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Introduction

Evolution of J-Works

The author of this program spent 17 years "running load calculations" for existing and new homes. The first few years were tedious due to the fact that even with a good calculator it took many hours to do a "room-by-room" load calculation.

J-Works 2.2, a stand alone DOS program, evolved from a very involved spreadsheet. This program is fast but still requires a source for the "HTM"s and climate data. Though faster and more accurate than the "manual" method, looking up the data is time consuming.   J-Works 2.2 is still available as shareware.

J-Works 4.0 (for the Windows operating system) is the evolving product of these efforts.   Now, everything you need to do a load calculation is within the program itself.

With a set of plans, the user can generate a complete load calculation in minutes compared to the hours it used to take.   Climate data, heat gain and loss multipliers, and tables are all at your fingertips.   Latent gain is calculated for you.
All you need is specific site and construction information for the system you are designing.

Load Calc Philosophy

The author firmly believes that the greatest obstacle to comfort and energy savings is incorrectly sized heating and cooling equipment.   The Manual J method was developed by ACCA (Air Conditioning Contractors of America) to provide an accurate method to obtain this information.   This process is tedious but, compared to "guessing", well worth the effort.

Many contractors prefer to guess using a ton/600 square feet or other equally inaccurate method. Whichever guess method is used, it will be wrong most of the time because even two houses with identical square feet will never have the same orientation, insulation, and building components.

J-Works was written to speed up the whole process of calculating loads for residential structures.   J-Works has been approved for use by the Tennessee Valley Authority as an approved software program for use in their Heat Pump Program.

The benefits of a properly sized system are many.   Among them are:
- Homeowner comfort
- Savings
- Proper humidity removal
- Quiet system operation
- Longer system life
- Fewer complaints
- Increased contractor business due to all of the above

Register J-Works

Registration

Print Registration Form

Name: _____

Address: _____

Address2: _____

City, St., Zip: _____, _____ _____

Day Phone: (_____) _____ - _____

____ Copies of J-Works 4.0 @ $149.50 : $ _____

      TN residents include 6% sales tax : $ _____

                    Total : $ _____

VISA   **MasterCard**

Method of Payment: __ Check   __ Money Order   __ Credit Card

Credit Card Info: __ VISA   __ MasterCard

                CC# _____

                Expiration Date _____

                Signature _____

Print out and complete this form and send to:

            MicroWorks, Inc.
            1907 Buck Daniels Rd.
            Culleoka, TN. 38451-2701

You may place Credit Card orders by calling 615-381-9167
            (Orders only please) 9-5 CST, Mon.-Fri.

Orders will ship next day US mail.   Other shipping methods
                        available upon request.

Quick Start

Before you begin

It is best if you have blueprints or a rough sketch of the floor plan with all the information marked on it.   For a room-by-room load, much of the information such as running feet, square feet, window square feet is easily calculated using the built-in calculator in the program which has a number of unique features to aid in this process.

On existing and new homes, try to use the most accurate information you can.   Especially on new homes from a blueprint, issues such as site orientation may not be known at this point.

You'll need the following information:

- Wall Construction -
    R-value of the insulation
    Sheathing type(s) and thickness
    Ceiling height(general)
    Running feet of wall area

- Ceiling Construction -
    Dimensions
    R-value of insulation
    Attic type
    Roof dark or light
    Roof type

- Floor Construction -
    Dimensions
    Type of floor
    Carpeted or Hardwood
    Open or Closed Crawlspace
    R-value of insulation

- Glass -
    Window sizes
    Window type(s)
    Glazing type
    Door glass type
    Orientation (i.e. front faces South)

- Duct System -
    Location
    R-value of duct wrap or liner
    System type (Heat Pump or fossil fuel)

- Doors -
    Dimensions
    Types

- Fireplaces -
    Number
    Damper
    Glass doors

General Program Features
Movement through the program -

- J-Works is set up so that for the most part you can move through the program using the Tab key. If you need to back up, you may use the Shift+Tab.
- You will notice that the program flows from left to right and from top to bottom as much as possible. The screens are shown in the order intended for ease of use.
- In the Room Data screen, each time you press the Add To Load button, a new Room Data screen appears.   Remember the Summary Report is designed to hold information for 14 rooms.

Site Information -
- J-Works remembers all of your Prepared By information each time you run the program so that you only enter this information once unless you wish to change it.

Room Reset button -
- If you omit information or make a typo as you are entering the information in the Room Data screen for a Room-by-Room design, rather than starting the program over, it is recommended that you use the "Reset" button to reset the present screen and start again. Failure to do so may yield inaccurate results.

Report Summary screen -
- At any time while using the Room Data screen, you may look at the report as it develops. Clicking the Room Data button on the menu bar will return you to the Room Data screen you were working on.

Jumps to Quick Start Help areas:
 Click on the underlined green topic for more information on each of the topics.

Site Information
Construction
Room
Other Considerations
Calculation Assumptions
Summary Report
Glossary

Site Information

- Enter the "Prepared For"/"Prepared By" information.

  Tip: The Prepared By information is saved so that you will only need to enter it once.   Any changes will become the default.

- Enter the actual City and State in which the house is located.

  Tip: You can type the first few letters of the state before clicking any of the state selectors and it will automatically go to that state.   Press tab to continue.

- Enter the design humidity level and the indoor temperature settings.
  Note: Recently ACCA has suggested using the 50% relative humidity to assure proper humidity control. (ACCA Bulletin 134, Nov. 1995)

- Press the OK button

Construction

Site Information Screen

- Use the Select Site control to move forward until you find your site city or one nearest to your site

and press the OK button in this section.

- Depending on the speed of your computer, it may take several seconds for the program to access the large construction data bases.

Envelope Components

Envelope

Envelope Components Screen

General Area	Sheathing	40	25H
Ceilings Under Vented Attic,Lt.roof,R30		1.30	1.20

Envelope — Search Construction Data

Dwelling Information

Wall#1	Walls,Siding/Brick/R 11 ,1/2" Asphalt Brd (R-1.3)
Wall#2	
Floor#1 □ Slab	Floors,Over Encl.Crawl space, Carpeted Floor,R19
Floor#2 □ Slab	
Door#1	Door,Wood/Solid
Door#2	Door,Metal/Polystyrene Core
Ceiling#1	Ceilings Under Vented Attic,Lt.roof,R30
Ceiling#2	

Ceiling Height: 8
Tot.Window/Door Opening: 234
Approximate Square Ft.: 2357

Glass

Window/Door Type	Frame	Glass Type	40
Skylights,Sgl.Pane	Wood	Clear	44.30

Search Glass Data

Internal Shading? ● Yes ○ No

General window glazing is ○ Single ● Double ○ Triple

Glass#1	Dbl. Pane,Wood,Clear
Glass#2	Sgl. Pane,Wood,Clear
Glass Dr.	
Skylight	Skylights,Sgl.Pane,Wood,Clear

Skylight Direction ○ N ● NE/NW ○ E/W ○ SE/SW ○ S   ○ Single ● Double

Summer Glass

Design F: 25
N: 18.00
NE or NW: 35.00
E or W: 48.00
SE or SW: 43.00
S: 27.00
13.00

Next

- Enter the general ceiling height of the house.
- Enter the total window and door square footage
- Enter the approximate square feet of conditioned area.
- The label box to the right of "Wall#1" should be light blue indicating that it's ready for your choice using the "Search Construction Data" button to move through the choices till you see the one that matches your construction.
- Setting and Re-setting the label frames -
  To choose an area (Wall#1, Floor#1, etc.) click on the gray label to the right of the command button.   The label will turn from gray to blue. You are now ready to use the "Search Construction Data" button to move trough the choices till you see the one that matches your construction.
  Note: If you want to change your choice, just click within the label area and it will change back to gray.   Click it again to make your new choice.
- At this point press the "Wall#1" button and your choice will appear within the blue label to the

right of the button.

- Slab floor checkbox - If your floor is slab, click the slab checkbox then click the gray label.

- Skip sections that do not apply.

Glass

- Check whether the windows will have <u>internal shading</u> or not.   This would be either curtains or blinds.   You need to enter this before continuing.

- Check the main type of window for the house -
  "Double" could be double paned or single paned with storm window.
  "Triple" could be triple pane or double pane with storm window.

- Proceed with identifying the types of glass using the label click, "Search Glass Data", and the labeled command buttons.

- Check the number of fireplaces

- Choose the button which best describes your house - either Best, Ave., or Poor (see Glossary for detailed descriptions) under the Square footage range.   After you choose the "Summer Air Changes Per Hour", the Winter button is automatically chosen for you.

Room Information

Room Data Screen

```
J-Works 4.0 - [Room 1 Data - Great Room]                    _ □ ×
File  Window  Tools  Help                                   _ ₧ ×
```

			Ceil.Ht.	8	Wall Ft.	24	Rm. Sq. Ft.	340	People	2	Appl.	
Room 1			Wall2 ☐	Wall2 Ft.			Int. Gain	600		Gross Wall	192	
Great Room ▼												

Area		W2	Area	xGain	Btuh Gain			Area	xLoss	Btuh Loss
Summer Glass	North	☐	24	16.0	384	**Winter Glass**	Window A	72	30.3	2182
	NE/NW	☐		33.0			Window B			
	E/W	☐	48	46.0	2208		Glass Door			
	SE/SW	☐		41.0			Skylights		0.0	
	South	☐		25.0						
	Skylight			0.0						

			Area	xGain	Btuh Gain	Loss Factor	Btuh Loss	Reset
Doors	Door A	☐	40	13.2	528	30.8	1232	↻
	Door B	☐						
Net Wall	Wall		80	6.4	512	14.9	1192
	Wall2					0.0	
Ceilings	Ceiling A		340	15.7	5338	32.9	11186
	Ceiling B						
Floors	Floor A		340	0.0	0	8.6	2924
	Floor B						
Infil.	Openings		112	10.05	1126	55.26	6189

	Summer Gain	Winter Loss
Sub-total	10,696	24,905
Duct Multiplier	.05	.05
Duct Btuh	535	1,245
Total Gain	11,231	26,150

Add To Load

Note: Items for which you entered no information on the Envelope Components Screen are grayed out.   If you have items to list for grayed out areas, you need to restart the program.

Heading Info

- Room # - Choose the room description. Use the arrow to scroll through the choices until the room is highlighted and press the tab key.   Your selection will stay in the box. (Tip: If you know that it is the "Living room" you can type an "L" and click on the arrow to the right of the box and it will automatically go to that letter in the list.)

- Running Wall Ft. - Enter the running feet of exposed wall. (Note: If you happen to have a partition wall, wait to enter this info under the Wall2 area.)

- Room Sq. Ft. - Enter the room square footage.   Use the Calculator if needed.

- People - Enter the number of people if it is the room where the people congregate during the day.   Rule of thumb is to assign 2 people per bedroom. (ie: If the house has 3 bedrooms, then you would assign 6 people to this room.)

- Appliances - If a room with internal loads, enter a 1 to assign all 1200 Btuh or decimal fraction to

assign a partial load to this room.   In most cases, you'll assign .5 for a utility room (600 Btuh) and, if a kitchen .5 (600 Btuh) to make up the whole 1200 Btuh.

- Wall2 - Click this box if the room contains a second wall type. (ie: Partition wall.)
- Ceiling Ht. - This is filled in with the default height entered earlier but you may change this if the room has a different height.

Room   Components

- Enter in the square feet for each item that applies to the room.
  Note: Make sure to add glass door square footage to an orientation under the Area section for Summer Glass.
- Window B - Enter in the square feet for other window types here.
- Glass Doors - Enter any glass door square footage.
- Enter in other components that apply.
- Click on "Add to Load" button when all items are entered for a room.

Other Considerations

This screen allows you to enter information regarding fireplaces, general "tightness" of the house, system used, and duct insulation R-value.
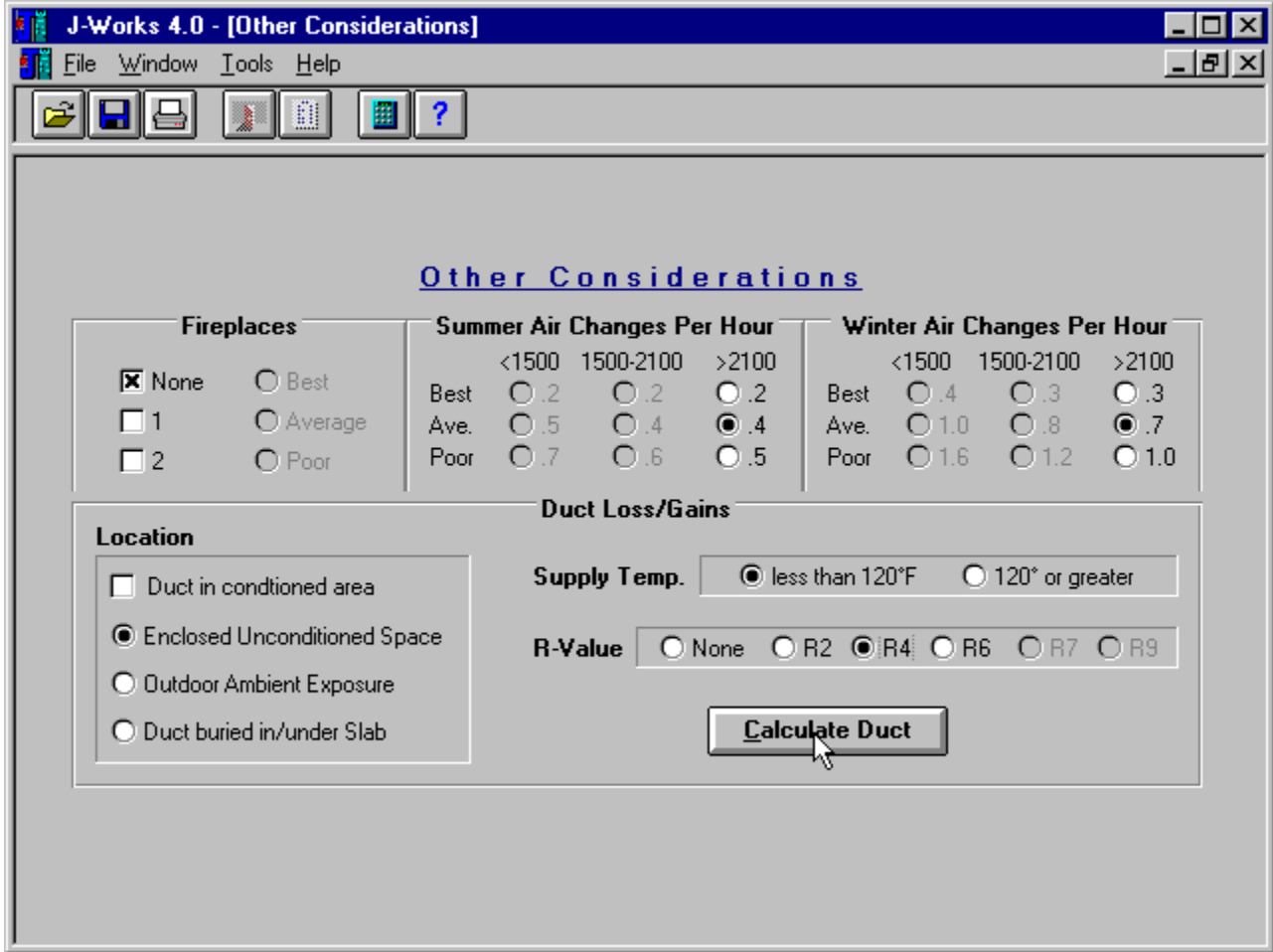
Other Considerations

- Check the number of fireplaces

- Choose the button which best describes your house - either Best, Ave., or Poor (see Glossary for detailed descriptions) under the Square footage range.   After you choose the "Summer Air Changes Per Hour", the Winter button is automatically chosen for you.

Glossary

- Indicate the location of the duct work - In most cases it will be the second choice "Enclosed Unconditioned Space".

- Choose the supply duct temperature - Usually if designing for a heat pump you choose less than 120 degrees and if for a fossil fuel system, you choose 120 degrees or greater.

- Indicate the R-value for the duct insulation.

- Check all of your data and press the "Calculate Duct" command button.

Glossary

[≜] [▥]
[#]
[A]
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[U]
[V]
[W]
[X]
[Y]
[Z]

A

ACCA
Ambient
ASHRAE
ASP
Ave (envelope)
Ave (fireplace)

B

Balance Point
Best (envelope)
Best (fireplace)
Btu

C

<u>U-value</u>

Calculation Assumptions

Glass

Summer Glass is assumed to be standard clear glass.   You can specify whether there is internal shading or not.   For the majority of loads this is the deciding factor.

Skylights are considered to be at a 45 degree roof slope.   This is the middle of the road in the slope charts and considering the usually small square footage involved, should be more than adequate.

Glass doors are treated as windows as far as listing them on the Room info form in the Gain section square footages.   They have their own listing under the Loss section square footage.

Temperature Differences

Winter and Summer temperature differences are to the nearest 5 degrees.   For example, if the indoor design temperature is 75 and the outdoor design temperature is 97 then the temperature used for calculations will be 20 degrees instead of the actual 22 degrees.

Multipliers were calculated according to an averaging system as outlined in the ASHRAE Handbook of Fundamentals manual.

Mechanical Ventilation

This program does not consider the effects of mechanical ventilation other than   bath exhausts and stove exhaust fans which are rarely used and when they are used, it is for short periods of time and small quantities of air are actually moved. If your design situation differs from this assumption, adjust your loads accordingly.

Walls

Walls which have more than 50% of their surface exposed should be considered exterior walls. Partition walls between a garage and indoor area can usually be considered exterior.

Internal Loads

The gain usually associated with interior loads is 1200 Btuh. J-Works allows the user to enter in a "1" to add the whole 1200 Btuh to a room or, to enter in a decimal for a more accurate distribution.   For example: ".5" (600 Btuh) for the kitchen and ".5" for the laundry room.

Summary Report

The Summary Report summarizes your load calculation giving all the design parameters and showing the Btuh totals by room and in whole.

This is the first screen you see when you press the Summary Report button.

Type	Area	Htg.	Clg.
	J-Works Materials Summary		
	Gross Exterior Walls	HTM	HTM
Type #1	Walls,Siding/Brick/R-13 ,1/2" Gypsum Brd (R-0.5)	4.0	1.9
Type #2			
	Winter Glass		
Type A	Dbl. Pane,T.I.M,Clear	30.5	
Type B	Dbl. Pane,T.I.M,Clear	30.5	
Glass Door			
Skylights	Skylights,Sgl.Pane,Wood,Clear	55.4	
	Summer Glass		
North			16.0
NE & NW			33.0
E & W			46.0
SE & SW			41.0
South			25.0
Skylights			137.0

Use the scroll bars to look at the report. (The Print button is the easiest way to view the results.)
This is provided for a quick view of the report as it progresses.
Each time the "Add Room" button is pressed on the Room Information screen, this report is updated.

This can also be used to verify a past report which you have loaded to check it before printing.

Calculator

This button on the tool bar will bring up the Calculator

The calculator can be used for calculating areas of rooms, windows, doors, etc.
 It is really two calculators in one.

The top portion is similar in function to a standard calculator with one exception. When the calculator is called while the cursor is in a text box, you can calculate an answer and press the copy button (top,right button) and the number in the calculator display will be transferred into the text box on the screen from which you left when you pressed the Calculator button.

The bottom portion is for calculating areas when the length and/or width is given in feet and inches. For the purposes of this program, the answer is rounded to a whole number.

Note: The copy button is not available while working in the lower portion since this number is usually multiplied by another number anyway.

Reference

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Menus

Toolbar Buttons

This opens an existing Design Summary Report from a previously saved <u>load calculation</u>.

Click this button to save the Design Summary Report to your hard disk or floppy.   You will be given a choice as to the name and location you want to save to.

Click this to print out the Design Summary Report.   It consists of two pages. Your regular printer is used.

Click this button to get back to the Room view. This returns you to the previous Room view from the Design Summary Report screen.

This goes to the Design Summary Report - In which all the totals are kept for each room and overall design parameters are stored for reference.

The Calculator button pops up the calculator for simple math operations.   Included at the bottom is a mini calculator for calculating the square footage of any component whose dimensions are given in feet and inches.   This Sq.Ft. calculator rounds to the nearest whole number.

This is the Help button and will bring up the J-Works Help file.

Main Menu

File
Open(Ctrl+O) - This opens an existing Design Summary Report from a previously saved load calculation.

Save(Ctrl+S) - This saves the Design Summary Report to your hard disk or floppy. You will be given a choice as to the name and location you want to save to.

Print(Ctrl+P) - This prints out the Design Summary Report.   It consists of two pages. Your regular printer is used.

Exit(Ctrl+E) - This quits the program and offers you a chance to save your work first.

Window
List - Lists the windows currently active.

Tools
Calculator(Ctrl+L) - This pops up the calculator for simple math operations. Included at the bottom is a mini calculator for calculating the square footage of any component whose dimensions are given in feet and inches.   This Sq.Ft. calculator rounds to the nearest whole number.

Tooltips - This turns on/off the tooltips help option where a tooltip appears as the cursor passes over

an item.

Help

Contents - This is the main table of contents for the J-Works Help file.   From here you can find the help topic you need.

Obtaining Technical Support - This is where you'll find access to technical resources, <u>shareware</u>, copyright, software license, and registration form.

About J-Works - Gives information on version and information regarding users free memory and system type.

Index

Tips and Tricks

- J-Works remembers all of your Prepared By information each time you run the program so that you only enter this information once unless you wish to change it.

- If you omit information or make a typo as you are entering the information in the Room Data screen for a Room-by-Room design, rather than starting the program over, you can reset the present screen.

- You can type the first few letters of the state before clicking any of the state selectors and it will automatically go to that state.   Press tab to continue.

- J-Works is set up so that for the most part you can move through the program using the Tab key. If you need to back up, you may use the Shift+Tab.

- Calculator auto copy function - If you call the Calculator from a text entry box, to calculate square feet for example, you can click on the copy button to transfer your results from the top calculator to that text box.   Then simply press the TAB key to move to the next area and record your entry.

- Context-sensitive help - At many places in the program you can press the F1 key to bring up the Help regarding that area of the program.

Technical Support

Registered Users receive:

- The fully licensed copy of the latest version of J-Works via U.S. mail.   This registered version is not an evaluation program with the time/use limitations. It contains none of the evaluation prompts.   Orders mailed within 24 hours of receipt.

- Registered users will be notified of upgrades, enhancements, and fixes as they occur.   Minor revision updates are free and major upgrades are at a reduced price for registered users.

- Manual

- Free Online Support -
  America Online:
      Send email to JWORKSWIN (Internet email: jworkswin@aol.com)
   MSN:
      MicroWorks offers a support area on Microsoft Network.
      Type "Go MicroWorks" to enter our BBS section of MSN.
      The latest upgrades and product announcements can be
       found here.
   CompuServe:
      Send email to 76743,1333.

- World Wide Web -
      Visit the MicroWorks, Inc.web site at http://delta.com/mworks/mworks.htm

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1907 Buck Daniels Road, Culleoka, TN 38451-2701.

Shareware

What is Shareware?

Shareware is a distribution method, not a type of software. You should find software that suits your needs and pocketbook, whether it's commercial or Shareware. The Shareware system makes fitting your needs easier, because you can try before you buy. And because the overhead is low, prices are low also. Shareware has the ultimate money-back guarantee -- if you don't use the product, you don't pay for it.

If you try a Shareware program and continue using it, you are expected to register. The evaluation copy of J-Works 4.0 is time and use limited.   Hopefully the time period and number of uses will give you enough time to evaluate whether it is right for you or your company.

Copyright laws apply to both Shareware and commercial software, and the copyright holder retains all rights, with a few specific exceptions as stated below. Shareware authors are accomplished programmers, just like commercial authors, and the programs are of comparable quality. (In both cases, there are good programs and bad ones!) The main difference is in the method of distribution. The author specifically grants the right to copy and distribute the software, either to all and sundry or to a specific group as outlined in the software license.

ASP (Association of Shareware Professionals)

This program is produced by a member of the Association of Shareware Professionals (ASP).   ASP wants to make sure that the shareware principle works for you.   If you are unable to resolve a shareware-related problem with an ASP member by contacting the member directly, ASP may be able to help.   The ASP Ombudsman can help you resolve a dispute or problem with an ASP member, but does not provide technical support for members' products.   Please write to the ASP Ombudsman at 545 Grover Rd., Muskegon, MI USA, or send a CompuServe message via CIS MAIL to ASP Ombudsman 72050,1433.

Removing J-Works for Windows

You may remove J-Works by deleting the directory in which you installed J-Works(usually C:\JWORKS). In Windows 3.1, you can go to File Manager or in Windows 95, Explorer, and highlight the JWORKS directory and choose delete.
Also, in your WINDOWS/SYSTEM directory, delete the JWORK.INI file.

ACCA

Air Conditioning Contractors of America is a trade organization dedicated to enhancing the HVACR trade through education, public policy, technical assistance and other services for it's members. For more information, you can contact them at (202) 483-9370.

Ambient

Used to refer to outside air surrounding the conditioned area.

ASHRAE

American Society of Heating, Refrigerating, and Air-Conditioning Engineers.   They provide industry guidelines regarding HVAC calculations and related topics.

ASP

Association of Shareware Professionals.   This is a trade organization dedicated to promoting excellence in software distributed via the Shareware method.

Ave (envelope)

Plastic vapor barrier, large cracks and penetrations sealed, combustion air from indoors, some duct leakage, exhaust fan vents dampered, tested window and door leakage between 0.25 and 0.50 CFM per running foot of crack.

Ave (fireplace)

Indoor air for combustion, damper or glass doors.

Balance Point

The temperature below which a heat pump can no longer provide enough heat for a home without the use of supplemental heating.

Best (envelope)

Continuous infitration barrier(all seams taped or sealed), windows and doors with a tested leakage of less than 0.25 CFM per running foot of crack, all cracks and penetrations sealed, combustion air from outside, and no duct leakage(mastic).

Best (fireplace)

Outdoor combustion air, tight fitting glass doors and damper.

Btu

British thermal unit.   This is the amount of heat required to raise one pound of water one degree Fahrenheit.   Used with "per hour" it is Btuh.

cfm

Cubic feet per minute.   Measurement of the volume and speed of air.

Daily range

The average difference between the daily high and low temperatures for a given location.

Degree Day

Measure of severity and duration of an outdoor temperature above or below a fixed temperature of 65 degrees Fahrenheit.

envelope

Term used to describe the house's building component which separates the conditioned from the unconditioned area.

fpm

Feet per minute. Measurement of the velocity of air.   Suggested fpm for supply registers is within 400-700 fpm. for comfort.

Heat transfer multiplier

This is the amount of heat that passes through one square foot of the building envelope at a given temperature difference. For winter it is calculated by multiplying the U-value by the winter temperature difference.   For summer, it is calculated by mutltiplying the U-value by the equivalent summer temperature difference.

Heat

Present in air and objects down to 450 degrees Fahrenheit below zero

Indoor Design Temperature

This is the indoor thermostat setting which you use to determine the temperature differences used in the load calculation.

Internal shading

Draperies or blinds on the inside of windows or glass doors.   Since this decreases solar gain, a lower multiplier is used.

Latent heat

Heat associated with moisture removal during summer air conditioning.

Load calculation

This is the process of considering all variables involved: site, envelope, design conditions, occupants, and other factors to determine the system requirements of a structure to provide the optimal comfort and efficiency.   At a minimum, you will find the winter and summer sensible loads and the summer latent load in Btuh.   Ideally, a "Room-by-room" load is run to determine the individual room loads for optimal comfort and efficiency.

Low-e

Low emittance glass - this glass has a coating or a composition which decreases its effective U-value.

Outdoor Design Temperature

This is the temperature which is exceeded only 2.5% of the time. Winter - below this temperature and Summer - above this temperature.

Poor (envelope)

No infiltration barrior, cracks and penetrations unsealed, leaky windows or doors, leaky ductwork, no dampers on vent fans, etc.

Poor (fireplace)

Indoor air for combustion, no damper.

R-value

This is the resistance to the flow of heat of a material.

Sensible heat
Heat associated with the actual temperature change due to heat loss and gain.

Shareware

This is a type of distribution method for software.   Usually less expensive than software distributed through retail outlets due to savings in distribution method. (see Shareware section for a more detailed description)

T.I.M.

Thermally insulated frame which some windows have.   Inner and outer frame design with a thermal break between to retard heat transmission.

Ton

Used here to refer to cooling capacity equal to 12,000 Btu per hour.

U-value

This is the transmission coefficient of a material. It is expressed in Btuh/sq.ft degree Fahrenheit.   It is the reciprocal of r-value.