Let's Take a PEEK at the PEAC software

This month our example is Aminoethylene also called Ethyleneimine or Ethylene Imine which is a clear, colorless liquid with an intense odor of ammonia (the odor threshold is 1.5 ppm). It is soluble in alcohol and miscible in water and most organic solvents. Its chemical formula is C_2H_5N, which corresponds to a molecular weight of 43.07. Aminoethylene has a vapor density greater than air, so any vapors are going to seek low spots.

At standard conditions of sea level and 68°F. The chemical has a vapor pressure of 0.21 atmospheres, which is equivalent to 160 mm of Hg. With a melting point of -97°F and a boiling point of 133°F, it is typically found as a liquid. It has a relatively low flash point 12°F making it a flammability hazard. It has an IDLH of 100 ppm, which means it is also presents a substantial health hazard. The OSHA work place exposure limit for an 8-hour work shift is 0.5 ppm.

- Ethyleneimine can affect you when breathed in and by passing through your skin.
- Ethyleneimine should be handled as a CARCINOGEN--WITH EXTREME CAUTION. It may damage the developing fetus.
- Exposure can cause nausea, headaches, dizziness and severely irritate the eyes, nose and throat. Higher levels can cause fluid in the lungs (pulmonary edema) and kidney damage. It can cause death.
- Ethyleneimine is a FLAMMABLE and REACTIVE CHEMICAL and is a FIRE AND EXPLOSION HAZARD.

Ethylene imine is extremely irritating to the eyes, skin, and respiratory tract and is a blistering agent. Respiratory effects may be delayed for several hours. Direct eye exposure may result in permanent corneal opacity. Renal damage and hematological effects have been seen in humans. Chronic exposure in humans and animals has been reported to cause effects on the blood.

Commercially shipped in the following containers - Glass bottles or security sealed glass ampules, metal drums, and cylinders.

Commercial uses - Monomer for polymerization (a chemical intermediate in the production of other chemicals); textile chemicals, adhesives, binders, resins, lubricants, surfactants, a flocculating agent in water treatment, and photographic chemicals.

Other chemicals or materials to avoid contact with - Acids; and sodium hypochlorite (bleach). Caution: Explosive polymerization may occur upon contact with acid. Explosive compounds may form on contact with bleach.

Other names or synonyms - Aminoethylene; azacyclopropane; azirane; azindine; 1H-azinne, dihydro-; dihydroazirene; dimethyleneimine; dimethylenimine; ethylenimine.

In using the PEAC application we access information for the chemical by first locating Aminoethylene in the database. The following figures show the screens displayed for chemical properties, Figure 1 for the *PEAC-WMD for Windows* application and Figure 2-4 for the *PEAC-WMD for the Pocket PC* application.

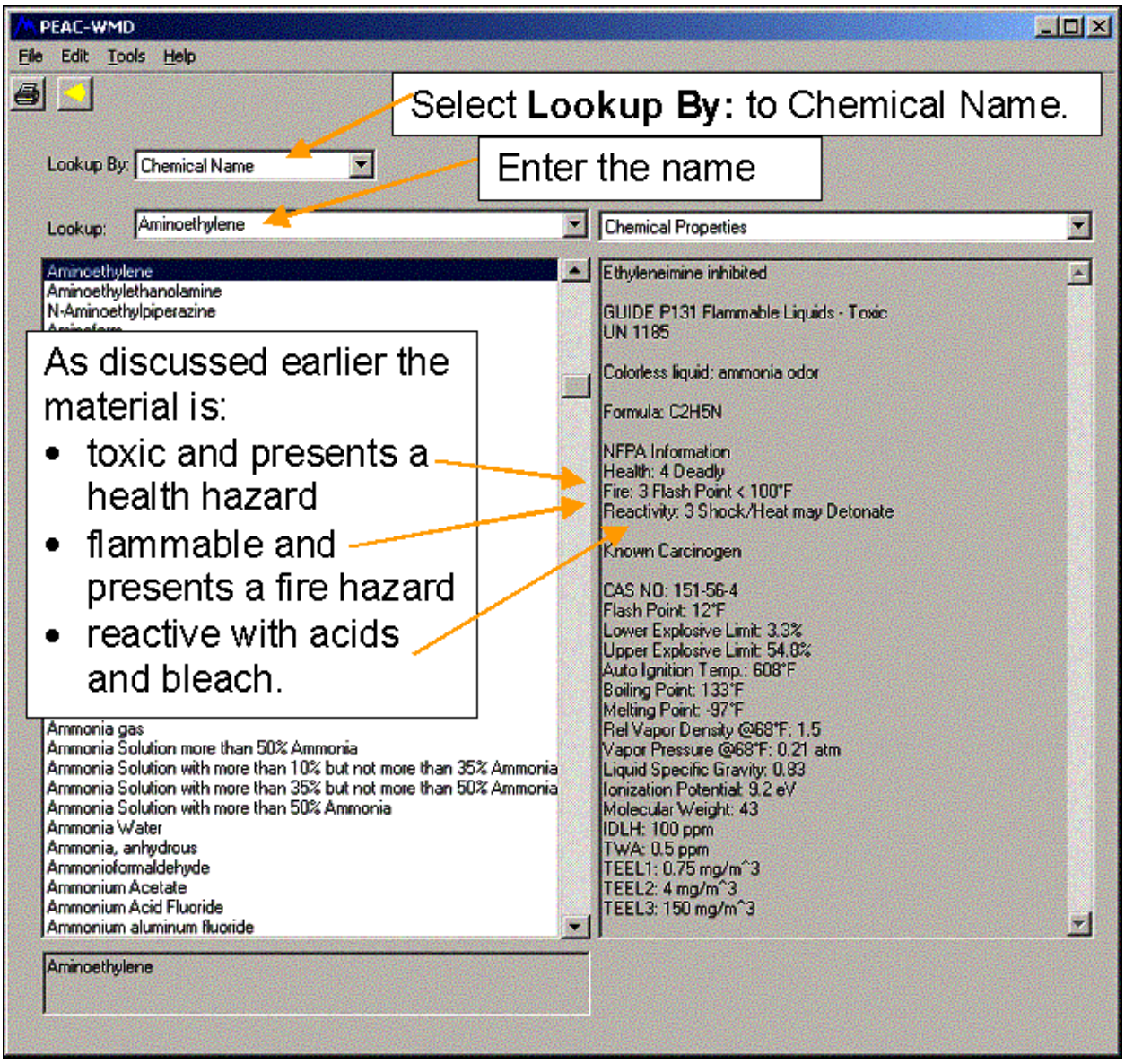


Figure 1 - Using the Lookup By: Name for Aminoethylene using the PEAC-WMD 2002 for Windows application

Review of the information displayed in the chemical properties screen whether in Figure 1 (above) or Figures 3 & 4 (below), show chemical properties values discussed earlier at the top of this discussion. In addition, other values are provided such as the TEELs (Temporary Emergency Exposure Limit) published by Department of Energy.

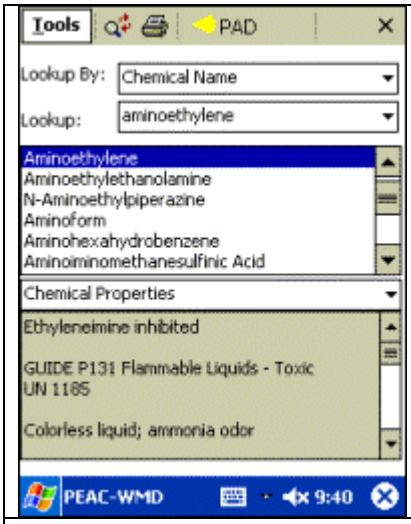


Figure 2 – Selecting Aminoethylene using the PEAC-WMD for Pocket PC application

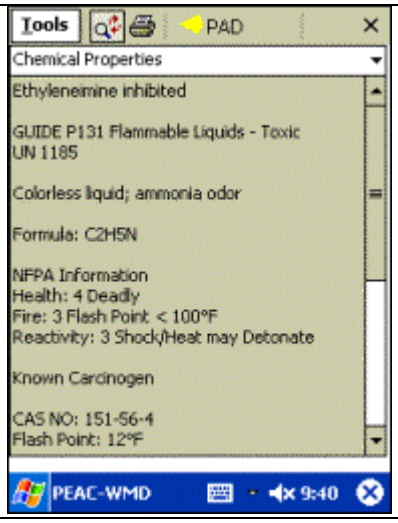


Figure 3 – The top portion of the Chemical Properties Data Display Screen

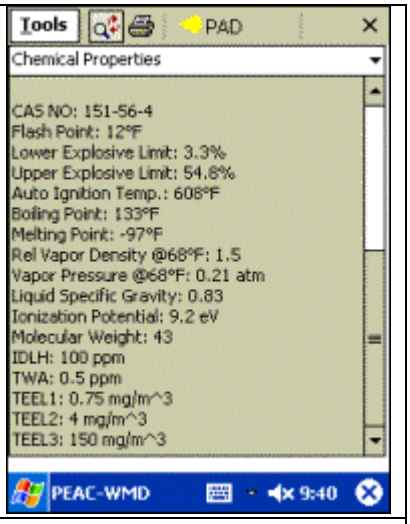


Figure 4 – The bottom portion of the Chemical Properties Data Display Screen

Additional information is available regarding how to prevent skin contact by checking the CPC listing, i.e., **Chemical Protective Clothing**. This is shown in Figure 5, and as with the Chemical Properties checking the CPC entries for Hydrogen Fluoride might also be useful. As shown, for **Aminoethylene** only miscellaneous and suits are listed. The miscellaneous category is how the PEAC database dealt with the DuPont CPC fabrics that were used in many suits, e.g., DuPont Tychem products, but weren't manufactured as final products by DuPont. This has changed to some degree since DuPont has recent entered into a collaborative partnership with Kappler, a manufacturer of CPC garments.

For those unfamiliar with the PEAC database and how CPC garments are displayed, there are two possible display screens for CPC garments. The **All Chemical Protective Clothing** displays all entries in the PEAC database for the specific chemical selected. The **Available Chemical Protective Clothing** selection is based on filtering the **All Chemical Protective Clothing** listing for only those manufacturers that the user has already indicated they have in their inventory. Without a great deal of explanation, there is a simple to use feature where the user indicates what manufacturers' products they have in their inventory so a "short list" can be provided rapidly to the user when on the scene.

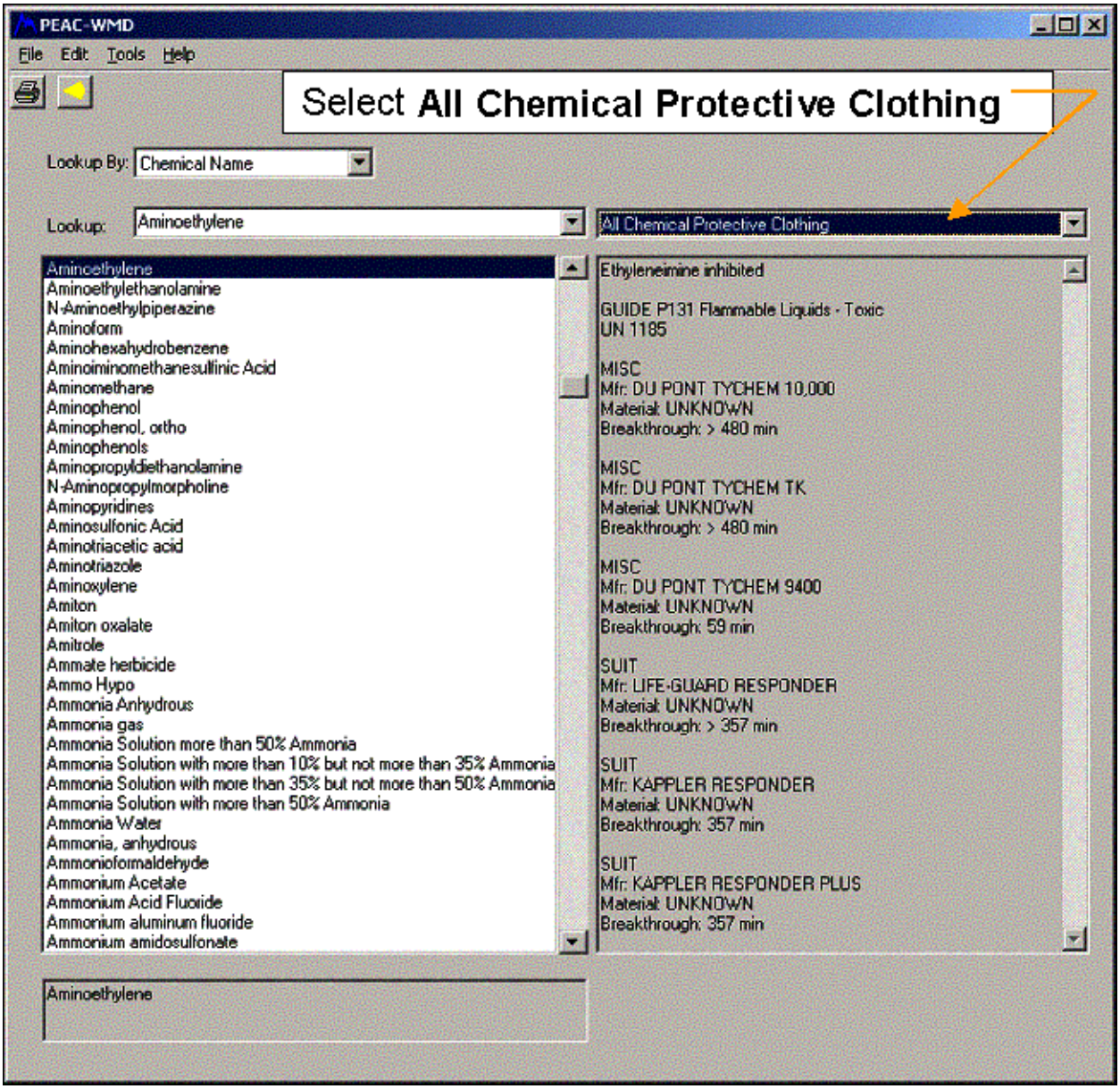
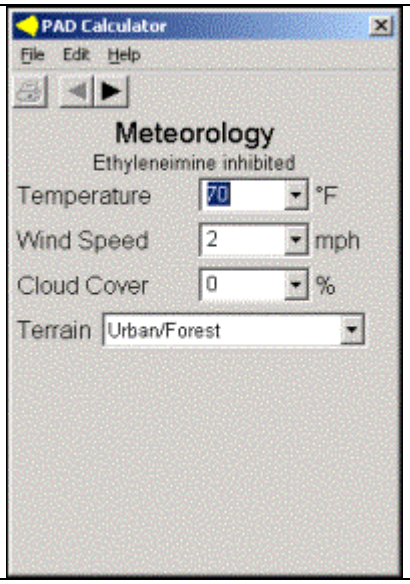


Figure 5 - Displaying the CPC entries in the PEAC database for Aminoethylene

Another benefit of using the PEAC tool is assistance in the development of an evacuation zone for those chemicals that produce a toxic vapor cloud. Aminoethylene has a substantial vapor pressure (160 mm Hg), so if spilled then an evacuation may probably be required.

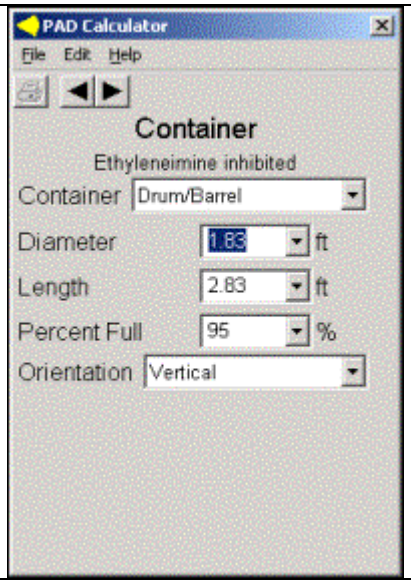
As with all of our examples, AristaTek creates a scenario for a spill or release of the specific chemical and then we work through the development of a PAD (Protective Action Distance) to demonstrate how the PEAC system works. For our scenario using Aminoethylene as the spilled chemical we'll use Houston as the location and the time as 10:45 PM on November 20th. A trailer carrying a mixed load of chemicals is involved in an accident and a drum of Aminoethylene is ruptured and spills to create a pool about 10 feet in diameter. The temperature is about 70°F, the winds are 2 mph, it's a clear night (no clouds) and it surrounding area contains warehouses and factories.

As seen at the top of the data display screens, there is a yellow icon displayed, this is the PEAC icon for notifying the user that a Protective Action Distance can be calculated. Clicking or tapping on the PAD icon will display a screen as shown in Figure 6. Following through the screens, provide information on the Meteorology, Container Size, and Type of Release (Source). The last screen displays the PAD based on the provided information.



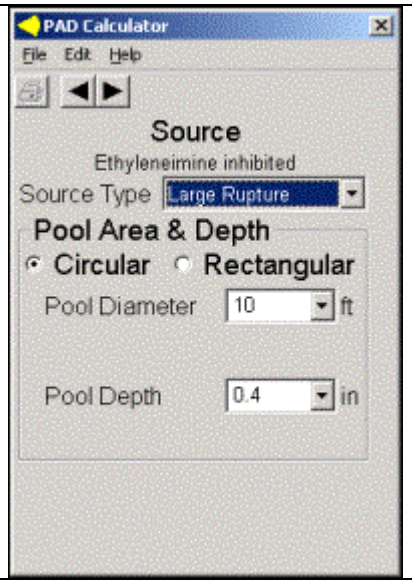
Meteorology

It's Houston (or nearby) in November and the temperature about 70°, light wind is set for 2 mph, clear sky so we'll set cloud cover to 0%, and the terrain is Urban/Forest since it's an industrial setting.



Container

We have selected from our list of container sizes the drum/barrel selection. This provides us with a default size that should get us pretty close to the actual size.



Source

Since Aminoethylene is a liquid at these temperatures a liquid pool will be formed. We've selected a circular pool and a diameter of 10' and the default depth of 0.4".

Figure 6 – Calculating a PAD using the PEAC System

The built-in PEAC dispersion model makes a calculation using the IDLH of 100 ppm as the **Level of Concern** as a default value.* This results in a downwind distance of ~250 yards, see Figure 7. The initial isolation zone in all directions is 100' as displayed in the ERG2000 "green pages". The responder has the option to use a value other than the IDLH as the end-point for the dispersion model calculation. A different value can be entered for the **Level of Concern** and the PAD calculator will recompute a distance and display a new screen.

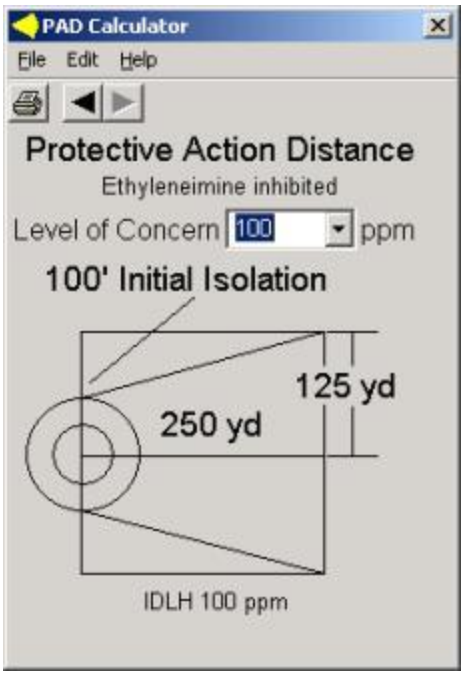


Figure 7 – PAD for Aminoethylene

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* Since the IDLH is a recommended concentration that allows for 30 minutes to vacate an area, the responder may elect to utilize a lower concentration for the **Level of Concern** to provide a safety margin when dealing with public evacuations.