

## ***Appendices***

### **APPENDIX A: Air Quality Glossary**

**ACFM** Actual cubic feet per minute. A measurement of exhaust rate from a release point.

**Act** refers to the 1990 Clean Air Act Amendments

**Actual Emissions** are the actual rate of emissions of a pollutant from an emission unit calculated using the emission unit's actual operating hours, production rates, and types of materials processed, stored, or combusted for the calendar year.

**Annual Throughput** is the quantity of raw material processed, handled, or used in an emission unit, such as fuels, solvents, coatings, or quantity of dust-producing material processed, handled, or transferred.

**Air Pollutant** is generally any substance in the air not part of the naturally occurring makeup of ambient air or that occurs in un-natural concentrations. In Iowa, this usually refers to hazardous air pollutants and criteria air pollutants.

**Allowable Emissions** is the emissions rate that represents a limit on the emissions that can occur from an emissions unit. This limit may be based on a federal, state, or local regulatory emission limit determined from state or local regulations and/or 40 Code of Federal Regulations (CFR).

**Ambient Standards** limit the concentration of a given pollutant in the ambient air. Ambient standards are not emissions limitations on sources, but usually result in such limits being placed on source operation as part of a control strategy to achieve or maintain an ambient standard.

**Ammonia** is a colorless gas with a very distinct odor. Ammonia emissions are important to air quality analyses because ammonia is involved in the formation of sulfate and nitrate, which are precursors for PM<sub>2.5</sub>. Only primary ammonia needs to be reported. Primary ammonia means it is in the same chemical form as when it was emitted into the atmosphere. Secondary ammonia, such as ammonium sulfate and ammonium nitrate, is formed by chemical reactions in the atmosphere.

**Attainment Area** is an area considered to have air quality as good as or better than the National Ambient Air Quality Standards (NAAQS) as defined in the Act. An area may be in attainment for one or more pollutants but be a nonattainment area for one or more other pollutants.

**Capture Efficiency** is the percentage of pollutant emitted from an emission unit that is caught or captured by a pickup hood or other collection mechanism. An example is a fume hood.

**Carbon Monoxide (CO)** is a colorless, odorless gas that depletes the oxygen-carrying capacity of blood. Example sources of CO emissions include industrial boilers, incinerators, and motor vehicles.

**CAS Number** refers to the Chemical Abstract Services number. CAS numbers are often found on Safety Data Sheets and are sometimes used as a way to identify air pollutants.

**CFR** is the Code of Federal Regulations. This is a book of rules published by the federal government. Title 40 of the CFR pertains to Protection of the Environment.

**Continuous Emissions Monitoring** Equipment that measures the concentration or emission rate of a gas or particulate matter using analyzer measurements and a conversion equation, graph, or computer program. Installation and operation of a CEM may be required by EPA or DNR in order to determine compliance with specific standards. Operation of a CEM must meet performance specifications, certification procedures, and recordkeeping and reporting requirements as specified in applicable regulations.

**Construction Permits** are permits required before installing or altering equipment or control equipment, with a goal of prevention of significant deterioration or degrading of clean air areas from new industrial development or expansion.

**Control Efficiency** is the emission reduction efficiency, and is a percentage value representing the amount of emissions that are controlled by a control device.

**Criteria Pollutant** refers to a pollutant for which a National Ambient Air Quality Standard has been set. Criteria pollutants are carbon monoxide, lead, nitrogen oxides, ozone, particulate matter with aerodynamic diameter less than or equal to 10 micrometers or less than or equal to 2.5 micrometers, and sulfur dioxide.

**Dual Fuel** refers to fuel burned at a ratio of 95% natural gas and 5% diesel fuel.

**Emergency Generator** ...any generator of which the sole function is to provide emergency backup power during an interruption of electrical power from the electrical utility. An emergency generator does not include peaking units at electrical utilities, generators at industrial facilities that typically operate at low rates, but are not confined to emergency purposes; or any standby generators that are used during times when power is available from the electric utility. An emergency is an unforeseeable condition that is beyond the control of the owner or operator.

**Emission** means pollution discharged into the atmosphere from smokestacks, other vents, and surface areas of commercial or industrial facilities; from residential chimneys; and from motor vehicle, locomotive, aircraft, or other nonroad engines.

**Emission Factors** The relationship between the amount of pollution produced and the amount of raw material processed. For example – pounds of CO per ton of coal fired.

**Emission Inventory** is a listing, by source, of the amount of air pollutants discharged into the atmosphere.

**Emission Limits** are limits on emissions that may be federally enforceable and exist in a permit. Such limits are usually expressed as a rate, generally in pounds per hour of emissions or as a concentration such as grains per dry standard cubic foot (7,000 grains is one pound).

**Emission point** is the point where emissions enter the atmosphere such as stacks, vents and ventilation exhausts. The term emission point is used interchangeably with release point.

**Emission Unit** is a piece of equipment where emissions are generated. Emission units may have one or more processes with actual emissions. Some examples of an emission unit with one or more processes are boilers (the ability to burn both natural gas and fuel oil), generators (the ability to burn both fuel oil and dual fuel), and grain dryers (the ability to dry grain and burn natural gas).

**Engineering Estimate** is a term commonly applied to the best approximation that can be made when the specific emission estimation techniques such as stack testing, material balance, or emission factors are not available. This estimation is usually made by an engineer familiar with the specific process, and is based on process information.

**Federally Enforceable** means all limitations and conditions that are enforceable by the administrator including, but not limited to, the requirements of new source performance standards, national emission standards for hazardous air pollutants, state rules, administrative orders, construction permits, and operating permits.

**Fugitive Emissions** are emissions that cannot reasonably pass through a stack, chimney, duct, vent or other opening. Fugitive emission sources can include haul roads, exposed storage piles, and wastewater retention ponds, etc.

**HAP or Hazardous Air Pollutants** are any of the 187 pollutants listed in Section 112 of the 1990 Clean Air Act Amendments. HAPs are known or suspected of being toxic or carcinogenic.

**Indirect Heating** occurs when the material being heated does not come in direct contact with the combustion gas, such as a hot water boiler.

**lowcleanair.gov** is the web site for the DNR's Air Quality Bureau with forms, assistance and guidance data.

**MMcf** equals 1,000,000 cubic feet. This unit of measure is most typically associated with the amount of natural gas combusted.

**Material Balance or Mass Balance** A process of estimating emissions using knowledge of the process, process rate, material used, and material properties.

**Manually Operated Equipment** means a machine or tool that is hand-held, such as a hand-held circular saw or compressed air chisel; a machine or tool for which the work piece is held or manipulated by hand, such as a bench grinder; a machine or tool for which the tool or bit is manipulated by hand, such as a lathe or drill press; any dust collection system which is part of such machine or tool; but not including any machine or tool for which the extent of manual operation is to control power to the machine or tool and not including any central dust collection system serving more than one machine or tool.

**MACT or Maximum Achievable Control Technology** are standards set under Title III of the 1990 Clean Air Act Amendments with an emphasis on control of hazardous air pollutants.

**Maximum Hourly Design Rate** is the highest amount of raw material processed or production achieved per hour based on manufacturer's data.

**Maximum True Vapor Pressure** means the equilibrium partial pressure of the material considering 1) for a material stored at ambient temperature, the maximum monthly average temperature as reported by the National Weather Service, or 2) for a material stored above or below the ambient temperature, the temperature equal to the highest calendar-month average of the material storage temperature.

**Minor Source Emissions Inventory** is the emissions inventory report that is due every third year for minor source facilities. Minor sources are facilities that do not meet the definition of a "major source" in 567-IAC 22.100.

**MSDS or Material Safety Data Sheets** are known as SDS or Safety Data Sheets as of December 1, 2013. See the definition of SDS or Safety Data Sheets below.

**National Ambient Air Quality Standards (NAAQS)** are the ambient standards for the following six criteria pollutants: carbon monoxide, lead, nitrogen oxides, ozone, sulfur dioxide, and particulate matter with an aerodynamic diameter less than or equal to 10 micrometers or less than or equal to 2.5 micrometers.

**National Emission Standards for Hazardous Air Pollutants (NESHAP)** are health-based standards set under the 1970 Clean Air Act for beryllium, mercury, vinyl chloride, benzene, arsenic, asbestos, radon, radionuclides and other HAPs. Under the 1990 Act, roughly 170 source categories are identified for eventual MACT regulations. See MACT definition on page 52. The NESHAPs are published in 40 CFR Parts 61 and 63.

**New Source Performance Standards (NSPS)** are promulgated for criteria, hazardous, and other pollutant emissions from new, modified, or reconstructed sources that the U.S. EPA determines contribute significantly to air pollution. These are typically emission standards, but may be expressed in other forms such as concentration and opacity. The NSPS are published in 40 CFR Part 60.

**Nitrogen Oxides (NOx)** are a class of compounds that are respiratory irritants that react with volatile organic compounds (VOC's) in the presence of sunlight to form Ozone. NOx compounds are also precursors to acid rain. Motor vehicles, power plants, and other stationary combustion facilities emit large quantities of NOx.

**North American Industrial Classification System (NAICS)** A North American system for classifying industries by a six-digit code. This six-digit hierarchical structure allows greater coding flexibility than the four-digit structure of the SIC. NAICS allows for the identification of 1,063 industries compared to the 1,004 found in the SIC system.

**Opacity** means the degree to which emissions reduce the transmission of light and obscure the view of an object in the background. Opacity can be measured by properly trained observers. The validity of such measurements has been well established in the courts, including the U.S. Supreme Court. DNR field inspectors often take opacity readings during inspections.

**Operating Permits** are permits required by Title V of the 1990 Act for major sources. Operating permits are for the facility as a whole and differ from construction permits, which are issued for individual release points.

**Overall Control Efficiency** is obtained by multiplying the capture efficiency by the control equipment's control efficiency to provide the overall control efficiency for reporting emissions.

**Ozone (O<sub>3</sub>)** is a colorless gas that damages lungs and can damage materials and vegetation. It is the primary constituent of smog, and is formed primarily when nitrogen oxides (NO<sub>x</sub>) and volatile organic compounds (VOCs) react in the presence of sunlight.

**Particulate Matter of aerodynamic diameter less than or equal to 10 micrometers (PM<sub>10</sub>)** is a measure of small solid matter suspended in the atmosphere. Small particles can penetrate deeply into the lung where they can cause respiratory problems. Emissions of PM-10 are significant from fugitive dust, power plants, commercial boilers, metallurgical industries, mineral industries, fires, and motor vehicles.

**Particulate Matter of aerodynamic diameter less than or equal to 2.5 micrometers (PM<sub>2.5</sub>)** is another measure of small solid matter suspended in the atmosphere. Primary PM-2.5 results largely from combustion of fossil fuels or biomass, although selected industrial processes can also be significant in some areas. The sources of PM-2.5 include, but are not limited to, gasoline and diesel exhaust, wood stoves and fireplaces, land clearing, wildland prescribed burning, and wild fires. Sources of primary particulate including fugitive emissions from paved and unpaved roads, dust from ore processing and refining, and to a lesser extent, crustal material from construction activities, agricultural tilling, wind erosion and other crustal sources are less important based on their relatively small contribution to ambient PM-2.5 concentrations. The condensable components are largely made up of semi-volatile organic compounds that condense at ambient temperature to form aerosol.

**Release Point** is the point where emissions enter the atmosphere such as stacks, vents and ventilation exhausts. The term release point is used interchangeably with emission point.

**Reported Emissions** are emissions estimates that are submitted to a regulatory agency. Emissions inventories are used for a variety of purposes such as planning pollution control programs, promoting compliance with laws and regulations, and conducting permit reviews.

**SDS or Safety Data Sheets** are an information source with details about chemical substances such as chemical composition and other environmental information. SDS can be a useful source of emissions information and are available for all chemical substances from the supplier of the material.

**Source Classification Codes (SCCs)** are codes defined by EPA that classify air emissions sources by individual processes and/or operations.

**Stack Tests** A test that measures the concentration of pollutants in the exhaust stack. Measurements are performed following procedures specified and developed by the US EPA and/or DNR. Such testing is required by DNR to be conducted by various stationary sources to determine compliance with applicable air emissions limits.

**SCFM** Standard cubic feet per minute. A measurement of exhaust rate from a release point.

**Standard Industrial Classification (SIC)** A United States government system for classifying industries by a four-digit code.

**SLEIS** State and Local Emissions Inventory System. SLEIS is the online emissions inventory reporting tool that replaced SPARS after the 2015 emissions reporting cycle.

**State Implementation Plan (SIP)** is a state plan approved by EPA for the establishment, regulation, and enforcement of air pollution standards.

**Stationary Source** is any building, structure, facility or installation that emits or may emit any air pollutant subject to regulation under the Clean Air Act. It includes all pollutant emitting activities which belong in the same major industrial grouping as identified by the first two digits in the facilities SIC code, are located on one or more contiguous or adjacent properties and are under common ownership or control. Mobile sources such as cars, trains, and forklifts are not regulated by DNR.

**Sulfur Oxides (SOx)** are a class of colorless, pungent gases that are respiratory irritants and precursors to acid rain. Sulfur oxides are emitted from various combustion or incineration sources, particularly from coal combustion.

**Tertiary-Butyl Acetate (TBAC)** is a pollutant common to surface coating operations that is neither a VOC nor a HAP. However, EPA still requires that TBAC emissions be reported on the emissions inventory as an "additional pollutant".

**Threshold** is a level of emissions that once reached, triggers requirements to obtain a permit.

**Transfer Efficiency** is the percentage of sprayed material such as paint or solvent that is actually adhered to the intended surface.

**Twelve-Month Rolling Period** is a period of 12 consecutive months determined on a rolling basis.

**Volatile Organic Compounds (VOCs)** are organic compounds that contribute to ground-level ozone or smog formation. Ground level ozone is a strong lung oxidant. Large amounts of VOCs are emitted from fuel distribution, chemical manufacturing, motor vehicles, and a wide variety of industrial, commercial, and consumer solvent uses.

**1000gal** equals 1,000 gallons. This unit of measure is most typically associated with the amount of fuel oil or LPG combusted.

## APPENDIX B: List of Criteria Pollutants, Chemicals Not Considered VOCs, and Hazardous Air Pollutants

### Criteria Pollutants

PM <sub>2.5</sub> .....	Particulate Matter less than or equal to 2.5 micrometers in diameter
PM <sub>10</sub> .....	Particulate Matter less than or equal to 10 micrometers in diameter
SO <sub>2</sub> .....	Sulfur Dioxide
NO <sub>x</sub> .....	Nitrogen Oxides
VOC .....	Volatile Organic Compound
CO.....	Carbon Monoxide
Pb .....	Lead

Chemicals Not Considered Volatile Organic Compounds (VOCs) – from paragraphs 40 CFR 51.100 (s):

(1) This includes any such organic compound other than the following, which have been determined to have negligible photochemical reactivity: Methane; ethane; methylene chloride (dichloromethane); 1,1,1-trichloroethane (methyl chloroform); 1,1,2-trichloro-1,2,2-trifluoroethane (CFC-113); trichlorofluoromethane (CFC-11); dichlorodifluoromethane (CFC-12); chlorodifluoromethane (HCFC-22); trifluoromethane (HFC-23); 1,2-dichloro 1,1,2,2-tetrafluoroethane (CFC-114); chloropentafluoroethane (CFC-115); 1,1,1-trifluoro 2,2-dichloroethane (HCFC-123); 1,1,1,2-tetrafluoroethane (HFC-134a); 1,1-dichloro 1-fluoroethane (HCFC-141b); 1-chloro 1,1-difluoroethane (HCFC-142b); 2-chloro-1,1,1,2-tetrafluoroethane (HCFC-124); pentafluoroethane (HFC-125); 1,1,2,2-tetrafluoroethane (HFC-134); 1,1,1-trifluoroethane (HFC-143a); 1,1-difluoroethane (HFC-152a); perchlorobenzotrifluoride (PCBTF); cyclic, branched, or linear completely methylated siloxanes; acetone; perchloroethylene (tetrachloroethylene); 3,3-dichloro-1,1,1,2,2-pentafluoropropane (HCFC-225ca); 1,3-dichloro-1,1,2,2,3-pentafluoropropane (HCFC-225cb); 1,1,1,2,3,4,4,5,5,5-decafluoropentane (HFC 43-10mee); difluoromethane (HFC-32); ethylfluoride (HFC-161); 1,1,1,3,3,3-hexafluoropropane (HFC-236fa); 1,1,2,2,3-pentafluoropropane (HFC-245ca); 1,1,2,3,3-pentafluoropropane (HFC-245ea); 1,1,1,2,3-pentafluoropropane (HFC-245eb); 1,1,1,3,3-pentafluoropropane (HFC-245fa); 1,1,1,2,3,3-hexafluoropropane (HFC-236ea); 1,1,1,3,3-pentafluorobutane (HFC-365mfc); chlorofluoromethane (HCFC-31); 1 chloro-1-fluoroethane (HCFC-151a); 1,2-dichloro-1,1,2-trifluoroethane (HCFC-123a); 1,1,1,2,2,3,3,4,4-nonafluoro-4-methoxy-butane (C<sub>4</sub>F<sub>9</sub>OCH<sub>3</sub> or HFE-7100); 2-(difluoromethoxymethyl)-1,1,1,2,3,3,3-heptafluoropropane ((CF<sub>3</sub>)<sub>2</sub>CFCF<sub>2</sub>OCH<sub>3</sub>); 1-ethoxy-1,1,2,2,3,3,4,4,4-nonafluorobutane (C<sub>4</sub>F<sub>9</sub>OC<sub>2</sub>H<sub>5</sub> or HFE-7200); 2-(ethoxydifluoromethyl)-1,1,1,2,3,3,3-heptafluoropropane ((CF<sub>3</sub>)<sub>2</sub>CFCF<sub>2</sub>OC<sub>2</sub>H<sub>5</sub>); methyl acetate; 1,1,1,2,2,3,3-heptafluoro-3-methoxy-propane (n-C3F7OCH3, HFE-7000); 3-ethoxy-1,1,1,2,3,4,4,5,5,6,6,6-dodecafluoro-2-(trifluoromethyl) hexane (HFE-7500); 1,1,1,2,3,3,3-heptafluoropropane (HFC 227ea); methyl formate (HCOOCH<sub>3</sub>); 1,1,1,2,2,3,4,5,5,5-decafluoro-3-methoxy-4-trifluoromethyl-pentane (HFE-7300); propylene carbonate; dimethyl carbonate; *trans*-1,3,3,3-tetrafluoropropene; HCF<sub>2</sub>OCF<sub>2</sub>H (HFE-134); HCF<sub>2</sub>OCF<sub>2</sub>OCF<sub>2</sub>H (HFE-236cal2); HCF<sub>2</sub>OCF<sub>2</sub>CF<sub>2</sub>OCF<sub>2</sub>H (HFE-338pcc13); HCF<sub>2</sub>OCF<sub>2</sub>OCF<sub>2</sub>CF<sub>2</sub>OCF<sub>2</sub>H (H-Galden 1040x or H-Galden ZT 130 (or 150 or 180)); *trans* 1-chloro-3,3,3-trifluoroprop-1-ene; 2,3,3,3-tetrafluoropropene; 2-amino-2-methyl-1-propanol; t-butyl acetate; 1,1,2,2-Tetrafluoro -1-(2,2,2-trifluoroethoxy) ethane; and perfluorocarbon compounds which fall into these classes:

- (i) Cyclic, branched, or linear, completely fluorinated alkanes;
- (ii) Cyclic, branched, or linear, completely fluorinated ethers with no unsaturations;
- (iii) Cyclic, branched, or linear, completely fluorinated tertiary amines with no unsaturations; and
- (iv) Sulfur containing perfluorocarbons with no unsaturations and with sulfur bonds only to carbon and fluorine.

The following chemicals have been added to the definition of chemicals not considered VOC:

- HFE-7300----January 18, 2007
- Propylene carbonate (108-32-7)----January 21, 2009
- Dimethyl carbonate (616-38-6)----January 21, 2009
- HFO-1234ze----July 23, 2012HCF2OCF2H (HFE-134)----March 14, 2013
- HCF2OCF2OCF2H (HFE-236cal2)----March 14, 2013
- HCF2OCF2CF2OCF2H (HFE-338pcc13)----March 14, 2013
- HCF2OCF2OCF2CF2OCF2H (H-Galden 1040X or H-Galden ZT 130 (or 150 or 180))----March 14, 2013
- Trans 1-chloro-3,3,3-trifluoroprop-1-ene (Solstice™ 1233zd(E))----September 27, 2013
- 2,3,3,3-tetrafluoropropene (HFO-1234yf)----November 21, 2013

- 2-amino-2-methyl-1-propanol (AMP)----March 27, 2014
- 1,1,2,2-Tetrafluoro-1-(2,2,2-trifluoroethoxy) Ethane (HFE-347pcf2)----September 30, 2016
- cis-1,1,1,4,4,4-hexafluorobut-2-ene (HFO-1336mzz-Z)----January 28, 2019

## Hazardous Air Pollutants – alphabetical listing

Note: Methyl ethyl ketone (MEK) is no longer considered to be a HAP as of 12/19/05.

CAS Number	Chemical Name	CAS Number	Chemical Name
<b>A</b>			
75-07-0	Acetaldehyde	510-15-6	Chlorobenzilate
60-35-5	Acetamide	75-00-3	Chloroethane (Ethyl chloride)
75-05-8	Acetonitrile	67-66-3	Chloroform
98-86-2	Acetophenone	74-87-3	Chloromethane (Methyl chloride)
53-96-3	2-Acetylaminofluorene	107-30-2	Chloromethyl methyl ether
107-02-8	Acrolein	126-99-8	Chloroprene
79-06-1	Acrylamide	0	Chromium Compounds
79-10-7	Acrylic acid	0	Cobalt Compounds
107-13-1	Acrylonitrile	0	Coke Oven Emissions
107-05-1	Allyl chloride	1319-77-3	Cresol/Cresylic acid (isomers/mixtures)
92-67-1	4-Aminobiphenyl		m-Cresol
62-53-3	Aniline	108-39-4	o-Cresol
90-04-0	o-Anisidine	95-48-7	p-Cresol
0	Antimony Compounds	106-44-5	Cumene
0	Arsenic Compounds	98-82-8	Cyanide Compounds
1332-21-4	Asbestos (friable)	0	
<b>B</b>			
71-43-2	Benzene	94-75-7	2,4-D, salts and esters
92-87-5	Benzidine	3547-04-4	DDE
98-07-7	Benzoic trichloride	117-81-7	Di(2-ethylhexyl) phthalate (DEHP)
100-44-7	Benzyl chloride	334-88-3	Diazomethane
0	Beryllium Compounds	132-64-9	Dibenzofuran
92-52-4	Biphenyl	96-12-8	1,2-Dibromo-3-chloropropane
111-44-4	Bis(2-chloroethyl) ether	106-93-4	1,2-Dibromoethane (Ethylene dibromide)
542-88-1	Bis(chloromethyl) ether		Dibutyl phthalate
75-25-2	Bromoform	84-74-2	1,4-Dichlorobenzene(p)
74-83-9	Bromomethane (Methyl Bromide)	106-46-7	3,3'-Dichlorobenzidine
106-99-0	1,3-Butadiene	91-94-1	1,1-Dichloroethane (Ethylidene dichloride)
106-88-7	1,2-Butylene oxide (1,2- Epoxybutane)	75-34-3	1,2-Dichloroethane (Ethylene dichloride)
		107-06-2	Dichloromethane (Methylene chloride)
<b>C</b>			
0	Cadmium Compounds	75-09-2	1,2-Dichloropropane (Propylene dichloride)
156-62-7	Calcium cyanamide	78-87-5	1,3-Dichloropropylene
133-06-2	Captan		Dichlorvos
63-25-2	Carbaryl	542-75-6	Diethanolamine
75-15-0	Carbon disulfide	62-73-7	N,N-Dimethylaniline
56-23-5	Carbon tetrachloride	111-42-2	Diethyl sulfate
463-58-1	Carbonyl sulfide	121-69-7	3,3'-Dimethoxybenzidine
120-80-9	Catechol	64-67-5	4-Dimethylaminoazobenzene
CAS Number	Chemical Name	119-90-4	3,3'-Dimethylbenzidine
133-90-4	Chloramben	60-11-7	Dimethyl formamide
57-74-9	Chlordane	119-93-7	1,1-Dimethyl hydrazine
7782-50-5	Chlorine	68-12-2	4,6-Dinitro-o-cresol
79-11-8	Chloroacetic acid	57-14-7	
532-27-4	2-Chloroacetophenone	534-52-1	
108-90-7	Chlorobenzene		

CAS Number	Chemical Name	CAS Number	Chemical Name
51-28-5	2,4-Dinitrophenol	1634-04-4	Methyl tert-butyl ether
121-14-2	2,4-Dinitrotoluene	101-14-4	4,4'-Methylenebis(2-chloroaniline)
<b>E</b>		101-68-8	Methylenebis (phenylisocyanate)
106-89-8	Epichlorohydrin	CAS Number	Chemical Name
140-88-5	Ethyl acrylate	101-77-9	4,4'-Methylenedianiline
100-41-4	Ethylbenzene	<b>N</b>	
107-21-1	Ethylene glycol	91-20-3	Naphthalene
75-21-8	Ethylene oxide	0	Nickel Compounds
96-45-7	Ethylene thiourea	98-95-3	Nitrobenzene
151-56-4	Ethyleneimine	92-93-3	4-Nitrobiphenyl
<b>F</b>		100-02-7	4-Nitrophenol
0	Fine Mineral Fibers	79-46-9	2-Nitropropane
50-00-0	Formaldehyde	62-75-9	N-Nitrosodimethylamine
<b>G</b>		59-89-2	N-Nitrosomorpholine
Glycol Ethers (See page 62)		684-93-5	N-Nitroso-N-methylurea
<b>H</b>		<b>P</b>	
76-44-8	Heptachlor	56-38-2	Parathion
87-68-3	Hexachloro-1,3-butadiene	87-86-5	Pentachlorophenol
118-74-1	Hexachlorobenzene	108-95-2	Phenol
77-47-4	Hexachlorocyclopentadiene	106-50-3	p-Phenylenediamine
67-72-1	Hexachloroethane	75-44-5	Phosgene
822-06-0	Hexamethylene-1,6-diisocyanate	7803-51-2	Phosphine
680-31-9	Hexamethylphosphoramide	7723-14-0	Phosphorus (yellow or white)
110-54-3	Hexane	85-44-9	Phthalic anhydride
302-01-2	Hydrazine	85-44-9	Phthalic anhydride
7647-01-0	Hydrochloric acid	1336-36-3	Polychlorinated biphenyls
7664-39-3	Hydrogen fluoride	0	Polycyclic Organic Matter
123-31-9	Hydroquinone	1120-71-4	Propane sultone
<b>I</b>		123-38-6	Propionaldehyde
78-59-1	Isophorone	57-57-8	beta-Propiolactone
<b>L</b>		114-26-1	Propoxur
0	Lead Compounds	75-56-9	Propylene oxide
58-89-9	Lindane	75-55-8	Propyleneimine
<b>M</b>		<b>Q</b>	
108-31-6	Maleic anhydride	91-22-5	Quinoline
0	Manganese Compounds	106-51-4	Quinone
0	Mercury Compounds	82-68-8	Quintozene
67-56-1	Methanol	<b>R</b>	
72-43-5	Methoxychlor	0	Radionuclides (including Radon)
60-34-4	Methyl hydrazine	<b>S</b>	
74-88-4	Methyl iodide	0	Selenium Compounds
108-10-1	Methyl isobutyl ketone	100-42-5	Styrene
624-83-9	Methyl isocyanate	96-09-3	Styrene oxide
80-62-6	Methyl methacrylate		

CAS Number	Chemical Name	CAS Number	Chemical Name
<b>T</b>		121-44-8	Triethylamine
1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)	1582-09-8	Trifluralin
79-34-5	1,1,2,2-Tetrachloroethane	540-84-1	2,2,4-Trimethylpentane
127-18-4	Tetrachloroethylene	<b>U</b>	
7550-45-0	Titanium tetrachloride	51-79-6	Urethane
108-88-3	Toluene	<b>V</b>	
95-80-7	2,4-Toluene diamine (2,4-Diaminotoluene)	108-05-4	Vinyl acetate
584-84-9	2,4-Toluene diisocyanate	593-60-2	Vinyl bromide
95-53-4	o-Toluidine	75-01-4	Vinyl chloride
800-135-2	Toxaphene	75-35-4	Vinylidene chloride
120-82-1	1,2,4-Trichlorobenzene 1,1,1-	<b>X</b>	
71-55-6	Trichloroethane	1330-20-7	Xylene (mixed isomers)
79-00-5	1,1,2-Trichloroethane	108-38-3	m-Xylene
79-01-6	Trichloroethylene	95-47-6	o-Xylene
95-95-4	2,4,5-Trichlorophenol	106-42-3	p-Xylene
88-06-2	2,4,6-Trichlorophenol		

## Hazardous Air Pollutants - by CAS Number

Note: Methyl ethyl ketone (MEK) is no longer considered to be a HAP as of 12/19/05.

CAS Number	Chemical Name	CAS Number	Chemical Name
0	Antimony Compounds	75-05-8	Acetonitrile
0	Arsenic Compounds	75-07-0	Acetaldehyde
0	Beryllium Compounds	75-09-2	Dichloromethane (Methylene chloride)
0	Cadmium Compounds		
0	Chromium Compounds	75-15-0	Carbon disulfide
0	Cobalt Compounds	75-21-8	Ethylene oxide
0	Coke Oven Emissions	75-25-2	Bromoform
0	Cyanide Compounds	75-34-3	1,1-Dichloroethane (Ethylidene dichloride)
0	Fine Mineral Fibers		
0	Glycol Ethers (See page 62)	75-35-4	Vinylidene chloride
0	Lead Compounds	75-44-5	Phosgene
0	Manganese Compounds	75-55-8	Propyleneimine
0	Mercury Compounds	75-56-9	Propylene oxide
0	Nickel Compounds	76-44-8	Heptachlor
0	Polycyclic Organic Matter	77-47-4	Hexachlorocyclopentadiene
0	Radionuclides (including Radon)	77-78-1	Dimethyl sulfate
0	Selenium Compounds	78-59-1	Isophorone
50-00-0	Formaldehyde	78-87-5	1,2-Dichloropropane (Propylene dichloride)
51-28-5	2,4-Dinitrophenol		
51-79-6	Urethane	79-00-5	1,1,2-Trichloroethane
53-96-3	2-Acetylaminofluorene	79-01-6	Trichloroethylene
56-23-5	Carbon tetrachloride	79-06-1	Acrylamide
56-38-2	Parathion	79-10-7	Acrylic acid
57-14-7	1,1-Dimethyl hydrazine	79-11-8	Chloroacetic acid
57-57-8	beta-Propiolactone	79-34-5	1,1,2,2-Tetrachloroethane
57-74-9	Chlordane	79-44-7	Dimethylcarbanyl chloride
58-89-9	Lindane	79-46-9	2-Nitropropane
59-89-2	N-Nitrosomorpholine	80-62-6	Methyl methacrylate
60-11-7	4-Dimethylaminoazobenzene	82-68-8	Quintozene
60-34-4	Methyl hydrazine	84-74-2	Dibutyl phthalate
60-35-5	Acetamide	85-44-9	Phthalic anhydride
62-53-3	Aniline	87-68-3	Hexachloro-1,3-butadiene
62-73-7	Dichlorvos	87-86-5	Pentachlorophenol
62-75-9	N-Nitrosodimethylamine	88-06-2	2,4,6-Trichlorophenol
63-25-2	Carbaryl	90-04-0	o-Anisidine
64-67-5	Diethyl sulfate	91-20-3	Naphthalene
67-56-1	Methanol	91-22-5	Quinoline
67-66-3	Chloroform	91-94-1	3,3'-Dichlorobenzidine
67-72-1	Hexachloroethane	92-52-4	Biphenyl
68-12-2	Dimethyl formamide	92-67-1	4-Aminobiphenyl
71-43-2	Benzene	92-87-5	Benzidine
71-55-6	1,1,1-Trichloroethane	92-93-3	4-Nitrobiphenyl
72-43-5	Methoxychlor	94-75-7	2,4-D, salts and esters
74-83-9	Bromomethane (Methyl Bromide)	95-47-6	o-Xylene
74-87-3	Chloromethane (Methyl chloride)	95-48-7	o-Cresol
74-88-4	Methyl iodide	95-53-4	o-Toluidine
75-00-3	Chloroethane (Ethyl chloride)	95-80-7	2,4-Toluene diamine (2,4-Diaminotoluene)
75-01-4	Vinyl chloride		

CAS Number	Chemical Name	CAS Number	Chemical Name
95-95-4	2,4,5-Trichlorophenol	120-82-1	1,2,4-Trichlorobenzene
96-09-3	Styrene oxide	121-14-2	2,4-Dinitrotoluene
96-12-8	1,2-Dibromo-3-chloropropane	121-44-8	Triethylamine
96-45-7	Ethylene thiourea	121-69-7	N,N-Dimethylaniline
98-07-7	Benzoic trichloride	122-66-7	1,2-Diphenylhydrazine
98-82-8	Cumene	123-31-9	Hydroquinone
98-86-2	Acetophenone	123-38-6	Propionaldehyde
98-95-3	Nitrobenzene	123-91-1	1,4-Dioxane
100-02-7	4-Nitrophenol	126-99-8	Chloroprene
100-41-4	Ethylbenzene	127-18-4	Tetrachloroethylene
100-42-5	Styrene	131-11-3	Dimethyl phthalate
100-44-7	Benzyl chloride	132-64-9	Dibenzofuran
101-14-4	4,4'-Methylenebis(2-chloroaniline)	133-06-2	Captan
101-68-8	Methylenebis (phenylisocyanate)	133-90-4	Chloramben
101-77-9	4,4'-Methylenedianiline	140-88-5	Ethyl acrylate
106-42-3	p-Xylene	151-56-4	Ethyleneimine
106-44-5	p-Cresol	156-62-7	Calcium cyanamide
106-46-7	1,4-Dichlorobenzene(p)	302-01-2	Hydrazine
106-50-3	p-Phenylenediamine	334-88-3	Diazomethane
106-51-4	Quinone	463-58-1	Carbonyl sulfide
106-88-7	1,2-Butylene oxide (1,2-Epoxybutane)	510-15-6	Chlorobenzilate
106-89-8	Epichlorohydrin	532-27-4	2-Chloroacetophenone
106-93-4	1,2-Dibromoethane (Ethylene dibromide)	534-52-1	4,6-Dinitro-o-cresol
106-99-0	1,3-Butadiene	540-84-1	2,2,4-Trimethylpentane
107-02-8	Acrolein	542-75-6	1,3-Dichloropropylene
107-05-1	Allyl chloride	542-88-1	Bis(chloromethyl) ether
107-06-2	1,2-Dichloroethane (Ethylene dichloride)	584-84-9	2,4-Toluene diisocyanate
107-13-1	Acrylonitrile	593-60-2	Vinyl bromide
107-21-1	Ethylene glycol	624-83-9	Methyl isocyanate
107-30-2	Chloromethyl methyl ether	680-31-9	Hexamethylphosphoramide
108-05-4	Vinyl acetate	684-93-5	N-Nitroso-N-methylurea
108-10-1	Methyl isobutyl ketone	822-06-0	Hexamethylene-1,6-diisocyanate
108-31-6	Maleic anhydride	1120-71-4	Propane sultone
108-38-3	m-Xylene	1319-77-3	Cresol/Cresylic acid (isomers and mixture)
108-39-4	m-Cresol	1330-20-7	Xylene (mixed isomers)
108-88-3	Toluene	1332-21-4	Asbestos (friable)
108-90-7	Chlorobenzene	1336-36-3	Polychlorinated biphenyls
108-95-2	Phenol	1582-09-8	Trifluralin
110-54-3	Hexane	1634-04-4	Methyl tert-butyl ether
111-42-2	Diethanolamine	1746-01-6	2,3,7,8-Tetrachlorodibenzo-p-dioxin (TCDD)
111-44-4	Bis(2-chloroethyl) ether	3547-04-4	DDE
114-26-1	Propoxur	7550-45-0	Titanium tetrachloride
117-81-7	Di(2-ethylhexyl) phthalate (DEHP)	7647-01-0	Hydrochloric acid
118-74-1	Hexachlorobenzene	7664-39-3	Hydrogen fluoride
119-90-4	3,3'-Dimethoxybenzidine	7723-14-0	Phosphorus (yellow or white)
119-93-7	3,3'-Dimethylbenzidine	CAS Number	Chemical Name
120-80-9	Catechol	7782-50-5	Chlorine
		7803-51-2	Phosphine
		8001-35-2	Toxaphene

## Glycol Ethers\*

Chemical Name	CAS Number
Diethylene glycol dimethyl ether	111-96-6
Diethylene glycol monobutyl ether acetate	124-17-4
Diethylene glycol monobutyl ether	112-34-5
Diethylene glycol monoethyl ether acetate	112-15-2
Diethylene glycol monoethyl ether	111-90-0
Diethylene glycol monohexyl ether	112-59-4
Diethylene glycol monomethyl ether acetate	629-38-9
Diethylene glycol monomethyl ether	111-77-3
Ethylene glycol dibutyl ether	112-48-1
Ethylene glycol diethyl ether	629-14-1
Ethylene glycol dimethyl ether	110-71-4
Ethylene glycol monoacetate	542-59-6
Ethylene glycol monobutyl ether acetate	112-07-2
Ethylene glycol monoethyl ether acetate	111-15-9
Ethylene glycol monoethyl ether	110-80-5
Ethylene glycol monohexyl ether	112-25-4
Ethylene glycol monomethyl ether acetate	110-49-6
Ethylene glycol monomethyl ether	109-86-4
Ethylene glycol monoethyl ether	10020-43-6
Ethylene glycol monophenyl ether	122-99-6
Ethylene glycol monopropyl ether	2807-30-9
Triethylene glycol	112-27-6
Triethylene glycol dimethyl ether	112-49-2
Triethylene glycol monoethyl ether	112-50-5
Triethylene glycol monomethyl ether	112-35-6

\*This is a partial list of common glycol ethers. A complete listing can be found on line at <https://www3.epa.gov/ttn/atw/glycol2000.pdf>

## APPENDIX C: Iowa DNR Control Efficiency Guidance

### Details

The level of air emissions from a facility depends on many factors. For many industrial processes, technical information is available to assist in determining the quantity and types of air pollutants that a process would create and thus be emitted without any control. This information on the quantity of air pollutants generated during a particular process is referred to as an emission factor. Facilities can control the amount of pollutants emitted to the atmosphere from these processes by installing air pollution control equipment. The level of control depends on various factors. These include: the type of equipment used; the design of the equipment; the process involved; temperature; air flow rates; raw materials; combustion products, etc.; as well as the pollutant(s) targeted for control. Control efficiency is contaminant specific.

DNR staff has prepared a general guidance document identifying typical control efficiencies achieved by different generic types of control equipment. The control efficiency values identified in the table represent single pieces of control equipment. Multiple pieces of control equipment in series should be evaluated on a case-by-case basis.

This control efficiency guidance document is used in reviewing emission inventories by comparing the facility's claimed control efficiency with the guidance document's value. If the facility claims higher control efficiency for a particular piece of equipment, DNR staff will request supporting information to substantiate the facility's claim. This supporting information would consist of test results either from a previous stack test, continuous emission monitoring, or from any other verifiable source of information.

The PM<sub>2.5</sub> control efficiency is currently assumed equal to the PM<sub>10</sub> control efficiency due to a lack of documentation. If a facility has any questions regarding PM<sub>2.5</sub> control efficiency, please call the emissions inventory staff.

## Control Efficiency Table

Control Device or Practice	Control Efficiency (%)						
	TSP	PM <sub>10</sub>	SO <sub>x</sub>	NO <sub>x</sub>	VOC	CO	Pb
Wet Scrubber - high efficiency	note 1		note 2				
Wet Scrubber - med efficiency	note 1		note 2				
Wet Scrubber - low efficiency	note 1		note 2				
Gravity Collector	3 <sup>a</sup>	--	--	--	--	--	2 <sup>a</sup>
Centrifugal Collector (cyclone)-high efficiency*	95 <sup>c</sup>	80 <sup>a</sup>	--	--	--	--	65 <sup>a</sup>
Centrifugal Collector (cyclone)-med efficiency*	75 <sup>c</sup>	50 <sup>a</sup>	--	--	--	--	40 <sup>a</sup>
Centrifugal Collector (cyclone)-low efficiency*	35 <sup>c</sup>	10 <sup>a</sup>	--	--	--	--	8 <sup>a</sup>
Electrostatic Precipitator-high efficiency**	95 <sup>a</sup>	95 <sup>a</sup>	--	--	--	--	75 <sup>a</sup>
Electrostatic Precipitator-medium efficiency**	80 <sup>a</sup>	80 <sup>a</sup>	--	--	--	--	65 <sup>a</sup>
Electrostatic Precipitator-low efficiency**	70 <sup>a</sup>	70 <sup>a</sup>	--	--	--	--	55 <sup>a</sup>
Fabric Filter	99 <sup>a</sup>	95 <sup>c</sup>	--	--	--	--	80 <sup>a</sup>
Catalytic Afterburner	--	--	--	--	95 <sup>c</sup>	--	--
Direct Flame Afterburner	--	--	--	--	95 <sup>c</sup>	--	--
Flaring	--	--	--	--	90 <sup>a</sup>	--	--
Low NO <sub>x</sub> Burners	--	--	--	note 3	--	--	--
Staged Combustion	--	--	--	40 <sup>a</sup>	--	--	--
Flue Gas Recirculation	--	--	--	50 <sup>a</sup>	--	--	--
Reduced Combustion Air Preheat	--	--	--	note 4	--	--	--
Steam or Water Injection	--	--	--	65 <sup>a</sup>	--	--	--
Low Excess Air Firing	--	--	--	30 <sup>a</sup>	--	--	--
Fuel with low Nitrogen Content	--	--	--	50 <sup>a</sup>	--	--	--
Sulfuric Acid Plant-Single Contact Process	--	--	50 <sup>a</sup>	--	--	--	--
Sulfuric Acid Plant-Double Contact Process	--	--	95 <sup>a</sup>	--	--	--	--
Vapor Recovery System (Condensers)	--	--	--	--	note 5	--	--
Activated Carbon Adsorption	--	--	note 6				--
Gas Absorption Column-packed	90 <sup>a</sup>	90 <sup>a</sup>	note 2				--
Gas Absorption Column-tray type	25 <sup>a</sup>	25 <sup>a</sup>	note 2				--
Spray Tower	20 <sup>a</sup>	20 <sup>a</sup>	note 2				--
Venturi Scrubber	90 <sup>a</sup>	90 <sup>a</sup>	note 2				--
Impingement Plate Scrubber	note 7		--	--	--	--	--
Mat or Panel Filter	90 <sup>c</sup>	90 <sup>c</sup>	--	--	--	--	--
Dust Suppression by Water Spray	40 <sup>a</sup>	40 <sup>a,d</sup>	--	--	--	--	--
Dust Suppression by Chemical or Wetting Agents	40 <sup>a</sup>	40 <sup>a,d</sup>	--	--	--	--	--
Catalytic Reduction	--	--	--	note 8	--	--	--
Wet Lime Slurry Scrubbing	--	--	85 <sup>c</sup>	--	--	--	--
Multiple Cyclone w/o Fly Ash Reinjection	80 <sup>a</sup>	80 <sup>a</sup>	--	--	--	--	65 <sup>a</sup>
Multiple Cyclone with Fly Ash Reinjection	50 <sup>a</sup>	50 <sup>a</sup>	--	--	--	--	40 <sup>a</sup>
Water Curtain	50 <sup>c</sup>	10 <sup>a</sup>	--	--	--	--	--

<sup>a</sup>Control efficiency was taken from a literature review and developmental work by the Minnesota Pollution Control Agency

<sup>b</sup>Control efficiency was taken from AP-42

<sup>c</sup>Control efficiency was developed from the combination of a literature review and developmental work by the Minnesota Pollution Control Agency, AP-42, and staff judgment

<sup>d</sup>Unless a higher efficiency is required as an operating condition of a DNR construction permit

\*Low, medium, and high efficiency cyclones will be defined based on pressure drop. The ranges of pressure drops are as follows:

Low-efficiency cyclones	2-4 inches water
Medium-efficiency cyclones	4-7 inches water
High-efficiency cyclones	7-10 inches water

\*\* Low, medium, and high efficiency electrostatic precipitators (ESP) will be defined based on the specific collection area (SCA). The SCA is the total collector plate area divided by the gas volume flow rate. It is usually expressed in terms of square feet per 1000 acfm of gas flow. For example, the SCA of an ESP with a gas flow rate of 250,000 acfm and collection plate area of 100,000 square feet is:

$$100,000 \text{ ft}^2 / 250,000 \text{ acfm} \times 0.001 = 400 \text{ ft}^2/\text{thousand acfm}$$

The ranges of SCA for low, medium, and high efficiency ESPs are as follows:

Low-efficiency ESP	< 400
Medium-efficiency ESP	400 - 700
High-efficiency ESP	> 700

Typical control efficiencies were not assigned to all control devices because some efficiencies strongly depend on source specific parameters. In these instances, the table will refer to one of the notes listed below for additional information.

Note 1. Particulate control equipment represented by these classifications should be included in the other, more specific categories (i.e., venturi scrubbers or packed bed absorption columns).

Note 2. The achievable gaseous pollutant control efficiencies for these types of control equipment will depend on the pollutant solubility, the solvent used, the vapor-liquid contact time, and the contact area. These devices are normally designed to achieve a promulgated control efficiency rather than the maximum achievable reduction. Control efficiencies for these devices should be evaluated on a case-by-case basis.

Note 3. Low NO<sub>x</sub> burners (LNB) have been developed by many boiler and burner manufacturers for both new and retrofit applications. Low NO<sub>x</sub> burners limit NO<sub>x</sub> formation by controlling both the stoichiometric and temperature profiles of the combustion process. This control is achieved with design features that regulate the aerodynamic distribution and mixing of the fuel and air, yielding one or more of the following conditions:

1. Reduced O<sub>2</sub> in the primary combustion zone, which limits fuel NO<sub>x</sub> formation;
2. Reduced flame temperature, which limits thermal NO<sub>x</sub> formation; and
3. Reduced residence time at peak temperature, which limits thermal NO<sub>x</sub> formation.

The amount of NO<sub>x</sub> reduction achievable is dependent upon the combustion system and burner design, actual operating practices, and fuel characteristics. The amount of reduction should be based on the manufacturer's demonstration.

Note 4. The amount of NO<sub>x</sub> reduction achievable from reducing preheating of combustion air will vary according to the temperatures before and after the modification. Therefore, efficiencies for this process should be evaluated on a case-by-case basis.

Note 5. Control efficiencies for a particular condenser will vary for different VOC compounds and depends on both the partial pressure of the pollutant and the operating parameters of the condenser. Efficiencies should be evaluated on a case-by-case basis.

Note 6. Since the overall control efficiency will depend on source specific parameters such as the physical characteristics of the absorbent bed and gaseous stream, the temperature, and the choice of regeneration technique, efficiencies should be evaluated on a case-by-case basis.

Note 7. Depending on the application, control efficiencies may range from 25-99%. Efficiencies should be evaluated on a case-by-case basis.

Note 8. Generic classification; recommend specific technologies be addressed on an individual basis. Two widely used NO<sub>x</sub> control technologies include Selective Catalytic Reduction (SCR) and Selective Noncatalytic Reduction (SNCR). SCR can obtain reductions of 60-90%. Urea based SNCR can achieve reductions of 30-80% and ammonia based 55-85%.

## APPENDIX D: Abbreviations, Conversion Factors, and Spray Painting Transfer Efficiencies

### Abbreviations

ACFM	Actual cubic feet per minute
CAA	Clean Air Act
CAS	Chemical Abstract Service Registry number
CFR	Code of Federal Regulation
CHIEF	Clearinghouse for Inventories and Emission Factors
CO	Carbon Monoxide
DNR	Iowa Department of Natural Resources
gr./dscf	grains per dry standard cubic foot
HAP	Hazardous Air Pollutant
IAC	Iowa Administrative Code
lbs/hr	pounds per hour
lbs/MMBtu	pounds per million British thermal units
lbs/MMcf	pounds per million cubic feet
MACT	Maximum Achievable Control Technology
MSEI	Minor Source Emission Inventory
NAAQS	National Ambient Air Quality Standards
NAICS	North American Industrial Classification System
NESHAP	National Emission Standards for Hazardous Air Pollutants
NOx	Nitrogen Oxides
NSPS	New Source Performance Standards
NSR	New Source Review
°F	degrees Fahrenheit
PM10	Particulate Matter less than or equal to 10 micrometers in diameter
PM2.5	Particulate Matter less than or equal to 2.5 micrometers in diameter
ppmv	parts per million by volume
SCC	Source Classification Code
SCFM	Standard cubic feet per minute
SDS (formerly MSDS)	Safety Data Sheet (formerly Material Safety Data Sheet)
SIC	Standard Industrial Classification
SLEIS	State and Local Emissions Inventory System
SO2	Sulfur Dioxide
TPY	Tons per year
TSP	Total Suspended Particulates
USEPA	United States Environmental Protection Agency
VOCs	Volatile Organic Compounds

## Conversion Factors\*

\*Additional conversion factors are located in [AP-42, Appendix A](#).

- 1,050 Btu per ft<sup>3</sup> (Natural Gas)
- 0.0905 MMBtu per gallon (Propane)
- 0.140 MMBtu per gallon (No.2 Fuel Oil)
- 0.140 MMBtu per gallon (Diesel Fuel)
- 1 pound is equal to 7,000 grains
- 1 ton is equal to 2,000 pounds
- 1 gallon is equal to 3.785 liters
- 1 gallon of water is equal to 8.345 pounds
- To convert ounces into pounds multiply by 0.0625
- 56 pounds per bushel (corn)
- 60 pounds per bushel (soybeans)
- To convert g/L to lbs/gal: lbs/gal = (g/L) x .008345
- To convert scfm to acfm at standard pressure:  
Acfm = (actual temp. (°F) + 460) x scfm (standard temp. (°F) + 460)
- standard temperature = 70 °F

## Spray Painting Transfer Efficiencies

Transfer Efficiency as a function of Spraying Method and Sprayed

Method of Spraying	Flat Surface (%)	Table Leg Surface (%)	Bird Cage Surface (%)
Air atomized	50	15	10
Airless	75-80	10	10
Electrostatic:			
Disk	95	90-65	90-95
Airless	80	70	70
Air atomized	75	65	65

Source: Air Pollution Engineering Manual (1992), Table 2, pg. 362

## APPENDIX E: Minor Source Emissions Inventory Completeness Checklist

### MSEI Completeness Checklist

Have you included...

#### Form INV-1 Facility Identification

- Your facility contact person's address and phone number
- Your facility latitude and longitude
- Your responsible official signature
- Your six digit NAICS
- Your statewide company employee count

#### Form INV-2 Release point Description

- Release point Forms for all emission units

#### Form INV-4 Emission Unit Description – Actual Emissions

- The annual throughput for each emission unit
- The actual operating schedule
- Multiple forms if more than one process
- PM-2.5 and Ammonia emissions where applicable

#### Form INV-5 Calculations

- All safety data sheets, if applicable
- For paint booths, a list containing the amount of each paint and solvent used
- All calculations shown in full, including engineering estimates

#### Form INV-6 Facility-Wide Actual Emissions

- Multiple forms if needed for additional pollutants
- Total actual emissions for each pollutant being emitted at the facility
- All pollutants listed on Form INV-4
- Facility-wide actual emissions for each pollutant on INV-6 match the total for each pollutant on all INV-4 forms

#### Other Reminders

- Are your control efficiencies acceptable according to the control efficiency guidance document?
- Did you use the most recent emission factors available?
- Did you address the emissions inventory to the correct location?

Air Quality Bureau  
Wallace Building, 2<sup>nd</sup> Floor  
502 E 9<sup>th</sup> St  
Des Moines IA 50319