low-VOC powder coatings are used to paint aluminum extrusions. Typical resins found in liquid and powder aluminum extrusion coatings are polyester, acrylic, siliconized polyester, and fluoropolymer. Aluminum extrusion coatings must be resistant to stresses caused by UV radiation, moisture, high temperatures and temperature fluctuations, aggressive environments, and physical damage [9].

Specifications for aluminum extrusion coatings have been developed by the American Architectural Manufacturers Association (AAMA) and the Architectural Spray Coaters Association (ASCA). Coatings covered by these specifications are rated on their performance in the following areas: ease of application, solvent resistance, chemical resistance, corrosion resistance, exterior durability, hardness, adhesion, flexibility, mar resistance, and color/gloss retention.

Emission Control Techniques. Powder coatings and oxidizers are the primary means of VOC/HAP emissions control in the aluminum extrusion industry. Powder coatings contain from 0 to 10 percent entrapped volatiles [11]. Oxidation, or incineration, is the most common method of controlling VOC/HAP emissions produced during the aluminum extrusion manufacturing process and are present in many areas associated with the coating process including pretreatment stations, coating booths, curing ovens, and flash-off areas.

Automobile Parts Industry

General. The Automobile Parts Industry is covered by the NAICS codes 336211 (Motor Vehicle Body Manufacturing) and the NAICS code series 3363 (Motor Vehicle Parts Manufacturing). This industry is also described by SIC code 3714 (Motor Vehicle Parts and Accessories). Under SIC code 3714, the Automobile Parts Industry includes establishments primarily engaged in manufacturing motor vehicle parts and accessories, but not engaged in manufacturing complete motor vehicles or passenger car bodies [2]. NAICS code 336211 includes dump truck lifting mechanisms and fifth wheels which are also covered by SIC code 3714. In accordance with NAICS code series 3363, this industry sector includes automobile parts that are covered by various SIC codes including 3714. A list of the NAICS codes in series 3363 and corresponding SIC codes (except SIC 3714) that are relevant to the miscellaneous metal parts and products source category is provided below [1].

336311	Carburetor, Piston, Piston Rings, and Valve Manufacturing [includes SIC 3592 (Carburetor, Pistons, Piston Rings, and Valve Manufacturing)]
336312	Gasoline Engine and Engine Parts Manufacturing
336321	Vehicular Lighting Equipment [includes SIC 3647 (Vehicular Lighting Equipment)
336322	Other Motor Vehicle Electrical and Electronic Equipment Manufacturing [includes SIC 3694 (Electrical Equipment for Internal Combustion Engines)]
33633	Motor Vehicle Steering and Suspension Components (except Spring) Manufacturing
33634	Motor Vehicle Brake System Manufacturing
33635	Motor Vehicle Transmission and Power Train Parts Manufacturing
33636	Motor Vehicle Seating and Interior Trim Manufacturing [includes metal motor vehicle seat frames SIC 3499 (Fabricated Metal Products, Not Elsewhere Classified)]
33637	Motor Vehicle Stamping, Metal [includes SIC 3465 (Automotive Stampings)]
336391	Motor Vehicle Air-Conditioning Manufacturing [includes motor vehicle air-conditioning from SIC 3585 (Air-Conditioning and Warm Air Heating Equipment and Commercial and Industrial Refrigeration Equipment)]

336399 All Other Motor Vehicle Parts Manufacturing
[includes luggage and utility racks from SIC 3429 (Hardware, Not Elsewhere Classified); stationary engine radiators from SIC 3519 (Internal Combustion Engines, Not Elsewhere Classified); gasoline, oil, and intake filters for internal combustion engines from SIC 3599 (Industrial and Commercial Machinery and Equipment, Not Elsewhere Classified); and trailer hitches from SIC 3799 (Transportation Equipment, Not Elsewhere Classified)]

The AIRS database indicates that there are approximately 263 facilities nationwide located in 23 States that manufacture automobile parts [3].

Trade Associations. The following trade associations have been identified for this industry sector:

- American Automobile Manufacturers Association
- Association of International Automobile Manufacturers
- Automotive Parts and Accessories Association

Process Description. HAP and VOC emissions are expected from pretreatment processes (when organic solvents are involved in the pretreatment process), and in coating application (including flash-off areas and curing ovens). Detailed information on these processes, however, is not available at this time.

Coatings. Detailed information is not available at this time.

Emission Control Techniques. Detailed information is not available at this time.

Contract Coating Facilities

General. Contract coating facilities, or "job shops", may be described as facilities that perform surface coating operations for a variety of industries on a contract basis. These facilities may specialize in coating products for one specific industry; or may coat several products for several different industries. Job shops may be covered by several SIC codes and NAICS codes including SIC code 3479 (Coating, Engraving, and Allied Services) and NAICS code 332812 (Metal Coating, Engraving (except Jewelry and Silverware) and Allied Services to Manufacturers). SIC code 3479 includes establishments primarily engaged in performing enameling, lacquering, and varnishing services of metal products for the trade. Also included in this industry are establishments which perform these types of activities on their own account on purchased metals or formed products [2].

Job shops showed dramatic increases in numbers of facilities and in sales between 1996 and 1998 [12]. Job shops utilize a variety of coating techniques to apply coatings to virtually all types of products and substrates.

Trade Associations. No trade associations have been identified for this industry sector.

Process Description. HAP and VOC emissions are expected from pretreatment processes (when organic solvents are involved in the pretreatment process), and in coating application (including flash-off areas and curing ovens). Detailed information, however, is not available at this time.

Coatings. Detailed information is not available at this time.

Emission Control Techniques. Detailed information is not available at this time.

Heavy-Duty Trucks and Buses Industry

General. The Heavy-Duty Trucks and Buses Industry is covered by the NAICS code 331316 (Motor Vehicle Body Manufacturing) and the SIC code 3713 (Truck and Bus Bodies). Under SIC code 3713, the Heavy-Duty Truck and Buses Industry is grouped with establishments primarily engaged in manufacturing large truck and bus bodies and cabs for sale separately or for assembly on purchased chassis, or in assembling large truck and bus bodies on purchased chassis. Also included in this industry sector are truck trailers which are covered by the NAICS code 336212 (Truck Trailer Manufacturing), and the SIC code 3715 (Truck Trailers). Under SIC code 3715, the truck trailer industry is grouped with establishments primarily engaged in manufacturing truck trailers, truck trailer chassis for sale separately, detachable trailer bodies (cargo containers) for sale separately, and detachable trailer (cargo container) chassis, for sale separately.

The AIRS database indicates that there are approximately 81 heavy-duty truck, trailer, and bus manufacturing facilities nationwide located in 18 States [3]. AAMA (American Automobile Manufacturers Association) reports that 346,000 large trucks (14,000+ lbs.) were sold in the United States in 1996.

Trade Associations. The following trade associations have been identified for this industry sector:

- Truck Manufacturers Association
- American Automobile Manufacturers Association

Process Description. Heavy-duty trucks consists of three major parts: chassis, cab, and trailer. Most parts are coated separately and prior to assembly. The basic chassis is formed using metal rails, axles, and cross beams. The chassis structure is completed by adding metallic brake lines, plastic wiring harnesses, and other metal and plastic parts. Chassis components are usually primed individually prior to assembly at the heavy-duty truck manufacturing facility. In some cases, chassis components are primed off-site by the parts manufacturers before being shipped to truck manufacturing facilities. Individual parts may be sanded and touched up, if necessary, before chassis assembly using a solvent-borne or waterborne paint. HAP and VOC emissions are

expected from pretreatment processes (when organic solvents are involved in the pretreatment process), and in coating application (including flash-off areas and curing ovens) [13,14,15].

The assembled chassis enters a paint booth where a top coat is applied. Heavy-duty truck manufacturers use conventional, electrostatic, and HVLP spray guns for this coating application. Black is the primary color used for chassis coating, however, some facilities use several other colors in addition to black. Greater than eighty percent of all heavy-duty truck chassis are black. Both solvent-borne and waterborne paints are used for chassis top coats. Solvent-borne top coats are likely to be high-solids acrylic or polyurethane coatings.

Cabs and cab components are primed prior to cab assembly; this is done for both metal and plastic parts. Following assembly, metal and plastic cab components are coated together. Cab assemblies are pretreated to prevent corrosion and promote coating adhesion. After pretreatment, cab seams are sealed with an emulsion caulk which may be water-based. Cabs are primed in a spray booth, using either conventional, HVLP, or electrostatic spray application methods. Cabs are then sent to a flash-off area, followed by a curing oven where they are dried under either "hi-bake" (350^{o}F or higher) or "lo-bake" (approximately 180^{o}F) conditions, depending on whether plastic parts have been assembled to the cab. Once dry, some manufacturers apply a low-VOC asphalt undercoat spray as a rust preventative measure. Cab surfaces are then sanded in preparation for the base coat. The base coat is applied in a spray booth, typically using HVLP application, followed by a flash-off area or lo-bake convection oven. Some cabs require multiple base coats. Typically, only one base coat is applied per day, with 24 hours allowed for the coating to cure. The final layer is a clear top coat which is often applied using conventional, HVLP, or electrostatic spray guns. Finally, the hood of the cab is removed and the interior parts (i.e. seats, dash) are inserted.

Coatings. Both waterborne and solvent-borne coatings are used for a variety of applications throughout the heavy-duty trucks and buses industry sector. Chassis are primed and coated with both solvent-borne and waterborne coatings. Solvent-borne paints used for chassis coating may be high-solids acrylics, polyurethanes, or other low-VOC coatings. Heavy-duty truck manufacturers use several hundred colors for cab coating applications. The use of solvent-borne coatings may be necessary for color matching, durability, and other coating requirements in this industry. However, heavy-duty truck manufacturers work closely with coating suppliers to find low solvent and low-HAP coating solutions, where feasible [13,14,15].

Emission Control Techniques. Add-on control devices were not observed in site visits to three heavy-duty truck facilities. Reviews of Title V permit applications, likewise, indicated that no add-on control devices are used in typical heavy-duty truck facilities.

Magnet Wire Industry

General. The Magnet Wire Industry is covered by the NAICS codes 331319 (Other Aluminum Rolling and Drawing), 331421 (Copper Rolling, Drawing, and Extruding); 331422 (Copper Wire [except mechanical] Drawing), 33149 (Nonferrous Metals [except copper and aluminum] Rolling, Drawing, and Extruding), and 335929 (Other Communication and Energy Wire Manufacturing). This industry is also described using the SIC code 3357 (Drawing and Insulating of Nonferrous Wire). Under SIC code 3357, the Magnet Wire Industry is grouped with establishments primarily engaged in drawing, drawing and insulating, and insulating wire and cable of nonferrous metals from purchased wire bars, rods, or wire and includes establishments primarily engaged in manufacturing insulated fiber optic cable [2]. SCCs identify facilities involved in the coating of magnet wire with the six-digit SCC 4-02-015 covering the industrial processes associated with the surface coating of magnet wire.

Magnet wire is produced predominantly in large facilities which both draw and insulate the wire and sell it for use in electrical and electronic products. The AIRS database indicates that there are approximately 33 magnet wire manufacturing facilities in the US [3]. These facilities are located in Arkansas, California, Connecticut, Georgia, Illinois, Indiana, Kentucky, Maryland, Massachusetts, Missouri, New Hampshire, New York, North Carolina, Pennsylvania, Tennessee, Texas, Vermont, and West Virginia. Fort Wayne, IN is home to the largest concentration of magnet wire manufacturers.

In magnet wire fabrication, a coating of electrically insulating enamel or varnish is applied to bare wire, usually made of copper or aluminum. The term “magnet” is used to describe this wire because it is usually formed into coils for the purpose of creating an electromagnetic field when an electrical current is applied. Magnet wire is used in electrical equipment such as clocks, telephones, electric motors, generators, and transformers [16]. It is usually classified by gauge which indicates the thickness/diameter of the wire, with greater gauge numbers indicative of increasingly finer wire. Wire of 20 gauge or less is called heavy wire; medium wire ranges from 21 to 32 gauge; fine wire ranges from 33 to 39 gauge; and extra fine wire is greater than 40 gauge.

Trade Associations. The following trade association has been identified for this industry sector:

- National Electrical Manufacturers Association (NEMA)

Process Description. Most magnet wire manufacturing facilities draw wire from bare metal rod in addition to insulating the wire with coating. The drawing of wire from bare rod is a process of elongating the rod and decreasing its diameter, using a series of dies, until wire of a desired thickness or gauge is achieved. Many processes require wire to incur several drawings before it reaches the specified gauge.

Once wire has been drawn to the desired gauge, it is passed several times through an annealing oven. This process softens the wire, making it more pliable, and cleans the wire of, oil and dirt [16]. The wire is then ready for coating application. Two methods are used in the magnet wire coating application process dependent upon the gauge of the wire. Typically, wire coating is applied using a die applicator for lower gauge (thicker) wire. In this process, wire passes through a bath where it picks up a thick layer of coating. The wire is then drawn through a coating die which removes excess coating and leaves a thin film of desired thickness. Die applicators typically coat wire of 30 gauge or lower (larger diameter wire). For fine wire of 30 gauge or more, a felt applicator may be used. In the felt application process, felt swabs, saturated with enamel, are used to transfer coating to the wire [17]. After the wire is coated, it is routed through a two-zone recirculating oven where the coating is dried and cured. The size of the oven is generally larger for lower gauge wire. Wire may be subjected to as many as 20 passes through the coating, baking, and curing processes before it is sufficiently coated. Finally, the insulated wire is passed through a cooling zone and is wound onto a spool where it awaits packaging. In many facilities, magnet wire is coated with a lubricant just after it is cooled and before it is wound onto a spool. This lubricant coatings helps to keep the wire in place as it is wound onto the spool. It is also used to lubricate wire as it is removed from the spool at the same or another manufacturing facility for use in high speed coil winding. HAP and VOC emissions are expected from the coating application (including the curing ovens).

Coatings. The materials used to coat magnet wire must meet rigid electrical insulating, thermal and abrasion specifications. Nyleze is a common insulator made from nylon and polyester. Other coatings include armored poly amide, polyester with a nylon overcoat, and solderable polyester. A bondable material may also be used to coat 40 to 46 gauge wire [17].

Insulation for magnet wire must be tough and flexible. The coating must be capable of elongating from 15 to 40 percent. The coating must stretch at the same rate as the wire which it coats to ensure its insulating properties when the wire is wound to its final form (e.g., in electrical motors). It must also be resistant to high temperatures and have a high thermal conductivity. The base coat, which is typically 6 to 9 layers provides most of the electrical insulating properties of the wire. The top coat, which may have as few as 1 to 3 layers, provides durability for winding, toughness, and chemical and/or heat resistance. In some specialized applications, a single-layered bond coat may be used as a final coat. This heat-activated coat is frequently used in the automotive industry and serves to bond each winding of the coated wire in a coil to other windings, forming a bonded coil [17].

Organic solvent-borne enamels are the principal coatings used in the magnet wire industry. The solvents in these enamels must not poison the catalyst used in oven operations, and must be compatible with the application method. Different coating formulations are used for felt and die applications. Low-solvent coatings have not yet been developed with properties that meet all wire coating requirements. The organic solvent content of wire coatings typically range from 67 to 85 percent by weight. Solvents used in enamels are selected because they are compatible with

the polymer used to insulate the wire and with the oven catalyst. Phenol, cresol, xylene, and cumene are common solvents used in magnet wire coatings. Fine wire coatings have a higher solvent content than medium or heavy wire. Other solvents that may be used to thin magnet wire coatings are cresylic acid, diacetone alcohol, toluene, hiflash naptha, methyl ethyl ketone, n-methyl pyrrolidine, and ortho cresol [16,17].

The solids content of a coating is a function of the type of enamel needed for insulation and the capabilities of the oven used for baking and curing. Base coats tend to have higher solids contents than top coats. Newer ovens are apt to process higher solids more efficiently than older models. Common resins used in magnet wire coatings are polyester amine imide, polyester, polyurethane, epoxy, polyvinyl formal, and polyimide [16].

In the magnet wire coating process, separate ovens are used for annealing, and for baking and curing the coated product. Most drying ovens consist of two zones. The drying zone is held at about 200^{o}C and the curing zone at about 430^{o}C. Many ovens are equipped with an in-line system that draws wire just before it is annealed. The number and type of ovens selected for a facility depends on the production needs of that facility. Over 140 coated wires can be processed in a single oven. Production in an oven may be limited to a specified range of wire gauges.

An oven's line speed capability may be expressed as a product of the diameter of the wire and its velocity through the oven (DV). The capacity of an oven is often characterized by its DV number. The DV range of an oven tends to decrease as the size of the wire increases. Heavy wire must move through an oven at a slower speed than fine wire because as wire travels through the oven, it must maintain a temperature that will insure a consistent cure of the enamel. Heavier wire takes longer to reach the set temperature throughout the wire [17].

The magnitude of emissions from wire coating operations depends on composition of the coating, thickness of the coat, and efficiency of the application [18]. The exhaust from the oven is the most important source of solvent emissions in the wire coating plant. Organic solvent emissions vary from line to line, by size and speed of wire, by number of wires per oven, and by number of passes through the oven. The exhaust from typical ovens range from 11 dry standard cubic meters (dscm) per minute to 42 dscm per minute, with the average being around 28 dscm per minute. The solvent concentration in exhaust normally ranges from 10 to 25 percent of the lower explosive limit (LEL) for that solvent. This is equivalent to about 12 kg of solvent per hour in a typical process. In addition to solvent, 10 to 25 percent of the coating resins may be volatized in the drying oven, and emitted with oven exhaust. Most of the volatized resin condenses in the atmosphere to form particles but some breaks down to form VOC [16].

One of three different types of solvent-based, VOC-containing coatings may be used to lubricate magnet wire. A waxy material is commonly used for this application. The lubricated magnet wire does not pass through the catalytic or thermal incineration systems used to control

VOC emissions in magnet wire processing. Emissions from this coating process are limited by restricting the VOC content of the lubricant material [19].

Emission Control Techniques. Incineration is the most common add-on control technique used to control emissions from wire coating ovens. The high temperatures at which magnet wire coating ovens operate and the moderate to high solvent loads of these ovens create a suitable environment for incineration. During thermal incineration, solvent-laden gas is passed through an oxidizer where the solvent is combusted. Heated exhaust from the thermal incinerator is then recirculated to the drying oven. This process typically yields a ninety-eight percent solvent destruction efficiency [16].

Magnet wire manufacturers often include catalytic incineration as an integral part of their baking ovens to minimize the cost of oven operation, with the added benefit of reducing the emissions of VOCs and HAPs in the solvent prior to any add-on controls. The heat generated by the catalyst is recirculated to the oven reducing or eliminating the need for fuel after reaching operational temperatures. During internal catalytic combustion, hot solvent-laden air from the oven circulates past a catalyst causing combustion of the solvent to take place. If air exits the drying oven at 260 to 320^{o}C, the oven may be self sustaining. However, a supplementary burner may be used to heat the solvent-laden gases if they do not reach these temperatures. Exhaust gases leave the catalyst at about 450^{o}C and are recirculated to the curing zone. Energy is conserved because less low-temperature makeup air is required due to recirculation, and less fuel is needed to heat the oven or to reach the solvent combustion temperature in the catalyst. Also, internal catalysts yield a 75 to 90 percent solvent destruction efficiency. Air that is not recirculated to the baking oven passes through a control device (if present) for additional solvent reduction.

Metal Shipping Containers Industry

General. Metal shipping containers are classified by the NAICS code 332439 (Other Metal Container Manufacturing) and the SIC code 3412 (Metal Shipping Barrels, Drums, Kegs, and Pails). Under SIC 3412, the Metal Shipping Containers Industry consists of establishments primarily engaged in manufacturing metal shipping barrels, drums, kegs, and pails, and includes the following products [2]:

- Containers, shipping: barrels, kegs, drums, packages - liquid tight (metal)
- Drums, shipping: metal
- Milk (fluid) shipping containers, metal
- Pails, shipping: metal - except tinned

This industry also includes the reconditioning of shipping containers which is classified by the NAICS code 81131 (Commercial and Industry Machinery and Equipment {except Automotive and Electronic} Repair and Maintenance) and the SIC code 7699 (Repair Shops and Related Services, Not Elsewhere Classified). The six-digit SCC 4-02-026 identifies the surface coating of

steel drums. This grouping has the potential to overlap with the Metal Can and Metal Coil surface coating categories.

AIRS data indicates that there are approximately 71 metal shipping container manufacturing facilities nationwide. Of those, only 29 facilities are equipped with the capability to coat both the interior and exterior of products [3].

Metal shipping containers can be grouped according to size into two major categories: drums, which include barrels and kegs and are 13 to 110 gallons (49 - 416 L); and pails, which are 1 to 12 gallons (4 - 45 L) [20]. They consist of a cylindrical body with a welded side seam and top and bottom heads. The thickness of pails and small drums usually range from 0.0115 in (0.3 mm) to 0.0269 in (0.7 mm). Larger drums are usually 0.030 in (0.8 mm) to 0.0533 in (1.4 mm) in thickness. Drums and pails are generally fabricated from commercial grade cold-rolled sheet steel; however, stainless steel, nickel, and other alloys are used for special applications.

Drums are used to transport and store liquids, viscous materials, and dry products. About seventy-five percent of all new drums are used for liquids. Pails are used to transport and store liquids, viscous products, powders, and solids. Currently, about 73 million new steel pails are produced in the United States each year. Almost eighty percent of all pails manufactured annually are the popular 5-gallon pail.

All steel pails and drums used in the United States for the transport of hazardous materials must comply with the Department of Transportation's (DOT) Hazardous Materials Regulations. For non-hazardous products, these containers usually comply with the minimum requirements of the specifications set forth by the railroads Uniform Classification Committee and the highway carriers National Classification Committee. Packagers must now provide their drum and pail suppliers with the following information: Packing Group, product vapor pressure (if liquid), net mass (if solid), and specific gravity (if liquid). The steel drum and pail manufacturer marks the container, after having performed the following tests: drop, leakproofness, stacking, and hydrostatic pressure (if liquid). Steel drums to be reconditioned and reused to transport hazardous materials must meet DOT specifications for minimum and nominal thickness. Each year over 40 million drums are reconditioned [20].

Trade Associations. The following trade associations have been identified for this industry sector:

- Association of Container Reconditioners
- Steel Shipping Container Institute

Process Description. HAP and VOC emissions are expected from pretreatment processes (when organic solvents are involved in the pretreatment process), and in coating application (including flash-off areas and curing ovens).

Surface Preparation. During new metal shipping container fabrication, parts are pretreated to protect against flash rust and to remove oil and dirt from the surfaces prior to surface coating. This is generally achieved using a spray washer and zinc or iron phosphate solution. A pretreatment system may have as many as six or seven stages. The following is an example of a typical pretreatment process for new metal shipping containers:

1. Hot water or detergent, oil skimming
2. Rinse
3. Cleaner or phosphate
4. Rinse
5. Final rinse sealer (optional)

In some facilities, dry steel is used to manufacture new shipping containers. Dry steel is steel received from the mill with no rust inhibiting oil on the surface. In cases where dry steel is used, the surface preparation process may be eliminated [21].

Spray washing is also the initial step in preparation of the reconditioning process. Alkaline-sodium hydroxide solutions are generally used to remove residue of prior container contents. Shot blasting is also used during reconditioning operations to clean the exterior of tight head drums and the interior and exterior of open head drums. Other operations performed before surface coating may include acid washing, chaining, dedenting, leak testing, and corrosion inhibiting [22].

Coating Application. Metal shipping containers are coated using either roll coating or spray application methods. Roll coating is used mostly for the coating of coil. Spray coating is performed after metal has been formed into shells or parts. Shells and parts are coated in spray booths using HVLP, airless, or conventional coating apparatus. Drum and pail parts usually receive one or two coats and may be coated on both inside and outside surfaces. After coating, parts are given a brief flash-off period to allow separation of solvents in the coating. Parts are typically cured in natural-gas fired ovens. This curing takes place for 5 to 15 minutes at 300 to 500°F [21].

Coatings. Waterbased, high-solids, polyesters, alkyds, epoxy phenolics and phenolics are typically used to coat metal shipping containers. The selection of interior coatings is based on several factors. The most important considerations are the compatibility of a coating with the products to be shipped or stored within the container and the performance of a coating under various tests (ie. reverse impact and rubbing). Though solvent-borne paints are still used for exterior coating, there is a trend in the industry toward low-VOC exterior coatings. The types of pigments used in exterior coatings affect the color consistency, application thickness, and surface adhesion of that coating. Thus, some colors may be more compatible with low-VOC coatings than others [21].

Emission Control Techniques. Low-VOC coatings, such as high-solids and waterborne coatings, are commonly used to minimize emissions from surface coating operations [21].

Pipe and Foundry Industry

General. The Pipe and Foundry Industry is covered by the NAICS code 33121 (Iron and Steel Pipe and Tube Manufacturing from Purchased Steel), and the NAICS code series 3315 (Foundries). This industry is also described using the SIC code 3317 (Steel Pipe and Tubes), and the SIC code series 332 (Iron and Steel Foundries) and 336 (Nonferrous Foundries {Castings}). SIC code 3317 covers establishments primarily engaged in the production of welded or seamless steel pipe and tubes and heavy riveted steel pipe from purchased materials. SIC code series 332 consists of establishments primarily engaged in manufacturing iron and steel castings. SIC code series 336 includes establishments primarily engaged in manufacturing castings and die-castings of aluminum, brass, bronze, and other nonferrous metals and alloys [2]. A list of the NAICS codes used to describe this industry and corresponding SIC codes is provided below [1].

33121	Iron and Steel Pipe and Tube Manufacturing from Purchased Steel [includes SIC 3317 (Steel Pipe and Tubes)]
331511	Iron Foundries [includes SIC 3321 (Gray and Ductile Iron Foundries) and 3322 (Malleable Iron Foundries)]
331512	Steel Investment Foundries [includes SIC 3324 (Steel Investment Foundries)]
331513	Steel Foundries (except Investment) [includes SIC 3325 (Steel Foundries, Not Elsewhere Classified)]
331521	Aluminum Die-Casting Foundries [includes SIC 3363 (Aluminum Die-Castings)]
331522	Nonferrous (except Aluminum) Die-Casting Foundries [includes SIC 3364 (Nonferrous Dies-Castings, except Aluminum)]
331524	Aluminum Foundries (except Die-Casting) [includes SIC 3365 (Aluminum Foundries)]
331525	Copper Foundries (except Die-Casting) [includes SIC 3366 (Copper Foundries)]
331528	Other Nonferrous Foundries (except Die-Casting) [includes SIC 3369 (Nonferrous Foundries, Except Aluminum and Copper)]

The AIRS database indicates that there are approximately 146 metal pipe and foundry facilities nationwide [3]. The largest concentration of these facilities is in the State of California.

Trade Associations. The following trade associations have been identified for this industry sector:

- American Foundrymens Society
- American Institute for International Steel
- American Iron and Steel Institute
- Iron and Steel Society
- Specialty Steel Industry of North America
- Steel Founders Society of America
- Steel Manufacturers Association
- Steel Tube Institute
- Tube and Pipe Association International

Process Description. HAP and VOC emissions are expected from pretreatment processes (when organic solvents are involved in the pretreatment process), and in coating application (including flash-off areas and curing ovens). Detailed information, however, is not available at this time.

Coatings. Detailed information is not available at this time.

Emission Control Techniques. Detailed information is not available at this time.

Rail Transportation Industry

General. The Rail Transportation Industry is covered by the NAICS code 33651 (Railroad Rolling Stock Manufacturing). This industry is also described using the SIC code 3743 (Railroad Equipment). Under SIC code 3743, the Rail Transportation Industry includes establishments primarily engaged in building and rebuilding locomotives (including frames and parts, not elsewhere classified) of any type or gauge; and railroad, street, and rapid transit cars and car equipment for operation on rails for freight and passenger service [2]. Locomotive fuel lubricating pumps and cooling medium pumps, also included in SIC code 3743, are covered by NAICS code 333911 (Pump and Pumping Equipment Manufacturing). In accordance with NAICS code 33651, this industry sector also includes railway truck maintenance equipment which is also covered by SIC code 3531 (Construction Machinery and Equipment). Approximately 38 rail transportation manufacturing facilities nationwide located in 18 States have been identified from queries of the AIRS database [3].

Trade Associations. The following trade association has been identified for this industry sector:

- American Railway Car Institute

Process Description. HAP and VOC emissions are expected from pretreatment processes (when organic solvents are involved in the pretreatment process), and in coating application (including flash-off areas and curing ovens).

Surface Preparation. Surface preparation for railcars and most railway equipment typically includes blasting of the surface using a non-metallic blast media, and/or grit [23]. This method may be used to prep the interior and exterior surfaces of railcars and other equipment. Surface preparation for locomotives may include blasting with glass and plastic bead media. Blast facilities usually contain filtering systems to capture waste [19]. Dust collectors may be used to control dust emissions and to recapture blast media. Felt floor coverings may also be used to recover paint and waste materials. Blast material may be recycled for future uses.

Coating Application. Railway transportation manufacturing facilities typically use airless spray apparatus for application of interior and exterior coatings. In some cases, surface coating is performed using HVLP spray systems [23]. Railcars and locomotives are painted in large enclosed paint booths. Coatings may be cured in thermal reacting drying ovens. In some facilities, coatings are allowed to dry in the paint booth at ambient temperature conditions, with the ventilation system in operation. Paint shops usually contain exhaust stacks with filtering systems to control particulate emissions. Stencils or decals are applied to railcars and locomotives using brush or roller apparatus. Facilities may also have smaller paint booths for coating of railcar and locomotive accessories and other rail transportation associated equipment such as sideframes and bolsters, sheet and aluminum blue flags, wood projects, steel lockers, racks, tables, logo panels, hopper outlets, air jacks, and for other miscellaneous coating projects. Some facilities coat motor coils with varnish on-site using a vacuum pressure impregnation process.

Coatings. The Rail Transportation Industry typically uses dual-component, waterborne paints for surface coating of railcars and equipment [23]. The dual component paint is usually mixed on-site, inside the paint booth. Once the paint is mixed the shelf life is very short. Locomotives are often coated with dual-component, solvent-based surface coatings [19].

Emission Control Techniques. No add-on control devices were observed in site visits or reviews of the Title V Permit application for the Union Pacific Railroad's DeSoto Car Shop in DeSoto, MO. In conversations with representatives of the American Railway Car Institute, it was also indicated that add-on controls are not common in railcar facilities.

Recreational Vehicle Industry

General. The Recreational Vehicle Industry is covered by the NAICS codes 336213 (Motor Home Manufacturing) and 336214 (Travel Trailer and Camper Manufacturing). This industry is also described using the SIC codes 3716 (Motor Homes) and 3792 (Travel Trailers and Campers). Under SIC code 3716, the industry includes establishments primarily engaged in manufacturing self-contained motor homes on purchased chassis. SIC code 3792 contains

establishments primarily engaged in manufacturing travel trailers and campers for attachment to passenger cars or other vehicles, pickup coaches (campers) and caps (covers) for mounting on pickup trucks [2]. NAICS code 336214 also includes automobile, boat, utility, and light truck trailers, which are also covered by SIC code 3799 (Transportation Equipment, Not Elsewhere Classified). Approximately 37 recreational vehicle manufacturing facilities were located in 10 States from a query of the AIRS database.

Trade Associations. The following trade association has been identified for this industry sector:

- Recreational Vehicle Industry Association

Process Description. HAP and VOC emissions are expected from pretreatment processes (when organic solvents are involved in the pretreatment process), and in coating application (including flash-off areas and curing ovens). Detailed information, however, is not available at this time.

Coatings. Detailed information is not available at this time.

Emission Control Techniques. Detailed information is not available at this time.

Rubber-to-Metal Bonded Part Manufacturing Industry

General. The Rubber-to-Metal Bonded Parts Manufacturing Industry is covered by the NAICS codes 326291 (Rubber Product Manufacturing for Mechanical Use) and 326299 (All Other Rubber Products Manufacturing). This industry is also described using the SIC codes 3061 (Molded, Extruded, and Lathe-Cut Mechanical Rubber Goods) and 3069 (Fabricated Rubber Products, Not Elsewhere Classified). SIC code 3061 includes establishments primarily engaged in manufacturing molded, extruded, and lathe-cut mechanical rubber goods, generally for machinery and equipment. SIC code 3069 consists of establishments primarily engaged in manufacturing industrial rubber goods, rubberized fabrics, and vulcanized rubber clothing, and miscellaneous rubber specialties and sundries, not elsewhere classified [2]. Many of the products manufactured in this industry are fabricated for use in the automotive industry. This grouping has the potential to overlap with the Automobile and Light-Duty Truck Surface Coating source category.

Trade Associations. The following trade association has been identified for this industry sector:

- Rubber Manufacturers Association

Process Description. HAP and VOC emissions are expected from pretreatment processes (when organic solvents are involved in the pretreatment process), and in coating application (including flash-off areas and curing ovens). Detailed information, however, is not available at this time.

Coatings. The main coatings associated with this industry are adhesives used to bond rubber to metal parts. More detailed information is not available at this time.

Emission Control Techniques. Detailed information is not available at this time.

Structural Metal Industry

General. The Structural Metal Industry is covered by the NAICS codes 332114 (Custom Roll Forming), 332311 (Prefabricated Metal Building and Component Manufacturing), 332312 (Fabricated Structural Metal Manufacturing), 332321 (Metal Window and Door Manufacturing), and 332323 (Ornamental and Architectural Metal Work Manufacturing). This industry is also described using the SIC codes 3441 (Fabricated Structural Metal), 3442 (Metal Doors, Sash, Frames, Molding, and Trim), 3446 (Architectural and Ornamental Metal Work), 3448 (Prefabricated Metal Building and Components), and 3449 (Miscellaneous Structural Metal Work). SIC code 3441 covers establishments primarily engaged in fabricating iron and steel or other metal for structural purposes, such as bridges, buildings, and sections for ships, boats, and barges [2]. SIC code 3442 includes establishments primarily engaged in manufacturing ferrous and nonferrous metal doors, sash, window and door frames and screens, molding, and trim. SIC code 3446 contains establishments primarily engaged in manufacturing architectural and ornamental metal work, such as stairs and staircases, open steel flooring (grating), fire escapes, grilles, railings, and fences and gates, except those made from wire. SIC code 3448 consists of establishments primarily engaged in manufacturing portable and other prefabricated metal buildings and parts and prefabricated exterior metal panels. SIC code 3449 is comprised of establishments primarily engaged in manufacturing miscellaneous structural metal work, such as metal plaster bases, fabricated bar joists, and concrete reinforcing bars. Also included in this SIC code are establishments primarily engaged in custom roll forming of metal. In accordance with NAICS code 332323, the structural metal industry also consists of metal corrals, stalls, and holding gates, which are covered by SIC code 3523 (Farm Machinery and Equipment).

Approximately 349 structural metal manufacturing facilities located in 31 States were identified from queries of the AIRS database [3]. However, information provided by the American Institute of Steel Construction (AISC) states that there are approximately 1,000 structural steel and bridge fabricators in the United States [24]. Of the 540 members of AISC, nearly 80 percent are small businesses and 90 percent produce less than 20,000 tons per year. A mid-sized AISC fabricator will process 2,500 tons of steel per year, and will make $3 million in sales annually. A survey was conducted by AISC of its members requesting paint usage for 1994. Of the 159 respondents, approximately 50 percent of them used less than 3,000 gallons of paint; approximately 78 percent used 7,000 gallons or less; and 90 percent used less than 10,000 gallons of paint.

Trade Associations. The following trade associations have been identified for this industry sector:

- American Institute of Steel Construction
- Metal Building Manufacturers Association
- Metal Construction Association
- National Association of Metal Finishers
- Specialty Steel Industry of North America
- Steel Deck Institute
- Steel Joists Institute
- Steel Structures Painting Council

Process Description. HAP and VOC emissions are expected from pretreatment processes (when organic solvents are involved in the pretreatment process), and in coating application (including flash-off areas and curing ovens). It is important to note that this industry covers several products with a wide variety of shapes and sizes. Parts may range from 8 inches to over 100 feet in any dimension (depth, width, or length); and weigh from less than 50 pounds to several tons. Therefore, some of the processes summarized in this industry description will not be feasible for all products covered by this industry [25,26].

Surface Preparation. Surface preparation of structural metal aids in the bonding of the substrate with adhesives or paints. Several methods are utilized to prepare structural metal parts for surface coating. Parts may be sanded to a mill finish. Hand or mechanical brushing or abrasive shot blasting may also be means of surface preparation [26]. Etching is another process used in preparing structural metal for coating. Etching is a chemical method that produces a silver-white surface, often referred to as frosted or matte. In this process, the substrate passes through a warm chemical solution (i.e. caustic soda) removing any natural oxidation. It is then rinsed and passed through a nitric acid bath to remove undissolved surface alloy constituents or impurities, and rinsed again. Some substrates may also require a chrome phosphate treatment. The following is an example of a chemical pretreatment process for structural metal:

1. Phosphate cleaner
2. Rinse
3. Sulfuric acid with small amounts of aluminum bichloride
4. Rinse
5. Nitric acid, which is used as a second cleaner due to the alloy leaving smut on the metal
6. Water rinse
7. Chromate conversion coat
8. City water rinse
9. Deionized water rinse with a small amount of chromic acid. The chromic acid is used to keep the system acidic. This allows the metal to retain a chrome/phosphate surface which is preferable for bonding.

Coating Application. After the pretreatment process, metal sheets or components are placed on racks and sent through a coating line, if feasible. A coating line may consists of a paint booth, a flash-off area, and a curing oven. Larger, heavier structures are not compatible with conveyor belt methods; and the use of an assembly line or line coating process is not practical [26]. Due to weight and size variability, most of these parts are processed in large open areas without enclosure. In these cases, flash-off areas and curing ovens are likewise not a part of the coating process. Coatings are applied using either HVLP or air atomized electrostatic spray application methods; or, for some larger parts, dip tank application methods also are utilized. Many steel joist manufacturers use large overhead cranes for the dip coating process [27]. Both manual and/or automated application systems can be used. Parts may receive up to 4 coats of paint depending on the type of paint used and the use of the substrate. Metallic or brightly colored parts may also require a clear coat. After coating, approximately 10 minutes is allowed for flash-off, and parts are sent to curing ovens, where applicable. Natural-gas fired ovens are used for curing in this industry. Ovens operate at between 400°F and 550°F.

Coatings. Multi-polymer, polyester, and acrylic based coatings are commonly used in the Structural Metal Industry. A large percentage of paint applied to structural steel for buildings is a single coat, red or grey oxide, alkyd primer [26]. A two-coat system, that may consist of a zinc rich paint or an epoxy, is typically used where greater protection is needed. In cases where a three-coat system is required, a polyurethane top-coat will be added. The main type of paint used in dip coating operations is a high-solids alkyd [27]. Xylene and toluene are the most common HAPs found in structural metal coatings.

Emission Control Techniques. Thermal oxidation (incineration) is the primary add-on control method used for controlling emissions from paint booths and curing ovens in the Structural Metal Industry. Thermal oxidizers can achieve up to ninty-nine percent destruction of VOC. Information provided by AISC indicates that most fabricators of larger, heavier steel structures do not operate any control devices in their facilities [26]. It is difficult to capture emissions generated from coating processes that take place in large open areas. Many structural metal manufacturing facilities operate systems to treat waste water from the pretreatment process. However, in facilities where hand or mechanical methods of surface preparation are utilized, no pretreatment waste waters are produced.

Resources

The MMPP Surface Coating source category is one of several source categories that will also be subject to VOC regulations under Section 183(e) of the CAA as amended in 1990. Two resources that will be used in that effort, and may prove useful in performing case-by-case MACT determinations under Section 112(g), at least for emissions of volatile HAPs, are the CTG documents for the MMPP and Magnet Wire source categories:

- *Control of Volatile Organic Emissions from Existing Stationary Sources - Volume VI: Surface Coating Of Miscellaneous Metal Parts and Products.* US Environmental Protection Agency. Office of Air Quality Planning and Standards. Research Triangle Park, NC. June 1978.

- *Control of Volatile Organic Emissions from Existing Stationary Sources - Volume IV: Surface Coating of Magnet Wire*. US EPA. Office of Air Quality Planning and Standards. Research Triangle Park, NC. December 1977.

In addition, NESHAP and NSPS developed for other surface coating operations may help to identify compliance options and/or control measures applicable to the MMPP Surface Coating industry. These regulations are as follows:

- Aerospace Manufacturing and Rework Facilities, 40 CFR Parts 9 and 63, Subpart GG - National Emission Standards for Aerospace Manufacturing and Rework Facilities. March 27, 1998.

- Ship Building and Repair Facilities, 40 CFR Part 63, Subpart II - National Emission Standards for Ship Building and Ship Repair (Surface Coating) Facilities. June 18, 1996.

Information on sources of emission may be obtained from the EPA's *AIRS/AFS* database and can be accessed through the Internet (http://www.epa.gov/airsweb/sources.htm).

IV. SUMMARY OF COMMENTS AND EPA RESPONSES

This section presents the general comments submitted by MMPP stakeholders on the Draft Preliminary Industry Characterization document and the responses to these comments from EPA.

Comment: Industry groups SIC 352 and SIC 353 have not been represented in the document. A list of "unique considerations" for the groups was included with comment.
Response: Comments and information provided have been incorporated into the Final document under the "Agricultural and Construction Machinery Industry" description.

Comment: A process description of the cast wheels manufacturing process at Reynolds Wheels International was submitted for use in development of the Automotive Parts Industry description.
Response: Comments and information provided have been incorporated into the Automotive Parts Industry description in the Final document.

Comment: A MACT proposal discussed at a past Stakeholder Meeting was excluded from the draft document. The proposal was to allow facilities to maintain their current level of VOM pounds per gallon if they can demonstrate that their process as a whole reduces overall VOM emissions.
Response: The initial phase of the regulatory development has focused on describing the industries applicable to the Miscellaneous Metal Parts and Products source category, and does not investigate options for the yet-to-be-proposed rule.

Comment: The industry group referred to as "Steel Pipe and Foundry" in the PIC document would be better described as "Steel Pipe and Steel Foundry".
Response: Comment has been incorporated into the Final document as a change in the industry name to "Pipe and Foundry," and the segment has been expanded to include other metal pipe and foundry industries.

Comment: The potential overlap with the Iron and Steel Foundry MACT category should be cited.
Response: Comment provided has been incorporated into the Final document.

Comment: The process description provided for the Structural Steel Industry is not representative of the entire industry. A summary of processes used by the industry was included with comment.
Response: Comments and information provided have been incorporated into the process description of the Structural Metal Industry in the Final document.

Comment: The industry group referred to as "Large Trucks and Buses" in the PIC document would be better described as "Heavy-Duty Trucks and Buses".

Response: Comment provided has been incorporated into the Final document under the description of "Heavy-Duty Trucks and Buses".

Comment: The process description provided for the Heavy-Duty Trucks and Buses Industry is not representative of the entire industry. A summary of processes used by the industry was included with comment.

Response: Comments and information provided have been incorporated into the Final document under the process description of "Heavy-Duty Trucks and Buses."

Comment: Need clarification on the use of SIC and NAICS Codes. The document currently addresses groups as being "previously described using SIC Code 3417". Most industries still use the SIC Code system and the language may be confusing.

Response: The language describing the classification of industries by SIC or NAICS Codes has been modified to avoid this confusion.

Comment: The use of a VOC-containing lubricant commonly used in the Magnet Wire industry was omitted from the process description. Emissions from this process are typically not controlled by catalytic or thermal incinerators.

Response: The section on the Magnet Wire industry has been updated to include this information.

Comment: The description for Railroad Transportation does not include locomotives and locomotive parts.

Response: The section on the Rail Transportation Industry has been updated to include this information.

Comment: The term "Job Shops" needs to be clarified.

Response: For the purposes of this document, the term "Job Shops" refers to surface coating contract facilities. To avoid further confusion, we have changed the name of the industry segment to "Contract Coating Facilities".

Comment: In the description of the Metal Shipping Container Industry eliminate references to container thickness requirements. These requirements change frequently and are irrelevant to surface coating.

Response: References to container thickness requirements have been removed from the Metal Shipping Container Industry description in the Final document.

Comment: The Metal Shipping Container industry description includes a list of DOT tests for containers. The vibration test, included on the list, is not required of manufacturers.

Response: The list of DOT tests for Metal Shipping Containers has been modified to exclude the vibration test.

Comment: The Steel Shipping Container Institute was not included on the list of applicable associations.

Response: The Steel Shipping Container Institute has been added to the association list.

Comment: The process description provided for the Metal Shipping Container Industry is not representative of the entire industry. A summary of processes used by the industry was included with comment.

Response: Comments and information provided have been incorporated into the Final document under the process description of Metal Shipping Containers.

Comment: Metal container reconditioning operations have been classified as SIC 7699 (NAICS 81131) by the U.S. Department of Commerce.

Response: SIC code 7699 has been added to the table of applicable industries.

Comment: Metal container reconditioning does not require the use of pretreatment processes using organic solvents. Steel shot blasting or wire brushing are used to strip drums prior to painting or lining.

Response: The process description for Metal Shipping Containers has been updated to include this information in the Final document.

Comment: The Rubber Manufacturers Association was not included on the list of industry members participating in the stakeholder process.

Response: The Rubber Manufacturers Association has been added to the stakeholder list in the Final document.

Comment: Rubber Manufacturers Association member company operations are not reflected in the SIC codes listed. Rubber-to-metal bonding operations are classified under either SIC 3061 or SIC 3069.

Response: SIC codes 3061 and 3069 have been added to the table of applicable industries.

Comment: There is not a process description for the rubber-to-metal bonding industry.

Response: Information on this industry was not available for Final document, but has been collected through other efforts and will be included in the Background Information Document (BID).

Comment: The Steel Joist Institute was not included on the list of industry members participating in the stakeholder process.

Response: The Steel Joist Institute has been added to the stakeholder list in the Final document.

Comment: The steel joist facilities are usually classified under SIC 3441, however, in the PIC document they have been listed under SIC 3449.

Response: The 1987 Standard Industrial Classification Manual specifically lists "fabricated bar joists" as one of the products included in SIC 3449. However, the manual also specifically lists "Steel joists, open web: long-span series" as a product under SIC 3441. Therefore, both SIC codes have been used to describe the steel joist industry.

Comment: According to the industries listed in the PIC document, the EPA is proposing to characterize the Miscellaneous Metal Parts and Products category into 11 subcategories.

Response: There has not been any subcategorization of the MMPP category as of yet. The industry sector profiles included in the PIC document are only those sectors which have been individually studied thus far and in no way denote a subcategorization. Furthermore, the industry segments listed in this document are not a definitive listing of all industries covered within this source category.

Comment: The process description provided for the Structural Steel Industry is not representative of the entire industry. A summary of processes used by the steel joist industry was included with comment.

Response: Comments and information provided have been incorporated into the Final document under the process description of Structural Metal.

V. REFERENCES

1. U.S. Census Bureau Website, 1997 NAICS and 1987 SIC Correspondence Tables. 1998. http://www.census.gov/epcd/www/naicstab.htm.

2. Standard Industrial Classification Manual. Executive Office of the President, Office of Management and Budget. 1987.

3. U.S. EPA's Aerometric Information Retrieval System (AIRS).

4. The Shapemakers Buyers' Guide. Aluminum Extruders Council. 1997.

5. The Shapemakers Extrusion Showcase. Aluminum Extruders Council. 1993.

6. Aluminum Extruders Council Website. Aluminum Extruders Council. 1997. http://www.aec.org.

7. Extrusion Technology Website. Extrusion Technology. http://www.extrutech.com.

8. *Extrusion Industry Profile Survey 1995*. Aluminum Extruders Council. 1996.

9. The Shapemakers - Extrusion Coatings Spotlight. Aluminum Exturders Council. 1997.

10. Kirsch, F. William and Gwen P. Loobey. Waste Minimization Assessment for a Manufacturer of Aluminum Extrusions. U.S. EPA, Risk Reduction Engineering Laboratory. Cincinnati, Ohio. April 1992.

11. Coatings Alternatives Guide (CAGE) Website. Research Triangle Institute in cooperation with U.S. EPA, Air Pollution Prevention and Control Division. Research Triangle Park, North Carolina. 1996. http://www.cage.rti.org.

12. Products Finishing Magazine, *1998 Large Coating Job Shop Survey*.

13. Summary of the Site Visit to the Freightliner Facility in Cleveland, North Carolina. July 1997.

14. Summary of the Site Visit to the Freightliner Facility in Mt. Holly, North Carolina. July 1997.

15. Summary of the Site Visit to the Volvo Facility in Dublin, Virginia. June 1997.

16. Control of Volatile Organic Emissions from Existing Stationary Sources - Volume IV: Surface Coating of Magnet Wire. U.S. EPA, Office of Air Quality Planning and Standards. Research Triangle Park, North Carolina. December 1977.

17. Summary of the Site Visit to the Phelps Dodge Magnet Wire Company. Laurinburg, North Carolina, August 1997.

18. Compilation of Air Pollutant Emission Factors - Volume I: Stationary Point and Area Sources, (AP-42), 5th edition. U.S. EPA, Office of Air Quality Planning and Standards. January 1995.

19. Letter. Comments on MMPPSC Industry Characterization from Bob Schenker, General Electric Company. September 18, 1998.

20. Brody, Aaron and Kenneth Marsh (ed). The Wiley Encyclopedia of Packaging Technology, 2nd edition. Washington, DC. 1997.

21. Letter. SSCI Comments on PIC from David Core, Steel Shipping Container Institute, September 22, 1998.

22. Letter. Comments from Dana Worcester, The Association of Container Reconditioners. September 21, 1998.

23. Summary of the Site Visit to the Union Pacific Railroad Facility in DeSoto, Missouri, September 1997.

24. Summary of the Site Visit to the Cupples Products, Inc. Facility in Union, Missouri, September 1997.

25. Summary of the Site Visit to the Windsor Metal Specialties Facility in Kissimmee, Florida, September 1997.

26. Letter. Comments from Kenneth G. Lee, American Institute of Steel Construction, September 21, 1998.

27. Letter. Comments from R. Donald Murphy, Steel Joist Institute, September 16, 1998.

In addition to the materials cited above, the following references were consulted for information pertaining to this document.

- Almag Website. Almag Aluminum Inc. 1997. http://www.almag.com.

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- Control Of Volatile Organic Emissions From Existing Stationary Sources - Volume VI: Surface Coating Of Miscellaneous Metal Parts and Products. U.S. EPA, Office of Air Quality Planning and Standards. Research Triangle Park, NC. June 1978.
- McMinn ,Beth, C.R. Newman, Robert C. McCrillis and Michael Kosusko. VOC Prevention Options for Surface Coating. Alliance Technologies Corporation, Chapel Hill, NC. SAIC, Durham, NC. U.S. EPA, Air and Energy Engineering Research Laboratory. Research Triangle Park, NC. 1992.
- Shapemakers - Aluminum Extrusions: Where Innovations Take Shape. Aluminum Extruders Council. 1991.
- SAPA's WWW Server. SAPA Limited. Tibshelf, Alfreton, Derbyshire DE55 5NH, United Kingdom. http://www.sapa-uk.com.
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ATTACHMENT 1

Summaries of the MMPP Stakeholder Meetings

ATTACHMENT 2

Existing State and Federal Regulations

ATTACHMENT 3

Detailed List of SIC Codes for Miscellaneous Metal Parts and Products

ATTACHMENT 4

Cross-Reference of SICs with SCCs for Facilities Identified in

ATTACHMENT 5

Summary of Control Devices Indicated in AIRS By SCC and Pollutant