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THE RESIDENTIAL STANDARDS DEMONSTRATION PROGRAM: COST ANALYSIS

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May 1986

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THE RESIDENTIAL STANDARDS DEMONSTRATION PROGRAM: COST ANALYSIS

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May 1986

Prepared for the Office of Conservation, Bonneville Power Administration.

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SUMMARY

The Pacific Northwest is currently experiencing a dramatic and exciting transformation in the way the region produces and consumes energy. Prompted by federal legislation and local initiative, the region is promoting the conservation of energy as the primary energy resource. In the residential sector, energy efficiency standards (Model Conservation Standards, MCS) for new construction have been proposed, and a demonstration program (the Residential Standards Demonstration Program, RSDP) is underway to demonstrate to the homebuilding industry what the MCS are, how to comply with them, and increase the industry's familiarity with them.

Another objective of the RSDP is to document the cost-effectiveness of the MCS by collecting energy use and cost data on the homes participating in the program. In this report, we examined the costs associated with building energy efficient homes using real data compiled by builders and their sub-contractors (energy data will be presented at a later time).

All four states participating in the RSDP were represented in our analysis of 395 homes (out of 423 RSDP homes): 44 (11%) from Idaho, 67 (17%) from Montana, 59 (15%) from Oregon, and 225 (57%) from Washington. All the homes in the sample were energy efficient homes (i.e., there were no control homes). Three climate zones were represented: 233 (59%) in zone 1 (the fewest number of heating degree days), 85 (22%) in zone 2, and 77 (20%) in zone 3 (the greatest number of heating degree days). The median floor area of the entire sample was 1883 square feet; the mean floor area was 2047 square feet with a standard deviation of 740 square feet. Most of the homes in our sample were found to be designed to be more energy efficient, on the average, than the standard MCS home.

Several levels of analysis were used in examining the cost data for the entire sample and for each of the three climate zones: absolute, incremental, and normalized (absolute and incremental) costs (standardized by floor area and/or component area); and component (e.g., ceiling), subcomponent (e.g., attic insulation), and total costs. The discussion emphasizes median costs for they are less susceptible to the positive skew of outliers and, therefore, better represent the central tendency of the sample. We also present other statistical descriptors in our analysis: mean, standard deviation, range, and sample size.

Upon examining total incremental building costs normalized by **floor area**, we found the median cost was \$2.76/ft^2. For the average home in the sample with a median floor area of 1883 square feet, the total incremental cost would be \$5,197. It is important to note that these costs include labor and materials, but exclude builder overhead, fees, and profit, and, therefore, the actual incremental costs would be somewhat larger. The median costs for the states and climate zones were as follows: Idaho (\$2.15/ft^2), Montana (\$2.65/ft^2), Oregon (\$3.35/ft^2), Washington (\$2.79/ft^2), climate zone 1 (\$2.84/ft^2), climate zone 2 (\$2.65/ft^2), and climate zone 3 (\$2.65/ft^2) (see Chapter 9 for more summary information).

Using incremental building component costs normalized by **component area** as a guide, we found that the largest median incremental component cost per square foot was glazing (\$2.64/ft^2). All other median component costs were below \$1.00/ft^2: doors (\$0.92/ft^2), walls (\$0.60/ft^2), ceiling (\$0.34/ft^2), floor (\$0.25/ft^2), air infiltration barriers (\$0.12/ft^2), and basement walls (\$0.00/ft^2). There was no clear-cut trend in the level of costs among climate zones or states (see Chapter 6 for more component summary information, and Chapter 7 for detailed analysis of selected component groups).

The RSDP findings from this cost analysis should be regarded as only indicative for MCS homes for the following reasons. First, due to different types of building codes and code enforcement among the states, the concept of "current practice" is very loosely defined and variable, and, therefore, the calculation of incremental costs, in which current practice costs are subtracted from energy efficient home costs, is subject to an unknown bias. Second, the cost data itself may be incorrect due to confusion and assumptions made by builders participating in the program. Third, the findings from this demonstration program are not generalizable due to the problem of self-selection in program participation. Fourth, this was the first time many of the builders ever attempted to build to this level of energy efficiency using innovative building materials and techniques. And fifth, the incremental costs calculated in this report are for energy efficient homes that, in general, achieve or go beyond the Model Conservation Standards (MCS) proposed by the Northwest Power Planning Council.

TABLE OF CONTENTS

		Page
	Summary	2
	List of Tables	5
	List of Figures	6
	Introduction	7
Chapter I.	Housing and Compliance Path Summary.	15
Chapter II.	Component Cost Definitions and Absolute Building Costs.	27
Chapter III.	Normalized Absolute Building Costs - By Component Area.	34
Chapter IV.	Incremental Building Costs.	40
Chapter V.	Normalized Incremental Building Costs - By Floor Area.	52
Chapter VI.	Normalized Incremental Building Costs - By Component Area.	57
Chapter VII.	Normalized Incremental Building Costs - Group Analysis.	63
Chapter VIII.	Multi-Family Homes.	86
Chapter IX.	Summary Analysis.	90
Chapter X.	Discussion and Conclusions.	102
Appendix A.	Cost Accounting Form.	
Appendix B.	Histograms for Chapter VII.	
Appendix C.	Spreadsheets for Chapter VII.	
Appendix D.	Spreadsheet for Chapter IX.	

LIST OF TABLES

		Page
Table 1	Model Conservation Standards for new residential buildings: Space heating targets by climate zone.	9
Table 2	Types of options for meeting the Model Conservation Standards.	10
Table 3	State representation by climate zone.	16
Table 4	Floor area by state and climate zone.	18
Table 5	Energy efficiency of homes by state and climate zone.	24
Table 6	"MCS/As-built" costs - by climate zone.	29
Table 7	"MCS/As-built" costs - by state.	31
Table 8	"MCS/As-built" costs per component area - by climate zone.	35
Table 9	"MCS/As-built" costs per component area - by state.	37
Table 10	Incremental "MCS/As-built" costs - by climate zone.	41
Table 11	Incremental "MCS/As-built" costs - by climate zone.	45
Table 12	Incremental "MCS/As-built" costs per floor area - by climate zone.	53
Table 13	Incremental "MCS/As-built" costs per component area - by climate zone.	58
Table 14	Incremental "MCS/As-built" costs per component area - by state.	60
Table 15	Incremental costs per square foot of ceiling by types of increments.	65
Table 16	Incremental costs per square foot of floor by types of increments.	69
Table 17	Incremental costs per square foot of wall by types of increments.	71
Table 18	Incremental costs per square foot of basement wall by types of increments.	74
Table 19	Incremental costs per square foot of window by types of increments.	76
Table 20	Incremental costs per square foot of air infiltration barrier by types of increments.	80
Table 21	Incremental costs per square foot of door by types of increments.	82
Table 22	Incremental costs of air-to-air heat exchanger by types of increments of home square footage.	84
Table 23	Multi-family homes - Total incremental "MCS/As-built" costs per floor area.	87
Table 24	Total incremental "MCS/As-built" costs per floor area.	91

LIST OF FIGURES

		Page
Figure 1	States by climate zone.	17
Figure 2	Heating type by state.	19
Figure 3	Heating type by climate zone.	20
Figure 4	Compliance path by state.	21
Figure 5	Compliance path by climate zone.	22
Figure 6	Points by state.	25
Figure 7	Points by climate zone.	26
Figure 8	MCS/As-Built costs.	33
Figure 9	MCS/As-Built costs per component area.	39
Figure 10	Incremental MCS/As-Built costs.	50
Figure 11	Incremental MCS/As-Built costs.	51
Figure 12	Incremental MCS/As-Built costs per component area.	62
Figure 13	Distribution of total incremental costs normalized by floor area - all cases	94
Figure 14	Distribution of total incremental costs normalized by floor area - climate zone 1	95
Figure 15	Distribution of total incremental costs normalized by floor area - climate zone 2	96
Figure 16	Distribution of total incremental costs normalized by floor area - climate zone 3	97
Figure 17	Distribution of total incremental costs normalized by floor area - Idaho	98
Figure 18	Distribution of total incremental costs normalized by floor area - Montana	99
Figure 19	Distribution of total incremental costs normalized by floor area - Oregon	100
Figure 20	Distribution of total incremental costs normalized by floor area - Washington	101

INTRODUCTION

The Pacific Northwest is currently experiencing a dramatic and exciting transformation in the way the region produces and consumes energy. Prompted by federal legislation and local initiative, the region is promoting the conservation of energy as the primary new energy resource. In the residential sector, energy efficiency standards for new construction have been proposed, and a demonstration program is underway to examine the costs and energy savings associated with building energy efficient homes. In this report, we examine the energy efficient construction costs reported by builders in this program. Our findings will be of interest not only to the building industry, government officials, and the general public in the Pacific Northwest, but also to those individuals and organizations outside this region who want to learn from this experience.

Prior to examining the cost data itself, we present an overview on the enabling federal legislation, the proposed residential conservation standards, and the demonstration program.

THE NORTHWEST POWER ACT

The Pacific Northwest Electric Power Planning and Conservation Act of 1980 (P.L. 96-501) (the "Northwest Power Act") was the federal legislation that directed that priority be given to the lowest cost sources of energy for meeting the electric energy needs in the Pacific Northwest, and, if all else was equal, then energy conservation was to have priority over all other resources. The Northwest Power Act also called for the establishment of the Northwest Power Planning Council (the Council), and specifically identified Model Conservation Standards as one of the elements to be contained in the Council's Power Plan.

MODEL CONSERVATION STANDARDS

The Council adopted Model Conservation Standards (MCS) for new residential and commercial buildings in their 1983 Power Plan.[1] The MCS are designed to make new, electrically-heated residential homes more energy efficient by establishing "energy budgets" for space heating.

[1]While the standards are for both residential and commercial buildings, the discussion and analysis that follow pertain to the residential sector. For a description of the development of the MCS, see Eckman and Watson, 1984.

These performance standards vary by climate (there are three climate zones) as seen in Table 1. Climate Zone 1 encompasses most of the mild marine climate west of the Cascades; Climate Zone 2 is the more extreme climate east of the Cascades except for higher elevations; those elevations and most of western Montana are in Climate Zone 3.[2]

The MCS also offer a number of options to meet the energy budgets, such as insulation, glazing, heat pumps, solar features, and control of air leakage as shown in Table 2. This method of setting standards allows homebuilders wide design flexibility. Homes meeting the MCS are expected to use about one-third of the heating energy of an otherwise comparable home built to current standards.

The Council initially called for state and local governments and utilities to adopt the MCS by January 1986. It was expected that local or state government would adopt the standards in the form of building codes. These entitites would also be responsible for implementing and enforcing the codes. If political jurisdictions failed to adopt and enforce the standards or refused to carry out a program to achieve comparable energy savings, they would be subject to a 10 percent surcharge on the wholesale power they purchase from the Bonneville Power Administration (BPA) (as stated in the Northwest Power Act).

In December 1985, the Council revised their initial deadline and amended the standards to allow BPA and the utilities to offer marketing and financial assistance to help builders construct MCS homes (the BPA/Utility MCS Program). Utilities not participating in the Program may offer an alternative program so long as it is judged by BPA to produce equivalent savings. Utilities must choose to participate in the Program or submit their own equivalent program by September 1, 1986. The programs are to go into effect for 1987.

RESIDENTIAL STANDARDS DEMONSTRATION PROGRAM

At the time the standards were adopted, there was no consensus within the building industry about either the additional costs involved in building to the standards or the energy savings which would result. To address these problems, the Council called for BPA to carry out a large scale demonstration program of homes built to the standards. The result was the Residential Standards Demonstration Program (RSDP).

[2]However, the climate zones associated with a particular building site were determined by the micro-climate heating degree days from the nearest weather station. Thus, Richland, Washington and Boise, Idaho have Climate Zone 1 homes despite being geographically in Climate Zone 2. Moreover, it is important to note that a home with 4001 heating degree days and one with 5999 heating degree days are both in the same climate zone despite a 50% difference in the severity of the weather.

Table 1. Model Conservation Standards for New Residential Buildings: Space Heating Targets by Climate Zone

	Climate Zones		
	1 4000-6000 HDD*	2 6000-8000 HDD*	3 over 8000 HDD*
Single-Family	2.0 kWh/ft^2/yr	3.2 kWh/ft^2/yr	3.2 kWh/ft^2/yr
Multi-Family	1.2 kWh/ft^2/yr	2.3 kWh/ft^2/yr	2.8 kWh/ft^2/yr

*HDD = Heating degree days at a base of 65°F.

Table 2. Types of Options for Meeting the Model Conservation Standards

- Relatively high levels of ceiling insulation (R-30 or R-38)
- Walls with insulation levels ranging from R-19 to R-31
- Underfloor insulation (over crawl spaces) of R-19 or R-30
- Perimeter insulation for slab-on-grade or basements (R-10 to R-15)
- Double or triple-glazed windows with "thermal breaks" (insulating material in the window frames to "break" the thermal path by which heat is lost)
- Insulated entry doors
- Control of air infiltration through careful caulking, weatherstripping, and installation of vapor barriers
- Use of dehumidifiers to avoid humidity problems
- Very low air infiltration designs incorporating continuous vapor barriers and air-to-air heat exchangers
- "Solar tempered" designs (south-oriented windows)
- Passive solar designs (south-oriented windows and the inclusion of thermal mass)
- Heat pumps as an alternative to high levels of insulation

REFERENCE: Eckman and Watson, 1984.

As stated in the final version of the Council's Power Plan (released in late 1983), the RSDP had two basic, interrelated objectives: (1) demonstrate to the homebuilding industry what the MCS are, how to comply with them, and increase the industry's familiarity with them; and (2) obtain more accurate estimates of the average energy savings and incremental costs associated with the MCS. In addition, data regarding the characteristics of the homes (e.g., indoor air quality, solar access, and operation of air-to-air heat exchangers) were also to be collected. The activities designed to meet these objectives were initiated in early 1984 by the energy agencies of the Northwest states (the Washington State Energy Office, the Oregon Department of Energy, the Idaho Department of Water Resources, and the Montana Department of Natural Resources and Conservation) with funding from BPA. Discretion in designing and implementing the RSDP was left to the states, resulting in a great amount of flexibility.[3]

To accomplish the first objective, briefings were held in the winter of 1984 throughout the region to inform homebuilders, architects, realtors, lenders, and members of the housing industry about the RSDP. In the spring of 1984, the states conducted builder training workshops which were open to the general public, but were particularly targeted to general contractors, subcontractors, designers, architects, local code officials, and others familiar with standard residential construction. Seven workshops were conducted in Washington, Oregon, and Idaho. Since the program was limited to the western portion of Montana, only two workshops were held in that state. Washington also scheduled seven additional sessions throughout the state.

The goal of the two-day workshops was to transfer a working understanding of the "hows" and "how not tos" of very energy efficient construction from current practicioners to those otherwise experienced builders who have not yet built super energy efficient homes. The contents of the workshops included a description of: (a) the model conservation standards, (b) how to design an energy efficient home, (c) construction documents, (d) inspection procedures, (e) monitoring of the program, (f) available technical assistance, (g) program requirements, and (h) cost accounting procedures. The training materials included slides of "at-the-site" applications, hands-on demonstrations, and a detailed manual the builder could use during actual design and construction.

To accomplish the second objective, the RSDP conducted the large scale monitoring of both construction costs and energy use in approximately 400 energy efficient (all-electric) homes. Heating energy use and costs of homes built to the MCS will be compared with those of homes built to current codes. The energy and cost data will be examined together to evaluate the cost-effectiveness of building homes to the MCS. Energy data are still being collected, and data collection is expected to continue until September 1986.

[3]For more information on the design aspect of the program, see Hart and Selby, 1984.

As part of the monitoring program, homes built to the MCS were "triple metered" as were a corresponding number of existing "control" homes (i.e., homes built in recent years to current energy codes). Triple metering involved the placing of separate kilowatt-hour meters on the heating circuit, the domestic hot water circuit, and the total load. Cooperating homeowners were paid to periodically record the meter readings and indoor and outdoor temperatures.

To achieve a more rigorous comparison, approximately 90 homes (a subset of the above 400) were built and monitored using a sophisticated multi-channel remote monitoring system to measure energy use, temperatures and other potentially important parameters every hour. These were sometimes matched pair homes which were two otherwise identical homes except that one was built to the MCS while the other one was built to the current energy code, with the control home being completely monitored.

The additional construction cost (i.e., incremental cost) of building a home to the MCS is the focus of this report. Incremental costs associated with the MCS were tracked by participating builders using a cost accounting system developed by the Energy Board of the National Association of Homebuilders in Area 15, state energy agencies, and BPA. The accounting system was taught to the builders during the training sessions through the use of a uniform cost accounting manual (see Appendix A). Using the manual, builders were asked to supply construction cost information on each component of the building to BPA. Those builders who constructed only MCS homes recorded actual material and labor costs for those elements of the home which differed from current code and estimated the costs of building those elements to current code. Those builders who built matched pair homes recorded actual costs for both the model standards and the current code homes. More detail on the types of items included in the accounting system is presented below.

RSDP COST ANALYSIS

Lawrence Berkeley Laboratory (LBL) was selected by BPA to analyze the cost data collected during the RSDP. Using a cost accounting form (see Appendix A), builders and their subcontractors calculated the cost of building an energy efficient home by determining the costs of the following items: air-to-air heat exchanger, subfloor, framing, insulation, glazing, doors, fireplace, plumbing, electrical, HVAC (heating, ventilation and air conditioning), drywall, painting, vapor barrier (including caulking), passive solar, supervision, design, and loan interest. Also, they provided detailed cost information for the following specific types of building components (identified by insulation value (R-value or U-value), area, and type (e.g., wood or aluminum framed windows)): ceilings, floors, walls, basement walls, glass, air infiltration barriers, and doors.

In addition, builders estimated the costs of these components for homes they usually built to current standards ("current practice").[4] Additional information was provided on the cost accounting forms, including floor area, type of heating system, how builders complied with meeting the MCS, and site location.

Builders submitted their cost data to the state energy offices which reviewed the data for mathematical and logical consistencies. The states submitted the cost data to BPA which placed the data onto their computer system. A cost data tape was sent to LBL for review and analysis. LBL cleaned the data by eliminating data entry errors such as keypunch errors and cost reporting errors (some may remain). In cooperation with BPA, LBL analyzed the cost data using statistical software (SPSS-X), the results of which are presented in the following chapters. The discussion in each chapter emphasizes median costs for they are less susceptible to the positive skew of outliers and, therefore, better represent the central tendency of the sample. We also present other statistical descriptors in our analyses: mean, standard deviation, range, and sample size.

ORGANIZATION OF REPORT

Chapter I briefly summarizes characteristics (e.g., average floor area, type of heating system, and energy efficiency) of 395 MCS homes (not control homes) while the remaining chapters deal explicitly with cost. Chapters II and III contain the analysis of absolute building costs while the other chapters contain analyses of incremental costs (the differences between building energy efficient homes and building to current practice). In Chapters IV, V, and VI, we examine the incremental costs of building components which are normalized by floor area and component area in the latter two chapters. Chapter VII contains the detailed analysis of the incremental costs of specific groups of building components; Appendix C contains the spreadsheet display that this chapter is based on. Chapter VIII contains the analysis of total incremental building costs for multi-family homes. In Chapter IX, we present total incremental building costs for single-family homes, and in the last chapter (Chapter X), we present our findings and conclusions.

REFERENCES

1. Eckman, Tom, "How the standards grew: the blueprint." *Northwest Energy News* 3(2):10-12 (1984).

[4] A discussion of the problems encountered in estimating these costs is presented in the last chapter of this report.

2. Eckman, Tom and Richard Watson, "Model Conservation Standards for new construction: the region's best buy." In ACEEE 1984 Summer Study on Energy Efficiency in Buildings, Vol. G., pp. 3-15.

3. Hart, Wayne and Jane Selby, "Residential Standards Demonstration Program." In ACEEE 1984 Summer Study on Energy Efficiency in Buildings, Vol. G., pp. 16-27.

4. Watson, Richard H., "How the standards work: the showcase." *Northwest Energy News* 3(2):13-15 (1984).

CHAPTER I

HOUSING AND COMPLIANCE PATH SUMMARY

All four states participating in the Residential Standards Demonstration Program (RSDP) were represented in our analysis of 395 MCS homes: 44 (11%) from Idaho, 67 (17%) from Montana, 59 (15%) from Oregon, and 225 (57%) from Washington. All the homes in the sample were energy efficient homes (i.e., there were no control homes). Three climate zones were represented: 233 (59%) in zone 1 (the fewest number of heating degree days), 85 (22%) in zone 2, and 77 (20%) in zone 3 (the greatest number of heating degree days).[1] In Table 3 and in Figure 1, we show the relationship between state and climate zone.[2] The largest cell was composed of Washington homes in zone 1.

As seen in Table 4, the median floor area was 1883 square feet; the mean floor area was 2047 square feet with a standard deviation of 740 square feet. The size range of homes was very broad: 930 to 5717 square feet. Differences in mean floor area among states and climate zones appear to be minimal. The smallest average (mean) sized homes were in Oregon and climate zone 1, and the largest average (mean) sized homes were in Montana and climate zone 3.

Five major heating system types were represented in our sample. There were 140 homes heated by electric baseboard systems, 109 by central forced air, 83 by wall forced air, 32 by heat pumps, and 22 by radiant heat. In Figures 2 and 3, we show the distribution of heating systems by state and climate zone, respectively.

There are four ways a builder can fulfill the requirements of the MCS: one can comply with the prescriptive standard (following a path or following a path with tradeoffs (a point system)) or a performance standard (estimating an energy budget or meeting an overall thermal integrity (UA)). In complying with the MCS standards, 219 households used the component prescriptive point path, 121 used the component prescriptive path, 36 used the energy budget path, and 11 used the component performance path. In Figures 4 and 5, we show the distribution of compliance paths by state and climate zones, respectively.

We used number of points (based on the prescriptive point system) for characterizing the energy efficiency of homes. Zero points represents a MCS home, and more points indicates increasing energy efficiency. In some cases, upon inspecting a home, a house received negative points because it was found to be deficient in complying with the MCS standards. It is important to note that points are not cost-optimized, i.e., points are not related to cost-effectiveness. Builders are permitted trade-offs to give them flexibility in designing a home. Because the point

[1] See the Introduction for a description of the climate zones.
[2] All three climate zones are represented in Idaho, climate zones 1 and 2 are found in Oregon and Washington, and climate zone 3 covers the entire state of Montana.

Table 3. State representation by climate zone				
	Climate Zone 1	Climate Zone 2	Climate Zone 3	Total
All cases	233	85	77	395
Idaho	12	22	10	44
Montana	0	0	67	67
Oregon	48	11	0	59
Washington	173	52	0	225

Fig. 1 STATES BY CLIMATE ZONE

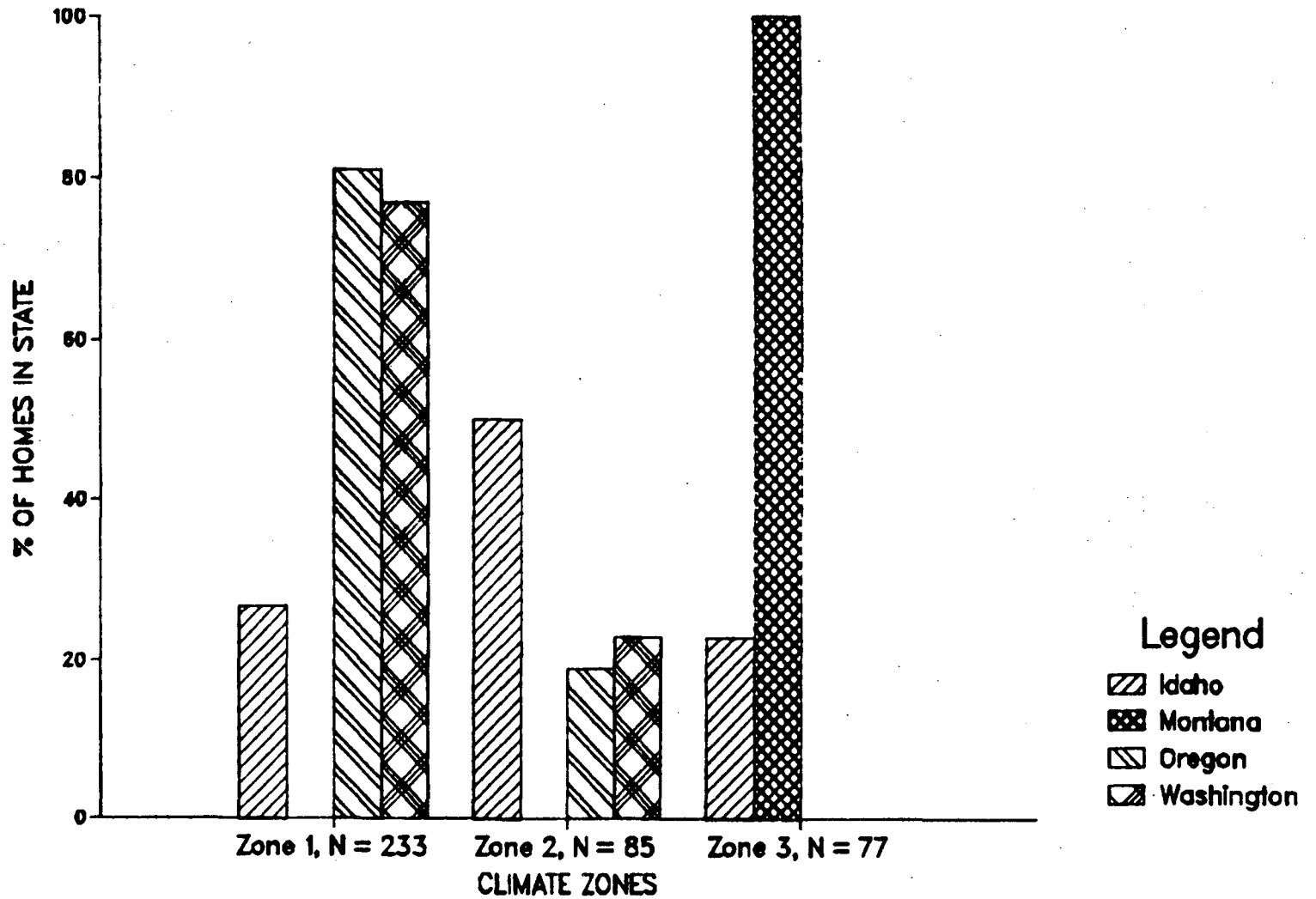


Table 4. Floor area by state and climate zone					
	Mean (ft^2)	Standard Deviation (ft^2)	Median (ft^2)	Minimum-Maximum (ft^2)	Sample Size
All cases	2047	740	1883	930-5717	395
Idaho	2072	738	1984	1128-4225	44
Montana	2252	665	2200	960-3690	67
Oregon	1874	637	1697	930-3464	59
Washington	2027	777	1820	1008-5717	225
Climate zone 1	1923	720	1713	930-5702	233
Climate zone 2	2200	792	1967	1176-5717	85
Climate zone 3	2254	669	2208	960-3850	77

Fig. 2 HEATING TYPE BY STATE

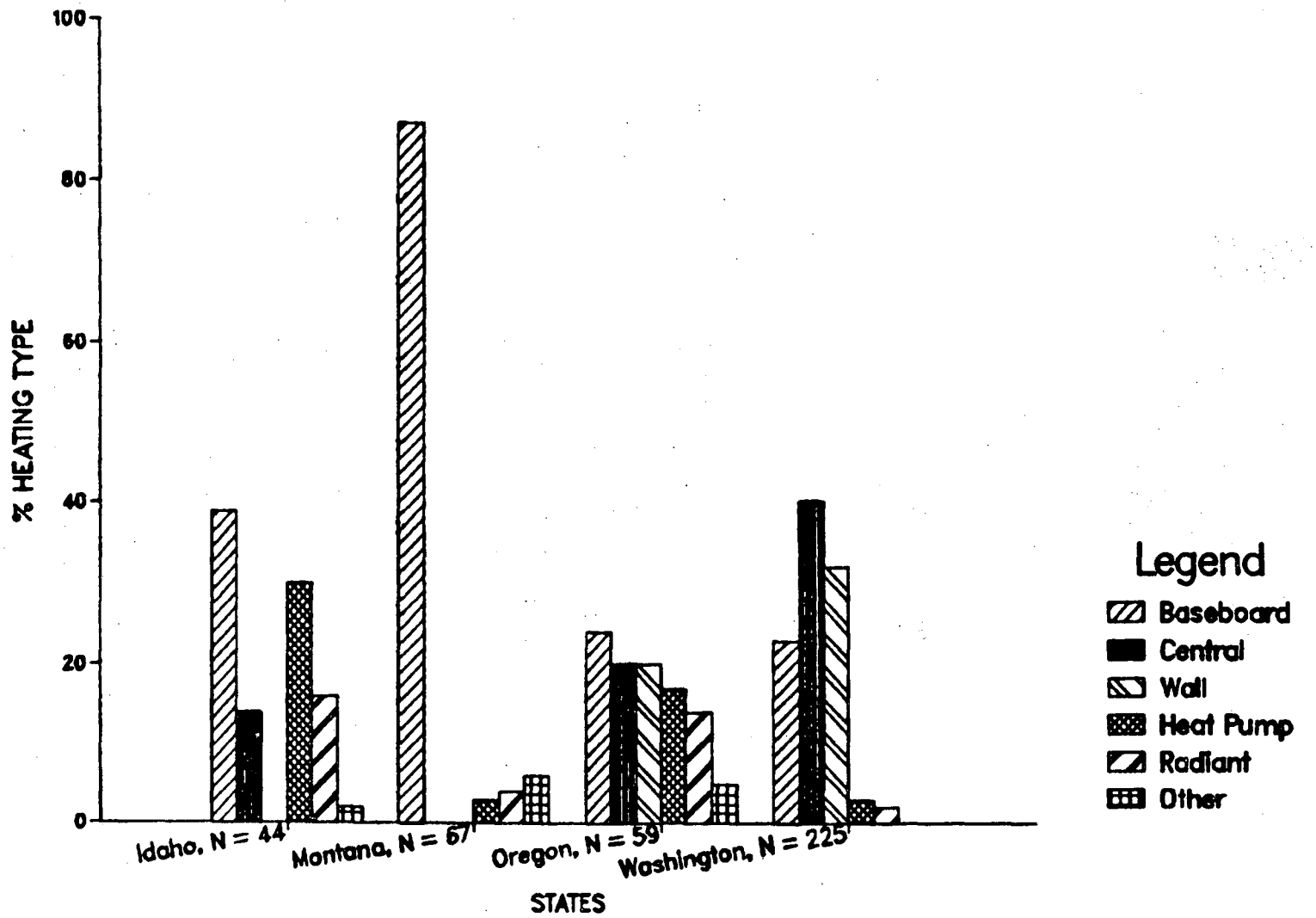


Fig. 3 HEATING TYPE BY CLIMATE ZONE

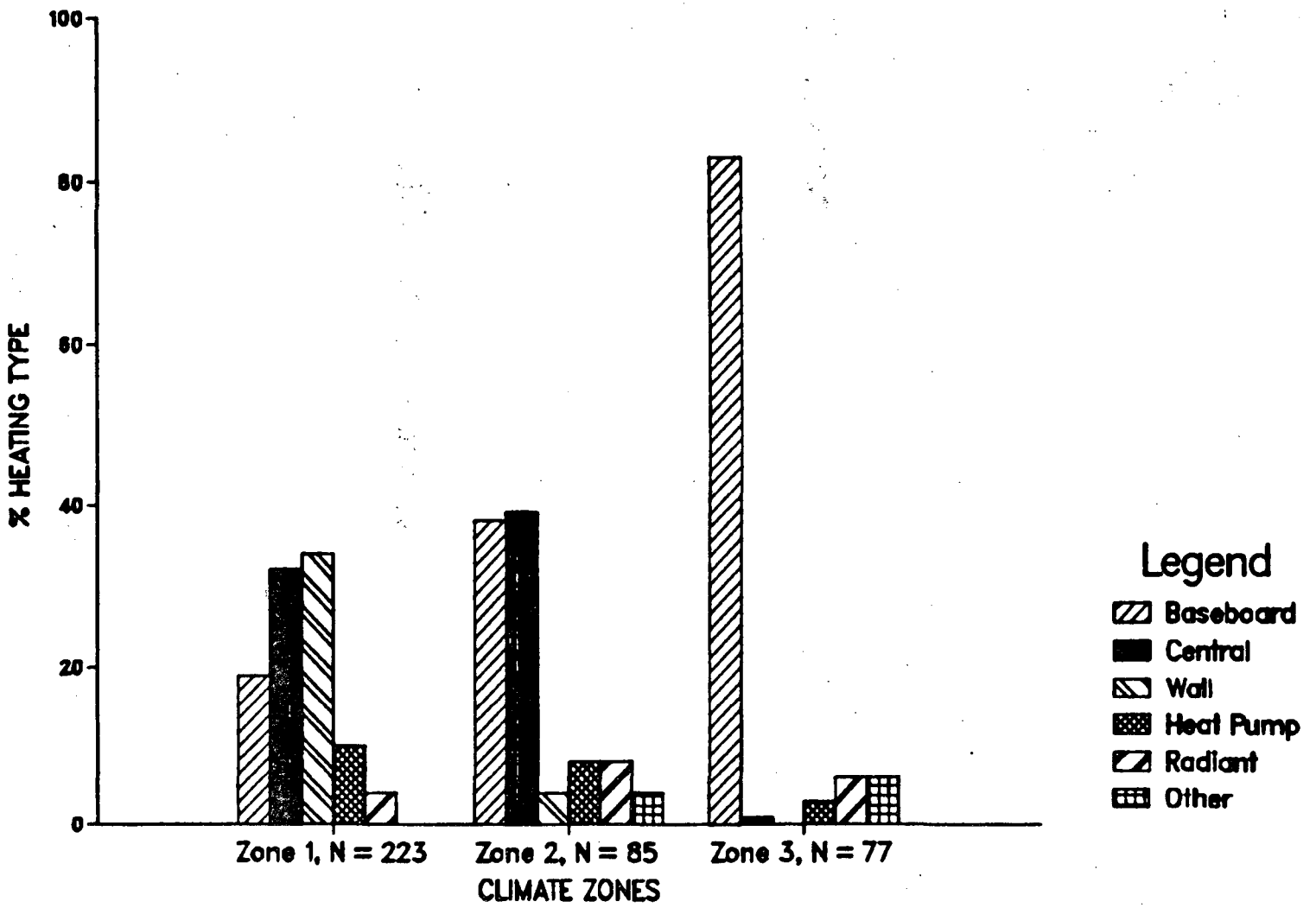


Fig. 4 COMPLIANCE PATH BY STATE

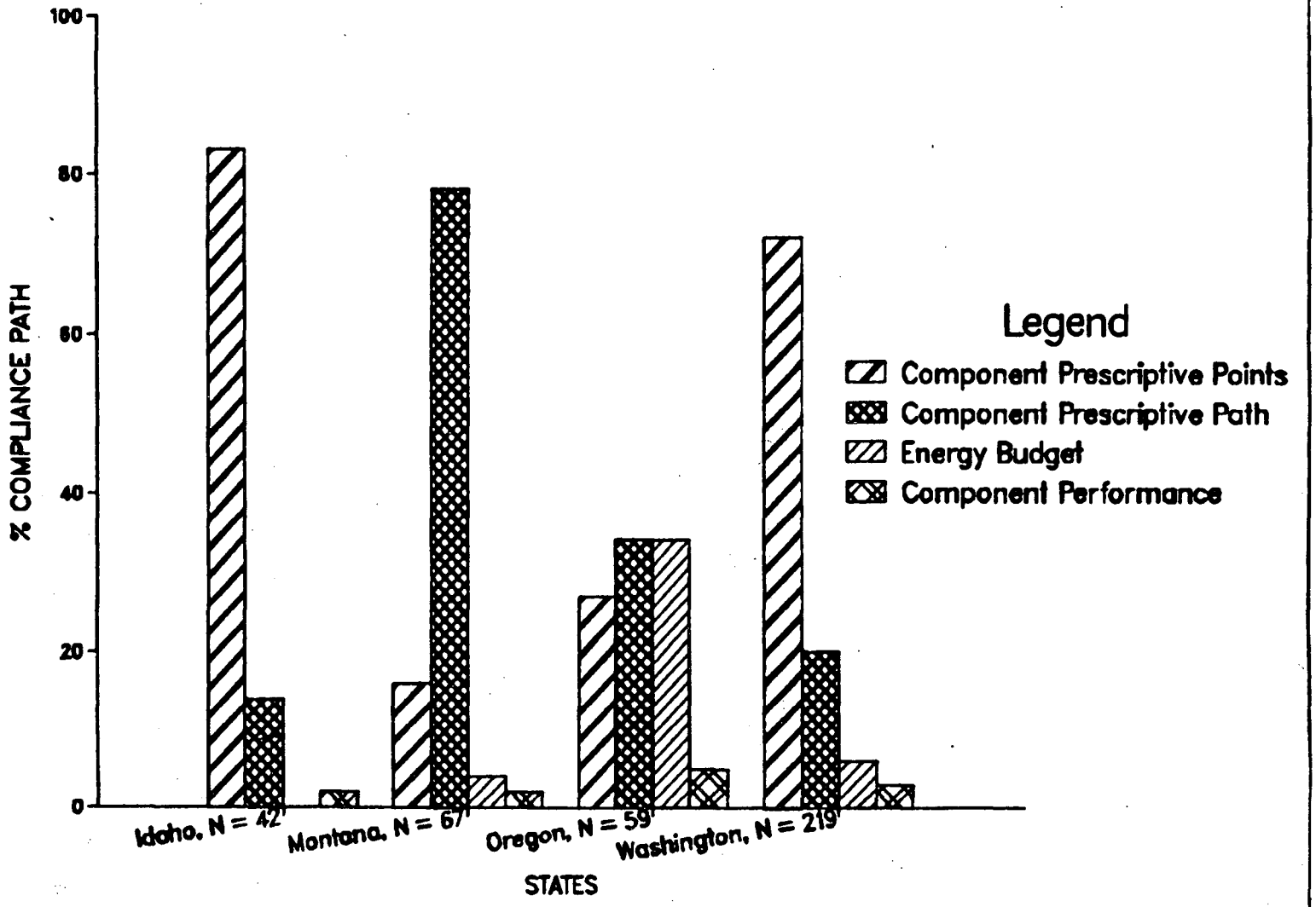
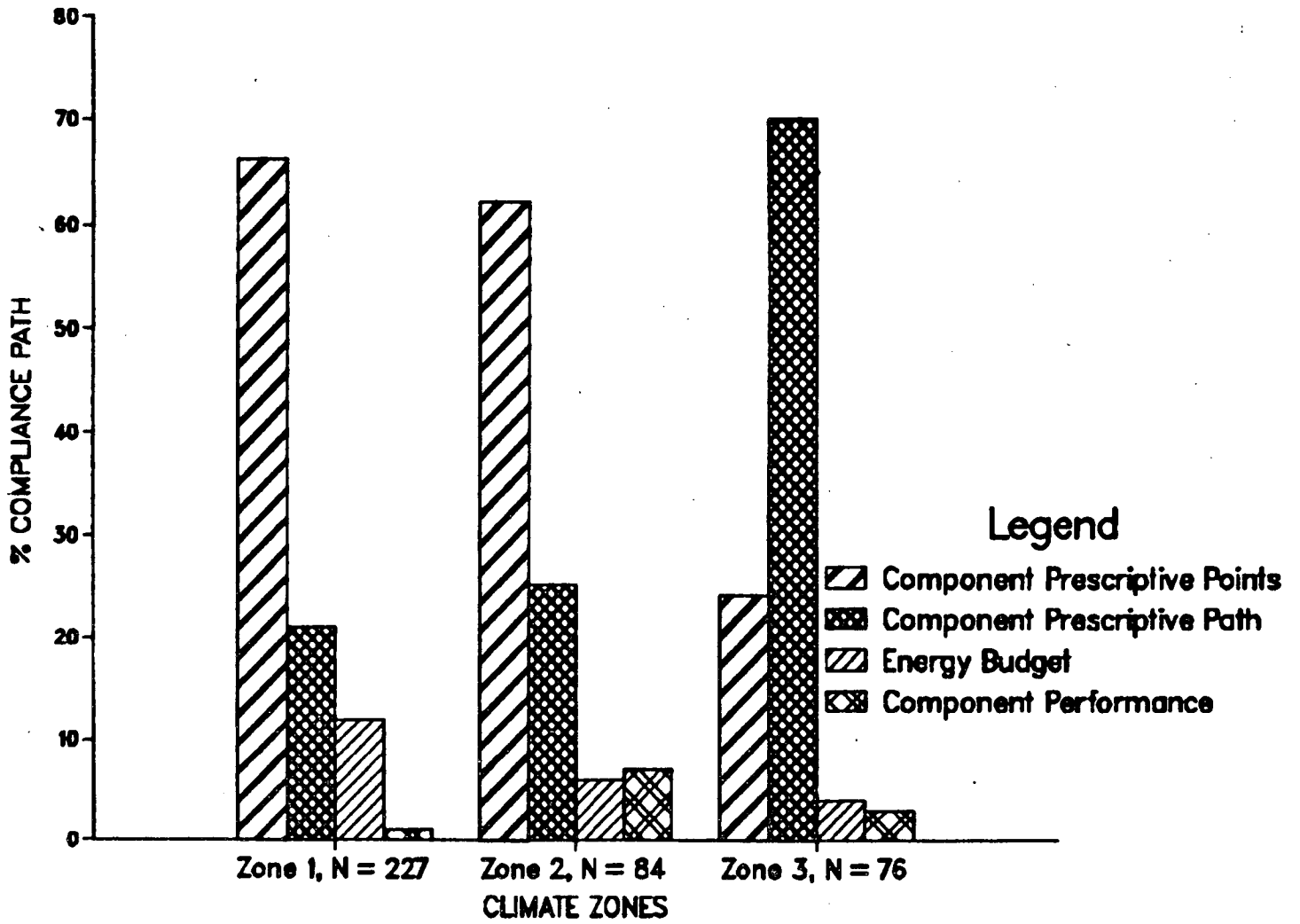


Fig. 5 COMPLIANCE PATH BY CLIMATE ZONE

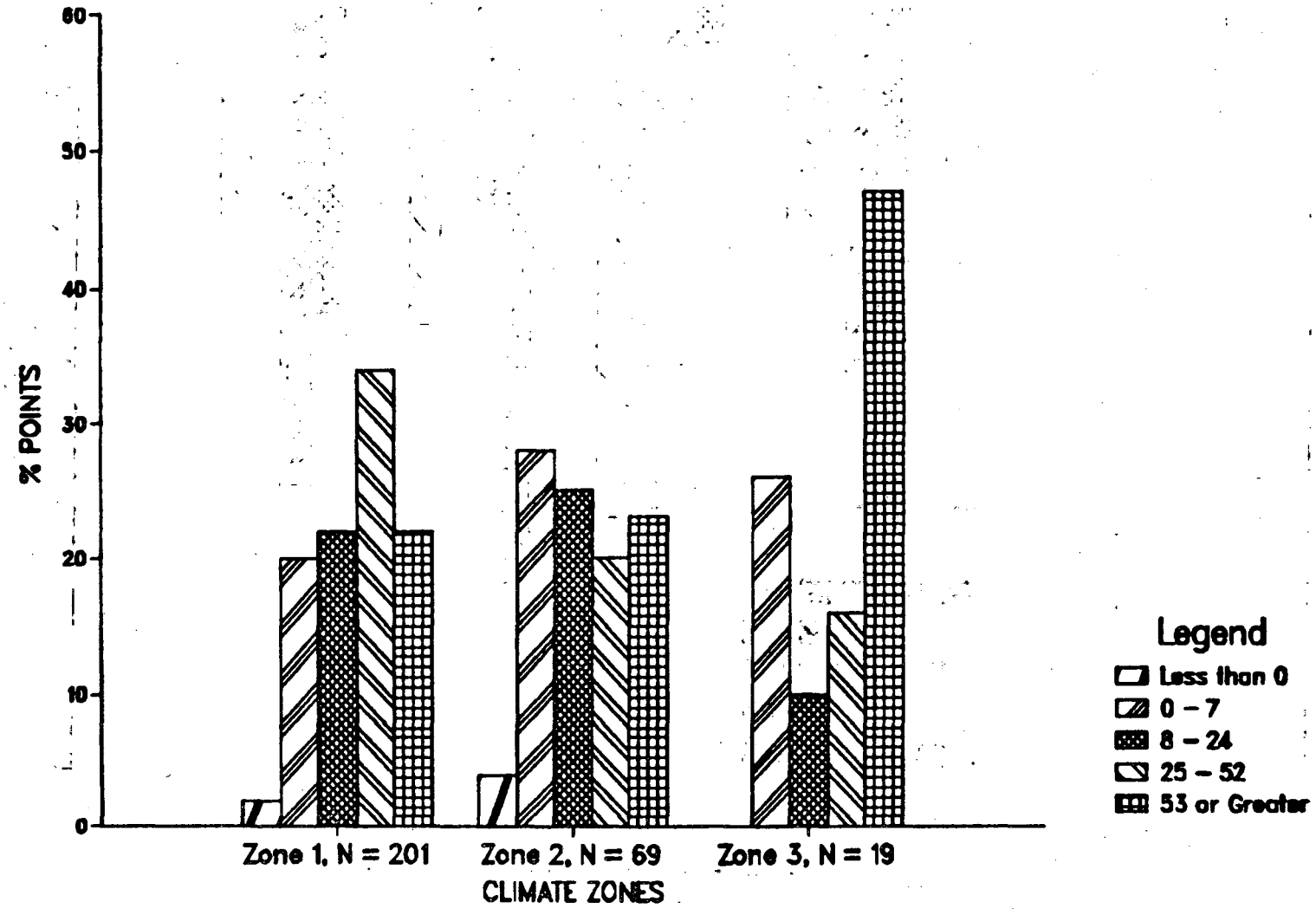


system allows a substitution for the standard MCS approach, trade-offs usually result in more expensive alternatives.

As seen in Table 5, the median number of points in our sample was 28; the mean number of points was 33 with a standard deviation of 34, and the range was -78 to 177 points. Thus, the sample of homes in this study was designed to be more energy efficient, on the average, than the prototypical MCS home.

We combined the homes into five groups based on their energy efficiency (less than 0 points, 0 to 7 points, 8 to 24 points, 25 to 52 points, and 53 or more points). The boundaries between groups do not represent any significant changes in energy use, but were constructed only for graphical display. In Figures 6 and 7, we show the distribution of these groups by states and climate zone, respectively. The greatest percent of the most energy efficient homes were located in Montana and in climate zone 3.

Fig. 7 POINTS BY CLIMATE ZONE



CHAPTER II

COMPONENT COST DEFINITIONS AND ABSOLUTE BUILDING COSTS

Prior to analyzing the costs discussed in this chapter and those to follow, we first provide definitions of some of the components that are examined in this report.

COMPONENT COST DEFINITIONS

Basement walls: Some states reported areas in linear feet instead of square feet, and these cases are excluded from analysis.

Ceiling: Includes the cost of insulation, but sometimes includes applicable framing (e.g., advanced trusses).

Design: Represents the cost of the architect's time to design the MCS home to include energy features.

Doors: Assumes door areas remain constant; costs of door jambs are included in wall costs.

Drywall: Includes the cost of improved caulking, but does not include Airtight Drywall Approach (ADA) costs which are included in vapor barrier costs.

Electrical: These costs may be less in MCS homes, especially, if kitchen and exhaust fans are no longer needed as a result of the installation of an air-to-air heat exchanger.

Floor: Usually involves only the cost of added insulation.

Framing: Includes floors, walls, and roof trusses.

Glass: Includes the frames, but not the structural framing costs which are included in wall costs.

Heat exchanger (AAHX): Includes duct costs.

HVAC: Heating, ventilation, and air conditioning costs are frequently less in MCS homes due to downsizing furnaces or switching from central to zonal heating.

Insulation: Includes only the cost of insulating materials and labor.

Loan interest: Represents interest costs due to increased home cost, MCS-related construction delays, or extended time in housing market.

Passive solar: Represents the costs of site orientation, thermal mass, insulating materials, and designing or installing extra glazing.

Point system: The point system allows modification of the standard component prescriptive packages given in the Component Prescriptive Standards. Specified variations are given points based upon the impact of the change upon the estimated yearly space heating requirements.

Points: Under the point system, points are calculated as 100 times the change in kWh/yr-ft^2 of heating requirements for the prototype resulting from the modification.

Sub-floor: Represents the costs of insulation and vapor barriers associated with slabs-on-grade, basements, and crawl spaces.

Supervision: Represents the cost of extra time required on-site to supervise workers' or subcontractors' work in order to assure that MCS standards are met.

Walls: Represents the cost of framing, insulation, window jambs, and door jambs.

In this chapter, we also present the absolute building costs for the builders as reported in constructing energy efficient homes. As noted in the Introduction, many of these homes contained more energy conservation measures than needed to achieve the Council's Model Conservation Standards (MCS). Accordingly, these costs may not represent the costs of building a MCS home, but may stand for the costs of building energy efficient homes that achieve or go beyond the standards proposed by the Council. All costs are in 1984 dollars and include labor and materials, but exclude builder overhead, fees, and profit.

As shown in Tables 6 and 7, the most expensive components in building energy efficient ("MCS/As-built") homes are, on average (using median costs), walls ($2454), glass (windows) ($2052), ceilings ($1950), and air-to-air heat exchangers (AAHX) ($1326). The next most expensive components are, on average (using median costs), vapor barriers ($813), basement walls ($547), floors ($506), and doors ($326). Mean costs and their standard deviations are reported in Tables 6 and 7 and displayed in Figure 8. The standard deviation and minimum-maximum values indicate the large variation in building component costs. There are a number of possible explanations for the large variance in building costs, and, in the next chapter, we examine one source of variation: building component size.

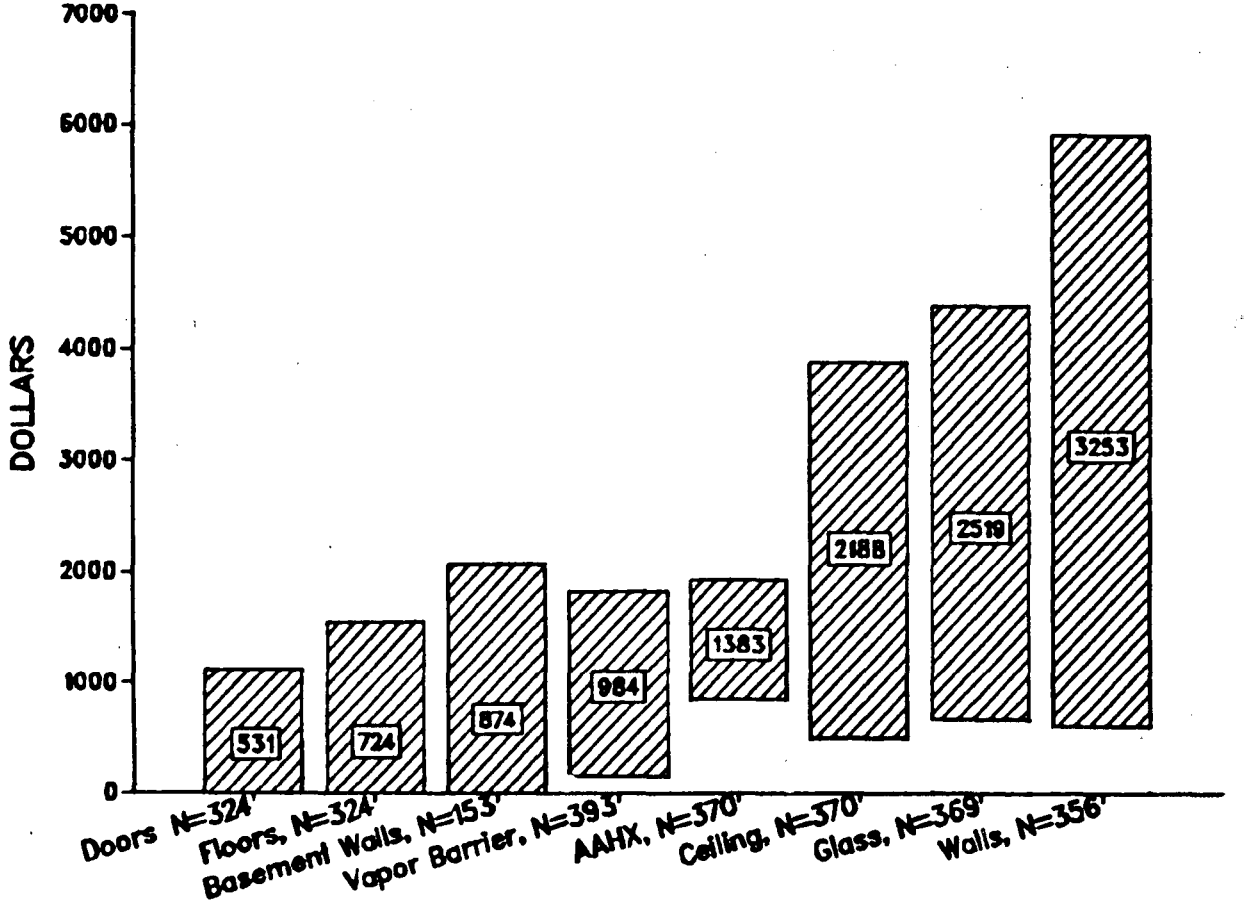
Table 6. "MCS/As-built" costs - by climate zone					
	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Ceiling					
All cases	2188	1689	1950	92-16895	370
Climate zone 1	2205	1509	1938	128-9635	221
Climate zone 2	2305	2359	2010	92-16895	82
Climate zone 3	1987	1204	1975	159-5692	67
Floor					
All cases	724	808	506	10-8150	324
Climate zone 1	745	795	537	25-8150	215
Climate zone 2	731	1025	478	10-6424	59
Climate zone 3	628	534	430	26-2316	50
Walls					
All cases	3253	2651	2454	51-22497	356
Climate zone 1	3174	2418	2306	51-14378	218
Climate zone 2	3654	3438	2908	337-22497	78
Climate zone 3	3019	2251	2565	340-11576	60
Basement Walls					
All cases	874	1175	547	21-9242	153
Climate zone 1	723	1242	409	21-8824	52
Climate zone 2	927	900	603	99-4462	55
Climate zone 3	981	1378	557	118-9242	46
Heat Exchanger					
All cases	1383	541	1326	75-5545	370
Climate zone 1	1300	544	1200	400-4180	223
Climate zone 2	1478	634	1370	75-5545	71
Climate zone 3	1540	365	1464	945-2654	76

	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Glazing					
All cases	2519	1858	2052	63-12820	369
Climate zone 1	2519	1906	2020	80-12820	216
Climate zone 2	2238	1744	1656	85-11000	80
Climate zone 3	2828	1809	2615	63-7830	73
Doors					
All cases	531	582	326	7-3869	324
Climate zone 1	549	604	358	7-3869	199
Climate zone 2	548	608	338	24-2787	58
Climate zone 3	463	488	180	20-1857	67
Vapor Barrier/ Caulking					
All cases	984	834	813	69-9354	393
Climate zone 1	994	924	796	69-9354	231
Climate zone 2	930	627	760	182-4040	85
Climate zone 3	1014	754	864	103-6107	77

Table 7. "MCS/As-built" costs - by state					
	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Ceiling					
All cases	2188	1689	1950	92-16895	370
Idaho	2456	2590	2240	92-16895	39
Montana	1839	1204	1663	159-5692	58
Oregon	2378	1916	1789	195-11092	55
Washington	2184	1523	1962	128-9635	218
Floor					
All cases	724	808	506	10-8150	324
Idaho	750	715	554	90-2315	23
Montana	558	476	406	26-2316	45
Oregon	1169	1159	836	151-6424	50
Washington	650	738	472	10-8150	206
Walls					
All cases	3253	2651	2454	51-22497	356
Idaho	2582	2497	1712	337-13941	33
Montana	3040	2339	2358	340-11576	51
Oregon	3726	2106	3300	916-10668	52
Washington	3291	2841	2354	51-22497	220
Basement Walls					
All cases	874	1175	547	21-9242	153
Idaho	1222	1199	700	99-4462	26
Montana	938	1469	532	118-9242	39
Oregon	890	843	406	100-2778	14
Washington	714	1030	518	21-8824	74

	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Heat Exchanger					
All cases	1383	541	1326	75-5545	370
Idaho	1659	418	1524	1179-2654	33
Montana	1504	330	1464	945-2460	67
Oregon	1167	378	1137	400-2131	59
Washington	1362	619	1245	75-5545	211
Glazing					
All cases	2519	1858	2052	63-12820	369
Idaho	2582	2034	2092	665-11000	30
Montana	2857	1832	2670	63-7830	64
Oregon	3078	2110	2557	100-10089	59
Washington	2258	1725	1799	80-12820	216
Doors					
All cases	531	582	326	7-3869	324
Idaho	641	623	466	38-2200	25
Montana	425	458	128	20-1857	61
Oregon	600	557	434	24-2787	54
Washington	531	618	344	7-3869	184
Vapor Barrier/ Caulking					
All cases	984	834	813	69-9354	393
Idaho	733	695	609	80-4040	44
Montana	1013	780	872	103-6107	67
Oregon	773	1241	600	69-9354	58
Washington	1079	723	936	131-6379	224

Fig. 8 MCS/AS-BUILT COSTS



Boxed figure is the mean. Shaded area is the mean +/- standard deviation, unless lower limit becomes less than minimum, in which case minimum is used.

CHAPTER III

NORMALIZED ABSOLUTE BUILDING COSTS - BY COMPONENT AREA

In this chapter, we present absolute building component costs normalized (standardized) by **component area** (square footage). As shown in Tables 8 and 9, the most expensive (using median costs) components per square foot in building energy efficient ("MCS/As-built") homes are glass (windows) ($9.90/ft^2), doors ($8.75/ft^2), walls ($1.64/ft^2), and ceilings ($1.50/ft^2). The next most expensive components per square foot are basement walls ($0.72/ft^2), floors ($0.54/ft^2), and vapor barriers ($0.16/ft^2). Mean costs and their standard deviations are reported in Tables 8 and 9 and displayed in Figure 9. The standard deviation and minimum-maximum values again indicate the large variation in building component costs, especially for walls and doors.

Table 8. "MCS/As-built" costs per component area - by climate zone					
	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Ceiling					
All cases	1.57	0.96	1.50	0.05-6.86	370
Climate zone 1	1.57	0.92	1.51	0.05-5.80	221
Climate zone 2	1.57	1.13	1.31	0.09-6.86	82
Climate zone 3	1.57	0.89	1.65	0.12-3.84	67
Floor					
All cases	0.89	1.44	0.54	0.01-19.37	324
Climate zone 1	0.82	0.89	0.58	0.08-8.66	215
Climate zone 2	1.24	2.65	0.63	0.01-19.37	59
Climate zone 3	0.77	1.26	0.39	0.10-6.99	50
Walls					
All cases	2.13	1.62	1.64	0.03-12.10	356
Climate zone 1	2.02	1.52	1.57	0.03-11.70	218
Climate zone 2	2.45	2.09	1.90	0.33-12.10	78
Climate zone 3	2.09	1.20	1.81	0.02-6.43	60
Basement Walls*					
All cases	1.32	1.50	0.72	0.08-9.27	114
Climate zone 1	1.08	1.15	0.68	0.08-6.98	52
Climate zone 2	1.50	1.81	0.73	0.20-9.27	55
Climate zone 3	1.63	1.01	1.10	0.65-3.12	7
Glass					
All cases	10.52	5.37	9.90	0.39-35.66	376
Climate zone 1	10.01	5.01	9.46	0.39-35.66	227
Climate zone 2	9.84	5.34	9.30	0.88-27.98	83
Climate zone 3	13.12	5.91	13.10	1.20-25.98	66

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Infiltration/ Vapor Barrier					
All cases	0.21	0.17	0.16	0.02-1.40	375
Climate zone 1	0.21	0.19	0.15	0.02-1.40	223
Climate zone 2	0.20	0.18	0.15	0.03-1.36	82
Climate zone 3	0.23	0.14	0.19	0.04-0.95	70
Doors					
All cases	10.16	8.66	8.75	0.04-52.86	289
Climate zone 1	9.40	8.30	8.40	0.08-52.86	183
Climate zone 2	9.98	7.32	8.82	0.04-27.42	71
Climate zone 3	14.55	11.52	11.26	0.52-45.00	35

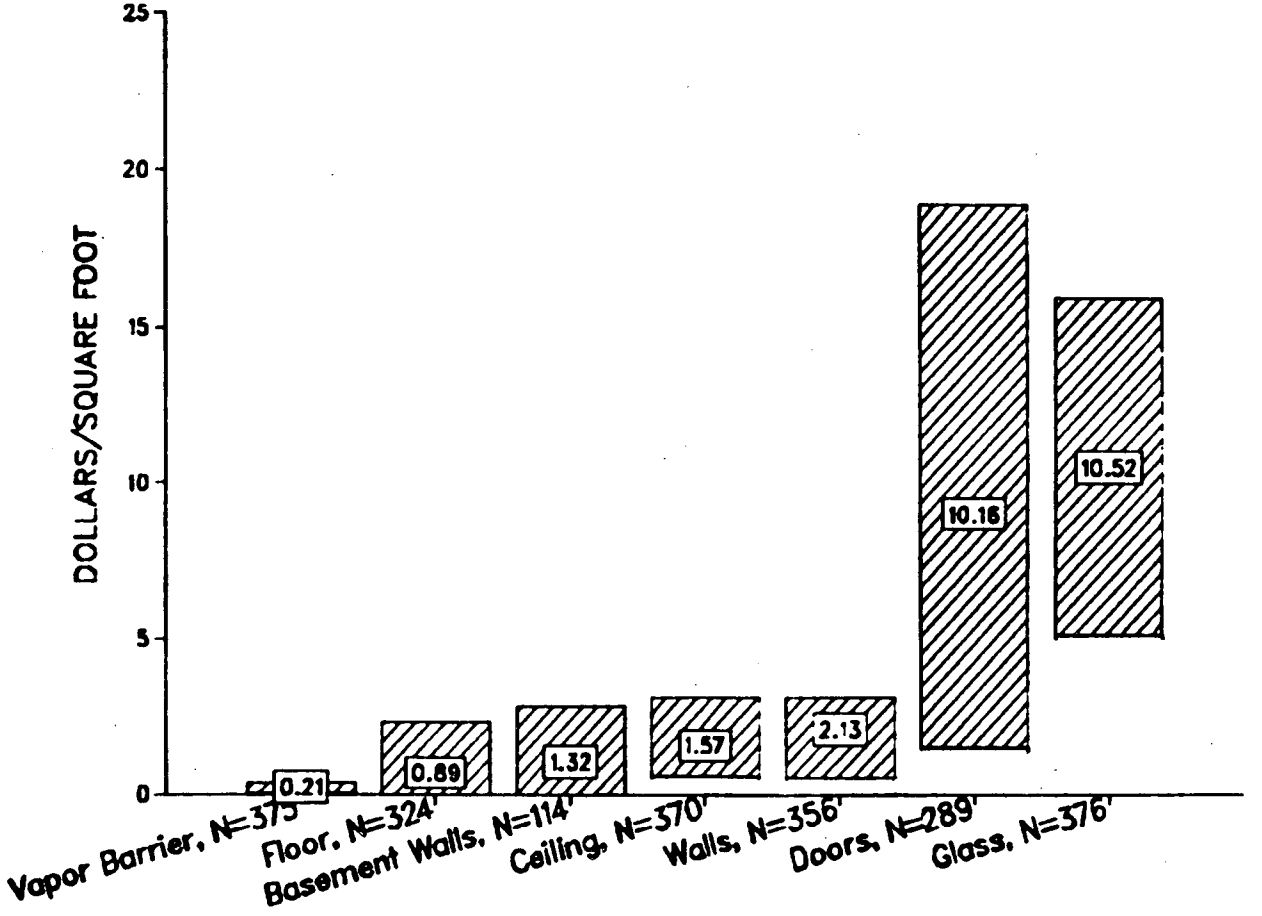
*Montana cases are not included in this analysis because component area was reported in linear feet instead of square feet.

Table 9. "MCS/As-built" costs per component area - by state					
	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Ceiling					
All cases	1.57	0.96	1.50	0.05-6.86	370
Idaho	1.69	1.21	1.56	0.09-6.86	39
Montana	1.44	0.84	1.44	0.12-3.41	58
Oregon	1.71	1.20	1.50	0.38-6.21	55
Washington	1.55	0.88	1.50	0.05-5.80	218
Floor					
All cases	0.89	1.44	0.54	0.01-19.37	324
Idaho	2.04	4.16	0.61	0.21-19.37	23
Montana	0.51	0.43	0.39	0.10-2.18	45
Oregon	0.89	0.79	0.61	0.12-3.60	50
Washington	0.84	1.01	0.58	0.01-8.67	206
Walls					
All cases	2.13	1.62	1.64	0.03-12.10	356
Idaho	1.71	1.22	1.32	0.33-5.48	33
Montana	2.15	1.25	1.83	0.02-6.43	51
Oregon	2.28	1.30	1.89	0.58-6.22	52
Washington	2.15	1.80	1.61	0.03-12.10	220
Basement Walls*					
All cases	1.32	1.50	0.72	0.08-9.27	114
Idaho	1.90	2.34	0.80	0.20-9.27	26
Montana	-	-	-	-	-
Oregon	1.63	1.56	1.03	0.10-5.26	14
Washington	1.06	0.99	0.68	0.08-6.98	74

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Glass					
All cases	10.52	5.37	9.90	0.39-35.66	376
Idaho	12.71	5.77	12.47	3.11-35.66	42
Montana	13.16	6.11	13.57	1.20-25.98	56
Oregon	10.45	5.17	10.53	0.44-22.84	59
Washington	9.45	4.80	9.01	0.39-32.67	219
Infiltration/ Vapor Barrier					
All cases	0.21	0.17	0.16	0.02-1.40	375
Idaho	0.12	0.10	0.09	0.02-0.49	41
Montana	0.24	0.14	0.20	0.04-0.95	60
Oregon	0.11	0.07	0.09	0.02-0.30	55
Washington	0.24	0.20	0.20	0.02-1.40	219
Doors					
All cases	10.16	8.66	8.75	0.04-52.86	289
Idaho	13.26	10.83	8.38	0.71-45.00	35
Montana	12.38	8.78	10.96	0.52-31.63	26
Oregon	9.66	7.20	9.63	0.04-25.47	43
Washington	9.39	8.37	8.75	0.08-52.86	185

*Montana cases are not included in this analysis because component area was reported in linear feet instead of square feet.

Fig. 9 MCS/AS-BUILT COSTS BY COMPONENT AREA



Boxed figure is the mean. Shaded area is the mean +/- standard deviation, unless lower limit becomes less than minimum, in which case minimum is used.

CHAPTER IV

INCREMENTAL BUILDING COSTS

In this chapter, we present "incremental" building costs of selected components. The costs are incremental because they represent the difference between the cost of "MCS/As-built" homes and the cost of homes built to "current practice." Current practice typically refers to existing state or local building standards; however, there are exceptions to this definition (for more discussion, see Chapter X). We include building components (e.g., walls and ceilings) as well as elements of components (e.g., insulation) in our analysis. Because the costs are examined in two different ways, the categories cannot be added to obtain total incremental costs for the whole house. We provide total incremental costs for multi-family homes and single-family homes in Chapters 8 and 9, respectively.

As shown in Tables 10 and 11, the largest median incremental cost for builders of energy efficient homes is the installation of air-to-air heat exchangers ($1268). Because of reduced air infiltration resulting from vapor barriers, the exchangers are required in these homes to provide adequate ventilation; they are not normally found in homes built to current practice. The next most expensive median incremental costs for builders in the RSDP program are walls ($923), insulation ($725), framing ($690), vapor barrier ($658), glass ($592), and ceiling ($417). The remaining median incremental costs are below $300. Mean costs and their standard deviations are reported in Tables 10 and 11, and displayed in Figures 10 and 11. As in the preceding analysis, there is a large variation in incremental building costs, especially for framing and HVAC systems.

Table 10. Incremental "MCS/As-built" costs - by climate zone					
	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Ceiling					
All cases	566	755	417	-671-11795	381
Climate zone 1	598	513	471	0-3617	226
Climate zone 2	596	1320	358	-547-11795	83
Climate zone 3	435	426	360	-671-2429	72
Floor					
All cases	291	275	224	-287-1847	338
Climate zone 1	293	268	204	-287-1847	219
Climate zone 2	260	324	133	0-1800	66
Climate zone 3	321	238	307	0-996	53
Walls					
All cases	1134	1063	923	-2562-9998	357
Climate zone 1	1086	915	918	-445-6233	219
Climate zone 2	1154	1043	1006	-2562-4741	77
Climate zone 3	1285	1502	843	0-9998	61
Basement Walls					
All cases	226	376	0	-423-3126	304
Climate zone 1	114	339	0	0-3126	187
Climate zone 2	379	337	297	-34-1235	68
Climate zone 3	438	402	444	-423-1572	49
Glass					
All cases	739	667	592	-460-4083	388
Climate zone 1	811	710	625	-224-4083	231
Climate zone 2	763	677	589	-460-3000	84
Climate zone 3	484	410	389	-424-1821	73

	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Infiltration/ Vapor Barrier					
All cases	797	614	658	-683-5442	380
Climate zone 1	773	598	642	-683-5442	226
Climate zone 2	788	616	664	70-3285	83
Climate zone 3	886	665	710	142-4893	71
Doors					
All cases	109	217	50	-736-2624	364
Climate zone 1	137	234	72	-209-2624	207
Climate zone 2	102	225	64	-736-908	81
Climate zone 3	39	125	0	-120-689	76
Heat Exchanger					
All cases	1308	557	1268	0-4180	366
Climate zone 1	1294	542	1200	400-4180	222
Climate zone 2	1132	657	1289	0-2633	76
Climate zone 3	1548	376	1456	945-2654	68

THE FOLLOWING COMPONENTS MAY CONTAIN COSTS THAT ARE ALSO INCLUDED IN THE COSTS REPORTED ABOVE

	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Subfloor					
All cases	285	439	114	-572-3578	360
Climate zone 1	186	424	17	-199-3578	212
Climate zone 2	242	296	122	-391-1300	76
Climate zone 3	622	448	589	-572-2048	72
Framing					
All cases	910	1525	690	-2167-24334	386
Climate zone 1	901	1770	654	-2167-24334	230
Climate zone 2	837	1248	526	-350-9277	79
Climate zone 3	1010	856	814	-1500-5180	77
Insulation					
All cases	872	736	725	-98980-4544	387
Climate zone 1	876	708	698	-980-4114	232
Climate zone 2	825	793	791	-569-3220	79
Climate zone 3	910	767	764	-979-4544	76
Electrical					
All cases	13	428	0	-1030-5708	342
Climate zone 1	-26	182	0	-885-820	210
Climate zone 2	200	839	0	-720-5708	70
Climate zone 3	-66	251	0	-1030-350	62
HVAC					
All cases	-77	897	0	-6000-4509	303
Climate zone 1	-178	788	0	-6000-4509	207
Climate zone 2	321	845	0	-1340-3311	68
Climate zone 3	-293	1401	-185	-5450-3045	28

	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Passive Solar					
All cases	115	544	0	0-5343	253
Climate zone 1	109	571	0	0-5343	189
Climate zone 2	88	411	0	0-3017	59
Climate zone 3	656	728	356	0-1885	5
Supervision					
All cases	339	419	250	0-3500	326
Climate zone 1	365	481	250	0-3500	209
Climate zone 2	322	327	245	0-1800	72
Climate zone 3	243	140	220	0-560	45
Design					
All cases	129	187	100	0-1400	329
Climate zone 1	120	193	60	0-1330	211
Climate zone 2	151	211	122	0-1400	69
Climate zone 3	138	114	150	0-600	49
Loan Interest					
All cases	200	329	137	-830-3700	306
Climate zone 1	215	369	122	-830-3700	205
Climate zone 2	189	258	142	0-1438	68
Climate zone 3	130	127	100	-135-402	33

Table 11. Incremental "MCS/As-built" costs - by state					
	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Ceiling					
All cases	566	755	417	-671-11795	381
Idaho	662	1834	297	0-11795	40
Montana	407	433	305	-671-2429	63
Oregon	557	487	421	-547-2001	55
Washington	596	514	482	0-3617	223
Floor					
All cases	291	275	224	-287-1847	338
Idaho	168	242	129	-256-996	22
Montana	306	227	282	0-904	49
Oregon	418	392	307	0-1847	51
Washington	270	244	190	-287-1800	216
Walls					
All cases	1134	1063	923	-2562-9998	357
Idaho	690	1124	491	-2562-4741	33
Montana	1348	1582	1001	0-9998	52
Oregon	1257	1034	918	141-4444	51
Washington	1122	882	950	-4-6233	221
Basement Walls					
All cases	226	376	0	-423-3126	304
Idaho	385	322	306	0-1232	26
Montana	416	389	432	-423-1572	42
Oregon	294	359	138	0-1113	15
Washington	166	364	0	-34-3126	221

	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Glass					
All cases	739	667	592	-460-4083	388
Idaho	472	637	309	-460-3000	43
Montana	442	371	371	-424-1779	63
Oregon	1150	930	886	-224-4083	59
Washington	766	592	608	0-3770	223
Infiltration/ Vapor Barrier					
All cases	797	614	658	-683-5442	380
Idaho	454	605	275	70-3285	41
Montana	920	666	743	142-4893	61
Oregon	537	451	517	-683-2673	55
Washington	891	598	739	0-5442	223
Doors					
All cases	109	217	50	-736-2624	364
Idaho	66	166	0	-60-689	38
Montana	20	70	0	-120-396	67
Oregon	161	280	132	-736-908	42
Washington	134	232	74	-104-2624	217
Heat Exchanger					
All cases	1308	557	1268	0-4180	366
Idaho	1711	466	1634	1179-2654	24
Montana	1506	337	1439	945-2460	60
Oregon	1144	354	1132	400-1890	58
Washington	1254	620	1214	0-4180	224

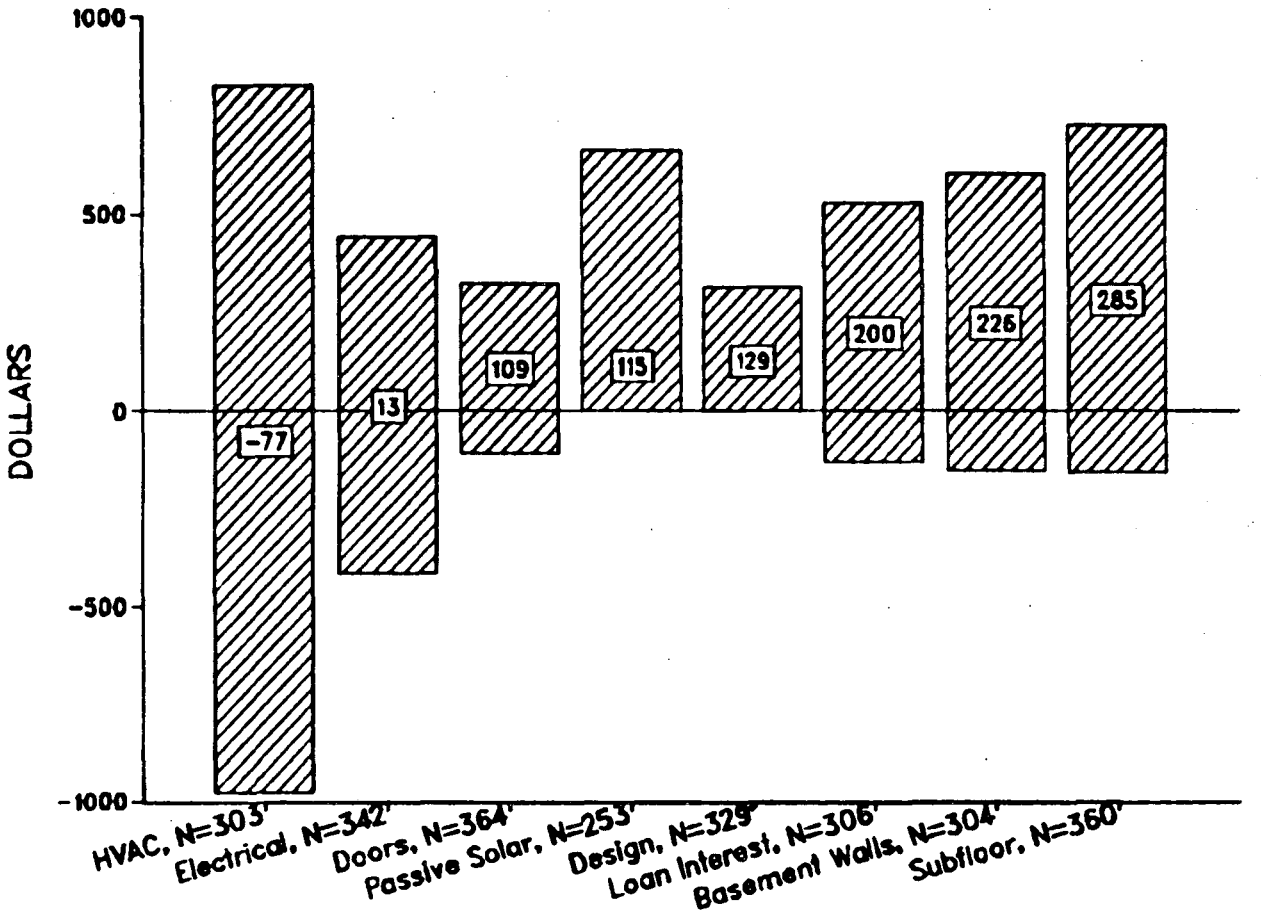
THE FOLLOWING COMPONENTS MAY CONTAIN COSTS THAT ARE ALSO INCLUDED IN THE COSTS REPORTED ABOVE

	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Subfloor					
All cases	285	439	114	-572-3578	360
Idaho	240	333	144	-572-1300	38
Montana	666	444	612	-411-2048	62
Oregon	278	352	177	-199-1492	36
Washington	188	410	0	-142-3578	224
Framing					
All cases	910	1525	690	-2167-24334	386
Idaho	773	1581	485	-1500-9277	38
Montana	1039	804	814	0-5180	67
Oregon	1226	1040	908	-2167-3495	57
Washington	814	1759	577	-910-24334	224
Insulation					
All cases	872	736	725	-980-4544	387
Idaho	814	927	562	-128-4544	38
Montana	840	656	735	-979-3768	66
Oregon	852	570	791	-980-2733	59
Washington	897	764	728	-569-4114	224
Electrical					
All cases	13	428	0	-1030-5708	342
Idaho	-123	288	-150	-1030-527	31
Montana	-46	220	0	-600-350	53
Oregon	-41	260	-51	-452-820	34
Washington	54	492	0	-885-5708	224

	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
HVAC					
All cases	-77	897	0	-6000-4509	303
Idaho	-278	1149	22	-5450-600	28
Montana	42	985	-190	-765-3045	21
Oregon	-174	1183	-112	-1100-3311	30
Washington	-96	803	0	-6000-4509	224
Passive Solar					
All cases	115	544	0	0-5343	253
Idaho	1094	1548	1094	0-2189	2
Montana	656	728	356	0-1885	5
Oregon	668	1226	302	0-5343	22
Washington	40	349	0	0-4108	224
Supervision					
All cases	339	419	250	0-3500	326
Idaho	195	236	150	0-850	20
Montana	253	139	240	0-560	37
Oregon	525	642	320	0-2500	45
Washington	328	396	250	0-3500	224
Design					
All cases	129	187	100	0-1400	329
Idaho	151	128	152	0-422	26
Montana	137	112	143	0-600	40
Oregon	214	254	150	0-1400	39
Washington	110	187	50	0-1330	224

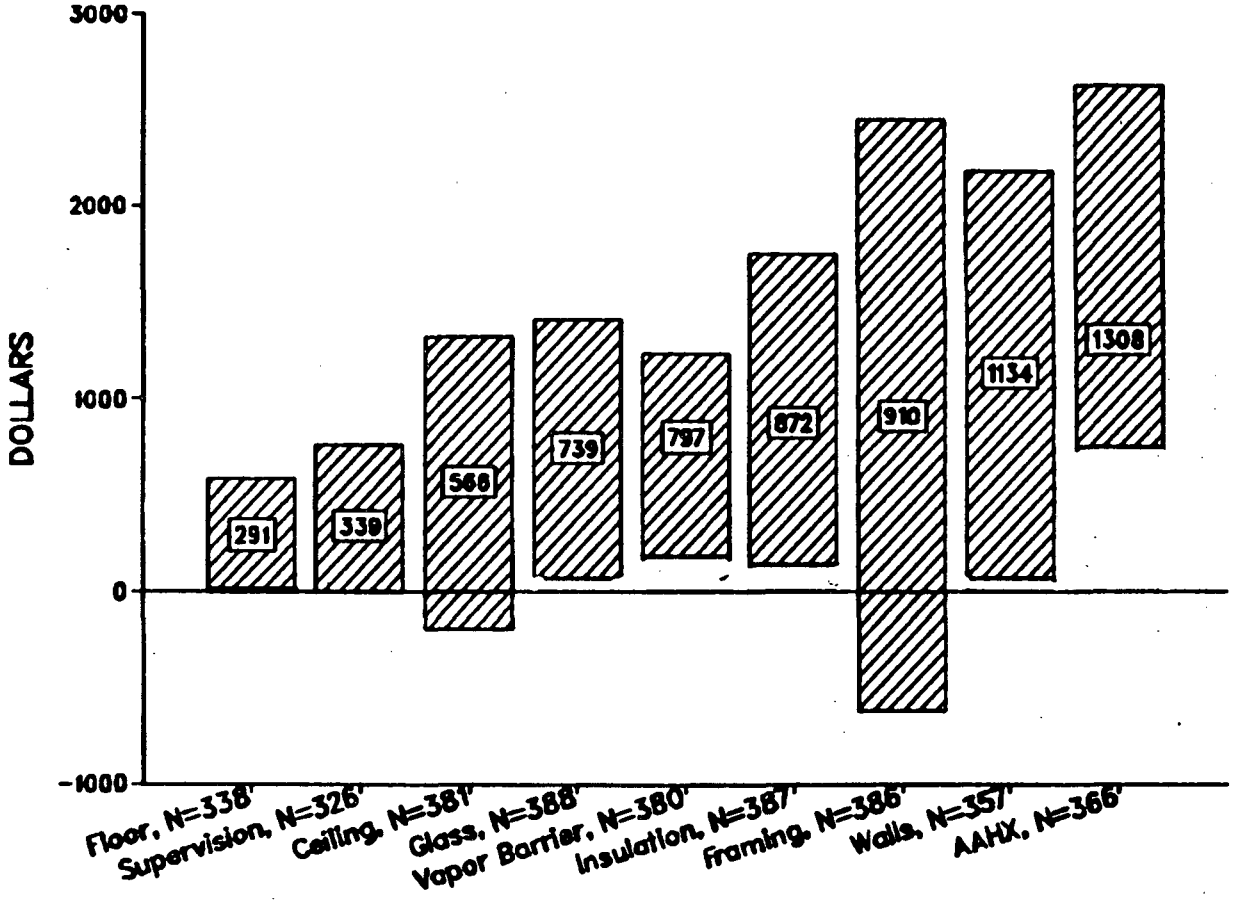
	Mean ($)	Standard Deviation ($)	Median ($)	Minimum-Maximum ($)	Sample Size
Loan Interest					
All cases	200	329	137	-830-3700	306
Idaho	139	118	163	0-400	14
Montana	132	130	100	-135-402	29
Oregon	264	462	139	-830-1925	39
Washington	201	328	132	0-3700	224

Fig. 10 INCREMENTAL MCS/AS-BUILT COSTS



Boxed figure is the mean. Shaded area is the mean +/- 1 standard deviation, unless lower limit becomes less than minimum, in which case minimum value is used.

Fig. 11 INCREMENTAL MCS/AS-BUILT COSTS



Boxed figure is the mean. Shaded area is the mean +/- standard deviation, unless lower limit becomes less than minimum, in which case minimum is used.

CHAPTER V

NORMALIZED INCREMENTAL BUILDING COSTS - BY FLOOR AREA

In this chapter, we present incremental building component costs normalized (standardized) by **floor area**. As shown in Table 12, the largest median incremental cost per square foot for builders of energy efficient homes is the installation of air-to-air heat exchangers ($0.69/ft^2). The next most expensive median incremental costs per floor area for builders in the RSDP program are walls ($0.47/ft^2), insulation ($0.42/ft^2), framing ($0.35/ft^2), vapor barrier ($0.35/ft^2), glass ($0.31/ft^2), and ceiling ($0.22/ft^2). The remaining median incremental costs are below $0.20/ft^2. Mean costs and their standard deviations are also reported in Table12.

Table 12. Incremental "MCS/As-built" costs per floor area - by climate zone

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Ceiling					
All cases	0.28	0.28	0.22	-0.56-2.79	381
Climate zone 1	0.32	0.26	0.27	0-1.72	226
Climate zone 2	0.25	0.36	0.17	-0.31-2.79	83
Climate zone 3	0.20	0.22	0.18	-0.56-1.35	72
Floor					
All cases	0.16	0.16	0.12	-0.26-1.22	338
Climate zone 1	0.16	0.15	0.13	-0.26-1.22	219
Climate zone 2	0.14	0.18	0.07	0-0.85	66
Climate zone 3	0.18	0.16	0.14	0-0.59	53
Walls					
All cases	0.58	0.56	0.47	-1.90-4.96	357
Climate zone 1	0.60	0.54	0.50	-0.28-4.44	219
Climate zone 2	0.52	0.51	0.46	-1.90-1.89	77
Climate zone 3	0.57	0.69	0.43	0-4.96	61
Basement Walls					
All cases	0.09	0.16	0	-0.35-1.47	304
Climate zone 1	0.04	0.14	0	0-1.47	187
Climate zone 2	0.17	0.15	0.15	-0.02-0.68	68
Climate zone 3	0.17	0.17	0.19	-0.35-0.52	49
Glass					
All cases	0.38	0.33	0.31	-0.24-2.12	388
Climate zone 1	0.43	0.35	0.36	-0.24-2.12	231
Climate zone 2	0.37	0.33	0.28	-0.22-1.77	84
Climate zone 3	0.23	0.25	0.20	-0.18-1.43	73

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Infiltration/ Vapor Barrier					
All cases	0.40	0.26	0.35	-0.30-1.54	380
Climate zone 1	0.41	0.27	0.37	-0.30-1.54	226
Climate zone 2	0.36	0.24	0.29	0.06-0.95	83
Climate zone 3	0.41	0.27	0.33	0.06-1.47	71
Doors					
All cases	0.05	0.10	0.02	-0.52-0.97	364
Climate zone 1	0.07	0.10	0.04	-0.08-0.97	207
Climate zone 2	0.04	0.12	0.03	-0.52-0.60	81
Climate zone 3	0.02	0.06	0	-0.05-0.33	76
Heat Exchanger					
All cases	0.69	0.30	0.69	0-2.08	366
Climate zone 1	0.72	0.26	0.69	0.17-1.54	222
Climate zone 2	0.52	0.38	0.62	0-1.50	76
Climate zone 3	0.75	0.29	0.72	0.41-2.08	68

THE FOLLOWING COMPONENTS MAY CONTAIN COSTS THAT ARE ALSO INCLUDED IN THE COSTS REPORTED ABOVE

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Subfloor					
All cases	0.13	0.19	0.06	-0.34-1.68	360
Climate zone 1	0.08	0.18	0.01	-0.12-1.68	212
Climate zone 2	0.09	0.15	0.05	-0.33-0.65	76
Climate zone 3	0.27	0.19	0.26	-0.34-0.69	72
Framing					
All cases	0.46	0.68	0.35	-0.89-10.06	386
Climate zone 1	0.49	0.81	0.36	-0.89-10.06	230
Climate zone 2	0.36	0.47	0.26	-0.28-2.20	79
Climate zone 3	0.46	0.35	0.39	-0.60-1.78	77
Insulation					
All cases	0.45	0.37	0.42	-0.82-3.40	387
Climate zone 1	0.48	0.37	0.42	-0.53-3.40	232
Climate zone 2	0.40	0.37	0.41	-0.18-1.76	79
Climate zone 3	0.42	0.38	0.35	-0.82-2.09	76
Electrical					
All cases	0.01	0.20	0	-0.54-2.70	342
Climate zone 1	-0.01	0.11	0	-0.54-0.75	210
Climate zone 2	0.12	0.38	0.02	-0.30-2.70	70
Climate zone 3	-0.02	0.12	0	-0.48-0.22	62
HVAC					
All cases	-0.06	0.40	0	-1.79-1.78	303
Climate zone 1	-0.11	0.34	0	-1.79-1.23	207
Climate zone 2	0.18	0.41	0	-0.54-1.78	68
Climate zone 3	-0.14	0.58	-0.08	-1.46-1.52	28

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Passive Solar					
All cases	0.06	0.28	0	0-2.81	253
Climate zone 1	0.06	0.29	0	0-2.81	189
Climate zone 2	0.06	0.27	0	0-1.98	59
Climate zone 3	0.23	0.21	0.18	0-0.54	5
Supervision					
All cases	0.18	0.24	0.12	0-1.78	326
Climate zone 1	0.20	0.27	0.15	0-1.78	209
Climate zone 2	0.17	0.20	0.12	0-1.28	72
Climate zone 3	0.12	0.07	0.10	0-0.27	45
Design					
All cases	0.07	0.09	0.04	0-0.67	329
Climate zone 1	0.06	0.09	0.04	0-0.67	211
Climate zone 2	0.08	0.10	0.06	0-0.50	69
Climate zone 3	0.06	0.05	0.06	0-0.24	49
Loan Interest					
All cases	0.10	0.16	0.07	-0.51-1.53	306
Climate zone 1	0.11	0.17	0.07	-0.51-1.53	205
Climate zone 2	0.10	0.15	0.06	0-0.94	68
Climate zone 3	0.06	0.07	0.04	-0.12-0.20	33

CHAPTER VI

NORMALIZED INCREMENTAL BUILDING COSTS - BY COMPONENT AREA

In this chapter, we present incremental building component costs normalized (standardized) by **component area**. As shown in Tables 13 and 14, the largest median incremental cost per square foot of component area for builders of energy efficient homes is glazing ($2.64/ft^2). The next most expensive median incremental costs per component area for builders in the RSDP program are below $1.00/ft^2: doors ($0.92/ft^2), walls ($0.60/ft^2), ceiling ($0.34/ft^2), floor ($0.25/ft^2), air infiltration barriers ($0.12/ft^2), and basement walls ($0.00/ft^2). Mean costs and their standard deviations are reported in Tables 13 and 14, and displayed in Figure 12.

Table 13. Incremental "MCS/As-built" costs per component area - by climate zone

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Ceiling					
All cases	0.40	0.40	0.34	-0.96-4.79	381
Climate zone 1	0.43	0.32	0.38	0-2.06	226
Climate zone 2	0.38	0.60	0.27	-0.96-4.79	83
Climate zone 3	0.34	0.32	0.26	-0.56-1.87	72
Floor					
All cases	0.39	1.24	0.25	-8.94-16.33	338
Climate zone 1	0.28	0.86	0.25	-8.94-3.50	219
Climate zone 2	0.70	2.15	0.25	-0.92-16.33	66
Climate zone 3	0.44	0.90	0.28	0-6.34	53
Walls					
All cases	0.37	6.54	0.60	-122.10-6.36	357
Climate zone 1	0.13	8.32	0.57	-122.10-4.95	219
Climate zone 2	0.66	0.96	0.70	-5.70-2.28	77
Climate zone 3	0.90	0.95	0.68	0-6.36	61
Basement Walls*					
All cases	0.24	0.55	0	-2.79-3.25	227
Climate zone 1	0.12	0.34	0	0-2.36	170
Climate zone 2	0.57	0.88	0.47	-2.79-3.25	50
Climate zone 3	0.64	0.45	0.70	0-1.26	7
Glass					
All cases	1.72	26.09	2.64	-508.45-18.58	388
Climate zone 1	3.29	2.60	2.79	-0.90-18.58	231
Climate zone 2	-3.06	55.85	2.76	-508.45-10.97	84
Climate zone 3	2.25	2.54	1.94	-2.96-14.23	73

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Infiltration/ Vapor Barrier					
All cases	0.14	0.16	0.12	-1.48-0.67	327
Climate zone 1	0.15	0.13	0.13	-0.18-0.67	187
Climate zone 2	0.12	0.14	0.14	-0.43-0.41	70
Climate zone 3	0.11	0.24	0.11	-1.48-0.65	70
Doors					
All cases	1.84	3.46	0.92	-18.40-21.87	364
Climate zone 1	2.43	3.28	1.63	-12.50-21.87	207
Climate zone 2	1.27	4.05	1.00	-18.40-9.19	81
Climate zone 3	0.82	2.91	0	-3.16-16.40	76

*Montana cases are not included in this analysis because component area was reported in linear feet instead of square feet.

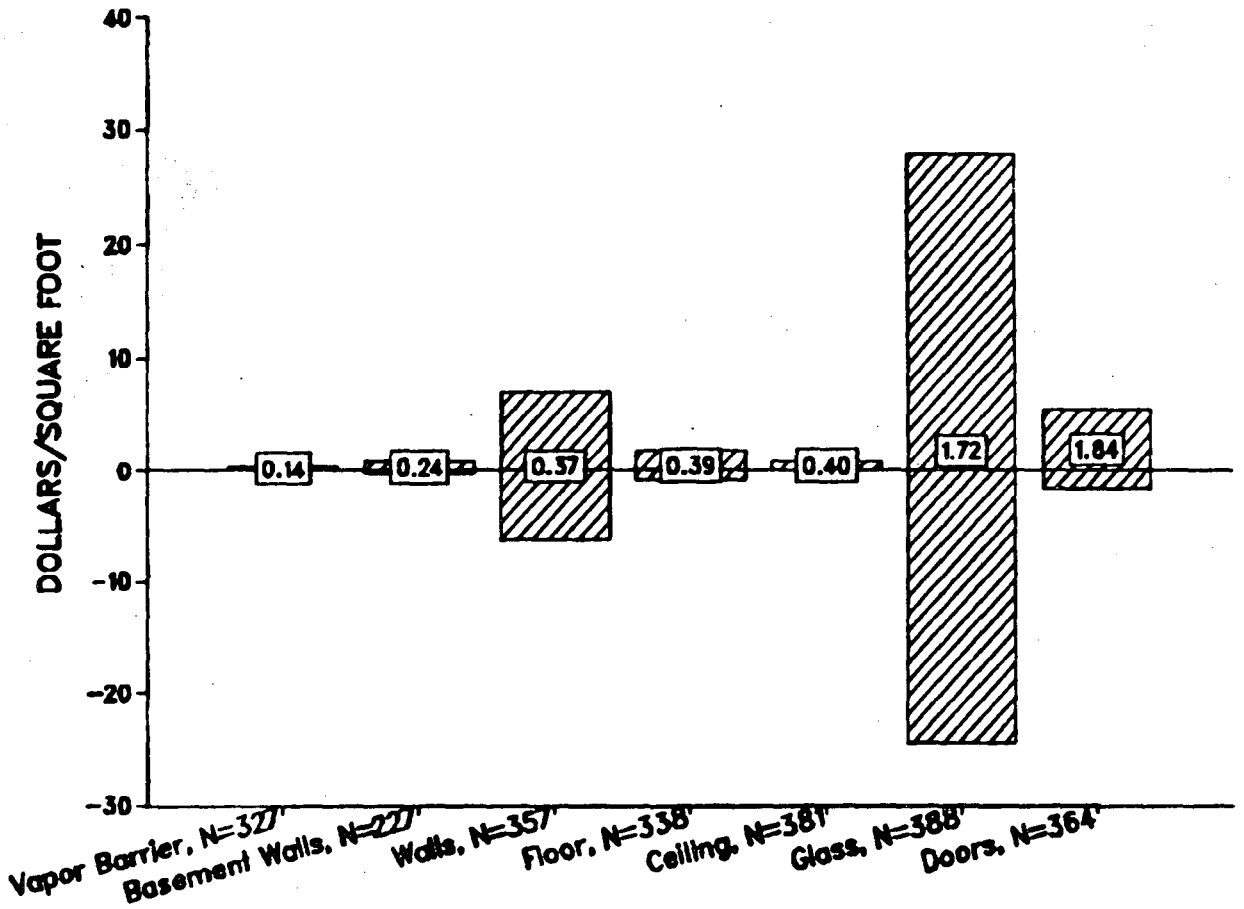
Table 14. Incremental "MCS/As-built" costs per component area - by state

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Ceiling					
All cases	0.40	0.40	0.34	-0.96-4.79	381
Idaho	0.38	0.78	0.24	-0.96-4.79	40
Montana	0.31	0.31	0.25	-0.56-1.87	63
Oregon	0.42	0.35	0.31	-0.31-1.87	55
Washington	0.43	0.32	0.37	0-2.06	223
Floor					
All cases	0.39	1.24	0.25	-8.94-16.33	338
Idaho	1.25	3.62	0.21	-0.13-16.33	22
Montana	0.32	0.35	0.28	0-2.18	49
Oregon	0	1.41	0.21	-8.94-1.60	51
Washington	0.41	0.72	0.27	-2.93-5.99	216
Walls					
All cases	0.37	6.54	0.60	-122.10-6.36	357
Idaho	0.21	1.28	0.38	-5.70-1.86	33
Montana	0.96	0.99	0.68	0-6.36	52
Oregon	0.78	0.82	0.52	0.13-4.95	51
Washington	0.17	8.28	0.65	-122.10-4.75	221
Basement Walls*					
All cases	0.24	0.55	0	-2.79-3.25	227
Idaho	0.39	0.74	0.47	-2.79-1.26	26
Montana	-	-	-	-	-
Oregon	0.60	0.87	0.23	0-2.91	15
Washington	0.19	0.47	0	0-3.25	186

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Glass					
All cases	1.72	26.09	2.64	-508.45-18.58	388
Idaho	2.58	3.65	2.18	-2.41-18.58	43
Montana	1.98	2.24	1.89	-2.96-14.23	63
Oregon	-4.79	66.76	3.12	-508.45-11.25	59
Washington	3.20	2.15	2.86	0-16.72	223
Infiltration/ Vapor Barrier					
All cases	0.14	0.16	0.12	-1.48-0.67	327
Idaho	0.05	0.13	0.04	-0.43-0.46	41
Montana	0.12	0.25	0.12	-1.48-0.65	60
Oregon	0.09	0.07	0.08	-0.13-0.28	51
Washington	0.18	0.13	0.15	-0.18-0.67	175
Doors					
All cases	1.84	3.46	0.92	-18.40-21.87	364
Idaho	1.33	3.80	0	-1.58-16.40	38
Montana	0.35	1.40	0	-3.16-8.80	67
Oregon	1.76	5.58	2.95	-18.40-9.58	42
Washington	2.40	3.18	1.60	-12.50-21.87	217

*Montana cases are not included in this analysis because component area was reported in linear feet instead of square feet.

Fig. 12 INCREMENTAL MCS/AS-BUILT COSTS BY COMPONENT AREA



Boxed figure is the mean. Shaded area is the mean +/- standard deviation, unless lower limit becomes more negative than minimum, in which case minimum is used.

NORMALIZED INCREMENTAL BUILDING COSTS - GROUP ANALYSIS

In this chapter, we present a detailed analysis of incremental building component costs normalized (standardized) by **component area** for selected groups of components. The building components are ceiling, floor, walls, basement walls, windows, air infiltration barriers, door, and air-to-air heat exchangers. This chapter contains the "cleanest" data because unusual cases are segregated into an "all other" category.

Before each table, we provide component type codes so that the reader can understand the various groups in that particular table. Because there are many approaches builders take in going from Current Practice to MCS practice, we provide descriptive statistics for several groups of approaches that are of particular interest. For example, Group 1 in Table 15 contains the incremental cost of increased ceiling insulation (from R-19 to R-30) in vaulted ceilings (with batt insulation but with no foam insulation).

If a case does not belong to the first group, one examines it to see if it belongs to the second group; if it does not belong to the second group, then the third group is examined, etc. Those cases not included in a numbered group are analyzed separately as part of the group "all other cases of increments." There is no overlapping of cases in groups: i.e., a case is placed in only one group. It is important to note that it is not possible to add particular groups in order to compare costs with another group: for example, one should expect different costs for going from R-30 to R-45 than from adding the costs of going from R-30 to R-38 and from R-38 to R-45.

As in the previous tables, we provide the median, mean, standard deviation, range, and sample size. If the number of cases is 30 or more for a particular group, then a histogram for this group is provided in Appendix B to illustrate the distribution of incremental costs. Finally, at the end of four tables (ceilings, walls, windows, and air-to-air heat exchangers) in this chapter, we present statistics on "aggregate groups" which represent a series of important and logically consistent aggregations of changes from Current Practice to MCS. It is important to note that these larger groups are inclusive of the previously detailed smaller groups. For those interested in examining individual cases, one should proceed to Appendix C where all the cases are presented in a spreadsheet form and are placed in consecutive order by group number.

CEILING GROUPS

Ceiling Insulation Type Code:

A Attic, advanced truss, loosefill insulation

B Attic, advanced truss, batt insulation

C Attic, standard truss, baffle, compressed batt perimeter

D Attic, standard truss, rigid foam perimeter

E Vaulted, batt, no foam

F Vaulted, batt, foam inside

G Vaulted, compressed batt

H Attic, standard truss, loosefill insulation

I Attic, standard truss, loosefill insulation, compressed batt perimeter

X Missing

Z Other

R-38 includes R-38 to R-41; R-45 includes R-42 to R-46; and R-49 includes R-47 to R-51.

Table 15. Incremental costs per square foot of ceiling by types of increments

Group No.	Current Practice	MCS	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
1	R-19 Type E	R-30 Type E	0.29	0.13	0.28	0.13-0.47	6
2	R-19 Type E	R-38 Type E,F,G	0.61	0.42	0.54	0.22-1.27	6
3	R-30 Type C	R-38 Type A	0.17	0.17	0.17	0.17-0.17	1
4	R-30 Type C	R-38 Type B	0.48	0.20	0.39	0.22-0.88	13
5	R-30 Type C	R-38 Type C	0.21	0.13	0.18	0.09-0.56	10
6	R-30 Type E	R-35 Type F	0.40	0.17	0.44	0.08-0.55	6
7	R-30 Type E	R-38 Type E	0.31	0.29	0.22	0.05-1.26	30
8	R-30 Type E	R-38 Type F	0.73	0.34	0.64	0.45-1.48	11
9	R-30 Type E	R-49 Type E	1.13	1.02	0.63	0.45-2.30	3
10	R-30 Type H	R-38 Type A	0.44	0.25	0.39	0-1.24	90
11	R-30 Type H	R-38 Type B	0.40	0.16	0.41	0.23-0.56	3
12	R-30 Type H	R-38 Type C	0.19	0.26	0.19	0.01-0.37	2
13	R-30 Type H	R-38 Type D	0.41	0.06	0.41	0.37-0.45	2
14	R-30 Type H	R-38 Type H	0.11	0.08	0.09	0.03-0.33	23

Group No.	Current Practice	MCS	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
15	R-30 Type H	R-45 Type A	0.32	0.21	0.23	0.09-0.65	10
16	R-30 Type H	R-49 Type A	0.55	0.47	0.47	0.20-2.07	15
17	R-30 Type H	R-49 Type H	0.23	0.10	0.16	0.16-0.39	5
18	R-30 Type H	R-60 Type A	0.60	0.19	0.58	0.30-0.83	6
19	R-38 Type H	R-38 Type A	0.24	0.26	0.16	0-1.34	36
20	R-38 Type H	R-45 Type A	0.30	0.23	0.32	-0.07-0.63	8
21	R-38 Type H	R-49 Type A	0.29	0.08	0.28	0.16-0.44	12
22	R-38 Type H	R-60 Type A	0.50	0.18	0.50	0.21-0.79	15
23	R-30 Type E,F,G	R-38 Type E,F,G	0.47	0.11	0.47	0.39-0.55	2
24	R-30 Type A,B,C, D,H,I	R-38 Type A,B,C, D,H,I	0.30	0.32	0.27	-0.31-0.99	17
25	R-30 Type A,B,C, D,H,I	R-49 Type A,B,C, D,H,I	0.19	0.14	0.12	0.10-0.35	3
26	R-30 Type A,B,C, D,H,I	R-45 Type A,B,C, D,H,I	0.42	0.42	0.42	0.42-0.42	1
27	R-38 Type A,B,C, D,H,I	R-49 Type A,B,C, D,H,I	0.18	0.18	0.18	0.18-0.18	1

Group No.	Current Practice	MCS	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
28	R-38 Type A,B,C, D,H,I	R-60 Type A,B,C, D,H,I	0.40	0.40	0.40	0.40-0.40	1
29	R-30 Type E,F,G	R-38 Type A,B,C, D,H,I	0.56	0.35	0.56	0.31-0.81	2
30	R-30 Any type	R-38 Any type	0.71	0.58	0.71	0.08-1.72	11
31	R-30 Any type	R-49 Any type	0.82	0.32	0.94	0.21-1.10	6
All other cases of increments			0.52	1.71	0.20	-0.57-12.40	56
AGGREGATE GROUPS (Attics only)							
A	R-30 Any type	R-38 Std. Frame	0.16	0.13	0.10	0.01-0.56	37
B	R-30 Any type	R-38 Adv. Frame	0.44	0.24	0.39	0-1.24	107
C	R-30 Any type	R-49 Any Type	0.44	0.41	0.30	0.10-2.07	23
D	R-30 Any type	R-60 Any Type	0.55	0.22	0.58	0.26-0.83	7
E	R-38 Any type	R-49 Any Type	0.28	0.08	0.27	0.16-0.44	13
F	R-38 Any type	R-60 Any Type	0.49	0.18	0.49	0.21-0.79	16

FLOOR GROUPS

Floor Type Code:

A Crawlspace (insulation under floor or overhangs)
B Slab below grade
C Slab on grade
D Heated crawlspace
E Foam insulation under slab
F Combination of floor and perimeter insulation
X Missing
Z Other

R-0 includes R-0 to R-2; R-5 includes R-3 to R-7; R-10 includes R-8 to R-12; R-15 includes R-13 to R-17; R-19 includes R-18 to R-22; R-25 includes R-23 to R-27; and R-30 includes R-28 to R-32.

Table 16. Incremental costs per square foot of floor by types of increments

Group No.	Current Practice	MCS	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
1	R-0 Type A	R-19 Type A	0.43	0.04	0.43	0.39-0.50	5
2	R-0 Type B	R-5 Type B	0.42	0.16	0.41	0.19-0.80	11
3	R-0 Type B	R-10 Type B	1.48	0.95	1.06	0.34-3.52	13
4	R-0 Type B	R-15 Type B	1.61	0.33	1.56	1.22-2.18	6
5	R-0 Type B	R-5 Type E	0.24	0.10	0.25	0.12-0.33	4
6	R-0 Type B	R-10 Type E	0.42	0.46	0.26	0.04-1.32	6
7	R-0 Type B	R-15 Type E	0.81	0.57	1.11	0.16-1.17	3
8	R-0 Type E	R-5 Type E	0.34	0.06	0.34	0.30-0.38	2
9	R-0 Type E	R-10 Type E	0.30	0.06	0.30	0.25-0.34	2
10*	R-0 Type C	R-5 Type C	1.04	0.19	1.14	0.65-1.14	7
11*	R-0 Type C	R-10 Type C	1.54	0.75	1.36	0.46-3.12	18
12*	R-0 Type C	R-15 Type C	2.04	0.14	2.04	1.94-2.14	2
13	R-5 Type B	R-10 Type B	0.43	0.33	0.25	0.13-0.91	5
14*	R-5 Type C	R-10 Type C	0.95	0.78	0.74	0.09-3.47	25
15*	R-5 Type C	R-15 Type C	1.74	1.24	1.76	0.47-3.50	7
16	R-11 Type A	R-19 Type A	0.12	0.08	0.12	-0.26-0.54	72
17	R-11 Type A	R-25 Type A	0.28	0.15	0.29	0-0.62	11
18	R-11 Type A	R-30 Type A	0.34	0.22	0.30	0.03-1.60	64
19	R-11 Type A	R-38 Type A	0.37	0.11	0.40	0.11-0.47	9
20	R-11 Type D	R-19 Type A	0.54	0.44	0.34	0.17-1.22	6
21	R-19 Type A	R-25 Type A	0.17	0.06	0.18	0.10-0.24	4
22	R-19 Type A	R-30 Type A	0.27	0.15	0.24	0-0.67	22
All other cases of increments			0.38	0.68	0.17	-0.64-3.78	82

*Costs are per linear feet.

WALL GROUPS

Wall Type Code:

A Strapped wall

B Double wall

C 2 X 6, 24" on center, advanced framing

D 2 X 6, 24" on center, standard framing

E 2 X 6, 16" on center, standard framing

F 2 X 6, 24" on center, foam outside

G 2 X 6, 24" on center, foam inside

H 2 X 4, 24" on center, foam outside

I 2 X 4, 24" on center, foam inside

J Foam blocks

K 2 X 8, 24" on center, advanced framing

L 2 X 8, 16" on center, standard framing

M All weather wood foundation

N Cement, foam outside

O Cement, batt inside

P Cement, foam outside, batt inside

Q 2 X 6, 24" on center, mod. advanced framing

R 2 X 6, 24" on center, mod. advanced framing with foam inside

S 2 X 6, 24" on center, mod. advanced framing with foam outside

T Larsen truss, batt insulation

U 2 X 4, 16" on center, standard framing

V No insulation on foundation

X Missing

Z Other

AA 2 X 4, 24" on center, standard framing

BB Cement, no insulation

R-11 includes R-10 to R-13; R-24 includes R-23 to R-26; R-27 includes R-27 to R-28; R-30 includes R-29 to R-32; R-35 includes R-33 to R-36; and R-38 includes R-37 to R-41.

Table 17. Incremental costs per square foot of wall by types of increments

Group No.	Current Practice	MCS	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
1	R-11 Type U	R-19 Type C,Q	0.29	0.15	0.27	0-0.65	55
2	R-11 Type U	R-19 Type D	0.40	0.48	0.30	0.03-1.71	10
3	R-11 Type U	R-19 Type E	0.36	0.17	0.35	0.06-0.65	13
4	R-11 Type U	R-24 Type G	0.80	0.30	0.81	0.22-1.54	43
5	R-11 Type U	R-24 Type K	0.29	0.02	0.29	0.27-0.31	3
6	R-11 Type U	R-24 Type L	0.68	0.04	0.70	0.63-0.74	5
7	R-11 Type U	R-27 Type A	0.84	0.39	0.88	0.24-1.57	26
8	R-11 Type U	R-27 Type B	1.12	0.32	1.30	0.75-1.32	3
9	R-11 Type U	R-30 Type B	1.09	0.61	0.89	0.51-2.32	8
10	R-11 Type U	R-27 Type F	0.96	0.23	0.99	0.48-1.21	9
11	R-11 Type U	R-27 Type G	0.85	0.46	0.80	0-2.18	26
12	R-19 Type D	R-27 Type F	0.73	0.44	0.71	0.22-1.27	4
13	R-19 Type D	R-38 Type B	0.77	0.40	0.68	0.28-1.39	9
14	R-19 Type E	R-24 Type F	0.18	0.29	0.30	-0.15-0.39	3
15	R-19 Type E	R-35 Type B	1.18	0.74	1.36	0.13-1.86	4
16	R-19 Type E	R-38 Type B	0.91	0.51	0.88	0.20-1.66	9
17	R-19 Type H	R-27 Type F	0.49	0.49	0.49	0.49-0.49	1
18	R-11 Type U	R-38 Type B	0.84	0.84	0.84	0.84-0.84	1
19	R-19 Type D	R-35 Type B	1.47	0.67	1.24	0.68-2.53	8
20	R-19 Type E	R-27 Type F	0.47	0.34	0.60	0.09-0.72	3
21	R-11 Any type	R-19 Any type	0.40	0.22	0.32	0.13-0.71	7
22	R-11 Any type	R-24 Any type	0.99	1.18	0.70	0-4.95	32
23	R-19 Any type	R-35 Any type	1.06	0.63	0.82	0.36-2.43	9
24	R-11 Any type	R-30 Any type	1.12	0.46	0.91	0.58-2.08	13
25	R-11 Any type	R-38 Any type	1.22	0.56	1.38	0.23-1.83	6
26	R-19 Any type	R-24 Any type	0.16	0.32	0.30	-0.42-0.62	13
27	R-19 Any type	R-27 Any type	0.46	0.49	0.29	0.10-1.17	4
28	R-19 Any type	R-35 Any type	0.76	0.36	0.83	0.23-1.22	9

Group No.	Current Practice	MCS	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
All other cases of increments			0.61	0.43	0.54	0-1.74	22
AGGREGATE GROUPS							
A	R-11 Any type	R-19 Any type	0.32	0.22	0.28	0-1.71	85
B	R-11 Any type	R-24 Any type	0.85	0.77	0.71	0-4.95	83
C	R-11 Any type	R-27 Any type	0.90	0.43	0.85	0-2.43	73
D	R-11 Any type	R-30 Any type	1.11	0.51	0.90	0.51-2.32	21
E	R-19 Any type	R-24 Any type	0.17	0.30	0.30	-0.42-0.62	16
F	R-19 Any type	R-27 Any type	0.56	0.39	0.54	0.09-1.27	12
G	R-19 Any type	R-30 Any type	0.57	0.32	0.57	0.10-1.11	7

BASEMENT WALL GROUPS

Basement Wall Type Code:

A Strapped wall

B Double wall

C 2 X 6, 24" on center, advanced framing

D 2 X 6, 24" on center, standard framing

E 2 X 6, 16" on center, standard framing

F 2 X 6, 24" on center, foam outside

G 2 X 6, 24" on center, foam inside

H 2 X 4, 24" on center, foam outside

I 2 X 4, 24" on center, foam inside

J Foam blocks

K 2 X 8, 24" on center, advanced framing

L 2 X 8, 16" on center, standard framing

M All weather wood foundation

N Cement, foam outside

O Cement, batt inside

P Cement, foam outside, batt inside

Q 2 X 6, 24" on center, mod. advanced framing

R 2 X 6, 24" on center, mod. advanced framing with foam inside

S 2 X 6, 24" on center, mod. advanced framing with foam outside

T Larsen truss, batt insulation

U 2 X 4, 16" on center, standard framing

V No insulation on foundation

X Missing

Z Other

AA 2 X 4, 24" on center, standard framing

BB Cement, no insulation

R-0 includes R-0 to R-2; R-5 includes R-4 to R-6; R-11 includes R-10 to R-13; R-15 includes R-14 to R-16; R-19 includes R-17 to R-22; and R-30 includes R-28 to R-32.

Table 18. Incremental costs per square foot of basement wall by types of increments

Group No.	Current Practice	MCS	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
1	R-0 Type BB,V	R-11 Type O	0.71	0.34	0.63	0.39-1.19	4
2	R-0 Type BB,V	R-11 Type N	0.78	0.46	0.62	0.22-1.98	28
3	R-0 Type BB,V	R-19 Type O	0.71	0.35	0.67	0.07-1.17	19
4	R-5 Type N	R-10 Type N	0.64	0.36	0.56	0.23-1.10	5
5	R-11 Type M	R-19 Type M	0.26	0.28	0.14	0.07-0.80	6
6	R-11 Type O	R-19 Type O	0.38	0.50	0.13	-0.03-1.49	15
7	R-0 Any type	R-11 Any type	1.09	1.22	0.57	0.30-3.25	5
8	R-0 Any type	R-15 Any type	0.92	0.31	0.89	0.66-1.26	4
9	R-0 Any type	R-19 Any type	0.34	0.94	0.32	-1.21-1.35	6
10	R-0 Any type	R-30 Any type	0.62	0.30	0.62	0.25-0.98	4
All other cases of increments			0.50	0.77	0.33	-1.35-2.91	53

WINDOW GROUPS

Window Type Code:

A Aluminum slider

B Wood slider

C Aluminum casement

D Wood casement

E Aluminum fixed

F Wood fixed

G Aluminum

H Wood

I Aluminum, thermal break

J Aluminum, heat mirror

K Wood, heat mirror

L Wood, awning

M Aluminum, awning

N Wood, double hung

O Aluminum, double hung

X Missing

Z Other

U-0.34 includes U-0.29 to U-0.36; U-0.38 includes U-0.37 to U-0.40; U-0.48 includes U-0.48 to U-0.50; U-0.70 includes U-0.69 to U-0.71; and U-0.74 includes U-0.74 to U-0.78.

Table 19. Incremental costs per square foot of window by types of increments

Group No.	Current Practice	MCS	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
1	U-0.47 Any type	Triple Glaz. Any type	3.43	1.95	2.80	0.92-7.12	9
2	U-0.56 Type A	Triple Glaz. Type I	2.29	1.90	1.53	0-4.79	5
3	U-0.56 Type H	Triple Glaz. Type H	3.61	1.83	3.06	2.24-7.52	7
4	U-0.56-0.70 Type H	Any Glaz. Type K	5.53	2.07	5.58	2.28-7.79	5
5	U-0.56 Any Type	U-0.34 Any Type	2.84	1.00	2.76	1.70-4.12	4
6	U-0.56 Any Type	U-0.38 Any Type	-1.24	2.70	-1.24	-3.15-0.67	2
7	U-0.56 Any Type	U-.48 Any Type	1.36	0.75	1.40	0.28-2.50	6
8	U-0.68 Type I	U-0.37 Type J	1.36	0.00	1.36	1.36-1.36	4
9	U-0.70-0.74 Type A,C,E, G,M,O	Triple Glaz. Type A,C,E, G,M,O	3.79	1.76	4.03	0.83-7.30	12

Group No.	Current Practice	MCS	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
10	U-0.70-0.74 Type A,C,E, G,M,O	Double Glaz. Type I	2.76	2.24	2.34	0-10.66	23
11	U-0.70-0.74 Type A,C,E, G,M,O	Double Glaz. Type J	5.92	4.26	8.22	1.01-8.53	3
12	U-0.70-0.74 Type B,D,F, H,L,N	Double Glaz. Type B,D,F, H,L,N	1.79	1.44	0.88	0.44-4.66	9
13	U-0.70-0.74 Type G	Double Glaz. Type H	4.85	3.48	4.05	0-11.25	10
14	U-0.70-0.74 Type A,C,E, G,M,O	Triple Glaz. Type I	3.36	1.64	2.95	0.67-7.32	47
15	U-0.70-0.74 Type A,C,E, G,M,O	Triple Glaz. Type J	4.23	1.46	4.58	0.98-6.14	18
16	U-0.70-0.74 Type G	Triple Glaz. Type K	10.84	6.51	7.11	7.05-18.35	3
17	U-0.70-0.74 Type G	Triple Glaz. Type H	7.48	2.11	7.13	5.43-10.25	4
18	U-0.70-0.74 Any type	Double Glaz. Any type	4.21	2.72	3.94	0-9.30	12

Group No.	Current Practice	MCS	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
19	U-0.70-0.74 Any type	Triple Glaz. Any type	4.55	2.42	4.20	2.28-10.51	10
All other cases of increments			1.12	2.57	0	-3.44-14.23	58
AGGREGATE GROUPS							
A	> U-0.65 Double Glaz. Aluminum	≤ U-0.41 Triple Glaz.* Aluminum	3.44	1.68	3.25	0.67-8.22	82
B	> U-0.65 Double Glaz. Aluminum	U-0.56-0.64 Double Glaz. Aluminum	3.29	1.77	2.79	1.52-6.91	9
C	U-0.56-0.64 Double Glaz. Aluminum	≤ U-0.41 Triple Glaz.* Aluminum	2.35	1.71	2.10	0-4.79	6
D	U-0.45-0.56 Double Glaz. Wood	≤ U-0.41 Triple Glaz.* Wood	4.55	2.30	3.72	0.92-14.23	21

*This MCS group also includes double-glaze windows with heat mirror.

AIR INFILTRATION BARRIER GROUPS

Air Infiltration Barrier Type Code:

A Polyethylene under sheetrock

B Foam

C Paint

D Exterior plywood

E Polyethylene between double wall

F Polyethylene between strapped wall

G Polyethylene under slab floor

H A and B

I D and G

J Polyethylene under subfloor

K Airtight drywall

L Craft or foil-faced insulation

M Building paper on exterior

N L and M

O None

X Missing

Z Other

* Any of the above types

Table 20. Incremental costs per square foot of air infiltration barrier by types of increments

Group No.	Current Practice C/W/F[1]	MCS C/W/F[1]	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
1	L,L,L	B,B,B	0.08	0.05	0.10	0.02-0.15	5
2	B,B,B	B,B,B	0.06	0.03	0.05	0.02-0.13	20
3	O,A,G	A,A,G	0.16	0.04	0.16	0.10-0.20	4
4	O,A,O	A,A,J	0.18	0.11	0.17	0.03-0.37	7
5	O,A,O	A,A,G	0.17	0.09	0.14	0.07-0.33	8
6	O,A,O	A,A,D	0.16	0.05	0.19	0.09-0.19	7
7	O,L,O	K,K,K	0.04	0.04	0.02	0.02-0.13	8
8	O,L,O	A,E,D	0.18	0.26	0.05	0.02-0.48	3
9	O,L,O	A,B,D	0.12	0.03	0.13	0.09-0.14	3
10	O,L,O	A,A,J	0.03	0.00	0.03	0.03-0.03	4
11	O,L,O	A,A,I	0.26	0.25	0.20	0.05-0.61	4
12	O,L,O	A,A,G	0.10	0.10	0.07	0-0.36	21
13	O,L,O	A,A,D	0.10	0.06	0.09	0.04-0.22	9
14	O,O,O	H,B,I	0.18	0.05	0.18	0.13-0.22	4
15	O,O,O	A,F,I	0.11	0.12	0.09	0-0.23	3
16	O,O,O	A,F,D	0.21	0.12	0.16	0.08-0.45	9
17	O,O,O	A,B,I	0.25	0.24	0.15	0.06-0.86	9
18	O,O,O	A,B,G	0.22	0.08	0.20	0.07-0.37	16
19	O,O,O	A,B,D	0.21	0.10	0.18	0.08-0.47	34
20	O,O,O	A,A,I	0.22	0.14	0.19	0.05-0.55	12
21	O,O,O	A,A,G	0.17	0.09	0.14	0.07-0.42	29
22	O,O,O	A,A,D	0.16	0.10	0.13	0.02-0.41	31
23	L,L,*	Any type	0.10	0.06	0.09	-0.01-0.30	21
24	M,M,*	Any type	0.13	0.07	0.12	0.03-0.20	6
25	N,N,*	Any type	0.10	0.11	0.08	0.01-0.38	10

[1]C=Ceiling, W=Wall, F=Floor

Group No.	Current Practice C/W/F[1]	MCS C/W/F[1]	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
26	O,A,O	Any type	0.21	0.15	0.20	0.07-0.45	5
27	O,L,O	Any type	0.25	0.16	0.25	0.02-0.50	10
28	O,O,*	Any type	0.21	0.12	0.21	0.01-0.46	37
All other cases of increments			0.16	0.16	0.15	-0.13-0.67	27

[1]C=Ceiling, W=Wall, F=Floor

DOOR GROUPS

Door Type Code:

A Insulated clad foam core
B Wood solid core
C Wood hollow core
D A and B
E A in both MCS and Current Practice
F B in both MCS and Current Practice
X Missing
Z Other

Table 21. Incremental costs per square foot of door by types of increments

Group No.	Current Practice	MCS	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
1	A,E	A,E	0.96	2.11	0.00	-0.57-16.40	179
2	B,F	B,F	1.55	2.37	0.00	0-7.78	24
3	B	A	3.33	4.35	3.18	-18.40-21.87	124
4	A	B	3.16	1.38	3.16	2.18-4.13	2
All other cases of increments			2.26	3.84	0.00	-0.38-10.93	16

AIR-TO-AIR HEAT EXCHANGER GROUPS

Air-to-Air Heat Exchanger (AAHX) Code:

A The Air Changer Company

B Airxchange (NuTone)

E Conservation Energy Systems (VanEE)

F Des Champs (79m-4)

G Des Champs (79m-6)

H Des Champs (200 series)

I Des Champs (300 series)

J EER Products (Heat-X-changer)

K Ener-Corp (Enerex 250)

M Mountain Energy and Resources

O Star Heat Exchanger 100A

P Star Heat Exchanger 200A

R Enter Matrix

X Missing

Z Other

Table 22. Incremental costs of air-to-air heat exchangers by increments of floor area

Group No.	AAHX Type	Floor Area	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
1	A	Less than 1500 ft^2	1.13	0.22	0.98	0.98-1.54	7
2	B	Less than 1500 ft^2	0.74	0.17	0.70	0.52-1.14	30
3	E	Less than 1500 ft^2	0.99	0.19	0.99	0.78-1.24	8
4	F	Less than 1500 ft^2	0.82	0.29	0.85	0-1.10	11
5	G	Less than 1500 ft^2	0.96	0.05	0.96	0.93-1.00	2
6	H	Less than 1500 ft^2	1.32	0.22	1.37	0.98-1.52	6
7	I	Less than 1500 ft^2	1.67	0.58	1.67	1.26-2.08	2
8	J	Less than 1500 ft^2	0.98	0.02	0.98	0.97-1.00	2
9	K	Less than 1500 ft^2	0.89	0.89	0.89	0.89-0.89	1
10	M	Less than 1500 ft^2	1.37	1.37	1.37	1.37-1.37	1
11	O	Less than 1500 ft^2	0.89	0.34	0.94	0-1.29	14
12	P	Less than 1500 ft^2	1.07	0.26	1.02	0.82-1.42	4
13	R	Less than 1500 ft^2	0.98	0.23	1.00	0.70-1.21	4
14	X	Less than 1500 ft^2	0.81	0.22	0.71	0.55-1.06	5
15	Z	Less than 1500 ft^2	0.99	0.40	0.89	0.64-1.43	3
16	A	1500-2500 ft^2	0.78	0.17	0.75	0.52-1.03	13
17	B	1500-2500 ft^2	0.50	0.19	0.51	0-0.81	34
18	E	1500-2500 ft^2	0.74	0.24	0.83	0-0.99	21
19	F	1500-2500 ft^2	0.78	0.18	0.74	0.61-1.03	4
20	G	1500-2500 ft^2	0.79	0.79	0.79	0.79-0.79	1
21	H	1500-2500 ft^2	0.66	0.16	0.66	0.22-0.94	27
22	I	1500-2500 ft^2	0.79	0.25	0.79	0.29-1.33	13
23	J	1500-2500 ft^2	0.72	0.72	0.72	0.72-0.72	1
24	K	1500-2500 ft^2	1.02	0.08	1.02	0.96-1.07	2
25	M	1500-2500 ft^2	0.65	0.34	0.69	0-1.48	26
26	O	1500-2500 ft^2	0.68	0.21	0.72	0.35-1.15	29
27	P	1500-2500 ft^2	0.62	0.11	0.58	0.50-0.77	8
28	R	1500-2500 ft^2	0.68	0.14	0.69	0.26-0.89	15

Group No.	AAHX Type	Floor Area	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Min.-Max. ($/ft^2)	Sample Size
29	X	1500-2500 ft^2	0.35	0.50	0.35	0-0.70	2
30	Z	1500-2500 ft^2	0.62	0.18	0.66	0.42-0.77	3
31	A	More than 2500 ft^2	0.25	0.15	0.27	0-0.45	7
32	B	More than 2500 ft^2	0.49	0.49	0.49	0.49-0.49	1
33	E	More than 2500 ft^2	0.49	0.12	0.50	0.25-0.64	12
34	F	More than 2500 ft^2	0.66	0.38	0.54	0.35-1.09	3
35	G	More than 2500 ft^2	0.56	0.21	0.50	0.40-0.87	4
36	H	More than 2500 ft^2	0.50	0.14	0.47	0.35-0.72	13
37	I	More than 2500 ft^2	0.62	0.22	0.50	0.38-1.00	9
38	J	More than 2500 ft^2	0.43	0.43	0.43	0.43-0.43	1
39	K	More than 2500 ft^2	0.55	0.55	0.55	0.55-0.55	1
40	M	More than 2500 ft^2	0.54	0.35	0.54	0-1.08	6
41	O	More than 2500 ft^2	0.50	0.36	0.49	0-1.22	14
42	P	More than 2500 ft^2	0.47	0.05	0.45	0.41-0.54	6
43	R	More than 2500 ft^2	0.62	0.62	0.62	0.62-0.62	1
44	X	More than 2500 ft^2	0.60	0.19	0.54	0.46-0.89	4
45	Z	More than 2500 ft^2	0.85	0.72	0.48	0.39-1.68	3
		AGGREGATE GROUPS					
A	All types	Less than 1500 ft^2	0.92	0.30	0.91	0-2.08	100
B	All types	1500-2500 ft^2	0.66	0.24	0.69	0-1.48	199
C	All types	More than 2500 ft^2	0.52	0.26	0.48	0-1.68	85

CHAPTER VIII

MULTI-FAMILY HOMES

In this chapter, we present total incremental building costs normalized (standardized) by floor area for two multi-family homes (Table 23). We first present "state calculated total costs" which are the total incremental costs per square foot as reported by the states. We also distinguish between "hard" and "soft" building costs for multi-family homes in the following way. "Hard" building costs include air-to-air heat exchanger, subfloor, framing, insulation, glazing, doors, fireplace, plumbing, electrical, HVAC, drywall, painting, vapor barrier and caulking, passive solar, and supervision costs. "Soft" building costs, which are normally part of a builder's overhead, include design, loan, and other costs (including appraisal fees, permit/inspection fees, etc.). It is important to note that the differences, if any, between state calculated total costs and those obtained by adding hard and soft costs are due to recalculations of floor areas by the states to reflect the inclusion of some heated or tempered basements. These revised square footages are not yet in the data base and, therefore, cannot be replicated. However, it can be assumed that these refinements are probably more accurate than previous data.

For the two cases, the median incremental "state calculated total cost" for building energy efficient multi-family homes (that met or exceeded the MCS standard) was $\$3.38/ft^2$; the mean incremental cost was also $\$3.38/ft^2$ with a standard deviation of $\$0.33/ft^2$. For the two cases, the median incremental "hard" cost for building energy efficient multi-family homes (that met or exceeded the MCS standard) was $\$3.50/ft^2$; the mean incremental cost was also $\$3.50/ft^2$ with a standard deviation of $\$0.27/ft^2$. The design, loan, and other costs are relatively minor in comparison to the hard costs.

Table 23. Multi-family homes - Total incremental "MCS/As-built" costs per floor area

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
State calculated total costs					
All cases	3.38	0.33	3.38	3.15-3.62	2
Climate zone 1	3.62	3.62	3.62	3.62-3.62	1
Climate zone 2	-	-	-	-	-
Climate zone 3	3.15	3.15	3.15	3.15-3.15	1
Idaho	-	-	-	-	-
Montana	3.15	3.15	3.15	3.15-3.15	1
Oregon	-	-	-	-	-
Washington	3.62	3.62	3.62	3.62-3.62	1
Total hard costs					
All cases	3.50	0.27	3.50	3.31-3.69	2
Climate zone 1	3.31	3.31	3.31	3.31-3.31	1
Climate zone 2	-	-	-	-	-
Climate zone 3	3.69	3.69	3.69	3.69-3.69	1
Idaho	-	-	-	-	-
Montana	3.69	3.69	3.69	3.69-3.69	1
Oregon	-	-	-	-	-
Washington	3.31	3.31	3.31	3.31-3.31	1

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Design costs					
All cases	0.04	0.05	0.04	0-0.08	2
Climate zone 1	0	0	0	0-0	1
Climate zone 2	-	-	-	-	-
Climate zone 3	0.08	0.08	0.08	0.08-0.08	1
Idaho	-	-	-	-	-
Montana	0.08	0.08	0.08	0.08-0.08	1
Oregon	-	-	-	-	-
Washington	0	0	0	0-0	1
Loan costs					
All cases	0.24	0.08	0.24	0.18-0.30	2
Climate zone 1	0.18	0.18	0.18	0.18-0.18	1
Climate zone 2	-	-	-	-	-
Climate zone 3	0.30	0.30	0.30	0.30-0.30	1
Idaho	-	-	-	-	-
Montana	0.30	0.30	0.30	0.30-0.30	1
Oregon	-	-	-	-	-
Washington	0.18	0.18	0.18	0.18-0.18	1

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Other costs					
All cases	0.30	0.25	0.30	0.13-0.48	2
Climate zone 1	0.13	0.13	0.13	0.13-0.13	1
Climate zone 2	-	-	-	-	-
Climate zone 3	0.48	0.48	0.48	0.48-0.48	1
Idaho	-	-	-	-	-
Montana	0.48	0.48	0.48	0.48-0.48	1
Oregon	-	-	-	-	-
Washington	0.13	0.13	0.13	0.13-0.13	1

CHAPTER IX

SUMMARY ANALYSIS

In this chapter, we present total incremental building costs normalized (standardized) by floor area for single-family homes (Table 24). We first present "state calculated total costs" which are the total incremental costs per square foot as reported by the states. We also distinguish between "hard" and "soft" building costs for multi-family homes in the following way. "Hard" building costs include air-to-air heat exchanger, subfloor, framing, insulation, glazing, doors, fireplace, plumbing, electrical, HVAC, drywall, painting, vapor barrier and caulking, passive solar, and supervision costs. "Soft" building costs, which are normally part of a builder's overhead, include design, loan, and other costs (including appraisal fees, permit/inspection fees, etc.). It is important to note that the differences, if any, between state calculated total costs and those obtained by adding hard and soft costs are due to recalculations of floor areas by the states to reflect the inclusion of some heated or tempered basements. These revised square footages are not yet in the data base and, therefore, cannot be replicated. However, it can be assumed that these refinements are probably more accurate than previous data.

For all cases (391), the median incremental "state calculated total cost" for building an energy efficient home was $\$2.95/ft^2$; the mean incremental cost was $\$3.07/ft^2$ with a standard deviation of $\$1.36/ft^2$. The median incremental "hard" cost for building an energy efficient home was $\$2.76/ft^2$; the mean incremental cost was $\$2.94/ft^2$ with a standard deviation of $\$1.32/ft^2$. The range was quite large: $\$0.28/ft^2$ to $\$13.68/ft^2$. In general, the design, loan, and other costs are relatively minor in comparison to the hard costs.

We also graphically display the distribution of incremental building hard costs normalized (standardized) by floor area for single-family homes in histograms for the entire sample, for each climate zone, and for each state (Figures 13 to 20). Appendix D contains the spreadsheet of the cases used in this analysis.

Table 24. Total incremental "MCS/As-built" costs per floor area					
	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
State calculated total costs					
All cases	3.07	1.36	2.95	0.31-15.90	391
Climate zone 1	3.19	1.49	3.10	0.31-15.90	230
Climate zone 2	3.07	1.28	2.98	1.00-8.25	85
Climate zone 3	2.67	0.88	2.57	0.88-6.23	76
Idaho	2.16	1.07	2.25	0.31-4.46	44
Montana	2.70	0.84	2.57	1.40-6.23	66
Oregon	3.58	1.54	3.59	0.32-8.25	57
Washington	3.22	1.39	3.08	0.91-15.90	224
Total hard costs					
All cases	2.94	1.32	2.76	0.28-13.68	391
Climate zone 1	2.96	1.33	2.84	0.28-13.68	230
Climate zone 2	2.90	1.29	2.65	1.22-7.98	85
Climate zone 3	2.91	1.32	2.65	0.82-7.34	76
Idaho	2.21	1.37	2.15	0.28-7.98	44
Montana	2.97	1.34	2.65	1.40-7.34	66
Oregon	3.48	1.32	3.35	1.36-7.48	57
Washington	2.94	1.24	2.79	0.86-13.68	224

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Design costs					
All cases	0.06	0.09	0.02	0-0.67	391
Climate zone 1	0.06	0.09	0.02	0-0.67	230
Climate zone 2	0.07	0.10	0.04	0-0.50	85
Climate zone 3	0.04	0.05	0.02	0-0.24	76
Idaho	0.07	0.10	0.04	0-0.46	44
Montana	0.04	0.05	0.02	0-0.24	66
Oregon	0.08	0.12	0.04	0-0.50	57
Washington	0.06	0.09	0.02	0-0.67	224
Loan costs					
All cases	0.08	0.14	0.04	0-1.53	391
Climate zone 1	0.10	0.16	0.06	0-1.53	230
Climate zone 2	0.08	0.14	0.04	0-0.94	85
Climate zone 3	0.03	0.05	0	0-0.20	76
Idaho	0.03	0.06	0	0-0.19	44
Montana	0.03	0.05	0	0-0.20	66
Oregon	0.11	0.22	0.02	0-1.14	57
Washington	0.10	0.14	0.07	0-1.53	224

	Mean ($/ft^2)	Standard Deviation ($/ft^2)	Median ($/ft^2)	Minimum-Maximum ($/ft^2)	Sample Size
Other costs					
All cases	0.10	0.15	0.01	0-0.78	391
Climate zone 1	0.12	0.16	0.02	0-0.78	230
Climate zone 2	0.11	0.16	0.04	0-0.75	85
Climate zone 3	0.03	0.08	0	0-0.40	76
Idaho	0.05	0.13	0	0-0.75	44
Montana	0.04	0.09	0	0-0.40	66
Oregon	0.07	0.12	0	0-0.68	57
Washington	0.13	0.16	0.04	0-0.78	224

Fig. 13 Distribution of total incremental costs normalised by floor area - all cases

```
# CASES    COST
 (COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY  4.ØØ OCCURRENCES

     Ø      -Ø.5Ø
     6        .25   **
    17       1.ØØ   ****
    73       1.75   ******************
   12Ø       2.5Ø   ******************************
    83       3.25   *********************
    46       4.ØØ   ************
    29       4.75   *******
     7       5.5Ø   **
     2       6.25   *
     5       7.ØØ   *
     2       7.75   *
     Ø       8.5Ø
     Ø       9.25
     Ø      1Ø.ØØ
     Ø      1Ø.75
     Ø      11.5Ø
     Ø      12.25
     Ø      13.ØØ
     1      13.75
     Ø      14.5Ø
                   I....+....I....+....I....+....I....+....I....+....I
                   Ø         4Ø        8Ø        12Ø       16Ø       2ØØ
                            HISTOGRAM FREQUENCY

MEAN          2.94Ø      MEDIAN        2.761      STD DEV       1.316
MINIMUM        .279      MAXIMUM      13.683

VALID CASES     391      MISSING CASES     Ø
```

Fig. 14 Distribution of total incremental costs normalized by floor area - climate zone 1

```
#CASES    COST
(COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY  1.5Ø OCCURRENCES

     Ø      -Ø.5Ø
     6        .25   ****
    11       1.ØØ   *******
    41       1.75   ****************************
    63       2.5Ø   ******************************************
    49       3.25   ********************************
    3Ø       4.ØØ   ********************
    23       4.75   ***************
     4       5.5Ø   ***
     1       6.25   *
     1       7.ØØ   *
     Ø       7.75
     Ø       8.5Ø
     Ø       9.25
     Ø      1Ø.ØØ
     Ø      1Ø.75
     Ø      11.5Ø
     Ø      12.25
     Ø      13.ØØ
     1      13.75   *
     Ø      14.5Ø
                   I....+....I....+....I....+....I....+....I....+....I
                   Ø         15        3Ø        45        6Ø        75
                             HISTOGRAM FREQUENCY

MEAN          2.964      MEDIAN        2.84Ø      STD DEV       1.329
MINIMUM        .279      MAXIMUM      13.683

VALID CASES    23Ø       MISSING CASES     Ø
```

Fig. 15 Distribution of total incremental costs normalized by floor area - climate zone 2

```
#CASES    COST
(COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .40 OCCURRENCES

    4      1.267   **********
   11      1.600   ****************************
    6      1.933   ***************
    8      2.267   ********************
   19      2.600   ************************************************
   10      2.933   *************************
    6      3.267   ***************
    7      3.600   ******************
    1      3.933   ***
    6      4.267   ***************
    0      4.600
    3      4.933   ********
    0      5.267
    1      5.600   ***
    0      5.933
    0      6.267
    0      6.600
    1      6.933   ***
    0      7.267
    1      7.600   ***
    1      7.933   ***
                 I....+....I....+....I....+....I....+....I....+....I
                 0         4         8        12        16        20
                          HISTOGRAM FREQUENCY

MEAN          2.902      MEDIAN        2.648      STD DEV       1.294
MINIMUM       1.220      MAXIMUM       7.979

VALID CASES     85       MISSING CASES     0
```

Fig. 16 Distribution of total incremental costs normalized by floor area - climate zone 3

```
#CASES     COST
(COUNT)   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .4Ø OCCURRENCES

     1       .733   ***
     1      1.Ø67   ***
     7      1.4ØØ   ******************
     4      1.733   **********
     7      2.Ø67   ******************
    16      2.4ØØ   ****************************************
    11      2.733   ****************************
     8      3.Ø67   ********************
     6      3.4ØØ   ***************
     6      3.733   ***************
     1      4.Ø67   ***
     1      4.4ØØ   ***
     1      4.733   ***
     Ø      5.Ø67
     Ø      5.4ØØ
     2      5.733   *****
     1      6.Ø67   ***
     Ø      6.4ØØ
     Ø      6.733
     2      7.Ø67   *****
     1      7.4ØØ   ***
                   I....+....I....+....I....+....I....+....I....+....I
                   Ø         4         8        12        16        2Ø
                             HISTOGRAM FREQUENCY

MEAN          2.9Ø9      MEDIAN        2.654      STD DEV       1.318
MINIMUM        .825      MAXIMUM       7.339

VALID CASES     76       MISSING CASES     Ø
```

Fig. 17 Distribution of total incremental costs normalized by floor area - Idaho

```
#CASES      COST
  (COUNT)   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .2Ø OCCURRENCES

     1          .1   *****
     5          .5   *************************
     1          .9   *****
     7         1.3   ************************************
     2         1.7   **********
    1Ø         2.1   ****************************************************
     7         2.5   ************************************
     4         2.9   ********************
     2         3.3   **********
     1         3.7   *****
     1         4.1   *****
     2         4.5   **********
     Ø         4.9
     Ø         5.3
     Ø         5.7
     Ø         6.1
     Ø         6.5
     Ø         6.9
     Ø         7.3
     Ø         7.7
     1         8.1   *****
                    I....+....I....+....I....+....I....+....I....+....I
                    Ø         2         4         6         8        1Ø
                              HISTOGRAM FREQUENCY

MEAN          2.2Ø6      MEDIAN        2.146      STD DEV       1.371
MINIMUM        .279      MAXIMUM       7.979

VALID CASES     44       MISSING CASES     Ø
```

Fig. 18 Distribution of total incremental costs normalized by floor area - Montana

```
# CASES     COST
(COUNT)   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .4Ø OCCURRENCES

     6        1.4   ***************
     4        1.7   **********
     4        2.Ø   **********
    15        2.3   ****************************************
     7        2.6   ******************
     9        2.9   ************************
     4        3.2   **********
     6        3.5   ***************
     4        3.8   **********
     Ø        4.1
     Ø        4.4
     1        4.7   ***
     Ø        5.Ø
     Ø        5.3
     1        5.6   ***
     1        5.9   ***
     1        6.2   ***
     Ø        6.5
     Ø        6.8
     2        7.1   *****
     1        7.4   ***
                   I....+....I....+....I....+....I....+....I....+....I
                   Ø         4         8        12        16        2Ø
                              HISTOGRAM FREQUENCY

MEAN          2.967      MEDIAN        2.654      STD DEV       1.336
MINIMUM       1.4Ø3      MAXIMUM       7.339

VALID CASES     66       MISSING CASES     Ø
```

Fig. 19 Distribution of total incremental costs normalized by floor area - Oregon

```
#CASES     COST
(COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .2Ø OCCURRENCES

      3       1.4   ***************
      3       1.7   ***************
      4       2.Ø   ********************
      4       2.3   ********************
      3       2.6   ***************
      5       2.9   *************************
      6       3.2   ******************************
      6       3.5   ******************************
      6       3.8   ******************************
      2       4.1   ********
      4       4.4   ********************
      3       4.7   ***************
      2       5.Ø   **********
      3       5.3   ***************
      Ø       5.6
      1       5.9   *****
      Ø       6.2
      Ø       6.5
      1       6.8   *****
      Ø       7.1
      1       7.4   *****
                   I....+....I....+....I....+....I....+....I....+....I
                   Ø         2         4         6         8        1Ø
                            HISTOGRAM FREQUENCY

MEAN          3.478      MEDIAN        3.354      STD DEV       1.319
MINIMUM       1.36Ø      MAXIMUM       7.475

VALID CASES     57       MISSING CASES     Ø
```

Fig. 20 Distribution of total incremental costs normalized by floor area - Washington

```
# CASES      COST
(COUNT)   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY  1.50 OCCURRENCES

     0        .00
     4        .75   ***
    29       1.50   ********************
    60       2.25   ****************************************
    68       3.00   ********************************************
    33       3.75   **********************
    22       4.50   ***************
     5       5.25   ***
     1       6.00   *
     1       6.75   *
     0       7.50
     0       8.25
     0       9.00
     0       9.75
     0      10.50
     0      11.25
     0      12.00
     0      12.75
     1      13.50   *
     0      14.25
     0      15.00
                   I....+....I....+....I....+....I....+....I....+....I
                   0        15        30        45        60        75
                          HISTOGRAM FREQUENCY

MEAN          2.939     MEDIAN        2.793     STD DEV       1.237
MINIMUM        .856     MAXIMUM      13.683

VALID CASES     224     MISSING CASES     0
```

CHAPTER X

DISCUSSION AND CONCLUSIONS

In this report, we examined the costs associated with building energy efficient homes in the Pacific Northwest as part of the Residential Standards Demonstration Program (RSDP). Several levels of analysis were used in examining the cost data: absolute, incremental, and normalized (absolute and incremental) costs (standardized by floor area and/or component area); and component (e.g., ceiling), sub-component (e.g., attic insulation), and total costs. These analyses were conducted on the entire sample (395 homes out of 423 RSDP homes) and for each of three climate zones.

Upon examining total incremental building costs normalized by **floor area**, we found the median cost was $\$2.76/ft^2$. For the average home in the sample with a median floor area of 1883 square feet, the total incremental cost would be $5,197. It is important to note that these costs include labor and materials, but exclude builder overhead, fees, and profit, and, therefore, the actual incremental costs would be somewhat larger. The median costs for the states and climate zones were as follows: Idaho ($\$2.15/ft^2$), Montana ($\$2.65/ft^2$), Oregon ($\$3.35/ft^2$), Washington ($\$2.79/ft^2$), climate zone 1 ($\$2.84/ft^2$), climate zone 2 ($\$2.65/ft^2$), and climate zone 3 ($\$2.65/ft^2$).

Using incremental building component costs normalized by **component area** as a guide, we found that the largest median incremental component cost per square foot was glazing ($\$2.64/ft^2$). All other median incremental component costs per square foot were below $\$1.00/ft^2$: doors ($\$0.92/ft^2$), walls ($\$0.60/ft^2$), ceiling ($\$0.34/ft^2$), floor ($\$0.25/ft^2$), air infiltration barriers ($\$0.12/ft^2$), and basement walls ($\$0.00/ft^2$). There was no clear-cut trend in the level of costs among climate zones or states.

A wide range of costs was encountered in all of our analyses. This finding is not unusual for small businesses spread over a large region with different purchasing habits and varying access to suppliers. In interviews with state energy officials, it was reported that some builders were able to take advantage of one-time-only "bargain buys" with local building suppliers. Accordingly, the mean and median values are more representative of the sample than the costs of individual houses. The findings from this cost analysis should be regarded as only indicative for MCS homes for the following reasons. First, in estimating building costs under "current practice," it was hoped that builders would use their current state code as the model for "current practice." However, while Washington and Oregon have statewide energy codes, Idaho and Montana do not have mandatory statewide codes but have local government options.[1]

[1]The following discussion on state energy codes is based on an article by Susan Skog, "What happens next: Adoption," *Northwest Energy News* 3(2):18-21 (1984).

In 1983 only about 40 percent of Idaho's population was covered by any type of energy efficient building code. While Idaho has produced an energy code, it is considered to be simply a guideline that local governments can enforce, modify, or ignore. Many governments have chosen to ignore it, largely because they lack the funds, staff, or training necessary to enforce it.

Montana's existing energy code is what the building industry calls a "minimum and maximum standard:" cities and counties cannot adopt codes that are either less or more strict than the state code, but they can choose not to enforce the code at all. If a town decides not to enforce a code, the state government is responsible for enforcement. However, the state only has authority over dwellings larger than a four-plex and has very few inspectors to cover an extremely large state. This situation has led to uneven enforcement throughout the state.

Oregon also has a "minimum and maximum standard," and cities and counties can choose whether they want to enforce it or leave the responsibility to the state. In general, smaller, less densely populated areas let the state do the enforcement work.

In contrast to the other states, Washington law allows local jurisdictions to pass codes that are stricter than the state's. In addition, all but three percent of the population live in areas that have some type of energy code.

In summary, due to the different types of building codes and code enforcement in the region, the concept of "current practice" is very loosely defined and variable. Hence, the calculation of incremental costs, in which current practice costs are subtracted from energy efficient home costs, is subject to an unknown bias.

Second, the cost data itself may be incorrect due to confusion and assumptions made by builders participating in the program. According to some state energy personnel, builders had difficulty in understanding the cost data manual and in completing the cost data forms. In particular, it was very difficult for builders to separate out the costs of building components: for example, separating insulation costs to "walls" for above-grade insulation and to "basement walls" for below-grade insulation. The workshops were helpful for most of the builders in determining this type of calculation. However, some builders didn't construct their homes until several months after the workshops were held, and others didn't complete the cost data forms until several months after they built their homes, leading to poor recall. To ensure high quality data, all the state energy agencies had a cost data review process. Typically, the states contacted individual builders an average of two to three times and for up to two hours at a time to resolve inconsistencies in the data. Thus, we believe that the cost data, on the whole, are good, but some discrepancies in the data may remain.

Third, the findings from this demonstration program are not generalizable. Builders participating in the RSDP are probably not representative of the builders in the Pacific Northwest because they were self-selected: they voluntarily participated in the program. Thus, those with experience in building energy efficient homes are probably over-represented in this program. Hence, we would expect the costs of these builders to be lower than those of less-experienced builders.

Fourth, this was the first time that many of the builders ever attempted to build to this level of energy efficiency using innovative building materials and techniques. For example, most builders had little experience with the sizing and installation of air-to-air heat exchangers and experienced several problems in the installation of this equipment. Consequently, we would expect the cost of building energy efficient homes to decrease over time as the building community becomes more informed and experienced in constructing energy efficient homes. As mentioned previously, one of the major purposes of the RSDP was to educate the building community about the construction techniques and materials involved in building MCS-type homes. The builder training workshops, the cost data manual, and the construction of MCS-type homes provided the resources to develop the skills necessary for constructing energy-efficient homes in a cost-effective manner. Thus, we would expect that these experienced builders would now be able to build these energy efficient homes less expensively than before.

Fifth, the incremental costs calculated in this report are, in many cases, for energy efficient homes that are designed to go beyond the Model Conservation Standards (MCS) proposed by the Northwest Power Planning Council. Initially, it was hoped that incremental costs could be calculated for MCS homes. However, because most of the homes built in the RSDP went beyond the MCS and because of the difficulty experienced by builders in separating out those costs that met the MCS from those costs that exceeded the MCS, the initial objective could not be met.

Finally, the builders did not try to take the most cost-effective routes in building their energy efficient homes, as assumed in the development of the MCS by the Council:

> "The MCS were developed by the Council in increments of cost-effective measures, and the costs were based on average costs for the most cost-effective techniques and materials. For aesthetic, marketing, or experimental reasons, the RSDP builders could skip the most cost-effective measures, and take more expensive alternatives to reach a comparable level of energy efficiency. Therefore, the RSDP costs can be expected to exceed the typical MCS costs."[2]

[2] Personal communication, Ken Keating, RSDP Evaluation Group, BPA, September 12, 1985.

Thus, direct comparisons of our findings with the Council's projections should be done cautiously.

In summary, we found that builders are able to build energy efficient homes with minimal changes in building materials and techniques without a substantial increase in costs. Moreover, builders learned during this demonstration program: in some cases, builders have changed their usage of materials and building practices after discovering their higher costs in comparison to alternative materials and techniques.[3] Accordingly, as builders gain more experience in building energy efficient homes, and as manufacturers, wholesalers, retailers, and distributors make energy efficient products more available in greater quantities, the costs of building energy efficient homes should decrease.

We would like to thank the following people for their assistance in this project: Ken Keating, Jane Selby, and Phil Thor of the Bonneville Power Administration; Tom Eckman of the Northwest Power Planning Council; Johnny Douglas, Pat Keegan, and Dan Silver of the Washington State Energy Office; Alan Tabachnikov and Jim Maloney of the Oregon Department of Energy; Paul Cartwright and Brian Green of the Montana Department of Natural Resources; Mike McSorely of the Idaho Department of Water Resources; Carol Wright of EDS; and Barry Barnes, Craig Conner, Steve Gold, Alan Meier, Dan Stein, and Tony Usibelli of the Lawrence Berkeley Laboratory.

[3] Based on interviews with state energy officials.

APPENDIX A

COST DATA

Residential Standards Demonstration Program

HOME I.D. # _____

Builder: _____

Address: _____

Telephone: _____

State Office: _____

Contact: _____

Address: _____

Telephone: _____

Prepared By: NAHB AREA XV, 15555 SW Bangy Road, Lake Oswego, OR 97034 (503) 684-1880 in association with NAHB Research Foundation.

Modified By: Bonneville Power Administration 2/29/84

General Instructions

The purpose of this manual is to demonstrate the difference in cost between homes built to meet the Model Conservation Standards (MCS) and homes built to current practice or code. It was designed by builders in the Northwest. Two sets of forms are contained in the manual. One set, with the words "Current Practice" in the upper right hand corner of the page, is to be used to enter the costs to the builder if the homes were built to current standards. The other set, marked "MCS", is to be used to enter the costs for the MCS home. The state will provide a description of the current practice home to the builders. Builders will enter their actual costs for the MCS house and their estimates of what those costs would be for the home built to current standards. Builders who are building a matched pair will enter information on these forms based on the homes they actually build to the MCS and current standards.

Information **only** needs to be entered on these forms if it represents an item whose cost is **different** for the MCS and Current Standards home **because** of the MCS. If no difference in costs occurs, simply check the column labeled NA (not applicable).

The builder will be required to calculate cost information for this manual which would not have to be calculated under normal circumstances. The reason this is necessary is to answer questions about the MCS which are very important to the building community of the region. Please make your best effort to enter accurate, complete information.

Monitor your costs, enter the information as construction progresses, follow the instructions below, and feel free to call the state office listed on the cover if you have any questions.

The instructions below will describe how to fill out the forms in this manual. The state office may ask you for some additional information or copies of some of the forms along the way.

COST FORMS INSTRUCTIONS

ITEM

"Items" are the materials or labor which could have a different cost for the MCS home and the current practice home. If an item is not listed for which cost differs between the two homes, list the information on an extra line.

NA

If an item is not required for a particular house, or if the cost is no different for the MCS and current standards homes, check this column. If NA is checked, no further information needs to be entered on the line.

MATERIALS

Two columns are available for entering costs of materials. Figures entered on these columns should include **all** the materials costs to the builder **and**, if obtainable, the materials cost to the subcontractor. The first column, headed "EST.", is to be used to enter the estimated costs of the materials before construction begins. The builder will be given a materials list of MCS materials taken off by a professional estimator hired by the state. This materials list will show quantities for most of the materials listed in this manual. The builder may use this materials list to obtain cost estimates or he may use a materials list he does himself. These estimated costs should be entered in the "EST." column under "Materials".

The second column, "Actual", is to be used after purchasing the materials to enter the actual costs. If the actual costs were exactly the same as the estimated costs, enter "same" in the "Actual" column.

BUILDER LABOR

This column is to be used to enter the builder's actual own labor cost. The labor cost could be either the cost of paying the builder's employees, and/or the fair market value of the builder's own labor. The costs of paying the builder's

employees should include gross wages plus benefits, insurance or social security above the gross wages. In other words, the total cost to the builder of the employee for the particular item. The builder's own labor should be figured as the amount the builder would have to pay someone else for the task.

The builder is not expected to break down "Builder Labor" by every line item listed. But costs should be broken down for each major category. If the builder were to do his own framing, for example, a builder labor figure (or an NA) should be entered for "A. Floor/Crawl Space", "B. Basement", "C. Joists", "D. Exterior Walls", etc.

SUBCONTRACTOR CHARGES

The subcontractor charge information is very important. But it will require some extra communication between the builder and subcontractor. The subcontractor must be persuaded to bid the MCS and current standards homes. If the subcontractor is **unable** to give material costs separately, the total bid, **including materials** should be entered under "BID", and the builder should then write in "L&M" next to the figure, indicating that **both** labor and materials are included. If the subcontractor is **able** to provide material costs separately, they should be entered under "MATERIALS."

The first column, "BID", should represent the subcontractor's bid. The subcontractor should break down the bid into the major categories (A, B, C, etc.) as much as possible. If the subcontractor is unable to do so, categories can be grouped into a single figure.

The second column, "Actual", must be filled in after the subcontractor has completed work. The builder must ask the subcontractor what the bid would have been had he known exactly how much time the job would take. The subcontractor may have little experience with the MCS, and under or overbid the job. This column allows the subcontractor to reflect upon the time and cost of doing the work, and suggest what he feels would be a competitive price in retrospect. Presumably, the subcontractor is familiar with the current standards techniques, so no information needs to be obtained on that form under "Actual".

RELATED COSTS

Many of the items under "Related Costs" will vary depending on the price of the home. The price of the home will be affected by the MCS, so these items could have different costs for the MCS and current practice homes. Please enter costs for all items which vary in cost for the two homes. The costs that have been incurred by the time of the completion of the home (and, therefore, the due date of this accounting manual) are to be entered, even though additional cost may still be incurred.

COST SUMMARY SHEET (Optional)

The totals from each component/task page can be used to fill in the Model Conservation Standards (MCS) and Current Practice Home columns.

ADDITIONAL INFORMATION/QUESTIONS:

Any questions that the builder may have should be directed to the State Office, unless they identify a different source below:

Name: _____

Phone Number: _____

COMPONENT: SLAB-ON-GRADE, CRAWL SPACE, BASEMENT **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Slab-on grade:		-	-	-	-	-
A.1. vapor barrier						
a.2. perimeter insul.						
a.3. Total labor		-	-			
B. Crawl Space		-	-	-	-	-
B.1. vapor bar., ground		see vapor barrier/calking/sealing				
B.2. vapor bar., perim.						
B.3. insulation-perim.						
B.4. flashing/insul. cover						
B.5. adhesive/fasteners						
C. Basement						
C.1. vapor barrier						
C.2. Insul.-Perimeter						
C.3. flashing/cover						
C.4. Adhesives/fasteners						
TOTALS		$	$	$	$	$

COMPONENT: SLAB-ON-GRADE, CRAWL SPACE, BASEMENT **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Slab-on grade:		-	-	-	-	-
A.1. vapor barrier						
a.2. perimeter insul.						
a.3. Total labor		-	-			
B. Crawl Space		-	-	-	-	-
B.1. vapor bar., ground		see vapor barrier/calking/sealing				
B.2. vapor bar., perim.						
B.3. insulation-perim.						
B.4. flashing/insul. cover						
B.5. adhesive/fasteners						
C. Basement						
C.1. vapor barrier						
C.2. Insul.-Perimeter						
C.3. flashing/cover						
C.4. Adhesives/fasteners						
TOTALS		$	$	$	$	$

COMPONENT: FRAMING **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Floor/Crawl Space						
B. Basements						
B.1. Studs						
B.2. Plates						
B.3. Flame spread material-see drywall and paneling						
B.4. Total labor-basement						
C. Joists						
C.1. Rim						
C.2. Support						
C.3. Total labor-Joists						
D. Exterior Walls						
D.1. Studs						
D.2. Plates						
D.3. Headers						
D.4. Sheathing						
D.5. Bracing						
D.6. Blocking/backing						
D.7. Total labor-Walls						
E. Ceilings						
E.1. Trusses						
E.2. Rafters (Vaults)						
E.3. Soffit Enclosures						
E.4. Total labor-Ceilings						
F. Window liners/jambs		See Windows				
G. Doors liners/jambs		See Doors				
TOTALS		$	$	$	$	$

COMPONENT: FRAMING **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Floor/Crawl Space						
B. Basements						
B.1. Studs						
B.2. Plates						
B.3. Flame spread material-see drywall and paneling						
B.4. Total labor-basement						
C. Joists						
C.1. Rim						
C.2. Support						
C.3. Total labor-Joists						
D. Exterior Walls						
D.1. Studs						
D.2. Plates						
D.3. Headers						
D.4. Sheathing						
D.5. Bracing						
D.6. Blocking/backing						
D.7. Total labor-Walls						
E. Ceilings						
E.1. Trusses						
E.2. Rafters (Vaults)						
E.3. Soffit Enclosures						
E.4. Total labor-Ceilings						
F. Window liners/jambs		See Windows				
G. Doors liners/jambs		See Doors				
TOTALS		$	$	$	$	$

COMPONENT: VAPOR BARRIER, CAULKING, SEALING **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. Vapor Barrier						
A.1. Crawl space ground						
A.2. Floor						
A.3. Walls						
A.4. Ceiling						
A.5. Total V.B. Labor						
B. Caulking/Sealing						
B.1. Rim Joists						
B.2. Sill Plates						
B.3. Sole Plate						
B.4. Framing joints						
B.5. Windows (to frame)						
B.6. Ex. Doors (to frame)						
B.7. Utility Holes						
B.8. All Baseboards						
B.9. Attic Floor						
B.10. Envelope openings						
B.11. Part. Wall Base Mldngs.						
B.12. Elect. Plate. gaskets						
B.13. Total Caulking labor						
C. Air Barrier (tyvek, etc.)						
TOTALS		$	$	$	$	$

COMPONENT: VAPOR BARRIER, CAULKING, SEALING **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Vapor Barrier						
A.1. Crawl space ground						
A.2. Floor						
A.3. Walls						
A.4. Ceiling						
A.5. Total V.B. Labor						
B. Caulking/Sealing						
B.1. Rim Joists						
B.2. Sill Plates						
B.3. Sole Plate						
B.4. Framing joints						
B.5. Windows (to frame)						
B.6. Ex. Doors (to frame)						
B.7. Utility Holes						
B.8. All Baseboards						
B.9. Attic Floor						
B.10. Envelope openings						
B.11. Part. Wall Base Mldngs.						
B.12. Elect. Plate. gaskets						
B.13. Total Caulking labor						
C. Air Barrier (tyvek, etc.)						
TOTALS		$	$	$	$	$

COMPONENT: INSULATION **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Perimeter		See Slab-on-Grade, crawl space, Basements				
B. Under Floor						
C. Exterior Wall						
C.1. Sheathing		See Framing				
D. Ceiling						
D.1. Insulation-Ceil.						
D.2. Vents/Baffle						
D.3.						
D.4. Total Ceil. Labor						
E. Pipe Insulation						
F. Heating Syst. Ducts						
F.1. Duct insulation						
F.2. boot insulation						
G. Heat Exchanger Ducts-See Heat Exchangers						
TOTALS		$	$	$	$	$

COMPONENT: INSULATION **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Perimeter		See Slab-on-Grade, crawl space, Basements				
B. Under Floor						
C. Exterior Wall						
C.1. Sheathing		See Framing				
D. Ceiling						
D.1. Insulation-Ceil.						
D.2. Vents/Baffle						
D.3.						
D.4. Total Ceil. Labor						
E. Pipe Insulation						
F. Heating Syst. Ducts						
F.1. Duct insulation						
F.2. boot insulation						
G. Heat Exchanger Ducts-See Heat Exchangers						
TOTALS		$	$	$	$	$

COMPONENT: WINDOWS **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. Window Units						
B.						
C.						
D. Liner &/or Ext. Jambs						
E.						
F. Insul. Shades/Shutters						
G.						
H.						
TOTALS		$	$	$	$	$

COMPONENT: DOORS **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. Door Units						
B. Liners/Extension Jamb						
C.						
D.						
E.						
F.						
TOTALS		$	$	$	$	$

COMPONENT: WINDOWS **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. Window Units						
B.						
C.						
D. Liner &/or Ext. Jambs						
E.						
F. Insul. Shades/Shutters						
G.						
H.						
TOTALS		$	$	$	$	$

COMPONENT: DOORS **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. Door Units						
B. Liners/Extension Jamb						
C.						
D.						
E.						
F.						
TOTALS		$	$	$	$	$

COMPONENT: Air to Air Heat Exchangers **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. Heat Exchanger Unit						
B. Ducting						
C. Duct Insulation						
D. Location						
E. Wiring						
F. Controls						
G.						
H.						
TOTALS		$	$	$	$	$

COMPONENT: HVAC **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. HVAC unit						
B. Ducting						
C. Duct Insulation		See Insulation				
D. Duct Sealing						
E.						
F.						
TOTALS		$	$	$	$	$

COMPONENT: Air to Air Heat Exchangers **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. Heat Exchanger Unit						
B. Ducting						
C. Duct Insulation						
D. Location						
E. Wiring						
F. Controls						
G.						
H.						
TOTALS		$	$	$	$	$

COMPONENT: HVAC **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. HVAC unit						
B. Ducting						
C. Duct Insulation		See Insulation				
D. Duct Sealing						
E.						
F.						
TOTALS		$	$	$	$	$

COMPONENT: ELECTRICAL **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Heating Unit Wiring						
B. Bath Fan Wiring						
C. Outlet Gasketing		See Caulking and sealing				
D. Polyethylene pans						
E. Heat Exchanger wiring		See Heat Exchanger				
F.						
G.						
H.						
I.						
J.						
K.						
L.						
M.						
N.						
O.						
P.						
Q.						
R.						
S.						
T.						
U.						
V.						
W.						
X.						
Y.						
Z.						
AA.						
BB.						
CC.						
DD.						
TOTALS		$	$	$	$	$

COMPONENT: ELECTRICAL **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Heating Unit Wiring						
B. Bath Fan Wiring						
C. Outlet Gasketing		See Caulking and sealing				
D. Polyethylene pans						
E. Heat Exchanger wiring		See Heat Exchanger				
F.						
G.						
H.						
I.						
J.						
K.						
L.						
M.						
N.						
O.						
P.						
Q.						
R.						
S.						
T.						
U.						
V.						
W.						
X.						
Y.						
Z.						
AA.						
BB.						
CC.						
DD.						
TOTALS		$	$	$	$	$

COMPONENT: FIREPLACE **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Combustion Air						
B. Door						
C. Damper						
D.						
E.						
F.						
G.						
H.						
TOTALS		$	$	$	$	$

COMPONENT: PLUMBING **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Pipe Insulation		see insulation				
B.						
C.						
D.						
E.						
F.						
TOTALS		$	$	$	$	$

COMPONENT: FIREPLACE **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	CHARGES EXCLUDING MATERIAL BID (EST)	CHARGES EXCLUDING MATERIAL ACTUAL
A. Combustion Air						
B. Door						
C. Damper						
D.						
E.						
F.						
G.						
H.						
TOTALS		$	$	$	$	$

COMPONENT: PLUMBING **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Pipe Insulation		see insulation				
B.						
C.						
D.						
E.						
F.						
TOTALS		$	$	$	$	$

COMPONENT: DRYWALL & PANELING **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. Walls						
B. Ceilings						
C. Clips						
D. Fasteners						
E. Flame spread material						
F.						
G.						
H.						
TOTALS		$	$	$	$	$

COMPONENT: PAINTING **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. Jambs						
B. Drywall returns						
C.						
D.						
E.						
F.						
TOTALS		$	$	$	$	$

COMPONENT: DRYWALL & PANELING **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. Walls						
B. Ceilings						
C. Clips						
D. Fasteners						
E. Flame spread material						
F.						
G.						
H.						
TOTALS		$	$	$	$	$

COMPONENT: PAINTING **Home I.D.#** _____

ITEM	NA	MATERIALS		BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES	
		EST.	ACTUAL		BID (EST)	ACTUAL
A. Jambs						
B. Drywall returns						
C.						
D.						
E.						
F.						
TOTALS		$	$	$	$	$

COMPONENT: PASSIVE SOLAR **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Thermal Mass						
B. mass support						
C. shading devices						
D. venting						
E. drapes/night insul.		See Windows				
F. Glazing		See Windows				
G. Ducting						
H. Equip. & Controls						
I.						
J.						
K.						
L.						
M.						
N.						
O.						
P.						
Q.						
R.						
S.						
T.						
U.						
V.						
W.						
X.						
Y.						
Z.						
AA.						
BB.						
CC.						
DD.						
TOTALS		$	$	$	$	$

COMPONENT: PASSIVE SOLAR **Home I.D.#** _____

ITEM	NA	MATERIALS EST.	MATERIALS ACTUAL	BUILDER ACTUAL LABOR	SUBCONTRACTOR CHARGES BID (EST)	SUBCONTRACTOR CHARGES ACTUAL
A. Thermal Mass						
B. mass support						
C. shading devices						
D. venting						
E. drapes/night insul.		See Windows				
F. Glazing		See Windows				
G. Ducting						
H. Equip. & Controls						
I.						
J.						
K.						
L.						
M.						
N.						
O.						
P.						
Q.						
R.						
S.						
T.						
U.						
V.						
W.						
X.						
Y.						
Z.						
AA.						
BB.						
CC.						
DD.						
TOTALS		$	$	$	$	$

House Identification NO: _____

Component: RELATED COST*

Item	n/a	Cost
a. Supervision		
b. Design		
c. Permit/inspection fees		
d. Hazard insurance		
e. Appraisal fee		
f. H.O.W.		
g. Construction loan interest**		
h. Commission		
i. Discount points		
j. Take-Out title insurance		
k. Transfer tax and/or sales tax		
l. Closing cost		
m. Escrow fee		
n. Estimated monthly, construction interest		
o.		

* Identify all related costs incurred at completion of home and include on this sheet.

** Identify construction loan interest incurred to point of completion.

Total: _____

House Identification NO: _____

Component: **RELATED COST***

Item	n/a	Cost
a. Supervision		
b. Design		
c. Permit/inspection fees		
d. Hazard insurance		
e. Appraisal fee		
f. H.O.W.		
g. Construction loan interest**		
h. Commission		
i. Discount points		
j. Take-Out title insurance		
k. Transfer tax and/or sales tax		
l. Closing cost		
m. Escrow fee		
n. Estimated monthly, construction interest		
o.		

* Identify all related costs incurred at completion of home and include on this sheet.

** Identify construction loan interest incurred to point of completion.

Total: _____ _____

COST SUMMARY

CURRENT PRACTICE	MODEL CONSERVATION STANDARDS (MCS)
Air to Air Heat Exchanger	
Slab, Crawl Space, Basement	
Framing	
Insulation	
Glazing	
Doors	
Fireplace	
Plumbing	
Electrical	
HVAC	
Drywall	
Painting	
Vapor Barriers, Caulking & Sealing	
Passive Solar	
Related Costs	
TOTAL	

Fig. B-1 Distribution of ceiling incremental costs - Group 7

Current Practice: Vaulted ceiling with batt insulation and no foam insulation; R-30

MCS: Vaulted ceiling with batt insulation and no foam insulation; R-38

```
 # CASES   COST
 (COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .2Ø OCCURRENCES

     Ø     -Ø.1ØØ
     Ø     -Ø.Ø25
     3       .Ø5Ø  ****************
     9       .125  ********************************************
     5       .2ØØ  *************************
     2       .275  **********
     3       .35Ø  ****************
     2       .425  **********
     Ø       .5ØØ
     2       .575  **********
     Ø       .65Ø
     2       .725  **********
     Ø       .8ØØ
     Ø       .875
     1       .95Ø  *****
     Ø      1.Ø25
     Ø      1.1ØØ
     Ø      1.175
     1      1.25Ø  *****
     Ø      1.325
     Ø      1.4ØØ
                  I....+....I....+....I....+....I....+....I....+....I
                  Ø         2         4         6         8        1Ø
                            HISTOGRAM FREQUENCY

MEAN            .312      MEDIAN          .22Ø      STD DEV        .287
MINIMUM         .Ø5Ø      MAXIMUM        1.26Ø

VALID CASES      3Ø       MISSING CASES     Ø
```

Fig. B-2 Distribution of ceiling incremental costs - Group 10

Current Practice: Attic, standard truss, loosefill insulation; R-30

MCS: Attic, advanced truss, loosefill insulation; R-38

```
#CASES   COST
 (COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .4Ø OCCURRENCES

    Ø     -Ø.15Ø
    Ø     -Ø.Ø75
    1       .ØØØ   ***
    4       .Ø75   **********
    7       .15Ø   ******************
   15       .225   ****************************************
    6       .3ØØ   ***************
   16       .375   ******************************************
    8       .45Ø   ********************
    9       .525   ************************
    3       .6ØØ   ********
    9       .675   ************************
    4       .75Ø   **********
    6       .825   ***************
    Ø       .9ØØ
    Ø       .975
    Ø      1.Ø5Ø
    Ø      1.125
    Ø      1.2ØØ
    2      1.275   *****
    Ø      1.35Ø
                  I....+....I....+....I....+....I....+....I....+....I
                  Ø         4         8        12        16        2Ø
                            HISTOGRAM FREQUENCY

MEAN          .436     MEDIAN        .39Ø     STD DEV       .246
MINIMUM       .ØØØ     MAXIMUM      1.24Ø

VALID CASES    9Ø      MISSING CASES    Ø
```

Fig. B-3 Distribution of ceiling incremental costs - Group 19

Current Practice: Attic, standard truss, loosefill insulation; R-38

MCS: Attic, advanced truss, loosefill insulation; R-38

```
# CASES     COST
  (COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .40 OCCURRENCES

     0      -0.100
     1      -0.025   ***
     6        .050   ***************
    11        .125   ****************************
     7        .200   ******************
     3        .275   ********
     1        .350   ***
     0        .425
     2        .500   *****
     3        .575   ********
     1        .650   ***
     0        .725
     0        .800
     0        .875
     0        .950
     0       1.025
     0       1.100
     0       1.175
     0       1.250
     1       1.325   ***
     0       1.400
                     I....+....I....+....I....+....I....+....I....+....I
                     0         4         8        12        16        20
                           HISTOGRAM FREQUENCY

MEAN            .245     MEDIAN          .165     STD DEV        .256
MINIMUM         .000     MAXIMUM        1.340

VALID CASES       36     MISSING CASES     0
```

Fig. B-4 Distribution of floor incremental costs - Group 16

Current Practice: Crawlspace (insulation under floor or overhangs); R-11

MCS: Crawlspace (insulation under floor or overhangs); R-19

```
#CASES    COST
(COUNT)   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .6Ø OCCURRENCES

     1      -Ø.26   **
     Ø      -Ø.22
     Ø      -Ø.18
     Ø      -Ø.14
     Ø      -Ø.1Ø
     Ø      -Ø.Ø6
     Ø      -Ø.Ø2
     1        .Ø2   **
    11        .Ø6   ******************
    29        .1Ø   ************************************************
    2Ø        .14   ********************************
     5        .18   ********
     1        .22   **
     1        .26   **
     2        .3Ø   ***
     Ø        .34
     Ø        .38
     Ø        .42
     Ø        .46
     Ø        .5Ø
     1        .54   **
                   I....+....I....+....I....+....I....+....I....+....I
                   Ø         6         12        18        24        3Ø
                             HISTOGRAM FREQUENCY

MEAN            .123      MEDIAN          .115      STD DEV        .Ø84
MINIMUM       -Ø.26Ø      MAXIMUM         .54Ø

VALID CASES      72       MISSING CASES     Ø
```

Fig. B-5 Distribution of floor incremental costs - Group 18

Current Practice: Crawlspace (insulation under floor or overhangs); R-11

MCS: Crawlspace (insulation under floor or overhangs); R-30

```
#CASES   COST
(COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY   .5Ø OCCURRENCES

   Ø       -Ø.2
   Ø       -Ø.1
   1         .Ø   **
   3         .1   ******
  13         .2   **************************
  23         .3   ************************************************
  15         .4   ******************************
   3         .5   ******
   1         .6   **
   3         .7   ******
   1         .8   **
   Ø         .9
   Ø        1.Ø
   Ø        1.1
   Ø        1.2
   Ø        1.3
   Ø        1.4
   Ø        1.5
   1        1.6   **
   Ø        1.7
   Ø        1.8
                 I....+....I....+....I....+....I....+....I....+....I
                 Ø         5        1Ø        15        2Ø        25
                          HISTOGRAM FREQUENCY

MEAN          .343      MEDIAN        .3ØØ      STD DEV       .216
MINIMUM       .Ø3Ø      MAXIMUM      1.6ØØ

VALID CASES    64       MISSING CASES    Ø
```

Fig. B-6 Distribution of wall incremental costs - Group 1

Current Practice: 2 X 4, 16" on center, standard framing; R-11

MCS: 2 X 6, 24" on center, (mod.) advanced framing; R-19

```
#CASES     COST
  (COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .2Ø OCCURRENCES

     1     -Ø.Ø1ØØ  *****
     Ø       .Ø233
     Ø       .Ø567
     4       .Ø9ØØ  ********************
     6       .1233  ******************************
     4       .1567  ********************
     5       .19ØØ  *************************
     2       .2233  **********
     8       .2567  ****************************************
     4       .29ØØ  ********************
     Ø       .3233
     5       .3567  *************************
     Ø       .39ØØ
     7       .4233  ************************************
     2       .4567  **********
     1       .49ØØ  *****
     3       .5233  ***************
     Ø       .5567
     2       .59ØØ  **********
     Ø       .6233
     1       .6567  *****
                  I....+....I....+....I....+....I....+....I....+....I
                  Ø         2         4         6         8        1Ø
                          HISTOGRAM FREQUENCY

MEAN          .287      MEDIAN        .27Ø      STD DEV       .152
MINIMUM       .ØØØ      MAXIMUM       .65Ø

VALID CASES     55      MISSING CASES    Ø
```

Fig. B-7 Distribution of wall incremental costs - Group 4

Current Practice: 2 X 4, 16" on center, standard framing; R-11

MCS: 2 X 6, 24" on center, foam inside; R-24

```
#CASES    COST
(COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY   .2Ø OCCURRENCES

   Ø       .15Ø
   1       .225  *****
   1       .3ØØ  *****
   3       .375  ***************
   3       .45Ø  ***************
   2       .525  **********
   4       .6ØØ  ********************
   4       .675  ********************
   3       .75Ø  ***************
   3       .825  ***************
   4       .9ØØ  ********************
   4       .975  ********************
   6      1.Ø5Ø  ******************************
   1      1.125  *****
   2      1.2ØØ  **********
   Ø      1.275
   Ø      1.35Ø
   Ø      1.425
   1      1.5ØØ  *****
   1      1.575  *****
   Ø      1.65Ø
                I....+....I....+....I....+....I....+....I....+....I
                Ø         2         4         6         8        1Ø
                          HISTOGRAM FREQUENCY

MEAN          .8Ø1      MEDIAN        .81Ø      STD DEV       .3Ø5
MINIMUM       .22Ø      MAXIMUM      1.54Ø

VALID CASES    43       MISSING CASES    Ø
```

Fig. B-8 Distribution of wall incremental costs - Group 22

Current Practice: Any type; R-11

MCS: Any type; R-24

```
#CASES      COST
 (COUNT)   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .2Ø OCCURRENCES

     1       -Ø.Ø5   *****
     6         .2Ø   ******************************
     7         .45   ************************************
     5         .7Ø   *************************
     6         .95   ******************************
     1        1.2Ø   *****
     1        1.45   *****
     1        1.7Ø   *****
     Ø        1.95
     Ø        2.2Ø
     2        2.45   **********
     Ø        2.7Ø
     Ø        2.95
     Ø        3.2Ø
     Ø        3.45
     Ø        3.7Ø
     Ø        3.95
     Ø        4.2Ø
     Ø        4.45
     1        4.7Ø   *****
     1        4.95   *****
                    I....+....I....+....I....+....I....+....I....+....I
                    Ø         2         4         6         8        1Ø
                              HISTOGRAM FREQUENCY

MEAN            .991      MEDIAN          .7ØØ      STD DEV       1.179
MINIMUM         .ØØØ      MAXIMUM        4.95Ø

VALID CASES       32      MISSING CASES     Ø
```

Fig. B-9 Distribution of window incremental costs - Group 14

Current Practice: Aluminum slider, aluminum casement, aluminum fixed, aluminum, aluminum with awning, or double hung aluminum windows; U-0.70-0.74

MCS: Aluminum windows with thermal break; triple glazing.

```
#CASES      COST
 (COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .2Ø OCCURRENCES

     1       .667   *****
     1      1.ØØØ   *****
     2      1.333   **********
     4      1.667   ********************
     6      2.ØØØ   ******************************
     4      2.333   ********************
     4      2.667   ********************
     4      3.ØØØ   ********************
     3      3.333   ***************
     1      3.667   *****
     3      4.ØØØ   ***************
     1      4.333   *****
     1      4.667   *****
     2      5.ØØØ   **********
     6      5.333   ******************************
     1      5.667   *****
     1      6.ØØØ   *****
     Ø      6.333
     Ø      6.667
     1      7.ØØØ   *****
     1      7.333   *****
                   I....+....I....+....I....+....I....+....I....+....I
                   Ø         2         4         6         8        1Ø
                             HISTOGRAM FREQUENCY

MEAN          3.36Ø      MEDIAN        2.95Ø      STD DEV       1.635
MINIMUM        .67Ø      MAXIMUM       7.32Ø

VALID CASES     47       MISSING CASES     Ø
```

Fig. B-10 Distribution of air infiltration barrier incremental costs - Group 19

Current Practice: No barriers for ceiling, wall, and floor

MCS: Polyvinyl under sheetrock for ceiling, foam for wall, and exterior plywood for floor

```
# CASES     COST
 (COUNT)   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .1Ø OCCURRENCES

      Ø        .Ø7
      2        .Ø9   ********************
      4        .11   ****************************************
      4        .13   ****************************************
      4        .15   ****************************************
      2        .17   ********************
      3        .19   ******************************
      2        .21   ********************
      1        .23   **********
      3        .25   ******************************
      2        .27   ********************
      2        .29   ********************
      Ø        .31
      Ø        .33
      1        .35   **********
      Ø        .37
      1        .39   **********
      2        .41   ********************
      Ø        .43
      Ø        .45
      1        .47   **********
                    I....+....I....+....I....+....I....+....I....+....I
                    Ø         1         2         3         4         5
                              HISTOGRAM FREQUENCY

MEAN            .2Ø6      MEDIAN          .18Ø      STD DEV        .1Ø1
MINIMUM         .Ø8Ø      MAXIMUM         .47Ø

VALID CASES       34      MISSING CASES     Ø
```

Fig. B-11 Distribution of air infiltration barrier incremental costs - Group 22

Current Practice: No barriers for ceiling, wall, and floor

MCS: Polyvinyl under sheetrock for ceiling and for wall, and exterior plywood for floor

```
# CASES    COST
(COUNT)   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .2Ø OCCURRENCES
   1        .Ø2   *****
   3        .Ø4   ***************
   1        .Ø6   *****
   1        .Ø8   *****
   2        .1Ø   **********
   7        .12   ************************************
   2        .14   **********
   1        .16   *****
   1        .18   *****
   2        .2Ø   **********
   Ø        .22
   3        .24   ***************
   3        .26   ***************
   Ø        .28
   1        .3Ø   *****
   Ø        .32
   1        .34   *****
   1        .36   *****
   Ø        .38
   Ø        .4Ø
   1        .42   *****
            I....+....I....+....I....+....I....+....I....+....I
            Ø         2         4         6         8         1Ø
                      HISTOGRAM FREQUENCY

MEAN          .165     MEDIAN        .13Ø     STD DEV       .1Ø1
MINIMUM       .Ø2Ø     MAXIMUM       .41Ø

VALID CASES    31      MISSING CASES   Ø
```

Fig. B-12 Distribution of air infiltration barrier incremental costs - Group 28

Current Practice: No barriers for ceiling and wall, and any type of floor barrier

MCS: Any type of barrier for ceiling, wall, and floor

```
# CASES      COST
  (COUNT)   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .1Ø OCCURRENCES

      Ø      -Ø.Ø15
      3        .Ø1Ø  ******************************
      1        .Ø35  **********
      Ø        .Ø6Ø
      1        .Ø85  **********
      5        .11Ø  ***************************************************
      5        .135  ***************************************************
      2        .16Ø  ********************
      Ø        .185
      2        .21Ø  ********************
      3        .235  ******************************
      3        .26Ø  ******************************
      1        .285  **********
      4        .31Ø  ****************************************
      Ø        .335
      4        .36Ø  ****************************************
      1        .385  **********
      1        .41Ø  **********
      Ø        .435
      1        .46Ø  **********
      Ø        .485
                    I....+....I....+....I....+....I....+....I....+....I
                    Ø         1         2         3         4         5
                              HISTOGRAM FREQUENCY

MEAN            .212      MEDIAN          .21Ø      STD DEV         .121
MINIMUM         .Ø1Ø      MAXIMUM         .46Ø

VALID CASES      37       MISSING CASES     Ø
```

Fig. B-13 Distribution of door incremental costs - Group 1

Current Practice: Insulated clad foam core

MCS: Insulated clad foam core

```
# CASES      COST
 (COUNT)   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY  4.ØØ OCCURRENCES

      Ø        -2
      2        -1   *
    1Ø6         Ø   ****************************
     32         1   ********
     19         2   *****
      8         3   **
      5         4   *
      3         5   *
      Ø         6
      1         7
      Ø         8
      1         9
      Ø        1Ø
      Ø        11
      Ø        12
      Ø        13
      Ø        14
      Ø        15
      2        16   *
      Ø        17
      Ø        18
                   I....+....I....+....I....+....I....+....I....+....I
                   Ø         4Ø        8Ø       12Ø       16Ø       2ØØ
                              HISTOGRAM FREQUENCY

MEAN            .962      MEDIAN          .ØØØ      STD DEV       2.1Ø7
MINIMUM      -Ø.57Ø       MAXIMUM       16.4ØØ

VALID CASES     179       MISSING CASES     Ø
```

Fig. B-14 Distribution of door incremental costs - Group 3

Current Practice: Wood solid core

MCS: Insulated clad foam core

```
#CASES    COST
 (COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .8Ø OCCURRENCES

     1       -18   *
     Ø       -16
     Ø       -14
     Ø       -12
     1       -1Ø   *
     1        -8   *
     Ø        -6
     2        -4   ***
     4        -2   *****
    16         Ø   ********************
    31         2   ****************************************
    4Ø         4   ***************************************************
    1Ø         6   *************
     7         8   *********
     7        1Ø   *********
     2        12   ***
     1        14   *
     Ø        16
     Ø        18
     Ø        2Ø
     1        22   *
                   I....+....I....+....I....+....I....+....I....+....I
                   Ø         8        16        24        32        4Ø
                             HISTOGRAM FREQUENCY

MEAN          3.334      MEDIAN        3.18Ø      STD DEV       4.353
MINIMUM     -18.4ØØ      MAXIMUM      21.87Ø

VALID CASES     124      MISSING CASES     Ø
```

Fig. B-15 Distribution of air-to-air heat exchanger incremental costs - Group 2

MCS: Airchange (NuTone) heat exchanger, in homes with less than 1500 ft^2

```
# CASES      COST
 (COUNT)   MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .2Ø OCCURRENCES

      3        .53   ***************
      Ø        .56
      1        .59   *****
      6        .62   ******************************
      3        .65   ***************
      1        .68   *****
      4        .71   ********************
      3        .74   ***************
      2        .77   **********
      Ø        .8Ø
      Ø        .83
      Ø        .86
      Ø        .89
      1        .92   *****
      Ø        .95
      Ø        .98
      5       1.Ø1   *************************
      Ø       1.Ø4
      Ø       1.Ø7
      Ø       1.1Ø
      1       1.13   *****
                    I....+....I....+....I....+....I....+....I....+....I
                    Ø         2         4         6         8        1Ø
                              HISTOGRAM FREQUENCY

MEAN            .743      MEDIAN          .7ØØ      STD DEV        .169
MINIMUM         .52Ø      MAXIMUM        1.14Ø

VALID CASES      3Ø       MISSING CASES     Ø
```

Fig. B-16 Distribution of air-to-air heat exchanger incremental costs - Group 17

MCS: Airchange (NuTone) heat exchanger, in homes with 1500-2500 ft^2

```
#CASES     COST
 (COUNT)  MIDPOINT    ONE SYMBOL EQUALS APPROXIMATELY    .1Ø OCCURRENCES

      2       .ØØ   ********************
      Ø       .Ø4
      Ø       .Ø8
      Ø       .12
      Ø       .16
      Ø       .2Ø
      1       .24   **********
      Ø       .28
      3       .32   ******************************
      1       .36   **********
      3       .4Ø   ******************************
      2       .44   ********************
      4       .48   ****************************************
      3       .52   ******************************
      3       .56   ******************************
      3       .6Ø   ******************************
      Ø       .64
      3       .68   ******************************
      2       .72   ********************
      3       .76   ******************************
      1       .8Ø   **********
                   I....+....I....+....I....+....I....+....I....+....I
                   Ø         1         2         3         4         5
                            HISTOGRAM FREQUENCY

MEAN          .5Ø4      MEDIAN        .51Ø      STD DEV        .194
MINIMUM       .ØØØ      MAXIMUM       .81Ø

VALID CASES     34      MISSING CASES    Ø
```

This appendix contains a listing of homes (spreadsheets) used in the determination of groups of components analyzed in Chapter 7. The following information is provided for each home: identification number, area of component, type of component, R-value (or U-value) of component, cost of component, incremental cost per square foot, and group number (identifying which group the home was placed).[1] The spreadsheets are presented in the same order as in Chapter 7: ceiling, floor, wall, basement wall, window, air infiltration barrier, door, and air-to-air heat exchanger. Column headings are explained in the glossary below.

GLOSSARY

SITEID[2]	Identification of house/builder.
AREA	Area of component.
CPTYPE	Component type - current practice.
MCSTYPE	Component type - MCS.
CPRVAL	Component R-value - current practice.
MCSRVAL	Component R-value - MCS.
CPUVAL	Component U-value - current practice.
MCSUVAL	Component U-value - MCS.
CP$	Component cost - current practice.
MCS$	Component cost - MCS.
INCOST$	Incremental cost/ft^2 = ((MCS$-CP$)/AREA)
GRP	Group number

[1] We have used group number 99 to indicate "all other cases of increments."

[2] SITEID is an eight digit number: the first digit indicates state location (1 = Idaho, 2 = Montana, 3 = Oregon, 4 = Washington); the second digit indicates climate zone location (1 = Zone 1, 2 = Zone 2, 3 = Zone 3); the third digit indicates a "matched pair" home (1 = matched, 2 = unmatched, 3 = unmatched and ELCAP, 4 = control home); the fourth digit indicates a MCS home (1 = MCS, 2 = current practice); the fifth digit indicates type of home (1 = single-family, 2 = multi-family-1, 3 = multi-family-2); and the last three digits indicate the house number (same number if it is a matched pair home).

CEILING SPREADSHEET

Ceiling Insulation Type Code:

A Attic, advanced truss, loosefill insulation

B Attic, advanced truss, batt insulation

C Attic, standard truss, baffle, compressed batt perimeter

D Attic, standard truss, rigid foam perimeter

E Vaulted, batt, no foam

F Vaulted, batt, foam inside

G Vaulted, compressed batt

H Attic, standard truss, loosefill insulation

I Attic, standard truss, loosefill insulation, compressed batt perimeter

X Missing

Z Other

24-APR-86 ceiling spreadsheet
11:33:47 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
31211106	1879	E	E	19	30	560	880	.17	1
31211133	950	E	E	19	30	470	767	.31	1
31211145	512	E	E	19	30	128	195	.13	1
31211200	1003	E	E	19	30	1403	1789	.38	1
31211292	2535	E	E	19	30	1136	2321	.47	1
31211410	408	E	E	19	30	180	286	.26	1
31211253	680	E	E	19	38	218	369	.22	2
31211270	270	E	E	19	38	950	1292	1.27	2
31211271	514	E	E	19	38	498	911	.80	2
32211162	360	E	E	19	38	419	524	.29	2
32211423	538	E	G	19	38	221	371	.28	2
32211232	1722	E	F	19	40	3755	5140	.80	2
31211250	943	C	A	30	40	752	912	.17	3
31111112	1193	C	B	30	38	3790	4840	.88	4
31211346	1230	C	B	30	38	2424	3297	.71	4
32211299	1260	C	B	30	38	1777	2052	.22	4
41111045	1035	C	B	30	38	3078	3718	.62	4
41211006	1521	C	B	30	38	2224	3034	.53	4
41211074	980	C	B	30	38	1054	1373	.33	4
41211075	980	C	B	30	38	1054	1373	.33	4
41211076	980	C	B	30	38	1054	1373	.33	4
41211077	980	C	B	30	38	1054	1373	.33	4
41211107	1413	C	B	30	38	2584	3281	.49	4
41211220	1204	C	B	30	38	2202	3081	.73	4
41211053	405	C	B	30	38	881	1040	.39	4
42211219	1408	C	B	30	38	3180	3720	.38	4
31211122	1404	C	C	30	38	468	627	.11	5
31211270	792	C	C	30	38	284	487	.26	5
32211289	1632	C	C	30	38	593	820	.14	5
41111151	1422	C	C	30	38	418	684	.19	5
41211002	1495	C	C	30	38	564	706	.09	5
41211025	1190	C	C	30	38	1977	2642	.56	5
41211123	738	C	C	30	38	480	663	.25	5
41211187	1263	C	C	30	38	520	744	.18	5
42211044	1406	C	C	30	38	450	657	.15	5
32211423	606	C	C	30	38	315	418	.17	5
41211053	1175	E	F	30	35	324	945	.53	6
41211119	416	E	F	30	35	0	229	.55	6
41211149	1350	E	F	30	35	0	556	.41	6
41211181	930	E	F	30	35	0	77	.08	6
41211118	814	E	F	30	35	0	292	.36	6
41211274	539	E	F	30	35	609	857	.46	6
41111209	732	E	E	30	38	430	500	.10	7
41111211	732	E	E	30	38	430	500	.10	7
41111213	732	E	E	30	38	430	500	.10	7
41111215	732	E	E	30	38	430	500	.10	7
41111217	732	E	E	30	38	430	500	.10	7
41211059	566	E	E	30	38	253	414	.28	7
41211081	1458	E	E	30	38	1853	3238	.95	7
41211164	1302	E	E	30	38	589	758	.13	7
42211115	224	E	E	30	38	186	212	.12	7

26-MAR-86 ceiling spreadsheet
11:44:43 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
42211219	720	E	E	30	38	1645	1924	.39	7
41111045	236	E	E	30	38	60	204	.61	7
41211026	132	E	E	30	38	152	204	.39	7
41211047	406	E	E	30	38	290	384	.23	7
41211052	330	E	E	30	38	71	192	.37	7
41211094	191	E	E	30	38	0	105	.55	7
41211095	315	E	E	30	38	599	712	.36	7
41211123	320	E	E	30	38	383	496	.35	7
41211156	719	E	E	30	38	352	503	.21	7
41211157	768	E	E	30	38	454	612	.21	7
41211163	375	E	E	30	38	343	438	.25	7
41211187	217	E	E	30	38	90	128	.18	7
42111021	64	E	E	30	38	32	35	.05	7
42211003	588	E	E	30	38	401	535	.23	7
42211004	64	E	E	30	38	32	35	.05	7
42211011	128	E	E	30	38	64	70	.05	7
42211264	544	E	E	30	38	320	403	.15	7
42211282	270	E	E	30	38	97	121	.09	7
42211285	416	E	E	30	38	333	623	.70	7
41211058	1178	E	F	30	38	953	1771	.69	7
42211148	764	E	E	30	41	2158	3118	1.26	7
41211124	608	E	F	30	38	49	682	1.04	8
41211171	695	E	F	30	38	0	1026	1.48	8
41211060	528	E	F	30	38	303	839	1.02	8
41211072	438	E	F	30	38	415	713	.68	8
41211074	196	E	F	30	38	131	220	.45	8
41211075	196	E	F	30	38	131	220	.45	8
41211076	196	E	F	30	38	131	220	.45	8
41211077	196	E	F	30	38	131	220	.45	8
41211087	285	E	F	30	38	43	225	.64	8
41211132	772	E	F	30	38	0	640	.83	8
41211266	434	E	F	30	38	0	223	.51	8
41211036	330	E	E	30	49	287	495	.63	9
41211234	1202	E	E	30	49	3473	6241	2.30	9
42211035	364	E	E	30	50	777	942	.45	9
31211166	1268	H	A	30	38	1940	2572	.50	10
31211338	819	H	A	30	38	2446	2867	.51	10
31211341	1600	H	A	30	38	4253	5473	.76	10
31211397	1587	H	A	30	38	1841	2211	.23	10
41111028	1052	H	A	30	38	1087	1538	.43	10
41111174	1435	H	A	30	38	3044	3791	.52	10
41111176	1299	H	A	30	38	2787	3683	.69	10
41211001	1152	H	A	30	38	620	1083	.40	10
41211005	1230	H	A	30	38	1766	2240	.39	10
41211008	1280	H	A	30	38	1270	1379	.09	10
41211009	1222	H	A	30	38	1617	2469	.70	10
41211013	1248	H	A	30	38	1845	2511	.53	10
41211014	1649	H	A	30	38	3207	4557	.82	10
41211018	1103	H	A	30	38	1622	1976	.32	10
41211023	1327	H	A	30	38	1275	1726	.34	10
41211024	1327	H	A	30	38	1275	1726	.34	10

26-MAR-86 ceiling spreadsheet
11:44:50 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
41211026	955	H	A	30	38	1975	2293	.33	10
41211027	1452	H	A	30	38	2513	3069	.38	10
41211031	1620	H	A	30	38	414	1057	.40	10
41211032	927	H	A	30	38	0	469	.51	10
41211038	1430	H	A	30	38	1670	2156	.34	10
41211039	893	H	A	30	38	1630	1886	.29	10
41211047	1034	H	A	30	38	3012	3262	.24	10
41211055	1140	H	A	30	38	876	1138	.23	10
41211067	1406	H	A	30	38	1779	2464	.49	10
41211068	1284	H	A	30	38	1935	2160	.18	10
41211069	1682	H	A	30	38	2897	4318	.84	10
41211070	1326	H	A	30	38	2418	3495	.81	10
41211071	1326	H	A	30	38	2418	3495	.81	10
41211078	1440	H	A	30	38	1698	2239	.38	10
41211082	1124	H	A	30	38	1536	1829	.26	10
41211092	1104	H	A	30	38	379	862	.44	10
41211094	700	H	A	30	38	0	527	.75	10
41211095	805	H	A	30	38	1726	2115	.48	10
41211097	1611	H	A	30	38	2582	2990	.25	10
41211106	1139	H	A	30	38	1610	2220	.54	10
41211125	1108	H	A	30	38	1946	2433	.44	10
41211131	806	H	A	30	38	0	169	.21	10
41211156	1092	H	A	30	38	2982	3368	.35	10
41211157	624	H	A	30	38	1918	2123	.33	10
41211168	1538	H	A	30	38	0	0	.00	10
41211170	1718	H	A	30	38	2937	4277	.78	10
41211180	1750	H	A	30	38	2566	4008	.82	10
41211183	1558	H	A	30	38	2054	2287	.15	10
41211184	1062	H	A	30	38	1248	1358	.10	10
41211193	1246	H	A	30	38	2104	3074	.78	10
41211195	1011	H	A	30	38	1727	2587	.85	10
41211201	1936	H	A	30	38	2360	3027	.34	10
41211202	1326	H	A	30	38	1039	1918	.66	10
41211203	1216	H	A	30	38	1399	2217	.67	10
41211204	1120	H	A	30	38	1666	2396	.65	10
41211246	1300	H	A	30	38	402	968	.44	10
41211251	1487	H	A	30	38	440	2291	1.24	10
41211252	1487	H	A	30	38	440	2291	1.24	10
41211254	1770	H	A	30	38	1086	1324	.13	10
41211255	1457	H	A	30	38	1738	2391	.45	10
41211267	1461	H	A	30	38	1555	1831	.19	10
41211268	1686	H	A	30	38	1947	2343	.23	10
41211271	1541	H	A	30	38	592	814	.14	10
41211275	1390	H	A	30	38	1985	2847	.62	10
41211276	1630	H	A	30	38	2392	3339	.58	10
41211277	1445	H	A	30	38	2497	3415	.64	10
41211289	1278	H	A	30	38	559	805	.19	10
41311186	1408	H	A	30	38	675	1231	.39	10
41311189	1714	H	A	30	38	1917	2457	.32	10
42111021	913	H	A	30	38	809	1094	.31	10
42211004	926	H	A	30	38	931	1143	.23	10

26-MAR-86 ceiling spreadsheet
11:44:56 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
42211011	944	H	A	30	38	892	1258	.39	10
42211037	1029	H	A	30	38	938	1155	.21	10
42211121	1009	H	A	30	38	1950	2475	.52	10
42211141	1120	H	A	30	38	940	1350	.37	10
42211147	1047	H	A	30	38	472	555	.08	10
42211241	952	H	A	30	38	904	1133	.24	10
42211264	2352	H	A	30	38	799	1709	.39	10
42211281	1562	H	A	30	38	1664	2068	.26	10
42211282	978	H	A	30	38	1751	2150	.41	10
42211283	1101	H	A	30	38	1630	2092	.42	10
42211284	1101	H	A	30	38	1630	2092	.42	10
42211285	605	H	A	30	38	485	906	.70	10
42311224	2104	H	A	30	38	2215	2573	.17	10
42311242	696	H	A	30	38	924	1069	.21	10
41211059	644	H	A	30	38	228	372	.22	10
41211124	1377	H	A	30	38	0	876	.64	10
41211171	1242	H	A	30	38	497	929	.35	10
31211135	683	H	A	30	40	594	1074	.70	10
31211257	2484	H	A	30	40	1108	1484	.15	10
32211186	1331	H	A	30	40	1407	2213	.61	10
41211120	1023	H	A	30	40	1232	1792	.55	10
41211163	330	H	A	30	40	643	690	.14	10
41211164	1026	H	A	30	40	297	356	.06	10
31211408	1423	H	B	30	38	3164	3746	.41	11
31211409	1917	H	B	30	38	2434	2871	.23	11
41211146	1288	H	B	30	38	1586	2304	.56	11
41211052	1480	H	C	30	38	319	860	.37	12
41211108	1290	H	C	30	38	234	247	.01	12
42211116	1408	H	D	30	38	876	1504	.45	13
42211115	1328	H	D	30	38	687	1173	.37	13
31211271	720	H	H	30	38	780	840	.08	14
32211426	2020	H	H	30	38	867	1071	.10	14
41211056	2440	H	H	30	38	0	128	.05	14
41211063	548	H	H	30	38	201	242	.07	14
41211072	768	H	H	30	38	250	455	.27	14
41211087	630	H	H	30	38	351	518	.27	14
41211091	817	H	H	30	38	315	341	.03	14
41211159	1764	H	H	30	38	645	814	.10	14
41211266	1036	H	H	30	38	412	578	.16	14
41211274	1768	H	H	30	38	4067	4651	.33	14
42211134	1768	H	H	30	38	600	700	.06	14
42211135	1768	H	H	30	38	600	700	.06	14
42211136	1768	H	H	30	38	600	700	.06	14
42211137	1768	H	H	30	38	600	700	.06	14
42211138	1768	H	H	30	38	600	700	.06	14
42211206	1912	H	H	30	38	822	1013	.10	14
41211062	508	H	H	30	38	186	225	.08	14
41211065	624	H	H	30	38	229	276	.08	14
41211169	1356	H	H	30	38	570	732	.12	14
41211181	1078	H	H	30	38	0	184	.17	14
31211248	1380	H	H	30	40	400	524	.09	14

26-MAR-86 ceiling spreadsheet
11:44:58 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
31211399	1089	H	H	30	40	324	432	.10	14
41211132	330	H	H	30	40	0	30	.09	14
41211012	1491	H	A	30	42	2026	2222	.13	15
41211048	728	H	A	30	42	617	787	.23	15
41211050	750	H	A	30	42	761	825	.09	15
41211244	1300	H	A	30	42	1323	1593	.21	15
41211118	952	H	A	30	44	252	474	.23	15
41211272	1740	H	A	30	44	626	979	.20	15
42211129	961	H	A	30	44	1099	1727	.65	15
42311270	1729	H	A	30	44	2042	2519	.28	15
41211093	2468	H	A	30	45	3117	4536	.57	15
41211054	597	H	A	30	46	310	686	.63	15
41211036	1058	H	A	30	49	2300	3027	.69	16
41211051	1776	H	A	30	49	3336	4173	.47	16
41211188	1352	H	A	30	49	1372	2168	.59	16
42211030	1755	H	A	30	49	3056	3412	.20	16
42211142	975	H	A	30	49	870	1113	.25	16
42211262	1755	H	A	30	49	3056	3412	.20	16
42211263	1755	H	A	30	49	3056	3412	.20	16
41211153	1032	H	A	30	50	400	665	.26	16
41211173	1478	H	A	30	50	4829	7883	2.07	16
41211234	992	H	A	30	50	2545	3394	.86	16
41211257	1605	H	A	30	50	1648	2716	.67	16
41211259	1802	H	A	30	50	2225	3037	.45	16
41211261	1418	H	A	30	50	2437	2861	.30	16
41311258	1845	H	A	30	50	1741	2667	.50	16
41211260	2264	H	A	30	51	5594	6936	.59	16
31211182	1686	H	H	30	49	720	1164	.26	17
42111144	975	H	H	30	49	329	487	.16	17
42211143	975	H	H	30	49	807	1187	.39	17
42211145	975	H	H	30	49	329	486	.16	17
42211304	975	H	H	30	49	329	486	.16	17
41211049	1325	H	A	30	60	2109	2815	.53	18
41211245	1672	H	A	30	60	2620	3114	.30	18
42211041	1088	H	A	30	60	1462	2096	.58	18
42211042	1088	H	A	30	60	1462	2096	.58	18
42211110	1820	H	A	30	60	2950	4467	.83	18
42211148	396	H	A	30	60	134	444	.78	18
11111140	1700	H	A	38	38	921	1062	.08	19
11111142	1697	H	A	38	38	904	1062	.09	19
11111143	1196	H	A	38	38	943	1067	.10	19
11111145	1491	H	A	38	38	1221	1349	.09	19
11111153	1348	H	A	38	38	1110	1342	.17	19
11211139	1888	H	A	38	38	1100	1216	.06	19
11211141	1890	H	A	38	38	2200	2298	.05	19
11211144	898	H	A	38	38	900	1003	.11	19
12211102	1003	H	A	38	38	0	92	.09	19
12211103	1692	H	A	38	38	3569	5829	1.34	19
12211121	1350	H	A	38	38	2703	2777	.05	19
12211130	950	H	A	38	38	2043	2228	.19	19
12211131	1352	H	A	38	38	822	1157	.25	19

26-MAR-86 ceiling spreadsheet
11:45:Ø4 Lawrence Berkeley Laboratory DEC VAX-86ØØ VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
12211133	1396	H	A	38	38	1661	1799	.1Ø	19
12211146	1442	H	A	38	38	Ø	Ø	.ØØ	19
12211148	875	H	A	38	38	Ø	511	.58	19
13211123	1277	H	A	38	38	2324	258Ø	.2Ø	19
23111521	96Ø	H	A	38	38	746	966	.23	19
23111573	96Ø	H	A	38	38	746	966	.23	19
2321151Ø1	1Ø11	H	A	38	38	469	544	.Ø7	19
23211507	1164	H	A	38	38	1391	1691	.26	19
23211516	1272	H	A	38	38	83Ø	1Ø18	.15	19
2321153Ø	1248	H	A	38	38	219Ø	2316	.1Ø	19
23211537	1344	H	A	38	38	Ø	159	.12	19
23211544	1232	H	A	38	38	1125	136Ø	.19	19
23211551	936	H	A	38	38	74Ø	81Ø	.Ø7	19
23211554	1496	H	A	38	38	1447	1633	.12	19
23211561	896	H	A	38	38	97Ø	119Ø	.25	19
2331151Ø	148Ø	H	A	38	38	85Ø	1154	.21	19
41111235	679	H	A	38	38	1442	1846	.59	19
41111237	1323	H	A	38	38	239Ø	3Ø18	.47	19
41211133	131Ø	H	A	38	38	199Ø	22Ø5	.16	19
41211273	1456	H	A	38	38	3436	4156	.49	19
11211136	1996	H	A	38	4Ø	2866	4187	.66	19
13211119	11Ø4	H	A	38	4Ø	28Ø5	3396	.54	19
1221111Ø	1224	H	A	4Ø	4Ø	2475	2925	.37	19
12111117	1ØØ2	H	A	38	42	2289	27Ø2	.41	2Ø
12211114	4823	H	A	38	42	3Ø47	3437	.Ø8	2Ø
23111574	1236	H	A	38	43	1774	2268	.4Ø	2Ø
23211545	1ØØ8	H	A	38	43	1144	1774	.63	2Ø
23211572	147Ø	H	A	38	43	1562	18Ø9	.17	2Ø
12111152	1142	H	A	38	44	28Ø5	3371	.5Ø	2Ø
12211151	14Ø8	H	A	38	44	2495	2397	-Ø.Ø7	2Ø
23211581	1227	H	A	38	45	Ø	31Ø	.25	2Ø
1221114Ø4	92Ø	H	A	38	49	395	665	.29	21
1321115Ø	1294	H	A	38	49	26Ø5	2899	.23	21
23211556	132Ø	H	A	38	49	Ø	388	.29	21
1221114Ø8	1Ø42	H	A	38	5Ø	1965	224Ø	.26	21
12211147	1493	H	A	38	5Ø	616	1Ø18	.27	21
13211113	1248	H	A	38	5Ø	1715	2264	.44	21
2321151Ø5	1235	H	A	38	5Ø	1672	2189	.42	21
23211519	1356	H	A	38	5Ø	1662	2149	.36	21
2321152Ø	1266	H	A	38	5Ø	1871	2221	.28	21
23211557	1579	H	A	38	5Ø	845	11Ø5	.16	21
23211578	11ØØ	H	A	38	5Ø	1866	2127	.24	21
23211513	1493	H	A	38	51	Ø	4Ø4	.27	21
1221114Ø7	1684	H	A	38	6Ø	528	156Ø	.61	22
12211132	1344	H	A	38	6Ø	2174	2769	.44	22
1321114Ø1	12ØØ	H	A	38	6Ø	2813	3758	.79	22
13211115	1Ø68	H	A	38	6Ø	33Ø3	41Ø6	.75	22
13211118	17ØØ	H	A	38	6Ø	2374	28ØØ	.25	22
23211511	15Ø4	H	A	38	6Ø	159Ø	24Ø4	.54	22
23211515	112Ø	H	A	38	6Ø	1Ø21	1393	.33	22
23211517	1669	H	A	38	6Ø	4542	5692	.69	22

26-MAR-86 ceiling spreadsheet
11:45:13 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
23211526	877	H	A	38	60	872	1056	.21	22
23211536	1516	H	A	38	60	0	756	.50	22
23211543	1166	H	A	38	60	1633	2142	.44	22
23211550	1018	H	A	38	60	2796	3444	.64	22
23211553	1652	H	A	38	60	1693	2490	.48	22
23211571	1304	H	A	38	60	1918	2576	.50	22
23211525	640	H	A	38	60	290	460	.27	22
41211169	232	E	G	30	38	0	91	.39	23
31211137	1700	G	G	30	38	2782	3717	.55	23
31211221	936	A	A	30	38	327	756	.46	24
41211182	1484	A	A	30	38	1986	2274	.19	24
31211253	1328	A	A	30	40	518	687	.13	24
31211146	832	B	A	30	38	316	543	.27	24
41211119	680	B	B	30	41	827	1503	.99	24
31111218	1038	C	A	30	38	2957	3763	.78	24
31211134	1388	C	A	30	38	973	2153	.85	24
31211153	1326	C	A	30	38	2037	2460	.32	24
31211201	1204	C	A	30	38	1785	2197	.34	24
31211297	768	C	A	30	38	1264	1339	.10	24
32211162	1602	C	A	30	38	1785	2235	.28	24
32211310	1776	C	A	30	38	3142	2595	-0.31	24
42211003	588	C	A	30	38	1600	1778	.30	24
31211216	1844	C	H	30	38	1300	1705	.22	24
41211160	1535	D	D	30	38	585	688	.07	24
41211060	801	H	I	30	38	448	554	.13	24
41211256	1021	I	I	30	38	559	610	.05	24
42211035	956	A	A	30	50	2217	2332	.12	25
42211043	1499	C	B	30	49	1664	2188	.35	25
42211088	1314	H	C	30	50	723	858	.10	25
42311306	1568	H	D	30	42	967	1618	.42	26
23211577	992	C	A	38	50	1709	1892	.18	27
13211125	1260	H	B	38	60	1928	2436	.40	28
41211227	1852	E	A	30	38	3714	5223	.81	29
31211265	800	E	B	30	38	1399	1649	.31	29
31211424	1998	C	G	30	38	1180	1640	.23	30
41211065	520	E	Z	30	38	479	849	.71	30
42211085	1008	E	Z	30	40	2261	3862	1.59	30
31211177	388	H	X	30	38	233	265	.08	30
41211020	1021	H	Z	30	38	559	661	.10	30
41211062	500	H	Z	30	38	423	802	.76	30
41211083	1692	H	Z	30	38	3226	5082	1.10	30
41211063	460	H	Z	30	38	377	767	.85	30
41211084	1425	Z	A	30	38	5815	8266	1.72	30
41211019	1244	Z	Z	30	38	538	654	.09	30
41211040	840	Z	Z	30	38	1029	1535	.60	30
41311167	728	C	Z	30	49	1490	2197	.97	31
41311167	940	E	Z	30	49	885	1919	1.10	31
42211099	1247	H	Z	30	49	1700	1968	.21	31
41211140	1439	Z	Z	30	49	1026	2434	.98	31
41311205	1145	Z	Z	30	49	2479	3532	.92	31
42211015	1154	Z	Z	30	49	299	1179	.76	31

26-MAR-86 ceiling spreadsheet
11:45:18 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
23211535	768	Z	Z	0	19	0	440	.57	99
42211111	3838	H	A	11	60	6845	9219	.62	99
31211155	1271	E	B	19	38	1366	1712	.27	99
31211177	688	E	H	19	38	227	495	.39	99
32211110	1050	E	A	19	60	1058	3017	1.87	99
31211395	1440	C	B	30	30	1203	1400	.14	99
31211308	1741	C	A	30	56	4955	5926	.56	99
41111112	1097	E	E	30	30	536	559	.02	99
41211196	1534	E	E	30	30	0	0	.00	99
41311676	777	E	E	30	30	0	0	.00	99
41211048	466	E	E	30	30	210	210	.00	99
41211051	99	E	E	30	30	0	0	.00	99
41211133	144	E	E	30	30	50	60	.07	99
41211165	784	E	E	30	30	0	0	.00	99
41211675	358	E	E	30	30	0	0	.00	99
42211116	224	E	E	30	30	246	309	.28	99
42311306	240	E	E	30	42	214	296	.34	99
41211054	752	E	Z	30	46	1236	1964	.97	99
41211303	1776	F	F	30	43	2342	4210	1.05	99
41211126	1456	H	A	30	30	915	1592	.46	99
41211165	736	H	A	30	30	0	0	.00	99
41211265	2078	H	A	30	30	2710	3285	.28	99
41211675	830	H	H	30	30	0	0	.00	99
31211410	192	H	H	30	30	135	135	.00	99
41311676	629	H	H	30	30	0	0	.00	99
41211073	2980	H	H	30	60	1026	1815	.26	99
42211017	912	Z	Z	30	44	299	996	.76	99
41211161	1296	Z	Z	30	60	492	975	.37	99
11111106	1628	H	A	33	38	2009	2435	.26	99
11211122	1426	H	A	33	38	1920	2220	.21	99
23111523	1392	A	A	38	38	0	0	.00	99
41211192	1246	A	A	38	38	2178	2716	.43	99
23211563	749	A	A	38	38	0	0	.00	99
41111239	866	C	B	38	38	1646	1979	.38	99
23211518	1422	E	E	38	38	0	281	.20	99
23211535	960	E	E	38	38	0	0	.00	99
23211539	1771	E	E	38	38	0	0	.00	99
23211552	890	E	E	38	38	1248	1857	.68	99
23211563	729	E	E	38	38	0	0	.00	99
23211565	1197	E	E	38	38	0	0	.00	99
23211570	1560	E	E	38	38	0	0	.00	99
12211103	769	E	E	38	38	1531	11066	12.40	99
42311242	256	E	E	38	38	112	149	.14	99
23211525	657	E	F	38	60	851	3110	3.44	99
12211149	1246	H	H	38	38	1220	1220	.00	99
23211565	760	H	H	38	38	0	0	.00	99
12211100	1288	H	C	38	40	2873	2873	.00	99
23211541	1443	H	Z	38	50	2680	3140	.32	99
23211506	1046	H	A	38	69	1500	2127	.60	99
23211566	1046	H	A	38	69	1500	1975	.45	99
23211548	925	Z	Z	38	38	823	1031	.22	99

26-MAR-86 ceiling spreadsheet
11:45:24 Lawrence Berkeley Laboratory DEC VAX-86ØØ VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
23111514	1184	Z	A	38	5Ø	3756	3Ø85	-Ø.57	99
23211567	1269	Z	Z	38	56	2124	266Ø	.42	99
23211502	1676	Z	Z	38	6Ø	1157	126Ø	.Ø6	99
42211129	58	C	B	44	44	Ø	17	.29	99
23211538	1ØØ8	H	A	5Ø	5Ø	Ø	19Ø	.19	99

NUMBER OF CASES READ = 413 NUMBER OF CASES LISTED = 413

FLOOR SPREADSHEET

Floor Type Code:

A Crawlspace (insulation under floor or overhangs)

B Slab below grade

C Slab on grade

D Heated crawlspace

E Foam insulation under slab

F Combination of floor and perimeter insulation

X Missing

Z Other

26-MAR-86 floor spreadsheet
12:00:17 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
23111514	1195	A	A	0	19	1674	2203	.44	1
23111521	960	A	A	0	19	0	376	.39	1
23111573	960	A	A	0	19	0	376	.39	1
23211562	435	A	A	0	19	0	188	.43	1
41211127	1449	A	A	0	19	0	726	.50	1
23211513	728	B	B	0	3	0	137	.19	2
23211550	988	B	B	0	5	0	482	.49	2
41211254	106	B	B	0	5	0	50	.47	2
41211255	142	B	B	0	5	0	113	.80	2
41211267	170	B	B	0	5	0	63	.37	2
23211506	988	B	B	0	6	0	397	.40	2
23211536	1344	B	B	0	6	0	319	.24	2
23211566	988	B	B	0	6	0	494	.50	2
23211530	576	B	B	0	6	0	237	.41	2
23211549	1146	B	B	0	6	1536	2055	.45	2
23211524	646	B	B	0	7	0	232	.36	2
23211553	918	B	B	0	10	0	641	.70	3
23211563	296	B	B	0	10	0	315	1.06	3
41111178	74	B	B	0	10	0	102	1.38	3
41211192	136	B	B	0	10	0	95	.70	3
41211193	136	B	B	0	10	0	104	.76	3
41211197	163	B	B	0	10	0	154	.94	3
41211203	140	B	B	0	10	0	262	1.87	3
42211121	128	B	B	0	10	0	450	3.52	3
42211147	144	B	B	0	10	0	268	1.86	3
41211166	76	B	B	0	10	0	70	.92	3
41211202	72	B	B	0	10	0	199	2.76	3
42211017	912	B	B	0	12	14	321	.34	3
42211264	82	B	B	0	12	0	202	2.46	3
23111574	256	B	B	0	15	0	410	1.60	4
23211516	152	B	B	0	15	0	331	2.18	4
23211518	268	B	B	0	15	0	465	1.74	4
23211551	308	B	B	0	15	0	375	1.22	4
23211572	192	B	B	0	15	0	291	1.52	4
23211564	256	B	B	0	15	0	355	1.39	4
13211118	928	B	E	0	5	0	308	.33	5
23211577	887	B	E	0	5	42	304	.30	5
23211580	1218	B	E	0	5	0	148	.12	5
23211543	1073	B	E	0	7	0	210	.20	5
23211505	1235	B	E	0	8	0	346	.28	6
12211103	2147	B	E	0	10	570	660	.04	6
23211560	1134	B	E	0	10	0	488	.43	6
23211567	1232	B	E	0	10	269	544	.22	6
13211113	1248	B	E	1	10	0	307	.25	6
13211125	660	B	E	1	10	86	958	1.32	6
23211502	1676	B	E	0	15	0	272	.16	7
23211544	188	B	E	0	15	0	220	1.17	7
23211556	200	B	E	0	17	0	221	1.11	7
42211148	1144	E	E	0	5	0	438	.38	8
41211260	1600	E	E	0	5	0	483	.30	8
41211106	1139	E	E	0	10	0	383	.34	9

26-MAR-86 floor spreadsheet
12:00:18 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
41211058	1445	E	E	0	10	0	361	.25	9
41111209	110	C	C	0	6	0	125	1.14	10
41111211	110	C	C	0	6	0	125	1.14	10
41111213	110	C	C	0	6	0	125	1.14	10
41111215	110	C	C	0	6	0	125	1.14	10
41111217	110	C	C	0	6	0	125	1.14	10
23211525	622	C	C	0	7	0	404	.65	10
41211048	65	C	C	2	5	49	108	.91	10
41211132	37	C	C	0	8	0	67	1.81	11
41211049	34	C	C	0	10	0	25	.74	11
41211069	170	C	C	0	10	0	79	.46	11
41211196	223	C	C	0	10	0	522	2.34	11
42211096	106	C	C	0	10	0	105	.99	11
42211148	44	C	C	0	10	0	46	1.05	11
42211283	12	C	C	0	10	0	17	1.42	11
42211284	12	C	C	0	10	0	17	1.42	11
41211060	68	C	C	0	10	0	68	1.00	11
41211124	140	C	C	0	10	0	365	2.61	11
41211220	140	C	C	0	10	0	133	.95	11
41211246	110	C	C	0	10	0	267	2.43	11
42211206	128	C	C	0	10	0	132	1.03	11
41211158	187	C	C	0	12	0	242	1.29	11
42211285	12	C	C	0	12	0	17	1.42	11
41211156	79	C	C	0	12	0	92	1.16	11
42311224	40	C	C	0	12	0	100	2.50	11
42311270	58	C	C	0	12	0	181	3.12	11
42211085	136	C	C	0	15	0	291	2.14	12
41311205	32	C	C	0	16	0	62	1.94	12
41211086	174	B	B	5	10	105	214	.63	13
41211055	116	B	B	5	10	35	61	.22	13
23211571	264	B	B	5	12	84	150	.25	13
32211299	870	B	B	6	12	59	168	.13	13
41211164	75	B	B	6	12	68	136	.91	13
41211081	169	C	C	4	8	356	942	3.47	14
41211050	84	C	C	4	8	15	40	.30	14
31211145	1688	C	C	4	10	0	577	.34	14
41211133	188	C	C	4	10	1160	1629	2.49	14
31211183	58	C	C	4	10	0	60	1.03	14
41211058	51	C	C	5	10	55	90	.69	14
41211119	108	C	C	5	10	80	160	.74	14
41211182	192	C	C	5	10	163	301	.72	14
41211260	272	C	C	5	10	164	373	.77	14
42211035	44	C	C	5	10	32	48	.36	14
41211149	80	C	C	5	10	120	209	1.11	14
41311189	35	C	C	5	10	48	79	.89	14
42211044	150	C	C	5	12	47	106	.39	14
31211133	624	C	C	6	10	100	157	.09	14
32211232	1804	C	C	6	10	173	506	.18	14
41111239	94	C	C	6	10	0	222	2.36	14
41211032	135	C	C	6	10	110	252	1.05	14
41211072	173	C	C	6	10	101	291	1.10	14

26-MAR-86 floor spreadsheet
12:00:18 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
31211128	215	C	C	6	10	332	415	.39	14
32211310	162	C	C	6	10	57	246	1.17	14
41111028	128	C	C	6	10	81	263	1.42	14
41211025	73	C	C	6	10	52	104	.71	14
41211047	148	C	C	6	12	240	386	.99	14
41211157	116	C	C	6	12	178	242	.55	14
41211163	112	C	C	6	12	56	112	.50	14
41111151	148	C	C	5	15	84	436	2.38	15
41211073	130	C	C	5	15	94	472	2.91	15
41211108	146	C	C	5	15	140	651	3.50	15
42211130	71	C	C	5	15	178	303	1.76	15
31211248	1380	C	C	6	16	160	910	.54	15
31211399	1089	C	C	6	16	130	775	.59	15
41211162	137	C	C	7	15	65	130	.47	15
41111045	1271	A	A	11	19	278	459	.14	16
41111174	1435	A	A	11	19	0	125	.09	16
41111176	1299	A	A	11	19	0	104	.08	16
41211005	1230	A	A	11	19	277	447	.14	16
41211008	1280	A	A	11	19	299	416	.09	16
41211013	1248	A	A	11	19	1176	1312	.11	16
41211014	1649	A	A	11	19	454	648	.12	16
41211016	771	A	A	11	19	261	456	.25	16
41211018	824	A	A	11	19	242	415	.21	16
41211023	1327	A	A	11	19	248	388	.11	16
41211024	1327	A	A	11	19	248	388	.11	16
41211025	560	A	A	11	19	191	291	.18	16
41211026	989	A	A	11	19	180	239	.06	16
41211031	1628	A	A	11	19	344	490	.09	16
41211038	1430	A	A	11	19	366	506	.10	16
41211040	840	A	A	11	19	827	960	.16	16
41211055	696	A	A	11	19	834	972	.20	16
41211059	1210	A	A	11	19	165	307	.12	16
41211060	704	A	A	11	19	171	241	.10	16
41211062	1008	A	A	11	19	272	435	.16	16
41211063	1008	A	A	11	19	272	435	.16	16
41211065	1144	A	A	11	19	308	493	.16	16
41211067	1406	A	A	11	19	343	537	.14	16
41211068	1284	A	A	11	19	306	414	.08	16
41211074	1176	A	A	11	19	179	338	.14	16
41211075	1176	A	A	11	19	179	338	.14	16
41211076	1176	A	A	11	19	179	338	.14	16
41211077	1176	A	A	11	19	179	338	.14	16
41211082	1124	A	A	11	19	1543	1256	-0.26	16
41211090	1462	A	A	11	19	323	506	.13	16
41211120	1023	A	A	11	19	308	357	.05	16
41211123	1058	A	A	11	19	264	360	.09	16
41211146	1288	A	A	11	19	250	406	.12	16
41211165	360	A	A	11	19	74	106	.09	16
41211166	260	A	A	11	19	106	129	.09	16
41211180	1750	A	A	11	19	499	734	.13	16
41211183	1558	A	A	11	19	378	405	.02	16

26-MAR-86 floor spreadsheet
12:00:18 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
41211184	1062	A	A	11	19	254	369	.11	16
41211195	1011	A	A	11	19	176	477	.30	16
41211201	1936	A	A	11	19	265	411	.08	16
41211202	665	A	A	11	19	157	225	.10	16
41211204	1120	A	A	11	19	265	381	.10	16
41211246	572	A	A	11	19	100	175	.13	16
41211257	1605	A	A	11	19	573	720	.09	16
41211259	1376	A	A	11	19	620	740	.09	16
41211265	2078	A	A	11	19	457	789	.16	16
41211271	1541	A	A	11	19	444	592	.10	16
41211275	1390	A	A	11	19	441	684	.17	16
41211276	1630	A	A	11	19	510	791	.17	16
41211277	1445	A	A	11	19	422	654	.16	16
41211675	1188	A	A	11	19	260	367	.09	16
41211677	1913	A	A	11	19	360	580	.12	16
41311189	1118	A	A	11	19	2886	3029	.13	16
41311258	1395	A	A	11	19	576	649	.05	16
41311676	1406	A	A	11	19	312	440	.09	16
42111021	130	A	A	11	19	32	41	.07	16
42211004	130	A	A	11	19	32	41	.07	16
42211037	108	A	A	11	19	27	34	.06	16
42211041	288	A	A	11	19	58	93	.12	16
42211042	288	A	A	11	19	58	93	.12	16
42211141	612	A	A	11	19	113	175	.10	16
42211241	208	A	A	11	19	50	67	.08	16
42311224	341	A	A	11	19	85	109	.07	16
41111178	553	A	A	11	19	0	169	.31	16
41111239	85	A	A	11	19	16	27	.13	16
41211047	193	A	A	11	19	65	85	.10	16
41211081	396	A	A	11	19	97	141	.11	16
41211086	35	A	A	11	19	16	35	.54	16
41211203	555	A	A	11	19	132	209	.14	16
41211254	651	A	A	11	19	100	168	.10	16
41211255	392	A	A	11	19	93	150	.15	16
42211011	64	A	A	11	22	25	36	.17	16
41211171	1937	A	A	11	24	710	1334	.32	17
41111235	660	A	A	11	25	163	570	.62	17
41111237	1314	A	A	11	25	289	732	.34	17
41211020	1021	A	A	11	25	312	657	.34	17
41211084	1425	A	A	11	25	1781	1787	.00	17
41211097	1611	A	A	11	25	526	841	.20	17
41211225	2535	A	A	11	25	532	1329	.31	17
41211256	1021	A	A	11	25	312	609	.29	17
41211261	1418	A	A	11	25	650	889	.17	17
42211206	952	A	A	11	25	209	446	.25	17
41211095	1110	A	A	11	26	300	571	.24	17
41211220	20	A	A	11	28	25	40	.75	18
32211423	495	A	A	11	30	826	1616	1.60	18
41211001	1152	A	A	11	30	591	879	.25	18
41211002	1495	A	A	11	30	791	1374	.39	18
41211006	1521	A	A	11	30	983	1416	.28	18

26-MAR-86 floor spreadsheet
12:00:19 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
41211009	1222	A	A	11	30	851	1077	.18	18
41211012	1491	A	A	11	30	365	716	.24	18
41211027	1452	A	A	11	30	781	1345	.39	18
41211033	734	A	A	11	30	776	957	.25	18
41211036	1388	A	A	11	30	1001	1519	.37	18
41211039	893	A	A	11	30	290	651	.40	18
41211050	325	A	A	11	30	78	211	.41	18
41211051	1875	A	A	11	30	389	756	.20	18
41211053	1580	A	A	11	30	544	998	.29	18
41211070	1326	A	A	11	30	320	910	.44	18
41211071	1326	A	A	11	30	320	910	.44	18
41211078	1440	A	A	11	30	400	920	.36	18
41211079	1310	A	A	11	30	903	1244	.26	18
41211087	915	A	A	11	30	210	347	.15	18
41211091	796	A	A	11	30	1426	1760	.42	18
41211092	1104	A	A	11	30	298	618	.29	18
41211093	1234	A	A	11	30	371	512	.11	18
41211094	850	A	A	11	30	0	351	.41	18
41211107	1413	A	A	11	30	333	760	.30	18
41211118	1764	A	A	11	30	324	808	.27	18
41211122	1494	A	A	11	30	379	695	.21	18
41211124	1157	A	A	11	30	197	486	.25	18
41211125	1335	A	A	11	30	7248	8150	.68	18
41211131	817	A	A	11	30	0	204	.25	18
41211132	326	A	A	11	30	0	56	.17	18
41211140	1439	A	A	11	30	576	857	.20	18
41211149	565	A	A	11	30	141	243	.18	18
41211153	1032	A	A	11	30	300	675	.36	18
41211156	1229	A	A	11	30	1062	1459	.32	18
41211159	1764	A	A	11	30	1223	1889	.38	18
41211160	1535	A	A	11	30	659	1311	.42	18
41211161	1296	A	A	11	30	258	750	.38	18
41211164	1808	A	A	11	30	443	1103	.37	18
41211168	1538	A	A	11	30	431	923	.32	18
41211169	996	A	A	11	30	269	598	.33	18
41211170	336	A	A	11	30	78	195	.35	18
41211173	1905	A	A	11	30	628	1100	.25	18
41211187	1480	A	A	11	30	234	610	.25	18
41211188	1585	A	A	11	30	294	758	.29	18
41211227	1852	A	A	11	30	389	1287	.48	18
41211244	280	A	A	11	30	63	148	.30	18
41211268	756	A	A	11	30	267	464	.26	18
41211272	1740	A	A	11	30	487	828	.20	18
41211273	1420	A	A	11	30	1585	1676	.06	18
41211274	2308	A	A	11	30	1321	1768	.19	18
41211289	1278	A	A	11	30	297	667	.29	18
41211303	1776	A	A	11	30	550	957	.23	18
41311205	32	A	A	11	30	14	15	.03	18
42211088	1314	A	A	11	30	378	538	.12	18
42211099	1247	A	A	11	30	181	455	.22	18
42211282	247	A	A	11	30	0	142	.57	18

26-MAR-86 floor spreadsheet
12:00:19 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
41211048	259	A	A	11	30	82	145	.24	18
41211119	300	A	A	11	30	675	822	.49	18
41211157	579	A	A	11	30	1024	1435	.71	18
41211158	152	A	A	11	30	39	90	.34	18
41211192	186	A	A	11	30	35	95	.32	18
41211193	186	A	A	11	30	35	95	.32	18
41211260	72	A	A	11	30	962	1013	.71	18
42211085	260	A	A	11	30	62	187	.48	18
41311167	1914	A	A	11	38	518	1416	.47	19
42211110	1820	A	A	11	38	450	1250	.44	19
42211111	3838	A	A	11	38	1056	1475	.11	19
42211134	1768	A	A	11	38	400	1110	.40	19
42211135	1768	A	A	11	38	400	1110	.40	19
42211136	1768	A	A	11	38	400	1110	.40	19
42211137	1768	A	A	11	38	400	1110	.40	19
42211138	1768	A	A	11	38	400	1110	.40	19
42211096	22	A	A	11	38	36	43	.32	19
31211177	1742	D	A	11	19	128	617	.28	20
31211260	1688	D	A	11	19	1795	2126	.20	20
31211408	1423	D	A	11	19	1897	3626	1.22	20
31211409	1917	D	A	11	19	1779	3626	.96	20
32211310	1614	D	A	11	19	130	786	.41	20
41111112	1097	D	A	11	19	142	331	.17	20
31211346	1230	A	A	19	24	492	618	.10	21
31211221	824	A	A	19	25	421	620	.24	21
31211297	768	A	A	19	25	193	300	.14	21
31211338	845	A	A	19	25	1500	1680	.21	21
12211104	256	A	A	19	30	54	90	.14	22
12211147	1493	A	A	19	30	378	630	.17	22
23211525	538	A	A	19	30	0	230	.43	22
31111218	1024	A	A	19	30	1357	1591	.23	22
31211106	1203	A	A	19	30	638	972	.28	22
31211128	1653	A	A	19	30	720	964	.15	22
31211135	672	A	A	19	30	242	355	.17	22
31211137	1700	A	A	19	30	475	1008	.31	22
31211155	1199	A	A	19	30	427	724	.25	22
31211201	1104	A	A	19	30	531	766	.21	22
31211216	1844	A	A	19	30	2542	3190	.35	22
31211253	1892	A	A	19	30	613	910	.16	22
31211271	901	A	A	19	30	750	1351	.67	22
31211424	1790	A	A	19	30	900	1170	.15	22
32211110	896	A	A	19	30	397	820	.47	22
32211162	1077	A	A	19	30	670	906	.22	22
32211186	1232	A	A	19	30	426	898	.38	22
32211289	768	A	A	19	30	650	1010	.47	22
32211427	768	A	A	19	30	1314	1563	.32	22
12211151	721	A	A	19	32	877	1077	.28	22
12211108	1042	A	A	20	30	1565	1565	.00	22
12211114	352	A	A	20	30	76	92	.05	22
23111512	1144	A	A	0	3	0	674	.59	99
23111523	1392	A	A	0	3	0	722	.52	99

26-MAR-86 floor spreadsheet
12:00:19 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
23211578	528	A	A	0	11	0	127	.24	99
23211537	152	B	B	0	0	0	26	.17	99
23211552	611	B	B	0	0	0	0	.00	99
23211561	672	B	B	0	0	0	0	.00	99
23211562	400	B	B	0	0	0	0	.00	99
23211541	1443	B	Z	0	19	0	595	.41	99
23211541	1147	C	C	0	0	0	0	.00	99
41211019	34	C	B	0	10	0	77	2.26	99
23211564	20	C	C	0	22	0	40	2.00	99
41211033	330	C	C	0	32	0	119	.36	99
23211535	768	D	D	0	3	0	474	.62	99
41211054	1013	E	E	0	14	0	777	.77	99
41211266	875	E	E	0	30	0	404	.46	99
23211535	1088	Z	Z	0	1	0	430	.40	99
23211527	1144	Z	Z	0	2	0	603	.53	99
23211509	1169	Z	Z	0	8	0	580	.50	99
23211562	170	B	B	3	3	0	0	.00	99
41211165	160	B	B	4	13	266	870	3.78	99
41211054	184	C	C	4	22	220	378	.86	99
42211130	953	C	E	5	5	220	401	.19	99
31211250	943	C	E	5	15	75	190	.12	99
41211269	1792	D	A	5	19	82	828	.42	99
32211162	268	E	E	5	15	87	143	.21	99
31211395	768	B	B	6	6	90	151	.08	99
31211166	1268	B	B	6	15	166	778	.48	99
31211270	506	E	E	6	15	117	204	.17	99
23211565	342	B	B	8	15	200	551	1.03	99
42211043	1499	D	A	8	30	200	960	.51	99
41211245	174	B	B	10	10	0	0	.00	99
41211083	200	C	C	10	10	0	0	.00	99
41211234	1780	C	E	10	10	324	900	.32	99
23211538	240	E	E	10	10	0	0	.00	99
23211539	280	E	E	10	15	225	321	.34	99
12211149	94	A	D	11	19	1662	1821	1.69	99
13211150	164	A	D	11	31	840	1146	1.87	99
42211219	542	A	Z	11	38	1941	3741	3.32	99
42211130	80	A	A	11	44	69	112	.54	99
31211134	1280	B	B	11	15	68	290	.17	99
31211183	1889	B	B	11	19	120	404	.15	99
41211127	518	D	D	11	11	250	283	.06	99
31211270	311	D	A	11	30	132	308	.57	99
13211125	400	Z	Z	11	33	758	882	.31	99
23211580	157	E	E	15	15	0	0	.00	99
11211136	1996	A	D	19	13	810	554	-0.13	99
31211101	1560	A	A	19	18	3600	3600	.00	99
23211511	648	A	A	19	19	0	0	.00	99
23211519	1356	A	A	19	19	439	439	.00	99
23211520	1200	A	A	19	19	421	421	.00	99
23211524	783	A	A	19	19	336	336	.00	99
23211530	576	A	A	19	19	169	169	.00	99
23211531	1478	A	A	19	19	0	0	.00	99

26-MAR-86 floor spreadsheet
12:00:20 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
23211549	612	A	A	19	19	251	261	.02	99
23211557	444	A	A	19	19	150	155	.01	99
31111112	1193	A	A	19	19	546	546	.00	99
31211122	1404	A	A	19	19	0	173	.12	99
31211146	832	A	A	19	19	0	0	.00	99
31211153	1334	A	A	19	19	437	437	.00	99
31211292	2480	A	A	19	19	660	852	.08	99
12211133	1396	A	D	19	19	856	856	.00	99
11111145	190	A	D	19	20	76	93	.09	99
42311270	158	A	A	19	38	38	50	.08	99
31211257	2304	B	X	19	20	0	1120	.49	99
31211265	972	B	B	19	30	375	525	.15	99
31111218	176	C	C	19	19	80	170	.51	99
23211544	608	Z	Z	19	30	218	280	.10	99
13211118	772	Z	Z	19	30	614	724	.14	99
23211560	421	Z	Z	19	30	158	244	.20	99
31211308	1085	Z	Z	19	30	384	575	.18	99
23211525	48	Z	Z	19	30	0	0	.00	99
23211572	780	Z	Z	19	30	285	468	.23	99
23211565	648	Z	Z	19	38	310	532	.34	99
12211110	1224	A	A	20	19	2201	2315	.09	99
11111106	598	A	A	20	20	123	123	.00	99
11111140	352	A	D	20	20	86	294	.59	99
11111142	382	D	D	20	20	89	95	.02	99
11111143	288	D	D	20	20	62	294	.81	99
11111153	304	D	D	20	20	65	209	.47	99
11211139	191	D	D	20	20	75	91	.08	99
11211141	207	D	D	20	20	208	75	-0.64	99
11211144	134	D	D	20	20	70	104	.25	99

NUMBER OF CASES READ = 386 NUMBER OF CASES LISTED = 386

WALL SPREADSHEET

Wall Type Code:

A Strapped wall

B Double wall

C 2 X 6, 24" on center, advanced framing

D 2 X 6, 24" on center, standard framing

E 2 X 6, 16" on center, standard framing

F 2 X 6, 24" on center, foam outside

G 2 X 6, 24" on center, foam inside

H 2 X 4, 24" on center, foam outside

I 2 X 4, 24" on center, foam inside

J Foam blocks

K 2 X 8, 24" on center, advanced framing

L 2 X 8, 16" on center, standard framing

M All weather wood foundation

N Cement, foam outside

O Cement, batt inside

P Cement, foam outside, batt inside

Q 2 X 6, 24" on center, mod. advanced framing

R 2 X 6, 24" on center, mod. advanced framing with foam inside

S 2 X 6, 24" on center, mod. advanced framing with foam outside

T Larsen truss, batt insulation

U 2 X 4, 16" on center, standard framing

V No insulation on foundation

X Missing

Z Other

AA 2 X 4, 24" on center, standard framing

BB Cement, no insulation

28-MAR-86 wall spreadsheet
16:31:30 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
31111112	1168	U	C	11	19	4063	4745	.58	1
31211128	1492	U	C	11	19	1932	2439	.34	1
31211260	1400	U	C	11	19	4546	5180	.45	1
31211297	1876	U	C	11	19	807	1090	.15	1
31211338	1712	U	C	11	19	4707	5570	.50	1
31211346	1101	U	C	11	19	1431	1572	.13	1
31211410	1000	U	C	11	19	1383	1610	.23	1
41111028	1589	U	C	11	19	4774	4976	.13	1
41111112	868	U	C	11	19	390	527	.16	1
41111209	1126	U	C	11	19	1362	1834	.42	1
41111211	1126	U	C	11	19	1362	1834	.42	1
41111213	1126	U	C	11	19	1362	1834	.42	1
41111215	1126	U	C	11	19	1362	1834	.42	1
41111217	1126	U	C	11	19	1362	1834	.42	1
41211001	1871	U	C	11	19	568	1106	.29	1
41211005	1120	U	C	11	19	595	716	.11	1
41211023	1337	U	C	11	19	964	1069	.08	1
41211024	1337	U	C	11	19	964	1069	.08	1
41211025	1546	U	C	11	19	2245	2396	.10	1
41211069	1800	U	C	11	19	1210	1461	.14	1
41211089	1215	U	C	11	19	1170	1505	.28	1
41211095	1728	U	C	11	19	3628	4757	.65	1
41211106	2874	U	C	11	19	1378	2149	.27	1
41211108	1049	U	C	11	19	842	1053	.20	1
41211146	954	U	C	11	19	2170	2166	.00	1
41211162	1830	U	C	11	19	1986	2358	.20	1
41211163	1225	U	C	11	19	412	642	.19	1
41211170	2104	U	C	11	19	1050	1263	.10	1
41211187	1185	U	C	11	19	1636	2241	.51	1
41211192	1818	U	C	11	19	716	1635	.51	1
41211193	1818	U	C	11	19	716	1635	.51	1
41211196	1507	U	C	11	19	1144	1499	.24	1
41211225	2087	U	C	11	19	1983	2616	.30	1
41211227	1712	U	C	11	19	967	1442	.28	1
41211251	1874	U	C	11	19	337	559	.12	1
41211252	1874	U	C	11	19	337	559	.12	1
41211266	2052	U	C	11	19	1009	1397	.19	1
41211267	1466	U	C	11	19	562	964	.27	1
41211268	1299	U	C	11	19	535	1001	.36	1
41211275	1266	U	C	11	19	777	1245	.37	1
41211276	1299	U	C	11	19	1136	1688	.42	1
41211277	1324	U	C	11	19	774	1334	.42	1
41211675	2007	U	C	11	19	1140	1386	.12	1
41311186	1922	U	C	11	19	766	1164	.21	1
41311676	1835	U	C	11	19	945	1274	.18	1
42211015	1860	U	C	11	19	21827	22497	.36	1
42211017	1314	U	C	11	19	12574	13035	.35	1
42211241	1346	U	C	11	19	753	1103	.26	1
42311224	1615	U	C	11	19	591	1007	.26	1
42311242	1321	U	C	11	19	742	1083	.26	1
41211259	607	U	C	11	19	84	359	.45	1

28-MAR-86 wall spreadsheet
16:31:30 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
31111218	1108	U	Q	11	19	3843	4007	.15	1
31211145	1491	U	Q	11	19	511	916	.27	1
31211216	1346	U	Q	11	19	1200	1996	.59	1
31211292	2088	U	Q	11	19	1153	1684	.25	1
31211134	2118	U	D	11	19	1004	1655	.31	2
31211135	1585	U	D	11	19	1606	2073	.29	2
31211253	2150	U	D	11	19	1338	2288	.44	2
31211270	2255	U	D	11	19	2620	3294	.30	2
31211395	1464	U	D	11	19	669	1099	.29	2
41211020	2180	U	D	11	19	931	989	.03	2
41211032	1882	U	D	11	19	0	51	.03	2
41211159	1406	U	D	11	19	2698	3336	.45	2
41211073	1136	U	D	11	19	421	597	.15	2
41211156	233	U	D	11	19	1200	1599	1.71	2
31211101	2371	U	E	11	19	5737	6585	.36	3
31211133	1520	U	E	11	19	2270	2805	.35	3
31211200	1540	U	E	11	19	1587	2505	.60	3
31211271	2105	U	E	11	19	2565	3306	.35	3
31211424	1181	U	E	11	19	1378	1594	.18	3
32211426	1766	U	E	11	19	3600	4152	.31	3
41211002	1319	U	E	11	19	687	1019	.25	3
41211087	1724	U	E	11	19	3455	4497	.60	3
41211165	3034	U	E	11	19	843	1977	.37	3
41211171	2718	U	E	11	19	1415	2157	.27	3
41211197	1544	U	E	11	19	2455	3451	.65	3
41211256	2180	U	E	11	19	932	1052	.06	3
31211257	1565	U	E	11	20	981	1424	.28	3
41211012	1228	U	G	11	24	1240	1723	.39	4
41211016	1867	U	G	11	24	915	2241	.71	4
41211027	1186	U	G	11	24	3129	4120	.84	4
41211031	2326	U	G	11	24	5898	8112	.95	4
41211038	1126	U	G	11	24	527	1035	.45	4
41211048	2381	U	G	11	24	1254	2466	.51	4
41211049	1247	U	G	11	24	858	1682	.66	4
41211050	1333	U	G	11	24	702	1547	.63	4
41211051	1448	U	G	11	24	740	1908	.81	4
41211060	1820	U	G	11	24	1150	3016	1.03	4
41211068	979	U	G	11	24	1323	1540	.22	4
41211070	1455	U	G	11	24	3184	4719	1.05	4
41211071	1455	U	G	11	24	3184	4719	1.05	4
41211092	952	U	G	11	24	4312	5256	.99	4
41211118	2237	U	G	11	24	951	1570	.28	4
41211120	1445	U	G	11	24	2132	2665	.37	4
41211122	1060	U	G	11	24	3971	4701	.69	4
41211125	2568	U	G	11	24	7341	8548	.47	4
41211126	1821	U	G	11	24	305	1359	.58	4
41211127	1290	U	G	11	24	1447	2839	1.08	4
41211132	948	U	G	11	24	0	1028	1.08	4
41211180	1256	U	G	11	24	486	1268	.62	4
41211182	1262	U	G	11	24	498	1356	.68	4
41211183	1195	U	G	11	24	618	1704	.91	4

28-MAR-86 wall spreadsheet
16:31:30 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
41211184	1970	U	G	11	24	920	2394	.75	4
41211201	2068	U	G	11	24	5226	6716	.72	4
41211202	1587	U	G	11	24	3970	5398	.90	4
41211203	1925	U	G	11	24	3805	5604	.93	4
41211204	2160	U	G	11	24	4401	6540	.99	4
41211234	2411	U	G	11	24	2599	3553	.40	4
41211254	1414	U	G	11	24	2408	3732	.94	4
41211255	1070	U	G	11	24	522	1427	.85	4
41211265	1445	U	G	11	24	6043	7667	1.12	4
41211271	2707	U	G	11	24	1093	2516	.53	4
41211273	2284	U	G	11	24	5371	6780	.62	4
41211274	1488	U	G	11	24	2450	3148	.47	4
42211129	1330	U	G	11	24	1159	2571	1.06	4
41211119	142	U	G	11	24	106	213	.75	4
31211106	1933	U	G	11	25	4898	7270	1.23	4
41111174	1255	U	G	11	25	2700	3790	.87	4
41111176	1295	U	G	11	25	2439	4003	1.21	4
41111178	1356	U	G	11	25	2747	4806	1.52	4
41211086	1651	U	G	11	25	8343	10881	1.54	4
31211155	2172	U	K	11	25	1321	1998	.31	5
42211043	1296	U	K	11	25	1330	1704	.29	5
42211096	1360	U	K	11	25	1498	1860	.27	5
42211141	1748	U	L	11	26	671	1769	.63	6
42211142	1320	U	L	11	26	662	1635	.74	6
42211143	1320	U	L	11	26	689	1544	.65	6
42211145	1320	U	L	11	26	621	1540	.70	6
42211304	1320	U	L	11	26	621	1540	.70	6
41211013	981	U	A	11	27	3073	3648	.59	7
41211014	1440	U	A	11	27	337	1470	.79	7
41211039	1841	U	A	11	27	1086	2178	.59	7
41211062	872	U	A	11	27	961	1835	1.00	7
41211063	887	U	A	11	27	1021	1885	.97	7
41211065	1156	U	A	11	27	1237	2168	.81	7
41211074	904	U	A	11	27	318	1295	1.08	7
41211075	904	U	A	11	27	318	1295	1.08	7
41211076	904	U	A	11	27	318	1295	1.08	7
41211077	904	U	A	11	27	318	1295	1.08	7
41211081	2437	U	A	11	27	5488	8544	1.25	7
41211082	1055	U	A	11	27	3037	3690	.62	7
41211084	1030	U	A	11	27	2758	3062	.30	7
41211107	1192	U	A	11	27	1576	1876	.25	7
41211153	1864	U	A	11	27	6008	8781	1.49	7
41211156	1382	U	A	11	27	2041	4128	1.51	7
41211158	1562	U	A	11	27	1426	2088	.42	7
41211259	790	U	A	11	27	135	1379	1.57	7
41211289	1075	U	A	11	27	582	1554	.90	7
41311189	1922	U	A	11	27	1260	1728	.24	7
41311205	1238	U	A	11	27	6175	7244	.86	7
42211206	1568	U	A	11	27	565	1167	.38	7
41211086	640	U	A	11	27	1138	1561	.66	7
41211090	1564	U	A	11	28	492	1899	.90	7

28-MAR-86 wall spreadsheet
16:31:30 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
41211245	1588	U	A	11	28	5679	6273	.37	7
41211269	1222	U	A	11	28	244	1618	1.12	7
41211047	1994	U	B	11	27	2693	4193	.75	8
41211072	1857	U	B	11	27	1765	4188	1.30	8
41211157	1464	U	B	11	27	4330	6263	1.32	8
31211308	1850	U	B	11	29	7911	10668	1.49	9
32211186	1933	U	B	11	30	3769	6415	1.37	9
41111045	1361	U	B	11	30	1077	1929	.63	9
41211036	1005	U	B	11	30	2948	3855	.90	9
41211260	1469	U	B	11	30	2040	2906	.59	9
41211261	1088	U	B	11	30	1170	1726	.51	9
41211246	652	U	B	11	30	112	1623	2.32	9
41211067	1283	U	B	11	32	776	1902	.88	9
31211408	1310	U	F	11	27	3282	4582	.99	10
31211409	1242	U	F	11	27	3351	4429	.87	10
41211019	1146	U	F	11	27	1532	2085	.48	10
41211078	1428	U	F	11	27	5542	6992	1.02	10
41211123	1392	U	F	11	27	943	2547	1.15	10
42211264	2062	U	F	11	27	1365	3217	.90	10
42211283	864	U	F	11	27	5562	6604	1.21	10
42211284	864	U	F	11	27	5562	6604	1.21	10
42211285	1544	U	F	11	27	5972	7267	.84	10
31211397	1492	U	G	11	27	812	2021	.81	11
41211006	1246	U	G	11	27	680	1691	.81	11
41211008	1060	U	G	11	27	423	1483	1.00	11
41211026	2412	U	G	11	27	3485	5295	.75	11
41211033	1428	U	G	11	27	708	1658	.67	11
41211040	1129	U	G	11	27	1019	2587	1.39	11
41211056	1958	U	G	11	27	35	3390	1.71	11
41211058	1201	U	G	11	27	12307	14056	1.46	11
41211124	2397	U	G	11	27	3264	5090	.76	11
41211131	1608	U	G	11	27	0	1429	.89	11
41211133	2734	U	G	11	27	8225	10379	.79	11
41211168	1211	U	G	11	27	0	0	.00	11
41211169	1529	U	G	11	27	652	1418	.50	11
41211181	1474	U	G	11	27	1509	2323	.55	11
41211188	2704	U	G	11	27	5856	8149	.85	11
41211246	1576	U	G	11	27	3813	5884	1.31	11
41211272	1519	U	G	11	27	3102	3573	.31	11
41211677	1382	U	G	11	27	4369	5685	.95	11
42111021	1515	U	G	11	27	1761	2505	.49	11
42211004	1692	U	G	11	27	1817	3156	.79	11
42211037	1692	U	G	11	27	1348	2791	.85	11
42211088	1280	U	G	11	27	319	883	.44	11
42211115	1221	U	G	11	27	2569	5231	2.18	11
42211282	1563	U	G	11	27	6058	6787	.47	11
42211011	1344	U	G	13	27	2090	3322	.92	11
42211281	1897	U	G	13	27	6376	7351	.51	11
12211146	1344	D	F	19	27	0	816	.61	12
12211148	1420	D	F	19	27	0	1152	.81	12
23211526	1159	D	F	19	27	1101	2571	1.27	12

28-MAR-86 wall spreadsheet
16:31:30 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
23211578	1127	D	F	19	27	490	741	.22	12
23211505	1040	D	B	19	37	1156	1866	.68	13
23211529	1456	D	B	19	38	700	1507	.55	13
23211519	1141	D	B	19	40	1359	2623	1.11	13
23211520	1437	D	B	19	40	1687	3028	.93	13
23211517	1158	D	B	19	41	1795	2123	.28	13
23211522	954	D	B	19	41	940	2117	1.23	13
23211560	919	D	B	19	41	735	1115	.41	13
23211563	2028	D	B	19	41	0	2823	1.39	13
13211115	2153	D	B	20	40	2246	3058	.38	13
11111145	796	E	F	19	25	546	424	-0.15	14
13211123	1104	E	F	19	25	255	690	.39	14
13211150	1104	E	F	19	25	425	760	.30	14
12211103	2546	E	B	19	33	9200	13941	1.86	15
13211113	1262	E	B	19	33	1377	1542	.13	15
23211527	1051	E	B	19	33	3131	4610	1.41	15
23211572	1296	E	B	19	33	597	2307	1.32	15
23211543	935	E	B	19	37	1058	1525	.50	16
23211571	1127	E	B	19	37	1173	1747	.51	16
13211101	1161	E	B	19	38	1084	3011	1.66	16
13211125	1449	E	B	19	38	3588	3882	.20	16
12211107	1073	E	B	19	39	815	1389	.53	16
13211118	1202	E	B	19	40	1117	2640	1.27	16
23211531	1227	E	A	19	41	2406	4246	1.50	16
23211516	1062	E	B	19	41	3359	4566	1.14	16
23211553	1243	E	B	19	41	912	2012	.88	16
23111573	872	H	F	19	27	1024	1447	.49	17
42211035	1216	U	B	11	38	2095	3122	.84	18
23211525	1701	D	B	19	33	6635	10940	2.53	19
23211554	1205	D	B	19	33	1549	2874	1.10	19
23211558	1170	D	B	19	33	2110	3598	1.27	19
23211570	1236	D	B	19	33	2889	5953	2.48	19
23211577	966	D	B	19	33	1470	2126	.68	19
23211528	1221	D	B	19	34	2206	3585	1.13	19
23211541	1092	D	B	19	34	2298	3634	1.22	19
23211581	1090	D	B	19	36	0	1501	1.38	19
11211136	1570	E	F	19	27	336	474	.09	20
12211132	700	E	F	19	27	686	1107	.60	20
12211104	1818	E	F	19	28	1911	3215	.72	20
41211164	1941	C	C	11	19	752	1204	.23	21
31211183	2225	E	E	11	19	2755	4003	.56	21
41211055	528	O	O	11	19	194	328	.25	21
41211195	1535	U	I	11	19	659	1582	.60	21
41111151	1209	U	Z	11	19	422	805	.32	21
32211232	1419	U	J	11	21	2957	3963	.71	21
41211055	1814	U	F	11	22	1336	1573	.13	21
41211091	1647	U	Z	11	23	2442	3326	.54	22
31211146	1596	U	C	11	24	2438	2977	.34	22
31211221	1728	U	F	11	24	937	1511	.33	22
41211166	1694	U	F	11	24	1640	2568	.55	22
41211244	1667	U	F	11	24	2652	3144	.30	22

28-MAR-86 wall spreadsheet
16:31:31 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
31211399	1034	U	N	11	24	1355	3940	2.50	22
41211018	1810	U	Z	11	24	910	2443	.85	22
41211053	2930	U	Z	11	24	3202	5625	.83	22
41211132	398	U	Z	11	24	0	426	1.07	22
32211427	1500	U	E	11	25	1066	2826	1.17	22
31211137	1320	U	F	11	25	1525	3816	1.74	22
31211166	1636	U	F	11	25	2793	4220	.87	22
32211423	1424	U	F	11	25	1101	2046	.66	22
42211130	2317	U	F	11	25	4981	8068	1.33	22
31211248	1328	U	N	11	25	1730	4965	2.44	22
31211250	846	U	N	11	25	1075	5266	4.95	22
31211153	1248	U	S	11	25	1304	2398	.88	22
32211162	1856	U	S	11	25	4947	4947	.00	22
32211310	1592	U	S	11	25	1521	2745	.77	22
42211003	910	U	Z	11	25	1683	2099	.46	22
42211134	1135	U	Z	11	25	575	680	.09	22
42211135	1135	U	Z	11	25	575	680	.09	22
42211136	1135	U	Z	11	25	575	680	.09	22
42211137	1135	U	Z	11	25	575	680	.09	22
42211138	1135	U	Z	11	25	575	680	.09	22
32211110	1639	U	S	11	26	763	2311	.94	22
41211083	1312	U	Z	11	26	8145	14378	4.75	22
41111235	1523	U	G	13	24	3652	4214	.37	22
41111237	1085	U	G	13	24	2782	3567	.72	22
41111239	1656	U	G	13	24	2880	3684	.49	22
42311270	1870	U	Z	13	24	1239	2539	.70	22
42111144	1320	U	L	13	26	621	1540	.70	22
41211079	1088	U	C	11	27	2499	3390	.82	23
41211160	1056	U	D	11	27	594	2142	1.47	23
31211177	2787	U	E	11	27	4593	6073	.53	23
41211009	1203	U	I	11	27	636	1573	.78	23
31211341	1762	U	R	11	27	4006	4639	.36	23
41211052	1650	U	Z	11	27	539	2855	1.40	23
41211094	1832	U	Z	11	27	0	1287	.70	23
41211097	1438	U	Z	11	27	959	2471	1.05	23
41211173	2541	U	Z	11	27	4876	11059	2.43	23
42211099	1012	U	A	11	30	2960	4712	1.73	24
42211148	1189	U	A	11	30	4262	5635	1.15	24
41211303	1654	U	G	11	30	1986	3350	.82	24
41211073	1888	U	Z	11	30	751	2207	.77	24
32211289	558	U	CC	11	31	1485	2643	2.08	24
42211147	2603	U	G	11	31	492	1997	.58	24
41211093	2733	U	K	11	31	5263	7760	.91	24
32211289	1512	U	Z	11	31	3940	5965	1.34	24
42211030	1296	U	Z	11	31	2222	3161	.72	24
42211262	1296	U	Z	11	31	2334	3364	.79	24
42211263	1296	U	Z	11	31	2334	3364	.79	24
42211041	1528	U	Z	11	32	2630	4839	1.45	24
42211042	1528	U	Z	11	32	2630	4839	1.45	24
42211219	1576	U	J	11	38	2945	5388	1.55	25
41211119	1492	U	Z	11	38	1114	3290	1.46	25

28-MAR-86 wall spreadsheet
16:31:31 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
42211110	1224	U	B	11	39	818	3064	1.83	25
42211111	1854	U	B	11	39	1229	3626	1.29	25
41211161	1754	U	B	11	41	650	2350	.97	25
42211044	1000	E	Z	13	27	360	594	.23	25
12211110	1237	D	B	19	25	2165	2932	.62	26
23311510	1119	D	B	19	25	2925	3302	.34	26
12211130	1390	D	G	19	25	2805	3265	.33	26
23211561	1182	D	C	19	26	1084	1453	.31	26
12211131	1034	E	G	19	23	2899	3370	.46	26
11211139	1218	E	S	19	25	1150	1225	.06	26
11111142	1098	E	S	19	26	800	1022	.20	26
11111140	1098	H	F	19	26	1192	1526	.30	26
11111143	978	H	F	19	26	918	651	-0.27	26
11111153	1577	H	F	19	26	1476	1175	-0.19	26
31211201	2880	U	Z	19	25	1706	3079	.48	26
11111106	1052	D	F	20	25	2312	1867	-0.42	26
11211122	2959	D	F	20	26	1935	1712	-0.08	26
12211149	1296	E	E	19	27	2393	2884	.38	27
23211513	1012	E	G	19	27	0	1189	1.17	27
11211141	1420	E	S	19	27	975	1115	.10	27
11211144	1791	E	S	19	27	978	1333	.20	27
12111117	1539	D	F	19	33	3412	4272	.56	28
23211536	1162	D	G	19	33	0	1423	1.22	28
23211507	1522	D	T	19	33	1165	2819	1.09	28
23211509	1070	D	F	19	34	767	1166	.37	28
12211121	1132	E	F	19	33	3558	4747	1.05	28
23211550	793	E	F	19	33	1888	2288	.50	28
13211119	1566	E	S	19	33	3910	4275	.23	28
12211151	988	E	A	19	34	3314	4320	1.02	28
12111152	1540	E	B	19	34	3315	4594	.83	28
12211148	423	BB	M	0	19	0	492	1.16	99
42211085	1876	U	Z	11	35	4500	7763	1.74	99
42211121	1323	U	Z	11	35	1947	3097	.87	99
41211054	2445	U	B	11	36	2703	5345	1.08	99
41311167	2299	U	T	11	49	408	2723	1.01	99
12211100	1039	E	F	15	26	1325	1373	.05	99
23111521	886	H	F	17	27	1024	1461	.49	99
23211538	895	U	F	17	26	0	340	.38	99
31211265	2590	C	C	19	19	2314	2649	.13	99
23211537	1462	D	Z	19	29	587	730	.10	99
23211524	1415	D	F	19	30	3050	3542	.35	99
23211549	2267	D	F	19	31	2782	5288	1.11	99
23211552	1962	D	Z	19	32	724	2087	.69	99
23211551	1417	D	F	19	38	1547	2065	.37	99
23211518	1411	E	E	19	19	0	0	.00	99
13211124	3760	E	B	19	31	3615	6208	.69	99
23211539	1944	E	Z	19	31	1250	2358	.57	99
23211545	1451	E	Z	19	32	552	1257	.49	99
12211147	1354	E	B	19	43	738	1899	.86	99
12211114	1143	D	C	20	31	1342	1511	.15	99
23211515	961	G	B	23	37	817	1332	.54	99

28-MAR-86 wall spreadsheet
16:31:31 Lawrence Berkeley Laboratory DEC VAX-86ØØ VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
23111574	1656	Z	Z	25	32	69Ø	1592	.54	99

NUMBER OF CASES READ = 358 NUMBER OF CASES LISTED = 358

BASEMENT WALL SPREADSHEET

Basement Wall Type Code:

A Strapped wall

B Double wall

C 2 X 6, 24" on center, advanced framing

D 2 X 6, 24" on center, standard framing

E 2 X 6, 16" on center, standard framing

F 2 X 6, 24" on center, foam outside

G 2 X 6, 24" on center, foam inside

H 2 X 4, 24" on center, foam outside

I 2 X 4, 24" on center, foam inside

J Foam blocks

K 2 X 8, 24" on center, advanced framing

L 2 X 8, 16" on center, standard framing

M All weather wood foundation

N Cement, foam outside

O Cement, batt inside

P Cement, foam outside, batt inside

Q 2 X 6, 24" on center, mod. advanced framing

R 2 X 6, 24" on center, mod. advanced framing with foam inside

S 2 X 6, 24" on center, mod. advanced framing with foam outside

T Larsen truss, batt insulation

U 2 X 4, 16" on center, standard framing

V No insulation on foundation

X Missing

Z Other

AA 2 X 4, 24" on center, standard framing

BB Cement, no insulation

26-MAR-86 basement wall spreadsheet
13:52:26 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
12211133	172	BB	O	0	11	0	99	.58	1
12111117	476	BB	O	0	12	1297	1865	1.19	1
12211151	735	BB	O	0	12	747	1032	.39	1
12111152	646	BB	O	0	13	443	883	.68	1
13211124	1656	BB	N	0	11	0	1232	.74	2
12211104	1024	BB	N	0	12	0	603	.59	2
41211019	688	V	N	0	10	0	1365	1.98	2
41211052	1200	V	N	0	10	0	1800	1.50	2
41211069	580	V	N	0	10	0	794	1.37	2
41211123	422	V	N	0	10	0	198	.47	2
41211124	864	V	N	0	10	0	547	.63	2
41211181	1325	V	N	0	10	0	1239	.94	2
42211004	333	V	N	0	10	0	521	1.56	2
42211011	608	V	N	0	10	0	823	1.35	2
42211037	333	V	N	0	10	0	495	1.49	2
41211170	616	V	N	0	11	0	312	.51	2
23211519	481	V	O	0	11	0	421	.88	2
23211520	481	V	O	0	11	0	390	.81	2
41211254	424	V	O	0	11	0	180	.42	2
41211255	1152	V	O	0	11	0	417	.36	2
41211266	856	V	O	0	11	0	192	.22	2
41211267	1212	V	O	0	11	90	489	.33	2
23211557	320	V	O	0	11	0	291	.91	2
23211577	1056	V	O	0	13	182	815	.60	2
41211158	1028	V	O	0	13	0	604	.59	2
42211147	1016	V	O	0	13	0	722	.71	2
42211264	1820	V	O	0	13	624	1188	.31	2
42211281	1136	V	O	0	13	0	681	.60	2
42211282	770	V	O	0	13	0	511	.66	2
42211283	1135	V	O	0	13	0	561	.49	2
42211284	1135	V	O	0	13	0	561	.49	2
42211285	1078	V	O	0	13	0	294	.27	2
12211146	292	BB	O	0	18	0	120	.41	3
12211114	947	BB	O	0	19	444	693	.26	3
23111574	453	BB	O	0	19	0	451	1.00	3
23211524	399	BB	O	0	19	0	219	.55	3
23211563	1175	BB	O	0	19	0	1129	.96	3
23211545	433	BB	O	0	19	0	457	1.06	3
11211122	772	BB	O	0	20	427	484	.07	3
23211531	595	V	O	0	19	123	523	.67	3
42111144	506	V	O	0	19	0	511	1.01	3
42211030	1532	V	O	0	19	52	971	.60	3
42211141	264	V	O	0	19	0	273	1.03	3
42211142	506	V	O	0	19	0	514	1.02	3
42211143	506	V	O	0	19	0	591	1.17	3
42211145	506	V	O	0	19	0	512	1.01	3
42211262	1532	V	O	0	19	52	971	.60	3
42211263	1532	V	O	0	19	52	971	.60	3
42211304	506	V	O	0	19	0	512	1.01	3
42311224	617	V	O	0	19	137	384	.40	3
13211125	485	BB	O	1	20	258	316	.12	3

26-MAR-86 basement wall spreadsheet
13:52:27 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
41211133	668	N	N	4	10	512	1131	.93	4
41211058	841	N	N	5	10	393	724	.39	4
41211086	496	N	N	5	10	280	559	.56	4
41211106	540	N	N	5	10	562	1158	1.10	4
41311189	141	N	N	5	10	369	401	.23	4
12211110	1185	M	M	10	19	405	523	.10	5
41211089	218	M	M	11	19	152	187	.16	5
42211015	936	M	M	11	19	0	300	.32	5
42211017	496	M	M	11	19	98	131	.07	5
42211035	812	M	M	11	19	242	347	.13	5
41211220	288	M	M	11	22	75	306	.80	5
23211509	470	O	O	11	19	162	292	.28	6
23211515	1078	O	O	11	19	454	558	.10	6
23211551	466	O	O	11	19	263	378	.25	6
23211570	1062	O	O	11	19	1148	1893	.70	6
31211134	724	O	O	11	19	205	369	.23	6
41211197	652	O	O	11	19	145	215	.11	6
41211245	704	O	O	11	19	380	418	.05	6
41211260	1264	O	O	11	19	2107	2941	.66	6
42211003	1120	O	O	11	19	350	316	-0.03	6
42211096	840	O	O	11	19	353	380	.03	6
42211148	784	O	O	11	19	162	224	.08	6
42211206	1024	O	O	11	19	225	358	.13	6
42211241	496	O	O	11	19	328	1066	1.49	6
42311242	496	O	O	11	19	328	1068	1.49	6
23211578	170	O	O	11	19	41	55	.08	6
11211136	382	BB	Z	0	10	0	327	.86	7
41211268	1040	U	O	0	11	0	308	.30	7
41211073	1040	V	U	0	11	0	595	.57	7
12211121	1400	X	X	0	12	695	1373	.48	7
42111021	380	Z	N	0	10	0	1235	3.25	7
13211119	620	BB	O	0	15	1153	1932	1.26	8
41211048	570	V	Z	0	16	0	635	1.11	8
41211049	908	V	Z	0	16	0	612	.67	8
41211244	471	V	Z	0	16	645	957	.66	8
23211537	624	BB	U	0	17	0	845	1.35	9
12211149	228	BB	M	0	19	1828	2113	1.25	9
11111106	322	BB	M	0	20	72	123	.16	9
23211502	1288	BB	Z	0	22	0	602	.47	9
23211529	736	V	Z	0	22	0	0	.00	9
13211113	888	V	M	2	19	3420	2347	-1.21	9
13211118	933	BB	Z	0	28	103	1022	.98	10
12211103	1361	BB	M	0	30	3550	3897	.25	10
12211107	1298	BB	O	0	30	0	706	.54	10
13211115	262	BB	O	0	30	406	586	.69	10
13211101	1168	BB	A	.	19	280	1093	.70	99
23111512	420	O	B	.	0	103	0	-0.25	99
41211203	191	V	N	0	5	0	110	.58	99
41211202	95	V	Z	0	5	0	66	.69	99
42311270	1128	V	P	0	23	0	1141	1.01	99
42211129	496	V	Z	0	24	0	1226	2.47	99

26-MAR-86 basement wall spreadsheet
13:52:27 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPRVAL	MCSRVAL	CP$	MCS$	INCOST$	GRP
23211516	553	V	B	0	38	429	1059	1.14	99
31211341	914	N	O	6	11	124	1040	1.00	99
42211130	800	N	N	8	15	673	1141	.59	99
12211100	1406	M	M	10	26	152	278	.09	99
41211126	200	N	N	10	10	0	0	.00	99
23211539	870	N	N	10	15	890	1340	.52	99
23211544	470	N	N	10	15	379	467	.19	99
23211535	396	N	N	10	18	0	530	1.34	99
23211518	1075	N	O	10	19	184	647	.43	99
23211517	1436	O	O	10	30	364	1313	.66	99
23211553	837	O	O	10	30	0	393	.47	99
23211525	395	Z	Z	10	22	317	448	.33	99
42211115	816	M	M	11	13	86	286	.25	99
31211270	172	N	N	11	10	161	222	.35	99
31211257	648	N	N	11	11	0	100	.15	99
41211195	516	N	N	11	11	0	0	.00	99
32211289	288	N	Z	11	12	675	1514	2.91	99
23211530	252	O	O	11	11	118	118	.00	99
31211166	1170	O	O	11	11	1952	2114	.14	99
41211192	605	O	O	11	11	0	0	.00	99
41211193	605	O	O	11	11	0	0	.00	99
41211047	560	O	O	11	13	310	355	.08	99
41211056	1088	O	O	11	13	0	100	.09	99
41211156	440	O	O	11	13	106	133	.06	99
41211157	144	O	O	11	13	40	53	.09	99
31211145	1490	O	N	11	15	103	141	.03	99
23211558	390	O	P	11	16	0	444	1.14	99
23211550	919	O	P	11	17	0	644	.70	99
42211041	396	O	Z	11	18	388	682	.74	99
42211042	396	O	Z	11	18	388	682	.74	99
31211200	617	O	N	11	19	299	437	.22	99
41211166	568	O	N	11	20	431	1200	1.35	99
41211132	432	O	Z	11	24	0	308	.71	99
42211121	512	O	Z	11	26	505	1210	1.38	99
41311205	1264	O	J	11	29	5698	8824	2.47	99
31211308	408	O	O	11	29	100	374	.67	99
32211299	872	O	M	11	31	2723	2778	.06	99
31111218	352	U	Q	11	19	1006	1093	.25	99
23111514	449	Z	Z	12	10	955	532	-0.94	99
41111178	256	O	Z	13	18	0	21	.08	99
23111523	468	Z	V	15	0	403	0	-0.86	99
23211541	460	D	D	19	19	0	0	.00	99
23211516	608	E	N	19	16	1819	1001	-1.35	99
12211131	468	M	M	19	30	3496	3571	.16	99
23211526	538	O	Z	19	17	284	1182	1.67	99
23211565	906	O	Z	19	20	1957	2825	.96	99
23211528	629	Z	Z	22	33	187	334	.23	99

NUMBER OF CASES READ = 149 NUMBER OF CASES LISTED = 149

WINDOW SPREADSHEET

Window Type Code:

A Aluminum slider

B Wood slider

C Aluminum casement

D Wood casement

E Aluminum fixed

F Wood fixed

G Aluminum

H Wood

I Aluminum, thermal break

J Aluminum, heat mirror

K Wood, heat mirror

L Wood, awning

M Aluminum, awning

N Wood, double hung

O Aluminum, double hung

X Missing

Z Other

26-MAR-86 window spreadsheet
14:26:05 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	PANES	CP$	MCS$	INCOST$	GRP
12211108	106	A	I	.470	.370	3	851	1175	3.06	1
12211121	262	B	K	.470	.300	3	3439	4034	2.27	1
23211516	171	B	B	.470	.368	3	1441	1775	1.95	1
23211548	223	D	D	.470	.350	3	3995	4619	2.80	1
23211513	259	D	D	.470	.370	3	0	237	.92	1
23211577	85	D	D	.470	.370	3	1260	1624	4.28	1
13211101	139	H	D	.470	.310	3	660	1649	7.12	1
12211149	156	I	I	.470	.350	3	715	1142	2.74	1
12211103	527	K	K	.470	.250	3	8000	11000	5.69	1
12211133	180	A	I	.560	.290	3	1372	2234	4.79	2
12111152	192	A	I	.560	.370	3	2660	2946	1.49	2
12211147	136	A	I	.560	.370	3	778	1272	3.63	2
13211150	194	A	I	.560	.370	3	952	1249	1.53	2
12211146	220	A	I	.560	.390	3	0	0	.00	2
41211072	197	H	H	.560	.340	3	2035	2488	2.30	3
41211019	366	H	H	.560	.380	3	4043	5404	3.72	3
41211036	278	H	H	.560	.380	3	3745	4596	3.06	3
41211123	290	H	H	.560	.380	3	0	774	2.67	3
41211133	494	H	H	.560	.380	3	5100	6950	3.74	3
41211234	321	H	H	.560	.380	3	8075	10488	7.52	3
41211274	168	H	H	.560	.380	3	2308	2684	2.24	3
41211149	478	H	K	.560	.340	3	6662	9198	5.31	4
41211260	393	H	K	.560	.340	3	6168	8806	6.71	4
41211303	484	H	K	.560	.340	3	9000	12770	7.79	4
42211043	160	H	K	.560	.380	3	1215	1580	2.28	4
41211008	161	H	K	.560	.480	3	1111	2009	5.58	4
12211100	116	A	A	.056	.350	3	598	907	2.66	5
41211140	223	H	Z	.560	.340	2	3407	3785	1.70	5
41211171	433	H	Z	.560	.340	2	0	1240	2.86	5
41311205	318	H	J	.560	.360	3	2546	3856	4.12	5
12111117	189	A	F	.560	.370	3	1334	1460	.67	6
12211151	146	B	I	.560	.380	3	2960	2500	-3.15	6
42211035	268	D	D	.560	.480	2	1241	1316	.28	7
41211053	500	H	H	.560	.480	2	6581	7199	1.24	7
41211163	167	H	H	.560	.480	2	1383	1538	.93	7
42211115	267	H	H	.560	.480	2	306	726	1.57	7
42211116	224	H	H	.560	.480	2	1601	2161	2.50	7
41211127	198	I	I	.560	.480	3	1743	2072	1.66	7
42211134	220	I	J	.680	.370	3	1400	1700	1.36	8
42211136	220	I	J	.680	.370	3	1400	1700	1.36	8
42211137	220	I	J	.680	.370	3	1400	1700	1.36	8
42211138	220	I	J	.680	.370	3	1400	1700	1.36	8
31211271	242	A	A	.700	.370	3	925	2006	4.47	9
31211338	162	A	A	.700	.390	3	1196	1960	4.72	9
32211426	171	A	A	.700	.440	3	1509	2393	5.17	9
31211338	80	O	O	.700	.390	3	589	964	4.69	9
41211005	122	A	A	.740	.350	3	1213	1370	1.29	9
41111237	189	A	A	.740	.410	3	874	1553	3.59	9
41211047	402	A	A	.740	.410	3	2882	3940	2.63	9
41211160	160	A	A	.740	.410	3	596	1311	4.47	9
41211183	143	A	A	.740	.410	3	698	1169	3.29	9

24-APR-86 window spreadsheet
12:09:57 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	PANES	CP$	MCS$	INCOST$	GRP
42211141	96	A	A	.740	.410	3	497	786	3.01	9
42211141	33	A	A	.740	.410	3	178	419	7.30	9
42211141	75	E	E	.740	.310	3	160	222	.83	9
31211403	448	A	I	.700	.470	2	3245	4316	2.39	10
31211260	197	A	I	.700	.500	2	856	1178	1.63	10
31211270	232	G	I	.700	.370	2	0	2474	10.66	10
31211397	181	G	I	.700	.380	2	1092	1798	3.90	10
31211253	397	G	I	.700	.470	2	0	240	.60	10
41211039	259	G	I	.740	.540	2	1656	2532	3.38	10
41211122	201	G	I	.740	.540	2	1184	1576	1.95	10
41211124	382	G	I	.740	.540	2	2400	2659	.68	10
41211201	248	G	I	.740	.540	2	1733	2240	2.04	10
41211251	188	G	I	.740	.540	2	850	1400	2.93	10
41211252	188	G	I	.740	.540	2	850	1400	2.93	10
41211254	194	G	I	.740	.540	2	1024	1395	1.91	10
41211006	217	G	I	.740	.550	2	1759	1925	.76	10
41211013	167	G	I	.740	.550	2	810	1374	3.38	10
41211048	193	G	I	.740	.560	2	990	1283	1.52	10
41211084	130	G	I	.740	.560	2	750	1648	6.91	10
41211132	268	G	I	.740	.560	2	0	590	2.20	10
41211203	287	G	I	.740	.560	2	1813	2614	2.79	10
41211204	246	G	I	.740	.560	2	1696	2271	2.34	10
41211225	287	G	I	.740	.560	2	1686	2792	3.85	10
41211227	251	G	I	.740	.560	2	1349	2128	3.10	10
41311205	35	G	I	.740	.560	2	510	570	1.71	10
41211128	283	G	I	.740	.740	2	0	0	.00	10
31211408	175	A	J	.700	.378	2	1118	2557	8.22	11
31211409	223	A	I	.700	.380	2	1181	3084	8.53	11
31211257	573	G	J	.700	.470	2	1251	1829	1.01	11
31211182	226	D	D	.700	.440	2	0	100	.44	12
31211341	555	H	H	.700	.330	2	7505	10089	4.66	12
31211106	266	H	H	.700	.350	2	2109	2864	2.84	12
31211135	252	H	H	.700	.450	2	0	180	.71	12
32211423	363	H	H	.700	.470	2	0	320	.88	12
31211106	159	H	H	.700	.470	2	1261	1377	.73	12
32211299	276	H	H	.700	.490	2	0	700	2.54	12
31211395	288	H	H	.700	.500	2	2400	3156	2.62	12
31211106	268	H	H	.700	.550	2	2130	2324	.72	12
31211248	241	G	H	.700	.450	2	1200	1800	2.49	13
31211399	159	G	H	.700	.450	2	1100	1590	3.08	13
31211101	363	G	H	.700	.470	2	1850	5933	11.25	13
31211145	535	G	H	.700	.470	2	1360	1360	.00	13
31211166	366	G	H	.700	.490	2	1356	2695	3.66	13
41211056	338	G	H	.740	.480	2	0	1500	4.44	13
41211081	364	G	H	.740	.480	2	4625	7666	8.35	13
41211677	180	G	H	.740	.480	2	2175	2448	1.52	13
41211023	185	G	H	.740	.490	2	958	2432	7.97	13
41211086	435	G	H	.740	.560	2	3402	5902	5.75	13
31211155	365	A	I	.700	.430	3	1855	3654	4.93	14
31211145	49	A	I	.700	.470	3	167	370	4.14	14
32211110	191	G	I	.700	.370	3	1687	2283	3.12	14

26-MAR-86 window spreadsheet
14:26:05 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	PANES	CP$	MCS$	INCOST$	GRP
31211308	204	G	I	.700	.490	3	1853	3346	7.32	14
12211132	258	A	I	.740	.390	3	1708	2426	2.78	14
42211219	192	G	I	.740	.340	3	1803	1970	.87	14
41211087	238	G	I	.740	.390	3	1277	1784	2.13	14
41211261	160	G	I	.740	.400	3	982	1320	2.11	14
42211044	215	G	I	.740	.400	3	803	1451	3.01	14
41111213	111	G	I	.740	.410	3	702	1299	5.38	14
41211002	183	G	I	.740	.410	3	1048	1572	2.86	14
41211016	202	G	I	.740	.410	3	1186	1550	1.80	14
41211018	155	G	I	.740	.410	3	977	1488	3.30	14
41211020	212	G	I	.740	.410	3	781	1263	2.27	14
41211040	175	G	I	.740	.410	3	975	1213	1.36	14
41211059	164	G	I	.740	.410	3	852	1767	5.58	14
41211119	108	G	I	.740	.410	3	600	1076	4.41	14
41211126	318	G	I	.740	.410	3	1816	2492	2.13	14
41211256	212	G	I	.740	.410	3	781	1263	2.27	14
42211015	168	G	I	.740	.410	3	1008	1273	1.58	14
42211017	154	G	I	.740	.410	3	1008	1273	1.72	14
42211241	186	G	I	.740	.410	3	930	1336	2.18	14
42311224	404	G	I	.740	.410	3	1990	2706	1.77	14
42311242	211	G	I	.740	.410	3	958	1394	2.07	14
41211180	218	G	I	.740	.420	3	1203	2074	4.00	14
41111209	111	G	I	.740	.480	3	702	1299	5.38	14
41111211	111	G	I	.740	.480	3	702	1299	5.38	14
41111215	111	G	I	.740	.480	3	702	1299	5.38	14
41111217	111	G	I	.740	.480	3	702	1299	5.38	14
41211001	237	G	I	.740	.480	3	0	1229	5.19	14
41211055	314	G	I	.740	.480	3	1896	2823	2.95	14
41211095	224	G	I	.740	.480	3	1200	1506	1.37	14
41211106	266	G	I	.740	.480	3	1306	3144	6.91	14
41211118	275	G	I	.740	.480	3	1508	2838	4.84	14
41211166	400	G	I	.740	.480	3	3323	4122	2.00	14
41211188	267	G	I	.740	.480	3	1808	3028	4.57	14
41211259	381	G	I	.740	.480	3	1650	1906	.67	14
41311186	376	G	I	.740	.480	3	2213	2951	1.96	14
42211206	279	G	I	.740	.480	2	2231	3289	3.79	14
42311270	305	G	I	.740	.480	3	1410	2399	3.24	14
41211024	185	G	I	.740	.490	3	958	1471	2.77	14
41211092	128	G	I	.740	.490	3	468	793	2.54	14
32211289	313	A	I	.750	.370	3	2295	4221	6.15	14
31211146	204	A	I	.780	.370	3	931	1745	3.99	14
31211221	162	A	I	.780	.370	3	796	1191	2.44	14
31211267	130	A	I	.780	.370	3	649	1066	3.21	14
31211268	145	A	I	.780	.370	3	699	1091	2.70	14
41211195	293	G	J	.710	.360	3	1651	2711	3.62	15
41111151	165	G	J	.740	.360	3	687	1475	4.78	15
41211014	250	G	J	.740	.360	3	737	2105	5.47	15
41211063	132	G	J	.740	.360	3	709	1249	4.09	15
41211065	166	G	J	.740	.360	3	803	1529	4.37	15
41211083	230	G	J	.740	.360	3	1202	2533	5.79	15
41211108	191	G	J	.740	.360	3	1051	2110	5.54	15

26-MAR-86 window spreadsheet
14:26:Ø6 Lawrence Berkeley Laboratory DEC VAX-86ØØ VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	PANES	CP$	MCS$	INCOST$	GRP
41211192	4Ø1	G	J	.74Ø	.36Ø	3	2198	3592	3.48	15
41211193	4Ø1	G	J	.74Ø	.36Ø	3	2198	3592	3.48	15
41211246	253	G	J	.74Ø	.36Ø	3	2215	2464	.98	15
41211275	168	G	J	.74Ø	.36Ø	3	935	1967	6.14	15
41211276	229	G	J	.74Ø	.36Ø	3	1352	2477	4.91	15
41211277	143	G	J	.74Ø	.36Ø	3	816	1547	5.11	15
42111Ø21	171	G	J	.74Ø	.36Ø	3	1Ø34	159Ø	3.25	15
42211Ø37	171	G	J	.74Ø	.36Ø	3	1114	1711	3.49	15
42211121	174	G	J	.74Ø	.36Ø	3	925	1825	5.17	15
42211129	252	G	J	.74Ø	.36Ø	3	1Ø25	2364	5.31	15
41211Ø62	144	G	J	.74Ø	.39Ø	3	392	55Ø	1.1Ø	15
41211187	138	G	K	.74Ø	.31Ø	3	1Ø72	36Ø4	18.35	16
42211111Ø	26Ø	G	K	.74Ø	.34Ø	3	3Ø75	4924	7.11	16
42211111	354	G	K	.74Ø	.34Ø	3	4935	743Ø	7.Ø5	16
41211Ø27	17Ø	G	H	.74Ø	.38Ø	3	93Ø	1853	5.43	17
41211Ø52	312	G	H	.74Ø	.38Ø	3	4215	6683	7.91	17
42211Ø85	22Ø	G	H	.74Ø	.38Ø	3	2262	4517	1Ø.25	17
41211273	284	G	H	.74Ø	.48Ø	3	1783	3586	6.35	17
31211Ø2Ø1	392	C	D	.7ØØ	.47Ø	2	26ØØ	4911	5.9Ø	18
32211426	12	E	E	.7ØØ	.57Ø	2	1Ø6	168	5.17	18
31211134	435	G	K	.7ØØ	.39Ø	2	2624	526Ø	6.Ø6	18
32211186	223	H	K	.7ØØ	.37Ø	2	1438	3511	9.3Ø	18
41211Ø48	82	A	D	.74Ø	.48Ø	2	48Ø	11ØØ	7.56	18
41211Ø7Ø	184	A	A	.74Ø	.54Ø	2	11Ø5	183Ø	3.94	18
41211Ø71	184	A	A	.74Ø	.54Ø	2	11Ø5	183Ø	3.94	18
41211269	148	A	A	.74Ø	.54Ø	2	11Ø7	1378	1.83	18
41211ØØ9	158	A	A	.74Ø	.55Ø	2	8Ø2	984	1.15	18
31211122	37Ø	A	B	.74Ø	.56Ø	2	2998	3895	2.42	18
31211137	27Ø	A	B	.74Ø	.56Ø	2	1845	2711	3.21	18
41211261	34	A	A	.74Ø	.74Ø	2	Ø	Ø	.ØØ	18
31111112	148	A	B	.7ØØ	.32Ø	3	78Ø	2335	1Ø.51	19
31211177	299	A	Z	.7ØØ	.37Ø	3	1629	3425	6.Ø1	19
31211ØØØ	36Ø	C	D	.7ØØ	.46Ø	3	5135	5957	2.28	19
32211131Ø	314	D	D	.7ØØ	.37Ø	3	3657	4389	2.33	19
31211265	261	H	H	.7ØØ	.34Ø	3	476Ø	596Ø	4.6Ø	19
32211427	288	H	H	.7ØØ	.37Ø	3	463Ø	5836	4.19	19
32211426	48	Z	Z	.7ØØ	.44Ø	3	424	672	5.17	19
41211168	173	G	Z	.74Ø	.41Ø	3	Ø	728	4.21	19
41211169	185	G	Z	.74Ø	.41Ø	3	Ø	541	2.92	19
42211Ø11	171	I	J	.74Ø	.36Ø	3	1Ø34	159Ø	3.25	19
31211141Ø	161	D	D	.17Ø	.47Ø	2	Ø	216	1.34	99
12211Ø7	182	I	I	.37Ø	.37Ø	3	2322	2281	-Ø.23	99
13211124	538	D	D	.41Ø	.41Ø	2	7532	7532	.ØØ	99
13211118	217	I	I	.44Ø	.44Ø	3	2189	2854	3.Ø6	99
11111145	139	D	D	.45Ø	.45Ø	2	2375	2375	.ØØ	99
11111153	169	D	D	.45Ø	.45Ø	2	1521	1521	.ØØ	99
11211138	81	D	D	.45Ø	.45Ø	2	1377	1377	.ØØ	99
11211139	192	D	D	.45Ø	.45Ø	2	3264	3264	.ØØ	99
11211141	149	D	D	.45Ø	.45Ø	2	2533	2533	.ØØ	99
11211144	156	D	D	.45Ø	.45Ø	2	2652	2652	.ØØ	99
23211501	156	D	D	.45Ø	.45Ø	2	Ø	Ø	.ØØ	99

26-MAR-86 window spreadsheet
14:26:06 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	PANES	CP$	MCS$	INCOST$	GRP
12211114	173	A	I	.470	.350	2	1231	1670	2.54	99
23211545	42	B	B	.470	.330	2	645	771	3.00	99
23211502	245	D	D	.470	.310	2	4463	4925	1.89	99
13211115	346	D	D	.470	.430	2	6105	6105	.00	99
11111140	192	D	D	.470	.450	2	1728	1728	.00	99
11111143	104	D	D	.470	.450	2	936	936	.00	99
11211122	115	D	D	.470	.470	2	2024	2024	.00	99
23211519	130	D	D	.470	.470	2	0	0	.00	99
23211520	130	D	D	.470	.470	2	0	0	.00	99
23211561	151	D	D	.470	.470	2	0	0	.00	99
11111106	198	O	D	.470	.470	2	2593	2593	.00	99
41211131	111	B	B	.480	.480	2	0	0	.00	99
41211131	50	F	F	.480	.480	2	0	0	.00	99
41211181	326	H	H	.480	.480	2	0	0	.00	99
41211267	248	H	H	.480	.480	2	0	130	.52	99
11211136	290	D	D	.490	.490	2	4502	4502	.00	99
41211031	260	H	H	.490	.490	2	80	475	1.52	99
41211073	415	H	H	.490	.490	2	0	725	1.75	99
11111140	80	A	A	.530	.530	2	220	220	.00	99
11111143	40	A	A	.530	.530	2	291	291	.00	99
11111153	40	A	A	.530	.530	2	262	262	.00	99
11211141	40	A	A	.530	.530	2	491	491	.00	99
11211144	80	A	A	.530	.530	2	495	495	.00	99
11211139	80	A	I	.530	.530	2	485	485	.00	99
11111145	40	E	E	.530	.530	2	474	474	.00	99
11211138	40	I	I	.530	.530	2	281	281	.00	99
11111145	20	L	L	.530	.530	2	250	250	.00	99
42211088	160	H	H	.540	.360	3	1677	2215	3.36	99
31211195	372	H	H	.540	.540	2	4900	5175	.74	99
41211187	40	H	H	.540	.540	2	286	730	11.10	99
23111523	125	B	K	.550	.350	2	1244	3023	14.23	99
12211102	328	A	J	.560	.290	2	0	1020	3.11	99
11111142	92	A	D	.560	.450	2	3281	3281	.00	99
42211147	169	B	B	.560	.560	2	0	622	3.68	99
41211082	129	H	H	.560	.560	2	15	50	.27	99
41211182	206	H	H	.560	.560	2	0	0	.00	99
41211265	248	H	H	.560	.560	2	4675	5606	3.75	99
41211266	330	H	H	.560	.560	2	0	286	.87	99
41211268	233	H	H	.560	.560	2	0	162	.70	99
41211271	427	H	H	.560	.560	2	0	240	.56	99
42311306	353	H	H	.560	.560	2	1720	2312	1.68	99
41211201	34	Z	Z	.560	.560	2	796	679	-3.44	99
41211078	179	H	H	.570	.490	2	2300	2780	2.68	99
12211151	45	A	A	.640	.640	2	771	771	.00	99
31211250	89	D	D	.650	.470	2	740	885	1.63	99
42211004	171	I	J	.680	.360	3	1034	1590	3.25	99
42211135	220	I	J	.680	.360	3	1400	1700	1.36	99

NUMBER OF CASES READ = 251 NUMBER OF CASES LISTED = 251

AIR INFILTRATION BARRIER SPREADSHEET

Air Infiltration Barrier Type Code:

A Polyethylene under sheetrock

B Foam

C Paint

D Exterior plywood

E Polyethylene between double wall

F Polyethylene between strapped wall

G Polyethylene under slab floor

H A and B

I D and G

J Polyethylene under subfloor

K Airtight drywall

L Craft or foil-faced insulation

M Building paper on exterior

N L and M

O None

X Missing

Z Other

CCPTYPE Ceiling component type - current practice

CMCSTYPE Ceiling component type - MCS

WCPTYPE Window component type - current practice

WMCSTYPE Window component type - MCS

FCPTYPE Floor component type - current practice

FMCSTYPE Floor component type - MCS

26-MAR-86 Infiltration barrier spreadsheet
14:45:28 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CCPTYPE	WCPTYPE	FCPTYPE	CMCSTYPE	WMCSTYPE	FMCSTYPE	CP$	MCS$	INCOST$	GRP
31111218	2858	L	L	L	B	B	B	278	413	.05	1
31211122	6086	L	L	L	B	B	B	188	784	.10	1
31211137	4720	L	L	L	B	B	B	178	891	.15	1
31211216	5084	L	L	L	B	B	B	0	80	.02	1
31211221	3488	L	L	L	B	B	B	9	364	.10	1
31211146	3260	B	B	B	B	B	B	9	180	.05	2
31211166	5766	B	B	B	B	B	B	20	385	.06	2
31211257	7612	B	B	B	B	B	B	47	207	.02	2
31211395	4449	B	B	B	B	B	B	20	615	.13	2
31111112	3554	B	B	B	B	B	B	75	430	.10	2
31211106	6088	B	B	B	B	B	B	12	479	.08	2
31211135	3083	B	B	B	B	B	B	0	77	.02	2
31211177	6330	B	B	B	B	B	B	0	173	.03	2
31211182	4876	B	B	B	B	B	B	48	205	.03	2
31211292	7103	B	B	B	B	B	B	175	474	.04	2
31211297	3412	B	B	B	B	B	B	30	177	.04	2
31211308	6027	B	B	B	B	B	B	70	208	.02	2
31211346	3764	B	B	B	B	B	B	98	289	.05	2
31211408	4331	B	B	B	B	B	B	0	204	.05	2
31211409	5299	B	B	B	B	B	B	0	211	.04	2
32211110	3834	B	B	B	B	B	B	0	252	.07	2
32211186	5220	B	B	B	B	B	B	26	605	.11	2
32211299	6234	B	B	B	B	B	B	401	725	.05	2
32211310	5145	B	B	B	B	B	B	70	451	.07	2
32211423	3063	B	B	B	B	B	B	0	210	.07	2
23211536	5104	O	A	G	A	A	G	72	586	.10	3
23211543	3168	O	A	G	A	A	G	63	563	.16	3
23211552	4145	O	A	G	A	A	G	97	763	.16	3
23211570	5271	O	A	G	A	A	G	487	1563	.20	3
23111521	3350	O	A	O	A	A	J	54	423	.11	4
23211511	5110	O	A	O	A	A	J	104	926	.16	4
23211519	4334	O	A	O	A	A	J	242	1190	.22	4
23211520	4384	O	A	O	A	A	J	257	1863	.37	4
23211557	4688	O	A	O	A	A	J	429	1507	.23	4
23211560	3335	O	A	O	A	A	J	555	949	.12	4
42211135	4671	O	A	O	A	A	J	240	365	.03	4
23111574	4524	O	A	O	A	A	G	107	660	.12	5
23211515	4279	O	A	O	A	A	G	165	645	.11	5
23211516	4767	O	A	O	A	A	G	371	853	.10	5
23211518	5084	O	A	O	A	A	G	64	1751	.33	5
23211522	4148	O	A	O	A	A	G	282	1260	.24	5
23211537	4774	O	A	O	A	A	G	0	355	.07	5
23211545	3858	O	A	O	A	A	G	105	1029	.24	5
41211073	9609	O	A	O	A	A	G	148	1638	.16	5
41111112	3062	O	A	O	A	A	D	43	585	.18	6
41211074	3256	O	A	O	A	A	D	55	672	.19	6
41211075	3256	O	A	O	A	A	D	55	672	.19	6
41211076	3256	O	A	O	A	A	D	55	672	.19	6
41211077	3256	O	A	O	A	A	D	55	672	.19	6
42211110	4864	O	A	O	A	A	D	82	543	.09	6
42211111	9530	O	A	O	A	A	D	165	1030	.09	6

26-MAR-86 infiltration barrier spreadsheet
14:45:29 Lawrence Berkeley Laboratory DEC VAX-86ØØ VMS V4.1

SITEID	AREA	CCPTYPE	WCPTYPE	FCPTYPE	CMCSTYPE	WMCSTYPE	FMCSTYPE	CP$	MCS$	INCOST$	GRP
11111140	4498	O	L	O	K	K	K	0	80	.02	7
11111143	3370	O	L	O	K	K	K	0	80	.02	7
11111153	3495	O	L	O	K	K	K	0	80	.02	7
11211138	3249	O	L	O	K	K	K	0	80	.02	7
11211139	3650	O	L	O	K	K	K	0	80	.02	7
11211141	5200	O	L	O	K	K	K	0	80	.02	7
11211144	3652	O	L	O	K	K	K	0	130	.04	7
12211133	4006	O	L	O	K	K	K	0	523	.13	7
12211108	3076	O	L	O	A	E	D	534	604	.02	8
13211115	4806	O	L	O	A	E	D	78	2370	.48	8
13211118	4607	O	L	O	A	E	D	313	563	.05	8
12211131	3738	O	L	O	A	B	D	0	327	.09	9
41211201	5940	O	L	O	A	B	D	80	940	.14	9
41211204	4400	O	L	O	A	B	D	32	616	.13	9
42211134	4671	O	L	O	A	A	J	240	365	.03	10
42211136	4671	O	L	O	A	A	J	240	365	.03	10
42211137	4671	O	L	O	A	A	J	240	365	.03	10
42211138	4671	O	L	O	A	A	J	240	365	.03	10
12211151	4503	O	L	O	A	A	I	169	395	.05	11
41211055	5000	O	L	O	A	A	I	72	698	.13	11
41211166	4334	O	L	O	A	A	I	0	2649	.61	11
41311186	4258	O	L	O	A	A	I	0	1149	.27	11
12111117	4019	O	L	O	A	A	G	86	451	.09	12
12111152	4470	O	L	O	A	A	G	120	395	.06	12
12211102	3981	O	L	O	A	A	G	0	280	.07	12
12211104	4214	O	L	O	A	A	G	0	720	.17	12
12211107	4441	O	L	O	A	A	G	56	271	.05	12
12211121	5232	O	L	O	A	A	G	175	687	.10	12
12211146	4520	O	L	O	A	A	G	0	0	.00	12
12211148	3593	O	L	O	A	A	G	0	112	.03	12
13211119	4394	O	L	O	A	A	G	0	482	.11	12
13211128	5804	O	L	O	A	A	G	231	395	.03	12
42311242	2769	O	L	O	A	A	G	200	1190	.36	12
11111106	4514	O	L	O	A	A	D	150	553	.09	13
11211122	7075	O	L	O	A	A	D	135	425	.04	13
12211100	2787	O	L	O	A	A	D	92	353	.09	13
12211110	3715	O	L	O	A	A	D	95	921	.22	13
12211114	4495	O	L	O	A	A	D	30	949	.20	13
12211147	4340	O	L	O	A	A	D	60	310	.06	13
12211149	3088	O	L	O	A	A	D	94	254	.05	13
13211123	3658	O	L	O	A	A	D	76	304	.06	13
13211150	3692	O	L	O	A	A	D	56	396	.09	13
41211048	5459	O	O	O	H	B	I	0	703	.13	14
41211053	6090	O	O	O	H	B	I	70	1400	.22	14
41211132	3982	O	O	O	H	B	I	0	866	.22	14
41211169	4288	O	O	O	H	B	I	0	596	.14	14
41211081	5087	O	O	O	A	F	I	2879	4059	.23	15
41211158	4618	O	O	O	A	F	I	0	0	.00	15
41311258	4686	O	O	O	A	F	I	98	510	.09	15
41211014	4738	O	O	O	A	F	D	62	815	.16	16
41211039	3866	O	O	O	A	F	D	0	1759	.45	16

26-MAR-86 Infiltration barrier spreadsheet
14:45:29 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CCPTYPE	WCPTYPE	FCPTYPE	CMCSTYPE	WMCSTYPE	FMCSTYPE	CP$	MCS$	INCOST$	GRP
41211082	3303	O	O	O	A	F	D	1940	2483	.16	16
41211084	3880	O	O	O	A	F	D	129	1548	.37	16
41211090	4488	O	O	O	A	F	D	65	1036	.22	16
41211107	4018	O	O	O	A	F	D	20	466	.11	16
41211153	3928	O	O	O	A	F	D	230	799	.14	16
41211257	4686	O	O	O	A	F	D	98	485	.08	16
41211269	4806	O	O	O	A	F	D	3	808	.17	16
41211050	3731	O	O	O	A	B	I	0	398	.11	17
41211056	7926	O	O	O	A	B	I	60	1926	.24	17
41211060	4675	O	O	O	A	B	I	2821	4379	.33	17
41211126	4996	O	O	O	A	B	I	0	463	.09	17
41211133	6310	O	O	O	A	B	I	276	5718	.86	17
41211254	5378	O	O	O	A	B	I	0	642	.12	17
42211041	3874	O	O	O	A	B	I	186	757	.15	17
42211042	3886	O	O	O	A	B	I	186	757	.15	17
42211115	5147	O	O	O	A	B	I	84	1901	.35	17
42211281	5877	O	O	O	A	B	I	153	495	.06	17
41111239	3314	O	O	O	A	B	G	0	940	.28	18
41211181	4807	O	O	O	A	B	G	0	1289	.27	18
41211182	4230	O	O	O	A	B	G	0	986	.23	18
41211192	3805	O	O	O	A	B	G	0	705	.19	18
41211193	3805	O	O	O	A	B	G	0	738	.19	18
41211195	3210	O	O	O	A	B	G	0	651	.20	18
41211220	4082	O	O	O	A	B	G	0	858	.21	18
41211234	6086	O	O	O	A	B	G	110	1828	.28	18
42111021	3849	O	O	O	A	B	G	43	761	.19	18
42211004	3913	O	O	O	A	B	G	0	655	.17	18
42211011	4149	O	O	O	A	B	G	55	1100	.25	18
42211037	4083	O	O	O	A	B	G	43	584	.13	18
42211044	3812	O	O	O	A	B	G	0	284	.07	18
42211121	3832	O	O	O	A	B	G	0	1425	.37	18
42211129	3864	O	O	O	A	B	G	537	1973	.37	18
42311270	6033	O	O	O	A	B	G	0	711	.12	18
41111174	4125	O	O	O	A	B	D	0	574	.14	19
41111176	3893	O	O	O	A	B	D	0	573	.15	19
41111235	2767	O	O	O	A	B	D	0	1111	.40	19
41111237	3722	O	O	O	A	B	D	0	1760	.47	19
41211006	4288	O	O	O	A	B	D	110	683	.13	19
41211008	3620	O	O	O	A	B	D	0	318	.09	19
41211009	3647	O	O	O	A	B	D	20	458	.12	19
41211012	4210	O	O	O	A	B	D	773	1390	.15	19
41211016	3687	O	O	O	A	B	D	0	676	.18	19
41211018	3737	O	O	O	A	B	D	0	361	.10	19
41211026	4488	O	O	O	A	B	D	117	965	.19	19
41211027	4648	O	O	O	A	B	D	99	1100	.22	19
41211031	5818	O	O	O	A	B	D	420	2070	.28	19
41211033	1556	O	O	O	A	B	D	35	633	.38	19
41211038	4215	O	O	O	A	B	D	0	648	.15	19
41211040	2809	O	O	O	A	B	D	27	613	.21	19
41211051	5198	O	O	O	A	B	D	0	622	.12	19
41211068	3547	O	O	O	A	B	D	40	901	.24	19

24-APR-86 Infiltration barrier spreadsheet
13:55:52 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CCPTYPE	WCPTYPE	FCPTYPE	CMCSTYPE	WMCSTYPE	FMCSTYPE	CP$	MCS$	INCOST$	GRP
41211070	4107	O	O	O	A	B	D	50	1062	.25	19
41211071	4107	O	O	O	A	B	D	50	1062	.25	19
41211079	3712	O	O	O	A	B	D	90	461	.10	19
41211093	5201	O	O	O	A	B	D	79	988	.17	19
41211120	3874	O	O	O	A	B	D	186	1543	.35	19
41211125	4784	O	O	O	A	B	D	508	2399	.40	19
41211131	3222	O	O	O	A	B	D	0	406	.13	19
41211160	4126	O	O	O	A	B	D	31	861	.20	19
41211173	5923	O	O	O	A	B	D	0	1585	.27	19
41211183	4394	O	O	O	A	B	D	0	445	.10	19
41211184	4460	O	O	O	A	B	D	0	454	.10	19
41211265	5292	O	O	O	A	B	D	50	1554	.28	19
41211271	5699	O	O	O	A	B	D	0	956	.17	19
41211272	4920	O	O	O	A	B	D	0	410	.08	19
41211273	5196	O	O	O	A	B	D	25	954	.18	19
41211677	5168	O	O	O	A	B	D	80	1495	.27	19
41111028	3976	O	O	O	A	A	I	84	823	.19	20
41211025	4378	O	O	O	A	A	I	55	1199	.26	20
41211078	4308	O	O	O	A	A	I	122	936	.19	20
41211156	5655	O	O	O	A	A	I	0	1232	.22	20
41211165	6563	O	O	O	A	A	I	8310	9173	.13	20
41211259	4964	O	O	O	A	A	I	112	633	.10	20
41211266	5253	O	O	O	A	A	I	0	1446	.28	20
42211116	6108	O	O	O	A	A	I	84	2341	.37	20
42211141	4252	O	O	O	A	A	I	20	607	.14	20
42211206	6416	O	O	O	A	A	I	0	1049	.16	20
42211282	4731	O	O	O	A	A	I	128	357	.05	20
42311306	3619	O	O	O	A	A	I	91	2066	.55	20
41111151	4053	O	O	O	A	A	G	2890	3636	.18	21
41111209	2590	O	O	O	A	A	G	0	215	.08	21
41111211	2590	O	O	O	A	A	G	0	215	.08	21
41111213	2590	O	O	O	A	A	G	0	215	.08	21
41111215	2590	O	O	O	A	A	G	0	215	.08	21
41111217	2590	O	O	O	A	A	G	0	215	.08	21
41211032	3736	O	O	O	A	A	G	0	1050	.28	21
41211069	5442	O	O	O	A	A	G	0	810	.15	21
41211106	5692	O	O	O	A	A	G	202	1126	.16	21
41211108	3748	O	O	O	A	A	G	0	349	.09	21
41211162	4600	O	O	O	A	A	G	0	901	.20	21
41211163	2635	O	O	O	A	A	G	0	670	.25	21
41211164	6597	O	O	O	A	A	G	0	951	.14	21
41211196	4575	O	O	O	A	A	G	0	652	.14	21
41211267	4139	O	O	O	A	A	G	50	1156	.27	21
41311205	4792	O	O	O	A	A	G	0	2036	.42	21
42211015	4862	O	O	O	A	A	G	0	1363	.28	21
42211017	3634	O	O	O	A	A	G	0	1502	.41	21
42211030	4669	O	O	O	A	A	G	26	690	.14	21
42211035	5008	O	O	O	A	A	G	19	743	.14	21
42211142	3776	O	O	O	A	A	G	22	717	.18	21
42211143	3730	O	O	O	A	A	G	20	759	.20	21
42211145	3776	O	O	O	A	A	G	22	680	.17	21

24-APR-86 infiltration barrier spreadsheet
13:55:52 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CCPTYPE	WCPTYPE	FCPTYPE	CMCSTYPE	WMCSTYPE	FMCSTYPE	CP$	MCS$	INCOST$	GRP
42211262	4669	O	O	O	A	A	G	26	690	.14	21
42211263	4669	O	O	O	A	A	G	26	690	.14	21
42211283	4083	O	O	O	A	A	G	150	465	.08	21
42211284	4083	O	O	O	A	A	G	150	465	.08	21
42211285	4937	O	O	O	A	A	G	129	473	.07	21
42311224	6440	O	O	O	A	A	G	0	1209	.19	21
11211136	5562	O	O	O	A	A	D	0	192	.03	22
41211001	4175	O	O	O	A	A	D	108	1051	.23	22
41211002	4273	O	O	O	A	A	D	0	495	.12	22
41211005	3580	O	O	O	A	A	D	26	449	.12	22
41211013	3649	O	O	O	A	A	D	12	477	.13	22
41211020	4212	O	O	O	A	A	D	60	253	.05	22
41211023	4718	O	O	O	A	A	D	26	581	.12	22
41211024	4718	O	O	O	A	A	D	26	581	.12	22
41211062	2888	O	O	O	A	A	D	0	68	.02	22
41211063	2918	O	O	O	A	A	D	0	79	.03	22
41211065	3474	O	O	O	A	A	D	0	113	.03	22
41211089	2704	O	O	O	A	A	D	0	554	.20	22
41211092	3160	O	O	O	A	A	D	118	474	.11	22
41211097	4660	O	O	O	A	A	D	124	1748	.35	22
41211123	4369	O	O	O	A	A	D	0	1134	.26	22
41211146	3530	O	O	O	A	A	D	60	395	.09	22
41211161	4346	O	O	O	A	A	D	0	545	.13	22
41211168	4287	O	O	O	A	A	D	0	534	.12	22
41211180	4756	O	O	O	A	A	D	20	503	.10	22
41211187	3850	O	O	O	A	A	D	119	1417	.34	22
41211225	7157	O	O	O	A	A	D	210	1672	.20	22
41211227	5416	O	O	O	A	A	D	191	1451	.23	22
41211252	4389	O	O	O	A	A	D	0	1815	.41	22
41211256	4212	O	O	O	A	A	D	60	393	.08	22
41211275	4046	O	O	O	A	A	D	0	1023	.25	22
41211276	4467	O	O	O	A	A	D	0	1024	.23	22
41211277	4214	O	O	O	A	A	D	0	758	.18	22
41211289	3631	O	O	O	A	A	D	0	1063	.29	22
41211675	4383	O	O	O	A	A	D	0	547	.12	22
41311676	4647	O	O	O	A	A	D	0	705	.15	22
42211043	4294	O	O	O	A	A	D	0	1124	.26	22
32211423	3063	L	L	B	A	A	B	0	397	.13	23
31211270	4575	L	L	D	L	A	D	0	180	.04	23
31211145	6641	L	L	D	A	A	B	0	407	.06	23
31211410	2301	L	L	G	K	K	G	10	332	.14	23
31211133	3094	L	L	G	A	A	G	0	431	.14	23
31211200	4088	L	L	J	L	L	J	110	493	.09	23
31211183	6635	L	L	J	L	L	G	210	493	.04	23
31211135	3083	L	L	L	N	N	L	132	442	.10	23
31211271	4240	L	L	L	L	L	L	0	364	.09	23
31211408	4331	L	L	L	L	L	D	37	0	-0.01	23
31211403	5974	L	L	L	K	K	Z	21	433	.07	23
31211297	3412	L	L	L	K	K	L	0	510	.15	23
31211409	5299	L	L	L	K	K	D	49	490	.08	23
32211310	5145	L	L	L	A	A	L	25	540	.10	23

24-APR-86 infiltration barrier spreadsheet
13:55:52 Lawrence Berkeley Laboratory DEC VAX-86ØØ VMS V4.1

SITEID	AREA	CCPTYPE	WCPTYPE	FCPTYPE	CMCSTYPE	WMCSTYPE	FMCSTYPE	CP$	MCS$	INCOST$	GRP
31211397	4666	L	L	L	A	A	J	Ø	4Ø2	.Ø9	23
41311167	58Ø1	L	L	L	A	A	D	75	694	.11	23
31111112	3554	L	L	O	L	L	L	115	278	.Ø5	23
31211253	6583	L	L	O	K	K	K	Ø	626	.1Ø	23
41211124	7Ø65	L	L	O	H	B	I	Ø	1Ø51	.15	23
41211261Ø	5744	L	L	O	A	A	I	354	21ØØ	.3Ø	23
41211261	3924	L	L	O	A	A	D	122	422	.Ø8	23
31211177	633Ø	M	M	D	N	N	D	Ø	572	.Ø9	24
31211153	39Ø8	M	M	D	H	H	L	181	683	.13	24
31211341	6471	M	M	G	M	M	G	12Ø	332	.Ø3	24
32211186	522Ø	M	M	J	K	K	K	Ø	629	.12	24
32211111	4428	M	M	J	A	A	J	251	1158	.2Ø	24
3221111Ø	3834	M	M	J	A	A	H	Ø	755	.2Ø	24
31211134	6ØØØ	N	N	B	K	K	G	2Ø2	1416	.2Ø	25
31211248	4Ø88	N	N	B	B	B	B	45	7Ø	.Ø1	25
31211399	3212	N	N	B	B	B	B	45	7Ø	.Ø1	25
32211299	6234	N	N	G	A	A	G	2Ø8	2557	.38	25
31211292	71Ø3	N	N	J	N	N	J	155	227	.Ø1	25
31211128	5Ø68	N	N	L	N	N	A	128	47Ø	.Ø7	25
3121138Ø8	6Ø27	N	N	L	A	A	J	Ø	658	.11	25
31211Ø6	6Ø88	N	N	L	A	A	B	12Ø	635	.Ø8	25
32211427	3362	N	N	N	A	A	J	31Ø	722	.12	25
3121128Ø1	5188	N	N	Z	A	A	C	Ø	29Ø	.Ø6	25
23211517	5992	O	A	O	A	E	G	728	1311	.1Ø	26
42211Ø88	39Ø8	O	A	O	A	B	D	68	856	.2Ø	26
23111514	3816	O	A	O	A	A	Z	434	13Ø4	.23	26
232115Ø9	2744	O	A	O	A	A	Z	Ø	1236	.45	26
13211Ø1	4729	O	A	O	A	A	B	26Ø	61Ø	.Ø7	26
41211Ø87	3882	O	L	O	H	A	D	8Ø	1481	.36	27
13211124	6271	O	L	O	B	A	G	Ø	1278	.2Ø	27
12211138Ø	334Ø	O	L	O	A	O	D	Ø	212	.Ø6	27
41211178Ø	6156	O	L	O	A	L	I	1Ø	131	.Ø2	27
41211Ø86	5742	O	L	O	A	H	I	8Ø7	2532	.3Ø	27
41211282	3745	O	L	O	A	B	I	22	19ØØ	.5Ø	27
13211125	4254	O	L	O	A	A	Z	121	784	.16	27
42211241	3ØØ2	O	L	O	A	A	H	2ØØ	1257	.35	27
12211Ø3	7782	O	L	O	A	A	B	3Ø5	359Ø	.42	27
12211132	4781	O	L	O	A	A	B	51	482	.Ø9	27
41211Ø72	4269	O	O	G	H	F	G	2Ø5	1526	.31	28
41211Ø83	4696	O	O	G	A	Z	G	189	829	.14	28
41211255	2919	O	O	G	A	H	I	25	892	.3Ø	28
41311189	5Ø63	O	O	G	A	F	I	73	713	.13	28
41211Ø52	6585	O	O	G	A	A	I	268	991	.11	28
42211264	9674	O	O	G	A	A	I	134	1186	.11	28
41211Ø19	43Ø1	O	O	G	A	A	G	188	521	.Ø8	28
41211197	5712	O	O	G	A	A	G	64	8Ø7	.13	28
42211Ø85	3892	O	O	I	B	B	I	83	853	.2Ø	28
42211148	4531	O	O	O	Z	F	G	1Ø3	1851	.39	28
11111142	4492	O	O	O	K	K	K	Ø	8Ø	.Ø2	28
11111145	3778	O	O	O	K	K	K	Ø	8Ø	.Ø2	28
32211162	5168	O	O	O	H	H	H	Ø	1216	.24	28

24-APR-86 infiltration barrier spreadsheet
13:55:52 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CCPTYPE	WCPTYPE	FCPTYPE	CMCSTYPE	WMCSTYPE	FMCSTYPE	CP$	MCS$	INCOST$	GRP
42211003	4456	O	O	O	H	F	G	0	1363	.31	28
41211118	5765	O	O	O	H	B	D	0	606	.11	28
41211149	4607	O	O	O	B	B	I	485	547	.01	28
41211058	4640	O	O	O	B	B	G	0	2117	.46	28
41211303	5206	O	O	O	B	B	D	0	1375	.26	28
41211059	3805	O	O	O	A	Z	D	29	811	.21	28
41211140	4893	O	O	O	A	Z	D	0	217	.04	28
41211159	4934	O	O	O	A	L	D	258	899	.13	28
41211171	6592	O	O	O	A	L	D	0	689	.10	28
41211246	4156	O	O	O	A	H	I	40	1553	.36	28
41211047	5398	O	O	O	A	E	I	0	1640	.30	28
41211157	4685	O	O	O	A	E	I	0	1104	.24	28
41211054	5506	O	O	O	A	E	G	906	3091	.40	28
41211067	4095	O	O	O	A	E	D	0	559	.14	28
41211036	3886	O	O	O	A	E	A	0	1048	.27	28
41211203	4027	O	O	O	A	B	H	0	1478	.37	28
41211049	4805	O	O	O	A	B	B	0	490	.10	28
42211219	4246	O	O	O	A	B	B	290	1474	.28	28
42111144	2801	O	O	O	A	A	O	22	681	.24	28
42211147	4698	O	O	O	A	A	O	0	1735	.37	28
42211304	3776	O	O	O	A	A	O	22	680	.17	28
41111045	3903	O	O	O	A	A	J	80	715	.16	28
41211091	3660	O	O	O	A	A	A	30	1293	.35	28
41211094	3564	O	O	O	A	A	A	0	960	.27	28
41211245	5664	A	A	G	A	F	G	0	1680	.30	99
42211130	5667	A	A	G	A	A	G	5473	7698	.39	99
32211426	5770	A	A	L	A	A	L	334	462	.02	99
42211099	3506	A	A	O	A	A	D	99	350	.07	99
41211119	3330	A	L	O	H	B	I	1000	1845	.25	99
41211244	1300	A	O	O	A	B	I	576	1444	.67	99
31211341	6471	B	B	B	K	K	G	0	312	.05	99
31211250	1886	B	B	B	C	Z	J	40	80	.02	99
31211338	3376	B	B	J	K	K	J	200	647	.13	99
31211270	4575	B	N	B	B	B	B	25	413	.08	99
31211424	1998	C	O	O	C	O	O	59	609	.28	99
32211289	5622	L	N	L	A	Z	O	60	760	.12	99
31211155	5257	M	L	L	L	C	L	802	119	-0.13	99
31211346	3764	M	L	O	N	N	L	245	316	.02	99
41211122	4048	O	A	G	A	B	D	553	1291	.18	99
13211113	2496	O	L	G	A	E	H	244	786	.22	99
41211188	5641	O	L	L	A	B	D	0	1218	.22	99
41211127	4188	O	X	O	A	B	D	628	1280	.16	99
23211538	2911	X	A	G	A	A	G	0	1431	.49	99
23211527	5460	X	A	X	A	B	G	143	1356	.22	99
23211539	6105	X	A	X	A	B	G	0	927	.15	99
23111573	2792	X	A	X	A	A	J	54	459	.15	99
23211551	3755	X	A	X	A	A	G	129	736	.16	99
23211577	3885	X	A	X	A	A	G	114	374	.07	99
41211158	1028	X	O	X	X	A	X	0	0	.00	99
41111178	4068	X	X	D	A	B	I	0	598	.15	99
23211560	1134	X	X	G	X	X	G	227	247	.02	99

24-APR-86 infiltration barrier spreadsheet
13:55:53 Lawrence Berkeley Laboratory DEC VAX-86ØØ VMS V4.1

NUMBER OF CASES READ = 357 NUMBER OF CASES LISTED = 357

DOOR SPREADSHEET

Door Type Code:

A Insulated clad foam core

B Wood solid core

C Wood hollow core

D A and B

E A in both MCS and Current Practice

F B in both MCS and Current Practice

X Missing

Z Other

26-MAR-86 door spreadsheet
15:00:23 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	CP$	MCS$	INCOST$	GRP
23111574	40	A	A	0	0	70	84	.35	1
23211526	43	A	A	0	0	0	0	.00	1
23211558	41	A	A	0	0	0	0	.00	1
23211572	43	A	A	0	0	70	84	.33	1
23211578	41	A	A	0	0	923	923	.00	1
23211531	40	A	A	0	0	730	855	3.13	1
23211570	81	A	A	0	0	0	0	.00	1
23211502	77	A	A	0	0	0	0	.00	1
23211507	60	A	A	0	0	0	0	.00	1
23211515	39	A	A	0	0	439	439	.00	1
23211518	38	A	A	0	0	0	0	.00	1
23211528	40	A	A	0	0	0	0	.00	1
23211538	40	A	A	0	0	0	0	.00	1
23211541	22	A	A	0	0	0	0	.00	1
23211544	58	A	A	0	0	320	320	.00	1
23211547	38	A	A	0	0	889	909	.53	1
23211552	44	A	A	0	0	40	54	.32	1
23211556	20	A	A	0	0	0	0	.00	1
41111028	40	A	A	0	0	490	491	.03	1
41111151	38	A	A	0	0	76	175	2.61	1
41111174	20	A	A	0	0	0	0	.00	1
41111176	20	A	A	0	0	0	0	.00	1
41111178	40	A	A	0	0	0	0	.00	1
41111239	20	A	A	0	0	0	0	.00	1
41211001	37	A	A	0	0	0	0	.00	1
41211019	20	A	A	0	0	0	30	1.50	1
41211020	88	A	A	0	0	905	935	.34	1
41211032	40	A	A	0	0	0	16	.40	1
41211038	20	A	A	0	0	0	0	.00	1
41211055	80	A	A	0	0	848	896	.60	1
41211056	95	A	A	0	0	0	0	.00	1
41211058	18	A	A	0	0	0	0	.00	1
41211059	40	A	A	0	0	0	120	3.00	1
41211062	20	A	A	0	0	180	219	1.95	1
41211063	37	A	A	0	0	180	247	1.81	1
41211065	37	A	A	0	0	180	247	1.81	1
41211067	40	A	A	0	0	53	90	.93	1
41211069	95	A	A	0	0	0	0	.00	1
41211071	40	A	A	0	0	460	545	2.13	1
41211083	58	A	A	0	0	286	308	.38	1
41211089	40	A	A	0	0	0	0	.00	1
41211108	40	A	A	0	0	90	190	2.50	1
41211120	38	A	A	0	0	0	57	1.50	1
41211122	40	A	A	0	0	0	86	2.15	1
41211123	40	A	A	0	0	0	65	1.63	1
41211125	74	A	A	0	0	983	941	-0.57	1
41211126	40	A	A	0	0	500	552	1.30	1
41211131	60	A	A	0	0	0	24	.40	1
41211158	60	A	A	0	0	0	61	1.02	1
41211161	20	A	A	0	0	0	50	2.50	1
41211162	74	A	A	0	0	670	925	3.45	1

26 MAR 86 User Spreadsheet
15:00:23 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	CP$	MCS$	INCOST$	GRP
41211163	40	A	A	0	0	0	54	1.35	1
41211164	80	A	A	0	0	563	735	2.15	1
41211168	40	A	A	0	0	0	0	.00	1
41211169	38	A	A	0	0	0	0	.00	1
41211170	73	A	A	0	0	0	64	.88	1
41211171	38	A	A	0	0	0	70	1.84	1
41211180	56	A	A	0	0	0	40	.71	1
41211183	40	A	A	0	0	0	0	.00	1
41211184	60	A	A	0	0	0	85	1.42	1
41211187	38	A	A	0	0	863	923	1.58	1
41211192	20	A	A	0	0	0	18	.90	1
41211193	20	A	A	0	0	0	18	.90	1
41211195	20	A	A	0	0	0	18	.90	1
41211204	18	A	A	0	0	0	0	.00	1
41211244	60	A	A	0	0	0	0	.00	1
41211246	40	A	A	0	0	20	42	.55	1
41211254	40	A	A	0	0	0	0	.00	1
41211256	38	A	A	0	0	0	0	.00	1
41211257	38	A	A	0	0	0	30	.79	1
41211259	38	A	A	0	0	0	0	.00	1
41211261	38	A	A	0	0	0	65	1.71	1
41211266	92	A	A	0	0	0	38	.41	1
41211267	40	A	A	0	0	0	40	1.00	1
41211268	38	A	A	0	0	0	40	1.05	1
41211269	20	A	A	0	0	0	0	.00	1
41211675	80	A	A	0	0	0	60	.75	1
41211677	40	A	A	0	0	0	0	.00	1
41311167	38	A	A	0	0	0	0	.00	1
41311205	72	A	A	0	0	1460	1585	1.74	1
41311258	40	A	A	0	0	0	30	.75	1
41311676	60	A	A	0	0	0	45	.75	1
42111144	60	A	A	0	0	146	172	.43	1
42211003	60	A	A	0	0	0	0	.00	1
42211015	20	A	A	0	0	0	0	.00	1
42211017	20	A	A	0	0	0	0	.00	1
42211035	80	A	A	0	0	0	0	.00	1
42211041	48	A	A	0	0	0	28	.58	1
42211042	48	A	A	0	0	0	28	.58	1
42211043	40	A	A	0	0	0	0	.00	1
42211085	60	A	A	0	0	733	808	1.25	1
42211088	60	A	A	0	0	1005	1257	4.20	1
42211096	40	A	A	0	0	0	0	.00	1
42211099	40	A	A	0	0	550	819	6.73	1
42211110	20	A	A	0	0	0	175	8.75	1
42211111	60	A	A	0	0	0	225	3.75	1
42211115	39	A	A	0	0	0	109	2.79	1
42211116	58	A	A	0	0	204	311	1.84	1
42211129	38	A	A	0	0	281	444	4.29	1
42211130	80	A	A	0	0	1346	1656	3.88	1
42211141	40	A	A	0	0	255	319	1.60	1
42211142	60	A	A	0	0	146	179	.55	1

26-MAR-86 door spreadsheet
15:00:23 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	CP$	MCS$	INCOST$	GRP
42211143	60	A	A	0	0	136	166	.50	1
42211145	60	A	A	0	0	146	160	.23	1
42211147	110	A	A	0	0	1510	1510	.00	1
42211148	60	A	A	0	0	0	0	.00	1
42211206	160	A	A	0	0	0	75	.47	1
42211241	20	A	A	0	0	0	32	1.60	1
42211304	60	A	A	0	0	146	160	.23	1
42311242	20	A	A	0	0	0	32	1.60	1
42311306	94	A	A	0	0	86	172	.91	1
23211516	60	A	A	0	0	537	603	1.10	1
23111521	60	A	A	0	0	0	0	.00	1
23211501	60	A	A	0	0	0	0	.00	1
23211581	41	A	A	0	0	0	0	.00	1
12211121	60	A	A	0	0	740	740	.00	1
12211107	89	A	A	0	0	685	746	.69	1
12211147	38	A	A	0	0	244	282	1.00	1
13211115	40	A	A	0	0	1800	1800	.00	1
11211139	38	A	A	1	1	320	320	.00	1
12211108	38	A	A	1	0	277	277	.00	1
13211125	40	A	A	1	1	1070	1710	16.00	1
13211113	60	A	A	1	1	225	250	.42	1
11111106	38	A	A	1	1	266	266	.00	1
11111140	38	A	A	1	1	291	291	.00	1
11111143	38	A	A	1	1	226	226	.00	1
11111153	38	A	A	1	1	242	242	.00	1
11211122	38	A	A	1	1	460	460	.00	1
11211141	55	A	A	1	1	400	400	.00	1
11211144	40	A	A	1	1	291	291	.00	1
12111117	40	A	A	1	1	916	1097	4.53	1
12211102	38	A	A	1	1	0	0	.00	1
12211130	20	A	A	1	1	125	125	.00	1
12211132	80	A	A	1	1	769	724	-0.56	1
13211101	42	A	A	1	1	750	1439	16.40	1
13211118	105	A	A	1	1	796	976	1.71	1
13211119	20	A	A	1	1	385	480	4.75	1
13211123	38	A	A	1	1	220	220	.00	1
13211128	20	A	A	1	1	150	150	.00	1
12211146	38	A	A	1	1	0	0	.00	1
11211136	40	A	A	1	1	310	310	.00	1
12211133	38	A	A	1	1	320	320	.00	1
12211114	86	A	A	1	1	493	853	4.19	1
12211104	61	A	A	1	1	600	887	4.70	1
12211149	56	A	A	1	1	326	407	1.45	1
23211530	40	A	A	10	0	0	0	.00	1
32211289	20	A	A	10	10	0	24	1.20	1
23211551	58	A	E	0	0	0	0	.00	1
23211505	39	E	E	0	0	0	0	.00	1
23211529	40	E	E	0	0	0	0	.00	1
23211535	20	E	E	0	0	0	0	.00	1
23211539	64	E	E	0	0	974	978	.06	1
23211543	57	E	E	0	0	0	0	.00	1

26-MAR-86 door spreadsheet
15:00:24 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	CP$	MCS$	INCOST$	GRP
23211548	42	E	E	0	0	8	22	.33	1
23211550	40	E	E	0	0	872	872	.00	1
23211554	42	E	E	0	0	679	823	3.43	1
23211577	37	E	E	0	0	0	0	.00	1
23311510	40	E	E	0	0	0	0	.00	1
23211565	103	E	E	0	0	0	0	.00	1
23111523	40	E	E	0	0	0	0	.00	1
23211580	44	E	E	0	0	0	0	.00	1
23111512	42	E	E	0	0	0	0	.00	1
23111514	72	E	E	0	0	469	625	2.17	1
23211503	60	E	E	0	0	0	0	.00	1
23211511	60	E	E	0	0	599	640	.68	1
23211519	42	E	E	0	0	0	0	.00	1
23211520	63	E	E	0	0	0	0	.00	1
23211525	20	E	E	0	0	0	0	.00	1
23211545	20	E	E	0	0	42	56	.70	1
23211553	44	E	E	0	0	1190	1190	.00	1
23211557	42	E	E	0	0	0	0	.00	1
23211560	90	E	E	0	0	546	546	.00	1
23211564	42	E	E	0	0	70	84	.33	1
23211568	38	E	E	0	0	288	288	.00	1
23211509	38	E	E	0	0	0	0	.00	1
23211561	60	E	E	0	0	0	0	.00	1
23111573	58	E	E	0	0	0	0	.00	1
23211563	41	E	E	0	0	0	0	.00	1
23211537	40	E	E	0	0	0	0	.00	1
31211403	83	B	B	0	0	450	546	1.16	2
31211410	36	B	B	0	0	93	117	.67	2
31211292	60	B	B	0	0	600	923	5.38	2
41211095	60	B	B	1	0	710	889	2.98	2
41211051	20	B	B	1	1	0	0	.00	2
41211073	80	B	B	1	1	0	74	.93	2
41211097	38	B	B	1	1	332	478	3.84	2
41211118	110	B	B	1	1	0	625	5.68	2
41211133	40	B	B	1	1	150	461	7.78	2
41211165	162	B	B	1	1	0	0	.00	2
41211173	137	B	B	1	1	0	0	.00	2
41211181	20	B	B	1	1	0	0	.00	2
41211234	92	B	B	1	1	0	150	1.63	2
41211271	79	B	B	1	1	0	100	1.27	2
41211303	38	B	B	1	1	0	225	5.92	2
41111174	20	B	B	1	1	0	0	.00	2
41111176	20	B	B	1	1	0	0	.00	2
41111178	20	B	B	1	1	0	0	.00	2
41111239	18	B	B	1	1	0	0	.00	2
41211038	18	B	B	1	1	0	0	.00	2
41211058	53	B	B	1	1	0	0	.00	2
41211079	20	B	B	1	1	0	0	.00	2
41211182	20	B	B	1	1	0	0	.00	2
41211204	20	B	B	1	1	0	0	.00	2
41211008	40	B	A	0	0	0	338	8.45	3

26-MAR-86 door spreadsheet
15:00:24 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	CP$	MCS$	INCOST$	GRP
12211151	54	B	A	0	0	1104	1069	-0.65	3
31211338	42	B	A	0	0	269	412	3.40	3
32211162	56	B	A	0	0	750	940	3.39	3
31211145	60	B	A	0	0	635	1160	8.75	3
31211183	110	B	A	0	0	460	830	3.36	3
32211111	100	B	A	0	0	1879	1437	-4.42	3
31211346	37	B	A	0	0	70	30	-1.08	3
23211517	66	B	A	0	0	259	555	4.48	3
23211522	45	B	A	0	0	236	632	8.80	3
31211128	56	B	A	0	0	933	1230	5.30	3
31211253	100	B	A	0	0	0	112	1.12	3
31211270	38	B	A	0	0	150	204	1.42	3
31111112	40	B	A	0	0	370	600	5.75	3
31211133	37	B	A	0	0	280	402	3.30	3
31211134	55	B	A	0	0	0	45	.82	3
31211135	20	B	A	0	0	0	59	2.95	3
31211177	64	B	A	0	0	501	712	3.30	3
31211248	40	B	A	0	0	720	970	6.25	3
31211397	20	B	A	0	0	53	167	5.70	3
31211399	40	B	A	0	0	650	820	4.25	3
31211408	38	B	A	0	0	200	285	2.24	3
31211409	40	B	A	0	0	200	285	2.13	3
32211232	40	B	A	0	0	0	118	2.95	3
32211110	58	B	A	0	0	986	460	-9.07	3
31211250	38	B	A	0	0	660	710	1.32	3
31211257	38	B	A	0	0	472	707	6.18	3
31211260	60	B	A	0	0	656	1146	8.17	3
31211265	84	B	A	0	0	720	1020	3.57	3
32211299	60	B	A	0	0	405	810	6.75	3
32211423	20	B	A	0	0	0	88	4.40	3
31211166	58	B	A	0	0	0	186	3.21	3
31211201	77	B	A	0	0	1040	831	-2.71	3
31211259	38	B	A	0	0	296	355	1.55	3
31211308	38	B	A	0	0	612	968	9.37	3
31211341	57	B	A	0	1	332	549	3.81	3
32211186	40	B	A	0	1	1354	618	-18.40	3
41111045	40	B	A	1	0	210	206	-0.10	3
41211002	37	B	A	1	0	345	513	4.54	3
41211005	58	B	A	1	0	520	621	1.74	3
41211006	38	B	A	1	0	546	676	3.42	3
41211013	37	B	A	1	0	368	480	3.03	3
41211014	40	B	A	1	0	1095	1212	2.93	3
41211024	37	B	A	1	0	478	877	10.78	3
41211025	37	B	A	1	0	302	509	5.59	3
41211026	40	B	A	1	0	296	358	1.55	3
41211027	78	B	A	1	0	576	1193	7.91	3
41211033	38	B	A	1	0	335	429	2.47	3
41211036	20	B	A	1	0	0	0	.00	3
41211039	60	B	A	1	0	676	855	2.98	3
41211040	37	B	A	1	0	227	250	.62	3
41211047	40	B	A	1	0	1003	1096	2.33	3

26-MAR-86 door spreadsheet
15:00:24 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	CP$	MCS$	INCOST$	GRP
41211048	40	B	A	1	0	336	329	-0.18	3
41211049	40	B	A	1	0	610	754	3.60	3
41211050	60	B	A	1	0	955	1091	2.27	3
41211052	120	B	A	1	0	1245	3869	21.87	3
41211053	126	B	A	1	0	1857	2248	3.10	3
41211060	60	B	A	1	0	523	666	2.38	3
41211074	40	B	A	1	0	0	34	.85	3
41211075	40	B	A	1	0	0	34	.85	3
41211076	40	B	A	1	0	0	34	.85	3
41211077	40	B	A	1	0	0	34	.85	3
41211078	42	B	A	1	0	240	439	4.74	3
41211079	20	B	A	1	0	534	690	7.80	3
41211081	65	B	A	1	0	313	546	3.58	3
41211084	54	B	A	1	0	1149	1344	3.61	3
41211086	98	B	A	1	0	1270	1905	6.48	3
41211087	38	B	A	1	0	295	440	3.82	3
41211091	38	B	A	1	0	398	549	3.97	3
41211092	38	B	A	1	0	338	400	1.63	3
41211093	40	B	A	1	0	823	1377	13.85	3
41211094	38	B	A	1	0	0	291	7.66	3
41211106	60	B	A	1	0	642	831	3.15	3
41211107	38	B	A	1	0	373	520	3.87	3
41211119	58	B	A	1	0	300	650	6.03	3
41211124	96	B	A	1	0	1052	1343	3.03	3
41211127	80	B	A	1	0	1150	1313	2.04	3
41211132	58	B	A	1	0	0	114	1.97	3
41211146	40	B	A	1	0	0	15	.38	3
41211153	60	B	A	1	0	254	530	4.60	3
41211156	58	B	A	1	0	0	61	1.05	3
41211157	118	B	A	1	0	0	81	.69	3
41211159	38	B	A	1	0	269	412	3.76	3
41211182	40	B	A	1	0	0	0	.00	3
41211188	38	B	A	1	0	565	461	-2.74	3
41211196	40	B	A	1	0	303	459	3.90	3
41211197	60	B	A	1	0	204	323	1.98	3
41211201	38	B	A	1	0	522	554	.84	3
41211202	38	B	A	1	0	422	521	2.61	3
41211203	38	B	A	1	0	107	199	2.42	3
41211220	60	B	A	1	0	550	667	1.95	3
41211251	58	B	A	1	0	750	1300	9.48	3
41211252	58	B	A	1	0	750	1300	9.48	3
41211265	55	B	A	1	0	472	625	2.78	3
41211274	38	B	A	1	0	1274	1345	1.87	3
41311186	76	B	A	1	0	1918	2843	12.17	3
42211030	84	B	A	1	0	1035	1807	9.19	3
42211121	58	B	A	1	0	450	725	4.74	3
42211134	37	B	A	1	0	460	600	3.78	3
42211135	37	B	A	1	0	460	600	3.78	3
42211136	37	B	A	1	0	460	600	3.78	3
42211137	37	B	A	1	0	460	600	3.78	3
42211138	37	B	A	1	0	460	600	3.78	3

26-MAR-86 door spreadsheet
15:00:24 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	CPTYPE	MCSTYPE	CPUVAL	MCSUVAL	CP$	MCS$	INCOST$	GRP
42211219	63	B	A	1	0	480	690	3.33	3
42211262	84	B	A	1	0	1035	1807	9.19	3
42211263	84	B	A	1	0	1035	1807	9.19	3
42211281	60	B	A	1	0	567	976	6.82	3
42211282	40	B	A	1	0	242	353	2.78	3
42211283	38	B	A	1	0	242	358	3.05	3
42211284	38	B	A	1	0	242	358	3.05	3
42211285	38	B	A	1	0	242	352	2.89	3
42311224	40	B	A	1	0	160	260	2.50	3
41211051	56	B	A	1	0	585	776	3.41	3
41211181	60	B	A	1	0	0	0	.00	3
41211244	18	B	A	1	0	737	801	3.56	3
41211269	18	B	A	1	0	306	390	4.67	3
41211274	72	B	A	1	0	0	280	3.89	3
41211289	38	B	A	1	0	377	445	1.79	3
12211100	73	B	A	1	1	52	52	.00	3
11111142	40	B	A	1	1	650	320	-8.25	3
31211297	20	B	A	1	0	185	140	-2.25	3
31211271	38	B	A	1	0	426	890	12.21	3
32211426	73	B	A	1	0	635	405	-3.15	3
31211153	64	B	A	10	0	0	75	1.17	3
31211106	133	A	B	0	0	1683	1973	2.18	4
11111142	80	A	B	1	1	320	650	4.13	4
12211103	81	A	D	1	1	2200	2200	.00	99
41111112	38	D	D	0	0	0	22	.58	99
42211264	64	D	D	10	10	0	133	2.08	99
41211012	46	X	A	10	0	498	570	1.57	99
41211018	37	X	A	10	0	486	812	8.81	99
41211072	56	X	A	10	0	2490	2960	8.39	99
42211147	40	Z	A	10	0	350	560	5.25	99
42111021	37	Z	A	10	0	527	513	-0.38	99
42211004	37	Z	A	10	0	527	513	-0.38	99
42211011	37	Z	A	10	0	527	513	-0.38	99
42211037	37	Z	A	10	0	527	513	-0.38	99
41211140	37	Z	Z	0	0	0	0	.00	99
23211567	62	Z	Z	0	0	0	0	.00	99
31211259	40	Z	Z	0	0	220	657	10.93	99
41211256	40	Z	Z	1	1	0	0	.00	99
13211124	55	Z	Z	1	0	800	800	.00	99

NUMBER OF CASES READ = 345 NUMBER OF CASES LISTED = 345

AIR-TO-AIR HEAT EXCHANGER SPREADSHEET

AAHX Type Code:

A The Air Changer Company

B Airxchange (NuTone)

E Conservation Energy Systems (VanEE)

F Des Champs (79m-4)

G Des Champs (79m-6)

H Des Champs (200 series)

I Des Champs (300 series)

J EER Products (Heat-X-changer)

K Ener-Corp (Enerex 250)

M Mountain Energy and Resources

O Star Heat Exchanger 100A

P Star Heat Exchanger 200A

R Enter Matrix

X Missing

Z Other

26-MAR-86 air-to-air heat exchanger spreadsheet
15:01:58 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	TYPE	COST$	INCOST$	GRP
41211074	1176	A	1150	.98	1
41211075	1176	A	1150	.98	1
41211076	1176	A	1150	.98	1
41211077	1176	A	1150	.98	1
31211135	1200	A	1846	1.54	1
41211084	1425	A	1639	1.15	1
41211127	1449	A	1865	1.29	1
31211133	930	B	586	.63	2
41211062	1008	B	706	.70	2
41211063	1008	B	757	.75	2
41111209	1143	B	1155	1.01	2
41111211	1143	B	1155	1.01	2
41111213	1143	B	1155	1.01	2
41111215	1143	B	1155	1.01	2
41111217	1143	B	1155	1.01	2
41211065	1144	B	787	.69	2
31211268	1153	B	869	.75	2
31111112	1193	B	925	.78	2
41211009	1222	B	790	.65	2
31211267	1239	B	812	.66	2
31211221	1247	B	938	.75	2
41211146	1288	B	780	.61	2
41211108	1290	B	699	.54	2
31211146	1304	B	1016	.78	2
41211079	1312	B	773	.59	2
41211033	1386	B	972	.70	2
41211275	1390	B	997	.72	2
31211259	1408	B	890	.63	2
41211107	1413	B	895	.63	2
41111151	1422	B	745	.52	2
41211277	1445	B	1046	.72	2
31211338	1450	B	1320	.91	2
41211027	1465	B	1676	1.14	2
41211187	1480	B	916	.62	2
31211195	1495	B	910	.61	2
41211002	1495	B	950	.64	2
41211025	1497	B	775	.52	2
23211509	1169	E	1237	1.06	3
31211346	1230	E	1403	1.14	3
12211100	1288	E	1592	1.24	3
41211070	1326	E	1035	.78	3
41211071	1326	E	1035	.78	3
23111523	1392	E	1269	.91	3
23211531	1478	E	1247	.84	3
42211043	1499	E	1775	1.18	3
41211092	1104	F	899	.81	4
41211082	1124	F	1214	1.08	4
41211059	1210	F	1069	.88	4
41211040	1221	F	1115	.91	4
41211023	1327	F	1134	.85	4
41211024	1327	F	1090	.82	4

26-MAR-86 air-to-air heat exchanger spreadsheet
15:01:59 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	TYPE	COST$	INCOST$	GRP
41211036	1388	F	1121	.81	4
41211067	1406	F	1543	1.10	4
42211044	1406	F	0	.00	4
41211261	1418	F	1058	.75	4
41211122	1494	F	1455	.97	4
41211005	1232	G	1140	.93	5
41211013	1248	G	1245	1.00	5
23111521	960	H	1232	1.28	6
23111573	960	H	1402	1.46	6
12211110	1224	H	1840	1.50	6
13211150	1294	H	1966	1.52	6
32211186	1403	H	1612	1.15	6
31211408	1423	H	1399	.98	6
13211123	1277	I	2654	2.08	7
11211122	1426	I	1800	1.26	7
12211108	1176	J	1179	1.00	8
41111174	1435	J	1393	.97	8
31211399	1089	K	970	.89	9
23111512	1144	M	1568	1.37	10
41211089	1011	O	1133	1.12	11
41211050	1185	O	910	.77	11
41111235	1246	O	1528	1.23	11
42211099	1247	O	0	.00	11
41211289	1278	O	1652	1.29	11
41211008	1280	O	1171	.91	11
41211068	1284	O	1217	.95	11
42211088	1314	O	1011	.77	11
41111237	1323	O	1486	1.12	11
12211131	1352	O	1266	.94	11
41211120	1403	O	1470	1.05	11
41211038	1430	O	879	.61	11
41211078	1440	O	1677	1.16	11
41211012	1491	O	842	.56	11
41111176	1299	P	1406	1.08	12
41211119	1316	P	1282	.97	12
42211282	1460	P	1193	.82	12
41211090	1462	P	2070	1.42	12
31211250	943	R	1137	1.21	13
23111514	1195	R	1310	1.10	13
23211519	1356	R	1202	.89	13
31211248	1380	R	970	.70	13
41211163	1155	X	1192	1.03	14
31111218	1200	X	850	.71	14
31211153	1334	X	730	.55	14
12211147	1423	X	1507	1.06	14
41211182	1484	X	1047	.71	14
31211410	1080	Z	686	.64	15
32211423	1236	Z	1097	.89	15
41111045	1271	Z	1819	1.43	15
32211111	1526	A	1579	1.03	16
32211110	1553	A	1506	.97	16

26-MAR-86 air-to-air heat exchanger spreadsheet
15:01:59 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	TYPE	COST$	INCOST$	GRP
31211128	1653	A	1667	1.01	16
41211123	1730	A	1339	.77	16
41211180	1750	A	1450	.83	16
41211303	1776	A	1595	.90	16
23211561	1792	A	1350	.75	16
41211001	1934	A	1403	.73	16
41211201	1936	A	1407	.73	16
31211155	2303	A	1213	.53	16
41211149	2321	A	1607	.69	16
41211220	2388	A	1250	.52	16
31211292	2480	A	1536	.62	16
41111028	1505	B	999	.66	17
41211006	1521	B	1047	.69	17
41211168	1538	B	490	.32	17
31211397	1587	B	1193	.75	17
41211087	1588	B	1200	.76	17
41211169	1589	B	490	.31	17
41211257	1604	B	750	.47	17
41311258	1605	B	661	.41	17
41211131	1623	B	996	.61	17
41211276	1630	B	997	.61	17
41211060	1651	B	884	.54	17
42211141	1652	B	940	.57	17
31211260	1688	B	890	.53	17
31211137	1697	B	870	.51	17
41211032	1705	B	970	.57	17
41211095	1725	B	874	.51	17
31211271	1763	B	415	.24	17
41211159	1764	B	834	.47	17
41211259	1778	B	606	.34	17
41211072	1819	B	796	.44	17
42111021	1824	B	1370	.75	17
42211004	1888	B	1368	.72	17
42211037	1893	B	1368	.72	17
41211132	1900	B	770	.41	17
42211121	2019	B	0	.00	17
42211011	2045	B	1370	.67	17
42211219	2112	B	0	.00	17
41311205	2132	B	1000	.47	17
31211395	2208	B	900	.41	17
31211403	2245	B	1070	.48	17
41311676	2255	B	808	.36	17
31211257	2304	B	1325	.58	17
41211128	2419	B	1956	.81	17
41211675	2423	B	1048	.43	17
42211241	1637	E	1403	.86	18
23211525	1800	E	1618	.90	18
42311242	1848	E	0	.00	18
23211551	1872	E	1801	.96	18
23211560	1889	E	1560	.83	18
23211545	1974	E	1645	.83	18

26-MAR-86 air-to-air heat exchanger spreadsheet
15:01:59 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	TYPE	COST$	INCOST$	GRP
23211550	1976	E	1430	.72	18
23211535	2016	E	1720	.85	18
23211552	2026	E	2001	.99	18
23211506	2034	E	1965	.97	18
23211566	2034	E	1965	.97	18
42211096	2044	E	1845	.90	18
23211572	2132	E	1765	.83	18
23211522	2200	E	1535	.70	18
42211003	2289	E	2065	.90	18
23211511	2312	E	1161	.50	18
23111574	2356	E	1645	.70	18
23211564	2359	E	1694	.72	18
23211505	2395	E	980	.41	18
31211308	2397	E	913	.38	18
13211101	2400	E	1718	.72	18
41211160	1535	F	1586	1.03	19
23211578	1628	F	1142	.70	19
41211161	2016	F	1590	.79	19
41211019	2471	F	1514	.61	19
41211125	2421	G	1905	.79	20
32211427	1536	H	1394	.91	21
23211548	1582	H	1250	.79	21
41211091	1592	H	1020	.64	21
31211182	1686	H	1287	.76	21
32211310	1776	H	1333	.75	21
23211558	1787	H	1684	.94	21
32211232	1804	H	1126	.62	21
31211216	1844	H	400	.22	21
31211409	1917	H	1490	.78	21
13211125	1920	H	1424	.74	21
32211162	1967	H	1300	.66	21
32211426	2020	H	1332	.66	21
41211153	2040	H	1752	.86	21
41211140	2193	H	1230	.56	21
41211156	2203	H	1230	.56	21
42211115	2216	H	1637	.74	21
23211515	2240	H	1135	.51	21
41211157	2266	H	1330	.59	21
41211274	2308	H	1554	.67	21
23211543	2332	H	1296	.56	21
23211571	2400	H	1178	.49	21
41211273	2417	H	1197	.50	21
31211424	2438	H	1634	.67	21
42211116	2464	H	2040	.83	21
41211166	2475	H	2045	.83	21
13211113	2496	H	1405	.56	21
32211289	2496	H	1226	.49	21
11111106	1598	I	2120	1.33	22
41211094	1680	I	1371	.82	22
41311189	1713	I	1266	.74	22
41211269	1792	I	1341	.75	22

26-MAR-86 air-to-air heat exchanger spreadsheet
15:01:59 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	TYPE	COST$	INCOST$	GRP
23211530	1824	I	1214	.67	22
23211501	1874	I	965	.51	22
31211106	2040	I	1305	.64	22
31211265	2089	I	600	.29	22
13211115	2136	I	2137	1.00	22
23211554	2223	I	1758	.79	22
23211507	2260	I	1892	.84	22
23211581	2456	I	2460	1.00	22
23211562	2474	I	2151	.87	22
23211524	2125	M	1523	.72	23
23211526	1709	N	1635	.96	24
23211538	2016	N	2160	1.07	24
41211196	1534	O	1368	.89	25
41211183	1558	O	1068	.69	25
41111112	1601	O	963	.60	25
41211039	1625	O	1522	.94	25
41211014	1649	O	1215	.74	25
41111239	1658	O	1288	.78	25
41211018	1684	O	1117	.66	25
41211083	1692	O	1468	.87	25
41211016	1713	O	1238	.72	25
42211134	1768	O	0	.00	25
42211135	1768	O	975	.55	25
42211136	1768	O	0	.00	25
42211137	1768	O	975	.55	25
42211138	1768	O	975	.55	25
41211026	1793	O	1595	.89	25
42211085	1818	O	0	.00	25
42211110	1820	O	1319	.72	25
42211017	1824	O	1253	.69	25
41111178	1851	O	1395	.75	25
41211227	1852	O	2750	1.48	25
42211041	1876	O	1120	.60	25
42211042	1876	O	1990	1.06	25
42211015	1910	O	1452	.76	25
42211285	2144	O	0	.00	25
42211283	2159	O	1454	.67	25
42211284	2159	O	1454	.67	25
12211130	1520	P	1278	.84	26
41211097	1611	P	1199	.74	26
41211202	1634	P	1593	.97	26
41211195	1715	P	866	.50	26
41211204	1738	P	1480	.85	26
41211272	1740	P	1230	.71	26
41211162	1756	P	1205	.69	26
41211254	1770	P	1117	.63	26
42111144	1860	P	1331	.72	26
42211142	1860	P	1354	.73	26
42211143	1860	P	1136	.61	26
42211145	1860	P	1332	.72	26
42211304	1860	P	1332	.72	26

26-MAR-86 air-to-air heat exchanger spreadsheet
15:02:00 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	TYPE	COST$	INCOST$	GRP
41211051	1875	P	1198	.64	26
41211020	1883	P	784	.42	26
41211256	1883	P	784	.42	26
41211677	1913	P	1460	.76	26
41211251	1916	P	2195	1.15	26
41211252	1916	P	2195	1.15	26
41211184	2002	P	1058	.53	26
41211203	2032	P	1552	.76	26
41211265	2078	P	1585	.76	26
31211166	2258	P	1890	.84	26
41211192	2306	P	812	.35	26
41211193	2306	P	812	.35	26
41211244	2320	P	872	.38	26
41211055	2430	P	1115	.46	26
41211188	2460	P	1763	.72	26
41211093	2468	P	1295	.52	26
23211520	1560	R	1202	.77	27
23211529	1720	R	1026	.60	27
23211577	1879	R	945	.50	27
23211544	1889	R	1353	.72	27
23211547	1926	R	1464	.76	27
23211556	2040	R	1118	.55	27
23211513	2221	R	1271	.57	27
23211568	2286	R	1135	.50	27
31211270	1618	X	415	.26	28
12211149	1896	X	1247	.66	28
31211200	1900	X	1370	.72	28
11211136	1996	X	1200	.60	28
12111117	2004	X	1200	.60	28
41211246	2028	X	1620	.80	28
12211148	2049	X	1532	.75	28
12211151	2059	X	1500	.73	28
12211102	2088	X	1524	.73	28
12211120	2092	X	1869	.89	28
12211105	2096	X	1453	.69	28
41211126	2184	X	1400	.64	28
41211118	2193	X	1714	.78	28
13211119	2208	X	1326	.60	28
12111152	2252	X	1500	.67	28
31211297	1536	Z	1071	.70	29
42211129	1971	Z	0	.00	29
31211253	2522	A	1675	.66	30
41311186	2576	A	1978	.77	30
41211271	2786	A	1175	.42	30
41211170	2771	B	480	.17	31
31211101	2791	B	1255	.45	31
31211122	2948	B	789	.27	31
42211147	3210	B	0	.00	31
31211183	3245	B	1075	.33	31
41211171	3366	B	678	.20	31
41211165	3658	B	1282	.35	31

26-MAR-86 air-to-air heat exchanger spreadsheet
15:02:00 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID	AREA	TYPE	COST$	INCOST$	GRP
23211539	3458	D	1695	.49	32
23211516	2544	E	1328	.52	33
23211553	2570	E	1612	.63	33
12211132	2616	E	1677	.64	33
23211527	2800	E	1613	.58	33
23211541	2886	E	1600	.55	33
23211528	2960	E	1232	.42	33
23211567	3133	E	1368	.44	33
23211517	3313	E	1579	.48	33
12211114	3352	E	1260	.38	33
23211502	3352	E	1407	.42	33
31211341	3464	E	2131	.62	33
42211264	5717	E	1452	.25	33
41211106	3100	F	1684	.54	34
41211069	3297	F	1142	.35	34
41211056	3635	F	3980	1.09	34
41211054	2770	G	1301	.47	35
41211124	3356	G	2913	.87	35
41211181	3968	G	1591	.40	35
41211073	5702	G	2940	.52	35
31211177	2512	H	1813	.72	36
42211035	2640	H	1442	.55	36
31211201	2678	H	927	.35	36
41211047	2687	H	1230	.46	36
23211537	2688	H	1374	.51	36
31211134	2956	H	1382	.47	36
42311306	3048	H	2164	.71	36
41211158	3056	H	1380	.45	36
23211565	3336	H	2179	.65	36
42211030	3458	H	1213	.35	36
42211262	3458	H	1213	.35	36
42211263	3458	H	1213	.35	36
41211133	3530	H	2178	.62	36
13211128	2526	I	1195	.47	37
13211118	2628	I	2397	.91	37
23211518	2800	I	1390	.50	37
41311167	2868	I	2872	1.00	37
23311510	2944	I	2234	.76	37
41211053	3300	I	1961	.59	37
23211580	3628	I	1810	.50	37
23211570	3690	I	1827	.50	37
41211260	4456	I	1673	.38	37
41211173	3383	J	1450	.43	38
41211052	2700	M	1476	.55	39
41211255	2501	O	1120	.45	40
41211225	2535	O	2750	1.08	40
41211268	2670	O	1710	.64	40
41211267	2803	O	1726	.62	40
41211266	2853	O	1355	.47	40
42211281	2979	O	0	.00	40
41211048	2636	P	1026	.39	41

26-MAR-86 air-to-air heat exchanger spreadsheet
15:Ø2:ØØ Lawrence Berkeley Laboratory DEC VAX-86ØØ VMS V4.1

SITEID	AREA	TYPE	COST$	INCOST$	GRP
41211Ø81	2643	P	1326	.5Ø	41
41211Ø58	2647	P	1827	.69	41
41211Ø49	265Ø	P	997	.38	41
41211Ø31	2714	P	1447	.53	41
422112Ø6	2872	P	Ø	.ØØ	41
42211148	3Ø87	P	77	.Ø2	41
42311224	3213	P	75	.Ø2	41
41211197	3275	P	1558	.48	41
41211245	3344	P	38ØØ	1.14	41
41211Ø86	3424	P	1934	.56	41
4231127Ø	3426	P	162Ø	.47	41
41211234	3439	P	418Ø	1.22	41
42211111	3838	P	2Ø83	.54	41
23211557	27Ø3	R	1464	.54	42
23211536	286Ø	R	1251	.44	42
23211549	317Ø	R	1621	.51	42
2321153Ø3	324Ø	R	1499	.46	42
31211145	3376	R	1475	.44	42
23211563	35Ø9	R	1448	.41	42
12211Ø3	4225	T	2633	.62	43
12211121	27ØØ	X	239Ø	.89	44
12211Ø4	32ØØ	X	1686	.53	44
12211146	32ØØ	X	1462	.46	44
12211Ø7	337Ø	X	1825	.54	44
32211299	282Ø	Z	1Ø92	.39	45
41211164	3Ø56	Z	1474	.48	45
4221113Ø	33ØØ	Z	5545	1.68	45

NUMBER OF CASES READ = 384 NUMBER OF CASES LISTED = 384

This appendix contains a listing of homes ordered by "state calculated total cost" (see main text), as discussed in Chapter 9. The following information is provided for each home: identification number, state calculated total cost, total hard building cost, design cost, loan cost, and other cost. Column headings are explained in the glossary below.

GLOSSARY

SITEID[1]	Identification of house/builder
COST094	State calculated total cost
TOTAL	Total hard building cost
DESIGN	Design cost
LOAN	Loan cost
OTHER	Other cost

[1] SITEID is an eight digit number: the first digit indicates state location (1 = Idaho, 2 = Montana, 3 = Oregon, 4 = Washington); the second digit indicates climate zone location (1 = Zone 1, 2 = Zone 2, 3 = Zone 3); the third digit indicates a "matched pair" home (1 = matched, 2 = unmatched, 3 = unmatched and ELCAP, 4 = control home); the fourth digit indicates a MCS home (1 = MCS, 2 = current practice); the fifth digit indicates type of home (1 = single-family, 2 = multi-family-1, 3 = multi-family-2); and the last three digits indicate the house number (same number if it is a matched pair home).

25-APR-86 total cost spreadsheet
14:12:46 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID1	COST094	TOTAL	DESIGN	LOAN	OTHER
11211139	.31	.28	.00	.00	.03
31211268	.32	2.76	.04	.17	.23
11111145	.37	.33	.02	.00	.02
11211144	.47	.45	.00	.00	.02
11111142	.49	.44	.04	.00	.01
11211138	.56	.52	.00	.00	.04
11111140	.73	.60	.12	.00	.01
13211128	.88	.82	.06	.00	.00
41211271	.91	.88	.00	.04	.00
12211105	1.00	7.98	.00	.00	.21
41211245	1.00	.86	.15	.00	.00
41211020	1.02	1.01	.00	.02	.00
41211256	1.08	1.06	.00	.02	.00
12211114	1.13	1.22	.00	.00	.00
13211113	1.22	1.18	.04	.00	.00
11111153	1.24	1.17	.06	.00	.01
41211272	1.30	1.26	.00	.04	.01
11211141	1.36	1.32	.00	.00	.03
41111112	1.36	1.36	.00	.00	.00
41211181	1.36	1.31	.01	.04	.00
31211122	1.39	1.40	.01	.00	.00
12211107	1.40	1.26	.00	.04	.09
23211502	1.40	1.40	.00	.00	.00
12211146	1.42	1.30	.06	.05	.02
41211055	1.43	1.43	.00	.00	.00
41211073	1.46	1.31	.02	.03	.10
41211267	1.51	1.44	.07	.00	.00
42211030	1.52	1.44	.00	.01	.07
42211262	1.52	1.44	.00	.01	.07
42211263	1.52	1.44	.00	.01	.07
23211537	1.53	1.51	.02	.00	.00
31211395	1.53	1.44	.09	.00	.00
13211124	1.55	1.49	.05	.00	.00
23211517	1.55	1.55	.00	.00	.00
42211035	1.58	1.33	.00	.03	.24
23211505	1.60	5.78	.00	.01	.00
42211264	1.60	1.60	.00	.00	.00
42211206	1.61	1.59	.02	.00	.00
23211528	1.62	1.62	.00	.00	.00
23211561	1.62	7.11	.01	.00	.08
23211578	1.63	1.44	.00	.10	.09
41211164	1.63	1.59	.00	.03	.02
23211571	1.64	5.59	.00	.11	.10
42211134	1.67	1.44	.08	.11	.04
42211135	1.67	1.44	.08	.11	.04
42211136	1.67	1.44	.08	.11	.04
42211137	1.67	1.44	.08	.11	.04
42211138	1.67	1.44	.08	.11	.04
31211424	1.68	1.97	.00	.00	.00
41211197	1.69	1.64	.00	.05	.00
31211297	1.70	1.60	.03	.07	.00

25-APR-86 total cost spreadsheet
14:12:48 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID1	COST094	TOTAL	DESIGN	LOAN	OTHER
41211261	1.70	1.52	.02	.01	.16
41211048	1.71	1.52	.02	.02	.16
23211515	1.73	1.41	.00	.11	.21
23211543	1.75	1.53	.00	.11	.11
11211122	1.77	1.60	.16	.00	.02
23211539	1.77	1.77	.00	.00	.00
23211577	1.78	7.09	.00	.00	.01
41211170	1.78	1.64	.09	.05	.00
41211268	1.79	1.71	.09	.00	.00
41311676	1.79	1.75	.04	.00	.00
31211253	1.80	1.76	.04	.00	.00
31211257	1.80	1.80	.00	.00	.00
41211675	1.81	1.77	.04	.00	.00
42311224	1.82	1.78	.00	.05	.00
23211567	1.83	1.73	.00	.08	.01
23211503	1.88	1.79	.06	.03	.00
41211259	1.89	1.88	.00	.02	.00
31211265	1.90	1.90	.00	.00	.00
13211119	1.91	1.91	.00	.00	.00
12211104	1.93	1.93	.00	.00	.00
41211049	1.94	1.89	.00	.03	.02
12211151	1.95	1.66	.10	.19	.00
41211244	1.95	1.95	.00	.00	.00
42211281	1.95	1.89	.02	.04	.02
41211266	1.96	1.88	.09	.00	.00
41211254	1.98	1.78	.02	.03	.15
12211121	2.02	2.02	.00	.00	.00
41211192	2.02	1.96	.00	.07	.00
41211169	2.05	2.05	.00	.00	.00
23211516	2.08	2.04	.04	.00	.00
41211171	2.08	1.86	.00	.08	.14
31211410	2.09	3.65	.00	.02	.05
41211032	2.12	2.06	.00	.06	.00
42211003	2.13	1.85	.28	.00	.00
23211560	2.14	2.14	.00	.00	.00
41211131	2.14	2.08	.00	.02	.04
31211341	2.16	2.06	.00	.07	.03
41211158	2.16	2.01	.00	.16	.00
41211140	2.17	2.07	.06	.02	.02
41211162	2.17	2.00	.04	.07	.07
23211530	2.18	2.18	.00	.00	.00
12211149	2.19	2.10	.09	.00	.00
41211193	2.21	2.15	.00	.07	.00
31211146	2.22	2.22	.00	.00	.00
41211050	2.22	2.02	.04	.02	.15
41211274	2.22	2.22	.00	.00	.00
11111106	2.24	1.96	.26	.00	.02
23211536	2.25	2.24	.01	.00	.00
41211026	2.25	2.02	.08	.04	.11
23211568	2.26	2.26	.00	.00	.00
41211019	2.26	2.09	.00	.03	.15

25-APR-86 total cost spreadsheet
14:12:49 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID1	COST094	TOTAL	DESIGN	LOAN	OTHER
12211102	2.27	2.23	.03	.00	.01
23211563	2.30	2.11	.03	.05	.00
41211163	2.30	2.22	.00	.03	.06
23211570	2.32	2.16	.05	.07	.04
11111143	2.34	2.19	.13	.00	.02
31211155	2.34	5.69	.00	.07	.04
41211025	2.34	1.95	.21	.19	.00
41211146	2.34	1.94	.12	.07	.22
12211132	2.35	2.35	.00	.00	.00
23311510	2.35	2.35	.00	.00	.00
23211544	2.37	2.13	.00	.03	.21
31211221	2.37	2.08	.00	.00	.00
31211201	2.38	2.22	.04	.04	.09
23211541	2.39	2.32	.05	.02	.00
41211126	2.39	2.40	.00	.00	.00
23211513	2.40	2.34	.06	.00	.00
23211547	2.40	2.35	.00	.05	.00
23211557	2.40	2.39	.01	.00	.00
42211283	2.41	2.31	.02	.06	.03
42211284	2.41	2.31	.02	.06	.03
12111152	2.42	2.10	.00	.08	.24
23211522	2.44	2.44	.00	.00	.00
41211038	2.44	2.19	.04	.05	.16
23211562	2.45	2.39	.06	.00	.00
31211182	2.45	2.33	.00	.12	.00
23111574	2.46	2.40	.06	.00	.00
41211255	2.47	2.13	.01	.10	.22
23211556	2.48	2.42	.06	.00	.00
31111218	2.51	2.41	.00	.00	.10
41311189	2.53	2.42	.07	.05	.00
23211580	2.54	2.47	.08	.00	.00
13211150	2.55	2.25	.15	.15	.00
23211551	2.55	2.25	.11	.03	.16
41211182	2.56	2.23	.04	.07	.23
41211183	2.56	2.35	.03	.04	.15
42211147	2.56	2.28	.09	.19	.00
42311270	2.56	2.49	.02	.05	.00
41211069	2.58	1.89	.00	.54	.16
23211550	2.59	2.51	.08	.00	.00
41111209	2.59	2.41	.05	.03	.10
41111211	2.59	2.41	.05	.03	.10
41111213	2.59	2.41	.05	.03	.10
41111215	2.59	2.41	.05	.03	.10
41111217	2.59	2.41	.05	.03	.10
23211553	2.60	2.60	.00	.00	.00
41211089	2.60	2.55	.00	.05	.00
41211184	2.60	2.26	.04	.04	.26
31211145	2.64	1.36	.00	.00	.00
41211012	2.64	2.57	.00	.08	.00
12211120	2.66	2.62	.04	.00	.00
23211538	2.66	2.66	.00	.00	.00

25-APR-86 total cost spreadsheet
14:12:55 Lawrence Berkeley Laboratory DEC VAX-86ØØ VMS V4.1

SITEID1	COSTØ94	TOTAL	DESIGN	LOAN	OTHER
31211346	2.67	2.67	.ØØ	.ØØ	.ØØ
41211118	2.68	2.61	.ØØ	.Ø7	.ØØ
41211Ø53	2.7Ø	2.46	.ØØ	.Ø6	.19
42211285	2.7Ø	2.66	.ØØ	.ØØ	.Ø4
41211168	2.72	2.72	.ØØ	.ØØ	.ØØ
41211277	2.73	2.4Ø	.ØØ	.Ø7	.27
42211Ø96	2.73	2.73	.ØØ	.ØØ	.ØØ
41211195	2.74	2.65	.ØØ	.Ø9	.ØØ
41211Ø91	2.76	2.61	.16	.ØØ	.ØØ
41211Ø2Ø1	2.77	2.71	.Ø7	.ØØ	.ØØ
23211558	2.78	3.7Ø	.Ø8	.11	.ØØ
31211271	2.79	2.6Ø	.Ø7	.Ø4	.Ø8
41211ØØ2	2.79	2.5Ø	.ØØ	.1Ø	.19
42311242	2.8Ø	2.44	.Ø5	.3Ø	.Ø1
41211257	2.81	2.55	.ØØ	.19	.Ø8
41211Ø31	2.82	2.57	.Ø6	.Ø7	.13
23211511	2.83	2.69	.Ø4	.1Ø	.ØØ
41311258	2.83	2.33	.Ø9	.Ø3	.38
31211133	2.84	2.74	.Ø8	.ØØ	.Ø2
23211535	2.86	2.79	.Ø7	.ØØ	.ØØ
41111Ø28	2.86	1.96	.17	.42	.31
41211165	2.86	2.86	.ØØ	.ØØ	.ØØ
42211Ø37	2.86	2.56	.Ø1	.Ø3	.27
23111514	2.87	2.33	.13	.Ø1	.4Ø
23211564	2.87	2.81	.Ø6	.ØØ	.ØØ
42211ØØ4	2.87	2.57	.Ø1	.Ø3	.26
41211159	2.88	2.47	.Ø3	.Ø8	.31
13211Ø1	2.89	3.41	.ØØ	.ØØ	.ØØ
23211518	2.89	2.7Ø	.ØØ	.Ø3	.15
41211Ø7	2.89	2.81	.ØØ	.Ø8	.ØØ
41211161	2.89	2.8Ø	.ØØ	.Ø9	.ØØ
41211276	2.89	2.5Ø	.Ø7	.Ø9	.23
41211Ø93	2.9Ø	2.91	.ØØ	.ØØ	.ØØ
12111117	2.91	2.33	.15	.11	.26
23211527	2.91	2.8Ø	.Ø9	.Ø1	.ØØ
41211120	2.91	2.77	.ØØ	.14	.ØØ
41211220	2.91	2.62	.Ø4	.13	.13
41211108	2.92	2.52	.ØØ	.11	.3Ø
12211108	2.93	2.46	.46	.ØØ	.ØØ
41211051	2.93	2.7Ø	.Ø4	.Ø3	.16
42211111	2.93	2.9Ø	.Ø4	.ØØ	.ØØ
42211011	2.94	2.74	.Ø2	.Ø2	.16
12211148	2.95	2.7Ø	.12	.Ø6	.Ø8
12211147	2.96	3.Ø4	.Ø6	.ØØ	.ØØ
42211017	2.96	2.65	.12	.Ø1	.18
11211136	2.97	2.92	.Ø5	.ØØ	.ØØ
12211100	2.98	2.63	.31	.ØØ	.ØØ
12211133	2.98	2.62	.ØØ	.13	.23
41211018	2.98	2.67	.Ø6	.1Ø	.15
23211545	2.99	2.89	.1Ø	.ØØ	.ØØ
41211106	3.ØØ	2.72	.12	.17	.ØØ

25-APR-86 total cost spreadsheet
14:13:Ø4 Lawrence Berkeley Laboratory DEC VAX-86ØØ VMS V4.1

SITEID1	COSTØ94	TOTAL	DESIGN	LOAN	OTHER
42111144	3.ØØ	2.55	.ØØ	.Ø8	.37
42211145	3.ØØ	2.55	.ØØ	.Ø8	.37
42211304	3.ØØ	2.55	.ØØ	.Ø8	.37
41211Ø47	3.Ø1	2.86	.Ø9	.Ø7	.ØØ
41211149	3.Ø2	2.75	.11	.17	.ØØ
12211130	3.Ø3	2.28	.ØØ	.ØØ	.75
23211507	3.Ø3	7.34	.Ø5	.Ø6	.ØØ
23211554	3.Ø4	3.Ø4	.ØØ	.ØØ	.ØØ
23211581	3.Ø4	2.64	.24	.15	.Ø1
31211153	3.Ø5	3.Ø4	.ØØ	.ØØ	.ØØ
41211122	3.Ø5	2.64	.13	.Ø6	.21
42111Ø21	3.Ø6	2.79	.Ø1	.Ø3	.24
13211115	3.Ø7	2.88	.19	.ØØ	.ØØ
23211509	3.Ø8	2.98	.Ø6	.ØØ	.Ø4
42311306	3.Ø8	2.99	.Ø4	.Ø5	.Ø1
41211269	3.Ø9	2.9Ø	.Ø8	.11	.ØØ
42211Ø88	3.Ø9	2.64	.46	.ØØ	.ØØ
41211157	3.1Ø	2.77	.Ø9	.Ø8	.17
42211142	3.11	2.67	.ØØ	.Ø8	.37
42211148	3.13	2.99	.Ø7	.Ø6	.ØØ
31211292	3.14	3.Ø3	.11	.ØØ	.ØØ
13211118	3.16	3.93	.ØØ	.ØØ	.ØØ
23211549	3.16	3.12	.Ø3	.ØØ	.ØØ
41211125	3.17	3.18	.ØØ	.ØØ	.ØØ
23211552	3.18	2.93	.Ø7	.ØØ	.ØØ
42211Ø15	3.19	2.8Ø	.12	.Ø2	.25
23211524	3.21	3.Ø2	.19	.ØØ	.ØØ
31211134	3.21	3.21	.ØØ	.ØØ	.ØØ
41211ØØ1	3.21	2.97	.ØØ	.Ø5	.19
41211ØØ6	3.21	2.99	.ØØ	.ØØ	.23
41211ØØ8	3.22	3.23	.ØØ	.ØØ	.ØØ
41211132	3.22	2.64	.13	.Ø8	.37
23211572	3.23	3.16	.Ø7	.ØØ	.ØØ
41211Ø16	3.23	2.94	.Ø6	.1Ø	.15
41211Ø67	3.26	2.86	.Ø4	.Ø7	.29
42211282	3.26	2.91	.Ø3	.ØØ	.31
23211529	3.27	3.27	.ØØ	.ØØ	.ØØ
31211177	3.27	2.86	.ØØ	.12	.3Ø
41311167	3.27	3.Ø7	.Ø2	.16	.Ø2
23111521	3.28	2.9Ø	.Ø2	.ØØ	.36
41211273	3.28	3.Ø1	.1Ø	.17	.ØØ
41211Ø87	3.29	2.98	.13	.Ø3	.16
42211143	3.29	2.6Ø	.11	.Ø9	.5Ø
31211397	3.32	3.18	.14	.ØØ	.ØØ
41311186	3.32	2.72	.12	.32	.17
31211338	3.33	3.33	.ØØ	.ØØ	.ØØ
41211Ø68	3.33	2.46	.ØØ	.36	.52
41211275	3.33	2.79	.Ø9	.17	.28
41111239	3.34	3.Ø3	.ØØ	.13	.18
41211251	3.41	3.42	.ØØ	.ØØ	.ØØ
31211267	3.42	3.ØØ	.44	.16	.21

25-APR-86 total cost spreadsheet
14:13:09 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID1	COST094	TOTAL	DESIGN	LOAN	OTHER
41111151	3.42	2.84	.06	.03	.49
13211123	3.44	3.09	.16	.18	.00
23111573	3.46	3.11	.02	.00	.34
23211526	3.46	3.46	.00	.00	.00
31211166	3.46	3.24	.09	.05	.08
41211127	3.46	3.46	.00	.00	.00
41211180	3.46	3.30	.00	.17	.00
42211043	3.46	3.47	.00	.00	.00
42211241	3.46	3.07	.06	.33	.01
12211131	3.47	3.26	.00	.11	.11
41211188	3.47	3.46	.00	.00	.01
41211204	3.47	3.47	.00	.00	.00
41211024	3.48	3.15	.00	.34	.00
41211086	3.49	3.30	.09	.11	.00
41211005	3.50	2.85	.00	.37	.29
41211062	3.53	2.82	.12	.15	.44
23211501	3.54	3.39	.08	.00	.00
41211079	3.55	2.97	.00	.12	.46
41211082	3.55	3.05	.06	.04	.40
41211013	3.56	3.00	.12	.00	.45
41211677	3.57	3.31	.08	.18	.00
42211115	3.57	3.40	.09	.05	.04
23211548	3.59	3.39	.00	.20	.00
31211101	3.59	3.35	.05	.29	.01
32211299	3.59	3.30	.50	.13	.00
41211196	3.59	3.17	.00	.14	.29
23211531	3.61	3.61	.00	.00	.00
31211216	3.61	4.47	.14	.08	.00
41211060	3.61	3.29	.06	.07	.19
41211095	3.63	3.42	.06	.16	.00
42211141	3.65	2.83	.12	.16	.54
23211520	3.67	3.65	.02	.00	.00
32211232	3.69	3.19	.33	.13	.04
41211058	3.71	3.32	.08	.32	.00
31211248	3.73	3.89	.07	.06	.00
32211423	3.73	3.75	.00	.00	.08
41211203	3.73	3.68	.00	.00	.06
42211041	3.73	3.20	.13	.13	.28
42211042	3.73	3.20	.13	.13	.28
41211265	3.74	3.65	.10	.00	.00
23111523	3.75	3.68	.07	.00	.00
41211123	3.75	2.82	.67	.12	.14
23211506	3.76	3.56	.00	.00	.20
23211519	3.76	3.74	.02	.00	.00
31211106	3.76	3.56	.12	.00	.07
41211156	3.78	3.35	.11	.09	.23
42211044	3.79	2.94	.14	.14	.57
31211183	3.80	3.51	.07	.12	.10
41211153	3.82	3.82	.00	.00	.00
41211033	3.83	2.84	.00	.36	.64
41211072	3.83	3.74	.00	.09	.00

25-APR-86 total cost spreadsheet
14:13:10 Lawrence Berkeley Laboratory DEC VAX-8600 VMS V4.1

SITEID1	COST094	TOTAL	DESIGN	LOAN	OTHER
32211310	3.86	3.51	.23	.68	.00
41211036	3.86	3.78	.00	.08	.00
41211074	3.86	3.70	.09	.07	.00
41211075	3.86	3.70	.09	.07	.00
41211076	3.86	3.70	.09	.07	.00
41211077	3.86	3.70	.09	.07	.00
41211092	3.88	3.21	.18	.10	.39
41211252	3.89	3.90	.00	.00	.00
41111178	3.91	3.22	.00	.29	.41
42211121	3.91	3.72	.02	.05	.12
23211566	3.93	3.73	.00	.20	.00
31211399	3.94	4.05	.09	.07	.00
41211225	3.94	3.82	.00	.10	.03
32211426	3.95	3.52	.08	.00	.01
12211110	3.96	3.63	.16	.16	.00
42211116	3.96	3.85	.05	.06	.01
41211054	4.00	3.48	.16	.29	.07
41211063	4.02	3.32	.12	.15	.44
31211308	4.03	3.79	.00	.24	.00
41111174	4.03	3.20	.00	.40	.43
41211065	4.04	3.29	.12	.18	.46
41211056	4.05	3.62	.08	.13	.23
41211160	4.06	3.59	.00	.07	.41
31211135	4.07	3.61	.47	.00	.00
41211124	4.08	3.44	.38	.27	.00
41211234	4.09	3.64	.17	.27	.00
32211289	4.11	3.69	.07	.18	.16
31211409	4.14	3.75	.00	.11	.28
32211427	4.14	4.11	.00	.00	.00
41211097	4.15	4.04	.00	.11	.00
12211103	4.21	4.30	.00	.00	.00
41211023	4.21	3.88	.00	.34	.00
41211039	4.21	4.02	.00	.05	.14
41211173	4.29	4.00	.00	.30	.00
41211094	4.32	3.87	.06	.24	.15
41211133	4.35	3.93	.14	.28	.00
41211202	4.36	4.20	.09	.00	.07
42211130	4.39	4.20	.06	.14	.00
32211162	4.40	4.41	.00	.00	.00
41111235	4.40	3.97	.00	.19	.24
41211040	4.42	3.81	.20	.12	.29
41211009	4.43	3.24	.00	.41	.78
42211219	4.43	4.43	.00	.00	.00
41211014	4.45	4.33	.00	.12	.00
42211099	4.45	4.25	.20	.00	.00
13211125	4.46	4.31	.01	.02	.00
41211303	4.50	4.39	.11	.00	.00
31211250	4.61	4.37	.00	.00	.24
31211137	4.64	4.44	.00	.00	.00
41211078	4.77	4.13	.20	.08	.37
41211070	4.79	4.48	.00	.09	.23

25-APR-86 total cost spreadsheet
14:13:11 Lawrence Berkeley Laboratory DEC VAX-86ØØ VMS V4.1

SITEID1	COSTØ94	TOTAL	DESIGN	LOAN	OTHER
41211Ø71	4.79	4.48	.ØØ	.Ø9	.23
23211565	4.81	4.7Ø	.Ø6	.Ø3	.Ø2
41111Ø45	4.85	4.51	.ØØ	.13	.23
41211289	4.85	4.42	.ØØ	.23	.21
41211227	4.9Ø	4.68	.ØØ	.13	.Ø9
42211111Ø	4.9Ø	4.83	.Ø8	.ØØ	.ØØ
32211111Ø	4.92	4.9Ø	.ØØ	.ØØ	.ØØ
41311205	4.92	4.67	.ØØ	.25	.ØØ
41211Ø27	4.96	4.47	.Ø9	.12	.28
41111237	4.99	4.58	.ØØ	.18	.23
31211408	5.ØØ	4.58	.ØØ	.1Ø	.33
41211Ø52	5.ØØ	4.76	.19	.Ø6	.Ø1
41211Ø81	5.Ø1	4.47	.Ø6	.13	.36
41211Ø84	5.Ø1	4.89	.ØØ	.12	.ØØ
41211246	5.15	4.82	.Ø6	.23	.Ø4
41111176	5.16	4.16	.ØØ	.44	.55
31111112	5.3Ø	4.81	.25	.Ø4	.2Ø
41211187	5.33	5.ØØ	.ØØ	.18	.15
42211129	5.45	4.85	.Ø8	.41	.13
41211166	5.47	4.97	.32	.16	.Ø2
41211Ø9Ø	5.49	4.78	.1Ø	.1Ø	.51
31211260	5.56	4.55	.15	1.14	.31
41211119	5.65	5.66	.ØØ	.ØØ	.ØØ
41211Ø59	5.66	5.ØØ	.ØØ	.13	.53
42211Ø85	5.84	5.47	.ØØ	.Ø9	.28
31211128	5.87	5.39	.ØØ	.ØØ	.ØØ
31211403	5.87	4.9Ø	.14	.16	.68
31211200	5.93	5.44	.26	.Ø4	.18
23211525	6.23	6.23	.ØØ	.ØØ	.ØØ
31211259	6.28	5.29	.18	.64	.15
41211Ø83	7.7Ø	6.83	.ØØ	.24	.64
32211111	8.Ø3	6.84	.1Ø	.94	.Ø9
32211186	8.25	7.47	.Ø6	.ØØ	.Ø7
*41211128	15.9Ø	13.68	.55	1.53	.11

NUMBER OF CASES READ = 391 NUMBER OF CASES LISTED = 391

*This case is a foam block house whose costs include failed attempts to build it.

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