PEDIC — A Computer Program to Estimate the Effect of Evacuation on Population Exposure Following Acute Radionuclide Releases to the Atmosphere

**D. L. Strenge
R. A. Peloquin**

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ABSTRACT

The computer program PEDIC is described for estimation of the effect of evacuation on population exposure. The program uses joint frequency, annual average meteorological data and a simple population evacuation model to estimate exposure reduction due to movement of people away from radioactive plumes following an acute release of activity. Atmospheric dispersion is based on a sector averaged Gaussian model with consideration of plume rise and building wake effects. Appendices to the report provide details of the computer program design, a program listing, input card preparation instructions and sample problems.

CONTENTS

1.0	INTRODUCTION	1.1
2.0	MATHEMATICAL MODELS	2.1
2.1	ATMOSPHERIC TRANSPORT AND DISPERSION	2.2
2.1.1	Plume Rise	2.3
2.1.2	Building Wake Correction Model	2.6
2.1.3	Terrain Elevation	2.7
2.1.4	Plume Depletion	2.8
2.1.5	Plume Width	2.8
2.2	EVACUATION	2.9
2.2.1	Normalized Population Function	2.9
2.2.2	Normalized Concentration Function	2.11
3.0	REFERENCES	3.1
	APPENDIX A Computer Program Design	A.1
	APPENDIX B Computer Program Listing	B.1
	APPENDIX C Input Preparation	C.1
	APPENDIX D Sample Problem	D.1

FIGURES

1.0-1	Site Grid Description	.	.	.	.	.	.	1.2
2.2.1	Normalized Plume Concentration Function	.	.	.	.	.	.	2.12
A.1-1	Hierarchy Diagram of the MAIN Program	.	.	.	.	.	.	A.2
A.2-1	Chapin Chart Logic Constructs	.	.	.	.	.	.	A.5
A.2-2	Logic Diagram for Module MAIN	.	.	.	.	.	.	A.6
A.2-3	Logic Diagram of Module FEREAD	.	.	.	.	.	.	A.9
A.2-4	Logic Diagram of Module FESET	.	.	.	.	.	.	A.11
A.2-5	Logic Diagram of Module FIN	.	.	.	.	.	.	A.12
A.2-6	Logic Diagram of Module PASSIG	.	.	.	.	.	.	A.14
A.2-7	Logic Diagram of Module PMCALC	.	.	.	.	.	.	A.15
A.2-8	Logic Diagram of Module POPIN	.	.	.	.	.	.	A.17
A.2-9	Logic Diagram of Module POPINT	.	.	.	.	.	.	A.19
A.2-10	Logic Diagram for Module PRISE	.	.	.	.	.	.	A.20
A.2-11	Logic Diagram for Module QAPAGE	.	.	.	.	.	.	A.23
A.2-12	Logic Diagram for Module TEREAD	.	.	.	.	.	.	A.25
A.2-13	Logic Diagram for Module TERSET	.	.	.	.	.	.	A.25
A.2-14	Logic Diagram for Module WAKE	.	.	.	.	.	.	A.26
A.2-15	Logic Diagram for Module ZEROR	.	.	.	.	.	.	A.26
B.0-1	Main Program Listing	.	.	.	.	.	.	B.2
B.0-2	Subroutine DEPLET Listing	.	.	.	.	.	.	B.4
B.0-3	Subroutine EDINPT Listing	.	.	.	.	.	.	B.7
B.0-4	Subroutine FEREAD Listing	.	.	.	.	.	.	B.11
B.0-5	Subroutine FESET Listing	.	.	.	.	.	.	B.12
B.0-6	Subroutine FIN Listing	.	.	.	.	.	.	B.14

B.0-7	Subroutine PASSIG Listing	B.15
B.0-8	Subroutine PMCALC Listing	B.17
B.0-9	Subroutine POPIN Listing	B.20
B.0-10	Subroutine POPINT Listing	B.21
B.0-11	Subroutine PRISE Listing	B.22
B.0-12	Subroutine QAPAGE Listing	B.24
B.0-13	Subroutine TEREAD Listing	B.28
B.0-14	Subroutine TERSET Listing	B.29
B.0-15	Subroutine WAKE Listing	B.30
B.0-16	Subroutine ZEROR Listing	B.31
B.0-17	Common Block Listings	B.32
C.0-1	PEDIC Input Logic Diagram	C.2
D.0-1	Sample Problem Input Listing	D.2
D.0-2	Sample Problem Output Listing	D.5

TABLES

2.1-1	Values of σ_z for Pasquill Stability Categories	.	.	.	2.7
A.3-1	PEDIC Common Block Usage Summary	.	.	.	A.27
A.3-2	Common Block BWAKE	.	.	.	A.29
A.3-3	Common Block DISTNC	.	.	.	A.29
A.3-4	Common Block EVAC	.	.	.	A.29
A.3-5	Common Block EVACIN	.	.	.	A.29
A.3-6	Common Block FEVAC	.	.	.	A.30
A.3-7	Common Block INDEX	.	.	.	A.30
A.3-8	Common Block JOINT	.	.	.	A.31
A.3-9	Common Block PLUMR	.	.	.	A.31
A.3-10	Common Block POPU	.	.	.	A.31
A.3-11	Common Block QACOM	.	.	.	A.31
A.3-12	Common Block QAPMAN	.	.	.	A.32
A.3-13	Common Block RISE	.	.	.	A.33
A.3-14	Common Block TERAIRN	.	.	.	A.33
A.3-15	Common Block TITLE	.	.	.	A.33

1.0 INTRODUCTION

The computer program PEDIC (Population-Evacuation-Dispersion-Calculation) calculates the effect of evacuation on the total population exposure via inhalation and external exposure to the plume following accidental releases of material to the atmosphere. The population exposure is indicated by a population weighted air concentration factor which is referred to in this report as the population dispersion factor, PM. This factor may be thought of as the sum (over all spatial intervals near a site) of the product of population and average air concentration. This product is modified by an evacuation function to account for reduced exposure due to movement of people away from the released plume of material. The calculation of the population dispersion factor is the primary purpose of the computer program PEDIC; actual exposures (doses) are not calculated. The calculations are performed for the spatial grid system of Figure 1.0-1.

The annual average air concentration is used in the calculation to represent the probable air concentration the population would be exposed to. This concentration is calculated using the crosswind averaged Gaussian dispersion model weighted by joint frequency of occurrence atmospheric data for the site. The dispersion model considers effects of plume rise due to momentum or buoyancy, plume depletion due to removal mechanisms and enhanced dispersion in the wake of buildings.

(FACILITY AT CENTER OF GRID)

FIGURE 1.0-1. Site Grid Description

2.0 MATHEMATICAL MODELS

The purpose of the computer program PEDIC is to estimate the population weighted atmospheric dispersion factor, PM, with consideration of population evacuation. The general equation for the population-dispersion factor is as follows:

$$PM = \sum_{i=1}^U \sum_{k=1}^S \sum_{j=1}^{\theta} f_{ijk} \sum_{x=1}^D (E/Q)_{xijk} \left[P_{xj} (1-f_{ejx}) + P_{xj} f_{ejx} \int_0^{T_m} P(t) C(t) dt \right] \quad (2.0-1)$$

where

- PM • population-dispersion factor, person-sec/m³,
- f_{ijk} • annual average joint frequency of occurrence of windspeed (i), stability (k), and sector direction (j) for the site, dimensionless,
- $(E/Q)_{xijk}$ • time-integrated air concentration at location x for windspeed i, sector j and stability k sec/m³,
- P_{xj} • total population in the spatial interval at distance x and sector j, persons,
- f_{ejx} • fraction of the population living in sector j at distance interval x that will move during an evacuation, dimensionless,
- T_m • time at which the plume has passed the midpoint of the spatial interval or when evacuation is complete, whichever is less, hours,
- $P(t)$ • normalized population evacuation function giving the fraction of the moveable population that remains at time t, dimensionless,
- $C(t)$ • normalized air concentration function representing the time variation of air concentration at the location of interest, dimensionless,
- U • number of windspeed groups,
- S • number of atmospheric stability categories,
- D • number of distance intervals,
- θ • number of sectors.

The first term in the brackets of Equation 2.0-1 represents exposure of the non-moving population and the integral term represents exposure of the evacuating population.

The time-integrated air concentration $(E/Q)_{xijk}$ is described in Section 2.1. The normalized population and air concentration functions, $P(t)$ and $C(t)$, are described in Section 2.2. Input to the computer program (see Appendix C) consists of joint frequency data, f_{ijk} ; population distribution information, P_{xj} and f_{ej} ; and evacuation model parameters for calculation of the normalized population function $P(t)$.

2.1 ATMOSPHERIC TRANSPORT AND DISPERSION

The time-integrated air concentration, $(E/Q)_{xijk}$, is calculated using the crosswind averaged Gaussian dispersion model for a 22.5° sector as represented by the following equation (USNRC 1977).

$$(E/Q)_{xijk} = \frac{2.032 f_d f_{ijk}}{\bar{u}_i \Sigma_{zxk} d_x} \exp \left[-h_e^2 / 2 \Sigma_{zxk}^2 \right] \quad 2.1-1$$

where

$\bar{u}_i$ • midpoint of windspeed class i at a height representative of release, m/sec,

f_d • fraction of material remaining in the plume after depletion in transit to location x , dimensionless

Σ_{zxk} • crosswind vertical standard deviation of plume concentration at distance x and stability class k , m,

h_e • effective release height, m,

d_x • distance from release point to midpoint of distance interval x , m,

$2.032 - (2/\pi)^{1/2}$ divided by the width in radians of a 22.5° sector, and other terms are as previously defined. The vertical dispersion parameter, Σ_{zxk} , includes a volumetric correction for releases within the building wake cavity when the release point is near ground level. For elevated releases the uncorrected dispersion factor σ_{zxk} is used. The building wake correction is described in Section 2.1-2.

The effective release height is calculated as a function of distance, direction, windspeed and stability as:

$$h_e = h_s + \Delta h_s - h_t \quad 2.1-2$$

where

h_s • elevation of release point above base elevation, m

Δh_s • correction to release height due to plume rise and downwash, m

h_t • effective terrain elevation at the location of interest, m.

Calculation of plume rise and downwash is described in Section 2.1-1 and terrain elevation variation is described in Section 2.1-3. The depletion fraction, f_d , is described in Section 2.1-4. A discussion of reasons for using the sector averaged Gaussian dispersion equation is given in Section 2.1-5.

2.1.1 Plume Rise

In determining the effective height of release for use in the atmospheric dispersion equation, the plume rise models presented here are used to account for buoyancy and momentum. These plume rise models can be used to describe releases from stacks and building vents. The plume rise correction to stack height (see Equation 2.1-2) is defined as

$$\Delta h_s = h_b \text{ (buoyancy)} \quad (2.1-3)$$

or

$$\Delta h_s = h_m \text{ (momentum)} \quad (2.1-4)$$

where

Δh_s • the plume rise increment to be added to the release height, m

h_b • the plume rise increment due to thermal buoyancy, m

h_m • the plume rise increment due to momentum, corrected as necessary for downwash, m.

The correction for plume buoyancy is a function of stability, wind speed, source heat content and downwind distance. Two sets of equations are needed to describe plume rise due to buoyancy: one for stable conditions, and one for neutral and unstable conditions. The following equation (Briggs 1975) applies for all stabilities out to a distance x^* .

$$h_b = 1.6 F^{1/3} u^{-1} x^{2/3} \quad (2.1-5)$$

where

F • buoyancy flux parameter

$$F = 3.7 \times 10^{-5} Q_H$$

Q_H • thermal energy release rate, calories/sec

u • wind speed at the release height, m/sec

x • downwind distance, m.

The distance to which this equation applies is a function of atmospheric stability. For stable conditions,

$$x^* = 2.1 u(S)^{-1/2} \quad (2.1-6)$$

where

S – restoring acceleration per unit vertical displacement for adiabatic motion in the atmosphere (sec^{-2}). For Pasquill E, stability S is 8.7×10^{-4} and for Pasquill F stability S is 1.75×10^{-3} , and for Pasquill G stability S is 2.45×10^{-3} .

$$S = \frac{g}{T} \frac{\partial \theta}{\partial z}$$

g • acceleration of gravity, m/sec^2

T • ambient temperature, K°

$\partial \theta / \partial z$ • vertical potential temperature gradient K°/m .

Beyond x^* , plume rise for stable conditions is constant at

$$h_b = 2.6 (F/uS)^{1/3} \quad (2.1-7)$$

For neutral and unstable conditions,

$$x^* = 14 F^{5/8} \text{ for } F \leq 55 \quad (2.1-8)$$

and

$$x^* = 34 F^{2/3} \text{ for } F > 55 \quad (2.1-9)$$

Between x^* and $5x^*$, plume rise for neutral and unstable conditions is given by

$$h_b = 1.6 F^{1/3} u^{-1} x^{*2/3} K \quad (2.1-10)$$

where

$$K = \left[\frac{2}{5} + \frac{16}{25} \frac{x}{x^*} + \frac{11}{5} \frac{x^2}{x^{*2}} \right] \left(1 + \frac{4x}{5x^*} \right)^{-2}$$

K may be approximated by a linear interpolation between x^* and $5x^*$. At distances beyond $5x^*$ plume rise is constant at the value of the above equation evaluated at $x = 5x^*$.

Plume rise due to momentum is described below by models recommended by Briggs (1969). A correction for downwash is included, as given by Gifford (1972).

For neutral and unstable conditions, plume rise is calculated by

$$h_m = 1.44 \left(\frac{w_o}{u} \right)^{2/3} \left(\frac{x}{D} \right)^{1/3} D \quad (2.1-11)$$

where

w_o • the stack or vent exit velocity, m/sec

D • the internal stack diameter, m.

Other terms are as previously defined.

When the exit velocity w_o is less than 1.5 times the wind speed u , a correction for downwash may be applied. This correction (Gifford 1972) is calculated as

$$h_d = 3 \left(1.5 - \frac{w_o}{u} \right) D \quad (2.1-12)$$

where

h_d • the value to be subtracted from h_m .

The result from Equation 2.1-11 after correction as necessary for downwash is compared with

$$h_m = 3 \left(\frac{w_o}{u} \right) D \quad (2.1-13)$$

and the smaller value of h_m is used as the momentum plume rise correction.

For stable conditions, the results from Equations 2.1-11 and 2.1-13 are compared with values calculated from the following two equations:

$$h_m = 4 \left(\frac{F_m}{S} \right)^{1/4} \quad (2.1-14)$$

$$h_m = 1.5 \left(\frac{F_m}{u} \right)^{1/3} S^{-16} \quad (2.1-15)$$

where

$$F_m = (W_0 D/2)^2$$

The smallest value of h_m from Equations 2.1-10, -13, -14, and -15 is used. For each postulated accident the plume rise will be defined for the controlling mechanism, which is either buoyancy or momentum. The mechanism will be selected by the user. Appropriate parameters are provided by input to the computer.

The above equations are used to estimate plume rise when the effluent release point is greater than two times the height of adjacent solid structures. When the release point is lower, no plume rise correction is applied and the effective release height is constant at the effluent release height (except for possible terrain elevation corrections).

2.1.2 Building Wake Correction Model

Material released at ground level or from building vents or short stacks may be subject to enhanced dispersion due to the turbulent wake caused by air flow around the building. Several models for estimating the effects of building wake on dispersion have been presented in the literature (Gifford 1972, Slade 1968, Sagendorf 1974, Sagendorf and Goll 1977, Powell et al. 1977, USNRC 1977). These models account for building wake through modification of the Gaussian dispersion equation. The general way to handle building wake is to add a term to the plume size parameters to account for enhanced mixing in the wake of the building.

The method employed in this study is the U.S. Nuclear Regulatory Commission Regulatory Guide 1.111 model (USNRC 1977) which was recommended by Sagendorf (1974). This model is to be applied to ground level releases only. The vertical plume spread term, Σ_z , of Equation 2.1-1 is calculated as:

$$\Sigma_z = (\sigma_z^2 + 0.5 D_z^2/\pi)^{1/2} \leq 3\sqrt{\sigma_z^2} \quad (2.1-16)$$

where

σ_z • crosswind vertical standard deviation of plume concentration at the location of interest, m,

D_z • maximum adjacent building height either up or downwind from the release point, m.

The evaluation of σ_z is made from curves presented by Slade (1968). Data points from the curves are presented in Table 2.1-1. For Pasquill category G, the category F values are multiplied by a factor of 0.60.

TABLE 2.1-1. Values of σ_z for Pasquill Stability Categories

Distance Meters	σ_z (m) for Pasquill Type					
	A	B	C	D	E	F
100	15	10	7.8	4.7	3.0	1.4
150	22	15	11	6.8	4.3	2.2
250	43	26	18	10	7.1	4.0
350	70	37	24	14	9.4	5.3
500	140	57	34	19	13	7.6
700	270	86	46	25	17	10
1,000	670	140	64	33	22	14
1,500	2,000	240	90	43	29	18
2,500	2,000	580	140	62	41	25
3,500	2,000	1,200	190	76	50	30
5,000	2,000	2,000	260	95	61	35
7,000	2,000	2,000	340	120	72	41
10,000	2,000	2,000	440	140	84	47
15,000	2,000	2,000	600	170	99	55
25,000	2,000	2,000	880	220	120	64
35,000	2,000	2,000	1,100	260	130	72
50,000	2,000	2,000	1,400	320	140	79
70,000	2,000	2,000	1,800	370	160	86
100,000	2,000	2,000	2,000	450	170	94

2.1.3 Terrain Elevation

The effects of terrain elevation variation are considered by defining an effective elevation, h_t , at the midpoint of each spatial interval. This effective elevation is used to determine the effective plume height in Equation 2.1-2. The recommended method for defining values of h_t is the horizontal plume model for terrain correction as described in Regulatory Guide 1.111 (USNRC 1977). Using this method the value of h_t is defined as the maximum terrain height between the release point and the exposure point. Values supplied for h_t should be positive or zero.

2.1.4 Plume Depletion

Reduction of plume concentration during transit may occur due to wet and dry deposition processes. The effect of plume depletion is considered by using plume depletion correction factors presented in Regulatory Guide 1.111 (USNRC 1972). The calculated air concentration is to be multiplied by these correction factors to obtain the air concentration remaining after depletion. The correction factors are presented in the form of curves for each stability as a function of downwind distance for several effluent release heights.

2.1.5 Plume Width

The use of Equation 2.1-1 implies that the plume concentration is uniform over the width of a 22.5° sector. For acute releases this is normally a poor assumption. However, for the purposes of the present calculation the use of the average sector concentration is sufficient for the following reasons.

- The resulting population-dispersion factor represents the probable exposure of the population assuming that the release may occur at any time during the year. The wind direction frequency information is therefore based on annual 22.5° sector data. On the average, the wind will blow uniformly in all portions of a given sector.
- The population data is defined for each spatial interval in each sector. It is assumed that within a given spatial interval the population density is uniform.
- The width of the plume determines the fraction of a sector that would be covered. A narrow plume would give a higher concentration but fewer people would be exposed. The concentration is inversely proportional to the plume spread and the population exposed is directly proportional to the plume spread. The net effect of the plume width is therefore not important (the effects tend to cancel).
- In calculating total population exposure, the individual exposure values are not needed; only the average for the exposed population is required. The concentration at specific points is therefore not important and an exact representation of plume spread is not needed.

2.2 EVACUATION

The evacuation of local populations following an event is described by the normalized population evacuation function, $P(t)$. The effective exposure of the population is calculated as the time integral term in Equation 2.0-1 which is:

$$\int_0^{T_m} P(t) C(t) dt$$

The normalized concentration function represents the movement of the plume past the midpoint of the spatial interval of interest. The integration time limit T_m represents the longest time that either people are present or activity is present at the given location.

2.2.1 Normalized Population Function

The normalized evacuation population function can be represented by Houston's (1976) relation which is based on historical evacuation data tabulated by Hans and Sell (1974):

$$P(t) = 1 - \alpha_e \left[T - \frac{1}{\lambda_E} (1 - e^{-\lambda_E T}) \right] \quad (2.2-1)$$

where

- $P_e(t)$ • fraction of population to be evacuated that remains at time t since warning,
- α_e • limiting fractional evacuation rate, hr^{-1}
- λ_E • evacuation time delay constant, hr^{-1}
- T • time since evacuation warning, hr .

The parameters α and λ are evaluated as follows:

$$\alpha_e = \bar{n}_l R' \bar{n}_p L_e / N_{eo} \quad (2.2-2)$$

where

- $\bar{n}_l$ • average number of lanes per route
- R' • number of cars per hour per lane
- $\bar{n}_p$ • average number of persons per car

- L_e • number of routes leaving the area to be evacuated
- N_{eo} • number of persons in the evacuation area that will be evacuated.

$$\lambda_E = 1.80 \times 10^{-4} p^{0.54} \quad (2.2-3)$$

where

- p • population density in the evacuation area, persons per square mile.

Evaluation of α_e and λ_E is site- and area-dependent. For consideration of a specific spatial interval, α_e and λ_E are determined for the area and population in the sector of the spatial interval, from the source to the outer limit of the interval. For each spatial interval the number of exit routes available to the population must be defined.

Assuming two lanes per route, three persons per car and 2,000 cars per hour, the equation for α_e becomes

$$\alpha_e = 1.20 \times 10^4 L_e / N_{eo} \quad (2.2-4)$$

An estimate of the evacuation end time, t_e , can be made by noting that $\lambda_E t$ is normally small. Then solving Equation 2.2-1 for $P(t_e) = 0$ and $\lambda_E t_e$ small results in

$$t_e^2 = \frac{2}{\alpha_E \lambda_E} \quad (2.2-5)$$

The evacuation model is applied to each spatial interval in PEDIC as follows. For each spatial interval the total population (N_{eo}) and area (A) between the source and outer radius of the interval is calculated. The population density ($p = N_{eo}/A$) and delay constant (λ_e) are then determined. The number of evacuation routes (L_e) is calculated by distance ratio with the number of routes at the outer distance interval.

$$L_e = L_o \frac{d}{d_o} \quad (2.2-6)$$

where

- L_e • effective number of routes leaving the given spatial interval
- L_o • number of routes leaving the outer distance interval (defined by user)
- d • outer distance of given interval, meters
- d_o • outer distance of outer interval, meters.

The limiting fractional evacuation rate is then calculated from L_e and N_e for the spatial interval. This distance correction to L_e is used to maintain the proper ratio of routes per boundary length and thus avoid generation of unrealistic values for α_e for spatial intervals near the release point.

2.2.2 Normalized Concentration Function

The normalized concentration function describes the time dependence of concentration of the location of interest. Figure 2.2-1 indicates the assumed form of the function. As the material is released from the facility, the wind transports it toward the location of interest at a rate equal to the constant windspeed. The concentration at the location is then assumed to be constant for a period equal to the release duration after which the concentration drops to zero. The time at which the plume reaches the location of interest is:

$$T = x/(\bar{u} \ 3600) \quad (2.2-7)$$

where

T • travel time to location of interest, hours,

x • downwind distance, m,

$\bar{u}$ • average (constant) windspeed, m/sec,

3600 • conversion from seconds to hours.

The time at which the concentration drops again to zero is:

$$T_e = T + T_r \quad (2.2-8)$$

where

T_e • time at end of exposure, hours

T_r • duration of release from facility, hours.

FIGURE 2.2.1. Normalized Plume Concentration Function

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* Available for purchase from the NRC/GPO Sales Program, U.S. Nuclear Regulatory Commission, Washington, D.C. 20555, and the National Technical Information Service, Springfield, Virginia 22161.

APPENDIX A

COMPUTER PROGRAM DESIGN

APPENDIX A

COMPUTER PROGRAM DESIGN

This appendix provides information on the computer program design useful to programmers desiring to make modifications to the program. The average user of the program will not need the information provided here. The following sections provide:

- code hierarchy diagrams (Section A.1)
- module summary information (Section A.2)
- module logic diagrams (Section A.2)
- common block usage (Section A.3).

The computer program was developed for execution on the UNIVAC 1100/44 system operated by Boeing Computer Services for the Department of Energy at Richland, Washington. The programming language is ASCII FORTRAN as implemented by the UNIVAC FIN compiler. A listing of the FORTRAN source code is given in Appendix B.

A.1 CODE HIERARCHY

The computer code PEDIC is composed of 16 modules including the main program. The calling sequence for the program is indicated in the hierarchy diagram of Figure A.1-1. This diagram only indicates module calling sequences; module logic diagrams are given in Section A.2. A brief description of the function of each model is also indicated on the hierarchy diagrams.

A.2 MODULE SPECIFICATIONS

The computer program PEDIC has been designed as a structured program consisting of 14 well defined modules. Summary information on each module is provided in the following subsections. The main program (module MAIN) is described first followed by each subroutine (or function) in alphabetical order. The descriptions contain the following information:

- module name
- calling module(s)

*These subroutines call ZEROR.

FIGURE A.1-1. Hierarchy Diagram of the MAIN Program

FIGURE A.1-1 (continued)

- primary function
- common block usage
- argument list
- subordinate modules
- detailed specifications

Logic diagrams for each module are also presented. The logic diagrams use flow charting techniques described by Chapin (1974)* and are referred to as Chapin charts. The basic logic constructs used in the diagrams are indicated in Figure A.2-1. Logic diagrams are provided for each module except DEPLET and EDINPT following the summary information.

A.2.1 Specifications for MAIN Program

The main program controls input of each case title and a NAMELIST INPUT data set. The logic for the MAIN program is shown in Figure A.2-2. The NAMELIST data set is edited by subroutine EDINPT. Depending on values given for control integers, the subroutines FIN, POPIN, and FERREAD are called to read additional data sets. Evacuation model parameters are set in subroutine FESET. A summary report of input data including calculated evacuation model parameters is printed in subroutine QAPAGE. The calculation of the population dispersion factor PM is performed by subroutine PMCALC. After printing the calculated population dispersion factor an attempt is made to read another case title card. Execution is terminated upon encountering an end-of-file on the title card read.

A.2.2 Specifications for Subroutine DEPLET (called by PMCALC)

This subroutine was taken from the computer program XOQDOQ (Sagendorff and Goll 1977). Empirical equations are used to evaluate depletion of the plume as a function of distance, stability category and release height. The argument list parameters have the following uses:

* Chapin, N. 1974. "New Format for Flowcharts," Software - Practice and Experience, Vol. 4, pp. 341-357, John Wiley and Sons Ltd, London.

Sequential Block of Code

Conditional

Do While Loop

Do Until Loop

Abnormal Transfer

Abnormal Termination

FIGURE A.2-1. Chapin Chart Logic Constructs

FIGURE A.2-2. Logic Diagram for Module MAIN

Parameter	Description
DIS	Downwind distance to the location of interest, m.
JSTAB	Stability category index. JSTAB = 1 for Pasquill A, 2 for Pasquill B, etc.
HEIGHT	Effective release height at the location of interest, m.
ANSWER	Fraction of material remaining in the plume at the distance of interest.

A.2.3 Specifications for Subroutine EDINPT (called by MAIN)

This subroutine tests values of some NAMELIST INPUT parameters. If errors are found the error flag IER is set. The following tests are made:

Test	Action
1. NUBAR < 1 or NUBAR > 8	Print "Message 1, Bad value for NUBAR, =", I4. Set IEQ = 0, IPOP = 0, IFE = 0; IER = IER + 1.
2. NMET < 1 or NMET > 7	Print "Message 2, Bad value for NMET, =", I4. Set IEQ = 0, IPOP = 0, IFE = 0; IER = IER + 1
3. ISTAB(i) < 7 or ISTAB(i) < 1	For i < NMET; Print "Message 3, Bad value for stability index "i", = ", I4. Set IER = IER + 1 for each occurrence.
4. NDIST < 1 or NDIST > 10	Print "Message 4, Bad values for NDIST, =", I4. Set IPOP = 0, IFE = 0, IER = IER + 1, NDIST = 10.
5. DIST(i) < 0 and NDIST not in error	For i < NDIST. Print "Message 5, Bad value given for distance, i, " = 1PE10.2. Set IER = IER + 1.
6. DIST(i) < DIST (i-1), i ≥ 2	Print "Message 6, Distance "i" out of order. DIST(i) = ", 1PE10.2, DIST (i-1) =", E10.2.
7. NSECT < 1 or NSECT > 16	Print "Message 7, bad value for NSECT", I4. Set IEQ = 0, IPOP = 0, IFE = 0, IER = IER + 1.

Tests 8 through 13 are made if IEVAC ≤ 0.

8. RLANE ≤ 0.	Print "Message 8, bad value for RLANES =", 1PE10.2. Set IER = IER + 1.
9. CPHL ≤ 0.	Print "Message 9, bad value for CPHL =", 1PE10.2. Set IER = IER + 1.

Test	Action
10. $PPCAR \leq 0$.	Print "Message 10, bad value for PPCAR =", 1PE10.2. Set $IER = IER + 1$.
11. $CLAM \leq 0$.	Print "Message 11, bad value for CLAM =", 1PE10.2. Set $IER = IER + 1$.
12. $MAXEV < 1$ or $MAXEV > NDIST$	Print "Message 12, bad value for MAXEV =", I4. Set $IER = IER + 1$. Set MAXEV to 10.
13. $ALANES(i) \leq 0$	For $i < NSECT$. Print "Message 13, bad value for ALANES(i) =", 1PE10.2, Set $IER = IER + 1$.
14. $FPR < 0$ when $IRISE = 1$	Print "Message 14, buoyant rise parameter FPR is bad, =", 1PE10.2, Set $IER = IER + 1$.
15. $FPR < 0$ when $IRISE = 2$	Print "Message 15, momentum rise parameter FPR is bad, =", 1PE10.2, Set $IER = IER + 1$.
16. $STACKD \leq 0$ when $IRISE = 2$	Print "Message 16, momentum rise parameter STACKD is bad, =", 1PE10.2, Set $IER = IER + 1$.
17. $TREL \leq 0$	Print "Message 17, bad value for TREL =", 1PE10.2, Set $IER = IER + 1$.

A.2.4 Specifications for Subroutine FERREAD (called by MAIN)

This subroutine reads a set of fractional evacuation data from the input file. Data are read for NDIST distances and NSECT sectors. The results are returned through argument list array FEIN (10,16).

If an end-of-file is encountered on input the following message is printed and execution is stopped: "End-of-file on input of fractional evacuation data in subroutine FERREAD, STOP". The logic for this module is given in Figure A.2-3.

A.2.5 Specifications for Subroutine FESET (called by MAIN)

This subroutine sets fractional evacuation data into array FE of common block FEVAC and calculates parameters for the evacuation model. The input parameter IFE controls specification of FE as follows

$IFE \leq 0$;	use previous values in array FEIN
$IFE = 1$;	set all values to 1.0 (total evacuation)
$IFE \geq 2$;	set new FEIN data into array FE.

FIGURE A.2-3. Logic Diagram for Module FEREAD

The array FEIN supplies fractional evacuation data read from cards (IFE#1). All values of arrays FE and FEIN are used, i.e., do loops cover specified dimensions. Up to 10 distances and 16 sectors are allowed in definition of FE and FEIN. Parameters α_e , λ_e and t_e for the evacuation model (see Section 2.2) are calculated for each sector. The logic diagram for this module is given in Figure A.2-4.

A.2.6 Specifications for Subroutine FIN (called by MAIN)

This subroutine reads a set of joint frequency of occurrence atmospheric data from cards into array F. The data array F is transferred through common block JOINT. The argument list parameters have the following uses:

<u>Parameter</u>	<u>Description</u>
NUBAR	Number of windspeed groups data will be supplied for.
NMET	Number of atmospheric stability categories to be considered.
NSECT	Number of sectors data will be supplied for (normally 16).

If an end-of-file on input is encountered the following message is printed and execution is stopped. "END-OF-FILE ON INPUT OF JOINT FREQUENCY DATA IN SUBROUTINE FIN, STOP".

The logic diagram for FIN is shown in Figure A.2-5.

A.2.7 Specifications for Subroutine PASSIG (called by PMCALC)

This subroutine interpolates stored data to determine dispersion parameters σ_y and σ_z for a Pasquill atmospheric stability category and a given distance. The argument list parameters have the following uses:

<u>Parameter</u>	<u>Use</u>
XX	Distance from the release point to the location at which dispersion parameters are to be determined, m.
IPC	Index to indicate which Pasquill stability category is to be used: IPC = 1 for A, IPC = 2 for B, IPC = 3 for C, IPC = 4 for D, IPC = 5 for E, IPC = 6 for F, and IPC = 7 for G.

FIGURE A.2-4. Logic Diagram for Module FESET

FIGURE A.2-5. Logic Diagram for Module FIN

SY	Crosswind horizontal standard deviation of plume concentration at the location of interest, m.
SZ	Crosswind vertical standard deviation of plume concentration at the location of interest, m.

Tabulated values are interpolated for the distance XX between 1 and 10^5 meters. In practical applications the distance XX should not be less than 100 meters or greater than 10^5 meters. The vertical dispersion parameter σ_z is limited to 2000 meters. A logic diagram for PASSIG is presented in Figure A.2-6.

Tabulated values are provided for distances given in array DIST(20). Horizontal dispersion parameters are given for 6 stabilities and 20 distances in the array SIGY(6,20) and vertical dispersion parameters are given in the array SIGZ(6,20). When stability category G is requested (IPC = 7), the values for category F are calculated and then category G values are calculated by

$$SY_G = SY_F * 0.6667$$

$$SZ_G = SZ_F * 0.60$$

A.2.8 Specifications for Subroutine PMCALC (called by MAIN)

This subroutine controls calculation of the population dispersion factor, PM. A logic diagram for this subroutine is given in Figure A.2-7. The first part of PMCALC sets intermediate parameters for the plume rise calculation as described in common block RISE.

Options selected for the calculation are implemented by calls to subroutines as follows:

<u>Option</u>	<u>FLAG</u>	<u>Subroutine</u>
Evacuation	IEVAC	POPINT
Plume rise	IRISE	PRISE
Plume depletion	IDEP	DEPLET
Building wake	IWAKE	WAKE

The vertical dispersion parameter, σ_z , is calculated by subroutine PASSIG.

FIGURE A.2-6. Logic Diagram for Module PASSIG

FIGURE A.2-7. Logic Diagram for Module PMCALC

A.2.9 Specifications for Subroutine POPIN (called by MAIN)

This subroutine reads a set of population distribution data from the input file. The population data is transferred through common block POPU. Population values are read for NDIST distance intervals and NSECT sectors.

If an end-of-file is encountered on input the following message is printed and execution is stopped:

"END-OF-FILE ON INPUT OF POPULATION DATA IN SUBROUTINE POPIN, STOP". The logic diagram for POPIN is given in Figure A.2-8.

A.2.10 Specifications for Subroutine POPINT (called by PMCALC)

This subroutine evaluates the integral

$$\int_0^{T_m} P(t) C(t) dt$$

where P is the normalized population movement function, C is the normalized air concentration function, and T_m is the minimum of

- evacuation end time
- time of passage of all of plume.

The argument parameter TT is the time the front of the plume reaches the location being evacuated (distance ID in sector IS).

If the plume reaches the location before evacuation begins ($TT < T_{WARN}$) then the integral from TT to T_{WARN} (assuming T_{WARN} is less than $TT + T_{REL}$) is given by

$$\int_{TT}^{T_{WARN}} P(t) C(t) dt = \frac{T_{WARN} - TT}{T_{REL}}$$

since $C(t) = 1/T_{REL}$.

The remainder of the integral is evaluated as

$$\int_{T_{WARN}}^{T_m} P(t) 1 dt$$

where T_m = minimum of TE and $TT + T_{REL}$. TE is given by Equation 2.2-5.

FIGURE A.2-8. Logic Diagram for Module POPIN

If the plume does not reach the location until after evacuation begins ($TT > TWARN$) but still before evacuation is completed then the integral to evaluate is

$$\int_{TT}^{T_m} P(t) \cdot 1 \, dt$$

where T_m is as defined above. If the evacuation is completed before the plume arrives there is no exposure.

If the plume has passed before evacuation begins ($TWARN \geq TT + TREL$) then the exposure factor is unity.

The equation for evaluating the population integral for times during evacuation (i.e., $TWARN \leq T \leq TE$) is

$$\int_{T_1}^{T_2} P(t) \, dt = \left[(T_2 - T_1) \left(1 - \frac{\alpha_e}{\lambda_e} \right) - (T_2^2 - T_1^2) \frac{\alpha_e}{2} + \frac{\alpha_e}{\lambda_e^2} (e^{-\lambda_e T_1} - e^{-\lambda_e T_2}) \right] \frac{1}{TREL}$$

Where α_e and λ_e are defined for each spatial interval. When the argument $\lambda_e T_2$ is small (≤ 0.01) then the following approximation is used for the population integral.

$$\int_{T_1}^{T_2} P(t) \, dt = \left[(T_2 - T_1) - \frac{\alpha_e \lambda_e}{6} (T_2^3 - T_1^3) \right] \frac{1}{TREL}$$

The logic diagram for this subroutine is given in Figure A.2-9.

A.2.11 Specifications for Subroutine PRISE (called by PMCALC)

This subroutine calculates the plume rise for either momentum or buoyancy controlled systems. The logic diagram for PRISE is given in Figure A.2-10.

The argument list parameters have the following uses:

<u>Parameter</u>	<u>Description</u>
IRISE	Control integer to select buoyant rise equations (IRISE = 1) or momentum equations (IRISE $\neq$ 1).

FIGURE A.2-9. Logic Diagram for Module POPINT

FIGURE A.2-10. Logic Diagram for Module PRISE

Parameter	Description
IM	Stability indicator: IM $\leq$ 4 for unstable and neutral IM = 5 for Pasquill E IM = 6 for Pasquill F IM = 7 for Pasquill G
X	Distance from release point to location where plume rise is to be evaluated, m.
U	Average wind speed, m/sec.
HPR	Calculated plume use increment, m.

Intermediate parameters calculated in PMCALC are supplied through common block RISE. The parameters are used in the plume rise equations as follows. For buoyant plume rise:

Equation 2.1-5

$$h_b = HBC * X^{2/3} / U$$

Equation 2.1-6

$$X^* = XS(IM) * U$$

Equation 2.1-7

$$h_b = HBF(IM) * U$$

Equation 2.1-8 and 2.1-9

$$X^* = XS(1)$$

Equation 2.1-10

$$h_b = HBC * X^{2/3} / U$$

For momentum plume rise:

Equation 2.1-11

$$h_m = HM1(1) * (X/U^2)^{1/3}$$

Equation 2.1-13

$$h_m = HM2(1)$$

Equation 2.1-14

$$h_m = HM1(IM)$$

Equation 2.1-15

$$h_m = HM2(IM) / U^{1/3}$$

A.2.12 Specifications for Subroutine QAPAGE (called by MAIN)

This subroutine prepares a summary report of input data for the current case. After printing the report, execution is stopped if the error flag IER is positive (IER is set in subroutine EDINPT). Information on the following parameters is reported.

- Title and data
- Grid parameters: NDIST, NSECT, DIST
- Release parameters: TREL, HS
- Options selected: IEVAC, IWAKE, IRISE, IDEP
- Evacuation model parameters: MAXEV, RLANE, CPHL, PPCAR, TWARN, CLAM, ALANES(j), PN(i,j), ALPHA(i,j), ALAM(i,j), TE(i,j)
- Joint frequency data: UBAR(i), ISTAB(i), F(i,j,k)
- Population distribution data: POP(i,j)
- Fractional evacuation data: FE(i,j)
- Terrain elevation data: TER(i,j).

The logic diagram for QAPAGE is given in Figure A.2-11.

A.2.13 Specifications for Subroutine TEREAD (called by MAIN)

This subroutine reads a set of terrain elevation cards. The argument array TERIN (10,16) returns input values of terrain elevation for each spatial interval. Common block index is used to supply sector and distance index limits. A logic diagram for subroutine TEREAD is given in Figure A.2-12.

A.2.14 Specifications for Subroutine TERSET (called by MAIN)

This subroutine sets terrain elevation data into array TER of common block TERAIRN. The action taken by TERSET depends on the value of the control integer ITER as follows:

- ITER $\leq$ 0; use previous TERIN values
- ITER = 1; set all values to zero
- ITER > 1; use new TERIN values

The argument array TERIN supplies input terrain elevation parameters.

The common blocks INDEX and TERAIRN are referenced. A logic diagram for this subroutine is given in Figure A.2-13.

FIGURE A.2-11. Logic Diagram for Module QAPAGE

Print page heading; TITLE, DAIT		
Print NDIST, NSECT, "The site considers (NDIST) distance intervals and (NSECT) sectors".		
Print TREL, "The release duration is (TREL) hours".		
Print HS, "The release elevation is (HS) meters".		
Print heading, "The following options have been selected".		
If IEAV ≤ 0		
Then		Else
Print "evacuation"		Null
If IWAKE > 0		
Then		Else
Print "Building Wake"		Null
If IRISE = 1		
Then		Else
Print "Bouyant Plume Rise"		Null
If IRISE = 2		
Then		Else
Print "Momentum Plume Rise"		Null
If IDEP > 0		
Then		Else
Print "Plume Depletion"		Null
If ITER ≠ 1		
Then		Else
Print "Terrain Elevation"		Null
If IEVAC ≤ 0		
Then		Else
Print "Evacuation Model Parameter Summary"		Null
Print MAXEV, "(MAXEV) distance intervals are evacuated".		
Print RLANE , "(RLANE) lanes per route"		
Print CPHL, "(CPHL) cars per hour per lane"		
Print PPCAR, "(PPCAR) persons per car"		
Print CLAM, "(CLAM) - Coefficient for time constant equation"		
Print TWARN, "(TWARN) hours evacuation warning time"		

FIGURE A.2-11. (Continued)

If IEVPRT > 0		
Then		Else
Print heading for calculated evacuation data		Print the array ALANES
Do while IS = 1,NSECT		
Do while ID = 1,NDIST		
For current ID and IS print ID,IS,ALANE,PN ALPHA,ALAM,TE		
If IEQ > 0		
Then		Else
Print heading "Joint Frequency Data"		Null
Print (IS,IS=1,NSECT) "Sector Number"		
Do while IU=1,NUBAR (windspeeds)		
Do while IM=1,NMET (stabilities)		
Print UBAR(IU), ISTAB(IM), (F(IU,IM,I), I=1,NSECT)		
If IPOP > 0		
Then		Else
Print heading "Population Distribution Data"/(DIST(i), i=1,NDIST)		Null
Do while IS=1,NSECT (sectors)		
Print POP(I,IS), I=1,NDIST		
If IEVAC ≤ 0		
Then		Else
Print heading "Factional Evacuation Data"/(DIST(i), i=1,NDIST)		Null
Do while IS=1,NSECT (sectors)		
Print FE(I,IS), I=1,NDIST		
If ITER ≠ 1		
Then		Else
Print heading "Terrain Elevation Data"/(DIST(i),i = 1,NDIST)		Null
Do while IS = 1,NSECT sectors		
Print TER(I,IS), I = 1,NDIST		
If IER > 0		
Then		Else
Print "Input errors - STOP"		Print signature lines.
STOP		
Return

FIGURE A.2-12. Logic Diagram for Module TEREAD

FIGURE A.2-13. Logic Diagram for Module TERSET

FIGURE A.2-14. Logic Diagram for Module WAKE

FIGURE A.2-15. Logic Diagram for Module ZEROR

A.2.15 Specifications for Subroutine WAKE (called by PMCALC)

This subroutine calculates the effective dispersion parameter, Σ_z , as defined by Equation 2.1-16. The argument list parameters have the following uses:

<u>Parameter</u>	<u>Description</u>
SZ	Value of σ_z (vertical dispersion parameter) at the location of interest, m.
ES	Calculated value for Σ_z , m.

The common block parameter DZH represents the expression:

$$DZH = 0.5 D_z^2 / \pi$$

of Equation 2.1-16. The parameter S3 is equal to $\sqrt{3}$. A logic diagram for this subroutine is given in Figure A.2-14.

A.2.16 Specifications for Subroutine ZEROR

This subroutine sets the first N values of real array A to zero. ZEROR is called by FIN, POPIN, FERED and FESET. A logic diagram is given in Figure A.2-15.

A.3 COMMON BLOCK USAGE

The computer code PEDIC uses labeled common blocks for the majority of data transfers between subroutines. Table A.3-1 gives a summary of each common block and indicates the subroutines that use each block. A detailed description of the parameters in each common block is given in Tables A.3-2 through A.3-14.

TABLE A.3-1. PEDIC Common Block Usage Summary

BWAKE	
Description:	Intermediate building wake parameter
Used by:	MAIN, WAKE
DISTNC	
Description:	Distances for site grid midpoints
Used by:	MAIN, FESET, PMCALC, QAPAGE

TABLE A.3-1. (contd)

EVAC	Description: Evacuation model parameters Used by: EDINPT, FESET, MAIN, POPINT, QAPAGE
EVACIN	Description: Input evacuation model data Used by: EDINPT, FESET, MAIN, QAPAGE
FEVAC	Description: Fractional evacuation data Used by: FESET, MAIN, QAPAGE
INDEX	Description: Parameter dimension index values Used by: EDINPT, FESET, MAIN, PMCALC, QAPAGE
JOINT	Description: Joint frequency atmospheric data Used by: FIN, PMCALC, QAPAGE
PLUMR	Description: Input plume rise parameters Used by: EDINPT, MAIN, PMCALC, QAPAGE
POPU	Description: Population distribution data Used by: FESET, PMCALC, POPIN, QAPAGE
QACOM	Description: Miscellaneous input parameters Used by: EDINPT, MAIN, QAPAGE
QAPMAN	Description: Miscellaneous input parameters Used by: EDINPT, MAIN, PMCALC, QAPAGE
RISE	Description: Intermediate parameters for the plume rise calculation Used by: PMCALC, PRISE
TERAIN	Description: Terrain elevation data Used by: MAIN, QAPAGE, PMCALC, TERSET
TITLE	Description: Case title and current date. Used by: MAIN, QAPAGE

TABLE A.3-2. Common Block BWAKE

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
DZH	Real	Effective building cross-sectional area calculated as $0.5 DZ^2/\pi$ (see Equation 2.1-16).

TABLE A.3-3. Common Block DISTNC

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
DIST(10)	Real	Distance, d_x , from the release point to the midpoint of each distance interval, m.

TABLE A.3-4. Common Block EVAC

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
TWARN	Real	Evacuation warning time. The evacuation begins at time TWARN after the accident start time, hours.
TREL	Real	Duration of activity release, T_r , hours.
ALPHA(10,16)	Real	Evacuation function limiting fractional evacuation rate, σ_e , for each sector, hours ⁻¹ .
ALAM(10,16)	Real	Evacuation function time delay constant, λ_e , for each sector, hours ⁻¹ .
TE(10,16)	Real	End time for evacuation for each spatial interval, t_e , hours.
ALANE(10,16)	Real	Number of routes for evacuation for each spatial interval, L_e .

TABLE A.3-5. Common Block EVACIN

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
ALANES(16)	Real	Number of routes (for each sector) leaving the area to be evacuated, L_e .
CLAM	Real	Constant of Equation 2.2-3 for evaluation of λ_e (default is 1.8×10^{-4}).

TABLE A.3-5. (contd)

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
CPHL	Real	Average number of cars per hour per lane, R_i , (default is 20).
PN(10,16)	Real	Total population within the evacuation area calculated for each spatial interval, persons.
PPCAR	Real	Average number of persons per car, n_p , (default is 3).
RLANE	Real	Average number of lanes per route, n , for the site (default is 2).

TABLE A.3-6. Common Block FEVAC

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
FE(10,16)	Real	Fractional evacuation data, F_e , giving the fraction of the population in each spatial interval that will evacuate. Data is provided for up to 10 distances and 16 sectors.

TABLE A.3-7. Common Block INDEX

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
NDIST	Int.	Number of distance intervals to consider, $1 \leq \text{NDIST} \leq 10$.
NMET	Int.	Number of atmospheric stability categories to consider, $1 \leq \text{NMET} \leq 7$.
NUBAR	Int.	Number of windspeed groups to consider, $1 \leq \text{NUBAR} \leq 8$.
MAXEV	Int.	Maximum distance interval for which evacuation will be considered, $1 \leq \text{MAXEV} \leq \text{NDIST}$.
NSECT	Int.	Number of sectors to consider, $1 \leq \text{NSECT} \leq 16$. Default value is 16.

TABLE A.3-8. Common Block JOINT

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
F(8,7,16)	Real	Joint frequency of occurrence of atmospheric conditions for 8 windspeeds, 7 stabilities and 16 sectors, f_{ijk} .

TABLE A.3-9. Common Block PLUMR

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
HS	Real	h_s , height of stack above ground level (m).
FPR	Real	Q_H for buoyant plume rise (cal/sec) and W_0 for momentum plume rise (m/sec).
STACKD	Real	D, internal stack diameter (m).
IRISE	Real	Control integer to indicate the plume rise model to be used for the current accident: 0 for no plume rise 1 for buoyant plume rise 2 for momentum plume rise

TABLE A.3-10. Common Block POPU

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
POP(10,18)	Real	Population distribution data, P_{xj} , giving the number of people living in each spatial interval for up to 10 distance intervals in 16 sectors.

TABLE A.3-11. Common Block QACOM

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
IPOP	Int.	Control integer for input (IPOP > 0) of population distribution data.

TABLE A.3-11. (contd)

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
IFE	Int.	Control integer for input and specification of fractional evacuation data. IFE $\leq$ 0; use previous input data, IFE = 1; set values to 1.0 (FE), IFE > 1; read new values from input.
FEIN(10,16)	Real	Storage array for input fractional evacuation data, fe _{jx} .
IWAKE	Int.	Control integer for consideration (IWAKE > 0) of building wake effects.
DZ	Real	Maximum adjacent building height, D _z , for calculation of building wake effects, m.
IEQ	Int.	Control integer for input of joint frequency data (array F). Values are read if IEQ > 0.
IEVPRT	Int.	Control integer for printing of calculated evacuation parameters. Print if IEVPRT > 0.
TERIN(10,16)	Real	Storage array for input terrain elevation data, h _t , meters.

TABLE A.3-12. Common Block QAPMAN

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
IEVAC	Real	Control integer for evacuation calculation IEVAC $\leq$ 0; include evacuation IEVAC > 0; do not consider evacuation
ISTAB(7)	Int.	Atmospheric stability class selection array. 1 $\leq$ ISTAB(i) $\leq$ 7.
IDEP	Int.	Control integer for consideration of plume depletion (IDEP > 0).
UBAR(8)	Real	Average windspeed for each windspeed group, u _i , m/sec.

TABLE A.3-13. Common Block RISE

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
HBC	Real	Constant for equations 2.1-5 and 2.1-10. $HBC = 1.6 (3.75E-5Q_H)^{1/3}$
XS(7)	Real	Special distance for buoyant plume rise calculations calculated by Equations 2.1-6, 2.1-8 and 2.1-9.
HBF(7)	Real	Constant for Equation 2.1-7.
HM1(7)	Real	Constant for Equations 2.1-11 and 2.1-14.
HM2(7)	Real	Constant for Equations 2.1-13 and 2.1-15.
WO	Real	Exit velocity at stack, W_0 (=FPR input).
SD	Real	Stack diameter, D (= STACKD input).

TABLE A.3-14. Common Block TERAIn

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
TER(10,16)	Real	Terrain elevation relative to the site base elevation, h_t meters. Values must be zero or positive.

TABLE A.3-15. Common Block TITLE

<u>Symbol and Dimension</u>	<u>Type</u>	<u>Problem Symbol/Definition/Values/Units</u>
TITL(20)	Char	Descriptive title for a case.
DAIT	Char	Current date (8 characters).

APPENDIX B
COMPUTER PROGRAM LISTING

APPENDIX B

COMPUTER PROGRAM LISTING

This Appendix presents a FORTRAN listing for each module of the computer program PEDIC. The listing of the main program is given first followed by the other modules in alphabetical order in Figures B.0-1 through B.0-16. A listing of all common blocks is given in Figure B.0-17.

MODULE MAIN

```

C
C *****
C
C   PEDIC - A COMPUTER PROGRAM TO ESTIMATE THE EFFECT OF EVACUATION
C   ON POPULATION EXPOSURE FOLLOWING ACUTE RADIONUCLIDE RELEASES
C   TO THE ATMOSPHERE.
C
C   WRITTEN BY DL STRENCE, RA PELOQUIN, SEPTEMBER 1980
C   PACIFIC NORTHWEST LABORATORY, RICHLAND WA
C   SPONSORED BY U.S. DEPARTMENT OF ENERGY UNDER CONTRACT
C   DE-AC05 75RLO 1830
C
C   MAIN CONTROLS DATA INPUT, PRINTING OF RESULTS AND RUN
C   TERMINATION.
C *****
C
C   SUBORDINATE ROUTINES-- EDINPT, FIN, POPIN, FEREAD, FESET, QAPAGE,
C                           PMCALC
C   COMMON BLOCKS USED-- BWAKE, DISTNC, EVAC, EVACIN, INDEX, PLUMR,
C                           QACOM, QAPMAN, TITLE
C -----
C
C   INCLUDE PEDIC.BWAKE, LIST
C   INCLUDE PEDIC.DISTNC, LIST
C   INCLUDE PEDIC.EVAC, LIST
C   INCLUDE PEDIC.EVACIN, LIST
C   INCLUDE PEDIC.INDEX, LIST
C   INCLUDE PEDIC.PLUMR, LIST
C   INCLUDE PEDIC.QACOM, LIST
C   INCLUDE PEDIC.QAPMAN, LIST
C   INCLUDE PEDIC.TITLE, LIST
C   INCLUDE PEDIC.TERAIN, LIST
C
C
C   DEFINE NAMELIST INPUT LIST--
C   NAMELIST /INPUT/IDEP,IEO,IEVAC,IEVPRT,IFE,IPOP,IRISE,ITER,IWAKE,
C   .       DZ, NDIST, NSECT,
C   .       DZ, FPR, HS, ISTAB, NMET, NUBAR, STACKD, UBAR,
C   .       ALANES, CLAM, CPHL, MAXEV, PPCAR, RLANE, TREL, TWARN
C
C   SET DEFAULT VALUES OF NAMELIST PARAMETERS--
C   DATA NSECT /16/
C   DATA DZ /0./
C   DATA FPR /0./
C   DATA HS /0./
C   DATA ISTAB /7 * 0/
C   DATA NMET /0/
C   DATA NUBAR /0/
C   DATA STACKD /0./
C   DATA UBAR /8 * 0./
C   DATA ALANES /16 * 0./
C   DATA CLAM /1.80E-04/
C   DATA CPHL /2000./
C   DATA MAXEV /0/
C   DATA PPCAR /3./
C   DATA RLANE /2./
C   DATA TREL /1.0/
C   DATA TWARN /0./
C   DATA IEVPRT/0/
C   DATA ITER/1/
C
C
C   CALL ADATE (DAIT, XX)
C   TO GET CURRENT TIME FOR PRINTING.
C
C   FOR EACH CASE INPUT FOR THIS RUN--
C 100 CONTINUE
C
C   READ TITLE, CARD TYPE 1--
C   READ (5,1000,ERR=300,END=900) TITL
C
C   READ NAMELIST PARAMETERS--
C   READ (5,INPUT,ERR=300,END=900)

```

FIGURE B.0-1. Main Program Listing

MODULE MAIN

```

C      CALL EDINPT (IER)
C      TO TEST FOR ERRORS IN NAMELIST INPUT VALUES.
C
C      IF (IEQ .GT. 0)      CALL FIN (NUBAR, NMET, NSECT)
C      TO READ IN JOINT FREQUENCY DATA.
C
C      IF (IPOP .GT. 0)      CALL POPIN (NDIST, NSECT)
C      TO READ IN A SET OF POPULATION DISTRIBUTION DATA--
C
C      IF (IFE .GT. 1)      CALL FEREAD (NDIST, NSECT, FEIN)
C      TO READ FRACTIONAL EVACUATION DATA.
C
C      IF EVACUATION IS CONSIDERED--
C      IF (IEVAC .LE. 0)      CALL FESET (IFE, FEIN)
C      TO SET FRACTIONAL EVACUATION DATA INTO ARRAY FE
C      AND TO CALCULATE EVACUATION MODEL PARAMETERS
C
C      IF TERRAIN ELEVATION DATA IS TO BE READ CALL TEREAD.
C      IF (ITER.GT.1) CALL TEREAD(TERIN)
C
C      SET TERRAIN ELEVATION, CALL TERSET.
C      CALL TERSET(TERIN)
C
C      IF BUILDING WAKE IS CONSIDERED, CALCULATE CONSTANT--
C      IF (IWAKE .GT. 0) DZH = 0.5 * DZ * DZ / 3.1415927
C
C      CALL QAPAGE (IER)
C      TO PRINT INPUT DATA REPORT.
C
C      CALL PMCALC (PM)
C      TO CALCULATE THE POPULATION DISPERSION FACTOR FOR THIS CASE.
C
C      PRINT PM RESULT FOR THIS CASE--
C      WRITE (6,2000) PM
C
C
C      GOTO 100
C      END OF LOOP
C
C      ERROR CONDITION--
800  WRITE (6,3000)
      STOP
C
C      END-OF-FILE
900  WRITE (6,4000)
      CALL EXIT
C
C
C      FORMAT STATEMENTS--
C
C      CARD TYPE 1--
1000 FORMAT (20A4)
C
2000 FORMAT (////'      THE POPULATION DISPERSION FACTOR FOR THIS CASE'
.      ' = ', 1PE10.2)
C
3000 FORMAT ('0      READ ERROR ON INPUT, FROM MAIN')
C
4000 FORMAT ('1      END OF INPUT FOR THIS RUN')
C
      END

```

FIGURE B.0-1. (contd)

```

MODULE DEPLET

SUBROUTINE DEPLET (DIS, JSTAB, HEIGHT, ANSWER)
C *****
C
C   DEPLET CALCULATES THE FRACTION OF MATERIAL REMAINING
C   IN THE PLUME.
C *****
C
C   CALLED BY-- PMCALC
C
C   SUBORDINATE ROUTINES-- NONE
C   INPUTS-- DIS, JSTAB, HEIGHT
C   OUTPUTS-- ANSWER
C   COMMON BLOCKS USED-- NONE
C
C -----
C
C           ARGUMENT LIST PARAMETER DESCRIPTIONS
C -----
C
C   PARAMETER   TYPE      DESCRIPTION
C -----
C
C   DIS         REAL      DOWNWIND DISTANCE TO LOCATION OF INTEREST, M
C   JSTAB       INTEGER    STABILITY CATEGORY INDEX, 1 FOR PASQUILL A
C   HEIGHT      REAL      EFFECTIVE RELEASE HEIGHT AT THE LOCATION
C                        OF INTEREST, M
C   ANSWER      REAL      FRACTION OF MATERIAL REMAINING IN THE PLUME
C                        AT THE DISTANCE OF INTEREST
C -----
C
C   DISLN = ALOG (DIS)
C   JS = JSTAB - 4
C   ANSWER = 1.000000
C
C   IF(HEIGHT.LE.15.0) GO TO 1
C   IF(HEIGHT.LE.45.0) GO TO 2
C   IF(HEIGHT.LE.80.0) GO TO 3
C
C   IF(JS) 4,5,7
C
C   IF(DIS.LE.600.0) RETURN
C   IF(DIS.GT.10000.0) GO TO 20
C
C   UNSTABLE,      H > 80,      500 < DIS <= 10000
C   ANSWER = .854906 + (.07225318*DISLN) - (.007984452*DISLN*DISLN)
C   GO TO 7
C 20 IF(DIS.GT.60000.0) GO TO 21
C
C   UNSTABLE,      H > 80,      10000 < DIS <= 50000
C   ANSWER = -2.2825 + (.745051*DISLN) - (.04395715*DISLN*DISLN)
C   GO TO 7
C
C   UNSTABLE,      HS > 80,      50000 < DIS
C 21 ANSWER = -.7504539 + (.5173522*DISLN) - (.03590245*DISLN*DISLN)
C   GO TO 7
C   IF(DIS.LE.1700.0) RETURN
C   IF(DIS.GT.10000.0) GO TO 22
C
C   NEUTRAL,      HS > 80,      1700 < DIS <= 10000
C   ANSWER = .1212574 + (.2528144*DISLN) - (.01812858*DISLN*DISLN)
C   GO TO 7
C 22 IF(DIS.GT.70000.0) GO TO 23
C
C   NEUTRAL,      HS > 80,      10000 < DIS <= 70000
C   ANSWER = .3417348 + (.2005985*DISLN) - (.01505005*DISLN*DISLN)
C   GO TO 7
C
C   NEUTRAL,      HS > 80,      70000 < DIS
C 23 ANSWER = 2.533078 - (.1532279*DISLN)
C   GO TO 7
C   IF(DIS.GT.1000.0) GO TO 24
C
C   ALL STABILITIES, H <= 15,      DIS <= 1000
C   ANSWER = .7793717 + (.09578525*DISLN) - (.01132715*DISLN*DISLN)

```

FIGURE B.0-2. Subroutine DEPLET Listing

MODULE DEPLET

```

      GO TO 7
24 IF(DIS.GT.10000.0) GO TO 25
C
C   ALL STABILITIES, H <= 15,          1000 < DIS <= 10000
C   ANSWER = .5659753 + (.1425852*DISLN) - (.01363635*DISLN*DISLN)
C   GO TO 7
C
C   ALL STABILITIES, H <= 15,          10000 < DIS
25 ANSWER = .7203016 + (.1085504*DISLN) - (.01172335*DISLN*DISLN)
C   GO TO 7
C
C   IF(JS) 8,9,10
2   IF(DIS.LE.180.0) RETURN
C   IF(DIS.GT.20000.0) GO TO 26
C
C   UNSTABLE,          15 < H <= 45,          DIS <= 20000
C   ANSWER = .9535697 + (.04257785*DISLN) - (.0065097*DISLN*DISLN)
C   GO TO 7
26 IF(DIS.GT.50000.0) GO TO 27
C
C   UNSTABLE,          15 < H <= 45,          20000 < DIS <= 50000
C   ANSWER = -4.521979 + (1.153126*DISLN) - (.06286699*DISLN*DISLN)
C   GO TO 7
C
C   UNSTABLE,          15 < H <= 45,          50000 < DIS
27 ANSWER = -1.441149 + (.6080615*DISLN) - (.03878529*DISLN*DISLN)
C   GO TO 7
9   IF(DIS.LE.400.0) RETURN
C
C   NEUTRAL,          15 < H <= 45,          400 < DIS
C   ANSWER = .8622019 + (.07495899*DISLN) - (.00873217*DISLN*DISLN)
C   GO TO 7
10 IF(DIS.LE.6000.0) RETURN
C   IF(DIS.GT.20000.0) GO TO 28
C
C   STABLE,          15 < H <= 45,          6000 < DIS <= 20000
C   ANSWER = -3.524029 + (1.055262*DISLN) - (.06153549*DISLN*DISLN)
C   GO TO 7
C
C   STABLE,          15 < H <= 45,          20000 < DIS
28 ANSWER = 4.247176 - (.4075444*DISLN) + (.007074156*DISLN*DISLN)
C   GO TO 7
3   IF(JS) 11,12,13
11 IF(DIS.LE.300.0) RETURN
C   IF(DIS.GT.10000.0) GO TO 29
C   ANSWER = .5938609 + (.1123458*DISLN) - (.01046413*DISLN*DISLN)
C
C   UNSTABLE,          45 < H <= 80,          300 < DIS <= 10000
C   GO TO 7
29 IF(DIS.GE.50000.0) GO TO 30
C
C   UNSTABLE,          45 < H <= 80,          10000 < DIS <= 50000
C   ANSWER = 2.10853 - (.1364853*DISLN)
C   GO TO 7
C
C   UNSTABLE,          45 < H <= 80,          50000 < DIS
30 ANSWER = -3.952915 + (1.059189*DISLN) - (.05883215*DISLN*DISLN)
C   GO TO 7
12 IF(DIS.LE.1000.0) RETURN
C   IF(DIS.GT.10000.0) GO TO 31
C
C   NEUTRAL,          45 < H <= 80,          1000 < DIS <= 10000
C   ANSWER = .5127362 + (.1385609*DISLN) - (.01197688*DISLN*DISLN)
C   GO TO 7
C
C   NEUTRAL,          45 < H <= 80,          10000 < DIS
31 ANSWER = .4809772 + (.1645758*DISLN) - (.0132591*DISLN*DISLN)
C   GO TO 7
13 IF(DIS.LE.60000.0) RETURN
C
C   STABLE,          45 < H <= 80,          50000 < DIS
C   ANSWER = -8.220195 + (1.594657*DISLN) - (.07789403*DISLN*DISLN)

```

FIGURE B.0-2. (contd)

```
MODULE DEPLET  
C  
7 CONTINUE  
C IF(ANSWER.GT.1.00000) ANSWER = 1.00000  
C RETURN  
END
```

FIGURE B.0-2. (contd)

```

MODULE EDINPT

SUBROUTINE EDINPT (IER)
C
C *****
C
C     EDINPT TESTS FOR ERRORS IN NAMELIST INPUT VALUES.
C
C *****
C
C     CALLED BY-- MAIN
C     SUBORDINATE ROUTINES-- NONE
C     INPUTS-- NONE
C     OUTPUTS-- IER
C     COMMON BLOCKS USED-- DISTNC, EVAC, EVACIN, INDEX, PLUMR, QACOM,
C                          QAPMAN
C
C -----
C
C     INCLUDE PEDIC.DISTNC, LIST
C     INCLUDE PEDIC.EVAC, LIST
C     INCLUDE PEDIC.EVACIN, LIST
C     INCLUDE PEDIC.INDEX, LIST
C     INCLUDE PEDIC.PLUMR, LIST
C     INCLUDE PEDIC.QACOM, LIST
C     INCLUDE PEDIC.QAPMAN, LIST
C
C     MESSAGE IS THE UNIQUE ALPHANUMERIC MESSAGE FOR EACH ERROR TYPE--
C     CHARACTER*32 MESSAGE
C
C     INITIALIZE ERROR FLAG--
C     IER = 0
C
C     TEST NO. 1--
C     IF (NUBAR .LT. 1 .OR. NUBAR .GT. 8) THEN
C         ITEST = 1
C         WRITE (6,1000) ITEST
C         MESSAGE = 'NUBAR'
C         WRITE (6,2001) MESSAGE, NUBAR
C         IEQ = 0
C         IPOP = 0
C         IFE = 0
C         IER = IER + 1
C     ENDIF
C
C     TEST NO. 2--
C     IF (NMET .LT. 1 .OR. NMET .GT. 7) THEN
C         ITEST = 2
C         WRITE (6,1000) ITEST
C         MESSAGE = 'NMET'
C         WRITE (6,2001) MESSAGE, NMET
C         NMET = 7
C         WRITE (6,4000) MESSAGE, NMET
C         IEQ = 0
C         IPOP = 0
C         IFE = 0
C         IER = IER + 1
C     ENDIF
C
C     TEST NO. 3--
C     ITEST = 3
C     DO 100 I = 1, NMET
C         IF (ISTAB(I) .LT. 1 .OR. ISTAB(I) .GT. 7) THEN
C             WRITE (6,1000) ITEST
C             MESSAGE = 'STABILITY INDEX -I-'
C             WRITE (6,2001) MESSAGE, ISTAB(I)
C             WRITE (6,3000) I
C             IER = IER + 1
C         ENDIF
C     100 CONTINUE
C
C     TEST NO. 4--
C     IF (NDIST .LT. 1 .OR. NDIST .GT. 10) THEN
C         ITEST = 4
C         WRITE (6,1000) ITEST
C         MESSAGE = 'NDIST'
C         WRITE (6,2001) MESSAGE, NDIST

```

FIGURE B.0-3. Subroutine EDINPT Listing

MODULE EDINPT

```

NDIST = 10
WRITE (6,4000) MESSAGE, NDIST
IPOP = 0
IFE = 0
IER = IER + 1
ENDIF
C
C TEST NO. 5--
ITEST = 5
DO 200 I = 1, NDIST
  IF (DIST(I) .LE. 0.) THEN
    WRITE (6,1000) ITEST
    MESSAGE = 'DISTANCE -I-'
    WRITE (6,2002) MESSAGE, DIST(I)
    WRITE (6,3000) I
    IER = IER + 1
  ENDIF
200 CONTINUE
C
C TEST NO. 6--
ITEST = 6
DO 300 I = 2, NDIST
  IF (DIST(I) .LT. DIST(I-1) ) THEN
    WRITE (6,1000) ITEST
    WRITE (6,5000) DIST(I), DIST(I-1)
    WRITE (6,3000) I
    IER = IER + 1
  ENDIF
300 CONTINUE
C
C TEST NO. 7--
IF (NSECT .LT. 1 .OR. NSECT .GT. 16) THEN
  ITEST = 7
  WRITE (6,1000) ITEST
  MESSAGE = 'NSECT'
  WRITE (6,2001) MESSAGE, NSECT
  NSECT = 16
  WRITE (6,4000) MESSAGE, NSECT
  IEQ = 0
  IPOP = 0
  IFE = 0
  IER = IER + 1
ENDIF
C
C IF EVACUATION IS CONSIDERED MAKE TESTS 8 - 13--
IF (IEVAC .LE. 0) THEN
C
C TEST NO. 8--
IF (RLANE .LE. 0.) THEN
  ITEST = 8
  WRITE (6,1000) ITEST
  MESSAGE = 'RLANE'
  WRITE (6,2002) MESSAGE, RLANE
  IER = IER + 1
ENDIF
C
C TEST NO. 9--
IF (CPHL .LE. 0.) THEN
  ITEST = 9
  WRITE (6,1000) ITEST
  MESSAGE = 'CPHL'
  WRITE (6,2002) MESSAGE, CPHL
  IER = IER + 1
ENDIF
C
C TEST NO. 10--
IF (PPCAR .LE. 0.) THEN
  ITEST = 10
  WRITE (6,1000) ITEST
  MESSAGE = 'PPCAR'
  WRITE (6,2002) MESSAGE, PPCAR
  IER = IER + 1
ENDIF
C
C TEST NO. 11--

```

FIGURE B.0-3. (contd)

MODULE EDINPT

```

      IF (CLAM .LE. 0.) THEN
        ITEST = 11
        WRITE (6,1000) ITEST
        MESSAGE = 'CLAM'
        WRITE (6,2002) MESSAGE, CLAM
        IER = IER + 1
      ENDIF
C
C      TEST NO. 12--
      IF (MAXEV .LT. 1 .OR. MAXEV .GT. NDIST) THEN
        ITEST = 12
        WRITE (6,1000) ITEST
        MESSAGE = 'MAXEV'
        WRITE (6,2001) MESSAGE, MAXEV
        IER = IER + 1
      ENDIF
C
C      TEST NO. 13--
      ITEST = 13
      MESSAGE = 'ALANES(I)'
      DO 400 I = 1, NSECT
        IF (ALANES(I) .LE. 0.) THEN
          WRITE (6,1000) ITEST
          WRITE (6,2002) MESSAGE, ALANES(I)
          WRITE (6,3000) I
          IER = IER + 1
        ENDIF
      400 CONTINUE
C
C      END OF EVACUATION PARAMETER TEST--
      ENDIF
C
C
C      TEST NO. 14--
      IF (IRISE .EQ. 1 .AND. FPR .LE. 0.) THEN
        ITEST = 14
        WRITE (6,1000) ITEST
        MESSAGE = 'BUOYANT RISE PARAMETER FPR'
        WRITE (6,2002) MESSAGE, FPR
        IER = IER + 1
      ENDIF
C
C      TEST NO. 15--
      IF (IRISE .GT. 1 .AND. FPR .LE. 0.) THEN
        ITEST = 15
        WRITE (6,1000) ITEST
        MESSAGE = 'MOMENTUM RISE PARAMETER FPR'
        WRITE (6,2002) MESSAGE, FPR
        IER = IER + 1
      ENDIF
C
C      TEST NO. 16--
      IF (IRISE .GT. 1 .AND. STACKD .LE. 0.) THEN
        ITEST = 16
        WRITE (6,1000) ITEST
        MESSAGE = 'MOMENTUM RISE PARAMETER STACKD'
        WRITE (6,2002) MESSAGE, STACKD
        IER = IER + 1
      ENDIF
C
C      TEST NO. 17--
      IF (TREL .LE. 0.) THEN
        ITEST = 17
        WRITE (6,1000) ITEST
        MESSAGE = 'TREL'
        WRITE (6,2002) MESSAGE, TREL
        IER = IER + 1
      ENDIF
C
C      RETURN
C
C      FORMAT STATEMENTS--
C
1000 FORMAT ('0 MESSAGE ', I4)
C
C      INTEGER ERROR MESSAGE--

```

FIGURE B.0-3. (contd)

```

                                MODULE EDINPT
2001 FORMAT (' BAD VALUE FOR ', A32, ', ' = ', I4)
C
C   REAL ERROR MESSAGE--
2002 FORMAT (' BAD VALUE FOR ', A32, ', ' = ', 1PE10.2)
C
3000 FORMAT (' I (INDEX VALUE) = ', I4)
C
4000 FORMAT (' ', A32, ' HAS BEEN SET TO ', I4)
C
5000 FORMAT (' DISTANCE(I) IS OUT OF ORDER' /
.      ' DIST(I) = ', 1PE10.2 /
.      ' DIST(I-1) = ', 1PE10.2)
C
      END

```

FIGURE B.0-3. (contd)

```

                                MODULE  FEREAD

      SUBROUTINE FEREAD (NDIST, NSECT, FEIN)
C *****
C
C      FEREAD READS A SET OF FRACTIONAL EVACUATION DATA FROM THE INPUT
C      FILE.
C *****
C
C      CALLED BY-- MAIN
C      SUBORDINATE ROUTINES-- NONE
C      INPUTS-- NDIST, NSECT
C      OUTPUTS-- FEIN
C      COMMON BLOCKS USED-- NONE
C -----
C
C      DIMENSION FEIN (10,16)
C
C      INITIALIZE ARRAY TO ZERO--
C      CALL ZEROR (160, FEIN)
C
C      FOR EACH SECTOR--
C      DO 100 IS = 1, NSECT
C
C          READ (5,1000,ERR=800,END=900) (FEIN(I,IS), I=1, NDIST)
C
C      100 CONTINUE
C
C      RETURN
C
C      ERROR MESSAGES--
C      800 WRITE (6,2000)
C          STOP
C      900 WRITE (6,3000)
C          STOP
C
C      FORMAT STATEMENTS--
C
C      CARD TYPE 4--
C      1000 FORMAT (10F8.5)
C
C      2000 FORMAT ('0 READ ERROR ENCOUNTERED IN SUBROUTINE FEREAD')
C
C      3000 FORMAT ('0 END-OF-FILE ENCOUNTERED IN SUBROUTINE FEREAD')
C      END

```

FIGURE B.0-4. Subroutine FEREAD Listing

MODULE FESET

```

SUBROUTINE FESET (IFE, FEIN)
C
C*****
C
C    FESET SETS FRACTIONAL EVACUATION DATA INTO ARRAY FE OF COMMON
C    BLOCK FEVAC AND CALCULATES EVACUATION MODEL PARAMETERS.
C*****
C
C    CALLED BY-- MAIN
C    SUBORDINATE ROUTINES-- ZEROR
C    INPUTS-- IFE, FEIN
C    OUTPUTS-- NONE
C    COMMON BLOCKS USED-- DISTNC, EVAC, EVACIN, FEVAC, INDEX, POPU
C
C-----
C
C    INCLUDE PEDIC.DISTNC, LIST
C    INCLUDE PEDIC.EVAC, LIST
C    INCLUDE PEDIC.EVACIN, LIST
C    INCLUDE PEDIC.FEVAC, LIST
C    INCLUDE PEDIC.INDEX, LIST
C    INCLUDE PEDIC.POPU, LIST
C
C    DIMENSION FEIN(10,15),AREA(10),R(10)
C
C    CONST = PI * CONVERSION FACTOR; SQ METERS TO SQ MILES / NO. SECTORS
C           = 3.1415927 * 3.861E-07 / 16.
C    DATA CONST /7.5811E-08/
C
C    DATA EXPON /0.54/
C    DATA TWO /2./
C
C    INITITALIZE ARRAY TO ZERO--
C    CALL ZEROR (160, FE)
C
C    IF TOTAL EVACUATION--
C    IF (IFE .EQ. 1) THEN
C
C        SET ALL VALUES TO 1.0--
C        DO 100 IS = 1, NSECT
C            DO 200 ID = 1, NDIST
C                FE(ID,IS) = 1.0
C        200 CONTINUE
C    100 CONTINUE
C
C    ELSE
C    READ VALUES FROM ARRAY FEIN--
C
C        DO 300 IS = 1, NSECT
C            DO 400 ID = 1, NDIST
C                FE(ID,IS) = FEIN (ID,IS)
C        400 CONTINUE
C    300 CONTINUE
C
C    ENDIF
C
C    CALCULATE TOTAL POPULATION WITHIN EVACUATION AREA FOR EACH SECTOR-
C
C    INITIALIZE ARRAY--
C    CALL ZEROR (160, PN)
C
C    FOR EACH EVACUATING DISTANCE INTERVAL--
C    DO 450 IS=1,NSECT
C        PN(1,IS)=POP(1,IS)*FE(1,IS)
C    450 CONTINUE
C        IF(MAXEV.GT.1) THEN
C            DO 500 ID = 2, MAXEV
C
C                FOR EACH SECTOR--
C                DO 600 IS = 1, NSECT
C
C                    PN(ID,IS) = PN(ID-1,IS) + POP(ID,IS) * FE(ID,IS)
C
C        500 CONTINUE

```

FIGURE B.0-5. Subroutine FESET Listing

```

                                MODULE FESFET
500  CONTINUE
C
C
C      ENDIF
C      RATIO = 1./DIST(NDIST)
C      ACON = RLANE * CPHL * PPCAR
C      DISTANCE LOOP OVER EVACUATING INTERVALS
C
C      DO 520 ID= 1 , MAXEV
C      SET DISTANCE TO CURRENT DISTANCE INTERVAL ENDPOINT
C
C      IF (ID.LT.MAXEV) THEN
C          R(ID) = (DIST(ID) + DIST(ID+1)) / TWO
C      ELSE
C          IF THE NUMBER OF INTERVALS IS LESS THAN THE NUMBER OF DISTANCES--
C          IF (MAXEV .LT. NDIST) THEN
C              R(ID) = (DIST(MAXEV+1) + DIST(MAXEV) ) / TWO
C          ELSE
C              R(ID) = DIST(MAXEV)
C          ENDIF
C      ENDIF
C
C      AREA(ID) = R(ID) * R(ID) * CONST
520  CONTINUE
C
C      FOR EACH SECTOR--
C      DO 700 IS = 1, NSECT
C      LOOP OVER EVACUATING DISTANCES
C
C      DO 650 ID=1,MAXEV
C
C      IF POPULATION IS GREATER THAN ZERO--
C      IF (PN(ID,IS) .LE. 0.) THEN
C
C          ALANE(ID,IS) = 0.0
C          ALPHA(ID,IS) = 0.
C          ALAM(ID,IS) = 0.
C          TE(ID,IS) = 0.
C
C      ELSE
C
C          ALANE(ID,IS)=ALANES(IS)*RATIO*R(ID)
C          ALPHA(ID,IS) = ACON * ALANE(ID,IS) / PN(ID,IS)
C          ALAM(ID,IS) = CLAM * (PN(ID,IS) / AREA(ID)) ** EXPON
C          TE(ID,IS) = SQRT (TWO / (ALPHA(ID,IS) * ALAM(ID,IS))) + TWARN
C
C      ENDIF
650  CONTINUE
C
C      700 CONTINUE
C
C      RETURN
C      END

```

FIGURE B.0-5. (contd)

```

                                MODULE  FIN

      SUBROUTINE FIN (NUBAR, NMET, NSECT)
C
C *****
C
C      FIN READS A SET OF JOINT FREQUENCY DATA.
C
C *****
C
C      CALLED BY-- MAIN
C      SUBORDINATE ROUTINES-- ZEROR
C      INPUTS-- NUBAR, NMET, NSECT
C      OUTPUTS-- NONE
C      COMMON BLOCKS USED-- JOINT
C
C -----
C
C      INCLUDE PEDIC.JOINT
C
C      INITIALIZE THE ARRAY FOR JOINT FREQUENCY DATA--
C      CALL ZEROR (896, F)
C
C      FOR EACH WINDSPEED CONSIDERED--
C      DO 100 IU = 1, NUBAR
C
C          FOR EACH STABILITY CLASS--
C          DO 200 IM = 1, NMET
C
C              READ (5,1000,ERR=800,END=900) (F(IU,IM,I), I = 1, NSECT)
C
C      200  CONTINUE
C      100  CONTINUE
C
C      RETURN
C
C      ERROR MESSAGES--
C      800  WRITE (6,2000)
C           STOP
C      900  WRITE (6,3000)
C           STOP
C
C
C      FORMAT STATEMENTS--
C
C      CARD TYPE 2--
C      1000  FORMAT (16F5.2)
C
C      2000  FORMAT ('0 READ ERROR ENCOUNTERED IN SUBROUTINE FIN')
C
C      3000  FORMAT ('0 END-OF-FILE ON INPUT OF JOINT FREQUENCY DATA IN '
C      .      'SUBROUTINE FIN')
C
C      END

```

FIGURE B.0-6. Subroutine FIN Listing

SUBROUTINE PASSIG (XX, IPC, SY, SZ)

FIGURE B.0-7. Subroutine PASSIG Listing

MODULE PASSIG

```

C      DATA (SIGZ(4,I),I=1,20)/100.,470.,680.,1050.,1400.,1900.,2500.,
13300.,4300.,6200.,7600.,9500.,1.15E4,1.4E4,1.7E4,2.2E4,2.55E4,
2  3.2E4,3.7E4,4.5E4/

C      DATA (SIGZ(5,I),I=1,20)/100.,300.,430.,710.,940.,1300.,1700.,2200.
1  ,2900.,4100.,5000.,6100.,7200.,8400.,9900.,1.17E4,1.3E4,1.4E4,
2  1.55E4,1.7E4/

C      DATA (SIGZ(6,I),I=1,20)/100.,140.,220.,400.,530.,760.,1000.,1350.,
11770.,2500.,3000.,3500.,4100.,4700.,5500.,6400.,7200.,7900.,8600.,
2  9400./

C      IF (IPC .EQ. 7) THEN
        IP = 6
      ELSE
        IP = IPC
      ENDIF

C      X = XX * 100.

C      CALCULATE SY AND SZ FOR EACH X POSITION DESIRED--
      IDATA = 1
1  IF (IDATA .GT. 20) GO TO 7

C      201 IF (X - DIST(IDATA) ) 4, 3, 2

C      IF X IS GREATER THAN DISTANCE--
2  IDATA = IDATA + 1
   GO TO 1

C      IF X IS EQUAL TO DISTANCE--
3  SY = SIGY(IP,IDATA)
   SZ = SIGZ(IP,IDATA)
   GO TO 8

C      IF X IS LESS THAN DISTANCE--
4  IF (IDATA .EQ. 1) GO TO 3
   SY1 = SIGY(IP,IDATA-1)
   SY2 = SIGY(IP,IDATA)
   SZ1 = SIGZ(IP,IDATA-1)
   SZ2 = SIGZ(IP,IDATA)
   D1 = DIST(IDATA-1)
   D2 = DIST(IDATA)

C      SY = SY1 + (X-D1) * (SY2-SY1) / (D2-D1)
C      SZ = SZ1 + (X-D1) * (SZ2-SZ1) / (D2-D1)

C      GO TO 8

C      IDATA IS GREATER THAN 20--
7  SY = SIGY(IP,20)
   SZ = SIGZ(IP,20)

C      IF (IPC .EQ. 7) THEN
        SY = SY * 0.6667
        SZ = SZ * 0.50
      ENDIF

C      CONVERT TO METERS--
8  SY = SY * .01
   SZ = SZ * .01

C      RETURN
      END

```

FIGURE B.0-7. (contd)


```

MODULE PMCALC

SUBROUTINE PMCALC (PM)
C
C *****
C
C   PMCALC CONTROLS CALCULATION OF THE POPULATION DISPERSION
C   FACTOR, PM.
C *****
C
C   CALLED BY-- MAIN
C   SUBORDINATE ROUTINES-- DEPLET, PASSIG, POPINT, PRISE, WAKE
C   INPUTS-- NONE
C   OUTPUTS-- PM
C   COMMON BLOCKS USED-- DISTNC, FEVAC, INDEX, JOINT, PLUMR, POPU,
C                       QACOM, QAPMAN, RISE
C -----
C
C   INCLUDE PEDIC.DISTNC, LIST
C   INCLUDE PEDIC.EVAC, LIST
C   INCLUDE PEDIC.FEVAC, LIST
C   INCLUDE PEDIC.INDEX, LIST
C   INCLUDE PEDIC.JOINT, LIST
C   INCLUDE PEDIC.PLUMR, LIST
C   INCLUDE PEDIC.POPU, LIST
C   INCLUDE PEDIC.QACOM, LIST
C   INCLUDE PEDIC.QAPMAN, LIST
C   INCLUDE PEDIC.RISE, LIST
C   INCLUDE PEDIC.TERAIN, LIST
C
C
C   DIMENSION SC(3), S(7)
C   DATA SC / 8.7E-4, 1.75E-3, 2.45E-3 /
C
C   INITIALIZE POPULATION DISPERSION FACTOR--
C   PM = 0.
C
C   IF BOUYANT PLUME RISE MODEL IS USED--
C   IF (IRISE .EQ. 1) THEN
C
C       FP = (3.75E-5) * FPR
C       HBC = 1.6 * FP ** .33333
C
C       IF (FP .LE. 55.) THEN
C           XS(1) = 14. * FP ** 0.625
C       ELSE
C           XS(1) = 34. * FP ** .66667
C       ENDIF
C
C       FOR EACH STABLE CATEGORY--
C       DO 100 IM = 5, 7
C
C           XS(IM) = 2.1 / (SQRT (SC(IM-4)))
C           HBF(IM) = 2.6 * (FP / SC(IM-4) ) ** .33333
C
C 100 CONTINUE
C
C       ELSE
C       IF MOMENTUM PLUME RISE MODEL USED--
C       IF (IRISE .EQ. 2) THEN
C
C           FM = (FPR * STACKD / 2.) ** 2
C           WO = FPR
C           SD = STACKD
C
C           FOR EACH STABLE CATEGORY--
C           DO 200 IM = 5, 7
C
C               S(IM) = SC(IM-4) ** 0.16667
C               HM1(IM) = 4. * (FM / SC(IM-4)) ** 0.25
C               HM2(IM) = 1.5 * FM ** .3333 * S(IM)
C
C 200 CONTINUE
C
C           HM1(1) = 1.44 * (FPR * STACKD) ** .66667
C           HM2(1) = 3. * FPR * STACKD

```

FIGURE B.0-8. Subroutine PMCALC Listing

MODULE PMCALC

```

C      ENDIF
C      ENDIF
C
C      FOR EACH DISTANCE--
C      DO 300 ID = 1, NDIST
C
C          FOR EACH WINDSPEED--
C          DO 400 IU = 1, NUBAR
C
C              X = DIST(ID)
C              U = UBAR(IU)
C              TT = X / (U * 3600.)
C
C              FOR EACH SECTOR--
C              DO 500 IS = 1, NSECT
C
C                  P = POP(ID,IS)
C                  FV = FE(ID,IS)
C                  TH = TER(ID,IS)
C
C                  IF (IEVAC .GT. 0 .OR. ID .GT. MAXEV .OR. TE(ID,IS) .LE. 0.)
C                      THEN
C                      PF = 1.0
C                  ELSE
C                      CALL POPINT (TT, ID, IS, PF)
C                      TO EVALUATE THE POPULATION-AIR CONCENTRATION INTEGRAL.
C                  ENDIF
C
C                  FOR EACH STABILITY CATEGORY--
C                  DO 600 IM = 1, NMET
C
C                      IF PLUME RISE CONSIDERED--
C                      IF (IRISE .GT. 0) THEN
C
C                          CALL PRISE (IRISE, ISTAB(IM), X, U, HPR)
C                          TO CALCULATE INCREMENT TO STACK HEIGHT DUE TO PLUME RISE.
C
C                      ELSE
C
C                          HPR = 0.0
C
C                      ENOIF
C
C                      HE = AMAX1(0.,HS+HPR-TH)
C
C                      CALL PASSIG (X, ISTAB(IM), SY, SZ)
C                      TO CALCULATE DISPERSION PARAMETERS.
C
C                      IF PLUME DEPLETION IS CONSIDERED--
C                      IF (IDEP .GT. 0) THEN
C
C                          CALL DEPLET (X, ISTAB(IM), HE, FD)
C                          TO CALCULATE THE FRACTION OF MATERIAL REMAINING IN THE PLUME.
C
C                      ELSE
C
C                          FD = 1.0
C
C                      ENOIF
C
C                      IF BUILDING WAKE IS CONSIDERED AND THE HEIGHT OF STACK IS <= 1
C                      IF (IWAKE .GT. 0 .AND. HS .LE. 1.) THEN
C
C                          CALL WAKE (SZ, ES)
C                          TO CALCULATE THE EFFECTIVE DISPERSION PARAMETER.
C
C                      ELSE
C
C                          ES = SZ
C
C                      ENOIF
C
C                      EQ = .02032 * FD * F(IU,IM,IS) / (U * ES * X)

```

FIGURE B.0-8. (contd)

```

                                MODULE  PMCALC
                                * EXP ( -HE * HE / (2. * SZ * SZ) )
C
C      IF EVACUATION CONSIDERED--
C      IF (IEVAC .GT. 0 .OR. ID .GT. MAXEV) THEN
C
C          PM = PM + P * EOQ
C
C      ELSE
C
C          PM = PM + EOQ * P * (1. - FV + FV*PF)
C
C      ENDIF
C
C      600      CONTINUE
C      500      CONTINUE
C      400      CONTINUE
C      300 CONTINUE
C
C      RETURN
C      END

```

FIGURE B.0-8. (contd)

```

                                MODULE  POPIN

      SUBROUTINE POPIN (NDIST, NSECT)
C
C *****
C
C      POPIN READS A SET OF POPULATION DISTRIBUTION DATA.
C
C *****
C
C      CALLED BY-- MAIN
C      SUBORDINATE ROUTINES-- ZEROR
C      INPUTS-- NDIST, NSECT
C      OUTPUTS-- NONE
C      COMMON BLOCKS USED-- POPU
C
C -----
C
C      INCLUDE PEDIC.POPU, LIST
C
C      INITIALIZE POPULATION DATA ARRAY--
C      CALL ZEROR (150, POP)
C
C      FOR EACH SECTOR--
C      DO 100 IS = 1, NSECT
C
C          READ (5,1000,ERR=800,END=900) (POP(I,IS), I = 1, NDIST)
C
C 100 CONTINUE
C
C      RETURN
C
C
C      ERROR MESSAGES--
C 300 WRITE (6,2000)
C      STOP
C 900 WRITE (6,3000)
C      STOP
C
C
C      FORMAT STATEMENTS--
C
C      CARD TYPE 3--
C 1000 FORMAT (10F8.0)
C
C 2000 FORMAT ('0 READ-ERROR ON INPUT OF POPULATION DATA '
C      .      'IN SUBROUTINE POPIN, STOP')
C
C 3000 FORMAT ('0 END-OF-FILE ON INPUT OF POPULATION DATA '
C      .      'IN SUBROUTINE POPIN, STOP')
C
C      END

```

FIGURE B.0-9. Subroutine POPIN Listing

MODULE POPINT

SUBROUTINE POPINT (TT, ID, IS, PF)

```

C
C*****
C
C    POPINT EVALUATES THE POPULATION - AIR CONCENTRATION INTEGRAL
C    WITH EVACUATION.
C*****
C
C    CALLED BY-- PMCALC
C    SUBORDINATE ROUTINES-- NONE
C    INPUTS-- TT, IS
C    OUTPUTS-- PF
C    COMMON BLOCKS USED-- EVAC
C
C-----
C
C    INCLUDE PEDIC.EVAC, LIST
C
C    IF FRONT OF PLUME REACHES LOCATION BEFORE EVACUATION IS COMPLETED--
C    IF (TT .LT. TE(ID,IS) ) THEN
C
C        IF EVACUATION COMMENCES BEFORE PLUME HAS PASSED--
C        IF (TWARN .LT. TT + TREL) THEN
C
C            IF THE PLUME REACHES THE LOCATION BEFORE EVACUATION BEGINS--
C            IF (TT .LE. TWARN) THEN
C
C                PF = (TWARN - TT) / TREL
C                T1 = 0.
C
C            ELSE
C                THE PLUME REACHES THE LOCATION AFTER EVACUATION BEGINS--
C
C                PF = 0.
C                T1 = TT - TWARN
C
C            ENDIF
C
C        T2 = AMIN1 (TE(ID,IS), TT + TREL) - TWARN
C
C        AF = ALPHA(ID,IS)
C        AL = ALAM(ID,IS)
C
C        TEST TO PREVENT UNDERFLOW--
C        IF (AL * T2 .GT. 0.01) THEN
C
C            A = (T2 - T1) * (1. + AF/AL)
C            B = - ( T2 * T2 - T1 * T1 ) * AF / 2.
C            C = -AF / (AL*AL) * (EXP (-AL*T1) - EXP (-AL*T2))
C            PF = PF + (A + B + C) / TREL
C
C        ELSE
C            USE APROXIMATION--
C
C            A = (T1 ** 3 - T2 ** 3) * AL * AF / 6.
C            PF = PF + (T2 - T1 + A) / TREL
C
C        ENDIF
C
C    ELSE
C        THE PLUME PASSED BEFORE EVACUATION BEGAN--
C
C        PF = 1.0
C
C    ENDIF
C
C    ELSE
C        THE EVACUATION IS COMPLETED BEFORE THE PLUME ARRIVES, NO EXPOSURE--
C
C        PF = 0.0
C
C    ENDIF
C
C    RETURN
C    END

```

FIGURE B.0-10. Subroutine POPINT Listing

```

MODULE PRISE

SUBROUTINE PRISE (IRISE, IM, X, U, HPR)
$$$START
C
C*****
C
C   PRISE CALCULATES THE INCREMENT TO STACK HEIGHT DUE TO PLUME RISE.
C*****
C
C   CALLED BY-- PMCALC
C   SUBORDINATE ROUTINES-- NONE
C   INPUTS-- IRISE, IM, X, U
C   OUTPUTS-- HPR
C   COMMON BLOCS USED-- RISE
C
C-----
C
C          ARGUMENT LIST PARAMETER DESCRIPTIONS
C-----
C   PARAMETER   TYPE      DESCRIPTION
C-----
C   IRISE       INTEGER    CONTROL TO SELECT BOUYANT RISE EQUATION
C   IM          INTEGER    STABILITY INDICATOR
C   X           REAL       DISTANCE FROM RELEASE POINT TO LOCATION
C                   WHERE PLUME IS TO BE EVALUATED
C   U           REAL       AVERAGE WIND SPEED, M/SEC
C   HPR         REAL       CALCULATED PLUME RISE INCREMENT, M
C-----
C
C   INCLUDE PEDIC.RISE, LIST
C
C   IF BUOYANT P MODEL USED--
C   IF (IRISE .EQ. 1) THEN
C
C     FOR NEUTRAL AND UNSTABLE CONDITIONS--
C     IF (IM .LE. 4) THEN
C
C       IF THE DISTANCE IS LESS THAN X*--
C       IF (X .LE. XS(1)) THEN
C
C         HPR = HBC * XK * X ** .66667 / U
C         RETURN
C
C       ELSE
C       DISTANCE IS GREATER THAN X*--
C
C       IF (X .LT. 5. * XS(1)) THEN
C
C         XK = (X-XS(1)) / (4. * XS(1)) * 1.34 + 1.
C         HPR = HBC * X ** 0.66667 / U
C
C       ELSE
C
C         HPR = HBC * 2.34 * XS(1) ** 0.66667 / U
C
C       ENDIF
C     ENDIF
C     RETURN
C
C   ELSE
C   FOR STABLE CONDITIONS--
C
C     IF (X .LE. XS(IM) * U) THEN
C
C       HPR = HBC * X ** 0.66667 / U
C
C     ELSE
C
C       HPR = HBF(IM) / U ** 0.33333
C
C     ENDIF
C   ENDIF
C
C   ENDIF

```

FIGURE B.0-11. Subroutine PRISE Listing

```

                                MODULE PRISE

                                RETURN
C
ELSE
C   MOMENTUM PLUME RISE MODEL USED--
C
C   FOR UNSTABLE AND NEUTRAL CONDITIONS--
C   IF (IM .LE. 4) THEN
C
C       HPR = HM1(1) * (X / U ** U) **.33333
C
C       IF EXIT VELOCITY FROM STACK IS < 1.5 TIMES THE WINDSPEED--
C       IF (WO .LT. 1.5 * U) THEN
C           HD = 3. * (1.5 - WO / U) * SD
C           HPR = HPR - HD
C       ENDIF
C
C       HP = HM2(1) / U
C
C       IF (HP .LT. HPR) HPR = HP
C
C   ELSE
C   FOR STABLE CONDITIONS--
C
C       H1 = HM1(1) * (X / U ** U) **.33333
C       H2 = HM2(1) / U
C
C       IF EXIT VELOCITY FROM STACK IS < 1.5 TIMES THE WINDSPEED--
C       IF (WO .LT. 1.5 * U) THEN
C           HD = 3. * (1.5 - WO / U) * SD
C           H1 = H1 - HD
C       ENDIF
C
C       H3 = HM1(IM)
C       H4 = HM2(IM) / U **.33333
C
C       HPR = AMIN1 (H1, H2, H3, H4)
C
C   ENDIF
C
ENDIF
RETURN
END

```

FIGURE B.0-11. (contd)

MODULE QAPAGE

```

SUBROUTINE QAPAGE (IER)                                $$$START
C
C *****
C
C   QAPAGE PRINTS A SUMMARY REPORT OF ALL INPUT DATA.
C
C *****
C
C   CALLED BY-- MAIN
C   SUBORDINATE ROUTINES-- NONE
C   INPUTS-- IER
C   OUTPUTS-- PRINTED REPORT
C   COMMON BLOCKS USED-- DISTNC, EVAC, EVACIN, FEVAC, INDEX, JOINT,
C                       PLUMR, POPU, QACOM, QAPMAN, TITLE
C
C -----
C
C   INCLUDE PEDIC.DISTNC, LIST
C   INCLUDE PEDIC.EVAC, LIST
C   INCLUDE PEDIC.EVACIN, LIST
C   INCLUDE PEDIC.FEVAC, LIST
C   INCLUDE PEDIC.INDEX, LIST
C   INCLUDE PEDIC.JOINT, LIST
C   INCLUDE PEDIC.PLUMR, LIST
C   INCLUDE PEDIC.POPU, LIST
C   INCLUDE PEDIC.QACOM, LIST
C   INCLUDE PEDIC.QAPMAN, LIST
C   INCLUDE PEDIC.TERAIN, LIST
C   INCLUDE PEDIC.TITLE, LIST
C
C   NOPT IS FLAG SET IF NO OPTIONS ARE SELECTED, USED FOR PRINTING--
C   LOGICAL NOPT
C   DATA NOPT /.FALSE./
C
C   PRINT HEADING INFORMATION--
C   WRITE (5,1000)
C   WRITE (5,1001) DATE, TITL
C   WRITE (5,1002)
C
C
C   WRITE (5,2000) NOIST, USECT
C   WRITE (5,2001) TREL
C   WRITE (5,2002) HS
C
C
C   PRINT OPTION INFORMATION--
C   WRITE (5,3000)
C
C   IF (IEVAC .LE. 0) THEN
C     WRITE (5,3001)
C     NOPT = .TRUE.
C   ENDIF
C
C   IF (IWAKE .GT. 0) THEN
C     WRITE (5,3002)
C     NOPT = .TRUE.
C   ENDIF
C
C   IF (IRISE .EQ. 1) THEN
C     WRITE (5,3003)
C     NOPT = .TRUE.
C   ENDIF
C
C   IF (IRISE .EQ. 2) THEN
C     WRITE (5,3004)
C     NOPT = .TRUE.
C   ENDIF
C
C   IF (IDEP .GT. 0) THEN
C     WRITE (5,3005)
C     NOPT = .TRUE.
C   ENDIF
C
C   IF (ITER.NE.1) THEN
C     WRITE(5,3007)
C     NOPT = .TRUE.

```

FIGURE B.0-12. Subroutine QAPAGE Listing

MODULE QAPAGE

```

C      ENDIF
C
C      IF NO OPTIONS HAVE BEEN SELECTED, PRINT "NONE"
C      IF (.NOT. NOPT) WRITE (5,3006)
C
C      IF (IWAKE .GT. 0) WRITE (5,3100) DZ
C
C      IF (IRISE .EQ. 1) WRITE (5,3200) FPR
C
C      IF (IRISE .EQ. 2) WRITE (5,3300) FPR, STACKD
C
C      IF EVACUATION IS CONSIDERED--
C      IF (IEVAC .LE. 0) THEN
C
C          PRINT EVACUATION MODEL PARAMETER SUMMARY--
C          WRITE (5,4000)
C          WRITE (5,4001) MAXEV
C          WRITE (5,4002) RLANE
C          WRITE (5,4003) CPHL
C          WRITE (5,4004) PPCAR
C          WRITE (5,4005) CLAM
C          WRITE (5,4006) TWARN
C      IF IEVPRT > 0 PRINT CALCULATED EVACUATION PARAMETERS.
C      IF (IEVPRT.GT.0) THEN
C
C          PRINT EVACUATION DATA--
C          WRITE (5,5000)
C          WRITE (5,5001)
C          WRITE (5,5002)
C
C          DO 100 IS = 1, NSECT
C              DO 100 ID=1,MAXEV
C                  WRITE (5,5003) ID,IS,ALANE(ID,IS),PN(ID,IS),ALPHA(ID,IS),
C                      ALAM(ID,IS),TE(ID,IS)
C          100 CONTINUE
C
C          WRITE (5,5002)
C
C      ELSE
C          WRITE (5,4007) (ALANES(I),I=1,NSECT)
C      ENDIF
C      ENDIF
C
C      IF JOINT FREQUENCY DATA HAS BEEN INPUT--
C      IF (IEQ .GT. 0) THEN
C
C          WRITE (5,6000)
C          WRITE (5,6001) (IS, IS = 1,NSECT)
C          WRITE (5,6002)
C          WRITE (5,6003)
C
C          DO 400 IU = 1, NUBAR
C              DO 500 IM = 1, NMET
C                  IF (IM .EQ. 1) THEN
C                      WRITE (5,6004) UBAR(IU),ISTAB(IM),(F(IU,IM,I),I=1,NSECT)
C                  ELSE
C                      WRITE (5,6005) ISTAB(IM), (F(IU,IM,I), I=1,NSECT)
C                  ENDIF
C          500 CONTINUE
C          400 CONTINUE
C          WRITE (5,6002)
C
C      ENDIF
C
C      IF POPULATION DISTRIBUTION DATA HAS BEEN INPUT--
C      IF (IPOP .GT. 0) THEN
C
C          WRITE (5,7000)
C          WRITE (5,7001) (DIST(ID), ID=1,NDIST)
C          WRITE (5,7002)
C          WRITE (5,7003)

```

FIGURE B.0-12. (contd)

MODULE QAPAGE

```

DO 200 IS = 1, NSECT
  WRITE (5,7004) IS, (POP(I,IS), I=1,NDIST)
200  CONTINUE
  WRITE (5,7002)
C
C  ENDIF
C
C  IF EVACUATION CONSIDERED, PRINT FRACTIONAL EVACUATION DATA--
C  IF (IEVAC .LE. 0) THEN
C
C    WRITE (5,8000)
C    WRITE (5,7001) (DIST(ID), ID=1,NDIST)
C    WRITE (5,7002)
C    WRITE (5,7003)
C    DO 300 IS = 1, NSECT
C      WRITE (5,8004) IS, (FE(I,IS), I=1,NDIST)
300  CONTINUE
C    WRITE (5,7002)
C
C  ENDIF
C
C  IF NEW TERRAIN DATA HAS BEEN READ OR OLD DATA RESET, PRINT TER
C  IF (ITER.NE.1) THEN
C    WRITE(5,8100)
C    WRITE(5,7001) (DIST(ID),ID=1,NDIST)
C    WRITE(5,7002)
C    WRITE(5,7003)
C    DO 450 IS = 1,NSECT
C      WRITE(5,8004) IS, (TER(I,IS),I=1,NDIST)
450  CONTINUE
C    WRITE(5,7002)
C
C  ENDIF
C
C  IF THERE HAS BEEN AN ERROR ON INPUT--
C  IF (IER .GT. 0) THEN
C
C    PRINT MESSAGE AND STOP--
C    WRITE (5,9900) IER
C    STOP
C
C  ELSE
C
C    PRINT SIGNATURE LINES--
C    WRITE (5,9000)
C
C  ENDIF
C
C  RETURN
C
C  FORMAT STATEMENTS
C
1000 FORMAT ('11', 54X, 'SUMMARY OF INPUT DATA' /
.      '1', 54X, '-----' /)
1001 FORMAT (52X, A8 / 25X, 20A4)
1002 FORMAT ('0-----
.-----' /)
C
2000 FORMAT (21X, 'THE SITE CONSIDERS ', I4, ' DISTANCE INTERVALS AND ',
.      I4, ' SECTORS' /)
2001 FORMAT (21X, 'THE RELEASE DURATION IS ', 1PE10.2, ' HOURS' /)
2002 FORMAT (21X, 'THE RELEASE ELEVATION IS ', 1PE10.2, ' METERS' /)
C
3000 FORMAT (21X, 'THE FOLLOWING OPTIONS HAVE BEEN SELECTED:' /)
3001 FORMAT (31X, 'EVACUATION')
3002 FORMAT (31X, 'BUILDING WAKE')
3003 FORMAT (31X, 'BOUYANT PLUME RISE')
3004 FORMAT (31X, 'MOMENTUM PLUME RISE')
3005 FORMAT (31X, 'PLUME DEPLETION')
3006 FORMAT (31X, 'NONE')

```

FIGURE B.0-12. (contd)

MODULE OAPAGE

```

3007 FORMAT (31X, 'TERRAIN ELEVATION')
C
3100 FORMAT ('0', 20X, 'BUILDING WAKE PARAMETER DZ = ', F5.1, ' METERS')
3200 FORMAT ('0', 20X, 'BOUYANT PLUME RISE PARAMETER FPR = ', 1PE10.2,
      ' CAL/SEC')
3300 FORMAT ('0', 20X, 'MOMENTUM PLUME RISE PARAMETERS:' /
      31X, 'FPR = ', F5.2, ' METERS/SEC' /
      31X, 'STACKD = ', F5.2, ' METERS')
C
4000 FORMAT ('0', 20X, 'EVACUATION MODEL PARAMETER SUMMARY:' /)
4001 FORMAT (31X, 14, ' (MAXEV) DISTANCE INTERVALS ARE EVACUATED.')
4002 FORMAT (31X, F5.0, ' (RLANE) LANES PER ROUTE.')
4003 FORMAT (31X, F5.0, ' (CPHL) CARS PER HOURS PER LANE.')
4004 FORMAT (31X, F5.0, ' (PPCAR) PERSONS PER CAR.')
4005 FORMAT (25X, 1PE10.2, ' (CLAM) = COEFFICIENT FOR TIME INTEGRAL ',
      'CONSTANT.')
4006 FORMAT (31X, F5.2, ' (TWARN) HOURS EVACUATION TIME WARNING.')
4007 FORMAT (28X, 'ALANES ', 8F8.2/35X, 8F8.2///)
C
5000 FORMAT (//// 53X, 'EVACUATION DATA' /
      53X, '-----' /)
C
5001 FORMAT (54X,
      .43X, 'NUMBER TO RATE'
      .42X, 'OF LANES EVACUATE HR-1'
      .22X, 'DISTANCE ', 'SECTOR ',
      ' (ALANE) (PN) (ALPHA) (ALAM) (TE)')
      TIME END//
      CONSTANT TIME//
      HR-1 HR-1 HOURS//
C
5002 FORMAT (22X, '-----', '-----',
      '-----')
C
5003 FORMAT (23X, 12, 7X, 12, 5X, 2(F10.2, 2X), 1PE10.2, 3X, E10.2, 2X,
      A 0PE10.3)
C
6000 FORMAT (//// 56X, 'JOINT FREQUENCY DATA' /
      56X, '-----' /)
6001 FORMAT (' SECTOR NUMBER ', 15 (5X, 12) )
6002 FORMAT (20X, 15('-----'))
6003 FORMAT (' WINDSPEED STABILITY' /
      '-----')
6004 FORMAT (/4X, F5.2, 5X, 11, 2X, 16 (2X, F5.2) )
6005 FORMAT ( 15X, 11, 2X, 16 (2X, F5.2) )
C
7000 FORMAT (//// 53X, 'POPULATION DISTRIBUTION DATA' /
      53X, '-----' /)
7001 FORMAT (' DISTANCE', F10.0, 9( 2X, F10.0) )
7002 FORMAT (9X, 10('-----'))
7003 FORMAT (' SECTOR' )
7004 FORMAT (5X, 12, 1X, 10 (2X, 1PE10.2) /)
C
8000 FORMAT (//// 54X, 'FRACTIONAL EVACUATION DATA' /
      54X, '-----' /)
8004 FORMAT (5X, 12, 1X, 10 (2X, 1PE10.2) )
C
9100 FORMAT (//// 55X, 'TERRAIN ELEVATION DATA' /
      3 55X, '-----' /)
C
9000 FORMAT (1H0, / 4X, '**** INPUT PREPARED BY:', 15X, 'DATE' /
      + 27X, '*****' /)
      + 4X, '**** INPUT CHECKED BY:', 17X, 'DATE' /
      + 25X, '*****' )
C
9900 FORMAT (14, ' INPUT ERRORS -- STOP')
      END

```

FIGURE B.0-12. (contd)

MODULE TEREAD

```

SUBROUTINE TEREAD(TERIN)
C
C *****
C
C   TEREAD READS A SET OF TERRAIN ELEVATION DATA CARDS.
C
C *****
C
C   CALLED BY - MAIN
C   SUBORDINATE ROUTINES - NONE
C   INPUTS - NONE
C   OUTPUTS - TERIN
C   COMMON BLOCKS USED - INDEX
C
C -----
C
C   INCLUDE PEDIC.INDEX, LIST
C   DIMENSION TERIN(10,16)
C
C   DO LOOP OVER SECTORS.
C
C   DO 200 IS = 1, NSECT
C     READ(5,1000,ERR=800,END=900) (TERIN(I,IS),I=1,NDIST)
C 200 CONTINUE
C   RETURN
C   READ ERROR, PRINT MESSAGE.
C 800 WRITE(6,8000)
C 8000 FORMAT(' READ ERROR IN SUBROUTINE TEREAD - STOP')
C   STOP
C
C   END OF INPUT FILE ENCOUNTERED, PRINT MESSAGE AND STOP
C 900 WRITE(6,9000)
C 9000 FORMAT(' END OF FILE ENCOUNTERED IN SUBROUTINE TEREAD, STOP')
C   STOP
C 1000 FORMAT(10E8.1)
C   END

```

FIGURE B.0-13. Subroutine TEREAD Listing

```

                                MODULE  TERSET

      SUBROUTINE TERSET(TERIN)
C *****
C
C      TERSET SETS TERRAIN ELEVATION DATA ARRAY TER
C *****
C
C      CALLED BY - MAIN
C      SUBORDINATE ROUTINES - NONE
C      INPUTS - TERIN
C      OUTPUTS - NONE
C      COMMON BLOCKS USED - INDEX, TERRAIN
C -----
C
C      INCLUDE PEDIC.INDEX, LIST
C      INCLUDE PEDIC.TERRAIN, LIST
C      DIMENSION TERIN(10,16)
C
C      IF ITER = 1 SET TER TO ZERO, OTHERWISE SET TO TERIN.
C
C      IF(ITER.EQ.1) THEN
C        CALL ZEROR(160,TER)
C      ELSE
C        DO FOR EACH SECTOR
C          DO 100, IS = 1,NSECT
C            DO FOR EACH DISTANCE INTERVAL
C              DO 50 ID = 1, NDIST
C                TER(ID,IS) = TERIN(ID,IS)
C              50 CONTINUE
C            100 CONTINUE
C          ENDIF
C        RETURN
C      END

```

FIGURE B.0-14. Subroutine TERSET Listing

```

MODULE WAKE

SUBROUTINE WAKE (SZ, ES)
C
C *****
C
C WAKE CALCULATES THE EFFECTIVE DISPERSION PARAMETER CONSIDERING
C BUILDING WAKE.
C *****
C
C CALLED BY-- PMCALC
C SUBORDINATE ROUTINES-- NONE
C INPUTS-- SZ
C OUTPUTS-- ES
C COMMON BLOCKS USED-- BWAKE
C
C -----
C
C ARGUMENT LIST PARAMETER DESCRIPTIONS
C
C PARAMETER TYPE DESCRIPTION
C -----
C
C SZ REAL VALUE OF VERTICAL DISPERSION PARAMETER
C AT THE LOCATION OF INTEREST, M
C ES REAL CALCULATED VALUE FOR EFFECTIVE DISPERSION
C PARAMETER, M
C -----
C
C INCLUDE PEDIC.BWAKE, LIST
C
C S3 IS THE SQUARE ROOT OF 3.
C DATA S3 / 1.7320508/
C
C SZ3 = S3 * SZ
C
C EZ2 = SZ * SZ + DZH
C ES = SQRT (EZ2)
C
C IF (ES .GT. SZ3) ES = SZ3
C
C RETURN
C END

```

FIGURE B.0-15. Subroutine WAKE Listing

```

                                MODULE  ZEROR

      SUBROUTINE ZEROR (N, A)
C *****
C
C      THIS MODULE INITIALIZES A REAL ARRAY TO ZERO.
C *****
C
C      CALLED BY-- FIN, POPIN, FEREAD, FESET
C      SUBORDINATE ROUTINES-- NONE
C      INPUTS-- N
C      INPUT COMMONS-- NONE
C      OUTPUTS-- A
C      OUTPUT COMMONS-- NONE
C -----
C      DIMENSION A(1)
C
C      DO 1 J=1,N
C        A(J)=0.
C 1 CONTINUE
C
C      RETURN
C      END

```

FIGURE B.0-16. Subroutine ZEROR Listing

```

3WAKE PROC
C-----
C      3WAKE
C      DESCRIPTION: INTERMEDIATE BUILDING WAKE PARAMETER
C      USED BY: MAIN, WAKE
C-----
C
C      COMMON /3WAKE/ DZH
C
C      DZH      - EFFECTIVE BUILDING CROSS-SECTIONAL AREA CALCULATED AS
C                0.5 DZ**2 / PI (SEE EQUATION 2.1-16)
C
C      END

DISTNC PROC
C-----
C      DISTNC
C      DESCRIPTION: DISTANCES FOR SITE GRID MIDPOINTS
C      USED BY: MAIN, FESET, PMCALC, QAPAGE
C-----
C
C      COMMON /DISTNC/ DIST(10)
C
C      DIST(10) - DISTANCE FROM THE RELEASE POINT TO THE MIDPOINT OF EACH
C                DISTANCE INTERVAL, M
C
C      END

EVAC PROC
C-----
C      EVAC
C      DESCRIPTION: EVACUATION MODEL PARAMETERS
C      USED BY: EDINPT, FESET, MAIN, POPINT, QAPAGE
C-----
C
C      COMMON /EVAC/ TWARN, TREL, ALPHA(10,16), ALAM(10,16), TE(10,16),
C      . ALANE(10,16)
C
C      TWARN      - EVACUATION WARNING TIME, HOURS
C      TREL      - DURATION OF ACTIVITY RELEASE, HOURS
C      ALPHA(10,16)- EVACUATION FUNCTION LIMITING FRACTIONAL RATE FOR EACH
C                DISTANCE AND SECTOR, HOURS**-1
C      ALAM(10,16)- EVACUATION FUNCTION TIME DELAY CONSTANT FOR EACH DISTANCE
C                AND SECTOR, HOURS**-1.
C      TE(10,16) - END TIME FOR EVACUATION FOR EACH DISTANCE AND SECTOR,
C                HOURS
C      ALANE(10,16)- NUMBER OF EVACUATION ROUTES FOR EACH SPATIAL INTERVAL.
C
C      END

EVACIN PROC
C-----
C      EVACIN
C      DESCRIPTION: INPUT EVACUATION MODEL DATA
C      USED BY: EDINPT, FESET, MAIN, QAPAGE
C-----
C
C      COMMON /EVACIN/ ALANES(16), CLAM, CPHL, PN(16), PPCAR, RLANE
C
C      ALANES(16) - NO. OF ROUTES (FOR EACH SECTOR) LEAVING THE AREA TO BE
C                EVACUATED.
C      CLAM      - CONSTANT FOR EQUATION 2.2-3 FOR EVALUATION OF LAMHDA E
C                (DEFAULT IS 1.3E-4)
C      CPHL      - AVERAGE NO. OF CARS PER HOUR PER LANE (DEFAULT IS 2000)
C      PN(16)    - TOTAL POPULATION WITH THE EVACUATION AREA (TO INTERVAL
C                MAXEV) CALCULATED FOR EACH SECTOR, PERSONS
C      PPCAR     - AVERAGE NO. OF PERSONS PER CAR (DEFAULT IS 3)
C      RLANE     - AVERAGE NO. OF LANES PER ROUTE FOR THE SITE (DEFAULT IS 2)
C
C      END

```

FIGURE B.0-17. Common Block Listing


```

FEVAC PROC
C-----
C   FEVAC
C       DESCRIPTION: FRACTIONAL EVACUATION DATA
C       USED BY: FESET, MAIN, QAPAGE
C-----
C
C   COMMON /FEVAC/  FE(10,16)
C
C   FE(10,16)  - FRACTIONAL EVACUATION DATA GIVING THE FRACTION OF THE POP-
C                ULATION IN EACH SPATIAL INTERVAL THAT WILL EVACUATE.
C                DATA IS PROVIDED FOR UP TO 10 DISTANCES AND 16 SECTORS.
C
C   END

INDEX PROC
C-----
C   INDEX
C       DESCRIPTION: PARAMETER DIMENSION INDEX VALUES
C       USED BY: EDINPT, FESET, MAIN, PMCALC, QAPAGE
C-----
C
C   COMMON /INDEX/  NDIST, NMET, NUBAR, MAXEV, NSECT
C
C   NDIST      - NO. OF DISTANCE INTERVALS TO CONSIDER, 1 <= NDIST <= 10
C   NMET       - NO. OF ATMOSPHERIC STABILITY CATEGORIES, 1 <= NMET <= 7
C   NUBAR      - NO. OF WINDSPEED GROUPS TO CONSIDER, 1 <= NUBAR <= 8
C   MAXEV      - MAXIMUM DISTANCE INTERVAL FOR WHICH EVACUATION WILL BE
C                CONSIDERED, 1<= MEXEV <= NDIST
C   NSECT      - NO. OF SECTORS TO BE CONSIDERED, 1<=NSECT<=16, DEFAULT = 16
C
C   END

JOINT PROC
C-----
C   JOINT
C       DESCRIPTION: JOINT FREQUENCY ATMOSPHERIC DATA
C       USED BY: FIN, PMCLAC, QAPAGE
C-----
C
C   COMMON /JOINT/  F(8,7,16)
C
C   F(8,7,16)  - JOINT FREQUENCY OF OCCURRENCE OF ATMOSPHERIC CONDITIONS FOR
C                8 WINDSPEEDS, 7 STABILITIES, AND 16 SECTORS
C
C   END

PLUMR PROC
C-----
C   PLUMR
C       DESCRIPTION: INPUT PLUME RISE PARAMETERS
C       USED BY: EDINPT, MAIN, PMCALC, QAPAGE
C-----
C
C   COMMON /PLUMR/  HS, FPR, STACKD, IRISE
C
C   HS         - HEIGHT OF STACK ABOVE GROUND LEVEL (M)
C   FPR        - Q(H) FOR BUOYANT PLUME RISE AND W(O) FOR MOMENTUM PLUME
C                RISE (M/SEC)
C   STACKD     - INTERNAL STACK DIAMETER (M)
C   IRISE      - CONTROL INTEGER TO INDICATE THE PLUME RISE MODEL TO BE USED
C                FOR THE CURRENT ACCIDENT: 0 FOR NO PLUME RISE, 1 FOR
C                BUOYANT PLUME RISE, 2 FOR MOMENTUM PLUME RISE
C
C   END

```

FIGURE B.0-17. (contd)

```

POPU PROC
C-----
C      POPU
C      DESCRIPTION: POPULATION DISTRIBUTION DATA
C      USED BY: FESET, PMCALC, POPIN, QAPAGE
C-----
C
C      COMMON /POPU/ POP(10,16)
C
C      POP(10,16) - POPULATION DISTRIBUTION DATA, P(XJ), GIVING THE NO. OF PEOPLE
C                  LIVING IN EACH SPATIAL INTERVAL FOR UP TO 10 DISTANCES
C                  IN 16 SECTORS
C
C      END

QACOM PROC
C-----
C      QACOM
C      DESCRIPTION: MISCELLANEOUS INPUT PARAMETERS
C      USED BY: EDINPT, MAIN, QAPAGE
C-----
C
C      COMMON /QACOM/ IPOP, IFE, FEIN(10,16), IWAKE, DZ, IEQ, IEVPRT,
C      B      TERIN(10,16)
C
C      IPOP      - CONTROL INTEGER FOR INPUT (IPOP>0) OF POPULATION DISTRIBUTION
C                  DATA
C      IFE      - CONTROL INTEGER FOR INPUT AND SPECIFICATIONS OF FRACTIONAL
C                  EVACUATION DATA
C      FEIN(10,16) - STORAGE ARRAY FOR INPUT FRACTIONAL EVACUATION DATA
C      IWAKE    - CONTROL INTEGER FOR CONSIDERATION (IWAKE>0) OF BUILDING
C                  WAKE EFFECTS
C      DZ      - MAXIMUM ADJACENT BUILDING HEIGHT FOR CALCULATION OF
C                  BUILDING WAKE EFFECTS, METERS
C      IEQ      - CONTROL INTEGER FOR INPUT OF JOINT FREQUENCY DATA (ARRAY F)
C                  VALUES ARE READ IF IEQ > 0.
C      IEVPRT   - CONTROL INTEGER FOR PRINTING CALCULATED EVACUATION
C                  PARAMETERS, PRINT IF IEVPRT > 0.
C      TERIN(10,16) - STORAGE ARRAY FOR INPUT TERRAIN ELEVATION DATA
C
C      END

QAPMAN PROC
C-----
C      QAPMAN
C      DESCRIPTION: MISCELLANEOUS INPUT PARAMETERS
C      USED BY: EDINPT, MAIN, PMCALC, QAPAGE
C-----
C
C      COMMON /QAPMAN/ IEVAC, ISTAB(7), IDEP, UBAR(8)
C
C      IEVAC    - CONTROL INTEGER FOR EVACUATION CALCULATION
C      ISTAB(7) - ATMOSPHERIC STABILITY CLASS SELECTION ARRAY, 1<=ISTAB(I)<=7
C      IDEP    - CONTROL INTEGER FOR CONSIDERATION OF PLUME DEPLETION
C                  (IDEP > 0)
C      UBAR(8)  - AVERAGE WINDSPEED FOR EACH WINDSPEED GROUP.
C
C      END

```

FIGURE B.0-17. (contd)

```

RISE PROC
C-----
C      RISE
C      DESCRIPTION: INTERMEDIATE PARAMETERS FOR THE PLUME RISE CALCULATION
C      USED BY: PMCALC, PRISE
C-----
C
C      COMMON /RISE/ HBC, XS(7), HBF(7), HM1(7), HM2(7), WO, SD
C
C      HBC          - CONSTANT FOR EQUATION 2.1-5 AND 2.1-10
C      XS(7)        - SPECIAL DISTANCE FOR BOUYANT PLUME RISE CALCULATIONS IN
C                     EQUATIONS 2.1-6, 2.1-8 AND 2.1-9
C      HBF(7)       - CONSTANTS FOR EQUATION 2.1-7
C      HM1(7)       - CONSTANTS FOR EQUATIONS 2.1-11 AND 2.1-14
C      HM2(7)       - CONSTANTS FOR EQUATIONS 2.1-13 AND 2.1-15
C      WO           - EXIT VELOCITY AT STACK (= FPR INPUT)
C      SD           - STACK DIAMETER (= STACKD INPUT)
C
C      END

TERRAIN PROC
C-----
C      TERRAIN
C      DESCRIPTION: TERRAIN ELEVATION DATA
C      USED BY: MAIN, QAPAGE, TERSET, PMCALC
C-----
C
C      COMMON /TERRAIN/ TER(10,16), ITER
C
C      TER(10,16)    - TERRAIN ELEVATION AT EACH SPATIAL INTERVAL, M
C
C      ITER          - CONTROL INTEGER FOR SPECIFICATION OF TERRAIN DATA
C                     ITER = 1 FOR ALL ZERO VALUES
C                     ITER < 1 TO RESET OLD INPUT VALUES
C                     ITER > 1 TO READ AND USE NEW INPUT VALUES
C
C      END

TITLE PROC
C-----
C      TITLE
C      DESCRIPTION: CASE TITLE AND CURRENT DATE
C      USED BY: MAIN, QAPAGE
C-----
C
C      COMMON /TITLE/ TITL(20), DAIT
C
C      CHARACTER*8 DAIT
C
C      TITL(20)      - DESCRIPTIVE TITLE FOR A CASE
C      DAIT          - CURRENT DATE (8 CHARACTERS)
C
C      END

```

FIGURE B.0-17. (contd)

APPENDIX C

INPUT PREPARATION

APPENDIX C

INPUT PREPARATION

This appendix describes preparation of input card images for use of PEDIC. Cards are defined by type for input of the following data categories:

- case title (card type 1),
- NAMELIST INPUT,
- joint frequency meteorological data (card type 2),
- population distribution data (card type 3),
- fractional evacuation data (card type 4).
- terrain elevation data (card type 5).

The order and use of each card type is determined by control integers as indicated in the input card logic diagram of Figure C.0-1. This diagram should be referred to when preparing input for PEDIC.

The first card for each case is a Type 1 title card with the following information.

<u>Card Type 1; Case Titles</u>			
<u>Variable</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
TITL(20)	1-80	20A4	Descriptive title for the current case used in report headings.

The title card is followed by a NAMELIST INPUT data set. The first card of the NAMELIST set must have \$INPUT in columns 2 to 7 followed by a blank. The remainder of the card and following cards may contain any combination of NAMELIST parameters separated by commas. The last card of the set must end with END. The parameter specifications may have the following forms:

- name = constant; example, IPOP = 1
- array name (subscript) = constant; example, UBAR(2) = 2.5
- array name (subscript) = set of constants; example UBAR(1) = 1.0, 2.5, 5.0
- array name = set of constants; example UBAR = 1.0, 2.5, 5.0, 5*0.0

FIGURE C.O-1. PEDIC Input Logic Diagram

The set of constants is represented by constants separated by commas, where K* constant represent K successive values of the constant. The number of constants specified must be less than or equal to the number of elements in the array. When the third form is used the number of constants specified must not exceed the remaining space available in the array (from the named element). The data items that appear on the input cards need not appear in the same order as the corresponding variable or array names in the NAMELIST list. All variable or array names of the list need not appear in the input record list. If a name does not appear the contents of the variable or array will be unchanged. Blanks must not be embedded in a constant or a repeat constant field, but may be used freely elsewhere.

The NAMELIST parameters used by PEDIC are divided into four parameter categories:

- A. Control Integers
- B. Site Grid Description
- C. Atmospheric Dispersion
- D. Evacuation

The parameters are described in the table below.

NAMELIST INPUT Parameters

A. Control Integers

<u>Parameter</u>	<u>Description</u>
IDEP	This control integer is for plume depletion during transit. Depletion is considered only if IDEP > 0.
IEQ	This integer controls input of joint frequency meteorological data. A new set of joint frequency meteorological data is read if IEQ > 0.
IEVAC	This integer controls consideration of evacuation. The evacuation model is included if IEVAC $\leq$ 0.
IEVPRT	This integer causes calculated evacuation parameters to be printed when IEVPRT > 0.

A. Control Integers (contd)

<u>Parameter</u>	<u>Description</u>
IFE	This control integer selects the method for specification of the fractional evacuation data. IFE ≤ 0 ; use previous values IFE = 1; use total evacuation within specified zone IFE ≥ 2 ; read new values
IPOP	This integer causes a new set of population distribution data to be read only if IPOP > 0 .
IRISE	This integer controls selection of the plume rise model. IRISE ≤ 0 ; no plume rise is considered IRISE = 1; use buoyant plume rise model IRISE = 2; use momentum plume rise model
ITER	This control integer selected specification of terrain elevation parameter TER. ITER ≤ 0 ; use previous TERIN ITER = 1; set TER to zero ITER > 1 ; use new values of TERIN
IWAKE	This control integer causes building wake effects to be considered only if IWAKE > 0 .

B. Site Grid Description Parameters

DIST(10)	This array gives the distance from the release point to the midpoint of each spatial interval, meters. Values must be given in increasing order.
NDIST	This parameter gives the number of distance intervals to be considered, $1 \leq \text{NDIST} \leq 10$.
NSECT	This parameter gives the number of sectors to be considered, $1 \leq \text{NSECT} \leq 16$. Default is NSECT = 16.

C. Atmospheric Dispersion Parameters

DZ	This parameter is used with the building wake model. DZ represents the maximum adjacent building height either up- or downwind from the release point, meters. Default is DZ = 0.
----	---

C. Atmospheric Dispersion Parameters (contd)

FPR	This plume rise parameter has two uses: <ol style="list-style-type: none">1. When $IRISE = 1$, FPR represents the thermal energy release rate, (QH) calories/sec.2. When $IRISE = 2$, FPR represents the stack gas exit velocity, (W_0) meters/sec. Default is $FPR = 0$.
HS	This parameter gives the height of the stack above ground level, meters. Default is $HS = 0$.
ISTAB(7)	This integer array selects atmospheric stability categories for each stability class. A value must be given for NMET classes as follows: ISTAB(i) = 1 for Pasquill Type A ISTAB(i) = 2 for Pasquill Type B ISTAB(i) = 3 for Pasquill Type C ISTAB(i) = 4 for Pasquill Type D ISTAB(i) = 5 for Pasquill Type E ISTAB(i) = 6 for Pasquill Type F ISTAB(i) = 7 for Pasquill Type G Default values are $ISTAB(i) = 0$.
NMET	This integer gives the number of atmospheric stability classes to be considered, $1 \leq NMET \leq 7$. Default is $NMET = 0$.
NUBAR	This integer gives the number of windspeed groups to be considered, $1 \leq NUBAR \leq 8$. Default is $NUBAR = 0$.
STACKD	This parameter is used when $IRISE = 2$ to represent the inside stack diameter, meters. Default is $STACKD = 0$.
UBAR(8)	This array gives the average windspeed for each windspeed group, m/sec. Default values are $UBAR(i) = 0$.

D. Evacuation Parameters

ALANES(16)	This array gives the effective number of available routes for evacuation of each sector defined at the outer distance interval radius, NDIST. Default values are $ALANES(i) = 0$.
CLAM	This parameter is the constant of Equation 2.2-3 for evaluation of the evacuation time delay constant. Default is $CLAM = 1.8 \times 10^{-4}$.

D. Evacuation Parameters (contd)

CPHL	This parameter gives the average number of cars per hour per lane for the site. Default is CPHL = 2000.
MAXEV	This integer represents the farthest distance interval to be considered for evacuation. $1 \leq \text{MAXEV} \leq \text{NDIST}$. Default is MAXEV = 0.
PPCAR	This parameter gives the average number of persons per car. Default is PPCAR = 3.
RLANE	This parameter gives the average number of lanes per route for the site. Default is RLANE = 2.
TREL	This parameter gives the duration of the release, hours. Default is TREL = 1.0.
TWARN	This parameter gives the time between the start of the accident and the time the first person has evacuated, hours. Default is TWARN = 0.

When the control integer IEQ is greater than zero, a set of joint frequency meteorological data is read using cards of Type 2. The number of cards in the set is equal to the product of NUBAR and NMET. Each card contains the following information:

Card Type 2; Joint Frequency Data

<u>Parameter</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
F(i,j,16)	1-5 6-10 ⋮ 75-80	16F5.2	Each card contains NSECT values for the array F for windspeed group i and atmospheric stability class j. Values are given as percent. One value is given for each sector.

When the control integer IPOP is greater than zero a population distribution data set is read using cards of Type 3. The number of cards read is equal to the value of NSECT (one card for each sector). Each card contains the following information.

Card Type 3; Population Distribution Data

<u>Parameter</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
P(10,i)	1-8 9-16 : 73-80	10F8.0	This card gives NDIST values of population residing within each spatial interval for NDIST distance intervals in sector i.

The population and joint frequency data arrays must be supplied for corresponding directions (the direction the wind blows toward).

When the control integer IFE is greater than one, a set of fractional evacuation data is read using cards of Type 4. The number of cards read is equal to the number of sectors considered (NSECT). Each card contains the following information:

Card Type 4; Fractional Evacuation Data

<u>Parameter</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
FEIN(10,i)	1-8 9-16 : 73-80	10F8.5	This parameter gives the fraction of the population that will evacuate from each spatial interval. Values are given for NDIST intervals in sector i.

When control integer ITER is greater than one, a set of terrain elevation data is read using cards of Type 5. The number of cards read is equal to the number of sectors considered (NSECT). Each card contains the following information:

Card Type 5; Terrain Elevation Data

<u>Parameter</u>	<u>Columns</u>	<u>Format</u>	<u>Description</u>
TERIN(10,i)	1-8 9-16 : 73-80	10E8.1	This parameter gives the terrain elevation at the midpoint of each spatial interval in sector i. Elevation values are the maximum elevation of any point between the release point and the distance of interest, relative to the base of the stack, meters. Values are given for NDIST distance intervals.

Calculations are performed after input for each case is complete. Input for the next case begins with the case title card (Type 1). An end of input file at this card is the normal mode of run termination. There is no limit to the number of cases that may be included in a run.

APPENDIX D

SAMPLE PROBLEM

APPENDIX D

SAMPLE PROBLEM

This appendix describes a sample problem for testing all options of the computer code PEDIC. The sample problem is composed of eight cases as follows:

- Case 1 ● defines atmospheric dispersion data and population distribution data and calculates the population dispersion factor without evacuation.
- Case 2 ● same as case 1 with evacuation of all people.
- Case 3 ● same as case 2 plus consideration of plume depletion, buoyant plume rise and building wake effects.
- Case 4 ● same as case 2 with fractional evacuation data read and momentum plume rise.
- Case 5 ● same as case 2 with evacuation only out to the second distance interval.
- Case 6 ● same as case 5 with evacuation to the fourth distance interval.
- Case 7 ● same as case 1 with terrain elevation.
- Case 8 ● tests error messages by setting several parameters to invalid values.

A listing of the sample problem input is shown in Figure D.0-1. A discussion of input parameters and data for each case follows.

Case 1. Control integer IEQ is set to one to cause reading of joint frequency data and IPOP is set to one to cause reading of population distribution data. All other options are turned off (IDEP=0, IEVAC=1, IFE=0, IRISE=0 and IWAKE=0). The distance values (DIST) correspond to 1.5, 2.5, 3.5, 4.5, 7.5, 15, 25, 35, and 45 miles expressed in meters. A stack height of 50 meters is selected (HS=50). The six stability categories (NMET=6) are Pasquill A-F (ISTAB). Six windspeed groups (NUBAR=6) are defined with average windspeed of 0.78, 2.5, 4.5, 6.9, 9.5 and 12.5 meters per second (UBAR). The duration of release is set at 2 hours (TREL=2.0). Joint frequency data and population distribution data follow the NAMELIST INPUT card set.

```

PEDIC SAMPLE CASE 1.  BASE CASE WITHOUT EVACUATION
$INPUT IDEP=0,IEQ=1,IEVAC=1,IFE=0,IPOP=1,IRISE=0,IWAKE=0,
DIST(1)=2414.,4022.,5632.,7240.,12070.,24140.,40220.,56320.,72400.,NDIST=9,
HS=50.,ISTAB(1)=1,2,3,4,5,6,NMET=6,NUBAR=6,UBAR(1)=0.73,2.5,4.5,6.9,9.5,12.5,
TREL=2.0 SEND
.00 .00 .00 .01 .00 .00 .00 .00 .00 .01 .01 .00 .00 .01 .00
.07 .05 .00 .01 .02 .00 .01 .03 .01 .02 .05 .02 .03 .07 .03 .05
.26 .23 .22 .19 .37 .38 .27 .27 .40 .35 .25 .23 .42 .38 .49 .38
.29 .25 .18 .16 .30 .26 .35 .43 .25 .22 .27 .37 .57 .38 .49 .43
.39 .17 .24 .22 .18 .19 .19 .23 .23 .23 .33 .23 .38 .39 .35 .43
.61 .80 .54 .52 .42 .17 .22 .24 .21 .31 .24 .15 .29 .50 .60 .73
.05 .05 .05 .03 .03 .09 .12 .05 .03 .05 .03 .14 .07 .08 .10 .17
.38 .16 .14 .06 .15 .22 .35 .39 .23 .25 .15 .22 .18 .19 .32 .57
.57 .30 .43 .32 .35 .51 1.00 .84 .78 .39 .39 .41 .61 .96 1.06 .67
.14 .35 .29 .21 .17 .45 .79 .75 .67 .65 .50 .58 .94 1.38 .94 .40
.32 .23 .18 .07 .13 .46 .87 .72 .78 .37 .40 .37 .45 .93 .87 .38
.43 .36 .27 .10 .11 .25 .55 .58 .26 .22 .16 .13 .22 . . .
.05 .10 .03 .02 .04 .04 .05 .29 .10 .04 .03 .08 .04 .09 .16 .04
.18 .06 .14 .08 .02 .05 .21 .46 .32 .14 .19 .23 .06 .08 .15 .32
.27 .14 .16 .10 .05 .10 .34 1.04 1.08 .48 .25 .33 .51 .67 .55 .59
.02 .01 .00 .02 .05 .25 .84 .75 .55 .29 .47 .59 1.18 1.31 .49 .10
.03 .02 .02 .00 .00 .11 .41 .54 .40 .10 .08 .30 .49 .29 .09 .01
.01 .03 .00 .00 .00 .01 .21 .49 .16 .05 .05 .02 .03 .16 .03 .02
.02 .00 .00 .00 .00 .00 .01 .14 .07 .08 .04 .14 .14 .08 .07 .04
.08 .01 .00 .00 .00 .00 .00 .08 .24 .17 .14 .15 .07 .08 .07 .08
.05 .01 .00 .00 .00 .05 .03 .39 .79 .48 .23 .34 .49 .45 .17 .14
.00 .00 .00 .00 .00 .02 .13 .33 .51 .35 .14 .17 .94 .37 .08 .01
.00 .03 .00 .00 .00 .00 .01 .10 .09 .03 .00 .02 .01 .01 .00 .00
.00 .00 .00 .00 .00 .00 .00 .00 .02 .00 .00 .00 .00 .02 .00 .00
.00 .00 .00 .00 .00 .00 .00 .03 .02 .06 .05 .02 .11 .05 .01 .00
.00 .00 .00 .00 .00 .00 .00 .02 .03 .05 .05 .03 .05 .08 .02 .00
.00 .02 .00 .00 .00 .00 .00 .02 .11 .26 .13 .13 .37 .26 .02 .00
.00 .00 .00 .00 .00 .01 .03 .01 .32 .07 .07 .03 .27 .06 .00 .00
.00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00
.00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .01 .00 .00
.00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .01 .00 .00
.00 .00 .00 .00 .00 .00 .00 .03 .05 .01 .07 .08 .06 .00 .00 .00
.00 .00 .00 .00 .00 .00 .00 .00 .00 .03 .02 .03 .00 .07 .00 .00
.00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00
.00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00 .00
0. 0. 0. 0. 0. 0 182. 507. 5482. 1241.
0. 0. 29. 39. 309. 257. 647. 1346. 787.
8. 19. 30. 35. 158. 387. 1774. 378. 533.
18. 42. 50. 57. 209. 421. 753. 701. 221.
21. 38. 46. 54. 218. 84. 109. 223. 583.
31. 57. 69. 82. 389. 141. 649. 452. 15162.
7. 26. 28. 37. 279. 20780. 659. 890. 1291.
0. 3. 17. 15. 217. 19314. 79. 570. 685.
0. 0. 1577. 5170. 21556. 519. 38. 5413. 950.
0. 0. 9. 151. 1028. 669. 51. 435. 598.
0. 0. 13. 241. 731. 1940. 25. 97. 78.
0. 0. 0. 75. 87. 822. 5319. 7262. 683.
0. 0. 0. 0. 0. 525. 2114. 13374. 13330.
0. 0. 0. 0. 0 0. 330. 327. 1967.
0. 0. 0. 0. 0 0. 0. 258. 715.
0. 0. 0. 0. 0 0. 0. 811. 1014.
PEDIC SAMPLE PROBLEM CASE 2.  BASE CASE WITH EVACUATION OF ALL PEOPLE
$INPUT IEVAC=0,IFE=1,IPOP=0,IEQ=0,ALANES(1)=3,3,3,4,4,4,5,5,5,
5,5,5,5,4,3,2,MAXEV=9,TWARN=0.5,SEND
PEDIC SAMPLE PROBLEM CASE 3.  CASE 2 PLUS DEPLETION, PLUME RISE AND WAKE EFFECTS
$INPUT IDEP=1,IRISE=1,IWAKE=1,OZ=30.,FPR=2000.,HS=0. SEND
PEDIC SAMPLE PROBLEM CASE 4.  BASE CASE WITH FRACTIONAL EVACUATION AND PLUME RIS
$INPUT IDEP=0,IFE=2,IRISE=2,IWAKE=0,FPR=20.,STACKD=2.5,HS=50. SEND
.1 .1 .1 .1 .1 .1 .1 .1 .1 .1
.2 .2 .2 .2 .2 .2 .2 .2 .2 .2
.3 .3 .3 .3 .3 .3 .3 .3 .3 .3
.4 .4 .4 .4 .4 .4 .4 .4 .4 .4
.5 .5 .5 .5 .5 .5 .5 .5 .5 .5
.6 .6 .6 .6 .6 .6 .6 .6 .6 .6
.7 .7 .7 .7 .7 .7 .7 .7 .7 .7
.8 .8 .8 .8 .8 .8 .8 .8 .8 .8
.9 .9 .9 .9 .9 .9 .9 .9 .9 .9
1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0 1.0
.111 .112 .113 .114 .115 .116 .117 .118 .119 .110
.121 .122 .123 .124 .125 .126 .127 .128 .129 .120

```

FIGURE D.0-1. Sample Problem Input Listing


```

.131      .132      .133      .134      .135      .136      .137      .138      .139      .130
.141      .142      .143      .144      .145      .146      .147      .148      .149      .140
.151      .152      .153      .154      .155      .156      .157      .158      .159      .150
.161      .162      .163      .164      .165      .166      .167      .168      .169      .160
PEDIC SAMPLE PROBLEM CASE 5.  BASE CASE WITH TOTAL EVACUATION TO INTERVAL 2
SINPUT IFE=1,IRISE=0,MAXEV=2 SEND
PEDIC SAMPLE PROBLEM CASE 6.  BASE CASE WITH TOTAL EVACUATION TO INTERVAL 4
SINPUT IFE=0,MAXEV=4,IEVPRT=1 SEND
PEDIC SAMPLE PROBLEM CASE 7.  BASE CASE WITH TERRAIN ELEVATION
SINPUT IEVPRT=0,ITER=2,IEVAC=1 SEND
10.      20.      30.      40.      50.      60.      70.      80.      90.
20.      40.      60.      80.      100.     120.     140.     160.     180.
20.      20.      20.      20.      40.      40.      40.      40.      40.
10.      50.      100.     100.     100.     100.     150.     150.     150.
10.      10.      10.      10.      10.      10.      10.      10.      10.
0.      10.      10.      10.      10.      10.      10.      10.      10.
0.      0.      10.      10.      10.      10.      10.      10.      10.
0.      0.      0.      10.      10.      10.      10.      10.      10.
0.      0.      0.      0.      10.      10.      10.      10.      10.
0.      0.      0.      0.      0.      10.      10.      10.      10.
0.      0.      0.      0.      0.      0.      10.      10.      10.
0.      0.      0.      0.      0.      0.      0.      10.      10.
0.      0.      0.      0.      0.      0.      0.      0.      10.
0.      0.      0.      0.      0.      0.      0.      0.      0.
20.      20.      20.      20.      20.      20.      20.      20.      20.
20.      20.      20.      20.      20.      20.      20.      20.      20.
PEDIC SAMPLE PROBLEM CASE 8.  TEST OF ERROR MESSAGES
SINPUT NUBAR=9,NMET=-1,ISTAB(1)=1,0,8,0,5,0,9,NDIST=11,DIST(1)=1.,100.,50.,
0.,500.,0.,10.,12.,-11.,NSECT=0,RLANE=0.,CPHL=-1.,PPCAR=0.,CLAM=-2.,
MAXEV=20,ALANES(1)=1.,2.,3.,5*0.,5*-1.,-14.,-15.,-15.,FPR=0.,STACKD=-1.,
IRISE=2.,TREL=0.,ITER=1 SEND

```

FIGURE D.0-1. (contd)

- Case 2. Evacuation is requested (IEVAC=0) and all people (IFE=1) are to be evacuated (MAXEV=9). Previous population and joint frequency data will be used (IPOP=0 and IEQ=0). The number of routes for each sector are defined (ALANES) and an evacuation warning time of one half hour is selected.
- Case 3. This case is to consider plume depletion during transit (IDEP=1), buoyant plume rise (IRISE=1) and building wake effects, IWAKE=1). Previous evacuation fractions will be used (IFE=0). The building wake parameter DZ is set to 30 meters and the plume rise parameter FPR is set to 2000 calories/second. The stack height is reduced to ground level (HS=0) so that building wake effects will be included.
- Case 4. This case considers momentum plume rise (IRISE=2) with FPR=20 meters/second and STACKD=2.5 meters. Plume depletion and building wake options are turned off (IDEP=0 and IWAKE=0). The fractional evacuation data will be read from cards (IFE=2). The stack height is reset to 50 meters (HS=50).
- Case 5. Total evacuation (IFE=1) is considered within the first two distance intervals (MAXEV=2). The plume rise option is turned off (IRISE=0).
- Case 6. Total evacuation using previous fractional data (IFE=0) is considered within the first four distance intervals (MAXEV=4). IEVPRT is set to one to cause printing of calculated evacuation parameters.
- Case 7. This case is the same as case 1 except terrain elevation is considered (ITER=2).
- Case 8. This case sets several parameters to incorrect values to test error message generation. The input and output listings are self explanatory.

The computer generated output from the sample problem is shown in Figure D.0-2.

SUMMARY OF INPUT DATA

122380

PEDIC SAMPLE CASE 1. BASE CASE WITHOUT EVACUATION

THE SITE CONSIDERS 9 DISTANCE INTERVALS AND 16 SECTORS

THE RELEASE DURATION IS 2.00+000 HOURS

THE RELEASE ELEVATION IS 5.00+001 METERS

THE FOLLOWING OPTIONS HAVE BEEN SELECTED:

NONE

JOINT FREQUENCY DATA

SECTOR NUMBER		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
WINDSPEED STABILITY																	
0.5	.78	1	.00	.00	.00	.01	.00	.00	.00	.00	.00	.01	.01	.00	.00	.01	.00
		2	.07	.05	.00	.01	.02	.00	.01	.03	.01	.02	.05	.02	.03	.07	.03
		3	.26	.23	.22	.19	.37	.38	.27	.27	.40	.35	.25	.23	.42	.38	.49
		4	.29	.25	.18	.16	.30	.26	.35	.43	.25	.22	.27	.37	.57	.38	.49
		5	.39	.17	.24	.22	.18	.19	.19	.23	.23	.23	.33	.23	.38	.39	.35
		6	.61	.80	.54	.52	.42	.17	.22	.24	.21	.31	.24	.15	.29	.50	.60
2.50		1	.05	.05	.05	.03	.03	.09	.12	.05	.03	.05	.03	.14	.07	.08	.10
		2	.38	.16	.14	.06	.15	.22	.35	.39	.23	.25	.15	.22	.18	.19	.32
		3	.57	.30	.43	.32	.35	.61	1.00	.84	.78	.39	.39	.41	.61	.96	1.06
		4	.14	.35	.29	.21	.17	.45	.79	.76	.67	.65	.50	.58	.94	1.38	.94
		5	.32	.23	.18	.07	.18	.46	.87	.72	.78	.37	.40	.37	.45	.93	.87
		6	.43	.36	.27	.10	.11	.25	.55	.58	.26	.22	.16	.13	.22	.00	.00
4.50		1	.05	.10	.03	.02	.04	.04	.06	.29	.10	.04	.03	.08	.04	.09	.16
		2	.18	.06	.14	.08	.02	.05	.21	.46	.32	.14	.19	.23	.06	.08	.15
		3	.27	.14	.15	.10	.05	.10	.34	1.04	.48	.25	.33	.61	.67	.55	.59
		4	.02	.01	.00	.02	.05	.25	.84	.75	.55	.29	.47	.59	1.18	1.31	.49
		5	.03	.02	.02	.00	.00	.11	.41	.54	.40	.10	.08	.30	.49	.29	.09
		6	.01	.03	.00	.00	.00	.01	.21	.49	.16	.05	.05	.02	.03	.16	.03
6.90		1	.02	.00	.00	.00	.00	.00	.01	.14	.07	.08	.04	.14	.14	.08	.07
		2	.08	.01	.00	.00	.00	.00	.00	.08	.24	.17	.14	.16	.07	.08	.07
		3	.05	.01	.00	.00	.00	.05	.03	.39	.79	.48	.23	.34	.49	.45	.17
		4	.00	.00	.00	.00	.00	.02	.13	.33	.51	.35	.14	.17	.94	.37	.08
		5	.00	.03	.00	.00	.00	.00	.01	.10	.09	.03	.00	.02	.01	.01	.00
		6	.00	.00	.00	.00	.00	.00	.00	.00	.02	.00	.00	.00	.00	.02	.00

FIGURE D.0-2. Sample Problem Output Listing

9.50	1	.00	.00	.00	.00	.00	.00	.00	.03	.02	.06	.05	.02	.11	.05	.01	.00
	2	.00	.00	.00	.00	.00	.00	.00	.02	.03	.06	.05	.03	.06	.08	.02	.00
	3	.00	.02	.00	.00	.00	.00	.00	.02	.11	.26	.13	.13	.37	.26	.02	.00
	4	.00	.00	.00	.00	.00	.01	.03	.01	.32	.07	.07	.03	.27	.06	.00	.00
	5	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
	6	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.00	.00
12.50	1	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.04	.02	.04	.06	.01	.00
	2	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.01	.01	.01	.05	.00	.00
	3	.00	.00	.00	.00	.00	.00	.00	.00	.03	.05	.01	.07	.08	.06	.00	.00
	4	.00	.00	.00	.00	.00	.00	.00	.00	.03	.02	.03	.00	.07	.00	.00	.00
	5	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00
	6	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00	.00

POPULATION DISTRIBUTION DATA

DISTANCE	2414.	4022.	5632.	7240.	12070.	24140.	40220.	56320.	72400.
SECTOR									
1	.00	.00	.00	.00	.00	1.82+002	5.07+002	5.48+003	1.24+003
2	.00	.00	2.90+001	3.90+001	3.09+002	2.57+002	6.47+002	1.35+003	7.87+002
3	8.00+000	1.90+001	3.00+001	3.50+001	1.58+002	3.87+002	1.77+003	3.78+002	6.33+002
4	1.80+001	4.20+001	5.00+001	5.70+001	2.09+002	4.21+002	7.53+002	7.01+002	2.21+002
5	2.10+001	3.80+001	4.60+001	5.40+001	2.18+002	8.40+001	1.09+002	2.23+002	5.83+002
6	3.10+001	5.70+001	6.90+001	8.20+001	3.89+002	1.41+002	6.49+002	4.62+002	1.52+004
7	7.00+000	2.60+001	2.80+001	3.70+001	2.79+002	2.08+004	6.59+002	8.90+002	1.29+003
8	.00	3.00+000	1.70+001	1.50+001	2.17+002	1.93+004	7.90+001	5.70+002	6.85+002
9	.00	.00	1.58+003	5.17+003	2.16+004	6.19+002	3.80+001	5.41+003	9.50+002
10	.00	.00	9.00+000	1.51+002	1.03+003	6.69+002	5.10+001	4.35+002	5.98+002
11	.00	.00	1.30+001	2.41+002	7.31+002	1.94+003	2.50+001	9.70+001	7.80+001
12	.00	.00	.00	7.50+001	8.70+001	8.22+002	5.32+003	7.26+003	6.83+002
13	.00	.00	.00	.00	.00	5.25+002	2.11+003	1.34+004	1.33+004
14	.00	.00	.00	.00	.00	.00	3.30+002	9.27+002	1.97+003
15	.00	.00	.00	.00	.00	.00	.00	2.58+002	7.15+002
16	.00	.00	.00	.00	.00	.00	.00	8.11+002	1.01+003

*** INPUT PREPARED BY: _____ DATE _____

*** INPUT CHECKED BY: _____ DATE _____

THE POPULATION DISPERSION FACTOR FOR THIS CASE = 2.44-003

FIGURE D.0-2. (contd)

SUMMARY OF INPUT DATA

122380

PEDIC SAMPLE PROBLEM CASE 2. BASE CASE WITH EVACUATION OF ALL PEOPLE

THE SITE CONSIDERS 9 DISTANCE INTERVALS AND 16 SECTORS

THE RELEASE DURATION IS 2.00+000 HOURS

THE RELEASE ELEVATION IS 5.00+001 METERS

THE FOLLOWING OPTIONS HAVE BEEN SELECTED:

EVACUATION

EVACUATION MODEL PARAMETER SUMMARY:

- 9 (MAYEV) DISTANCE INTERVALS ARE EVACUATED.
2. (RLANE) LANES PER ROUTE.
2000. (CPHL) CARS PER HOURS PER LANE.
3. (PPCAR) PERSONS PER CAR.
- 1.80+004 (CLAM) - COEFFICIENT FOR TIME INTEGRAL CONSTANT.
- .50 (TWARN) HOURS EVACUATION TIME WARNING.

ALANES	3.00	3.00	3.00	4.00	4.00	4.00	5.00	5.00
	5.00	6.00	6.00	6.00	5.00	4.00	3.00	2.00

FRACTIONAL EVACUATION DATA

DISTANCE	2414.	4022.	5632.	7240.	12070.	24140.	40220.	56320.	72400.
SECTOR									
1	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
2	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
3	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
4	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
5	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
6	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
7	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
8	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
9	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
10	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
11	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
12	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
13	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
14	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000

FIGURE D.0-2. (contd)

SUMMARY OF INPUT DATA

122380

PEDIC SAMPLE PROBLEM CASE 3. CASE 2 PLUS DEPLETION, PLUME RISE AND WAKE EFFECTS

THE SITE CONSIDERS 9 DISTANCE INTERVALS AND 16 SECTORS

THE RELEASE DURATION IS 2.00+000 HOURS

THE RELEASE ELEVATION IS .00 METERS

THE FOLLOWING OPTIONS HAVE BEEN SELECTED:

EVACUATION

BUILDING WAKE

BOUYANT PLUME RISE

PLUME DEPLETION

BUILDING WAKE PARAMETER DZ = 30.0 METERS

BOUYANT PLUME RISE PARAMETER FPR = 2.00+003 CAL/SEC

EVACUATION MODEL PARAMETER SUMMARY:

9 (**XEV) DISTANCE INTERVALS ARE EVACUATED.

2. (RLANE) LANES PER ROUTE.

2000. (CPHL) CARS PER HOURS PER LANE.

3. (PPCAR) PERSONS PER CAR.

1.80-004 (CLAM) - COEFFICIENT FOR TIME INTEGRAL CONSTANT.

.50 (TWAR) HOURS EVACUATION TIME WARNING.

ALANES	3.00	3.00	3.00	4.00	4.00	4.00	5.00	5.00
	5.00	6.00	6.00	6.00	5.00	4.00	3.00	2.00

FRACTIONAL EVACUATION DATA

DISTANCE	2414.	4022.	5632.	7240.	12070.	24140.	40220.	56320.	72400.
SECTOR									
1	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
2	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
3	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
4	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
5	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
6	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
7	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
8	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
9	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000

FIGURE D.0-2. (contd)

10	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
11	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
12	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
13	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
14	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
15	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
16	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000

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*** INPUT PREPARED BY:          DATE
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*** INPUT CHECKED BY:          DATE
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THE POPULATION DISPERSION FACTOR FOR THIS CASE = 1.71-003

FIGURE D.0-2. (contd)

SUMMARY OF INPUT DATA

122380

PEDIC SAMPLE PROBLEM CASE 4. BASE CASE WITH FRACTIONAL EVACUATION AND PLUME RIS

THE SITE CONSIDERS 9 DISTANCE INTERVALS AND 16 SECTORS

THE RELEASE DURATION IS 2.00+000 HOURS

THE RELEASE ELEVATION IS 5.00+001 METERS

THE FOLLOWING OPTIONS HAVE BEEN SELECTED:

EVACUATION
MOMENTUM PLUME RISE
MOMENTUM PLUME RISE PARAMETERS:
FPR = 20.00 METERS/SEC
STACKD = 2.50 METERS
EVACUATION MODEL PARAMETER SUMMARY:

9 (MAXEV) DISTANCE INTERVALS ARE EVACUATED.
2. (RLANE) LANES PER ROUTE.
2000. (CPHL) CARS PER HOURS PER LANE.
3. (PPCAR) PERSONS PER CAR.
1.80-004 (CLAM) - COEFFICIENT FOR TIME INTEGRAL CONSTANT.
.50 (TWARN) HOURS EVACUATION TIME WARNING.
ALANES 3.00 3.00 3.00 4.00 4.00 4.00 5.00 5.00
5.00 6.00 6.00 6.00 5.00 4.00 3.00 2.00

FRACTIONAL EVACUATION DATA

DISTANCE	2414.	4022.	5632.	7240.	12070.	24140.	40220.	56320.	72400.
SECTOR									
1	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001
2	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001
3	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001
4	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001
5	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001
6	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001
7	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001
8	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001
9	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001
10	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000

FIGURE D.0-2. (contd)

SUMMARY OF INPUT DATA

122380

PEDIC SAMPLE PROBLEM CASE 5. BASE CASE WITH TOTAL EVACUATION TO INTERVAL 2

THE SITE CONSIDERS 9 DISTANCE INTERVALS AND 16 SECTORS

THE RELEASE DURATION IS 2.00+000 HOURS

THE RELEASE ELEVATION IS 5.00+001 METERS

THE FOLLOWING OPTIONS HAVE BEEN SELECTED:

EVACUATION

EVACUATION MODEL PARAMETER SUMMARY:

2 (MAXEV) DISTANCE INTERVALS ARE EVACUATED.

2. (RLANE) LANES PER ROUTE.

2000. (CPHL) CARS PER HOURS PER LANE.

3. (PPCAR) PERSONS PER CAR.

1.80-004 (CLAM) - COEFFICIENT FOR TIME INTEGRAL CONSTANT.

.50 (TWARN) HOURS EVACUATION TIME WARNING.

ALANES	3.00	3.00	3.00	4.00	4.00	4.00	5.00	5.00
	5.00	6.00	6.00	6.00	5.00	4.00	3.00	2.00

FRACTIONAL EVACUATION DATA

DISTANCE	2414.	4022.	5632.	7240.	12070.	24140.	40220.	56320.	72400.
SECTOR									
1	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
2	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
3	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
4	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
5	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
6	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
7	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
8	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
9	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
10	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
11	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
12	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
13	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
14	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000

FIGURE D.0-2. (contd)

15	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
16	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
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*** INPUT PREPARED BY: _____ DATE _____

*** INPUT CHECKED BY: _____ DATE _____

THE POPULATION DISPERSION FACTOR FOR THIS CASE = 2.44-003

FIGURE D.0-2. (contd)

SUMMARY OF INPUT DATA

122380

PEDIC SAMPLE PROBLEM CASE 6, BASE CASE WITH TOTAL EVACUATION TO INTERVAL 4

THE SITE CONSIDERS 9 DISTANCE INTERVALS AND 16 SECTORS

THE RELEASE DURATION IS 2.00+000 HOURS

THE RELEASE ELEVATION IS 5.00+001 METERS

THE FOLLOWING OPTIONS HAVE BEEN SELECTED:

EVACUATION
EVACUATION MODEL PARAMETER SUMMARY:

- 4 (MAXEV) DISTANCE INTERVALS ARE EVACUATED.
- 2. (RLANE) LANES PER ROUTE.
- 2000. (CPHL) CARS PER HOURS PER LANE.
- 3. (PPCAR) PERSONS PER CAR.
- 1.80-004 (CLAM) - COEFFICIENT FOR TIME INTEGRAL CONSTANT.
- .50 (TWAR) HOURS EVACUATION TIME WARNING.

EVACUATION DATA

DISTANCE	SECTOR	NUMBER OF LANES (ALANE)	POPULATION TO EVACUATE (PN)	LIMITING RATE HR-1 (ALPHA)	TIME CONSTANT HR-1 (ALAM)	END TIME HOURS (TE)
1	1	.00	.00	.00	.00	.000
2	1	.00	.00	.00	.00	.000
3	1	.00	.00	.00	.00	.000
4	1	.00	.00	.00	.00	.000
1	2	.00	.00	.00	.00	.000
2	2	.00	.00	.00	.00	.000
3	2	.27	5.80	5.52+002	2.51-004	.430+001
4	2	.40	13.50	3.53+002	2.56-004	.520+001
1	3	.13	2.40	6.67+002	3.29-004	.352+001
2	3	.20	8.10	2.96+002	4.10-004	.456+001
3	3	.27	17.10	1.87+002	4.49-004	.538+001
4	3	.40	27.60	1.74+002	3.76-004	.503+001
1	4	.18	7.20	2.96+002	5.96-004	.387+001
2	4	.27	24.00	1.33+002	7.36-004	.501+001
3	4	.36	44.00	9.70+001	7.49-004	.575+001
4	4	.53	66.80	9.58+001	6.05-004	.637+001
1	5	.18	10.50	2.03+002	7.30-004	.417+001
2	5	.27	29.50	1.08+002	8.23-004	.523+001

FIGURE D.0-2. (contd)

3	5	.36	52.50	8.13+001	8.24-004	.597+001
4	5	.53	79.50	8.05+001	6.65-004	.661+001
1	6	.18	18.60	1.15+002	9.94-004	.469+001
2	6	.27	52.80	6.06+001	1.13-003	.591+001
3	6	.35	94.20	4.53+001	1.13-003	.675+001
4	6	.53	143.40	4.46+001	9.15-004	.750+001
1	7	.22	4.90	5.44+002	4.84-004	.326+001
2	7	.33	23.10	1.73+002	7.21-004	.450+001
3	7	.44	42.70	1.25+002	7.37-004	.516+001
4	7	.67	68.60	1.17+002	6.14-004	.578+001
1	8	.00	.00	.00	.00	.000
2	8	.33	2.40	1.67+003	2.12-004	.288+001
3	8	.44	16.00	3.33+002	4.34-004	.422+001
4	8	.67	28.60	2.86+002	3.79-004	.480+001
1	9	.00	.00	.00	.00	.000
2	9	.00	.00	.00	.00	.000
3	9	.44	1419.30	3.76+000	4.89-003	.109+002
4	9	.67	6072.30	1.32+000	6.91-003	.153+002
1	10	.00	.00	.00	.00	.000
2	10	.00	.00	.00	.00	.000
3	10	.53	9.00	7.11+002	3.18-004	.347+001
4	10	.80	160.00	6.00+001	9.70-004	.636+001
1	11	.00	.00	.00	.00	.000
2	11	.00	.00	.00	.00	.000
3	11	.53	1.47	4.36+003	1.19-004	.246+001
4	11	.80	28.94	3.32+002	3.85-004	.446+001
1	12	.00	.00	.00	.00	.000
2	12	.00	.00	.00	.00	.000
3	12	.00	.00	.00	.00	.000
4	12	.80	9.30	1.03+003	2.09-004	.355+001
1	13	.00	.00	.00	.00	.000
2	13	.00	.00	.00	.00	.000
3	13	.00	.00	.00	.00	.000
4	13	.00	.00	.00	.00	.000
1	14	.00	.00	.00	.00	.000
2	14	.00	.00	.00	.00	.000
3	14	.00	.00	.00	.00	.000
4	14	.00	.00	.00	.00	.000
1	15	.00	.00	.00	.00	.000
2	15	.00	.00	.00	.00	.000
3	15	.00	.00	.00	.00	.000
4	15	.00	.00	.00	.00	.000
1	16	.00	.00	.00	.00	.000
2	16	.00	.00	.00	.00	.000
3	16	.00	.00	.00	.00	.000
4	16	.00	.00	.00	.00	.000

FRACTIONAL EVACUATION DATA

DISTANCE	2414.	4022.	5632.	7240.	12070.	24140.	40220.	56320.	72400.
SECTOR									
1	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001
2	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001

FIGURE D.0-2. (contd)

3	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001
4	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001
5	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001
6	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001
7	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001
8	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001
9	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001
10	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000
11	1.11-001	1.12-001	1.13-001	1.14-001	1.15-001	1.16-001	1.17-001	1.18-001	1.19-001
12	1.21-001	1.22-001	1.23-001	1.24-001	1.25-001	1.26-001	1.27-001	1.28-001	1.29-001
13	1.31-001	1.32-001	1.33-001	1.34-001	1.35-001	1.36-001	1.37-001	1.38-001	1.39-001
14	1.41-001	1.42-001	1.43-001	1.44-001	1.45-001	1.46-001	1.47-001	1.48-001	1.49-001
15	1.51-001	1.52-001	1.53-001	1.54-001	1.55-001	1.56-001	1.57-001	1.58-001	1.59-001
16	1.61-001	1.62-001	1.63-001	1.64-001	1.65-001	1.66-001	1.67-001	1.68-001	1.69-001

*** INPUT PREPARED BY: DATE

*** INPUT CHECKED BY: DATE

THE POPULATION DISPERSION FACTOR FOR THIS CASE = 2.42-003

FIGURE D.0-2. (contd)

SUMMARY OF INPUT DATA

122380

PEDIC SAMPLE PROBLEM CASE 7. BASE CASE WITH TERRAIN ELEVATION

THE SITE CONSIDERS 9 DISTANCE INTERVALS AND 16 SECTORS

THE RELEASE DURATION IS 2.00+000 HOURS

THE RELEASE ELEVATION IS 5.00+001 METERS

THE FOLLOWING OPTIONS HAVE BEEN SELECTED:

TERRAIN ELEVATION

TERRAIN ELEVATION DATA

D.18

DISTANCE	2414.	4022.	5632.	7240.	12070.	24140.	40220.	56320.	72400.
SECTOR									
1	1.00+001	2.00+001	3.00+001	4.00+001	5.00+001	6.00+001	7.00+001	8.00+001	9.00+001
2	2.00+001	4.00+001	6.00+001	8.00+001	1.00+002	1.20+002	1.40+002	1.60+002	1.80+002
3	2.00+001	2.00+001	2.00+001	2.00+001	4.00+001	4.00+001	4.00+001	4.00+001	4.00+001
4	1.00+001	5.00+001	1.00+002	1.00+002	1.00+002	1.00+002	1.50+002	1.50+002	1.50+002
5	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001
6	.00	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001
7	.00	.00	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001
8	.00	.00	.00	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001
9	.00	.00	.00	.00	1.00+001	1.00+001	1.00+001	1.00+001	1.00+001
10	.00	.00	.00	.00	.00	1.00+001	1.00+001	1.00+001	1.00+001
11	.00	.00	.00	.00	.00	.00	1.00+001	1.00+001	1.00+001
12	.00	.00	.00	.00	.00	.00	.00	1.00+001	1.00+001
13	.00	.00	.00	.00	.00	.00	.00	.00	1.00+001
14	.00	.00	.00	.00	.00	.00	.00	.00	.00
15	2.00+001	2.00+001	2.00+001	2.00+001	2.00+001	2.00+001	2.00+001	2.00+001	2.00+001
16	2.00+001	2.00+001	2.00+001	2.00+001	2.00+001	2.00+001	2.00+001	2.00+001	2.00+001

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THE POPULATION DISPERSION FACTOR FOR THIS CASE = 2.59-003

FIGURE D.0-2. (contd)

MESSAGE 1			
BAD VALUE FOR NUBAR	,	=	9
MESSAGE 2			
BAD VALUE FOR NMET	,	=	-1
MET	HAS BEEN SET TO		7
MESSAGE 3			
BAD VALUE FOR STABILITY INDEX -I-	,	=	0
(INDEX VALUE) = 2			
MESSAGE 3			
BAD VALUE FOR STABILITY INDEX -I-	,	=	8
(INDEX VALUE) = 3			
MESSAGE 3			
BAD VALUE FOR STABILITY INDEX -I-	,	=	0
(INDEX VALUE) = 4			
MESSAGE 3			
BAD VALUE FOR STABILITY INDEX -I-	,	=	0
(INDEX VALUE) = 6			
MESSAGE 3			
BAD VALUE FOR STABILITY INDEX -I-	,	=	9
(INDEX VALUE) = 7			
MESSAGE 4			
BAD VALUE FOR NDIST	,	=	11
DIST	HAS BEEN SET TO		10
MESSAGE 5			
BAD VALUE FOR DISTANCE -I-	,	=	.00
(INDEX VALUE) = 4			
MESSAGE 5			
BAD VALUE FOR DISTANCE -I-	,	=	.00
(INDEX VALUE) = 6			
MESSAGE 5			
BAD VALUE FOR DISTANCE -I-	,	=	-1.10+001
(INDEX VALUE) = 9			
MESSAGE 5			
BAD VALUE FOR DISTANCE -I-	,	=	.00
(INDEX VALUE) = 10			
MESSAGE 6			
DISTANCE(I) IS OUT OF ORDER			
DIST(I) = 5.00+001			
DIST(I-1) = 1.00+002			
(INDEX VALUE) = 3			
MESSAGE 6			
DISTANCE(I) IS OUT OF ORDER			
DIST(I) = .00			
DIST(I-1) = 5.00+001			
(INDEX VALUE) = 4			
MESSAGE 6			
DISTANCE(I) IS OUT OF ORDER			
DIST(I) = .00			
DIST(I-1) = 5.00+002			
(INDEX VALUE) = 6			
MESSAGE 6			
DISTANCE(I) IS OUT OF ORDER			
DIST(I) = -1.10+001			
DIST(I-1) = 1.20+001			
(INDEX VALUE) = 9			
MESSAGE 7			
BAD VALUE FOR NSECT	,	=	0
NSECT	HAS BEEN SET TO		16
MESSAGE 8			

FIGURE D.0-2. (contd)

BAD VALUE FOR RLANE		, =	.00
MESSAGE 9			
BAD VALUE FOR CPHL		, =	-1.00+000
MESSAGE 10			
BAD VALUE FOR PPCAR		, =	.00
MESSAGE 11			
BAD VALUE FOR CLAM		, =	-2.00+000
MESSAGE 12			
BAD VALUE FOR MAXEV		, =	20
MAXEV	HAS BEEN SET TO	10	
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	.00
(INDEX VALUE) = 4			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	.00
(INDEX VALUE) = 5			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	.00
(INDEX VALUE) = 6			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	.00
(INDEX VALUE) = 7			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	.00
(INDEX VALUE) = 8			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	-1.00+000
(INDEX VALUE) = 9			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	-1.00+000
(INDEX VALUE) = 10			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	-1.00+000
(INDEX VALUE) = 11			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	-1.00+000
(INDEX VALUE) = 12			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	-1.00+000
(INDEX VALUE) = 13			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	-1.40+001
(INDEX VALUE) = 14			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	-1.50+001
(INDEX VALUE) = 15			
MESSAGE 13			
BAD VALUE FOR ALANES(1)		, =	-1.60+001
(INDEX VALUE) = 16			
MESSAGE 15			
BAD VALUE FOR MOMENTUM RISE PARAMETER FPR		, =	.00
MESSAGE 16			
BAD VALUE FOR MOMENTUM RISE PARAMETER STACKD		, =	-1.00+000
MESSAGE 17			
BAD VALUE FOR TREL		, =	.00

FIGURE D.0-2. (contd)

SUMMARY OF INPUT DATA

122380

PEDIC SAMPLE PROBLEM CASE 8. TEST OF ERROR MESSAGES

THE SITE CONSIDERS 10 DISTANCE INTERVALS AND 16 SECTORS

THE RELEASE DURATION IS .00 HOURS

THE RELEASE ELEVATION IS 5.00+001 METERS

THE FOLLOWING OPTIONS HAVE BEEN SELECTED:

EVACUATION
MOMENTUM PLUME RISE
MOMENTUM PLUME RISE PARAMETERS:
FPR = .00 METERS/SEC
STACKD = -1.00 METERS
EVACUATION MODEL PARAMETER SUMMARY:

10 (MAXEV) DISTANCE INTERVALS ARE EVACUATED.
0. (RLANE) LANES PER ROUTE.
-1. (CPHL) CARS PER HOURS PER LANE.
0. (PPCAR) PERSONS PER CAR.
-2.00+000 (CLAM) - COEFFICIENT FOR TIME INTEGRAL CONSTANT.
.50 (TWAR) HOURS EVACUATION TIME WARNING.
ALANES 1.00 2.00 3.00 .00 .00 .00 .00 .00
-1.00 -1.00 -1.00 -1.00 -1.00 -14.00 -15.00 -16.00

FRACTIONAL EVACUATION DATA

DISTANCE	1.	100.	50.	0.	500.	0.	10.	12.	-11.	0.
SECTOR										
1	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	1.00-001	.00
2	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	2.00-001	.00
3	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	3.00-001	.00
4	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	4.00-001	.00
5	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	5.00-001	.00
6	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	6.00-001	.00
7	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	7.00-001	.00
8	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	8.00-001	.00
9	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	9.00-001	.00
10	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	1.00+000	.00

FIGURE D.0-2. (contd)

11	1.11-001	1.12-001	1.13-001	1.14-001	1.15-001	1.16-001	1.17-001	1.18-001	1.19-001	.00
12	1.21-001	1.22-001	1.23-001	1.24-001	1.25-001	1.26-001	1.27-001	1.28-001	1.29-001	.00
13	1.31-001	1.32-001	1.33-001	1.34-001	1.35-001	1.36-001	1.37-001	1.38-001	1.39-001	.00
14	1.41-001	1.42-001	1.43-001	1.44-001	1.45-001	1.46-001	1.47-001	1.48-001	1.49-001	.00
15	1.51-001	1.52-001	1.53-001	1.54-001	1.55-001	1.56-001	1.57-001	1.58-001	1.59-001	.00
16	1.61-001	1.62-001	1.63-001	1.64-001	1.65-001	1.66-001	1.67-001	1.68-001	1.69-001	.00

38 INPUT ERRORS -- STOP

FIGURE D.0-2. (contd)

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