

Solvents Safety Handbook

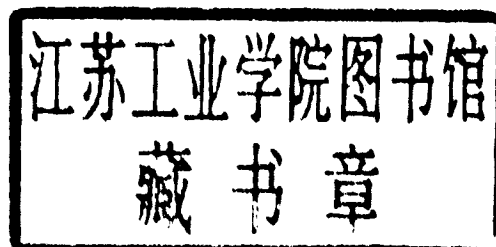
D.J. De Renzo

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SOLVENTS SAFETY HANDBOOK

Edited by

D.J. De Renzo



NOYES DATA CORPORATION

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SOLVENTS SAFETY HANDBOOK

Foreword

Instant information for decision-making regarding industrial solvents in everyday use, and in emergency situations by personnel involved with chemical accidents, is provided in this handbook which is a compilation of data on 335 hazardous and frequently-used solvents. The book, prepared in clear, concise, easy-to-locate format, will be a valuable source book on any library or laboratory shelf. It is intended for use by scientists, engineers, managers, transportation personnel, and anyone else who might have contact with, or require data on, a particular solvent.

Included in the large amount of pertinent data for each solvent are the following categories of information:

- Health Hazards and Toxicity
- Fire, Exposure, and Water Pollution Effects and Methods for Handling
- Protective Equipment
- Responses to Discharge
- Fire Hazards
- Chemical Reactivity
- Labeling
- Shipping Information
- Saturated Liquid Density
- Liquid Heat Capacity, Thermal Conductivity, and Viscosity
- Solubility in Water
- Saturated Vapor Pressure and Vapor Density
- Ideal Gas Heat Capacity

The data in the book are part of the Chemical Hazard Response Information System (CHRIS) designed by the U.S. Coast Guard, consisting of *A Condensed Guide to Chemical Hazards*, *Hazard Assessment Handbook*, *Response Methods Handbook*, and *Hazardous Chemical Data*; a hazardous assessment computer system; and technical support personnel located at Coast Guard headquarters. The information in the book is from *CHRIS Hazardous Chemical Data*, prepared by the U.S. Department of Transportation, U.S. Coast Guard, issued June 1985.

The table of contents is organized in such a way as to serve as a subject index and provides easy access to the 335 solvents detailed in the book.

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A Related Noyes Publication

INDUSTRIAL SOLVENTS HANDBOOK

1985

Third Edition

Edited by

Ernest W. Flick

Completely revised, and vastly expanded, this well-established and successful reference volume is designed principally for the chemical and other process industries, but will be found useful by anyone needing the latest pertinent data on industrial solvents.

This Third Edition is uniquely helpful when it becomes necessary to select a new solvent on a competitive or comparative basis; when the customary solvent, employed hitherto, might no longer be available; or when prices have risen to such an extent that an existing process must be redesigned to make it economically feasible again.

The more than 1100 tables in this book contain basic data on the physical properties of most solvents and on the solubilities of a variety of materials in these solvents. Even phase diagrams for multicomponent systems are included.

The contents of the tables were selected by the editor mainly from manufacturers' literature at no cost to, nor influence from, the manufacturers or distributors of these solvents.

The vast amount of information contained in this book is shown in the condensed table of contents that follows here. The numbers in parentheses after each entry indicate the number of tables per topic.

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Explanation of Terms

This section explains the special terms used in the data sheets, gives the sources of specific items, and includes other information that will be useful to the reader in interpreting the data. The paragraphs below are keyed to the relevant portions by the subheading and number used in the data sheets.

The expression "Not pertinent" means that the data item either has no real meaning (such as the flash point of a nonflammable chemical) or is not required for assessing a hazardous situation. The expression "Data not available" means that the information sought was not found in the general or specialized data sources listed at the end of this manual. In a few cases where important data were not available, values were estimated by usually reliable procedures; all such values are labeled "(est.)". If more accurate values for those items are found, they will be included in later revisions.

The *name* used for each of the chemicals included in this manual is either (1) that specified in the Code of Federal Regulations, Title 46, Table 151.01-10(b) (Compounds Regulated by Subchapter O) and Table 151.01-10(d) (Compounds to be Regulated by Subchapter D) or (2) a common name for those chemicals not now regulated by Subchapters O and D but known to be hazardous during shipment. The data sheets are arranged in alphabetic order by chemical name, not by the 3-letter code.

The *3-letter code* is designed to facilitate correct identification of chemicals in oral or written communication. The code should be used only *in addition* to the compound name; it should not be used alone. For transmitting the code, use the phonetic alphabet given in the "International Code of Signals."

1. RESPONSE TO DISCHARGE

In every case of a discharge or leak, it is obvious that an effort should be made to reduce, stop, or contain the flow of material at its source if this can be done safely. The purpose of the terms used in this section is to describe in a general way the cautionary and corrective responses that are described in greater detail in the Response Methods Handbook.

- "*Issue warning*" is used when the chemical is a *poison*, has a *high flammability*, is a *water contaminant*, is an *air contaminant* (so as to be hazardous to life), is an *oxidizing material*, or is *corrosive*. In the Response Methods Handbook the italicized properties are the bases for cautionary responses to restrict ignition, and to restrict contaminated water for human use, farm use, and industrial use.
- "*Restrict access*" is used only for those chemicals that are unusually and immediately hazardous to personnel

unless they are protected properly by respirators, protective clothing, etc. In the Response Methods Handbook this cautionary response is sometimes used in a broader sense to ensure exclusion of spectators and others who might ignite flammable compounds.

- *"Evacuate area"* is used primarily for unusually poisonous chemicals or those that ignite easily. The same expression is used in the Response Methods Handbook for this cautionary response.
- *"Mechanical containment"* is used for water-insoluble chemicals that float and do not evaporate readily. In the Response Methods Handbook the corresponding corrective response is "Contain".
- *"Should be removed"* is used for chemicals that cannot be allowed to disperse because of their harmful effect on humans or on the ecological system in general. The term is not used unless there is a reasonable chance of preventing dispersal, after a discharge or leak, by chemical and physical treatment.
- *"Chemical and physical treatment"* is recommended for chemicals that can be removed by skimming, pumping, dredging, burning, neutralization, absorption, coagulation, or precipitation. The corrective response may also include the use of dispersing agents, sinking agents, and biological treatment. Specific procedures to be followed are found in the Response Methods Handbook. Cleaning of the shoreline is also specified there for some compounds.
- *"Disperse and flush"* is used for chemicals that can be made non-hazardous to humans by simple dilution with water; a corresponding corrective response is used in the Response Methods Handbook. In a few cases the response is indicated even when the compound reacts with water because, when proper care is taken, dilution is still the most effective way of removing the primary hazard.

2. LABELS

2.1 Category—The category refers to the type label or placard required by regulation on any container of the subject compound being shipped.

2.2 Class—The class refers to the United Nations Class or Division numbers which may be displayed at the bottom of placards or in the hazardous materials description on shipping papers. The class numbers help to further classify the type of hazard represented by the material being shipped. The class numbers and their complete definitions can be found in the 1984 Emergency Response Guidebook published by the Department of Transportation.

3. CHEMICAL DESIGNATIONS

3.1 Coast Guard Compatibility Classification—An entry is made when the chemical has been assigned to one of the 43 cargo groups listed in Code of Federal Regulations, Title 46, Part 150, "Compatibility of Cargoes and Operational Requirements for Bulk Liquid Hazardous Waste Cargoes." Appropriate parts of these regulations are included in this manual. Chemicals included in the Guide were assigned to a group by the Cargo and Hazardous Materials Division, Coast Guard Headquarters. If the chemical is not a liquid carried in bulk in ships' tanks, this data item is "Not listed."

3.2 Chemical Formula—This has been limited to a commonly used one-line formula. In the case of some organic compounds it has not been possible to represent chemical structure within such a limitation.

3.3 IMO/United Nations Numerical Designation—The designation is that of the "International Maritime Dangerous Goods Code" published by the International Maritime Organization (IMO), London, 1977.

3.4 Department of Transportation Identification Number—This is an identification number assigned by the Department of Transportation to aid in categorizing hazards and recommended responses. The ID's and appropriate responses can be located in the 1984 Emergency Response Guidebook.

3.5 Chemical Abstracts Services Registry Number—The unique identification number assigned each compound registered with the Chemical Abstracts Service (CAS) is listed to aid in quick identification of the compound.

4. OBSERVABLE CHARACTERISTICS

4.1 Physical State (as shipped)—All chemicals that are listed in the Code of Federal Regulation, Title 46, Tables 151.01-10(b) and 151.01-10(d) are shipped as liquids. Other designations include liquefied gas, liquefied compressed gas, and solid. Where a compound may be shipped either as a liquid or solid, both designations are given.

4.2 Color—All color descriptions found in the common reference sources are included. The color description is that for pure material. Occasionally the color of a chemical changes when it dissolves in water or becomes a gas.

4.3 Odor—All odor descriptions found in the common reference sources are included. The expression "characteristic" is used only when no other reasonable description was found. The odor description is that for pure material.

5. HEALTH HAZARDS

5.1 Personal Protective Equipment—The items listed are those recommended by (a) manufacturers, either in technical bulletins or in Material Safety Data Sheets, (b) the Chemical Manufacturers Association or (c) the National Safety Council, for use by personnel while responding to fire or accidental discharge of the chemical. They are intended to protect the lungs, eyes, and skin. Safety showers and eyewash fountains are considered to be important protective equipment for the handling of almost all chemicals; they are not usually listed.

5.2 Symptoms Following Exposure—These are brief descriptions of the effects observed in humans when the vapor (gas) is inhaled, when the liquid or solid is ingested (swallowed), and when the liquid or solid comes in contact with the eyes or skin.

5.3 Treatment for Exposure—"First-aid" procedures are recommended. They deal with exposure to the vapor (gas), liquid, or solid and include inhalation, ingestion (swallowing) and contact with eyes or skin. The instruction "Do NOT induce vomiting" is given if an unusual hazard is associated with the chemical being sucked into the lungs (aspiration) while the patient is vomiting. "Seek medical attention" or "Call a doctor" is recommended in those cases where only competent medical personnel can treat the injury properly. In all cases of human exposure, seek medical assistance as soon as possible.

5.4 Threshold Limit Value—The Threshold Limit Value (TLV) is usually expressed in units of parts per million (ppm)—i.e., the parts of vapor (gas) per million parts of contaminated air by volume at 25°C (77°F) and one atmosphere of pressure. For a chemical that forms a fine mist or dust, the concentration is given in milligrams per cubic meter (mg/m³). The TLV is defined as the concentration of the substance in air that can be breathed for five consecutive eight-hour workdays (40-hour work week) by most people without adverse effect.* As some people become ill after exposure to concentrations lower than the TLV, this value cannot be used to define exactly what is a "safe" or "dangerous" concentration.

No entry appears when the chemical is a mixture; it is possible to calculate the TLV for a mixture only when the TLV for each component of the mixture is known and the composition of the mixture by weight is also known.

5.5 Short-Term Inhalation Limits—The parts of vapor (gas) per million parts of contaminated air by volume at 25°C (77°F) and one atmosphere of pressure is given. The limits are given in milligrams per cubic meter for chemicals that can form a fine mist or dust. The values given are the maximum permissible average exposures for the time periods specified. Most of the data came from the Commonwealth of Pennsylvania, Department of Environmental Resources, Title 25, Article IV, Chapter 201 (1971). Some of the data (called "Emergency Exposure Limits") were provided by the committee on Toxicology, National Academy of Science—National Academy of Engineering, National Research Council.

*American Conference of Governmental Industrial Hygienists, "Threshold Limit Values for Substance in Workroom Air, Adopted by ACGIH for 1972"