User's Guide for ENVSTD24 Program Version 2.4

**R. L. Hanlon
L. M. Connell**

May 1993

**Prepared for the U.S. Department of Energy
under Contract DE-AC06-76RLO 1830**

**Pacific Northwest Laboratory
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Pacific Northwest Laboratory
Richland, Washington 99352

SUMMARY

On January 30, 1989, the U.S. Department of Energy (DOE) promulgated an interim rule entitled "Energy Conservation Voluntary Performance Standards for New Commercial and Multi-Family High Rise Residential Buildings; Mandatory for New Federal Buildings" (10 CFR Part 435, Subpart A). These standards require federal agencies to design all future federal commercial and multifamily high-rise residential buildings in accordance with the standards, or demonstrate that their current requirements already meet or exceed the energy-efficiency requirements of the standards.

Although these newly enacted standards do not regulate the design of nonfederal buildings, the DOE recommends that all design professionals use the standards as guidelines for designing energy-conserving buildings. To encourage private sector use, the DOE published the standards in the January 30, 1989, *Federal Register* in the format typical of commercial standards. The Pacific Northwest Laboratory developed several computer programs for the DOE to make it easier for designers to comply with the standards.

One of the programs, ENVSTD24 (Version 2.4), is detailed in this user's guide and is provided on the accompanying diskettes. The program will facilitate the designer's use of the standards dealing specifically with building envelope design. Using this program will greatly simplify the designer's task of performing the calculations needed to determine if a design complies with the standards.

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1.0 INTRODUCTION

In accordance with Title III of the Energy Conservation and Production Act of 1976, the U.S. Department of Energy (DOE) is developing energy conservation performance standards for new buildings. The law provides that the standards will be voluntary for new nonfederal buildings but mandatory for new federal buildings.

On January 30, 1989, the DOE promulgated interim energy conservation performance standards (10 CFR Part 435, Subpart A) for new commercial and multifamily high-rise residential buildings. Within 180 days of the promulgation date, federal agencies were required to design all future federal commercial and multifamily high-rise residential buildings in accordance with the interim standards, or demonstrate that their current standards satisfy the energy-efficiency requirements of the interim standards. The interim standards do not regulate the design of nonfederal buildings, although the DOE encourages designers to use the standards as guidelines to design energy-conserving buildings.

The interim standards represent a significant federal effort to assist the private sector in developing energy conservation standards. Congress has directed federal agencies to regulate their design practices to set an example that may be transferred to the private sector through adoption of similar standards.

To facilitate transfer to private design practices, the January 1989 interim standards are presented in the format of commercial standards rather than that typical of federal regulations. For the same reason, the interim standards also contain extensive explanatory material not normally included in federal standards.

The Pacific Northwest Laboratory (PNL)^(a) developed a computer program for the DOE that makes it easier to use the standards. The program, ENVSTD24 (Version 2.4), is designed to help building designers and other users of the

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interim standards determine the building envelope requirements and calculate whether the building design complies with these requirements.

This user's guide explains the scope and operation of the computer program. Section 2.0 contains generic instructions for installing the program on a computer and conventions used in this guide. The data required for the program and the operation of special function and cursor control keys are described in Section 3.0.

Two diskettes (3-1/2 in. and 5-1/4 in.) containing the program and related example data files are included at the back of this user's guide. The files contained on the diskettes are listed in Appendix A. If the diskettes included in this guide do not contain the files listed, contact

Building Energy Standards Program Office
Pacific Northwest Laboratory
P.O. Box 999, MSIN K5-02
Richland, WA 99352
Facsimile (509) 375-3614

Other appendixes in this guide provide useful support information. Appendix B is a list of cities and climate data for the ENVSTD24 program. Hard-copy examples of data files created using the program are provided in Appendix C. Appendix D includes a user comment form. Use this form to provide comments or to report program problems.

2.0 GETTING STARTED

The ENVSTD24 program (Version 2.4) is provided on the diskettes at the back of this user's guide.

2.1 REQUIRED EQUIPMENT

The following equipment is needed to run the ENVSTD24 program:

- an MS-DOS compatible computer that has
 - at least 384K RAM
 - two floppy disk drives or a floppy disk drive and a hard disk drive.
- a monochrome or color monitor^(a)
- MS-DOS Version 2.0 or later.

A math coprocessor, often called an 8087, 80287, or 80387 chip, is optional but significantly increases the speed with which the program performs the calculations.

2.2 INSTALLING THE PROGRAM

Before installing or using the program, make a copy of the diskette containing the program software. Refer to the DOS reference manual for instructions on formatting and copying diskettes.

The configuration of the computer you are using will determine which installation instructions to follow. Section 2.2.1 gives instructions for running the program from a floppy disk drive. Section 2.2.2 gives instructions for installing and running the program from a hard disk drive.

(a) The program uses color to make it easier to distinguish data from other parts of the program. You do not need a color monitor, however. The colors will appear as shades of grey on monochrome monitors.

Both sets of instructions were written assuming that the computer has been started with the DOS operating system^(a) and has a DOS prompt on the screen.

2.2.1 Running the Program from a Floppy Disk Drive

To run the program on a computer with two floppy disk drives, insert the copy of the program diskette into Drive A:. Make drive A: the current drive by typing **A:**. To start the program from Drive A:, type the name of the program, **ENVSTD24**, and press **Enter**. After the title and disclaimer screens appear, press any key to continue. The first input screen will then appear.

2.2.2 Running the Program from a Hard Disk Drive

If your computer has a hard disk drive, copy the program onto the hard disk. Using the hard disk reduces the time required to load and save data files. The first step in copying the ENVSTD24 program files to the hard disk is to create a directory for those files. Directories allow you to organize files into related groups. Put all of the files from the program diskette into the same directory. The following instructions assume that the directory name is STANDARD, but any name allowed by DOS can be used for the directory.

- Make sure that the **C:>** prompt is on the screen. Type **C:** and press **Enter**.
- Type **md C:\STANDARD** (make directory) and press **Enter**. This DOS command creates a directory on the hard disk called STANDARD under the main root directory (C:). The DOS manual contains more information about creating and using directories.
- Type **cd C:\STANDARD** (change directory) and press **Enter**. This DOS command makes STANDARD the current default directory.

Now copy the files from the program diskette to the hard disk.

- Insert the program diskette into drive A:.

(a) For computers without a hard disk drive, insert the DOS diskette into drive A: and turn on the computer.

For computers with DOS installed on the hard disk drive, turn on the computer. The screen will show a **C:>** prompt. The instructions given for computers with a hard disk drive assume that DOS is already on the hard disk and the hard disk is designated as drive C:.

- Type **copy A:*. * C:\STANDARD*. *** and press **Enter**. This DOS command copies every file from the diskette in drive A: to the current STANDARD directory on the hard disk, drive C:.

To run the program, change the current default directory to the directory created for the program (**cd C:\STANDARD**). To start the program, type the name of the program, **ENVSTD24**, and press **Enter**. After the title and disclaimer screens appear, press any key to continue. The first input screen will appear.

2.3 USING THE GUIDE

Throughout the remainder of this user's guide, the following conventions are used:

- Function keys are written in a **bold** typeface (e.g., the **F1** function key).
- Cursor control keys are written in a **bold** typeface. The following cursor control keys are used in the program:

←	left arrow cursor key
→	right arrow cursor key
↑	up arrow cursor key
↓	down arrow cursor key
Home	home key
PgUp	page up key
PgDn	page down key
Esc	escape key
Del	delete key
Ins	insert key
Enter	enter or return key
Backspace	backspace key

Specific instructions for using the function and cursor control keys are provided in Section 3.0.

3.0 USING THE ENVSTD22 PROGRAM

In this section, instructions are provided for using the ENVSTD22 program. The ENVSTD22 program (from ENVelope STanDards) was designed to help the user assess whether a particular building design meets the envelope system performance requirements in Section 5.3.9 and Section 5.5 of the standards (10 CFR Part 435, Subpart A). The calculations performed by the ENVSTD22 program *duplicate the requirements and compliance calculations contained in Section 5.3.9 and Section 5.5 of the standards* with the exception of Sections 5.5.6.5-8, which the user should read.

To evaluate compliance of a proposed design with the envelope requirements of the standards, you must enter data on the proposed wall, roof, and foundation configurations. This data is entered on two input screens, the Exterior Wall screen and the Other Requirements screen. Figure 3.1 illustrates the layout of these screens and the keys required to traverse

FIGURE 3.1. ENVSTD22 Screen Layout

them. Instructions for interacting with each input screen are provided in detail in Sections 3.1 and 3.2.

The data files created by this program are ASCII files which can be sent directly to most printers or imported to most word processors. The data files all have an .ENV extension.

For additional assistance in using ENVSTD24, the program diskettes contain example data files to demonstrate how the program works. Hard copies of these files are included in Appendix C. The files were created by first applying the standards to three buildings and then using the data from those buildings as input to the ENVSTD24 program. To review any of the data files from within the program, press F1 (load). A list of ENVSTD24 data files in the current directory will appear. You will be prompted for a filename. Type the name of the file (**MEDOF24**, **BANK24**, or **APART24**) and press Enter. The program will load the information contained in the file and will perform a calculation based on that information.

3.1 EXTERIOR WALL SCREEN

In this section, the input values, calculated values, cursor control keys, and special function keys for the Exterior Wall screen are described. The Exterior Wall screen is shown in Figure 3.2 without data.

3.1.1 Exterior Wall Screen Input Values

Information is entered by the user in two areas. The top area of the screen is for general information about the building. The large middle section of the screen is for information relating to each compass orientation of the wall. Eight wall orientations are provided.

The program automatically checks the input data to ensure that it is within the ranges allowed by the standards. *The program will not attempt to calculate compliance with the exterior wall requirements of the standards if any value is beyond the allowable ranges indicated in the category descriptions that follow.*

Data in 16 categories must be entered on the Exterior Wall screen:

CITY: CODE <B,C,H>:		BUILDING: DATE:		FENESTRATION VALUES: 85 Fund.		WEIGHTED AVERAGE CRITERIA	
ENVSTD Version 2.2 - February 1993							
		N — NE — E — SE — S — SW — W — NW					
WL AREA							
GL AREA							
SCx							
PF							
VLT							
Uof							
WALL Uo							
HC							
INS POS							
EQUIP							
LIGHTS							
DLCF							
				L O A D S		TOTAL	
HEATING							
COOLING							
TOTAL							
F1 Load F2 Save		F3 Clear Input F4 Directory		F5 Other Screen F6 List Cities		F7 Help F9 Calculate	
						F10 Copy Across Esc Exit to DOS	

FIGURE 3.2. Exterior Wall Screen

- CITY** Enter a city code for one of the 234 available sites. Alternatively, press **F6** and enter a state postal abbreviation. Available sites for that state and their corresponding numeric codes will be displayed. If the exact project location is not listed, select the code for a city with a similar climate. The city codes are also listed alphabetically by state in Appendix B.
- BUILDING** Use this space to identify the project being evaluated. The name or description is limited to 25 characters. The **BUILDING** field is optional, and may be left blank.
- CODE** Enter **B** if the building will be both heated and cooled. Enter **C** if the building will be cooled only. Enter **H** if the building will be heated only.
- GROSS FLOOR AREA** The Gross Floor Area field is only necessary for locations with greater than 15,000 HDD65. This field will not be visible on your screen for cities with less than 15,000 HDD65. If visible, the field can be toggled by pressing the space bar. Alternatively, type '<' for less than 12,000 square feet, and '>' for greater than or equal to 12,000 square feet. The **GROSS FLOOR AREA** field is not shown in Figure 3.2.
- DATE** Use this space to identify the date and other information such as the initials of the individual conducting the evaluation. A maximum of 25 characters may be entered. The **DATE** field is optional, and may be left blank.

- WL AREA** Enter the total wall area (both glazed and opaque) for each compass orientation appropriate for your design. Orientations that are not applicable may be left blank. If the actual direction the wall faces falls between available increments, use the closest orientation. The program accepts values from 0.0 to 99,999. The units may be either ft^2 or m^2 , but must be consistent with those used for glazing area.
- GL AREA** Enter the glazed wall area including window frames for each compass orientation appropriate for your design. Orientations that are not applicable may be left blank. The program accepts values from 0 to 99,999. The units may be either ft^2 or m^2 , but must be consistent with those used for wall area.
- SCx** Enter the shading coefficient (SCx) of the glazing, including interior and exterior shading devices other than horizontal overhangs. Use projection factors (PF) to describe horizontal overhangs. The program accepts values from 0.0 to 1.0. See manufacturer literature or the ASHRAE Handbook (ASHRAE 1989) for appropriate values.
- PF** If there is a horizontal overhang over the windows, enter a projection factor (PF) for the orientation. The projection factor is the ratio of the depth of the external shading projection to the height of the projection above the bottom of the window. The program accepts values from 0.0 to 2.0. No additional credit is given in the standards for a PF greater than 0.5.
- VLT** If automatic electric lighting controls for daylight utilization are used, enter the visible light transmittance (VLT) of the glazing. Visible light transmittance is the decimal fraction of visible light that is transmitted through the glazing. The program accepts values from 0.0 to 1.0. See manufacturer literature for values.
- Uof** Enter the glazing assembly U-value (Uof) in $\text{Btu}/(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})$. Include the effects of sash, frames, and spacers in multiple-glazed units. Section 5.3 of the standards describes procedures for determining these values. In general, the program accepts values from 0.0 to 1.4. For orientations with a positive wall area (WL AREA), either the Uof or the WALL Uo may be 0.0, but both cannot be 0.0. Some ranges are subject to climatic restrictions and may vary depending on the chosen location. For locations with greater than 15,000 HDD65, refer to Table 5.3-5 of the standards.
- WALL Uo** Enter the U-value of the opaque exterior wall (WALL Uo) in $\text{Btu}/(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})$. Include the effects of parallel-path conduction. Section 5.3 of the standards describes procedures for determining the effect of parallel paths. In general, the program accepts values from 0.0 to 1.4. For orientations with a positive wall area (WL AREA), either the WALL Uo or the Uof may be 0.0, but both cannot be 0.0. Some ranges are subject to climatic restrictions and may vary depending on the chosen location. For locations with greater than 15,000 HDD65, refer to Table 5.3-5 of the standards.

- HC** Enter the heat capacity (HC) of the opaque exterior wall in Btu/ft²·°F. Heat capacity is calculated by summing the products of the thickness, density, and specific heat of each material that makes up the exterior wall. The program accepts values from 1.0 to 100.0. No additional credit is given in the standards for heat capacity above 20.0.
- INS POS** Enter the integer code that best describes the location of insulating material in the opaque exterior wall. Codes for insulation position (INS POS) are
- 1 - Exterior insulation is outside of the wall's thermal mass.
 - 2 - Integral insulation is integral with the wall's thermal mass.
 - 3 - Interior insulation is inside of the wall's thermal mass.
- EQUIP** Enter the equipment power density as determined by Section 5.3.8.1.1 of the standards. The program accepts values from 0.0 to 10.0 W/ft².
- LIGHTS** Enter the electric lighting power density as determined by Section 5.3.8.1.1 of the standards. The program accepts values from 0.0 to 10.0 W/ft². The value can be calculated by the LTGSTD program and is located on the LTGSTD main screen [Hanlon 92]. All values for the electric lighting power density must be entered before the criteria for the percentage of roof area in skylights can be correctly calculated on the Other Requirements screen.
- DLCF** Enter the fraction of the lighting power within 15 ft of the exterior wall that will be automatically controlled for daylight utilization. The program accepts values from 0.0 to 1.0. If the lights will not be controlled for daylight utilization, enter zero.

3.1.2 Exterior Wall Screen Calculated Values

In this section the calculated values for the Exterior Wall screen are explained. The calculated values are generated when the user presses F9. Until the calculation is performed, these numbers will remain blank.

- Criteria** The criteria column is calculated from the standards. Criteria are specific to the climate associated with the chosen city. These numbers represent a minimally compliant building allowed by the standards for each input. There are tradeoffs allowed between the inputs. If one input exceeds compliance and another is below compliance, the total may still be in compliance.
- Weighted Average** This column is provided as a guide for comparing the building design against the criteria column. The weighted average for EQUIP and LIGHTS is based on the gross wall area (WL AREA). The weighted average for Wall Uo and HC is based on the opaque wall area

(WL AREA - GL AREA). The weighted average for each of the glazing parameters (SCx, PF, VLT, Uof, and DLCF) is based on the glazing area (GL AREA). A weighted average is not calculated for the insulation position (INS POS) row.

Loads The loads section is for the intermediary steps of the calculations performed in attachment 5B of the standards. There are three row of numbers for each orientation. These rows contain loads for heating, for cooling, and for the two combined.

Total The total section displays the end results of the calculations as outlined in attachment 5B of the standards. This set of numbers is used to determine if the building design passes or fails the exterior wall requirements.

The calculated values on the left are for the building design. The values on the right are for the criteria. The building passes if the values for the building design are less than or equal to the corresponding values for the criteria.

3.1.3 Exterior Wall Screen Cursor Control Keys

The following six keys allow you to move the cursor on the Exterior Wall screen:

Enter moves the cursor to the next field.

Backspace deletes the last character if the cursor is in the BUILDING or DATE field. If at the first character of a compass orientation, **backspace** moves the cursor to the previous orientation.

← moves the cursor one orientation to the left. If at the first orientation, moves the cursor to the last orientation of the previous row.

→ moves the cursor one orientation to the right. If at the last orientation, moves the cursor to the first orientation of the next row.

↑ moves the cursor up one row in the same orientation.

↓ moves the cursor down one row in the same orientation.

3.1.4 Exterior Wall Screen Function Keys

The following function keys for the Exterior Wall screen enable you to calculate compliance, save and recall ENVSTD24 data files, and access additional features.

- F1 lists all ENVSTD24 data files in the current directory (all files with the .ENV extension). You are then prompted for the name of a file to load into the ENVSTD24 program.
- F2 saves an ENVSTD24 data file to disk. The files are saved as ASCII files, allowing you to print or edit them using a text editor or word processor. Enter the filename without the .ENV extension. Any legal DOS filename of up to eight characters can be used. Data that is not saved will be lost when you exit the program.
- F3 clears all data from the screen and initializes all variables.
- F4 lists files in the current default directory with the .ENV extension.
- F5 switches the display from the Exterior Wall screen to the Other Requirements screen. The Other Requirements screen is described in Section 3.2.
- F6 displays the available climate cities and states in a menu. The menu will only be displayed if the cursor is in the CITY field. Once the menu is displayed, enter a two-letter state postal abbreviation to view available cities for that state. Entering the city code or pressing Enter will return you to the Exterior Wall screen. Press Esc to return to the Main screen without making a selection.
- F7 displays a context-sensitive help message pertaining to the current field. Press any key to return to the Exterior Wall screen.
- F9 performs calculations based on the data currently entered on the screen. The criteria, weighted averages, and cooling and heating totals are calculated and displayed. A pass/fail message is displayed at the bottom of the screen, indicating whether the envelope configuration complies.

Compliance is determined by the code (Heating, Cooling, or Both) entered in the upper left corner of the screen. The pertinent values for determining compliance are displayed in the corresponding row of the TOTAL section in the lower right corner. For example, if an 'H' is entered in the Code field, the only relevant loads and totals are those in the 'Heating' row. The rows labeled 'Cooling' and 'Both' can be ignored.

Totals for the building design are displayed on the left and the criteria are displayed on the right. Separating these two values is a comparison operator (<, >, or =). If the building design is greater than or equal to the criteria, the building passes.

If any data is missing or out of range, the program will not perform the calculation.

- F10** copies an orientation value to other orientations. The cursor must be positioned on the value to be copied. Values for the wall parameters (WALL Uo, HC, INS POS, EQUIP, and LIGHTS) are copied into all orientations with a wall area (WL AREA) greater than zero. Values for the glazing parameters (SCx, PF, VLT, Uof, and DLCF) are copied into all orientations with a glazing area (GL AREA) greater than zero. **F10** does not work on the first or second rows, WL AREA and GL AREA.
- Del** deletes the entry at the current cursor position.
- Esc** is used to cancel operations, exit screens, and exit the program. The exact response of the ESC key depends on the context in which it is used.

3.2 OTHER REQUIREMENTS SCREEN

In this section, the input values, cursor control keys, and function keys for the Other Requirements screen are described. The Other Requirements screen is shown in Figure 3.3 without data.

3.2.1 Other Requirements Screen Input Values

In this section, the data required to use the Other Requirements screen is described. Some of the calculations made to determine the criteria on this screen are dependent on data from the Exterior Wall screen. The program will not perform calculations for this screen until you have entered a validity and a heating/cooling code on the Exterior Wall screen. In addition, values for the electric lighting power density, wall area, and glazing area must be entered on the Exterior Wall screen before the criteria for allowable skylight area can be correctly calculated.

There are three sections on this screen. The values entered in the first two sections (SKYLIGHTS and Uo) must be less than or equal to the corresponding criteria. The values entered in the last section (R-VALUE) must be greater than or equal to the corresponding criteria. Eleven user inputs are described below.

Percentage of Roof Area in Skylights Enter the percentage of total building roof area that consists of skylights, including the skylight frame. The program accepts values from 0 to 100. If the skylight area in the design does not exceed the limit, the condition in Section 5.3.10.3.1 of the standards has been met. If the other

CITY:		BUILDING:	
ENVSTD Version 2.4 - February 1993			
MAXIMUM PERCENTAGE OF ROOF AREA IN SKYLIGHTS:		DESIGN	CRITERIA MAXIMUM
Percentage of Roof Area in Skylights: Visible Transmittance of Skylight Design Lighting Footcandles of Space (30, 50, 70)			
MAXIMUM ALLOWABLE Uo:			MAXIMUM
Roof Wall Adjacent to Unconditioned Space Floor Over Unconditioned Space			
MINIMUM ALLOWABLE R-VALUE:			MINIMUM
Wall Below Grade R-Value of Slab Insulation Heated or Unheated Slab (H/U) Horizontal or Vertical Insulation Position (H/V) Depth or Width of Insulation (24, 36, or 48 in.)			
F5 Wall Screen F7 Help	F9 Calculate Del Delete Entry	Arrows Move Esc Wall Screen	

FIGURE 3.3. Other Requirements Screen

conditions in Section 5.3.10.3 are met, skylight conductance can be excluded from the roof conductance (U_o) entry below. To receive daylight credit, electric lighting fixtures must be automatically controlled for daylight utilization and certain standards for skylight thermal integrity must be met. The program uses the lighting power density that you enter on the Exterior Wall screen to calculate the criteria for allowable skylight area. If no skylights will be used, leave this field blank.

Visible Transmittance of Skylight

If skylights are used, enter the visible light transmittance of the skylight glazing. Visible transmittance is the decimal fraction of visible light that is transmitted through the glazing. The program accepts values from 0.0 to 1.0. Skylight area limits are constant for visible transmittances below 0.50 and above 0.75 and are interpolated between these two values. See manufacturer's literature for appropriate values of visible transmittance. The criteria for allowable skylight area will not be displayed if this field is blank. If no skylights will be used, leave this field blank.

Design Lighting Footcandles of Space

If skylights are used, enter the illumination level (in footcandles) that the electric lighting system in the space below the skylights will be designed to provide. The program accepts values of 30, 50, or 70. Enter only the first numeral (3, 5, or 7). The criteria for allowable skylight area will not be

displayed if this field is blank. If no skylights will be used, leave this field blank.

Roof (and Skylights Not Qualifying for Daylight Credit)	Enter the conductance (U_o), in $\text{Btu}/(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})$, of the roof. Include any skylights that do not qualify for the daylight credit. The program accepts values from 0.0 to 1.4. Section 5.3 of the standards describes how to calculate the total conductance of combinations of materials. To determine whether skylights are eligible for the daylight credit, check the requirements of Section 5.3.10.3 of the standards. This field is required and cannot be left blank.
Wall Adjacent to Unconditioned Space	Enter the overall conductance (U_o), in $\text{Btu}/(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})$, of opaque walls that enclose conditioned spaces and are adjacent to interior unconditioned spaces. The program accepts values from 0.0 to 1.4. Section 5.3.1 of the standards describes how to calculate the overall conductance of combinations of assemblies. Requirements related to walls adjacent to unconditioned space can be found in Section 5.5.3 of the standards. If there are no opaque walls enclosing conditioned spaces and adjacent to interior unconditioned spaces, leave this field blank.
Floor Over Unconditioned Space	Enter the overall conductance, in $\text{Btu}/(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})$, of floor areas of conditioned spaces that are over unconditioned spaces. The program accepts values from 0.0 to 1.4. Section 5.3.1 of the standards describes how to calculate the overall conductance of combinations of assemblies. Requirements related to floors over unconditioned space can be found in Section 5.5.2.1.1 of the standards. If there are no floor areas of conditioned spaces that are over unconditioned spaces, leave this field blank.
Wall Below Grade	Enter the thermal resistance (R), in $(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})/\text{Btu}$, of walls below grade. The program accepts values from 0 to 100. No insulation is required in climates with fewer than 3000 HDD65 or for those portions of walls more than one story below grade. Requirements related to walls below grade can be found in Section 5.5.4 of the standards. If there are no walls below grade, leave this field blank.
R-Value of Slab Insulation	Enter the resistance (R), in $(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})/\text{Btu}$, of slab insulation. The program accepts values from 0.0 to 100. There are no insulation requirements for slab-on-grade in locations with fewer than 3000 HDD65 or where footings extend less than 18 inches below grade. If the design does not include a concrete slab, leave this field blank.
Heated or Unheated Slab (H/U)	Enter "H" for heated concrete slabs or "U" for unheated concrete slabs. Requirements for heated slabs on grade are higher by 2 $(\text{h}\cdot\text{ft}^2\cdot^\circ\text{F})/\text{Btu}$ than those for unheated slabs. Requirements related to insulation of slabs on grade can be

found in Section 5.5.2.1.2 of the standards. This field is required for designs with a concrete slab. If there is no concrete slab, leave this field blank.

Horizontal or Vertical Insulation Position (H/V) Enter "V" for vertical or "H" for horizontal to indicate the position of the insulation. Vertical insulation extends from the top of the slab downward. Horizontal insulation extends from the top of the slab downward to the bottom of the slab and then horizontally beneath the slab. Vertical insulation is not required to extend below foundation footings. This field is required for designs with a concrete slab. If there is no concrete slab, leave this field blank.

Depth or Width Width of Insulation (in.) Enter, in inches, the depth of insulation (if placed vertically) or the width of insulation beneath the slab (if placed horizontally). The program accepts values of 24, 36, or 48 inches. Enter only the first numeral (2, 3, or 4). The R-value requirement for slab insulation varies depending on insulation position and depth (or width). This field is required for designs with a concrete slab. If there is no concrete slab, leave this field blank.

3.2.2 Other Requirements Screen Cursor Control Keys

The following keys allow you to move the cursor on the Other Requirements screen:

- ↑ moves the cursor up one row.
- ↓ moves the cursor down one row.

3.2.3 Other Requirements Screen Function Keys

The following function keys are used on the Other Requirements screen:

- F5** switches the display from the Other Requirements screen to the Exterior Wall screen.
- F7** displays a context-sensitive help message pertaining to the current field.
- F9** calculates design limits and compliance for the Other Requirements screen.
- Del** deletes the entry at the current cursor position.
- Esc** switches the display from the Other Requirements screen to the Exterior Wall screen.

4.0 REFERENCES

10 CFR Part 435, Subpart A, January 30, 1989. U.S. Department of Energy, "Energy Conservation Voluntary Performance Standards for Commercial and Multi-Family High Rise Residential Buildings; Mandatory for New Federal Buildings; Interim Rule." Superintendent of Documents, U.S. Government Printing Office, Washington D.C.

American Society of Heating, Refrigerating, and Air Conditioning Engineers, Inc. (ASHRAE). 1985. *ASHRAE Handbook, 1985 Fundamentals Volume*. Atlanta, Georgia.

Energy Conservation and Production Act. August 14, 1976. Public Law 94-385, as amended, 42 USC 6831, 90 Stat 1144 et seq.

Hanlon, R.L., and L.M. Connell. 1993. *User's Guide for LTGSTD24 Program Version 2.4*. PNL-8660, Pacific Northwest Laboratory, Richland, Washington.

APPENDIX A

FILES CONTAINED ON THE PROGRAM DISKETTES

APPENDIX A

FILES CONTAINED ON THE PROGRAM DISKETTES

ENVSTD24 FILES

The ENVSTD24 program diskette contains the following files:

- **ENVSTD24.EXE**, the Envelope Program
- **MEDOF24.ENV**, an example data file for a medium office building
- **APART24.ENV**, an example data file for a high-rise apartment building
- **BANK24.ENV**, an example data file for a single-story bank building.

APPENDIX B

LIST OF CITIES AND CLIMATE DATA

APPENDIX B

LIST OF CITIES AND CLIMATE DATA

												NO HRS 8AM-4PM	
NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	T<55	55<T<69
<u>Alabama</u>													
28	Birmingham	AL	765	2882	464	789	908	5182	1825	6272	17.5	720	760
143	Mobile	AL	164	1580	486	816	919	6478	2419	7479	16.6	408	774
145	Montgomery	AL	491	2261	462	823	981	5821	2116	8473	19.5	609	734
<u>Alaska</u>													
2	Adak	AK	3562	8913	280	434	652	124	0	0	9.9	2754	156
9	Anchorage	AK	5301	10540	272	538	926	236	0	0	13.8	2398	521
10	Annette Island	AK	2545	7277	285	482	739	756	12	0	10.1	2169	719
24	Bethel	AK	8285	13449	252	453	789	312	0	0	14.3	2555	347
25	Big Delta	AK	9355	14069	249	527	989	777	16	25	19.0	2141	606
76	Fairbanks	AK	9841	14414	241	492	919	922	19	8	18.2	2083	682
93	Gulkana	AK	8865	13846	257	522	943	498	4	6	18.5	2225	615
105	Juneau	AK	4223	9350	254	410	642	348	0	0	12.7	2367	540
106	King Salmon	AK	6843	11992	270	499	860	330	4	6	15.4	2395	502
109	Kodiak	AK	3775	8896	276	509	852	360	6	0	10.6	2519	384
132	McGrath	AK	9967	14868	246	467	841	578	3	0	15.9	2265	596
152	Nome	AK	9061	14418	242	478	871	119	0	0	9.0	2710	210
208	Summit	AK	9210	14530	247	488	893	155	0	0	13.6	2616	298
231	Yakutat	AK	4486	9714	247	402	650	248	0	0	9.3	2471	439
<u>Arizona</u>													
163	Phoenix	AZ	90	1382	488	1116	1310	7830	3647	34521	21.2	373	746
171	Prescott	AZ	1477	4462	473	1090	1334	3385	895	3973	24.0	1021	725
218	Tucson	AZ	178	1601	500	1112	1280	6822	2769	19657	21.9	399	716
229	Winslow	AZ	1695	4603	471	1092	1338	3708	1141	7347	27.7	1130	634
234	Yuma	AZ	43	782	493	1151	1330	8921	4186	37892	23.5	247	697
<u>Arkansas</u>													
79	Fort Smith	AR	1149	3394	462	842	1005	5307	2077	10413	22.4	925	547
121	Little Rock	AR	912	3091	465	831	981	5351	2055	8450	17.5	865	626
<u>California</u>													
12	Arcata	CA	582	5020	407	724	926	1038	1	0	8.9	1396	1509
19	Bakersfield	CA	305	2194	474	1053	1211	5879	2294	15447	28.9	645	848
48	China Lake	CA	409	2444	468	1091	1312	6222	2782	26739	27.4	582	772
58	Daggett	CA	237	1916	475	1102	1309	6516	2720	22302	27.0	472	841
71	El Toro	CA	32	1577	486	977	1163	4764	834	2391	22.3	215	1474
82	Fresno	CA	492	2700	459	1029	1199	5070	1803	13085	31.8	780	785
122	Long Beach	CA	54	1483	482	956	1144	4947	900	1616	16.1	263	1502
123	Los Angeles	CA	3	1494	482	962	1146	4456	472	136	14.1	145	1849
146	Mount Shasta	CA	1947	5583	419	909	1153	2395	556	2073	16.2	1544	756
156	Oakland	CA	157	2922	453	909	1102	2792	82	23	16.4	770	1905
167	Point Mugu	CA	8	2193	477	936	1131	3435	145	70	12.3	209	2146
176	Red Bluff	CA	589	2884	428	951	1177	5110	1930	14404	29.5	860	810
185	Sacramento	CA	381	2753	444	987	1185	4274	1171	7315	34.6	834	990
191	San Diego	CA	2	1275	490	950	1121	4865	662	383	11.5	102	1911
192	San Francisco	CA	186	3238	454	941	1146	2496	73	204	20.2	782	1796
194	Santa Maria	CA	138	3041	476	950	1128	2663	92	513	20.9	414	2016
209	Sunnyvale	CA	142	2708	456	947	1145	3112	204	421	16.9	610	1794

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS 8AM-4PM	
												T<55	55<T<69
<u>Colorado</u>													
50	Colorado Springs	CO	2587	5996	435	976	1321	2557	491	2075	24.0	1357	725
62	Denver	CO	2652	6083	428	971	1321	2611	567	2934	25.5	1329	739
68	Eagle	CO	4232	8317	432	976	1296	1480	90	1008	35.4	1650	660
86	Grand Junction	CO	2616	5701	438	1003	1303	3611	1221	6147	27.4	1383	518
173	Pueblo	CO	2223	5285	442	992	1309	3384	971	5899	27.5	1077	720
<u>Connecticut</u>													
95	Hartford	CT	2953	6277	384	646	834	2857	706	2197	23.7	1459	598
<u>Delaware</u>													
227	Wilmington	DE	2133	5084	414	726	921	3602	1078	2188	17.2	1289	617
<u>District of Columbia</u>													
223	Washington	DC	2004	4828	419	724	905	3734	1083	3592	18.6	1205	657
<u>Florida</u>													
11	Apalachicola	FL	163	1366	508	887	971	6967	2695	8289	14.3	322	778
60	Daytona	FL	81	787	503	860	953	7404	2635	5252	14.8	177	641
104	Jacksonville	FL	206	1357	495	849	943	7045	2721	7488	16.4	354	674
136	Miami	FL	3	185	527	874	936	9338	4045	9166	12.4	55	259
160	Orlando	FL	33	532	511	881	974	8288	3312	9757	17.1	131	571
211	Tallahassee	FL	307	1721	495	845	944	6462	2401	7323	16.1	421	747
212	Tampa	FL	37	575	518	890	974	7985	3047	8905	14.9	147	592
224	West Palm Beach	FL	0	177	519	846	906	9203	3904	10324	13.1	22	308
<u>Georgia</u>													
15	Atlanta	GA	866	3070	467	807	930	4837	1566	3799	17.6	915	749
16	Augusta	GA	664	2584	468	803	933	5458	1904	6904	21.3	690	774
128	Macon	GA	514	2330	476	822	939	5769	2111	8097	18.7	667	787
196	Savannah	GA	410	1967	474	805	926	6112	2194	6308	16.6	529	725
<u>Hawaii</u>													
22	Barbers Point	HI	0	3	592	978	965	9314	3842	3617	11.2	1	97
97	Hilo	HI	0	0	557	817	805	8494	3019	1112	11.0	0	153
98	Honolulu	HI	0	0	588	953	932	9625	4150	4537	9.8	0	69
120	Lihue	HI	0	2	567	895	893	9219	3746	1912	9.6	0	140
<u>Idaho</u>													
30	Boise	ID	2276	5667	399	916	1228	2828	744	4512	28.9	1542	647
117	Lewiston	ID	2015	5426	370	729	988	2709	645	4121	29.7	1467	748
166	Pocatello	ID	3404	7075	405	935	1262	2330	526	3293	32.8	1681	546
<u>Illinois</u>													
47	Chicago	IL	3000	6151	402	729	936	3339	1015	3190	16.6	1426	613
144	Moline	IL	3085	6250	405	736	959	3204	894	2808	19.5	1357	640
207	Springfield	IL	2490	5448	422	768	962	3675	1158	4038	20.2	1260	600
<u>Indiana</u>													
75	Evansville	IN	1948	4625	426	736	890	4063	1265	4288	18.4	1141	611
80	Fort Wayne	IN	3023	6145	395	664	826	3096	743	1629	17.7	1400	601
101	Indianapolis	IN	2624	5620	407	692	851	3430	951	2263	18.0	1375	602
204	South Bend	IN	3038	6280	396	690	857	2917	684	1840	21.1	1415	635
<u>Iowa</u>													
35	Burlington	IA	3009	6094	419	802	1030	3393	1002	2598	17.1	1354	649
63	Des Moines	IA	3275	6447	413	788	1027	3116	812	2383	17.5	1423	667
130	Mason City	IA	4311	7735	400	783	1053	2708	658	1882	20.8	1548	610
202	Sioux City	IA	3608	6750	406	794	1064	3326	993	3488	18.6	1438	602

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS 8AM-4PM	
												T<55	55<T<69
<u>Kansas</u>													
66	Dodge City	KS	2280	5131	450	942	1196	4008	1384	7186	26.0	1252	637
84	Goodland	KS	2757	6090	434	935	1228	3047	905	5147	26.3	1358	625
215	Topeka	KS	2458	5201	434	837	1068	4120	1388	5212	22.3	1192	608
<u>Kentucky</u>													
56	Covington	KY	2154	5030	408	687	843	3656	1057	2638	18.3	1316	661
119	Lexington	KY	1921	4649	425	729	872	3904	1157	2853	15.6	1211	618
124	Louisville	KY	1851	4539	424	727	883	4144	1357	4716	17.6	1192	636
<u>Louisiana</u>													
23	Baton Rouge	LA	237	1573	488	806	889	6682	2543	8814	17.2	440	677
113	Lake Charles	LA	214	1455	489	795	864	6849	2615	7883	14.8	396	668
148	New Orleans	LA	179	1392	497	838	923	6840	2578	7380	15.1	324	789
201	Shreveport	LA	447	2265	484	843	954	6022	2365	10039	18.1	687	697
<u>Maine</u>													
21	Bangor	ME	4132	7998	378	693	950	1853	243	454	21.5	1721	669
38	Caribou	ME	5297	9483	357	649	922	1410	121	203	18.1	1862	692
169	Portland	ME	3531	7305	376	643	856	1946	245	399	19.6	1604	665
<u>Maryland</u>													
20	Baltimore	MD	2020	4946	419	739	932	3683	1134	3825	18.6	1268	593
161	Patuxent	MD	1418	4002	429	758	943	4180	1289	2966	12.9	1118	729
<u>Massachusetts</u>													
31	Boston	MA	2416	5775	387	659	849	2810	695	1601	16.5	1495	713
<u>Michigan</u>													
7	Alpena	MI	4282	8164	371	661	862	1928	335	894	17.3	1707	695
64	Detroit	MI	2799	5997	390	676	858	3199	922	2238	18.8	1404	632
78	Flint	MI	3471	6917	379	641	811	2502	473	921	18.1	1563	634
87	Grand Rapids	MI	3392	6777	390	688	872	2680	590	1461	22.2	1562	622
195	Sault Sainte Marie	MI	5087	9282	359	640	858	1399	119	246	21.0	1838	733
216	Traverse City	MI	3934	7654	369	642	818	2193	438	1124	21.0	1651	679
<u>Minnesota</u>													
67	Duluth	MN	5797	9918	355	633	886	1511	157	258	20.0	1882	650
102	International Falls	MN	6414	10535	351	669	962	1473	119	167	22.0	1870	656
140	Minneapolis	MN	4563	8060	380	709	972	2751	773	2509	20.7	1620	566
181	Rochester	MN	4544	8100	383	691	927	2360	442	590	18.8	1584	652
<u>Mississippi</u>													
103	Jackson	MS	546	2424	481	833	942	5927	2330	8789	17.2	646	640
135	Meridian	MS	546	2446	480	811	905	5723	2148	9508	20.2	613	719
<u>Missouri</u>													
51	Columbia	MO	2225	4994	431	790	972	3940	1234	4242	21.5	1189	633
186	Saint Louis	MO	2111	4860	432	797	983	4193	1467	5379	18.7	1124	614
206	Springfield	MO	1839	4509	446	812	982	4115	1311	4170	20.4	1215	544
<u>Montana</u>													
26	Billings	MT	3627	7156	380	814	1160	2544	598	2695	25.6	1650	617
57	Cutbank	MT	4718	8941	357	768	1150	1368	117	702	27.6	1834	672
65	Dillon	MT	4140	8210	386	838	1187	1564	159	784	28.6	1814	639
83	Glasgow	MT	5082	8828	361	752	1115	2272	543	2642	26.0	1688	570
88	Great Falls	MT	3728	7454	366	776	1133	2199	450	1886	26.7	1684	641
96	Helena	MT	3926	7817	372	771	1098	1911	328	1771	28.3	1784	651
118	Lewistown	MT	4027	8089	368	753	1084	1629	216	1270	29.8	1740	673

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS 8AM-4PM	
												T<55	55<T<69
138	Miles City	MT	4435	7989	374	800	1156	2694	773	4364	26.9	1588	565
142	Missoula	MT	3492	7560	363	704	957	1629	221	1513	30.8	1843	658
<u>Nebraska</u>													
85	Grand Island	NE	3315	6477	420	843	1115	3309	996	4580	24.5	1431	611
155	North Platte	NE	3447	6905	419	880	1183	2731	715	3468	26.2	1514	592
159	Omaha	NE	2981	5968	414	806	1066	3618	1130	3883	19.6	1355	586
197	Scottsbluff	NE	3335	6900	413	861	1168	2603	693	3745	28.3	1457	620
<u>Nevada</u>													
72	Elko	NV	3345	7178	420	1000	1332	1997	355	4065	37.8	1540	569
73	Ely	NV	3683	7666	432	1014	1350	1650	157	1317	30.1	1529	683
116	Las Vegas	NV	449	2399	456	1136	1417	6567	3043	26408	25.5	604	719
125	Lovelock	NV	2438	5845	418	1094	1452	2813	745	6659	34.7	1358	606
178	Reno	NV	2181	5841	428	1068	1401	2180	365	4059	39.3	1306	752
214	Tonopah	NV	2308	5652	427	1130	1502	2742	611	3777	28.4	1257	660
228	Winnemucca	NV	2774	6471	418	1014	1350	2264	486	6366	41.0	1383	608
233	Yucca Flats	NV	1664	4802	450	1112	1399	3378	1041	11568	35.9	1004	670
<u>New Hampshire</u>													
54	Concord	NH	3742	7425	375	630	824	2254	463	1865	22.6	1533	683
<u>New Jersey</u>													
114	Lakehurst	NJ	2174	5265	407	712	917	3299	915	3019	20.5	1312	645
151	Newark	NJ	2027	4956	406	710	912	3556	1009	2487	17.7	1325	644
<u>New Mexico</u>													
5	Albuquerque	NM	1633	4423	469	1105	1361	3942	1257	5705	25.3	1148	703
49	Clayton	NM	2138	5176	457	1019	1310	3122	685	2093	20.0	1150	770
184	Roswell	NM	1008	3486	490	1081	1280	4536	1539	11135	26.1	825	677
217	Truth or Consequences	NM	1074	3592	488	1113	1326	4457	1500	6882	23.4	889	744
219	Tucumcari	NM	1344	3922	470	1046	1300	4451	1554	8424	26.9	914	710
<u>New York</u>													
4	Albany	NY	3488	6770	395	719	942	2812	619	1308	19.7	1487	605
27	Binghamton	NY	3885	7397	370	592	733	2373	410	672	18.5	1657	662
34	Buffalo	NY	3213	6721	371	609	746	2476	509	779	19.2	1571	697
131	Massena	NY	4583	8397	380	708	942	2026	365	913	20.9	1674	627
149	New York (Central Pk)	NY	1986	5022	392	650	817	3273	834	911	12.5	1335	790
150	New York (LAG)	NY	1986	5022	392	650	817	3273	834	911	12.5	1335	790
182	Rochester	NY	3482	6995	374	622	771	2557	595	1642	20.1	1612	608
210	Syracuse	NY	3448	6856	371	611	764	2579	513	926	20.2	1521	730
<u>North Carolina</u>													
13	Asheville	NC	1407	4203	449	782	946	3442	763	1298	21.1	1083	915
37	Cape Hatteras	NC	635	2745	460	819	972	4978	1613	2039	10.0	765	820
43	Charlotte	NC	1086	3412	456	809	968	4698	1549	4299	19.6	892	777
45	Cherry Point	NC	569	2556	461	826	996	5277	1788	3614	15.2	690	757
90	Greensboro	NC	1261	3760	449	810	994	4274	1298	3642	17.4	1018	718
174	Raleigh	NC	1131	3509	445	774	935	4485	1389	3697	16.5	918	740
<u>North Dakota</u>													
29	Bismarck	ND	5196	8992	371	766	1114	2175	496	2067	27.8	1724	556
77	Fargo	ND	5582	9242	371	751	1077	2388	573	2288	22.2	1730	546
141	Minot	ND	5336	9178	358	724	1059	2064	431	1570	24.5	1800	581
<u>Ohio</u>													
3	Akron	OH	2881	6172	396	664	812	2845	661	1100	17.3	1460	680
53	Columbus	OH	2424	5493	401	671	819	3195	789	2268	22.6	1375	708
59	Dayton	OH	2573	5549	408	696	855	3367	868	1346	17.1	1388	611

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	COD50	COD65	CDH80	DR	NO HRS 8AM-4PM	
												T<55	55<T<69
213	Toledo	OH	3132	6514	393	676	853	2791	698	1794	17.8	1500	652
232	Youngstown	OH	3129	6557	383	624	760	2593	546	1128	21.4	1523	679
<u>Oklahoma</u>													
157	Oklahoma City	OK	1417	3825	465	875	1053	4901	1834	8878	20.8	980	733
220	Tulsa	OK	1429	3732	453	820	991	5244	2072	10065	19.7	983	591
<u>Oregon</u>													
14	Astoria	OR	1080	5226	350	588	782	1357	29	145	12.3	1571	1236
133	Medford	OR	1531	4893	405	814	1005	2681	568	4081	32.9	1442	749
154	North Bend	OR	629	4678	392	740	977	1429	2	0	11.8	1351	1553
170	Portland	OR	1151	4577	364	647	841	2321	272	1086	22.8	1421	1060
177	Redmond	OR	2535	6665	395	835	1127	1573	228	2390	34.4	1631	695
187	Salem	OR	1128	4926	373	680	874	1849	172	1224	29.3	1499	916
<u>Pennsylvania</u>													
6	Allentown	PA	2692	5760	401	682	864	3105	698	1146	17.0	1335	710
18	Avoca	PA	2931	6236	389	646	811	2823	652	1547	19.7	1505	705
74	Erie	PA	3006	6426	384	646	792	2527	472	378	14.8	1532	716
94	Harrisburg	PA	2302	5251	404	687	864	3518	992	2860	20.1	1342	648
162	Philadelphia	PA	2044	4923	408	701	889	3661	1065	3172	17.1	1286	646
165	Pittsburgh	PA	2773	5907	392	642	780	2989	648	1040	19.0	1426	700
<u>Rhode Island</u>													
172	Providence	RI	2610	6022	393	677	874	2756	693	1284	16.8	1429	684
<u>South Carolina</u>													
41	Charleston	SC	435	2194	467	796	925	5722	2005	5249	16.4	570	767
52	Columbia	SC	694	2666	467	816	953	5613	2110	8541	19.5	741	705
91	Greenville	SC	907	3220	459	814	971	4563	1400	3494	17.7	866	851
<u>South Dakota</u>													
100	Huron	SD	4820	8351	390	769	1044	2718	774	3739	24.5	1630	545
164	Pierre	SD	4028	7358	392	822	1147	3079	934	5262	24.2	1564	557
175	Rapid City	SD	3672	7229	394	819	1142	2581	663	3477	28.2	1530	572
203	Sioux Falls	SD	4240	7683	394	778	1078	2811	779	3029	20.2	1553	599
<u>Tennessee</u>													
44	Chattanooga	TN	1232	3595	444	738	869	4652	1541	5079	17.6	1050	684
108	Knoxville	TN	1283	3818	446	762	898	4455	1514	3840	17.8	1076	703
134	Memphis	TN	1034	3259	460	806	935	5319	2069	7807	19.2	865	851
147	Nashville	TN	1165	3609	443	749	863	4583	1552	5078	18.2	897	749
<u>Texas</u>													
1	Abilene	TX	792	2714	494	924	1066	5968	2416	13206	21.5	760	648
8	Amarillo	TX	1592	4331	471	1013	1253	4113	1377	6763	23.9	1109	680
17	Austin	TX	271	1735	503	877	972	6873	2862	14093	19.3	564	664
32	Brownsville	TX	35	642	547	908	908	8531	3664	12218	14.8	191	422
55	Corpus Christi	TX	106	889	529	906	946	8200	3508	13109	17.2	249	543
61	Del Rio	TX	186	1397	511	903	1008	7376	3112	14870	19.8	474	732
70	El Paso	TX	522	2605	503	1133	1306	5617	2225	13224	21.3	660	735
81	Fort Worth	TX	605	2354	485	875	994	6174	2448	13682	20.5	673	772
99	Houston	TX	195	1346	490	805	883	7215	2891	10569	18.2	352	703
107	Kingsville	TX	49	874	527	881	922	8302	3652	15512	19.2	260	523
115	Laredo	TX	65	842	532	900	936	8827	4130	25225	21.4	286	598
126	Lubbock	TX	1173	3643	488	1070	1267	4754	1749	9827	25.1	917	743
127	Lufkin	TX	370	1846	492	848	942	6667	2668	11737	21.5	478	681
137	Midland	TX	634	2573	504	1079	1247	5695	2159	11177	25.9	698	729
168	Port Arthur	TX	167	1416	497	824	900	6888	2662	8837	17.4	384	697
189	San Angelo	TX	538	2110	503	944	1076	6522	2619	14621	20.6	641	619

NO	CITY	STATE	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS 8AM-4PM	
												T<55	55<T<69
190	San Antonio	TX	261	1579	510	878	955	7170	3013	13841	20.1	462	690
200	Sherman	TX	699	2708	476	862	996	5844	2378	12065	20.2	785	721
221	Waco	TX	488	2166	495	874	972	6676	2879	15658	21.1	651	622
226	Wichita Falls	TX	984	3049	480	911	1077	5708	2299	14487	18.8	802	723
<u>Utah</u>													
33	Bryce Canyon	UT	4709	9288	445	1063	1386	899	4	69	30.0	1660	841
40	Cedar City	UT	2592	5888	447	1054	1342	2802	624	3119	27.1	1392	629
188	Salt Lake City	UT	2570	5975	422	975	1266	3011	941	7030	29.1	1426	586
<u>Vermont</u>													
36	Burlington	VT	4211	7932	382	698	925	2118	365	490	18.3	1697	637
<u>Virginia</u>													
153	Norfolk	VA	1185	3609	443	792	964	4636	1586	4554	15.0	1014	685
179	Richmond	VA	1322	3895	430	745	923	4225	1323	4021	17.6	996	716
180	Roanoke	VA	1520	4192	433	763	946	3986	1183	3306	19.0	1148	713
<u>Washington</u>													
158	Olympia	WA	1546	5550	351	619	819	1550	79	466	26.4	1577	985
198	Seattle/Tacoma	WA	1382	5281	350	621	828	1683	106	256	16.5	1700	982
205	Spokane	WA	2983	6727	363	758	1064	2094	363	1595	25.3	1669	640
225	Whidbey Island	WA	1179	5274	344	630	878	1403	22	7	14.8	1671	1169
230	Yakima	WA	2323	5877	373	790	1091	2370	449	3285	31.2	1413	703
<u>West Virginia</u>													
42	Charleston	WV	1816	4587	409	667	798	3712	1008	3054	20.8	1215	704
<u>Wisconsin</u>													
69	Eau Claire	WI	4751	8285	376	683	923	2545	603	1898	18.2	1565	661
89	Greenbay	WI	4310	8039	380	696	947	2172	426	957	22.1	1604	651
112	La Crosse	WI	3838	7243	386	701	937	2786	716	2121	18.9	1568	644
129	Madison	WI	4009	7466	391	717	955	2559	542	1329	19.1	1511	658
139	Milwaukee	WI	3586	7121	396	724	941	2427	487	1013	17.1	1587	618
<u>Wyoming</u>													
39	Casper	WY	3824	7617	403	961	1343	2177	495	2699	29.8	1670	535
46	Cheyenne	WY	3435	7218	416	906	1267	1963	271	1040	26.4	1618	608
183	Rock Springs	WY	4407	8391	411	1012	1395	1698	207	702	29.1	1828	552
199	Sheridan	WY	3605	7366	387	806	1133	2074	360	2105	30.8	1650	574
<u>Other Locations Outside U.S.A.</u>													
92	Guantanamo Bay	CU	0	0	612	1045	1018	11071	5596	18452	15.5	0	17
110	Koror Island	PN	0	0	662	890	827	11435	5960	14548	9.5	0	0
111	Kwajalein Island	PN	0	0	678	961	888	11635	6160	16217	8.2	0	0
193	San Juan	PR	0	0	608	963	931	10648	5173	11563	12.7	0	14
222	Wake Island	PN	0	0	609	1002	977	10869	5394	10167	9.7	0	0

Canadian Cities

NO HRS 8AM-4PM

NO	CITY	PROV	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	T<55	55<T<69
Alberta													
245	Calgary	AB	5295	9690	224	691	1027	1122	61	258	24.7	1929	717
253	Cold Lake	AB	6815	11159	234	635	917	1190	77	166	21.5	1975	690
256	Coronation	AB	6402	10721	230	698	1022	1238	100	480	24.5	1921	682
261	Edmonton	AB	6250	10689	227	658	962	1066	49	159	23.5	1956	715
263	Fort McMurray	AB	7595	12044	211	602	899	1074	66	259	24.3	2020	644
271	Grande Prairie	AB	6633	11114	222	623	921	1017	41	137	22.7	2046	682
280	Lethbridge	AB	4602	8625	228	710	1013	1619	185	939	27.0	1758	715
282	Medicine Hat	AB	4965	8827	221	723	1039	1908	313	1671	27.1	1699	671
293	Peace River	AB	7099	11621	215	628	948	974	39	140	23.7	2039	687
302	Red Deer	AB	6179	10656	234	676	991	1021	42	188	24.9	1981	686
306	Rocky Mountain House	AB	5752	10336	207	626	939	899	26	118	24.1	2025	678
338	Vermilion	AB	6911	11295	237	666	959	1133	61	276	24.1	1921	707
341	Whitecourt	AB	6646	11318	218	620	926	806	21	107	25.7	2089	650
British Columbia													
235	Abbotsford	BC	1798	5797	208	559	711	1536	79	400	22.8	1639	969
247	Cape St. James	BC	1593	6409	240	516	691	642	1	0	8.9	2295	623
254	Comox	BC	1831	5896	219	584	751	1467	75	124	18.7	1768	993
264	Fort Nelson	BC	8395	12852	206	575	888	1056	56	163	22.6	2049	632
265	Fort St. John	BC	6573	11090	221	622	924	980	39	63	20.4	2059	697
276	Kamloops	BC	3192	6823	229	643	857	2218	392	1964	28.2	1626	756
294	Penticton	BC	2736	6454	216	618	809	2054	316	1406	29.4	1586	759
295	Port Hardy	BC	2002	6757	223	483	647	703	1	1	13.6	2161	752
298	Prince George	BC	5150	9780	229	563	768	852	25	140	25.0	2062	673
299	Prince Rupert	BC	2574	7500	202	416	586	531	0	1	10.8	2265	650
301	Quesnel	BC	4665	9024	228	573	783	1153	55	442	27.3	1947	709
312	Sandspit	BC	2069	6729	227	489	668	800	4	1	9.8	2144	769
320	Smithers	BC	4980	9680	231	536	732	779	23	142	23.8	2157	628
321	Spring Island	BC	1465	6085	208	516	670	843	6	5	11.0	2028	881
327	Terrace	BC	3661	8100	198	462	627	1093	75	245	18.6	2118	662
332	Tofino	BC	1548	6106	201	521	695	906	6	9	14.7	1972	906
337	Vancouver	BC	1637	5602	215	563	724	1546	54	14	16.5	1693	1067
339	Victoria	BC	1624	5790	215	598	755	1323	33	83	19.8	1690	1044
344	Williams Lake	BC	4834	9384	239	613	837	959	53	213	24.0	2072	642
Manitoba													
243	Brandon	MB	6963	11059	234	699	998	1565	204	887	25.6	1857	621
252	Churchill	MB	11592	16716	226	599	920	354	22	61	18.2	2617	231
258	Dauphin	MB	7001	11133	238	689	1000	1526	201	725	24.0	1867	622
296	Portage La Prairie	MB	6494	10439	231	681	970	1819	307	912	22.5	1836	622
328	The Pas	MB	8027	12373	209	633	945	1234	123	220	20.0	2059	599
329	Thompson	MB	9571	14261	220	621	931	830	62	232	24.8	2195	495
346	Winnipeg	MB	6776	10737	216	672	964	1799	304	862	22.5	1830	614
New Brunswick													
249	Charlo	NB	5762	10114	248	597	818	1226	121	229	21.0	2038	644
251	Chatham	NB	4973	9066	234	617	860	1581	218	527	22.1	1885	663
267	Fredericton	NB	4702	8712	214	576	807	1670	223	575	22.9	1816	703
283	Moncton	NB	4663	8764	232	596	811	1502	147	208	21.4	1855	714
309	Saint John	NB	4494	8765	221	583	815	1232	47	38	18.9	1908	812
Newfoundland													
240	Battle Harbour Lor	NF	6478	11742	243	539	802	193	1	1	14.2	2773	142
242	Bonavista	NF	4416	9094	235	497	657	812	34	6	15.8	2281	552
248	Cartwright	NF	7034	12059	223	526	792	447	15	27	20.1	2520	334
257	Daniels Harbour	NF	5097	9886	268	492	604	675	8	0	11.5	2299	611
259	Deer Lake	NF	5229	9787	239	520	679	963	64	117	23.7	2047	619
268	Gander	NF	4846	9366	228	490	661	1012	75	61	19.3	2126	602
269	Goose Bay	NF	7385	12115	231	524	793	794	67	180	19.7	2297	470

NO	CITY	PROV	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS 8AM-4PM		
												T<55	55<T<69	T>69
274	Hopedale	NF	8146	13338	221	531	815	270	5	7	14.4	2678	220	
310	St. John's	NF	4300	8888	230	480	626	913	44	7	17.3	2158	620	
322	Stephenville	NF	4370	8859	231	500	620	1004	36	3	13.8	2053	768	
340	Wabush Lake	NF	9418	14411	243	543	783	480	16	26	18.5	2441	406	
<u>Northwest Territories</u>														
239	Baker Lake	NW	14691	19975	248	606	898	175	2	3	18.3	2713	194	
246	Cambridge Bay	NW	16380	21797	274	582	829	40	0	0	14.1	2841	79	
255	Coral Harbour	NW	14179	19582	244	594	901	54	0	0	16.3	2799	120	
266	Fort Smith	NW	9512	14103	208	605	912	927	61	194	23.6	2123	571	
273	Hall Beach	NW	15954	21400	273	590	831	11	0	0	11.4	2897	25	
275	Inuvik	NW	13302	18275	255	561	804	511	27	27	20.7	2524	312	
289	Norman Wells	NW	11442	16085	218	563	834	877	63	111	20.4	2298	484	
304	Resolute	NW	17397	22852	349	540	718	2	0	0	9.9	2919	3	
349	Yellowknife	NW	10815	15481	219	621	913	838	47	21	16.0	2288	526	
<u>Nova Scotia</u>														
272	Greenwood	NS	3813	7768	237	583	743	1709	207	274	22.6	1748	751	
307	Sable Island	NS	2814	7051	251	540	671	1251	30	0	9.6	1968	915	
317	Shearwater (Halifax)	NS	3625	7724	235	559	742	1444	86	39	15.7	1867	855	
326	Sydney	NS	4141	8380	235	568	722	1347	130	116	19.4	1920	715	
348	Yarmouth	NS	3238	7490	235	550	685	1226	21	2	14.8	1835	987	
<u>Ontario</u>														
236	Atikokan	ON	6829	11144	217	632	874	1281	138	289	25.2	1975	647	
241	Big Trout Lake	ON	9312	13963	221	607	923	881	75	49	18.1	2273	492	
260	Earlton	ON	6538	10792	244	610	815	1367	164	423	23.6	1946	627	
270	Gore Bay	ON	4797	8791	216	645	829	1647	185	112	18.5	1833	755	
277	Kapuskasing	ON	7333	11744	252	596	806	1178	133	347	23.9	2059	572	
278	Kenora	ON	6724	10776	231	660	917	1656	251	336	18.5	1920	632	
281	London	ON	3893	7556	236	624	742	2183	389	645	21.7	1635	679	
287	Muskoka	ON	4960	8974	244	634	788	1632	190	305	23.4	1749	718	
291	North Bay	ON	5687	9785	249	613	794	1535	176	129	18.9	1908	715	
292	Ottawa	ON	4822	8565	208	594	801	2095	381	732	20.6	1738	657	
314	Sault Ste. Marie	ON	5190	9371	225	611	782	1417	142	229	23.5	1914	701	
319	Sioux Lookout	ON	7178	11407	223	628	885	1415	187	338	20.6	1970	611	
323	Sudbury	ON	5850	9924	230	617	821	1591	209	347	20.6	1909	657	
330	Thunder Bay	ON	6198	10532	213	650	908	1232	109	318	24.1	1973	671	
331	Timmins	ON	6995	11346	244	604	816	1249	143	415	25.1	2012	588	
333	Toronto	ON	3894	7593	206	586	732	2161	404	918	22.5	1654	669	
334	Trenton	ON	4012	7707	247	653	821	2126	364	369	19.9	1659	711	
343	Warton	ON	4247	8206	249	622	722	1710	213	206	19.7	1767	741	
345	Windsor	ON	3274	6636	232	641	777	2763	669	1405	19.6	1542	646	
<u>Prince Edward Island</u>														
250	Charlottetown	PE	4496	8614	250	584	756	1476	137	46	16.7	1895	773	
324	Summerside	PE	4408	8438	221	600	814	1589	162	48	16.1	1891	767	
<u>Quebec</u>														
237	Bagotville	PQ	6341	10612	247	579	784	1334	147	317	21.7	1975	635	
238	Baie Comeau	PQ	6350	11021	222	600	851	805	20	8	19.8	2137	681	
279	Lake Eon	PQ	8887	13896	244	567	828	458	10	4	18.0	2435	426	
284	Mont Joli	PQ	5597	9982	230	589	786	1180	108	84	18.3	2102	641	
285	Montreal	PQ	4605	8308	222	566	760	2162	407	566	19.1	1710	670	
288	Nitchequon	PQ	9642	14626	246	567	831	485	12	3	15.8	2464	411	
300	Quebec	PQ	5400	9456	213	585	809	1600	200	316	21.1	1858	669	
305	Roberval	PQ	6460	10695	239	602	829	1395	173	253	19.6	1965	640	
308	St. Hubert	PQ	4648	8404	226	635	852	2071	370	703	21.1	1696	662	
311	Ste. Agathe des Monts	PQ	5874	10116	223	618	827	1347	133	122	21.4	1911	682	
315	Schefferville	PQ	10060	15160	221	536	813	367	10	14	17.4	2529	338	

NO	CITY	PROV	HDD50	HDD65	VSN	VSEW	VSS	CDD50	CDD65	CDH80	DR	NO HRS 8AM-4PM	
												T<55	55<T<69
316	Sept-Îles	PQ	6548	11314	216	589	856	706	14	8	16.4	2233	633
318	Sherbrooke	PQ	5365	9524	248	593	754	1453	155	284	24.2	1782	691
336	Val d'Or	PQ	6909	11278	234	595	807	1225	136	263	22.5	2015	609
<u>Saskatchewan</u>													
244	Broadview	SK	6802	11009	228	690	1001	1416	167	741	26.1	1913	625
262	Estevan	SK	6016	9956	237	706	994	1827	310	1426	25.6	1829	613
286	Moose Jaw	SK	5871	9800	244	700	988	1828	301	1460	26.1	1815	619
290	North Battleford	SK	6866	11023	239	666	956	1456	156	541	22.6	1938	661
297	Prince Albert	SK	7546	11846	229	659	960	1266	108	397	24.3	1946	649
303	Regina	SK	6583	10641	234	709	1013	1633	234	1098	25.7	1864	616
313	Saskatoon	SK	6851	10958	212	708	1044	1543	194	764	24.8	1880	640
325	Swift Current	SK	5889	10020	218	700	1008	1521	194	882	25.3	1845	637
335	Uranium City	SK	9715	14317	201	622	940	916	62	81	18.7	2208	566
347	Wynyard	SK	6935	11115	218	686	1008	1445	169	502	22.4	1966	632
350	Yorkton	SK	7137	11310	228	678	993	1446	162	577	23.7	1912	624
<u>Yukon Territory</u>													
342	Whitehorse	YT	7752	12661	228	561	815	557	9	35	22.5	2309	528

APPENDIX C

EXAMPLE DATA FILES

APPENDIX C

EXAMPLE DATA FILES

To illustrate the data files produced using the ENVSTD24 program, three example files are included. **MEDOF24.ENV** contains data for a 48,664-ft² three-story office building in El Paso Texas. **APART24.ENV** contains data for a nine-story high-rise apartment building with 496,976 ft² in Milwaukee, Wisconsin. **BANK24.ENV** contains data for a single-story branch bank building with 2,250 ft² in Los Angeles, California.

MEDOF24.ENV

ENVELOPE SYSTEM PERFORMANCE COMPLIANCE CALCULATION PROGRAM
VERSION 2.4
U.S. DEPARTMENT OF ENERGY
VOLUNTARY PERFORMANCE STANDARDS FOR NEW COMMERCIAL AND MULTI-FAMILY
HIGH RISE RESIDENTIAL BUILDINGS; MANDATORY FOR FEDERAL BUILDINGS

CITY: 70 El Paso TX BUILDING: Medium Office Building
CODE <B,C,H>: Both Heated and Cooled DATE: September 1992
FENESTRATION VALUES: 85 Fund.

ENVSTD Version 2.4 - February 1993

								WEIGHTED AVERAGE CRITERIA	
	N	NE	E	SE	S	SW	W	NW	
WL AREA	4113		7137		4299		6023		0.284 0.281
GL AREA	1096		1950		1170		1914		WWR WWR
SCx	0.482		0.482		0.482		0.482		0.482 0.500
PF	0.20		0.18		0.18		0.20		0.190 0.000
VLT	0.36		0.36		0.36		0.36		0.360 N/A
Uof	1.042		1.042		1.042		1.042		1.042 1.150
WALL Uo	0.22		0.22		0.22		0.22		0.220 0.158
HC	5.33		5.33		5.33		5.33		5.330 1
INS POS	3		3		3		3		N/A N/A
EQUIP	0.50		0.50		0.50		0.50		0.500 0.500
LIGHTS	1.73		1.73		1.73		1.73		1.730 1.730
DLCF	0		0		0		0		0.000 0.000
L O A D S									TOTAL
HEATING	2.008		2.594		1.355		2.400		8.357> 6.992
COOLING	7.697		17.731		10.028		16.059		51.515< 59.447
TOTAL	9.706		20.325		11.383		18.458		59.872< 66.439

***** PASSES EXTERIOR WALL TOTAL CRITERIA *****

MEDOF24.ENV (contd)

OTHER ENVELOPE REQUIREMENTS

ENVSTD Version 2.4 - February 1993

MAXIMUM PERCENTAGE OF ROOF AREA IN SKYLIGHTS:

DESIGN

CRITERIA
MAXIMUM

Percentage of Roof Area in Skylights:

4

<

6.0

Visible Transmittance of Skylight

0.5

Design Lighting Footcandles of Space (30, 50, 70)

50

MAXIMUM ALLOWABLE Uo:

MAXIMUM

Roof

0.050

<

0.061

Wall Adjacent to Unconditioned Space

0.200

<

0.249

Floor Over Unconditioned Space

0.100

<

0.115

MINIMUM ALLOWABLE R-VALUE:

MINIMUM

Wall Below Grade

0.0

R-Value of Concrete Slab Insulation

Heated or Unheated Slab (H/U)

Horizontal or Vertical Insulation Position (H/V)

Depth or Width of Insulation (24, 36, or 48 in.)

***** PASSES OTHER ENVELOPE REQUIREMENTS *****

APART24.ENV

ENVELOPE SYSTEM PERFORMANCE COMPLIANCE CALCULATION PROGRAM
VERSION 2.4

U.S. DEPARTMENT OF ENERGY

VOLUNTARY PERFORMANCE STANDARDS FOR NEW COMMERCIAL AND MULTI-FAMILY
HIGH RISE RESIDENTIAL BUILDINGS; MANDATORY FOR FEDERAL BUILDINGS

BUILDING: Apartment

DATE: September 1991

FENESTRATION VALUES: 85 Fund.

ENVSTD Version 2.4 - February 1993

									WEIGHTED AVERAGE CRITERIA	
	N	NE	E	SE	S	SW	W	NW		
WL AREA	16575	11362	56810	6812	16965	9737	57330	7137	0.129	0.300
GL AREA	2420	1480	7670	320	2500	740	8145	360	WWR	WWR
SCx	.85	.85	.85	.85	.85	.85	.85	.85	0.850	0.630
PF	0	0	0	0	0	0	0	0	0.000	0.000
VLT	0	0	0	0	0	0	0	0	0.000	N/A
Uof	.54	.54	.54	.54	.54	.54	.54	.54	0.540	0.480
WALL Uo	.193	.193	.193	.193	.193	.193	.193	.193	0.193	0.077
HC	10.48	10.48	10.48	10.48	10.48	10.48	10.48	10.48	10.480	1
INS POS	2	2	2	2	2	2	2	2	N/A	N/A
EQUIP	.38	.38	.38	.38	.38	.38	.38	.38	0.380	0.380
LIGHTS	.674	.674	.674	.674	.674	.674	.674	.674	0.674	0.674
DLCF	0	0	0	0	0	0	0	0	0.000	0.000
									TOTAL	
HEATING	3.433	2.206	10.192	1.282	2.484	1.763	10.376	1.477	33.214	> 22.783
COOLING	1.088	0.802	4.686	0.283	1.500	0.521	4.939	0.262	14.081	< 24.550
TOTAL	4.521	3.008	14.878	1.565	3.984	2.284	15.316	1.739	47.295	< 47.332

***** PASSES EXTERIOR WALL TOTAL CRITERIA *****

APART24.ENV (contd)

OTHER ENVELOPE REQUIREMENTS

ENVSTD Version 2.4 - February 1993

MAXIMUM PERCENTAGE OF ROOF AREA IN SKYLIGHTS:

DESIGN

CRITERIA
MAXIMUM

Percentage of Roof Area in Skylights:

2

< 3.9

Visible Transmittance of Skylight

0.5

Design Lighting Footcandles of Space (30, 50, 70)

50

MAXIMUM ALLOWABLE U_o :

MAXIMUM

Roof

0.050

< 0.053

Wall Adjacent to Unconditioned Space

0.100

< 0.125

Floor Over Unconditioned Space

0.040

< 0.045

MINIMUM ALLOWABLE R-VALUE:

MINIMUM

Wall Below Grade

10.00

> 9.8

R-Value of Concrete Slab Insulation

18

> 7.7

Heated or Unheated Slab (H/U)

Unheated

Horizontal or Vertical Insulation Position (H/V)

Vertical

Depth or Width of Insulation (24, 36, or 48 in.)

24 in.

***** PASSES OTHER ENVELOPE REQUIREMENTS *****

BANK24.ENV

ENVELOPE SYSTEM PERFORMANCE COMPLIANCE CALCULATION PROGRAM
VERSION 2.4
U.S. DEPARTMENT OF ENERGY
VOLUNTARY PERFORMANCE STANDARDS FOR NEW COMMERCIAL AND MULTI-FAMILY
HIGH RISE RESIDENTIAL BUILDINGS; MANDATORY FOR FEDERAL BUILDINGS

CITY: 123 Los Angeles CA BUILDING: BANK
CODE <B,C,H>: Both Heated and Cooled DATE: September 1991
FENESTRATION VALUES: 85 Fund.
ENVSTD Version 2.4 - February 1993

	N	NE	E	SE	S	SW	W	NW	WEIGHTED AVERAGE CRITERIA	
WL AREA	385		500		490		350		0.356	0.275
GL AREA	223		25		295		71		WWR	WWR
SCx	.534		.534		.534		.534		0.534	0.500
PF	.21		.5		.14		0		0.164	0.000
VLT	0		0		0		0		0.000	N/A
Uof	.54		.54		.54		.54		0.540	1.150
WALL Uo	.258		.258		.258		.258		0.258	0.235
HC	9.96		9.96		9.96		9.96		9.960	1
INS POS	2		2		2		2		N/A	N/A
EQUIP	.5		.5		.5		.5		0.500	0.500
LIGHTS	2.17		2.17		2.17		2.17		2.170	2.170
DLCF	0		0		0		0		0.000	0.000
L O A D S									TOTAL	
HEATING	0.418		0.571				0.181		1.171	< 2.970
COOLING	8.843		4.001		21.180		7.046		41.070	> 39.282
TOTAL	9.261		4.572		21.180		7.227		42.241	< 42.252
***** PASSES EXTERIOR WALL TOTAL CRITERIA *****										

BANK24.ENV (contd)

OTHER ENVELOPE REQUIREMENTS

ENVSTD Version 2.4 - February 1993

MAXIMUM PERCENTAGE OF ROOF AREA IN SKYLIGHTS:

DESIGN

**CRITERIA
MAXIMUM**

Percentage of Roof Area in Skylights:

9.0

<

10.2

Visible Transmittance of Skylight

0.5

Design Lighting Footcandles of Space (30, 50, 70)

50

MAXIMUM ALLOWABLE Uo:

MAXIMUM

Roof

.115

<

0.116

Wall Adjacent to Unconditioned Space

0.395

Floor Over Unconditioned Space

0.187

MINIMUM ALLOWABLE R-VALUE:

MINIMUM

Wall Below Grade

0.0

R-Value of Concrete Slab Insulation

11

>

0.0

Heated or Unheated Slab (H/U)

Unheated

Horizontal or Vertical Insulation Position (H/V)

Vertical

Depth or Width of Insulation (24, 36, or 48 in.)

24 in.

***** PASSES OTHER ENVELOPE REQUIREMENTS *****

APPENDIX D

USER COMMENT FORM

APPENDIX D

USER COMMENT FORM

The following form is for your comments and suggests on or problems with the program or documentation.

PROGRAM AND DOCUMENTATION COMMENTS

Name _____
Company _____
Address _____
City _____ State _____ Zip _____
Telephone _____
(area code)

1. What version of ENVSTD are you using?

Version _____

2. Please evaluate the user's guide:

	Excellent				Poor
Technical Accuracy	5	4	3	2	1
Organization	5	4	3	2	1
Procedures	5	4	3	2	1
Figures	5	4	3	2	1
Examples	5	4	3	2	1
Other _____	5	4	3	2	1

3. Rate your own knowledge of personal computers:

___ First-time computer user ___ Intermediate user
___ Advanced user ___ Programmer

4. Note any errors you found in the user's guide.

<u>Error</u>	<u>Page No.</u>
_____	_____
_____	_____
_____	_____
_____	_____

5. Note any problems/bugs you experienced with the program. Please list the keystrokes you used, if possible. _____

6. What other comments or suggestions do you have on the program or the user's guide? _____

Thank you for taking the time to complete this form. Please return it to:

Building Energy Standards Program Office
Pacific Northwest Laboratory
P.O. Box 999/MSIN K5-02
Richland, Washington 99352
Facsimile (509) 375-3614