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TPEPT	EP-545	17	1		ST	09/20/02		AFC

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PROTECTIVE ACTION RECOMMENDATIONS

Revision Summary

1) Added notes 2 and 3 to PAR Flowchart, Enclosure A, to clarify PAR basis.

Implementation Plan

1) This procedure goes into effect upon issuance.

Attachments - None

CM

Enclosures

A	090402	PAR Flowchart
B	050602	Downwind Affected Sector to Area Conversion Table
C	012798	Protective Action Areas
D	012798	EF 2 10-Mile EPZ Evacuation Time Estimates Summary
E	012798	EF 2 10-Mile EPZ Population Analysis
F	050602	Representative Shielding Factors From a Gamma Cloud Source
G	050602	Inhalation Shielding Factors for a Wood House, Snug Doors, Closed Windows (Thyroid)

CONTROLLED

Information and Procedures				
DSN EP-545	**Revision** 17	**DCR #** 02-1315	**DTC** TPEPT	**File #** 1703.10
IP Code I	**Date Approved** 9-16-02	**Released By** D. Adams/s/	**Date Issued** 9-20-02	**Recipient** 935

1.0 PURPOSE

To provide guidelines for formulating and recommending appropriate protective actions for the general public in the event of a General Emergency.

2.0 USE REFERENCES

2.1 EP-290, Emergency Notifications

3.0 ENTRY CONDITIONS

3.1 A Site Area Emergency or General Emergency is declared.

4.0 GENERAL INFORMATION

4.1 Protective actions (evacuation and/or sheltering) are required for the affected areas of the general public at the General Emergency declaration and are recommended to local and/or state authorities as appropriate.

4.2 Protective Action Recommendation (PAR) formulation involves an assessment of risk to the general public. Appropriate recommendations are determined using Enclosure A, PAR Flowchart, which considers risk assessment based on two primary indicators.

4.2.1 Dose Projections

1. Dose projections are classified as "Actual" or "Potential".

   a. **Actual** doses are based on radioactivity actually being released from the plant. They are calculated using either effluent radiation monitor readings (normal), grab sample results, or actual field measurements.

   b. **Potential** doses are based on radioactivity in primary containment available for release. They are calculated using Containment High Range Radiation Monitors (CHRRMs) or containment atmosphere grab sample results.

2. PAR decision making may be based on an estimate of radiation exposure an individual might receive over a projected period in comparison to a Protective Action Guideline (PAG).

   a. A PAG is a level of exposure that an individual might receive that warrants a specific protective action to be implemented.

   b. PAG values are expressed in units of dose and represent the risk of health effects to the exposed population.

   c. PAG values are as follows:

TEDE	1 rem
Adult Thyroid	5 rem

   d. A projected dose greater than a PAG value is used to initiate PAR decision-making and **normally** requires an evacuation.

3. The risk associated with a projected dose that exceeds a PAG value is generally higher than the risk associated from an evacuation.

   a. The risks associated with an evacuation during inclement weather or other competing disasters may be greater than that associated with a PAG value. This will require state decision-makers to assess those risks and take appropriate protective actions.

4. When projected doses exceed a PAG value at a distance greater than 10 miles, manual dose calculations may be used to determine the affected areas and distances.

4.2.2 Plant Status

1. PAR decision-making also includes an assessment of plant conditions, specifically core damage estimates.

2. A General Emergency declaration represents a significant risk to the general public and indicates a severe core damage accident is in progress **or** projected (>20% gap release).

3. Severe core damage accidents reflect an amount of radioactivity that may be available and present an unacceptable risk to the general health of the public. These accidents would require evacuation of those close to the plant and sheltering of further out areas should later evacuations be needed.

4. The risks due to the potential radiation exposure from a severe core damage accident are reduced by the implementation of protective actions.

5. PAR decision-making based on plant status represents the desired proactive approach to the protection of the public. It focuses the decision-maker on the likelihood of radiation exposure thereby offering the greatest reduction of risk.

6. Careful evaluation of plant conditions is needed to properly determine if a fuel melt accident is in progress or projected. This evaluation may include, but is not limited to:

   a. Status of injection capabilities

   b. How long fuel has been uncovered (reactor water level)

   c. CHRRMs

   d. Core damage estimates such as EP-547, "Rapid Estimate of Core/Fuel Damage Based on Containment High Range Radiation Monitor," or dose assessment program

7. Fuel melt sequences represent the greatest risk to the health of the general public. Activity produced from these sequences, if released, can produce severe early health effects and necessitates immediate protection of the public.

8. Analysis of potential primary containment failure during a severe accident may prove to be extremely difficult or impossible to predict due to plant conditions are outside of plant design. Therefore, status of primary containment is not considered for the initial PAR development.

4.2.3 PARs must be **continually** evaluated to assure the public's health and safety as conditions change or more information becomes available.

1. If dose calculations become available after an initial PAR has been made the impact on PAR effectiveness must be determined.

2. Meteorological data and the Offsite Radiological Emergency Team (RET) survey(s) provide useful information for PAR development. Each provides information on plume position.

3. Current offsite hazards may also exist that might impact protective actions. The presence of physical or environmental hazards (e.g., tornadoes, ice storms, road hazards, etc.) should be communicated to offsite authorities for their consideration.

4. The current status of emergency response efforts can provide insight to future PARs. Successful (or failed) efforts can provide decision makers with data to help determine likelihood of further core damage.

4.3 Other considerations may be involved when evaluating the effectiveness of a PAR and are normally evaluated by **state** decision-makers.

4.3.1 Certain members of the general public may be at a greater risk from an evacuation or evacuation efforts may take much longer. These members may include, but are not limited to, schools, hospitals, nursing homes, parks, golf courses, etc.

4.3.2 Evacuations are most effective if completed before plume arrival.

1. Enclosures D and E identify evacuation time estimates and total population which may be useful to evaluate evacuation effectiveness.

4.3.3 Dose received before PAR implementation is not used for PAR effectiveness evaluations.

4.3.4 In cases where evacuations are **not** prudent, sheltering may be appropriate.

1. Enclosure F, Representative Shielding Factors From a Gamma Cloud Source, and Enclosure G, Inhalation Shielding Factors for a Wood House, Snug Doors, Closed Windows (Thyroid), may be used to evaluate sheltering effectiveness by multiplying projected Total Effective Dose Equivalent (TEDE) and adult thyroid dose respectively by the Enclosure's shielding factors.

4.4 Protective actions for the early phase of a General Emergency are prescribed for the 10-Mile Emergency Planning Zone (EPZ) surrounding the site.

4.4.1 For planning purposes, the EPZ is divided into concentric rings of 2, 5, and 10 miles.

4.4.2 The EPZ is also divided into sixteen 22.5° sectors.

4.4.3 The EPZ is further divided into five Protective Action Areas (PAAs) as shown in Enclosure C, Protective Action Areas.

4.4.4 When making PARs, the minimum area considered is the PAAs located in the 2-mile radius, and the projected plume's centerline sector, and two adjacent sectors out to five miles.

1. When developing PARs for "Security Event Resulting in Loss of Physical Control of the Plant" (HG1), the minimum area considered is the PAA located in the 2-mile radius (Area 1).

2. If the projected dose exceeds a PAG value >10 miles away, adhoc protective actions would be developed in conjunction with offsite authorities.

4.4.5 Once a PAR has been determined **and** communicated, less stringent recommendations are normally **not** considered or used.

4.4.6 Other information such as better understood accident sequence, presence of significant particulate fission products or radioiodine, or the presence of an unmonitored or unfiltered release path may lead to more stringent Adhoc protective actions.

4.5 Responsibility for PARs

4.5.1 Detroit Edison decision-makers only **recommend** protective actions. State decision-makers make the final decision on what protective action(s) to implement.

4.5.2 If the Technical Support Center (TSC) and Emergency Operations Facility (EOF) are **not** functional:

1. The Shift Technical Advisor evaluates available information and advises the Emergency Director in matters related to protective action recommendations.

2. The Emergency Director is responsible for making the final recommendation(s) to local and/or state authorities as appropriate.

4.5.3 If the TSC is functional and the EOF is **not** functional:

1. The Radiation Protection Advisor and/or Technical Engineer, as appropriate, evaluate available information and advise the Emergency Director in matters related to protective action recommendations.

2. The Emergency Director is responsible for making a final recommendation to local and/or state authorities as appropriate.

4.5.4 If the EOF is functional:

1. The Radiation Protection Coordinator evaluates available information and advises the Emergency Officer in matters related to protective action recommendations. The Nuclear Operations Advisor should assist as appropriate.

2. The Emergency Officer is responsible for making a final recommendation to local and/or state authorities as appropriate.

4.5.5 PARs are made to the State Emergency Operations Center (SEOC) if the SEOC is functional.

1. Recommendations will be discussed with the State Emergency Director before issuance, when time permits.

2. The State Emergency Director will consider recommendations and issue a Protective Action Order, when appropriate, acting with the delegated authority of the Governor.

4.5.6 PARs are made directly to Wayne and Monroe Counties when the SEOC is **not** functional.

1. Recommendations will be discussed with county officials before issuance, when time permits.

2. When deemed appropriate, recommendations will be passed on to the public by county officials.

5.0 IMMEDIATE ACTIONS

5.1 When a Site Area Emergency is declared:

NOTE: Do **not** make any PAR until a General Emergency has been declared.

5.1.1 Initiate formulation of PARs using Enclosures A and B when possible before declaration of a General Emergency.

5.2 When a General Emergency is declared:

NOTE: A PAR shall be made to appropriate offsite authorities concurrent with the initial notification of General Emergency declaration and documented using a Nuclear Plant Event Notification Form.

5.2.1 Formulate PARs using Section 6.0.

6.0 PROCEDURE

6.1 Initial PAR

6.1.1 Determine centerline sector using available resources.

6.1.2 Determine appropriate PAR using Enclosures A and B.

NOTE: Notifications of initial PARs must be completed within 15 minutes of the General Emergency declaration.

6.1.3 Immediately communicate the PAR to offsite authorities in accordance with EP-290, "Emergency Notifications."

6.1.4 GO TO step 6.2.

6.2 PAR Effectiveness

6.2.1 Evaluate the effectiveness of the existing PAR using the questions listed in Enclosure A, "Evaluation Considerations for PAR Effectiveness" block as a guide.

6.2.2 Modify the existing PAR using Enclosures A and B as necessary.

NOTE: Notifications of any change to PARs must be completed within 15 minutes upon indication(s) of conditions requiring a PAR change.

6.2.3 **Immediately** communicate the new PAR to offsite authorities in accordance with EP-290, "Emergency Notifications."

7.0 FOLLOW-UP ACTIONS

7.1 Continue to evaluate PAR effectiveness (step 6.2.1) as conditions require.

7.2 Keep offsite authorities informed of current dose projection results, plant status, response efforts, and other information which may potentially affect PARs in accordance with EP-290, "Emergency Notifications."

8.0 RECORDS

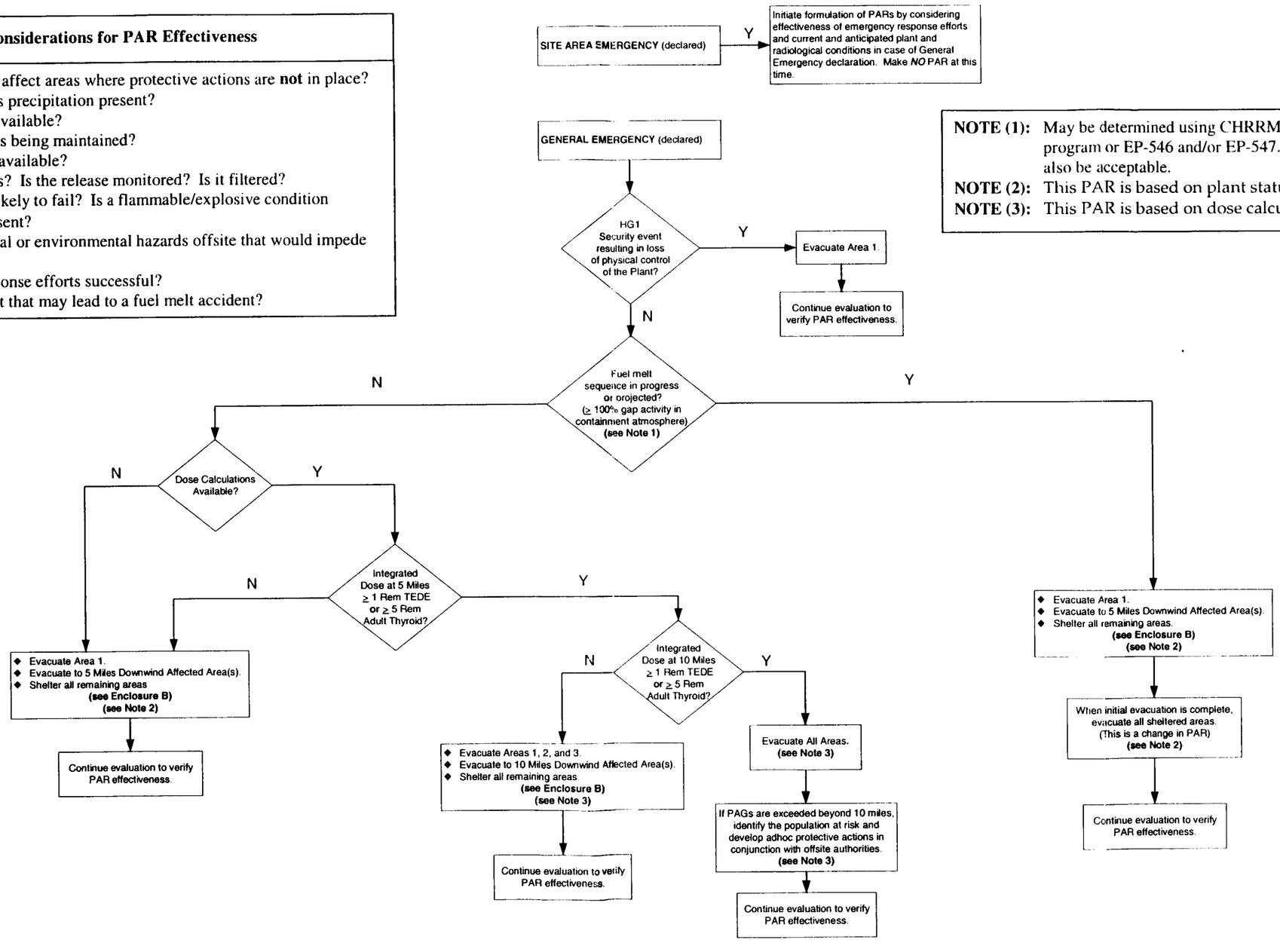
8.1 There are no required records generated through this procedure.

END OF TEXT

PAR FLOWCHART

Evaluation Considerations for PAR Effectiveness

1. Are wind shifts expected to affect areas where protective actions are **not** in place?
2. Is a lake breeze in effect? Is precipitation present?
3. Is offsite RET survey data available?
4. Are core cooling capabilities being maintained?
5. Are core damage estimates available?
6. Is there a release in progress? Is the release monitored? Is it filtered?
7. Has containment failed or likely to fail? Is a flammable/explosive condition ($H_2 \geq 6\%$ and $O_2 \geq 5\%$) present?
8. Are there significant physical or environmental hazards offsite that would impede an evacuation?
9. Are current emergency response efforts successful?
10. Are plant conditions present that may lead to a fuel melt accident?



NOTE (1): May be determined using CHRRMs and Dose Assessment program or EP-546 and/or EP-547. Other methods may also be acceptable.
NOTE (2): This PAR is based on plant status.
NOTE (3): This PAR is based on dose calculations.

DOWNWIND AFFECTED SECTOR TO AREA CONVERSION TABLE

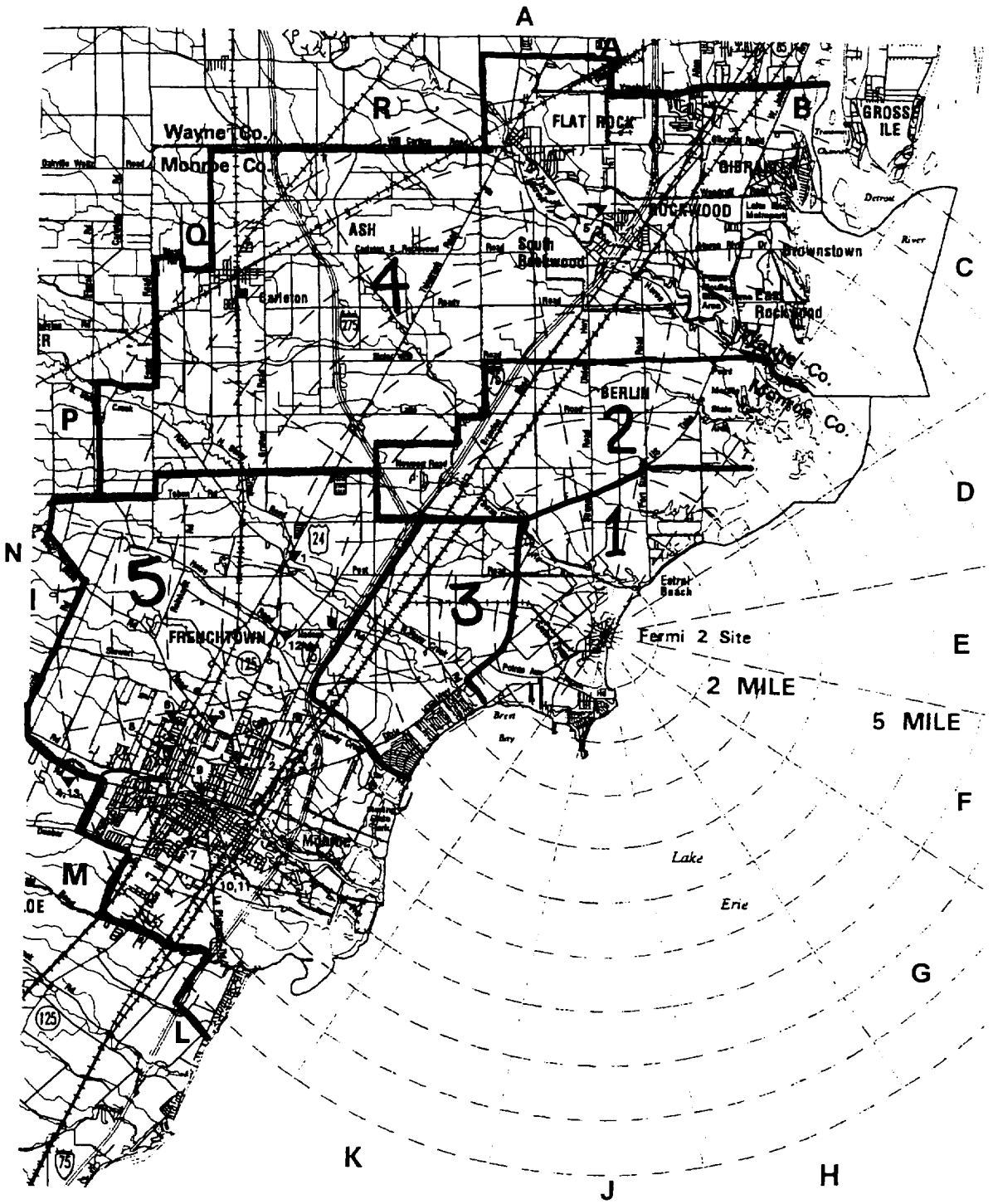
NOTE: The Centerline Sector can be identified on:

- the ERIS "Straight Line" plume plot display
- dose reports indicating "Affected Sector"
- field team data

When evacuating to 5 miles "Downwind Affected Area(s)"	**The "Downwind Affected Area(s)" are:**
If Downwind Centerline Sector is E, F, G, H, or J	Area 1
If Downwind Centerline Sector is A, B, C, or D	Areas 1 **and** 2
If Downwind Centerline Sector is K, L, or M	Areas 1 **and** 3
If Downwind Centerline Sector is N, P, Q, or R	Areas 1, 2, **and** 3

When evacuating to 10 miles "Downwind Affected Area(s)"	**The "Downwind Affected Area(s)" are:**
If Downwind Centerline Sector is R, A, B, C, or D	Areas 1, 2, 3, **and** 4
If Downwind Centerline Sector is E, F, G, H, or J	Areas 1, 2, **and** 3
If Downwind Centerline Sector is K, L, or M	Areas 1, 2, 3, **and** 5
If Downwind Centerline Sector is N, P, or Q	Areas 1, 2, 3, 4, **and** 5

PROTECTIVE ACTION AREAS



EF2 10-MILE EPZ EVACUATION TIME ESTIMATES SUMMARY*

Area	Description	Summer Day Normal	Summer Day Adverse[b]	Summer Night Normal	Summer Night Adverse[b]	Winter Day Normal	Winter Day Adverse[b]	Winter Night Normal	Winter Night Adverse[b]
1	All Sectors to 2 miles	2:55	3:25	1:55	2:05	2:55	3:30	1:55	2:15
1 & 2	All Sectors to 2 miles Northwest sectors to 5 miles	2:55	3:25	1:55	2:05	2:55	3:30	1:55	2:15
1 & 3	All Sectors to 2 miles Southwest sectors to 5 miles	2:55	3:25	1:55	2:05	2:55	3:30	1:55	2:15
1, 2, & 3	All sectors to 5 miles	2:55	3:25	1:55	2:05	2:55	3:30	1:55	2:15
1, 2, 3, & 4	All Sectors to 5 miles Northwest sectors to 10 miles	3:10	3:35	2:20	2:35	3:10	3:45	2:20	2:50
a. 1, 2, 3, & 5	All Sectors to 5 miles Southwest sectors to 10 miles	3:10	3:35	2:20	2:35	3:10	3:45	2:20	2:50
a. 1, 2, 3, 4, & 5	All sectors to 10 miles	3:15	3:45	2:25	2:40	3:15	3:55	2:25	2:55

* These are comparative times based on data drawn from the Evacuation Time Estimates Analyses for the Enrico Fermi Atomic Power Plant Unit No. 2 Plume Exposure Pathway Emergency Planning Zone, Rev. 2, May, 1994, prepared by JB/A, Inc. **Times are given in hours : minutes.**

a. When evaluating an evacuation PAR for distances greater than 5 miles, and including Area 5, consideration should be given to the special needs of Mercy Memorial Hospital and Mercy Memorial Nursing Center. These facilities are located approximately 7 miles from the site and require approximately 6 hours - 20 minutes to complete an evaluation.

b. "Adverse" weather conditions are those which may impair visibility and/or traction, such as light snow, ice, rain, or fog.

EF2 10-MILE EPZ POPULATION ANALYSIS*

Area	Description	Summer Day	Summer Night	Winter Day	Winter Night
1	All Sectors to 2 miles	4419	3598	4398	3598
1 & 2	All Sectors to 2 miles Northwest sectors to 5 miles	7053	5571	7656	5571
1 & 3	All Sectors to 2 miles Southwest sectors to 5 miles	15466	10413	13097	9633
1, 2, & 3	All sectors to 5 miles	18102	12388	16354	11608
1, 2, 3, & 4	All sectors to 5 miles Northwest sectors to 10 miles	53888	45029	57547	44174
1, 2, 3, & 5	All sectors to 5 miles Southwest sectors to 10 miles	65861	55516	71296	53334
1, 2, 3, 4, & 5	All sectors to 10 miles	109937	96038	121367	93581

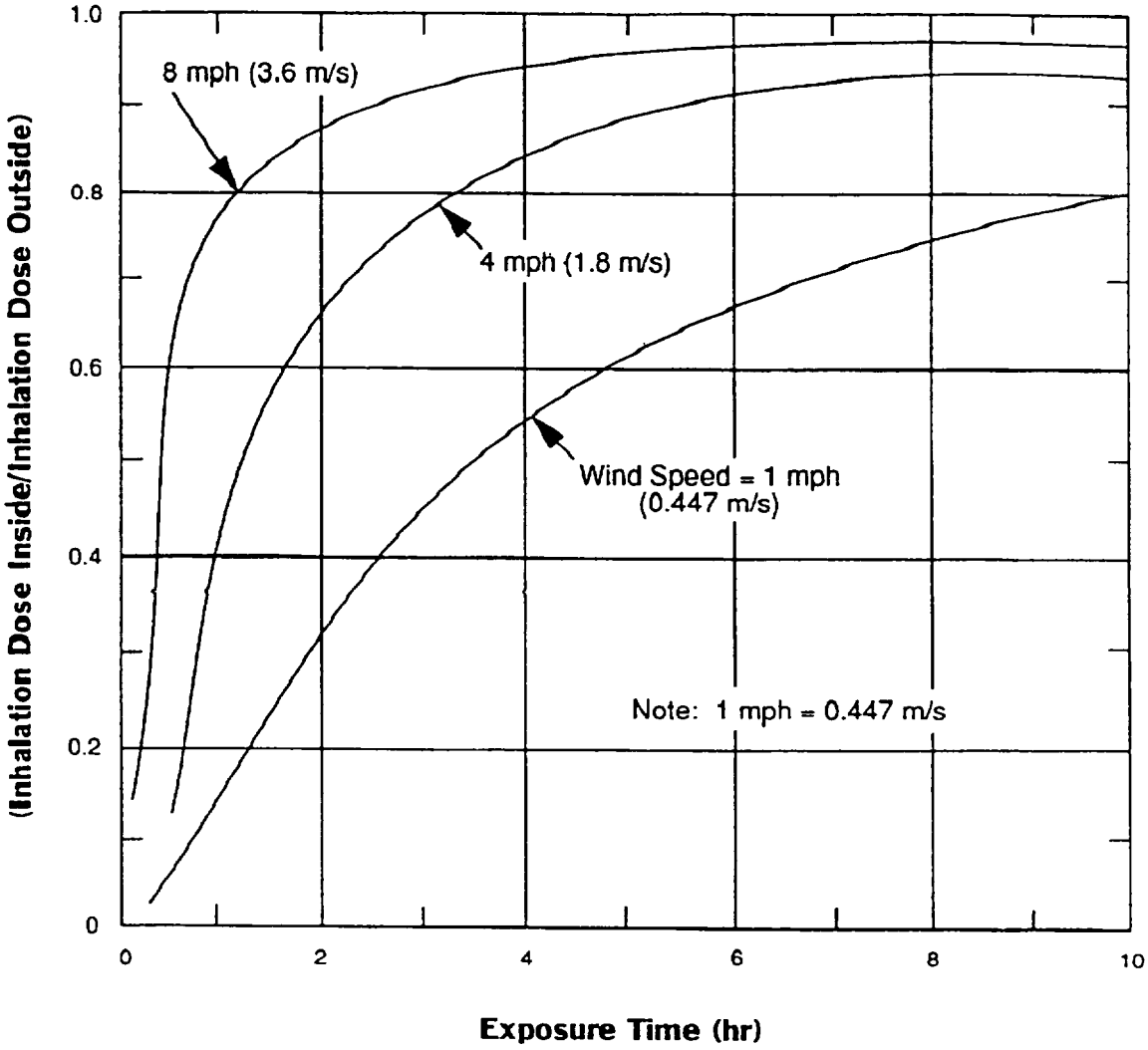
* EPZ population data extracted from the Evacuation Time Estimates Analyses for the Enrico Fermi Atomic Power Plant Unit No. 2 Plume Exposure Pathway Emergency Planning Zone, Rev. 2, May, 1994, prepared by JB/A, Inc. Additional population data provided by local planning agencies using U.S. Census data.

REPRESENTATIVE SHIELDING FACTORS FROM GAMMA CLOUD SOURCE[a]

Structure or Location	Representative Shielding Factor [b]	Representative Range
Outside	1.0	--
Vehicles	1.0	--
Wood frame house[c] (no basement)	0.9	0.9
Basement of wood house	0.6	0.1 to 0.7[d]
Masonry house (no basement)	0.6	0.4 to 0.7[d]
Basement of masonry house	0.4	0.1 to 0.5[d]
Large office or industrial building	0.2	0.1 to 0.3[d,e]

(a) Taken from SAND 77-1725 (Unlimited Release).
(b) The ratio of the dose received inside the structure to the dose that would be received outside the structure.
(c) A wood-frame house with brick or stone veneer is approximately equivalent to a masonry house for shielding purposes.
(d) This range is mainly due to different wall materials and different geometries.
(e) The shielding factor depends on where the personnel are located within the building (e.g., the basement or an inside room).

INHALATION SHIELDING FACTORS FOR A WOOD HOUSE, SNUG DOORS, CLOSED WINDOWS (THYROID)



The above curve assumes the house remains closed up for the duration. Actually, the dose inside the house can be further reduced by opening the doors and windows after the cloud has passed and purging the house with fresh air.

"Reactor Safety Study," Appendix VI, Wash-1400, October 1975

END