# DEPARTMENT OF TRANSPORTATION

## UNITED STATES COAST GUARD

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# CHRIS APPENDIXES I - VI

(Preliminary System Development - Chemical Hazards Response Information System - CHRIS)



BY

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• Final Report

• May 1972



Prepared for: COMMANDANT (GDST)
U.S. COAST GUARD HEADQUARTERS
WASHINGTON, D.C., 20590

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# CHRIS APPENDIXES I - VI. (PRELIMINARY SYSTEM DEVELOPMENT - CHEMICAL HAZARDS RESPONSE INFORMATION SYSTEM - CHRIS)

Arthur D. Little, Incorporated

Prepared for:

Coast Guard

May 1972

DATE: 19 October 1972

This report has been submitted in fulfillment of Contract DOT-CG-03,223-A and is promulgated subject to the following qualifications:

The contents of this report reflect the views of the authors, who are responsible for the facts and the accuracy of the data presented herein. The contents do not necessarily reflect the official views or policy of the Coast Guard. This report does not constitute a standard, specification or regulation.

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Chris Manual No 1

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## 1.0 SUMMARY

This manual is to be a convenient source of chemical-related information that may be needed during the early stages of an incident involving the accidental release of a hazardous chemical. It will serve as a guide to port security personnel and others who may first arrive at the site of the incident and need readily available, easily understood, qualitative information on the hazardous nature of the chemical and situation confronted. It will assist these personnel in quickly determining responsible actions that must be taken immediately to safeguard life and property and reduce, insofar as may be possible, further contamination of the environment. The guide will contain precautionary advice on the chemical, physical, and biological hazards posed by the material and assist field personnel in performing an initial assessment of the threat as a prerequisite to determining subsequent actions.

The manual will consist of a compilation of chemical data sheets having the format and general content illustrated in Figure 1. The data sheets will be filed alphabetically by the chemical name that is specified either in the Code of Federal Regulations (CFR) or other Government documentation. Reference to the chemical name will be aided by a coded designation for each chemical and by a thesaurus that will cross-reference synonyms (and trade names) with the official chemical name. In addition to the chemical data sheets and the thesaurus, the manual will contain explanatory material of the interpretation and use of its contents and a guide to the compatibility of chemicals.

The manual will be approximately 8-1/2 x 11 inches with the data sheets contained within a 7-ring loose-leaf binder having a water-resistant, durable cover. Single color printing (black ink) will be employed with special markings to highlight critical information.

CHEMICAL NAME CODE
(SYNONYM)
COLOR, ODOR, AND PHASE
PHYSICAL ACTION ON RELEASE

POISON (SYMBOL)

| | |
|---|---|
| Fire | FIRE HAZARDS |
| Exposure | HEALTH HAZARDS AND FIRST AID |
| Spill or Leak | RESPONSE METHODS |
| Water Pollution | EFFECT ON MARINE AND WILDLIFE |

DATA SHEET NO
DATE

FIGURE 1 DATA SHEET LAYOUT

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## 2.0 CONCLUSIONS AND RECOMMENDATIONS

- Based on a comprehensive evaluation of the needs of emergency response personnel followed by a detailed review of the preliminary specifications with potential users it is concluded that:
  - The manual will meet critical needs that will not be satisfied by other existing or planned sources of information.
  - The preliminary specifications provide an adequate basis for composing and publishing the manual.
- It is recommended that the Coast Guard proceed with the final development of the manual and in doing so consider the following:
  - The chemical-specific, qualitative information for each data sheet should be developed primarily from the more detailed data compilation of Manual No. 2 (Hazardous Chemical Data).
  - The specific chemicals that are to be listed in the first edition of the manual should be the same as those incorporated in Manual No. 2, be approved by the Coast Guard, and be those that are deemed to be most critical relative to their hazardous nature and the quantity and frequency by which they are shipped.
  - A working group consisting of representatives of the chemical industry, emergency services (e.g., municipal fire fighting organizations) and Government agencies should be formed to review, guide and supplement the formulation of the manual in order to insure accuracy and completeness in both the content and its presentation.
  - Sources and procedures used in developing the information for the manual should be documented and preserved, and the specifications should be revised during and following the completion of the first edition so as to provide reference documentation for future additions and modifications.
  - Methods of updating the information and distributing changes should be reviewed, revised and documented and procedures should be developed for periodic and/or routine field surveys of the utility and adequacy of the manual.

# 3.0 INTRODUCTION

## 3.1 OBJECTIVES

The primary objectives of Manual Number 1 are to provide port security personnel and others who first arrive at the scene of an accident involving the release of a hazardous chemical with

- easily understood, qualitative information on the hazardous nature of the chemical
- guidance that would allow personnel to quickly carry out a preliminary assessment of and response to the accident.

The manual is intended to assist Coast Guard field personnel in determining actions that they may take prior to obtaining additional support and information from other components. The document may also serve as a training aid and safety guide for those personnel who patrol and/or inspect tank vessels, tank barges and transfer operations involving hazardous chemicals.

## 3.2 SCOPE

The recommended content of this manual (see the Preliminary Specifications) includes introductory and supporting information, such as notification procedures, an explanation of the content and use of the manual, and essential information on each hazardous chemical. It also includes a thesaurus that provides a cross-reference of chemical names and a guide to the compatibility of chemicals for assessing whether two or more different chemicals will be hazardous when they come in contact with each other.

The specific information and the form in which it is to be presented is designed primarily for use by personnel who have little or no training in chemistry and engineering and who, for the most part, have not had training in the physical sciences beyond the high school level. Capability is provided, however, for combining this manual with Manual Number 2, which contains more detailed chemical-specific information for those units that require and are capable of utilizing a more technical field guide.

Manual Number 1 is intended for Coast Guard components that generally will have little or no facility for actively responding to the incident. That is, they are not expected to have significant fire fighting capability nor equipment to contain and remove spilled material. Neither do they, at least now, usually have protective equipment such as special clothing and breathing apparatus.

Although they may not participate actively, the presence of Coast Guard personnel may and can very significantly affect the outcome of an accident. Their presence allows a first-hand reporting of the conditions of the accident, including that of the tank ship or barge, the spilled chemical, and wind, current, and tides. They may effectively prevent or avoid injury and property loss by policing the area and, most importantly, perform rescue work. All of these functions require that they have information readily available on the specific chemical involved.

In addition to these minimal requirements, we have considered the possibility that Coast Guard field units may be better equipped in the future and that other emergency services (e.g., municipal fire departments) who may have the capability to actively attempt to control and eliminate the hazard may be furnished copies of the manual. In addition, Coast Guard personnel may need enough information to enable them to evaluate the responses of other, better equipped units. Accordingly, we have included additional information that would only be useful should those that are first on the scene have a greater capability to respond than Coast Guard field units now have. This information also is limited to that which personnel who have a meager knowledge and training on the character and behavior of hazardous chemicals can most effectively use.

The scope (and content) of this manual is based upon an interpretation and evaluation of users' needs as established during the early phase of the program and as later influenced by comments made by potential users on a first draft of the Preliminary Specifications. Wherever possible, advantage has been taken of approaches to this kind of information that have been developed by others.

## 3.3 GENERAL CRITERIA

Since the information to be provided in this manual pertains to the first-response mode, its need will be urgent; therefore, the user must be able to obtain the most essential information as quickly as possible without undue effort. Because of the urgent nature of the user's needs and his limitations in knowledge and training, we have established the following overall criteria for the chemical-specific information to be provided:

- The information should be presented in the sequence of its most probable use.
- The most critical information should be highlighted to command the reader's attention.
- Only the most basic and pertinent information should be included.
- The information should be presented in prose rather than as quantitative data.
- The text should be clear, concise, and use commonly understood terminology.
- The manual should be capable of use with a minimum of training and without reference to other documents.

## 4.0 CONTENT DESCRIPTION

### 4.1 INTRODUCTORY MATERIAL

The introductory material will include guidance on the use of the manual and supplementary information that will assist field personnel in making appropriate early responses to hazardous chemical spills. It will include the purpose and scope of the manual and describe CHRIS, the other manuals in the system and their use and relationship to each other. The terminology, the content and the use of the manual will be explained. Supporting information relating to the use of protective equipment and general responses that may be considered will also be presented.

Since the early response of other supporting services may be an urgent requirement, the manual will provide guidance on notification. An explanation of other hazardous chemical information systems, such as the Tentative Guide, [1] the Manufacturing Chemists Association System, [2] and the National Fire Protection Association placarding methods, [3] will also be included so that these resources may be used, when appropriate.

### 4.2 CHEMICAL-SPECIFIC INFORMATION

The information to be supplied for each chemical will require a single (full) page. The page will be headed by the official chemical name, either that specified in the Code of Federal Regulations or that used in other Government documents. The data sheets will be arranged in alphabetical order.

The basic arrangement of the information generally will be consistent from one data sheet to another and be presented in the sequence that conforms to the user's needs during an emergency (see Figure 1).

#### 4.2.1 Chemical Designation

The recommended general layout of the data sheets for this manual is shown in Figure 2. An example of a data sheet for sulfuric acid is given in Figure 3. As may be seen this latter sheet is included only to exemplify the type of information to be presented. It is preliminary and will require additional input and review by potential users and specialists.

The basic designation for each chemical will be the common chemical name that is specified in the Code of Federal Regulations because this is the designation used to regulate the transport of the material and hence is employed by the Coast Guard for other purposes as well. For chemicals not cited in the Code of Federal Regulations, but which are specified as being sufficiently important to be included in the manual because of their hazardous or polluting nature and the quantities shipped, the common name that appears in the federal documents that provide the basis for its incorporation in the manual will be employed.

A coded symbol for each chemical will be included to enhance the ability to transmit the chemical designation orally. Experience has shown that it can be difficult to convey the chemical name (particularly when the name is long) by voice transmission and an error in identifying the chemical could lead to serious injuries and/or losses. An alphabetical code is preferable since this form is easier to transmit by standard communication procedures than a numerical code. In addition, the first character of the code will be the same as the first letter of the chemical name to facilitate reference to the desired chemical in the alphabetical compilation of data sheets. Where possible, the code will be made up of alphabetical letters that will facilitate recognition of the chemical name (e.g., SFA for sulfuric acid).

A well-known synonym for each chemical will also be included under the common chemical name to enhance recognition by people who may be more accustomed to its use than the federally specified name.

4.2.2 Observable Characteristics

Although a chemical cannot usually, if ever, be identified exclusively by observing it as it is released from its container, the manual will describe the most pronounced physical characteristics of the chemical as an aid in confirming its identification and in monitoring its movement. A special attempt will be made to describe its color and odor in the most common terms, since many of the descriptors used in other sources are not universally understood even by personnel with technical training.

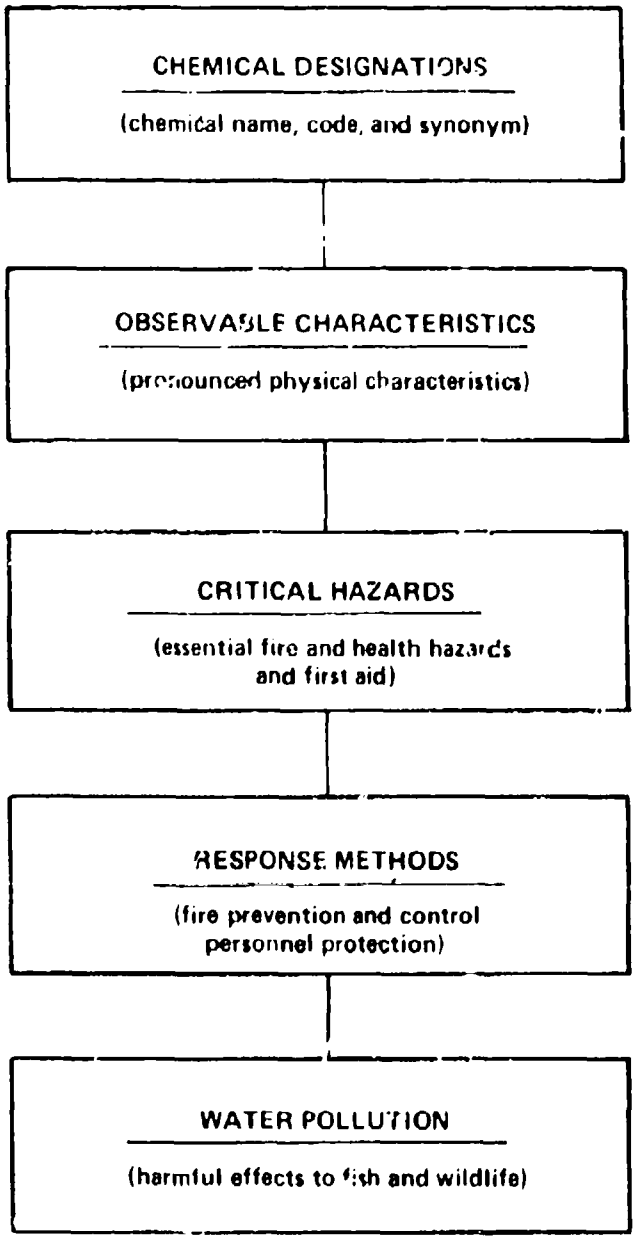


FIGURE 2 LAYOUT OF MAJOR GROUPINGS OF CHEMICAL SPECIFIC INFORMATION

# Sulfuric Acid SFA

(Oil of Vitriol)

Colorless to dark brown oily liquid, sharp irritating odor.
Reacts vigorously with water; tends to sink; mixes completely with water.

| | |
|---|---|
| Fire | CANNOT CATCH FIRE. Contact with combustibles may cause fire. Will react with many metals to produce highly flammable hydrogen gas. The gas is explosive when confined. Cool exposed tanks with water, but do not get water in tank. |
| Exposure | CAUSES SEVERE BURNS. In case of contact, immediately flush skin or eyes with plenty of low pressure water for at least 15 minutes, remove contaminated clothing and shoes at once. Call a physician. Keep patient at rest. Wash contaminated clothing and shoes. |
| Spill or Leak | AVOID CONTACT WITH LIQUID. Shut off all ignition sources. Keep people away. If necessary to enter spill area, wear chemical goggles and full protective clothing including boots. Do not strike the tank fittings with tools or other hard objects |
| Water Pollution | Harmful to birds, fowl and wildlife only in high concentrations. Harmful to fish even when diluted. |

DATA SHEET 22
OCT 71

FIGURE 3 EXAMPLE DATA SHEET

A description of the physical (and reactive) effects that may be expected upon the release of the chemical are also included. It can be crucially important for the user to recognize very early that the material floats, sinks, mixes, reacts or evaporates. These are not only observable characteristics which can aid in confirming identification but also properties that can be important in assessing the overall hazard in terms of the chemical's potential movement or dispersal.

4.2.3 Critical Hazards

The critical hazards of all the chemicals will be divided into three categories: poison, fire, and health. Poison is separated from the other health hazards because chemicals listed in the Code of Federal Regulations are so specified and because the skull and crossbone notation offers the best and most well-known means of conveying that the material is poisonous.

Information on fire hazards will indicate the relative flammability of the material and any special precautions concerning the ignition and/or prevention of fires.

Health hazards include all of the critical effects that the chemical may produce if it comes in contact with skin or eyes, if it is ingested, and if it is inhaled. Essential and immediate first aid treatment will also be included.

4.2.4 Response Methods

Measures within the capability of field personnel that may (or may not) be taken to prevent and control hazards will be included in this section. Guidance on avoiding exposure, preventing fires, and using protective equipment and special information unique to the specific chemical will be provided. It will also contain instructions on the notification to close water intakes (where appropriate), which are particularly important.

### 4.2.5 Water Pollution

Water pollution has little or no significant role in personnel safety; however, the ability of many chemicals to produce great harm to marine and wild life makes it imperative that the first Coast Guard personnel on the scene of the incident have some information to help them recognize the potential danger and to aid them in taking appropriate preliminary action.

## 4.3 THESAURUS

After the individual chemical data sheets, a cross-reference of chemical names will be given in the form of a thesaurus, which will include all known English synonyms referenced to the common chemical name and arranged alphabetically. Consideration has been given to coding foreign names and numerical designations such as those given by the Inter-Governmental Maritime Consultive Organization (IMCO) and for the United Nations; however, potential field users have not expressed the need for this information.

## 4.4 COMPATIBILITY GUIDE

The shipping of mixed cargoes containing chemicals that are hazardous when they come in contact with each other remains a serious concern to the Coast Guard as well as the shipping industry. The compatibility of chemicals can also be of concern when they are released into the water from different shipments. To help in recognition of this potential danger, we recommend that the Guide to Compatibility of Chemicals in the form used in CG 388[4] be incorporated.

## 5.0 SOURCES OF INFORMATION

Essentially all of the chemical information specified for this manual will be derivable from the more detailed and comprehensive Manual No. 2, Hazardous Chemical Data. Hence, Manual No. 2 will be the primary source for each item. However, in most instances, the information from Manual 2 will not be directly transposable to Manual 1, since the data will be presented differently in each manual; that is, Manual 2 will use technical terms whereas Manual 1 will use commonly understood terms. For example, flash point data will have to be converted to an expression of flammability, TLV and $LD_{50}$ values will have to be presented in terms of descriptions of health hazards, and the best of many possible color and odor descriptions in Manual 2 will have to be chosen for presentation in Manual 1.

As in the many handbooks, manuals, and data sheets created by other organizations, the conversion process will have to be carried out by personnel familiar with both the technical aspects of chemical hazards and Coast Guard operations. The Chemical Data Guide for Bulk Shipment by Water (CG-388) and the MCA Cargo Information Card Manual [5] will provide valuable guides to the conversion process.

The recommended general procedure for the development of the specific content for each data sheet in this manual is as follows:

- List the specific data for each chemical in Manual No. 2 that will be transposed to Manual No. 1
- Transpose the information, using data sheets from CG 388 Cargo Information Cards, and Chem Cards[6] (where they exist) as a guide.
- Where data sheets for a given chemical are not given in CG 388 and Cargo Information and Chem Cards use descriptive material, provided in Manufacturers' bulletins and Safety Data Sheets[7] [8] as a guide.
- Where additional basic information is needed, refer to the sources recommended for the development of Manual No. 2

## 6.C PRELIMINARY SPECIFICATIONS

Preliminary specifications for the content of each major section of the Condensed Guide to Hazardous Chemicals are presented here. A preliminary estimate of the maximum number of characters (letters and digits) that may have to be employed in expressing each item in any given chemical data sheet are included.

### CONTENT

### 6.1 PREFACE

Cite purpose and scope of manual, authorization and Coast Guard components(s) responsible for content and distribution. Describe CHRIS, the other manuals in the system, their use and relationship.

### 6.2 TABLE OF CONTENTS

Cite the following:

| Subject | Page |
|---|---|
| Notification | |
| Explanation of Content | |
| Use of the Manual | |
| Use of Other Information Systems | |
| Chemical - Specific Information | |
| Synonyms | |
| Compatability Guide | |

### 6.3 NOTIFICATION

State procedures for notifying other interested and responsible agencies. Recommend that all notifications be made by the Captain of the Port (COTP) except where the COTP cannot be contacted and the urgency of the situation requires that emergency services be notified directly. List those agencies that may have to be notified and provide space and facility for entering means of making contact. These agencies may include but should not necessarily be restricted to:

- Municipal and industrial fire services
- Industrial and governmental strike forces or response teams
- Physicians and hospital
- Police

## 6.4 EXPLANATION OF CONTENT

Elaborate on the meaning of specific chemical characteristics and precautions wherever additional clarity may aid in the use of the manual. For example, it is recommended that the source of the chemical name, use of the synonym and purpose of the code be explained. Differences between such terms as combustible, flammable might also be explained. Precautions concerning use of personnel protective equipment should be included.

## 6.5 USE OF THE MANUAL

Present a brief stepwise method for employing the manual when responding to an emergency involving the potential or actual release of a hazardous chemical. As an example, the general or major steps that might be taken during the first response may be stated, with a reference to the manual being given for each step, as follows:

| Step | Reference to Manual |
|---|---|
| 1. Identify the chemical. | • Check chemical name, code designation and synonym (where applicable. |
| 2. Confirm chemical identity. | • Compare observed characteristics to those stated in the manual. |
| 3. Assess the existing and potential extent of the hazard. | • Determine the critical hazards presented by the release of the material. |
| 4. Determine necessary immediate action to prevent injury and property loss. | • Utilize information on response methods. |
| 5. Evaluate potential effect on marine and wildlife. | • Refer to water pollution characteristics of the chemical. |

## 6.6 USE OF OTHER INFORMATION SYSTEMS

Explain the use of the following hazard-identification systems:

- A Tentative Guide, Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, National Academy of Sciences, Contract Tcg-15559-A.
- Chemical Transportation Emergency Guides, Manufacturing Chemists Association.
- Identification of the Fire Hazards of Materials, NFPA No. 704M, National Fire Protection Association.

## 6.7 INFORMATION ON SPECIFIC CHEMICALS

### 6.7.1 CHEMICAL DESIGNATION

6.7.1.1 Chemical Name - Cite chemical name as given in the Code of Federal Regulations

Number of characters: 40 (maximum number of letters for any chemical in CFR is 35).

6.7.1.2 Code - Cite a three-character alphabetic designation for the specific chemical.

Number of characters: 4.

6.7.1.3 Synonym - Cite a common or commercial name that is most commonly used other than the federally specified name. If there is no commonly used synonym, omit the synonymic designation.

Number of characters: 35.

### 6.7.2 OBSERVABLE CHARACTERISTICS

6.7.2.1 Color - Cite one or more of the following, where applicable.

- Characteristic color (and hue)
- Clarity (e.g., clear or cloudy)
- Colorless

Commonly understood terminology should be employed.

Number of characters: 30.

6.7.2.2 Odor - Cite the characteristic odor, or if odorless so state. Use commonly understood terminology such as domestic type odor descriptions (e.g., garlic, ammonia and fishy).

Number of characters: 25.

6.7.2.3 Phase - State whether the chemical is liquid, solid, or a compressed, or liquefied gas.

6.7.2.4 Physical Action on Release - State the interaction between the chemical and water or air, as in the following examples.

- Floats on water
- Mixes rapidly with water
- Sinks in water
- Vaporizes rapidly
- Forms vapor clouds
- Reacts vigorously with water
- Catches fire when exposed to air

Number of characters: 40.

6.7.3 HAZARDS

6.7.3.1 Poison - If listed as a poison in CFR, state (or designate) that it is a poison.

Number of characters: 15 (or a symbol).

6.7.3.2 Fire - Cite the most critical fire hazards associated with the chemical. Include the following:

- State whether it is combustible, flammable, explosive or not. Include relative sensitivity, where important.
- State whether fire from the burning material will cause violent rupture of the tank.
- State whether products of combustion are harmful.

- State whether the chemical reacts with other common substances, where important, and harmful effects or conditions that may result.

Fire hazards should be given as one or more brief statements using commonly understood terminology.

Number of characters: 200.

6.7.3.3 Health - Cite the most critical hazards produced by exposure to the liquid or gas. Include the following:

- Indicate the qualitative hazardous nature of the vapor such as harmful, irritating and poisonous. Indicate the degree of harmfulness, where particularly important. Where not defined as a poison but where exposure may be particularly fatal, so state. State any unusual and critical hazards (e.g., potential eye, skin, or lung damage).
- Indicate the qualitative hazardous nature of the liquid, such as: the chemical may cause severe burns; poisonous by skin absorption, etc. Cite unusual critical hazards (e.g., delayed effects).
- If health hazards are relatively minor, so state.

Number of characters: 150.

6.7.3.4 First Aid - Cite recommended first aid information and procedures. Include the following:

- Symptoms, where applicable.
- Treatment (e.g., washing, artificial respiration, rest, etc.)
- Disposition of clothing
- Notification of a physician when any reasonable likelihood of personnel injury.

Number of characters: 500.

6.7.4 RESPONSE METHODS

6.7.4.1 Precautions - Cite the critical precautions that should be exercised when the chemical is accidentally released (or when there is a significant likelihood that it may be accidentally released). Include the following:

- Notification to close water intakes
- Precautions necessary to avoid ignition
- Precautions necessary to prevent exposure
- Methods of using water to reduce hazard and where water application may be harmful
- Personnel protective equipment necessary for entering the spill area.

Number of characters: 300

6.7.4.2 Fire Protection - Cite the most critical fire fighting procedures. Include the following:

- Extinguishants recommended for small fires
- Extinguishants recommended for large fires
- Extinguishants that should not be used because of the introduction of an additional hazard(s)
- Personnel protective equipment necessary for fighting fire
- Specific methods of fighting fire (e.g., cooling of tanks, fighting fire from distance) where they are particularly critical.

Number of characters: 300

6.7.5 WATER POLLUTION

Cite the related potential for water pollution. Include the following:

- Conditions under which the material becomes harmful to birds and waterfowl (e.g., by ingestion or contact)

- Conditions under which the materials are harmful to marine life
- If generally not considered to be a pollutant, so etate

Number of characters: 200

## 6.8 SYNONYMS

Place all known English synonyms for all chemicals in a single listing and arrange in alphabetical order. Cite the common chemical name that applies with each synonym.

## 6.9 CHEMICAL COMPATIBILITY

Reproduce the Guide to Compatibility of Chemicals, including the compatibility chart and the listing of chemicals arranged in groupings as now incorporated in the Coast Guard document (CG-388).

## 7.0 PRELIMINARY PUBLICATION SPECIFICATIONS

This manual is the most highly structured of the five; consequently, the publication specifications are the most detailed.

### 7.1 ORGANIZATION

Manual No. 1 will be organized by titled major sections and sub-sections bearing arabic decimal classifications as follows:

1.0 UPDATE CONTROL
2.0 TABLE OF CONTENTS
3.0 PREFACE
4.0 NOTIFICATION
5.0 EXPLANATION OF CONTENT
6.0 USE OF THE MANUAL
7.0 USE OF OTHER INFORMATION SYSTEMS
8.0 COMPATIBILITY GUIDE (Same as in Manual No. 2)
9.0 INFORMATION ON SPECIFIC CHEMICALS
10.0 THESAURUS (Synonyms) (Same as in Manual No. 2)

The individual sections will be printed on light-colored stock. Section 1.0 will be one color, Section 2.0 - 7.0 a second color, Section 8.0 a third color, Section 9.0 white, and Section 10.0 a fifth color. Neither index tabs nor an index will be used in Manual No. 1

Each major section will begin on a separate right-hand (odd-numbered) page. Sections 2.0 through 8.0 will be paginated sequentially, beginning with 1. Sections 1.0 and 9.0 will not be paginated; but pages in Section 9.0 will bear a Data Sheet Number (not necessarily sequential). Section 10.0 will be numbered sequentially, beginning with T-1, T-2, etc.

Each page will bear the month and year of revision or creation if a new chemical is incorporated. If a chemical is intentionally deleted, a page so stating will be inserted in place of the original.

The following specifications are based upon an initial version of Manual No. 1 containing 400 hazardous chemicals.

## 7.2 FORMAT AND LAYOUT

### 7.2.1 Method of Preparing Camera-ready Copy

a. Sections 1.0-8.0 -- Composer (cold type)

b. Section 9.0 -- Special mask, typeset chemical names, composer for text.

c. Section 10.0 -- Computer-based phototypesetting. See Manual No. 2 publication specifications.

### 7.2.2 Overall Physical Appearance

a. Page size: 8-1/2 in. x 11 in.

b. Paper: lightweight linen stock

c. Number of pages: approximately 450

d. Type size: Not less than 12-point pica for text

e. Colors: light-colored or white stock

f. Printing: 2-sided print; black ink

g. Number of chemicals: 400 initially; increasing to 1000

h. Binding: 7-ring loose-leaf spring binders

i. Covers: weather-resistant vinyl or other durable plastic or cloth, front cover embossed appropriately and bearing copy number

j. Number of volumes: 1

k. Number of copies: 500 initially

### 7.2.3 Section 1.0

Section 1.0, Update Control, is a series of unnumbered pages, each giving the date of a particular past revision or update to Manual No. 1 and a summary of all sections and chemicals affected. Each Update Control page is to be signed by Coast Guard personnel and dated at the time the manual is actually updated by inserting new pages and removing and destroying obsolete ones. All Update Control pages should be retained in the manual as a written record of update activity.

The Update Control page is furnished by the CHRIS Organization along with the actual pages to be inserted in Manual No. 1. The Update Control page provides instructions on how to update the manual; its format is exemplified in Figure 4.

7.2.4 Sections 2.0-7.0

This will be standard single-spaced typed text containing no graphics. All sections will be printed on the same light-colored stock.

7.2.5 Section 8.0

The Compatibility Guide will be identical to that presently contained in CG 388[4] and later in CHRIS Manual No. 2. A different light-colored stock will be used.

7.2.6 Section 9.0

Section 9.0 contains the bulk (estimated 400 pages) of material in Manual No. 1; there is to be exactly one page per chemical. To facilitate readability, this section should be printed on white stock (black print). Pages are to appear in alphabetic order based on the full chemical name given in the Code of Federal Regulations. Pages are unnumbered (aside from a convenient Data Sheet Number).

Figure 5 is a mask containing standard headings (FIRE, EXPOSURE, SPILL OR LEAK, WATER POLLUTION) that may be typeset and printed in sufficient quantity to be used as a framework for entering chemical-related information and guidance. With this framework, all specific chemical information may be added by (1) typesetting the chemical name which appears at the top of the page, and (2) filling in all information within the matrix using a composer or similar device.

In Figure 5 the EXPOSURE category border has been crosshatched (shaded), exemplifying the manner in which attention is to be focused on the most critical hazard or hazard presented by a particular chemical. This method of highlighting avoids the

use of color, which significantly increases the cost of publishing Manual No. 1.

Figure 3 is an example of a completed data sheet for Manual No. 1. By way of example, note the following:

- The full chemical name appears at the top of the page, centered in large, bold type.
- The unique three-character alphabetic code for this chemical appears at the right margin, on the same level with the chemical name.
- Beneath the chemical name, centered in parentheses, appears a single common synonym or commercial name, if one is frequently used.
- Beneath the synonym, if one appears, are brief descriptions of observable characteristics on one or more lines.
- Within the blocked area are four categories of hazards, always in the following order: FIRE, EXPOSURE, SPILL OR LEAK, and WATER POLLUTION. The fixed order stated should not be varied even when no hazard is presented. If a chemical does not present one of the four specified hazards, so state (e.g., NOT FLAMMABLE).
- The most critical hazard or hazards are crosshatched.
- The Data Sheet Number and date of revision or creation is specified at the lower right-hand corner in a box.
- Important precautions are printed in large, bold-face type.

Figure 4

CHRIS MANUAL NO. 1

CONDENSED GUIDE TO CHEMICAL HAZARDS

REVISION 3: December 20, 1973

SECTION 4.0

Replace pages 13-14

SECTION 9.0

Replace ETHYLENE (DATA SHEET 30)

Insert THYMYLAMINE (DATA SHEET 305)

Replace VINYL CHLORIDE (DATA SHEET 230)

SECTION 10.0

Replace pages T-3, T-4

Manual Updated By_____

Date_____

DEC. 1973

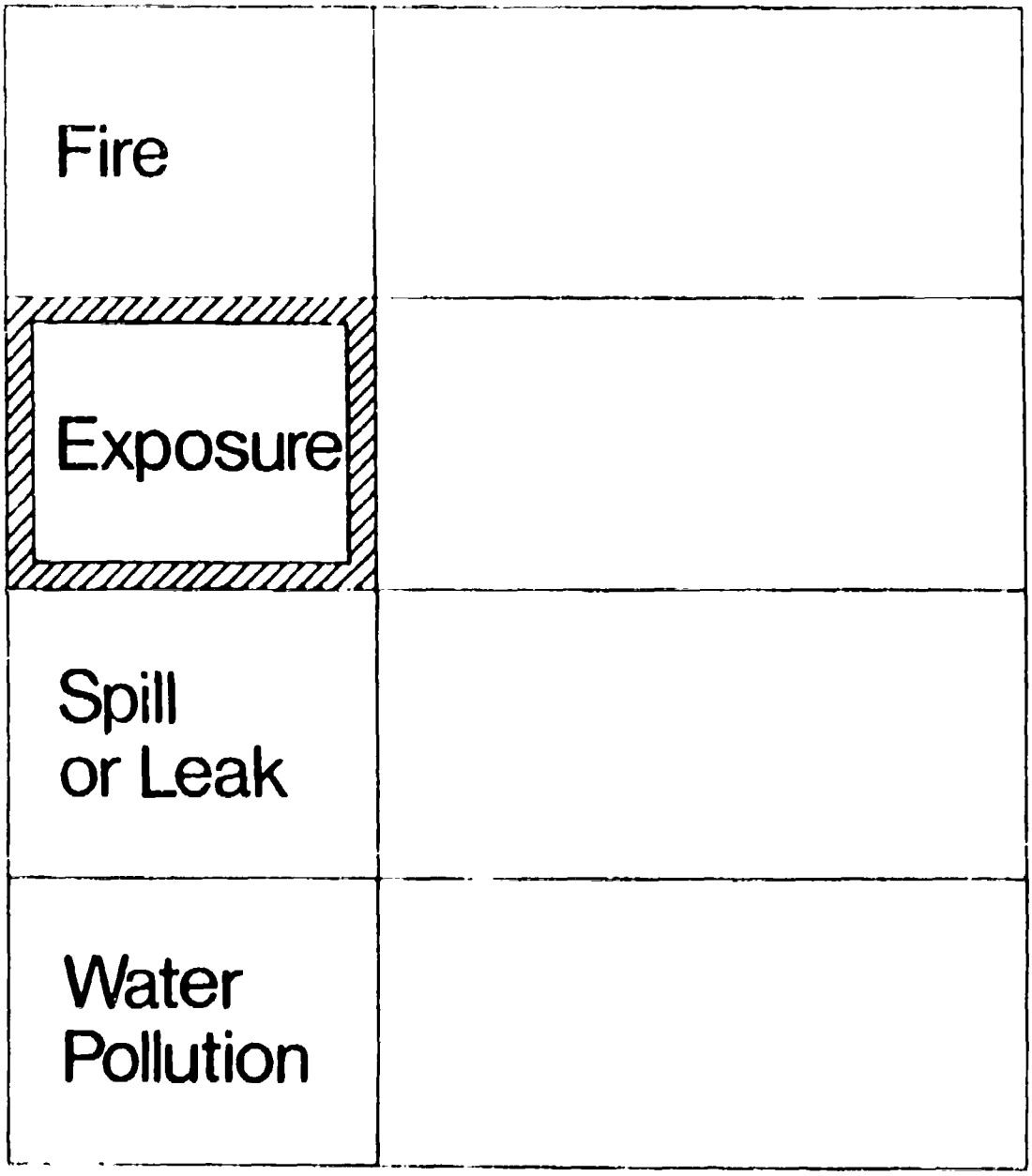


FIGURE 5 AN EXAMPLE OF A MASK CONTAINING STANDARD HEADINGS

7.2.7 Section 10.0

The Thesaurus of chemical synonyms will be produced by computer-based phototypesetting as a by-product in the publication of Manual No. 2. It will be printed on light-colored stock. Opposite each synonym, arranged alphabetically, is the CFR chemical name and code. The Thesaurus should have six columns per page, as indicated below:

| Synonym | Chemical Name | Chemical Code | Synonym | Chemical Name | Chemical Code |
|---|---|---|---|---|---|

Two blank lines should separate groups of synonyms with different initial characters.

## 8.0 REFERENCES


1. "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, a Tentative Guide," Committee on Hazardous Materials, Advisory to the U. S. Coast Guard, Contract Tcg-1559-A, National Academy of Sciences, Washington, D. C., 1970.

2. "A Manual of Transportation Emergency Guides," Manufacturing Chemists Association, Washington, D. C., November 1968.

3. "Identification of the Fire Hazards of Materials,"NFPA No. 704M, National Fire Protection Association, Boston, Mass., 1966

4. "Chemical Data Guide for Bulk Shipment by Water," CG-388, U. S. Coast Guard, Department of Transportation, 1969.

5. "MCA Cargo Information Card Manual for Bulk Dangerous Cargoes," Manufacturing Chemists' Association, Inc., Washington, D. C., 1970.

6. "MCA CHEM-CARD Manual," Manufacturing Chemists' Association, Inc., Washington, D.C., 1970

7. "Chemical Safety Data Sheets," Manufacturing Chemists' Association, Washington, D.C.

8. "Chemical Safety Data Sheets," Chemical Section, National Safety Council, Chicago, Illinois.

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13. ABSTRACT

This Appendix to the Final Report on the Preliminary System Development of a Chemical Hazard Response Information System (CHRIS) contains the preliminary design of Manual Number 1, A Condensed Guide to Chemical Hazards. A description of and preliminary specifications for the manual are included. The manual will contain chemical-related information that may be needed by personnel responding during the early stages of an incident involving the accidental release of a hazardous chemical into the water. The manual will consist of a compilation of chemical data sheets each containing information on the chemical, physical and biological hazards of a specific chemical. It will also contain guidance as to precautionary and response measures that are applicable to each chemical.

This manual is one of five CHRIS manuals.

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Security Classification

| KEY WORDS | LINK A | | LINK B | | LINK C | |
|---|---|---|---|---|---|---|
| | ROLE | WT | ROLE | WT | ROLE | WT |
| Chemical hazards | | | | | | |
| Chemical properties | | | | | | |
| Chemical spills | | | | | | |
| Safety manual | | | | | | |
| Information System | | | | | | |
| Water pollution | | | | | | |

## PREFACE

This Appendix contains the preliminary design of one of the five CHRIS manuals that have been designed to meet the needs of personnel who respond to emergencies involving the accidental release of hazardous chemicals into the water. An explanation of the design of this manual as well as Preliminary Specifications are contained in this Appendix.

This manual will provide complete detailed chemical-specific information for use by trained field personnel and hazardous chemical specialists. It will be utilized as a self-sufficient source of data during some responses and will also provide data required for the use of other manuals (No. 4 and No. 5) on other occasions. The other four manuals, described in other Appendices of the final report are as follows:

- Appendix I - CHRIS Manual Number 1, a Condensed Guide to Chemical Hazards
- Appendix III-CHRIS Manual Number 3, Regional Contingency Plan Data Base
- Appendix IV -CHRIS Manual Number 4, Hazard Assessment Handbook
- Appendix V -CHRIS Manual Number 5, Response Methods Handbook

The principal authors of the main text in this appendix were D. S. Allan and R. C. Reid (consultant). The authors of the Hazardous Materials automated file were S. B. Cole and G. H. Harris. Other contributors to this appendix included S. Atallah, R. J. McMahan, E. R. Atkinson and V. R. Valeri.

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## 1.0 SUMMARY

This manual is to contain chemical-specific information in sufficient detail to assist trained field personnel and hazardous chemical specialists in monitoring, guiding and managing responses to accidental releases. In contrast to Manual No. 1 that is a source of qualitative, easily understood information for use by less well trained personnel during the early stage of response, this manual will contain all of the existing, pertinent, and detailed information on each chemical. This data will encompass physical and chemical properties; flammability, health and pollution hazards; industrial information; and response information specific to each chemical.

The manual will consist of a compilation of data sheets with several pages devoted to each chemical. The sets of data sheets will be filed alphabetically by the chemical name that is specified either in the Code of Federal Regulations (CFR) or other Government documentation. Reference to the chemical name will be aided by a coded designation for each chemical and by a thesaurus that will cross-reference synonyms (and trade names) with the official chemical name. In addition to the chemical data sheets and the thesaurus, the manual will contain explanatory and supplementary material that will be necessary and helpful to the user, and a guide to the compatibility of chemicals.

The manual will be printed in two versions; one containing a complete set of data for each chemical for the hazardous chemical specialists, and the other containing only [illegible]ta items deemed useful by trained field personnel. The data sheet[illegible]nual No. 1 will be combined with those of Manual No. 2 for the fie[illegible]ation. Quantitative data required by Headquarters personnel in p[illegible]ing hazard assessment and other evaluations relating to the transport of hazardous chemicals will also be stored on a computer for automated retrieval and processing.

The complete manual will consist of three volumes approximately 8 1/2 x 11 inches contained in 7-ring loose-leaf binders and a standard computer file containing the necessary quantitative data.

## 2.0 CONCLUSIONS AND RECOMMENDATIONS

- Based on comprehensive evaluations of the needs of potential users of this manual and other existing and planned sources of similar data, it is concluded that this manual, as specified, will meet critical needs that will not otherwise be satisfied in the forseeable future.

- The Preliminary Specifications as to the content, presentation and procedures for the development of the manual provide an adequate base from which to initiate the composition and publication of the first edition of the manual.

- It is recommended that the Coast Guard proceed with the formulation of the manuscript and the publication and distribution of the manual and, in doing so, consider the following:

  - The first edition of the manual should contain data on several hundred chemicals. The specific chemicals should be specified by the Coast Guard and be those deemed to be most critical relative to their hazardous nature and the quantity and frequency by which they are shipped.

  - In compiling the data, other hazardous chemical information sources should be utilized in so far as possible; the resulting data should be reviewed, evaluated and selected by specialists in the appropriate fields of interest; and the reference sources and procedures used in formulating the manual should be carefully documented.

  - A working group consisting of representatives of the chemical industry and Government agencies should be formed to provide an independent review of the manual content.

  - During the development of the manual the specifications should be revised; methods for updating the manual in the future reviewed and modified; and procedures for periodic and/or routine field surveys of the effectiveness of the manual developed.

# 3.0 INTRODUCTION

## 3.1 PURPOSE AND SCOPE

The principal objectives of this manual are to provide detailed data on hazardous chemicals to:

- Trained field personnel, for assessing and responding to accidents involving the threatened or actual release of the chemical; and,
- Specialists, for use in assisting field personnel and for performing calculations to assess the threat presented by potential or actual releases of hazardous materials.

The manual will supplement the Condensed Guide to Chemical Hazards during emergencies and generally will be used during the second response mode, when there is sufficient time to utilize more detailed information. The data contained in the manual will also be used by field personnel as input to hazard assessments to be made with the help of a field version of Manual No. 4 and for essential information in the selection and application of appropriate response methods, as outlined in Manual No. 5.

Specialists, including Headquarters' personnel, will use additional data specified for this manual in assisting field personnel during emergencies and will use the data as input to more detailed hazard assessment calculation procedure The manual will also provide the essential data required for the formulation of the qualitative interpretations that are to be employed in the nontechnical Condensed Guide Manual No. 1.

This manual being part of CHRIS will support the National Response Center (NRC) and the National Contingency Plan (NCP). The preliminary design has focused on Coast Guard users, especially the On-Scene Coordinators. Other principal users will be personnel in the Captain of the Ports Offices, specialists at Coast Guard Headquarters, and Strike Forces. The design has considered parallel Environmental Protection Agency (EPA) and Corps. of Engineers (COE) organizations and their representatives have been interviewed in the course of this study. The requirements for

specific detailed chemical information will vary according to the user and the conditions that generate the need; however, we have specified the chemical-specific information that we believe will encompass all of the potential emergency needs within the foreseeable future.

Although the content of this manual is not designed for non-emergency usage, such as research and development and the formulation of regulatory and other preventative measures, much of the information will also be of value for these purposes. Non-emergency requirements over and above those that are met in this manual will generally be of the type that are used for a single purpose (or analysis) for a specific study which, when completed, will not usually present a further need for the information. Since the needs for this kind of information are difficult to perceive and the information may also be difficult to acquire, we do not recommend that such information be included in the manual. However, because of the effort required to obtain data for specific non-emergency related studies, any data acquired in performing such work should be recorded and stored as a component of the files that will support this manual.

## 3.2 DIFFERENT VERSIONS OF MANUAL NO. 2

During reviews of the first draft of the Preliminary Specifications by potential users of the manual and other interested Coast Guard personnel, it became clear that some data needed by specialists will not be used by most field personnel. The incorporation of little-used data in the manual sent to the field would only detract from its use. Desired data would be more difficult to find during an emergency, and the bulk of the manual required to contain the more comprehensive set of data could be detrimental to its use. Because of this, we recommend that this manual be published in two versions: one containing all of the conceivable data that hazardous materials' specialists and experts may need during an emergency; the other, a field version containing less data but all that will be required by field personnel. However,

the manual will be arranged so that it will basically be a single manual in which some of the data is deleted (and so noted) for those copies sent to the field.

Some of the port security representatives have expressed the desire to add material from Manual No. 2 to Manual No. 1 to provide more information to the better-trained personnel that first arrive on the scene. The specific data in Manual No. 2 that they referred to includes essentially all the data that we have now recommended to be incorporated in the field version of Manual No. 2. We have concluded that the best way to take care of these varying field requirements for hazardous chemical data is to combine Manual No. 1 and the field version of Manual No. 2 and arrange it so that the data sheets from Manual No. 1 can be removed, if the field personnel so desire.

In the following discussion of the content of this manual, we treat the material to be contained in the comprehensive, specialists' version. We do, however, note the data which will be deleted in the field version.

Provision is also made for a Hazardous Materials Automated File involving a computer storage and retrieval system for the quantitative data of Manual No. 2. This file is presented as a supplement to the Preliminary Specifications for this manual.

## 4.0 CONTENT DESCRIPTION

### 4.1 INTRODUCTORY MATERIAL

The manual will contain, in addition to the chemical-specific information, explanatory and supplementary material that will be necessary and helpful to the user. It will, as in other manuals, include the purpose and scope of the manual and describe CHRIS, the other manuals in the system and their use and relationship to each other.

The explanation of terms will be of particular importance since each item of chemical-specific information must be adequately defined and limitations as to its accuracy and scope must be known if the data is to be properly used. An explanation of other information systems is also included so that the Coast Guard may more effectively communicate and cobrdinate information with other emergency services (e.g., municipal fire departments). Conversion tables and properties of water are included to aid personnel in making hazard assessments.

### 4.2 CHEMICAL-SPECIFIC INFORMATION

The following list of terms and properties specified for this manual was established as the result of a review of other similar data listings, an examination of user needs derived in earlier phases of the program, a user re-evaluation, and from discussions with and contributions of consultants. The list is preliminary and should be further evaluated, modified, and revised as additional inputs from potential users of the manual and other interested groups are received. We also expect that the manual will undergo further revision during the process of assembling, tabulating, and formulating its contents.

In considering each item of information, we have concluded a single implied or actual need is sufficient reason to include the information in the manual. A complete and thorough documentation of all of the potential uses (and needs) for each item of information would require a text of excessive proportions. Some of the potential uses (and not necessarily the most important uses in every case) for the chemical-specific information are given in the following section. Those data items that will be eliminated from the field version of the manual are marked with an asterisk.

4.2.1 Chemical Designations

4.2.1.1 Chemical name - The basic designation for each chemical should be the common chemical name that is specified in the Code of Federal Regulations since this is the designation used to regulate the transport of the chemicals. The list of chemicals to be incorporated in this manual will also include chemicals other than those presently specified in subchapter O of the CFR. However, we expect that the common name of these additional chemicals will be listed either in the CFR or some other (to be specified) Government document.

4.2.1.2 Code - A coded symbol for each chemical will enhance the ability to transmit the chemical designation orally.

4.2.1.3 Synonyms - Chemical names other than those given in the CFR (or other Federal documents) such as commercial and trade names can provide additional general information to the user of the manual. In particular, another name may enhance recognition of the chemical by people who are more accustomed to its use rather than the name specified in the CFR.

4.2.1.4 Chemical family - The designation for the chemical family is needed in the present Coast Guard compatibility guide.

4.2.1.5 Chemical formula - The chemical formula will reveal certain physical and chemical properties to chemically trained personnel.

4.2.1.6 United Nations' numerical designation - This numerical designation provides a reference to the United Nations' documents on dangerous cargoes.

4.2.1.7 DOT classification - Provides a quick reference to the major hazard presented by the chemical. It also provides a key to the CFR governing the shipment of the chemical.

4.2.2 Observable Characteristics

The physical state (under pressure and temperature conditions normally imposed during shipment) and the color and odor of the chemical

can aid in confirming the identity of the substances. All reasonable descriptions of color and odor should be included to insure recognition by different potential users of the manual.

4.2.3 Shipping Information

4.2.3.1 Grades or purity - Constituents other than the primary chemical may significantly influence or modify the hazardous nature of the material and its physical and chemical properties. A tabulation of the concentration of the significant constituents will provide a basis for modifying the characteristics cited in this manual for the pure substance. Where there are special hazards or physical and chemical characteristics that are significantly different from those of the basic chemical to which the data sheets apply the pertinent information will be inserted and highlighted. If a large number of data items are changed significantly, then a complete set of data will be reported for the mixture.

4.2.3.2 Storage temperature, inert atmosphere, and venting - These characteristics all denote special transport conditions that are unique to specific chemicals--and which may influence the hazards presented during an accident.

4.2.4 Physical and Chemical Properties

4.2.4.1 General Properties

- Physical State (standard conditions, e.g., 1 atm, 15°C) Provides a quick reference as to the principal phase that the chemical will exhibit at the atmospheric pressure and temperature that may exist at the time of the incident.
- * Molecular weight - Necessary input to an equation of state that may be employed for estimating pressure, volume and temperature relationship for the vapor. It also indicates the relative buoyancy of vapor at standard temperature and pressure.

- Normal boiling point - Specific indicator as to whether the chemical will be in liquid or gaseous phase at ambient conditions.
- Freezing point - Specific indicator as to whether the chemical will be in liquid or solid phase at ambient conditions.

* • Critical constants and acentric factor - Primary value of these constants will be for the detailed estimation of physical properties. They will be more important to the generation of other data in the manual than for an emergency use. These constants are included in the manual because they are fundamental properties that provide additional information on the existence of different phases of the material at conditions much different than ambient and because a hazardous materials specialist may conceivably (but infrequently) employ them during an emergency to estimate values of other physical properties or of the properties given in the manual at temperature and pressure conditions that are not covered.

4.2.4.2 Liquid Properties

- Specific gravity (liquid) - Provides a quick reference as to whether or not the liquid may be heavier than water and gives the absolute value of density at or near ambient conditions.

* • Saturated liquid density - Provides a means of estimating the weight of the liquid for a given volume (and vice-versa) for substances that are transported as liquids.

* • Coefficient of thermal expansion (liquid) - Provides a quick method for estimating the change in volume of the liquid cargo with a change in temperature.

- Viscosity of liquid as a function of temperature - Applicable to the calculation of flow rates of the liquid through lines and fittings as, for example, during accidental release (For field version, a qualitative description of viscosity will be given).

* • Thermal conductivity of the liquid as a function of temperature - Applicable to estimates of the rate of heat transfer to the liquid as, for example, when the liquid container is exposed to a fire.

* • Heat capacity of the liquid as a function of temperature - Applicable to estimates of the temperature rise of the liquid when heated, as, for example, when the liquid container is exposed to a fire.

• Surface tension of the liquid - Applicable to estimates of the spreading rate of the liquid on the surface of the water.

• Interfacial tension (liquid-water) - Applicable to estimates of the spreading rate of the liquid on the surface of the water and to the occurrence of emulsions.

• Solubility in water as a function of temperature - Provides a basis for determining whether the chemical will be dispersed by mixing with the water or by some other means.

4.2.4.3 Properties of the Vapor

• Specific gravity (vapor) ambient conditions - Provides a quick reference as to whether the vapor is positively or negatively buoyant in the atmosphere.

* • Saturated vapor density as a function of temperature - Provides a means of estimating the weight of the vapor for a given volume (or vice-versa) for liquids transported in closed systems and which generally have low boiling points.

• Vapor pressure (of the liquid) as a function of temperature - Applicable to the estimation of pressure for a liquid transported in a closed container. It will also indicate the relative volatility of the substance at one atmosphere. (For field version, the vapor pressure will be given at 15°C only.)

* • Heat capacity of vapor as a function of temperature - Applicable to the estimates of the temperature rise when the vapor is heated as, for example, when a closed container is exposed to fire.

* • Ratio of specific heats of the vapor as a function of temperature - Applicable to the estimation of the mass rate of sonic flow of the vapor through an orifice.

* • Latent heat of fusion - Applicable to estimates of energy requirement to liquefy the material during transport or during an accidental release of the substance.

* • Latent heat of vaporization - Applicable to estimates of energy requirements to vaporize the material during transport or during an accidental release of the substance.

* • Heat of combustion - One indicator of the extent of the fire hazard presented by the burning of the substance.

* • Heat of decomposition - An indicator of the relative hazard presented by decomposition of the material.

* • Heat of solution - An indicator of the relative hazard presented by the substance mixing but not chemically reacting with water.

* • Heat of reaction with water - An indicator of the relative hazard presented by the substance chemically reacting with water.

* • Heat of polymerization - An indicator of the potential hazard that may result when the substance is accidentally polymerized.

4.2.4.4 Chemical Reactivity

The reactivity of the substance with water and other common materials, as well as any propensity to decompose or polymerize, are potential hazards in an emergency involving the accidental release of the substance or in other accidental situations (e.g., exposure to fire). Common materials with which there is concern as to reactivity include fuels, and materials of construction for ships, barges, and docks. The name of the

inhibitor employed to prevent or deter polymerization is included since it may be important to determine its effectiveness when the substance is exposed to air, water, or heat.

Potential neutralizing agents will also be included. Notation will be given when a particular hazard may be presented by its use. Agents that may be used primarily for assisting in removal, dispersing or sinking of the chemical will be listed in Manual No. 5 rather than this manual since they tend to apply to classes of chemicals and their use is closely tied with the specific response methods.

4.2.4.5 Flammability

- Flash point, ignition temperature, and flammability limits - Prime indicators as to the relative flammability of the substance.
- Burning rate - Provides a means of predicting the duration of a fire when the depth of the burning pool of liquid can be estimated.
- Fire-extinguishing agents - Although the Coast Guard field units are not normally equipped with significant quantities of fire-extinguishing agents or the means for deployment, knowledge of the agents that should and should not be used may provide an important aid to other emergency services (e.g., municipal fire departments). This knowledge will also help the Coast Guard to evaluate the utility of available emergency services.
- Special hazards of products of combustion - Provides a basis for taking necessary precautions when toxic gases or other hazardous products result.
- Behavior in fires - Provides a basis for taking necessary precautions in response to unusual behavior of the substance or its products either prior to, during, or after the fire occurs.

- Electrical hazard - Provides an indication of the propensity with which the substance may be ignited by electrical equipment.

#### 4.2.4.6 Health Hazard

The items listed cover those health hazard and related subjects that are generally treated in common references dealing with chemical safety and toxicology with the exception that "late toxicity" items, including carcinogenicity, teratogenicity and mutagenicity, have been added to provide guidance as to potential long-term health hazards of some chemicals. Some items such as vapor irritant and liquid or solid irritant characteristics and toxicity by ingestion essentially use the method of presentation employed in the NAS Guide on the "Evaluation of the Hazards of Bulk Water Transportation of Hazardous Chemicals."[1] In the case of toxicity by inhalation and short-term limits, quantitative values of TLV are given with the intent that the section in the manual on the explanation of terms may provide an indication as to the relative significance of different levels of TLV. It is also planned that the section on explanation of terms will provide additional clarification on the $LD_{50}$ values as, for example, relating the $LD_{50}$ to a specific quantity of material ingested (teaspoon, pint, etc., of the substance). The odor threshold is included since in insolated instances it may be helpful to know whether the odor of the substance might be detected at concentrations significantly less (or greater) than the TLV. Because the odor of a specific substance can be masked by other odors, an odor threshold could be misleading and its use could endanger emergency personnel. In addition, data on odor thresholds are very limited. We believe that it may be advisable to omit this item from the manual, but we retained it in the preliminary specifications so that its value can be considered at a later date.

The symptoms and treatment for exposure (first aid) should be presented as brief, concise, and unambiguous statements expressed in commonly understood terminology. These statements should be taken

verbatim from acceptable sources whenever possible. The development of, or revisions to statements on these two subjects will, in particular, require that they be reviewed and approved by medical specialists.

Specifications for personnel protective equipment will consist of a description of the type of equipment required. Reference to a specific make or manufacturer of the equipment should be avoided.

4.2.4.7 Water Pollution

The water pollution hazards as separated from health hazards deal primarily with those hazards presented by the chemical being spilled into the water that endanger marine and wildlife property. Aquatic toxicity, food chain potential, and biological oxygen demand that relate to effects on marine life are included as well as propensity for deleterious effects on water treatment processes and as a fouling agent on industrial and municipal systems, such as heat exchangers.

The minimum concentrations that can be detected with currently available field and laboratory test equipment are also included.

4.2.4.8 Response Methods

The cautionary and corrective response methods that may be applied upon the release of the specific chemical need to be designated in order to insure that the appropriate procedures that are treated in more detail in Manual No. 5, Response Methods Handbook, may be selected. Emphasis should be on corrective response methods and the influence of the conditions under which the incident takes place on the selection of applicable response measures should be indicated.

4.2.4.9 Industrial Information

- Names and addresses of major manufacturers - Should provide assistance in the search for sources of unusual or specialized chemical information during an emergency. This information may also provide assistance in locating those within the chemical company that may have responsibility for insuring that containment and cleanup of the spill has been adequately

treated. (For the field version, only two or three of the major manufacturers of each chemical will be listed.)

- Manufacturer-furnished chemical information - provides a reference to one of the more important sources of data for this manual. This information may not be published in most of the copies of the manual since a wide distribution of this list could result in an excessive number of requests for the manufacturers to furnish copies of their bulletins, data sheets, etc.

4.2.4.10. Hazard Classifications

The classification of the chemical by other systems that are in use can aid in communicating and working with other emergency services that may employ sources of information other than this manual.

4.2.5 Thesaurus and Chemical Compatibility

This manual will also contain an alphabetical listing of chemical synonyms referenced to the common chemical name as an aid to identification of the chemical and a chemical compatibility guide identical to that contained in Coast Guard document CG-388.[2]

# 5.0 SOURCES OF INFORMATION

## 5.1 BACKGROUND

Of the many sources of chemical information that are available in the literature no single source contains a major portion of the material required for this manual. Sources of chemical information are, to varying degrees, specialized; and those that are of interest here tend to fall into broad categories, such as:

- Information by class of chemical (e.g., solvents, plastics, petroleum refining chemicals, hydrocarbons and refrigerants).
- Information on properties (e.g., physical, chemical, flammability and toxicity).
- Information on specific chemicals (e.g., manufacturers' bulletins limited to only the products that the manufacturer produces.)
- General information (e.g., handbooks, chemical dictionaries, and encyclopedias).
- Safety information (e.g., safety data sheets and handbooks).

Within each category there is further specialization, with the content of each source limited by the author's perceived needs for the information. The chemical safety data sheets, for example, have apparently been compiled with objectives sufficiently dissimilar to those of this manual to make them of only limited usefulness for our purposes. The data sheets tend to contain only the minimum of information required to evaluate the most critical hazards. Quantitative data on physical and chemical properties and on toxicity that are needed to make detailed assessments of the potential chemical hazards are inadequate. Some data sheets are quite variable in the material presented and in their format. Also, the data sheets that have been compiled only cover a fraction of the chemicals to be incorporated in this manual.

The large number of potential sources of chemical information poses additional problems in the compilation of the required data. Some sources tend to be more reliable than others, but their relative reliability is not simply assessed. Data are presented in many different ways (e.g., terminology, units, and nomographs or figures and tabulated data) and in many cases, the data given in several sources may be based on the same original reference (or source). Comparisons as to adequacy, accuracy, and reliability are difficult to make and a significant amount of the information may have to be converted to a standard or uniform presentation for this manual.

The fact that the sources of the needed information are diffuse and non-uniform, however, reinforces the need for the development of a specific chemical data base for the CHRIS system.

## 5.2 SELECTION OF SOURCES

With the large number of sources, properties, and chemicals that will be involved in compiling this manual, we cannot specify a single source for each and every characteristic listed in the Preliminary Specifications and for each chemical to be placed in the manual for this would require an undertaking almost as large as that of compiling the data itself. We can, however, recommend a scheme or approach to the selection and use of the available source material. This approach involves a sequential procedure, as follows:

- Utilize the principal sources that researchers (physicists, chemists, toxicologists, etc.) have found to be the most productive and reliable. A reasonably complete listing of these resources is given in the Preliminary Specifications.
- For key data not found in the principal sources, search for original references in the literature. This will primarily involve the use of the Chemical Abstracts Service to locate technical reports, papers and journal articles reporting on the determination of the values needed. The extent to which

this step is employed for any given property may best be left to the judgment of someone experienced in using and searching for the kind of data that is desired.

- For physical and chemical properties that are still missing, but are needed, we recommend analytical estimation techniques. Sources of such estimation techniques are listed with the Preliminary Specifications. For some properties, it may be more expedient to use step 3 before step 2.

The recommended source(s) of information are given for each item of information listed in the Preliminary Specifications. Physical and chemical properties are an exception in that the recommended sources are given for this class of information as a whole rather than for each property since most of the sources apply to several properties. The Source Listing has been derived from those sources recommended by ADL personnel and consultants experienced in using and searching for information in the technical fields of interest. We believe this list to be relatively complete; however, we expect and plan that it will be enlarged and/or modified during the actual compilation of the data.

## 5.3 PRELIMINARY CONSIDERATION ON DATA ACQUISITION AND COMPILATION

Depending upon the specific item of information to be recorded, extraction of data from the literature and its insertion into the manual will involve one of the following processes:

- Extract a single value or statement for each property and characteristic and insert in the manual;
- Record several values and statements from one or more sources and insert all of them in the manual; or
- Record values and statements from several sources and select the best of these for insertion in the manual.

Examples of the first case are items that depend on the Code of Federal Regulations. The second type of data is exemplified by color and odor, where several descriptors will be recorded in the manual. The third case pertains primarily to physical and chemical properties, where

we are particularly concerned with reliability of the data. Here it is recommended that several values for each property (for a given chemical) be derived from several independent primary sources and tabulated. Where discrepancies are found, the most reliable value will be selected by referring to the original work in which the values were derived. We expect, however, that reference to original work will be infrequent and that the reason for discrepancies will be obvious in most cases.

For most cases, the required information may be found and collated by a scientific librarian. However, in cases where quantitative data must be converted to written statements, where there are discrepancies in the data sources, where data must be estimated, or where materials may have different properties or behave differently depending upon the particular situation, then assistance will be required from specialists in the pertinent area. Also, in all cases, a review of the compilation should be made by competent chemists, chemical engineers, and toxicologists.

In the compilation of the data, advantage should be taken of sources developed by the Coast Guard and the National Academy of Sciences, and of the specific data that has been compiled both in previous Coast Guard programs and by the Environmental Protection Agency.

In the Preliminary Specifications we have specified a temperature range over which certain physical properties will be recorded. The lowest temperature is intended to take into consideration the lowest temperature at which the material will be shipped or to which it may be exposed while being shipped. The highest temperature is somewhat arbitrary and is intended to take into consideration the possibility that the liquid or gas may be heated during a fire involving either the substance itself or some other flammable material. We recommend that the temperature range be reexamined during the compilation of the data and readjusted for specific chemicals, where appropriate.

The number of characters has been estimated for each data item and is based on an approximate count of the maximum number of alphabetical

or numerical characters (including one set of units) that might be required for any given chemical. The count was then rounded off to the next highest multiple of five. An allowance has been made for a maximum of five significant figures for most of the quantitative data.

We have not specified the accuracy required for quantitative values since we believe that the application of the data will generally not require a high level of accuracy (e.g., usually no better than three significant figures). The reliability of the data will be very important, however, for gross errors could detract from the credibility of the document and possibly lead to a hazardous situation if the wrong value were used for hazard assessment purposes. We recommend that the data be recorded to the number of significant figures that is compatible with the accuracy given in the source from which the data item was obtained.

In the conversion table for units, we recommend that the source for the SI (international metric) units be that defined by the ASTM[3].

## 6.0 PRELIMINARY SPECIFICATIONS

Preliminary specifications for the content of the manual containing detailed specific information on hazardous chemicals are presented here. A preliminary estimate of the number of characters (letters and digits) that may have to be employed in expressing each item for any given chemical is included. The recommended source(s) of the data for each item or group of items is specified by a coded designation. An itemized list of sources along with the code designations is also presented at the end of the specifications. Specific items to be deleted or modified in the field version of the manual are marked with an asterisk.

### 6.1 PREFACE

Cite purpose and scope of the manual, authorization and Coast Guard component(s) responsible for the content and distribution. Describe the relationship between this manual and CHRIS.

### 6.2 TABLE OF CONTENTS

Cite the following:

| Subject | Page |
|---|---|
| CHRIS Manuals | |
| Explanation of Terms | |
| Other Information Systems | |
| Conversion Tables | |
| Properties of Water | |
| Chemical Specific Information | |
| Chemical Designations | |
| Observable Characteristics | |
| Shipping Information | |
| Physical and Chemical Properties | |
| Chemical Reactivity | |
| Flammability | |

Health Hazards

Water Pollution

Industrial Information

Response Methods

Hazard Classifications

Source Listing

General Sources

Chemical Designations

Physical and Chemical Properties

Reactivity

Flammability

Health Hazards

Industrial Information

Hazard Classifications

Synonyms

Compatibility Guide

## 6.3 CHRIS MANUALS

List each of the CHRIS manuals and describe its content, intended use, and relationship with this manual.

## 6.4 EXPLANATION OF TERMS

Except for commonly understood terms and properties, define and explain each item of information, using the specifications as a guide. Indicate any limitations on the use of the data. For example, elaborate on the use of Threshold Limit Values in assessing toxicity by inhalation. Discuss the application of less commonly employed terms (e.g. acentric factor).

Explain the use of the chemical thesaurus and the compatibility guide.

## 6.5 OTHER INFORMATION SYSTEMS

Describe the methods of rating or classifying chemicals by the three systems listed under Hazard Classifications of the Chemical-Specific Information (NAS Guide,[1] NFPA 704M,[4] CHEMTREC).[5]

## 6.6 CONVERSION TABLES

Provide a table for conversion of all English units in this manual to cgs and S.I. (metric) units.

## 6.7 PROPERTIES OF WATER

Tabulate all of the physical properties of water, as specified under Physical and Chemical Properties of the Chemical-Specific Information, that are appropriate and applicable.

## 6.8 CHEMICAL SPECIFIC INFORMATION

For each chemical cite the information specified below. Each item must be included for every chemical whether or not the specific data are applicable or available. If the data item is not applicable to the specific chemical, not available, or yet to be extracted from available sources, so state. Use English units except in those cases where other units are more commonly employed.

### 6.8.1 CHEMICAL DESIGNATIONS

1. Chemical Name - State the federally specified name as in Code of Federal Regulations. Limited abbreviations allowed (see CG-388, e.g. ammonia, aqua). Additional chemicals may be added from a federal (unspecified document) list of "hazardous polluting substances."

   Number of characters: 40
   Source: CS-1, Subchapter O
   Table 151.01-10(b) and Table 150.01-10(d)

2. Code - Cite a three-character alphabetic designation for the specific chemical.

   Number of characters: 3
   Source: Coding scheme to be developed in final design of data base.

3. Synonyms - Cite alternative chemical names and all commonly used and known English names, including trade names, other than federally specified.

   Number of characters: 10 (25 characters) synonyms
   Source: CS-2, CS-3, CS-4, C-1, C-2

4. Chemical Family - State the chemical families or groups to which the chemical belongs (e.g., aldehyde, inorganic acid, etc.).

   Number of characters: 50
   Source: C-3

5. Chemical Formula - Cite the most commonly used one-line chemical formula.

   Number of characters: 25
   Source: CS-2, CS-3, CS-4, C-1, C-2.

6. United Nations Numerical Designation - Cite the numerical designation for the chemical as defined in United Nations documents.

   Number of characters: 10
   Source: C-4

7. DOT Classification - Cite the Federally specified classification. Only these terms apply: inflammable liquid, oxidizing material, corrosive liquid, compressed gas, Class B poison, combustible liquid.

   Number of characters: 20
   Source: CS-1, Tables 146.21-100, 146.22-200, 146.23-100, 146.24-100, 146.25-200, 146.26-100

6.8.2 OBSERVABLE CHARACTERISTICS

1. Physical State (as shipped) - State whether the chemical is a liquid (and character, e.g. oily, viscous), liquefied gas or compressed gas when shipped. If shipped in more than one state, cite them.

   Number of characters: 20
   Source: CS-2, Physical property data in this manual

2. Color - Cite the color of either (or both) the liquid and gas, where applicable, If colorless, so state. Cite the clarity (clear or cloudy), where applicable. Include all of the different color descriptions given in the sources listed below.

   Number of characters: 100
   Source: CS-2, CS-3, CS-4, H-2, H-3

3. Odor - Cite all of the different odor descriptions given in the sources listed below.

   Number of characters: 150
   Source: CS-2, CS-3, CS-4, H-2, H-3

## 6.8.3 SHIPPING INFORMATION

1. Grades or Purity - Cite name and percentage of major constituents for major grades shipped in bulk by water; cite associated commercial or federal designation (including synonyms) for grade(s), where applicable. Cite major difference in chemical specific data from that of pure chemical.

   Number of characters: Maximum of 10 grades, maximum average of 35 characters for each grade designation (including synonyms). Maximum of two constituents for each grade with 15 characters each, maximum of 5 significant figures for each percentage value.
   Source: GS-2, GS-3, GS-4, I-1, I-2

2. Storage Temperature - Cite temperature (or range of temperatures) at which the chemical is normally shipped in bulk by water transport. If shipped at ambient temperature, so state.

   Number of characters: 10
   Units: °F.
   Source: GS-2, GS-3, GS-4

3. Inert Atmosphere - Cite one of the following:

   a. Inerted
   b. Padded
   c. Ventilated (forced)
   d. Ventilated (natural)
   e. No requirement

   Number of characters: 20
   Source: GS-1, GS-2, GS-3, GS-4

4. Venting - Cite one of the following:

   a. Open
   b. Pressure-vacuum
   c. Safety relief

   Number of characters: 15
   Source: GS-1, GS-2, GS-3, GS-4

## 6.8.4 PHYSICAL AND CHEMICAL PROPERTIES

Sources - The sources of physical and chemical properties should be used in the following order:

Primary GS-2, P-1 through P-14

Secondary - Single compound data and original references (use Chemical Abstracts Service)

Tertiary - estimate data by analytical methods.

1. Physical State - (Standard temperature and pressure) - state whether the chemical is solid, liquid or gas at one atmosphere and at 15°C.

   Number of characters: 15
   Units: None

*2. Molecular Weight - Cite the Molecular Weight.

   Number of characters: 10
   Units: None

3. Normal Boiling Point - Cite the normal boiling point (at one atmosphere).

   Number of characters: 10
   Units: °F

4. Freezing Point - Cite the freezing point at one atmosphere.

   Number of characters: 10
   Units: °F

*5. Critical Temperatures - Cite the critical temperature.

   Number of characters: 10
   Units: °F

*6. Critical Pressure - Cite the critical pressure.

   Number of characters: 10
   Units: psia

*7. Critical Volume - Cite the critical volume.

   Number of characters: 15
   Units: $ft^3/lb$

*8. Acentric Factor - Cite the value of the acentric factor.

   Number of characters: 5
   Units: None

9. Specific Gravity (liquid) - If the substance is a liquid at one atmosphere and 15°C, cite the value for the specific gravity of the liquid at these conditions (compared to water at 4°C). If not a liquid at these conditions, give the specific gravity at its normal boiling point.

   Number of characters: 15
   Units: None

*10. Saturated Liquid Density - Plot the density of the saturated liquid as a function of temperature from either 32°F or the normal boiling point, whichever is less, up to the critical temperature of 500°F, whichever is less.

Number of characters: (Plot)
Units: lbs/ft$^3$, °F

*11. Coefficient of Thermal Expansion (liquid) - Cite the coefficient of thermal expansion at one atmosphere and 70°F. If boiling point is below 70°F, cite coefficient at or near the boiling point and at the conditions normally employed during shipping.

Number of characters: 15
Units: °F$^{-1}$

12. Viscosity of Liquid as a Function of Temperature - Plot the viscosity of the liquid as a function of temperature (one atmosphere) from 32°F up to its normal boiling point or to 500°F, whichever is lower. If the normal boiling point is below 32°F, no data are required. (For field version--give qualitative description.)

Number of characters: (Plot)
Units: Centipoise, °F

*13. Thermal Conductivity of the Liquid as a Function of Temperature - Plot the thermal conductivity of the liquid as a function of temperature from 32°F up to its normal boiling point or 500°F, whichever is lower. If the normal boiling point is below 32°F, no data are required.

Number of characters: (Plot)
Units: Btu/hr-ft-°F, °F

*14. Heat Capacity of the Liquid as a Function of Temperature - Plot the heat capacity of the liquid as a function of temperature from 32°F up to its normal boiling point or 500°F, whichever is lower. If the normal boiling point is below 32°F, no data are required.

15. Surface Tension of the Liquid - Cite the surface tension of the liquid at 15°C.

Number of characters: 15
Units: ergs/cm$^2$

16. Interfacial Tension (liquid-water) - Cite the interfacial tension between the liquid and water at 15°C.

Number of characters: 15
Units: ergs/cm$^2$

17. Solubility in Water as a Function of Temperature - Plot the solubility of the liquid in water as a function of temperature from 0°C up to its normal boiling point or 25°C, whichever is lower. If the normal boiling point is below 0°C, no data are required.

Number of characters: (Plot)
Units: g/l, °C

18. Specific Gravity (Vapor) - If the substance is a gas at one atmosphere and 15°C, cite the value for the specific gravity of vapor at these conditions (compared to air at one atmosphere and 15°C). If not a gas at these conditions, so state.

Number of characters: 5
Units: None

*19. Saturated Vapor Density as a Function of Temperature - Plot the density of the saturated vapor as a function of temperature from the normal boiling point up to the critical temperature or to 500°F, whichever is less. If the normal boiling point is above 500°F no data are required.

Number of characters: (Plot)
Units: $lbs/ft^3$

*20. Saturated Vapor Pressure as a Function of Temperature - Plot the saturated vapor pressure as a function of temperature from 32°F or the normal boiling point, whichever is less, up to the critical temperature or to 500°F, whichever is less.

Number of characters: (Plot)
Units: psia, °F

21. Viscosity of Vapor as a Function of Temperature - Plot the viscosity of the vapor as a function of temperature from the normal boiling point up to 500°F. If the normal boiling point is above 500°F, no data are required. (For field version give qualitative description.)

Number of characters: 5
Units: None, °F

*22. Gas Heat Capacity of Vapor as a Function of Temperature - Plot the heat capacity of the vapor at one atmosphere as a function of temperature from the normal boiling point up to 500°F. If the normal boiling point is above 500°F, no data are required.

*23. Ratio of Specific Heats of the Vapor as a Function of Temperature - Plot the ratio of specific heats as a function of temperature from the normal boiling point up to 500°F. If the normal boiling point is above 500°F, no data are required.

Number of characters: 5
Units: None, °F

*24. Latent Heat of Fusion - Cite the latent heat of fusion at the melting point.

Number of characters: 15
Units: Btu/lb

'72

*25. Latent Heat of Vaporization - Cite the latent heat of evaporation at the normal boiling point.

Number of characters: 15
Units: Btu/lb

*26. Heat of Combustion - Cite the heat of combustion for flammable materials.

Number of characters: 15
Units: Btu/lb

*27. Heat of Decomposition - Cite the heat of decomposition for materials that decompose exothermically.

Number of characters: 15
Units: Btu/lb

*28. Heat of Solution - Cite the heat of solution (to infinite dilution) for materials where the heat release may lead to hazardous conditions.

Number of characters: 15
Units: Btu/lb

*29. Heat of Reaction with Water - Cite the heat of reaction with water for materials where the heat release may lead to hazardous conditions.

Number of characters: 15
Units: Btu/lb

*30. Heat of Polymerization - Cite the heat of polymerization for materials where the heat release may lead to hazardous conditions.

Number of characters: 15
Units: Btu/lb

## 6.8.5 CHEMICAL REACTIVITY

1. Reactivity with Water - Cite the intensity in qualitative terms with which the substance reacts with water. If the substance does not react with water, so state. Note particularly hazardous conditions resulting from either mixing or reacting with water.

   Number of characters: 50
   Source: GS-2, GS-3, GS-4, H-1, H-2

2. Reactivity with Common Materials - Cite the intensity (in qualitative terms) with which the substance reacts with common materials and state the type or class of material with which it is particularly reactive. If the substance does not react with common materials, so state. Note

particularly hazardous conditions resulting from the substance reacting with common materials.

Number of characters: 75
Source: GS-2, GS-3, GS-4, H-1, H-2

3. Decomposition - Cite the conditions that may lead to decomposition of the substance during transport or when involved in a shipping accident. Cite the intensity (in qualitative terms) with which the decomposition takes place. If the material will not decompose during transport or when involved in a shipping accident, so state. Note particularly hazardous conditions resulting from decomposition of the substance.

Number of characters: 75
Source: GS-2, GS-3, GS-4, H-1, H-2

4. Polymerization - Cite the conditions and intensity with which the substance may polymerize during transport or when involved in a shipping accident. If the substance does not polymerize, so state.

Number of characters: 50
Source: GS-2, GS-3, GS-4, H-1, H-2

5. Inhibitor (Polymerization) - Cite the name and concentration of inhibitor use to prevent polymerization of the substance. If inhibitor is not used, so state.

Number of characters: 50
Source: GS-2

6. Neutralizing Agents - Cite the common chemical names (and synonyms, where applicable) of chemicals that may be employed to neutralize the acidic or basic nature of the substance. Note precautions required in the application of the neutralizing agent and any hazards associated with its use.

Number of characters: 75
Source: R-1

6.8.6 FLAMMABILITY

1. Flash Point - Cite the flash point and the method used to obtain it (e.g. ASTM D56, D93).

Number of characters: 15
Units: °F
Source: F-1, GS-2, GS-3, GS-4

2. Ignition Temperature - Cite the ignition temperature and method used to obtain it (ASTM 2155 preferred).

Number of characters: 10
Units: °F
Source: F-1, GS-2, GS-3, GS-4

3. Flammable Limits in Air - Cite volume concentration in air (in percent) for both upper and lower flammability limits.

   Number of characters: 25
   Units: %(LEL). %(UEL).
   Source: F-1, F-2, GS-2, GS-3, GS-4

4. Burning Rate - Cite the burning rate as the rate of decrease in depth of a burning pool of the liquid.

   Number of characters: 15
   Units: in/min
   Source: Estimated

5. Fire Extinguishing Agents Recommended - Specify extinguishing agents for application to:

   - Small fires
   - Large fires

   Number of characters: 100
   Source: GS-2, F-3, F-4

6. Fire Extinguishing Agents Not Recommended - Cite those extinguishing agents which, if employed, would worsen the fire or lead to other hazards.

   Number of characters: 50
   Source: GS-2, F-3, F-4

7. Special Hazards of Products of Combustion - Cite unusual health hazards presented by products of combustion.

   Number of characters: 75
   Source: GS-2, F-3, F-4

8. Behavior in Fires - Cite characteristic behavior that may significantly affect the fire hazard presented by the specific chemical (e.g. smoky, difficult to extinguish, downwind flammable vapor clouds, etc.).

   Number of characters: 75
   Source: GS-2, F-3, F-4

9. Electrical Hazard - Cite the group and class to which the chemical belongs as determined by its ability to be ignited by electrical equipment.

   Number of characters: 25
   Source: F-1, GS-2

6.8.7 HEALTH HAZARDS

1. Vapor Irritant Characteristics - Cite the most applicable of the following statements (as taken from the NAS, Tentative Guide):

   a. Nonvolatile

   b. Vapors are nonirritating to the eyes and throat

   c. Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.

   d. Vapor is moderately irritating such that personnel will not usually tolerate moderate or high vapor concentrations.

   e. Vapor causes severe eye or throat irritants which are capable of causing eye or lung injury, and which cannot be tolerated even at low concentrations.

   Number of characters: 140
   Source: Primary H-1, H-2, H-3, H-4, H-5
   Secondary GS-3, GS-4

2. Liquid or Solid Irritant Characteristics - Cite the most applicable of the following statements (as taken from - NAS, Tentative Guide):

   a. No appreciable hazard. Practically harmless to the skin.

   b. No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly from the skin.

   c. Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.

   d. Causes smarting of the skin and first degree burns on short exposure and may cause secondary burns on long exposure.

   e. Fairly severe skin irritant, may cause pain and second degree burns after a few minutes contact.

   f. Severe skin irritant. Causes second and third degree burns on short contact and very injurious to the eyes.

   Number of characters: 125
   Source: Primary H-1, H-2, H-3, H-4, H-5
   Secondary GS-3, GS-4

3. Toxicity by Inhalation (TLV) - Cite the Threshold Limit Value as defined and expressed in ACGIH, Threshold Limit

Values. Cite parts of vapor or gas per million parts of contaminated air by volume at 25°C and 760 mm Hg pressure and/or approximate milligrams of particulate per cubic meter of air. When not given in ACGIH, Threshold Limit Values, list, from other available sources, TLV's and associated animal species to which they apply.

Number of characters: 25
Source: Primary H-6, H-7
Secondary H-2, H-3, H-4
Units: ppm, $mg/M^3$

4. Odor Threshold - Cite the smallest concentration in air that most people can detect by smell.

Number of characters: 10
Source: GS-3
Units: ppm

5. Short Term Limits (Inhalation) - Cite the threshold limit value for short-term exposure. State more than one value and associated time, where applicable.

Number of characters: 25
Source: H-8, H-10, H-7
Units: ppm, $mg/M^3$

6. Toxicity by Ingestion - Rate human toxicity as defined in the NAS Guide as follows:

| Grade | $LD_{50}$ |
|---|---|
| 0 | Above 15 g/kg |
| 1 | 5 to 15 g/kg |
| 2 | 0.5 to 5 g/kg |
| 3 | 50 to 500 mg/kg |
| 4 | Below 50 mg/kg |

Use Handbook of Toxicology, Volume I, as a guide. State both grade and associated range of $LD_{50}$ values.

Number of characters: 10
Source: Primary H-14, H-15
Secondary H-2
Units: As above

7. Late Toxicity - Cite a qualitative indication of the potential carcinogenicity, mutegenicity and teratogenicity of the chemical.

Number of characters: 125
Source: H-2, H-7
Units: None

8. Symptoms - Cite, where applicable, symptoms resulting from exposure to the following:

   a. Skin

   b. Inhalation

   c. Ingestion

   Number of characters: 300
   Source: GS-2, GS-3, GS-4, H-13, H-11

9. Treatment for Exposure - Cite, where applicable, first-aid treatment for the following exposures.

   a. Skin or mucous membranes

   b. Eyes

   c. Inhalation

   d. Taken internally

   Number of characters: 400
   Source: Primary H-11, H-12, H-13
   Secondary GS-2, GS-3, GS-4

10. Personal Protective Equipment - Cite recommended types of respiratory equipment and protective clothing and when they should be used. Note special equipment that may be furnished on the vessel or at the loading facility.

    Number of characters: 200
    Source: GS-2, GS-3, GS-4

6.6.8 WATER POLLUTION

1. Aquatic Toxicity - Cite Median Tolerance Limit ($TL_m$) values and marine species to which they apply. Include the applicable time of exposure.

   Number of characters: 75
   Source: H-15, H-16
   Units: mg/l

2. Biological Oxygen Demand (BOD) - Cite values of BOD as a function of time (preferably 5 days and 20 days).

   Number of characters: 75
   Source: W-3, W-4
   Units: %, days

3. Food Chain Concentration Potential - Cite the propensity and significance of concentration of the chemical or its derivatives in the food chain of marine and wildlife.

   Number of characters: 75
   Source: To be determined
   Units: None

4. Effect on Water Treatment Processes - Cite deleterious effects that the chemical may have on water treatment processes.

   Number of characters: 75
   Source: To be determined
   Units: None

5. Fouling Agent - Cite the propensity to interfere with or harmfully affect industrial and municipal process systems (e.g., heat exchangers) that rely on cooling water taken from natural suppliers.

   Number of characters: 75
   Source: To be determined
   Units: None

6. Field Detection Limit - Cite the minimum concentration that can be measured with currently available field test equipment.

   Number of characters: 10
   Source: W-5, W-6
   Units: ppm

7. Laboratory Detection Limit - Cite the minimum concentration that can be measured with currently available laboratory equipment.

   Number of characters: 10
   Source: W-5, W-6
   Units: ppm

6.8.9 INDUSTRIAL INFORMATION

1. Names and Addresses of Major Manufacturers - Cite names and addresses of manufacturing division (or corporate headquarters) of major companies that produce the chemical. (For field version cite only two or three.)

   Number of characters: 1500
   Source: I-1, I-2, I-3

*2. Manufacturer Furnished Chemical Information - Cite references to manufacturers, data sheets, technical bulletins, bibliography lists, etc., that contain technical information on the specific chemical. List the reference by title, author(s), publication number, date, and chemical company where given.

   Number of characters: Estimated maximum of twenty references per chemical with a maximum of 150 characters per reference.
   Source: GS-2

## 6.8.10 RESPONSE METHODS

Response to a Hazardous Condition - Cite cautionary and corrective response methods most appropriate to the chemical, general conditions under which they apply (e.g., quantity, type of location, weather condition) and unique features that require special methods or modifications of the methods given in CHRIS Manual No. 5., Response Methods Handbook.

Number of characters: 500
Source: CHRIS Manuals Nos. 2 and 5 and the sources used for these manuals.

## 6.8.11 HAZARD CLASSIFICATIONS

1. National Academy of Sciences - Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide - Cite the ratings given in the guide for each catagory, as follows:

| Category | Rating |
|---|---|
| Fire | -- |
| Health | -- |
| Vapor Irritant | -- |
| Liquid or Solid Irritant | -- |
| Poisons | -- |
| Water Pollution | -- |
| Human Toxicity | -- |
| Aquatic Toxicity | -- |
| Aesthetic Effect | -- |
| Reactivity | -- |
| Other Chemicals | -- |
| Water | -- |
| Self-Reaction | -- |

Number of characters: 160
Source: H-1, Other Items in this Manual

2. National Fire Protection Association - Identification of the Fire Hazards of Materials, NFPA 704M - Cite the numerical identification for each category of hazard, as follows:

| Category | Identification |
|---|---|
| Health Hazard (Blue) | -- |
| Flammability (Red) | -- |
| Reactivity (Yellow) | -- |

Number of characters: 60
Source: HC-1

3. Manufacturing Chemists Association - Transportation Emergency Guides - Cite the placard designation and guide number, as follows:

| Placard Designation | Guide Number |
|---|---|
| Poison | -- |
| Compressed Gas | -- |
| Flammable Gas | -- |
| Corrosive | -- |
| Oxidizer | -- |
| Flammable | -- |

Number of characters: 15
Source: HC-2

## 6.9 SOURCE LISTING

### 6.9.1 GENERAL SOURCES

GS-1 "Code of Federal Regulations," published by Office of the Federal Register, national Archives and Record Service, U. S. Government Printing Office, Washington, D. C.

GS-2 Manufacturers' Bulletins - Bulletins, reports, nomographs, and books published by individual manufacturers primarily for customer use. May be obtained by writing to the manufacturer of the chemical for which data is desired.

GS-3 "Chemical Safety Data Sheets," Manufacturing Chemists Association, 1825 Conn. Avenue, Washington, D. C. 20009

GS-4 "Chemical Safety Data Sheets," Chemical Section, National Safety Council, 425 N. Michigan Avenue, Chicago, Illinois 60611

### 6.9.2 CHEMICAL DESIGNATIONS

C-1 "Synthetic Organic Chemical Manufacturers' Association (SOCMA) Handbook, Commercial Organic Chemical Names," The Chemical Abstracts Service, American Chemical Society, 1965.

C-2 "The Merck Index of Chemicals and Drugs," Merck & Co., Inc., Rahway, N. J 2nd Ed.

C-3 "Guide to Compatibility of Chemicals," U. S. Coast Guard

C-4 "Transport of Dangerous Goods," 1970 (4 Volumes), United Nations

### 6.9.3 PHYSICAL AND CHEMICAL PROPERTIES

P-1 "Matheson Gas Data Book," The Matheson Co., Inc. 4th Ed., 1966.

P-2 "Physical Properties of Chemical Compounds," Advances in Chemistry Series, American Chemical Society, Washington, D. C.

P-3 "Handbook of Chemistry and Physics," Chemical Rubber Publishing Co., Cleveland, Ohio.

P-4 Tsederberg, N. V., "Thermal Conductivity of Gases and Liquids," MIT Press, Cambridge, Mass. 1965.

P-5 Stull, D. R. et al., "The Chemical Thermodynamics of Organic Compounds," John Wiley & Sons, Inc., New York, 1969.

P-6 "ASHRAE, Thermodynamic Properties of Refrigerants," American Society of Heating, Refrigerating and Air Conditioning Engineers, Inc., 1968

P-7 "Technical Data Book ...troleum Refining," American Petroleum Institute, Division of Refining, 1966.

P-8 Maxwell, J. B., "Data Book on Hydrocarbons," D. Van Norstrand Co., Inc., 1955.

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P-11 "International Critical Tables," McGraw-Hill Book Company, 1926.

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R-1 Dawson, G. W., et al., "Control of Spillage of Hazardous Polluting Substances," Water Pollution Control Research Series 15090 FOZ10/70, Federal Water Quality Administration.

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F-1 "Fire-Hazard Properties of Flammable Liquids, Gases and Volatile Solids," NFPA No. 325 M, National Fire Protection Association, 60 Batterymarch St., Boston, Mass. 02110, 1965.

F-2 Zabetakis, M. G., "Flammability Characteristics of Combustible Gases and Vapors," Bureau of Mines, Bulletin 627, 1965.

F-3 Tryon, G. H., "Fire Protection Handbook," National Fire Protection Association, Boston, Mass., 13th Ed., 1969.

F-4 "Handbook of Industrial Loss Prevention," prepared by Factory Mutual Engineering Corp., McGraw-Hill Book Co., N. Y. 2nd Ed., 1967.

6.9.6 HEALTH HAZARDS

H-1 "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, A Tentative Guide," National Academy of Sciences, Washington, D. C., 1970.

H-2 Patty, F. A., "Industrial Hygiene and Toxicology," Interscience Publishers, New York, 2nd Rev. Ed.

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H-6 "Threshold Limit Values of Airborne Contaminants, Adopted by ACGIH for 1969," American Conference of Governmental Hygienists, 1014 Broadway, Cincinnati, Ohio 45202.

H-7 "Toxicology Information Program (TIP)," National Library of Medicine, Washington, D. C.

H-8 "Pennsylvania Short Term Limits," Pennsylvania Department of Health, Box 90, Harrisburg, Pennsylvania.

H-9 "Emergency Exposure Limits," American Industrial Hygiene Association, Detroit, Michigan 48227.

H-10 "Short Term Limits (STL)" established by the National Academy of Sciences - National Research Council Committee...

H-11 Deichmann, W. B., and Gerarde, H. W., "Symptomatology and Therapy of Toxicological Emergencies," Academic Press, N. Y., 1964.

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H-14 Spector, W. S., "Handbook of Toxicology, Vol 1., Acute Toxicities of Solids, Liquids and Gases to Laboratory Animals," Saunders, Philadelphia, Pennsylvania, 1956.

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W-1 "Relationship Between Organic Chemical Pollution of Fresh Water and Health," Report by Arthur D. Little, Inc., Cambridge, Mass., December 1970.

W-2 Christensen, H. E., "Toxic Substances, Annual List," National Institute for Occupational Safety and Health, Rockville, Md.

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W-5 "FWPCA Methods for Chemical Analysis of Water and Wastes," 1971.

W-6 "Standard Test Methods for Water and Wastewater," Volume 13, American Water Works Association.

### 6.9.8 INDUSTRIAL INFORMATION

I-1 "Chemical Week Buyers' Guide Issue," McGraw-Hill, Inc. N.Y.

I-2 Faith, W. L., et al., "Industrial Chemicals," John Wiley & Sons, Inc., New York, 2nd Edition, 1957.

I-3 SRI Chemical Marketing Handbook

### 6.9.9 HAZARD CLASSIFICATIONS

HC-1 "Identification of the Fire Hazards of Materials," National Fire Protection Association, NFPA No. 704M-1966.

HC-2 "A Manual of Transportation Emergency Guides," Manufacturing Chemists Association, Washington, D. C., November 1968.

## 6.10 SYNONYMS

Place all known English synonyms for all chemicals in a single list and arrange in alphabetical order. Cite the common chemical name that applies to each.

## 6.11 CHEMICAL COMPATIBILITY

Reproduce the Guide to Compatibility of Chemicals including the compatibility chart and the listing of chemicals arranged in groupings as now incorporated in the Coast Guard document (CG-388).

## 7.0 SUPPLEMEN TO PRELIMINARY SPECIFICATIONS: A HAZARDOUS CHEMICALS AUTOMATED FILE

### 7.1 INTRODUCTION

The National Academy of Sciences Coast Guard Advisory Committee has recommended that certain of the more quantifiable chemical, physical and biological properties of hazardous chemicals contained in CHRIS Manual No. 2, primarily for use during an emergency, should also be maintained in a computerized data base to facilitate non-emergency technical analyses. Some examples of the type of non-emergency use of Manual No. 2 data would be research and development work and the formulation of regulatory (e.g., cargo-size limitations) and other preventative measures, but the exact nature of the analyses and the techniques to be used in performing them are difficult to predict.

This section presents the preliminary specifications for establishing and maintaining an automated data base of hazardous chemical properties and characteristics. However, designing a data structure with little knowledge of the type and extent of operations which might be made of it can eventually lead to a cumbersome operation. With this important drawback in mind, the proposed data base should incorporate the simplest and most commonly available data architecture so the file may be reformatted (if necessary) with relative ease once its uses unfold. Fortunately, since the number of unique chemicals under consideration is not great (on the order of 1000), file design is probably not a very critical issue at this time.

Included in this section is (1) a list of data elements, all of which have been previously defined in the preliminary specifications for CHRIS Manual No. 2 and would most likely comprise a hazardous chemicals automated file; (2) a description of the mechanism by which the information in the file can be updated; and (3) a brief discussion of the computer processing required to facilitate file maintenance. The data elements selected for inclusion in the automated file are those likely or capable of being operated upon (quantitatively or logically) in computer analyses by technically trained research and development personnel. Again, since these analyses have not been specified in advance, there is some element of uncertainty concerning the comprehensiveness of selected data.

## 7.2 CONTENT

### 7.2.1 File Design

The Hazardous Chemicals Automated File should be organized sequentially (alphabetically) by Chemical Code, a unique three-character alphabetic designation for a specific chemical described previously under Preliminary Specifications for CHRIS Manuals No. 1 and 2. The file index or key, then, is to be Chemical Code, although special programs could be written to select on any other chemical designation term or physical property. All records are to be a fixed length: 1921 characters.

Table 1, Hazardous Chemicals Automated File Record Design, identifies all data elements along with: an abbreviated field identification for ease of reference, field length in terms of characters (not bytes), format (alphabetic, numeric or alphanumeric) and the maximum number of occurrences of that element (one if not stated otherwise) The field length in many cases differs from that specified in Manual No. 2 for a variety of reasons (e.g., physical units are not included, codes may be substituted for narrative, etc.). Table 2 presents possible coding schemes for certain data elements.

Data elements in the file contain neither decimal points nor physical units. The decimal point location is implicit; it is made explicit by the user through a formatted I/O statement in his application program. Of course, the I/O statement must correspond to the implicit decimal point location for the subject data element, which will be determined at the time the file is initially created. Physical units are also implicit -- those standard units specified in Manual No. 2. The user may easily convert standard units to other systems within his own application program.

### 7.2.2 Input Transactions

A field by field update is suggested because of the large record size, the need to facilitate updating of individual fields within a master record, and the variability of field occurrences. An input document from which keytape transactions may be transcribed appears in figure 1 the Chemical Code (N 4 0) and the Transaction Type (1 = new chemical,

TABLE 1

HAZARDOUS CHEMICALS AUTOMATED FILE RECORD DESIGN

| Field Description | Field ID | Length | Format | Occurrences* |
|---|---|---|---|---|
| A. Observable Characteristics | | | | |
| Chemical Code (Index) | NAMCO | 3 | A | |
| Chemical Name | NAME | 40 | A/N | |
| Synonym | NAMSY | 25 | A/N | 10 |
| Chemical Family | NAMFA | 50 | A | |
| Chemical Formula | NAMFO | 25 | A/N | |
| United Nations Numerical Designation | NAMUN | 10 | A/N | |
| DOT Classification (code) | NAMCL | 2 | N | |
| Physical State (as shipped) (code) | STATE | 2 | N | 2 |
| Color--liquid and gas | COLOR | 100 | A | |
| Odor | ODOR | 150 | A | |
| B. Shipping Information | | | | |
| Grades or Purity | | | | |
| Grade Designation | GRADE | 35 | A/N | 10 |
| Grade Constituent | GRCON | 15 | A/N | 2 |
| Grade Percentage | GRPER | 3 | N | 2 |
| | | 710 Total | | |
| Storage Temperature | TSTOR | 5 | A/N | |
| Inert Atmosphere | INERT | 2 | N | |
| Venting | VENT | 2 | N | |
| C. Physical and Chemical Properties | | | | |
| Physical State | STP | 2 | N | |
| Molecular Weight | MW | 5 | N | |
| Normal Boiling Point | BP | 5 | N | |

* If not stated otherwise

TABLE 1 (Cont)

| Field Description | Field ID | Length | Format | Occurrences* |
|---|---|---|---|---|
| C. Physical and Chemical Properties | | | | |
| Freezing Point | FP | 5 | N | |
| Critical Temperature | TC | 5 | N | |
| Critical Pressure | PC | 5 | N | |
| Critical Volume | VC | 5 | N | |
| Acentric Factor | OMEGA | 5 | N | |
| Specific Gravity | SPGRL | 5 | N | |
| Saturated Liquid Density (Temperature) | RHOL | 5 | N | 4** |
| Coefficient of Thermal Expansion | THEXP | 5 | N | |
| Liquid Viscosity (Temperature) | MVL | 5 | N | 4** |
| Liquid Thermal Conductivity (Temperature) | KL | 5 | N | 4** |
| Liquid Heat Capacity (Temperature) | CPL | 5 | N | 4** |
| Liquid Surface Tension | SIGMA | 5 | N | |
| Interfacial Tension (Liquid-Water) | SGMLW | 5 | N | |
| Aqueous Solubility of Liquid (Temperature) | SOL | 5 | N | 4** |
| Specific Gravity (Vapor) | SPGRV | 5 | N | |
| Saturated Vapor Density (Temperature) | RHOV | 5 | N | |
| Saturated Vapor Pressure (Temperature) | PVAP | 5 | N | 4** |
| Vapor Viscosity (Temperature) | MUV | 5 | N | 4** |
| Gas Heat Capacity (Temperature) | CPVAP | 5 | N | 4** |
| Gas Specific Heat Ratio (Temperature) | GAMMA | 5 | N | 4** |
| Latent Heat of Fusion | DLTHF | 5 | N | |

* If not stated otherwise

** Includes 4 coefficients for property expressed as cubic equation in temperature

TABLE 1 (Cont)

| Field Description | Field ID | Length | Format | Occurrences* |
|---|---|---|---|---|
| C. Physical and Chemical Properties (cont) | | | | |
| Latent Heat of Vaporization | DLTHV | 5 | N | |
| Heat of Combustion | DLTHC | 5 | N | |
| Heat of Decomposition | DLTHD | 5 | N | |
| Heal of Solution | DLTHS | 5 | N | |
| Heat of Reaction with Water | DLTHW | 5 | N | |
| D. Flammability | | | | |
| Flash Point | FP | 5 | N | |
| Flash-Point Method | FPM | 10 | A/N | |
| Ignition Temperature | TI | 5 | N | |
| Ignition-Temperature Method | TIM | 10 | A/N | |
| Lower Flammability Limit | LEL | 3 | N | |
| Upper Flammability Limit | UEL | 3 | N | |
| Burning Rate | BRATE | 5 | N | |
| E. Health Hazards | | | | |
| Toxicity by Inhalation (Vapor) | TLVG | 5 | N | |
| Toxicity by Inhalation (Particulate) | TLVP | 5 | N | |
| Odor Threshold | OOTH | 5 | N | |
| Short-Term Limits (Inhalation) | TLVST | 5 | N | |
| Toxicity by Ingestion (Grade) | LDFIF | 2 | N | |
| F. Water Pollution | | | | |
| Aquatic Toxicity | | | | 5 |
| Marine Species | MS | 25 | A | |
| Median Tolerance Limit | TLM | 5 | N | |
| Exposure Time | ET | 5 | N | |
| | | 175 Total | | |

* If not stated otherwise

TABLE 1 (Cont)

| Field Description | Field ID | Length | Format | Occurrences* |
|---|---|---|---|---|
| G. Hazard Classification | | | | |
| NAS Evaluation of Hazard--Rating | | | | |
| Fire | NASRF | 2 | N | |
| Vapor Irritant | NASRV | 2 | N | |
| Liquid or Solid Irritant | NASRL | 2 | N | |
| Poison | NASRP | 2 | N | |
| Human Toxicity | NASRH | 2 | N | |
| Aquatic Toxicity | NASRA | 2 | N | |
| Aesthetic Effect | NASRE | 2 | N | |
| Other Chemicals Reactivity | NASRC | 2 | N | |
| Water Reactivity | NASRW | 2 | N | |
| Self-Reaction | NASRS | 2 | N | |
| NFPA Hazard Evaluation--Identification | | | | |
| Health Hazard | NFPAH | 2 | N | |
| Flammability | NFPAF | 2 | N | |
| Reactivity | NFPAR | 2 | N | |
| MCA Guides--Guide Number | | | | |
| Poison | MCAP | 2 | N | |
| Compressed Gas | MCACG | 2 | N | |
| Flammable Gas | MCAFG | 2 | N | |
| Corrosive | MCAC | 2 | N | |
| Oxidizer | MCAO | 2 | N | |
| Flammable | MCAF | 2 | N | |
| | | 1921 | Total | |

* 1 if not stated otherwise

TABLE 2

SPECIAL CODES

| | |
|---|---|
| DOT Classification | 01 = inflammable liquid |
| | 02 = oxidizing material |
| | 03 = corrosive liquid |
| | 04 = compressed gas |
| | 05 = class B poison |
| | 06 = combustible liquid |
| Physical State (as shipped) | 01 = oily liquid |
| | 02 = viscous liquid |
| | 03 = liquified gas |
| | 04 = compressed gas |
| Inert Atmosphere | 01 = inerted |
| | 02 = padded |
| | 03 = ventilated (forced) |
| | 04 = ventilated (natural) |
| | 05 = no requirement |
| Venting | 01 = open |
| | 02 = pressure-vacuum |
| | 03 = safety relief |
| Physical State | 01 = solid |
| | 02 = liquid |
| | 03 = gas |
| Toxicity by Ingestion | 00 = Above 15 g/kg |
| | 01 = 5 to 15 g/kg |
| | 02 = 0.5 to 5 g/kg |
| | 03 = 50 to 500 mg/kg |
| | 04 = Below 50 mg/kg |

Name  Trans Type

FIGURE 1

CHRIS TRANSACTIONS

| Field No. | | | Cont. Seq. | Source | | | | | | Field |
|---|---|---|---|---|---|---|---|---|---|---|
| 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 80 |

2 = change, 3 = deletion) should be duplicated in positions 1-6 of each field supplied for a specific chemical. Each element, in addition to the abbreviated identification, must also have a numeric designation. This Field Number is supplied in positions 7-9. For those fields which may have more than one value, an indication of the Continuation Sequence must be noted in position 10. Finally in positions 11-80 (or more if keytaped) the data element value appears. Alphabetic and alphanumeric data should be left-justified; numeric information is right-justified. An alternative approach would be to left-justify all data with the additional stipulation that numeric fields must have non-significant digits zero-filled.

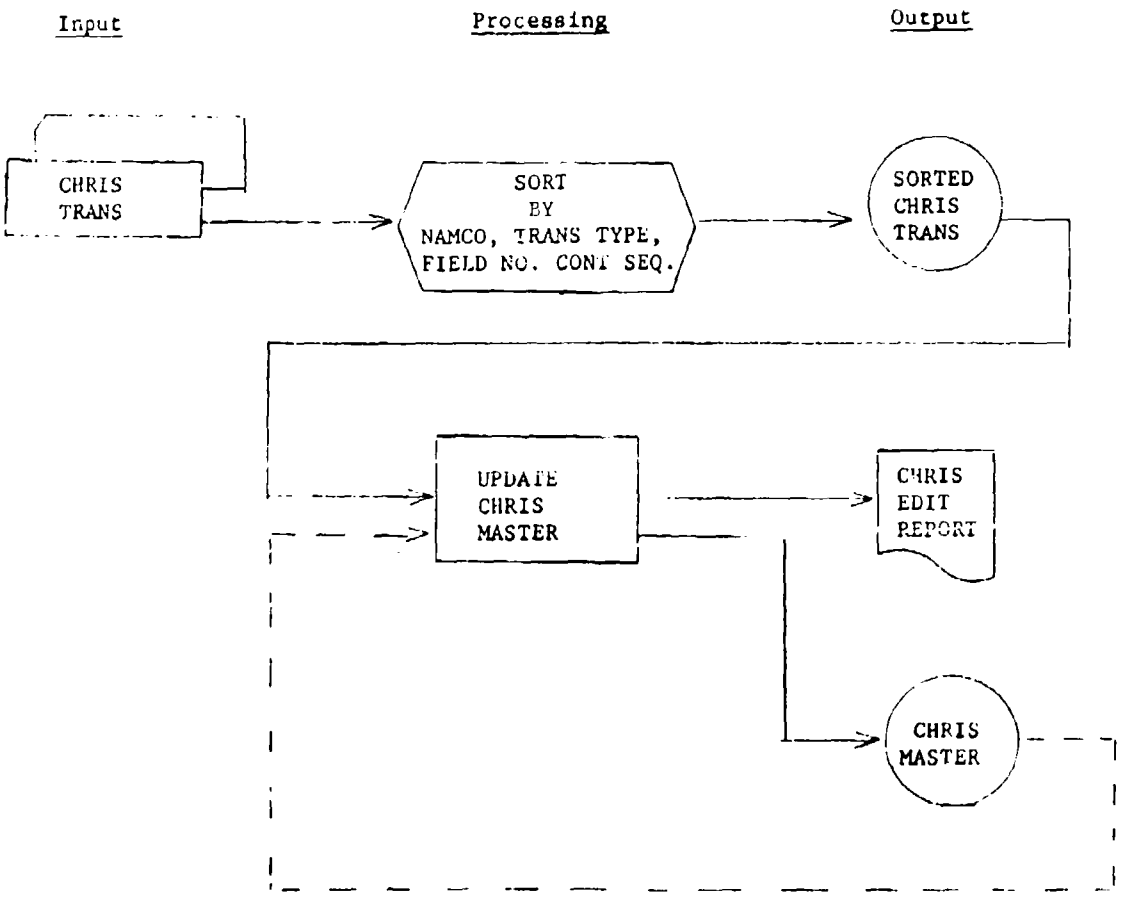
7.2.3 Processing

The input data, after being encoded, keyed, and verified, must then be sorted, the primary sort key being Chemical Code, and sub-keys being Transaction Type, Field Number and Continuation Sequence. These sorted transactions can be edited for correct format and content (if applicable). A further cross-field check may be required for certain information. For example, if DOT Classification equals 01, 03 or 06, the Physical State must be 02. Provided that a minimum subset of elements (to be specified) for a new chemical passes the edits, the data input for that chemical may then be updated. No minimum requirement is necessary, however, for change transactions. Rather, if a field passes, it is eligible for updating; if it fails, it is rejected. Suitable messages should be printed explaining rejections.

In addition to the input transactions, the most recent version of the Hazardous Chemicals Automated File must be available. Output from the update process includes a new Hazardous Chemicals Automated File plus an edit or activity listing to note the acceptance and rejection of the various input data. If core capacity is severely limited, the edit and update operations may be handled as separate problem programs; otherwise one program should suffice. A system level flowchart is shown in Figure 4.

FIGURE 2

SYSTEM FLOW CHART



### 7.2.4 Accessing the File

No attempt has been made in this specification to describe the inquiry programs which will be required to access the data in the Hazardous Chemicals Automated File. Because the nature of most inquiries is unknown at this time, the design of such access programs would be premature. As specific needs are identified, special-purpose application programs will have to be constructed to obtain the desired information. Since the format of the file is rather simple, the access routines will most likely be straightforward. In the absence of any special reporting programs, it might be desirable each time the file is updated to include as part of the edit report a formatted dump of each chemical.

## 8.0 PRELIMINARY PUBLICATIONS SPECIFICATIONS

This is a highly structured manual; the publication specifications are, therefore, fairly detailed.

### 8.1 ORGANIZATION

The content of Manual No. 2 has been specified earlier in this report. Manual No. 2 will be organized by titled major sections and subsections bearing arabic decimal classifications as follows:

1.0 UPDATE CONTROL
2.0 TABLE OF CONTENTS
3.0 PREFACE
4.0 CHRIS MANUALS
5.0 EXPLANATION OF TERMS
6.0 OTHER INFORMATION SYSTEMS
7.0 CONVERSION TABLES
8.0 PROPERTIES OF WATER
9.0 COMPATIBILITY GUIDE
10.0 SOURCE LISTING
- 10.1 General Sources
- 10.2 Chemical Designations
- 10.3 Physical and Chemical Properties
- 10.4 Chemical Reactivity
- 10.5 Flammability
- 10.6 Health Hazards
- 10.7 Water Pollution
- 10.8 Industrial Information
- 10.9 Response Methods
- 10.10 Hazard Classifications

11.0 CHEMICAL-SPECIFIC INFORMATION
- 11.1 Condensed Guide Sheet
- 11.2 Chemical Designations
- 11.3 Observable Characteristics

11.4 Shipping Information

11.5 Physical and Chemical Properties

11.6 Chemical Reactivity

11.7 Flammability

11.8 Health Hazards

11.9 Water Pollution

11.10 Industrial Information

11.11 Response Methods

11.12 Hazard Classifications

12.0 THESAURUS (Synonyms)

13.0 CHEMICAL COMPATIBILITY

The individual sections will be printed on light-colored stock. Section 1.0 will be one color, Sections 2.0-8.0 a second color, Section 9.0 a third color, Section 10.0 a fourth color, Section 11.0 white, and sections 12.0 and 13.0 sixth and seventh colors. Neither index tabs nor an index will be used in Manual No. 2.

Each major section will begin on a separate right-hand (odd numbered) page. Sections 2.0-10.0 will be paginated sequentially, beginning with 1. Section 1.0 will not be paginated. For each chemical in Section 11.0, pages will be numbered sequentially beginning with T-1, T-2, ecc.

Each page at the bottom will bear the month and year of revision or creation if a new chemical is incorporated. If a chemical is intentionally deleted, a page so stating will be inserted in place of the original pages.

All specifications following are based upon an initial version of Manual No. 2 containing 250 hazardous chemicals.

## 8.2 FORMAT AND LAYOUT

### 8.2.1 Method of Preparing Camera-ready Copy

- Sections 1.0-10.0: Composer (cold type)

- Sections 11.0-13.0: Computer-based phototypesetting using the Government Printing Office's Linotron machine; embedded manually-drawn plots.

8.2.2 Overall Physical Appearance

- Page size: 8-1/2 in. x 11 in.
- Paper: Standard grade (70-pound white offset)
- Number of pages: Approximately 2,500
- Type size: Not less than 12-point pica
- Colors: Light-colored or white stock
- Printing: 2-sided print, black ink
- Number of chemicals: 400 initially, increasing to 1,000
- Binding: 3-in. thick, 7-ring, loose-leaf spring binders
- Covers: Vinyl or other durable plastic or cloth, front cover embossed appropriately and bearing copy number
- Number of volumes: 3
- Number of copies: 250 initially

8.2.3 Section 1.0

Section 1.0, Update Control, is a series of unnumbered pages, each giving the date of a particular past revision or update to Manual No. 2 and a summary of all sections and chemicals affected. Each Update Control page is to be signed by Coast Guard personnel and dated at the time the manual is actually updated by inserting new pages and removing and destroying obsolete ones. All Update Control pages should be retained in the manual as a written record of update activity. An example appears in Figure 3.

8.2.4 Sections 2.0-8.0

This will be standard single-spaced typed text, containing graphics only in Section 7.0 (certain properties of water as a function of temperature). All sections will be printed on the same light-colored stock.

Figure 3

CHRIS MANUAL NO. 2

HAZARDOUS CHEMICAL DATA

REVISION 3: December 20, 1973

SECTION 7.0

Replace pages 21-22 and 23-24

SECTION 11.0

Replace ETHYLENE (DATA SHEET 30) pages 1, 3, 5

Insert THYMYLAMINE (DATA SHEET 305) pages 1-6

Replace VINYL CHLORIDE (DATA SHEET 230) pages 1,6

SECTION 12.0

Replace pages T-3, T-4

Manual Updated By_____

Date_____

Dec. 1973

8.2.5 Section 9.0

The Compatibility Guide will be identical to that presently contained in CG 388 and later in CHRIS Manual No. 1. A third light-colored stock will be used.

8.2.6 Section 10.0

Standard single-spaced typed text containing no graphics. A fourth light-colored stock will be used.

8.2.7 Section 11.0

This section contains the bulk (estimated 2,400 pages) of material in Manual No. 2. There will be about six pages per chemical, the first page being identical to that contained in Manual No. 1. To facilitate readability, this section should be printed on white stock (black ink). Chemicals are to appear in alphabetic order based on the full chemical name given in the Code of Federal Regulations. Each page pertaining to the same chemical is numbered sequentially, beginning with 1, and bears the full chemical name and chemical code. Pages contain two-column justified text.

Each chemical may have up to ten physical properties plotted as a function of temperature ($^{o}F$). These plots will be approximately 3 in. x 3 in. and are embedded in the text.

In order to simplify as far as possible the access to desired properties or characteristics for chemicals, it is important that specific categories of information always appear in the same location on the corresponding page for each chemical. For example, molecular weight must always have the same page location on page 1 for all chemicals. This means that some chemicals will have more blank space for certain categories of information (e.g., Health Hazards, Response Methods) than others.

The most appropriate organization of information categories will require further evaluation. Certainly the Condensed Guide Sheet should be the first page. On the second page, Chemical Designations and Observable Characteristics are next in order, followed by certain physical properties aiding identification (e.g., physical state, normal boiling point, specific gravity, aqueous solubility). Health Hazards and Response Methods are also extremely important candidates for early listing.

However, these considerations aside, the organization of Manual No. 2 should facilitate the preparation of a field version limited to the more essential informational data items. Thus, all information in Manual No. 2 for inclusion in the field version should be grouped together in the first few pages of Section 11.0 for each chemical. The major sections to be so included are Chemical Designations, Observable Characteristics, Identifying Physical and Chemical Properties, Chemical Reactivity, Flammability, Health Hazards, and Response Methods.

The text in Section 11.0 is to be produced by a computer-based phototypesetting process. This greatly facilitates the updating of information and preparation of a field version of Manual No. 2, since selected data items can be automatically formatted into alternative versions. This effectively eliminates the need to group common information elements into the first few pages of this section.

8.2.8 Section 12.0

The Thesaurus of chemical synonyms (identical to that in Manual No. 1) will also be produced by a computer-based phototypesetting process. It will be printed on light-colored stock. Opposite each synonym, arranged alphabetically, is the CFR chemical name and code. The Thesaurus should have six colums per page, as indicated below:

| Synonym | Chemical Name | Chemical Code | Synonym | Chemical Name | Chemical Code |
|---|---|---|---|---|---|

Two blank lines should separate groups of synonyms with different initial characters.

## 9.0 REFERENCES


1. "Evaluation of the Hazard of Bulk Water Transportation of Industrial Chemicals, a Tentative Guide," Committee on Hazardous Materials, Advisory to the U. S. Coast Guard, Contract Tcg-15559-A, National Academy of Sciences, Washington, D.C., 1970.

2. "Chemical Data Guide for Bulk Shipment by Water," CG-388, U. S. Coast Guard, Department of Transportation, 1969.

3. "Metric Practice Guide," ASTM Publication E380, 1970.

4. "Identification of the Fire Hazards of Materials," NFPA No. 704M National Fire Protection Association, Boston, Mass., 1966.

5. "A Manual of Transportation Emergency Guides," Manufacturing Chemists Association, Washington, D. C., November, 1968.

Security Classification

**DOCUMENT CONTROL DATA - R & D**

*(Security classification of title, body of abstract and indexing annotation must be entered when the overall report is classified)*

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|---|---|
| 1 ORIGINATING ACTIVITY (Corporate author)<br>Arthur D. Little, Inc.<br>Acorn Park<br>Cambridge, Massachusetts 02140 | 2a REPORT SECURITY CLASSIFICATION<br>Unclassified<br>2b GROUP |

3 REPORT TITLE

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4 DESCRIPTIVE NOTES (Type of report and inclusive dates)

Final Report for Period November 1970 - May 1972

5 AUTHOR(S) (First name, middle initial, last name)

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10 DISTRIBUTION STATEMENT

Availability is unlimited. Document may be released to the Clearinghouse for Federal Scientific and Technical Information, Springfield, Virginia 22151 for sale to the public

| | |
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| 11 SUPPLEMENTARY NOTES | 12 SPONSORING MILITARY ACTIVITY<br>Department of Transportation<br>United States Coast Guard<br>Washington, D. C. 20590 |

13 ABSTRACT

This Appendix to the Final Report on the Preliminary System Development of a Chemical Hazard Response Information System (CHRIS) contains the preliminary design of Manual Number 2, Hazardous Chemical Data. A description of and preliminary specifications for the manual are included. The manual will contain chemical-specific information in sufficient detail to assist trained field personnel and hazardous chemical specialists in monitoring, guiding and managing responses to accidental releases of hazardous chemicals into the water. The manual will consist of a compilation of chemical data sheets. Each set of data sheets will be devoted to a specific chemical and will contain physical and chemical properties; flammability, health, and pollution hazards; industrial information; and response information applicable to that chemical.

This manual is one of five CHRIS manuals.

DD FORM 1473

66

Security Classification

| 14 KEY WORDS | LINK A | | LINK B | | LINK C | |
|---|---|---|---|---|---|---|
| | ROLE | WT | ROLE | WT | ROLE | WT |
| Chemical hazards | | | | | | |
| Chemical properties | | | | | | |
| Chemical spills | | | | | | |
| Water pollution | | | | | | |
| Safety manual | | | | | | |
| Information system | | | | | | |

Chris Manual No 3

## PREFACE

This Appendix contains the preliminary design of one of the five CHRIS manuals that have been designed to meet the needs of personnel who respond to emergencies involving the accidental release of hazardous chemicals into the water. An explanation of the design of this manual as well as Preliminary Specifications are contained in this Appendix.

This manual consists of a series of regional data bases each containing such data as the location and vulnerability of life and property that may be threatened by chemical spills and inventories of available equipment for responding to emergencies. Information in these data bases will be used as input to Manual No. 3 in assessing the threat imposed by an accidental spill and in Manual No. 4 in the selection and interpretation of methods of responding to chemical incidents.

The other four CHRIS manuals are described in the following appendices of the final report.

- Appendix I - CHRIS Manual No. 1, A Condensed Guide To Chemical Hazards
- Appendix II - CHRIS Manual No. 2, Hazardous Chemical Data
- Appendix IV - CHRIS Manual No. 4, Hazard Assessment Handbook
- Appendix V - CHRIS Manual No. 5, Response Methods Handbook

The principal author of this Appendix was M. F. Stankard. Other contributions included G. H. Harris, S. Fineman and D. S. Allan.

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## Table of Contents

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## List of Tables

## 1.0 SUMMARY

The Regional Contingency Plan Data Base is to contain regional-specific information that is necessary to assist the local On-Scene Coordinator in responding to accidental releases of hazardous chemicals. A separate manual, or data base, will be prepared for each (sub) region. Each data base will provide emergency response personnel with necessary local information on vulnerable property and lifeforms, potential pollution sources, response resources and appropriate environmental factors.

These data bases will contain the same type of information that currently exists in the Subregional Appendices of the Regional Contingency Plans. They will, however, by conforming to more detailed specifications and a standard format be more uniform and complete. The development of the manuals (or data bases) will also be accompanied by improved procedures for acquiring and validating the data and for their updating and control. Standardized data content and presentation will also ensure that the data requirements of Manuals Nos. 4 and 5 for the assessment of the threat and the selection and application of the appropriate response procedures will be adequately met.

The individual data bases will be prepared as separately bound volumes that may serve either as independent information sources or as components (or attachments) of the appropriate Regional Contingency Plans.

## 2.0 CONCLUSIONS AND RECOMMENDATIONS

- The content and presentation of regional-specific information as reported in existing Regional Contingency Plans is often inconsistent and incomplete and highly variable from region to region.
- The preliminary specifications for this manual, Regional Contingency Plan Data Bases, provide an improved approach to the development of a stable and sufficiently complete source of local or regional information necessary for adequate response to chemical spills.
- It is recommended that the Coast Guard proceed with the development of the data bases as outlined in the preliminary specifications for this manual. Consideration should be given to the following:
  - A pilot model of a (sub) Regional Contingency Plan Data Base for a representative (sub) region should first be created so that procedures and plans for the formulation of data bases for all (sub) regions can be developed and refined.
  - In the formulation of the pilot model, criteria should be established for setting priorities on data requirements and for the level of detail and accuracy that will be appropriate. Data acquisition procedures should be refined and the level of effort and personnel qualifications that will be required to compile all (sub) regional plans should be established.
  - After the pilot model data base has been completed and plans and procedures documented, Regional Contingency Plan Data Bases for all (sub) regions should be developed.

- Coast Guard field personnel responsible for the control and/or use of the data bases should participate in the development of the data bases for both the pilot model and all (sub) regions to ensure that there will be sufficient local knowledge to maintain and update adequately the data bases in the future.

- During the development of the (sub) Regional Contingency Plan Data Bases methods of updating them should be reviewed and refined; procedures for conducting periodic surveys of their effectiveness should be developed; and specifications for their form and content should be revised.

## 3.0 INTRODUCTION

The primary purpose of the Regional Contingency Plan (RCP) Data Base is to provide information that is specific to the region to assist the local On-Scene Coordinator in his assessment of and response to emergencies involving the accidental release of a hazardous chemical. It is intended to provide stable documentation of local (or regional) knowledge in a standard format and, since it applies to local information, the specific content of the data base will vary from one region (or subregion) to another.

The manual will contain such information as identification of vulnerable resources that may be threatened, physical and manpower resources that are potentially available and certain environmental factors that may influence both the threat and the response to it. This information will be used in the second response mode when there is sufficient time to utilize more detailed data than that presented in the Condensed Guide to Chemical Hazards, Manual No. 1. Manual No. 3 will be used in the decision processes leading to direct response to the accident, as input to Manual No. 4 in assessing the threat, and in using Manual No. 5 in the selection and evaluation of potential methods of response.

With a few exceptions, such as data on local water quality and topographic and environmental features, the content of the RCP Data Base is already included, to varying degrees, in the Subregional Appendices of the Regional Contingency Plans. Since the Regional Contingency Plans vary widely from region to region in their levels of detail and methods of presentation, we recommend a standardized format and content which will be a necessary component of CHRIS but which may also be incorporated into existing RCP's.

The recommended detailed content of this manual is presented in the Preliminary Specifications, Section III. It is based on a comprehensive review of existing contingency plans, on the data required to supplement other manuals in the CHRIS system and on our evaluation of users' needs.

As with other manuals, some modification and revision of the content and its organization will occur during the time that data bases for different regions are completed, since the compilation phase will introduce certain practical limitations that may be difficult to anticipate. For this reason, we recommend that a pilot data base be established first for a selected region. It will provide the basis for refining the organization and detail of the manual so that the data bases for other regions can then be carried out in a straightforward and consistent manner.

## 4.0 CONTENT DESCRIPTION

### 4.1 INTRODUCTORY MATERIAL

The introductory material in the manual will provide general guidance for its use during an emergency, including a description of the role it serves in the employment of the Hazard Assessment and Response Methods Handbooks (Manuals No. 4 and 5). Content and terminology will be explained and measures of the accuracy and adequacy of the data will be given.

### 4.2 DATA BASES

#### 4.2.1 Vulnerable Resources

The Regional Contingency Plans have covered some aspects of the Vulnerable Resources content area under a variety of headings, especially "Critical Water Use." As we have defined Vulnerable Resources, they include all publicly and privately-owned resources and facilities that could be threatened by a chemical hazard incident.

Specific information on the location and distribution of the human population that might be threatened and related data on services and methods for notification and protection of life are particularly critical. Similar information on commercial, industrial, and governmental operations and facilities is included, with particular emphasis on the location and vulnerability of water intakes. The characterization of marine life and wildlife in terms of species, population, vulnerability and location presents considerable difficulty in achieving an adequate basis for assessing the threat presented by a hazardous chemical spill, since specific information concerning endangered species is in general very limited. Nevertheless, appropriate data that are available will be entered into the manual in conformance with a standard format. Conservation and recreation areas will also be treated in this section of the manual.

#### 4.2.2 Emergency Task Forces and Cooperating Agencies

One of the most important files within the CHRIS RCP Data Base will

contain information on cooperating agencies. At present, the most common method of presenting this within the Regional Contingency Plans is to list the various cooperating agencies and to briefly describe each in narrative form. The CHRIS data definitions under cooperating agencies and response/strike forces will be more detailed than in the Regional Contingency Plans.

Contractors that are available to contain and clean up spills, mutual aid groups, port task forces and the national strike force will be listed along with federal, state, local and institutional cooperating agencies. Local experts who can provide information and guidance during an emergency will be also included.

4.2.3 Potential Pollution Sources

Generally, potential pollution sources are listed in the Regional Contingency Plans by town or responsible company. In some instances, the list is accompanied by a chart or a map to assist in locating the potential pollution sources within a locale.

The categories of potential pollution sources specified for this manual include dock-side facilities (water-side docks, warehouses and storage tanks), offshore facilities, disposal sites, and industrial plants and pipelines.

4.2.4 Physical Resources Inventory

The Regional Contingency Plans also contain subregional sections on physical resource inventories. Most frequently these important inventories consist of lists of resources, and occasionally the location of the resource. Most of this information pertains to resources useful in the event of an oil spill. The information already gathered into the Regional Contingency Plans will serve as a major source of information for CHRIS.

Physical resources include the full range of material and equipment that is available and necessary for monitoring the spill, communicating information on the course of the spill, personal protective equipment, amelioration and salvage supplies and equipment, and transportation and disposal areas.

### 4.2.5 Water Quality Base Lines

Water quality base lines (i.e., seasonal water quality norms for bodies that may be threatened in each region) can in theory provide the necessary basis for detecting the presence of low concentrations of pollutants that have been accidentally released into the water. At times this may be an important base from which to assess whether the release of a hazardous chemical presents a significant threat.

The Regional Contingency Plans do not now contain any information on water quality base lines. A number of federal, state and local agencies are concerned with measuring water quality and with enforcing laws pertaining to water quality. The Coast Guard must be aware of both the required specific water quality limits and the normal levels of water quality in order to determine accurately the effects of spills. Knowledge of these base lines is very limited at present, but we expect that such information will increase with the growing effort to improve water quality in most waterways. The potential quantity of information is enormous; however, their practical application remains to be demonstrated.

### 4.2.6 Observation and Surveillance

The CHRIS file on observational forces includes information on surveillance forces and capabilities.

Generally, the Regional Contingency Plans omit formal consideration of observational forces, although in a few instances a surveillance alert network or a list of surveillance sources has been provided within a subregional contingency plan. It is important to recognize both trained and casual observational forces within the CHRIS RCP Data Base. Most of the trained observation forces are government personnel--either military, police and firefighting or similar personnel. Certain industrial personnel--particularly industrial waste treatment specialists--will also be included as trained observation forces.

### 4.2.7 Topographic, Marine and Related Environmental Features

These data include charts, lists and tabulated information relating to waterways and other bodies of water which may influence the dispersion

or spread of the pollutant relative to vulnerable resources. The characterization of the water flow and movement (tides, run-off, stream velocities, volumetric rates) are important inputs to estimation of the advection and diffusion of chemicals in the water. The boundaries of the waterway, estuary or shore provide limits to the movement of the chemical, and known seasonal and mean values of weather conditions can also be used along with real-time data from the Weather Bureau in applying hazard assessment techniques.

## 4.2 PRELIMINARY CONSIDERATIONS ON DATA ACQUISITION AND COMPILATION

The RCP Data Base is to be an integral part of the respective Regional Contingency Plan. The format of these plans needs to be revised as recommended to eliminate repetitive and certain administrative information not of immediate use in hazardous chemical emergencies. Standardization of data presentation in the plans is of paramount concern.

Within the regions and subregions, information in the RCP Data Base will be organized along state lines to facilitate Coast Guard coordination and planning with state agencies. (We understand that this is presently being implemented by the Coast Guard.) This is particularly important insofar as itemizing available physical and human resources. We do not believe it is necessary, however, to create a separate data base organized solely according to state.

There are time and effort limitations that must be imposed in creating and maintaining the RCP Data Base. The total amount of data that could be assembled in detail is so great that an attempt to gather all data specified would overwhelm the personnel responsible for CHRIS at the field level. Therefore, each jurisdiction must set intelligent priorities so that the effort expended results in the type of information that an On-Scene Commander can effectively use to cope with at least the most critical incidents.

We strongly recommend that the District Commander, with guidance from the CHRIS Organization, review and approve the level of detail to be used in each content area. The facts will differ from one geographic area to another, and the significance of data elements in making an effective

response in the event of a chemical hazard incident varies accordingly. The allocation of data gathering and file maintenance effort within CHRIS must be tailored to each jurisdiction's specific needs by personnel most familiar with conditions within each locale.

The level of data detail must be flexible. While this document is a specification for the HCP Data Base, it is not intended to force or to unreasonably restrict local data-gathering efforts. We recommend that the minimum requirement for level of detail be established in the process of developing a pilot data base for a selected region. The pilot model will provide examples of the minimum requirements, as well as give indications of the level of detail that field personnel may achieve on their own initiative.

When identified, limitations on available knowledge must be recorded, especially in the area of vulnerable resources, such as wildlife. Concern for the safety of local wildlife is quite recent, and there frequently almost total ignorance of the seasonal habits, food chains, life cycles and behavior of species of wildlife. Often, local and state game and wildlife officials are the only available sources. Major gaps in expertise or knowledge should be clearly identified and not camouflaged, otherwise it will be impossible to assign subsequent data-gathering priorities to the content areas where the needs are greatest.

Sources of HCP data will have to be developed for each region and district. The best starting points for seeking out such sources will usually be the following:

Local, State and Federal Water Quality, Public Safety, and Public Works Authorities

Local or Regional Bridge and Port Authorities

Local and State Departments of Sanitation and Health

Industrial Plants, Public Utilities and Industry Associations

Local Wildlife and Environmental Groups

University and Research-related Experts

Municipal and State Police and Firefighting Agencies

Contacts with each of these sources are likely to produce lists of other suggested secondary persons, agencies or sources to contact. Each of these secondary sources should again be asked to provide references to other sources that may exist. This method is the only means available in most of the regions because there is no currently available central source of data. Once all sources have provided their data contributions, and these have been organized into the RCP Data Base, it will be possible to determine where gaps in knowledge exist. Special surveys or other primary data gathering by Coast Guard personnel or by outside contractors will be needed to fill in these gaps in knowledge for high priority content areas.

The predesignated On-Scene Coordinator in each area will maintain custody of and be responsible for the RCP Data Base. The district office should have copies of all data bases for subregions within its jurisdiction. Although most of the information in the data base will be gathered and maintained by the OSC, it may be more cost-effective to assemble data in some content areas (such as wildlife) centrally. The centrally gathered data by the CHRIS Organization would then be selectively issued for insertion into relevant data bases.

Since the information to be assembled into the RCP Data Base may pertain to any response phase, the content is organized by subject matter rather than by the sequence of decisions or actions to be taken. The content will anticipate the possibly urgent nature of the user's needs and be presented in short, simple and complete form with a minimum of excess wording. The data base will clearly state when needed facts, relevant to a given jurisdiction, are not known, and appropriate provisions should be made for obtaining the missing data as resources and priorities allow.

Since this data base is organized by content area, and since important information may not fit neatly into one and only one content area, cross-referencing to other sections of the data base may be required. Content in one area may be relevant to another area either because it pertains to the same geographic point or because of some logical relationship. Repeating such information in every content area where relevant would introduce

excessive redundancy and the file would become unwieldy. On the other hand, the data base could become too difficult to use if each data base element appeared only once. Cross-references in instances where content repetition is unnecessary will avoid either extreme.

For effective response to chemical hazard incidents, some types of quantitative data may have to be estimated to a stated level of accuracy. When estimates are made, say of population sizes or of the economic or social importance of a vulnerable resource, the basis for the estimate should be summarized. An On-Scene Coordinator must know when he is dealing with estimates and be given some indication of their accuracy. Estimates generally should be avoided unless it is impossible to obtain accurate measurements, since there is real danger that superficial estimates may be used in place of hard data. In certain cases, it may be possible to state minimum, normal, and maximum value for some quantity such as the total quantity of boom at any time within a jurisdiction.

## 5.0 PRELIMINARY SPECIFICATIONS

The preliminary specifications for the content of this manual are intended to outline and standardize the data items which are specific to the region and are necessary for the full employment of CHRIS. At this stage, concise definitions for each of the data items have not been inserted in the specifications; however, the names or titles used should convey a basic understanding of the intended content. Clear and concise definitions or criteria for each data item should however be established and documented in the early stages of the manual development.

### CONTENT

### 5.1 PREFACE

Cite purpose and scope of the manual, authorization and Coast Guard component(s) responsible for the content and distribution. Describe the relationship between this manual and CHRIS and to the National and Regional Contingency Plans.

### 5.2 TABLE OF CONTENTS

Cite the following:

Subject — PAGE

CHRIS Manuals
Explanation of Content
Data Bases
- Vulnerable Sources
- Emergency Task Forces and Cooperating Agencies
- Potential Pollution Sources
- Physical Resources Inventory
- Water Quality Base Lines
- Observation and Surveillance
- Marine and Related Environmental Features

### 5.3 CHRIS MANUALS

List each of the CHRIS manuals and describe their content, intended

use, and relationship with this manual.

## 5.4 EXPLANATION OF CONTENT

Define and explain all terms where there may be ambiguity, misunderstanding or where misinterpretation may be critical to hazard assessment and/or response. Indicate limitations in the use of the data and uncertainties in quantitative values. Note where data is derived by estimates rather than by detailed survey.

## 5.5 DATA BANKS

The data items in each content area are specified and organized according to a numerical method of denoting classes and subclasses of the data, and are presented in the following exhibit:

### Exhibit A - Data Base Items

1.0 - Vulnerable Resources

1.1 Cities, Towns or Population Concentration (if vulnerable)

- 1.1.1 Name
- 1.1.2 Location--boundaries on bodies of water
- 1.1.3 Number of People
- 1.1.4 Available Methods for Alerting People
- 1.1.5 Persons Responsible for Public Safety
  - 1.1.5.1 Name
  - .2 Telephone number--day
  - .3 Telephone number--night
  - .4 Address
  - .5 Designated alternate (cross reference)
- 1.1.6 Evacuation Preparedness
- 1.1.7 Nature of Vulnerability
- 1.1.8 Other

1.2 Commercial Operations and Facilities (if vulnerable)

- 1.2.1 Name
- 1.2.2 Location--on body of water
- 1.2.3 Estimated Size of Operation
  - 1.2.3.1 Number of employees--estimated

.2 Daily volume of production--estimated

1.2.4 Nature of Vulnerability

1.2.5 Type of Operation, e.g., chemical manufacturer, fishing fleet

1.2.6 Persons Responsible for

1.2.6.1 Names

.2 Telephone number--day

.3 Telephone number--night

.4 Address

.5 Designated alternate (cross reference)

1.2.7 Other Hazards in this Facility

1.2.7.1 Nature of potential hazard

.2 Size of potential hazard (major/minor)

1.2.8 Other

1.3 Water Intakes

1.3.1 Location

1.3.2 Size (c.f.m. or gal./hr.)

1.3.3 Use of Water

1.3.4 Communities Served

1.3.5 Persons Responsible for

1.3.5.1 Name

.2 Telephone number--day

.3 Telephone number--night

.4 Address

.5 Designated alternate

.6 Other

1.3.6 Nature of Vulnerability

1.3.7 Other

1.4 Other Population-Related Vulnerable Resources

1.5 Marine-life

1.5.1 Shellfish Species

1.5.1.1 Name

.2 Description

.3 Approximate location and size of beds

.4 Seasonal habits

.5 Major known threats

1.5.1.5.1 How can this species be protected from this threat?

.2 Other

.6 Groups interested in this species address and telephone number

.7 Economic value

.8 Other

1.5.2 Fin Fish

1.5.2.1 Name

.2 Description

.3 Approximate location

.4 Seasonal habits

.5 Major known threats

1.5.2.5.1 How can this fish be protected from this threat?

.2 Other

.6 Groups interested in this fish, address and telephone number

.7 Economic value

.8 Other

1.6 Wildlife

1.6.1 Endangered Species

1.6.1.1 Name

.2 Description

.3 Appropriate location

.4 Location of nesting or feeding grounds

.5 Seasonal habits

.6 Major known threats

1.6.3.6.1 How can this species be protected from this threat?

.2 Other

.7 Groups interested in this species, address and telephone number

.8 Other

1.6.2 Water Fowl

1.6.2.1 Name

.2 Description

.3 Seasonal Habits

.4 Locations of nesting or feeding grounds

.5 Major known threats

1.5.4.5.1 How can this fowl be protected from this threat?

.2 Other

.6 Groups interested in this species, address and telephone number

.7 Economic value

.8 Other

1.6.3 Other Wildlife (e.g., Sea Mammals)

1.6.3.1 Name

.2 Description

.3 Seasonal Habits

.4 Location of feeding or breeding grounds

.5 Major known threats

1.6.5.5.1 Means of protection

.2 Other

.6 Groups interested in this species, address and telephone number

.7 Economic value

.8 Other

1.7 Marine and Wildlife Experts

1.7.1.1 Name

.2 Telephone number--day

.3 Telephone number--night

.4 Address

.5 Area of expertise

.6 Other

1.8 Vulnerable Attractive or Popular Natural Features

1.8.1 Shorefront recreational areas and beaches

1.8.1.1 Name

.2 Location and access routes

.3 Size

.4 Persons responsible

1.6.1.4.1 Name and title

.2 Telephone numbers

.3 Address

.5 Other

1.8.2 Natural or Wilderness Areas--State and Local

1.8.2.1 Name

.2 Location and access routes

.3 Size

.4 Persons responsible

1.6.2.4.1 Name and title

.2 Telephone numbers

.3 Address

.4 Other

1.8.3 National Parks and Federal Wildlife Preserves

1.8.3.1 Name

.2 Location and access routes

.3 Size

.4 Persons responsible

1.6.3.4.1 Name and title

.2 Telephone numbers

.3 Address

.4 Other

1.8.4 Pleasure Boating and Small Craft

1.8.4.1 Name of water area

.2 Location

.3 Other

Exhibit A Con'd.

2.0 Emergency Task Forces and Cooperating Agencies

2.1 Clean-up Contractors

2.1.1 Name

2.1.2 Location

2.1.3 Address

2.1.4 Person to be Contacted to Mobilize

2.1.4.1 Name and title

.2 Telephone number, day and night

.3 Other

2.1.5 Types of Skills and Clean-up Capabilities

2.1.5.1 Restrictions and limitations

.2 Previous chemical hazard experience

.3 Other

2.2 Cooperating Agencies

2.2.1 Federal Agencies

2.2.1.1 Nature of agencies' cooperation

2.2.1.1.1 Phase of response, where relevant

.2 Capabilities and jurisdiction

2.2.1.2 Persons to be contacted to mobilize agency cooperation

2.2.1.2.1 Names

.2 Title and position in agency

.3 Telephone numbers--day and night

.4 Address

.5 Other

2.2.2 State and Local Agencies

2.2.2.1 Nature of agencies' cooperation

2.2.2.1.1 Phase of response, where relevant

.2 Capabilities and jurisdiction

2.2.2.2 Persons to be contacted to mobilize agency cooperation

2.2.2.2.1 Names

.2 Title and position in agency

.3 Telephone numbers--day and night

.4 Address

.5 Other

2.2.3 Academic Institutions

2.2.3.1 Nature of cooperation

2.2.3.1.1 Phase of response, where relevant

.2 Capabilities

2.2.3.2 Persons to be contacted to mobilize agency cooperation

2.2.3.2.1 Names

.2 Title and position in institution

.3 Telephone numbers--day and night

.4 Address

.5 Other

2.2.4 Laboratories

2.2.4.1 Nature of cooperation

2.2.4.1.1 Phase or response, where relevant

.2 Capabilities

2.2.4.2 Persons to be contacted to mobilize agency cooperation

2.2.4.2.1 Names

.2 Title and position in laboratory

.3 Telephone numbers--day and night

.4 Address

.5 Other

2.3 Mutual Aid Groups

2.3.1 Industrial Resource Pools

2.3.1.1 Nature of Cooperation

2.3.1.1.1 Phase of response, where relevant

.2 Capabilities

2.3.1.2 Persons to be contacted

2.3.1.2.1 Names

.2 Title and position

.3 Telephone numbers--day and night

.4 Address

.5 Other

2.3.2 Individual Companies

2.3.2.1 Nature of Cooperation

2.3.2.1.1 Phase of response, where relevant

.2 Capabilities

2.3.2.2 Persons to be contacted

2.3.2.2.1 Names

.2 Title and position

.3 Telephone numbers--day and night

.4 Address

.5 Other

2.4 Emergency Port Task Forces/National Strike Force

2.4.1 Nature of Capability and Previous Training or Experience

2.4.1.1 Response phase, where most relevant

.2 Limitations on capability

.3 Other

2.4.2 Authorizations required

2.4.3 Persons to be contacted

2.4.3.1 Names

.2 Rank and title

.3 Telephone numbers--day and night

.4 Address

.5 Other

2.5 Human Resources--not included above

2.5.1 Volunteer Groups

2.5.1.1 Nature of Cooperation

.2 Response phase, where relevant

.3 Persons to be contacted

2.5.1.3.1 Names

.2 Telephone numbers--day and night

.3 Address

.4 Other

2.5.2 Other Experts, Contractors and Government Officials

2.5.2.1 Nature of Cooperation

.2 Response phase, where relevant

.3 Person to be contacted

Exhibit A Con'd.

2.5.2.3.1 Name (title)

.2 Telephone number--day and night

.3 Address

.4 Other

Exhibit A Con'd.

3.0 - Potential Pollution Sources

3.1 Dock-side Pollution Sources

3.1.1 Water side Docks, Warehouses and Storage Tanks

3.1.1.1 Location

.2 Nature of Hazard for this potential source

3.1.1.2.1 Type of Pollutant(s)

.2 Vulnerable resources threatened

.3 Size and possible severity of potential hazard

.4 Other

.3 Access routes to site

.4 Person responsible

3.1.1.4.1 Name

.2 Telephone number--day and night

.3 Title

.4 Address

.5 Other

3.1.2 Offshore Facilities and Pipelines

3.1.2.1 Location

.2 Nature of potential hazard

3.1.2.2.1 Type of pollutants

.2 Vulnerable resources threatened

.3 Size and severity of potential hazard

.4 Shipping traffic threatened

.3 Persons responsible for

3.1.2.3.1 Name

.2 Telephone number--day and night

.3 Title

.4 Address

.5 other

3.1.3 Disposal Sites and Sewage Treatment Plants

3.1.3.1 Location

.2 Nature of potential hazard

Exhibit A Con'd.

3.1.3.2.1 Type of pollutants

.2 Vulnerable resources threatened

.3 Size and severity of potential hazard

.3 Persons responsible

3.1.3.3.1 Name

.2 Telephone number--day and night

.3 Title

.4 Address

.5 Other

.4 Other

3.1.4 Industrial Plants, Pipelines, Rail Bridges

3.1.4.1 Location

.2 Nature of potential hazard

3.1.4.2.1 Type of pollutants

.2 Vulnerable resources threatened

.3 Size and severity of potential hazard

.4 Address

.5 Other

.3 Person responsible for

3.1.4.3.1 Name

.2 Telephone number--day and night

.3 Title

.4 Address

.5 Other

Exhibit A Con'd.

## 4.0 - Physical Resources Inventory

### 4.1 Detection and Monitoring Equipment

4.1.1 Name of Equipment

4.1.2 Functional Description of equipment

4.1.2.1 Properties detected

.2 Other use in chemical hazard response

4.1.3 Limitations on use of equipment

4.1.3.1 Special power or other support requirements

.2 Special personnel requirements

.3 Other

4.1.4 Where available

4.1.4.1 Name

.2 Person to contact

.3 Telephone number--day and night

.4 Address

4.1.5 Commitments for use of equipment, if any

4.1.5.1 How many units

.2 How quickly available

4.1.6 Conditions on use of equipment

4.1.6.1 Financial

.2 Logistical

4.1.7 Background on use and effectiveness of this equipment

4.1.7.1 Field operating experience

### 4.2 Communications Equipment

4.2.1 Fixed Site Equipment, e.g., radio transmitters, TTY, telephone (see 4.2.2.1)

4.2.2 Mobile Communication Equipment - Ship-to-Shore Radio, Citizens' Band equipment, Other radio equipment

4.2.2.1 Limitations on use of equipment

4.2.2.1.1 Frequencies

.2 Range (line of sight, etc.)

.3 Other

4.2.2.2 Where available

4.2.2.2.1 Name

.2 Person to contact

.3 Telephone number--day and night

.4 Address

.5 Other

4.2.2.3 Commitments for use of equipment, if any

4.2.2.4 Conditions on use of equipment

4.2.2.4.1 Financial - funding needed

.2 Logistical - portability

.3 Special power supply needs

.4 Other

## 4.3 Personnel and Special Protective Devices

4.3.1 Type of hazard or condition used on

4.3.1.1 Name of device

.2 Limitations on use of equipment

.3 Effectiveness of equipment

.4 Where available

4.3.1.4.1 Name

.2 Person to contact

.3 Telephone numbers--day and night

.4 Address

.5 Other

4.3.1.5 Commitments for use of equipment or devices

4.3.1.5.1 Name of supplier

.2 Description of commitment

.3 Funding or other conditions underlying commitment

.4 Limitations on use of equipment

4.3.1.6 Special skills on training needed for use

Exhibit A Con'd.

4.4 Transportation Equipment

4.4.1 Personnel Transport

4.4.1.1 Name of resource

.2 Limitations on use

.3 Capacity

.4 Where available

4.4.1.4.1 Name

.2 Person to contact

.3 Telephone number--day and night

.4 Address

.5 Commitments for use

4.4.1.4.5.1 Name of supplier

.2 Describe commitment

.3 Funding or other conditions underlying commitment

.4 Limitations on use of equipment

4.4.1.5 Special skills or training needed (e.g., special driver training or operating instructions)

4.4.2 Equipment Transportation

4.4.2.1 Type of equipment

.2 Limitations on use: maximum carrying capacity

.3 Effectiveness

4.4.2.3.1 Experience in use

.4 Where available

4.4.2.4.1 Name

.2 Person to contact

.3 Telephone numbers

.4 Address

.5 Commitments for use

Exhibit A Con'd.

4.4.2.4.5.1 Name of supplier

.2 Describe commitment

.3 Funding or other conditions underlying commitment.

.4 Limitations on use of equipment or resources committed

.5 Special skills or training needed

4.4.3 Hazardous Material Transport

4.4.3.1 Type of hazard or condition where used

4.4.3.1.1 Name of Resource

.2 Limitations on use, e.g. arrangements needed to use at incident site

.3 Effectiveness and carrying capacity experience in use

.4 Where available

4.4.3.1.4.1 Name

.2 Person to contact

.3 Telephone numbers

.4 Address

.5 Commitments for use

.6 Name of supplier

.7 Describe commitment

.8 Funding or other conditions underlying commitment

.9 Limitations on use of equipment or resources committed

.5 Special skills or training needed

4.5 Amelioration Equipment (for each equipment type in Hazard)

4.5.1 Mechanical Containment

4.5.2 Mechanical Recovery

4.5.3 Shoreline Cleanup

4.5.4 Chemical Treatment

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Exhibit A Con'd.

4.5.X.1 (X = 1,2,3,4,) Type of hazard or condition

4.5.4.1 Name of equipment

.2 Limitations on use

.3 Effectiveness, experience in use

.4 Where available

4.5.4.4.1 Name

.2 person to contact

.3 Telephone numbers

.4 Address

.5 Commitments for use

4.5.4.4.5.1 Name of supplier

.2 Describe commitment

.3 Funding or other conditions underlying commitment

.4 Limitations on use of equipment or resources committed

.5 Special skills or training needed

4.5.5 Amelioration Chemicals

4.5.5.1 Absorbent

.2 Sinking Materials

.3 Dispersants

.4 Other

4.5.5.X.1 Type of hazard or condition where used

.1 Name of chemical

.2 Limitations of use

.3 Effectiveness, experience in use

.4 Where available

4.5.5.4.4.1 Name

.2 Person to contact

.3 Telephone numbers

.4 Address

.5 Commitments for use

.6 Name of supplier

.7 Describe commitment (amount available)

.8 Funding or other conditions underlying commitment

.9 Limitations on amount of chemicals committed

.5 Special skills or training needed to use

4.6 Salvage Equipment

4.6.1 Type of hazard or condition where used

4.6.1.1 Name of equipment

.2 Limitations on use and capacity

.3 Where available

4.6.1.3.1 Name

.2 Person to contact

.3 Telephone numbers

.4 Address

.5 Commitments for use

4.6.1.3.5.1 Name of supplier

.2 Describe commitment

.3 Funding or other conditions underlying commitment

.4 Limitations on use of equipment or resources committed

4.6.1.4 Special skills or training needed

4.7 Disposal Site

4.7.1 Name of site

4.7.2 Location and directions for access

4.7.3 Type of materials handled

4.7.4 Restrictions on materials disposed of at this site

4.7.5 Commitments for use

4.7.5.1 Name of person or agency

.2 Describe commitments

Exhibit A Con'd.

.3 Funding or other conditions on commitment

.4 Limitations on use of disposal site (time of day or day of week)

.5 Other

4.7.6 Person to contact - Name

4.7.6.1 Telephone number--day and night

.2 Address

.3 Title

.4 Designated alternate

Exhibit A Con'd.

5.0 Water Quality Base Line

5.1 Beneficial Uses Related to Present Water Quality

5.1.1 Use name and description

5.1.2 Location

5.1.3 Intensity of use

5.1.3.1 Number of people

.2 Frequency of use

5.1.4 Permissible range of each measurement for this use

5.1.4.1 Federal, state and local standards

.2 References to applicable regulations and laws

5.1.5 Persons responsible for controlling water quality in conformance with beneficial uses made

5.1.5.1 References to other CHRIS files pertaining to this file (e.g., vulnerable resources)

5.2 Water Quality Measurements

5.2.1 Physical properties

5.2.1.1 Definition of measurement

.2 Time

.3 Location

.4 Person making observation

.5 Person performing analyses (if any)

.6 Frequency of measurement

.7 Length of comparable history for each type of measurement, by location, etc.

.8 Use currently made of these measurements

.9 Other

5.2.2 Chemical properties

5.2.2.1 Definition of measurement

.2 Time mode

.3 Location

.4 Person making observation

.5 Person performing analyses (if any)

.6 Frequency of measurement

.7 Length of comparable history for this measurement

Exhibit A Con'd.

.8 Use currently made of these measurements

.9 Other

5.2.3 Biological properties

5.2.3.1 Definition of measurement

.2 Time mode

.3 Location

.4 Person making observation

.5 Person performing analyses

.6 Frequency of measurement

.7 Length of comparable history for this measurement

.8 Uses currently made of this measurement

.9 Other

5.3 Authorities and Information Sources

5.3.1 Water quality information type (e.g., chemical, biological measurements, etc.)

5.3.1.1 Name of source

5.3.1.1.1 Telephone numbers--day and night

.2 Address

.3 Description of experience

.2 Other

Exhibit A Con'd.

6.0 Observation and Surveillance

6.1 Fire and Police Authorities

6.1.1 Name

6.1.2 Main purpose of force

6.1.3 Persons in charge

6.1.3.1 Names and titles

.2 Telephone numbers--day and night

.3 Address

.4 Region covered by force

.5 Types of observations that force is trained to make

6.1.3.5.1 Visual observation

.2 Chemical measurement

.3 Biological measurement

.4 Physical measurement

.5 Other

6.1.3.6 Frequency of routine observations

6.1.4 References to other sections of CHRIS Area Data Base

6.2 Coast Guard Surveillance and Security Patrols

6.2.1 Name of unit

6.2.2 Main purpose of force

6.2.3 Persons in command

6.2.3.1 Names and rank

.2 Telephone numbers--day and night

.3 Address

.4 Region covered by unit

.5 Types of observations that unit is trained to make

6.2.3.5.1 Visual

.2 Chemical measurement

.3 Biological measurement

.4 Physical measurement

.5 Other

.6 Frequency of routine observations

6.2.4 References to other sections of CHRIS Area Data Base

Exhibit A Con'd.

6.3 State and Local Water Quality Officials and Agencies

6.3.1 Names

6.3.1.1 Telephone numbers--day and night

.2 Address

.3 Region covered by force

.4 Types of observations that force is trained to make

6.3.1.4.1 Visual

.2 Chemical measurement

.3 Biological measurement

.4 Physical measurement

.5 Other

6.3.2 References to other sections of CHRIS Area Data Base (See especially Water Quality Base Line)

6.3.3 Commitments

6.4 Military, Civil Defence, Corps of Engineers and Airborne Observers

6.4.1 Name of unit

6.4.2 Main purpose of unit

6.4.3 Persons in charge

6.4.3.1 Names

.2 Telephone numbers--day and night

.3 Address

.4 Region covered by unit

.5 Types of observations that unit is trained to make

6.4.3.5.1 Visual

.2 Chemical measurement

.3 Biological measurement

.4 Physical measurement

.5 Other

.6 Frequency of routine observations

6.4.4 References to other sections of CHRIS Area Data Base

6.4.5 Commitments

6.5 Industrial Observers

6.5.1 Name of firm

6.5.2 Persons in charge

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6.5.2.1 Names

.2 Telephone numbers--day and night

.3 Address

.4 Region covered by force

.5 Types of observations that force is trained to make

6.5.2.5.1 Visual

.2 Chemical measurement

.3 Biological measurement

.4 Physical measurement

.5 Other

6.5.2.6 Frequency of routine observations

6.5.3 References to other sections of CHRIS Area Data Base

6.5.4 Commitments

6.6 Customs Officials

6.7 Casual Observers

6.7.1 Person first observing or causing incident

6.7.2 Fisherman

6.7.3 Small boat operators

6.7.4 Bridge tenders

6.7.5 Lock operators

6.7.6 Citizens' groups

6.7.7 Traffic helicopters

6.7.8 Others