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Using the Technical Planning and Evaluation Course to Demonstrate an Integrated Approach to Technological Risk Analysis and Protective Action Decision Making

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Based on
CSEPP Planning Guidance Appendix D
Oak Ridge Evacuation Modeling System (OREMS)
Atmospheric Dispersion Model D2PC
Protective Action Dose Reduction Estimator (PADRE)

Prepared for the
International Emergency Management and Engineering Conference
TIEMEC 1994
Hollywood, Florida
April 21, 1994

Prepared by the
Oak Ridge National Laboratory
Oak Ridge, Tennessee 37831
managed by
Martin Marietta Energy Systems, Inc.
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DISCLAIMER

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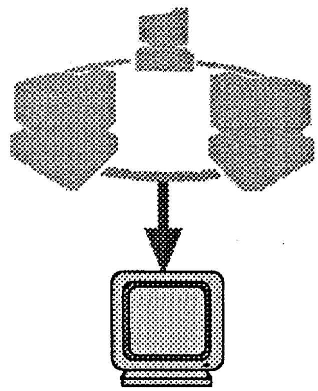

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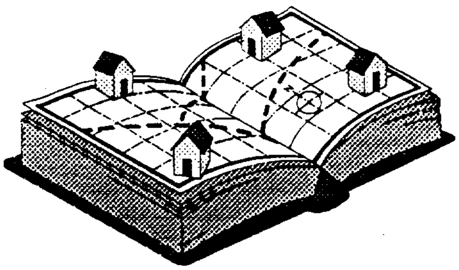
Technical Planning and Evaluation Course (TPE)



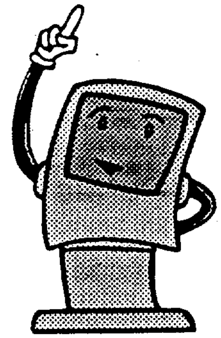
Purpose

- TPE has been developed to aid planners and other Chemical Stockpile Emergency Preparedness Program (CSEPP) personnel in using CSEPP Planning Guidance and Standards and the modeling tools developed to analyze hazard prediction and protective action strategies.
- TPE integrates planning, modeling, training, documentation functions to meet specific objectives

Course Objectives

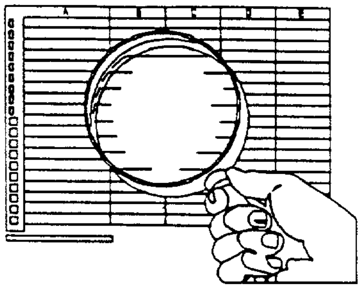
- Describe technical aspects of CSEPP protective action standards in relation to the planning process
- Describe the protective action decision-making process and the relationships among its various components.
- Demonstrate the use of a decision-making framework to maximize public protection.
- Demonstrate a skill level with each of the major tools and techniques commensurate with expected use of the system.
- Use the tools and techniques to evaluate and modify (if necessary) current emergency plans.

Course Structure



- This course consists of six major modules.
  - — Introduction and Key Concepts
  - — Implementing the Standards
  - — OREMS
  - — D2PC
  - — PADRE
  - — Evaluation
- Each module contains two units:
  - — Computer-assisted instruction covering the general concepts and principles.
  - — Workbook-based example that is analyzed utilizing:
    - – the models themselves,
    - – the forms developed to guide the process, and
    - – the job aids that provide additional instruction or data needed to run the models.

Forms



- Are **IMPORTANT PART OF PROCESS**; they provide structure to the planning
- Look complicated but will be explained.
- Without recording your data analysis, you may lose important data or not be able to duplicate it when needed.

Job Aids

- Are provided to assist you by
  — providing pertinent data in tabular form
  — providing quick reference to model options or instructions.
- Will be identified in the modules where they are applied.

Protective Action Decision-Making Process

- An accident involving chemical agents could be a rapidly occurring event with no time for detailed analysis and would require an immediate emergency response reaction. In order to achieve such a reaction, as much decision making as possible should be done in the planning phase.
- Planning within CSEPP focuses on doing as much decision making as possible during the planning phase. Then the decisions made can be implemented in the case of an accident.
- Planning for potential emergencies begins with developing protective action strategies that become components of the Protective Action Decision-Making Process.

Potential Public Health Effects

- The magnitude of any potential public health effects depends on a multitude of variables:
  — the amount and type of agent released;
  — the method of release (e.g., spill, explosion, etc.);
  — meteorological conditions;
  — the number of unprotected people potentially exposed to the agent(s);
  — distance from the chemical event to the unprotected individuals;
  — age, gender, and state of health of exposed people;
  — route and duration of exposure; and
  — timeliness of decontamination and medical treatment.
- You will be using the following *Health Effects Table* (see next page) to make decisions about protective actions.

Selected Health Effects Reference Points[a]

	Agent Dose (mg-min/m^3) (estimate)		
	VX	GB	H/HD
Inhalation lethal dose; 70 kg adult male; LCt_{50}	30 – 36	70 – 100	1000 – 1500
Incapacitating/Inhalation dose; 70 kg adult male; LCt_{50}	24	35 – 75	200
Inhalation lethal dose; infants; LCt_{50}	6 – 7	14 – 20	300
No death dose; 70 kg adult male	2.0	6	100
Minimum inhalation effective dose; 70 kg adult male; ECt_{50} tremors	1.6	4	NA
Minimum inhalation effective dose; 70 kg adult male; ECt_{50} miosis	.09	2 – 4	NA
Minimum to skin effective dose; 70 kg adult male; ECt_{50} blistering	NA	NA	50
No death dose; infants	0.4	1.2	2.0
No effects (eyes) dose; 70 kg adult male	.02	.5	<12

[A]Estimated from lab animal data.

Source:

A. P. Watson, et al., "Health Effects of Warfare Agent Exposure", Oak Ridge National Laboratory, Oak Ridge, TN and Papirmeister, et al., "Medical Defense Against Mustard Gas."

Protective Action Options

Evacuation

- Evacuation consists of removing individuals from an area of actual or potential hazard to a safe area. It is the most effective of all protective actions, provided it is completed before the arrival of the toxic plume.
- Evacuation may be precautionary or responsive in nature. Precautionary evacuation is desirable because it occurs before the population is at risk. A responsive evacuation, in contrast, occurs after a release and could expose some or all evacuees to the hazard.
- Both types of evacuation entail similar planning tasks:
  — estimating the number of potential evacuees, with particular emphasis on special populations;
  — identifying the most appropriate evacuation routes;
  — designating needed traffic control;
  — estimating the time needed for evacuation; and
  — anticipating potential problems.

Sheltering

- Normal shelters: Nothing has been done to modify the structure except closing windows and doors, and shutting off ventilation systems.
- Enhanced shelters: Weatherization techniques are applied to permanently reduce the air infiltration rate (leakiness).
- Expedient shelters: Measures are taken at the time of an emergency to reduce the air infiltration rate of the room being used as a shelter. These measures would likely include such steps as taping around doors and windows and covering vents with plastic sheeting.
- Pressurized shelters: Pressurizing a shelter with air drawn through a special filter to remove chemical agent. This method eliminates the infiltration of agent into the shelter. (This option is available only for institutions and special populations who cannot evacuate.)

Emergency Decision Process

- Three elements of the Emergency Decision Process to be used for deciding which protective action strategy to implement and in which sectors the strategy should be implemented are
  - — identify the critical information (e.g., release and meteorological conditions) required to make the decision,
  - — identify the portion of the emergency planning zone affected, and
  - — identify the protective action strategy to be implemented.

Protective Action Decision-Making Problem

- The CSEPP standards call for planners to develop a Protective Action Strategy Plan that includes two elements:
  - — Protective action strategies that list the protective actions recommended for each affected area and population group under given emergency conditions.
  - — A decision process to be used during an emergency to select the appropriate protective action strategy to implement.
- We have designed two forms for documenting these two elements which appear on the next two screens.
  - — *Form H*, which is used to document protective action strategies (attached); and
  - — *Form J*, which is used to document the decision process (attached).

Steps in Developing a Protective Action Strategy Plan

We have identified ten steps in developing a protective action strategy. Each step will be discussed in detail in the appropriate TPE module. This flowchart (see next page) shows the relationship of the ten steps.

- One way to develop a Protective Action Strategy Plan which contains protective action strategies and an emergency decision process is to use the ten steps we have developed. To do this, you must determine the planning assumptions and information you will need, run the models developed for CSEPP using your assumptions, and interpret the results based on a set of predetermined evaluation criteria and good planning judgment.
- For example, you can
  - — first define your subzones based on known factors (geography, population density, etc.),
  - — then define the categories of meteorological conditions and ranges of accidents you want to test, and
  - — finally, analyze the results from the models to decide which protective action recommendation you would make for the various populations in your planning subzones.
  - — You should recognize that the results of some of the model runs could be used to fine-tune or redefine your subzone boundaries.

Summary of Protective Action Strategies for Subzone ______

A1

Form H

This form assigns each Protective Action Strategy a unique identifier.

Protective Action to be recommended for:

Protective Action Strategy	Normal Day A4	Normal Night A5	Population Subgroup 1 A6	Population Subgroup 2 A7	Population Subgroup 3 A8	Population Subgroup 4 A9

H1

Values in this form are the protective action recommendations (either Evacuate or Shelter) from data fields G1 through G6 of Form G. Shelter may be Normal, Expedient, or Pressurized but is only indicated here as Shelter. Column H1 is where the planner assigns a unique Protective Action Strategy number. A database of protective action strategies for all subzones could be created so that no two identical protective action strategies have different identifiers.

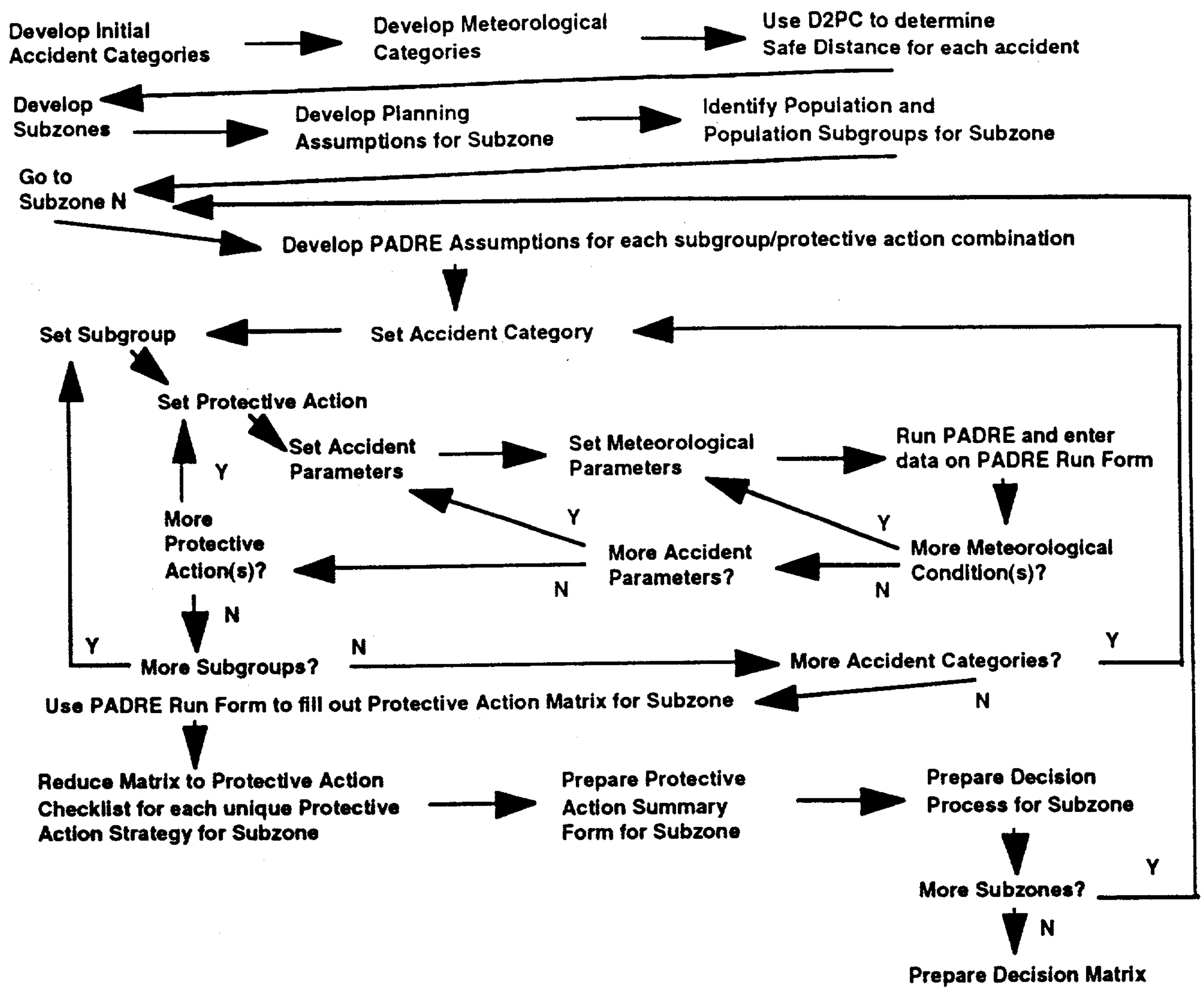
Form J

Decision Process for Planning Subzones in an Accident Involving Agent ____

A7

If **Amount** of Release is:	AND **Duration** is:	AND **Windspeed** is:	AND **Stab. Class** is:	AND **WD** is:	THEN **Implement**	
					for Subzone	**Strategy**

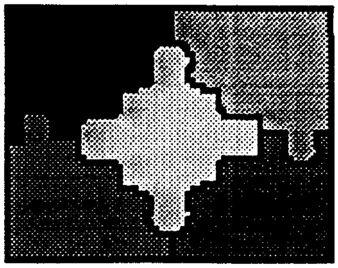
The last two columns of this table are created by overlaying a directional grid on a planning map and determining whether or not a subzone is affected by a given wind direction. Planners may decide to recommend that all subzones within 90º of a wind direction are considered to be in the path of a plume and should implement the predetermined protective action strategy for the given wind conditions. The



- A second approach to developing a Protective Action Strategy Plan would be to use the ten steps as guides for developing planning subzones based on changes in recommended protective actions which result from running the models. This is a bounding approach to developing planning subzones.
- For example, you could accomplish the bounding approach by running the models and using the results to define planning subzones. By changing the distance from the storage site in successive runs, you could see where changes in the recommended protective actions occur and use this data to define the planning subzones.
  — You could also vary the meteorological parameters and agent quantities, etc. in order to determine at what point changes would occur in the protective action recommendations you would make for your subzone's populations.

Five Critical Information Pieces

- Five pieces of information are critical to making a protective action recommendation.
- These five pieces of information and a brief definition of each follow.
  - — type of agent
    - Nerve agents (VX, GB, GA)
    - Blister agents (H, HD, HT, L)
  - — amount of agent
    - how much agent is involved in a release
  - — duration of the release event
    - how long in minutes the release occurs
  - — windspeed
    - the average speed of the wind for a given period of time.
  - — stability class
    - designations used to represent the extent of atmospheric turbulence at the time of an accident. Turbulence affects the dispersion and concentration of agent in the atmosphere.



Models

- Various models are available to examine the interaction of the chemical agent characteristics, environmental conditions, and population characteristics.
- These tools can help evaluate the effectiveness of various protective actions in terms of dosage reduction. Planners should use these tools in developing their Protective Action Strategy Plan.
- The models used as planning tools in this course and in CSEPP include:
  - — OREMS (an evacuation model),
  - — D2PC (an atmospheric dispersion model), and
  - — PADRE (a dose reduction estimator model).

Summary

- The models to be used as planning tools in this course were developed within the framework of the protective action standards. One of the critical questions posed by CSEPP is:

"How can planners use these tools to develop protective action plans to maximize the protection of the public?"

- The Planning Guidance and Standards also functions as a framework for stating the planning problems, utilizing available tools to suggest solutions to these problems, and then systematically producing plans to address the potential problems.

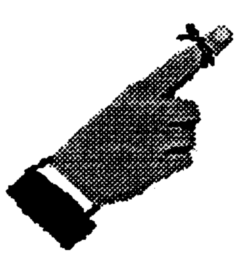
Implementing the Standards

- Three questions from the standards which are intended to guide you while you are developing your emergency plans are:
  — What is the critical information needed to make a protective action decision?
  — There are five critical pieces of information needed to make a protective action recommendation, as listed earlier:
    - type of agent
    - amount of agent
    - duration of the release event
    - windspeed and
    - stability class.
  — How can a planner get this information into an emergency protective action plan?
    - One of the ways you can get the critical information into your emergency plans is to use the implementing the standards process to develop protective action strategies.
  — What features of a plan can allow for speedy decisions to be made during the emergency response phase?
    - One way to address this issue is to use the information generated in developing protective action strategies to create a protective action decision table, and incorporate this decision table into your emergency protective action plans.
- In the next few screens you will see how you can use these questions to help strengthen emergency plans.

TPE Example

- So that we can see how all this information and the planning process work together, we will be taking an example accident through the entire planning process. We will identify a typical planning subzone from an example planning map, make various assumptions about an accidental release of agent and see how we can use the planning models to decide what people should do for protection under our assumed conditions.

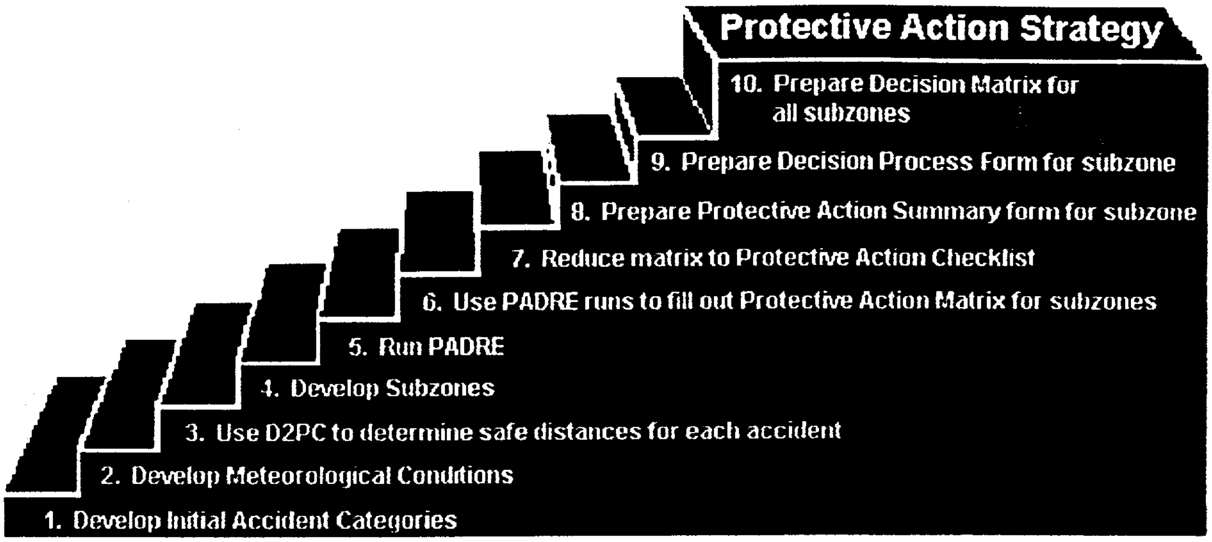
Remember



Models can only aid the planner in developing a good plan. They do not replace sound judgment and planning experience.

Developing a Protective Action Strategy Using the Standards

- We have identified ten steps for developing a protective action strategy.



Step 1: Developing Initial Accident Categories

- Accident Categories are defined by ranges of no death downwind distances. These distances are determined by the interaction of specific accident characteristics and meteorological conditions.
- A category of accidents, when evaluated by our planning tools, should include the range of accidents likely to have the same protective action recommendation.
- Remember, the process of developing protective action strategies helps us link the information which describes the conditions for a set of accidents to appropriate protective action recommendations.

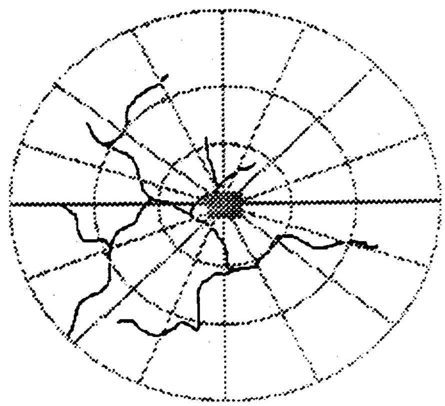
Step 2: Develop Meteorological Categories

- The preliminary work done in the location-specific Hazard Vulnerability Analysis (HVA) sorted the accidents from the risk analysis by agent and munition combinations downwind "no-deaths" distances and two sets of windspeed/ atmospheric stability conditions (the most likely conditions and worst case conditions).
- Meteorological conditions have a great impact on no death downwind distances and so are an important factor in defining the accident categories.
- Downwind distance was defined as the distance downwind from an agent release where the concentration of agent should produce no deaths in the population. The worst case scenario was defined as 1 mps (2.2 mph) windspeed and E stability class.
- The downwind distance values produced by this set of meteorological conditions can be used to establish beginning and possible ending values for the meteorological values we should analyze in developing our protective action strategies.

Step 3: Use D2PC to Determine Safe Distances for Each Accident

- Using D2PC, we calculate the downwind distance to safety. We calculate the safe distance as the downwind no-deaths distance estimated by D2PC minus the distance from the accident to the planning subzone. This determines how far people must travel to reach a safe area and, given the speed of travel, how much time it will take for them to be protected.

Step 4: Develop Subzones



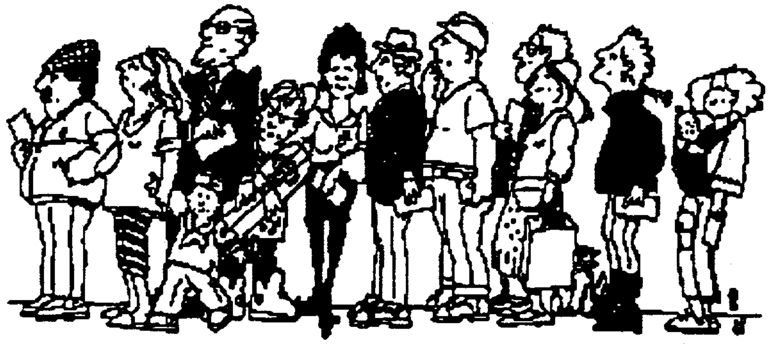
- When developing your planning subzones, the first subzone you choose to analyze should be the subzone with an at-risk population that is nearest to a potential chemical agent release. Then it is appropriate to move to subzones that have the next nearest at-risk population until you have planned for your entire location.
- This step has four sections:
  a. Develop Planning Assumptions for Subzone.
  b. Identify Population and Population Subgroups for Subzone.
  c. Go to First Subzone. (Subsequent subzones are analyzed after completing Step 9.)
  d. Develop PADRE Assumptions for Each Subgroup/Protective Action Combination. (OREMS and D2PC provide input into this step.)

Step 5: Run PADRE

- The PADRE model is used to calculate
  — the expected dose and the relative number of people affected if no protective action is taken;
  — the expected dose and relative number of people who receive a reduced dose if specified protective actions are taken; and
  — the relative number of people who, due to implementing the protective action, receive no dose or are protected when the plume arrived.
- Setting up and running PADRE involves completing the following steps:
  a. Set Accident Category;
  b. Set Population Subgroup;
  c. Set Protective Action;
  d. Set Accident;
  e. Set Meteorological Conditions; and
  f. Run PADRE and enter data on PADRE Run Form.

Step 6: Use PADRE Run to Fill out Protective Action Matrix for Subzone

- After PADRE runs have been completed, you should
  - — examine the *Health Effects Table* to see if the reported dose is a significant health hazard;
  - — determine which of the tested protective actions provides the greatest reduction in dose;
  - — determine how the dose was distributed among the population (did some individuals within the population receive large doses and some extremely small doses); and
  - — make a protective action recommendation based on interpretation of the results.



Step 7: Reduce Matrix to Protective Action Checklist for Each Unique Protective Action Strategy for Subzone

- When one of the values changes (for instance, when "shelter" becomes "evacuate" for a population), then that case is the beginning case for a new category of accidents. Your task is to logically describe the conditions (agent, amount, duration, windspeed, and stability class) that are now associated with a unique protective action recommendation.

Step 8: Prepare Protective Action Summary Sheet for Subzone

- This step involves entering the data from the *Protective Action Checklists* into a summary form which lists the different protective action strategies for the subzone and provides them with unique identifiers.

Step 9: Prepare Decision Process Form for Subzone

- This step uses information from the *Protective Action Checklist* and the *Summary of Protective Action Strategies* to document the links between the accident conditions, meteorological characteristics and the recommended protective actions.

Step 10: Prepare Decision Matrix

- Once analysis for all subzones is completed, it is then possible to create an overall decision table for all subzones. Step 10 combines the information from different subzones and establishes the links between the accident conditions, meteorological characteristics and the recommended protective actions. It also links the recommendations back to the planning subzones by indicating wind direction.

Using PADRE in CSEPP Emergency Planning

- PADRE can be used in CSEPP emergency planning to help planners and public officials decide what protective actions to recommend under various conditions. Running PADRE or undertaking a similar analysis is a critical step in developing protective action strategies.

Use PADRE Run to Fill Out Protective Action Matrix for Subzone

- After PADRE runs have been completed, you should compare the PADRE output with the *Health Effects Table* and make a protective action recommendation for each PADRE case run. This information is documented on the *Protective Action Matrix Chart* (Form F).
- A decision about which protective action to recommend—evacuate or shelter—is made by comparing the dose results reported for evacuation with the dose results reported for the various shelter options.

Decision Criteria

- When you are making a protective action decision you should answer the following three questions:
  - — Is the expected dose significantly different from the doses received by people taking other protective actions?
    - Does one of the protective actions being evaluated provide better protection than the other protective actions?
    - This question is answered by examining the expected doses for each of the protective actions evaluated. On Form E, expected doses for the different protective actions are recorded in the columns labeled Evacuate Protected Dose, Normal Protected Dose, Expedient Protected Dose, and Pressurized Protected Dose.
  - — Is the distribution of the dose for each protective action significant?
    - How is the expected dose distributed among the population? (How was the overall average dose compiled? Did a small part of the population receive a large dose and the rest no dose, or did all the population receive a small dose?)

    - This question is answered by comparing both the PADRE protected dose for a protective action and the percent implementing the protective action by plume arrival time with the same two values reported for the other protective actions.
  - Is the dose significant when compared to the Health Effects Table?
    - Is there an indication that the possible dose received by individuals in this location would have significant health effects?
    - This question is answered by comparing the PADRE protected dose for a protective action with the *Health Effects Table* for the appropriate agent.
    - After you have examined the answers to these three critical questions you can then make a protective action recommendation which is documented on the *Protective Action Matrix* (Form F).

Interpreting the Results from PADRE

Remember

- Evacuation is the most effective protective action if it can be completed before the arrival of the agent plume.
- This means that the results of PADRE can be used to focus planning on those areas where actions you can take can help reduce the time required to evacuate. These areas include
  - improvement in the decision to warn time,
  - more effective warning systems, and
  - improvements in the public response times.

Percent Implemented by Plume Arrival

- This is the percentage of people who have taken the protective action at the minute the plume arrives and achieve full effectiveness from the protective action. The remaining percentage of people will be expected to have received either a full or partial dose.

Model Results

Percent Implemented by plume arrival	90
Minute plume arrives	36
Minutes plume present	46
Minute plume departs	82
Exposure mg-min/cu m	
Maximum Unprotected	0.15
Maximum Capacity not vacated	0.14
Maximum Protected not vacated	0.14
Maximum Capacity vacated	0.04
Maximum Protected vacated	0.04
Cumulative Exposure Reduction (percent)	
Overall Exposure Reduction	58.4
Relative Exposure Reduction	74.4

Minute Plume Arrives

- This is the time (in minutes) following a release when the leading edge of the agent plume reaches the downwind distance of interest. The downwind distance of interest would be your subzone boundary.

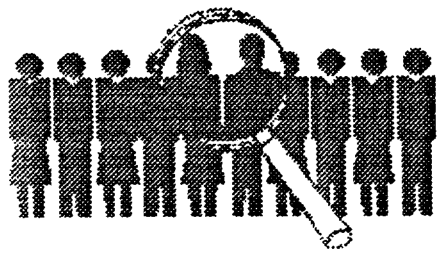
PARDOS

- PARDOS is a program which takes output from D2PC and extracts the dosage for a particular distance of interest. In this case, it is the distance between the planning subzone and the source of an accidental release.

Minutes Plume Present

- This is the length of time the plume remains over the distance of interest (subzone).

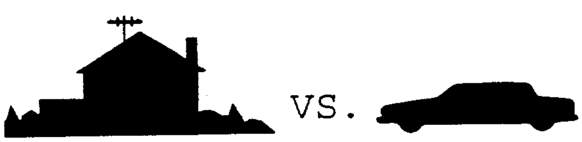
Exposure in mg min/m^3



- Maximum Unprotected is the expected dose for a person who is unprotected (takes no protective action) and is in the middle of the plume .
- Maximum Capacity is the ability of the protective action selected to protect people if they have enough time to complete the protective action before plume arrival. It is the expected dose if the protective action were implemented by all of the people in a location.
- Maximum Protected is the expected dose received by a person who takes the protective action being evaluated. (This may be different from the Maximum Capacity value because some people would not have enough time to complete the protective action before being exposed to some amount of agent.)

Cumulative Exposure Reduction (Percent)

- Overall Exposure Reduction measures the difference between receiving no exposure and the reduction in exposure achieved by taking the protective action. This measure is used to compare the effectiveness of one protective action with another from another category of protective actions (for example, evacuation with sheltering) or from the same category (for example, normal shelter with pressurized shelter). This measure is a good way of making most comparisons using PADRE.
- Relative Exposure Reduction is a measure of the ability of the protective action to reduce exposure. It is used to compare the relative effectiveness of two protective action scenarios within a category of protective actions (for example, normal shelter with pressurized shelter). It measures the difference between the expected exposure and the capacity of the protective action. It is chiefly a measure of the performance of the emergency system.



Results Screens

- The results screens for evacuation and sheltering contain identical information except for the Exposure section.
- Since it is extremely important for people to leave their shelters at the appropriate time (when the plume has passed), the Exposure section for a sheltering run of PADRE gives two values for Maximum Capacity and Maximum Protected —a "vacated shelter" value and a "not vacated shelter" value.

Interpreting the Results

- PADRE estimates the human health effects of agent exposure and does so in terms of a dose of agent over time. The unit used to measure dose is milligram minutes per cubic meter (mg-min/cu m).
- The vertical axis of the PADRE display screen shows the expected dose of agent. The top curve is the expected dose standing outdoors in the center of the plume (the Unprotected Dose).
- The second curve reflects the impact on expected dose given the expectation that some people will take the protective action. The expected dose represents an average dose for the population at the selected downwind distance. This means that some people get no dose, some get the full outside dose, and others receive a partial dose.
- To interpret the results of running PADRE, you must compare the dose values to reference points on human health effects. (*See Health Effects Table*)

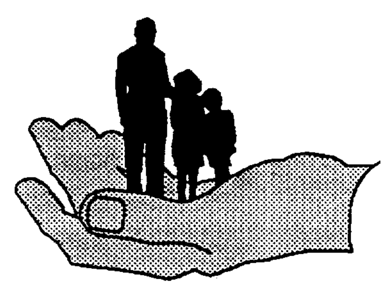
The Evaluation Module

The Evaluation module

— shows you how to make protective action strategy decisions based on information generated by the models;

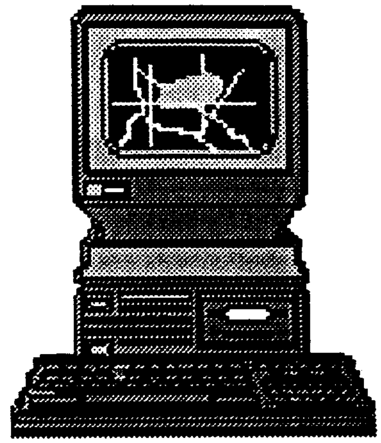
— lists the steps and associated recordkeeping forms that have been developed for the process of implementing the standards and developing protective action strategies; and

— gives more detailed explanations of some of the recordkeeping forms used in developing protective action strategies.



- In the Implementing the Standards module, we established our example accident category, developed a set of initial meteorological conditions, identified our example planning subzone, and developed our subzone planning assumptions.
- In the OREMS module, we produced two major data elements, Evacuation Clearance Time, and Average Evacuation Speed. Later, we used OREMS' Average Evacuation Speed in PADRE as part of our strategy for Implementing the Standards and developing protective action strategies.

- In the D2PC module, we produced downwind no-deaths distances for the series of example accidents. We varied meteorological conditions and accident characteristics and produced downwind no-deaths distances for each unique set of conditions. Later, we used these values in PADRE to calculate our safe-distance input parameter.
- In the PADRE module, we combined data elements from OREMS and D2PC with information from our subzone planning assumptions to produce a series of estimated dose-reduction values for the implementation of various protective actions.
- We also evaluated these dose-reduction values by asking the following three questions:
  — Is the expected dose significantly different from the doses received by people taking other protective actions?
  — Is the distribution of the dose for each protective action significant?
  — Is the dose significant when compared to a Health Effects Table?



- We then made protective action recommendations and completed a *Protective Action Matrix Form* for all the population subgroups we had identified in our planning subzone assumptions.

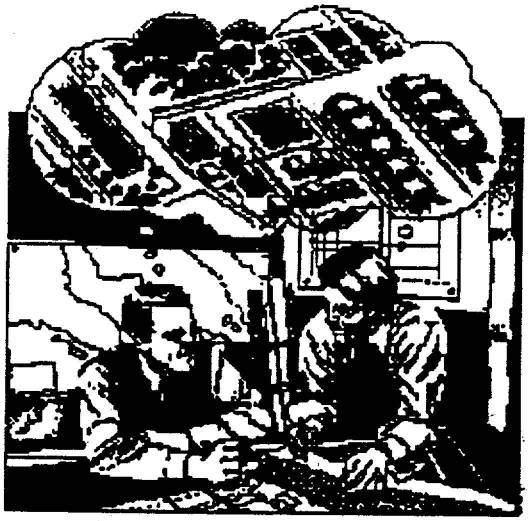
Review of Protective Action Matrix

- The Protective Action Matrix helps you document changes in protective action recommendations. Whenever a different protective action sequence is recommended for a case, that signals the beginning of a new protective action strategy for a subzone. **In this stage, Normal, Expedient, or Pressurized are all considered only one option, Shelter, so that a change from Normal sheltering to Expedient sheltering would not be considered a new strategy**.
- The purpose of this step is to group information from the generated data into similar protective action strategies. If the values in the *Protective Action Matrix* never change, then only one protective action strategy exists.
- This step helps you determine the lower and upper boundaries of agent amount, duration, windspeed, and stability class associated with each of the protective action recommendations. This determination is based on the PADRE output and comparisons of those values with selected health data values.
- This collection of protective action recommendations becomes the Protective Action Strategies for your chemical agent storage location. These Protective Action Strategies become part of your Emergency Plan.

Prepare Decision Process Form for Subzone

- Step 9 uses the unique protective action recommendations information to document the links between the accident conditions, meteorological characteristics and the recommended protective actions for a single subzone.
- By combining data from Forms G and H, it is possible to develop a decision process for the planning subzone. Step 9 ties together the conditions under which a protective action strategy would be implemented to the specific planning subzone. After completing this step for all subzones, you can then proceed to *Prepare a Decision Matrix* to create a decision process which incorporates all your planning subzones.

Prepare Decision Matrix



- Once analysis for all subzones is completed, it is then possible to create an overall decision table for all subzones.
- Step 10 combines the decision matrix information from different subzones that establish the links between the accident conditions, meteorological characteristics and the recommended protective actions. This step further links the recommendations back to the planning subzones by indicating wind direction.
- In this step you combine the upper and lower limits for agent amount, duration of the event, windspeed, and stability class which are associated with a particular protective action strategy with information about wind direction and planning subzones.

Emergency Planning Guide/HVA

In this section we will see how the results of our exercises would fit into an Emergency Plan.

- The Hazard Vulnerability Analysis provided a starting point for beginning to implement the CSEPP standards. In the example you took one of the HVA accident classifications to use as a lower boundary. Next, you tied boundaries of the accident characteristics and meteorological conditions provided by the HVA classification to a set of protective action recommendations. This process has implications for producing Emergency Plans.
- The Accident Planning Base Review Group has provided a structure for developing emergency plans in their Emergency Planning Guide (EPG).