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#### HAZARDOUS MATERIALS DATABASE

Veena Vadiala

Thesis submitted to the College of Engineering and Mineral Resources at

West Virginia University

in partial fulfillment of the requirements for the degree of

**Masters of Science** 

in

**Industrial Engineering** 

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2000

Keywords: hazardous materials, database, Visual Basic, dismantling

## ABSTRACT HAZARDOUS MATERIALS DATABASE

#### Veena Vadiala

Handling and disposal of a retired object can be a major component of its Life Cycle Cost. Often, during dismantling of a retired object many hazardous materials are released. Disposal of hazardous materials also need to comply with various federal regulations. Agencies like Occupational Safety and Health Administration (OSHA) and the Environmental Protection Agency (EPA) set these safety regulations. It is possible to apply generic exposure and release controls to protect workers from hazardous materials. For the most cost effective hazard controls it is necessary first to identify the materials and their properties of primary concern. There is a need to have an integrated database for properties of Hazardous Materials.

This project developed a database for properties of hazardous materials. The database was implemented in Microsoft Access. Thirty-four chemicals and their categories were identified. These chemicals are encountered during dismantling of a retired object. The database currently contains 60 main fields, which also contain subfields. Information such as its physical properties, chemical properties, health hazards, releases from demolition or various other industrial processes and references to safety, health and environmental regulations can be obtained from this database. A decision support system was developed as a front end to Access. The decision support system was implemented in Visual Basic.

In the future, this database can be expanded to include non-hazardous materials. The database capabilities were demonstrated on the hazardous materials occurring in the ship dismantling industry. It is expected that the database will save significant time and cost in data retrieval. Information retrieval from the database is through an intuitive graphical interface, and suitable for use by a non-computer person.

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## **CHAPTER 1: INTRODUCTION**

Development of the database structure described in this work was originally motivated by the need for an easily used compendium of the properties of materials encountered in dismantling and recycling or disposal of components of retired marine vessels, here called 'ships'. However, the broader need was recognized to create a database structure which could be useful for many activities, including those where materials encountered could harm people or the environment.

This database structure was developed for use in the United States (US), so it contains referrals to applicable US regulations. However, in principle, similar references to the requirement of other jurisdictions could easily be incorporated in the future.

#### **1.1 DATABASES AND DECISION SUPPORT SYSTEMS**

It is only in recent years that the profound impact of the ongoing explosion of useful information on organizations and individuals has been widely appreciated. Previously, people considered tangible assets whose value could be appraised with reasonable precision [1]. The value of information is harder to define, but nonetheless it can be enormously important. Computers process data to derive and arrange information, and data is often stored in large databases. Complex software called database systems or database management systems have been developed to allow convenient storage and retrieval of data to provide useful information. Until a few years ago, database systems were used almost exclusively in large organizations on mainframes. Today, many people interact with database systems on microcomputers for personal and business applications.

Decision Support Systems (DSS) are computer-based systems that help decision-makers confront ill-structured problems through direct interaction with data and analysis models [3]. In late 1960s and early 1970s, the first DSS began to appear. They were the result of a number of factors such as:

- Emerging computer hardware and software technology
- Research efforts at leading universities

- A growing awareness of how to support decision making
- A desire for better information
- An increasingly turbulent economic environment and
- Stronger competition pressures.

The principal tenets of a Decision Support System are [2]:

- These systems can be designed specifically to facilitate the decision making processes
- These systems support rather than automate decision making, and
- These systems are able to respond quickly to the changing needs of decision-makers.

Decision Support Systems have to balance three system capabilities, ease of use by non-technical users, access to a wide variety of data, and analysis and modeling in a variety of ways. DSS constitute a significant current frontier in the application of computers. DSS help by expediting access to information that would otherwise not be readily available.

# **1.2 NEED FOR AN INTEGRATED DATABASE FOR HAZARDOUS MATERIAL:**

Retirement from use is inevitable for any manufactured or constructed object. Dismantling and disposal are vital parts of Life Cycle Cost (LCC) of a retired object. During dismantling and disposal many things need to be taken into consideration, such as environmental issues and safety regulations. Effects of chemicals released to the environment during dismantling and disposal are a major concern [4], including issues like aquatic fate, terrestrial fate, and atmospheric fate. Within the US, safety regulations set by the Occupational Safety and Health Administration (OSHA), and the Environmental Protection Agency (EPA) have to be strictly followed. A need was recognized for an integrated Hazardous Materials Database (HMD), which has all the above-mentioned characteristics.

#### **1.3 PROBLEM STATEMENT:**

There is no database which provides broad coverage for the properties of hazardous chemicals, including the applicable safety and environmental regulations, which can assist the user in handling and disposal of a retired object. The HMD is being developed primarily for assisting

the persons or organizations responsible for handling and disposal of hazardous materials in objects to be dismantled at the end of their useful life. With all of the potential availability among dismantling scenarios, we have recognized the value of assembling a substantial database of recognized properties of materials, hazardous or otherwise, likely to be found on objects to be dismantled and their components recycled or disposed, now and in the future.

During dismantling, and replacing or disposal of components of a retired object the possible effects of chemicals encountered during the process on the people and environment need to be considered. When there is need to determine safe and legal handling and disposal of a particular chemical substance, gathering all its properties (physical, chemical and hazardous), applicable health regulations, and safety and environmental issues is a tedious and a time consuming activity. This led to the idea of developing a database of hazardous chemical substances with all their relevant properties, including health hazards to workers and potential to harm the environment from the chemicals released, and the applicable safety, health and environmental regulations, which would be flexible, easy and rapid for an organization to use, when it is interested in the dismantling and rcycling or disposal of a retired object.

The HMD for chemicals developed here includes metals and nonmetals, as well as organic and inorganic compounds, with access to properties pooled at one place.

#### **1.4 SOLUTION APPROACH:**

Keeping in mind the above issues the HMD was developed which can hold extensive information about a chemical. The Database was designed by creating tables and linking them with primary keys. There is one main table called the **Materials Table**, with links to the other tables. The HMD contains a total of 22 tables. Visual Basic (VB) was used as the front-end tool for designing a query engine for the database. VB is flexible, compatible with any database and can be installed on any kind of a computer.

#### **1.5 OBJECTIVES OF THIS RESEARCH:**

#### The objectives of this research are to:

• Design a database for hazardous materials

- Populate this structure with properties of a sample of chemicals encountered in ship dismantling
- Develop a user interface which facilitates accessing data related to any kind of chemical substance, and
- Apply this database finally to ship dismantling.

#### **CHAPTER 2: LITERATURE REVIEW**

#### 2.1 EXISTING CHEMICAL DATA SOURCES

**CHEMICAL INVENTORY DATABASE** is a user-friendly tool to help maintain an inventory of chemicals and produce summary documentation [6]. It is designed so that a user can find where a particular chemical is stored. It helps in saving money by not allowing him to purchase a chemical, which is already in use by the company and also in saving time when keeping the inventory up to date and. It makes printing and editing of the listing easy. This database is suitable for small organizations with a moderate level of inventory of several hundred chemicals. It's designed for use, so that everyone authorized in the organization can easily access the inventory information. This database cannot be used by dismantling industry since it is designed only for maintaining inventory of chemicals.

**BRETHERICK'S REACTIVE CHEMICAL HAZARDS DATABASE VERSION 2.0** is a CD ROM, which offers access to information on safe handling and use of reactive chemicals [8]. It includes every chemical for which documented information on reactive hazards has been found. This CD ROM is published by Butterworth-Heinemann, Newton MA.02158 USA. It costs \$554.96.

**SAMPLE CHEMICAL DATABASE** is a chemical database consisting of experimental data and correlations of temperature-dependent properties for 1635 pure chemicals [7]. Collected data have been evaluated, correlated, and checked for thermodynamic consistency. From this database we can view data sets, Design Institute for Physical property Data (DIPPR) approved property constants and regressed correlation coefficients for temperature-dependent properties, as well as calculate temperature-dependent properties in any set of units.

**CHEMICAL DATABASE DEVELOPED BY UNITED NUCLEAR SCIENTIFIC EQUIPMENT & SUPPLIES** deals with chemicals that are used in Fireworks, Explosives, Rocket Fuels or explosives in themselves [11]. All of the uses are not given and only the related purposes of each are stated. Whenever possible the following information on chemical formula, melting temperature, decomposition temperature, form (liquid, powder, crystal, etc), whether it will explode, whether it is poisonous, and its usage is provided. These chemicals are offered as a guide for information purposes only and cannot be purchased.

**LIGAND CHEMICAL DATABASE FOR ENZYMATIC REACTIONS: A LINK BETWEEN ENZYME STRUCTURES AND CHEMICAL REACTIONS:** This database is developed by LIGAND chemical Database for Enzymatic Reactions, which is designed to link enzyme structures with enzyme-catalyzed chemical reactions [10].

**GUIDE FOR HANDLING HAZARDOUS MATERIALS**: This is designed as a simple guide to Hazardous Materials. United Parcel Service has recognized the need for a manual, which will provide all necessary information, while being simple enough for inexperienced shippers to use [18]. The manual incorporates a large number of products, which do not appear in the official DOT listing. The serial number permits UPS to maintain a record of persons holding copies, with the intent that revision pages will be provided as required.

**INDUSTRIAL FIRE HAZARDS HANDBOOK**: The purpose of this is to provide a broad yet thorough introduction to major industries and industrial processes, with emphasis on the fire hazards that accompany them. This Handbook, therefore, is intended to complement the NFPA codes and standards, and help the user apply them intelligently. It is meant as a basic reference book, which will serve a broad audience, including fire science students as well as those directly involved in industrial fire protection.

**HAZARDOUS MATERIALS HANDBOOK**: The design of this handbook enables a firefighter to carry information useful to him primarily during inspections, but also at fires. There are seven headings in the main section of the handbook [19]. These are Name of the material (Description of Flash Point), NFPA 704M ID (The National Fire Prevention Association Classification of the fire hazards of material based on their flash points and boiling points), DOT Classification (The Department of Transportation classification for each hazardous

substance is noted), Firefighting Procedures (FFP), Explosive Hazards, Water and Air Reactivity, Hazardous Mixtures and Toxicity Hazards

**EMERGENCY ACTION GUIDE FOR SELECTED HAZARDOUS MATERIALS**: This guide was prepared to help emergency service personnel during the first 30 minutes of an accident involving a spill of a volatile, toxic, gaseous and /or flammable material that is shipped in bulk [20]. General and specific safety procedures to follow are provided in spill guides arranged alphabetically by hazardous material. Each left-hand page identifies a specific hazardous material, outlines its potential hazards and provides immediate action information for fires, spills and first aid. Each right hand page specifies recommended evacuation areas and distances for protecting the public from dangerous concentrations of toxic vapors and explosions. Where applicable, necessary water pollution controls are provided.

**HAZARDOUS MATERIALS:** This book approaches the study of Hazardous Materials from a frame of reference, which explains why the various materials act and react as they do [21]. This explanation is based on the atomic and molecular structure and the chemical reactivity of the materials. This book communicates through the use of common nomenclature, chemical symbols, and structural formulas. The reader is introduced to the laws and principles governing the behavior of hazardous materials as a background for learning to control the behavior. Frequently encountered materials, which have hazardous properties, are identified, both chemically and practically, rationale for fire fighting is based on both their chemical reactivity and their physical properties. Nationally accepted procedures for identifying hazardous chemicals and methods for crisis –handling of them are summarized.

**TOXIC METALS POLLUTION CONTROL AND WORKER PROTECTION**: This book contains those metals and compounds that are most likely to cause poisoning in industry while being processed, and in general environment while the disposal of their process-effluents is being implemented [22]. What is more important and effective in the prevention of toxic metals poisoning is through removal of toxic agents in a manner that positively precludes ingestion or contact by all potential victims, and therein lies the emphasis and main endeavor of the book. In this book are condensed vital data that are scattered and difficult to pull together. Important

techniques are interpreted and explained by actual case histories. This condensed information will enable the users to establish a sound background for action.

A GUIDE TO WORKING WITH HAZARDOUS MATERIALS – The high degree of concern in the industrial community as well as the public at large, is often needlessly aggravated by unfamiliarity with many of these substances as well as the extent of their presence and potential effects [23]. This book is provided as a resource to help the industrial manager, safety and pollution control engineer establish his/her comprehensive program for information and procedures about hazardous substances in workplace.

#### 2.2 MAJOR DRAWBACKS OF SOME OF EXISTING DATA SOURCES:

**CHEMICAL STRUCTURES DATABASE:** The chemical structures database contains more than 2250 automatically collected chemical structures from the Internet, complete with the information about HTML page addresses. This database is searchable with usual chemical search operations, full structure and sub structure search, formula search name search and so on [5]. This database makes chemical information much more accessible and boosts publication of quality chemical information with attached chemical structures. But it is temporarily disabled.

**HAZARDOUS CHEMICAL DATABASE** is a resource of approximately 2000 dangerous chemicals [9]. The database contains information about organic chemicals, inorganic chemicals, data, information, laws and regulations, EPA number, name of chemical substances, molecular formula, molecular weight, physical properties, use of chemical, melting point, boiling point, flash point, vapor pressure, water solubility, acute human health effects, safety protection for workers, first aid, spills and emergencies, handling and storage, fire hazards, work place exposure etc. This data can be obtained in the form of a CD ROM.

## 2.3 SOURCES USED TO POPULATE THE HAZARDOUS MATERIALS DATABASE (HMD):

**HAZARDOUS PROPERTIES OF CHEMICAL SUBSTANCES:** A wide range of information about hazardous characteristics, toxic properties of chemical substances, target organs and toxicology, cancer causing chemicals, teratogenic substances, flammable and combustile properties of chemical substances, explosive characteristics of chemical substances are obtained [13].

**FATE AND EXPOSURE DATA FOR ORGANIC CHEMICALS:** For each chemical, the physical properties as well as the environmental fate and monitoring data were identified by conducting searches of the environmental Fate Data Bases of Syracuse Research Corporation (SRC) [14].

**CHEMICAL NAMES AND SYNONYMS:** This gives a list of CAS Registry Numbers, Simplified Molecular Input Line Entry System (SMILES) notation, chemical names, chemical synonyms and molecular weights of all the chemicals [15].

**HAZARDOUS MATERIALS HANDBOOK:** Hazardous Materials Handbook covers nearly 1350 hazardous chemicals found in industrial workplace and frequently transported in bulk. It has a record of all the chemical names, their synonyms, physical description, chemical designation, health hazards, fire hazards, chemical reactivity, environmental, shipping information, hazard classification and physical and chemical properties [16].

**ENVIRONMENTAL CONTAMINANT REFERENCE DATA BOOK:** It is a reference compendium of physical, chemical and biological effects of environmental contaminants-primarily individual chemicals but also some selected simple and complex mixtures. Each substance is summarized and summaries include information on CAS number, DOT and NIOSH numbers, synonyms various detection limits, environmental transport, fate, and effects (selected narrative information on soil adsorption, volatilization, biodegradation, bioaccumulation, probable exposures and effect types), water hemistry, metabolic pathways, molecular formulas,

regulatory jurisdictions and authorities, standards, reactions, monitoring methods and international standards [17].

## CHAPTER 3: DATABASE DESIGN

There are currently a total of 22 tables in the Hazardous Materials Database (HMD), among which the Materials Table is the main table and all the other tables are sub-tables to it. The user can get a wide range of information regarding the materials, which have been entered such as physical properties, chemical properties, environmental transport and fate properties, toxicity etc. We have initially identified 30 chemicals and categories of chemicals, mostly hazardous, occurring in ship dismantling.

HMD is divided into six major groups:

- > PHYSICAL PROPERTIES
- > CHEMICAL PROPERTIES
- > HEALTH AND ECOLOGICAL HAZARDS
- > ENVIRONMENTAL CONCERN
- > SAFETY AND ENVIRONMENTAL REGULATIONS
- > EXPOSURE CRITERIA

#### **3.1 PHYSICAL PROPERTIES**

At present physical properties are divided into three tables:

- 1. Materials Table
- 2. Percent Dissociated Table
- 3. Water Solubility

#### **3.1.1 MATERIALS TABLE**

Table 3.1.1 gives the Materials Table and its fields. The various fields are explained below:

**CAS** #: It is a unique identifier assigned to each chemical registered with Chemical Abstracts Services (CAS) of the American Chemical Society. This number is used to identify chemicals on the basis of their molecular structure. CAS numbers, in the format xxx-xx-x, can be used in conjunction with chemical names for positive identification and searching on computerized databases.

**Molecular Formula**: The formula is in Hill notation, which is given as the number of carbons followed by the number of hydrocarbons followed by any other elements in alphabetical order.

**Wiswesser Line Notation**: This is a chemical structure representation that can be used for substructure searching, in order to predict a property from that structure.

**Smiles Notation:** A different chemical structure representation that can be used for substructure searching, in order to predict a property from that structure.

**Boiling Point:** Boiling Point at 1 atmosphere is the temperature of a liquid when its vapor pressure is 1 atmosphere. It indicates whether a liquid will boil and become gas at any particular temperature and sea-level atmospheric pressure.

**Melting Point**: The melting/freezing point is the temperature at which a solid changes to a liquid or a liquid changes to a solid.

**Molecular Weight:** It is the weight of a molecule of the chemical relative to a value of 12 for one atom of carbon.

**Henry's constant:** The Henry's Law constant (H), is the air/water partition coefficient, which is published in two forms. A non-dimensional H relates the chemical concentration in the gas phase to its concentration in the water phase. The dimensional H can be determined by dividing the vapor pressure in atmospheres by the water solubility in mole/m3 to give H in atm-m3/mole. H provides an indication of the partition between air and water at equilibrium and also is used to calculate the rate of evaporation from water.

**Vapor Pressure:** It is defined as the equilibrium pressure of the saturated vapor above the liquid, measured in millimeters of mercury (760mmHg = 14.7 psia) at 20deg C unless another

temperature is specified. The vapor pressure of a chemical provides considerable insight into the transport of a chemical in the environment. The volatility of the pure chemical is dependent upon the vapor pressure, while volatilization from water is dependent upon the vapor pressure and solubility in water.

**Log Octanol/Water Partition Coefficient**: The octanol water partition coefficient is the ratio of the chemical concentration in Octanol divided by the concentration in water at equilibrium. Occasionally chemical Octanol/water partition coefficients are not calculated because a necessary fragment constant for the chemicals are not available.

**Bioconcentration Factor**: Certain chemicals due to their hydrophobic nature have a tendency to partition from the water column and bioconcentrate in aquatic organisms. This concentration of chemicals in aquatic organisms is of concern because it can lead to toxic concentrations being reached when the organism is consumed by higher organisms such as wild life and humans. Such bioconcentrations are usually reported as the Bioconcentration factor (BCF), or its log which is the concentration of chemical in the organism at equilibrium divided by the concentration of the chemical in water.

**Oral LD50 rat:** LD stands for lethal dose. LD50 is the amount of material given all at once, which causes death of 50% (one half) of a group of test animals. LD50 is one way to measure short term poisoning potential (acute toxicity) of a material. Here rat is used as the test animal. For example LD50 (oral rat) 5mg/kg means that 5 milligrams of that chemical for every one-kilogram body weight of the rat, when administered in one dose by mouth causes the death of 50% of the test group.

| Chemical Name                           | Description   |
|---|---|
| CAS #                                   | Identifier assigned by Chemical Abstaract Society   |
| Smiles                                  | Chemical structure representation                   |
| Classification                          | Which group the chemical belongs to                 |
| Wiswesser_Notation                      | One of chemical structure representation            |
| Molecular_Wt                            | Weight of molecule of chemical                      |
| Molecular_Formula                       | Number of carbons and hydrocarbons present          |
| Boiling_Point                           | Temperature at which chemical boils                 |
| Boiling_Point_Range                     | Range of temp at which the chemical boils           |
| Melting_Point                           | Temperature at which it melts                       |
| Melting_Point_Range                     | Range of temperature at which the chemical melts    |
| Log Octanol Water partition coefficient | Conc in octanol/conc in water at equibrium          |
| Density                                 | Density of chemical at 25 deg C                     |
| VP                                      | Equiibrium pressure of saturated vapor above liquid |
| Henry's constant                        | It is the air/water partition coefficient           |
| Bioconcentration factor                 | Conc of chemical in organism/conc in water          |
| Oral LD50 rat                           | Dose given causes the death of 50% of test animals  |
| Sources                                 | Sources used to get the information                 |
| Notes                                   | Notes for the chemical                              |

#### **Table 3.1.1- MATERIALS**

#### **3.1.2 PERCENT DISSOCIATED**

Table 3.1.2 gives the various fields of Percent Dissociated which are explained below

**Dissociation constants:** The acid dissociation constant as the negative log (pKa) is given for chemicals that are likely to dissociate at environmental pHs (between 5 and 9). Chemical classes where dissociation is important include phenols, carboxylic acids, and aliphatic aromatic amines. The degree of dissociation affects such processes as photolysis (absorption spectra of chemicals that dissociate can be considerably affected by pH), evaporation from water (ions do not evaporate), soil or sediment adsorption, and bioconcentration.

| Chemical Name | % Dissociation in aqueous solution |
|---------------|------------------------------------|
| pH2           |                                    |
| pH4           |                                    |
| pH7           |                                    |
| pH9           |                                    |
| pH11          |                                    |

#### Table 3.1.2- PERCENT DISSOCIATED

#### **3.1.3 WATER SOLUBILITY**

Table 3.1.3 is Water Solubility, which is explained below

Water Solubility: The water solubility of chemicals provides considerable insight into the fate and transport of a chemical in the environment. High water soluble chemicals, which have a tendency to remain dissolved in the water column and not partition to soil or sediment or bioconcentrate in aquatic organisms, are less likely to volatilize from water and are generally more likely to biodegrade. Low water soluble chemicals are just the opposite; they partition to soil or sediments and bioconcentrate in aquatic organisms, many volatilize more readily from water, and are less likely to be biodegradable. Other fate processes that are or can be affected by water solubility include photolysis, hydrolysis, oxidation, and wash out from the atmosphere by rain or fog. The water solubility Table is shown below.

| Chemical Name | Description                              |
|---------------|--|
| Soluble       | If the chemical is soluble (Yes/No)      |
| Low           | If the solubility of the chemical is low |
| Medium        | If the solubility of chemical is medium  |
| High          | If the solubility of chemical is high    |

#### **3.2 CHEMICAL PROPERTIES**

Chemical Properties are divided into four tables:

- 1. Reactivity/Instability
- 2. Flammability/Combustibility
- 3. Extinguishing Agents

4. Corrosivity

#### 3.2.1. REACTIVITY/INSTABILITY

This Table gives the reactivity of the chemical with oxidizers, titanium, and selenium

| Chemical Name | Description                           |
|---------------|---------------------------------------|
| Oxy           | If the chemical reacts with oxidizers |
| Ti            | If the chemical reacts with titanium  |
| Se            | If the chemical reacts with selenium  |

#### Table 3.2.1- REACTIVITY/INSTABILITY

#### 3.2.2 FLAMMABILITY/COMBUSTIBILITY

This table gives information about the flash point, auto ignition temperature and the upper and lower exposure limits of the chemical.

**Flash Point:** It is defined as the lowest temperature at which vapors above a volatile combustile substance will ignite in air when exposed to a flame.

**Flammable limits in air:** The percent concentration in air (% by volume) is given for the LEL (lower explosive-flammable limit in air, % by volume) and UEL (upper explosive-flammable limit in air, % by volume) at room temperature unless otherwise specified. The values, along with those in Flash Point and Auto ignition temperature give an indication of relative Flammability of the chemical.

| Chemical Name      | Description   |  |
|--------------------|---|--|
| Non Flammable      | If chemical is not flammable                                      |  |
| Flash Point        | Lowest temp at which chemical vapor ignites when exposed to flame |  |
| Auto ignition temp | Lowest temperature at which chemical catches fire                 |  |
| LEL percent        | Lower exposure limit  |  |
| UEL percent        | Upper exposure limit  |  |

Table 3.2.2 -FLAMMABILITY/ COMBUSTIBILITY

#### **3.2.3 EXTINGUISHING AGENTS**

Table 3.2.3 gives whether the chemical is used or not used as an extinguishing agent

| <b>Chemical Name</b> | Description   |  |
|----------------------|---|--|
| Use                  | Any extinguishing agent that can be used in the presence of the chemical    |  |
| Not Use              | Any extinguishing agent that cannot be used in the presence of the chemical |  |

**Table 3.2.3 - EXTINGUISHING AGENTS** 

#### **3.2.4 CORROSIVITY**

This table gives the information about the reactivity of the chemical towards flesh, towards steel and the material, which corrodes that particular chemical.

| Chemical Name | Description                               |  |
|---------------|---|--|
| Toward Metal  | Corrosivity of the chemical towards metal |  |
| Toward Flesh  | Corrosivity of the chemical towards flesh |  |
| Towards Glass | Corrosivity of the chemical towards glass |  |

#### Table 3.2.4 - CORROSIVITY

#### **3.3 HEALTH AND ECOLOGICAL HAZARDS**

This group is divided into six tables:

- 1. Aquatic Fate
- 2. Acute Symptoms
- 3. Chronic Symptoms
- 4. Allergen
- 5. Oral Acute Aquatic Toxicity
- 6. Cancer

#### **3.3.1 AQUATIC FATE**

This section reviews how a chemical will behave if released to fresh, marine, or estuarine surface waters. Field studies or aquatic model ecosystems are used when they provide insight into the overall behavior in water. When field or aquatic ecosystems studies are not available or do not give enough data to make conclusions on the aquatic fate of the chemical, data from appropriate degradation, transport, or monitoring sections will be used to synthesize how a chemical is likely to behave if released to water.

| Chemical Name      | Description  |  |
|--------------------|--|--|
| Biodegrade         | Breakdown by the action of living things                               |  |
| Adsorb to Sediment | Adsorption of chemical to sediment                                     |  |
| Photolysis         | Destruction of materials initiated by reactions by absorption of light |  |
| Photo -Oxidation   | Uses light to initiate reactions that destroy contaminants             |  |

#### Table 3.3.1– AQUATIC FATE

#### **3.3.2 ACUTE SYMPTOMS AND TOXICITY**

Acute Symptoms observed when the chemical is taken inside the body either through inhalation or ingestion or adsorption through skin or eye.

#### Table 3.3.2 - ACUTE SYMPTOMS AND TOXICITY

| Chemical Name | Description                            |
|---------------|--|
| Inhalation    | Intake into the body through breathing |
| Ingestion     | Intake into the body through mouth     |

#### 3.3.3 CHRONIC SYMPTOMS AND TOXICITY

These are the chronic symptoms observed when the chemical is inhaled or taken in by ingestion or by adsorption through the skin.

#### Table 3.3.3 - CHRONIC SYMPTOMS AND TOXICITY

| Chemical Name | Description                            |
|---------------|--|
| Inhalation    | Intake into the body through breathing |
| Ingestion     | Intake into the body through mouth     |

#### **3.3.4 ALLERGENICITY**

Table 3.3.4 gives the information about whether the chemical is an allergen to skin, respiratory tract or other organs of the body.

| Chemical Name | Description              |
|---------------|--------------------------|
| Skin          | Allergen to skin         |
| Respiratory   | Allergen to lungs        |
| Other         | Allergen to other organs |

#### Table 3.3.4 - ALLERGENICITY

#### **3.3.5 ORAL ACUTE AQUATIC TOXICITY**

**Toxicity by ingestion**: The  $LD_{50}$  values are those defined by the National Academy of Sciences, committee on Hazardous Materials.  $LD_{50}$  signifies that about 50% of the animals given the specified dose by mouth will die [14]. The values of Water Fowl  $LD_{50}$  and Fish  $LC_{50}$  for the chemical in table 3.3.5

| Chemical Name               | Name of the chemical                      |
|-----------------------------|---|
| Fish LC <sub>50</sub>       | Amount when taken will kill the fish      |
| Water Fowl LD <sub>50</sub> | When consumed 50% of the animals will die |

Table 3.3.5 - ORAL ACUTE AQUATIC TOXICITY

#### 3.3.6 CANCER

A carcinogen is a substance capable of causing cancer. Most cancers are induced by many synthetic or naturally occurring chemicals, which include inorganic substances, organics, hormones, and many solid-state materials.

**Mutagens:** These cause cell mutations, which may or may not later develop into cancer, birth defects or other health effects.

**Genotoxic Carcinogens:** Carcinogenic chemicals may alter Deoxyribonucleic acid (DNA) to cause uncontrolled cell replication. DNA is a long macromolecule that carries a genetic code through which genotypic characteristics are inherited. A chemical may interact with DNA through the genetic mechanism, altering the structure or number of the chromosomes, causing gene mutation or duplication. Such substances are known as Genotoxic carcinogens.

**Teratogens:** These are chemical and physical agents that can cause birth defects and mortality among new born, malformations, growth retardation and functional disorders.

| Chemical Name             | Description                                     |
|---------------------------|---|
| Mutagen                   | Causes mutations                                |
| Genotoxic carcinogen only | Alters genes, can lead to cancer                |
| Promoter carcinogen only  | Enhances cell proloferation, can lead to cancer |

| Table | 3.3.6 - | CANCER |
|-------|---------|--------|
|-------|---------|--------|

#### **3.4 ENVIRONMENTAL CONCERN:**

This group has three tables under it, which are as follows:

- 1. Atmospheric Fate
- 2. BOD
- 3. Terrestrial Fate

#### **3.4.1 ATMOSPHERIC FATE**

This section reviews how a chemical will behave if released to atmosphere. The vapor pressure will be used to determine if the chemical is likely to be in the vapor phase or adsorbed to particulate matter. The water solubility will be used to assess the likelihood of washout with rain.

| Chemical Name                      | Description                                  |
|------------------------------------|--|
| Reactions                          | Various other chemicals with which it reacts |
| $T_{1/2}$ for 24 hrs               | Half life for 24 days                        |
| $T_{1/2}$ day time                 | Half life during day                         |
| $T_{1/2}$ night time               | Half life during night                       |
| T <sub>1/2</sub> Dry sedimentation | Dry remove half life                         |
| $T_{1/2}$ Wet deposition           | Precipitation washout half life              |

 Table 3.4.1 – Atmospheric Fate

#### 3.4.2 BOD

**Biological Oxygen Demand (BOD):** Also called "biochemical oxygen demand", this is a standard way of describing how much oxygen dissolved in water is consumed by biological oxidation of the chemical during the stated period of time. When given in percent, the values indicate the pounds of chemical during the time stated.

#### **Table 3.4.2 - BOD**

| Chemical Name        | Description                             |
|----------------------|---|
| BOD 5 day mg/l       | Biological oxygen demand for 5day, mg/l |
| BOD T <sub>1/2</sub> | Biological oxygen demand other formats  |

#### **3.4.3 TERRESTRIAL FATE**

This section shows how a chemical will behave if released to soil or ground water. Field studies or terrestrial model ecosystem studies are used when they provide insight into overall behavior in soil. Quite often, field or terrestrial ecosystem studies either are not available or do not give enough data to make conclusions on the terrestrial fate of a chemical. In these cases, data from sections on biodegradation, abiotic degradation, soil adsorption/mobility, volatilization from water/soil, and any appropriate monitoring data will be used to synthesize how a chemical is likely to behave if released to soil.

**Soil Adsorption/Mobility:** For many chemicals experimental soil or sediment partition coefficients are available. These values are measured by determining the concentration in both the solution (water) and solid (soil or sediment) phases after shaking for about 24 to 48 hours and using different initial concentrations.

 Table 3.4.3 – TERRESTRIAL FATE

| Chemical Name            | Description   |
|--------------------------|---|
| Aerobic Biodegradation   | Biodegradation in the presence of air                       |
| Anaerobic Biodegradation | Biodegradation in the absence of air                        |
| Soil adsorption/Mobility | Conc in both solution / solid after shaking for 24 to 48hrs |

#### **3.5 SAFETY AND ENVIRONMENTAL REGULATIONS**

This group is divided into three tables:

- 1. Clean Air Act
- 2. DOT (U.S Department of Transportation)
- 3. Resource Conservation and Recovery Act (RCRA, Waste Management)

#### 3.5.1 CLEAN AIR ACT

Table 3.5.1 has three fields HAP stands for Hazardous Air Pollutant EHS stands for Extremely Hazardous Substance HRP stands for High Risk Pollutants

| Chemical Name       | Description                    |
|---------------------|--------------------------------|
| Criteria Pollutants | Co, SO, $NO_x$ etc             |
| HAP                 | Hazardous air pollutants       |
| EHS                 | Extremely hazardous substances |
| HRP                 | High risk pollutant            |

#### Table 3.5.1- CLEAN AIR ACT

#### 3.5.2 DOT

This is a Hazard identification number that is assigned to the substance by the US Department of Transportation (DOT). This identification number identifies substances regulated by DOT and must appear on shipping documents, the exterior of packages and on specified containers.

FIFRA stands for Federal Insecticide Fungicide Rodenticide Act. Table 3.5.2 has following fields

#### **Table 3.5.2 – DOT**

| Chemical Name                | Description                                   |
|------------------------------|---|
| Water pollutant              | If it pollutes water                          |
| Hazard class                 | Rating given to every chemical                |
| Registration pesticide FIFRA | If it can be used as pesticide or insecticide |

 Table 3.5.3 – Resource Conservation and Recovery Act (RCRA, Waste Management)

| Chemical Name    | Description                  |  |
|------------------|------------------------------|--|
| Flammability     | Flammability of the chemical |  |
| Reactivity       | Reactivity of the chemical   |  |
| Primary valence  | Valency of chemical          |  |
| Ion coordination | Ion coordination of chemical |  |
| Corrosivity      | Corrosivity of the chemical  |  |
| Toxicity         | Toxicity of the chemical     |  |

#### **3.6 EXPOSURE CRITERIA:**

This group is divided into three tables:

- 1. Worker Exposure Criteria (acute- STEL), Short-Term Exposure Limit
- 2. Worker Exposure Criteria (acute-CEIL), Ceiling Exposure Limit
- 3. Worker Exposure Criteria (chronic-TWA), Time-Weighted Average Exposure Limit

#### **Exposure Limits:**

These are legally enforceable airborne permissible exposure limits (PELs) from OSHA, and recommended airborne exposure limit guidelines called recommended exposure limits (RELs) from National Institute of Ocupational Safety and Health (NIOSH) or called threshold limit values (TLVs) from the American Conference of Government Industrial Hygenists (ACGIH) or called Work Place Environmental Exposure Levels (WEEL) from the American Industrial Hygenists Association.

There are 3 kinds of **TLVs**. A time weighted average TLV (TLV-TWA) is a concentration in breathing air for a normal 8-hour workday and a 40-hour workweek, to which it is believed that nearly all workers may be exposed, day after day without adverse effects. A ceiling TLV value (TLV-C) is the concentration that should not be exceeded during any part of the working exposure. If instantaneous monitoring is not feasible, then the (TLV-C) can be assessed by sampling over 15-minute periods except for those substances that may cause immediate irritation when exposures are short. A short-term exposure limit (TLV-STEL) is a 15-minute TWA exposure concentration in air, which should not be exceeded at any time in a workday, even if the 8-hour TWA is within the TLV-TWA. Exposures above the 8 hour TLV-TWA up to the TLV-STEL should not last more than 15 minutes and should not occur more than 4 times in a work day. This should be atleast 60 minutes between successive exposures in the range.

There are 3 kinds of **PELs.** A time weighted average PEL (PEL-TWA) is a concentration that must not be exceeded during any 8-hour shift or 40-hour workweek. An OSHA ceiling concentration must not be exceeded during any part of the workday; if instantaneous monitoring is not feasible, the ceiling must be assessed as a 15 minute TWA exposure. A short-term exposure limit PEL (PEL\_STEL) is defined similarly to a TLV STEL.

All **WEELS** are expressed as either time weighted average (TWA) concentrations or ceiling values, however, different time periods are specified depending on the properties of the agent. An 8-hour TWA indicates a time weighted average concentration for a normal 8-hour workday and a 40-hour workweek. A ceiling limit should not be exceeded at any time during the

workday. A short-term TWA is a time weighted average concentration of shorter duration (such as 15 minutes) established to limit excursion levels.

All the above-discussed values for a chemical are tabulated which can be seen from tables 3.6.1, 3.6.2 and 3.6.3.

Table 3.6.1 - WORKER EXPOSURE CRITERIA (ACUTE-STEL) mg/m<sup>3</sup>

| Chemical Name | Description                            |  |  |  |
|---------------|--|--|--|--|
| TLV           | Threshold limit value                  |  |  |  |
| WEEL          | Workplace environmental exposure level |  |  |  |

#### Table 3.6.2 - WORKER EXPOSURE CRITERIA (ACUTE-CEIL) mg/m<sup>3</sup>

| Chemical Name | Description                            |  |  |
|---------------|--|--|--|
| PEL           | Permissible exposure limit             |  |  |
| TLV           | Threshold limit value                  |  |  |
| WEEL          | Workplace environmental exposure level |  |  |

## Table 3.6.3 - WORKER EXPOSURE CRITERIA (CHRONIC-TWA) mg/m<sup>3</sup>

| Chemical Name    | Description                            |  |  |
|------------------|--|--|--|
| TLV              | Threshold limit value                  |  |  |
| WEEL             | Workplace environmental exposure level |  |  |
| PEL (respirable) | Permissible exposure limit             |  |  |

### **CHAPTER 4: IMPLEMENTATION**

Microsoft Access is a powerful, yet intuitively easy-to-use, database management system, designed to run in the Windows environment. Its primary purpose is to provide an efficient system for storing large amounts of data - a system in which any one piece of information can be quickly located. Additionally, relationships between data can be established allowing one to additionally retrieve the related information of any one piece of information requested. Access includes many features for manipulating the information that is stored. Using the program, one can

- Sort and rearrange information in various ways
- Extract and work with subsets of the information.

The Database contains a main table and several sub tables under it. These are linked with the help of Primary keys and foreign keys. In HMD the chemical name was made the primary key since most chemicals have a unique name. The relationships diagram can be seen from appendix 26 at the end.

#### **4.1 THE QUERY ENGINE:**

A Query engine was developed to assist the user in creating and retrieving data for HMD. Visual Basic was selected to be the front end for accessing data from HMD. It is flexible and compatible with any kind of database. The Graphical User Interface (GUI) an inherent feature of Visual Basic, uses illustrations for text, which enable users to interact with the application.

## TABLES SHOWING THE MAIN MENUS THEIR CORRESPONDING FIELDS AND SUB FIELDS:

#### Table 4.1: MAIN FORM WITH MENUS

| File               | Tools  | Help      |
|--------------------|--------|-----------|
| Record Maintenance | Search | Help file |
| Exit               | Query  |           |

#### Table 4.2: RECORD MAINTENANCE

| Physical    | Chemical        | Health       | Safety         | Environmental    | Exposure |
|-------------|-----------------|--------------|----------------|------------------|----------|
| Properties  | Properties      | Hazards      | Regulations    | Concern          | Criteria |
| Materials   | Reactivity      | Aquatic Fate | Clean Air      | Atmospheric      | Worker   |
|             | /Instability    |              | Act            | Fate             | exposure |
|             |                 |              |                |                  | criteria |
|             |                 |              |                |                  | (STEL)   |
| Percent     | Flammability    | Acute        | DOT            | Biological       | Worker   |
| Dissociated | /combustibility | symptoms     |                | Oxygen           | exposure |
|             |                 |              |                | demand (BOD)     | criteria |
|             |                 |              |                |                  | (CEIL)   |
| Water       | Extinguishing   | Chronic      | Characteristic | Terrestrial Fate | Worker   |
| Solubility  | Agents          | symptoms     | RCRA           |                  | exposure |
|             |                 |              |                |                  | criteria |
|             |                 |              |                |                  | (TWA)    |
|             | Corrosivity     | Allergen     |                |                  |          |
|             |                 | Oral Acute   |                |                  |          |
|             |                 | Aquatic Tox  |                |                  |          |
|             |                 | Cancer       |                |                  |          |

#### Table 4.3: TOOLS

| Search               | Query                  |  |
|----------------------|------------------------|--|
| By CAS #             | On Molecular weight    |  |
| By Chemical Name     | On Boiling Point       |  |
| By Molecular Formula | On Melting Point       |  |
|                      | On Vapor Pressure (VP) |  |
|                      | On classification      |  |
|                      | Print                  |  |

Help: helps the user in using the database

**Exit:** exits the program

The first screen of HMD Query Engine is shown in Figure 4.1. There are two buttons 1."ENTER" button, which is to enter into the database, and the "EXIT" Button, which is used to end the program.

On clicking the "ENTER" button a new form is opened as shown in Figure 4.2

It asks the user to enter a password. This feature is included for security reasons; only authorized users can access the database



Figure 4.1: HMD Query Engine

| Complexes |                       |          | 1412 |
|-----------|-----------------------|----------|------|
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|           | Sater the password :  |          |      |
|           | Lage                  | Error 10 |      |
|           |                       | Edite    |      |
|           |                       |          |      |
|           |                       |          |      |

Figure 4.2: Password Form

There is a "LOGIN" button, which should be clicked after typing in the password. If an Invalid Password is entered then a message saying "Invalid Password" appears on the screen as shown in

Figure 4.3. If correct password is typed, then the form named home is displayed. The menu items of the home form are

- File
- Tools
- Help



Figure 4.3: Screen showing Invalid Password

When the mouse is placed on top of File, it displays the following pull down menu Figure 4.4

- 1. Record Maintenance
- 2. Exit



Figure 4.4: Home form with the pull down menu for the file displayed

On the home form when user clicks on the Record Maintenance of the file pull down menu option, another pull down menu, showing the following properties appears Figure 4.5.

- a) Physical properties
- b) Chemical Properties
- c) Health and Ecological Hazards
- d) Exposure Criteria
- e) Safety and Environmental Regulations and
- f) Environmental concern

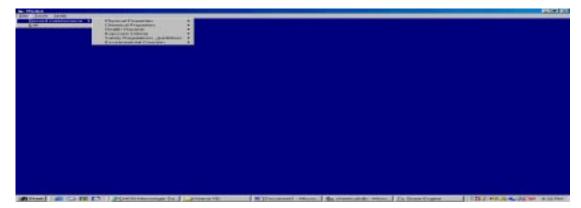


Figure 4.5: Showing the pull down menu of Record Maintenance

Clicking on the physical properties leads to another pull down menu, which has the following:

- 1) Materials
- 2) Water solubility and
- 3) Percent Dissociated tables as shown in the Figure 4.6 below

| Lie Jose Meter   |   |
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Figure 4.6: Listing the items in pull down menu for Physical Properties

Clicking on the chemical properties leads to another pull down menu of the following items:

- 1) Flammability/Combustibility
- 2) Extinguishing Agents
- 3) Reactivity/ Instability and
- 4) Corrosivity

as shown in the Figure 4.7 below

| Example from investment     Physical Pagewrise       Example from investment     Example from investment       Example from investment     Example from investment | Ele Look Help        |  |  |  |  |  |
|--|----------------------|--|--|--|--|--|
|  | Becad maintenance 14 | Hould's Happenson F<br>Exponent Citlering F<br>Tallety Peopletions: guidelines F | Extrapoliting agents<br>Reactivity.Enclability |  |  |  |
|  |                      |  |  |  |  |  |
|  |                      |  |  |  |  |  |
|  |                      |  |  |  |  |  |
|  |                      |  |  |  |  |  |

Figure 4.7: Showing the list of items in the pull down menu for Chemical Properties

Clicking on the Health Hazards leads to another pull down menu of the following items:

- 1) Cancer
- 2) Aquatic Fate
- 3) Acute Symptoms and Toxicity
- 4) Chronic Symptoms and Toxicity
- 5) Allergenicity and
- 6) Oral acute aquatic Toxicity

#### as shown in the Figure 4.8 below

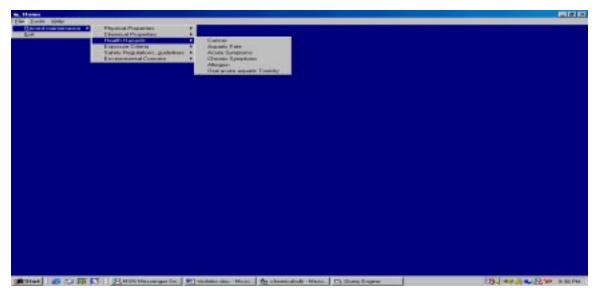


Figure 4.8: showing the pull down menu for Health Hazards

Clicking on the Safety Regulations and guidelines on the Record Maintenance leads to another pull down menu of the following items:

- 1) DOT
- 2) Clean Air Act and
- 3) RCRA

which are shown in the Figure 4.9 below

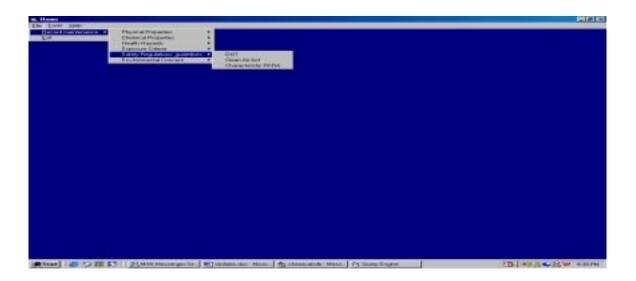


Figure 4.9: Showing the pull down menu for Safety and Environmental Regulations

Clicking on the Exposure Criteria leads to another pull down menu of the following items:

- 1) Worker Exposure Criteria (acute-STEL)
- 2) Worker Exposure Criteria (acute-CEIL) and
- 3) Worker Exposure Criteria (chronic- TWA)

as shown in the Figure 4.10 below

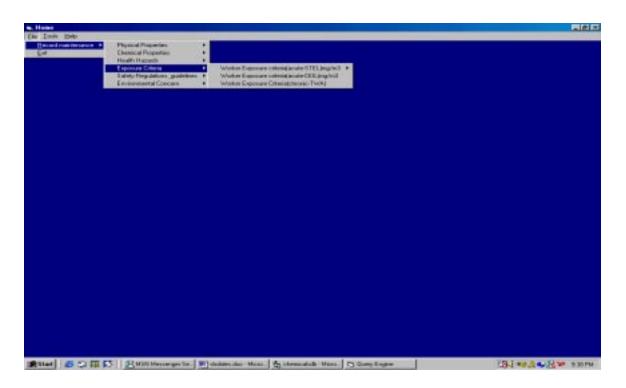


Figure 4.10: Showing the pull down menu for Exposure Criteria

Clicking on the Environmental Concern on the Record Maintenance menu selection leads to another pull down menu of the following:

- 1) Toxicity
- 2) Atmospheric Fate
- 3) Terrestrial Fate and
- 4) BOD

which is shown in the Figure 4.11 below

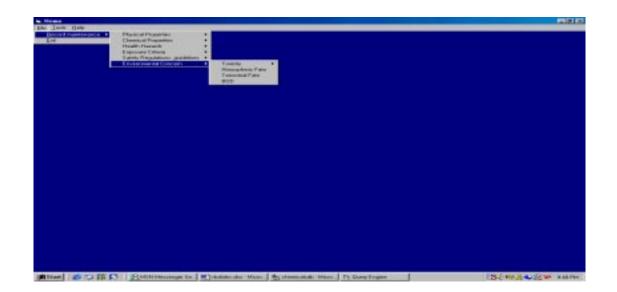


Figure 4.11: Showing the pull down menu for Environmental Concern

When the user clicks on the menu item Search, of the Tools, a form is displayed with the following three options

- a) By CAS#
- b) By Chemical Name
- c) By Molecular Formula as shown in Figure 4.12 below

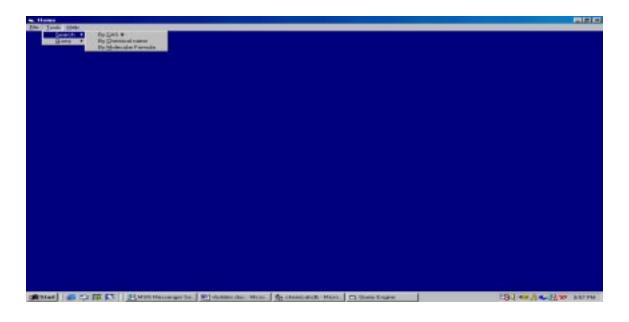


Figure 4.12: Showing the pull down menu for Search

When the user clicks on the menu item Query of the Tools, the form as shown in Figure 4.13 below is displayed with the following seven options

- d) On Molecular Weight
- e) On Boiling point
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Figure 4.13: Showing the pull down menu for query

HELP: The Help option in the main menu helps the user in using the frontend for the Hazardous Materials Database effectively. It guides the user by providing information about all the forms and how to use them.

# **CHAPTER 5: APPLICATION**

### **5.1 SHIP DISPOSAL APPLICATION:**

The database can be applied to handling and disposal of many kinds of retired objects. The object may be as simple thing as a pen or as a complex as a ship. During dismantling of a ship many hazardous substances are released. These are of major concern to workers, communities and the environment, so they should be dealt with carefully during disposal. Chemical substances like asbestos, cadmium, lead, and tributyl tin are released. To illustrate how we can utilize the Hazardous Material Database (HMD) we will use as an example a small sample of the above-mentioned chemicals, and apply the HMD to it.

#### **Physical Properties:**

We can get the Physical properties of the chemical from the Materials Table, Percent Dissociated table and the Water Solubility Table. From the HMD database Molecular Weight of Cadmium is found to be 112.4. Its Melting Point 321 deg C and Boiling Point is 767 deg C. Vapor pressure is 0.12mg/m3 at 25 deg C.

When the user clicks on the menu item Materials of the Physical Properties pull down menu the form shown in Figure 5.1 is displayed. All the tables in the database can be accessed through the front end. The user can add, update, delete and refresh the records in the database.

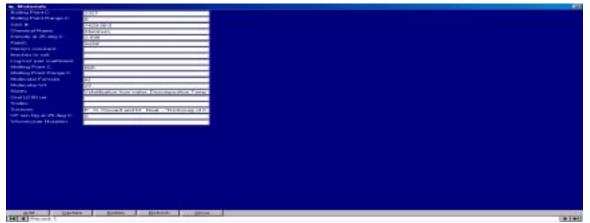


Figure 5.1: Physical Properties

When the user clicks on the menu item Water Solubility of the Physical Properties, the form shown in Figure 5.2 is displayed

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Figure 5.2: Water Solubility

When the user clicks on the menu item Percent Dissociated of the Physical Properties, the form as shown in Figure 5.3 below is displayed

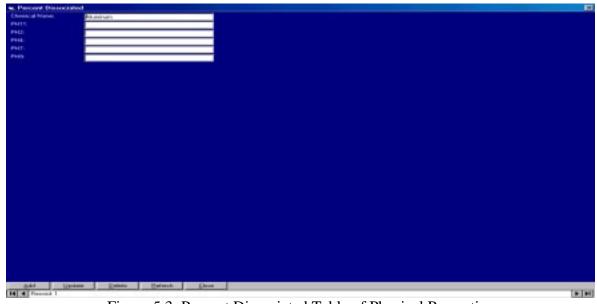


Figure 5.3: Percent Dissociated Table of Physical Properties

**Chemical properties:** These can be obtained from the Flammability/Combustibility, Extinguishing Agents, Reactivity/Instability and Corrosivity Tables. Since it is a metal, cadmium doesn't have a flash point, auto ignition temperature and upper and lower exposure limits. It is not corrosive.

When the user clicks on the menu item Flammability/Combustibility of the Physical Properties, the form shown in Figure 5.4 is displayed

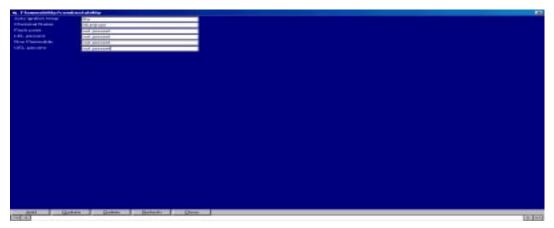


Figure 5.4: showing Flammability/Combustibility Table

When the user clicks on the menu item Extinguishing Agents of the Chemical Properties, a form as shown in Figure 5.5 below is displayed

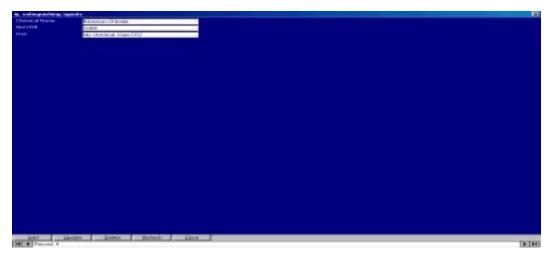


Figure 5.5: Extinguishing Agents Table of Chemical Properties

When the user clicks on the menu item Reactivity/Instability of the Chemical Properties, form as shown in Figure 5.6 below is displayed

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Figure 5.6: Reactivity/Instability Table of Chemical properties

When the user clicks on the menu item Corrosivity of the Chemical Properties, the form as shown in Figure 5.7 below is displayed

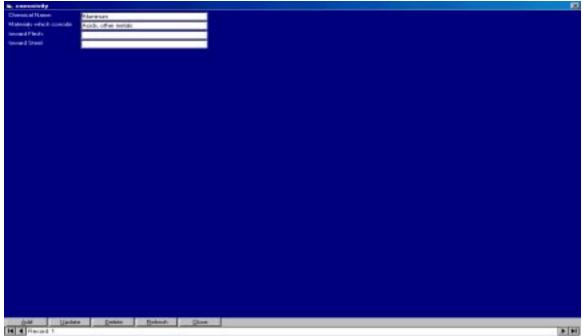


Figure 5.7: Corrosivity Table of chemical Properties

**Health and Ecological Hazards:** These can be obtained from Cancer, Aquatic Fate, Acute Symptoms, Chronic Symptoms, Allergen and Oral Acute Aquatic Toxicity tables. Cadmium is genotoxic, has acute symptoms from both inhalation and ingestion, has chronic symptoms both from inhalation and ingestion, and damages the liver badly.

When the user clicks on the menu item Cancer of the Health and Ecological Hazards, the form as shown in Figure 5.8 below is displayed

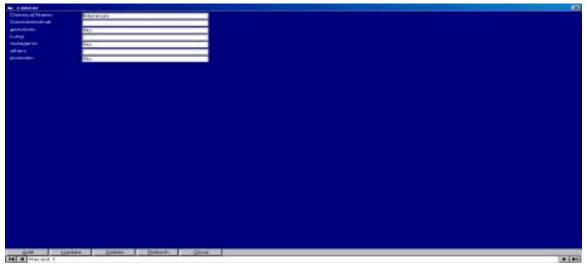


Figure 5.8: Cancer Table of the Health and Ecological Hazards

When the user clicks on the menu item Aquatic Fate of the Health and Ecological Hazards, the form below in Figure 5.9 is displayed

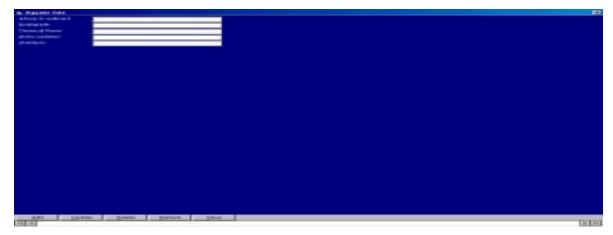


Figure 5.9: Showing the Aquatic Fate Table

When the user clicks on the menu item acute symptoms of the Health and Ecological Hazards, the form as shown in Figure 5.10 is displayed

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Figure 5.10: Acute Symptoms Table of Health and Ecological Hazards

When the user clicks on the menu item chronic symptoms of the Health and Ecological Hazards, form as shown in Figure 5.11 below is displayed

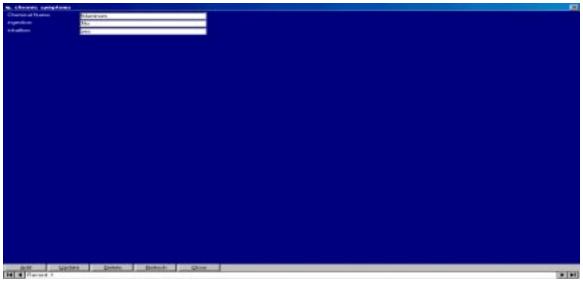


Figure 5.11: Chronic Symptoms Table of Health and Ecological Hazards

When the user clicks on the menu item Allergen of the Health and Ecological Hazards, the form as shown in Figure 5.12 below is displayed

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Figure 5.12: Allergen Table of Health and Ecological Hazards

When the user clicks on the menu item Oral Acute Aquatic Toxicity of the Health and Ecological Hazards, the form below in Figure 5.13 is displayed

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Figure 5.13 - Oral Acute Aquatic Toxicity Table

### Safety and Environmental Regulations:

These can be obtained from Clean Air Act, Clean Water Act, RCRA, and DOT tables.

When the user clicks on the menu item Clean Air Act of the Safety and Environmental Regulations, the form below in Figure 5.14 is displayed

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Figure 5.14: Showing the Clean Air Act Table

When the user clicks on the menu item RCRA table of the Safety and Environmental Regulations, the form below in Figure 5.15 is displayed

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Figure 5.15: Showing the RCRA Table

When the user clicks on the menu item DOT of the Safety and Environmental Regulations, the form as shown in Figure 5.16 below is displayed

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Figure 5.16: DOT Table of Safety and Environmental Regulations

**Environmental Concern:** These can be obtained from Atmospheric Fate, Terrestrial Fate and BOD tables.

When the user clicks on the menu item Terrestrial Fate of the Environmental Concern, the form as shown in Figure 5.17 below is displayed

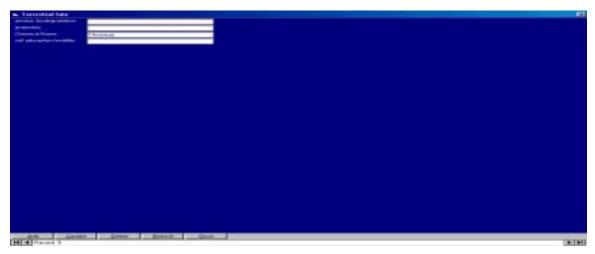


Figure 5.17: Terrestrial Fate Table

When the user clicks on the menu item Atmospheric Fate of the Environmental Concern menu selection the form as shown in Figure 5.18 below is displayed

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Figure 5.18: Atmospheric Fate Table

When the user clicks on the menu item BOD of the Environmental Concern pull, the form below in Figure 5.19 is displayed

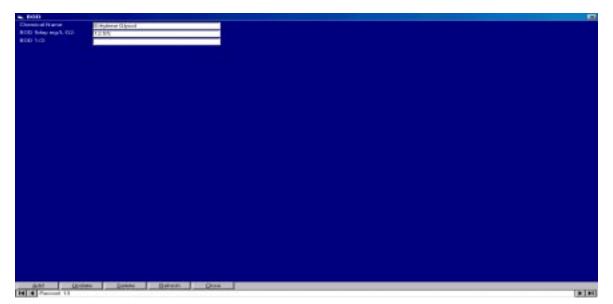


Figure 5.19: BOD Table

**Exposure Criteria:** These can be obtained from Worker Exposure Criteria (acute- STEL), Worker Exposure Criteria (acute-CEIL) and Worker Exposure Criteria (chronic-TWA) tables. Cadmium has a TWA TLV of 0.05 mg/m<sup>3</sup> and TWA PEL of 0.3mg/m<sup>3</sup>.

When the user clicks on the menu item Worker Exposure Criteria (acute-STEL) of the Exposure Criteria, the form as shown in Figure 5.20 below is displayed

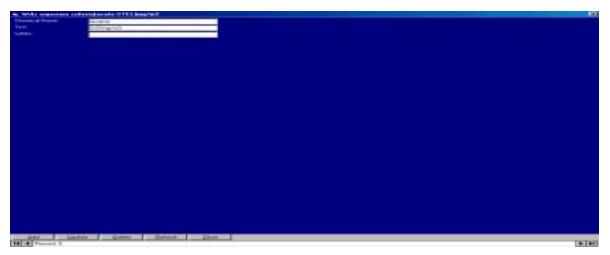


Figure 5.20: Worker Exposure Criteria (acute-STEL) Table

When the user clicks on the menu item Worker Exposure Criteria (acute-CEIL) of the Exposure Criteria, the form below in Figure 5.21 is displayed

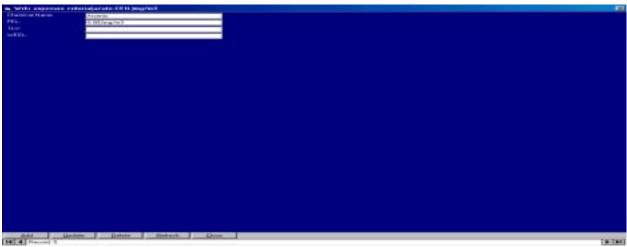


Figure 5.21: Worker Exposure Criteria (acute-CEIL) Table

When the user clicks on the menu item Worker Exposure Criteria (chronic-TWA) of the Exposure Criteria, the form below in Figure 5.22 is displayed.

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Figure 5.22: Worker Exposure Criteria (chronic-TWA) Table

When the user clicks on the menu item Search, of the Tools a form is displayed with the following three options

- j) By CAS#
- k) By Chemical Name
- 1) By Molecular Formula as shown in Figure 5.23 below

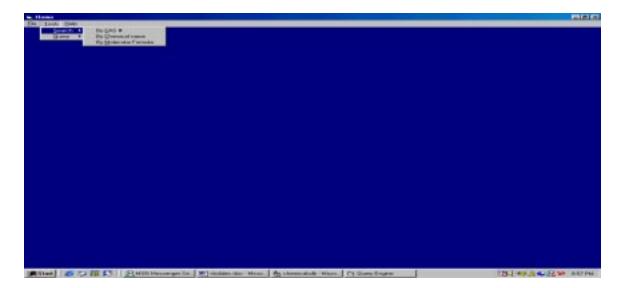


Figure 5.23: Pull down menu for Search

The user can get specific information desired such as, he can search for a specific Chemical and its properties from the database by inputting the CAS # or Molecular Formula and vice versa.

When the user clicks on "By CAS#" in the Search the form shown below opens. A drop down list of all CAS numbers in the database is provided at "Enter the CAS#" in the form at the top. User can chose any CAS# from the drop down list and get the corresponding properties of that particular chemical. The form is as shown in Figure 5.24 below

| Search by CASE                                  |                                   | 10               |
|---|-----------------------------------|------------------|
| Enter the CAS#                                  | 2                                 |                  |
| These are the prop-                             | attics of the element Label9      |                  |
| Boiling point                                   |                                   |                  |
| Melting point                                   |                                   |                  |
| Molecular weight                                |                                   |                  |
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Figure 5.24: Form to enter CAS#

Let's say the user chose '7429-30-5' from the drop down list of CAS numbers, the search program will search the database and gets the corresponding chemical name and its properties as shown in Figure 5.25 below

| <ul> <li>Searth by CMS8</li> </ul>              |                      |                                   |                 |
|---|----------------------|-----------------------------------|-----------------|
|   |                      |                                   |                 |
|   |                      |                                   |                 |
| Enter the CAS#                                  | SA0                  |                                   |                 |
|   |                      |                                   |                 |
| These are                                       | the properties of th | e clement Aluminum                |                 |
| 2012 Back                                       | - <u>19</u> 94-19    |                                   |                 |
| Boiling point                                   | 2327                 |                                   |                 |
| Melting point                                   | 660                  |                                   |                 |
| Molecular weight                                | 27                   |                                   |                 |
| Molecular Formula                               | AL                   |                                   |                 |
| <ul> <li>New Mathematical Statistics</li> </ul> |                      |                                   |                 |
|   |                      |                                   |                 |
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Figure 5.25: Chemical Name and its Properties

When the user clicks on "By Chemical Name" in the Search, a form shown below opens Figure 5.26. A drop down list of all chemical Names in the database is provided at "Enter the Chemical name" in the form at the top. User can chose any Chemical from the drop down list and get the corresponding properties of that particular chemical along with its CAS#.

| w Search to Cholese Base                                  | Aite               |
|---|--------------------|
| Enter the Chemical Name                                   |                    |
| These are the properties of the above compound with CAS # |                    |
| Boiling point   |                    |
| Melting point   |                    |
| Melting point<br>Molecular weight                         |                    |
| Molecular Formula   |                    |
|   |                    |
|   |                    |
|   |                    |
|   |                    |
|   |                    |
|   |                    |
|   |                    |
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Figure 5.26: Search by Chemical Name

Let's say the user chose 'Ethylene Glycol', the search program will search the database and gives the corresponding CAS# and its properties as shown in Figure 5.27 below

| S. Toursh by Chemical Haves    |             |                       |                             |                | EIWIN .        |
|--------------------------------|-------------|-----------------------|-----------------------------|----------------|----------------|
| Enter the Chemical             | Name        | Ellylene Glyco =      |                             |                |                |
| These are the propertie        | a of the ab | ove compound with CAS | # 107-21-1                  |                |                |
| Boiling point                  | 198         |                       |                             |                |                |
| Melting point                  | -13         |                       |                             |                |                |
| Molecular weight               | 62          |                       |                             |                |                |
| Molecular Formula              | C2H6O       | 2                     |                             |                |                |
|                                |             |                       |                             |                |                |
|                                |             |                       |                             |                |                |
|                                |             |                       |                             |                |                |
|                                |             |                       |                             |                |                |
|                                |             |                       |                             |                |                |
|                                |             |                       |                             |                |                |
|                                |             |                       |                             |                |                |
|                                |             |                       |                             |                |                |
| (MINAN)   40 734 88 83   1 144 | and//eleme  | William Marcard West  | To a American Statement VI. | To Manufington | Bi Berre saire |

Figure 5.27: Form to choose a Chemical

When the user clicks on "By Molecular Formula" in the Search, the form shown below Figure 5.28 opens. A drop down list of all Molecular Formulas in the database is provided at "Enter the Molecular Formula" in the form at the top. User can chose Molecular Formula of any Chemical from the drop down list and get the corresponding properties of that particular chemical.

| . Investe ine Holesador Freenala       |  |                               |                        |
|--|--|-------------------------------|------------------------|
| Eater the Molecular form               | ula 🗾  |                               |                        |
| These are the properties of th         | e compound with above molecular formula      |                               |                        |
| Boiling point                          |  |                               |                        |
| Melting point                          |  |                               |                        |
| Molecular weight                       |  |                               |                        |
|  |  |                               |                        |
|  |  |                               |                        |
|  |  |                               |                        |
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Figure 5.28: Form to Search by Molecular Formula

Let's say the user chose 'C2H6O2' which is the molecular formula of Ethylene Glycol. The search program will search the database and gives the corresponding chemical name and its properties as shown in Figure 5.29 below

| in. Lowerk by Halesake Farmals   |   |                 |                |
|--|---|-----------------|----------------|
|  |   |                 |                |
| Enter the Molecu   | lar formula C2116O2                               |                 |                |
|  |   |                 |                |
| These are the proper   | ties of the compound with above molecular formula | Ethylene Olycol |                |
| Boiling point  | 198   |                 |                |
| Melting point  | -13   |                 |                |
| Molecular weight   | 62  |                 |                |
|  |   |                 |                |
|  |   |                 |                |
|  |   |                 |                |
|  |   |                 |                |
|  |   |                 |                |
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Figure 5.29: Search Results Form

When the user clicks on the menu item Query of the Tools pull down menu the form as in Figure 5.30 shown below is displayed with the following seven options

- a) On Molecular Weight
- b) On Boiling point
- c) On Melting point
- d) Molecular formula
- e) Save query as and
- f) Print

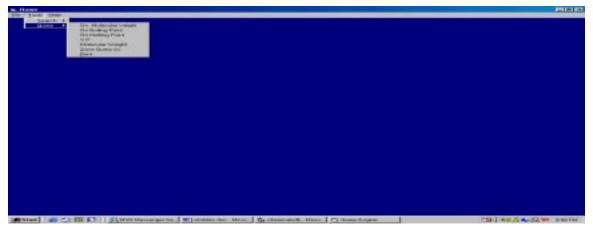


Figure 5.30: Pull Down Menu

Querying with molecular Weight form looks like the Figure 5.31 shown below. This is useful when he wants chemicals and its properties with molecular weight greater or less than certain value.

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|---|-----------------|-------|--|-------------------------|-----------------------|--------------------------------|---|
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| Maindacain 13 Acesba  | 15446-1558      |       | Address of the second  | 0.52                    | ABI                   | 100.000                        | 154.00  |
| 1000  | 7480 3912       |       | 100.0  | 200                     | ide .                 | 1,000,000                      | 494.00  |
| a desident  | 10002074        |       | compound.  |                         |                       |                                |   |
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Figure 5.31: Molecular Weight Query

Let's say the user enters a value of 100 and he selects greater than, he can do this as shown below Figure 5.32

| second PLanar            | STATE MANUAL COLUMN   |                                  | Comment of the second |              |        | or Frank Flamps                |  |
|--------------------------|-----------------------|----------------------------------|-----------------------|--------------|--------|--------------------------------|--|
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| and and                  | 1000-02-02            | marks.                           | 112.00                | Ea           | 767.00 | 321.08                         |  |
| A DESCRIPTION OF         | 1309-36-0             | Females company                  | 121100                | FRB2         |        |                                |  |
| Internet Children in     | 7445.75.0             | All and the storing              | 110.00                | ACD .        | 105.00 | 194.00                         |  |
| a Chicode                | 1640.05.7             | Contractory (1978) Incontractory | 114.00                | ELLER.       | 126.00 | 20100                          |  |
| east Childrender         | mestere               | pressed                          | 140.00                | A40          |        |                                |  |
| engelik (s               | 1717-08-0             | Farmer compress                  | 101.00                | 16390        |        |                                |  |
| -                        | 1436-531<br>1217-62-5 | and a                            | 207 80                | Pb.          | 174538 | 246.04                         |  |
| rendere Disk             | 771745-9              | Parameter and strength           | 202.00                | Fe304<br>400 |        |                                |  |
| and the building         | 100110.2              | ingenic congre                   | 54.00                 | CLANDING.    |        |                                |  |
| And in the second second | 100 101               | angent total                     | 110.00                | ETUHONIN     |        |                                |  |
| statistics.              | 16.051                | engene constant                  | 214.00                | 1294-0421-2  | 254.00 |                                |  |
|                          |                       |                                  |                       |              |        |                                |  |
|                          |                       |                                  |                       |              |        |                                |  |

Figure 5.32: Search Criteria Form.

After the selection on clicking Enter all the chemicals with molecular weight greater than 100 and their corresponding properties are displayed. This can be seen from the form below Figure 5.33

| International Science         International Accession Descent DescentDescent DescentDescent Descent Descent Descent DescentDescent Des   | Junitation         JULE 305         mail         JULE 305         Model         MODE           Instanding         JULE 305         mail         JULE 305         Model         MODE           Instanding         JULE 305         mail         Model         Model         Model           Instanding         Model         Model         Model         Model         Model         Model           Instanding         Model         Model         Model         Model         Model         Model         Model           Instanding         Model         Model         Model         Model         Model         Model  |                     |          |        |        |                  |        | ۰  | Insertities | 100              |                        |
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Figure 5.33: Search Results Form

Note: the query is executed and the results will be displayed only after the user enters the specified value and clicks "Enter"

Querying with Boiling Point form looks like the Figure 5.34 shown below. This is useful when user wants chemicals and its properties with boiling point greater or less than certain value.

| C 101<br>779 90 1<br>27 9 9<br>80 90 2<br>80 90 3<br>20 2 1 9<br>90 9 2 1<br>90 9 1<br>90 9 2 1<br>90 90 90 90 90 90 90 90 90 90 90 90 90 9  | Anna and Anna anna a   |   | 440   | Sec.   | 14.25  |
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7:99-4<br>9:94-9<br>9:95-1<br>9:95-1<br>9:95-9<br>6:39-1<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9:95-9<br>9: | 12.81         International<br>Status         International<br>Status           12.11         SSC3         Market<br>Market<br>Status         Exat<br>Status           12.11         Market<br>Market<br>Status         Exat<br>Status         Exat<br>Status           12.12         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| 17.33-0         Approximit         0.30           17.11         Approximit         0.31           18.11         Approximit         0.31           18.12         Approximit         0.31           18.13         Approximit         0.31           18.14         Approximit         0.31           18.15         Approximit         0.31           18.15         Approximit         0.31           18.16         Approximit         0.31           < | 12.81<br>(2011)         12.81<br>(2011)< | 12.93         12.93         12.93         12.93         12.93         12.93           12.91         Aug         12.93         Aug         12.93         12.93           12.91         Aug         Aug         12.93         Aug         12.93           12.91         Aug         Aug         12.93         Aug         12.93           12.92         Aug         Aug         12.93         Aug         12.93           12.93         Aug         Aug         12.93         Aug         12.93           12.94         Aug         Aug         12.93         Aug         11.93           12.94         Aug         Aug         12.94         Aug         11.93           12.94         Aug         Aug         12.94         Aug         11.93           12.94         Aug  |

Figure 5.34: Boiling Point Query

Let's say the user enters a value of 1000 and he selects lesser than, as shown below- Figure 5.35

| Lang Lin   | CALCULATION IN CONTRACTOR  | and a  | 21100             | w.           | TRACKS PROFILE | The second se  |
|--|--|--|-------------------|--------------|----------------|--|
| and the second second  | 107108892  |  |                   |              |                |  |
| angene Brenider  | 2007.06.9  | and an and an an and   | CALL OF THE OWNER | in the later |                | and the second se  |
| untrum Ditanter  | 12446-1044   | Distantinan some   | 1121-04           | AND I        | 100.00         | 104.00   |
| the second s   | 12440.001  | A CONTRACTOR OF A CONTRACTOR A CONTRA   | 38.01             | As .         | 1 300 66       | ADD DO NOT   |
| design of the local division of the local di | TORDUTE:   | and a second sec |                   |              |                |  |
| man Carlanda   | 5000 + 00 +  | and the second s | 3654              | 1004         |                |  |
| a de la calendaria de la c  | 1440403  |  | 20130             | 20           | 312            | 105.000  |
|  | 794047-1   |  | 30.00             | <u>10</u>    | 104210         | 1 1411 000   |
| 10 - 10 - C  | 744058   | 1999 August 1  | H UU              | 51           | 205.00         | 100100   |
| mer Debi   | 10001088   | investment .   | 102               | 100          |                | A CONTRACTOR OF  |
| a delivery little of   | THE PARTY CONTRACTOR   | August cond  | 1000              | ALC: NO.     | 100.00         | 11000  |
| States Charles   | TRACING MARKED   | Carlos Links   | U LO MA           | Partie a     | 11000          | 11100  |
| State Date har   | 1146.201   | Tarine Links   | 5100              | Tell.        |                |  |
| Contract of Contract of Contract   | SHOTH LAND   | Patrone London   | 1000              | 100          |                |  |
|  | CHERTER BARTAL<br>TOPOLO   | Contraction of the local division of the loc | 100.00            | CHERT        |                |  |
| House a  | CONTRACTOR .   | French Linnand   | 1900/20           | Frank I      |                |  |
| 1000   | 17439-00-0   |  | Dis Mil           | 24           |                |  |
| The state of the s |  |  | 307.48            | 19           | 1163.58        | 208.00   |
| manner of all  | 10004-00-4   |  |                   |              |                | CONTRACTOR DESCRIPTION   |
| to accelerate to   | A RECORD DOM: NO.  | THE PARTY CONTRACT   |                   |              |                |  |
|  | 81500.024  | Congress, company  |                   |              |                | And a local division of the local division o |
| daments of the second  |  | and the second se  |                   |              |                |  |
| the second second  | CONTRACTOR OF CONT   | Review restant   | 1000              | EHELD.       |                |  |
| All all  | Construction of Construction o | Property Line and  | Sales -           |              |                |  |
| ball lawse   |  | composed in the second   | 242000            | April 1      |                |  |
| and the Production of  | eg beschritten   | Contract of the local diversion of the local  |                   | 1.0.00       |                |  |
|  |  |  |                   |              |                |  |

Figure 5.35: Boiling Point Criteria

|   | What a  | e the con | ipounds whose Boili  | ng point is                                    | <ul> <li>Greater</li> <li>Instar th</li> </ul>   | 1000   |   |
|---|---|-----------|--|--|--|--|---|
| anana Crissia<br>atau Crissia<br>atau Good<br>ata Good<br>- Diana<br>dian | 1446-X60<br>507-25-1<br>55-26-1<br>N445-4510<br>M445-4510 | been a    | Automatication of the second s | 112140<br>805 18<br>196 00<br>114 00<br>112 90 | ALC<br>ALC<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIST<br>CONSIS | An Estang Part Lating P<br>Million<br>Part and<br>Part and<br>Part and<br>Net an | And Flamps - Holding Fried In<br>196 July<br>171 July<br>2003 Mi<br>2017 Mi |
|   |   |           |  |  |  |  |   |
|   |   |           |  |  |  |  |   |
|   |   |           |  |  |  |  |   |
|   |   |           |  |  |  |  |   |

The results are as shown below Figure 5.36

Figure 5.36: Query Results

Querying with Melting Point looks like the Figure 5.37 shown below. This is useful when user wants chemicals and their properties with melting point greater or less than certain value.

| Fornical Flamm  |            | (Della |                       | Vinaerren Fallatori |        |  | Stating Parts Stating Paint Parage |   |
|---|------------|--------|-----------------------|---------------------|--------|--|------------------------------------|---|
|   | 1271058-2  |        | 1000                  |                     | 2100   | M  | 22327 M                            | 111.00  |
| Annenala Rosende  | 7723-15-1  |        | Harmen core           |                     | 36100  | ARCE   |                                    |   |
| American Disorde  | 7446-754   |        | Aleman com            |                     | 129.08 | All I  | 105.04                             | 194.00  |
|   | 746385     |        | Contra Cont           |                     | 70.00  | 4  | 1303.00                            | 454.00  |
| and an  | 1100101-4  |        | and the second        |                     |        |  | 1.000.00                           | 100.00  |
| ear Lalaia  | 1.080-024  |        | ranged                |                     | 10.00  | 001  |                                    |   |
| and an and a second   | MINU       |        | and a                 |                     | 11208  | G4   | 19120                              | 225.00  |
| 1 Think   | 244242-3   |        |                       |                     | NUM    |  | 242.00                             | 11656.000   |
| 10.00   | 7940/8018  |        | 1000                  |                     | 66.00  | Ga   | 206.00                             | 100100  |
| and Date  | TATIF BEE  |        | and the second second |                     | 80.00  | 640  |                                    |   |
| na sidana   | 19021164   |        | distanting over       |                     | 102.08 |  |                                    |   |
| spleme Libyersd   | 110201     | 80.22  | district 1            |                     | 162-00 | COHEDO   | 1910                               | 11.00   |
| ne mitarie Onella   | STITUT A   |        | Forme tanget          |                     | 212-08 | Valle  |                                    |   |
| move Quarter New Owle   |            |        | Farmer ranges         |                     | 72:00  | Fel.   |                                    |   |
| non older for Mys   |            | 1474   | Terms make            |                     | 1600   | 746  |                                    |   |
|   | 78-466     | 10710  | intel gen             |                     | 16.00  | 0.000  |                                    |   |
| rhéte   | 1011404    |        | Farmer Langes         |                     | 1993   | 3680   |                                    |   |
|   | 420-004    |        | inter a               |                     | 56.00  | Fe   |                                    | Concernent in the second se |
| et.   | 7439-024   |        | 1000                  |                     | 301.00 | <u>p</u>   | 1140.00                            | 328.00  |
| englandsch Mitters  | 100045314  |        | and the second second |                     |        |  |                                    |   |
| e acceptant   | 0100012-0  |        | Ingles Limbu          |                     |        |  |                                    |   |
| the second se | e contra - |        | again compil          |                     |        |  |                                    |   |
| in the second second  | 120-24     |        | Parried Langer        |                     | 100    | Fell   |                                    |   |
|   | 9008-00-4  |        | STATISTICS COMPANY    |                     |        | 7914   |                                    |   |
| en Distante   | 276210-6   |        | instanted.            |                     | 10.900 | Agd  |                                    |   |
| advers" slysteres   |            |        | mumb seman            |                     |        | 10101  |                                    |   |
|   |            |        |                       |                     |        | Company of the local division of the local d |                                    |   |

Figure 5.37: Melting Point Query

Let's say the user enters a value of 500 and he selects greater than, the following results are displayed as shown in Figure 5.38 below

|            | What are the                        | compounds whose r | menting point is                  | reater than 500                                       |                              |
|------------|-------------------------------------|-------------------|-----------------------------------|---|------------------------------|
| nini Aanti | Callon Unite<br>Data 262<br>DC2 264 | Gauduales Arizon  | Trans. Scores Historica (cf. Mont | Tana Canada Balana, Panta Balana,<br>Tanzar<br>Tanzar | Rent Earlyse Directory Frant |
|            | 1443.534                            |                   |                                   | 211.0   | 1092                         |
|            | naters                              |                   | NH D.                             | 244.00  | 180.0                        |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |
|            |                                     |                   |                                   |   |                              |

Figure 5.38: Results of Query

The user has an option of finding out what all compounds belonging to a certain family by the following query Figure 5.39

| Torne of Harris   |                     |  |         |             | THE STORE IN STORE  |   |
|---|---------------------|--|---------|-------------|---|---|
| diam'r a llenar a lle   | 104105905           | and the second second second second  | 100 100 | 1.4         | 12057-00  | 964.00  |
| Annual and address  | 12779-9612          | 1990   |         |             |   |   |
| Alaminan Birthide   | 7727-45-3           | Address at 1 and   | 367.00  | A6.1        |   | and the second se |
| Adaption of Delayable   | 7446-20-8           | Adapterian cares   | 100.00  | VARCE       | Tancas  | 194100  |
| Asserve)  | 7440-30-2           | 0400   | 15.80   | Ai .        | 1900.00   | 058100  |
| Automation and | 100014              | and got and  |         |             |   |   |
| Report Carbon   | 12008-024           | 200400400  | 255.80  | 004         |   | ALC: NO. OF CO.   |
| Centralized   | 7680-6218           | THE R. LEWIS CO.   | 112.00  | 124         | NUM   | 121.00  |
| Olivite   | 2440.410            | a second   | 32.00   | 0           | 342.00  | 11901-00  |
| Segure 2.   | Next Hore           | and a second   | 84.80   | Gu.         | 2010.00   | Noted on the  |
| Case+ 0+0   | 1917-00-0           | contract and   | 300.00  | 1550        | THE OWNER AND A DESCRIPTION OF | and the second  |
| Constant .  | 1302744             | Adventure comp   | 100.00  | Address     |   | the second s  |
| Water of Chaird   | 11152510 00000      | accelo 000   | 31200   | E HER       | 190300  | 1010  |
| encardente L'arte   | 131761-0            | FRIER DEPART   | 210.00  | Participa - |   |   |
| tenas Dale For Or   | +411345-251         | Freeze Longon  | 12.00   | 10.00       |   |   |
| annes taitige i se bis  |                     | Family company   | 145.80  | Yel         |   |   |
| 1000  | THEFT PROPERTY      | Set set  | 1998    | 1998 L      |   |   |
| Hartaniae   | 1317 60-8           | Family complete  | HARD    | Maddi S     |   |   |
| 192   | 19 Martine          |  | 20.00   | - B         | 1242.00   | 1800  |
| -   | 2436.651            | and all a second | 207.00  | 16          | 1240.005  | 101101  |
| The second street   | 120341014           | 200 C  |         |             |   |   |
|   | - Income the second | subarts conder   |         |             |   |   |
| Participation in the Party Name   | ATTNEST 4           | ingent interest  |         |             |   |   |
|   | 133536-3            |  | URDA .  |             |   |   |
| A distant   | 905.415             | Press internet   | unu     | Vera .      |   |   |
| Like Okath  | 2503-854            | Contract and   | 140.00  | 190         |   |   |
|   |                     | compared managed   | 10000   | Cartas      |   |   |
| And own Columbus a  |                     |  |         |             |   |   |

Figure 5.39: Select Any Class Form

|                          |                                       |                            | alcohol  |         |                |            |  |
|--------------------------|---------------------------------------|----------------------------|--|---------|----------------|------------|--|
|                          | · · · · · · · · · · · · · · · · · · · | فبحج ومستحد والمحاوية      | alley  |         |                |            | a second a second s |
| Inneral Alarm            | Transfer 1                            | inite Caus                 | Aluminum compo   | And and | of Makeula Sta | LILLI CO.  | ing Point Earlyse Diretting Poll +   |
| Amount the               | LITTE AGE                             | also .                     | compound   |         |                |            |  |
| Antonio Contracto        | 1021450                               | 404                        | a second s  |         | 148/2          |            |  |
| Annual Victoria          | 1445-754                              | and a second               | Ferrous compound   | 1 1000  | and it         |            | 154.00   |
| unital l                 | 1999/06/2                             | 1004                       | intert gas   |         |                | Table (db) | 100100   |
| Uddeler                  | 1002214                               | Solution in the local data | metal  |         |                |            | the second s |
| oon Letide               | 12065-324                             | 0.04                       |  |         | 01+            |            |  |
| adapt.                   | Description In                        |                            | organic compound   |         |                | 367.60     | 21 30  |
| Denetare                 | 14604073                              | janta.                     | CALCULATION DESCRIPTION OF THE OWNER | 12.00   | D.             | 3942100    | 1805-00  |
| 040#F                    | 100504                                | 1444                       |  | 원분      | 100            | 1995.00    | 1000.00  |
| neger Suite              | 1302746                               | Anna                       |  | 100.00  | 140            |            |  |
| Taken Glob               |                                       | ACT (0.00)                 | 4 (0.0)  | 102100  | LINE CO.       | 199.00     | 1000   |
| accentance Darks         | 131741.0                              |                            | 1 10.21  | 202     | Failed         |            | 1100   |
| suma Date Invitin        |                                       |                            |  | 72.48   | 140            |            |  |
| was added on the         |                                       |                            | Longer   | THE R.  | 141            |            |  |
|                          |                                       | cini) Saar                 |  | 10.00   | 0.001          |            |  |
| Second Ball              | CHIVERS                               |                            | Long and   | 140.00  | 1000           |            |  |
|                          | 14254894                              | 144                        |  | 16.00   | Fe             |            |  |
| AND                      | 7405-824                              | 1444                       |  | 202 10  |                | 04000      | 209.00   |
| Ampress allost           | 12506514                              | 48.6                       |  |         |                |            |  |
| hip manufacture          | a .                                   |                            |  |         |                |            | The second s |
| Series 2                 | 11789-374                             |                            | 6.00040  |         |                |            |  |
| National Address (Salari |                                       | (RE                        |  |         |                |            |  |
| -                        | 1209-38-8                             |                            | 1 Factors  | 128.88  | THE            |            |  |
| And Oaksta               | 7790-884                              |                            | L Longer   | 141.00  | 440            |            |  |
| And Concerns             |                                       | 2014                       |  | THEIR   | A State        |            |  |
|                          |                                       |                            |  |         | 1.44.64        |            | T  |

Figure 5.40 below shows the drop down list of various classes of chemicals present

Figure 5.40: Drop down list of various classes of compounds

Lets say the user selected "organic compound", then the following results are displayed Figure 5.41

| 84   | dect a Class :   | ismic comp                  | ount -           |  |                  |                |  |
|--|--|-----------------------------|------------------|--|------------------|----------------|--|
| n and farm<br>all<br>all<br>all<br>all<br>all and far to be<br>all for to be<br>all for to be<br>all for to be | 0<br>1 mg 014<br>1 | Apple Parts<br>Spire Street | Colorer Millions | Carris<br>Carris<br>Carris<br>Carris<br>Carris<br>Carris | NUMBER OF STREET | Det Nege Makey |  |
| d to another   | 14.20.4  |                             | he a             | Carlot La  | 124.00           |                |  |
|  |  |                             |                  |  |                  |                |  |
|  |  |                             |                  |  |                  |                |  |
|  |  |                             |                  |  |                  |                |  |
|  |  |                             |                  |  |                  |                |  |

Figure 5.41: Results of Query

Querying with Vapor pressure form looks like the Figure 5.42 shown below. This is useful when he wants chemicals and their properties with Vapor pressure greater or less than certain value.

| Instal at Plant   | College Bandes | Checkettel, Voutcom,   | Patrane Holesale | of the second section. | INAN TORONT. PLANT MARKING, PLANT | in Farge Monty Ford &   |
|---|----------------|--|------------------|------------------------|-----------------------------------|---|
| Lowner aller  | 12779-90-2     | and the second s |                  |                        |                                   |   |
| Anterior Determine  | 2022-06.3      | Addressed comp   | 1927.00          | 2480                   |                                   |   |
| Arranan Orienida  | THE THE        | Address comp   | 1700             | - Min                  | 10000                             | 194.00  |
|   | THE NE .       | and a second sec | 100              | 144                    | 1200.00                           | 100010  |
| denis.  | 1205214        | CONSISTENCE IN CONSISTENCE   |                  |                        |                                   | The second se |
| unus Carbido  | 12003100       | dompound   | 怒曲               | 1000                   |                                   |   |
| almian.   | 1940-611       | 224  | 112.88           | 54                     | 101.00                            | 401.00  |
| konstan.  | THEFT I        |  | 12.00            | 9                      | 264210                            | 1900-01   |
| Marth .   | 746554         | 444.00   |                  | - 24                   | 2001                              | 1000.00   |
| opper Crate   | 192386         |  |                  | No.                    |                                   |   |
| tion bat  | 1305544        | Addressed powers   | 110.00           | 14401                  |                                   |   |
| Rodere Storad   | 187251 20003   | ROAD UNI   | 188              | 20440                  | 1909                              | 2000  |
| stress light law  | 158201         | Cartan Integra   | 120              | Fed                    |                                   | 100 C   |
| and a state law   | 121323 3454    | Carloss Longer   |                  | 140                    |                                   |   |
| and the second second   | 75454 1010     | Start One  | 122              | Citor:                 |                                   |   |
| The second se | 19768          | Cartan Lange   | 100.00           | 920                    |                                   |   |
| -   | 1923-034       |  | 16.00            |                        |                                   |   |
| ALC: NOT  | 203431         | 1444   | 107.04           | 14                     | 1100.000                          | 100.00  |
| angenera alter-   | 12684304       | 200  |                  |                        |                                   |   |
| or samples as   | 8              | States Linguist  |                  |                        |                                   |   |
| Sectors 1   | 11701-114      | Country, Linkson   |                  |                        |                                   |   |
| and the second second   |                |  |                  |                        |                                   |   |
| pater .   | 120930-0       | Consul Lineard   | 120.00           | 1442                   |                                   |   |
| die   | 1006-611       | organity, company  |                  |                        |                                   |   |
| No Citato   | 2011/014       | -composed  | 160.00           | 40                     |                                   |   |
| Instant Advent  | 1 100011010    | Augustur australität   |                  | a carden               |                                   |   |

Figure 5.42: Vapor Pressure Query

For example if 0 is entered and greater than is chosen as the option then the following results are displayed Figure 5.43

| theraping with Van  |                |  | ~    |                             |                          | 110                 |
|---|----------------|--|------|-----------------------------|--------------------------|---------------------|
|   | What are the c | ompounds whose Vapor Pressure i          | •    | Greater than<br>lesser than | 8                        |                     |
| Control of Alastics<br>Des. Officers<br>Industrian config | 544 05 F       | La L | 1000 |                             | In the local division of | ACCESSION ACCESSION |
|   |                |  |      |                             |                          |                     |
|   |                |  |      |                             |                          |                     |
|   |                |  |      |                             |                          |                     |
|   |                |  |      |                             |                          |                     |
|   |                |  |      |                             |                          |                     |
|   |                |  |      |                             |                          |                     |
|   |                |  |      |                             |                          |                     |
|   |                |  |      |                             |                          |                     |
|   |                |  |      |                             |                          |                     |
|   |                |  |      |                             |                          |                     |

Figure 5.43: Results of Query

When user clicks on the "help" of the main menu the following screen pops up which helps the user to understand the front end well. Helps him in accessing data using front end This can be seen from the form below Figure 5.44

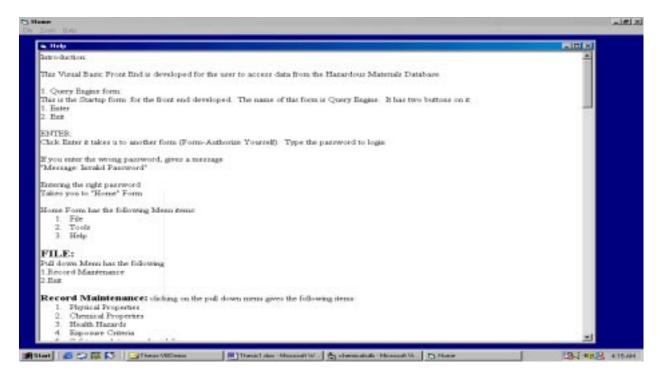


Figure 5.44: Help

## **CHAPTER 6: CONCLUSIONS AND FUTURE WORK**

#### **6.1 Conclusions**

A Hazardous Materials Database (HMD) was developed. HMD stores physical and chemical properties of the chemicals along with their CAS numbers. It also stores data on health hazards, safety regulations and guidelines set by agencies like ACGIH, EPA, and OSHA on exposure criteria and environmental concern. Since this database has all the properties pooled at a single place, it saves look up time. The HMD is made available to a user through a front end developed in Visual Basic. The Graphical User Interface of Visual Basic is easy to use.

The HMD presently has a total of 34 hazardous chemicals with all the above listed properties. The names of the chemicals include aluminum, aluminum alloy, aluminum bromide, aluminum chloride, arsenic, asbestos, boron carbide, cadmium, chromium, copper, copper oxide, corundum, ethylene glycol, ferrosoferric oxide, ferrous oxide, ferrous sulfide, freon, hematite, iron, lead, manganese alloy, oxy acetylene, plastic, platinum-niobium alloy, pyrite, rubber, silver chloride, styrofoam, titanium, titanium alloy, tri butyl tin hydride, tri butyl tin oxide, tri butyl tin, zinc chloride. The Hazardous Materials Database is presently being applied to ship dismantling. By knowing various properties of the chemical the necessary safety measures can be implemented which help in safe handling and disposal of the product, without any detrimental impact on the environment.

#### 6.2 Future work

The database can be expanded to Non Hazardous Materials. Apart from the disposal application the HMD database can also be used for recycling of a retired object. This database could be web based so that, it will be easy to access for anyplace and anytime.

The front end of the database is designed only for physical properties. In future the front-end design can be expanded to chemical properties, health hazards, safety regulations and guidelines exposure criteria and environmental concern.

The database can be used for the entire Life Cycle Design of a Product, from the beginning stages, that is, collection of raw materials to disposal of the product, including recycling. This is illustrated below.

## Expansion of Database to be used over the Life Cycle of a Product:

Database is designed in such a way that it can be useful over the entire life cycle of a product. To demonstrate this we have added four more tables to the database as shown below, for the example of a ship scrapping.

The different tables added are as follows:

- Main Table
- Ships Table
- Dismantling sites table and
- Cutting technology table

Main Table which has the following fields

- Chemical Name
- Cutting technology
- Ship Type
- Country

Ships table has the following fields:

- Name
- Ship type
- Flag state
- Dead Weight (DWT)
- Build Date
- Retrofit
- Estimated Volume of Hazardous Materials

Dismantling sites Table has the following fields

• Country

- City
- Capacity
- Safety Record
- Hazardous Material Handling Capability
- Health Hazards
- Labor Cost

Cutting Technology Table has the following fields

- Cutting Technology
- Cutting tool
- Energy Requirement
- Energy Cost

This Database can be used to get many kinds of information regarding a ship, like its location, name of the ship, type of the ship, the different cutting technologies used etc. The whole history of the ship, how it is constructed, what are the hazardous materials that are released during disposal, safety regulations to be followed, health hazards from chemicals released and much more.

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Bretherick's Reactive Chemical Hazards Database Version 2.0

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## **APPENDIX 1 - ACUTE SYMPTOMS TABLE**

| licrosoft Access - [acute symptoms :      |  |                               |   |
|---|--|-------------------------------|---|
| <u>File Edit View Insert Format Recor</u> |  |                               |   |
| • 🖬 🕘 🔕 🖤 👗 🖻 🛍 🖄                         | y 🕫 🚷 🛃 🕻 🏹 🛅 🖓 🛤                      | 🕨 🕅 🛅 🚈 🛛 🕄 🗸                 |   |
| Chemical Name                             | inhalation                             | ingestion                     |   |
| E Aluminum                                | yes                                    | No                            | - |
| E Aluminum alloy                          |  |                               |   |
| E Aluminum Bromide                        |  |                               |   |
| Aluminum chloride                         | yes                                    | yes                           |   |
| Arsenic                                   | yes                                    |                               |   |
| Asbestos                                  | yes                                    |                               |   |
| Boron Carbide                             |  |                               |   |
| E Cadmium                                 | yes                                    | yes                           |   |
| Chromium                                  | yes                                    |                               |   |
| Copper                                    | yes                                    |                               |   |
| Copper Oxide                              |  |                               |   |
| Corundum                                  |  |                               |   |
| Ethylene Glycol                           | no                                     | yes                           |   |
| Ferrosoferric Oxide                       |  |                               | - |
| Ferrous Oxide                             |  |                               |   |
| Ferrous Sulfide                           |  |                               | - |
| Freon                                     |  |                               | - |
| Hematite                                  |  |                               | - |
| Iron                                      | yes                                    |                               | - |
| Lead                                      | ,                                      |                               | - |
| Manganese alloy                           |  |                               | - |
| Oxy-acetylene                             |  |                               | - |
| Plastics                                  |  |                               | - |
| Platinum-Niobium                          |  |                               | - |
| Pyrite                                    |  |                               | - |
| Rubber                                    |  |                               |   |
| Silver Chloride                           |  |                               |   |
| Styrofoam(Polystyrene)                    |  |                               |   |
| Titanium                                  | yes                                    |                               |   |
| Titanium alloy                            | ,                                      |                               |   |
| tributyl                                  |  |                               |   |
| tributyl tin hydride                      |  |                               |   |
| tributyl tin oxide                        |  |                               |   |
| Zinc Chloride                             | yes                                    | yes                           |   |
| rd: II - II | · ·                                    |                               |   |
| asheet View                               | 01.01                                  |                               |   |
|   | .doc - Microsof 👼 APPENDIX.doc - Mic 🗧 | VDemo 🛛 🔂 Topy of Materialsdb |   |

### **APPENDIX 2 – ALLERGEN TABLE**

| • 🖬 🖨 🖪 🖤 👗 🖻 🖻 🖉 🕫   | 🛞 🛃 🖓 🚡 🗸 👫 🕨 | < 🗇 \land - 🛛 - |           |
|---|---------------|-----------------|-----------|
| Chemical Name   | skin          | respiratory     | other     |
| Aluminum  |               | yes             | Brain     |
| ∃ Aluminum alloy  |               |                 |           |
| E Aluminum Bromide  |               |                 |           |
| Aluminum Chloride   |               |                 |           |
| 🗄 Arsenic   | yes           | yes             | Liver     |
|   |               | yes             |           |
| 🗉 Bron Carbide  |               |                 |           |
| 🗉 Cadmium   |               | yes             | Liver     |
|   | yes           | yes             | Kidneys   |
| ± Copper  | yes           | yes             |           |
| 🗉 Copper Oxide  |               |                 |           |
| 🗉 Corundum  |               |                 |           |
|   | yes           | no              | Eyes      |
|   |               |                 |           |
|   |               |                 |           |
|   |               |                 |           |
| ± Freon   |               |                 |           |
| ± Hematite  |               |                 |           |
| ± Iron  |               | yes             |           |
| ± Lead  |               |                 |           |
| ± Manganese alloy   |               |                 |           |
|   |               |                 |           |
|   |               | yes             | eyes,nose |
|   |               |                 |           |
|   |               |                 |           |
| H     Rubber     Second Seco |               |                 |           |
| E Silver Chloride   |               |                 |           |
| ∃ Styrofoam(Polystyrene)  |               |                 |           |
| ± Titanium  |               | yes             |           |
| ± Titanium alloy  |               |                 |           |
| ± tributyl tin  |               |                 |           |
|   |               |                 |           |
| ± tributyl tin oxide  |               |                 |           |
| ± Zinc Chloride   |               |                 |           |
| cord: Ⅰ 	   1 	 ▶ ▶ ▶ ★ of 34   |               |                 |           |

# **APPENDIX 3 – AQUATIC FATE TABLE**

| Microsoft Access - [Aquatic fate : Table   | 9]  |                           |                    |                  | _ B ×               |
|--|---|---------------------------|--------------------|------------------|---------------------|
| Eile Edit View Insert Format Records   | <u>T</u> ools <u>W</u> indow <u>H</u> elp |                           |                    |                  | _ 8 ×               |
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| Chemical Name  | biodegrade                                | adsorp to sediment        | , photolysi        | s                | photo-oxidation 🔺   |
| 🕨 🗉 Aluminum   |   |                           |                    |                  |                     |
|  |   |                           |                    |                  |                     |
| <ul> <li>Aluminum Bromide</li> </ul>   |   |                           |                    |                  |                     |
| E Aluminum Chloride  |   |                           |                    |                  |                     |
|  |   |                           |                    |                  |                     |
| 🗄 Asbestos   |   |                           |                    |                  |                     |
| 🗉 Boron Carbide  |   |                           |                    |                  |                     |
| 🗉 Cadmium  |   |                           |                    |                  |                     |
| E Chromium   |   |                           |                    |                  |                     |
| 🗉 🗉 Copper   |   |                           |                    |                  |                     |
| 🗉 🗉 Copper Oxide   |   |                           |                    |                  |                     |
| 🗉 🗄 Corundum   |   |                           |                    |                  |                     |
|  | yes                                       | No                        |                    | insignifi        | cant                |
| 🗉 Errosoferric Oxide   |   |                           |                    |                  |                     |
| 🗉 🗉 Ferrous Oxide, Iron Oxide  |   |                           |                    |                  |                     |
| 🛨 Ferrous sulfide,Iron Monosulfide   |   |                           |                    |                  |                     |
| 🗄 🗄 Freon  |   |                           |                    |                  |                     |
| Hematite     Hematite |   |                           |                    |                  |                     |
| ± Iron   |   |                           |                    |                  |                     |
| ± Lead   |   |                           |                    |                  |                     |
|  |   |                           |                    |                  |                     |
|  |   |                           |                    |                  |                     |
|  |   |                           |                    |                  |                     |
|  |   |                           |                    |                  |                     |
| ∃ Pyrite   |   |                           |                    |                  |                     |
| Rubber   |   |                           |                    |                  |                     |
|  |   |                           |                    |                  |                     |
| ± Styrofoam(Polystyrene)   |   |                           |                    |                  |                     |
| 🗄 Titanium   |   |                           |                    |                  |                     |
| ∃ Titanium alloy   |   |                           |                    |                  |                     |
| ± tributyl tin   |   |                           |                    |                  |                     |
| tributyl tin hydride   |   |                           |                    |                  |                     |
| ± tributyl tin oxide   |   |                           |                    |                  |                     |
|  |   |                           |                    |                  |                     |
| Record: II I I I I I I I Record:   | 34  | i                         |                    |                  | Þ                   |
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## **APPENDIX 4 – ATMOSPHERIC FATE TABLE**

| Chemical Name         reactions         T12 for 24 hrs         T12 daytime         T12 nightime         dry remov112           Aluminum         Aluminum alloy         Image: State St   | • 🖬 🎒 🔍 🖑 🐰 🖻 🛍                   | 🚿 🕫 🚷 🛃 🕅 | ý 🚡 🖓 🙀 🕨 📈 🛅 🤅 | 🔄 • 🛛 • |                |                |
|--|-----------------------------------|-----------|-----------------|---------|----------------|----------------|
| Ferrosoferric Oxide  |                                   |           |                 |         | T1/2 nighttime | dry remov T1/2 |
| Aluminum BromideImage: set of the set of                           |                                   |           |                 |         |                |                |
| Aluminum Chloride     Image: Strain Str                           |                                   |           |                 |         |                |                |
| Assenic     Image: section of a                           |                                   |           |                 |         |                |                |
| Abbestos     Image: set and                            |                                   |           |                 |         |                |                |
| Baron Carbide     Image: state sta                           |                                   |           |                 |         |                |                |
| Cadmium       Image: set of the set o   |                                   |           |                 |         |                |                |
| Chromium     Image: set of the set of th                           |                                   |           |                 |         |                |                |
| Copper       Image: Copper Covide       Image: Copper Covide       Image: Copper Covide         Coundum       Image: Covide       Image: Covide       Image: Covide         Ethylene Glycol       yes       24 hrs       Image: Covide         Ethylene Glycol       yes       24 hrs       Image: Covide         Ferrous Oxide, Iron Oxide       Image: Covide       Image: Covide       Image: Covide         Ferrous Sulfide, Iron Monosulfide       Image: Covide       Image: Covide       Image: Covide         Ferrous Sulfide, Iron Monosulfide       Image: Covide       Image: Covide       Image: Covide         Ferrous Sulfide, Iron Monosulfide       Image: Covide       Image: Covide       Image: Covide       Image: Covide         Ferrous Sulfide, Iron Monosulfide       Image: Covide       Image: Covide       Image: Covide       Image: Covide       Image: Covide         Foron       Image: Covide  |                                   |           |                 |         |                |                |
| Copper Oxide       Image: set of the  | E Chromium                        |           |                 |         |                |                |
| Coundum       yes       24 hrs   |                                   |           |                 |         |                |                |
| Ethylene Glycol       yes       24 hrs       Image: Strate Stra   | E Copper Oxide                    |           |                 |         |                |                |
| Ferrous Oxide, Iron Oxide       Image: Construction of the ima   | E Corundum                        |           |                 |         |                |                |
| Ferrous Oxide, Iron Oxide       Image: Comparison of Compari   | Ethylene Glycol                   | yes       | 24 hrs          |         |                |                |
| Ferrous sulfide iron MonosulfideImage: sulfideImage: sulfide <thimage< td=""><td>Ferrosoferric Oxide</td><td></td><td></td><td></td><td></td><td></td></thimage<>   | Ferrosoferric Oxide               |           |                 |         |                |                |
| Freon       Image: sea alloy       Image: sea alloy       Image: sea alloy         Manganese alloy       Image: sea alloy       Image: sea alloy       Image: sea alloy         Oxy-acetylene       Image: sea alloy       Image: sea alloy       Image: sea alloy         Plastics       Image: sea alloy       Image: sea alloy       Image: sea alloy         Platinum-Niobium       Image: sea alloy       Image: sea alloy       Image: sea alloy         Platinum-Niobium       Image: sea alloy       Image: sea alloy       Image: sea alloy         Platinum-Niobium       Image: sea alloy       Image: sea alloy       Image: sea alloy         Platinum-Niobium       Image: sea alloy       Image: sea alloy       Image: sea alloy         Platinum-Niobium       Image: sea alloy       Image: sea alloy       Image: sea alloy         Platinum-Niobium       Image: sea alloy       Image: sea alloy       Image: sea alloy         Platinum-Niobium       Image: sea alloy       Image: sea alloy       Image: sea alloy       Image: sea alloy         Silver Chloride       Image: sea alloy       Image: sea alloy       Image: sea alloy       Image: sea alloy         Tranum       Image: sea alloy         tranum <td>Ferrous Oxide, Iron Oxide</td> <td></td> <td></td> <td></td> <td></td> <td></td>  | Ferrous Oxide, Iron Oxide         |           |                 |         |                |                |
| Hematite       Image and the set of t   | Ferrous sulfide, Iron Monosulfide |           |                 |         |                |                |
| Iron       Image and the set of the s   | Freon                             |           |                 |         |                |                |
| Lead       Image alloy       Image alloy       Image alloy         Manganese alloy       Image alloy       Image alloy       Image alloy         Oxy-acetylene       Image alloy       Image alloy       Image alloy         Plastics       Image alloy       Image alloy       Image alloy         Plastics       Image alloy       Image alloy       Image alloy         Platinum-Niobium       Image alloy       Image alloy       Image alloy         Pyrite       Image alloy       Image alloy       Image alloy         Rubber       Image alloy       Image alloy       Image alloy         Styrofoam(Polystyrene)       Image alloy       Image alloy       Image alloy         Itanium       Image alloy       Image alloy       Image alloy       Image alloy         Itanium alloy       Image alloy       Image alloy       Image alloy       Image alloy         Itanium alloy       Image alloy       Image alloy       Image alloy       Image alloy       Image alloy         Itanium alloy       Image alloy       Image alloy       Image alloy       Image alloy       Image alloy         Itanium alloy       Image alloy       Image alloy       Image alloy       Image alloy       Image alloy         Itanium alloy   | E Hematite                        |           |                 |         |                |                |
| Manganese alloy       Image alloy       Image alloy       Image alloy         Oxy-acetylene       Image alloy       Image alloy       Image alloy         Plastics       Image alloy       Image alloy       Image alloy         Plastics       Image alloy       Image alloy       Image alloy         Plastics       Image alloy       Image alloy       Image alloy         Pyrite       Image alloy       Image alloy       Image alloy         Rubber       Image alloy       Image alloy       Image alloy         Silver Chloride       Image alloy       Image alloy       Image alloy         Silver Chloride       Image alloy       Image alloy       Image alloy         Silver Chloride       Image alloy       Image alloy       Image alloy         Ttanium       Image alloy       Image alloy       Image alloy         Ttanium alloy       Image alloy       Image alloy       Image alloy         tributyl tin hydride       Image alloy       Image alloy       Image alloy         tributyl tin hydride       Image alloy       Image alloy       Image alloy         tributyl tin oxide       Image alloy       Image alloy       Image alloy         Tributyl tin oxide       Image alloy       Image alloy   | Iron                              |           |                 |         |                |                |
| Oxy-acetylene       Image: Section of the   | Lead                              |           |                 |         |                |                |
| Oxy-acetylene       Image: Section of the   | Manganese alloy                   |           |                 |         |                |                |
| Plastics       Image: Section of the sect   |                                   |           |                 |         |                |                |
| Platinum-Niobium       Image: Silver Chloride       Image:  |                                   |           |                 |         |                |                |
| Pyrite     Image: Sector                            | ∄ Platinum-Niobium                |           |                 |         |                |                |
| Rubber     Image: Chloride       Silver Chloride     Image: Chloride       Silver Chloride     Image: Chloride       Silver Chloride     Image: Chloride       Titanium     Image: Chloride       Titanium alloy     Image: Chloride   |                                   |           |                 |         |                |                |
| Silver Chloride       Image: Silver Chloride       Image: Silver Chloride         Styrofoam(Polystyrene)       Image: Silver Chloride       Image: Silver Chloride         Titanium       Image: Silver Chloride       Image: Silver Chloride         Titanium alloy       Image: Silver Chloride       Image: Silver Chloride         Silver Chloride       Image: Silver Chloride       Image: Silver Chloride  |                                   |           |                 |         |                |                |
| Styrofoam(Polystyrene)       Image: Styrofoam(Polystyrene)       Image: Styrofoam(Polystyrene)         Titanium       Image: Styrofoam(Polystyrene)       Image: Styrofoam(Polystyrene)         Titani  |                                   |           |                 |         |                |                |
| Titanium     Image: Second secon                           |                                   |           |                 |         |                |                |
| Titanium alloy     Image: Constraint of the second of the se                           |                                   |           |                 |         |                |                |
| tributyl tin     Image: Constraint of the second of the seco                           |                                   |           |                 |         |                |                |
| tributyl tin hydride tributyl tin oxide tributyl ti |                                   |           |                 |         |                |                |
| tributyl tin oxide Zinc Chloride   |                                   |           |                 |         |                |                |
| Zinc Chloride  |                                   |           |                 |         |                |                |
|  |                                   |           |                 |         |                |                |
|  | rd: 14 4 2 > >1 >*                | of 34     | •               |         |                |                |

### **APPENDIX 5 – BOD TABLE**

| 🖉 Microsoft Access - [BOD : Table]   |                          | X                |
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| Chemical Name  | BOD 5day mg/L-02         | BOD 1/2          |
| ▶  | 505 044j mgr 02          |                  |
| Aluminum alloy   |                          |                  |
| Huminum Bromide  |                          |                  |
| Aluminum Chloride  |                          |                  |
| ± Arsenic  | none                     | none             |
| ± Asbestos   |                          |                  |
| 🗉 Boron Carbide  |                          |                  |
| ± Cadmium  |                          |                  |
|  |                          |                  |
| + Copper   |                          |                  |
| Copper Oxide   |                          |                  |
| Corundum   |                          |                  |
|  | 12.5%                    |                  |
|  |                          |                  |
| Ferrous Oxide, Iron Oxide  |                          |                  |
| Ferrous sulfide,Iron Monosulfide   |                          |                  |
| + Freon  |                          | -                |
| Hematite     Hematite |                          |                  |
| + Iron   |                          |                  |
|  |                          |                  |
| ▪ Manganese alloy  |                          |                  |
|  |                          |                  |
|  |                          |                  |
| 🗉 Platinum-Niobium   |                          |                  |
| Pyrite     Pyrite  |                          |                  |
| Rubber     Rubber  |                          |                  |
| Silver Chloride     Silver Chloride  |                          |                  |
| 🗉 Styrofoam(Polystyrene)   |                          |                  |
| 🗉 Titanium   |                          |                  |
| 🗉 Titanium alloy   |                          |                  |
| 🖭 tributyl tin   |                          |                  |
| 🖭 tributyl tin hydride   |                          |                  |
| 🛨 tributyl tin oxide   |                          |                  |
| 🗉 🗉 Zinc Chloride  | none                     | none             |
| Record: II ( 1 ) II > I A  | · •                      |                  |
| Datasheet View   |                          |                  |
| 🏨 Start 🛛 🏉 🧊 🐺 🚫 🕴 🛅 Copy of Materialsdb : Data 🗐   | APPENDIX.doc - Microsoft | 📴 🌾 🖓 🎦 1:54 PM  |

### **APPENDIX 6 – CANCER TABLE**

| • 🔒 🌢 🖪 🖤 🐰 🖻 🖻                    |           | 🌶 🚡 🏹 👫 🕨 | ( 🗇 ⁄/ 🕄 🗸 |      |                |                 |
|------------------------------------|-----------|-----------|------------|------|----------------|-----------------|
| Chemical Name                      | mutagenic | genotoxic | promoter   | Lung | others         | Gastrointestina |
| E Aluminum                         | No        | No        | No         |      |                |                 |
| E Aluminum alloy                   |           |           |            |      |                |                 |
| E Aluminum Bromide                 |           |           |            |      |                |                 |
| E Aluminum Chloride                |           |           |            |      |                |                 |
| E Arsenic                          | yes       |           |            | yes  | kidneys, liver | yes             |
| E Asbestos                         |           |           |            |      |                | yes             |
| E Boron Carbide                    |           |           |            |      |                |                 |
| E Cadmium                          |           | yes       |            |      |                |                 |
| E Chromium                         |           |           |            | yes  |                |                 |
| E Copper                           |           |           |            |      |                |                 |
| E Copper Oxide                     |           |           |            |      |                |                 |
| E Corundum                         |           |           |            |      |                |                 |
| E Ethylene Glycol                  |           |           |            |      |                |                 |
| E Ferrosoferric Oxide              |           |           |            |      |                |                 |
| E Ferrous Oxide, Iron Oxide        |           |           |            |      |                |                 |
| E Ferrous sulfide,Iron Monosulfide | 9         |           |            |      |                |                 |
| E Freon                            |           |           |            |      |                |                 |
| E Hematite                         |           |           |            |      |                |                 |
| E Iron                             |           |           |            |      |                |                 |
| E Lead                             |           |           |            |      |                |                 |
| E Manganese alloy                  |           |           |            |      |                |                 |
| E Oxy-acetylene                    |           |           |            |      |                |                 |
| E Plastics                         |           |           |            |      |                |                 |
| E Platinum-Niobium                 |           |           |            |      |                |                 |
| E Pyrite                           |           |           |            |      |                |                 |
| E Rubber                           |           |           |            |      |                |                 |
| E Silver Chloride                  |           |           |            |      |                |                 |
| E Styrofoam(Polystyrene)           |           |           |            |      |                |                 |
| E Titanium                         |           |           |            |      |                |                 |
| E Titanium alloy                   |           |           |            |      |                |                 |
| E tributyl tin                     |           |           |            |      |                |                 |
| E tributyl tin hydride             |           |           |            |      |                |                 |
| E tributyl tin oxide               |           |           |            |      |                |                 |
| E Zinc Chloride                    |           |           |            |      |                |                 |
| ord: 14 🕂 🔰 5 🕨 🕨                  | of 34     |           |            |      |                |                 |

### **APPENDIX 7 – RCRA TABLE**

| Chemical Name         fina maability         reactivity         primary valence         loc controls         controls           # Jurninum alloy         ine powder fammable         fine powder component o         3         6   | <u>'</u> . | 🖬 🖨 🗟 🖤 👗 🖻 🕄 : | 🖉 🗠 🚷 🛃 🕺 🕅           | マ 🕺 🕨 🕅 値 名・            | 2.              |              |             |          |
|--|------------|-----------------|-----------------------|-------------------------|-----------------|--------------|-------------|----------|
| Auminum Bloynide     Image: Section Sectin Section Sectin Section Sectin Section Section Section Sec |            |                 |                       | reactivity              | primary valence | lon coordina | corrosivity | toxicity |
| Aurinum Bromide     Image: state s |            |                 | fine powder flammable | fine powder component o |                 | 36           |             |          |
| Auminum Chloride     Image: Constraint of the second of the  |            |                 |                       |                         |                 |              |             |          |
| Assenic       Image: set of the set o               |            |                 |                       |                         |                 |              |             |          |
| Ablestos         Image: section of the sectin of the sectin of the section of the section of the section of t       | -          |                 |                       |                         |                 |              |             |          |
| Boron Carbide       Image: section of the               |            |                 |                       |                         |                 |              |             |          |
| Cadmium       Image: Comparison of the compa               | -          |                 |                       |                         |                 |              |             |          |
| Chromium       Image: state stat               | -          |                 |                       |                         |                 |              |             |          |
| Copper       Image: section of the sectin of the section of the section of the section               | -          |                 |                       |                         |                 |              |             |          |
| © Copper Oxide       Image: Section of the section of th               | -          |                 |                       |                         |                 |              |             |          |
| • Coundum       Image: state sta               |            |                 |                       |                         |                 |              |             |          |
| Ethylene Glycol       Image: Section of the section of t               |            |                 |                       |                         |                 |              |             |          |
| • Ferrous Oxide       Image: sulfide Iron Oxide       Image: sulfide Iron Monosulfide         • Ferrous sulfide Iron Monosulfide       Image: sulfide Iron Monosulfide       Image: sulfide Iron         • Hematite       Image: sulfide Iron       Image: sulfide Iron       Image: sulfide Iron         • Lead       Image: sulfide Iron       Image: sulfide Iron       Image: sulfide Iron       Image: sulfide Iron         • Lead       Image: sulfide Iron       Image: sulfide Iron       Image: sulfide Iron       Image: sulfide Iron         • Manganese alloy       Image: sulfide Iron       Image: sulfide Iron       Image: sulfide Iron       Image: sulfide Iron         • Platinum-Niobium       Image: sulfide Iron       Image: sulfide Iron       Image: sulfide Iron       Image: sulfide Iron         • Platinum-Niobium       Image: sulfide Iron       Image: sulfide Iron       Image: sulfide Iron       Image: sulfide Iron         • Platinum-Niobium       Image: sulfide Iron         • Platinum-Niobium       Image: sulfide Iron  | -          |                 |                       |                         |                 |              |             |          |
| • Ferrous Oxide, Iron Oxide             • Ferrous sulide, Iron Monosulide              • Ferron  |            |                 |                       |                         |                 |              |             |          |
| • Feronus sulfide Iron Monosulfide   | -          |                 |                       |                         |                 |              |             |          |
| • Freon       Image: sea of the sea o               |            |                 |                       |                         |                 |              |             |          |
| • Hemaite       Image and the set of                |            |                 |                       |                         |                 |              |             |          |
| Iron       Iron       Iron       Iron       Iron       Iron         Iron       Iron       Iron       Iron       Iron       Iron         Iron       Iron       Iron       Iron       Iron       Iron       Iron         Iron <t< td=""><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></t<>   | -          |                 |                       |                         |                 |              |             |          |
| • Lead     Image alloy     Image alloy     Image alloy       • Manganese alloy     Image alloy     Image alloy       • Oxy-acetylene     Image alloy     Image alloy       • Oxy-acetylene     Image alloy     Image alloy       • Plastics     Image alloy     Image alloy       • Rubber     Image alloy     Image alloy       • Styrofoam(Polystyrene)     Image alloy     Image alloy       • Ttanium     Image alloy     Image alloy       • Ttanium alloy     Image alloy     Image alloy <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>  |            |                 |                       |                         |                 |              |             |          |
| Imaganese alloy       Imaganese alloy       Imaganese alloy         Imaganese alloy       Imaganese alloy       Imagenese alloy         Imagenese alloy       Imagenese alloy       Imagenese alloy <td< td=""><td>-</td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>   | -          |                 |                       |                         |                 |              |             |          |
| • Oxy-acetylene  | -          |                 |                       |                         |                 |              |             |          |
| Image: Plastics       Image: Plastics       Image: Plastics       Image: Plastics         Image: Plastics       Image: Plastics       Image: Plastics       Image: Plastics         Image: Plastics       Image: Plastics       Image: Plastics       Image: Plastics       Image: Plastics         Image: Plastics       Image: Plastics       Image: Plastics       Image: Plastics       Image: Plastics       Image: Plastics         Image: Plastics </td <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td> <td></td>   |            |                 |                       |                         |                 |              |             |          |
| Image: Platinum-Niobium       Image: Platinum-Niobium       Image: Platinum-Niobium       Image: Platinum         Image: Platinum       Image: Platinum       Image: Platinum       Image: Platinum  |            |                 |                       |                         |                 |              |             |          |
| Image: Pyrite       Image: Pyrite       Image: Pyrite         I  |            |                 |                       |                         |                 |              |             |          |
| Image: Rubber       Image: Rubber<   | -          |                 |                       |                         |                 |              |             |          |
| Bilver Chloride       Image: Silver Chloride       Image: Silver Chloride       Image: Silver Chloride         Styrofoam(Polystyrene)       Image: Silver Chloride       Image: Silver Chloride       Image: Silver Chloride         Titanium       Image: Silver Chloride       Image: Silver Chloride       Image: Silver Chloride       Image: Silver Chloride         Titanium alloy       Image: Silver Chloride       Image: Silv   |            |                 |                       |                         |                 |              |             |          |
| • Styrofoam(Polystyrene)       • Intanium       • Intanium <td< td=""><td></td><td></td><td></td><td></td><td></td><td></td><td></td><td></td></td<>   |            |                 |                       |                         |                 |              |             |          |
| Titanium         Image: Constraint of the second s                                       | -          |                 |                       |                         |                 |              |             |          |
| Titanium alloy          Image: Section   |            |                 |                       |                         |                 |              |             |          |
| tributyl tin     tributyl tin hydride     tributyl tin oxide     Tributyl tin oxide     Zinc Chloride  |            |                 |                       |                         |                 |              |             |          |
| tributyl tin hydride             tributyl tin oxide             Izinc Chloride   |            |                 |                       |                         |                 |              |             |          |
| tributyl tin oxide     Zinc Chloride   |            |                 |                       |                         |                 |              |             |          |
| Tinc Chloride  |            |                 |                       |                         |                 |              |             |          |
|  |            | '               |                       |                         |                 |              |             |          |
|  | t          |                 |                       |                         |                 |              |             |          |

## **APPENDIX 8 – CHRONIC SYMPTOMS TABLE**

| Microsoft Access - [chronic symptoms : Table]            |                          | <u>_[8]</u> |
|--|--------------------------|-------------|
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| Chemical Name  | inhaltion                | ingestion   |
| ▶  | Yes                      | No          |
| ± Aluminum alloy   | ,                        |             |
| Aluminum Bromide   |                          |             |
|  | yes                      | yes         |
|  | yes                      |             |
|  | yes                      |             |
| 🗉 Boron Carbide  |                          |             |
| ▪ Cadmium  | Yes                      | yes         |
|  | yes                      |             |
| ▪ Copper   | yes                      |             |
| ▪ Copper Oxide   |                          |             |
|  |                          |             |
|  | no                       | yes         |
|  |                          |             |
| E Ferrous Oxide, Iron Oxide                              |                          |             |
| E Ferrous sulfide, Iron Monosulfide                      |                          |             |
| + Freon  |                          |             |
| • Hematite   |                          |             |
| + Iron   | yes                      |             |
| 🗉 Lead   |                          |             |
| ▪ Manganese alloy  |                          |             |
| Oxy-acetylene  |                          |             |
|  |                          |             |
| ▪ Platinum-Niobium                                       |                          |             |
|  |                          |             |
| 🗉 Rubber   |                          |             |
| Silver Chloride  |                          |             |
| Styrofoam(Polystyrene)                                   |                          |             |
| • Titanium   | yes                      |             |
| 🗉 Titanium alloy   |                          |             |
| tributyl tin   |                          |             |
| 🗉 tributyl tin hydride                                   |                          |             |
| tributyl tin oxide                                       |                          |             |
| 🗉 Zinc Chloride  | yes                      | yes         |
| Record: H ( 1 ) ) ) * of 34                              |                          | •           |
| Datasheet View   |                          |             |
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## **APPENDIX 9 – CLEAN AIR ACT TABLE**

| 🖉 Microsoft Access - [clean air act : Tab | e]  |               |      |                   |
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| Chemical Name                             | criteria pollutants                       | HAP           | EHS  | HRS               |
| ▶ ± Aluminum                              | NA  |               |      |                   |
|   |   |               |      |                   |
| E Aluminum Bromide                        |   |               |      |                   |
| E Aluminum Chloride                       |   |               |      |                   |
| + Arsenic                                 |   |               |      |                   |
| + Asbestos                                |   |               |      |                   |
| 🗄 Boron Carbide                           |   |               |      |                   |
|   | NA  |               |      |                   |
| E Chromium                                |   |               |      |                   |
| ± Copper                                  |   |               |      |                   |
| Copper Oxide                              |   |               |      |                   |
| 🗄 Corundum                                |   |               |      |                   |
|   | NA  |               |      |                   |
|   |   |               |      |                   |
| E Ferrous Oxide, Iron Oxide               |   |               |      |                   |
| ∃ Ferrous sulfide,Iron Monosulfide        |   |               |      |                   |
|   |   |               |      |                   |
|   |   |               |      |                   |
| ± Iron                                    | NA  |               |      |                   |
| ± Lead                                    |   |               |      |                   |
| ∃ Manganese alloy                         |   |               |      |                   |
|   |   |               |      |                   |
|   |   |               |      |                   |
|   |   |               |      |                   |
|   |   |               |      |                   |
| ± Rubber                                  |   |               |      |                   |
|   |   |               |      |                   |
| ± Styrofoam(Polystyrene)                  |   |               |      |                   |
| ± Titanium                                |   |               |      |                   |
| 🗄 Titanium alloy                          |   |               |      |                   |
| tributyl tin                              |   |               |      |                   |
| tributyl tin hydride                      |   |               |      |                   |
| tributyl tin oxide                        |   |               |      |                   |
| ± Zinc Chloride                           |   |               |      |                   |
| Record: H 🕢 1 🕨 H 🕨 of                    | 34 🚺                                      |               |      | F                 |
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## **APPENDIX 10 – CORROSIVITY TABLE**

| Microsoft Access - [corrosivity : Table]     |  |                       | _ 8                              |
|--|--|-----------------------|----------------------------------|
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| 🔟 • 🖬 🖨 🖪 🖤 👗 🖻 🖻 🚿 🕫                        | Al XI V A V A IN K     AN IN     AN     AN IN     AN     AN | 🗗 🕼 • 🛛 .             |                                  |
| Chemical Name                                | toward Steel   | toward Flesh          | Materials which corrode material |
| 🕨 🗉 Aluminum                                 |  |                       | Acids, other metals              |
|  |  |                       |                                  |
| Aluminum Bromide                             |  |                       |                                  |
|  | no   | no                    |                                  |
|  |  |                       |                                  |
|  |  |                       |                                  |
| 🗉 Boron Carbide                              |  |                       |                                  |
| . E Cadmium                                  |  |                       |                                  |
|  |  |                       |                                  |
| 🗄 Copper                                     |  |                       |                                  |
| 🗉 Copper Oxide                               |  |                       |                                  |
| Corundum                                     |  |                       |                                  |
| 🗉 Ethylene Glycol                            |  |                       |                                  |
|  |  |                       |                                  |
| 🗉 Ferrous Oxide, Iron Oxide                  |  |                       |                                  |
|  |  |                       |                                  |
| I Freon                                      |  |                       | -                                |
| . Hematite                                   |  |                       |                                  |
| ± Iron                                       |  |                       |                                  |
| . Eead                                       |  |                       |                                  |
| ▪ Manganese alloy                            |  |                       |                                  |
|  |  |                       |                                  |
|  |  |                       |                                  |
| 🗉 Platinum-Niobium                           |  |                       |                                  |
|  |  |                       |                                  |
| Rubber                                       |  |                       |                                  |
|  |  |                       |                                  |
| 🗉 Styrofoam(Polystyrene)                     |  |                       |                                  |
| 🗄 Titanium                                   |  |                       |                                  |
| 🗉 Titanium alloy                             |  |                       |                                  |
| ∃ tributyl tin                               |  |                       |                                  |
| tributyl tin hydride                         |  |                       |                                  |
| ∃ tributyl tin oxide                         |  |                       |                                  |
| 🗉 Zinc Chloride                              |  |                       |                                  |
| Record: Ⅰ 	 1 	 ► ► ► of 34                  |  |                       |                                  |
| Datasheet View                               |  |                       |                                  |
| ;<br>🕃 Start 📗 🏈 🞲 🐺 🚫 📗 🛅 Copy of Material  | sdb : Data 🗑 APPENDIX.doc - Microsoft  | 🖩 corrosivity : Table | 2.01 PM                          |

## **APPENDIX 11 – DOT TABLE**

| ficrosoft Access - [DOT : Table]                |                                       |                   |                              |
|---|---------------------------------------|-------------------|------------------------------|
| <u>File Edit View Insert Format Records Ioc</u> | ols <u>W</u> indow <u>H</u> elp       |                   | <u>.</u>                     |
| • 🔒 💩 🖏 🐇 🖻 R 🚿 🖉                               | ) 🛞 🛃 🕌 🍹 🛅 🍸 👬 🕨 🕷                   | 🗗 <b>⁄a</b> - 🛛 . |                              |
| Chemical Name                                   | water pollution                       | hazard class      | registration pesticide FIFRA |
| + Aluminum                                      | · · · · · · · · · · · · · · · · · · · |                   |                              |
| + Aluminum alloy                                |                                       |                   |                              |
| Aluminum Bromide                                |                                       |                   |                              |
| ▪ Aluminum Chloride                             | harmful to acquatic life              | 8                 |                              |
| + Arsenic                                       | dangerous if it enters water          | 6.1               |                              |
| + Asbestos                                      |                                       |                   |                              |
| ▪ Boron Carbide                                 |                                       |                   |                              |
| ▪ Cadmium                                       |                                       |                   |                              |
| E Chromium                                      |                                       |                   |                              |
| ± Copper  |                                       |                   |                              |
| ▪ Copper Oxide                                  |                                       |                   |                              |
| E Corundum                                      |                                       |                   |                              |
| ▪ Ethylene Glycol                               | dangerous if enters water;acquatic    | life - 9          |                              |
|   |                                       |                   |                              |
| ▪ Ferrous Oxide, Iron Oxide                     |                                       |                   |                              |
| € Ferrous sulfide,Iron Monosulfide              |                                       |                   |                              |
| + Freon   |                                       |                   |                              |
| ▪ Hematite                                      |                                       |                   |                              |
| + Iron  |                                       |                   |                              |
| + Lead  |                                       |                   |                              |
| ± Manganese alloy                               |                                       |                   |                              |
|   |                                       |                   |                              |
|   |                                       |                   |                              |
| ▪ Platinum-Niobium                              |                                       |                   |                              |
| ▪ Pyrite  |                                       |                   |                              |
| + Rubber  |                                       |                   |                              |
| ▪ Silver Chloride                               |                                       |                   |                              |
| Styrofoam(Polystyrene)                          |                                       |                   |                              |
| + Titanium                                      |                                       |                   |                              |
| ± Titanium alloy                                |                                       |                   |                              |
| ± tributyl tin                                  |                                       |                   |                              |
| ± tributyl tin hydride                          |                                       |                   |                              |
| ± tributyl tin oxide                            |                                       |                   |                              |
| ± Zinc Chloride                                 | harmful to aquatic life, dangerous v  | /hen 8            |                              |
| ord: H < 1 → H →* of 34                         |                                       |                   |                              |
| tasheet View                                    |                                       |                   | NUM                          |

## **APPENDIX 12 – EXTINGUISHING AGENTS TABLE**

| • 🖬 🎒 🖪 🖤 👗 🖻 🖻 🖉 🕫 🚷 🛃 🕌        | ҄҄҄УЪТ 🗛 н 🕺 🗗 🚈 - 🛛 - |         |  |
|----------------------------------|------------------------|---------|--|
| Chemical Name                    | Use                    | Not USE |  |
| Aluminum                         |                        |         |  |
| Aluminum alloy                   |                        |         |  |
| Aluminum Bromide                 |                        |         |  |
| Aluminum Chloride                | dry chemical, foam,CO2 | water   |  |
| Arsenic                          |                        |         |  |
| Asbestos                         |                        |         |  |
| Boron Carbide                    |                        |         |  |
| Cadmium                          |                        |         |  |
| Chromium                         |                        |         |  |
| Copper                           |                        |         |  |
| Copper Oxide                     |                        |         |  |
| Corundum                         |                        |         |  |
| Ethylene Glycol                  |                        |         |  |
| Ferrosoferric Oxide              |                        |         |  |
| Ferrous Oxide, Iron Oxide        |                        |         |  |
| Ferrous sulfide,Iron Monosulfide |                        |         |  |
| Freon                            |                        |         |  |
| e Hematite                       |                        |         |  |
| Iron                             |                        |         |  |
| Lead                             |                        |         |  |
| Manganese alloy                  |                        |         |  |
| Oxy-acetylene                    |                        |         |  |
| Plastics                         |                        |         |  |
| Platinum-Niobium                 |                        |         |  |
| Pyrite                           |                        |         |  |
| Rubber                           |                        |         |  |
| Silver Chloride                  |                        |         |  |
| Styrofoam(Polystyrene)           |                        |         |  |
| Titanium                         |                        |         |  |
| Titanium alloy                   |                        |         |  |
| tri butyl tin hydride            |                        |         |  |
| tri butyl tin oxide              |                        |         |  |
| tributyl tin                     |                        |         |  |
| Zinc Chloride                    |                        |         |  |
| rd: 🚺 🧹 1 🕨 🕨 📲 of 34            |                        |         |  |

## **APPENDIX 13 – FLAMMABILITY/COMBUSTIBILITY TABLE**

| • 🔒 🎒 🗟 🖤 👗 🖻 🖻 🖇                  | 9   10   🚷   🛃 🕌   🏹 | 🌶 🚡 🏹 🛤 🕨 🕷 🛅 | <b>⁄a</b> •   ♀ •  |             |             |
|------------------------------------|----------------------|---------------|--------------------|-------------|-------------|
| Chemical Name                      | Non Flammable        | e Flash point | Auto ignition temp | LEL percent | UEL percent |
| E Aluminum                         |                      | NA            | NA                 | NA          | NA          |
| E Aluminum alloy                   |                      |               |                    |             |             |
| E Aluminum Bromide                 |                      |               |                    |             |             |
| E Aluminum Chloride                | not flammable        | not flammable | not flammable      |             |             |
| E Arsenic                          |                      | NA            | NA                 | NA          | NA          |
| E Asbestos                         |                      |               |                    |             |             |
| E Boron Carbide                    |                      |               |                    |             |             |
| E Cadmium                          |                      | NA            | NA                 | NA          | NA          |
| E Chromium                         |                      |               |                    |             |             |
| E Copper                           |                      |               |                    |             |             |
| E Copper Oxide                     |                      |               |                    |             |             |
| E Corundum                         |                      |               |                    |             |             |
| E Ethylene Glycol                  | flammable            | 116deg C      | 400 deg C          | 3.2%        | 15.3%       |
| E Ferrosoferric Oxide              |                      |               |                    |             |             |
| E Ferrous Oxide, Iron Oxide        |                      |               |                    |             |             |
| E Ferrous sulfide,Iron Monosulfide |                      |               |                    |             |             |
| E Freon                            |                      |               |                    |             |             |
| E Hematite                         |                      |               |                    |             |             |
| E Iron                             |                      | NA            | NA                 | NA          | NA          |
| E Lead                             |                      |               |                    |             |             |
| E Manganese alloy                  |                      |               |                    |             |             |
| E Oxy-acetylene                    |                      |               |                    |             |             |
| E Plastics                         |                      |               |                    |             |             |
| E Platinum-Niobium                 |                      |               |                    |             |             |
| E Pyrite                           |                      |               |                    |             |             |
| E Rubber                           |                      |               |                    |             |             |
| E Silver Chloride                  |                      |               |                    |             |             |
| E Styrofoam(Polystyrene)           |                      |               |                    |             |             |
| E Titanium                         |                      |               |                    |             |             |
| E Titanium alloy                   |                      |               |                    |             |             |
| E tributyl tin                     |                      |               |                    |             |             |
| E tributyl tin hydride             |                      |               |                    |             |             |
| E tributyl tin oxide               |                      |               |                    |             |             |
| Zinc Chloride                      | not flammable        | NA            | NA                 | NA          | NA          |
| ord: H ( 1 ) ) ) * )               |                      |               |                    |             |             |

#### **APPENDIX 14 – IRRITANT TABLE**

| :- 🖬 🖨 🖪 🆤 👗 🖻 🖻 🚿 🕫 😫             | 👬 🏹 🖥 🏹 🛤 🕨 🕷 🛅 | ⁄a • 🛛 •                              |             |
|------------------------------------|-----------------|---------------------------------------|-------------|
| Chemical Name                      | skin            | eye                                   | respiratory |
| • Aluminium alloy                  |                 |                                       |             |
| Aluminum                           |                 | No                                    | yes         |
| Aluminum Bromide                   |                 |                                       |             |
| Aluminum Chloride                  | yes             | yes                                   |             |
| Arsenic                            | yes             |                                       | yes         |
| ± Asbestos                         |                 |                                       | yes         |
| ▪ Boron Carbide                    |                 |                                       |             |
| ▪ Cadmium                          |                 |                                       | yes         |
| Chromium                           | yes             |                                       | yes         |
| ▪ Copper                           | yes             | yes                                   | yes         |
| ▪ Copper Oxide                     |                 |                                       |             |
| Corundum     Corundum              |                 |                                       |             |
| Ethylene Glycol                    | No              | No                                    |             |
| ∃ Ferrosoferric Oxide              |                 |                                       |             |
| ▪ Ferrous Oxide, Iron Oxide        |                 |                                       |             |
| ▪ Ferrous sulfide,Iron Monosulfide |                 |                                       |             |
| + Freon                            |                 |                                       |             |
| ▪ Hematite                         |                 |                                       |             |
| + Iron                             |                 |                                       | yes         |
| ± Lead                             |                 |                                       |             |
| + Manganese alloy                  |                 |                                       |             |
| ▪ Oxy-acetylene                    |                 |                                       |             |
| ▪ Plastics                         | yes             | yes                                   | yes         |
| Platinum-Niobium                   |                 |                                       |             |
| ± Pyrite                           |                 |                                       |             |
| + Rubber                           |                 |                                       |             |
| ± Silver Chloride                  |                 |                                       |             |
| ± Styrofoam(Polystyrene)           |                 |                                       |             |
| ± Titanium                         |                 |                                       | yes         |
| ± Titanium alloy                   |                 |                                       |             |
| ± tributyl tin                     |                 |                                       |             |
| ± tributyl tin hydride             |                 |                                       |             |
| ± tributyl tin oxide               |                 |                                       |             |
|                                    | yes             | yes                                   |             |
| ord: Ⅰ 	 1 	 ► ► ► of 34           |                 | · · · · · · · · · · · · · · · · · · · |             |

### **APPENDIX 15 – MATERIALS TABLE**

| <u>/</u> - | - 🔒 🌢 🕻            | ۵ 🖁 🎖      | 1 💉   10 |                | ¥ [ | 7      | ) <b>)*</b> 1 | K 🗗     | <b>a</b> • 🛛 • |      |       |       |    |         |     |        |      |                         |      |
|------------|--------------------|------------|----------|----------------|-----|--------|---------------|---------|----------------|------|-------|-------|----|---------|-----|--------|------|-------------------------|------|
|            | Chemical_Nan       | CASno      | Smiles   | Classification | Wis | Molecu | Molecu        | Boiling | Melting_Po     | oint | Log/( | Densi | VP | Henry's | lea | Oral   |      | Sources                 |      |
| +          | Aluminum           | 7429-90-5  |          | metal          |     | 27     | Al            | 2327    |                | 660  |       | 2.698 |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| +          | Aluminum alloy     | 12770-50-2 |          | alloy          |     |        |               |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| _          | Aluminum Brom      |            |          | Aluminum comp  |     | 267    | AlBr3         |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n    |
| ŧ          | Aluminum Chlor     | 7446-70-0  |          | Aluminum comp  |     | 133    | AICI3         | 185     |                | 194  |       | 2.44  |    |         |     |        | R. F | <sup>p</sup> . Pohanish | a Vo |
| ŧ          | Arsenic            | 7440-38-2  |          | metal          |     | 75     | As            | 1380    |                | 650  |       |       |    |         |     |        | R. F | <sup>p</sup> . Pohanish | a Vo |
| ŧ          | Asbestos           | 1332-21-4  |          | compound       |     |        |               |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| ŧ          | Boron Carbide      | 12069-32-8 |          | compound       |     | 55     | CB4           |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| ŧ          | Cadmium            | 7440-43-9  |          | metal          |     | 112    | Cd            | 767     |                | 321  |       |       |    |         |     | 250m   | Ρ.   | H. Howard a             | n Vo |
| ŧ          | Chromium           | 7440-47-3  |          | metal          |     | 52     | Cr            | 2642    | 1              | 900  |       | 7.14  |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| ŧ          | Copper             | 7440-50-8  |          | metal          |     | 64     | Cu            | 2595    | 1              | 083  |       | 8.94  |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| t          | Copper Oxide       | 1317-38-0  |          | compound       |     | 80     | CuO           |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| t          | Corundum           | 1302-74-5  |          | Aluminum comp  |     | 102    | Al203         |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n    |
| t          | Ethylene Glycol    | 107-21-1   | 0000     | alcohol        | Q2C | 62     | C2H6O2        | 198     |                | -13  | -1.36 |       |    | 6x10E-8 | yes | 5 to 1 | Ρ.   | H. Howard a             | n Vo |
| t          | Ferrosoferric Ox   | 1317-61-9  |          | Ferrous compou |     | 232    | Fe3O4         |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n    |
| t          | Ferrous Oxide,     | 1345-25-1  |          | Ferrous compou |     | 72     | FeO           |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n    |
| t          | Ferrous sulfide,   | 1317-37-9  | S=[Fe]   | Ferrous compou |     | 88     | FeS           |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n    |
| ŧ          | Freon              | 75-45-6    | FC(F)CI  | inert gas      |     | 86     | CHCIF2        |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| ŧ          | Hematite           | 1317-60-8  | , ,      | Ferrous compou |     | 160    | Fe203         |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n    |
| ŧ          | Iron               | 7439-89-6  |          | metal          |     | 56     | Fe            |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| t          | Lead               | 7439-92-1  |          | metal          |     | 207    | Pb            | 1740    |                | 328  |       | 11.35 |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| t          | Manganese allo     | 12604-53-4 |          | alloy          |     |        |               |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| -          | Oxy-acetylene      |            |          | organic compou |     |        |               |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| ŧ          | Plastics           | 61788-97-4 |          | organic compou |     |        |               |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| t          | Platinum-Niobiu    |            |          | alloy          |     |        |               |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| +          | Pyrite             | 1309-36-0  |          | Ferrous compou |     | 120    | FeS2          |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n    |
| -          | Rubber             | 9006-03-5  |          | organic compou |     |        |               |         |                |      |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| +          | Silver Chloride    | 7783-90-6  |          | compound       |     | 143    | AgCI          |         |                |      |       |       |    |         |     |        |      | H. Howard a             | -    |
| -          | Styrofoam(Poly:    |            |          | organic compou |     |        | (C8H8)»       |         |                |      |       |       |    |         |     |        |      | H. Howard a             | -    |
| -          | Titanium           | 7440-32-6  |          | metal          |     | 48     | ` '           | 3277    | 1              | 677  |       |       |    |         |     |        | Ρ.   | H. Howard a             | n Vo |
| -          |                    | 7440-32-6  |          | alloy          |     | 48     |               |         |                |      |       |       |    |         |     |        |      | H. Howard a             |      |
| -          | tributyl tin       | 688-73-3   |          | organic compou |     |        | C12H28        |         |                |      |       |       |    |         |     |        |      | H. Howard a             |      |
| -          | tributyl tin hydri |            |          | organic compou |     |        | C12H28        |         |                |      |       |       |    |         |     |        |      | H. Howard a             |      |
| -          | tributyl tin oxide |            |          | organic compou |     |        | C24H54        |         |                |      |       | 1.17  | 1  |         |     |        |      | H. Howard a             | -    |
|            |                    | 7646-85-7  |          | compound       |     |        | Cl2Zn         | 730     |                | 283  |       | 2.91  | 1  |         |     |        |      | P. Pohanish             | -    |
| _          |                    | 1 1 1      | •¥ of 24 |                | •   |        |               |         |                |      |       | 1     |    |         |     |        |      |                         |      |

## **APPENDIX 16 – ORAL ACUTE AQUATIC TOXICITY TABLE**

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|---|--------------------------|-----------------|
| 🗒 File Edit View Insert Format Records Tools Window Help  | p                        | <u> </u>        |
| ×·₽₿₿₿♥₿₿₽₽₽₽₿₿₽₽   |                          |                 |
| Chemical Name   | Fish LC50                | Water fowl LD50 |
|   |                          |                 |
| I Aluminum alloy  |                          |                 |
| Aluminum Bromide  |                          |                 |
| Aluminum Chloride   |                          |                 |
| E Arsenic   |                          |                 |
| Asbestos  |                          |                 |
| Boron Carbide   |                          |                 |
| E Cadmium   |                          |                 |
| Chromium  |                          |                 |
| E Copper  |                          |                 |
|   |                          |                 |
| ± Corundum  |                          |                 |
| Ethylene Glycol   |                          |                 |
| ± Ferrosoferric Oxide   |                          |                 |
|   |                          |                 |
|   |                          |                 |
| ± Freon   |                          |                 |
| ± Hematite  |                          |                 |
| + Iron  |                          |                 |
| ± Lead  |                          |                 |
| ▪ Manganese alloy   |                          |                 |
| Oxy-acetylene   |                          |                 |
|   |                          |                 |
| Telatinum-Niobium   |                          |                 |
| Pyrite  |                          |                 |
| Rubber  |                          |                 |
|   |                          |                 |
| Styrofoam(Polystyrene)     Styrofoam(Po |                          |                 |
| Titanium  |                          |                 |
| 🗉 Titanium alloy  |                          |                 |
|   |                          |                 |
| tributyl tin     tributyl     tributyl   |                          |                 |
| 🕑 tributyl tin oxide  |                          |                 |
| Zinc Chloride   |                          | •               |
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| Datasheet View  |                          |                 |
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#### **APPENDIX 17 – PERCENT DISSOCIATED TABLE**

| • 🖬 🖨 🖪 🖤 👗 🖻 🖻 🚿                        | ю 🍓 🛃 🏹 🍹 | 🚡 🗸 🗛 🕨 🗶 🛅 🌾 | <b>a</b> • 2, . |     |      |
|--|-----------|---------------|-----------------|-----|------|
| Chemical Name                            | PH2       | PH4           | PH7             | PH9 | PH11 |
| Aluminum                                 |           |               |                 |     |      |
| Aluminum alloy                           |           |               |                 |     |      |
| Aluminum Bromide                         |           |               |                 |     |      |
| Aluminum Chloride                        |           |               |                 |     |      |
| Arsenic                                  |           |               |                 |     |      |
| Asbestos                                 |           |               |                 |     |      |
| Boron Carbide                            |           |               |                 |     |      |
| Cadmium                                  |           |               |                 |     |      |
| Chromium                                 |           |               |                 |     |      |
| Copper                                   |           |               |                 |     |      |
| Copper Oxide                             |           |               |                 |     |      |
| Corundum                                 |           |               |                 |     |      |
| Ethylene Glycol                          |           |               |                 |     |      |
| Ferrosoferric Oxide                      |           |               |                 |     |      |
| Ferrous Oxide, Iron Oxide                |           |               |                 |     |      |
| Ferrous sulfide,Iron Monosulfide         |           |               |                 |     |      |
| Freon                                    |           |               |                 |     |      |
| Hematite                                 |           |               |                 |     |      |
| Iron                                     |           |               |                 |     |      |
| Lead                                     |           |               |                 |     |      |
| Manganese alloy                          |           |               |                 |     |      |
| Oxy-acetylene                            |           |               |                 |     |      |
| Plastics                                 |           |               |                 |     |      |
| Platinum-Niobium                         |           |               |                 |     |      |
| Pyrite                                   |           |               |                 |     |      |
| Rubber                                   |           |               |                 |     |      |
| Silver Chloride                          |           |               |                 |     |      |
| Styrofoam(Polystyrene)                   |           |               |                 |     |      |
| Titanium                                 |           |               |                 |     |      |
| Titanium alloy                           |           |               |                 |     |      |
| tributyl tin                             |           |               |                 |     |      |
| tributyl tin hydride                     |           |               |                 |     |      |
| tributyl tin oxide                       |           |               |                 |     |      |
| Zinc Chloride                            |           |               |                 |     |      |
| d: II → II | 34 🚺      |               |                 |     |      |

### **APPENDIX 18 – REACTIVITY/INSTABILITY TABLE**

|                                  | <u> </u> | 自 🛛 🕺 🕨 🚿 🗐 泊・ |    |   |
|----------------------------------|----------|----------------|----|---|
| Chemical Name                    | Оху      | Ti             | Se | Other Reactions                             |
| Aluminum                         |          |                |    |   |
| Aluminum alloy                   |          |                |    |   |
| Aluminum Bromide                 |          |                |    |   |
| Aluminum Chloride                |          |                |    | Reacts with water liberating hydrogen chlor |
| Arsenic                          |          |                |    |   |
| Asbestos                         |          |                |    |   |
| Boron carbide                    |          |                |    |   |
| Cadmium                          |          |                |    |   |
| Chromium                         |          |                |    |   |
| Copper                           |          |                |    |   |
| Copper Oxide                     |          |                |    |   |
| Corundum                         |          |                |    |   |
| Ethylene Glycol                  |          |                |    |   |
| Ferrosoferric Oxide              |          |                |    |   |
| Ferrous Oxide, Iron Oxide        |          |                |    |   |
| Ferrous sulfide,Iron Monosulfide |          |                |    |   |
| Freon                            |          |                |    |   |
| Hematite                         |          |                |    |   |
| ron                              |          |                |    |   |
| Lead                             |          |                |    |   |
| Manganese alloy                  |          |                |    |   |
| Oxy-acetylene                    |          |                |    |   |
| Plastics                         |          |                |    |   |
| Platinum-Niobium                 |          |                |    |   |
| Pyrite                           |          |                |    |   |
| Rubber                           |          |                |    |   |
| Silver Chloride                  |          |                |    |   |
| Styrofoam(Polystyrene)           |          |                |    |   |
| Titanium                         |          |                |    |   |
| Titanium alloy                   |          |                |    |   |
| tributyl tin                     |          |                |    |   |
| tributyl tin hydride             |          |                |    |   |
| tributyl tin oxide               |          |                |    |   |
| Zinc Chloride                    |          |                |    | reacts with water and aqueous soln is acet  |
| ord: 📕 🕢 🚺 🕨 🕨 🕨                 | of 34    |                |    | ······································      |

## **APPENDIX 19 – TARGET ORAN APPLICABLE TABLE**

| L - 日 🖨 🕻                           | V 🖇 🗎 | 6              | ý 🗠 🚷 🛔     |     | 🌶 🚡 🖓 | ₩ <b>)* )</b> X | 🖥 🕭 • 🝳 . |                |           |              |           |
|-------------------------------------|-------|----------------|-------------|-----|-------|-----------------|-----------|----------------|-----------|--------------|-----------|
| Chemical Nam                        |       | immu           |             |     | itant | allergen        |           | cardiovascular | fertility | developmenta | teratogen |
| Aluminum                            | yes   |                | yes         | yes | у     | es              |           |                |           |              |           |
| Aluminum alloy                      |       |                |             |     |       |                 |           |                |           |              |           |
| Aluminum Brom                       |       |                |             |     |       |                 |           |                |           |              |           |
| Aluminum Chlor                      |       |                |             |     |       |                 |           |                |           |              |           |
| Arsenic                             | yes   |                | yes         |     |       |                 | yes       |                |           |              |           |
| Asbestos                            |       |                | yes         | yes | у     | es              | yes       | yes            |           |              |           |
| Boron Carbide                       |       |                |             |     |       |                 |           |                |           |              |           |
| Cadmium                             | yes   |                | yes         | yes | Y     | es              |           |                |           |              |           |
| Chromium                            | yes   |                | yes         | yes |       | es              |           |                |           |              |           |
| Copper                              |       |                | yes         | yes |       | es              |           |                |           |              |           |
| Copper Oxide                        |       |                |             | ĺ   |       |                 |           |                |           |              |           |
| Corundum                            |       |                |             |     |       |                 |           |                |           |              |           |
| Ethylene Glycol                     | ves   |                |             | yes |       |                 |           | yes            |           |              |           |
| Ferrosoferric Ox                    |       |                |             |     |       |                 |           | <u> </u>       |           |              |           |
| Ferrous Oxide,                      |       |                |             |     |       |                 |           |                |           |              |           |
| Ferrous sulfide,                    |       |                |             |     |       |                 |           |                |           |              |           |
| Freon                               |       |                |             |     |       |                 |           |                |           |              |           |
| Hematite                            |       |                |             |     |       |                 |           |                |           |              |           |
| Iron                                |       |                | yes         |     |       |                 |           |                |           |              |           |
| Lead                                |       |                | ,           |     |       |                 |           |                |           |              |           |
| Manganese allo                      |       |                |             |     |       |                 |           |                |           |              |           |
| Oxy-acetylene                       |       |                |             |     |       |                 |           |                |           |              |           |
| Plastics                            |       |                | yes         | yes | v     | es              |           |                |           |              |           |
| Platinum-Niobiu                     |       |                | <u>y</u> c5 | yes | ŗ     | 60              |           |                |           |              |           |
| Pyrite                              |       |                |             |     |       |                 |           |                |           |              |           |
| Rubber                              |       |                |             |     |       |                 |           |                |           |              |           |
| Silver Chloride                     |       |                |             |     |       |                 |           |                |           |              |           |
|                                     |       |                |             |     |       |                 |           |                |           |              |           |
| Styrofoam(Poly:<br>Titanium         |       |                | 200         | Vac |       |                 |           |                |           |              |           |
|                                     |       |                | yes         | yes | У     | es              |           |                |           |              |           |
| Titanium alloy<br>tributul tin      |       |                |             |     |       |                 |           |                |           |              |           |
| tributyl tin<br>teikotol tin koelei |       |                |             |     |       |                 |           |                |           |              |           |
| tributyl tin hydri                  |       |                |             |     |       |                 |           |                |           |              |           |
| tributyl tin oxide                  |       |                |             |     |       |                 |           |                |           |              |           |
| Zinc Chloride                       |       |                |             |     | _     |                 |           |                |           |              |           |
| cord: 🔣 🕢                           | 1 🕨   | • <b>I •</b> * | if 34       |     | •     |                 |           |                |           |              |           |

#### **APPENDIX 20 – TERRESTRIAL FATE TABLE**

| Þ  | Microsoft Access - [Terrestrial fate : T   | able]                                       |                                     |                          | _ 8 X    |
|----|--|---|-------------------------------------|--------------------------|----------|
|    | Eile Edit View Insert Format Record  | s <u>T</u> ools <u>W</u> indow <u>H</u> elp |                                     |                          | _ B X    |
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|    | Chemical Name  | aerobic biodegradation                      | anaerobic biodegradation            | soil adsorption/mobility | <b></b>  |
|    | ∃ Aluminum   | _   |                                     |                          |          |
|    |  |   |                                     |                          |          |
|    |  |   |                                     |                          |          |
|    |  |   |                                     |                          |          |
|    | ± Arsenic  |   |                                     |                          |          |
|    |  |   |                                     |                          |          |
|    | 🗄 Boron Carbide  |   |                                     |                          |          |
|    | . E Cadmium  |   |                                     |                          |          |
| )  | Chromium   |   |                                     |                          |          |
|    | ± Copper   |   |                                     |                          |          |
|    | Copper Oxide   |   |                                     |                          |          |
|    | Corundum     Corundum  |   |                                     |                          |          |
|    | Ethylene Glycol  | 1-4 days                                    |                                     | low                      |          |
|    |  |   |                                     |                          |          |
|    | 🗄 Ferrous Oxide, Iron Oxide  |   |                                     |                          |          |
|    | 🗄 Ferrous sulfide,Iron Monosulfide   |   |                                     |                          |          |
|    |  |   |                                     |                          |          |
|    | Hematite     Hematite |   |                                     |                          |          |
|    | ± Iron   |   |                                     |                          |          |
|    | 🗄 Lead   |   |                                     |                          |          |
|    | 🗄 Manganese alloy  |   |                                     |                          |          |
|    |  |   |                                     |                          |          |
|    |  |   |                                     |                          |          |
|    |  |   |                                     |                          |          |
|    | ± Pyrite   |   |                                     |                          |          |
|    | ± Rubber   |   |                                     |                          |          |
|    |  |   |                                     |                          |          |
|    | ± Styrofoam(Polystyrene)   |   |                                     |                          |          |
|    | 🗄 Titanium   |   |                                     |                          |          |
|    | 🗄 Titanium alloy   |   |                                     |                          |          |
|    | tributyl tin   |   |                                     |                          |          |
|    | ± tributyl tin hydride   |   |                                     |                          |          |
|    | ± tributyl tin oxide   |   |                                     |                          |          |
|    | ▪ Zinc Chloride  |   |                                     |                          | <b>•</b> |
| Re | ecord: 🔣 📢 🦻 🕨 🕨 o   | f 34  |                                     |                          | •        |
| D  | atasheet View  |   |                                     |                          |          |
|    | 🛿 Start 🛛 🏉 🗊 🐺 🚿 🗍 🛅 Copy of  | f Materialsdb : Data 🕅 APPENDIX.doc - Mi    | icrosoft 🔳 Terrestrial fate : Table | <b>₩</b>                 | 2:18 PM  |

### **APPENDIX 21 – WATER SOLUBILITY TABLE**

| File Edit View Insert Format Records | n 🖁 🛃 🏹 🏹 🌆 🕅 | ▶★ 〆 目 海・ 2 . |        |      |
|--------------------------------------|---------------|---------------|--------|------|
| Chemical Name                        | soluble       | low           | medium | high |
| Aluminum                             | No            |               |        |      |
| Aluminum alloy                       |               |               |        |      |
| Aluminum Bromide                     |               |               |        |      |
| Aluminum Chloride                    |               |               |        |      |
| Arsenic                              |               |               |        |      |
| Asbestos                             |               |               |        |      |
| Boron Carbide                        |               |               |        |      |
| Cadmium                              |               |               |        |      |
| Chromium                             | yes           |               |        |      |
| Copper                               |               |               |        |      |
| Copper Oxide                         |               |               |        |      |
| Corundum                             |               |               |        |      |
| Ethylene Glycol                      | yes           |               |        |      |
| Ferrosoferric Oxide                  |               |               |        |      |
| Ferrous Oxide, Iron Oxide            |               |               |        |      |
| Ferrous sulfide,Iron Monosulfide     |               |               |        |      |
| Freon                                |               |               |        |      |
| Hematite                             |               |               |        |      |
| Iron                                 |               |               |        |      |
| Lead                                 |               |               |        |      |
| Manganese alloy                      |               |               |        |      |
| Oxy-Acetylene                        |               |               |        |      |
| Plastics                             |               |               |        |      |
| Platinum-Niobium                     |               |               |        |      |
| Pyrite                               |               |               |        |      |
| Rubber                               |               |               |        |      |
| Silver Chloride                      |               |               |        |      |
| Styrofoam(Polystyrene)               |               |               |        |      |
| Titanium                             |               |               |        |      |
| Titanium alloy                       |               |               |        |      |
| tributyl tin                         |               |               |        |      |
| tributyl tin hydride                 |               |               |        |      |
| tributyl tin oxide                   |               |               |        |      |
| Zinc Chloride                        |               |               |        |      |
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| asheet View                          |               |               |        |      |

#### APPENDIX 22 – WORKER EXPOSURE CRITERIA (CHRONIC-TWA) TABLE

| <u>File Edit View Insert Format Recon</u>  |                   |               |                 |            | - 6 |
|--|-------------------|---------------|-----------------|------------|-----|
| • 🖬 🌢 🖪 🖤 🐰 🖻 🖻                            | 🖉 🕫 🚷 🛃 👬 🏹 🗃 🖓 🖓 | * 🕅 🔓 🕯 - 🛛 - |                 |            |     |
| Chemical Name                              | TLV               | WEEL          | PEL(respirable) | PEL(total) |     |
| + Aluminum                                 | 10                |               | 5               | 15         |     |
| E Aluminum alloy                           |                   |               |                 |            |     |
| E Aluminum Bromide                         |                   |               |                 |            |     |
| E Aluminum Chloride                        | 2mg/m3            |               |                 |            |     |
| ± Arsenic                                  | 0.1mg/m3          |               | 0.010 mg/m3     |            |     |
| ± Asbestos                                 |                   |               |                 |            |     |
| 🗉 Boron Carbide                            |                   |               |                 |            |     |
| ± Cadmium                                  | 0.05mg/m3         |               |                 |            |     |
| Chromium                                   | 0.5mg/m3          |               |                 |            |     |
| + Copper                                   | 1mg/m3            |               |                 |            |     |
| ▪ Copper Oxide                             |                   |               |                 |            |     |
| E Corundum                                 |                   |               |                 |            |     |
|  |                   |               |                 |            |     |
|  |                   |               |                 |            |     |
|  |                   |               |                 |            |     |
| € Ferrous sulfide,Iron Monosulfide         |                   |               |                 |            |     |
| + Freon                                    |                   |               |                 |            |     |
| + Hematite                                 |                   |               |                 |            |     |
| + Iron                                     |                   |               |                 |            |     |
| + Lead                                     |                   |               |                 |            |     |
| ± Manganese alloy                          |                   |               |                 |            |     |
| ± Oxy-acetylene                            |                   |               |                 |            |     |
|  |                   |               |                 |            |     |
| ▪ Platinum-Niobium                         |                   |               |                 |            |     |
| ± Pyrite                                   |                   |               |                 |            |     |
| ± Rubber                                   |                   |               |                 |            |     |
|  |                   |               |                 |            |     |
|  |                   |               |                 |            | _   |
| ± Titanium                                 |                   |               |                 |            |     |
| Titanium alloy                             |                   |               |                 |            |     |
| ± tributyl tin                             |                   |               |                 |            |     |
| tributyl tin hydride                       | 0.1ppm            |               |                 |            |     |
| It tributyl tin oxide                      |                   |               |                 |            |     |
| ■ Zinc Chloride                            | 1mg/m3            |               | 1mg/m3          |            | _   |
|  | -                 |               | 11131112        |            |     |
| ord: 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 | UI 34 <u>1</u>    |               |                 | NUM        | _,  |

#### APPENDIX 23 – WORKER EXPOSURE CRITERIA (ACUTE-CEIL) TABLE

| • 🖬 🖨 🖪 🖤 👗 🛍 🖻 🚿 🕫 😫             | Z  🔽 🏹 🗛 🕨 🗰 🛵 . | 2    |      |
|-----------------------------------|------------------|------|------|
| Chemical Name                     | PEL              | TLV  | WEEL |
| Aluminum                          |                  | 127  |      |
| Aluminum alloy                    |                  |      |      |
| Aluminum Bromide                  |                  |      |      |
| Aluminum Chloride                 |                  | 5ppm |      |
| Arsenic                           | 0.002mg/m3       |      |      |
| Asbestos                          |                  |      |      |
| Boron Carbide                     |                  |      |      |
| Cadmium                           | 0.3mg/m3         |      |      |
| Chromium                          |                  |      |      |
| Copper                            |                  |      |      |
| Copper Oxide                      |                  |      |      |
| Corundum                          |                  |      |      |
| Ethylene Glycol                   |                  |      |      |
| Ferrosoferric Oxide               |                  |      |      |
| Ferrous Oxide, Iron Oxide         |                  |      |      |
| Ferrous sulfide, Iron Monosulfide |                  |      |      |
| Freon                             |                  |      |      |
| B Hematite                        |                  |      |      |
| Iron                              |                  |      |      |
| Lead                              |                  |      |      |
| Manganese alloy                   |                  |      |      |
| Oxy-acetylene                     |                  |      |      |
| Plastics                          |                  |      |      |
| Platinum-Niobium                  |                  |      |      |
| Pyrite                            |                  |      |      |
| Rubber                            |                  |      |      |
| Silver Chloride                   |                  |      |      |
| Styrofoam(Polystyrene)            |                  |      |      |
| Titanium                          |                  |      |      |
| Titanium alloy                    |                  |      |      |
| tributyl tin                      |                  |      |      |
| tributyl tin hydride              |                  |      |      |
| tributyl tin oxide                |                  |      |      |
| Zinc Chloride                     |                  |      |      |
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#### APPENDIX 24 – WORKER EXPOSURE CRITERIA(ACUTE-STEL) TABLE

| ijle Edit View Insert Format Records Iools \<br>□ | â \$i \$i Ў┓╯м ↦₩ @ @ · Q . |      | _ |
|---|-----------------------------|------|---|
| Chemical Name                                     |                             | WEEL |   |
|   | TLV                         | WEEL |   |
| Aluminum<br>Aluminum allau                        |                             |      |   |
| Aluminum alloy<br>Aluminum Bromide                |                             |      |   |
| Aluminum Chloride                                 |                             |      |   |
|   | 0.01                        |      |   |
| Arsenic   | 0.01mg/m3                   |      |   |
| Asbestos  |                             |      |   |
| Boron Carbide                                     |                             |      |   |
| Cadmium   | 0.1mg/m3                    |      |   |
| Chromium  |                             |      |   |
| Copper  |                             |      |   |
| Copper Oxide                                      |                             |      |   |
| Corundum  |                             |      |   |
| Ethylene Glycol                                   |                             |      |   |
| Ferrosoferric Oxide                               |                             |      |   |
| Ferrous Oxide, Iron Oxide                         |                             |      |   |
| Ferrous sulfide,Iron Monosulfide                  |                             |      |   |
| Freon   |                             |      |   |
| Hematite  |                             |      |   |
| Iron  |                             |      |   |
| Lead  |                             |      |   |
| Manganese alloy                                   |                             |      |   |
| Oxy-acetylene                                     |                             |      |   |
| Plastics  |                             |      |   |
| Platinum-Niobium                                  |                             |      |   |
| Pyrite  |                             |      |   |
| Rubber  |                             |      |   |
| Silver Chloride                                   |                             |      |   |
| Styrofoam(Polystyrene)                            |                             |      |   |
| Titanium  |                             |      |   |
| Titanium alloy                                    |                             |      |   |
| tributyl tin                                      |                             |      |   |
| tributyl tin hydride                              | 0.2                         |      |   |
| tributyl tin oxide                                |                             |      |   |
| Zinc Chloride                                     | 2mg/m3                      |      |   |
| d: 1 + H + of 34                                  |                             |      |   |

#### **APPENDIX - 25**

#### 25.1 Acute Symptoms Code

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) 'This is where you would put error handling code 'If you want to ignore errors, comment out the next line 'If you want to trap them, add code here to handle them MsgBox "Data error event hit err:" & Description End Sub Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) This is where you put validation code 'This event gets called when the following actions occur Dim bCancel As Boolean Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUpdate End Select If bCancel Then adStatus = adStatusCancel End Sub Private Sub cmdAdd Click()

On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub

Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub

Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

#### 25.2 Allergen form Code

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) 'This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description

End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset

datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub Private Sub datPrimaryRS WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This is where you put validation code 'This event gets called when the following actions occur Dim bCancel As Boolean Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUpdate End Select If bCancel Then adStatus = adStatusCancel End Sub Private Sub cmdAdd Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew Exit Sub AddErr: MsgBox Err.Description End Sub Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate\_Click()

On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub Private Sub cmdClose\_Click()

Unload Me End Sub

#### 25.3 Aquatic Fate form Code

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) 'This is where you would put error handling code

'If you want to ignore errors, comment out the next line 'If you want to trap them, add code here to handle them MsgBox "Data error event hit err:" & Description End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

This is where you put validation code This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUndoUpdate Case adRsnUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

#### 25.4 Atmospheric Fate form Code

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr:

MsgBox Err.Description End Sub Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub

Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub

Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) 'This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them MsgBox "Data error event hit err:" & Description End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code 'This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnRequery Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUndoUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub

Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub

Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps

On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate Click() On Error GoTo UpdateErr datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub Private Sub cmdClose\_Click() Unload Me End Sub

#### 25.5 BOD form Code :

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean)

'This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

"This is where you put validation code "This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew

Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUpdate End Select If bCancel Then adStatus = adStatusCancel End Sub Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew Exit Sub AddErr: MsgBox Err.Description End Sub Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub Private Sub cmdClose\_Click() Unload Me End Sub

#### 25.6 Clean Air Act Code:

rivate Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) "This is where you would put error handling code "If you want to ignore errors, comment out the next line "If you want to trap them, add code here to handle them MsgBox "Data error event hit err:" & Description End Sub Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As

ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset

datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code

'This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUndoUpdate Case adRsnUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub

Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub

Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub

Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

#### 25.7 Cancer form Code :

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) "This is where you would put error handling code "If you want to ignore errors, comment out the next line "If you want to trap them, add code here to handle them MsgBox "Data error event hit err:" & Description End Sub Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) "This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

'This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose

Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUpdate End Select If bCancel Then adStatus = adStatusCancel End Sub Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew Exit Sub AddErr: MsgBox Err.Description End Sub Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub Private Sub cmdClose\_Click() Unload Me End Sub

#### **25.8 Chronic symptoms form Code:**

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) "This is where you would put error handling code
'If you want to ignore errors, comment out the next line
'If you want to trap them, add code here to handle them
MsgBox "Data error event hit err:" & Description
End Sub
Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)
'This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition)
End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

"This is where you put validation code "This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnRequery Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub

Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete

.MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub Private Sub cmdClose\_Click() Unload Me End Sub

#### 25.9 Corrosivity form Code

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) 'This is where you would put error handling code

This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This will display the current record position for this recordset

datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code

This event gets called when the following actions occur

Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUpdate End Select If bCancel Then adStatus = adStatusCancel End Sub Private Sub cmdAdd Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew Exit Sub AddErr: MsgBox Err.Description End Sub Private Sub cmdDelete Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

#### 25.10 Characteristic RCRA form Code :

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) 'This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description

End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This will display the current record position for this recordset

datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code

'This event gets called when the following actions occur

Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUndoUpdate Case adRsnUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub

Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub

Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub

Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

# 25.11 DOT Code

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean)

'This is where you would put error handling code 'If you want to ignore errors, comment out the next line

If you want to rap them, add code here to handle them

MsgBox "Data error event hit err:" & Description

End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub Private Sub datPrimaryRS WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This is where you put validation code 'This event gets called when the following actions occur Dim bCancel As Boolean Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUpdate End Select If bCancel Then adStatus = adStatusCancel End Sub Private Sub cmdAdd Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew Exit Sub AddErr: MsgBox Err.Description End Sub Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate\_Click()

On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub Private Sub cmdClose\_Click()

Unload Me End Sub

### 25.12 Extinguishing Agents form Code

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean)

'This is where you would put error handling code 'If you want to ignore errors, comment out the next line 'If you want to trap them, add code here to handle them MsgBox "Data error event hit err:" & Description End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

This is where you put validation code This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUndoUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click()

On Error GoTo AddErr datPrimaryRS.Recordset.AddNew Exit Sub AddErr: MsgBox Err.Description End Sub Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub Private Sub cmdClose\_Click() Unload Me

#### 25.13 File Maintenance form Code:

End Sub

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean)

'This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description End Sub Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code 'This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUndoUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub

Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub

Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub

Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

#### 25.14 Flammability/Combustibility form Code

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean)

This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This will display the current record position for this recordset

datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code

This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUndoUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub

Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub

Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub

Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

# 25.15 Main Form Code:

Private Sub AC\_Click() frmacutesymptoms.Show 1 End Sub

Private Sub AF\_Click()

frmaquaticfate.Show 1 End Sub

Private Sub allergen\_Click() frmallergen.Show 1 End Sub

Private Sub ATF\_Click() frmatmfate.Show 1 End Sub

Private Sub bod\_Click() frmbod.Show 1 End Sub

Private Sub Boilingpoint\_Click() frmquerybp.Show 1 End Sub

Private Sub CAA\_Click() frmcaa.Show 1 End Sub

Private Sub cancer\_Click() frmcancer.Show 1 End Sub

Private Sub casno\_Click() frmsearchcsno.Show 1 End Sub

Private Sub chemicalname\_Click() frmsearchchname.Show 1 End Sub

Private Sub Co\_Click() frmcorrosivity.Show 1 End Sub

Private Sub CRCRA\_Click() frmcrcra.Show 1 End Sub

Private Sub CS\_Click() frmchronicsymptoms.Show 1 End Sub

Private Sub DOt\_Click() frmdot.Show 1 End Sub

Private Sub Ea\_Click() frmextinguishingagents.Show 1 End Sub

Private Sub exit\_Click()

Unload frmmain End Sub

Private Sub FC\_Click() frmflammabilitycombustibility.Show 1 End Sub

Private Sub materials\_Click() frmmaterial.Show 1 End Sub

Private Sub melting\_Click() frmquerymeltingpoint.Show 1 End Sub

Private Sub MF\_Click() frmsearchmolfor.Show 1 End Sub

Private Sub mnuClassify\_Click() frmqueryclass.Show 1 End Sub

Private Sub molweight\_Click() frmquerymw.Show 1 End Sub

Private Sub OAAT\_Click() frmoralacuteaquatictox.Show 1 End Sub

Private Sub PD\_Click() frmpercentdissociated.Show 1 End Sub

Private Sub records\_Click() "frmpassword1.Show 1 'Unload frmpassword1 End Sub

Private Sub RI\_Click() frmReactivityInstability.Show 1 End Sub

Private Sub TF\_Click() frmtf.Show 1 End Sub

Private Sub vp\_Click() frmqueryvp.Show 1 End Sub

Private Sub WECCEIL\_Click() frmwecceil.Show 1 End Sub Private Sub WECSTEL\_Click() frmwecstel.Show 1 End Sub

Private Sub WECTWA\_Click() frmwectwa.Show 1 End Sub

Private Sub WL\_Click()

End Sub

Private Sub WS\_Click() frmwatersolubility.Show 1 End Sub

### 25.16 Materials form Code

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) 'This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description

End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset

datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code 'This event gets called when the following actions occur Dim bCancel As Boolean Select Case adReason Case adRsnAddNew

Case adRsnClose Case adRsnDelete

Case adRsnFirstChange

Case adRsnMove

Case adRsnRequery

Case adRsnResynch

Case adRsnUndoAddNew

Case adRsnUndoDelete

Case adRsnUndoUpdate

Case adRsnUpdate End Select If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub

Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub

Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub

Private Sub cmdUpdate\_Click() 'On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll 'Exit Sub 'UpdateErr: 'MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

# 25.17 Oral Acute aquatic Tox Form – code

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean)

This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description

End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code 'This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnRequery Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUndoUpdate Case adRsnUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub

Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub

Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub

Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

# 25.18 Invalid Password Code:

Private Sub Command1\_Click() If Text1.Text = "a" Then Unload frmpassword frmmain.Show 1 Else Unload frmpassword MsgBox ("Invalid password") frmpassword.Show 1 Text1.Text = "" End If End Sub

# **25.19 Percent Dissociated Code:**

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean)

'This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description

End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code 'This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUndoUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub

Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub

Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub

Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

## 25.20 Form Query on boiling point:

Private optCheck As Boolean Private Sub Option1\_Click() optCheck = True End Sub Private Sub Option2\_Click() optCheck = False End Sub Private Sub Text1\_KeyPress(KeyAscii As Integer) If KeyAscii = 13 Then If Text1.Text = "" Then MsgBox "Please enter a value for Boiling Point" Exit Sub Else If optCheck Then adoQmw.RecordSource = "select \* from materials where boiling\_point is not null and boiling\_point > " & Text1.Text & " order by boiling\_point" adoOmw.Refresh Else adoQmw.RecordSource = "select \* from materials where boiling\_point is not null and boiling\_point<" & Text1.Text & " order by boiling\_point" adoQmw.Refresh End If End If End If End Sub

#### 25.21 Query on Classification form code:

Private optCheck As Boolean

Private Sub Option1 Click() optCheck = True End Sub Private Sub Option2\_Click() optCheck = False End Sub Private Sub Combo1\_click() adoQmw.RecordSource = "select \* from materials where classification =" & Combo1.Text & "" adoOmw.Refresh End Sub Private Sub Form Load() Dim dbcs As Database Dim rscs As Recordset Dim i Set dbcs = DBEngine.Workspaces(0).OpenDatabase("c:\vdemo\db2.mdb") Set rscs = dbcs.OpenRecordset("select distinct classification from materials") Do Until rscs.EOF If rscs.Fields("classification") <> "" Then Combo1.AddItem rscs!classification End If rscs.MoveNext Loop rscs.Close dbcs.Close End Sub

# 25.22 Query on Melting point code

Private optCheck As Boolean Private Sub Option1\_Click() optCheck = True End Sub Private Sub Option2\_Click() optCheck = False End Sub Private Sub Text1\_KeyPress(KeyAscii As Integer) If KeyAscii = 13 Then If Text1.Text = "" Then MsgBox "Please enter a value for Melting Point" Exit Sub Else If optCheck Then adoQmw.RecordSource = "select \* from materials where melting point is not null and melting point > " & Text1.Text & " order by melting\_point" adoQmw.Refresh Else adoQmw.RecordSource = "select \* from materials where melting\_point is not null and melting\_point<" & Text1.Text & " order by melting\_point"

adoQmw.Refresh End If End If End If End Sub

#### 25.23 Query on Molecular Weight code:

Private optCheck As Boolean Private Sub Option1\_Click() optCheck = True End Sub Private Sub Option2\_Click() optCheck = False End Sub Private Sub Text1\_KeyPress(KeyAscii As Integer) If KeyAscii = 13 Then If Text1.Text = "" Then MsgBox "Please enter a value for Molecular weight" Exit Sub Else If optCheck Then adoQmw.RecordSource = "select \* from materials where molecular\_wt is not null and molecular\_wt > " & Text1.Text & " order by molecular\_wt" adoQmw.Refresh Else adoQmw.RecordSource = "select \* from materials where molecular\_wt is not null and molecular\_wt<" & Text1.Text & " order by molecular\_wt" adoQmw.Refresh End If End If End If End Sub

# 25.24 Query on VP Code

Private optCheck As Boolean

Private Sub Option1\_Click() optCheck = True End Sub

Private Sub Option2\_Click() optCheck = False End Sub

Private Sub Text1\_KeyPress(KeyAscii As Integer)

```
If KeyAscii = 13 Then
  If Text1.Text = "" Then
    MsgBox "Please enter a value for Vapor Pressure"
    Exit Sub
  Else
    If optCheck Then
       adoQmw.RecordSource = "select * from materials where vp is not null and vp > " & Text1.Text & " order by
vp"
       adoQmw.Refresh
    Else
       adoQmw.RecordSource = "select * from materials where vp is not null and vp < " & Text1.Text & " order by
vp"
       adoOmw.Refresh
    End If
  End If
End If
End Sub
```

#### 25.25 Reactivity/Instability form code:

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean)

This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset

datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code

'This event gets called when the following actions occur

Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete

Case adRsnUndoUpdate Case adRsnUpdate End Select If bCancel Then adStatus = adStatusCancel End Sub Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew Exit Sub AddErr: MsgBox Err.Description End Sub Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub Private Sub cmdClose\_Click() Unload Me End Sub

#### 25.26 Search By chemical Name Form code:

Option Explicit Private dbcs As Database Private rscs As Recordset Private Sub dbcmbcs\_Click() Dim strsql As String Dim i As Field Set rscs = dbcs.OpenRecordset("select \* from materials where chemical name = "" & dbcmbcs.Text & """, dbOpenSnapshot) txtmw.Text = IIf(IsNull(rscs!molecular\_wt), "Not Available", rscs!molecular\_wt) txtbp.Text = IIf(IsNull(rscs!boiling\_point), "Not Available", rscs!boiling\_point) txtmp.Text = IIf(IsNull(rscs!melting\_point), "Not Available", rscs!melting\_point) txtmf.Text = IIf(IsNull(rscs!molecular\_formula), "Not Available", rscs!molecular\_formula) lblcn.Caption = IIf(IsNull(rscs!casno), "Not available", rscs!casno) End Sub Private Sub Form\_Load() Dim i Set dbcs = DBEngine.Workspaces(0).OpenDatabase("c:\vdemo\db2.mdb") Set rscs = dbcs.OpenRecordset("materials") Do Until rscs.EOF If rscs.Fields("casno") <> "" Then dbcmbcs.AddItem rscs.Fields("chemical\_name").Value End If rscs.MoveNext Loop rscs.Close End Sub Private Sub Form Unload(Cancel As Integer) dbcs.Close

```
End Sub
```

# 25.27 Search By CAS number code:

**Option Explicit** Private dbcs As Database Private rscs As Recordse Private Sub dbcmbcs Click() Dim strsql As String Dim i As Field Set rscs = dbcs.OpenRecordset("select \* from materials where casno = "" & dbcmbcs.Text & """, dbOpenSnapshot) txtmw.Text = IIf(IsNull(rscs!molecular\_wt), "Not Available", rscs!molecular\_wt) txtbp.Text = IIf(IsNull(rscs!boiling\_point), "Not Available", rscs!boiling\_point) txtmp.Text = IIf(IsNull(rscs!melting\_point), "Not Available", rscs!melting\_point) txtmf.Text = IIf(IsNull(rscs!molecular\_formula), "Not Available", rscs!molecular\_formula) lblcn.Caption = IIf(rscs!chemical\_name = Null, "Not available", rscs!chemical\_name) End Sub Private Sub Form Load() Dim i Set dbcs = DBEngine.Workspaces(0).OpenDatabase("c:\vdemo\db2.mdb") Set rscs = dbcs.OpenRecordset("materials") Do Until rscs.EOF If rscs.Fields("casno") <> "" Then dbcmbcs.AddItem rscs.Fields("casno").Value End If rscs.MoveNext Loop rscs.Close

End Sub

Private Sub Form\_Unload(Cancel As Integer) dbcs.Close End Sub

#### 25.28 Search by Molecular Formula Code

**Option Explicit** Private dbcs As Database Private rscs As Recordset Private Sub dbcmbcs Click() Dim strsql As String Dim i As Field Set rscs = dbcs.OpenRecordset("select \* from materials where molecular\_formula = "" & dbcmbcs.Text & """, dbOpenSnapshot) txtmw.Text = IIf(IsNull(rscs!molecular\_wt), "Not Available", rscs!molecular\_wt) txtbp.Text = IIf(IsNull(rscs!boiling\_point), "Not Available", rscs!boiling\_point) txtmp.Text = IIf(IsNull(rscs!melting\_point), "Not Available", rscs!melting\_point) lblcn.Caption = IIf(rscs!chemical\_name = Null, "Not available", rscs!chemical\_name) End Sub Private Sub Form Load() Dim i Set dbcs = DBEngine.Workspaces(0).OpenDatabase("c:\vdemo\db2.mdb") Set rscs = dbcs.OpenRecordset("materials") Do Until rscs.EOF If rscs.Fields("molecular\_formula") <> "" Then dbcmbcs.AddItem rscs.Fields("molecular formula").Value End If rscs.MoveNext Loop rscs.Close End Sub Private Sub Form\_Unload(Cancel As Integer)

dbcs.Close End Sub

#### 25.29 Start up form code:

Private Sub Command1\_Click() frmpassword.Show 1 End Sub Private Sub Command2\_Click() End End Sub

#### 25.30 Terrestrial Fate form code:

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) "This is where you would put error handling code "If you want to ignore errors, comment out the next line "If you want to trap them, add code here to handle them MsgBox "Data error event hit err:" & Description End Sub Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) "This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code 'This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnRequery Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUndoUpdate Case adRsnUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub

Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete

.MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub Private Sub cmdClose\_Click() Unload Me End Sub

#### 25.31 Water Solubility Form code:

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) 'This is where you would put error handling code

This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This will display the current record position for this recordset

datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code

This event gets called when the following actions occur

Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUpdate End Select If bCancel Then adStatus = adStatusCancel End Sub Private Sub cmdAdd Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew Exit Sub AddErr: MsgBox Err.Description End Sub Private Sub cmdDelete Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

#### 25.32 Worker Exposure Criteria (acute-CEIL) CODE;

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) 'This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description

End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This will display the current record position for this recordset

datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This is where you put validation code

'This event gets called when the following actions occur

Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUndoUpdate Case adRsnUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub

Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew

Exit Sub AddErr: MsgBox Err.Description End Sub

Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub

Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub

Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

# 25.33 Worker Exposure Criteria (acute-STEL) code

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) 'This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This will display the current record position for this recordset datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset) 'This is where you put validation code This event gets called when the following actions occur Dim bCancel As Boolean Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnMove Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUpdate End Select If bCancel Then adStatus = adStatusCancel End Sub Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew Exit Sub AddErr: MsgBox Err.Description End Sub Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub

Private Sub cmdUpdate\_Click()

On Error GoTo UpdateErr

datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub

Private Sub cmdClose\_Click() Unload Me End Sub

#### 25.34 Worker Exposure Criteria (chronicTWA) code:

Private Sub Form\_Unload(Cancel As Integer) Screen.MousePointer = vbDefault End Sub

Private Sub datPrimaryRS\_Error(ByVal ErrorNumber As Long, Description As String, ByVal Scode As Long, ByVal Source As String, ByVal HelpFile As String, ByVal HelpContext As Long, fCancelDisplay As Boolean) 'This is where you would put error handling code

'If you want to ignore errors, comment out the next line

'If you want to trap them, add code here to handle them

MsgBox "Data error event hit err:" & Description

End Sub

Private Sub datPrimaryRS\_MoveComplete(ByVal adReason As ADODB.EventReasonEnum, ByVal pError As ADODB.Error, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

'This will display the current record position for this recordset

datPrimaryRS.Caption = "Record: " & CStr(datPrimaryRS.Recordset.AbsolutePosition) End Sub

Private Sub datPrimaryRS\_WillChangeRecord(ByVal adReason As ADODB.EventReasonEnum, ByVal cRecords As Long, adStatus As ADODB.EventStatusEnum, ByVal pRecordset As ADODB.Recordset)

This is where you put validation code

'This event gets called when the following actions occur Dim bCancel As Boolean

Select Case adReason Case adRsnAddNew Case adRsnClose Case adRsnDelete Case adRsnFirstChange Case adRsnRequery Case adRsnRequery Case adRsnResynch Case adRsnUndoAddNew Case adRsnUndoDelete Case adRsnUndoUpdate Case adRsnUpdate End Select

If bCancel Then adStatus = adStatusCancel End Sub Private Sub cmdAdd\_Click() On Error GoTo AddErr datPrimaryRS.Recordset.AddNew Exit Sub AddErr: MsgBox Err.Description End Sub Private Sub cmdDelete\_Click() On Error GoTo DeleteErr With datPrimaryRS.Recordset .Delete .MoveNext If .EOF Then .MoveLast End With Exit Sub DeleteErr: MsgBox Err.Description End Sub Private Sub cmdRefresh\_Click() 'This is only needed for multi user apps On Error GoTo RefreshErr datPrimaryRS.Refresh Exit Sub RefreshErr: MsgBox Err.Description End Sub Private Sub cmdUpdate\_Click() On Error GoTo UpdateErr datPrimaryRS.Recordset.UpdateBatch adAffectAll Exit Sub UpdateErr: MsgBox Err.Description End Sub Private Sub cmdClose\_Click() Unload Me End Sub

# APPENDIX 26 - RELATIONSHIPS DIAGRAM OF TABLES IN THE DATABASE

