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PART I

MANUAL L-1—A GUIDE FOR THE PREPARATION OF WARNING LABELS FOR HAZARDOUS CHEMICALS

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The development of new chemical products and the introduction of chemical processes into ever-widening fields has accentuated the need for furnishing appropriate information in those cases where special precautions are necessary. Many chemicals present no hazards in normal handling and storage and for these products no precautionary labels are necessary.

The education of employees regarding chemical hazards is, and must remain, the direct responsibility of their employers. However, such hazards are not confined to employees alone, and information concerning them should, so far as practicable, reach every person using, transporting, or storing chemicals. The most practical means for the seller to disseminate this information appears to be by labels affixed to containers of hazardous chemicals, bearing appropriate precautionary statements and instructions stated as simply and briefly as circumstances permit.

In the interest of uniformity and more adequate labeling of chemical products, the Manufacturing Chemists' Association has prepared this Manual for the benefit and guidance of its members. A series of definitions is included in Schedule 1 in order that the terms used may be clearly understood. In addition to the general recommendations contained herein, the MCA has prepared suggested labels for specific products. These have been printed as Manual L-2, which will be supplemented from time to time as additional recommended labels are developed.

A precautionary label does not take the place of safety equipment such as suitable goggles, airline respirators, gas masks, clothing, shoes, etc.

Individual statutes, regulations or ordinances may require that particular information be included on a label or that a specific label be affixed to a container. In each case, the requirements of these laws should also be studied. *The warning labels suggested in this Manual should be used in addition to, or in combination with, any label required by law.**

* Federal statutes include:

Interstate Commerce Commission Regulations for Transportation of Explosives and Other Dangerous Articles: Supt. of Documents, Govt. Printing Office, Washington, D. C.

Federal Caustic Poison Act and regulations: Food and Drug Administration, Federal Security Agency, Washington, D. C.

Federal Insecticide Act of 1910 and regulations: Agricultural Marketing Administration, U. S. Department of Agriculture, Washington, D. C.

Federal Food, Drug and Cosmetic Act and regulations: Food and Drug Administration, Federal Security Agency, Washington, D. C.

Related statutes of the 48 States and the District of Columbia include Caustic Acid, Pharmacy, Poison, and Insecticide Acts.

GENERAL PRINCIPLES

In the preparation of any precautionary label the following principles should first be considered:

- 1) Each chemical product (including mixtures) presents a distinct problem and must be treated individually, in the light of its own characteristics.
- 2) Extreme care should be exercised in the choice of terminology. Statements should be brief and simple.
- 3) On labels for different products, uniformity in language to indicate the same hazards is most desirable in order to gain greater understanding through standardization.
- 4) Precautionary statements must be accurate, selectively chosen, and expressed in clearly defined terms. To be effective they should be used only when and to the extent necessary. Labeling of a relatively harmless product so as to indicate that it is hazardous, as well as the failure to give adequate notice of a hazard, will develop a disregard for labels and defeat their purpose.

For example, if the word "POISON" is to retain its usefulness on a label, it should be applied exclusively to those products (1) which are poisons according to a definite toxicity standard*, or (2) with which it is associated through common usage, or (3) for which its use is prescribed by law. In all other cases the relative degree of the hazard can be better indicated by the use of signal words such as: "DANGER" to cover extremely serious hazards; "WARNING" to cover less serious hazards; and "CAUTION" to cover minor hazards, together with a descriptive statement of the hazard.

- 5) Chemical names should be those recommended by the American Chemical Society.
- 6) The use of a non-descriptive code designation or trade name as the only identification of a hazardous chemical should be avoided. If for any reason, it is undesirable to show the chemical name, or if the chemical name is so complex as to be meaningless except to the trained chemist, the label should state the type of chemical, e.g., "corrosive acid," "lead compound."
- 7) The following subject matter should be considered for inclusion on a precautionary label:
 1. Chemical name
 2. "Signal word" (DANGER-WARNING-CAUTION) designating degree of hazard (Column A, Schedule 3)
 3. Affirmative statement of "hazard" (Column B, Schedule 3)
 4. "Precautionary measures" covering actions to be followed or avoided (Column C, Schedule 3)
 5. "Instructions in case of accident," where advisable (Column D, Schedule 3)
- 8) Warning labels should be printed in easily legible type, which is in contrast by typography, layout, or color with any other printed matter on the label and should be placed conspicuously on containers. Legibility may be preserved with a suitable protective coating.

* To provide a practical working standard for labeling purposes "POISON" is defined in Schedule 1 of this Manual to include only chemicals capable of causing acute effects by ingestion and inhalation, the principal modes of entry into the body. This definition excludes chemicals capable of causing injuries as a result of skin absorption or of chronic exposure by inhalation, because the variable actions and effects of chemicals with these characteristics preclude a practical means of measuring their hazards.

PREPARATION OF PRECAUTIONARY LABELS

The basic considerations in the preparation of a precautionary label for any chemical product (including mixtures) are:

- 1) Determination of the hazards present in the particular chemical product.
- 2) Selection of appropriate statements for each significant hazard inherent in the product.
- 3) Arrangement of statements in the order of emphasis desired.

The most frequently encountered hazards have been classified by the MCA into 10 types ^{as} listed in Schedule 2. Set opposite each class are statements illustrating characteristic precautions usually required for that type of hazard.

Many chemical products will have more than one type of hazard, in which case appropriate statements for each significant type should be included on the label. Most chemical products contain impurities. When these are present in harmful quantities, appropriate warnings and precautionary measures should be included on the labels.

As each chemical product must be treated individually, there will be many instances in which the illustrative statements will not be applicable either because they do not accurately express the degree of hazard or because they fail to cover the particular characteristics. In such cases, suitable statements should be selected from Schedule 3. This Schedule presents a more comprehensive list of statements arranged in columnar form, and grouped as follows:

A	B	C	D
Signal Word	Hazards	Precautionary Measures	Instructions in Case of Accident

Column A—The degree of hazard can be expressed only in relative terms. The purpose is two-fold: to indicate to the reader the comparative seriousness of the danger involved in handling a given product and to call attention to the precautionary instructions which should immediately follow. The "signal words" recommended are, in the order of diminishing severity of hazard, (1) DANGER; (2) WARNING; (3) CAUTION.

Example: WARNING!

Column B—From this column should be selected the phrase (or phrases) that most accurately describes the principal hazard. This is placed on the same line as the "signal word."

Example: WARNING! FLAMMABLE

If other significant hazards are present, they should be tabulated under the principal hazard.

Column C—The appropriate statement of "precautionary measures" should be chosen from Column C and should follow on subsequent lines.

Example: WARNING! FLAMMABLE

Keep away from heat and open flame.

Keep container closed.

Use with adequate ventilation.

Avoid prolonged breathing of vapor.

Avoid prolonged or repeated contact with skin.

Column D—When it is advisable to include instructions in case of accident, the appropriate statements may be selected from this column. Instructions in case of accident to individuals are valuable but should be limited to recognized first aid procedures based upon simple methods and commonly available materials. Instructions for strictly medical treatment should be omitted except when specifically required by law. Because of the serious and lasting effects that may result from eye injuries, a recommendation to obtain medical attention should accompany any specific instruction directed to the treatment of the eyes. If the statements from Schedule 3 fail to meet the exact needs, they should be modified to suit. In the example shown, toluene, no phrase from this column appears to be necessary.

While every compound carries some hazard, if improperly used, it is impractical to cover every possible contingency on a label. Efforts should be directed toward naming the serious hazards, and warning against such abuses and accidents as are likely to be encountered under normal conditions. There are scarcely any means of measuring in absolute terms the relative seriousness of hazards, and the recommendations in Schedule 3 only contemplate their division into two or three degrees of intensity. It follows that of two compounds one may be less hazardous than the other and yet may carry the same warnings and cautions.

Instructions for handling and storage of containers should be included where conditions indicate their need. These instructions should take into consideration both the characteristics of the chemical product and the limitations of the type or types of container in which it is packed.

Schedule 4 presents suggested labels for samples of experimental products for which full data regarding hazards are not yet known.

Schedule 5 illustrates the application of caution statements to three specific products. In the case of toluene, the statements used are similar to those given in Schedule 2 for a compound or mixture having hazards in classifications I-B and IV. The second example, aqueous hydrofluoric acid, represents a very special case where the particular hazards require modification of the standard statements. The third example is that of a label for a proprietary compound or mixture.

Schedule 1

DEFINITIONS

- Flammable Liquid*¹—An inflammable¹ liquid is any liquid which gives off inflammable vapors (as determined by flash point from Tagliabue's open-cup tester, as used for test of burning oils) at or below a temperature of 80° F.
- Extremely Flammable Liquid*²—An extremely flammable liquid is a liquid which gives off flammable vapors (as determined by flash point from Tagliabue's open-cup tester, as used for test of burning oils) at or below a temperature of 20° F.
- Corrosive*²—(Physiological)—A corrosive is an agent which in contact with living tissue will cause more or less severe destruction of tissue by chemical action.
- Irritant*²—(Physiological)—An irritant is an agent which in contact with living tissue will induce either immediately or after prolonged or repeated contact a more or less severe local tissue reaction not leading directly to destruction of tissue.
- Sensitizer*²—(Physiological)—A sensitizer is a material which as ordinarily handled does not necessarily cause any discernible reaction in living tissue but which after initial or repeated contact with the tissue of some individuals may, at a later date, produce a prompt inflammatory reaction on contact, even in minute amounts, with the tissue of the same individuals.
- Dusts*³—Solid particles generated by handling, crushing, grinding, rapid impact, detonation and decrepitation of organic or inorganic materials such as rock, ore, metal, coal, wood, grain, etc. Dusts do not tend to flocculate except under electrostatic forces; they do not diffuse in air but settle under the influence of gravity.
- Fumes*³—Solid particles generated by condensation from the gaseous state, generally after volatilization from molten metals, etc., and often accompanied by a chemical reaction such as oxidation. Fumes flocculate and sometimes coalesce.
- Mists*³—Suspended liquid droplets generated by condensation from the gaseous to the liquid state or by breaking up a liquid into a dispersed state, such as by splashing, foaming, and atomizing.
- Gases*³—Normally formless fluids which occupy the space of enclosure and which can be changed to the liquid or solid state only by the combined effect of increased pressure and decreased temperature. Gases diffuse.
- Vapors*³—The gaseous form of substances which are normally in the solid or liquid state and which can be changed to these states either by increasing the pressure or decreasing the temperature alone. Vapors diffuse.
- Poison*²—Poison means a substance which, when taken by mouth in amounts of 60 grains (4 grams) or less, or when inhaled in concentrations of less than 200 parts per million by volume in the air, rapidly (within 5 or 10 minutes) jeopardizes life by other than mechanical or physical action.

Note: This definition of "Poison" is based on practical considerations only, as an aid in determining, generally, when the word "Poison" should be included on a warning label. See General Principles 4.

- Mixture*²—A physical commingling of two or more substances which may or may not bear a fixed proportion to one another and which have not reacted chemically with one another.

¹ ICC definition. While the term "inflammable" is used by the ICC, the preferred form "flammable" is used in this Manual.

² MCA definition.

³ As defined in Chapter II "Engineering Control of the Air Contamination of the Working Environment" (Allen D. Brandt, D.Sc.) page 198, "Manual of Industrial Hygiene," USPHS.

Schedule 2
CLASSIFICATION OF HAZARDS

Class	Typical Label
I. Flammable Liquids and Oxidizing Agents which Support Combustion. (Flash points for liquids are determined by Tagliabue's Open-Cup Method). A. Flash point 20° F. or below. B. Flash point above 20° to 80° F. inclusive.	DANGER! EXTREMELY FLAMMABLE Keep away from heat and open flame. Keep container closed. WARNING! FLAMMABLE. Keep away from heat and open flame. Keep container closed.
II. Flammable Solids and Oxidizing Agents as Classified by the ICC.	CAUTION! EXPOSURE MAY CAUSE FIRE OR CREATE FIRE HAZARD Keep away from heat and open flame. Keep container closed. In case of contact, immediately flush with plenty of water; remove and wash clothing before re-use.
III. Vapors Immediately Toxic or Extremely Irritating Even on Exposure for a Short Time or to Low Concentrations.	DANGER! VAPOR EXTREMELY HAZARDOUS Do not breathe vapor. Do not get on skin. Do not get in eyes. Keep container closed and away from heat. Keep away from feed or food products. Have air line respirator or gas mask approved by U. S. Bureau of Mines specifically for (name of chemical) available for emergency.
IV. Vapors Hazardous from Prolonged or Repeated Exposures, or Exposure to Higher Concentrations.	WARNING! VAPOR HARMFUL Use only with adequate ventilation. Avoid prolonged or repeated breathing of vapor. Keep container closed and away from heat.

Schedule 3
RECOMMENDED LABEL CAUTIONS

A.	B.	C.	D.
Signal Words	Hazards	Precautionary Measures	Instructions in Case of Accident
a. DANGER! b. WARNING! c. CAUTION!	Flammability		
	a. Extremely Flammable (Flash point 20° F. or below) b. Flammable (Flash point above 20° to 80° F. inclusive). c. Exposure May Cause Fire or Create Fire Hazard.	a. Keep away from heat (sparks) and open flame. b. Keep container closed (and away from heat).	
	Volatility		
	a. Highly Volatile. b. Volatile (Solvent or Liquid).	a. Keep out of sun and away from heat. b. Keep container closed (and away from heat).	
	Inhalation		
	a. Vapor Extremely Hazardous. b. May be Fatal if Inhaled. c. Vapor Harmful. d. Vapor Reduces Oxygen Available for Breathing. e. Harmful Dust. f. Causes Irritation to Eyes, Nose and Throat.	a. Do not breathe vapor (or) Avoid breathing vapor. b. Avoid prolonged or repeated breathing of vapor. c. Use (only) with adequate ventilation. d. Avoid prolonged breathing of dust.	a. In case of exposure remove to fresh air. b. Have air-line respirator or gas mask approved by U. S. Bureau of Mines specifically for (name of chemical) available for emergency.
	Contact		
	a. Corrosive Liquid. b. Causes (Severe) Burns. c. Dangerous Because (Rapidly) Absorbed Through Skin. d. Causes Skin Irritation. e. May Cause Skin Irritation.	a. Do not get (1) in eyes, (2) on skin, (3) on clothing. b. Avoid contact with (1) eyes, (2) skin, (3) clothing. c. Wash thoroughly before eating or smoking.	a. In case of contact: (1) Immediately flush (skin or eyes) with plenty of water (for at least 15 minutes). (For eyes, get medical attention). (2) Immediately wash with soap and plenty of water. (3) Remove and wash clothing before re-use.
	Ingestion		
	a. Poison (skull & crossbones). b. May be Fatal if Swallowed	a. Do not take internally.	
	General		
	a. Strong Oxidant. b. Contact with Combustible Material May Cause Fire.	a. Keep away from feed or food products. b. Keep dry. c. Store in cool place. d. Keep away from combustible materials	a. Get medical attention. b. In case of spillage, flush with plenty of water. c. In case of spillage, absorb with sand, ashes or earth.

The use of any warning or other statement listed above is not necessarily limited to the hazard under which it is grouped. The grouping merely indicates the type of hazard to which given statements most frequently apply.

The small letters are not intended to indicate a correlation between similarly lettered statements in adjacent columns but are for identification only.

The parenthetical words indicate optional statements.

Schedule 4

LABELS FOR EXPERIMENTAL SAMPLES

The labeling of experimental samples of new products presents unusual problems. All of the properties or possible uses of a product are seldom known. The following safeguards are therefore recommended:

1. Samples of a product already on the market should carry the same warning label as a commercial shipment.
2. The following label is suggested for samples of any material that has never been in commercial production unless (1) the material is known to be wholly innocuous, or (2) the dangers are limited to known hazards and appropriate cautions are submitted.

SAMPLE () Name or Description of Product FOR EXPERIMENTAL USE ONLY CAUTION! The chemical, physical and toxicological properties of this product have not been fully investigated and its handling or use may be hazardous. Exercise due care.
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3. The identity of the sample, indicated in parentheses above, should be as clear as possible. Wherever feasible, it should be the name of the compound or mixture, and in any case it should be the best possible identification to aid the user in knowing with what he is concerned.

4. Where there are significant known hazards they should be so indicated.
5. The above label may be used in the case of old products being considered for new uses.

Schedule 5

SPECIMEN PRODUCT LABELS

The following specimen labels illustrate the application to specific products of the principles set forth in this Manual:

Product Combining
Hazards of
Class I-B and IV
(Schedule 2)
Chemicals.

TOLUENE**WARNING! FLAMMABLE.**

Keep away from heat and open flame.
Use with adequate ventilation.
Avoid prolonged breathing of vapor.
Avoid prolonged or repeated contact with skin.

HYDROFLUORIC ACID, AQUEOUS

DANGER! CORROSIVE LIQUID

VAPOR HAZARDOUS

**CAUSES SEVERE BURNS WHICH MAY NOT BE
IMMEDIATELY PAINFUL OR VISIBLE**

Product Requiring,
Modified Cautions
and First Aid:

Do not breathe vapor.

Do not get in eyes, on skin, on clothing.

In case of contact or suspicion of contact:

Immediately flush skin with plenty of water until whiteness disappears, paying particular attention to skin under nails. Soak affected areas with crushed ice in 70% ethyl alcohol until physician arrives. Flush eyes with plenty of water for at least 15 minutes. In all cases get medical attention. Remove and wash clothing before re-use. Avoid use of greasy ointments.

Proprietary Product
(e.g., containing fluorine salts)

(PROPRIETARY NAME)

Contains Fluorine Compounds.

**WARNING! POISONOUS IF TAKEN
INTERNALLY**

Avoid breathing dust.

Flush spillage to sewer with water.