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Construction Cost Analysis
Residential Construction Demonstration Project
Cycle II

June 1990

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MASTER *tb*

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EXECUTIVE SUMMARY

The Pacific Northwest is promoting the conservation of energy as the primary energy resource. In the residential building sector, energy-efficient new construction standards, known as the Model Conservation Standards (MCS), have been proposed, and a demonstration project (Residential Construction Demonstration Project (RCDP)) has been underway to implement MCS features, while exploring new innovations in energy efficiency. RCDP provides a testing ground for energy efficient technologies. Innovations that prove consistently effective may be incorporated into the MCS in the future or in programs such as Super GOOD CENTS (SGC) that promote MCS.

RCDP is sponsored by the Bonneville Power Administration (BPA) with administration provided by the Washington State Energy Office (WSEO), and local project implementation by each of the State Energy Offices of Oregon, Idaho, and Montana.

The first cycle of RCDP occurred during 1986-1987 and included building 165 homes with various mechanical ventilation and envelope innovations installed. Each home was built to the MCS and had at least one of the following innovations: (1) advanced drywall approach (ADA), (2) air-to-air heat exchanger (AAHX), (3) exhaust air heat pump (EAHP), (4) high R-value in walls, and (5) prepackaged modular homes (PMH).

A second cycle occurred during 1988-89. Results from the second cycle are presented in this paper. One hundred seventy-seven homes were built under Cycle II. Much like Cycle I, contractors chose from a menu of innovations. There were three general innovations: (1) energy efficient appliances, (2) air-leakage control, and (3) future house (a future house is an MCS house with 30 percent more energy efficiency). There were also two heat recovery ventilation innovations: (1) low cost AAHX, and (2) low cost EAHP; and five non-heat recovery ventilation (NHRV) options: (1) integrated spot and whole house design, (2) ducted central exhaust design, (3) discrete spot and whole house design, (4) forced air heating/cooling system, and (5) innovative design. A more detailed description of the innovations can be found in each section of the component cost analysis. Data were collected for some of the building components, while window cost data were required from all buildings.

This paper reports on the incremental costs for windows, ceiling and wall insulation, and the total costs of mechanical ventilation systems, and efficient appliances, from data provided from the 177 homes participating in the project. In this report, the costs associated with building energy-efficient homes using real data compiled by builders and their subcontractors are examined. Energy data will be presented in a different report.

All four states participating in RCDP were represented in the analysis of 177 homes: 27 from Idaho (15 percent), 21 from Montana (12 percent), 56 from Oregon (32 percent), 71 from Washington (40 percent), and 2 from Wyoming (1 percent). All the homes in the sample were energy-efficient homes, no "control" group of less well insulated homes was included in this project.

The data were separated into five areas of analysis: (1) window costs, (2) envelope measures (insulation), (3) non-heat recovery ventilation (NHRV), (4) heat recovery ventilation (HRV), and (5) energy efficient appliances. The analysis emphasizes median costs, for they are generally less susceptible to the influence of outlying or unusual values in the sample than in the mean; and therefore, better at representing the central tendency of the sample.

Because of the variety of cost information and analysis, it is difficult to summarize the major conclusions. In any event, those conclusions should be drawn from the various tables presented throughout the text. By examining the tables, the reader can understand the findings contained in this report.

INTRODUCTION

The Residential Construction Demonstration Project (RCDP) is designed to demonstrate new residential building techniques and product innovations which advance the state-of-the-art in constructing energy-efficient electrically heated residences. A secondary purpose is to obtain documented cost and energy savings data from which to make accurate assessments of the cost-effectiveness of various conservation innovations. Bonneville Power Administration (BPA) operates the project in conjunction with the Washington State Energy Office (WSEO) and the State Energy Offices of Idaho, Montana, and Oregon.

The project solicits participation of regional homebuilders by offering them financial incentives for constructing homes to the Model Conservation Standards (MCS) and including at least one "innovation." The innovations are determined by BPA and the States prior to construction and represent construction techniques or energy saving products that might reduce the cost of building MCS homes, or expand the options available to builders in achieving MCS levels of energy efficiency in homes.

Besides covering some of the additional risk for employing the innovation, the incentive payment guarantees that builders will provide certain amounts of information regarding the cost and acceptability of building the homes. In addition, an incentive is paid to homeowners for their participation in data collection efforts following construction. Several "one-time" tests were performed on the houses and homeowners were required to report energy consumption and temperature data on a weekly basis for approximately 18 months.

BPA and the States compile the information obtained from the builders and homeowners. Access to this data is provided for the purpose of analyzing the cost and performance of the RCDP homes, as well as understanding the value of the various innovations that are tested. BPA intends to provide the results of the data analyses to builders and utilities thereby transferring the technical knowledge gained through the project directly into the hands of the shelter industry. Cycles I and II of the project are operated over a 2-year period, with the first year devoted to selection of innovations, developing specifications for their installation, recruiting builders, and constructing the homes. The second year involves collecting and analyzing the data. This 2-year cycle can then be repeated as often as necessary to investigate new innovations.

The first cycle of RCDP (Cycle I) was begun in October 1985. By October 1986, most of the 165 homes constructed during the cycle were completed and occupied. Monitoring of these homes for energy consumption began in December 1986, although not all homes were fully instrumented until March 1987. For this reason, thermal monitoring continued for an additional 8 months and ended in April 1988. By this date all information was available for data analysis. The following innovations were offered: (1) airtight drywall approach (ADA), (2) high R-value walls, (3) exhaust air heat pumps (EAHP), (4) air-to-air heat exchangers (AAHX), incorporating air tempering, and (5) prepackaged modular homes (PMH).

Homes built under Cycle II of the RCDP were completed in early 1988. Data collection will be completed by June 1990. In Cycle II, a slightly different set of innovations was offered. They include: (1) appliances, (2) air leakage control, (3) future house, (4) low cost AAHX, (5) EAHP, and (6) five non-heat recovery ventilation options including innovative design.

Analysis of the Residential Standards Demonstration Project (RSDP) suggests that at least 60 percent of total electric consumption is used for water heating, appliances, and other uses. So one of the objectives of RCDP Cycle II was to better define the energy savings realized by installing energy efficient appliances and water heaters.

III. ANALYTICAL CONTRIBUTIONS

This report presents the basic results of data analysis for the costs collected during RCDP Cycle II on a regional basis. It was our intention to complete this analysis at this level of detail so that results would be made available soon after the completion of the project. We are confident, however, that many readers will be interested in examining more specific questions using the detailed data which was originally collected. Therefore, BPA has established a procedure to provide data in computer-ready form for analysis and to publish any analyses completed by others in a later version of this report. This procedure is described in more depth in the following paragraphs.

The basic data analyzed in this report are shown in the various appendices. The data are arranged in Lotus 1-2-3 spreadsheets. The appendices are copies of the printed versions of these spreadsheets. They contain most of the raw data originally collected and some new variables which were calculated from the raw data. Copies of these spreadsheets on 5 1/4 inch floppy diskettes may be obtained from BPA by writing Cole Barnett at the address indicated at the end of this section.

If after receiving the diskette, anyone completes an analysis covering some aspect of the data which is unique from that contained in this report, that analysis may be sent to BPA for inclusion in a later version of this report. All analyses received by August 31, 1990, will be included. If any contributions are made BPA will reissue this report soon after that date with all contributions published in a section entitled Additional Contributions.

Analyses sent to BPA should conform to the following general format.

- I. Title of Analysis, Author, Organization
- II. Procedure for Analysis
- III. Results of Analysis
- IV. Summary of Analysis, including what was done and what was found

The exact format may vary according to the specific questions addressed or the technique used in the analysis. The format indicated above represents the minimum requirements in order for readers to understand what was accomplished. It is not our intention to make the "reporting" requirements difficult. We are more interested in presenting the most comprehensive set of analyses of the data possible.

Please send all analysis contributions to.

Cole Barnett
Bonneville Power Administration
P.O. Box 3621 - RMRD
Portland, Oregon 97208-3621

Questions and requests for data diskettes may be directed to Cole Barnett (503) 230-5492.

IV. GENERAL ANALYSIS PROCEDURE

This section describes the basic analysis procedures common to all of the analyses. Procedures specific to a particular analysis are detailed in the first part of the Components section.

A Residential Construction Cost Manual were developed by WSEO to collect cost data for Cycle II. Cost data were collected on specific innovations being installed and for those innovations which exceeded the Super Good Cents (SGC) path. The manual served as the tool for the builders to report information on the energy-efficient measures they installed. Prior to the construction of the home, cost manuals were customized for each builder. They contained only the pages that the builder needed to fill out based on the innovation selected and other unique features. The window schedule was required for all homes and was included in all packages. A copy of the complete cost manual can be found in Appendix A. It was necessary for the builder to complete the cost manual and mail it to WSEO prior to the site visit to be eligible for the incentive. The site visit was conducted by the state energy offices (SEO) or their designees. The SEO's then entered the data into the data base to help identify missing and/or out of bounds raw data. Any problems were solved before or during the site visit. Builders received payment after this stage was complete.

The manuals contained two major sections - Building components and Innovations. Each of these sections was broken up into individual items. Building components contained cost information on :

- Below grade walls with interior insulation
- Below grade walls with exterior insulation
- Below grade walls with All Weather Wood Foundations (AWWF)
- Slab with perimeter insulation
- Slab with entire insulation
- Floor over unconditioned space
- Ceiling
- Above grade wall
- Window Schedule

The Innovation cost information was divided into three groups, general innovations, heat recovery ventilation (HRV), and non-heat recovery ventilation (NHRV). The following is a list of innovations offered:

General Innovations:

- Energy efficient appliances
- Air-leakage control
- Future house

Heat Recovery Ventilation Options:

- Air-to-Air Heat Exchanger (AAHX)
- Exhaust Air Heat Pump (EAHP)

Non-Heat Recovery Options:

- Option 1 - Integrated spot and whole house design.
 - Option 2 - Ducted central exhaust design.
 - Option 3 - Discrete spot and whole house design.
 - Option 4 - Forced air heating/cooling system integrated design.
- Innovative Design

These will be discussed in more detail in the individual component cost analysis sections.

Once received by BPA, the data set was converted into a mainframe Statistical Analysis System (SAS) data base file. Electronic Data Services (EDS) contract personnel created a program for retrieval known as the "RCDP Data Acquisition System" or "RDAS". RDAS enables persons unfamiliar with the mainframe SAS environment access to the data base. It is operated from a personal computer (PC) SAS program. The program uses a series of menus to write a code that the mainframe SAS environment can understand and use to download data in various formats.

Cost data were selected, with the help of the RDAS program, and downloaded to a format that was translatable into Lotus 1-2-3 spreadsheets. The data was converted to spreadsheet files with the final format adjusted within the Lotus 1-2-3 software.

Several new variables were created just prior to downloading within RDAS to better fit the needs of the analysis. These variables were generally summations of individual costs. They provide the complete cost values that are needed to develop summary-type information for each component.

V. COMPONENT COST ANALYSIS

There are five components of RCDP homes discussed in this report. They include windows, insulation costs for ceilings and walls, NHRV, HRV, and energy-efficient appliances.

Each section contains the content, variable descriptions, analysis procedures, any conclusions, and relevant tables and graphs.

Throughout this section, tables are presented to summarize the data contained in the various cost spreadsheets. All tables include the sample size, mean, standard deviation, median, minimum and maximum values, for the category examined.

The data spreadsheets from which these results were developed are shown in their entirety in the Appendices. The reader is invited to examine the data if more specific analysis is desired.

The following tables are presented:

<u>TABLE NUMBER</u>	<u>TITLE</u>	<u>PAGE</u>
1a	Window - Cost Analysis (complete & filtered, by window data)	10
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A. Window Analysis

All builders were required to complete the window schedule contained in the cost manual. This provided specific information on the characteristics and costs of the glazing portion of the building. The manual requested the following data:

- Builder
- Site address
- Manufacturer and Model number
- Window Orientation
- Codes regarding location within house (Window number & Plan symbol)
- Quantity
- Rough opening width, height, and square foot of each window.
- Total square foot (sqft of each window x quantity)
- Air gap
- Tested U-Value
- Frame type and thermal break
- Low E indicator
- Gas type
- Window cost

A copy of the window schedule can be found in Appendix A, page 11 of the Cost Manual. A complete copy of the window cost data base can be found in Appendix B. A normalized cost (cost/total sqft) was calculated for each line of data for use in all of the analyses.

Two methods were used to analyze the window cost data. The first method looks at the data on a line by line (or by window basis). Each home's data contained more than one line of data due to differences in size and characteristics (manufacturer, model, frame...). The results for this analysis are referred to as "complete, by window data". The second method combined data for windows of similar class and frame type for each home. In most cases we succeeded in condensing the variety of window sizes into one or two lines of data for each home. The results for this analysis are referred to as the "complete, by home data".

These two major methods were repeated again with a filtered data base. The filters used for these latter analyses included (1) separating out skylight and site built windows (site built are windows that are constructed at the site, opposed to being pre-made in a factory), (2) removal of all door manufacturers, (3) the removal of windows with a normalized cost of less than \$1.00, and (4) the removal of windows with less than 4 square feet in area. The results are referred to as the "filtered, by window data" and "filtered, by home data" analyses respectively.

All data sets and tables are sorted by class. The following gives the U-value range of each class:

- Less than 0.41 - Class 40
- 0.41 thru 0.50 - Class 50
- 0.51 thru 0.60 - Class 60
- 0.61 thru 0.65 - Class 65
- 0.66 thru 0.75 - Class 75

The range for class 75 extended from 0.61 through 0.75 when no data fell into the class 65 range.

Table 1a presents a simple analysis on the cost per square foot for both the complete and filtered, by window data.

TABLE 1a
RCDP CYCLE 11 WINDOW COST ANALYSIS

FRAME TYPE:	# OF WNDWS	MEAN	MEDIAN	STD DEV	MIN	MAX

COMPLETE, BY WINDOW DATA						
=====						
WOOD						
=====						
CLASS 40:	410	\$18.99	\$16.83	\$9.16	\$4.16	\$87.68
CLASS 50:	395	\$13.71	\$12.02	\$10.74	\$2.02	\$77.86
CLASS 60:	35	\$18.82	\$15.25	\$15.26	\$10.10	\$23.33
=====						
VINYL						
=====						
CLASS 40:	240	\$10.76	\$9.22	\$6.27	\$0.25	\$38.40
CLASS 50:	167	\$7.04	\$6.58	\$2.64	\$2.59	\$14.58
CLASS 60:	34	\$8.98	\$8.58	\$3.27	\$5.09	\$20.21
=====						
METAL						
=====						
CLASS 40:	251	\$8.45	\$7.64	\$3.54	\$0.97	\$26.70
CLASS 50:	149	\$13.16	\$8.48	\$12.86	\$2.39	\$68.56
CLASS 60:	360	\$9.45	\$8.13	\$4.91	\$0.92	\$35.00
CLASS 65:	16	\$10.42	\$6.23	\$8.22	\$4.72	\$29.03
CLASS 75:	30	\$11.54	\$9.17	\$5.27	\$4.71	\$17.80

FILTERED, BY WINDOW DATA						
=====						
WOOD						
=====						
CLASS 40:	397	\$18.85	\$16.83	\$8.00	\$4.42	\$62.20
CLASS 50:	284	\$16.67	\$14.91	\$9.27	\$2.50	\$77.86
CLASS 60:	25	\$14.44	\$13.71	\$4.90	\$10.10	\$33.06
=====						
VINYL						
=====						
CLASS 40:	203	\$10.73	\$9.57	\$6.13	\$4.05	\$38.40
CLASS 50:	156	\$6.76	\$6.57	\$2.39	\$2.59	\$14.49
CLASS 60:	34	\$8.98	\$8.57	\$3.27	\$5.09	\$20.21
=====						
METAL						
=====						
CLASS 40:	246	\$8.43	\$7.64	\$3.50	\$2.71	\$26.70
CLASS 50:	111	\$12.44	\$9.50	\$7.30	\$5.36	\$42.48
CLASS 60:	345	\$9.06	\$8.10	\$4.06	\$2.04	\$34.00
CLASS 75:	33	\$8.40	\$5.68	\$5.98	\$4.71	\$29.03
=====						

Table 1b presents the average mean and median cost results on each class for the complete, by window data.

TABLE 1b
AVERAGE RESULTS BY CLASS

	N	MEAN	MEDIAN
CLASS 40	901	\$13.52	\$10.87
CLASS 50	711	\$12.00	\$8.45
CLASS 60	429	\$10.12	\$8.53
CLASS 65	16	\$10.42	\$6.23
CLASS 75	30	\$11.54	\$9.17

Table 1c presents the median deltas and the cumulative deltas for each class and frame type for both the complete and filtered, by window data. These values represent the difference in cost between classes (e.g. class 50 wood framed windows are \$4.81/sqft. less expensive than class 40 wood framed windows. Similarly, class 60 wood frame windows are \$3.23/sqft. more expensive than class 50 wood frame window).

TABLE 1c
MEDIAN & CUMULATIVE DELTAS

	MEDIAN DELTAs			CUMULATIVE DELTAs		
	FRAME TYPE:			FRAME TYPE:		
	WOOD	VINYL	METAL	WOOD	VINYL	METAL
COMPLETE, BY WINDOW DATA						
CLASS 40:						
CLASS 50:	\$4.81	\$2.64	(\$0.84)	\$4.81	\$2.64	(\$0.84)
CLASS 60:	(\$3.23)	(\$2.00)	\$0.35	\$1.58	\$0.64	(\$0.49)
CLASS 65:			(\$1.04)			(\$1.53)
CLASS 75:			(\$2.94)			(\$4.47)
FILTERED, BY WINDOW DATA						
CLASS 40:						
CLASS 50:	\$1.92	\$3.00	(\$1.86)	\$1.92	\$3.00	(\$1.86)
CLASS 60:	\$1.20	(\$2.00)	\$1.40	\$3.12	\$1.00	(\$0.46)
CLASS 75:			\$2.42			\$1.96

Table 1d presents weighted deltas for the median cost values for the complete, by window data. It also contains a cumulative column which is based on the median deltas displayed in table 1c.

The numbers were calculated from the individual median deltas (found in table 1c or Appendix C) for each class and frame type. The values were weighted to make the resulting costs close to the general practice (for Oregon), and added together to create the median deltas.

Here you can see a median class 50 window costs less than a median class 40 window by \$2.25.

TABLE 1d
WEIGHTED COST DIFFERENCES

	WEIGHTING VALUES			MEDIAN DELTAs	CUMULATIVE DELTAs
	WOOD	VINYL	METAL		
CLASS 40:	30%	50%	20%		
CLASS 50:	33%	33%	33%	\$2.25	\$2.25
CLASS 60:	10%	10%	80%	\$0.05	\$2.30
CLASS 65:	0%	0%	100%	\$2.66	\$4.96
CLASS 75:	0%	0%	100%	(\$2.94)	\$2.02

Table 2 presents the costs for site built and skylight windows. These results were taken from the filtered, by home data.

TABLE 2
ANALYSIS ON SKYLIGHTS AND SITE BUILT DATA

	# OF BLDGs	MEAN	MEDIAN	STD DEV	MIN	MAX
SKYLIGHTS	31	\$19.72	\$20.19	\$10.74	\$6.83	\$45.65
SITE BUILT	140	\$3.93	\$3.06	\$4.41	\$2.02	\$44.70

Table 3a presents a simple analysis on the cost per square foot for both the complete and filtered, by home data. The previous reports 1a, 1b, 1c, and 1d (or by window data) were redone using a modified set of the data. The modification to the data included combining costs for each line of data with the same class, frame type and home number. This data is referred to as the "by home" data, while the previous data is labeled "by window" data.

TABLE 3a
RCDP CYCLE II WINDOW COST ANALYSIS

FRAME TYPE:	# OF BLDGS	MEAN	MEDIAN	STD DEV	MIN	MAX

COMPLETE, BY HOME DATA						
=====						
WOOD						
=====						
CLASS 40:	33	\$16.21	\$18.56	\$5.65	\$4.16	\$26.85
CLASS 50:	49	\$13.11	\$12.63	\$11.96	\$2.39	\$64.44
CLASS 60:	6	\$32.24	\$15.09	\$25.45	\$10.93	\$83.33

VINYL						
=====						
CLASS 40:	18	\$8.57	\$9.16	\$3.45	\$2.96	\$16.02
CLASS 50:	22	\$7.31	\$6.54	\$2.12	\$5.01	\$12.32
CLASS 60:	5	\$8.86	\$7.78	\$2.08	\$7.01	\$12.62

METAL						
=====						
CLASS 40:	41	\$8.71	\$7.52	\$4.15	\$5.36	\$25.07
CLASS 50:	20	\$9.83	\$8.59	\$5.48	\$2.39	\$23.63
CLASS 60:	46	\$8.93	\$8.33	\$4.49	\$3.84	\$24.92
CLASS 65:	4	\$14.72	\$5.42	\$9.86	\$5.42	\$29.03
CLASS 75:	12	\$14.03	\$5.82	\$4.45	\$5.26	\$17.80
=====						
FILTERED, BY HOME DATA						

WOOD						
=====						
CLASS 40:	30	\$17.24	\$18.56	\$4.59	\$8.01	\$26.85
CLASS 50:	31	\$16.02	\$13.65	\$6.94	\$2.50	\$33.50
CLASS 60:	3	\$13.46	\$14.38	\$1.82	\$10.93	\$15.09

VINYL						
=====						
CLASS 40:	18	\$8.68	\$9.57	\$2.85	\$5.15	\$16.02
CLASS 50:	19	\$6.60	\$6.54	\$1.21	\$5.01	\$8.87
CLASS 60:	5	\$8.86	\$7.78	\$2.08	\$7.01	\$12.62

METAL						
=====						
CLASS 40:	39	\$8.62	\$7.74	\$4.17	\$5.36	\$25.07
CLASS 50:	14	\$10.92	\$8.89	\$4.09	\$5.86	\$20.86
CLASS 60:	45	\$8.57	\$8.33	\$4.09	\$2.71	\$24.92
CLASS 75:	7	\$12.54	\$5.42	\$8.73	\$5.26	\$29.03
=====						

Table 3b presents the average mean and median cost results on each class for the complete, by home data.

TABLE 3b
ALL INCLUSIVE AVERAGE RESULTS

	N	MEAN	MEDIAN
CLASS 40:	92	\$11.37	\$10.42
CLASS 50	91	\$10.99	\$8.40
CLASS 60	57	\$11.38	\$8.49
CLASS 65	4	\$14.72	\$5.42
CLASS 75	12	\$14.03	\$5.82

Table 3c presents the median deltas and the cumulative deltas for each class and frame type for both the complete and filtered, by home data. These values represent the difference in cost between classes (i.e. the cost difference between class 50 and class 40 wood frame would be \$5.93/sqft. less for class 50).

TABLE 3c
MEDIAN & CUMULATIVE DELTAS

	MEDIAN DELTAs FRAME TYPE:			CUMULATIVE DELTAs FRAME TYPE:		
	WOOD	VINYL	METAL	WOOD	VINYL	METAL
COMPLETE, BY HOME DATA						
CLASS 40:						
CLASS 50:	\$5.93	\$2.62	(\$1.07)	\$5.93	\$2.62	(\$1.07)
CLASS 60:	(\$2.46)	(\$1.24)	\$0.26	\$3.47	\$1.38	(\$0.81)
CLASS 65:			\$2.51			\$1.70
CLASS 75:			(\$0.40)			\$1.30
FILTERED, BY HOME DATA						
CLASS 40:						
CLASS 50:	\$4.91	\$3.03	(\$1.15)	\$4.91	\$3.03	(\$1.15)
CLASS 60:	(\$0.73)	(\$1.24)	\$0.56	\$4.18	\$1.79	(\$0.59)
CLASS 75:			\$2.91			\$2.32

Table 3d presents weighted deltas for the median cost values for the complete, by home data. It also contains a cumulative column which is based on the median deltas. The numbers were calculated from the individual median deltas for each class and frame type. The data was weighted as described for table 1d.

TABLE 3d
WEIGHTED COSTS

	WEIGHTING VALUES			MEDIAN DELTA _s	CUMULATIVE DELTA _s
	WOOD	VINYL	METAL		
CLASS 40:	30%	50%	20%		
CLASS 50:	33%	33%	33%	\$2.49	\$2.49
CLASS 60:	10%	10%	80%	\$0.21	\$2.70
CLASS 65:	0%	0%	100%	\$3.53	\$6.23
CLASS 75:	0%	0%	100%	(\$0.40)	\$5.83

B. Insulation Analysis

Various insulation information was collected with the help of the cost manual. The analyses presented in this section are costs associated with ceiling and wall insulation. The forms used to collect this information can be found on pages 2 through 10 of the cost manual. A copy of the cost manual can be found in Appendix A.

Cost information for insulation was only required if the builder exceeded the base case, illustrative levels of the MCS for the specific climate zone. Due to the lack of response in other types of insulation cost, only ceiling and wall data were analyzed. A normalized cost (cost per square foot) was calculated for each line of data. The data were then sorted into various categories.

Ceiling Insulation Analysis:

Data used for the ceiling analysis includes:

- House identification (contract #)
- Zone
- WATTSUN Code and description
- Area
- Reference Cost
- Total Cost

A copy of the ceiling cost data base can be found in Appendix F.

The reference cost is the estimate of materials and labor for a standard framed R-38 ceiling of the same type. This is considered the base case. Builders insulated ceilings above base case levels in 10 different ways. Incremental costs for each of these ways was determined by subtracting the cost of installing a particular level of insulation from the base case.

Table 4 presents the ceiling insulation cost analysis results. The data was grouped in ten categories, or ceiling descriptions. All values on the table are incremental costs per square foot of ceiling. Costs in parenthesis are negative values, meaning a cost decrease from the base case.

TABLE 4
INCREMENTAL CEILING COST ANALYSIS

CEILING DESCRIPTION	N	Mean	Median	Min	Max
R-38 standard, joist/truss	5	\$0.07	\$0.00	\$0.00	\$0.22
R-30 vaulted & R-49 2x6	1	\$0.12		\$0.12	\$0.12
R-38 advanced, joist/truss	9	\$0.10	\$0.09	(\$0.81)	\$1.03
R-40 standard	1	\$0.02		\$0.02	\$0.02
R-44 approximately, various methods	3	\$0.64	\$0.53	\$0.27	\$1.10
R-49 advanced, 2x6 joist or 2x4 truss	19	\$0.27	\$0.21	(\$1.09)	\$1.56
R-49 standard, joist/truss	9	\$0.42	\$0.17	\$0.11	\$2.26
R-60 advanced, 2x6 joist	11	\$0.42	\$0.47	(\$0.66)	\$1.09
R-60 standard, joist/truss	2	\$0.47	\$0.47	\$0.46	\$0.48
mixture	9	\$0.91	\$0.51	(\$0.79)	\$4.81
TTL CASES	69				

Wall Insulation Analysis:

Data used for the wall analysis include:

House identification (contract #)
Zone
WATTSUN Code and description
Area
Total cost
Reference cost

A copy of the wall cost database can be found in Appendix G.

The reference cost is the estimate of materials and labor for a standard framed (2x6) R-19 wall of the same type. This is considered the base case. Builders insulated walls above base case levels in 18 different ways. Incremental costs for each of these ways was determined by subtracting the base case from the cost of installing this particular level of insulation.

Table 5 presents the wall insulation cost analysis results. The data were grouped in eighteen categories, or wall descriptions, varying in framing, R-value, insulation types and/or methods. All values on the table are incremental costs per square foot wall area. Costs in parenthesis are negative values, meaning a cost decrease from the base case.

TABLE 5
INCREMENTAL WALL COST ANALYSIS

WALL DESCRIPTIONS	N	Mean	Median	Min	Max
2x4 R-13 standard + R-7.2 sheath	2	\$0.58	\$0.58	\$0.47	\$0.69
2x6 R-19 batt/standard	1	\$0.00		\$0.00	\$0.00
2x6 R-19 batt/advanced	3	\$0.05	\$0.07	(\$0.15)	\$0.23
2x6 R-22 batt/standard	6	\$0.11	\$0.13	(\$0.23)	\$0.34
2x6 R-22 batt/advanced	22	\$0.14	\$0.06	(\$0.08)	\$0.83
2x6 R-19 std + R-5 sheathing	2	\$2.13	\$2.13	\$1.01	\$3.24
2x6 R-19 adv + R-5 sheathing	1	\$0.24		\$0.24	\$0.24
2x6 R-19 std + R-7.2 sheathing	4	\$0.50	\$0.51	\$0.26	\$0.72
2x6 R-19 adv + R-7.2 sheathing	5	\$1.12	\$0.32	\$0.21	\$4.34
Double 2x4 advanced R-19 + R-11	1	\$0.67		\$0.67	\$0.67
Dble 2x4 advanced R-11 + R-19 + R-11	2	\$0.97	\$0.97	\$0.92	\$1.01
MIXED	3	\$0.88	\$0.54	\$0.22	\$1.86
R-22	2	\$0.66	\$0.66	\$0.62	\$0.71
R-29	1	\$0.76		\$0.76	\$0.76
R-36	4	\$1.64	\$1.75	\$0.85	\$2.20
R-41	1	\$0.32		\$0.32	\$0.32
R-45	1	\$1.09		\$1.09	\$1.09
R-48	1	\$0.70		\$0.70	\$0.70
TTL CASES	62				

C. Non-Heat Recovery Ventilation Analysis

The Non-Heat Recovery Ventilation (NHRV) section of the cost manual can be found on pages 17 through 21. A copy of the cost manual can be found in Appendix A.

Five different NHRV innovations were used. This included four options and one innovative design category. The options involved specific requirements essentially identical to the 1987 SGC specifications. The fifth type did not meet any particular requirements and was improved on an individual basis.

Active mechanical ventilation systems were designed and installed with a goal of providing adequate fresh air in these homes. SGC specifications required the systems (options 1 thru 4) to provide a minimum of 10 CFM fresh air to each bedroom and one combined living space, a whole house exhaust fan with a flow rate equal to fresh air intake requirements, and have a spot ventilation of 100 CFM for the kitchen and 50 CFM for each bathroom.

Option #1 is an integrated spot and whole house design. This is a system which uses one or more of the spot ventilation fans (usually a bathroom fan) to provide whole house exhaust capabilities.

Option #2 is a ducted central exhaust design. This system uses a single large multi-speed exhaust fan ducted to baths, and kitchen to provide both whole house and spot ventilation.

Option #3 is a discrete spot and whole house design. This system uses separate fans and control systems to provide both spot and whole house ventilation.

Option #4 is a forced air heating/cooling system integrated design. In this system, spot ventilation is provided through bath and kitchen exhaust fans, but whole house ventilation and make up air are provided through integration with the forced air heating/cooling system.

The innovative design option was added to encourage new ideas in ventilation. It was required that the systems satisfy the intent of the SGC technical specifications.

The information used in the cost analyses for all system types included the following:

- House identification
- Innovation description
- Innovation number
- Manufacturer
- Model
- CFM
- Sone ratings
- Material costs
- Labor costs

The CFM and Sone ratings were obtained from the Home Ventilating Institute (HVI) certified products directory. The listings use ratings provided by the manufacturer.

In addition, the following information was also used in some of the analyses:

- Kitchen and bath fan savings
- Control descriptions
- Control material costs
- Hardware and wiring material costs
- Hardware and wiring labor costs
- Ductwork material costs
- Ductwork labor costs
- Furnace make-up material costs
- Furnace make-up labor costs
- Make-up air/thru wall material costs
- Make-up air/thru wall labor costs
- Make-up air/inlet manufacturer
- Make-up air/inlet model
- Make-up air/inlet quantity
- Backdraft damper description
- Backdraft damper material cost
- Backdraft damper labor cost
- Other description
- Other labor costs
- Other material costs
- Total fan costs
- Total ventilation costs
- Comments
- Concept description

A copy of the data base used is in Appendix H.

The data was separated and sorted for the variety of analyses completed. Results are displayed in Tables 6 through 14. These tables represent the total costs for the various analyses. More complete costs are found in Appendix I. The tables found there contain not only total costs but separate values for material and labor costs.

Table 6 presents the cost data of NHRV fan costs by manufacturer. Manufacturers such as Aubrey, Broan, and Nutone monopolized our data set.

TABLE 6
TOTAL NHRV FAN COSTS BY MANUFACTURER

MANUFACTURER	N	MEAN	MEDIAN	STD DEV	MIN	MAX

ALDES	7	\$561.69	\$472.58	\$251.72	\$292.00	\$905.00
ASTON	4	\$247.80	\$247.80	\$0.00	\$247.80	\$247.80
AUBREY	60	\$35.79	\$29.50	\$17.66	\$20.00	\$117.75
BROAN	71	\$53.60	\$47.00	\$28.99	\$12.65	\$155.00
DAYTON	3	\$256.00	\$256.00	\$0.00	\$256.00	\$256.00
FASCO	1	\$30.00		\$0.00	\$30.00	\$30.00
HONEYWELL	1	\$140.00		\$0.00	\$140.00	\$140.00
KENMORE	2	\$51.00	\$51.00	\$0.00	\$51.00	\$51.00
NUTONE	40	\$98.65	\$60.00	\$96.60	\$27.00	\$423.00
RANGAIRE	2	\$52.00	\$52.00	\$2.00	\$50.00	\$54.00
ROPER	2	\$601.50	\$601.50	\$500.50	\$101.00	\$1,102.00
UTILITY	1	\$85.40		\$0.00	\$85.40	\$85.40
WHIRLPOOL	5	\$56.00	\$55.00	\$2.00	\$55.00	\$60.00

ALL	199	\$88.11	\$50.50	\$140.88	\$12.65	\$1,102.00

Table 7 presents the NHRV cost data by the manufacturers that monopolized our data set. The data for each manufacturer is grouped by flow rate.

TABLE 7
TOTAL NHRV FAN COSTS BY MOST POPULAR MANUFACTURER

MANUF/ FLOW RATE	N	MEAN	MEDIAN	STD DEV	MIN	MAX

AUBREY						

50	43	\$29.35	\$22.00	\$13.18	\$20.00	\$79.00
70	13	\$48.92	\$47.00	\$7.07	\$29.00	\$56.00
80	2	\$36.07	\$36.07	\$7.07	\$29.00	\$43.13
110	1	\$117.75		\$0.00	\$117.75	\$117.75
180	1	\$38.00		\$0.00	\$38.00	\$38.00

BROAN						

50	20	\$33.00	\$23.00	\$26.95	\$12.65	\$112.65
70	8	\$70.75	\$65.00	\$28.52	\$47.00	\$135.00
80	9	\$68.89	\$65.00	\$13.08	\$50.00	\$90.00
100	2	\$98.00	\$98.00	\$57.00	\$41.00	\$155.00
160	2	\$61.20	\$61.20	\$7.70	\$53.50	\$68.90
180	17	\$44.12	\$42.00	\$8.47	\$42.00	\$78.00
190	9	\$75.56	\$68.00	\$18.05	\$50.00	\$100.00

NUTONE						

50	22	\$56.04	\$60.00	\$19.10	\$27.00	\$120.00
70	1	\$78.00		\$0.00	\$78.00	\$78.00
80	4	\$74.33	\$70.50	\$32.14	\$37.00	\$119.33
110	11	\$194.44	\$100.20	\$140.56	\$99.95	\$423.00
200	1	\$106.95		\$0.00	\$106.95	\$106.95

Table 8 presents the fan cost data for the NHRV options and innovative design.

TABLE 8
NHRV FAN COSTS BY OPTION

OPTION	N	MEAN	MEDIAN	STD DEV	MIN	MAX

INNOVATIVE DESIGN	12	\$430.46	\$366.23	\$191.63	\$87.00	\$793.25

ONE	43	\$173.15	\$104.00	\$205.94	\$25.00	\$1,282.20

TWO	6	\$462.16	\$318.50	\$297.02	\$106.95	\$905.00

THREE	4	\$102.50	\$95.00	\$27.95	\$75.00	\$145.00

FOUR	26	\$71.35	\$60.00	\$66.34	\$ 12.65	\$291.48

Table 9 presents the NHRV fan costs by sone rating. The sone ratings were extracted from the "Home Ventilating Institute (HVI) Certified Products Directory".

TABLE 9
NHRV FAN COSTS BY SONE RATING

SONE RATING	N	MEAN	MEDIAN	STD DEV	MIN	MAX
1.5	5	\$65.27	\$65.00	\$30.73	\$25.00	\$119.33
2	15	\$28.63	\$12.65	\$32.24	\$12.65	\$112.65
2.5	55	\$52.80	\$30.00	\$54.54	\$20.00	\$256.00
3	5	\$47.18	\$25.00	\$35.98	\$25.00	\$117.75
3.5	24	\$59.00	\$47.00	\$29.25	\$29.00	\$155.00
4	16	\$136.67	\$60.00	\$139.39	\$60.00	\$423.00
5	1	\$78.00		\$0.00	\$78.00	\$78.00
6.5	1	\$50.00		\$0.00	\$50.00	\$50.00
ALL	122	\$62.51	\$47.00	\$72.09	\$12.65	\$423.00

Table 10 presents the NHRV fan costs grouped by CFM (flow rate).

TABLE 10
NHRV FAN COSTS BY CFM RATING

CFM RATING	N	MEAN	MEDIAN	STD DEV	MIN	MAX
50	90	\$45.28	\$29.50	\$45.02	\$12.65	\$256.00
70	22	\$58.18	\$50.50	\$21.24	\$29.00	\$135.00
80	17	\$71.46	\$65.00	\$27.93	\$29.00	\$140.00
100	3	\$367.00	\$155.00	\$383.26	\$41.00	\$905.00
110	12	\$188.05	\$108.98	\$136.23	\$99.95	\$423.00
120	3	\$649.08	\$793.25	\$231.82	\$322.00	\$832.00

(Continued)

NHRV FAN COSTS BY CFM RATING (CONTINUED)

CFM RATING	N	MEAN	MEDIAN	STD DEV	MIN	MAX
*****	*****	*****	*****	*****	*****	*****
150	4	\$247.80	\$247.80	\$0.00	\$247.80	\$247.80
160	7	\$148.43	\$53.50	\$155.70	\$50.00	\$472.58
180	19	\$44.63	\$42.00	\$8.90	\$38.00	\$78.00
190	9	\$75.56	\$68.00	\$18.05	\$50.00	\$100.00
200	1	\$106.95		\$0.00	\$106.95	\$106.95
220	1	\$54.00		\$0.00	\$54.00	\$54.00
250	1	\$315.00		\$0.00	\$315.00	\$315.00
300	5	\$55.00	\$55.00	\$0.00	\$55.00	\$55.00
*****	*****	*****	*****	*****	*****	*****
ALL	194	\$88.82	\$50.25	\$142.53	\$12.65	\$1,102.00
*****	*****	*****	*****	*****	*****	*****

Table 11 presents the NHRV control costs by control combinations. These were all the costs associated with the materials and installation of control devices.

TABLE 11
NHRV CONTROL TOTAL COSTS

CONFIGURATION	N	MEAN	MEDIAN	STD DEV	MIN	MAX
CLOCK TIMERS	21	\$53.48	\$50.00	\$18.66	\$30.00	\$131.14
CLOCK TIMER/DEHUMIDISTATS	1	\$95.70		\$0.00	\$95.70	\$95.70
CRANK TIMERS	4	\$81.52	\$97.85	\$38.05	\$16.59	\$113.80
CRANK TIMERS/CLOCK TIMERS	3	\$206.01	\$172.00	\$60.19	\$155.43	\$290.59
CRANK TIMERS/DEHUMIDISTATS	19	\$124.31	\$117.25	\$33.38	\$67.25	\$191.16
CRANK TIMERS/DEHUMIDISTATS/SWITCHES	1	\$195.00		\$0.00	\$195.00	\$195.00
CRANK TIMERS/DEHUMIDISTATS/SPECIAL RELAY	1	\$222.85		\$0.00	\$222.85	\$222.85
DEHUMIDISTATS	31	\$97.49	\$76.76	\$74.04	\$45.00	\$424.92
SWITCHES	1	\$84.00		\$0.00	\$84.00	\$84.00
SWITCHES/DEHUMIDISTATS	3	\$93.57	\$70.00	\$33.33	\$70.00	\$140.70
SWITCHES/TIMERS (INCOMPLETE TIMER INFO)	1	\$25.00		\$0.00	\$25.00	\$25.00
ALL COSTS	86	\$97.15	\$76.76	\$62.86	\$16.59	\$424.92

Table 12 presents the costs associated with furnace through the wall make-up by manufacturer.

TABLE 12
NHRV FURNACE/THRU WALL MAKE UP TOTAL COSTS

MANUFACTURER	N	MEAN	MEDIAN	STD DEV	MIN	MAX

ALDES	8	\$232.33	\$194.00	\$73.24	\$128.00	\$355.00
ARTIS	1	\$118.25		\$0.00	\$118.25	\$118.25
FRESH 80	32	\$116.66	\$119.00	\$30.63	\$30.00	\$195.09
OTHER	3	\$149.93	\$90.00	\$106.83	\$59.80	\$300.00
SITE BUILT	4	\$51.00	\$55.00	\$6.93	\$39.00	\$55.00
ALL	48	\$132.15	\$123.00	\$68.28	\$30.00	\$355.00

Table 13 presents the costs associated with furnace through the wall make-up by manufacturer on a cost per inlet basis.

TABLE 13
NHRV FURNACE/THRU WALL MAKE UP - ON A PER INLET BASIS

MANUFACTURER	N	# INLETS	MEAN	MEDIAN	STD DEV	MIN	MAX

ALDES	7	33	\$47.66	\$39.25	\$13.06	\$32.00	\$67.50
ARTIS	1	1	\$47.66		\$0.00	\$32.00	\$67.50
FRESH 80	30	107	\$32.96	\$30.33	\$8.62	\$7.50	\$53.33
OTHER	3	6	\$134.98	\$14.95	\$120.64	\$14.95	\$300.00
SITE BUILT	3	12	\$13.75	\$13.75	\$0.00	\$13.75	\$13.75
ALL	43	158	\$41.13	\$32.20	\$42.61	\$7.50	\$300.00

Table 14 presents the costs associated with ductwork and the backdraft damper.

TABLE 14
HRV DUCTWORK AND BACKDRAFT DAMPER TOTAL COSTS

OPTION	N	MEAN	MEDIAN	STD DEV	MIN	MAX

INNOVATIVE DESIGN	11	\$245.16	\$116.20	\$206.65	\$20.00	\$564.91

TWO	5	\$193.29	\$186.21	\$88.15	\$100.00	\$337.76

THREE	1	\$155.00		\$0.00	\$155.00	\$155.00

FOUR	8	\$70.13	\$70.00	\$39.28	\$13.00	\$115.00

ALL	25	\$175.17	\$115.00	\$163.11	\$13.00	\$564.91

D. Heat Recovery Ventilation Analysis

The Heat Recovery Ventilation (HRV) section of the cost manual can be found on pages 15 and 16 in Appendix A.

There were two options to choose from for HRV (1) air-to-air heat exchangers (AAHX), and (2) exhaust air heat pump (EAHP).

HRV's were installed in compliance with the Super Good Cents Specification Appendix A Chapter 4 (April 1987 version). They were required to be UL listed or CSA approved. Attic installations were approved prior to installation. The systems also had to comply with specific specifications for the installation and use of flow measuring stations (FMS). FMS's are short sections of round duct which contain a pilot system for measuring flow-induced pressure differences. This equipment is in place at the time of initial installation and are left there permanently. A flow measurement can be made at any subsequent time by attaching a pressure gauge to the FMS and reading the flow rate directly.

The information used for the analyses included the following:

- House identification
- Innovation description
- Manufacturer
- Model
- HRV material costs
- HRV labor costs
- HRV total costs
- Ductwork material costs
- Ductwork labor costs
- Ductwork total costs
- Control description(s)
- Control material costs
- Hardware and wiring material (or total) costs
- Hardware and wiring labor costs
- Hardware and wiring total costs
- Grill and register material (or total) costs
- Grill and register labor costs
- Grill and register total costs
- Flow measure station material (or total) costs
- Flow measure station labor costs
- Flow measure station total costs
- System balancing labor costs
- Backdraft damper description
- Kitchen and bath fan savings
- Furnace/AAHX integration savings
- Furnace equipment differential
- Make-up air inlet manufacturer
- Make-up air inlet model
- Make-up air inlet quantity
- Make-up air inlet material (or total) costs
- Make-up air inlet labor costs
- Make-up air inlet total costs

(continued)

Remote fan coil material (or total) costs
 Remote fan coil labor costs
 Remote fan coil total costs
 Remote radiant slab material (or total) costs
 Other costs
 All costs
 Comments

A copy of the data base can be found in Appendix J.

The data were separated and sorted in a variety of ways to complete the analyses displayed in Tables 15 through 22. These tables represent only the total costs for the various analyses. More complete costs separated by labor and material can be found in Appendix K.

In all the analyses, AAHX and EAHP were treated separately.

One builder installed an "Earthtube" in combination with a Vent-Aire heat exchanger. In this situation, the Earthtube was a Y-shaped system of 6 inch corrugated sewer pipe with each parallel section extending 50 feet. Each section sloped from ground level to approximately 6 feet below the ground surface, joined together and extended into the basement. The joined section of pipe attached to the intake port of the AAHX. The earthtube system was designed to temper the incoming ventilation air thru heat transfer from the ground. Preliminary thermal analysis indicates that outdoor air of ten degrees farenheit rose to fifty degrees farenheit by the time it reached the intake of the AAHX. The total cost of the system was \$457.00. A fan savings of \$337.50, and a water heater savings of \$190.00 (by not having to install an additional water heater unit) was reported.

Table 15 presents the results of the HRV unit costs

TABLE 15
 RCDP CYCLE II HRV ANALYSIS - AAHX UNIT COSTS

TYPE/ MANUFACTURER	N	MEAN	MEDIAN	STD DEV	MIN	MAX

ALL						
AAHX	19	\$877.14	\$714.00	\$492.29	\$402.00	\$2,480.00

ALL						
EAHP (DEC)	6	\$1,598.37	\$1,542.38	\$171.35	\$1,405.00	\$1,850.00

AAHX						
=====						
NUTONE	2	\$406.50	\$406.50	\$4.50	\$402.00	\$411.00
=====						
VAN EE	13	\$711.36	\$690.00	\$192.70	\$507.00	\$1,135.00
=====						
VENT AIRE	3	\$1,375.00	\$1,400.00	\$54.01	\$1,300.00	\$1,425.00
=====						
NUTECH/ LIFEBREATH	1	\$2,480.00		\$0.00	\$2,480.00	\$2,480.00
=====						

Table 16 presents the costs associated with HRV ductwork. The top two lines present the results for the entire sample separated only by AAHX and EAHP. The last three lines present the AAHX ductwork costs by manufacturer.

TABLE 16
RCDP CYCLE II HRV ANALYSIS - DUCTWORK COSTS

TYPE/ MANUFACTURER	N	MEAN	MEDIAN	STD DEV	MIN	MAX

ALL - AAHX	16	\$543.70	\$413.00	\$476.09	\$85.00	\$1,900.00
ALL - EAHP	6	\$458.93	\$430.00	\$296.10	\$49.46	\$1,000.00

AAHX						
NUTONE	2	\$279.70	\$279.70	\$190.30	\$89.40	\$470.00
VAN EE	12	\$455.40	\$318.00	\$344.99	\$85.00	\$1,101.00
VENT AIRE	2	\$1,337.50	\$1,337.50	\$562.50	\$775.00	\$1,900.00

Table 17 presents the costs for the HRV control materials. The top four lines present the AAHX costs by control type and the bottom section presents the costs, by control type for EAHPs.

TABLE 17
RCDP CYCLE II HRV ANALYSIS - CONTROL MATERIAL COSTS

	N	MEAN	MEDIAN	STD DEV	MIN	MAX

AAHX						
CRANK TIMERS	2	\$40.50	\$40.50	\$10.50	\$30.00	\$51.00
DEHUMIDISTATS	2	\$33.29	\$33.29	\$6.71	\$26.58	\$40.00
DEHUMIDISTATS/ CRANK TIMERS	4	\$46.71	\$50.00	\$22.63	\$12.00	\$74.82
OTHER/UNKNOWN	2	\$22.50	\$22.50	\$7.50	\$15.00	\$30.00

EAHP						
CLOCK TIMER/ SPEED CONTROLS	1	\$80.00		\$0.00	\$80.00	\$80.00
DEHUMIDISTATS	2	\$39.92	\$39.92	\$8.82	\$31.10	\$48.74
OTHER/UNKNOWN	2	\$115.00	\$115.00	\$10.00	\$105.00	\$125.00

Table 18 presents hardware and wiring costs by control type.

TABLE 18
RCDP CYCLE II HRV ANALYSIS - HARDWARE AND WIRING COSTS

	N	MEAN	MEDIAN	STD DEV	MIN	MAX

<u>AAHX</u>						
CRANK TIMERS	2	\$27.50	\$27.50	\$7.50	\$20.00	\$35.00
=====						
DEHUMIDISTATS	1	\$40.00		\$0.00	\$40.00	\$40.00
=====						
DEHUMIDISTATS/ RANK TIMERS	4	\$67.75	\$65.50	\$42.66	\$10.00	\$130.00
=====						
OTHER/UNKNOWN	2	\$36.50	\$36.50	\$8.50	\$28.00	\$45.00

<u>EAHP</u>						
CLOCK TIMER	1	\$230.00		\$0.00	\$230.00	\$230.00
=====						
OTHER/UNKNOWN	1	\$45.00		\$0.00	\$45.00	\$45.00
=====						

Table 19 presents the costs associated with the grills and registers.

TABLE 19
RCDP CYCLE II HRV ANALYSIS - GRILL AND REGISTER COSTS

	N	MEAN	MEDIAN	STD DEV	MIN	MAX

<u>AAHX</u>						
CRANK TIMERS	2	\$78.50	\$78.50	\$38.50	\$40.00	\$117.00
=====						
DEHUMIDISTATS	2	\$60.75	\$60.75	\$23.25	\$37.50	\$83.99
=====						
DEHUMIDISTATS/ CRANK TIMERS	3	\$79.88	\$100.00	\$34.00	\$32.00	\$107.64
=====						
OTHER/UNKNOWN	4	\$97.51	\$116.01	\$32.05	\$42.00	\$116.01

<u>EAHP</u>						
DEHUMIDISTATS	2	\$41.15	\$41.15	\$25.65	\$15.50	\$66.80
=====						

Table 20 presents the average flow measure station costs.

TABLE 20
RCDP CYCLE II HRV ANALYSIS - FLOW MEASURE STATION COSTS

	N	MEAN	MEDIAN	STD DEV	MIN	MAX

AAHX						
CRANK TIMERS	2	\$75.00	\$75.00	\$15.00	\$60.00	\$90.00
DEHUMIDISTATS	2	\$47.50	\$47.50	\$2.50	\$45.00	\$50.00
DEHUMIDISTATS/ CRANK TIMERS	2	\$70.50	\$70.50	\$9.50	\$61.00	\$80.00
OTHER/UNKNOWN	3	\$65.00	\$65.00	\$0.00	\$65.00	\$65.00
DEHUMIDISTATS	1	\$35.00		\$0.00	\$35.00	\$35.00

EAHP						
CLOCK TIMER/ SPEED CONTROLS	1	\$60.00		\$0.00	\$60.00	\$60.00

Table 21 presents the costs associated with system balancing.

TABLE 21
RCDP CYCLE II HRV ANALYSIS - SYSTEM BALANCING COSTS

	N	MEAN	MEDIAN	STD DEV	MIN	MAX

AAHX SYSTEM						
BALANCING COSTS	5	\$30.40	\$25.70	\$21.51	\$10.00	\$72.00

Table 22 presents the insulation and material savings associated with the ventilation type. Savings for AAHXs may include: savings from designs that make the installation of kitchen and/or bath fans unnecessary, or if integration of the AAHX and furnace creates savings by not having to install supply air ductwork from the AAHX to the living space. EAHP savings were also reported for those designs that made kitchen/bath fans unnecessary, and/or for the installation of a domestic hot water tank.

TABLE 22
RCDP CYCLE 11 HRV ANALYSIS - SYSTEM SAVINGS

	N	MEAN	MEDIAN	STD DEV	MIN	MAX

AAHX						

FAN SAVINGS	14	\$173.79	\$135.00	\$125.65	\$28.00	\$400.00
INTEGRATION SVGS	5	\$340.00	\$300.00	\$149.67	\$200.00	\$600.00
TOTAL SVGS	15	\$275.53	\$260.00	\$248.87	\$28.00	\$920.00

EAHP						

FAN SAVINGS	3	\$263.83	\$337.50	\$105.95	\$114.00	\$340.00
WATER HEATING SVGS	4	\$184.99	\$195.00	\$20.64	\$149.95	\$200.00
TOTAL SVGS	4	\$382.86	\$395.73	\$152.64	\$200.00	\$540.00

E. Appliance Efficiency Analyses.

A sample of the information provided is found on page 12 of the cost manual. A copy of the cost manual is found in Appendix A. Cost data were collected for three energy-efficient appliance types, refrigerators, dishwashers, and hot water tanks. Each of these components will be discussed later in the text.

The builder supplied the following information for each appliance:

Manufacturer

Model number

Appliance cost

Energy guide label (EGL) cost rating (estimated yearly operating costs)

Bill of Sale

Dishwasher average electric rate

Water Tank average electric rate

The appliances selected were either from a list of RCDP approved appliances or individually approved in writing by the Washington State Energy Office (WSEO). Builders were required to leave the Energy Guide Label (EGL) attached to the appliance until the final inspection. The appliance's EGL cost rating could not be more than \$2.00 over the EGL rating listed in the approved appliance list. Builders were required to provide a refrigerator, dishwasher, and hot water tank.

Refrigerator cost analysis:

Refrigerators were required to be selected from the current "The Top 15% Energy Efficient Refrigerators and Freezers" brochure, published through the BPA Blue Clue Program. They were installed in the kitchen and required to function as the home's primary refrigeration for the monitoring period.

The results of the refrigerator cost analysis is found in Table 23. Costs of the unit and estimated yearly operating costs were examined. The data base used to produce this report is in Appendix L. Following the table, two graphs are presented. The first graph compares the refrigerator size to its estimated yearly operating costs, and the second graph compares the approximate volume to the cost of the unit.

TABLE 23
RCDP CYCLE 11 APPLIANCE ANALYSIS - REFRIGERATOR COSTS

SIZE (CUFT)	N	MEAN	MEDIAN	STD DEV	MIN	MAX

17						
UNIT COST	1	\$500.00		\$0.00	\$500.00	\$500.00
EST. OPERATING COST	4	\$58.75	\$58.00	\$1.92	\$57.00	\$62.00

18						
UNIT COST	8	\$590.00	\$597.50	\$88.07	\$475.00	\$725.00
EST. OPERATING COST	8	\$60.50	\$61.00	\$2.50	\$58.00	\$66.00

19						
UNIT COST	6	\$817.74	\$753.75	\$193.72	\$599.00	\$1,198.00
EST. OPERATING COST	6	\$63.83	\$63.50	\$5.93	\$57.00	\$72.00

20						
UNIT COST	4	\$698.25	\$714.50	\$67.83	\$590.00	\$774.00
EST. OPERATING COST	7	\$72.14	\$68.00	\$6.81	\$68.00	\$86.00

21						
UNIT COST	5	\$564.40	\$561.00	\$20.48	\$540.00	\$588.00
EST. OPERATING COST	5	\$65.40	\$64.00	\$2.80	\$64.00	\$71.00

22						
UNIT COST	5	\$863.60	\$815.00	\$129.62	\$752.00	\$1,099.00
EST. OPERATING COST	5	\$79.00	\$82.00	\$6.51	\$67.00	\$86.00

24						
UNIT COST	2	\$1,109.00	\$1,109.00	\$261.00	\$848.00	\$1,370.00
EST. OPERATING COST	2	\$94.00	\$94.00	\$0.00	\$94.00	\$94.00

25						
UNIT COST	1	\$1,329.00		\$0.00	\$1,329.00	\$1,329.00
EST. OPERATING COST	2	\$79.00	\$79.00	\$9.00	\$70.00	\$88.00

27						
UNIT COST	1	\$1,699.00		\$0.00	\$1,699.00	\$1,699.00
EST. OPERATING COST	1	\$95.00		\$0.00	\$95.00	\$95.00

Estimated operating costs were taken from the 1989 AHAM directory of refrigerators and freezers.

APPLIANCES REFRIGERATOR COMPARISONS

APPLIANCES REFRIGERATOR COMPARISONS

Dishwasher cost analysis:

Dishwashers were to be selected from the "RCDP Approved Appliance List - Most Efficient Electric Dishwashers" provided to the builder, or as approved by WSEO.

The results of the dishwasher cost analysis is in Table 24. Costs of the unit and estimated yearly operating costs were examined. The data base used to produce this report is in Appendix L. For the analysis, the estimated yearly operating cost was calculated using four cents per estimated kwh used.

TABLE 24
RCDP CYCLE II APPLIANCE ANALYSIS - DISHWASHER COSTS

MANUFACTURER	N	MEAN	MEDIAN	STD DEV	MIN	MAX

<u>FRIDGIDARE</u>						
UNIT COST	3	\$289.80	\$240.00	\$70.43	\$240.00	\$389.40
EST. OPERATING COST	3	\$30.06	\$29.88	\$0.25	\$29.88	\$30.41

<u>GENERAL ELECTRIC</u>						
UNIT COST	5	\$356.80	\$340.00	\$58.10	\$299.00	\$468.00
EST. OPERATING COST	5	\$35.23	\$35.12	\$0.70	\$34.08	\$36.17

<u>HOT POINT</u>						
UNIT COST	5	\$266.80	\$259.00	\$15.99	\$249.00	\$286.00
EST. OPERATING COST	6	\$31.45	\$31.98	\$0.74	\$30.41	\$31.98

<u>INSINKERATOR</u>						
UNIT COST	1	\$475.00		\$0.00	\$475.00	\$475.00
EST. OPERATING COST	1	\$43.51		\$0.00	\$43.51	\$43.51

<u>KENMORE</u>						
UNIT COST	4	\$291.75	\$288.50	\$66.62	\$219.00	\$371.00
EST. OPERATING COST	3	\$26.21	\$24.12	\$2.97	\$24.12	\$30.41

<u>KITCHEN AID</u>						
UNIT COST	3	\$642.33	\$699.00	\$102.09	\$499.00	\$729.00
EST. OPERATING COST	3	\$30.41	\$30.41	\$0.00	\$30.41	\$30.41

<u>MAYTAG</u>						
UNIT COST	3	\$515.14	\$465.00	\$75.19	\$459.00	\$621.42
EST. OPERATING COST	3	\$30.41	\$30.41	\$0.00	\$30.41	\$30.41

<u>TAPPAN</u>						
UNIT COST	4	\$255.25	\$249.00	\$10.83	\$249.00	\$274.00
EST. OPERATING COST	3	\$30.41	\$30.41	\$0.00	\$30.41	\$30.41

<u>WHIRLPOOL</u>						
UNIT COST	24	\$345.10	\$359.50	\$72.93	\$233.00	\$478.00
EST. OPERATING COST	14	\$30.71	\$30.93	\$0.26	\$30.41	\$30.93

THE ESTIMATED OPERATION COST WAS CALCULATED @ 4 CENTS PER KWH

Water Tank Analysis:

Domestic Hot Water Heaters were required to be selected from the "RCDP Approved Appliance List - Most Efficient Electric Water Heaters", be installed inside the heated space, or as approved, have all pipe within four feet of the tank insulated, set on a non-compressible insulation pad if located on concrete slab floors, and have a setpoint no greater than 130 degrees fahrenheit.

The results of the water tank cost analysis is in Table 25. Costs of the unit and estimated yearly operating costs were examined. For this analysis the estimated yearly operating cost was calculated using four cents per estimated kwh used. The data base used to produce this report is in Appendix L. Following the table, two graphs are presented. The first graph compares the tanks approximate volume to its estimated yearly operating costs, the second graph compares the approximate volume to the unit's cost.

TABLE 25
RCDP CYCLE II APPLIANCE ANALYSIS - HOT WATER TANK COSTS

APPROXIMATE VOLUME	N	MEAN	MEDIAN	STD DEV	MIN	MAX

50						

UNIT COST	14	\$250.39	\$241.48	\$90.90	\$144.00	\$497.00
EST. OPERATING COST	16	\$232.44	\$232.77	\$12.18	\$214.42	\$274.18

52						

UNIT COST	28	\$190.19	\$201.00	\$35.44	\$110.00	\$290.00
EST. OPERATING COST	12	\$261.56	\$231.19	\$64.80	\$217.56	\$403.15

65						

UNIT COST	2	\$271.50	\$271.50	\$51.50	\$220.00	\$323.00
EST. OPERATING COST	4	\$223.20	\$224.12	\$12.40	\$207.08	\$237.48

66						

UNIT COST	2	\$293.44	\$293.44		\$293.44	\$293.44
EST. OPERATING COST	2	\$232.77	\$232.77		\$232.77	\$232.77

OPERATING COSTS WERE CALCULATED AT 4 CENTS PER KWH.

APPLIANCE ANALYSIS

HOT WATER TANK COMPARISONS

APPLIANCE ANALYSIS

HOT WATER TANK COMPARISONS

APPENDIX A

RCDP CONSTRUCTION COST MANUAL

This appendix contains a copy of the complete RCDP cost manual and cost reviewers instructions. It was developed by WSEO to collect the cost data from builders.

The manual consists of an instruction sheet that identifies the builder and cost reviewer, gives an overview of the process and lists the building components and innovations. Following the instruction page, forms for each of the building components and innovations are provided.

The manuals were customized to contain only those pages that the builder needed to complete. The manual was provided to the builder prior to construction of the home. The builder completed all of the manual and returned it to WSEO.

JANUARY 4
RESIDENTIAL CONSTRUCTION DEMONSTRATION PROJECT
COST MANUAL

Provider Name: _____
Site Address: _____

Agreement Id.# _____
Cost Reviewer _____
Address _____
Phone No. _____

OVERVIEW

Builders participating in the RCDP will provide information about the energy-efficient measures they've installed in their RCDP homes. Part of this information concerns the costs of certain energy efficient-measures. The builder must fill out this cost manual in order to receive the incentive. This manual can be easily completed by remembering the following:

1. Monitor the following building component(s) and ventilation costs during construction.
2. Enter costs according to the specific instructions. These instructions will tell you which elements you costs should and should **not** include. You will be entering all direct costs, such as materials and labor, to the general contractor, but not including overhead, profit, or sales tax. If your subcontractor will be filling out parts of this manual, provide them with the appropriate sections as soon as possible.
3. In the event that a subcontractor is unwilling to separate material and labor costs you may enter a total cost in the appropriate space.
4. Have your window dealer(s) assist you in completing the Window and Glass Door Schedule at the time of purchase.
5. For questions that do not apply to your home enter "NA" rather than leave blank. When you do not know the Answer to a question, enter "DK". All questions should have a \$ amount, NA, or DK entered.
6. Round all costs to the nearest dollar amount.
7. **Submit your cost manual to the cost reviewer named at the top of this page. The final RCDP site inspection can only be scheduled after receipt of this cost manual.** A RCDP staff member from your state energy office will contact you to schedule the final site visit inspection. If you, your window dealer, or subcontractors have questions about the manual, you are encouraged to call the cost reviewer for clarification.
8. Your Cost Manual is customized for you. It only contains the pages you need to fill out. Your manual should contain the pages checked below.

BUILDING COMPONENTS:

("x" components included in Cost Manual)

Below grade wall with interior insulation	pg 2
Below grade wall with exterior insulation	pg 3
Below grade wall with AWWF	pg 4
Slab with perimeter insulation	pg 5
Slab with entire insulation	pg 6
Floor over unconditioned space	pg 7
Ceiling	pg 8
Above grade wall	pg 9 & 10
☒ Window Schedule (required)	pg 11

INNOVATIONS(S):

(Enter "\$" for paid innovation and "x" for non-paid innovation)

Energy efficient appliance	pg 12
Air leakage control	pg 13
Future house	pg 14
<i>Heat Recovery Ventilation</i>	
Air-to-air heat exchanger	pg 15
Exhaust air heat pump	pg 16
<i>Non-heat recovery ventilation</i>	
Option #1	pg 17
Option #2	pg 18
Option #3	pg 19
Option #4	pg 20
Innovative design	pg 21

The following pages contain information taken from your house plans and WATTSUN 4.1 or 4.2 file, which are submitted by your utility. If any of these descriptions or areas are incorrect please cross out and enter the correction legibly. Also, notify the utility so that the original WATTSUN file can be corrected.

LOW GRADE WALL WITH INTERIOR INSULATION

Agreement Id.# _____

ur below grade wall is: _____

e perimeter length is: _____

at type of wood framed wall was the insulation attached to?2"x _____

ur cavity insulation type was: check one _____

fiberglass batt _____ blown in batt _____ other (describe) _____

vity insulation was done by (check one):

Self _____ Subcontractor Name _____ Phone _____

vall has rigid insulation check appropriate location: inside _____ outside _____

ur rigid insulation type was: check one.....

isocyanurate _____ extruded polystyrene (blue/pink) _____ urethane _____ other (describe) _____

ckness: 1/2 in. _____ 5/8 in. _____ 3/4 in. _____ 7/8 in. _____ 1 in. _____ 1.5 in. _____ 2 in. _____

id insulation was done by (check one):

Self _____ Subcontractor Name _____ Phone _____

Your costs on line 7 and 8 should include:

- Studs
- Plates
- Headers

Your costs on line 7, 8, or 9 should not include:

- Sheetrock
- Costs related to advanced air leakage control, i.e.
 - caulking/taping joints of rigid insulation or sheetrock
- Structural bracing
- Moisture reduction measures
- Electrical or plumbing work

at was the cost for labor and materials of the framing?\$ _____

at was the cost for labor and materials of the cavity insulation?\$ _____

ou used rigid insulation on interior of studs, what was the labor and material cost?.....\$ _____

aments or other costs: _____

LOW GRADE WALL WITH EXTERIOR INSULATION

Agreement Id.# _____

Your below grade wall is: _____ 1

The perimeter length is: 2

Your costs on line 3 and 4 should include:

Rigid insulation

Your costs on line 3 and 4 should not include:

Sheetrock

Cost related to advanced air leakage control, i.e.,
caulking/taping joints of rigid insulation or sheetrock

What was the material cost of the insulation?\$ _____ 3.

What was the labor or installation cost of applying the insulation?\$ _____ 4.

Were there other costs associated with your below grade wall with exterior insulation? yes _____ no _____ 5.

	Material	Labor	Total
Adhesive, mastic, or fasteners	_____	_____	_____ 6.
Insulation protection describe type _____	_____	_____	_____ 7.
Flashing/finishing for siding	_____	_____	_____ 8.
Full moisture protection (describe) _____	_____	_____	_____ 9.
Other (describe) _____	_____	_____	_____ 10.

Comments or other costs: _____ 11.

I BELOW GRADE WALL WITH ALL WEATHER WOOD FOUNDATION

Agreement Id.# _____

Your below grade wall is: _____

The perimeter length is: _____

Your costs on line 3, 4, and 5 should include:

Studs
Plates
Headers
Cavity insulation

Your costs on line 3, 4, and 5 should not include:

Footings
Sheetrock
Costs related to advanced air leakage control, i.e.,
caulking/taping joints of sheetrock

What was the labor and material cost of the cavity insulation?.....\$ _____

What was the cost of the materials for the wood foundation?.....\$ _____

What was the cost of labor for framing the wood foundation?.....\$ _____

What were the labor and materials costs of footings?.....\$ _____

Footing type:(check one) concrete _____ wood and compacted gravel _____

If you had not used an All-weather wood foundation, what would the complete labor and material costs have been for:

Concrete foundation (include footings and stem wall but not the slab)\$ _____

A 2"x 4" wood framed wall firred-in from the cement foundation\$ _____

Comments or other costs: _____

LAB WITH PERIMETER INSULATION

Agreement Id.# _____

Your slab is: _____ 1.

Your costs should include labor and materials for installing rigid insulation under your slab, not the cost of the slab.

The perimeter length insulated is: _____ 2

What was the cost of labor and materials to insulate the perimeter (to the required depth of 24"):\$ _____ 3

Estimate the cost if you had insulated the slab to R-10 to a depth of 24" along the perimeter)\$ _____ 4

Comments or other costs: _____ 5.

SLAB WITH INSULATION BENEATH ENTIRE SLAB

Agreement Id.# _____

Your slab is: _____ 1

Your costs should include labor and materials for installing rigid insulation under your slab, not the cost of the slab.

The slab area is: _____

What was the cost of labor and materials to insulate the entire slab? _____

Estimate the cost if you had insulated the slab to R-10 (to a depth of 24" along the perimeter) _____

FLOOR OVER UNCONDITIONED SPACE

Agreement Id.# _____

Your floor R-value is: 1.

The area is: 2.

Describe the floor framing dimensions: " x " 3.

Your cost should include insulation materials and labor only.

What was the cost for labor and materials to insulate
the floor? 4.

Comments or other costs: 5.

CEILING

Agreement Id.# _____

Your most typical ceiling is an: _____

The area is: _____

Your cost on line 3 should include labor and material for insulating the ceiling described above.

What was the cost for labor and materials to insulate the ceiling?\$ _____

Were there other costs associated with ceiling insulation or framing type? yes _____ no _____

	Material	Labor	Total
Oversized/extended trusses	_____	_____	_____
Soffit/additional siding costs	_____	_____	_____
Other (describe) _____	_____	_____	_____

Estimate labor and material costs for a standard framed R-38 ceiling of the same type (attic or vault) you built\$ _____

Comments or other costs, i.e., baffles, larger rafters, rigid board at perimeter, etc.: _____

ABOVE GRADE WALL

Agreement Id.# _____

The RCDP is trying to learn how much it costs to build the exterior walls in your home compared to a more standard less efficient wall. The costs of your exterior wall will be compared to other RCDP homes, so it is important that you use the same standard, less insulated wall which will be a standard framed 2x6 16" on-center wall with R-19 fiberglass batt (double top plate, normal headers, and 3-stud corners). You will need to gather some cost information from subcontractors and suppliers for this "standard wall." In the event that you constructed more than one wall type, RCDP staff will select the most typical wall.

Your most typical wall is a: _____ 1

The area of the above grade wall (not including windows or doors) is _____ 2

Be sure to enter only costs for this wall on lines 3 through 23.

FRAMING COSTS

FRAMING MATERIALS

Your costs on lines 3 through 12 should **not** include:

- Sheet rock
- Costs associated with applying Advanced Air Leakage Control
- Sub sheathing
- Structural bracing
- Interior walls

MATERIALS COSTS	Your RCDP wall	Std. 2x6 wall 16" o.c.
Studs	\$ _____ 3.	\$ _____ 8.
Plates	\$ _____ 4.	\$ _____ 9.
Headers	\$ _____ 5.	\$ _____ 10.
Other (describe) _____	\$ _____ 6.	\$ _____ 11.
Total	\$ _____ 7.	\$ _____ 12.

FRAMING LABOR

Your costs on lines 3 through 12 should **not** include:

- Framing costs for floors
- Ceiling
- Roof
- Interior walls

What was the labor cost of framing your RCDP wall? _____ \$ _____ 13

Framing subcontractor name _____ Phone _____

What would have been the labor cost to frame your wall if it had been a standard framed 2x6 16" on-center (double top plate, normal headers, and 3-stud corners)? _____ \$ _____ 14

Were there any other framing labor costs? Describe _____ \$ _____ 15.

INSULATION COSTS

INSULATION

What was the labor and material cost for installation of your wall cavity insulation?\$ _____

Cavity insulation was done by (check one):

☐ Self ☐ Subcontractor Subcontractor Name _____ Phone _____

What would it have cost for labor and materials to insulate this wall with R-19 fiberglass batts in 16" on-center cavities?\$ _____

Your costs should not include: insulation installed in interior walls or caulking/taping joints of the rigid insulation board. These costs may be applicable to Air Leakage Control.

What was the cost, if any, for labor and material of rigid insulation board?\$ _____

Rigid insulation was done by (check one):

☐ Self ☐ Subcontractor Subcontractor Name _____ Phone _____

Were there any other labor and material costs you incurred that are not accounted for above i.e., header insulation? yes ☐ no ☐

Describe _____ \$ _____ 1

Your cavity insulation type was: (check one).....

fiberglass batt ☐ blown in batt ☐ urethane ☐ other _____

If wall has rigid insulation check appropriate location: inside ☐ outside ☐

Type: isocyanurate ☐ extruded polystyrene (blue/pink) ☐ other _____ 2

Thickness: 1/2 in. ☐ 5/8 in. ☐ 3/4 in. ☐ 7/8 in. ☐ 1 in. ☐ 1.5 in. ☐ 2 in. _____

RESIDENTIAL CONSTRUCTION DEMONSTRATION PROJECT Id. # _____

WINDOW and GLASS DOOR SCHEDULE

Builder _____ Site Address _____

See other side of this sheet for instructions.

NO.	SYMBOL ON PLAN	MANUFACTURER Note if site built	MODEL NUMBER	N ↑ S ↓ E V	QTY.	ROUGH OPENING			TOTAL Ft ²	AIR GAP in.	TESTED U VALUE	NUMBER OF GLAZINGS	FRAME TYPE: THERMAL/BRK. WOOD or METAL	LOW E Y or N	GAS: Argon or CO ₂	WINDOW COST	NO.
						V	H	Ft ² ea									
1																	1
2																	2
3																	3
4																	4
5																	5
6																	6
7																	7
8																	8
9																	9
10																	10
11																	11
12																	12
13																	13
14																	14
15																	15
16																	16
17																	17
18																	18
19																	19
20																	20
21																	21
22																	22
23																	23

TOTAL AREA []

TOTAL COST []

ENERGY EFFICIENT APPLIANCE INNOVATION

Id.# _____

Attach bills of sale to this page which indicates:

Manufacturer
Brand
Model Number
Quantity Purchased
Purchase Price
Buyer's Name
Seller's Name
seller's Address

Attach Energy Guide labels to this page. If label does not readily peel off appliance, leave it on the appliance. The information will be collected at the final RCDP site visit.

Shown are samples of Water Heater, Dishwasher and Refrigerator-Freezer Energy Guide Labels.

Water Heater—ELECTRIC
FIRST HOUR RATING .59 EES 32 2172 C20

ENERGYGUIDE

ESTIMATES ON THE SCALE ARE BASED ON A NATIONAL AVERAGE ELECTRIC RATE OF 5.63 CENTS PER KILOWATT HOUR.

ONLY MODELS WITH FIRST HOUR RATINGS OF .56 TO .64 GALLONS ARE USED IN THE SCALE.

Model with lowest energy cost \$496

\$444

Model with highest energy cost \$519

THIS MODEL

Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how you use the product. The energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

Yearly cost	
Estimated yearly energy cost	
Cost per kilowatt hour	2¢ \$36
	4¢ \$73
	6¢ \$109
	8¢ \$146
	10¢ \$182
	12¢ \$218

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Your cost will vary depending on your local energy rate and how you use the product. The energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

Yearly cost	
Estimated yearly energy cost	
COST PER KILOWATT HOUR	2¢ \$116
	4¢ \$233
	6¢ \$349
	8¢ \$466
	10¢ \$582
	12¢ \$698

Yearly cost = \$289 at 4.97 cents/kilowatt hour

ASK YOUR SALESPERSON OR LOCAL UTILITY FOR THE ENERGY RATE (COST PER KILOWATT HOUR) IN YOUR AREA.

IMPORTANT Removal of this label before consumer purchase is a violation of Federal law (42 U.S.C. 6302). PART NO 433140 REV. 6

Refrigerator-Freezer
Capacity: 23 Cubic feet

(Name of Corporation)
Model(s) AH503, AH504, AH507
Type of Defrost: Full Automatic

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 4.97¢ per kilowatt hour.

Only models with 22.5 to 24.4 cubic feet are compared in the scale.

Model with lowest energy cost \$68

\$91

Model with highest energy cost \$132

THIS MODEL

Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how you use the product. The energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

Yearly cost	
Estimated yearly energy cost	
Cost per kilowatt hour	2¢ \$36
	4¢ \$73
	6¢ \$109
	8¢ \$146
	10¢ \$182
	12¢ \$218

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour) in your area.

Dishwasher
Capacity: Standard

Models DWU7025D

ENERGYGUIDE

Estimates on the scale are based on a national average electric rate of 7.63¢ per kilowatt hour and a natural gas rate of 62.7¢ per therm.

Only standard size dishwashers are used in the scale.

Model with lowest energy cost \$58

\$58

Model with highest energy cost \$90

THIS MODEL

Estimated yearly energy cost

Gas Water Heater

Model with lowest energy cost \$33

\$33

Model with highest energy cost \$52

THIS MODEL

Estimated yearly energy cost

Your cost will vary depending on your local energy rate and how you use the product. The energy cost is based on U.S. Government standard tests.

How much will this model cost you to run yearly?

with an electric water heater											with a gas water heater										
Loads of dishes per week											Loads of dishes per week										
2 4 6 8 10											2 4 6 8 10										
Cost per kilowatt hour	2¢	3¢	\$10	\$15	\$20	\$25	4¢	\$15	\$20	\$30	\$40	5¢	\$15	\$20	\$30	\$40	6¢	\$15	\$20	\$30	\$40
	10¢	\$25	\$40	\$50	\$60	\$75	10¢	\$25	\$40	\$50	\$60	10¢	\$25	\$40	\$50	\$60	10¢	\$25	\$40	\$50	\$60
	12¢	\$30	\$45	\$55	\$65	\$80	12¢	\$30	\$45	\$55	\$65	12¢	\$30	\$45	\$55	\$65	12¢	\$30	\$45	\$55	\$65

Ask your salesperson or local utility for the energy rate (cost per kilowatt hour or therm) in your area and for estimated costs if you have a propane or oil water heater.

Important Removal of this label before consumer purchase is a violation of Federal law (42 U.S.C. 6302). Part No 5278015

IR LEAKAGE CONTROL TO FOLLOW IN JANUARY

CDP VENTILATION COSTS

Id.# _____

You may wish to have your ventilation subcontractor complete this form.

IR-TO-AIR HEAT EXCHANGER

Manufacturer _____ 1. Model No. _____ 2.

ITEM	Materials	Labor	Total Cost
Heat exchanger unit	_____	_____	_____ 3.
DUCTWORK (incl. exhaust hoods, grills & reg.)	_____	_____	_____ 4.
Controls (switches, crank timers, clock timers, humidistats, etc.) describe _____	_____	xxx	_____ 5.
Pipe and wiring	_____	_____	_____ 6.
Grills and Registers	_____	_____	_____ 7.
Direct Heater Unit: check one: ☐ yes ☐ no	_____	_____	_____ 8.
Flow measurement station	_____	_____	_____ 9.
Backdraft damper (if included in above unit, enter NA)	_____	_____	_____ 10.
Balancing damper ☐ yes ☐ no	_____	_____	_____ 11.
Balancing (labor only)	xxx	_____	_____ 12.
Backdraft damper type (check one): ☐ motorized ☐ manual ☐ barometric ☐ none used	_____ 13.		

If your design saved you from installing kitchen and/or bath fans, enter materials and installation savings. _____ 14.

If you integrated your Heat Exchanger with the furnace, enter amount saved as a result of not installing supply air ductwork from AAHX to living spaces. _____ 15.

Was there any difference in the price for the purchase and installation of the furnace: Furnace Unit +/- \$ _____ 16. Furnace Installation +/- \$ _____ 17.

Other miscellaneous costs (additional or reduced), i.e., envelope penetrations _____ 18.

Describe impacts: _____ 19.

Comments _____

RCDP VENTILATION COSTS

Id.# _____

may wish to have your ventilation subcontractor complete this form.

EXHAUST AIR HEAT PUMP

Manufacturer _____ 1. Model No. _____ 2.

ITEM	Materials	Labor	Total Cost
Exhaust Air Heat Pump unit	_____	_____	_____ 3.
DUCTWORK (incl. exhaust hoods, grills & reg.)	_____	_____	_____ 4.
Main unit controls (switches, crank timers, clock timers, dehumidistats, etc.) describe _____	_____	xxx	_____ 5.
Main unit hardware and wiring	_____	_____	_____ 6.
Exhaust grill	_____	_____	_____ 7.
Make Up Air/Through Wall Inlets	_____	_____	_____ 8.
Flow measurement station	_____	_____	_____ 9.
Remote Fan Coil ___yes ___no (include: hardware, wiring, ductwork, grills, controls, etc.)	_____	_____	_____ 10.
Remote radiant slab ___yes ___no (include: hardware, wiring, tubing, insulation, controls, etc. Describe slab below)	_____	_____	_____ 11.
If your design saved you from installing kitchen and/or bath fans, enter material and installation savings.	_____	_____	_____ 12.
If your EAHP installation saved you from installing a domestic hot water tank, enter material and labor cost saved.	_____	_____	_____ 13.
Make Up Air/Through Wall Inlets: Manufacturer _____ 14. model no. _____ 15. quantity _____	_____	_____	_____ 16.
Other miscellaneous costs (additional or reduced) i.e., envelope penetrations	_____	_____	_____ 17.
Describe _____	_____	_____	_____ 18.

RCDP VENTILATION COSTS

Id.# _____

You may wish to have your ventilation subcontractor complete this form.

NON-HEAT RECOVERY VENTILATION SYSTEM OPTION #1: Integrated Spot and Whole House Design

ITEM (circle Kitchen or Bath)	Manufacturer	Model #	CFM	Materials	Labor	Total Cost
Kitchen/Bath fan #1	_____	_____	_____	_____	_____	1.
Kitchen/Bath fan #2	_____	_____	_____	_____	_____	2.
Kitchen/Bath fan #3	_____	_____	_____	_____	_____	3.
Kitchen/Bath fan #4	_____	_____	_____	_____	_____	4.
Other _____	_____	_____	_____	_____	_____	5.
Controls (switches, crank timers, clock timers, dehumidistats, etc.) describe _____				_____	xxx	6.
Hardware and wiring				_____	_____	7.
DUCTWORK (incl. exhaust hoods, grills & reg.)				_____	_____	8.
Backdraft dampers (if included in above units, enter NA)				_____	_____	9.
Make Up Air/Through Wall Inlets				_____	_____	10.
Other Installed Costs				_____	_____	11.
Describe _____						12.
TOTAL SYSTEM COST						13.
Make Up Air/Through Wall Inlets: Manufacturer _____	14.	model no. _____	15.	quantity _____	16.	
Comments _____						

17.						

RCDP VENTILATION COSTS

Id.# _____

You may wish to have your ventilation subcontractor complete this form.

NON-HEAT RECOVERY VENTILATION SYSTEM OPTION #2: Ducted Central Exhaust Design

ITEM	Manufacturer	Model #	CFM	Materials	Labor	Total Cost
Whole House Ventilation Fan	_____	_____	_____	_____	_____	_____
Other _____	_____	_____	_____	_____	_____	_____
Controls (switches, crank timers, clock timers, dehumidistats, etc.) describe _____					xxx	_____
Hardware and wiring						_____
DUCTWORK (incl. exhaust hoods, grills & reg.)						_____
Backdraft dampers(if included in above units, enter NA)						_____
Make Up Air/Through Wall Inlets						_____
Other Installed Costs						_____
Describe _____						

TOTAL SYSTEM COST _____1

Backdraft damper type (check one): _____ motorized _____ manual _____ barometric _____ none used.....1

Make Up Air/Through Wall Inlets:
manufacturer _____12. model no. _____13. quantity _____1/

If your design saved you from installing kitchen and/or bath fans enter material and installation savings

Comments _____1

CDP VENTILATION COSTS

Id.# _____

ou may wish to have your ventilation subcontractor complete this form.

ON-HEAT RECOVERY VENTILATION SYSTEM PTION #3: Discrete Spot and Whole House Design

ITEM	Manufacturer	Model #	CFM	Materials	Labor	Total Cost
hole House entilation Fan ircle Kitchen or Bath)	_____	_____	_____	_____	_____	_____1.
tchen/Bath fan #1	_____	_____	_____	_____	_____	_____2.
tchen/Bath fan #2	_____	_____	_____	_____	_____	_____3.
tchen/Bath fan #3	_____	_____	_____	_____	_____	_____4.
tchen/Bath fan #4	_____	_____	_____	_____	_____	_____5.
her _____	_____	_____	_____	_____	_____	_____6.
ontrols (switches, crank timers, ock timers, dehumidistats, etc.) escribe _____					xxx	_____7.
ardware and wiring						_____8.
CTWORK (incl. exhaust hoods, grills & reg.)						_____9.
ckdraft dampers (if included in above units, iter NA)						_____10.
ke Up Air/Through Wall Inlets						_____11.
ier Installed Costs						_____12.
scribe _____						_____13.

TOTAL SYSTEM COST _____14.

ckdraft damper type (check one): _____ motorized _____ manual _____ barometric _____ none used.....15.

ke Up Air/Through Wall Inlets:

nufacturer _____16. model no. _____17. quantity _____18.

mments _____19.

RCDP VENTILATION COSTS

Id.# _____

You may wish to have your ventilation subcontractor complete this form.

NON-HEAT RECOVERY VENTILATION SYSTEM OPTION #4 Forced Air Heating/Cooling System Integrated Design

ITEM	Manufacturer	Model #	CFM	Materials	Labor	Total Cost
Spot fans	_____	_____	_____	_____	_____	_____
Controls (switches, crank timers, clock timers, dehumidistats, etc.) describe _____				_____	xxx	_____
Hardware and wiring				_____	_____	_____
Ductwork including exhaust hood (for spot fan only)				_____	_____	_____
Make Up Air Inlet/Damper				_____	_____	_____
Ductwork (make up air to furnace only)				_____	_____	_____
Other Installed Costs				_____	_____	_____
Describe _____						

TOTAL SYSTEM COST

Backdraft damper type (check one): ____ motorized ____ manual ____ barometric ____ none used.....

Make Up Air/Through Wall Inlets:

nanufacturer _____ 11. model no. _____ 12. quantity _____ 1

If your design saved you from installing kitchen and/or bath fans enter material and installation savings

DP VENTILATION COSTS

Id.# _____

I may wish to have your ventilation subcontractor complete this form.

N-HEAT RECOVERY VENTILATION SYSTEM NOVATIVE DESIGN

ITEM	Manufacturer	Model #	CFM	Materials	Labor	Total Cost
ole House Ventilation Fan _____	_____	_____	_____	_____	_____	_____ 1.
role Kitchen or Bath)						
hen/Bath fan #1 _____	_____	_____	_____	_____	_____	_____ 2.
hen/Bath fan #2 _____	_____	_____	_____	_____	_____	_____ 3.
or _____	_____	_____	_____	_____	_____	_____ 4.
ontrols (switches, crank timers, ck timers, dehumidistats, etc.)						
scribe _____					xxx	_____ 5.
ware and wiring _____						_____ 6.
WORK (incl. exhaust hoods, grills & reg.)						_____ 7.
draft dampers __yes__no (if included in						
ve unit(s), enter NA)						_____ 8.
e Up Air/Through Wall Inlets __yes__no			_____			_____ 9.
r Installed Costs						_____ 10.
cribe _____						_____ 11.

TOTAL SYSTEM COST _____ 12.

draft damper type (check one): __motorized__ manual __barometric__ none used..... 13.

e Up Air/Through Wall Inlets:

ufacturer _____ 14. model no. _____ 15. quantity _____ 16.

If your design saved you from installing kitchen
and/or bath fans enter material and installation savings 17.

cribe your innovative design concept and control function (attach additional information if necessary)..... 18.

COST REVIEWERS INSTRUCTIONS

1. Enter builder and reviewer information on page 1 of cost manual. Review house plan and Transmittal Sheet to identify paid and non-paid innovation(s) and ventilation type, enter "\$" and "X" in appropriate space(s) on page one.
2. Select the appropriate innovation cost pages for inclusion in the manual.
3. Select the appropriate ventilation cost page for inclusion in the manual. If ventilation type is not clear contact builder and utility to clarify.
4. Select building components for inclusion in manual by reviewing WATTSUN print out. Identify the building components that are *beyond* the following R values and framing types:

BÉLOW GRADE WALLS Interior R-19 standard
Exterior R-10

SLAB R-10 24" at perimeter

FLOOR R-30

ABOVE GRADE WALLS R-19 advanced

CEILING R-38 standard

These components, if any, will be the only included in the cost manual. Identify components by entering an "X" in the appropriate space(s) under "Building Components" on page 1 of the manual.

Since there will soon be a 4.2 WATTSUN enhancement you will be referencing the 4.2 WATTSUN menu descriptions (attached), which have been changed to increase accuracy. You will enter the 4.2 menu description (which most accurately resembles the 4.1 menu descriptions) and the perimeter length or area on the first two lines of each page which will be included in the manual.

5. Include Window and Glass Door Schedule in all manuals.
6. Enter the ID. number on the upper right hand corner of each page in the cost manual
7. The builder is required to submit the cost manual before the RCDP site visit. The intent here is to receive the manual and enter it into the data base which should help identify missing and or out of bounds raw data. You can then discuss and plan a resolution of the problems when you contact the builder to schedule the site visit. This should allow you to have the cost manual finalized at the site visit. You must complete this process within 5 working days of receipt of the cost manual, i.e. define problem and schedule, but not necessarily conduct, site visit.

APPENDIX B

COMPLETE WINDOW DATA BASE

This appendix contains a copy of the initial data base that was used for the window cost analyses. Each home has more than one line of data due to differences in orientation and characteristic (manufacturer, model, gap size, etc.) data. The data shown was sorted by class and frame type.

The data set includes the following information:

- House identification number
- Window number
- Manufacturer
- Model
- Orientation
- Number of windows
- Median calculation
- Rough opening (RO) width (in inches)
- RO height (in inches)
- RO area (in SQFT)
- Total area
- Gap code
- Gap size (in fractions of an inch)
- U-Value
- Number of glazings
- Frame type (code)
- Frame description
- Low-E coating indicator
- Gas type (code)
- Gas description
- Cost
- Normalized cost (cost/total area)

The median was found by using the median calculation or "For median" column. Because a line of data could contain more than one window determining the correct median was more difficult than simply going to the middle value of the list. To overcome this problem the column titled "for median" was created. This column keeps a running total of the number of windows. To find the median, calculate the mid point of the sample, find that number on the "for median" list and use the value at that point.

All data sets and tables are sorted by class. The following gives the ranges of U-values make up each class:

- Less than 0.41 - Class 40
- 0.41 thru 0.50 - Class 50
- 0.51 thru 0.60 - Class 60
- 0.61 thru 0.65 - Class 65
- 0.66 thru 0.75 - Class 75

For those analyses without Class 65, the range for Class 75 extended from 0.61 through 0.75.

HOUSE ID	MANUFACTURER	MODEL	ORIENT	# OF WINDOWS	R.O. WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	SAP CODE	SAP SITE	U-VALUE	# OF BLAZINGS	FRAME TYPE	FRAME DESCR	LOW-E	SAS TYPE	GAS DESC.	COST	NOFALIZED COST (\$50P1)	
303	7 Milgard Manufacturing, Inc.	2100*	S	1	64	48	28.0	28.0	1 1/2	0.39	1	1	Thermal B	Thermal B	M		1	\$27.98	\$27.98	
314	5 Milgard Manufacturing, Inc.	2100	E	3	4	47	42.0	14.0	1 1/2	0.38	1	1	Thermal B	Thermal B	M		1	\$114.06	\$114.06	
326	5 Milgard Manufacturing, Inc.	2100	E	2	6	36	30.0	15.0	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$102.37	\$102.37	
322	6 Milgard Manufacturing, Inc.	2100	S	1	7	48	24.0	14.0	1 1/2	0.38	1	1	Thermal B	Thermal B	M		1	\$94.24	\$94.24	
366	7 Milgard Manufacturing, Inc.	2100	E	2	9	48	28.0	12.0	99 Other>1/2	0.38	1	1	Thermal B	Thermal B	M		1	\$133.90	\$133.90	
444	3 Milgard Manufacturing, Inc.	2100	N	1	10	48	36	12.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$45.83	\$45.83	
412	3 Milgard Manufacturing, Inc.	2100	N	1	11	36	36	9.0	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$44.51	\$44.51	
413	3 Milgard Manufacturing, Inc.	2100	N	1	12	36	36	9.0	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$44.51	\$44.51	
414	3 Milgard Manufacturing, Inc.	2100	N	1	13	36	36	9.0	11 11/16	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
417	3 Milgard Manufacturing, Inc.	2100	N	1	14	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
418	3 Milgard Manufacturing, Inc.	2100	N	1	15	36	36	9.0	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
415	3 Milgard Manufacturing, Inc.	2100	N	1	16	36	36	9.0	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
430	3 Milgard Manufacturing, Inc.	2100	N	1	17	36	36	9.0	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
430	3 Milgard Manufacturing, Inc.	2100	N	1	18	36	36	9.0	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
449	3 Milgard Manufacturing, Inc.	2100	E	1	19	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
441	3 Milgard Manufacturing, Inc.	2100	N	1	20	36	36	9.0	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
445	3 Milgard Manufacturing, Inc.	2100	N	1	21	36	36	9.0	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
439	3 Milgard Manufacturing, Inc.	2100	S	1	22	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
436	6 Milgard Manufacturing, Inc.	2100	S	1	23	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
421	3 Milgard Manufacturing, Inc.	2100	E	1	24	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
425	3 Milgard Manufacturing, Inc.	2100	N	1	25	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
425	3 Milgard Manufacturing, Inc.	2100	N	1	26	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
444	5 Milgard Manufacturing, Inc.	2100	N	1	27	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
444	5 Milgard Manufacturing, Inc.	2100	N	1	28	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$40.51	\$40.51	
422	2 Milgard Manufacturing, Inc.	2100	N	2	29	48	42	14.0	1 1/2	0.38	1	1	Thermal B	Thermal B	M		1	\$165.90	\$165.90	
412	2 Milgard Manufacturing, Inc.	2100	S	1	30	60	48	20.0	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$120.16	\$120.16	
412	1 Milgard Manufacturing, Inc.	2100	N	1	31	60	48	20.0	20.0	0.38	1	1	Thermal B	Thermal B	M		1	\$129.16	\$129.16	
105	5 Milgard Manufacturing, Inc.	2100	E	1	32	72	48	24.0	24.0	99 Other>1/2	0.38	1	1	Thermal B	Thermal B	M		1	\$145.00	\$145.00
376	2 Northwest Aluminum Products	2130	S	1	33	60	60	25.0	1 1/2	0.39	2	2	Thermal B	Thermal B	M		1	\$152.50	\$152.50	
131	2 Milgard Manufacturing, Inc.	2100	N	1	34	72	36	18.0	1 1/2	0.38	1	1	Thermal B	Thermal B	M		1	\$113.26	\$113.26	
121	2 Milgard Manufacturing, Inc.	2100	N	2	35	36	72	18.0	0	0.4	1	1	Thermal B	Thermal B	M		1	\$113.26	\$113.26	
121	2 Milgard Manufacturing, Inc.	2100	N	2	37	36	72	18.0	1 1/2	0.38	1	1	Thermal B	Thermal B	M		1	\$113.26	\$113.26	
413	2 Milgard Manufacturing, Inc.	2100	S	1	38	60	42	17.5	11 11/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
413	2 Milgard Manufacturing, Inc.	2100	N	1	39	60	42	17.5	11 11/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
414	2 Milgard Manufacturing, Inc.	2100	N	1	40	60	42	17.5	11 11/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
414	2 Milgard Manufacturing, Inc.	2100	N	1	41	60	42	17.5	11 11/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
417	2 Milgard Manufacturing, Inc.	2100	S	1	42	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
417	2 Milgard Manufacturing, Inc.	2100	N	1	43	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
418	2 Milgard Manufacturing, Inc.	2100	N	1	44	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
419	2 Milgard Manufacturing, Inc.	2100	N	1	45	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
419	2 Milgard Manufacturing, Inc.	2100	N	1	46	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
420	2 Milgard Manufacturing, Inc.	2100	N	1	47	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
430	2 Milgard Manufacturing, Inc.	2100	N	1	48	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
430	2 Milgard Manufacturing, Inc.	2100	N	1	49	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
430	2 Milgard Manufacturing, Inc.	2100	N	1	50	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
436	2 Milgard Manufacturing, Inc.	2100	E	1	51	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
436	2 Milgard Manufacturing, Inc.	2100	N	1	52	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
430	2 Milgard Manufacturing, Inc.	2100	N	1	53	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
440	2 Milgard Manufacturing, Inc.	2100	N	1	54	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
440	2 Milgard Manufacturing, Inc.	2100	N	1	55	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
441	2 Milgard Manufacturing, Inc.	2100	N	1	56	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
441	2 Milgard Manufacturing, Inc.	2100	N	1	57	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
444	2 Milgard Manufacturing, Inc.	2100	N	1	58	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
444	2 Milgard Manufacturing, Inc.	2100	N	1	59	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
445	2 Milgard Manufacturing, Inc.	2100	N	1	60	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
445	2 Milgard Manufacturing, Inc.	2100	N	1	61	60	42	17.5	13 13/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
449	2 Milgard Manufacturing, Inc.	2100	N	1	62	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
449	2 Milgard Manufacturing, Inc.	2100	N	1	63	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
450	2 Milgard Manufacturing, Inc.	2100	N	1	64	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
450	2 Milgard Manufacturing, Inc.	2100	N	1	65	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
451	2 Milgard Manufacturing, Inc.	2100	N	1	66	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
451	2 Milgard Manufacturing, Inc.	2100	N	1	67	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
455	2 Milgard Manufacturing, Inc.	2100	N	1	68	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
455	2 Milgard Manufacturing, Inc.	2100	N	1	69	60	42	17.5	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
457	8 Milgard Manufacturing, Inc.	2100	N	1	70	72	42	21.0	1 1/2	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
437	2 Milgard Manufacturing, Inc.	2100	N	2	72	72	48	24.0	48.0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
431	3 Milgard Manufacturing, Inc.	2100	N	1	73	36	36	9.0	6 5/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
431	3 Milgard Manufacturing, Inc.	2100	N	1	74	36	36	9.0	6 5/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
431	3 Milgard Manufacturing, Inc.	2100	N	1	75	36	36	9.0	6 5/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
431	3 Milgard Manufacturing, Inc.	2100	N	1	76	36	36	9.0	6 5/16	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
431	3 Milgard Manufacturing, Inc.	2100	N	1	77	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
431	3 Milgard Manufacturing, Inc.	2100	N	1	78	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
431	3 Milgard Manufacturing, Inc.	2100	N	1	79	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
431	3 Milgard Manufacturing, Inc.	2100	N	1	80	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
431	3 Milgard Manufacturing, Inc.	2100	N	1	81	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	
431	3 Milgard Manufacturing, Inc.	2100	N	1	81	36	36	9.0	0	0.38	1	1	Thermal B	Thermal B	M		1	\$112.41	\$112.41	

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HOUSE NO	WINDOW	MANUFACTURER	MODEL	DATE	# OF WINDOWS	FOR MEDIAN	R.O. WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	GAF CODE	GAF SITE	U-VALUE	# OF BLATTINGS	FRAME DESCRIPTION	LOW-E	GAS TYPE	GAS DESC.	COST	NORMALIZED COST (1.50¢/ft²)
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4 3/8	1 1/2	0.59	2	2	1 Thermal B	M		1	\$141.00	\$11.75
102	10	GLS	670	2	193	36	24	6.0	12.0	4										

HOUSE ID	WINDUW	MANUFACTURER	MODEL	OFFSHOOT	# OF WINDOWS	# OF MEDIAN	R.U. WIDTH	R.R. HEIGHT	R.O. AREA	TOTAL AREA	GAP CODE	GAP SITE	U-VALUE	GLAZING TYPE	FRAME DESCRIPTION	LOW-E	SAS DESC.	SAS	COST	NORMALIZED COST (1/2501)
114	4	Alford Manufacturing, Inc.	920	E	1	138	6	72	3.0	3.0	1/12	1/12	0.59	2	1 Thermal B	M	1		\$7.22	\$7.22
494	7	Jeffrey-Bell Aluminum	640	N	1	139	60	48	20.0	20.0	3/14	3/14	0.58	2	1 Thermal B	M	1		\$147.60	\$147.60
356	7	Jeffrey-Bell Aluminum	1100	N	1	140	60	42	17.5	17.5	1/12	1/12	0.57	2	1 Thermal B	M	1		\$129.65	\$129.65
340	3	Alford Manufacturing, Inc.	1170	S	1	141	48	48	16.0	16.0	5/34	5/34	0.56	2	1 Thermal B	M	1		\$117.80	\$117.80
318	3	Alford Manufacturing, Inc.	9253	E	1	142	60	42	17.5	17.5	1/12	1/12	0.56	2	3 Metal	M	1		\$129.81	\$129.81
318	5	Alford Manufacturing, Inc.	7100	E	1	143	72	48	24.0	24.0	10/17/32	10/17/32	0.58	2	1 Thermal B	M	1		\$160.00	\$160.00
431	8	Alford Manufacturing, Inc.	920	E	5	143	48	72	24.0	120.0	1/12	1/12	0.53	2	1 Thermal B	M	1		\$60.00	\$60.00
431	8	Alford Manufacturing, Inc.	920	E	1	144	48	24	8.0	8.0	1/12	1/12	0.53	2	1 Thermal B	M	1		\$39.29	\$39.29
498	12	Alford Manufacturing, Inc.	4530	S	2	151	72	48	24.0	48.0	3/14	3/14	0.59	2	1 Thermal B	M	1		\$189.60	\$189.60
206	12	Alford Manufacturing, Inc.	7500	S	1	152	12	80	6.7	6.7	1/12	1/12	0.59	2	1 Thermal B	M	1		\$124.25	\$124.25
318	4	Alford Manufacturing, Inc.	7100	E	1	153	60	60	25.0	25.0	10/17/32	10/17/32	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
356	2	Alford Manufacturing, Inc.	1120	E	2	155	60	48	20.0	40.0	1/12	1/12	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
386	2	Alford Manufacturing, Inc.	7100	E	1	157	60	48	20.0	20.0	1/12	1/12	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
386	3	Alford Manufacturing, Inc.	7100	E	1	158	60	48	20.0	20.0	1/12	1/12	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
386	3	Alford Manufacturing, Inc.	7100	E	1	159	72	48	24.0	24.0	1/12	1/12	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
386	3	Alford Manufacturing, Inc.	7100	E	1	160	48	48	16.0	16.0	1/12	1/12	0.57	2	1 Thermal B	M	1		\$152.40	\$152.40
386	12	Alford Manufacturing, Inc.	11000	S	1	161	48	48	16.0	16.0	1/12	1/12	0.57	2	1 Thermal B	M	1		\$152.40	\$152.40
498	4	Alford Manufacturing, Inc.	4530	S	1	162	72	48	24.0	24.0	1/12	1/12	0.54	2	1 Thermal B	M	1		\$152.40	\$152.40
376	4	Alford Manufacturing, Inc.	4530	S	1	163	72	48	24.0	24.0	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
348	6	Alford Manufacturing, Inc.	1120	S	1	164	72	48	24.0	24.0	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
351	5	Alford Manufacturing, Inc.	1120	S	1	165	72	48	24.0	24.0	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
352	5	Alford Manufacturing, Inc.	1120	S	1	166	48	48	16.0	16.0	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
107	5	Alford Manufacturing, Inc.	502	E	1	166	48	48	16.0	16.0	1/12	1/12	0.54	2	1 Thermal B	M	1		\$152.40	\$152.40
111	5	Alford Manufacturing, Inc.	500	E	1	167	48	48	16.0	16.0	1/12	1/12	0.54	2	1 Thermal B	M	1		\$152.40	\$152.40
498	5	Alford Manufacturing, Inc.	11000	S	1	168	96	48	32.0	32.0	1/12	1/12	0.57	2	1 Thermal B	M	1		\$152.40	\$152.40
251	4	Alford Manufacturing, Inc.	1120	S	1	169	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	3	Alford Manufacturing, Inc.	4530	S	1	170	60	60	25.0	25.0	1/12	1/12	0.54	2	1 Thermal B	M	1		\$152.40	\$152.40
376	3	Alford Manufacturing, Inc.	4530	S	1	171	60	60	25.0	25.0	1/12	1/12	0.54	2	1 Thermal B	M	1		\$152.40	\$152.40
266	10	Alford Manufacturing, Inc.	11000	S	2	173	36	60	15.0	30.0	1/12	1/12	0.57	2	1 Thermal B	M	1		\$152.40	\$152.40
346	9	Alford Manufacturing, Inc.	11000	S	1	174	36	60	15.0	15.0	1/12	1/12	0.57	2	1 Thermal B	M	1		\$152.40	\$152.40
375	4	Alford Manufacturing, Inc.	505	S	1	175	36	48	12.0	12.0	5/34	5/34	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
113	4	Alford Manufacturing, Inc.	500	S	1	176	48	48	16.0	16.0	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
375	13	Alford Manufacturing, Inc.	505	S	3	179	60	48	20.0	60.0	5/34	5/34	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
466	6	Alford Manufacturing, Inc.	11000	S	2	181	60	48	20.0	40.0	1/12	1/12	0.57	2	1 Thermal B	M	1		\$152.40	\$152.40
181	10	Alford Manufacturing, Inc.	11000	S	1	182	60	48	20.0	20.0	1/12	1/12	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
107	4	Alford Manufacturing, Inc.	1530	E	1	183	48	60	20.0	20.0	1/12	1/12	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
255	3	Alford Manufacturing, Inc.	920	E	2	185	24	60	10.0	20.0	1/12	1/12	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
376	7	Alford Manufacturing, Inc.	920	E	1	186	12	60	5.0	5.0	1/12	1/12	0.53	2	1 Thermal B	M	1		\$152.40	\$152.40
376	4	Alford Manufacturing, Inc.	1120	E	2	188	12	60	5.0	10.0	1/12	1/12	0.53	2	1 Thermal B	M	1		\$152.40	\$152.40
411	4	Alford Manufacturing, Inc.	1120	S	1	189	60	36	15.0	15.0	13/17/16	13/17/16	0.52	2	1 Thermal B	M	1		\$152.40	\$152.40
411	3	Alford Manufacturing, Inc.	1120	S	3	192	60	36	15.0	45.0	13/17/16	13/17/16	0.52	2	1 Thermal B	M	1		\$152.40	\$152.40
316	5	Alford Manufacturing, Inc.	1120	M	1	193	48	42	14.0	14.0	1/12	1/12	0.54	2	1 Thermal B	M	1		\$152.40	\$152.40
113	1	Alford Manufacturing, Inc.	500	M	1	194	64	48	22.0	22.0	1/12	1/12	0.54	2	1 Thermal B	M	1		\$152.40	\$152.40
447	2	Alford Manufacturing, Inc.	420	E	1	195	60	72	30.0	30.0	5/34	5/34	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
376	10	Alford Manufacturing, Inc.	1120	M	1	196	48	60	20.0	20.0	1/12	1/12	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
376	10	Alford Manufacturing, Inc.	4530	M	1	197	60	48	20.0	20.0	1/12	1/12	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
399	8	Alford Manufacturing, Inc.	7100	M	2	200	60	36	15.0	30.0	3/14	3/14	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
494	8	Alford Manufacturing, Inc.	640	S	2	201	60	36	15.0	15.0	3/14	3/14	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
494	6	Alford Manufacturing, Inc.	640	S	2	203	60	36	15.0	30.0	3/14	3/14	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
376	1	Alford Manufacturing, Inc.	7100	S	2	205	60	42	17.5	35.0	10/17/32	10/17/32	0.58	2	1 Thermal B	M	1		\$152.40	\$152.40
376	1	Alford Manufacturing, Inc.	7100	S	2	207	18	60	7.5	15.0	1/12	1/12	0.57	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	208	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	209	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	210	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	211	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	212	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	213	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	214	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	215	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	217	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	219	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	221	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	223	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	225	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	227	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	229	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	231	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	233	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	235	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	237	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	239	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	241	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1		\$152.40	\$152.40
376	5	Alford Manufacturing, Inc.	1120	M	1	243	60	42	17.5	17.5	1/12	1/12	0.56	2	1 Thermal B	M	1			

HOUSE NO	WINDOW	MANUFACTURER	MODEL	ORIENT	# OF WINDOWS	FOR MEDIAN	R.O. WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	GAP CODE	SIZE	U-VALUE	# OF BLAZES	FRAME TYPE	FRAME DESCRIPTION	LOK-E	GAS TYPE	GAS DESC.	COST	NORMALIZED COST (14.55/Ft²)
3	315	3	Northwest Aluminum Products	505	S	216	36	36	9.0	9.0	5 3/4	0.56	2	2	1 Thermal	B	M	1	1	\$84.00	\$9.15
6	278	6	Vilma Industries	7200	E	219	36	72	19.0	54.0	10 17/32	0.57	2	2	1 Thermal	B	M	1	1	\$95.00	\$9.55
6	316	6	Northwest Aluminum Products	450	N	210	72	72	18.0	18.0	1 1/2	0.54	2	2	1 Thermal	B	M	1	1	\$165.50	\$5.42
12	458	12	Empire Pacific Industries	11000	S	241	48	48	14.0	14.0	1 1/2	0.57	2	2	1 Thermal	B	M	1	1	\$172.25	\$5.47
12	316	12	Northwest Aluminum Products	450	N	242	48	48	16.0	16.0	1 1/2	0.54	2	2	1 Thermal	B	M	1	1	\$181.50	\$5.47
17	376	17	Northwest Aluminum Products	450	M	245	48	48	16.0	16.0	1 1/2	0.51	2	2	1 Thermal	B	M	1	1	\$185.40	\$5.47
17	414	17	Northwest Aluminum Products	500	M	245	48	48	17.5	35.0	5 3/4	0.54	2	2	1 Thermal	B	M	1	1	\$195.00	\$5.44
17	355	17	Midland Manufacturing, Inc.	1120	N	246	48	48	14.0	14.0	1 1/2	0.56	2	2	1 Thermal	B	M	1	1	\$195.00	\$5.44
17	355	17	Midland Manufacturing, Inc.	1120	N	247	48	48	14.0	14.0	1 1/2	0.56	2	2	1 Thermal	B	M	1	1	\$195.00	\$5.44
6	313	6	Midland Manufacturing, Inc.	11000	N	247	36	36	6.0	12.0	1 1/2	0.57	2	2	1 Thermal	B	M	1	1	\$195.00	\$5.44
5	316	5	Midland Manufacturing, Inc.	1500	S	251	36	72	15.0	30.0	5 3/4	0.56	2	2	1 Thermal	B	M	1	1	\$204.00	\$5.46
5	316	5	Midland Manufacturing, Inc.	1120	E	252	36	36	9.0	9.0	5 3/4	0.56	2	2	1 Thermal	B	M	1	1	\$204.00	\$5.46
6	313	6	Midland Manufacturing, Inc.	1120	N	253	36	36	9.0	9.0	5 3/4	0.54	2	2	1 Thermal	B	M	1	1	\$204.00	\$5.46
6	313	6	Northwest Aluminum Products	500	SE	254	36	36	9.0	9.0	1 1/2	0.56	2	2	1 Thermal	B	M	1	1	\$204.00	\$5.46
1	313	1	Northwest Aluminum Products	502	N	255	36	36	9.0	9.0	1 1/2	0.56	2	2	1 Thermal	B	M	1	1	\$204.00	\$5.46
1	313	1	Northwest Aluminum Products	1120	N	256	36	36	12.0	12.0	1 1/2	0.55	2	2	1 Thermal	B	M	1	1	\$204.00	\$5.46
8	458	8	Empire Pacific Industries	11000	S	258	72	81	40.5	81.0	3 1/4	0.58	2	2	1 Thermal	B	M	1	1	\$219.50	\$5.42
4	474	4	Peller Built Aluminum	640	N	259	36	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$219.50	\$5.42
11	315	11	Northwest Aluminum Products	728	N	269	12	48	3.8	3.8	1 1/2	0.56	2	2	1 Thermal	B	M	1	1	\$219.50	\$5.42
11	315	11	Northwest Aluminum Products	728	N	271	12	48	3.8	3.8	1 1/2	0.56	2	2	1 Thermal	B	M	1	1	\$219.50	\$5.42
10	315	10	Midland Manufacturing, Inc.	920	E	262	72	72	36.0	36.0	5 3/4	0.51	2	2	1 Thermal	B	M	1	1	\$228.35	\$5.41
10	315	10	Midland Manufacturing, Inc.	920	E	262	72	72	36.0	36.0	5 3/4	0.51	2	2	1 Thermal	B	M	1	1	\$228.35	\$5.41
3	488	3	Northwest Aluminum Products	450	S	263	36	36	9.0	9.0	13 13/16	0.52	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	264	48	48	12.0	12.0	1 1/2	0.54	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	265	48	48	12.0	12.0	1 1/2	0.56	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	266	48	48	12.0	12.0	1 1/2	0.56	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	267	48	48	12.0	12.0	1 1/2	0.55	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	268	48	48	12.0	12.0	1 1/2	0.56	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	269	48	48	12.0	12.0	1 1/2	0.56	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	270	48	48	12.0	12.0	1 1/2	0.55	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	271	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	272	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	273	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	274	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	275	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	276	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	277	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	278	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	279	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	280	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	281	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	282	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	283	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	284	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	285	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	286	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	287	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	288	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	289	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	290	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	291	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	292	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	293	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	294	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	295	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	296	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	297	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	298	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	299	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	300	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	301	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	302	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	303	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	304	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	305	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	306	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	307	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	308	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	309	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	310	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	311	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	312	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	313	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42
1		1	Midland Manufacturing, Inc.	1120	N	314	48	48	12.0	12.0	1 1/2	0.58	2	2	1 Thermal	B	M	1	1	\$235.37	\$5.42

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WIND-UP	WIND-DOWN	MANUFACTURER	MODEL	ORIENTA	# OF WINDMILLS	FOR MEDIAN	R.O.D. WIDTH	R.O.D. HEIGHT	R.O.D. AREA	TOTAL AREA	GSP CORE SIZE	U-VALUE	# OF BLADING TYPE	FRAME DESCRIBING TYPE	LOW-E	SBS TYPE	SBS DESC.	COST	WIND-UP	WIND-DOWN	MANUFACTURER	MODEL	ORIENTA	# OF WINDMILLS	FOR MEDIAN	R.O.D. WIDTH	R.O.D. HEIGHT	R.O.D. AREA	TOTAL AREA	GSP CORE SIZE	U-VALUE	# OF BLADING TYPE	FRAME DESCRIBING TYPE	LOW-E	SBS TYPE	SBS DESC.	COST	WIND-UP	WIND-DOWN	MANUFACTURER	MODEL	ORIENTA	# OF WINDMILLS	FOR MEDIAN	R.O.D. WIDTH	R.O.D. HEIGHT	R.O.D. AREA	TOTAL AREA	GSP CORE SIZE	U-VALUE	# OF BLADING TYPE	FRAME DESCRIBING TYPE	LOW-E	SBS TYPE	SBS DESC.	COST
10	Alpine Industries	789	477	1	1	17	48	69	29.0	29.0	5 3/4	0.38	2	4 Vinyl	N	N	3	\$1.08	10	Alpine Industries	789	477	1	1	17	48	69	29.0	29.0	5 3/4	0.38	2	4 Vinyl	N	N	3	\$1.08																			
10	Alpine Industries	790	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08	10	Alpine Industries	790	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08																			
10	Alpine Industries	791	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08	10	Alpine Industries	791	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08																			
10	Alpine Industries	792	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08	10	Alpine Industries	792	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08																			
10	Alpine Industries	793	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08	10	Alpine Industries	793	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08																			
10	Alpine Industries	794	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08	10	Alpine Industries	794	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08																			
10	Alpine Industries	795	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08	10	Alpine Industries	795	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08																			
10	Alpine Industries	796	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08	10	Alpine Industries	796	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08																			
10	Alpine Industries	797	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08	10	Alpine Industries	797	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08																			
10	Alpine Industries	798	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08	10	Alpine Industries	798	478	1	1	19	72	72	12.0	12.0	5 3/4	0.35	2	4 Vinyl	N	N	3	\$1.08																			
 																																															

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WINDING	MANUFACTURER	MODEL	ORIENTN	% OF WINDOWS	FOR	R.O. WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	ESP	ESP CODE	ESP SIZE	U-VALUE	# OF BLAZES	FRAME TYPE	FRAME DESCR	LCM-E	GAS BESC.	GAS BESC.	EOST	WINDSPEED (MPH)
110	5	ASSTO	V-10	HH	224	24	48	8.0	16.0	5 3/4	5 3/4	0.38	2	2	4	Vinyl	Y	1	1	\$250.55	121.71
110	7	ASSTO	V-10	M	228	30	36	7.5	6.0	5 3/4	5 3/4	0.38	2	2	4	Vinyl	Y	1	1	\$175.97	121.71
110	13	ASSTO	V-10	M	228	30	36	7.5	6.0	5 3/4	5 3/4	0.38	2	2	4	Vinyl	Y	1	1	\$175.97	121.71
117	4	Northwest Aluminum Products	V-10	E	229	48	12	12.5	4.0	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
117	15	ASSTO	V-10	E	230	60	30	12.5	12.5	5 3/4	5 3/4	0.39	2	2	4	Vinyl	Y	1	1	\$101.00	121.71
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HOUSE NO	WINDOW	MANUFACTURER	MODEL	ORIGIN	# OF WINDOWS	FOR REGION	R.O. WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	SAP CORN SIZE	U-VALUE	# OF GLAZING TYPES	FRAME RESISTANCE TYPE	LOW-E	ES RESC	COST	REMARKS
437	3	Insulate Industries	3000	S	1	1	2	72	48	24.0	24.0	0.55	2	4 Vinyl	M	1	\$12.25	\$5.47
438	10	Insulate Industries	3001	S	1	1	3	96	48	32.0	32.0	0.55	2	4 Vinyl	M	1	\$12.25	\$5.47
439	5	Insulate Industries	3000	S	1	1	4	48	48	16.0	16.0	0.55	2	4 Vinyl	M	1	\$10.00	\$4.31
440	5	Insulate Industries	3000	S	1	1	5	48	48	16.0	16.0	0.55	2	4 Vinyl	M	1	\$10.00	\$4.31
441	7	Insulate Industries	3000	S	1	1	6	48	48	17.5	17.5	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
442	7	Insulate Industries	3000	S	1	1	7	48	48	17.5	17.5	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
443	8	Insulate Industries	3000	S	1	1	8	60	42	17.5	17.5	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
444	8	Insulate Industries	3000	S	1	1	9	60	42	17.5	17.5	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
445	8	Insulate Industries	3000	S	1	1	12	48	48	14.0	14.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
446	8	Insulate Industries	3000	S	1	1	13	60	36	15.0	15.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
447	2	Insulate Industries	3000	S	1	1	14	36	36	9.0	9.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
448	2	Insulate Industries	3000	S	1	1	15	36	36	9.0	9.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
449	2	Insulate Industries	3000	S	1	1	16	36	36	9.0	9.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
450	2	Insulate Industries	3000	S	1	1	17	36	36	9.0	9.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
451	16	Insulate Industries	3000	S	1	1	18	36	42	10.5	10.5	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
452	15	Insulate Industries	3000	S	1	1	19	36	42	10.5	10.5	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
453	14	Insulate Industries	3000	S	1	1	20	36	42	10.5	10.5	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
454	17	Insulate Industries	3000	S	1	1	21	30	42	8.8	8.8	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
455	11	Insulate Industries	3000	S	1	1	22	24	60	10.0	10.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
456	11	Insulate Industries	3000	S	1	1	23	24	60	10.0	10.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
457	14	Insulate Industries	3000	S	1	1	26	24	36	6.0	6.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
458	14	Insulate Industries	3000	S	1	1	29	24	36	6.0	6.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
459	12	Insulate Industries	3000	S	1	1	31	18	48	6.0	6.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
460	15	Insulate Industries	3000	S	1	1	33	24	36	6.0	6.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
461	6	Insulate Industries	3000	S	1	1	34	48	42	14.0	14.0	0.55	2	4 Vinyl	M	1	\$15.00	\$6.57
462	8	Insulate Industries	3000	S	1	1	60	36	36	15.0	15.0	0.9	1	4 Vinyl	M	1	\$15.00	\$6.57
463	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
464	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
465	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
466	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
467	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
468	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
469	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
470	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
471	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
472	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
473	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
474	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
475	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
476	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
477	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
478	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
479	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
480	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
481	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
482	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
483	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
484	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
485	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
486	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
487	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
488	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
489	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
490	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
491	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
492	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
493	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
494	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
495	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
496	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
497	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
498	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
499	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57
500	11	Insulate Industries	3000	S	1	1	61	42	42	12.8	12.8	0.35	3	2 Wood	M	1	\$15.00	\$6.57

HOUSE ID	WIND-#	MANUFACTURER	MODEL	ORIENT	# OF WINDOWS	R.O. WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	GAP CODE	GAP SIZE	U-VALUE	# OF GLAZINGS	FRAME DESCR	LOW-E	GAS TYPE	GAS DESC.	COST	NORMALIZED COST (\$/SF)
116	8	Marvin Windows	MC Sliding	S	2	67	48	60	20.0	40.0	5 3/4	0.34	2	1 Wood	Y		I	\$475.58	\$11.97
117	11	Marvin Windows	3145	SE	1	68	79	72	14.5	14.5	99 Other	1/2	2	2 Wood	Y		I	\$174.48	\$12.05
118	11	Marvin Windows	3145	SE	1	70	71	81	39.9	39.9	99 Other	1/2	2	2 Wood	Y		I	\$193.00	\$12.05
119	8	Marvin Windows	327424M	SW	1	71	42	55	15.5	15.5	2 5/8	0.37	2	2 Wood	Y		I	\$195.00	\$12.05
120	8	Marvin Windows	327424M	SW	1	72	37	48	12.3	12.3	99 Other	1/2	2	2 Wood	Y		I	\$136.00	\$12.05
121	6	Marvin Windows	MC	R	1	73	36	36	9.0	9.0	5 3/4	0.38	2	1 Wood	Y		I	\$114.86	\$12.76
122	4	Marvin Windows	MC	R	1	74	36	36	9.0	9.0	5 3/4	0.38	2	1 Wood	Y		I	\$114.86	\$12.76
123	10	Marvin Windows	3046	R	1	75	38	57	15.0	15.0	1 1/2	0.37	2	2 Wood	Y		I	\$192.66	\$12.81
124	9	Marvin Windows	3046	R	1	77	38	57	15.0	15.0	1 1/2	0.37	2	2 Wood	Y		I	\$192.66	\$12.81
125	11	Marvin Windows	3144	E	2	77	38	57	28.9	28.9	2 5/8	0.37	2	2 Wood	Y		I	\$193.32	\$12.81
126	11	Marvin Windows	3144	E	1	79	38	38	10.0	10.0	9	0.38	2	2 Wood	Y		I	\$129.00	\$12.85
127	11	Marvin Windows	3144	E	1	69	38	38	10.0	10.0	9	0.38	2	2 Wood	Y		I	\$129.00	\$12.85
128	6	Marvin Windows	MAGNUM III	S	1	81	38	38	10.0	10.0	0	0.38	2	2 Wood	Y		I	\$129.00	\$12.85
129	6	Marvin Windows	MAGNUM III	S	1	82	38	38	10.0	10.0	0	0.38	2	2 Wood	Y		I	\$129.00	\$12.85
130	14	Marvin Windows	Casement	S	1	83	60	50	25.0	25.0	0	0.4	2	2 Wood	Y		I	\$233.19	\$12.93
131	11	Marvin Windows	2474M2	NE	1	84	58	53	21.3	21.3	99 Other	1/2	2	2 Wood	Y		I	\$278.00	\$13.02
132	12	Marvin Windows	2474M2	SE	1	85	58	53	21.3	21.3	99 Other	1/2	2	2 Wood	Y		I	\$278.00	\$13.02
133	4	Marvin Windows	3046	SW	1	87	29	33	10.7	10.7	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
134	9	Marvin Windows	3046	SW	1	88	38	49	12.9	12.9	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
135	16	Marvin Windows	Casement	SE	2	90	38	49	12.9	12.9	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
136	16	Marvin Windows	Casement	SE	2	94	108	48	36.0	36.0	1 1/2	0.21	2	2 Wood	Y		I	\$193.00	\$13.13
137	1	Marvin Windows	3046	S	1	95	77	57	30.5	30.5	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
138	2	Marvin Windows	3046	S	1	96	77	57	30.5	30.5	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
139	2	Marvin Windows	3046	S	1	98	44	54	16.5	16.5	1 1/2	0.29	2	2 Wood	Y		I	\$193.00	\$13.13
140	2	Marvin Windows	3046	S	1	100	44	54	16.5	16.5	1 1/2	0.29	2	2 Wood	Y		I	\$193.00	\$13.13
141	2	Marvin Windows	3046	S	1	101	44	54	16.5	16.5	1 1/2	0.29	2	2 Wood	Y		I	\$193.00	\$13.13
142	2	Marvin Windows	3046	S	1	105	38	53	14.0	14.0	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
143	2	Marvin Windows	3046	S	1	109	38	53	14.0	14.0	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
144	1	Marvin Windows	3046	S	1	110	96	81	54.0	54.0	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
145	1	Marvin Windows	3046	S	1	111	58	47	18.9	18.9	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
146	1	Marvin Windows	3046	S	1	113	58	47	18.9	18.9	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
147	1	Marvin Windows	3046	S	1	114	42	53	15.5	15.5	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
148	1	Marvin Windows	3046	S	1	115	48	72	24.0	24.0	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
149	1	Marvin Windows	3046	S	1	116	48	72	24.0	24.0	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
150	1	Marvin Windows	3046	S	1	117	30	16	7.5	7.5	5 3/4	0.38	2	2 Wood	Y		I	\$193.00	\$13.13
151	1	Marvin Windows	3046	S	1	119	40	48	20.0	20.0	1 1/2	0.21	2	2 Wood	Y		I	\$193.00	\$13.13
152	1	Marvin Windows	3046	S	1	121	60	48	20.0	20.0	1 1/2	0.21	2	2 Wood	Y		I	\$193.00	\$13.13
153	1	Marvin Windows	3046	S	1	122	54	53	19.9	19.9	1 1/2	0.21	2	2 Wood	Y		I	\$193.00	\$13.13
154	1	Marvin Windows	3046	S	1	124	57	48	19.0	19.0	4 3/8	0.29	2	2 Wood	Y		I	\$193.00	\$13.13
155	1	Marvin Windows	3046	S	1	126	36	48	12.0	12.0	4 3/8	0.33	2	2 Wood	Y		I	\$193.00	\$13.13
156	1	Marvin Windows	3046	S	1	126	90	48	30.0	30.0	1 1/2	0.21	2	2 Wood	Y		I	\$193.00	\$13.13
157	1	Marvin Windows	3046	S	1	135	59	84	33.8	33.8	99 Other	1/2	2	2 Wood	Y		I	\$193.00	\$13.13
158	1	Marvin Windows	3046	S	1	136	59	84	33.8	33.8	99 Other	1/2	2	2 Wood	Y		I	\$193.00	\$13.13
159	1	Marvin Windows	3046	S	1	138	72	74	48	48	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
160	1	Marvin Windows	3046	S	1	140	38	49	12.9	12.9	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
161	1	Marvin Windows	3046	S	1	144	38	49	12.9	12.9	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
162	1	Marvin Windows	3046	S	1	146	38	49	12.9	12.9	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
163	1	Marvin Windows	3046	S	1	147	40	38	10.6	10.6	4 1/2	0.29	2	2 Wood	Y		I	\$193.00	\$13.13
164	1	Marvin Windows	3046	S	1	149	49	80	27.2	27.2	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
165	1	Marvin Windows	3046	S	1	150	121	48	40.3	40.3	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
166	1	Marvin Windows	3046	S	1	151	121	48	40.3	40.3	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
167	1	Marvin Windows	3046	S	1	157	36	73	12.3	12.3	5 3/4	0.35	2	2 Wood	Y		I	\$193.00	\$13.13
168	1	Marvin Windows	3046	S	1	158	24	73	12.3	12.3	5 3/4	0.35	2	2 Wood	Y		I	\$193.00	\$13.13
169	1	Marvin Windows	3046	S	1	159	60	81	33.8	33.8	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
170	1	Marvin Windows	3046	S	1	160	56	43	16.7	16.7	5 3/4	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
171	1	Marvin Windows	3046	S	1	161	72	80	40.0	40.0	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
172	1	Marvin Windows	3046	S	1	163	54	53	19.9	19.9	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
173	1	Marvin Windows	3046	S	1	164	84	48	28.0	28.0	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
174	1	Marvin Windows	3046	S	1	165	103	54	35.6	35.6	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
175	1	Marvin Windows	3046	S	1	167	60	36	15.0	15.0	0	0.33	2	2 Wood	Y		I	\$193.00	\$13.13
176	1	Marvin Windows	3046	S	1	168	24	60	10.0	10.0	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
177	1	Marvin Windows	3046	S	1	169	83	48	28.0	28.0	0	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
178	1	Marvin Windows	3046	S	1	170	83	48	28.0	28.0	0	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
179	1	Marvin Windows	3046	S	1	171	122	72	61.0	61.0	4 3/8	0.33	2	2 Wood	Y		I	\$193.00	\$13.13
180	1	Marvin Windows	3046	S	1	172	97	60	40.4	40.4	4 3/8	0.33	2	2 Wood	Y		I	\$193.00	\$13.13
181	1	Marvin Windows	3046	S	1	173	59	40	13.9	13.9	99 Other	1/2	2	2 Wood	Y		I	\$193.00	\$13.13
182	1	Marvin Windows	3046	S	1	175	59	40	13.9	13.9	99 Other	1/2	2	2 Wood	Y		I	\$193.00	\$13.13
183	1	Marvin Windows	3046	S	1	177	73	48	24.3	24.3	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
184	1	Marvin Windows	3046	S	1	177	73	48	24.3	24.3	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
185	1	Marvin Windows	3046	S	1	178	73	48	24.3	24.3	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
186	1	Marvin Windows	3046	S	1	179	24	81	10.2	10.2	5 3/4	0.35	2	2 Wood	Y		I	\$193.00	\$13.13
187	1	Marvin Windows	3046	S	1	180	42	41	12.0	12.0	2 5/8	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
188	1	Marvin Windows	3046	S	1	181	168	55	41.3	41.3	5 3/4	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
189	1	Marvin Windows	3046	S	1	182	168	55	41.3	41.3	5 3/4	0.37	2	2 Wood	Y		I	\$193.00	\$13.13
190	1	Marvin Windows	3046	S	1	182	168	55	41.3	41.3	5 3/4	0.37	2	2 Wood	Y		I	\$193.00	\$13.13

MANUFACTURER	MINIMUM	# OF WINDOWS	ORIENT	FOR MEDIAN	R.O. WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	SAP CODE SITE	U-VALUE	# OF GLAZINGS	FRAME TYPE	FRAME DESCRIPTION	LOW-E	GAS TYPE	GAS DESC.	COST	UNEMPLIFIED COST 10/1/91
2 Andersen Corporation	214	1	S	103	82	43	22.8	22.8	2.5/8	0.37	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
23 Andersen Corporation	179	1	N	184	48	40	14.3	14.3	3.5/4	0.39	2	2 Wood	2 Wood	Y	1	1	\$30.10	\$16.57
3 Weather Shield Mfg. Inc.	207	8	M	192	38	50	13.2	105.6	2.5/8	0.36	2	2 Wood	2 Wood	Y	1	1	\$1,498.05	\$16.57
6 Andersen Corporation	221	1	N	131	38	41	10.8	10.8	2.5/8	0.37	2	2 Wood	2 Wood	Y	1	1	\$175.00	\$16.57
11 Andersen Corporation	212	2	ne	195	30	49	10.2	20.4	2.5/8	0.37	2	2 Wood	2 Wood	Y	1	1	\$331.24	\$16.57
9 Weather Shield Mfg. Inc.	213	1	S	197	40	80	22.2	44.4	1.1/2	0.21	2	2 Wood	2 Wood	Y	1	1	\$470.00	\$16.57
18 Andersen Corporation	213	1	SE	197	60	72	30.0	30.0	2.5/8	0.31	2	2 Wood	2 Wood	Y	1	1	\$557.00	\$16.57
18 Andersen Corporation	213	1	SE	202	24	102	17.0	34.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$557.00	\$16.57
3 Andersen Corporation	213	2	S	202	24	102	17.0	34.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$557.00	\$16.57
3 Andersen Corporation	213	1	S	204	28	54	15.5	10.5	1.1/2	0.29	2	2 Wood	2 Wood	Y	1	1	\$171.00	\$16.57
3 Andersen Corporation	213	1	N	205	36	42	10.5	10.5	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$171.00	\$16.57
3 Andersen Corporation	213	1	N	207	36	42	10.5	10.5	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$171.00	\$16.57
3 Andersen Corporation	213	1	S	208	33	72	3.7	3.7	4.3/8	0.33	2	2 Wood	2 Wood	Y	1	1	\$35.87	\$16.57
3 Andersen Corporation	213	1	E	208	33	72	3.7	3.7	4.3/8	0.33	2	2 Wood	2 Wood	Y	1	1	\$35.87	\$16.57
2 Weather Shield Mfg. Inc.	214	1	E	210	46	46	13.4	13.4	2.5/8	0.36	2	2 Wood	2 Wood	Y	1	1	\$227.79	\$16.57
3 Andersen Corporation	214	1	SW	211	46	64	21.8	21.8	1.1/2	0.38	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
2 Andersen Corporation	214	2	E	213	26	53	9.6	19.1	2.5/8	0.37	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
2 Andersen Corporation	214	1	E	214	72	60	30.0	30.0	2.5/8	0.37	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	215	24	40	6.7	6.7	2.5/8	0.32	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1	\$16.57	\$16.57
15 Andersen Corporation	215	1	E	216	48	27	9.0	9.0	2.5/8	0.39	2	2 Wood	2 Wood	Y	1	1</		

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HOUSE NO.	MANUFACTURER	MODEL	OFFICIN	WINDOWS	FOR	R.O. WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	GSP CODE	GSP SIZE	U-VALUE	# OF GLAZINGS	FRAME DESCRIPTION	LOW-E	GAS TYPE	GAS DESC.	COST	NORMALIZED COST (\$/SQFT)
211	9 Andersen Corporation	DELTA 10	M	1	387	36	9.0	36	9.0	2 5/8	2 5/8	0.32	2	2 Wood	Y		1	\$281.93	\$1.73
221	9 Andersen Corporation	DELTA 10	M	1	389	17	36	36	4.3	2 5/8	2 5/8	0.32	2	2 Wood	Y		1	\$155.90	\$1.76
242	2 Inca Window Company	ICM44	e	1	389	37	38	48	12.3	2 5/8	2 5/8	0.37	2	2 Wood	Y		1	\$36.48	\$2.13
242	2 Inca Window Company	ICM44	e	1	390	25	37	38	6.4	2 5/8	2 5/8	0.39	2	2 Wood	Y		1	\$27.88	\$2.73
112	14 HITA	SALE 11E	UP	2	392	21	21	21	6.1	99 Other	1 1/2	0.4	2	2 Wood	Y		1	\$18.60	\$2.42
118	2 Marsen Windows	ME-Cascent	S	7	394	41	31	21	9.3	1 1/2	1 1/2	0.38	2	2 Wood	Y		1	\$18.00	\$2.95
205	6 Poca Window Company	ZCMB12	S	1	395	37	36	36	9.3	2 5/8	2 5/8	0.37	2	2 Wood	Y		1	\$18.00	\$2.95
205	6 Poca Window Company	ZCMB12	S	1	396	37	36	36	9.3	2 5/8	2 5/8	0.37	2	2 Wood	Y		1	\$18.00	\$2.95
127	14 HITA	12540C	M	1	397	17	60	7.1	7.1	98 Other	1 1/2	0.4	2	2 Wood	Y		1	\$18.00	\$2.95
127	14 HITA	42120A	M	1	398	47	18	5.9	5.9	98 Other	1 1/2	0.4	2	2 Wood	Y		1	\$18.00	\$2.95
454	3 Andersen Corporation	C13	E	1	399	34	36	8.5	8.5	8 3/16	8 3/16	0.33	2	2 Wood	Y		1	\$18.00	\$2.95
454	3 Andersen Corporation	C13	E	1	400	34	36	8.5	8.5	8 3/16	8 3/16	0.33	2	2 Wood	Y		1	\$18.00	\$2.95
454	3 Andersen Corporation	C13	E	1	401	34	36	8.5	8.5	8 3/16	8 3/16	0.33	2	2 Wood	Y		1	\$18.00	\$2.95
454	3 Andersen Corporation	C13	E	1	402	19	36	4.8	4.8	2 5/8	2 5/8	0.39	2	2 Wood	Y		1	\$18.00	\$2.95
203	1 Andersen Corporation	ICMB12	M	2	404	17	25	3.0	3.0	2 5/8	2 5/8	0.33	2	2 Wood	Y		1	\$18.00	\$2.95
255	1 Andersen Corporation	CR12	N	1	405	52	24	8.7	8.7	2 5/8	2 5/8	0.33	2	2 Wood	Y		1	\$18.00	\$2.95
275	1 Andersen Corporation	CR12	N	1	406	34	36	18.0	18.0	2 5/8	2 5/8	0.33	2	2 Wood	Y		1	\$18.00	\$2.95
309	Freestone	Custom	E	1	407	72	36	55	22.9	2 5/8	2 5/8	0.37	2	2 Wood	Y		1	\$18.00	\$2.95
465	8 Andersen Corporation	ICMB 2	N	1	408	69	55	22.9	22.9	5 3/4	5 3/4	0.37	2	2 Wood	Y		1	\$18.00	\$2.95
465	8 Andersen Corporation	ICMB 2	N	1	409	30	48	10.0	10.0	0	0	0.37	2	2 Wood	Y		1	\$18.00	\$2.95
125	9 Andersen Corporation	C1CM1	M	1	410	30	17	3.5	3.5	7 7/16	7 7/16	0.37	2	2 Wood	Y		1	\$18.00	\$2.95
418	11 site built	fixed glass	NE	2	28	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
418	9 site built	fixed glass	NE	2	28	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
418	10 site built	fixed glass	NE	2	28	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
418	9 site built	fixed glass	SE	1	9	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
414	10 site built	fixed glass	S	1	10	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
414	7 site built	fixed glass	S	2	12	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
414	11 site built	fixed glass	SW	1	13	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
419	8 site built	fixed glass	N	1	14	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
420	6 site built	fixed glass	N	1	15	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
420	10 site built	fixed glass	N	1	16	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
420	11 site built	fixed glass	SW	1	17	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
420	9 site built	fixed glass	S	2	18	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	2	20	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	7 site built	fixed glass	N	2	22	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	2	24	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	NE	1	25	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	7 site built	fixed glass	NE	1	26	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	29	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	31	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	33	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	35	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	37	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	39	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	41	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	43	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	45	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	47	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	49	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	51	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	53	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	55	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	57	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	59	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	61	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	63	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	65	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	67	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	69	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	71	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	73	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	75	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37
430	8 site built	fixed glass	N	3	77	28	76	16.8	29.6	5 3/4	5 3/4	0.49	2	2 Wood	N		1	\$37.70	\$2.37

HOUSE ID	WINDO W	MANUFACTURER	MODEL	ORIENTN	# OF WINDOWS	R.O. MEDIAN	R.O. HEIGHT	R.O. AREA	TOTAL AREA	SAP CODE	SAP SIZE	U-VALUE	% OF GLAZING	FRAME DESCRIBING	LOW-E	SOS	GLAS DESC.	COST	MANUFACTURER COST (1985-87)
451	11	site built	fixed glass	N	1	75	28	14.8	14.8	5/3/4	18.8	0.49	2	2 Wood	N			\$45.28	\$1.05
451	8	site built	fixed glass	N	2	77	28	14.8	29.6	5/3/4	18.8	0.49	2	2 Wood	N			\$90.56	\$2.09
451	9	site built	fixed glass	N	1	78	28	14.8	14.8	5/3/4	14.8	0.49	2	2 Wood	N			\$45.28	\$1.06
452	9	site built	fixed glass	N	1	79	28	14.8	14.8	5/3/4	14.8	0.49	2	2 Wood	N			\$45.28	\$1.06
452	10	site built	fixed glass	N	1	80	28	14.8	14.8	5/3/4	14.8	0.49	2	2 Wood	N			\$45.28	\$1.06
452	8	site built	fixed glass	N	2	82	28	14.8	29.6	5/3/4	14.8	0.49	2	2 Wood	N			\$90.56	\$2.09
452	14	site built	fixed glass	N	1	83	28	14.8	14.8	5/3/4	14.8	0.49	2	2 Wood	N			\$45.28	\$1.06
452	8	Best Built	fixed glass	N	4	87	36	60	15.0	0	1/2	0.45	2	2 Wood	N			\$210.60	\$4.71
453	8	site built	fixed glass	SE	1	88	36	76	14.8	5/3/4	14.8	0.44	2	2 Wood	N			\$45.28	\$1.06
453	8	site built	fixed glass	SW	2	90	28	14.8	29.6	5/3/4	14.8	0.49	2	2 Wood	N			\$90.56	\$2.09
453	14	site built	fixed glass	S	1	91	28	14.8	14.8	5/3/4	14.8	0.49	2	2 Wood	N			\$45.28	\$1.06
453	14	site built	fixed glass	S	1	92	28	14.8	14.8	5/3/4	14.8	0.49	2	2 Wood	N			\$45.28	\$1.06
453	10	site built	fixed glass	SE	1	93	28	14.8	14.8	5/3/4	14.8	0.49	2	2 Wood	N			\$45.28	\$1.06
453	8	site built	fixed glass	N	2	95	28	14.8	29.6	5/3/4	14.8	0.49	2	2 Wood	N			\$90.56	\$2.09
453	15	site built	fixed glass	S	1	96	12	84	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
453	13	site built	fixed glass	S	1	97	36	28	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
453	12	site built	fixed glass	N	1	98	12	84	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
453	12	site built	fixed glass	N	1	99	36	28	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
454	15	site built	fixed glass	S	1	100	36	28	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
454	15	site built	fixed glass	S	1	101	36	28	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
455	13	site built	fixed glass	N	1	102	36	28	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
455	13	site built	fixed glass	N	1	103	12	84	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
455	13	site built	fixed glass	N	1	104	12	84	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
455	10	site built	fixed glass	N	1	105	36	28	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
455	8	site built	fixed glass	S	1	106	36	28	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
455	8	site built	fixed glass	S	1	107	36	28	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
455	8	site built	fixed glass	S	1	108	36	28	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
455	8	site built	fixed glass	S	1	109	72	30	30.0	9/9/16	30.0	0.45	2	2 Wood	N			\$151.59	\$3.24
455	12	site built	fixed glass	N	1	110	36	28	7.0	5/3/4	7.0	0.49	2	2 Wood	N			\$45.28	\$1.06
455	8	Window Visions	fixed glass	S	1	111	96	60	49.0	1/2	1/2	0.48	2	2 Wood	N			\$151.59	\$3.24
455	2	Best Built	fixed glass	N	2	113	15	80	16.7	0	1/2	0.45	2	2 Wood	N			\$45.28	\$1.06
455	3	Window Visions	fixed glass	N	1	114	48	16.0	16.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	3	Window Visions	fixed glass	N	1	115	60	25.0	25.0	1/2	1/2	0.42	2	2 Wood	N			\$121.60	\$2.61
455	13	Best Built	fixed glass	N	2	117	36	66	16.5	0	0	0.45	2	2 Wood	N			\$45.28	\$1.06
455	17	Best Built	fixed glass	N	2	119	36	66	16.5	0	0	0.45	2	2 Wood	N			\$45.28	\$1.06
455	11	Best Built	fixed glass	N	2	121	36	66	16.5	0	0	0.45	2	2 Wood	N			\$45.28	\$1.06
455	6	Best Built	fixed glass	N	2	123	48	72	24.0	0	0	0.45	2	2 Wood	N			\$45.28	\$1.06
455	7	Best Built	fixed glass	N	2	125	36	66	16.5	0	0	0.45	2	2 Wood	N			\$45.28	\$1.06
455	8	Window Visions	fixed glass	N	2	127	36	72	18.0	0	0	0.45	2	2 Wood	N			\$45.28	\$1.06
455	8	Window Visions	fixed glass	N	1	128	72	48	24.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	8	Window Visions	fixed glass	N	1	129	96	60	49.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	8	Window Visions	fixed glass	N	1	130	96	60	49.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	8	Seattle Sash & Door	fixed glass	N	1	131	55	40	15.3	2/5/8	15.3	0.44	2	2 Wood	N			\$281.04	\$6.08
455	5	Window Visions	fixed glass	N	1	132	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	6	Window Visions	fixed glass	N	1	133	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	6	Window Visions	fixed glass	N	1	134	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	12	Window Visions	fixed glass	N	1	135	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	11	Window Visions	fixed glass	N	1	136	72	48	24.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	11	Window Visions	fixed glass	N	1	137	72	48	24.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	139	72	48	24.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	140	72	48	24.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	3	Window Visions	fixed glass	N	1	141	60	48	20.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	142	48	48	16.0	1/2	1/2	0.49	2	2 Wood	N			\$45.28	\$1.06
455	6	Window Visions	fixed glass	N	1	143	48	48	16.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	6	Window Visions	fixed glass	N	1	144	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	4	Best Built	fixed glass	N	1	145	60	48	20.0	9/9/16	20.0	0.45	2	2 Wood	N			\$45.28	\$1.06
455	7	Window Visions	fixed glass	N	1	146	48	48	16.0	9/9/16	16.0	0.45	2	2 Wood	N			\$45.28	\$1.06
455	7	Window Visions	fixed glass	N	1	147	48	48	16.0	9/9/16	16.0	0.45	2	2 Wood	N			\$45.28	\$1.06
455	6	Window Visions	fixed glass	N	1	148	48	48	16.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	6	Window Visions	fixed glass	N	1	149	48	48	16.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	4	Window Visions	fixed glass	N	1	150	96	60	49.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	151	48	48	16.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	152	48	48	16.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	153	48	48	16.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	154	48	48	16.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	155	72	48	24.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	156	72	48	24.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	1	Seattle Sash & Door	fixed glass	N	1	157	72	48	24.0	1/2	1/2	0.42	2	2 Wood	N			\$45.28	\$1.06
455	1	Window Visions	fixed glass	N	1	158	32	34	7.6	2/5/8	7.6	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	159	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	160	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	161	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	162	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	163	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	164	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	165	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	166	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	167	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	168	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	169	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	170	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	171	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.28	\$1.06
455	2	Window Visions	fixed glass	N	1	172	60	48	20.0	1/2	1/2	0.48	2	2 Wood	N			\$45.	

MODEL	NAME AL TUBER	MODEL	ORIENT	# OF WINDOWS	FOR	R.O. WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	GAP CODE	GAP SIZE	U-VALUE	# OF GLAZINGS	FRAME TYPE	FRAME DESCRIPTION	GAS TYPE	GAS DESC.	COST	MINI-POLYMER COST (1.5 FEET)
433	5 Window Visions	P-2000	E	1	177	48	36	12.0	36.0	2 5/8	0.48	2	2	2 Wood	2 Wood	N	3	\$254.46	\$5.90
434	5 Window Visions	S-3300	E	1	180	48	36	12.0	36.0	2 5/8	0.48	2	2	2 Wood	2 Wood	N	3	\$119.70	\$5.90
435	21 site built	Indefinite	E	7	180	72	36	19.5	39.0	1 1/2	0.44	2	2	2 Wood	2 Wood	N	1	\$333.60	\$10.02
436	2 Window Visions	S-3300	M	1	181	48	42	14.0	14.0	1 1/2	0.42	2	2	2 Wood	2 Wood	M	3	\$101.52	\$10.11
437	2 Window Visions	S-3300	M	1	182	48	42	14.0	14.0	1 1/2	0.42	2	2	2 Wood	2 Wood	M	3	\$101.52	\$10.11
438	7 Window Visions	C-1000	S	1	183	96	36	24.0	24.0	1 1/2	0.44	2	2	2 Wood	2 Wood	S	3	\$247.95	\$10.23
439	17 site built		E	1	184	41	45	12.8	12.8	1 1/2	0.44	2	2	2 Wood	2 Wood	E	1	\$133.00	\$10.29
440	7 Seattle Sash & Door	Fineract	S	6	190	40	66	18.3	110.0	2 5/8	0.45	2	2	2 Wood	2 Wood	S	1	\$162.00	\$10.56
441	12 site built	Bo	M	1	191	36	42	10.5	10.5	9 9/16	0.45	2	2	2 Wood	2 Wood	M	1	\$116.00	\$11.02
442	9 Window Visions	E-1000	S	1	192	36	60	12.5	12.5	3 1/4	0.46	2	2	2 Wood	2 Wood	S	0	\$111.32	\$11.22
443	6 Fort Window Company	Custom	S	1	193	78	48	26.0	26.0	2 5/8	0.47	2	2	2 Wood	2 Wood	S	1	\$211.60	\$11.60
444	5 Window Visions	S-3300	S	1	194	72	80	40.0	40.0	1 1/2	0.42	2	2	2 Wood	2 Wood	S	1	\$211.60	\$11.60
445	5 Window Visions	S-3300	N	1	195	48	42	14.0	14.0	1 1/2	0.42	2	2	2 Wood	2 Wood	N	3	\$117.84	\$11.93
446	4 Window Visions	P-2000	N	1	196	48	42	14.0	14.0	1 1/2	0.42	2	2	2 Wood	2 Wood	N	3	\$117.84	\$11.93
447	6 Window Visions	P-2000	E	2	198	36	30	6.3	12.5	1 1/2	0.46	2	2	2 Wood	2 Wood	E	0	\$120.21	\$12.02
448	5 Window Visions	C-1000	E	1	199	36	36	9.0	9.0	3 1/4	0.46	2	2	2 Wood	2 Wood	E	0	\$120.21	\$12.02
449	5 Window Visions	C-1000	E	1	200	30	60	12.5	12.5	1 1/2	0.48	2	2	2 Wood	2 Wood	E	1	\$151.38	\$12.11
450	6 Seattle Sash & Door	Fineract	N	1	201	60	42	12.5	12.5	2 5/8	0.48	2	2	2 Wood	2 Wood	N	1	\$151.38	\$12.11
451	5 Window Visions	S-3300	M	1	202	60	60	23.0	23.0	1 1/2	0.42	2	2	2 Wood	2 Wood	M	3	\$122.42	\$12.22
452	5 Window Visions	S-3300	M	1	203	60	60	23.0	23.0	1 1/2	0.42	2	2	2 Wood	2 Wood	M	3	\$122.42	\$12.22
453	6 Seattle Sash & Door	C1825-21	M	1	204	42	42	12.3	12.3	1 1/2	0.44	2	2	2 Wood	2 Wood	M	3	\$123.60	\$12.36
454	2 Seattle Sash & Door	Fineract	E	3	205	55	48	18.3	18.3	2 5/8	0.44	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
455	1 Fort Window Company	PW56	E	1	206	71	48	23.7	23.7	2 5/8	0.44	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
456	1 Fort Window Company	PW56	E	1	209	72	60	30.0	30.0	1 1/2	0.49	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
457	11 site built	Bo	E	2	210	72	60	30.0	30.0	1 1/2	0.49	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
458	8 Fort Window Company	FINW5	M	1	212	60	24	16.0	16.0	9 9/16	0.45	2	2	2 Wood	2 Wood	M	1	\$122.42	\$12.42
459	8 Fort Window Company	FINW5	M	1	213	78	60	11.7	11.7	1 1/2	0.49	2	2	2 Wood	2 Wood	M	1	\$122.42	\$12.42
460	11 Fort Window Company	FINW5	S	1	214	28	60	11.7	11.7	1 1/2	0.49	2	2	2 Wood	2 Wood	S	1	\$122.42	\$12.42
461	7 Fort Window Company	FINW5	S	1	215	28	60	11.7	11.7	1 1/2	0.49	2	2	2 Wood	2 Wood	S	1	\$122.42	\$12.42
462	4 Seattle Sash & Door	Fineract	M	2	217	28	42	8.2	16.3	2 5/8	0.44	2	2	2 Wood	2 Wood	M	1	\$122.42	\$12.42
463	1 site built	Bo	E	2	219	30	48	10.0	24.0	9 9/16	0.45	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
464	10 Seattle Sash & Door	C1444-20-1	E	1	220	48	72	24.0	24.0	2 5/8	0.47	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
465	11 Seattle Sash & Door	Fineract/C	E	1	221	52	54	19.5	19.5	4 3/8	0.44	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
466	18 Window Visions	Fineract/C	S	1	222	71	48	19.5	19.5	4 3/8	0.44	2	2	2 Wood	2 Wood	S	1	\$230.58	\$12.58
467	11 Window Visions	S-3300	M	1	223	24	36	8.0	8.0	3 1/4	0.45	2	2	2 Wood	2 Wood	M	0	\$110.98	\$11.98
468	11 Window Visions	S-3300	M	1	224	24	36	8.0	8.0	3 1/4	0.45	2	2	2 Wood	2 Wood	M	0	\$110.98	\$11.98
469	13 Window Visions	FINW5	M	1	225	24	60	10.0	10.0	2 5/8	0.47	2	2	2 Wood	2 Wood	M	3	\$122.42	\$12.42
470	13 Window Visions	FINW5	M	1	226	90	60	37.5	37.5	1 1/2	0.46	2	2	2 Wood	2 Wood	M	0	\$122.42	\$12.42
471	21 site built	Picture	M	1	227	48	60	20.0	20.0	0	0.5	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
472	4 Post Built		S	1	228	48	48	16.0	16.0	0	0.45	2	2	2 Wood	2 Wood	S	1	\$230.58	\$12.58
473	18 Post Built		S	1	229	30	36	7.5	7.5	0	0.45	2	2	2 Wood	2 Wood	S	1	\$230.58	\$12.58
474	18 Post Built		S	1	230	48	36	12.0	12.0	0	0.45	2	2	2 Wood	2 Wood	S	1	\$230.58	\$12.58
475	16 Post Built		M	1	231	24	48	8.0	8.0	0	0.45	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
476	20 Post Built		S	1	232	24	36	6.0	6.0	0	0.45	2	2	2 Wood	2 Wood	S	1	\$230.58	\$12.58
477	18 Post Built		S	1	233	24	36	6.0	6.0	0	0.45	2	2	2 Wood	2 Wood	S	1	\$230.58	\$12.58
478	3 Best Built		S	1	235	36	48	16.0	16.0	0	0.45	2	2	2 Wood	2 Wood	S	1	\$230.58	\$12.58
479	4 Window Visions	S-3300	S	2	238	72	48	24.0	24.0	1 1/2	0.44	2	2	2 Wood	2 Wood	S	1	\$230.58	\$12.58
480	5 Seattle Sash & Door	Fineract	M	2	240	48	36	12.0	12.0	99 Other 1/2	0.44	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
481	16 site built	Bo	M	1	241	60	48	20.0	20.0	1 1/2	0.44	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
482	16 Window Visions	C-1000	S	1	244	36	36	9.0	9.0	3 1/4	0.46	2	2	2 Wood	2 Wood	S	0	\$117.84	\$11.84
483	9 Fort Window Company	FINW5	E	1	245	56	48	19.7	18.7	1 1/2	0.49	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
484	9 Fort Window Company	FINW5	M	2	246	56	48	18.0	18.0	1 1/2	0.49	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
485	9 Fort Window Company	FINW5	M	2	248	48	48	16.0	16.0	99 Other 1/2	0.44	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
486	6 Post Built	Bo	M	2	251	18	60	7.5	15.0	9 9/16	0.45	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
487	7 Fort Window Company	FINW5	M	2	253	28	48	9.3	18.7	1 1/2	0.49	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
488	4 Fort Window Company	C170-4020	E	1	254	96	60	40.0	40.0	1 1/2	0.44	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
489	4 Fort Window Company	FINW5	M	1	255	48	60	20.0	20.0	1 1/2	0.49	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
490	8 Fort Window Company	FINW5	M	1	256	48	60	20.0	20.0	1 1/2	0.49	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
491	12 Fort Window Company	FINW5	M	1	258	48	48	16.0	16.0	99 Other 1/2	0.44	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
492	15 Fort Window Company	C156	E	3	261	60	84	35.0	35.0	2 5/8	0.47	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
493	11 Window Visions	S-3300	M	2	263	40	30	8.3	25.0	2 5/8	0.47	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
494	11 Window Visions	S-3300	M	2	264	40	30	8.3	25.0	2 5/8	0.47	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
495	7 Fort Window Company	C18420-1	E	3	269	30	72	15.0	45.0	2 5/8	0.47	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
496	16 Seattle Sash & Door	Fineract/C	E	1	271	42	42	12.3	12.3	1 1/2	0.44	2	2	2 Wood	2 Wood	E	1	\$230.58	\$12.58
497	1 Fort Window Company	FINW5	M	1	273	55	40	15.3	15.3	4 3/8	0.47	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
498	10 Fort Window Company	FINW5	M	1	274	35	24	6.0	6.0	1 1/2	0.47	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58
499	10 Fort Window Company	FINW5	M	1	275	36	24	6.0	6.0	1 1/2	0.47	2	2	2 Wood	2 Wood	M	1	\$230.58	\$12.58

HOUSE NO.	WINDOW #	MANUFACTURER	MODEL	ORIGIN	# OF WINDOWS	FOR MEDIAN	R.O. WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	GAP CODE	U-VALUE	# OF GLAZING	FRAME TYPE	FRAME DESCRIPTION	LOW-E	GAS TYPE	GAS DESC.	COST	WARRANTY COST (10 SEPT)
107	107	6 FELLA	304212	N	1	276	72	48	24.0	24.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$79.00	\$15.21
439	439	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	277	66	54	24.8	24.8	1 1/4	0.49	2	2	2 Wood	M	1	1	\$82.13	\$16.21
440	440	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	279	36	60	15.3	15.3	2 5/8	0.47	2	2	2 Wood	M	1	1	\$82.52	\$16.25
441	441	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	280	72	72	11.0	11.0	2 5/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
442	442	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	281	84	61	28.0	28.0	4 3/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
443	443	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	282	84	61	35.6	35.6	4 3/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
444	444	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	283	28	60	11.7	11.7	4 3/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
445	445	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	284	28	60	11.7	11.7	4 3/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
446	446	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	285	84	96	56.0	56.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
447	447	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	286	48	42	14.0	14.0	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
448	448	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	287	48	42	14.0	14.0	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
449	449	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	288	48	42	14.0	14.0	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
450	450	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	289	48	42	14.0	14.0	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
451	451	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	290	48	42	14.0	14.0	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
452	452	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	291	48	42	14.0	14.0	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
453	453	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	292	48	42	14.0	14.0	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
454	454	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	293	48	42	14.0	14.0	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
455	455	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	294	48	42	14.0	14.0	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
456	456	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	295	48	42	14.0	14.0	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
457	457	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	296	55	40	15.3	15.3	4 3/8	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
458	458	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	297	24	36	6.0	6.0	9 9/16	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
459	459	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	298	47	40	13.1	13.1	4 3/8	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
460	460	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	299	30	42	8.8	8.8	1 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
461	461	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	300	70	42	8.8	8.8	1 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
462	462	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	301	70	42	8.8	8.8	1 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
463	463	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	302	24	46	8.0	8.0	1 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
464	464	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	303	55	54	20.6	20.6	4 3/8	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
465	465	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	304	60	48	20.0	20.0	1 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
466	466	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	305	60	48	20.0	20.0	1 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
467	467	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	306	60	48	20.0	20.0	1 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
468	468	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	307	72	60	30.0	30.0	2 5/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
469	469	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	308	48	46	20.0	20.0	2 5/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
470	470	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	309	48	46	20.0	20.0	2 5/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
471	471	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	310	57	46	23.8	23.8	4 3/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
472	472	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	311	48	36	12.0	12.0	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
473	473	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	312	63	40	17.5	17.5	12 25/32	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
474	474	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	313	47	40	13.1	13.1	4 3/8	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
475	475	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	314	48	48	16.0	16.0	1 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
476	476	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	315	60	54	35.0	35.0	2 5/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
477	477	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	316	66	54	24.8	24.8	3 1/4	0.49	2	2	2 Wood	M	1	1	\$179.55	\$16.42
478	478	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	317	33	30	6.9	6.9	2 5/8	0.47	2	2	2 Wood	M	1	1	\$179.55	\$16.42
479	479	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	318	48	46	16.0	16.0	1 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
480	480	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	319	48	46	16.0	16.0	1 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
481	481	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	320	48	46	16.0	16.0	1 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
482	482	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	321	60	80	33.3	33.3	2 5/8	0.49	2	2	2 Wood	M	1	1	\$179.55	\$16.42
483	483	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	322	66	48	22.0	22.0	3 1/4	0.49	2	2	2 Wood	M	1	1	\$179.55	\$16.42
484	484	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	323	66	48	22.0	22.0	3 1/4	0.49	2	2	2 Wood	M	1	1	\$179.55	\$16.42
485	485	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	324	24	36	6.0	6.0	1 1/2	0.49	2	2	2 Wood	M	1	1	\$179.55	\$16.42
486	486	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	325	24	36	6.0	6.0	1 1/2	0.49	2	2	2 Wood	M	1	1	\$179.55	\$16.42
487	487	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	326	24	36	6.0	6.0	1 1/2	0.49	2	2	2 Wood	M	1	1	\$179.55	\$16.42
488	488	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	327	36	36	9.0	9.0	4 3/8	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
489	489	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	328	36	36	9.0	9.0	4 3/8	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
490	490	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	329	36	36	9.0	9.0	4 3/8	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
491	491	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	330	36	36	9.0	9.0	4 3/8	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
492	492	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	331	36	36	9.0	9.0	4 3/8	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
493	493	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	332	24	36	6.0	6.0	1 1/2	0.42	2	2	2 Wood	M	1	1	\$179.55	\$16.42
494	494	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	333	57	41	16.2	16.2	4 3/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
495	495	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	334	57	41	16.2	16.2	4 3/8	0.45	2	2	2 Wood	M	1	1	\$179.55	\$16.42
496	496	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	335	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
497	497	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	336	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
498	498	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	337	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
499	499	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	338	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
500	500	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	339	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
501	501	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	340	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
502	502	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	341	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
503	503	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	342	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
504	504	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	343	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
505	505	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	344	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
506	506	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	345	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
507	507	14 Marvin Windows	PICTURE DIR C-2714-1	S	1	346	24	36	9.0	9.0	99 Other 1/2	0.44	2	2	2 Wood	M	1	1	\$179.55	\$16.42
 																	

DOUSE ID	WINDOW	MANUFACTURER	MODEL	ORIGIN	# OF WINDOWS	# OF DIV	R.O. WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	GAP CODE	GAP SITE	U-VALUE	# OF GLAZING TYPE	FRAME DESIGN	LOW-E	GAS TYPE	GAS ESC.	COST	WARRANTY COST (1.5% OF COST)
222	12 Seattle South & East	Firecraft	Firecraft	S	1	1	562	20	40	5.4	5.6	4 3/8	0.44	2	2 Wood	Y			\$137.79	\$20.67
230	12 Seattle South & East	Firecraft	Firecraft	S	2	2	564	33	31	7.1	14.2	2 5/8	0.44	2	2 Wood	Y			\$234.70	\$35.20
435	17 Marvin Windows	Bombale Case	Bombale Case	S	1	1	565	54	54	15.8	15.8	3 1/4	0.5	2	2 Wood	K			\$462.40	\$69.36
436	17 Marvin Windows	Bombale Case	Bombale Case	S	1	1	566	48	54	18.0	18.0	3 1/4	0.5	2	2 Wood	K			\$456.08	\$68.41
437	10 Forzi Windows	Gable End	Gable End	E	1	1	567	16	30	3.3	3.3	2 5/8	0.47	2	2 Wood	M			\$86.06	\$12.91
438	10 Forzi Windows	Gable End	Gable End	E	1	1	568	22	34	4.2	4.2	2 5/8	0.47	2	2 Wood	M			\$86.06	\$12.91
439	10 Forzi Windows	Gable End	Gable End	E	2	2	569	12	60	5.0	10.0	1 1/2	0.47	2	2 Wood	M			\$172.12	\$25.82
440	10 Forzi Windows	Gable End	Gable End	E	2	2	570	12	60	5.0	10.0	1 1/2	0.47	2	2 Wood	M			\$172.12	\$25.82
441	3 Forzi Windows	Gable End	Gable End	E	1	1	571	27	28	7.3	7.3	2 5/8	0.45	2	2 Wood	M			\$274.80	\$41.22
442	3 Forzi Windows	Gable End	Gable End	E	1	1	572	28	28	5.4	5.4	2 5/8	0.45	2	2 Wood	M			\$170.24	\$25.54
443	3 Forzi Windows	Gable End	Gable End	E	1	1	573	24	48	8.0	8.0	1 1/2	0.49	2	2 Wood	M			\$314.23	\$47.13
444	10 Marvin Windows	Picture Dir	Picture Dir	S	1	1	574	96	30	20.0	20.0	3 1/4	0.44	2	2 Wood	M			\$129.00	\$19.35
445	9 Forzi Windows	Picture Dir	Picture Dir	S	1	1	575	24	24	4.0	4.0	9 9/16	0.45	2	2 Wood	M			\$129.00	\$19.35
446	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	576	24	24	4.0	4.0	9 9/16	0.45	2	2 Wood	M			\$129.00	\$19.35
447	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	577	107	48	35.7	35.7	2 5/8	0.45	2	2 Wood	M			\$174.00	\$26.10
448	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	578	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
449	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	579	40	30	12.5	12.5	1 1/2	0.42	2	2 Wood	M			\$444.54	\$66.68
450	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	580	60	30	12.5	12.5	1 1/2	0.42	2	2 Wood	M			\$444.54	\$66.68
451	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	581	96	66	44.0	44.0	3 1/4	0.49	2	2 Wood	M			\$1368.39	\$205.26
452	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	582	48	36	12.0	12.0	3 1/4	0.45	2	2 Wood	M			\$444.54	\$66.68
453	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	583	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
454	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	584	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
455	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	585	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
456	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	586	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
457	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	587	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
458	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	588	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
459	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	589	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
460	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	590	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
461	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	591	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
462	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	592	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
463	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	593	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
464	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	594	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
465	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	595	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
466	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	596	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
467	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	597	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
468	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	598	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
469	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	599	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
470	10 Forzi Windows	Picture Dir	Picture Dir	S	1	1	600	24	24	4.0	4.0	2 5/8	0.47	2	2 Wood	M			\$174.00	\$26.10
 										

HOUSE NO.	MANUFACTURER	MODEL	ORIGIN	# OF WINDOWS	FOR MEDIAN	F.O.D.	R.O.D.	R.O.A.	TOTAL AREA	GAP CODE	U-VALUE	# OF BLINDS	FRAME TYPE	LOW-E TYPE	GAS DEC.	COST	MANUFACTURER COST (1980)
1	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
2	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
3	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
4	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
5	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
6	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
7	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
8	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
9	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
10	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
11	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
12	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
13	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
14	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
15	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
16	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
17	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
18	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
19	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
20	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
21	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
22	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
23	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
24	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
25	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
26	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
27	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
28	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
29	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
30	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
31	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
32	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
33	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
34	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
35	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
36	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
37	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
38	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
39	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
40	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
41	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
42	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
43	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
44	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
45	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
46	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
47	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
48	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
49	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
50	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
51	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
52	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
53	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
54	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
55	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
56	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
57	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
58	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
59	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
60	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
61	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
62	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
63	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
64	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
65	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
66	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
67	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
68	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
69	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
70	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
71	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
72	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
73	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
74	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
75	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
76	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
77	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
78	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
79	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
80	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
81	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
82	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
83	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
84	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
85	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$481.72	\$12.95
86	Window Visions	F-6000	S	1	1	72	82	41.0	41.0	1 1/2	0.48	2	2	M	3	\$475.24	\$12.44
87	Window Visions	F-6000	S	1	1	72	80	40.0	40.0	1 1/2	0.42	2	2	M	3	\$48	

HOUSE NO	WINDOW	MANUFACTURER	MODEL	ORIENT	# OF WINDOWS	FOR MEDIAN WIDTH	R.O. HEIGHT	R.O. AREA	TOTAL AREA	GAP CODE	GAP SIZE	U-VALUE	# OF SLATINGS	FRAME TYPE	FEAME DESCRIPTION	LOW-F	GAS TYPE	GAS BESE	COST	NEGALIZED COST (\$/SFT)
319	2	site built		N	1	1	12	40	5.0	5.0	1 1/2	0	2	2	Wood	N		1	\$120.00	\$120.00
322	8	Hilgard Manufacturing, Inc.	7508 Strlight		1	1	24	24	4.0	4.0	3 1/4	0	2	2	3 Metal	N		1	\$54.18	\$17.72
341	16	Northwest Aluminum Products	1680	E	1	1	18	60	7.5	7.5	5 3/4	0	2	2	4 Vinyl	N		1	\$79.51	\$17.50
401	11	Northwest Aluminum Products	1680	E	1	1	18	60	7.5	7.5	5 3/4	0	2	2	4 Vinyl	N		1	\$79.51	\$17.50
403	13	unknown		N	1	1	24	48	8.0	8.0	1 1/2	0	2	2	1 Thermal	N		3	\$144.10	\$18.76
404	14	unknown	slider	E	1	1	48	48	16.0	16.0	0	0	1	1	2 Wood	N		1	\$87.33	\$5.45
406	10	Northwest Aluminum Products	1680	E	1	1	18	60	7.5	7.5	5 3/4	0	2	2	4 Vinyl	N		1	\$79.51	\$17.50
409	11	Northwest Aluminum Products	1680	E	1	1	18	60	7.5	7.5	5 3/4	0	2	2	4 Vinyl	N		1	\$79.51	\$17.50
412	17	site built		S	1	1	28	76	14.8	14.8	5 3/4	0	2	2	2 Wood	N		1	\$66.70	\$17.62
412	19	site built		SE	1	1	28	76	14.8	14.8	5 3/4	0	2	2	2 Wood	N		1	\$66.70	\$17.62
412	13	site built		SE	1	1	84	12	7.0	7.0	5 3/4	0	2	2	2 Wood	N		1	\$66.70	\$17.62
418	13	Hilgard Manufacturing, Inc.	21008	S	1	1	60	42	17.5	17.5	0	0	3	3	1 Thermal	N		0	\$130.55	\$5.83
418	2	Hilgard Manufacturing, Inc.	21008	N	1	1	60	36	15.0	15.0	0	0	3	3	1 Thermal	N		0	\$102.81	\$7.72
418	3	Hilgard Manufacturing, Inc.	21008	S	1	1	72	36	18.0	18.0	0	0	3	3	1 Thermal	N		0	\$121.31	\$8.14
418	12	Hilgard Manufacturing, Inc.	21008	S	1	1	60	42	17.5	17.5	0	0	3	3	1 Thermal	N		0	\$121.31	\$8.14
418	6	Hilgard Manufacturing, Inc.	21008	N	1	1	36	36	9.0	9.0	0	0	3	3	1 Thermal	N		0	\$121.31	\$8.14
418	5	Hilgard Manufacturing, Inc.	21008	N	1	1	24	36	6.0	6.0	0	0	3	3	1 Thermal	N		0	\$121.31	\$8.14
418	8	Hilgard Manufacturing, Inc.	21008	N	1	1	12	60	17.5	17.5	0	0	3	3	1 Thermal	N		0	\$121.31	\$8.14
418	9	Hilgard Manufacturing, Inc.	21008	E	1	1	34	35	8.3	8.3	5 3/4	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	1	site built		E	1	1	34	35	8.3	8.3	5 3/4	0	2	2	2 Wood	N		1	\$15.00	\$1.67
417	1	Hilgard Manufacturing, Inc.		N	2	2	46	76	24.3	48.6	1 1/2	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	1	Hilgard Manufacturing, Inc.	Double Case	N	2	2	46	76	24.3	48.6	1 1/2	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	4	Quanta		N	2	2	69	48	20.0	40.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	2	Quanta		N	2	2	72	60	30.0	150.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	12	Quanta		N	3	3	72	48	24.0	72.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	8	Quanta		N	3	3	72	48	24.0	72.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	3	Quanta		N	2	2	74	48	8.0	16.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	5	Quanta		N	2	2	74	48	8.0	16.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	11	Quanta		N	1	1	48	48	16.0	16.0	0	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	7	Quanta		N	1	1	69	42	17.5	17.5	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	8	Quanta		N	1	1	96	48	32.0	32.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	18	site built		E	1	1	48	48	14.0	14.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	19	site built		E	1	1	78	76	14.8	44.3	0	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	20	site built		S	2	2	35	77	15.5	31.0	1 1/2	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	22	site built		S	2	2	47	77	25.1	25.1	1 1/2	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	16	Fallsburgh Lining Corp.	glass block	S	2	2	54	36	18.0	36.0	1 1/2	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	20	Feather Windows and Doors	9130 Strlight	N	1	1	24	36	0.0	0.0	3 1/4	0	2	2	3 Metal	N		1	\$15.00	\$1.67
418	20	Northwest Aluminum Products	circular	S	1	1	28	36	7.0	7.0	2 5/8	0	2	2	1 Thermal	N		1	\$15.00	\$1.67
418	13	site built		S	1	1	74	96	16.0	16.0	5 3/4	0	2	2	1 Thermal	N		1	\$15.00	\$1.67
418	20	Northwest Aluminum Products	5130	S	2	2	18	74	0.0	0.0	5 3/4	0	2	2	4 Vinyl	N		1	\$15.00	\$1.67
418	10	Forzi Window Company	28H100	N	1	1	28	14	2.7	2.7	1 1/2	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	5	site built		S	1	1	36	40	15.0	15.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	7	site built		S	2	2	37	40	13.3	26.7	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	10	site built		S	2	2	24	48	13.3	26.7	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	8	site built		N	1	1	39	72	15.0	15.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	14	site built		E	1	1	36	78	15.5	58.5	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	11	site built		N	1	1	12	40	5.0	5.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	9	site built		E	1	1	36	72	18.0	18.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	15	site built		E	2	2	36	40	13.9	30.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	7	site built		N	2	2	30	46	13.9	30.0	2 5/8	0	2	2	2 Wood	N		1	\$15.00	\$1.67
418	15	Anderson Corporation	3032	N	2	2	36	42	10.5	21.0	0	0	2	2	2 Wood	N		0	\$15.00	\$1.67

APPENDIX C

ADDITIONAL WINDOW ANALYSIS

This appendix contains more complete, or broken out cost information. The tables found there contain not only window cost information but separate values for U-values as well.

Table C1 presents the window cost/U-value data for the complete, by window data.

Table C2 presents the window cost/U-value data for the filtered, by window data.

Table C3 presents the window cost/U-value data for the complete, by home data.

Table C4 presents the window cost/U-value data for the filtered, by home.

 

44 444

CLASS 4a:	Q-Value:	410	0.39	0.39	0.09	0.21	0.21	0.00	0.00
	Cost:	410	\$18.79	\$12.83	\$9.15	\$4.15	\$37.66	\$0.00	\$0.00
CLASS 5a:	Q-Value:	395	0.46	0.46	0.01	0.41	0.50	0.00	0.00
	Cost:	395	\$13.71	\$12.02	\$10.74	\$2.02	\$77.56	\$1.81	\$1.00
CLASS 6a:	Q-Value:	35	0.55	0.57	0.02	0.52	0.57	0.00	0.00
	Cost:	35	\$18.82	\$15.25	\$13.26	\$10.10	\$83.53	\$2.00	\$0.00

VIMS

Class 40:	U-Value:	240	0.35	0.35	0.03	0.26	0.29		
	Cost:	240	\$10.76	\$9.22	\$6.27	\$9.25	\$5.40		
Class 50:	U-Value:	167	0.46	0.46	0.02	0.42	0.50		
	Cost:	167	\$7.04	\$6.58	\$2.64	\$7.59	\$12.56		
Class 60:	U-Value:	34	0.55	0.55	0.01	0.54	0.62		
	Cost:	34	\$3.98	\$3.58	\$1.27	\$5.09	\$9.24		

Type 101

CLASS 40:	U-Value:	251	0.38	0.38	0.42	0.22	0.30		
	Cost:	251	\$8.45	\$7.64	\$3.54	\$0.77	\$2.77		
CLASS 50:	U-Value:	149	0.47	0.45	0.42	0.43	0.47		
	Cost:	149	\$13.16	\$9.48	\$12.86	\$7.37	\$8.45		
CLASS 60:	U-Value:	339	0.55	0.53	0.42	0.41	0.60		
	Cost:	339	\$9.45	\$8.13	\$4.21	\$0.77	\$5.07		
CLASS 65:	U-Value:	15	0.61	0.63	0.41	0.63	0.61		
	Cost:	15	\$10.17	\$5.23	\$3.77	\$1.77	\$2.91		
CLASS 75:	U-Value:	39	0.70	0.67	0.64	0.67	0.71		
	Cost:	39	\$11.54	\$9.17	\$5.27	\$1.71	\$1.77		

REFERENCES

Category	Sub-category	Value	Unit	Value	Unit	Value	Unit	Value	Unit
Energy	Electricity	100	kWh	100	kWh	100	kWh	100	kWh
	Gas	100	kWh	100	kWh	100	kWh	100	kWh
 

REFERENCE C2
RCDP CYCLE II WINDOW COST ANALYSIS
FILTERED BY WINDOW DATA

FRAME TYPE: # OF MEAN MEDIAN STD DEV MIN MAX U-VALUE COST

CLASS 40:	U-Value:	397	0.35	0.35	0.04	0.21	0.40		
	Cost:	397	\$18.85	\$18.83	\$3.90	\$4.42	\$62.20		
CLASS 50:	U-Value:	284	0.45	0.45	0.02	0.41	0.50	-0.07	-0.01
	Cost:	284	\$16.67	\$14.91	\$9.27	\$2.50	\$77.50	\$1.32	\$1
CLASS 60:	U-Value:	25	0.55	0.56	0.02	0.53	0.57	-0.11	0.01
	Cost:	25	\$14.44	\$13.71	\$4.90	\$10.10	\$33.00	\$1.30	\$5

VINYL

CLASS 40:	U-Value:	203	0.35	0.35	0.03	0.31	0.39		
	Cost:	203	\$10.73	\$9.57	\$6.13	\$4.05	\$38.10		
CLASS 50:	U-Value:	156	0.46	0.46	0.02	0.42	0.50	-0.11	0.01
	Cost:	156	\$6.73	\$6.57	\$2.39	\$2.57	\$11.40	\$7.00	\$5
CLASS 60:	U-Value:	34	0.55	0.55	0.01	0.54	0.60	-0.07	0.01
	Cost:	34	\$8.98	\$8.57	\$3.27	\$5.09	\$20.21	\$24.00	\$1

METAL

CLASS 40:	U-Value:	246	0.38	0.38	0.01	0.31	0.40		
	Cost:	246	\$8.43	\$7.64	\$3.50	\$2.71	\$26.70		
CLASS 50:	U-Value:	111	0.46	0.45	0.02	0.43	0.49	-0.07	0.01
	Cost:	111	\$12.44	\$9.50	\$7.30	\$5.36	\$42.40	(\$1.50)	\$1
CLASS 60:	U-Value:	345	0.56	0.56	0.02	0.51	0.50	-0.11	0.01
	Cost:	345	\$9.06	\$8.10	\$4.06	\$2.04	\$34.00	0.00	\$5
CLASS 75:	U-Value:	33	0.66	0.67	0.02	0.63	0.67	-0.11	0.01
	Cost:	33	\$8.40	\$5.68	\$5.68	\$4.71	\$29.03	0.00	\$5
SLIGHTS	U-Value:	31	0.48	0.49	0.06	0.40	0.64		
	Cost:	31	\$19.72	\$20.19	\$10.74	\$6.83	\$45.65		
W/TH BUILT	U-Value:	140	0.48	0.49	0.03	0.35	0.56		
	Cost:	140	\$3.93	\$1.90	\$4.11	\$1.00	\$11.70		

ALL COSTS IN \$/SQ FT ALL U-VALUES IN GED HP-1 SOFT

APPENDIX C4
RCDF CYCLE II WINDOW COST ANALYSIS
FILTERED, BY HOME DATA

FRAME TYPE:	# OF BLDGS	MEAN	MEDIAN	STD DEV	MIN	MAX	MEAN	STD DEV
WOOD								
CLASS 40: U-Value:	30	0.35	0.36	0.04	0.21	0.40		
Cost:	30	\$17.24	\$18.56	\$4.59	\$5.01	\$25.05		
CLASS 50: U-Value:	31	0.45	0.45	0.03	0.41	0.49	-0.05	
Cost:	31	\$16.02	\$13.65	\$6.94	\$2.50	\$33.50	\$4.91	
CLASS 60: U-Value:	3	0.55	0.56	0.02	0.53	0.57	-0.11	
Cost:	3	\$13.46	\$14.38	\$1.92	\$10.93	\$15.09	\$0.70	
VINYL								
CLASS 40: U-Value:	18	0.35	0.36	0.03	0.31	0.38	0.32	
Cost:	18	\$8.68	\$9.57	\$2.85	\$5.15	\$16.02		
CLASS 50: U-Value:	19	0.46	0.46	0.02	0.42	0.49	-0.10	
Cost:	19	\$6.60	\$6.54	\$1.21	\$5.01	\$8.37	\$1.54	
CLASS 60: U-Value:	5	0.55	0.55	0.01	0.55	0.57	-0.04	
Cost:	5	\$8.86	\$7.78	\$2.08	\$7.01	\$12.54	\$1.24	
METAL								
CLASS 40: U-Value:	39	0.38	0.38	0.01	0.34	0.40		
Cost:	39	\$8.62	\$7.74	\$4.17	\$5.36	\$25.07		
CLASS 50: U-Value:	14	0.46	0.45	0.02	0.43	0.49	-0.07	
Cost:	14	\$10.92	\$8.89	\$4.09	\$5.86	\$20.56	\$1.15	
CLASS 60: U-Value:	45	0.56	0.56	0.02	0.51	0.59	-0.11	
Cost:	45	\$8.57	\$8.33	\$4.09	\$2.71	\$24.31	\$0.56	
CLASS 75: U-Value:	7	0.65	0.67	0.02	0.63	0.69	-0.11	
Cost:	7	\$12.54	\$5.47	\$8.73	\$5.00	\$19.03	\$1.21	

ALL COSTS IN \$/SOFT ALL U-VALUES IN Btu/HR-F-SOFT

APPENDIX D

WSEO WINDOW ANALYSIS CONTRIBUTION

The following is a copy of a report on window costs prepared by Dick Byers of WSEO. It is included in this report as an analysis contribution.

This report presents the findings of WSEO for the window cost data. It mentions the difficulty in gathering the data and the strong support of the state energy offices. The report also includes results from information gathered from nine window manufacturers, which were selected as being representative of the window market in Washington.

WASHINGTON STATE
ENERGY OFFICE

The Cost of Energy Efficient Windows in Washington

*Research supported by Bonneville Power
Administration under RCDP Cycle II*

WASHINGTON STATE
ENERGY OFFICE

WAOENG #89-61
January 1990

The Cost of Energy Efficient Windows in Washington

*Research supported by Bonneville Power
Administration under RCDP Cycle II*

*Prepared by
Dick Byers*

This report provides window cost data collected as a part of the RCDP/SGC cost data collection project. The original research design for this project called for window costs to be collected through a random sample of builders in each of the states of Idaho, Oregon, Montana and Washington. Builder samples were selected and cost collection instruments distributed in Oregon and Idaho during February and March of 1989. The response to these surveys was discouraging. Even considering the 50 dollar payment, and significant follow-up efforts by Idaho and Oregon SEO staff, both states were unable to obtain more than 20 to 25 percent of the desired sample size. Oregon was particularly frustrated, having actually signed agreements with builders who agreed to participate and then did not.

In light of the low response rate experienced in the Idaho and Oregon samples, a different strategy was used for window costs in Washington. A detailed survey of nine window manufacturers was undertaken. The manufacturers were selected to be broadly representative of the window market place in Washington. Costs were collected to be representative of direct sales to builders and developers. In all cases, manufacturers were instructed to provide costs appropriate for a builder/developer purchasing windows for 10 to 50 projects per year.

Appendix A includes a description of the survey approach used to collect the window costs. Briefly, data were collected for a range of window sizes and styles intended to represent typical window schedules (Table 1). The schedule includes horizontal sliding glass windows, fixed windows, casement windows, a sliding glass door and a skylight. Separate cost data were collected for three frame material types: aluminum, vinyl and wood. A sub-category of aluminum frame, with argon gas filling, was collected as well. These frame types were intersected with five thermal efficiency classifications: class 40, 50, 60, 65 and 75. The Seattle Department of Construction and Land Use (DCLU) June, 1989 Listing of window test data was used to identify appropriate window model numbers for as many cross-classifications of window frame types, styles and efficiency levels as possible. Finally, the window manufacturers were surveyed to verify the DCLU model numbers, and to supply information about new tested models in their product line, or those missed in the original DCLU screening. Costs were collected in August, 1989 from each manufacturer for the final set of window model numbers identified.

In order to ensure that efficiency classifications were reliable, only tested window models (AMMA 1503.1 or ASTM C236/C976) were included in this

survey. Consequently, the survey does not represent a manufacturer's entire product line; it only covers those products that have been tested.

Table 1

Window schedule for Washington window cost survey

Dimensions	SF	Operator Style
2030	6	horizontal slider
4040	16	horizontal slider
4050	20	horizontal slider
6040	24	horizontal slider
1650	7.5	fixed
8050	40	fixed (double vent)
2030	6	casement
2650	12.5	casement
4050	20	casement
6068	40	Sliding Glass Door
2040	8	Skylight

Results of the Washington Survey

Costs were collected for a total of 303 windows. Table 2 presents the distribution of these windows across manufacturers, window type and window efficiency classes.

Table 2

Sample distribution of slider/fixed windows by manufacturer and class.

Manufacturer	Efficiency Class				
	40	50	60	65	75
Alpine	8	10	14	0	4
Anderson	0	2	4	0	0
Insulate	6	10	18	0	0
Marvin	5	2	5	0	0
Milgard	10	2	12	6	0
Northwest	26	6	22	4	4
Peachtree	0	1	0	0	0
Viking	2	2	10	6	0
Total	57	35	85	16	8

Table 3

Sample distribution of casement windows by manufacturer and class.

Manufacturers	Efficiency Class				
	40	50	60	65	75
Alpine	0	6	3	3	0
Anderson	3	0	0	0	0
Insulate	3	0	0	0	0
Marvin	3	0	0	0	0
Milgard	0	3	6	3	3
Northwest	3	3	3	0	0
Peachtree	3	3	0	0	0
Pella	3	3	0	0	0
Viking	0	3	3	3	0
Total	18	21	15	9	3

Table 4Sample distribution of **sliding glass doors** by manufacturer and class.

Manufacturers	Efficiency Class				
	40	50	60	65	75
Alpine	1	2	2	1	1
Anderson	1	1	0	0	0
Insulate	0	1	1	0	0
Marvin	1	0	1	0	0
Milgard	1	1	1	0	1
Northwest	1	1	2	0	1
Peachtree	0	0	1	0	1
Pella	0	0	0	0	0
Viking	0	1	1	0	1
Total	5	7	9	1	4

Table 5Sample distribution of **skylights** windows by manufacturer and class.

Manufacturers	Efficiency Class				
	40	50	60	65	75
Alpine	0	1	1	0	0
Anderson	0	1	1	0	0
Insulate	0	0	0	0	0
Marvin	0	0	0	0	0
Milgard	1	0	2	1	0
Northwest	0	1	1	0	0
Peachtree	0	0	0	0	0
Pella	0	0	0	0	0
Viking	0	0	0	0	0
Total	1	3	5	1	0

Throughout the tabulations in this report, data for horizontal sliding and fixed windows have been aggregated. This has been done for practical reasons, both to increase the sample cell sizes and to reduce the size of the survey result tables. Similarly, the Aluminum/Argon frame type has been combined with the Aluminum frame type. Tabulations have been done which preserve these classifications, and are available if requested.

Table 6 tabulates the sample's distribution among frame types and efficiency classes. It is interesting to note that nearly all vinyl framed windows fall in class 50 or below. The only exceptions are sliding glass doors.

Table 7 examines the frequency of thermal break frames in aluminum frame windows in the sample. The thermally broken frame clearly prevails in class 50 and 40 aluminum windows. In class 60 about sixty percent of the aluminum frame windows do not have thermally broken frames. Of these 56 non-thermally broken windows, 9 have low-e glazing and 24 contain argon gas. This means that 19 (or 20 percent) of the class 60 windows in the survey have standard

aluminum frames, clear glazing and contain no special gas fillings. This appears to refute the often heard claim that in order to achieve class 60 performance, aluminum frame windows must resort to thermal frame breaks, gas fillings or low-e glazing.

Table 6Sample distribution of **window frame types** by efficiency class.

Frame type	Efficiency Class				
	40	50	60	65	75
Aluminum	36	27	99	27	15
Vinyl	26	26	3	0	0
Wood	19	13	12	0	0
Total	81	66	114	27	15

Table 7Sample distribution of **thermally broken frames** in aluminum framed windows by efficiency class.

Thermal Break	Efficiency Class				
	40	50	60	65	75
yes	33	25	43	1	0
no	3	2	56	26	15
Total	36	27	99	27	15

Table 8 examines the frequency of argon filling in both aluminum and vinyl framed windows in the sample. Argon gas is clearly most prevalent at the class 60 level.

Table 8Sample distribution of **argon gas fillings** in aluminum and vinyl framed windows by efficiency class.

Argon	Efficiency Class				
	40	50	60	65	75
yes	8	3	24	4	0
no	54	50	78	23	15
Total	62	53	102	27	15

Table 9 examines the frequency of low emissivity coatings in both aluminum and vinyl framed windows represented within the sample.

Table 9Sample distribution of **low emissivity coatings** in aluminum and vinyl framed windows by efficiency class.

Low Emissivity	Efficiency Class				
	40	50	60	65	75
yes	28	10	17	0	0
no	34	43	85	27	15
Total	62	53	102	27	15

Table 10 examines the frequency of multiple glazing types in the sample of aluminum and vinyl framed windows. All wood framed windows in the sample are double glazed. It is interesting to note that the majority of triple glazed windows fall in class 50 rather than 40.

Table 10

Sample distribution of multiple glazing in aluminum and vinyl framed windows by efficiency class.

Glazing	Efficiency Class				
	40	50	60	65	75
triple	10	14	0	0	0
double	48	39	102	27	15
dbl/storm	4	0	0	0	0
Total	62	53	102	27	15

Analysis Method

The objective of the analysis is two-fold; first, to develop a set of window cost estimators (cost per square foot) for the various window efficiency classes, styles and frame types, and second, to use these estimators to estimate the difference in cost between the various window efficiency classes. To be of practical value, these estimators must be appropriate for estimating total window cost (or incremental cost) in a home through simple multiplication by total home window area.

Both total window cost and window cost per square foot are strongly correlated with window size. As window size increases, total window cost increases and window cost per square foot decreases (see figures 1 and 2 for an example, based on Class 40 Aluminum Framed windows). Because window cost per square foot is related to window size, and we want to develop a cost estimator based on size, it is incorrect to simply calculate the cost per square foot of all windows in the sample, and then take the average. This will lead to an over estimation of average window costs because small windows will contribute a high cost per square foot while only contributing a small total cost (because of their small size).

This problem can be avoided simply by calculating cost per square foot as the sum of the cost for all the windows in a sample, divided by the total square footage of windows in the sample. This is equivalent to dividing the average window cost by the average square footage and yields an estimate of cost per square foot that is low for small windows and high for large windows. It is exactly correct for the average window size in the sample.

For example, the following cost figures are taken from the data set and represent one manufacturer's

cost for Class 40 windows. The average cost per square foot is calculated in both ways discussed above.

Size (sf)	Cost	Cost/sf
6	95.72	15.95
16	153.71	9.60
20	180.29	9.01
24	195.68	8.15

Total square footage = 66.00

Total cost = 625.40

Average based on $\text{sum}(\text{cost}/\text{sf})/n$ = 10.67

Average based on $\text{sum}(\text{cost})/\text{sum}(\text{sf})$ = 9.47

If the \$10.67/sf estimator is applied to the total of 66 square feet of windows, the estimate of total cost is \$704.22, high by 13 percent. If the \$9.47/sf estimator is used, the answer is, of course, exactly \$625.40. More importantly, the \$9.47 estimate is very close to the cost per square foot for the 16 square foot window. This reflects the fact that the average size of this set of four windows is 16.5 square feet.

Even when the cost per square foot averages are properly calculated, further consideration of the relationship between cost per square foot and window size must be made if figures are to be compared between sample cells (e.g., Class 60 \$/sf compared with Class 40 \$/sf). The average cost per square foot for a data set containing only ten square foot windows (or for a data set with an average size of ten square feet) will be considerably higher than the cost per square foot for a data set containing only 40 square foot windows (or for a data set with an average size of 40 square feet). This means that comparisons between samples will only be correct if the samples have the same average window size. Because some window sizes were not available in desired frame type and efficiency category combinations, samples in this data set do not always represent the same square footage (table 11).

In order to adjust the averages to permit correct comparisons, regressions of cost per square foot on window size were estimated for each sample cell (e.g., Class 40 aluminum frame sliding/fixed windows). Table 12 presents the coefficient for window size from these regression fits, as well as its significance level. In all aluminum and vinyl cases for sliding/fixed windows the coefficient is very well determined. The casement window coefficients are less well determined and the wood window coeffi-

cients the least well determined -- owing largely to very small sample sizes and great variation in cost between manufacturers.

Table 11

Average window size (sf) in sample by frame type, operator type and efficiency class.

Aluminum Framed Windows:

Operator style	Efficiency Class				
	40	50	60	65	75
Sliding/fixed	19.5	18.9	18.8	18.3	16.5
Casement	N/A	12.8	12.8	12.8	12.8
SG Door	40	40	40	40	40
Skylight	8	8	8	8	8

Vinyl Framed Windows:

Operator style	Efficiency Class				
	40	50	60	65	75
Sliding/fixed	18.9	18.9	N/A	N/A	N/A
Casement	12.0	12.8	N/A	N/A	N/A
SG Door	40	40	40	N/A	N/A

Wood Framed Windows:

Operator style	Efficiency Class				
	40	50	60	65	75
Sliding/fixed	21.5	20.5	19.3	N/A	N/A
Casement	12.8	12.8	N/A	N/A	N/A
SG Door	40	40	40	N/A	N/A
Skylight	N/A	8	8	N/A	N/A

Table 12

Slope coefficient for square foot term in cost per square foot versus square foot regressions.

		Slope (\$/sf)	Signif. (t-prob)	Slope (\$/sf)	Signif. (t-prob)
Aluminum Frame:		Sliders and Fixed		Casement Windows	
Class :					
	40	-.16	.001	N/A	N/A
	50	-.17	.006	-.81	.132
	60	-.15	.000	-.64	.049
	65	-.11	.011	-.55	.119
	75	-.25	.000	-.57	.08
Vinyl Frame:		Sliders and Fixed		Casement Windows	
Class :					
	40	-.18	.000	-.57	.003
	50	-.18	.000	-.51	.002
	60	N/A	N/A	N/A	N/A
	65	N/A	N/A	N/A	N/A
	75	N/A	N/A	N/A	N/A
Wood Frame:		Sliders and Fixed		Casement Windows	
Class :					
	40	-.49	.191	-1.07	.084
	50	-.18	.430	-.73	.038
	60	-.64	.029	N/A	N/A
	65	N/A	N/A	N/A	N/A
	75	N/A	N/A	N/A	N/A

These coefficients have been used to normalize cell averages for sliding/fixed and casement windows to 16 square feet. This represents the average window size contained in the 160 RCDP Cycle 1 homes. The modal window in this data set was 4040, regardless of frame type or operator style. This normalization permits cell averages to be directly compared. It also yields a correct estimator for calculating total window costs in homes based on total window area, so long as the average window size is 16 square feet and they have a distribution of window sizes similar to that in this survey. For comparison, the average window sizes in the prototype homes used in the Super Good Cents cost evaluation project are 15.7 sf, 14.1 sf, and 17.5 sf for prototypes 1 through 3, respectively. Taking all three prototypes together, the average window size is 15.8 square feet. It is important to note that this normalization increases the cost average for all sliding/fixed windows because all averages exceed 16 square feet.

No normalization of sliding glass door data is necessary because all costs represent the standard 40 square foot door. All costs for skylights represent an 8 square foot skylight.

Window Cost Averages

Table 13 presents the cost estimators for each efficiency class, frame type, and operator style. The statistical precision of these estimators range from +/- 15 percent to +/- 40 percent. Imprecision in this case measures variance due to the range of window sizes in the sample and variance due to costs. Given that only a limited number of window models for any manufacturer satisfy the requirements for any given sample cell, it is probably not possible to increase precision by increasing sample size unless more manufacturers were sampled.

Each average is followed in parentheses by the total number of windows contributing to the average and the number of manufacturers represented by those windows (i.e., windows, manufacturers). The averages for wood windows and those for skylights are not well determined; sample sizes are very small.

APPENDIX A

SURVEY APPROACH

PURPOSE

The purpose of this study was to collect cost data for a range of window efficiencies and frame types. This is being done as part of an effort to improve the region's base of information concerning the impact of increasing window thermal efficiency standards on the cost of housing.

PROCEDURE

I. The window types, sizes, thermal categories, and manufacturers were determined by contract:

A. Type and Sizes of Windows (2030 = 2'-0" x 3'-0")

1. Sliding Windows - 2030, 4040, 4050, 6040
2. Fixed Windows - 1650, 8050
3. Casement Windows - 2030, 2650, 4050
4. Sliding Glass Door - 6068
5. Skylights - 2040

B. Thermal Categories (Based on AMMA Test Values)

1. Class 75 ($.65 < U < .76$)
2. Class 65 ($.60 < U < .66$)
3. Class 60 ($.50 < U < .61$)
4. Class 50 ($.40 < U < .51$)
5. Class 40 ($U < .41$)

C. Manufacturers

1. ALPINE INDUSTRIES
Types: Aluminum, Aluminum with Argon, Vinyl
2. ANDERSEN CORPORATION
Type: Wood
3. INSULATE INDUSTRIES
Types: Aluminum, Aluminum with Argon, Vinyl
4. MARVIN WINDOWS
Type: Wood
5. MIKRON INDUSTRIES
Type: Vinyl
6. MILGARD MANUFACTURING
Types: Aluminum, Aluminum with Argon, Vinyl
7. NORTHWEST ALUMINUM PRODUCTS
Types: Aluminum, Aluminum with Argon, Vinyl
8. PEACHTREE WINDOWS AND DOORS
Type: Wood
9. PELLA PRODUCTS
Type: Wood
10. VIKING INDUSTRIES
Type: Wood

APPENDIX E

WINDOW NORMALIZED COST GRAPHS

This appendix contains a set of XY graphs showing the correlation between window cost and average area for each class and frame type. Bins were created for windows within a particular area range. The average cost for these ranges was calculated and plotted against the area bins. These plots were generated using the filtered, by home data. They show that there is little correlation between normalized cost (cost/sqft) and area. A bar chart presenting the average window cost by size of window is included in this appendix. The graph was also generated with the use of the filtered, by home data.

The result shows:

Graph E1 shows that smaller windows cost more per area than larger windows. At 14 to 16 square feet the cost per area flattens out.

Graphs E2 through E11 shows the average cost of the windows for the house was not correlated to the average window size for that house.

From the results, it appears that one can use the cost per square foot directly in estimating costs for any house irrespective of the average window size. This conclusion differs from that found by the WSEO cost analysis presented in Appendix D.

AVE WINDOW \$ BY SIZE FOR TOTAL SAMPLE

EXCLUDING SITE BUILT AND SKYLIGHTS

CLASS 60 WOOD

CLASS 50 WOOD

CLASS 40 WOOD

CLASS 60 VINYL

CLASS 50 VINYL

CLASS 40 VINYL

CLASS 75 METAL

CLASS 60 METAL

CLASS 50 METAL

CLASS 40 METAL

APPENDIX F

CEILING INSULATION COST DATA BASE

This appendix contains a copy of the initial data base that was used for the ceiling insulation cost analyses. Many of the homes reported have a variety of R-values, framing methods, and materials.

This data set contains the following information:

- House identification (contract #)
- Zone
- Wattsun Code
- Wattsun description
- Area
- Reference Cost
- Total Cost

The Wattsun Code and description provided the descriptive information used for categorizing the data for the analysis. It includes R-Value, framing, and other information.

The reference cost refers to the estimation for materials and labor for a standard framed R38 ceiling of the same area.

The total cost includes all material, labor, and other costs associated with the insulation of the ceiling.

RLDP CYCLEZ CEILING COSTS

CEILING APPENDIX

CONTRACT	ZONE	WATTSUN CODE	WATTSUN DESCRIPTION	AREA	REFERENCE COST	TOTAL COST
101	3	0 R-49 advanced, 2x6 joist or 2x4 truss		1140	0.00	673.00
103	3	0 R-60 standard, joist/truss		1362	800.00	1450.00
104	2	0 R-49 advanced, 2x6 joist or 2x4 truss		265	0.00	0.00
105	2	0 R-49 advanced, joist/truss		1598	677.00	873.00
106	2	0 R-60 advanced, 2x6 joist		948	974.00	2006.25
107	2	0 R-38 standard, joist/truss		1132	458.00	708.00
108	2	0 R-49 advanced, 2x6 joist or 2x4 truss		1169	2500.00	1230.00
109	2	0 R-49 advanced, 2x6 joist or 2x4 truss		1082	250.00	643.00
110	3	0 R-49 standard, joist/truss		882	893.00	2890.00
111	2	0 R-49 advanced, 2x6 joist or 2x4 truss		580	220.00	324.28
112	2	0 R-49 advanced, 2x6 joist or 2x4 truss		838	175.00	575.00
113	2	0 R-49 advanced, 2x6 joist or 2x4 truss		1525	427.00	757.76
114	2	0 R-49 standard, joist/truss		1344	430.00	776.00
115	3	0 R-49 advanced, 2x6 joist or 2x4 truss		1277	549.00	1038.00
116	2	0 R-49 standard, joist/truss		1838	771.00	992.00
117	2	0 R-49 standard, joist/truss		863	353.00	457.00
119	3	0 R-49 standard, joist/truss		1378	578.00	814.00
120	2	0 R-49 advanced, 2x6 joist or 2x4 truss		4619	0.00	2991.00
124	3	0 R-44 ADVANCED FRAME		1524	655.32	1074.00
125	2	0 R-38 advanced, joist/truss		1079	0.00	614.00
126	2	0 R-40 STANDARD		858	325.00	341.38
127	2	0 R-60 advanced, 2x6 joist		1877	774.00	1181.00
201	3	0 R-60 advanced, 2x4 truss		2048	0.00	1667.00
202	3	0 OTHER R-60 adv + R-5 dow board		2016	1060.20	2096.76
203	3	0 OTHER R-60 adv + R-5 rigid		2016	1060.20	2096.76
205	3	0 R-49 advanced, 2x6 joist or 2x4 truss		1204	600.00	807.00
207	3	0 R-60 adv, 2x4, 1"Ureth + R-49 Cellulose		2082	1020.00	2165.00
208	3	0 R-38 advanced, joist/truss		950	890.48	1870.52
211	3	0 R-60 advanced, 2x4 truss		1494	1850.00	1490.74
212	3	0 OTHER 2x4 adv truss 1"ureth+R-49 Blown		1311	1945.00	3191.88
213	3	0 R-49 advanced, 2x6 joist or 2x4 truss		1730	0.00	2700.00
214	3	0 R-60 advanced, 2x4 truss		1800	915.00	1685.00
215	3	0 OTHER R-62 CELLULOSE, 2x4 RH TRUSS		1344	650.00	1410.00
218	3	0 OTHER 1" POLYURETHANE + R-40 CELLULOSE		1533	1594.32	2333.00
219	3	0 OTHER R-76 BLOWN FIBERGLASS		1556	585.00	2516.00
220	3	0 R-49 advanced, 2x6 joist or 2x4 truss		2500	2375.00	2872.00
221	3	0 R-49 advanced, 2x6 joist or 2x4 truss		1720	2580.00	1596.00
222	3	0 R-49 standard, joist/truss		740	1161.00	1331.00
223	3	0 R-60 standard, joist/truss		1800	798.00	1617.00
225	3	0 R-49 advanced, 2x6 joist or 2x4 truss		1288	698.00	1434.00
226	3	0 R-60 advanced, 2x4 truss		1920	875.00	1785.00
228	3	0 R-49 advanced, 2x6 joist or 2x4 truss		1428	1097.00	1178.00
229	3	0 OTHER R-50, 1.5" URETHANE + CELLULOSE		946	1268.00	1492.00
304	1	0 R-38 advanced, joist/truss		1056	433.00	528.00
310	1	0 R-38 standard, joist/truss & 17		1305	530.00	730.00
314	1	0 R-38 advanced, joist/truss		1347	533.00	1097.50
315	1	0 R-38 advanced, joist/truss		883	-213.00	634.70
317	1	0 R-38 advanced, joist/truss		1104	1607.00	972.00
318	1	0 R-38 advanced, joist/truss		1177	1673.00	718.00
319	1	0 R-38 advanced, joist/truss		1177	1673.00	718.00
328	1	0 R-30 vaulted & R-49 2x6		128	75.00	90.00

RCDP CYCLE2 CEILING COSTS

CEILING APPENDIX

CONTRACT	ZONE	WATTSUN CODE	WATTSUN DESCRIPTION	AREA	REFERENCE COST	TOTAL COST
339	1		0 OTHER R38 standard/R38 Scissor Truss	1568	1947.00	705.00
368	1		0 OTHER 11-1/2" R-Control foam panel	2100	0.00	10100.00
375	1		0 OTHER-404 sf R-30 vault; 758 sf R-38	1162	0.00	737.00
383	1		0 R-44 Vaulted 12' IJI	1636	255.00	2054.60
403	1		0 R-38 advanced, joist/truss	1750	661.00	661.00
413	2		0 R-38 standard, joist/truss	944	349.00	349.00
415	2		0 R-49 advanced, 2x6 joist or 2x4 truss	1500	2000.00	3925.00
419	2		0 R-38 standard, joist/truss	946	350.00	350.00
420	2		0 R-38 standard, joist/truss	991	367.00	367.00
424	2		0 R-49 advanced, 2x6 joist or 2x4 truss	1219	500.00	700.00
454	2		0 R-49 Advanced 2x6, Mound to R-60	1254	1300.00	2253.00
455	2		0 R-49 advanced, 2x6 joist or 2x4 truss	1092	1770.00	775.00
456	2		0 R-60 advanced, 2x6 joist	1092	1830.00	1107.00
465	1		0 R-49 standard, joist/truss	980	343.00	702.00
466	1		0 R-49 standard, joist/truss	2046	1100.00	1330.00
489	2		0 R-60 advanced, 2x4 truss	1276	500.00	750.00
701	3		0 R-49 advanced, 2x6 joist or 2x4 truss	1093	0.00	1017.00
702	3		0 R-38 PLUS 1 INCH POLYISO	930	970.00	1465.00

APPENDIX G

WALL INSULATION COST DATA BASE

This appendix contains a copy of the initial data base that was used for the wall insulation cost analysis. Many of the homes reported have a variety of R-values, framing methods, and materials.

This data contains the following information:

- House identification (contract #)

- Zone

- Wattsun Code

- Wattsun description

- Area

- Total Cost

The Wattsun Code and description provided the descriptive information used for categorizing the data for the analysis. It includes R-Value, framing, and other information.

The total cost includes all material, labor, and framing costs associated with the insulation of the walls of participating homes.

The reference cost refers to R19, 2x6 standard frame.

CONTRACT	ZONE	WATTSON CODE	WATTSON DESCRIPTION	AREA	TOTAL COST	REFERENCE COST
101	3	10	2x6 R-22 batt/advanced	1882	2694.47	2481.02
102	3	13	2x6 R-19 std + R-7.2 sheathing	1262	1586.00	1260.00
103	3	14	2x6 R-19 adv + R-7.2 sheathing	3112	5060.00	4410.00
201	3	29	OTHER: 2x6 DIP 16" D.C. R22 + 7.2 sheath	1785	3625.00	2260.00
202	3	29	OTH. R-36, 2x6 16oc 2"dow ext, 1.5 bb in	1241	4456.92	1725.27
203	3	29	OTHER R-36 2x6 w/2" dow out 1.5" bb in	1241	4456.92	1725.27
205	3	13	2x6 R-19 std + R-7.2 sheathing	965	2051.00	1352.00
207	3	29	OTHER 2x4 16" oc 3" foam R-21	1750	3396.00	2187.00
208	3	13	2x6 R-19 std + R-7.2 sheathing	872	1826.56	1266.56
211	3	29	OTHER 2x6 16 oc R-22 Batt + 1" foil foam	2104	3050.90	1750.00
212	3	29	OTHER 2x4 16" oc dtp 2-stud corner	1216	2630.20	1975.28
213	3	29	OTHER 2x4 W/ FOAM	1312	2360.00	2065.00
214	3	29	OTHER 2x6 R-22 w/ 1" inside thermal guar	1496	2889.00	1827.00
215	3	18	Double 2x4 advanced R-11 + R-19 + R-11	910	2583.00	1742.28
218	3	29	OTHER 2x6 polyurethane R-36	2304	4336.00	2367.00
219	3	29	OTHER 2x4 DOUBLE R-48, 13+13+22	1328	2680.20	1756.56
220	3	13	2x6 R-19 std + R-7.2 sheathing	1144	9590.00	9160.00
221	3	14	2x6 R-19 adv + R-7.2 sheathing	1301	1929.00	1633.00
222	3	14	2x6 R-19 adv + R-7.2 sheathing	1860	4405.00	3475.00
223	3	29	OTHER 2x4 DOUBLE STANDARD R41	2500	3374.00	2585.00
225	3	11	2x6 R-19 std + R-5 sheathing	448	1078.00	625.00
226	3	14	2x6 R-19 adv + R-7.2 sheathing	1664	8219.00	995.00
228	3	14	2x6 R-19 adv + R-7.2 sheathing	1764	2000.00	1437.00
229	3	29	OTHER 2x6 URETHANE R-36	946	2606.00	1385.00
304	1	10	2x6 R-22 batt/advanced	869	325.87	282.43
306	1	10	2x6 R-22 batt/advanced	1605	2025.21	1462.19
307	1	10	2x6 R-22 batt/advanced	1247	3008.58	2972.28
308	1	10	2x6 R-22 batt/advanced	1265	2069.00	1023.00
318	1	10	2x6 R-22 batt/advanced	1184	1980.00	2078.00
320	2	8	2x6 R-19 batt/advanced	1215	1680.69	1407.26
339	1	7	2x6 R-19 batt/standard	1359	2013.00	2013.00
341	1	10	2x6 R-22 batt/advanced	1158	1150.00	1017.00
368	1	29	OTHER 2x6 R-Control foam panel (5-1/2")	1647	7070.00	4000.00
370	1	8	2x6 R-19 batt/advanced	1215	1680.69	1407.26
375	1	29	OTHER R-22 1/2 advanced	2028	2091.00	1825.00
383	1	4	2x4 R-13 standard + R-7.2 sheath	2349	5246.55	4149.00
401	1	10	2x6 R-22 batt/advanced	1042	771.90	767.24
402	1	10	2x6 R-22 batt/advanced	1042	771.90	767.24
403	1	10	2x6 R-22 batt/advanced	1680	3384.92	3276.32
404	1	10	2x6 R-22 batt/advanced	1042	766.36	767.24
405	1	10	2x6 R-22 batt/advanced	1771	4168.00	3300.00
406	1	10	2x6 R-22 batt/advanced	1663	1080.95	1079.40
407	1	10	2x6 R-22 batt/advanced	1662	1122.44	1120.89
408	1	10	2x6 R-22 batt/advanced	1631	1116.06	1119.03
410	1	10	2x6 R-22 batt/advanced	1021	1213.82	1291.52
411	2	10	2x6 R-22 batt/advanced	1641	3430.66	2448.00
415	2	17	Double 2x4 advanced R-19 + R-11	1452	3431.00	2461.00
419	2	8	2x6 R-19 batt/advanced	922	1104.00	1036.00
420	2	8	2x6 R-19 batt/advanced	1037	1004.29	1157.56
424	2	11	2x6 R-19 std + R-5 sheathing	1118	5630.00	2005.00
438	2	10	2x6 R-22 batt/advanced	1565	3624.97	3484.66
439	1	10	2x6 R-22 batt/advanced	1876	2239.00	2204.60

FCDP CYCLE2 WALL COSTS

CONTRACT	ZONE	WATTSUN CODE	WATTSUN DESCRIPTION	AREA	TOTAL COST	REFERENCE COST
441	2	18	Double 2x4 advanced R-11 + R-19 + R-11	464	955.00	486.00
456	2	12	2x6 R-19 adv + R-5 sheathing	919	1310.00	1094.00
458	1	9	2x6 R-22 batt/standard	2364	756.00	476.00
463	1	9	2x6 R-22 batt/standard	1339	2512.28	2058.19
464	1	9	2x6 R-22 batt/standard	1376	1435.00	1261.00
465	1	10	2x6 R-22 batt/advanced	1614	1818.00	1590.00
466	1	9	2x6 R-22 batt/standard	2202	1650.00	1356.00
488	1	29	2x6 R-22 std + cedar siding (0.056)	1713	1631.00	2022.00
489	2	29	R-45 Double wall std frame	2169	4601.00	2231.00
496	1	9	2x6 R-22 batt/standard	920	2313.00	2183.00

APPENDIX H

NON-HEAT RECOVERY VENTILATION COST DATA BASE

This appendix contains a copy of the initial data base that was used for the non-heat recovery ventilation cost analyses.

The information provided included the following information on all fan types:

- House identification
- Innovation description
- Innovation number
- Manufacturer
- Model
- CFM
- Sone ratings - from the Home Ventilating Institute certified products directory
- Material costs
- Labor costs

The following information was also provided:

- Kitchen and bath fan savings
- Control descriptions
- Control material costs
- Hardware and wiring material costs
- Hardware and wiring labor costs
- Ductwork material costs
- Ductwork labor costs
- Furnace make-up material costs
- Furnace make-up labor costs
- Make-up air/thru wall material costs
- Make-up air/thru wall labor costs
- Make-up air/inlet manufacturer
- Make-up air/inlet model
- Make-up air/inlet quantity
- Backdraft damper description
- Backdraft damper material cost
- Backdraft damper labor cost
- Other description
- Other labor costs
- Other material costs
- Total fan costs
- Total ventilation Costs
- Comments
- Concept description

Five types of systems were examined. Four of them (shown as option 1 through 4) represent current SGC systems as described below. The fifth system is innovative in design and can not be categorized.

Option #1 is an integrated spot and whole house design. This is a system which uses one or more of the spot ventilation fans to provide whole house ventilation as necessary.

Option #2 is a ducted central exhaust design. This system uses a single large multi-speed exhaust fan ducted to bedrooms, baths, kitchen, and living areas to provide both whole house and spot ventilation.

Option #3 is a discrete spot and whole house design. This system uses separate fans and control systems to provide spot and whole house ventilation.

Option #4 is a forced air heating/cooling system integrated design. In this system spot ventilation is provided through bath and kitchen exhaust fans, but whole house ventilation and make up air are provided through integration with the forced air heating/cooling system.

The innovative design option was added to encourage new ideas in ventilation. It was required that the systems satisfy the intent of the SGC technical specifications.

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41B	41A	41C	41D	41E	41F	41G	41H	41I	41J	41K	41L	41M	41N	41O	41P	41Q	41R	41S	41T	41U	41V	41W	41X	41Y	41Z	41AA	41AB	41AC	41AD	41AE	41AF	41AG	41AH	41AI	41AJ	41AK	41AL	41AM	41AN	41AO	41AP	41AQ	41AR	41AS	41AT	41AU	41AV	41AW	41AX	41AY	41AZ	41BA	41BB	41BC	41BD	41BE	41BF	41BG	41BH	41BI	41BJ	41BK	41BL	41BM	41BN	41BO	41BP	41BQ	41BR	41BS	41BT	41BU	41BV	41BW	41BX	41BY	41BZ	41CA	41CB	41CC	41CD	41CE	41CF	41CG	41CH	41CI	41CJ	41CK	41CL	41CM	41CN	41CO	41CP	41CQ	41CR	41CS	41CT	41CU	41CV	41CW	41CX	41CY	41CZ	41DA	41DB	41DC	41DD	41DE	41DF	41DG	41DH	41DI	41DJ	41DK	41DL	41DM	41DN	41DO	41DP	41DQ	41DR	41DS	41DT	41DU	41DV	41DW	41DX	41DY	41DZ	41EA	41EB	41EC	41ED	41EE	41EF	41EG	41EH	41EI	41EJ	41EK	41EL	41EM	41EN	41EO	41EP	41EQ	41ER	41ES	41ET	41EU	41EV	41EW	41EX	41EY	41EZ	41FA	41FB	41FC	41FD	41FE	41FF	41FG	41FH	41FI	41FJ	41FK	41FL	41FM	41FN	41FO	41FP	41FQ	41FR	41FS	41FT	41FU	41FV	41FW	41FX	41FY	41FZ	41GA	41GB	41GC	41GD	41GE	41GF	41GG	41GH	41GI	41GJ	41GK	41GL	41GM	41GN	41GO	41GP	41GQ	41GR	41GS	41GT	41GU	41GV	41GW	41GX	41GY	41GZ	41HA	41HB	41HC	41HD	41HE	41HF	41HG	41HH	41HI	41HJ	41HK	41HL	41HM	41HN	41HO	41HP	41HQ	41HR	41HS	41HT	41HU	41HV	41HW	41HX	41HY	41HZ	41IA	41IB	41IC	41ID	41IE	41IF	41IG	41IH	41II	41IJ	41IK	41IL	41IM	41IN	41IO	41IP	41IQ	41IR	41IS	41IT	41IU	41IV	41IW	41IX	41IY	41IZ	41JA	41JB	41JC	41JD	41JE	41JF	41JG	41JH	41JI	41JJ	41JK	41JL	41JM	41JN	41JO	41JP	41JQ	41JR	41JS	41JT	41JU	41JV	41JW	41JX	41JY	41JZ	41KA	41KB	41KC	41KD	41KE	41KF	41KG	41KH	41KI	41KJ	41KK	41KL	41KM	41KN	41KO	41KP	41KQ	41KR	41KS	41KT	41KU	41KV	41KW	41KX	41KY	41KZ	41LA	41LB	41LC	41LD	41LE	41LF	41LG	41LH	41LI	41LJ	41LK	41LM	41LN	41LO	41LP	41LQ	41LR	41LS	41LT	41LU	41LV	41LW	41LX	41LY	41LZ	41MA	41MB	41MC	41MD	41ME	41MF	41MG	41MH	41MI	41MJ	41MK	41ML	41MN	41MO	41MP	41MQ	41MR	41MS	41MT	41MU	41MV	41MW	41MX	41MY	41MZ	41NA	41NB	41NC	41ND	41NE	41NF	41NG	41NH	41NI	41NJ	41NK	41NL	41NM	41NO	41NP	41NQ	41NR	41NS	41NT	41NU	41NV	41NW	41NX	41NY	41NZ	41OA	41OB	41OC	41OD	41OE	41OF	41OG	41OH	41OI	41OJ	41OK	41OL	41OM	41ON	41OO	41OP	41OQ	41OR	41OS	41OT	41OU	41OV	41OW	41OX	41OY	41OZ	41PA	41PB	41PC	41PD	41PE	41PF	41PG	41PH	41PI	41PJ	41PK	41PL	41PM	41PN	41PO	41PP	41PQ	41PR	41PS	41PT	41PU	41PV	41PW	41PX	41PY	41PZ	41QA	41QB	41QC	41QD	41QE	41QF	41QG	41QH	41QI	41QJ	41QK	41QL	41QM	41QN	41QO	41QP	41QQ	41QR	41QS	41QT	41QU	41QV	41QW	41QX	41QY	41QZ	41RA	41RB	41RC	41RD	41RE	41RF	41RG	41RH	41RI	41RJ	41RK	41RL	41RM	41RN	41RO	41RP	41RQ	41RR	41RS	41RT	41RU	41RV	41RW	41RX	41RY	41RZ	41SA	41SB	41SC	41SD	41SE	41SF	41SG	41SH	41SI	41SJ	41SK	41SL																																																																									
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50A-H

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CONCEPT DESCR

10 COMMENTS

214
423
429
354
297
414
419
347
323
446
345
421
375
424 Base Case \$149.00
366
367
431
355
432 INCOMPLETE
411
491 Dehumidistat included in Altes price. Kitchen exhaust hood: Broan Model #4200-E, 190 CFM.
430 Design centered on Aston 2000 unit; controlled by three switches, dehumidistat living room, crank timers in bathroom
310 Design centered on Aston 2000 unit; controlled by two switches, LR one is dehumidistat type and RR is timer switch.
462 Design centered on Aston 2000 unit; controlled by two switches, LR one is dehumidistat type and RR is timer switch.
340
451
451 Base Case: \$134
314
375
315
406 Is not included. D-stat and wall vents included in Fan #1 cost.
462
291 Heat Pump EIC-SublineA - fork
352
467
316 Makep air through wall inlets are connected to a central duct.
425
383
376
341 Model #4915519, Thermo-Star Products
417
430
471
404 D-Stat included in fan #1 price. Is not included.
311
364
453
372
309 Hard to anchor fresh air to studs

844-8

 10 COMMENTS CONCEPT DESIG
 =====

413
 378
 302
 439
 426
 411
 312
 414 Base case: \$134
 410
 415
 304
 415 Base case: \$134
 412
 410 Base case: \$134
 417
 414
 416 Exhaustistat included in bath fan #1 price. Prices doesn't include tax.
 412
 415
 380
 477
 481
 478
 213
 413
 353
 427 Base Case \$256
 363
 363
 213
 436 Base Case \$256
 424 3 fresh gals and 1 Aline 200 cfm
 166 DON'T KNOW NUMBER OF MAKE-UP VENTS
 213
 446
 346
 221
 346 Tort Heat Pump - E1E50JW6A
 437 Model no. P/N 11538. Base case: \$365 FH Incremental: \$163
 413
 427 Make Up Air/Inrough Wall Inlets - PM-Healthy Home Vents
 476
 416
 407
 402
 374 5.5144 made for house by FPL of Elanath Falls - Steve #51.
 374 4.24.95 ea. = 97.69 + shipping 5.59 = 103.28 total.

Actual cost of #495 is highlighted... (267.56)... bath fan inst. for city codes only. Only timers extra for program.

4 barrel, opt. #5.
 4 barrel, opt. #5.
 4-barrel system, Range Exhaust Hood: from #1200-E, 150 CFM

APPENDIX I

ADDITIONAL NON-HEAT RECOVERY VENTILATION ANALYSES

This appendix contains more complete, or broken out cost information. The tables found here contain not only total costs but separate values for material and labor costs as well.

- Table 11 presents the NHRV cost data by type/manufacture.
- Table 12 presents the NHRV cost by prominent manufacturers.
- Table 13 presents the NHRV cost by option.
- Table 14 presents the cost by sone rating.
- Table 15 presents the cost by CFM rating.
- Table 16 presents the cost for controls mechanisms.
- Table 17 presents the cost for furnace/thru wall make-up.
- Table 18 presents the cost for furnace/thru wall make-up on a per inlet basis.
- Table 19 presents the cost for ductwork & backdraft damper.

TABLE II
RCDP CYCLE II NHRV ANALYSIS - FAN COSTS BY MANUFACTURER

MANUFACTURER	N	MEAN	MEDIAN	STD DEV	MIN	MAX

ALDES						
MATERIALS	7	\$435.98	\$322.58	\$219.47	\$265.00	\$905.00
LABOR	7	\$125.71	\$50.00	\$125.00	\$0.00	\$360.00
TOTAL	7	\$561.69	\$472.58	\$251.72	\$292.00	\$905.00

ASTON						
MATERIALS	4	\$222.80	\$222.80	\$0.00	\$222.80	\$222.80
LABOR	4	\$25.00	\$25.00	\$0.00	\$25.00	\$25.00
TOTAL	4	\$247.80	\$247.80	\$0.00	\$247.80	\$247.80

AUBREY						
MATERIALS	60	\$24.26	\$20.00	\$12.77	\$13.00	\$77.75
LABOR	60	\$11.53	\$9.50	\$9.92	\$0.00	\$40.00
TOTAL	60	\$35.79	\$29.50	\$17.66	\$20.00	\$117.75

BROAN						
MATERIALS	71	\$41.72	\$36.00	\$23.83	\$8.92	\$120.00
LABOR	71	\$11.88	\$10.00	\$11.78	\$0.00	\$65.00
TOTAL	71	\$53.60	\$47.00	\$28.99	\$12.65	\$155.00

DAYTON						
MATERIALS	3	\$256.00	\$256.00	\$0.00	\$256.00	\$256.00
LABOR	3	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
TOTAL	3	\$256.00	\$256.00	\$0.00	\$256.00	\$256.00

FASCO						
MATERIALS	1	\$20.00	ERR	\$0.00	\$20.00	\$20.00
LABOR	1	\$10.00	ERR	\$0.00	\$10.00	\$10.00
TOTAL	1	\$30.00	ERR	\$0.00	\$30.00	\$30.00

HONEYWELL						
MATERIALS	1	\$100.00	ERR	\$0.00	\$100.00	\$100.00
LABOR	1	\$40.00	ERR	\$0.00	\$40.00	\$40.00
TOTAL	1	\$140.00	ERR	\$0.00	\$140.00	\$140.00

KENMORE						
MATERIALS	2	\$31.00	\$31.00	\$0.00	\$31.00	\$31.00
LABOR	2	\$20.00	\$20.00	\$0.00	\$20.00	\$20.00
TOTAL	2	\$51.00	\$51.00	\$0.00	\$51.00	\$51.00

"Continued"

TABLE 11 (cont)

RCDP CYCLE II NHRV ANALYSIS - FAN COSTS BY MANUFACTURER

MANUFACTURER	N	MEAN	MEDIAN	STD DEV	MIN	MAX

NUTONE						
=====						
MATERIALS	40	\$86.72	\$60.00	\$98.91	\$15.00	\$423.00
LABOR	40	\$11.93	\$12.00	\$13.40	\$0.00	\$45.00
TOTAL	40	\$98.65	\$60.00	\$96.60	\$27.00	\$423.00

RANGAIRE						
=====						
MATERIALS	2	\$40.00	\$40.00	\$2.00	\$38.00	\$42.00
LABOR	2	\$12.00	\$12.00	\$0.00	\$12.00	\$12.00
TOTAL	2	\$52.00	\$52.00	\$2.00	\$50.00	\$54.00

ROPER						
=====						
MATERIALS	2	\$568.00	\$568.00	\$483.00	\$85.00	\$1,051.00
LABOR	2	\$ 33.50	\$33.50	\$17.50	\$16.00	\$51.00
TOTAL	2	\$601.50	\$601.50	\$500.50	\$101.00	\$1,102.00

UTILITY						
=====						
MATERIALS	1	\$60.40	ERR	\$0.00	\$60.40	\$60.40
LABOR	1	\$25.00	ERR	\$0.00	\$25.00	\$25.00
TOTAL	1	\$85.40	ERR	\$0.00	\$85.40	\$85.40

WHIRLPOOL						
=====						
MATERIALS	5	\$33.00	\$30.00	\$6.00	\$30.00	\$45.00
LABOR	5	\$23.00	\$25.00	\$4.00	\$15.00	\$25.00
TOTAL	5	\$56.00	\$55.00	\$2.00	\$55.00	\$60.00

ALL						
=====						
MATERIALS	199	\$71.46	\$36.00	\$124.50	\$8.92	\$1,051.00
LABOR	199	\$16.65	\$10.00	\$33.47	\$0.00	\$360.00
TOTAL	199	\$88.11	\$50.50	\$140.88	\$12.65	\$1,102.00

RCRDP CYCLE II NHRV ANALYSIS - FAN COSTS BY MANUFACTURER

(VS5-5(i)67r)

TABLE I3

RCDP CYCLE II NHRV ANALYSIS - FAN COSTS BY OPTION

OPTION	N	MEAN	MEDIAN	STD DEV	MIN	MAX

INNOVATIVE DESIGN						
=====						
MATERIAL COST	12	\$356.54	\$291.23	\$174.07	\$60.00	\$663.00
LABOR COST	12	\$73.92	\$50.00	\$95.12	\$0.00	\$360.00
TOTAL COST	12	\$430.46	\$366.23	\$191.63	\$87.00	\$793.25

ONE						
=====						
MATERIAL COST	43	\$138.96	\$68.00	\$193.51	\$25.00	\$1,166.20
LABOR COST	43	\$34.20	\$20.00	\$30.60	\$0.00	\$122.00
TOTAL COST	43	\$173.15	\$104.00	\$205.94	\$25.00	\$1,282.20

TWO						
=====						
MATERIAL COST	6	\$398.83	\$272.00	\$268.01	\$96.95	\$905.00
LABOR COST	6	\$63.33	\$35.00	\$85.57	\$0.00	\$250.00
TOTAL COST	6	\$462.16	\$318.50	\$297.02	\$106.95	\$905.00

THREE						
=====						
MATERIAL COST	4	\$61.25	\$61.00	\$9.55	\$48.00	\$75.00
LABOR COST	4	\$41.25	\$40.50	\$30.31	\$0.00	\$84.00
TOTAL COST	4	\$102.50	\$95.00	\$27.95	\$75.00	\$145.00

FOUR						
=====						
MATERIAL COST	26	\$53.25	\$44.00	\$45.25	\$12.65	\$171.48
LABOR COST	26	\$18.10	\$7.50	\$26.54	\$0.00	\$120.00
TOTAL COST	26	\$71.35	\$60.00	\$66.34	\$12.65	\$291.48
=====						

TABLE 14
RCDP CYCLE II NHRV ANALYSIS - FAN COSTS BY SONE RATING

SONE RATING *	N	MEAN	MEDIAN	STD DEV	MIN	MAX

1.5						
MATERIALS	5	\$48.27	\$50.00	\$18.11	\$25.00	\$79.33
LABOR	5	\$17.00	\$15.00	\$12.88	\$0.00	\$40.00
TOTAL	5	\$65.27	\$65.00	\$30.73	\$25.00	\$119.33
2						
MATERIALS	15	\$25.56	\$12.65	\$31.23	\$12.65	\$112.65
LABOR	15	\$3.07	\$ 0.00	\$4.43	\$0.00	\$12.00
TOTAL	15	\$28.63	\$12.65	\$32.24	\$12.65	\$112.65
2.5						
MATERIALS	55	\$39.39	\$16.50	\$55.50	\$13.00	\$256.00
LABOR	55	\$13.41	\$15.00	\$11.04	\$0.00	\$50.00
TOTAL	55	\$52.80	\$30.00	\$54.54	\$20.00	\$256.00
3						
MATERIALS	5	\$35.18	\$25.00	\$21.30	\$23.13	\$77.75
LABOR	5	\$12.00	\$ 0.00	\$16.00	\$0.00	\$40.00
TOTAL	5	\$47.18	\$25.00	\$35.98	\$25.00	\$117.75
3.5						
MATERIALS	24	\$44.17	\$37.00	\$19.84	\$20.00	\$120.00
LABOR	24	\$14.83	\$10.00	\$12.55	\$9.00	\$65.00
TOTAL	24	\$59.00	\$47.00	\$29.25	\$29.00	\$155.00
4						
MATERIALS	16	\$134.17	\$60.00	\$139.71	\$60.00	\$423.00
LABOR	16	\$2.50	\$ 0.00	\$9.68	\$0.00	\$40.00
TOTAL	16	\$136.67	\$60.00	\$139.39	\$60.00	\$423.00
5						
MATERIALS	1	\$48.00	ERR	\$0.00	\$48.00	\$48.00
LABOR	1	\$30.00	ERR	\$0.00	\$30.00	\$30.00
TOTAL	1	\$78.00	ERR	\$0.00	\$78.00	\$78.00
6.5						
MATERIALS	1	\$38.00	ERR	\$0.00	\$38.00	\$38.00
LABOR	1	\$12.00	ERR	\$0.00	\$12.00	\$12.00
TOTAL	1	\$50.00	ERR	\$0.00	\$50.00	\$50.00

ALL						
MATERIALS	122	\$51.31	\$35.00	\$72.43	\$12.65	\$423.00
LABOR	122	\$11.20	\$ 9.50	\$12.05	\$0.00	\$65.00
TOTAL	122	\$62.51	\$47.00	\$72.09	\$12.65	\$423.00

* Some ratings from the Home Ventilating Institute (HVI)

TABLE 15
RCDP CYCLE II NHRV ANALYSIS - FAN COSTS BY CFM RATING

CFM RATING	N	MEAN	MEDIAN	STD DEV	MIN	MAX

50						
MATERIALS	90	\$37.02	\$20.00	\$46.27	\$12.65	\$256.00
LABOR	90	\$8.26	\$6.00	\$9.97	\$0.00	\$40.00
TOTAL	90	\$45.28	29.50	\$45.02	\$12.65	\$256.00
70						
MATERIALS	22	\$43.09	\$37.00	\$10.70	\$20.00	\$70.00
LABOR	22	\$15.09	\$10.00	\$12.69	\$9.00	\$65.00
TOTAL	22	\$58.18	\$50.50	\$21.24	\$29.00	\$135.00
80						
MATERIALS	17	\$49.64	\$45.00	\$21.19	\$20.00	\$100.00
LABOR	17	\$21.82	\$20.00	\$10.92	\$9.00	\$50.00
TOTAL	17	\$71.46	\$65.00	\$27.93	\$29.00	\$140.00
100						
MATERIALS	3	\$352.00	\$120.00	\$392.71	\$31.00	\$905.00
LABOR	3	\$15.00	\$10.00	\$14.72	\$0.00	\$35.00
TOTAL	3	\$367.00	\$155.00	\$383.26	\$41.00	\$905.00
110						
MATERIALS	12	\$169.55	\$85.20	\$146.48	\$77.75	\$423.00
LABOR	12	\$18.50	\$20.00	\$13.44	\$0.00	\$40.00
TOTAL	12	\$188.05	\$108.98	\$136.23	\$99.95	\$423.00
120						
MATERIALS	3	\$429.08	\$433.25	\$126.59	\$272.00	\$582.00
LABOR	3	\$220.00	\$250.00	\$128.32	\$50.00	\$360.00
TOTAL	3	\$649.08	\$793.25	\$231.82	\$322.00	\$832.00
150						
MATERIALS	4	\$222.80	\$222.80	\$0.00	\$222.80	\$222.80
LABOR	4	\$25.00	\$25.00	ERR	\$25.00	\$25.00
TOTAL	4	\$247.80	\$247.80	\$0.00	\$247.80	\$247.80
160						
MATERIALS	7	\$110.64	\$38.50	\$118.87	\$31.00	\$322.58
LABOR	7	\$37.79	\$20.00	\$46.03	\$12.00	\$150.00
TOTAL	7	\$148.43	\$53.50	\$155.70	\$50.00	\$472.58

Continued

TABLE 15
RCDP CYCLE II NHRV ANALYSIS - FAN COSTS BY CFM RATING (CONTINUED)

CFM RATING	N	MEAN	MEDIAN	STD DEV	MIN	MAX

180						
=====						
MATERIALS	19	\$35.42	\$36.00	\$5.00	\$16.00	\$45.00
LABOR	19	\$9.21	\$6.00	\$8.70	\$6.00	\$42.00
TOTAL	19	\$44.63	\$42.00	\$8.90	\$38.00	\$78.00

190						
=====						
MATERIALS	9	\$68.33	\$58.00	\$23.36	\$35.00	\$100.00
LABOR	9	\$7.22	\$10.00	\$5.33	\$0.00	\$15.00
TOTAL	9	\$75.56	\$68.00	\$18.05	\$50.00	\$100.00

200						
=====						
MATERIALS	1	\$96.95	ERR	\$0.00	\$96.95	\$96.95
LABOR	1	\$10.00	ERR	\$0.00	\$10.00	\$10.00
TOTAL	1	\$106.95	ERR	\$0.00	\$106.95	\$106.95

220						
=====						
MATERIALS	1	\$42.00	ERR	\$0.00	\$42.00	\$42.00
LABOR	1	\$12.00	ERR	\$0.00	\$12.00	\$12.00
TOTAL	1	\$54.00	ERR	\$0.00	\$54.00	\$54.00

250						
=====						
MATERIALS	1	\$265.00	ERR	\$0.00	\$265.00	\$265.00
LABOR	1	\$50.00	ERR	\$0.00	\$50.00	\$50.00
TOTAL	1	\$315.00	ERR	\$0.00	\$315.00	\$315.00

300						
=====						
MATERIALS	5	\$234.20	\$30.00	\$408.40	\$30.00	\$1,051.00
LABOR	5	\$30.20	\$25.00	\$10.40	\$25.00	\$51.00
TOTAL	5	\$55.00	\$55.00	\$0.00	\$55.00	\$55.00

ALL						
=====						
MATERIALS	194	\$72.32	\$36.00	\$125.91	\$12.65	\$1,051.00
LABOR	194	\$16.50	\$10.00	\$33.83	\$0.00	\$360.00
TOTAL	194	\$88.82	\$50.25	\$142.53	\$12.65	\$1,102.00

TABLE I6
RCDP CYCLE II NHRV ANALYSIS - CONTROL COSTS

CONFIGURATION	N	MEAN	MEDIAN	STD DEV	MIN	MAX

CLOCK TIMERS						
=====						
CONTROL MATERIAL COST(S)	21	\$22.85	\$22.00	\$1.98	\$22.00	\$30.00
H&W MATERIAL COST	21	\$23.32	\$28.00	\$12.87	\$0.00	\$53.69
H&W LABOR COST	21	\$7.31	\$0.00	\$14.35	\$0.00	\$52.50
H&W TOTAL COST	21	\$30.63	\$28.00	\$18.57	\$0.00	\$106.19
COMPLETE COST	21	\$53.48	\$50.00	\$18.66	\$30.00	\$131.14

CLOCK TIMER/DEHUMIDISTATS						
=====						
CONTROL MATERIAL COST(S)	1	\$95.70	ERR	\$0.00	\$95.70	\$95.70
H&W MATERIAL COST	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
H&W LABOR COST	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
H&W TOTAL COST	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
COMPLETE COST	1	\$95.70	ERR	\$0.00	\$95.70	\$95.70

CRANK TIMERS						
=====						
CONTROL MATERIAL COST(S)	4	\$44.02	\$47.85	\$17.12	\$16.59	\$63.80
H&W MATERIAL COST	4	\$37.50	\$50.00	\$21.65	\$0.00	\$50.00
H&W LABOR COST	4	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00
H&W TOTAL COST	4	\$37.50	\$50.00	\$21.65	\$0.00	\$50.00
COMPLETE COST	4	\$81.52	\$97.85	\$38.05	\$16.59	\$113.80

CRANK TIMERS/CLOCK TIMERS						
=====						
CONTROL MATERIAL COST(S)	3	\$147.01	\$155.43	\$39.48	\$95.00	\$190.59
H&W MATERIAL COST	3	\$25.67	\$27.00	\$20.43	\$0.00	\$50.00
H&W LABOR COST	3	\$33.33	\$50.00	\$23.57	\$0.00	\$50.00
H&W TOTAL COST	3	\$59.00	\$77.00	\$42.76	\$0.00	\$100.00
COMPLETE COST	3	\$206.01	\$172.00	\$60.19	\$155.43	\$290.59

CRANK TIMERS/DEHUMIDISTATS						
=====						
CONTROL MATERIAL COST(S)	19	\$82.78	\$67.25	\$22.10	\$45.00	\$117.85
H&W MATERIAL COST	19	\$30.79	\$50.00	\$21.17	\$0.00	\$50.00
H&W LABOR COST	19	\$10.74	\$0.00	\$20.31	\$0.00	\$75.00
H&W TOTAL COST	19	\$41.53	\$50.00	\$21.03	\$0.00	\$85.00
COMPLETE COST	19	\$124.31	\$117.25	\$33.38	\$67.25	\$191.16

CRANK TIMERS/DEHUMIDISTATS/SWITCHES						
=====						
CONTROL MATERIAL COST(S)	1	\$95.00	ERR	\$0.00	\$95.00	\$95.00
H&W MATERIAL COST	1	\$75.00	ERR	\$0.00	\$75.00	\$75.00
H&W LABOR COST	1	\$25.00	ERR	\$0.00	\$25.00	\$25.00
H&W TOTAL COST	1	\$100.00	ERR	\$0.00	\$100.00	\$100.00
COMPLETE COST	1	\$195.00	ERR	\$0.00	\$195.00	\$195.00

Continued

TABLE I6 (cont.)
RCDP CYCLE II NHRV ANALYSIS - CONTROL COSTS

CONFIGURATION	N	MEAN	MEDIAN	STD DEV	MIN	MAX
CRANK TIMERS/DEHUMIDISTATS/SPECIAL RELAYS						
CONTROL MATERIAL COST(S)	1	\$222.85	ERR	\$0.00	\$222.85	\$222.85
H&W MATERIAL COST	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
H&W LABOR COST	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
H&W TOTAL COST	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
COMPLETE COST	1	\$222.85	ERR	\$0.00	\$222.85	\$222.85
DEHUMIDISTATS						
CONTROL MATERIAL COST(S)	31	\$49.64	\$56.00	\$29.14	\$0.00	\$116.50
H&W MATERIAL COST	31	\$16.95	\$0.00	\$45.66	\$0.00	\$228.42
H&W LABOR COST	31	\$30.91	\$16.00	\$35.22	\$0.00	\$100.00
H&W TOTAL COST	31	\$47.86	\$26.00	\$68.51	\$0.00	\$308.42
COMPLETE COST	31	\$97.49	\$76.76	\$74.04	\$45.00	\$424.92
SWITCHES						
CONTROL MATERIAL COST(S)	1	\$19.00	ERR	\$0.00	\$19.00	\$19.00
H&W MATERIAL COST	1	\$29.00	ERR	\$0.00	\$29.00	\$29.00
H&W LABOR COST	1	\$36.00	ERR	\$0.00	\$36.00	\$36.00
H&W TOTAL COST	1	\$65.00	ERR	\$0.00	\$65.00	\$65.00
COMPLETE COST	1	\$84.00	ERR	\$0.00	\$84.00	\$84.00
SWITCHES/DEHUMIDISTATS						
CONTROL MATERIAL COST(S)	3	\$58.57	\$40.00	\$26.26	\$40.00	\$95.70
H&W MATERIAL COST	3	\$10.00	\$15.00	\$7.07	\$0.00	\$15.00
H&W LABOR COST	3	\$25.00	\$15.00	\$14.14	\$15.00	\$45.00
H&W TOTAL COST	3	\$35.00	\$30.00	\$7.07	\$30.00	\$45.00
COMPLETE COST	3	\$93.57	\$70.00	\$33.33	\$70.00	\$140.70
SWITCHES/TIMERS (INCOMPLETE TIMER INFO)						
CONTROL MATERIAL COST(S)	1	\$25.00	ERR	\$0.00	\$25.00	\$25.00
H&W MATERIAL COST	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
H&W LABOR COST	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
H&W TOTAL COST	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
COMPLETE COST	1	\$25.00	ERR	\$0.00	\$25.00	\$25.00
ALL COSTS						
CONTROL MATERIAL COST(S)	86	\$56.30	\$53.38	\$40.39	\$0.00	\$222.85
H&W MATERIAL COST	86	\$22.80	\$15.50	\$31.97	\$0.00	\$228.42
H&W LABOR COST	86	\$18.04	\$0.00	\$27.48	\$0.00	\$100.00
H&W TOTAL COST	86	\$40.85	\$28.00	\$46.08	\$0.00	\$308.42
COMPLETE COST	86	\$97.15	\$76.76	\$62.86	\$16.59	\$424.92

H&W = Hardware and Wiring

TABLE I7
RCDP CYCLE II NHRV ANALYSIS - FURNACE/THRU WALL MAKE UP

MANUFACTURER	N	MEAN	MEDIAN	STD DEV	MIN	MAX

ALDES						
=====						
MATERIAL	8	\$105.38	\$120.00	\$33.04	\$50.00	\$157.00
LABOR	8	\$126.96	\$134.00	\$84.54	\$0.00	\$250.64
TOTAL	8	\$232.33	\$194.00	\$73.24	\$128.00	\$355.00

ARTIS						
=====						
F/MU MATERIAL	1	\$60.00	ERR	\$0.00	\$60.00	\$60.00
F/MU LABOR	1	\$20.56	ERR	\$0.00	\$20.56	\$20.56
TW/MU MATERIAL	1	\$37.69	ERR	\$0.00	\$37.69	\$37.69
TW/MU LABOR	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
TOTAL	1	\$118.25	ERR	\$0.00	\$118.25	\$118.25

FRESH 80						
=====						
MATERIAL	32	\$80.99	\$79.00	\$23.16	\$20.00	\$110.00
LABOR	32	\$35.67	\$30.00	\$19.71	\$10.00	\$103.80
TOTAL	32	\$116.66	\$119.00	\$30.63	\$30.00	\$195.09

OTHER						
=====						
MATERIAL	3	\$119.93	\$35.00	\$127.58	\$20.00	\$300.00
LABOR	3	\$30.00	\$20.00	\$29.44	\$0.00	\$70.00
TOTAL	3	\$149.93	\$90.00	\$106.83	\$59.80	\$300.00

SITE BUILT						
=====						
MATERIAL	4	\$14.75	\$15.00	\$0.43	\$14.00	\$15.00
LABOR	4	\$36.25	\$40.00	\$6.50	\$25.00	\$40.00
TOTAL	4	\$51.00	\$55.00	\$6.93	\$39.00	\$55.00

ALL						
=====						
F/MU MATERIAL	1	\$60.00	ERR	\$0.00	\$60.00	\$60.00
F/MU LABOR	1	\$20.56	ERR	\$0.00	\$20.56	\$20.56
TW/MU MATERIAL	48	\$81.07	\$79.00	\$46.43	\$14.00	\$300.00
TW/MU LABOR	48	\$49.83	\$35.00	\$52.20	\$0.00	\$250.64
TOTAL	48	\$132.15	\$123.00	\$68.28	\$30.00	\$355.00
=====						

F/MU = FURNACE MAKE-UP, TW/MU = AIR/THRU WALL MAKE UP
SOME ITEMS, SUCH AS THE ALDES, HAD NO FURNACE MAKE-UP COSTS.
THEREFORE, THE COSTS ARE FOR AIR/THRU WALL MAKE UP.

TABLE 18
RCDP CYCLE II NHRV ANALYSIS - FURNACE/THRU WALL MAKE UP - ON A PER INLET BASIS

MANUFACTURER	N	# OF INLETS	MEAN	MEDIAN	STD DEV	MIN	MA

ALDES							
=====							
MATERIAL	7	33	\$22.75	\$24.00	\$9.36	\$10.00	\$39.
LABOR	7	33	\$24.91	\$26.80	\$17.13	\$0.00	\$50.
TOTAL	7	33	\$47.66	\$39.25	\$13.06	\$32.00	\$67.

ARTIS							
=====							
F/MU MATER	1	1	\$60.00	ERR	\$0.00	\$60.00	\$60.
F/MU LABOR	1	1	\$20.56	ERR	\$0.00	\$20.56	\$20.
TW/MU MATERIAL	1	1	\$37.69	ERR	\$0.00	\$37.69	\$37.
TW/MU LABOR	1	1	\$0.00	ERR	\$0.00	\$0.00	\$0.
TOTAL	1	1	\$118.25	ERR	\$0.00	\$118.25	\$118.

FRESH 80							
=====							
MATERIAL	30	107	\$22.69	\$22.00	\$6.64	\$5.00	\$36.
LABOR	30	107	\$10.27	\$8.33	\$5.02	\$2.50	\$25.
TOTAL	30	107	\$32.96	\$30.33	\$8.62	\$7.50	\$53.

OTHER							
=====							
MATERIAL *	3	6	\$109.98	\$9.95	\$134.42	\$9.95	\$300.
LABOR	3	6	\$25.00	\$5.00	\$31.89	\$0.00	\$70.
TOTAL	3	6	\$134.98	\$14.95	\$120.64	\$14.95	\$300.

SITE BUILT							
=====							
MATERIAL	3	12	\$3.75	\$3.75	\$0.00	\$3.75	\$3.
LABOR	3	12	\$10.00	\$10.00	\$0.00	\$10.00	\$10.
TOTAL	3	12	\$13.75	\$13.75	\$0.00	\$13.75	\$13.

ALL							
=====							
F/MU MATER	1	1	\$60.00	ERR	\$0.00	\$60.00	\$60.
F/MU LABOR	1	1	\$20.56	ERR	\$0.00	\$20.56	\$20.
TW/MU MATETERIAL	43	158	\$27.47	\$22.00	\$42.89	\$3.75	\$300.
TW/MU LABOR	43	158	\$13.67	\$ 8.75	\$13.22	\$0.00	\$70.
TOTAL	43	158	\$41.13	\$32.20	\$42.61	\$7.50	\$300.
=====							

F/MU = FURNACE MAKE-UP, TW/MU = AIR/THRU WALL MAKE UP
SOME ITEMS, SUCH AS THE ALDES, HAD NO FURNACE MAKE-UP COSTS.
THEREFORE, THE COSTS ARE FOR AIR/THRU WALL MAKE UP ON A PER INLET BASIS.

TABLE 19

OPTION	N	MEAN	MEDIAN	STD DEV	MIN	MAX

INNOVATIVE DESIGN						
=====						
DCTWK MATERIAL COST	11	\$198.28	\$100.00	\$179.35	\$11.00	\$489.91
DCTWK LABOR COST	11	\$40.00	\$20.00	\$38.49	\$0.00	\$100.00
BD MATERIAL COST	2	\$35.35	\$35.35	\$25.85	\$9.50	\$61.20
BD LABOR COST	2	\$2.50	\$2.50	\$2.50	\$0.00	\$5.00
TOTAL COST	11	\$245.16	\$116.20	\$206.65	\$20.00	\$564.91

TWO						
=====						
DCTWK MATERIAL COST	5	\$108.54	\$100.00	\$53.75	\$45.92	\$187.76
DCTWK LABOR COST	5	\$78.60	\$75.00	\$52.80	\$0.00	\$150.00
BD MATERIAL COST	2	\$12.90	\$12.90	\$2.40	\$10.50	\$15.29
BD LABOR COST	2	\$2.50	\$2.50	\$2.50	\$0.00	\$5.00
TOTAL COST	5	\$193.29	\$186.21	\$88.15	\$100.00	\$337.76

THREE						
=====						
DCTWK MATERIAL COST	1	\$75.00	ERR	\$0.00	\$75.00	\$75.00
DCTWK LABOR COST	1	\$80.00	ERR	\$0.00	\$80.00	\$80.00
TOTAL COST	1	\$155.00	ERR	\$0.00	\$155.00	\$155.00

FOUR						
=====						
DCTWK MATERIAL COST	8	\$45.38	\$40.00	\$30.47	\$5.00	\$85.00
DCTWK LABOR COST	8	\$17.25	\$15.00	\$13.85	\$0.00	\$40.00
BD MATERIAL COST	2	\$30.00	\$30.00	\$0.00	\$30.00	\$30.00
TOTAL COST	8	\$70.13	\$70.00	\$39.28	\$13.00	\$115.00

ALL						
=====						
DCTWK MATEIAL COST	25	\$126.47	\$85.00	\$139.90	\$5.00	\$489.91
DCTWK LABOR COST	25	\$42.04	\$30.00	\$42.36	\$0.00	\$150.00
BD MATERIAL COST	6	\$26.08	\$22.65	\$17.79	\$9.50	\$61.20
BD LABOR COST	6	\$1.67	\$2.50	\$2.36	\$0.00	\$5.00
TOTAL COST	25	\$175.17	\$115.00	\$163.11	\$13.00	\$564.91

APPENDIX J

HEAT RECOVERY VENTILATION COST DATA BASE

This appendix contains a copy of the initial data base that was used for the heat recovery ventilation cost analyses. It includes data for both AAHX's and EAHP's.

The information used in the analyses included the following:

- House identification
- Innovation description
- Manufacturer
- Model
- HRV material costs
- HRV labor costs
- HRV total costs
- Ductwork material costs
- Ductwork labor costs
- Ductwork total costs
- Control description(s)
- Control material costs
- Hardware and wiring material (or total) costs
- Hardware and wiring labor costs
- Hardware and wiring total costs
- Grill and register material (or total) costs
- Grill and register labor costs
- Grill and register total costs
- Flow measure station material (or total) costs
- Flow measure station labor costs
- Flow measure station total costs
- System balancing labor costs
- Backdraft damper description
- Kitchen and bath fan savings
- Furnace/AAHX integration savings
- Furnace equipment differential
- Make-up air inlet manufacturer
- Make-up air inlet model
- Make-up air inlet quantity
- Make-up air inlet material (or total) costs
- Make-up air inlet labor costs
- Make-up air inlet total costs
- Remote fan coil material (or total) costs
- Remote fan coil labor costs
- Remote fan coil total costs
- Remote radiant slab material (or total) costs
- Other costs
- All costs
- Comments

MOORE ID	DESCRIPTION	MANUFACTURER	MODEL	HRV		HRV		DCIMK LABR \$	DCIMK TOTAL \$	CONTROL		CONTROL		HEW		SLR	
				MATL \$	LABR \$	MATL \$	LABR \$			DESC	WESC	DESC	WESC	MATL \$ (TOTAL)	LABR \$ (TOTAL)	HEW TOTAL \$	SLR TOTAL \$
101	HRV Enhp	DEC	HRV 80	\$1,350.44	\$100.00	\$1,450.44	\$49.46	\$0.00	\$49.46	Dehumidists				\$31.10	\$0.00	\$0.00	\$42.86
102	HRV Low Cost AHH	Conservation /Van EE	2000	\$850.00	\$0.00	\$850.00	\$400.00	\$200.00	\$600.00					\$0.00	\$0.00	\$0.00	\$0.00
103	HRV Low Cost AHH	Conservation /Van EE	p2000slah	\$746.00	\$28.00	\$774.00	\$410.39	\$560.00	\$970.39	Crnk timers	Dehumidists			\$34.09	\$43.00	\$28.00	\$71.00
203	HRV Low Cost AHH	Conservation /Van EE	1000	\$563.00	\$0.00	\$563.00	\$540.58	\$0.00	\$540.58	Switches	Crnk timers	Dehumidists		\$30.00	\$0.00	\$0.00	\$0.00
205	HRV Low Cost AHH	Conservation /Van EE	2000+	\$1,079.00	\$56.00	\$1,135.00	\$555.00	\$546.00	\$1,101.00					\$30.00	\$6.00	\$28.00	\$0.00
215	HRV Low Cost AHH	Conservation /Van EE	ECS403BB	\$1,300.00	\$100.00	\$1,400.00	\$506.00	\$275.00	\$775.00	Crnk timers				\$51.00	\$10.00	\$25.00	\$35.00
219	HRV Low Cost AHH	Conservation /Van EE	2000	\$697.00	\$0.00	\$697.00	\$342.00	\$550.00	\$692.00	Crnk timers				\$30.00	\$20.00	\$0.00	\$20.00
220	HRV Low Cost AHH	Conservation /Van EE	2000	\$1,359.75	\$125.00	\$1,484.75	\$121.11	\$154.00	\$275.11	Dehumidists				\$48.74	\$0.00	\$0.00	\$15.50
311	HRV Enhp	DEC	HRV80	\$470.00	\$100.00	\$570.00	\$186.00	\$100.00	\$280.00	Crnk timers	Dehumidists			\$42.00	\$20.00	\$40.00	\$50.00
317	HRV Low Cost AHH	Conservation /Van EE	1000	\$474.00	\$240.00	\$714.00	\$85.00	\$0.00	\$85.00	Crnk timers	Dehumidists			\$12.00	\$10.00	\$0.00	\$100.00
328	HRV Low Cost AHH	Conservation /Van EE	1000VHL	\$498.58	\$30.00	\$528.58	\$109.27	\$45.00	\$154.27					\$0.00	\$0.00	\$0.00	\$0.00
329	HRV Low Cost AHH	Conservation /Van EE	1000	\$447.00	\$60.00	\$507.00	\$116.98	\$60.00	\$176.98	Dehumidists				\$36.58	\$0.00	\$0.00	\$91.01
331	HRV Low Cost AHH	Conservation /Van EE	1000	\$498.58	\$30.00	\$528.58	\$109.27	\$45.00	\$154.27					\$0.00	\$0.00	\$0.00	\$131.01
337	HRV Low Cost AHH	Conservation /Van EE	1000	\$498.58	\$30.00	\$528.58	\$109.27	\$45.00	\$154.27					\$0.00	\$0.00	\$0.00	\$131.01
371	HRV Low Cost AHH	Conservation /Van EE	1000	\$650.00	\$40.00	\$690.00	\$175.99	\$180.00	\$355.99	Crnk timers	Dehumidists			\$0.00	\$0.00	\$0.00	\$101.01
383	HRV Low Cost AHH	Conservation /Van EE	200	\$1,800.00	\$0.00	\$1,800.00	\$525.00	\$0.00	\$525.00					\$74.82	\$55.00	\$75.00	\$130.00
405	HRV Enhp	DEC	HRV80	\$1,300.00	\$125.00	\$1,425.00	\$530.00	\$1,370.00	\$1,500.00					\$125.00	\$0.00	\$0.00	\$0.00
424	HRV Low Cost AHH	OTHER - Vent Air	ECS40	\$800.00	\$160.00	\$960.00	\$0.00	\$0.00	\$0.00	Dehumidists				\$0.00	\$0.00	\$0.00	\$0.00
425	HRV Low Cost AHH	Conservation /Van EE	2000	\$361.00	\$50.00	\$411.00	\$220.00	\$250.00	\$470.00	OTHER				\$15.00	\$20.00	\$25.00	\$17.00
443	HRV Low Cost AHH	Air IChange / Nutone	507cm	\$1,405.00	\$0.00	\$1,405.00	\$309.00	\$260.00	\$569.00	OTHER relays				\$105.00	\$0.00	\$45.00	\$0.00
452	HRV Enhp	DEC	HRV 80	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00					\$0.00	\$0.00	\$0.00	\$0.00
454	HRV Low Cost AHH	Vent Air	ECS-40	\$1,100.00	\$200.00	\$1,300.00	\$0.00	\$0.00	\$0.00	Dehumidists				\$0.00	\$0.00	\$0.00	\$0.00
455	HRV Low Cost AHH	OTHER Vent Air	ECS4033	\$1,850.00	\$0.00	\$1,850.00	\$160.00	\$175.00	\$335.00	Clock timers				\$0.00	\$30.00	\$150.00	\$0.00
465	HRV Enhp	DEC	HRV 80	\$2,480.00	\$0.00	\$2,480.00	\$0.										

HEAT

HOME ID	FR STAIN			BOYDRAFT	KIT/BATH FURN/ASHI			FURN			REMOIE			REMOIE			REMOIE			OTHER COSTS	ALL COSTS												
	BGR	MATRL \$	FM STAIN		SYS	BALNCG	DAMPK	DESC	FAN SVGS	INTIES	MTR	HTR	EQUIP	DIFF	MU	MANUF	MODEL	QUANTITY	MU			MATRL \$	LABR \$	TOTAL \$	MU	MATRL \$	LABR \$	TOTAL \$	FAN COIL	REMOIE	FAN COIL	RADIANT	
101	\$66.10	\$25.00	\$0.00	\$35.00	\$0.00	\$0.00	Manual	\$0.00	\$0.00	\$0.00	\$200.00	\$0.00	\$0.00	5	\$128.29	\$20.00	\$148.29	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$3,731.08		
103	\$0.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Manual	\$0.00	\$400.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$3,300.00		
203	\$0.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Manual	\$120.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$3,804.78		
205	\$1.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$0.30	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,211.16		
215	\$0.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$260.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$50.00	\$4,878.00	
219	\$117.10	\$25.00	\$25.00	\$90.00	\$10.00	\$0.00	Barometric	\$300.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$3,795.00	
220	\$40.10	\$50.00	\$0.00	\$50.00	\$72.00	\$0.00	Barometric	\$150.00	\$200.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$4,270.00	
311	\$15.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$114.00	\$0.00	\$0.00	\$149.95	\$0.00	\$0.00	4	\$105.44	\$0.30	\$105.44	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$4,074.29	
317	\$32.10	\$0.00	\$0.00	\$0.00	\$25.00	\$0.00	Barometric	\$100.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,055.00	
328	\$100.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$100.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,052.00	
329	\$113.11	\$20.00	\$15.00	\$65.00	\$0.00	\$0.00	Barometric	\$35.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,762.72	
331	\$83.59	\$50.00	\$0.00	\$50.00	\$0.00	\$0.00	Barometric	\$28.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,690.52	
370	\$116.11	\$50.00	\$15.00	\$5.00	\$0.00	\$0.00	Barometric	\$35.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,762.72	
371	\$116.11	\$50.00	\$15.00	\$5.00	\$0.00	\$0.00	Barometric	\$35.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,762.72	
383	\$197.14	\$50.00	\$30.00	\$80.00	\$0.00	\$0.00	Barometric	\$400.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$3,202.08	
405	\$0.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	3	\$75.00	\$60.00	\$135.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$5,845.00	
424	\$0.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$320.00	\$600.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$7,576.00	
425	\$0.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$200.00	\$200.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,410.00	
443	\$42.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,975.00	
452	\$0.10	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	3	\$75.00	\$30.00	\$105.00	\$465.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$5,295.00	
454	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$2,600.00	
455	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$350.00	\$300.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$3,250.00
465	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$340.00	\$0.00	\$0.00	\$200.00	\$0.00	\$0.00	3	\$60.00	\$60.00	\$120.00	\$260.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$6,570.00
466	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	Barometric	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$20.00	\$4,580.00
489	\$0.00	\$50.00	\$0.00	\$50.00	\$0.00	\$0.00	Barometric	\$337.50	\$0.00	\$0.00	\$190.00	\$0.00	\$0.00	1	\$150.00	\$100.00	\$250.00	\$610.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$9,447.50
493	\$37.50	\$0.00	\$0.00	\$0.00	\$20.00	\$0.00	Barometric	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	0	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$0.00	\$1,277.80

HEAT

NAME
10

COMMENTS

101

103

203

205

DE-RUB UNIT

215 SAVED 1,400 BY NOT INSTALLING CADET HEATERS

226

311

317

328 5 yrs. designed to operate continuously at low speed - no need for backdraft damper

359

331

370

371

383 no furnace

405

424

425

443 Builder's first self installation. Labor figured @ \$25/hr.

452 backdraft damper

454

455

465 Same nat number

488

489

493 H/V installed after drywall. Easier for drywallers, harder for HVAC; ceiling crawl + 1HR.

APPENDIX K

ADDITIONAL HEAT RECOVERY VENTILATION ANALYSES

This appendix contains more complete, or broken out cost information. The tables found here contain not only total costs but separate values for material and labor costs as well.

Often the total costs of various components were reported under the material cost section, but were not specified as total cost. This makes the 'total' line of data of each analyses the most accurate.

Table K1 presents the total cost of the HRV system by type/manufacturer.

Table K2 presents the ductwork costs.

Table K3 presents the hardware and wiring costs.

Table K4 presents grill and register costs.

Table K5 presents flow measure station costs.

TABLE K1
RCDP CYCLE II HRV ANALYSIS - AAHX UNIT COSTS

TYPE/MANUF.	N	MEAN	MEDIAN	STD DEV	MIN	MAX

ALL - AAHX						
=====						
MATERIALS	19	\$810.35	\$650.00	\$489.93	\$361.00	\$2,480.00
LABOR	19	\$66.79	\$40.00	\$68.36	\$0.00	\$240.00
TOTAL	19	\$877.14	\$714.00	\$492.29	\$402.00	\$2,480.00

ALL EAHP (DEC)						
=====						
MATERIALS	6	\$1,560.87	\$1,502.50	\$204.67	\$1,350.44	\$1,850.00
LABOR	6	\$37.50	\$0.00	\$53.52	\$0.00	\$125.00
TOTAL	6	\$1,598.37	\$1,542.38	\$171.35	\$1,405.00	\$1,850.00

AAHX - NUTONE						
=====						
MATERIALS	2	\$371.50	\$371.50	\$10.50	\$361.00	\$382.00
LABOR	2	\$35.00	\$35.00	\$15.00	\$20.00	\$50.00
TOTAL	2	\$406.50	\$406.50	\$4.50	\$402.00	\$411.00

AAHX - VAN EE						
=====						
MATERIALS	13	\$651.83	\$565.00	\$195.59	\$447.00	\$1,079.00
LABOR	13	\$59.54	\$30.00	\$67.33	\$0.00	\$240.00
TOTAL	13	\$711.36	\$690.00	\$192.70	\$507.00	\$1,135.00

AAHX - VENT AIRE						
=====						
MATERIALS	3	\$1,233.33	\$1,300.00	\$94.28	\$1,100.00	\$1,300.00
LABOR	3	\$141.67	\$125.00	\$42.49	\$100.00	\$200.00
TOTAL	3	\$1,375.00	\$1,400.00	\$54.01	\$1,300.00	\$1,425.00

AAHX - NUTECH/LIFEBREATH						
=====						
MATERIALS	1	\$2,480.00	ERR	\$0.00	\$2,480.00	\$2,480.00
LABOR	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
TOTAL	1	\$2,480.00	ERR	\$0.00	\$2,480.00	\$2,480.00
=====						

TABLE K2
RCDP CYCLE II HRV ANALYSIS - DUCTWORK COSTS

TYPE/MANUFACTURER	N	MEAN	MEDIAN	STD DEV	MIN	MAX

ALL - AAHX						
=====						
MATERIALS	16	\$275.82	\$200.00	\$181.77	\$29.40	\$555.00
LABOR	16	\$267.88	\$140.00	\$342.49	\$0.00	\$1,370.00
TOTAL	16	\$543.70	\$413.00	\$476.09	\$85.00	\$1,900.00

ALL - EAHP						
=====						
MATERIALS	6	\$252.43	\$234.50	\$160.21	\$49.46	\$525.00
LABOR	6	\$206.50	\$164.50	\$219.31	\$0.00	\$650.00
TOTAL	6	\$458.93	\$430.00	\$296.10	\$49.46	\$1,000.00

AAHX - NUTONE						
=====						
MATERIALS	2	\$124.70	\$124.70	\$95.30	\$29.40	\$220.00
LABOR	2	\$155.00	\$155.00	\$95.00	\$60.00	\$250.00
TOTAL	2	\$279.70	\$279.70	\$190.30	\$89.40	\$470.00

AAHX - VAN EE						
=====						
MATERIALS	12	\$261.15	\$178.00	\$170.14	\$85.00	\$555.00
LABOR	12	\$194.25	\$80.00	\$214.77	\$0.00	\$560.00
TOTAL	12	\$455.40	\$318.00	\$344.99	\$85.00	\$1,101.00

AAHX - VENT AIRE						
=====						
MATERIALS	2	\$515.00	\$515.00	\$15.00	\$500.00	\$530.00
LABOR	2	\$822.50	\$822.50	\$547.50	\$275.00	\$1,370.00
TOTAL	2	\$1,337.50	\$1,337.50	\$562.50	\$775.00	\$1,900.00

TABLE K3

TYPE	N	MEAN	MEDIAN	STD DEV	MIN	MAX

AAHX - CRANK TIMERS						
MATERIALS	2	\$15.00	\$15.00	\$5.00	\$10.00	\$20.00
LABOR	1	\$25.00	ERR	\$0.00	\$25.00	\$25.00
TOTAL	2	\$27.50	\$27.50	\$7.50	\$20.00	\$35.00

AAHX - DEHUMIDISTATS						
MATERIALS	1	\$20.00	ERR	\$0.00	\$20.00	\$20.00
LABOR	1	\$20.00	ERR	\$0.00	\$20.00	\$20.00
TOTAL	1	\$40.00	ERR	\$0.00	\$40.00	\$40.00

AAHX - DEHUMIDISTATS/CRANK TIMERS						
MATERIALS	4	\$32.00	\$31.50	\$17.87	\$10.00	\$55.00
LABOR	3	\$47.67	\$40.00	\$19.94	\$28.00	\$75.00
TOTAL	4	\$67.75	\$65.50	\$42.66	\$10.00	\$130.00

AAHX - OTHER/UNKNOWN						
MATERIALS	2	\$14.00	\$14.00	\$6.00	\$8.00	\$20.00
LABOR	2	\$22.50	\$22.50	\$2.50	\$20.00	\$25.00
TOTAL	2	\$36.50	\$36.50	\$8.50	\$28.00	\$45.00

EAHP - CLOCK TIMER						
MATERIALS	1	\$50.00	ERR	\$0.00	\$50.00	\$50.00
LABOR	1	\$180.00	ERR	\$0.00	\$180.00	\$180.00
TOTAL	1	\$230.00	ERR	\$0.00	\$230.00	\$230.00

EAHP - OTHER/UNKNOWN						
MATERIALS	NONE REPORTED					
LABOR	1	\$45.00	ERR	\$0.00	\$45.00	\$45.00
TOTAL	1	\$45.00	ERR	\$0.00	\$45.00	\$45.00

TABLE K4

TYPE	N	MEAN	MEDIAN	STD DEV	MIN	MAX

AAHX - CRANK TIMERS						
=====						
MATERIALS	2	\$53.50	\$53.50	\$13.50	\$40.00	\$67.00
LABOR	2	\$25.00	\$25.00	\$25.00	\$0.00	\$50.00
TOTAL	2	\$78.50	\$78.50	\$38.50	\$40.00	\$117.00

AAHX - DEHUMIDISTATS						
=====						
MATERIALS	2	\$50.75	\$50.75	\$33.24	\$17.50	\$83.99
LABOR	2	\$10.00	\$10.00	\$10.00	\$0.00	\$20.00
TOTAL	2	\$60.75	\$60.75	\$23.25	\$37.50	\$83.99

AAHX - DEHUMIDISTATS/CRANK TIMERS						
=====						
MATERIALS	3	\$62.21	\$67.64	\$33.29	\$19.00	\$100.00
LABOR	3	\$17.67	\$13.00	\$16.66	\$0.00	\$40.00
TOTAL	3	\$79.88	\$100.00	\$34.00	\$32.00	\$107.64

AAHX - OTHER/UNKNOWN						
=====						
MATERIALS	4	\$80.01	\$101.01	\$36.38	\$17.00	\$101.01
LABOR	4	\$17.50	\$15.00	\$4.33	\$15.00	\$25.00
TOTAL	4	\$97.51	\$116.01	\$32.05	\$42.00	\$116.01

EAHP - DEHUMIDISTATS						
=====						
MATERIALS	2	\$31.15	\$31.15	\$15.65	\$15.50	\$46.80
LABOR	2	\$10.00	\$10.00	\$10.00	\$0.00	\$20.00
TOTAL	2	\$41.15	\$41.15	\$25.65	\$15.50	\$66.80
=====						

TABLE K5
RCDP CYCLE II HRV ANALYSIS - FLOW MEASURE STATION COSTS

TYPE	N	MEAN	MEDIAN	STD DEV	MIN	MAX

AAHX - CRANK TIMERS						
=====						
MATERIALS	2	\$62.50	\$62.50	\$2.50	\$60.00	\$65.00
LABOR	2	\$12.50	\$12.50	\$12.50	\$0.00	\$25.00
TOTAL	2	\$75.00	\$75.00	\$15.00	\$60.00	\$90.00

AAHX - DEHUMIDISTATS						
=====						
MATERIALS	2	\$40.00	\$40.00	\$10.00	\$30.00	\$50.00
LABOR	2	\$7.50	\$7.50	\$7.50	\$0.00	\$15.00
TOTAL	2	\$47.50	\$47.50	\$2.50	\$45.00	\$50.00

AAHX - DEHUMIDISTATS/CRANK TIMERS						
=====						
MATERIALS	2	\$55.50	\$55.50	\$5.50	\$50.00	\$61.00
LABOR	2	\$15.00	\$15.00	\$15.00	\$0.00	\$30.00
TOTAL	2	\$70.50	\$70.50	\$9.50	\$61.00	\$80.00

AAHX - OTHER/UNKNOWN						
=====						
MATERIALS	3	\$50.00	\$50.00	\$0.00	\$50.00	\$50.00
LABOR	3	\$15.00	\$15.00	\$0.00	\$15.00	\$15.00
TOTAL	3	\$65.00	\$65.00	\$0.00	\$65.00	\$65.00

EAHP - DEHUMIDISTATS						
=====						
MATERIALS	1	\$35.00	ERR	\$0.00	\$35.00	\$35.00
LABOR	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
TOTAL	1	\$35.00	ERR	\$0.00	\$35.00	\$35.00

EAHP - CLOCK TIMER/SPEED CONTROLS						
=====						
MATERIALS	1	\$60.00	ERR	\$0.00	\$60.00	\$60.00
LABOR	1	\$0.00	ERR	\$0.00	\$0.00	\$0.00
TOTAL	1	\$60.00	ERR	\$0.00	\$60.00	\$60.00

APPENDIX L

EFFICIENT APPLIANCE COST DATA BASE

This appendix contains a copy of the initial data base that was used for the efficient appliance cost analyses.

The builder supplied the following information for each appliance:

Manufacturer

Model number

Appliance cost

Energy guide label (EGL) cost rating (estimated yearly operating costs)

Bill of Sale

Dishwasher average electric rate

Water Tank average electric rate

L-1

[illegible]

REFUGEE AFFIDAVIT

ID	DISHWASHER MODEL	HOT WIF MODEL	REFUG. MODEL	WIF TANK SERIAL NO.	DISHWASHER MODEL	HOT WIF TANK MODEL	REFUG. MODEL	DISHWASHER COST	HOT WIF COST	YEARLY EST YEARLY EST YEARLY EST YEARLY EST				TANK AVE ELEC RATE
										DISHWASHER	REFUG.	DISHWASHER	REFUG.	AVE ELEC RATE
455	EE	As. Appl.	Kenmore	587.14-5585	05L/92	EIA 52	48281	0	210	1010	0	0	0	0
456	Kenmore		Kenmore	587.14-5585	05L/92	EIA 52	48281	233	184	1645	0	0	0	0
457	Whirlpool	State	Whirlpool	00899001	55V322K13JNH	ED20041540	363.858781	382	275	774	59	419	79	7.63
464	Hotpoint	Bradford White	Hotpoint	H0278706	H35605-8	C1110E06	254	254	220	586	61	453	0	7.63
465	Hotpoint	Bradford White	Hotpoint	H02787AD	H35605-8	C1110E06	249	249	280	540	61	419	71	7.63
471	Whirlpool	State	Asaca	00899001	55V322K13JNH	SE256	440	440	290	1129	59	0	88	7.63
477				H02787	816V659		0	0	0	0	61	395	0	7.63
486	Whirlpool	n/a	Whirlpool	00899001	H-3-50-505-8	E1206M11H	352	352	0	0	59	439	0	7.63
487	Whirlpool	Rhea	Whirlpool	00899001	E12201	E12201	345.5	345.5	0	915	0	0	0	0
493	Hotpoint		S.E.	H02787	816V6520	18421 FL	259	259	209	581	61	409	64	7.63

REFERENCE

ID	SURVEYOR	SURFICE	ASSIGNABLE SURFIER ADDRESS	CITY, STATE, ZIP	COMMENTS
100	10001 Home	FINLEY HONES	5142 2nd St. Dillon, MT	INCOMPLETE INFORMATION	
201	Steve Hufnagel	Dillard	44 E. Broadway Dillon, MT	Refrigerator use based on 4.97	
202	GARY PALMARE	EMMA INC.	2614 STREET 204 397 CORVALLIS, MT 59828	FRIDGE AT 4.97/AMB	
203	Madara	Emm Inc.	Main Street Box 387 Corvallis, MT 59828	Refr 2 4.97/AMB	
205	EDMUND	WHITES	7th St. & 9th Ave South Great Falls, MT		
207	JOHN EASER	WOM'S	1100 E. AVE. W. MISSOULA, MT	Refring 2 4.97/AMB	
208	JOHN ROYER	SLON'S	215 N. 10th St VALSPELL, MT 59901	FRIDGE COSTS 2 4.97/AMB	
211	Lynnette Marcowski	Kutsche's	125 S. Idaho P.O. Box 1262 Dillon		
212		Massa Home Center			
213	LIN WELSH	MUSKIE TELEVISION A	1525 RUSSELL Hamilton, MT	FRIDGE AT 4.97/AMB, OCCUPANTS BROUGHT FRIDGE-DISH	
214	Tom FRANKS	DILLARD	P.O. Box 555 MISSOULA, MT 59806	FRIDGE AT 4.97/AMB	
215		Bales Maytag		OWNER SUPPLIED FRIDGE	
216	Ken BOLT	BLINCH'S	Box 1119 Libby, MT	FRIDGE 2 4.97/AMB, OCCUPANT SUPPLIED, NOT MEN	
217	EDGER FANESOLD	WOM'S	1100 SOUTH AVE WEST VALSPELL, MT 59903	REFRIGERATOR ANNUAL COST AT 4.97/AMB	
218	Pat ELMER	SLON'S	Box 73 MISSOULA, MT	FRIDGE BASED ON 4.97/AMB	
219	FAIMIA GOSI	SEAKS & MOUNTAIN SUP	2101 MULLAN MISSOULA, MT 59802	FRIDGE 2 4.97	
220	Pat OLSON	WAYNE ELECTRONICS	6529 HWY. 35 RIGBY, MT 59711		
221	Michaelbrook Bldg.	Second Cabinets	P.O. Box 4009-83 Portland, OR 97208		
222	Michaelbrook Bldg.	Diamond Cabinets	P.O. Box 4009-83 Portland, OR 97208		
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REFERENCE

IS	FINCHER	SUPPLIER	AFFILIATE SUBPLIER ADDRESS	CITY, STATE, ZIP	COMMENTS
455	Joe Egan	True Value	P.O. Box 436	Republic, WA 98166	Russel bought DW and Fridge. Fridge from Sears.
458	Four Sons Constr				
462	Statewide Constr	General Builder Sup	4459 S. 134th Pl. Fosteria Pl Seattle, WA 98168		
464	Creative Builders	Modern Supply Co.	1240 18th Ave West (Pier 89) Seattle, WA 98107		
466	Creative Builders	Cascade Lumber	Box 37	Camano Is., WA 98292	Refer and Dishwasher from Modern Supply - Seattle
471	Amendth Builders	Derby Electric	210 E. Main St.	Walla Walla WA 99362	DH:
477					
488	Mart's Bamer	Whirlpool Seattle	2901 115th Ave NE	Bellevue WA 98004	
489	Copeland Design	Prudential Dist.	E. 1304 Ferry Ave	Spokane, WA 99220	
493	Francisat Custom Hous	General Builders Sup	4459 S 134th Pl	Tumalla, WA 98168	

END

DATE FILMED

10 / 26 / 90