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## Publication Date
1985-04-01

LBL-19413
Preprint

# Lawrence Berkeley Laboratory
UNIVERSITY OF CALIFORNIA

## APPLIED SCIENCE DIVISION

Submitted to ASHRAE Journal

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Prepared for the U.S. Department of Energy under Contract DE-AC03-76SF00098

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LBL-19413
EEB-BED-85-06

# MEASURED ENERGY PERFORMANCE OF ENERGY-EFFICIENT NEW COMMERCIAL BUILDINGS: RESULTS FROM THE BECA-CN DATA COMPILATION

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The work described in this paper was funded by the Assistant Secretary for Conservation and Renewable Energy, Office of Building Energy Research and Development, Building Systems Division of the U.S. Department of Energy under Contract No. DE-AC03-76SF00098.

## ABSTRACT

Measured energy consumption data have been compiled and analyzed for 133 new commercial buildings. Many of these buildings are energy award winners at the forefront of energy-efficient design. About two-thirds of the buildings achieved site energy consumption levels below 70 kBtu/ft$^2$-yr, or 220 kBtu/ft$^2$-yr in resource energy units. Almost half of the buildings are all electric. Offices and schools are the dominant building types in the data base. Over 70 percent of the buildings have floor areas larger than 50,000 ft$^2$. A majority of the buildings presently in the data base are government owned and occupied. Besides energy use, other building characteristics and specific energy-saving features are discussed. Cost data are not available for many of the buildings; preliminary results of the limited data do not show a correlation between energy use and construction cost.

**KEYWORDS:** Energy Conservation, Commercial Buildings, Office Buildings, Monitoring, Energy Efficiency.

## INTRODUCTION

This study represents an extensive and ongoing data collection effort for new commercial buildings designed to be energy efficient, based on actual *measured* performance data. Despite a number of recent reports summarizing the design characteristics of new commercial buildings or reporting on general trends in the stock (Booz-Allen, 1982; DOE, 1982; GE, 1980; EIA, 1981; and BOMA, 1983) there has been a need for a continuing, systematic compilation and analysis of measured data for new, efficient commercial buildings. The BECA-CN* data base attempts to fill that need.

We began this study in 1982 by collecting energy-use data on award winners from competitions sponsored by Owens-Corning, ASHRAE (see insert for a report on the ASHRAE Award Winning Buildings), American Institute of Architects, and the Government of Canada and from buildings described at conferences or in special programs. New government buildings (Federal GSA buildings and California State Office Buildings) were included because of their energy performance guidelines. Although we principally compile data for new energy-efficient commercial buildings, we also compile limited data on conventional buildings since energy data for conventional buildings are needed to establish a performance base line for comparison.

Ideally, we hope to create a data base and devise analytical techniques that allow meaningful comparisons of performance despite differences in climate, occupant densities, operating hours, interior comfort conditions, and special loads such as computers. Another objective is to try to correlate efficient energy usage with features of the building envelope, HVAC or lighting systems, and special equipment or operating practices. This includes analyzing discrepancies between predicted and actual energy performance. A third objective is to analyze the economics of efficient new buildings--specifically, the cost effectiveness of added energy features. Finally, we hope to encourage the exchange of documented performance data and to help establish guidelines for the collection and analysis of such data.

In this article we first discuss our current data collection and analysis procedures. We also discuss the limitations involved with our techniques and with the data currently available. Next, we present the most pertinent results of our present analysis. Finally, we summarize our conclusions and describe future work.

* Buildings Energy-Use Compilation and Analysis (BECA) is an ongoing project at Lawrence Berkeley Laboratory. It includes compilations on the energy performance and cost effectiveness of low-energy new homes (BECA-A), existing "retrofitted" homes (BECA-B), energy-efficient new commercial buildings (BECA-CN), existing "retrofitted" commercial buildings (BECA-CR), appliances and equipment (BECA-D), and validations of building performance models (BECA-V).

## DATA COLLECTION AND ANALYSIS

In most cases the first step in gathering data is identifying leads to buildings in reports or journal articles. We then contact the owner, designer, or those responsible for the building's operation (or all three) and collect data using a standard request form to supplement the information contained in the reports and articles. The data are then coded in a consistent format and recorded in the data base.

### *Types of Data*

Data sought for each building include:

- **energy** - usage by fuel type, including peak electric demand, costs, and predicted usage,
- **building description** - location, completion date, gross and conditioned floor area, building type, number of floors,
- **energy-saving features** - lighting and daylighting, HVAC system and controls, building envelope, other features,
- **operating conditions** - hours, occupant density, process loads (e.g., computers or copy machines), temperature and ventilation settings, lighting levels,
- **economics** - total construction cost, added cost of energy features, added operating and maintenance costs.

As a minimum for each building we need to know: size, type, location, year built, annual energy consumption, and some information on features and operating characteristics. Appendix B contains data tables with individual building records for the 133 buildings with actual measured energy values. These tables contain more detailed data on building characteristics, energy use, electric peak demand, energy costs, and special energy features.

### *Energy Analysis*

Our analyses have two main purposes: (1) to find correlations between energy intensities and other building parameters and (2) to compare the BECA-CN energy intensities to other commercial building data sets for bench marks. We calculate energy intensities (kBtu/ft$^2$-yr, using gross floor area) in both site and resource* units for the most recent year of energy data available for each building.

Limitations of the data restrict evaluations of the energy performance of these buildings. For example, more multi-year data are needed; some of the BECA-CN data represent the first year of occupancy, which may not be indicative of long-term performance. Monthly and seasonal

* Site energy units are calculated using 3413 Btu/kWh. We use 11,500 Btu/kWh for resource units to account for typical power plant efficiency of 33 percent and transmission losses of about 10 percent.

profiles, available for most of the buildings, are essential in sorting out weather-dependent loads and in verifying annual values but have not yet been analyzed in detail. By far the majority of BECA-CN data points currently include only whole-building metered consumption, by fuel type. To get a better understanding of building performance and to make comparisons more meaningful we need more *end-use* (e.g. individual lighting or heating system energy consumption) data. Submetered end-use data will assist us in analyzing specific features. Variations in process loads, outdoor lighting, and operating hours, for example, presently complicate comparisons among building energy intensities.

*Economic Assessment*

We are able to make only general comparisons of building economics. Both energy and cost data are needed to evaluate the cost effectiveness of a new building, but accurate and complete cost data are very difficult to obtain. Ideally, our analysis would compare the incremental costs of building construction and operation due to the energy-saving design features with the incremental savings in annual energy costs. Lacking these data, we examined the relationship between annual energy consumption and *total* building construction cost for a portion of the data set. Construction costs are not strictly comparable among buildings due to differences in accounting practices. Moreover, these costs vary by location. We offer this comparison as a rough indicator of trade-offs between energy-related first cost and operating costs.

## RESULTS OF DATA ANALYSIS

The data base currently consists of 119 U.S. and 14 foreign (mostly Canadian) buildings. The sample includes both very low energy buildings and buildings operating above U.S. stock averages.

*Building Characteristics*

We summarize some characteristics of the data below.

- **Tenancy**: almost 60% of the buildings are public buildings because government sources have been more willing than private building owners to share energy consumption data. In the future we hope for more cooperative efforts to obtain data on efficient new privately owned and privately occupied buildings.

- **Building type**: office buildings (66%) and educational buildings (14%) are the principal types.

- **Location**: the 119 U.S. buildings are distributed throughout the country across all climate zones with a concentration (about 50% of the total) in the Pacific Northwest and California because of regional studies.

- **Features**: energy management and control systems (EMS's), economizers, and heat-recovery systems are common features and are fast becoming standard equipment for many large commercial buildings. Daylighting is also becoming popular; about one-third of the buildings incorporate some daylighting.
- **Size**: most of the buildings are large. Only 13 of the 133 BECA-CN buildings are under 10,000 $ft^2$, compared with about three-fourths of the U.S. stock, representing only about 20 percent of the U.S. commercial floor space (EIA, 1981).

*Distribution of Energy Consumption*

Figure 1 shows the wide range in the actual site energy intensities for the 88 office buildings. The distribution of energy intensities for the 35 all-electric buildings (bottom shade pattern) is very similar to that of the 53 buildings that use some fuel. We do not distinguish between the all-electric and mixed-fueled buildings in the other graphics and tables. However, we do all analyses in both site and resource units; conclusions are similar except as noted below. The majority of the buildings (over 60%) use between 40 and 70 kBtu/$ft^2$-yr; the median large office intensity is 59 kBtu/ft–yr, and the median small office intensity is 47 kBtu/$ft^2$-yr. In the next section we further evaluate the energy performance of these buildings by comparing the data to the available bench marks for each building type.

*Energy Use by Building Type*

The site and resource energy intensities according to building type are summarized in Table 1. Figure 2 shows the same data with less disaggregation among building types. This plot also contains standard deviations for BECA-CN data. The performance data for each building type are compared with 1979 Nonresidential Buildings Energy Consumption Survey (NBECS) data, representative of overall U.S. commercial stock (EIA, 1983), and with energy budgets based on the latest proposed ASHRAE (90-E) standards for new commercial buildings (Battelle PNL, 1983).

The bench mark ranges correspond to differences among U.S. climate zones. In the case of the ASHRAE values, the ranges also include differences across two HVAC systems used to model prototype buildings. Since BECA-CN buildings are much newer than existing stock, we would prefer to compare BECA-CN to energy consumption data for conventional *new* commercial construction rather than *existing* stock. Such data are presently unavailable; therefore we use NBECS data for existing stock.

The average energy intensities for both large and small offices are slightly above the range of ASHRAE standards and well below the intensities of the existing U.S. office stock, as reported in NBECS. The educational buildings contained in our data base consume energy within the ASHRAE 90-E range and well below the NBECS site average but slightly above the NBECS

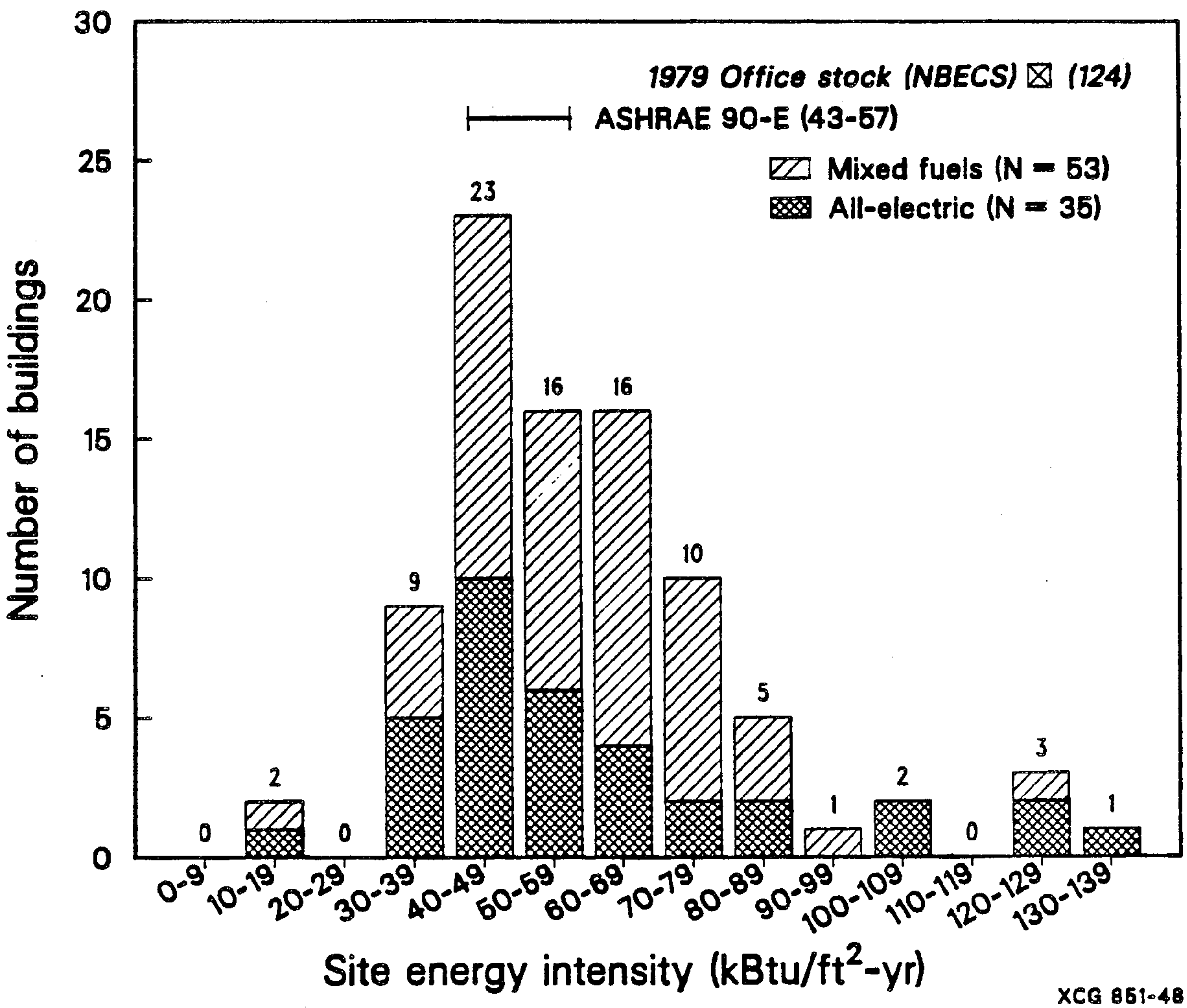


Figure 1. Actual site energy intensity for new office buildings in BECA-CN. The distribution for all-electric and mixed-fuel buildings are similar. Over 60% use between 40 to 70 kBtu/ft$^2$-yr. The average U.S. office stock (EIA, 1981) and the proposed ASHRAE 90-E values for large offices are included for reference.

**Table 1**
**Summary of Energy Performance**

| Building Type | Site Intensity (kBtu/ft²-yr) BECA-CN N | Mean[1] | Median | Range | ASHRAE[2] Stnd. 90-E | NBECS[3] Mean | NBECS[3] Range | Resource Intensity (kBtu/ft²-yr) BECA-CN N | Mean[1] | Median | Range | ASHRAE[2] Stnd. 90-E | NBECS[3] Mean |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Large Office | 69 | 61 | 59 | 15-129 | 43-57 | | | 66 | 176 | 164 | 47-435 | 124-159 | |
| Small Office | 19 | 55 | 47 | 11-135 | 39-51 | 124 | 83-147 | 17 | 167 | 145 | 38-453 | 133-166 | 264 |
| College | 3 | 81 | 74 | 62-108 | | 87 | 71-95 | 3 | 216 | 212 | 186-250 | | |
| Secondary | 6 | 73 | 60 | 38-129 | 50-110 | 87 | 71-95 | 5 | 184 | 165 | 129-298 | 92-191 | 153 |
| Elementary | 9 | 47 | 42 | 32-68 | | 87 | 71-95 | 9 | 143 | 143 | 72-209 | | |
| Retail | 8 | 77 | 69 | 39-134 | 57-75 | 87 | 82-92 | 8 | 237 | 233 | 130-451 | 192-252 | 177 |
| Warehouse | 4 | 42 | 40 | 26-62 | 43-89 | 108 | 53-158 | 3 | 118 | 93 | 53-209 | 94-130 | 199 |
| Other | 15 | 61 | 60 | 17-99 | | 184 | 106-131 | 15 | 176 | 176 | 58-332 | | 336 |
| Total | 133 | 60 | 56 | | | | | 126 | 177 | 165 | | | |

1. All BECA-CN means are unweighted, i.e. each building's energy intensity is weighted equally regardless of floor space.
2. ASHRAE values are based on simulations for prototype buildings and are only rough approximations of how buildings would perform under the standard. The ranges include 7 climate zones, and two alternate HVAC systems (Battelle PNL, 1983). The range also incorporates Standard 90-E both with and without daylighting. The values listed for a small office are based on a 49,500 ft$^2$, 3-story building, which is near the BECA-CN size limit for small offices of 50,000 ft$^2$. The retail ranges are based on a mall department store, similar in type to most of the BECA-CN retail data. For educational buildings, the range is derived from a junior high prototype, although BECA-CN includes elementary schools, secondary schools, and colleges.
3. NBECS (EIA, 1981) does not distinguish between large and small offices, however, the average U.S. office from this sample has a floor area of 13,700 ft$^2$. NBECS does not distinguish between colleges, secondary schools and elementary schools. All-electric buildings are averaged with those using mixed fuels. The ranges include sub-averages across 4 U.S. census regions.

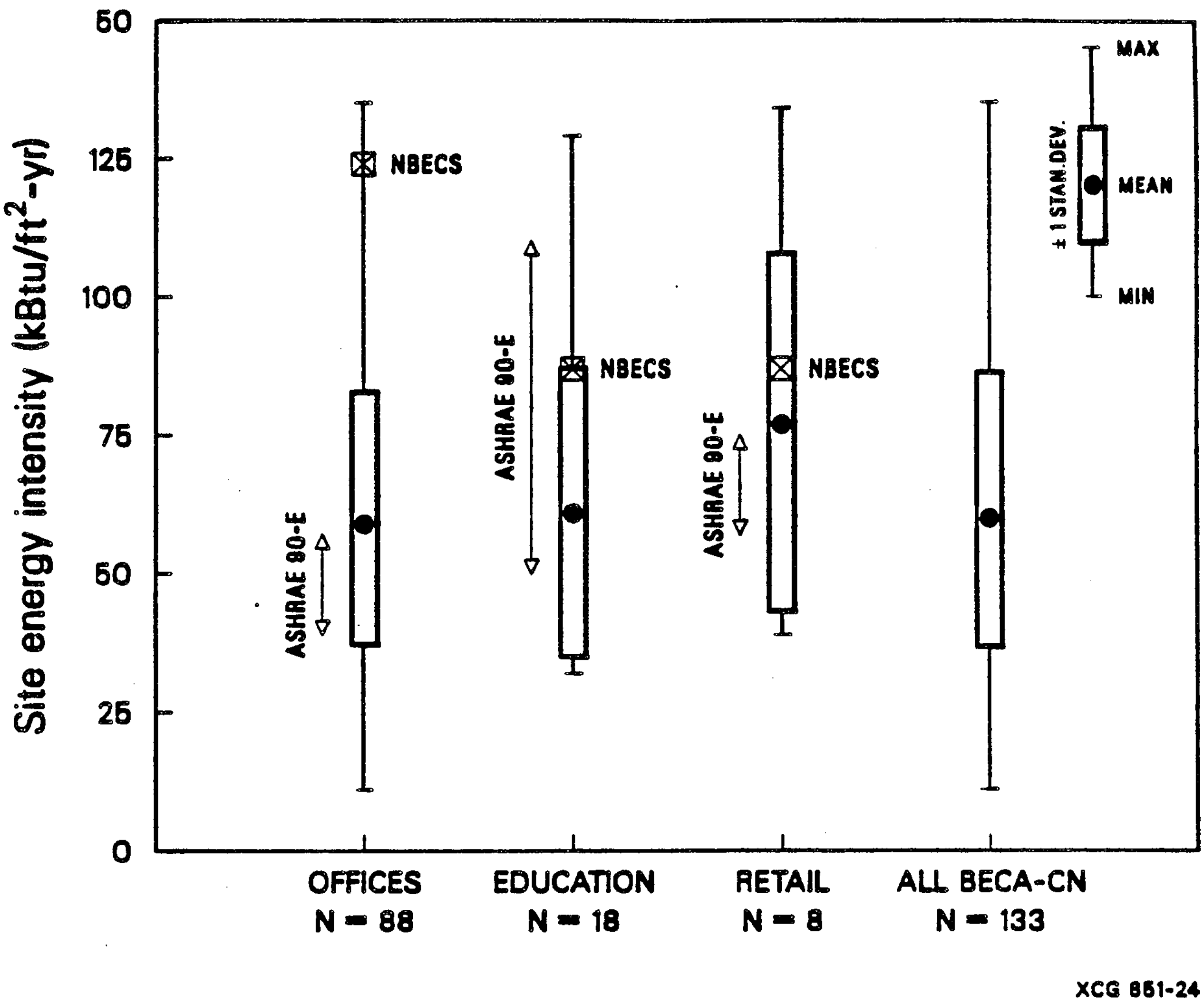


Figure 2. Summary of energy performance by building type for BECA-CN compared to 1979 average U.S. stock (EIA, 1981) and proposed ASHRAE Standard 90-E. Data are from Table 1. The minimum, maximum, mean, and standard deviation are presented for each of the four BECA-CN categories of buildings. No NBECS average or Standard 90-E data are presented for the fourth category because of the wide variety of building types in the total data base. For all three building types the BECA-CN mean is clearly below the U.S. average stock, but in only one case is it within the range of the standard.

resource intensity average. The latter result indicates the relatively higher electricity component of the total building consumption by the BECA-CN educational structures as compared to the overall U.S. educational stock.

There appears to be less emphasis placed on energy-efficient design in the retail sector, compared to offices and schools. For the retail sector the average intensity is approximately the same as the upper value in the ASHRAE 90-E range and below the NBECS site average, but above the NBECS resource average. The "retail" classification covers a wide variety of businesses that require vastly different energy inputs, making the NBECS and ASHRAE bench marks less comparable than for the other commercial building types. Although the NBECS retail data includes energy-intensive supermarkets, BECA-CN does not. The ASHRAE 90-E value is based on a shopping mall department store.

In this section we have attempted to address the questions, "what is an energy-efficient commercial building?" and "efficient compared to what?" These comparisons highlight some of the difficulties in analyzing whole-building data for commercial buildings and in finding valuable bench marks. An example of the problems involved in comparing actual building energy use with energy standards is that the ASHRAE values do not include energy used for exterior lighting, whereas the BECA-CN data do in most cases. Also, the ASHRAE simulations assume only minimal process loads (0.5 to 1.0 W/ft$^2$); we don't know the process load range among the BECA-CN buildings. As mentioned earlier, we hope to make comparisons more valid in the future as end-use data become available, enabling us to correct for the energy consumption of these extraneous systems.

*Economics*

Neither energy intensity nor annual energy costs are correlated with construction costs. Figure 3 shows the relationship between resource energy intensity and construction cost for the 63 buildings with available cost data. We present this plot in resource energy units since they reflect energy costs better than site units. All costs are inflated to 1984 dollars and normalized by building floor area. Even though most (60%) of these buildings are offices, the data are well scattered. The average BECA-CN construction cost is \$76/ft$^2$; the average resource energy intensity for this subset is 181 kBtu/ft$^2$-yr. These averages compare favorably with the NBECS average of 264 kBtu/ft$^2$-yr (resource intensity) for 1979 office stock and with average U.S. office building costs*, which range from \$55/ft$^2$ to \$85/ft$^2$ (Dodge, 1976 and 1982). The buildings in this subsample that are the least energy intensive are as likely to be at the low end of the range of

* This range is derived from 1976 and 1982 national average construction costs per ft$^2$ for corporate and general offices. Dodge divides averages into low, middle, and high cost buildings to represent differences in construction quality and complexity.

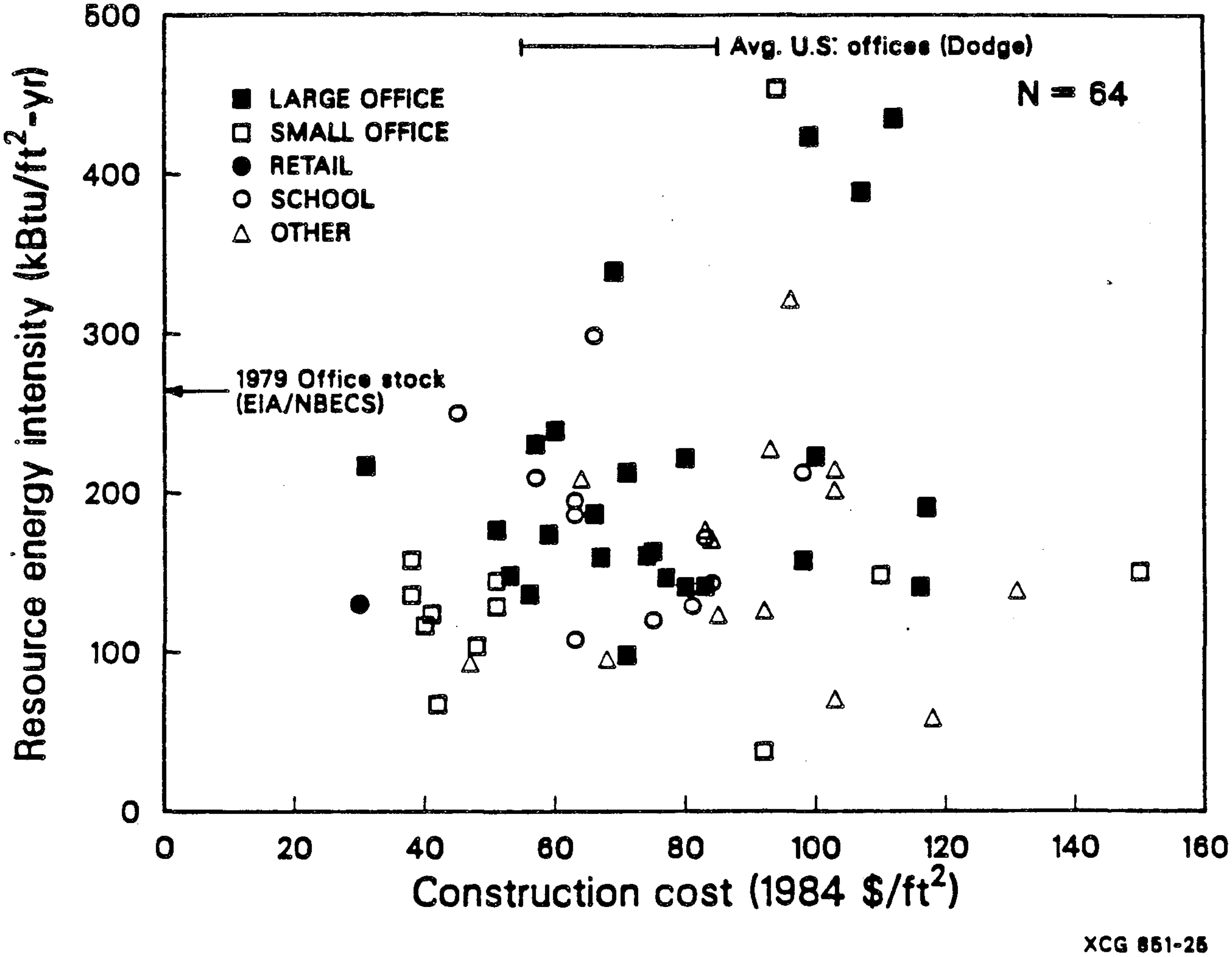


Figure 3. Resource energy intensity versus construction cost, for new commercial buildings in BECA-CN. Based on this subsample there is no clear correlation between construction costs per square foot and energy intensities; it is possible to produce a low-energy building over a considerable range of construction costs. National average construction costs for offices ($\$55/ft^2$ to $\$85/ft^2$) are included for reference.

construction costs as at the high end. The data suggest it is possible to build relatively low-cost buildings that also perform well.

*Actual vs. Predicted Energy Use*

Figure 4 shows actual measured site energy intensity versus the designed site intensity for a subset of 33 buildings. The average site energy intensity for this sample is 57 kBtu/ft$^2$-yr, and the average predicted value is 46 kBtu/ft$^2$-yr. Much of the difference between the two preceding averages can be attributed to the 8 cases for which designed performance levels of 30-40 kBtu/ft$^2$-yr (site) were not achieved and actual total site intensities ranged from 60 to 127 kBtu/ft$^2$-yr. We will continue to collect energy data and operating characteristics from all 33 of these buildings to see if they more closely approach their designed consumption.

Discrepancies between "predicted" and actual consumption are to be expected. Many of these "predictions" are based on simulations made to test the relative performance of various strategies, not to predict the actual performance. For several of the buildings, the design estimates did not include major process loads. In addition, buildings are often not operated according to design conditions. Some of the buildings contain design features that are currently not being used.

We offer two examples. In one office building we visited, the light-dimming controls were installed but not yet operational even though the building had been fully occupied for over a year and daylighting was ample. This building uses 77 kBtu/ft$^2$-yr, about twice the design prediction of 35 kBtu/ft$^2$-yr. In another large office the actual energy use of 101 kBtu/ft$^2$-yr was almost three times the design value of 38 kBtu/ft$^2$-yr during the first year of full occupancy. The building is operated longer hours than anticipated, which would be expected to increase the energy consumption. This increased operating schedule has also limited the effectiveness of the design features. A night flushing system to cool down the structural thermal mass has not been used because it causes turbulence and noise unacceptable to nighttime occupants. In addition, the design prediction of energy use did not include process loads. A computer center in the building contributes to the high energy consumption; current monitoring will enable us to assess the magnitude of this load.

*Energy Intensity vs. Building Size*

Figure 5 shows that, on average, the larger BECA-CN buildings use about the same amount of energy per square foot as the entire sample. There appears to be a larger range of energy intensities for small buildings than for larger ones. This may be partially attributable to the greater weather dependency of small buildings; internal gains tend to dominate the conditioning requirements of large buildings. Again, the present compilation of buildings operate at intensities well below 1979 office stock and 1979 school stock as reported by NBECS.

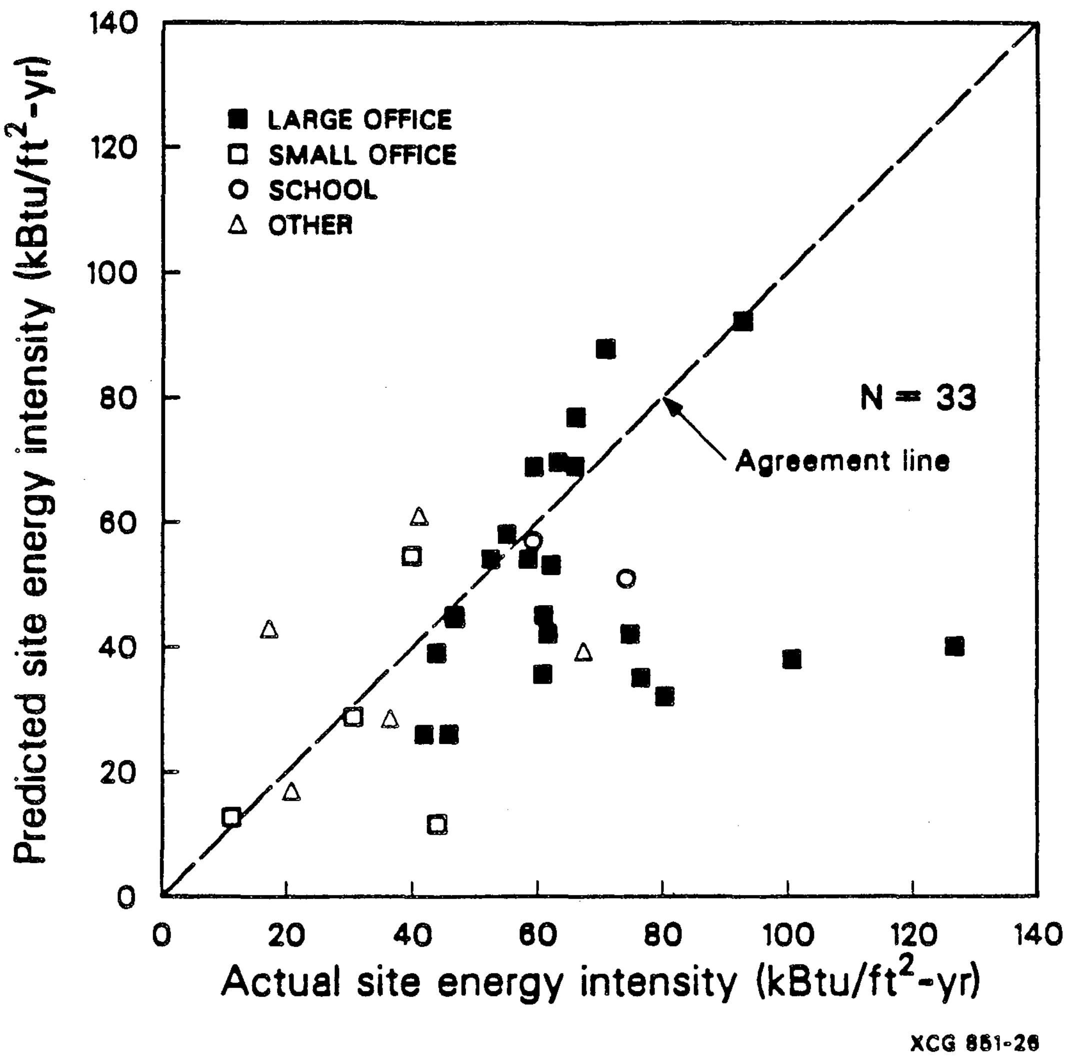


Figure 4. Predicted energy intensity versus actual energy intensity, for new commercial buildings in BECA-CN. The average actual site intensity is 57 kBtu/ft$^2$-yr, and the average predicted intensity is 46 kBtu/ft$^2$-yr. Energy use is above predictions for two-thirds of the buildings. The most important reason for the discrepancies is that design conditions often varied greatly from actual operating conditions.

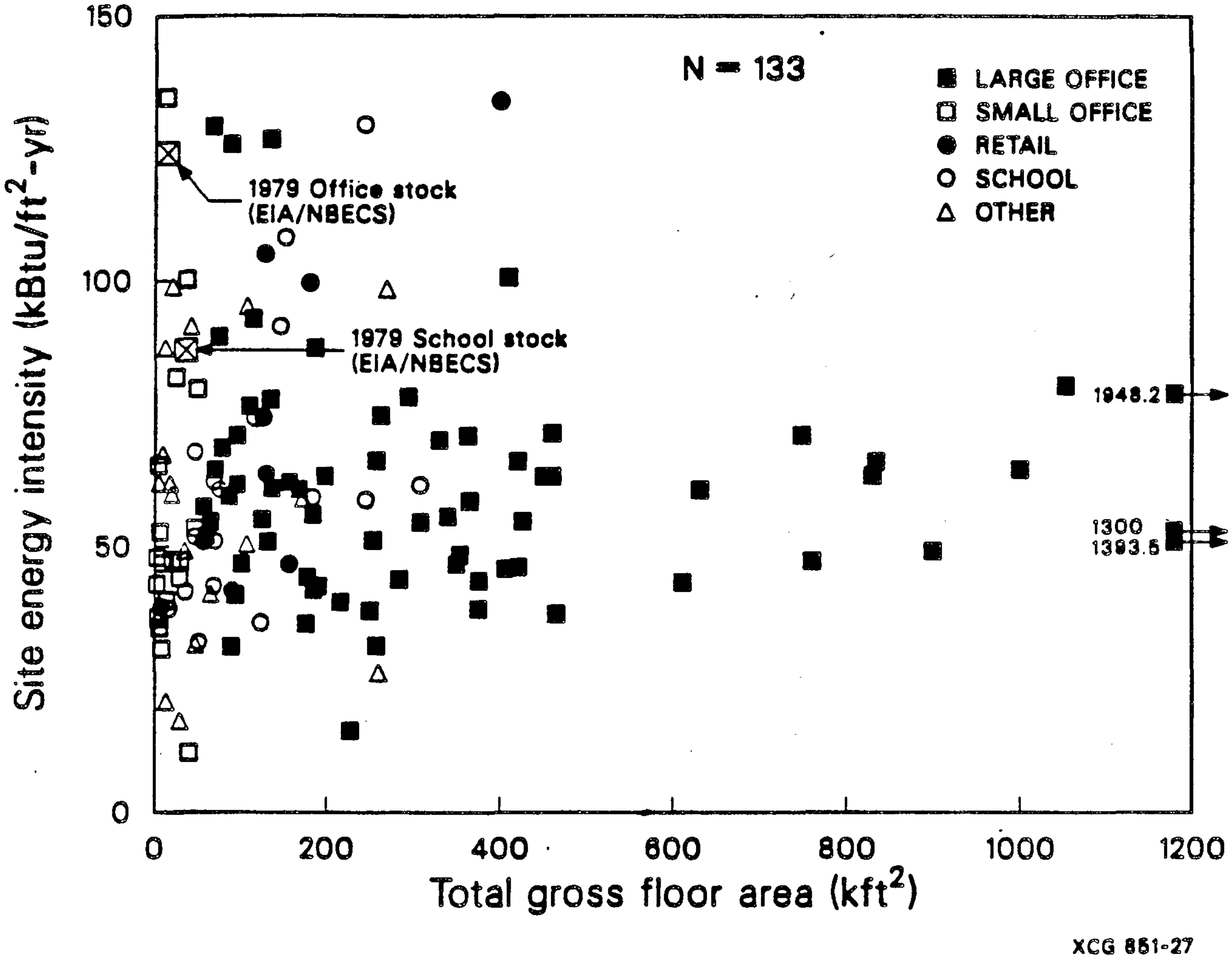


Figure 5. Site energy intensity versus gross floor area for new commercial buildings in BECA-CN. The larger buildings use, on average, about as much energy per square foot as the average for the overall sample, but there appears to be more variation in energy intensities among smaller buildings. Average 1979 U.S. office and school stock are included for reference.

## CONCLUSIONS

The data presented in this paper provide an initial view of trends in new, energy-efficient commercial buildings. Most new buildings in our sample are operating at energy intensities far below average for the U.S. commercial building stock and near the range predicted for the proposed ASHRAE 90-E guidelines. The low energy use of these building may be attributed to a variety of building features, as documented in the data tables (discussed earlier). Innovative design features involving the HVAC system and controls are common in this sample. For the newest buildings there is also emphasis on efficiency-related features of the glazing, daylighting, and lighting systems.

Limitations in data continue to restrict our understanding of energy use in new commercial buildings. The wide range of energy intensities is difficult to explain with annual whole-building energy data. Occupancy, operating, and weather conditions may affect the energy consumption more than the presence of energy-efficient features. These factors should be taken into account in evaluation of the energy performance of commercial buildings.

To address these issues future work will include compiling data on additional buildings, collecting additional detail on building operating and occupancy conditions, and improving our base line data for comparison. Along this line, we will be collecting detailed end-use data, which are becoming available for many new commercial buildings. A large-scale end-use monitoring project in the Pacific Northwest will be a major source for these data. We are also studying the use of EMS's as a source of submonitored data. In addition, we are working on evaluating "low-power" buildings and documenting the performance of various load-management techniques.

Since the data compilation project is a continuing effort, we solicit from the reader any comments, suggestions, or leads to additional data sources.

## ACKNOWLEDGMENTS

The work described in this report was funded primarily by the Assistant Secretary for Conservation and Renewable Energy, Office of Building Energy Research and Development, Buildings Systems Division of the U.S. Department of Energy under Contract No. DE-AC03-76SF00098. Additional funding sources include the California Energy Commission and the Bonneville Power Administration.

The authors would like to thank the many people who supplied the actual building data for this study, as well as those who provided us with valuable leads to new data. Special thanks to Robert Shibley for his assistance in helping us gather data on the Owens-Corning Energy Award Winners and to the many ASHRAE members and staff who supplied us with information on the ASHRAE Energy Awards Program. We also thank Scott Crowder, Denise Flora, and John Hartmann for their assistance with data collection in California and the Pacific Northwest, and

Jeffrey Harris for his helpful advice.

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## APPENDIX A

This section and the accompanying figure is to be appear in the ASHRAE Journal article as a highlighted sub-article.

### ASHRAE ENERGY AWARD WINNERS

Fourteen commercial buildings that have been national winners in the ASHRAE Energy Awards Program (1981-84) are included in the present data base. Their characteristics, energy performance, and special features are fairly consistent with that for the overall collection of buildings. Twelve of the fourteen buildings are either office buildings or schools. The date of construction for the set ranges from 1978 to 1982. Slightly over one-half are all electric, and exactly one-half are public buildings. The floor areas are large, with all but three buildings over 50,000 $ft^2$. Ten of the buildings are in the U.S., scattered throughout the country. The other four are located outside of the U.S.. The site energy intensities of the ASHRAE winners are displayed in the histogram (Figure A) and can be compared with the distribution for all the buildings in the data base. The energy performances are very similar, with the average site value of 61 $kBtu/ft^2$-yr for the ASHRAE winners differing only slightly from the average values of 60 $kBtu/ft^2$-yr for the entire 133-building collection. Both values are much lower than the average energy consumption intensities of existing commercial stock. A majority of the ASHRAE award-winning buildings have EMS's, economizers, heat-recovery systems, and thermal storage as part of their special energy features.

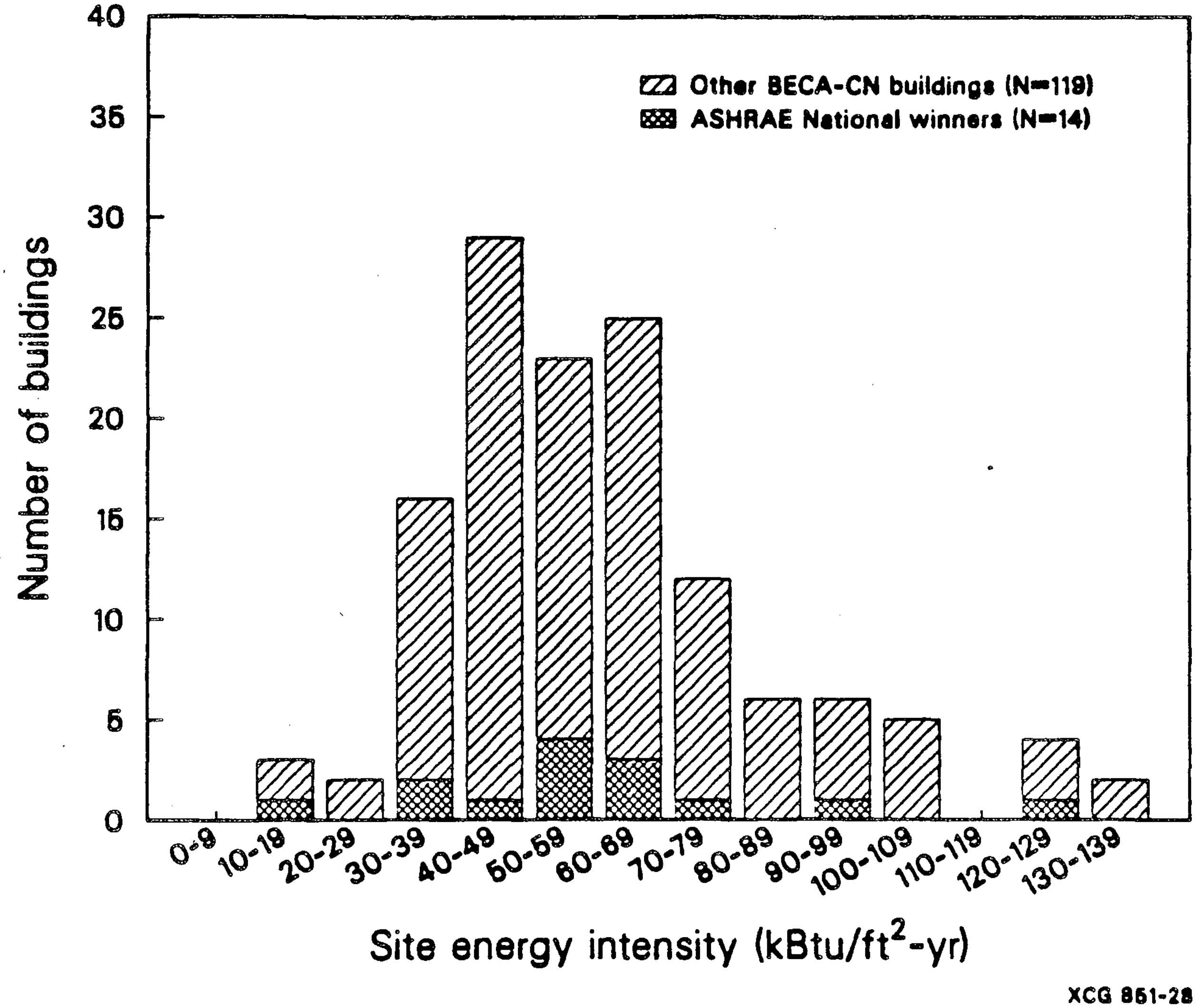


Figure A. Actual site energy intensity of the ASHRAE winners compared to the entire BECA-CN collection. The distribution of energy performance for these two samples are very similar. Nine of the fourteen ASHRAE winners are offices; three are schools.

APPENDIX B

## BECA-CN Data Table Definitions

July 1985

These data tables contain characteristics, features and energy usage for 133 buildings in the BECA-CN (Buildings Energy-Use Compilation and Analysis - part CN: New Energy-Efficient Commercial buildings) data base. The data are in order by building type and descending floor area.

The BECA-CN data base contains additional information for each buildings not printed below. Some of this information will be printed in future reports. Contact the Buildings Energy Data Group at Lawrence Berkeley Laboratory for more information.

### Data Table 1 Definitions: FEATURES OF BUILDINGS IN BECA-CN

A. BUILDING IDENTIFICATION NUMBER: assigned arbitrarily.

B. LOCATION: city (B1) and state (B2) where building is located. For buildings located outside of the United States, country is printed instead of state (B2). These are AU-Australia, CN-Canada, JP-Japan, and PH-Philippines.

C. BUILDING TYPE: based on predominant use of occupied space.

| | |
|---|---|
| LOFF | Large office building, over 50,000 $ft^2$ |
| SOFF | Small office building, less than 50,000 $ft^2$ |
| BANK | Branch bank and loan offices |
| COLL | College or university |
| SECN | Secondary school, high school |
| ELEM | Elementary school, primary |
| DEPT | Department store |
| SHOP | Shopping center |
| RETL | Retail |
| CLIN | Clinic |
| ARPT | Airport terminal |
| LIBR | Library |
| WARE | Warehouse |
| OTHR | Other type of building (ex: community center, laboratory, post office) |

D. YEAR BUILT: year construction completed.

E. GROSS FLOOR AREA: total gross floor area in 1000 $ft^2$. This includes conditioned and non-conditioned spaces, but generally does not include parking. If parking is included it is noted in the comments section (Y). For three of the buildings we only have conditioned floor area. A "C" follows the floor area value in these cases.

F. NUMBER OF FLOORS: maximum number of stories, excluding indoor parking.

G1. ENVELOPE R-VALUES WALL: average wall R-value (English Units).

G2. ENVELOPE R-VALUES ROOF: average roof R-value (English Units).

G3. ENVELOPE R-VALUES GLASS: average glass R-value (English Units).

H. NUMBER OF PANES: predominant number of window panes.

I1. GLASS AS % OF WALLS ALL: overall % of wall area covered by windows.

I2. GLASS AS % OF WALLS SOUTH: southern wall % of area covered by windows.

J1. OCCUPANTS NUMBER/$KFT^2$: average number of occupants per 1000 $ft^2$. This data is also often estimated.

J2. OCCUPANTS HOURS: building occupancy code.

- M Minimal (less than 40 hrs/week)
- R Regular (40-50 hrs/week)
- E Extended (51-75 hrs/week)
- F Full (76-168 hrs/week)

**Data Table 2 Definitions: CHARACTERISTICS OF BUILDINGS IN BECA-CN**

**The first two columns in Table 2 are the same as the first two in Table 1. The definitions below begin with the third column.**

K. INSTALLED LIGHTING LOAD ($W/FT^2$): installed lighting load. Data may not be consistent among buildings. Often this data is estimated. We ask for overall average for the building, but data may be for the office area only, for example. Task lighting is often not included.

L1. LIGHTING TYPE 1: space for the three main types are recorded in the data base. The most predominant two are printed here. The first type is the major type. The codes are:

- FLU Fluorescent
- HGV Mercury vapor
- HAL Metal halide
- INC Incandescent
- HPS High pressure sodium
- HID High intensity discharge (when we don't know if it is HGV, HAL, or HPS)
- PFL Parabolic Fluorescent Luminaires.

L2. LIGHTING TYPE 2: see above (L1).

M. AVERAGED USED LIGHTING LOAD ($W/FT^2$): average used load. This data is also often estimated. May or may not include task lighting.

N1. DAYLIGHT TYPE:

- RF Reflectors for bouncing light into the building
- LW Light wells
- SKY Skylights for lighting (not included if just decorative)
- RM Roof monitors
- AT Atrium for lighting (often for heat gain too)
- SH Light shelves
- CL Clerestory.
- OT Other

N2. LIGHT CONTROLS:

- SW Switches for banking rooms or floors
- CP Computerized (on the Energy Management System)
- PC Photocell for dimming with daylight sources
- PM Photocell & Microprocessor
- TM Timer
- PS Personnel Sensors
- RS Radio active switches for easy control
- DM Dimmers that allow selective reductions

OT Other type

O1. SPECIAL EQUIPMENT: (some of these codes may be found in either column O1 or O2, there is some overlap.)

ST Thermal Storage (hot or cold water tanks, ice, eutectic salts, etc.)
TM Thermal Mass (usually means trombe walls, passive solar)
SO Active Solar
EB Earth Berms
EZ Economizer
ED Direct Evaporative Cooling
HR Heat Recovery
HL Heat Recovery Luminaires
OW Operable Windows
CT Cooling Tower
SH External Shading (fixed or movable)
FS Fixed External Shading
MS Movable External Shading
MI Movable Insulation
HL Heat Recovery Luminaires
OT Other

O2. SPECIAL CONTROLS OR CONTROL STRATEGIES: (some of these codes may be found in either column O1 or O2, there is some overlap.)

EMS Energy Management Control System
NS Night Setback
LM Load Management
NC Natural cooling/night ventilation
TM Timers/clock thermostats
OA Outside Air (use for cooling, i.e. economizer usage)

P1. PRIMARY HEATING FUEL:

S Steam
E Electricity
G Natural Gas
O Oil
H Solar
X Other (one case includes purchased geothermal hot water)
N None

P2. PRIMARY HEATING EQUIPMENT DESCRIPTION:

RS Resistance (electric)
HP Heat Pump
HR Heat Recovery
SO Active Solar
BO Boiler
IR Infrared (used in warehouses)
FR Furnace

RP Roof Top Package

OS Off Site Source

Q1. PRIMARY COOLING FUEL:

S Steam

E Electricity

H Solar (for solar absorption chillers)

W Chilled Water

N None

Q2. PRIMARY COOLING EQUIPMENT DESCRIPTION:

HP Heat Pump

CH Chiller (general: don't know type)

CC Centrifugal Chiller

RC Reciprocating Chiller

AC Absorption Chiller

SA Solar Absorption

EC Evaporative Cooling

ST Thermal Storage (Ice or Water)

RP Rooftop Package

DX Direct Expansion Cooler

OS Off site source (chilled water)

OT Other

N None

**Data Table 3 Definitions:** ENERGY CONSUMPTION OF BUILDINGS IN BECA-CN

The first two columns in Table 3 are the first and the fourth column in Table 1. The definitions below begin with the third column.

R. YEAR OF DATA: most recent year of energy data available for the building. The year built is printed next to data year to show the age of the building for the year of data. For many of the buildings, this is the first year of operation.

S1. MEASURED ANNUAL ENERGY INTENSITY ELECTRICITY (KWH/FT$^2$-YEAR): electrical energy consumption in.

S2. MEASURED ANNUAL ENERGY INTENSITY FUEL, OTHER (KBTU/FT$^2$-YEAR): fuel (gas, oil, etc.) and other (steam, chilled water, etc.) consumption totals at the site.

S3. ANNUAL RESOURCE ENERGY (KBTU/FT$^2$-YEAR): Total resource energy intensity. Electricity is multiplied by 11,500 to convert kWh to Btu.

S4. ANNUAL SITE ENERGY (KBTU/FT$^2$-YEAR): Total site energy intensity. Electricity is multiplied by 3413 to convert kWh to Btu.

T. PREDICTED ANNUAL SITE TOTAL (KBTU/FT$^2$-YEAR): predicted annual site energy intensity. Sometime these predictions do not include all of the building loads. When available, we record the prediction method.

U1. MEASURED PEAK ELECTRICITY LOAD (W/FT$^2$) WINTER: peak electrical load for the winter (heating) months of November through April.

U2. MEASURED PEAK ELECTRICITY LOAD ($KW/FT^2$) SUMMER: peak electrical load for the summer (cooling) months of May through October.

V. ANNUAL ENERGY COST (1984 $\$/FT)^2$: total energy cost per $ft^2$ for the recorded year of operation. All costs have been adjusted to first quarter 1984 dollars using GNP deflators from the first quarter dollars of the year for the energy data.

W. CONSTRUCTION COST (1984 $\$/FT^2$): total building construction cost per $ft^2$ excluding land. Costs have been adjusted to first quarter 1984 dollars using GNP deflators.

X. CFA RATIO: conditioned floor area ratio. Obtained by dividing the conditioned floor area by the gross floor area.

Y. BUILDING CONFIDENCE LEVELS: Our assessment of the data quality.

- A Well documented case study information, high confidence in most values
- B Reported or certified by reputable person who had direct access
- C Marginally Acceptable, second hand data

Z. COMMENTS: miscellaneous information.

DATA TABLE 1: CHARACTERISTICS OF BUILDINGS IN BECA-CN
N = 133, JULY 1985

| (A) BLDG ID | (B1) CITY/STATE | (B2) | (C) BLDG TYPE | (D) YEAR BUILT | (E) FLOOR AREA (K SQFT) | (F) # FLOORS | (G1) <-------ENVELOPE <-------R-VALUES WALL | (G2) ROOF | (G3) ------> ------> GLASS | (H) # PANES | (I1) <GLASS AS % <-OF WALLS ALL | (I2) > -> SO. | (J1) <-OCCUPANTS (#/K SQFT) | (J2) -> HRS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | WASHINGTON | DC | LOFF | | 1948.2 | 6 | | | | 1 | | 64 % | 2.1 | |
| 51 | STE-FOY | CN | LOFF | | 1393.5 | 8 | 10.9 | 16.7 | 2.0 | | 46 % | | 2.2 | R |
| 37 | TORONTO | CN | LOFF | 1975 | 1300.0 | 23 | 10.0 | 14.3 | | | | 52 % | 3.8 | R |
| 71 | HOUSTON | TX | LOFF | 1981 | 1053.3 | 5 | 6.7 | 5.0 | 0.9 | | 54 % | 60 % | 0.1 | R |
| 136 | EL SEGUNDO | CA | LOFF | 1982 | 1000.0 | 21 | | | | 1 | 60 % | | 5.3 | F |
| 24 | SAN DIEGO | CA | LOFF | 1976 | 899.2 | | | | | | | | | |
| 47 | NORTH YORK | CN | LOFF | 1978 | 834.0 | 13 | | | | 2 | | | | R |
| 1 | SEATTLE | WA | LOFF | 1973 | 830.0 | 38 | | | | | 50 % | | 3.0 | R |
| 66 | ATLANTA | GA | LOFF | 1980 | 760.4 | 24 | 25.0 | 20.0 | | 2 | | 50 % | | |
| 147 | SAN FRANCISCO | CA | LOFF | 1981 | 748.7 | 38 | | | | 1 | 50 % | 50 % | | E |
| 42 | ANCHORAGE | AK | LOFF | 1979 | 631.3 | | 16.7 | 16.7 | | 2 | | 27 % | | R |
| 17 | INDIANAPOLIS | IN | LOFF | | 611.2 | 6 | | | | 1 | 70 % | 70 % | 2.6 | |
| 13 | JACKSON | MS | LOFF | | 465.3 | 15 | | | | | | | | E |
| 182 | REGINA | CN | LOFF | 1981 | 460.0 | 15 | 11.0 | 20.0 | | 2 | | 40 % | | R |
| 65 | BIRMINGHAM | AL | LOFF | 1981 | 460.0 | 3 | 20.0 | 12.5 | | 2 | | | | |
| 20 | LINCOLN | NE | LOFF | 1975 | 450.2 | 7 | 3.0 | 7.1 | | | | 80 % | 2.0 | |
| 145 | WESTLAKE VILLAGE | CA | LOFF | 1982 | 426.0 | 3 | 5.9 | 5.3 | 2.0 | 2 | 60 % | | 2.3 | R |
| 14 | COLUMBIA | SC | LOFF | | 421.4 | | | | | | | | | |
| 2 | PORTLAND | OR | LOFF | 1975 | 420.5 | 20 | | | | | 42 % | | 3.3 | |
| 74 | SACRAMENTO | CA | LOFF | 1982 | 410.0 | 2 | 14.3 | 14.3 | | 2 | | | 4.9 | |
| 165 | PORTLAND | OR | LOFF | 1982 | 406.0 | 15 | | | | 1 | | | 3.2 | R |
| 10 | SYRACUSE | NY | LOFF | 1976 | 376.0 | 14 | 10.0 | 16.7 | | 2 | 13 % | | 2.4 | |
| 19 | AKRON | OH | LOFF | | 375.6 | 5 | | | | 2 | 25 % | 25 % | | |
| 169 | PORTLAND | OR | LOFF | 1980 | 365.0C | | | | | 2 | | | | R |
| 52 | LONDON | CN | LOFF | 1980 | 362.6 | 9 | 10.5 | | | 2 | 28 % | | 2.8 | R |
| 56 | TACOMA | WA | LOFF | 1971 | 354.1C | 5 | 11.1 | 11.1 | | | | | | R |
| 25 | WOODBURY | MN | LOFF | 1978 | 350.0 | | | 20.0 | | | | | | |
| 30 | TROY | MI | LOFF | 1979 | 339.5 | 3 | | | | | | | | R |
| 55 | | PA | LOFF | 1971 | 330.0 | | | | | | 25 % | | 5.5 | |
| 50 | LONDON | CN | LOFF | 1976 | 308.5 | 11 | 11.6 | | | 2 | 25 % | | | R |
| 48 | RED DEER | CN | LOFF | 1979 | 294.0 | 6 | 14.3 | 10.9 | | 2 | 28 % | | | R |
| 70 | IDAHO FALLS | ID | LOFF | 1979 | 284.0 | 3 | 12.5 | 16.7 | | 2 | 40 % | 40 % | 5.3 | R |
| 62 | | MI | LOFF | 1979 | 263.0 | 14 | 12.5 | | 1.8 | | 20 % | | 2.5 | |
| 23 | VAN NUYS | CA | LOFF | 1975 | 258.2 | | | | | | | | | |
| 9 | ALBANY | NY | LOFF | 1974 | 257.4 | 10 | 6.7 | 5.7 | 2.0 | | 15 % | | 4.7 | |
| 15 | FT.LAUDRDALE | FL | LOFF | 1979 | 253.6 | 4 | | | | 2 | | | 1.6 | |
| 11 | NORFOLK | VA | LOFF | | 250.3 | | | | | | | | | |
| 32 | BRISBANE | AU | LOFF | 1980 | 227.6 | 26 | | | | 2 | | | | |
| 183 | PERTH | AU | LOFF | 1980 | 216.8 | 3 | | | | 1 | | | | R |
| 3 | FAIRBANKS | AK | LOFF | 1977 | 197.3 | 4 | | | | | | | | |
| 149 | SAN FRANCISCO | CA | LOFF | 1980 | 191.0 | 19 | | | | 1 | 50 % | 50 % | | |
| 8 | NEW HAVEN | CT | LOFF | | 186.8 | | | | | | | | | |
| 60 | TOPEKA | KS | LOFF | 1977 | 185.2 | 4 | 20.0 | 11.9 | | | 17 % | | 3.2 | |
| 16 | ORLANDO | FL | LOFF | 1975 | 183.6 | 6 | | | | | | | 2.7 | |
| 143 | BURLINGAME | CA | LOFF | 1980 | 177.6 | 9 | | | | 1 | | | 3.9 | R |

DATA TABLE 1 - CONTINUED: CHARACTERISTICS OF BUILDINGS IN BECA-CN

| (A) BLDG ID | (B1) CITY/STATE | (B2) | (C) BLDG TYPE | (D) YEAR BUILT | (E) FLOOR AREA (K SQFT) | (F) # FLOORS | (G1) <--ENVELOPE-- <--R-VALUES-- WALL | (G2) ROOF | (G3) --> GLASS | (H) # PANES | (I1) <GLASS AS %> <-OF WALLS-> ALL | (I2) SO. | (J1) <-OCCUPANTS-> (#/K SQFT) | (J2) HRS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 5 | MANCHESTER | NH | LOFF | 1976 | 176.4 | 7 | 16.7 | 16.7 | | 2 | 6 % | | | E |
| 141 | WALNUT CREEK | CA | LOFF | 1982 | 168.0 | 3 | | | | 1 | | 50 % | | E |
| 117 | LONG BEACH | CA | LOFF | 1982 | 156.0 | 4 | 14.3 | 25.0 | | 1 | 38 % | | | R |
| 126 | ANAHEIM | CA | LOFF | 1980 | 136.1 | 7 | 12.5 | 20.0 | | 1 | | | 2.2 | R |
| 67 | SACRAMENTO | CA | LOFF | 1979 | 135.0 | 2 | | | | | | | | F |
| 140 | SANTA CLARA | CA | LOFF | 1981 | 134.0 | 3 | | | | | | | 2.4 | |
| 6 | FITCHBURG | MA | LOFF | | 131.2 | | | | | | | | | |
| 115 | SAN JOSE | CA | LOFF | 1982 | 125.0 | 3 | 20.0 | 16.7 | | 1 | 38 % | | | |
| 49 | SWIFT CURRNT | CN | LOFF | 1977 | 114.9 | 5 | | | | 2 | 30 % | | 2.6 | F |
| 135 | SANTA ROSA | CA | LOFF | 1983 | 110.0 | 3 | | | | | | | 2.7 | F |
| 41 | BROOKFIELD | WI | LOFF | 1979 | 101.2 | | 22.2 | 11.2 | | 2 | | | | |
| 116 | SANTA ROSA | CA | LOFF | 1983 | 96.0 | 4 | 16.7 | 25.0 | | 1 | 37 % | | | |
| 171 | SEATTLE | WA | LOFF | 1981 | 95.5 | 2 | 16.7 | 16.7 | | 2 | | 50 % | 4.5 | E |
| 22 | HURON | SD | LOFF | 1977 | 94.4 | 5 | 6.5 | 8.3 | | 2 | | 13 % | | |
| 38 | WAUWATOSA | WI | LOFF | 1979 | 89.6 | | 20.0 | 11.1 | | | | | | |
| 158 | CORVALLIS | OR | LOFF | 1983 | 89.0 | 2 | 11.0 | 18.9 | | 2 | | | 4.8 | R |
| 72 | MINNEAPOLIS | MN | LOFF | 1977 | 86.6 | | | | | | | | 3.3 | E |
| 184 | LAVAL | CN | LOFF | 1981 | 78.2 | 5 | | | | 2 | 27 % | | | R |
| 148 | PLEASANTON | CA | LOFF | 1983 | 75.0 | 3 | | | | | | | | |
| 157 | SEATTLE | WA | LOFF | 1982 | 70.0 | 5 | | | | 2 | | | 3.7 | E |
| 162 | PORTLAND | OR | LOFF | 1978 | 68.0 | 4 | 7.7 | 10.9 | 1.9 | 2 | 22 % | 13 % | 3.7 | |
| 12 | HATTIESBURG | MS | LOFF | 1974 | 65.2 | 4 | | | | | 20 % | | | R |
| 21 | FAYETTEVILLE | AR | LOFF | | 60.4 | | | | | | | | | |
| 163 | BOZEMAN | MT | LOFF | 1979 | 56.7 | 3 | 8.3 | 25.0 | 2.0 | 2 | 47 % | 52 % | 3.5 | F |
| 57 | SAGINAW | MI | SOFF | 1976 | 49.5 | 1 | | | | | | | 3.4 | E |
| 81 | BROOKFIELD | WI | SOFF | 1979 | 47.1 | | 22.2 | 20.8 | | | 40 % | | | |
| 76 | TOKYO | JP | SOFF | 1982 | 40.6 | 4 | 8.1 | 9.8 | | 2 | | 50 % | 3.9 | R |
| 18 | CARBONDALE | IL | SOFF | | 37.5 | 2 | | | | | | | | E |
| 7 | PITTSFIELD | MA | SOFF | | 30.5 | | | | | | | | | |
| 174 | NEWPORT | OR | SOFF | 1982 | 29.6 | 2 | | | | | | 90 % | 3.4 | R |
| 82 | RICHLAND | WA | BANK | 1980 | 24.7 | | | | | | | | | E |
| 78 | COEUR D'ALENE | ID | SOFF | 1981 | 21.5 | 2 | 20.0 | 30.3 | | 2 | | | 3.3 | R |
| 43 | W. VALLEY C. | UT | SOFF | 1981 | 14.9 | | | 35.7 | | | | | | |
| 35 | AUSTIN | TX | SOFF | 1978 | 14.6 | | 16.7 | 20.0 | | | | 43 % | | R |
| 68 | SPOKANE | WA | BANK | 1979 | 13.5 | | 8.3 | 14.3 | | | | | 3.7 | R |
| 161 | SUNNYSIDE | WA | SOFF | 1981 | 9.7 | 1 | 14.3 | 25.0 | 1.8 | 2 | | | 6.2 | R |
| 36 | DENVER | CO | SOFF | 1977 | 9.0 | 2 | 25.0 | 55.6 | | 2 | | 28 % | | E |
| 133 | PALM DESERT | CA | BANK | 1982 | 6.5 | | | | | | | | | |
| 175 | SWEET HOME | OR | SOFF | 1979 | 6.3 | 3 | | | | 2 | 6 % | 6 % | | R |
| 128 | PALO ALTO | CA | SOFF | 1980 | 4.6 | 1 | | | | | | | | |
| 166 | YAKIMA | WA | SOFF | 1982 | 4.5 | 1 | 22.7 | 33.3 | | 2 | | 13 % | 6.7 | E |
| 150 | BOISE | ID | SOFF | 1978 | 3.2 | 2 | 18.9 | 20.0 | | 2 | | 10 % | 4.4 | R |
| 177 | SPRINGFIELD | OR | SOFF | 1977 | 3.1 | 2 | 20.0 | 40.0 | | 2 | | | | R |
| 173 | PORTLAND | OR | SHOP | 1981 | 400.0 | 2 | | | | | | | | E |
| 155 | BELLEVUE | WA | DEPT | 1982 | 180.0 | 3 | | | | | | | | |

DATA TABLE 1 - CONTINUED: CHARACTERISTICS OF BUILDINGS IN BECA-CN

| (A) BLDG ID | (B1) CITY/STATE | (B2) | (C) BLDG TYPE | (D) YEAR BUILT | (E) FLOOR AREA (K SQFT) | (F) # FLOORS | (G1) <--------ENVELOPE------> <--------R-VALUES------> WALL | (G2) ROOF | (G3) GLASS | (H) # PANES | (I1) <GLASS AS %> <-OF WALLS-> ALL | (I2) SO. | (J1) <-OCCUPANTS-> (#/K SQFT) | (J2) HRS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 151 | PORTLAND | OR | DEPT | 1981 | 155.9 | | | | | | | | | E |
| 153 | PORTLAND | OR | DEPT | 1981 | 128.9 | 2 | | | | | | | | |
| 154 | TACOMA | WA | DEPT | 1983 | 127.8 | 2 | | | | | | | | |
| 152 | LYNNWOOD | WA | DEPT | 1979 | 125.1 | 2 | | | | | | | | |
| 176 | EUGENE | OR | DEPT | 1983 | 55.9 | 1 | | | | 2 | | 2 % | | E |
| 34 | FORT WAYNE | IN | RETL | 1979 | 7.6 | 1 | 20.0 | 35.7 | | | | 21 % | | E |
| 58 | WESTMINSTER | CO | COLL | 1977 | 307.7 | | 15.4 | | | 2 | | | | F |
| 27 | TOMS RIVER | NJ | SECN | 1979 | 245.0 | | | | | | | | | R |
| 63 | MINNEAPOLIS | MN | COLL | 1977 | 244.2 | | 14.3 | 14.3 | | 2 | | | 2.0 | F |
| 26 | BASSETT | VA | SECN | 1978 | 183.0 | 1 | 7.1 | 7.7 | 0.9 | 1 | 12 % | | | |
| 144 | STANFORD | CA | COLL | 1977 | 152.0 | 7 | | 10.0 | | 1 | 50 % | 50 % | 1.6 | |
| 160 | SPOKANE | WA | SECN | 1982 | 146.0 | 2 | | | | | 6 % | | 9.0 | R |
| 168 | PENDLETON | OR | ELEM | 1982 | 123.7 | 2 | | | | | | | 17.5 | R |
| 164 | TACOMA | WA | COLL | 1980 | 115.9 | 7 | | | | | | | 7.1 | E |
| 159 | PUYALLUP | WA | ELEM | | 90.2C | | | | | 3 | | | | R |
| 53 | OTTAWA | CN | COLL | 1973 | 75.6 | 4 | 10.0 | 7.1 | | 2 | 17 % | | | F |
| 69 | MIAMI | FL | ELEM | 1979 | 70.0 | 2 | 11.1 | 29.4 | | | | | 14.3 | E |
| 59 | RESTON | VA | ELEM | 1977 | 69.0 | 1 | | | | | | | 14.3 | |
| 75 | BURKE | VA | ELEM | 1982 | 69.0 | 1 | | | | | | | 14.3 | |
| 156 | BOISE | ID | ELEM | 1979 | 51.4 | 1 | 16.7 | 25.0 | | | 6 % | 6 % | | |
| 40 | NIAGARA | WI | ELEM | 1979 | 46.9 | | 8.3 | 12.5 | | 2 | | | | |
| 61 | SANTA ANA | CA | ELEM | 1974 | 46.6 | | | | | | | | 17.2 | R |
| 39 | SHEBOYGAN | WI | ELEM | 1979 | 35.8 | | 9.4 | 13.2 | | 2 | | | | |
| 29 | REEDSBURG | WI | SECN | 1978 | 16.8 | 1 | | | | | | | | E |
| 33 | BALTIMORE | MD | OTHR | | 270.0 | | | | | | | | | |
| 80 | ST. PAUL | MN | WARE | | 260.0 | | 12.5 | 16.7 | | 2 | 20 % | | | |
| 28 | KANSAS CITY | KS | OTHR | 1979 | 172.0 | 2 | | | | | | | | E |
| 172 | SEATTLE | WA | OTHR | 1983 | 108.4 | 2 | 16.7 | 16.7 | | 2 | 65 % | 50 % | 1.8 | R |
| 54 | BARRIE | CN | OTHR | 1976 | 107.5 | 5 | 12.5 | 16.7 | | 2 | 7 % | | | E |
| 127 | THOUS. OAKS | CA | OTHR | 1982 | 66.0 | 1 | | | | 2 | | | | F |
| 170 | BILLINGS | MT | WARE | 1978 | 48.0 | 1 | | | | | | | | E |
| 64 | MTN VIEW | CA | OTHR | 1979 | 43.0 | 2 | 20.0 | 30.3 | | 2 | | | | F |
| 73 | ASPEN | CO | WARE | 1980 | 35.3 | | 20.0 | 40.0 | 1.5 | | 20 % | | 1.4 | E |
| 83 | MILLBROOK | NY | OTHR | 1978 | 29.7 | 2 | 15.4 | | | 2 | 13 % | | | R |
| 178 | SPOKANE | WA | OTHR | 1980 | 21.2 | | 12.5 | 30.3 | | | | | 43.9 | E |
| 31 | ASPEN | CO | OTHR | 1980 | 20.5 | 1 | | | | | | | | |
| 167 | LEWISTON | MT | WARE | 1981 | 18.0 | | | | | | | | 1.7 | R |
| 44 | MOUNT AIRY | NC | LIBR | 1982 | 13.5 | | 20.0 | 20.0 | | 2 | 11 % | 66 % | 3.7 | E |
| 132 | SANTA ROSA | CA | OTHR | 1980 | 12.7 | 1 | 20.0 | 20.0 | | 2 | | | | |
| 45 | GUNNISON | CO | ARPT | 1981 | 9.7 | | 20.8 | 33.3 | | 2 | | | | |
| 46 | TROY | NY | OTHR | 1981 | 5.2 | | 23.3 | 30.3 | | | | | | F |
| 125 | DAVIS | CA | OTHR | 1982 | 5.2 | 1 | 11.1 | 20.0 | | | | | 4.0 | E |
| 137 | LOS ANGELES | CA | CLIN | 1983 | 4.8 | 1 | 11.0 | 30.3 | 1.0 | 1 | | | 3.1 | E |

DATA TABLE 2: FEATURES OF BUILDING IN BECA-CN
N = 133, JULY 1985

| (A) | (C) | (K) | (L1) | (L2) | (M) | (N1) | (N2) | (O1) | (O2) | (P1) | (P2) | (Q1) | (Q2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | <-------------------- | LIGHTING | ---------- | ---------- | ---------- | ------------------> | <----SPECIAL- | FEATURES----> | <----HEATING | ---> | <---COOLING | --> |
| BLDG ID | BLDG TYPE | INSTALLED LIGHT (W/SQFT) | TYPE 1 | TYPE 2 | AVG USED LIGHT (W/SQFT) | DAYLIGHT TYPE | LIGHT CONTROLS | SPECIAL EQUIPMENT | CONTROLS & STRATEGY | FUEL TYPE | EQUIP | FUEL TYPE | EQUIP |
| 4 | LOFF | 2.5 | FLU | | | | | EZ | EMS TM | S | | E | CC |
| 51 | LOFF | 1.6 | FLU | INC | | | CP | HR CT | HR | E | HP | E | |
| 37 | LOFF | 2.2 | FLU | HGV | | | CP | ST HR | EMS LM | | HP | | |
| 71 | LOFF | 1.3 | FLU | INC | | AT RF | CP | EZ CT SH | SH EZ | E | RS | E | CH |
| 136 | LOFF | 1.6 | FLU | HGV | 0.8 | | CP | ST OT | EMS | G | BO | E | |
| 24 | LOFF | | | | | | | SH | EMS | | | | |
| 47 | LOFF | 2.0 | | | | AT | | ST HR CT | ST HR | G | BO | E | CC |
| 1 | LOFF | | | | 3.5 | | CP | | EMS | S | | E | CC |
| 66 | LOFF | 1.0 | HPS | | | | PM | SO EZ ST | EMS | | | E | CC |
| 147 | LOFF | | FLU | INC | | AT | SW CP | EZ | EMS OA | S | | E | |
| 42 | LOFF | 1.4 | FLU | INC | | | CP | CT | | G | BO | | CC |
| 17 | LOFF | | FLU | | | | SW | EMS NS | EMS NS | S | | E | CC |
| 13 | LOFF | | FLU | | | | | | EMS | | | | |
| 182 | LOFF | 2.0 | | | | | | EZ | EMS LM | | BO | E | CC |
| 65 | LOFF | 2.0 | PFL | | | | | SO ST | HR | E | BO | E | CC |
| 20 | LOFF | 2.0 | FLU | INC | | | SW | | OA TM | G | BO | E | CC |
| 145 | LOFF | | FLU | | 2.1 | SKY AT | | FS HR | EMS | E | HR | E | CH |
| 14 | LOFF | | | | | | | | | | | | |
| 2 | LOFF | | FLU | | | | | | EMS | S | | E | CC |
| 74 | LOFF | 2.5 | FLU | PFL | 1.5 | CL AT | SW | ST HR EZ | EMS OA | N | HR | E | CH |
| 165 | LOFF | | FLU | HGV | | | CP | TM EZ HR | EMS | E | | E | |
| 10 | LOFF | | FLU | | | | SW | | NS OA EZ | E | | E | |
| 19 | LOFF | 0.8 | FLU | HGV | | | SW | | TM OA | G | | E | |
| 56 | LOFF | 2.8 | | | | | OT | ST HR FS | EMS | E | HP | E | CC |
| 169 | LOFF | | | | | | | HR EZ | EMS | E | RS | E | HP |
| 52 | LOFF | | FLU | | | AT | CP | HR EZ | EMS | E | HP | E | CC |
| 56 | LOFF | 2.8 | | | | | OT | ST HR FS | EMS | E | HP | E | CC |
| 25 | LOFF | | | | | | | ST EZ | EMS | | HR | | |
| 30 | LOFF | 2.2 | | | | | | | EMS NS | | BO | | CH |
| 55 | LOFF | | | | | | | | OA EMS | | HR | | CC |
| 50 | LOFF | 2.2 | | | | | | | NS TM | S | OS | E | CC |
| 48 | LOFF | 2.1 | | | | | | EZ | TM | | OS | | CC |
| 70 | LOFF | 1.4 | HPS | FLU | 1.2 | RF | SW | NS OA | HR ST | E | HP | E | HP |
| 62 | LOFF | 1.8 | PFL | | | | | HR CT | HR | | | | |
| 23 | LOFF | | | | | | | | | | | | |
| 9 | LOFF | | FLU | | | | SW | HR EZ | | E | | E | |
| 15 | LOFF | | FLU | INC | | | | | | | | | |
| 11 | LOFF | | | | | | | | | | | | |
| 32 | LOFF | | | | | | | | OA NC | | | | |
| 183 | LOFF | | | | | | | EZ HL FS SO ST | EMS | O | BO | E | CC |
| 3 | LOFF | | | | | | | | | | | | |
| 149 | LOFF | | FLU | INC | | | | OW | OA | | HP | E | |
| 8 | LOFF | | | | | | | | | | | | |
| 60 | LOFF | 2.0 | FLU | | | AT | | EZ | EMS | | HR | E | CC |
| 16 | LOFF | | FLU | | | | | | EMS | | | | |
| 143 | LOFF | | FLU | | | | CP DM | EZ | EMS | G | BO | E | CH |

DATA TABLE 2 - CONTINUED: FEATURES OF BUILDING IN BECA-CN

| (A) | (C) | (K) | (L1) | (L2) | (M) | (N1) | (N2) | (O1) | (O2) | (P1) | (P2) | (Q1) | (Q2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | <--- | --- | LIGHTING | --- | --- | ---> | <----SPECIAL- | FEATURES----> | <----HEATING | ---> | <---COOLING | --> |
| BLDG ID | BLDG TYPE | INSTALLED LIGHT (W/SQFT) | TYPE 1 | TYPE 2 | AVG USED LIGHT (W/SQFT) | DAYLIGHT TYPE | LIGHT CONTROLS | SPECIAL EQUIPMENT | CONTROLS & STRATEGY | FUEL TYPE | EQUIP | FUEL TYPE | EQUIP |
| 5 | LOFF | 2.3 | | | | | | SO ST | NS HR | | | | |
| 141 | LOFF | 3.0 | FLU | | | SKY | CP | EZ | EMS | | | | |
| 117 | LOFF | 4.0 | HAL | | | AT | CP | SH EZ HR | | G | | | |
| 126 | LOFF | | FLU | | | SKY | PS | TM FS HL | EMS | G | | E | RC |
| 67 | LOFF | 2.1 | | | | | | ST ED HR EB SH | HR | E | BO | E | EC |
| 140 | LOFF | | FLU | | | SKY AT | PC | MS FS TM | | | BO | | CH |
| 6 | LOFF | | | | | | | | | | | | |
| 115 | LOFF | 1.9 | | | | AT SKY LW | PC | ST TM EZ SH | EMS NC | G | | | |
| 49 | LOFF | 1.8 | FLU | | | | | EZ | NS TM LM | G | BO | E | CC |
| 135 | LOFF | | PFL | | | AT SKY | PM | ST HR EZ FS ED | | | | E | ST |
| 41 | LOFF | 2.0 | | | | | | | TM | E | OS | | |
| 116 | LOFF | 1.8 | | | | AT | | ST EZ SH TM | NC | | | | |
| 171 | LOFF | 3.0 | FLU | HPS | | | SW | EZ HL ST | NS | E | HP | E | HP |
| 22 | LOFF | 2.0 | FLU | | | | TM | EZ | NS TM | G | BO | E | RC |
| 38 | LOFF | 2.0 | | | | | | | TM | | | | |
| 158 | LOFF | | | | | LW | SW | FS HR EZ | EMS | | HR | E | CH |
| 72 | LOFF | 1.2 | FLU | HAL | | CL | | SO HR | EZ EMS | S | | | AC |
| 184 | LOFF | | FLU | | 1.5 | | SW | HR | NS LM | E | HR | E | CH |
| 148 | LOFF | 2.3 | PFL | | | SKY AT | | SH | | | | | |
| 157 | LOFF | 1.8 | INC | FLU | | | RS | EZ. | NS | E | | E | CH |
| 162 | LOFF | | FLU | INC | 3.0 | | | SO | | E | HP | E | HP |
| 12 | LOFF | | FLU | | | | | | | G | BO | E | CC |
| 21 | LOFF | | | | | | | | | | | | |
| 163 | LOFF | | FLU | | 3.0 | NONE | | SO ST HR OT | NS EZ | G | BO | E | CC |
| 57 | SOFF | | | | | | | SO ST | | O | BO | | AC |
| 81 | SOFF | 2.0 | | | | | | EZ | NS TM | E | OS | E | RP |
| 76 | SOFF | 0.7 | FLU | | | | PM | SO ST EB HR | EMS NC | E | HP | E | AC |
| 18 | SOFF | | FLU | | | SKY | SW | SO | EMS | | SO | E | AC |
| 7 | SOFF | | | | | | | | | | | | |
| 174 | SOFF | 1.7 | FLU | | | SKY SH AT | SW PC | ST TM OT | NS | E | | E | |
| 82 | BANK | | | | | | | SO ST | | | | | AC |
| 78 | SOFF | | FLU | | | AT | | EZ EB | TM NS | | | | DX |
| 43 | SOFF | | | | | SH CL | PC | NC EMS | NC EMS | G | | E | EC |
| 35 | SOFF | 1.5 | FLU | | | | | SO ST | | | | | |
| 68 | BANK | | PFL | | | | | SO ST | | E | BO | | |
| 161 | SOFF | | FLU | | | | SW | EB FS TM OT | EMS | E | HP | E | HP |
| 36 | SOFF | 1.3 | INC | FLU | | SC CL | SW | SO ST | NC | E | HP | | |
| 133 | BANK | | | | | SKY CL | | EB | | H | SO | H | SA |
| 175 | SOFF | | | | | | | SO OT | | E | FR | E | |
| 128 | SOFF | | FLU | | | SKY | | ST OW | NC | H | SO | E | CH |
| 166 | SOFF | 2.4 | FLU | | | | | | NS | G | RP | E | RP |
| 150 | SOFF | | FLU | INC | | SKY | SW | OT | | X | HP | E | HP |
| 177 | SOFF | | | | | | | | | E | HP | E | HP |
| 173 | SHOP | | FLU | | | SKY | | | | E | RP | E | RP |
| 155 | DEPT | | FLU | INC | | | | | EMS | | | | |

DATA TABLE 2 - CONTINUED: FEATURES OF BUILDING IN BECA-CN

| (A) | (C) | (K) | (L1) | (L2) | (M) | (N1) | (N2) | (O1) | (O2) | (P1) | (P2) | (Q1) | (Q2) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | <-------LIGHTING------- | | | | | --> | <----SPECIAL-FEATURES | ----> | <----HEATING | ---> | <---COOLING | --> |
| BLDG ID | BLDG TYPE | INSTALLED LIGHT (W/SQFT) | TYPE 1 | TYPE 2 | AVG USED LIGHT (W/SQFT) | DAYLIGHT TYPE | LIGHT CONTROLS | SPECIAL EQUIPMENT | CONTROLS & STRATEGY | FUEL TYPE | EQUIP | FUEL TYPE | EQUIP |
| 151 | DEPT | | | | | | | | EMS | E | BO | E | CH |
| 153 | DEPT | | FLU | INC | | | | | | | | | |
| 154 | DEPT | | FLU | INC | | | | | EMS | | | | |
| 152 | DEPT | | FLU | INC | | | | | | | | | |
| 176 | DEPT | | FLU | | | | CP | | | | | | |
| 34 | RETL | 2.5 | FLU | INC | | | SW | ST EB ED | | E | HP | E | |
| 58 | COLL | | | | | | | SO ST HR | | | HP | | HP |
| 27 | SECN | | HPS | | | | | HR ST | | | | | |
| 63 | COLL | 2.5 | FLU | | | SKY | | HR | | S | | S | AC |
| 26 | SECN | | | | | | | EZ | TM | O | BO | E | CC |
| 144 | COLL | | FLU | | | SKY LW CL | | MS OW | NC | S | OS | W | OS |
| 160 | SECN | | FLU | HAL | | LW | | EB HR EZ | EMS | | | | |
| 168 | ELEM | 2.1 | | | | RM SKY | | SO EB ST OW | NS | H | | | |
| 164 | COLL | | FLU | HAL | | OT | | OW ST | | E | HP | E | HP |
| 159 | ELEM | | | | | | | OT | EMS | | HP | | |
| 53 | COLL | 2.5 | FLU | HCV | | | | | | S | OS | | |
| 69 | ELEM | 2.0 | HPS | HAL | | SKY | | HR ST SO | | | | E | AC |
| 59 | ELEM | | | | | SKY | | HR SO ST EZ | TM | E | BO | E | |
| 75 | ELEM | | | | | | | SO ST HR EZ | TM | E | BO | E | |
| 156 | ELEM | | | | | | SW | EB SO ST HL EZ | | E | | E | |
| 40 | ELEM | 2.2 | | | | | | | TM | | | | RP |
| 61 | ELEM | | | | | | | EZ TM EB | | | | | |
| 39 | ELEM | 2.0 | | | | | | EZ | TM | | BO | | |
| 29 | SECN | 1.9 | | | | | SW | SO ST | HR EMS | E | HP | | |
| 33 | OTHR | | | | | | | HR ST | EMS | N | HR | | CC |
| 80 | WARE | | | | | | | SO ST | HR EMS | | | | AC |
| 28 | OTHR | | | | | | | EZ | | E | HP | E | RC |
| 172 | OTHR | 3.0 | FLU | HPS | | | DM | EZ HL | NS TM | E | RP | E | RP |
| 54 | OTHR | | | | | | | ST HR | EMS | E | HP | E | CC |
| 127 | OTHR | | | | | CL | | ST OW SH | NC LM | | | | |
| 170 | WARE | | | | | | | SO | | | IR | | |
| 64 | OTHR | 2.6 | | | 1.5 | CL SKY | PC | EB SH ST EZ | | G | BO | E | RC |
| 73 | WARE | 1.5 | FLU | INC | | SKY | SW | ST | NC | G | BO | | |
| 83 | OTHR | 1.8 | HPS | | | SKY AT | | EB MI ST HR SO | EMS | H | SO | | |
| 178 | OTHR | | FLU | HID | | SKY | | EB TM SO OT | | G | | E | |
| 31 | OTHR | | | | | | | EZ | | | SO | E | EC |
| 167 | WARE | | FLU | HAL | | SKY | | EB OT FS SO | | E | HP | E | HP |
| 44 | LIBR | 1.3 | FLU | INC | | CL SH | | ST EZ | NC LM TM | E | HP | E | HP |
| 132 | OTHR | 2.3 | PFL | FLU | | SKY | | ST EZ SH ED | OA TM LM | | | | OT |
| 45 | ARPT | 1.5 | | | | SH CL | TM | ST SO | NC LM NS | E | BO | N | N |
| 46 | OTHR | | FLU | | | SKY RF | | MI SO ST | LM NC | E | RS | E | |
| 125 | OTHR | | FLU | | | SKY | | HR EZ | OA NS | G | FR | E | |
| 137 | CLIN | | | | | CL SKY | | OW SH | TM NC | G | HP | E | HP |

DATA TABLE 3: ENERGY DATA FOR BUILDINGS IN BECA-CN
N = 133, JULY 1984

| (A) BLDG ID | (D) YEAR BLT | (R) YR OF DATA | (S1) <----MEASURE ANNUAL ENERGY----> ELEC (KWH/ SQFT) | (S2) FUEL&OT (KBTU/ SQFT) | (S3) SOURCE (KBTU/ SQFT) | (S4) SITE (KBTU/ SQFT) | (T) PRED (KBTU/ SQFT) | (U1) <MEASURED PEAK> <ELEC LOAD> (W/SQFT) WINT. | (U2) SUM. | (V) <-ECONOMICS-> ANNUAL (EN $/ SQFT) | (W) CONSTR (84$/ SQFT) | (X) CFA RATIO | (Y) CONF LVL | (Z) COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 4 | | | 12.6 | 35.7 | 200.9 | 78.8 | | 2.9 | 3.9 | 1.24 | | .61 | A | NO SPECIAL EFFIC FEATURES |
| 51 | | 3 | 15.3 | 0.0 | 175.7 | 52.1 | | 3.5 | 3.5 | | | .60 | C | GROSS FLR AREA INCLDS GARAGE |
| 37 | 1975 | | 14.9 | 1.6 | 174.0 | 52.5 | 54.0 | | | | 59 | | C | |
| 71 | 1981 | 2 | 23.5 | 0.0 | 270.5 | 80.3 | 32.0 | | | 1.38 | | .85 | B | PRED. INTENSITY EXCLUDS CMPTR, ETC. |
| 136 | 1982 | 1 | 18.4 | 1.6 | 213.6 | 64.5 | | | 4.7 | 1.42 | | .96 | A | TWO BUILDINGS |
| 24 | 1976 | 6 | 13.7 | 2.6 | 160.7 | 49.2 | | | | 1.61 | | | A | GSA; NOT VERY "ENERGY-EFFICIENT" DESIGN |
| 47 | 1978 | | 13.7 | 19.4 | 176.7 | 66.0 | 68.8 | 3.2 | 3.6 | | 51 | .78 | C | FLR INCLDS GARGE,BLDG$ INCLDS LANDSCAPE |
| 1 | 1973 | 10 | 17.0 | 5.2 | 204.2 | 63.4 | | 4.8 | 5.5 | 0.41 | | .93 | B | NO SPECIAL FEATURES, WELL RUN |
| 66 | 1980 | 2 | 13.8 | 0.0 | 159.3 | 47.3 | | | 3.8 | | 67 | | A | BRONZED VISION GLASS |
| 147 | 1981 | | | | | 71.0 | | | | | | 1.00 | C | ENERGY DATA NOT YET ON FILE; PART RETAIL |
| 42 | 1979 | 1 | 12.0 | 20.0 | 157.4 | 60.7 | 35.6 | | | 0.42 | 98 | | A | EFFICIENT HVAC EQUIP |
| 17 | | | 7.3 | 18.3 | 111.4 | 43.3 | | | | 0.40 | | 1.00 | A | ENERGY USE UP: CMPTR & FLEXTIME |
| 13 | | | 10.9 | 0.0 | 125.6 | 37.3 | | 2.8 | 2.5 | 0.61 | | .62 | A | |
| 182 | 1981 | | 14.3 | 22.7 | 186.7 | 71.3 | | | | | 66 | | C | CONVENTNL SYSTEM OVER HI TECH |
| 65 | 1981 | 1 | 18.5 | 0.0 | 212.9 | 63.2 | | | | 0.93 | 71 | | A | HEAT EXTRACTED FROM POND |
| 20 | 1975 | 8 | 9.0 | 32.4 | 136.2 | 63.2 | 69.5 | 2.9 | 3.9 | 0.63 | 56 | .76 | A | TINTED INSUL GLASS, 75% OCCUPIED |
| 145 | 1982 | 2 | 16.0 | 0.0 | 184.2 | 54.7 | | | 5.0 | 1.31 | | .73 | A | SOME SUBMETERING; BUILDING SOLD |
| 14 | | | 11.7 | 6.3 | 140.4 | 46.1 | | 3.7 | 4.4 | 0.79 | | .59 | A | |
| 2 | 1975 | 9 | 15.1 | 13.4 | 196.4 | 66.0 | | 3.9 | 3.6 | 1.23 | | .93 | B | GROSS NOT INCLUDE PARKING |
| 74 | 1982 | 1 | 29.5 | 0.0 | 339.0 | 100.6 | 38.0 | 5.2 | 5.3 | | 69 | .89 | A | PRED. ENRG EXCLDS PROCS. |
| 165 | 1982 | 2 | 13.4 | 0.0 | 154.4 | 45.8 | 26.0 | 4.1 | 4.2 | 0.61 | 0 | .89 | B | CP-30W/SQ FT, 1 PANE 1ST FLRS |
| 10 | 1976 | 7 | 12.7 | 0.0 | 146.5 | 43.5 | | | | 0.95 | 77 | .78 | B | GROSS FLR AREA INCLDS GARAGE |
| 19 | | | 5.7 | 18.9 | 83.9 | 38.2 | | 2.1 | 2.3 | 0.54 | | .90 | A | FLR AREA INCLDS GARG, 88% OCCUPIED |
| 169 | 1980 | 4 | 17.1 | 0.0 | 197.2 | 58.5 | 54.0 | 4.7 | 5.3 | 0.89 | | | | EFFIC HVAC, WELL OPERATED |
| 52 | 1980 | 2 | 17.6 | 10.7 | 213.1 | 70.8 | 87.7 | | | | | .61 | C | ENRG AND FLR AREA ECLDS GARGE |
| 56 | 1971 | 11 | 14.2 | 0.0 | 163.0 | 48.4 | | 6.2 | 5.1 | 0.28 | 75 | | A | HEAT RECOV OFF CHILLERS, STORED |
| 25 | 1978 | 2 | | | | 46.6 | 45.0 | | | | 65 | | B | HEAT RECOV FROM CMPTR |
| 30 | 1979 | 3 | 15.6 | 2.5 | 181.5 | 55.6 | | | | 0.89 | | | A | PIPING FOR DECEN. HVAC |
| 55 | 1971 | 1 | | | | 70.0 | | | | | 67 | | B | HEAT RECOV FROM LIGHTS |
| 50 | 1976 | 6 | 9.7 | 21.6 | 132.8 | 54.6 | | 4.0 | 3.5 | | | .70 | C | GARGE INCLD, PRCS:SNOW MLT |
| 48 | 1979 | 1 | 8.5 | 49.2 | 147.0 | 78.2 | | | | | | .75 | C | EFFICIENT HVAC EQUIP |
| 70 | 1979 | 3 | 12.8 | 0.0 | 147.8 | 43.8 | 39.0 | 5.4 | | 0.31 | 53 | .99 | A | WATER THERMAL STORAGE |
| 62 | 1979 | 3 | 21.9 | 0.0 | 251.7 | 74.7 | 42.0 | | | | | .77 | A | CURTAIN WALL, 2-COLOR EXTER, DAYLITE |
| 23 | 1975 | 7 | 6.8 | 8.2 | 86.1 | 31.3 | | | | 0.51 | | .89 | A | GSA; NOT VERY "ENERGY-EFFICIENT" DESIGN |
| 9 | 1974 | 9 | 19.4 | 0.1 | 222.8 | 66.1 | 76.7 | 10.3 | 7.7 | 1.33 | 100 | | A | NO SPECIAL EFFIC FEATURES |
| 15 | 1979 | | 15.0 | 0.0 | 172.4 | 51.1 | | 3.2 | 3.3 | 0.93 | | | A | GROSS FLR AREA INCLDS GARAGE |
| 11 | | | 11.1 | 0.0 | 127.6 | 37.9 | | 3.2 | 2.7 | 0.32 | | | A | |
| 32 | 1980 | 1 | 4.0 | 1.8 | 47.4 | 15.3 | | | | 0.24 | | | B | GROSS FLR AREA INCLDS GARAGE |
| 183 | 1980 | | 8.1 | 11.9 | 105.3 | 39.6 | | | | | | | C | CMPTR DEDUCTED, $32000=SOLAR |
| 3 | 1977 | 6 | 8.9 | 32.9 | 135.1 | 63.2 | | | | 1.09 | | | A | GROSS FLR AREA INCLDS GARAGE |
| 149 | 1980 | 3 | 12.1 | 1.1 | 140.6 | 42.5 | | | 4.0 | 0.92 | 80 | .93 | A | |
| 8 | | | 11.3 | 48.7 | 179.1 | 87.4 | | | | 1.47 | | | A | |
| 60 | 1977 | 5 | 12.3 | 0.0 | 141.1 | 41.9 | 26.0 | | | 0.57 | 83 | | A | |
| 16 | 1975 | | 16.4 | 0.0 | 188.9 | 56.0 | | 5.9 | 5.9 | 1.02 | | .71 | A | VERY LITTLE INFO ON BLDG |
| 143 | 1980 | 4 | 11.2 | 5.9 | 134.8 | 44.2 | | | 4.0 | 0.88 | | .92 | A | EMS USED TO BILL TENANTS AFTER-HOUR-USE |

DATA TABLE 3 - CONTINUED: ENERGY DATA FOR BUILDINGS IN BECA-CN

| (A) | (D) | (R) | (S1) | (S2) | (S3) | (S4) | (T) | (U1) | (U2) | (V) | (W) | (X) | (Y) | (Z) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | <----MEASURE ANNUAL ENERGY----> | | | | | <MEASURED PEAK> | | <-ECONOMICS-> | | | | |
| | | | ELEC | FUEL&OT | SOURCE | SITE | PRED | <ELEC LOAD> | | ANNUAL | CONSTR | | | |
| BLDG ID | YEAR BLT | YR OF DATA | (KWH/ SQFT) | (KBTU/ SQFT) | (KBTU/ SQFT) | (KBTU/ SQFT) | (KBTU/ SQFT) | (W/SQFT) WINT. | SUM. | (EN $/ SQFT) | (84$/ SQFT) | CFA RATIO | CONF LVL | COMMENTS |
| 5 | 1976 | 6 | 7.8 | 8.9 | 98.6 | 35.5 | | 2.3 | 2.5 | 0.66 | | | A | GROSS FLR AREA INCLDS GARAGE |
| 141 | 1982 | 2 | 12.8 | 17.1 | 164.5 | 60.8 | | | | 1.05 | | | B | |
| 117 | 1982 | 2 | 16.0 | 7.5 | 191.5 | 62.1 | 53.0 | | 5.6 | 1.46 | | | A | |
| 126 | 1980 | 4 | 16.0 | 6.3 | 190.5 | 60.9 | 45.0 | | | | 117 | | B | EMS, LIGHTING RETROFITS 1983 |
| 67 | 1979 | 5 | 32.4 | 16.1 | 388.5 | 126.6 | 40.0 | | 7.0 | 0.98 | 107 | .88 | B | HEAT RECOV FROM CMPTR RM A/C |
| 140 | 1981 | 2 | 17.8 | 16.9 | 221.7 | 77.7 | | | 4.2 | 0.81 | 80 | | B | WEDGE-SHAPED BUILDING |
| 6 | | | 4.5 | 35.7 | 86.9 | 50.9 | | 2.1 | 2.2 | 0.68 | | | A | |
| 115 | 1982 | 2 | 11.2 | 17.0 | 145.2 | 55.1 | 58.0 | | 4.2 | 0.86 | | | A | |
| 49 | 1977 | 4 | 14.7 | 42.7 | 211.6 | 92.8 | 92.1 | | | | | | C | EFFICIENT HVAC EQUIP |
| 135 | 1983 | 1 | 15.7 | 22.8 | 203.6 | 76.4 | 35.0 | | 4.6 | 1.27 | | | A | SITE VISIT; DAYLITE CNTRLS NOT WORKING |
| 41 | 1979 | 1 | 13.7 | 0.0 | 157.3 | 46.7 | | 4.2 | 3.6 | 0.80 | | | A | EFFICIENT HVAC EQUIP |
| 116 | 1983 | 1 | 10.0 | 27.5 | 142.4 | 61.6 | 42.0 | | 4.4 | 0.88 | | | A | |
| 171 | 1981 | 1 | 20.8 | 0.0 | 239.0 | 70.9 | | 4.3 | 3.6 | 0.35 | 60 | .83 | B | SOME 24 HR./DAY USE & AUDITORIUM |
| 22 | 1977 | | 7.1 | 16.7 | 98.0 | 40.8 | | 2.3 | 3.1 | 0.56 | 71 | .65 | A | FLR AREA INCLDS GARG, 86% OCCUPIED |
| 38 | 1979 | 1 | 9.1 | 0.0 | 104.9 | 31.1 | | 2.3 | 2.6 | 0.51 | | .51 | A | EFFICIENT HVAC EQUIP |
| 158 | 1983 | 1 | 36.8 | 0.0 | 423.4 | 125.7 | | 7.7 | 6.3 | 1.45 | 99 | | A | CMPTR HEAT RECOV=MOST HEAT |
| 72 | 1977 | 5 | 11.0 | 22.0 | 160.4 | 59.4 | 68.8 | | | 0.04 | 74 | | A | BOTH ACTIVE AND PASSIVE SOLAR |
| 184 | 1981 | | 20.1 | 0.0 | 230.7 | 68.5 | | | | | 57 | | C | HEATED FROM CHILLED HEAT RECOV |
| 148 | 1983 | 1 | 13.0 | 45.1 | 194.4 | 89.4 | | | 4.9 | 1.22 | | .96 | A | AWAIT MORE DESCRIPTIVE DATA |
| 157 | 1982 | 2 | 18.9 | 0.0 | 217.0 | 64.4 | | 5.0 | 4.6 | 0.38 | 31 | .90 | B | MINIMAL DAYLIT & GREENHOUSE |
| 162 | 1978 | 5 | 37.8 | 0.0 | 434.6 | 129.0 | | 6.4 | 7.1 | | 112 | .88 | B | SOLAR NOW OFF, DELAMPED |
| 12 | 1974 | 9 | 10.6 | 18.3 | 140.6 | 54.6 | | 4.6 | 6.0 | 0.87 | 116 | .59 | A | NO SPECIAL EFFIC FEATURES |
| 21 | | | 9.1 | 20.8 | 125.4 | 51.9 | | 3.1 | 3.8 | 0.49 | | | A | |
| 163 | 1979 | 3 | 8.3 | 28.9 | 124.8 | 57.4 | | 2.7 | 4.1 | 0.38 | | .87 | A | ACTIVE SOLAR HEAT-LONG HRS. |
| 57 | 1976 | 7 | 8.7 | 50.0 | 149.9 | 79.6 | | 2.3 | 2.3 | 0.86 | 150 | | A | BOTH ACTIVE AND PASSIVE SOLAR |
| 81 | 1979 | 1 | 15.7 | 0.0 | 180.0 | 53.4 | | 5.5 | 4.8 | 0.97 | | .81 | B | |
| 76 | 1982 | 1 | 3.3 | 0.0 | 37.7 | 11.2 | 12.7 | | | 0.48 | 92 | .66 | B | PHOTOVOLTS & 2 SKINND,60% OCCUPIED |
| 18 | | | 29.4 | 0.0 | 337.6 | 100.2 | | 11.5 | 11.8 | 1.85 | | .96 | A | |
| 7 | | | 4.7 | 31.2 | 85.5 | 47.3 | | 1.6 | 2.3 | 0.62 | | | A | |
| 174 | 1982 | 2 | 12.9 | 0.0 | 148.3 | 44.0 | 11.6 | 6.5 | 3.6 | | 110 | .97 | A | PREDICTED NOT INCL. PROC. |
| 82 | 1980 | 2 | 24.0 | 0.0 | 275.6 | 81.8 | | 9.6 | 7.2 | 0.70 | | | B | ACTIVE SOLAR W/HIGH MAINT COSTS |
| 78 | 1981 | 1 | 10.9 | 10.1 | 135.8 | 47.4 | | | | | 38 | .72 | C | ATRIUM FOR DIRECT GAIN TOO |
| 43 | 1981 | 1 | | | | 39.9 | 54.6 | | | 0.59 | 62 | 1.00 | B | |
| 35 | 1978 | | 10.4 | 4.2 | 124.0 | 39.8 | | | | 0.59 | 41 | | B | BOTH ACTIVE AND PASSIVE SOLAR |
| 68 | 1979 | 4 | 39.4 | 0.0 | 453.2 | 134.5 | | 11.9 | 10.2 | 1.22 | 94 | .67 | B | ACTIVE SOLAR, HIGH MAINT COSTS |
| 161 | 1981 | 3 | 13.7 | 0.0 | 157.7 | 46.8 | 44.6 | | | | 38 | .97 | B | BEAD WALL & TROMBE WALL |
| 36 | 1977 | | 9.0 | 0.0 | 103.6 | 30.7 | 28.8 | | | | 48 | | C | ABSORBING GLASS ALSO, SUNSCOOPS |
| 133 | 1982 | | | | | 52.7 | | | | | | | C | METERED ENERGY DATA NOT ON FILE |
| 175 | 1979 | 4 | 10.2 | 0.0 | 116.8 | 34.7 | | 5.2 | 3.5 | 0.57 | 40 | .79 | B | ACTIVE SOLAR NOT AS GOOD AS EST. |
| 128 | 1980 | 4 | 19.1 | 0.0 | 219.9 | 65.2 | | | | 0.87 | | 1.00 | A | ACTIVE SOLAR |
| 166 | 1982 | 2 | 3.8 | 23.8 | 67.3 | 36.7 | | 2.4 | 4.0 | 0.38 | 42 | 1.00 | B | EFFIC HVAC, WELL INSULATED |
| 150 | 1978 | 6 | 10.0 | 13.8 | 128.8 | 47.9 | | 7.8 | 7.2 | 0.58 | 51 | .94 | B | SWITCH TO GEOTH. '83 |
| 177 | 1977 | 5 | 12.6 | 0.0 | 144.7 | 42.9 | | | | 0.42 | 51 | | A | |
| 173 | 1981 | 2 | 39.2 | 0.0 | 450.9 | 133.8 | | | | 1.81 | 363 | 1.00 | C | NOT INCLUDE 5 DEPART. STORES |
| 155 | 1982 | 2 | 29.2 | 0.0 | 335.8 | 99.7 | | 6.7 | 6.4 | | | | B | |

DATA TABLE 3 - CONTINUED: ENERGY DATA FOR BUILDINGS IN BECA-CN

| (A) ID | (D) YEAR BLT | (R) YR OF DATA | (S1) ELEC (KWH/ SQFT) | (S2) FUEL&OT (KBTU/ SQFT) | (S3) SOURCE (KBTU/ SQFT) | (S4) SITE (KBTU/ SQFT) | (T) PRED (KBTU/ SQFT) | (U1) WINT. | (U2) SUM. | (V) ANNUAL (EN $/ SQFT) | (W) CONSTR (84$/ SQFT) | (X) CFA RATIO | (Y) CONF LVL | (Z) COMMENTS |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | <----MEASURE ANNUAL ENERGY----> | | | | | <MEASURED PEAK> <ELEC LOAD> (W/SQFT) | | <-ECONOMICS-> | | | | |
| 151 | 1981 | 3 | 13.7 | 0.0 | 157.5 | 46.7 | | | | | | | B | |
| 153 | 1981 | 3 | 18.6 | 0.0 | 214.4 | 63.6 | | 6.7 | 5.7 | | | | B | |
| 154 | 1983 | 1 | 30.8 | 0.0 | 354.0 | 105.1 | | 5.2 | 6.6 | | | | B | REMODELED AND EXPANDED 1983 |
| 152 | 1979 | 5 | 21.8 | 0.0 | 250.6 | 74.4 | | 5.8 | 6.1 | | | | B | |
| 176 | 1983 | 1 | 14.9 | 0.0 | 173.7 | 50.9 | | 4.3 | 4.0 | | | .88 | C | ONLY 9 MNTHS ENERGY, PRORATED |
| 34 | 1979 | 4 | 11.3 | 0.0 | 130.1 | 38.6 | | 5.0 | 4.2 | 0.54 | 30 | | A | |
| 58 | 1977 | 6 | 15.4 | 9.0 | 186.0 | 61.5 | | 4.1 | 4.2 | 0.84 | 63 | | A | PARTIAL UNDERGROUND, ACTIVE SOLAR |
| 27 | 1979 | 2 | 17.2 | 0.0 | 197.8 | 58.7 | | | | 1.00 | | | B | REGENERATIVE HEAT RECOVERY WHEELS |
| 63 | 1977 | 5 | 15.6 | 76.0 | 298.3 | 129.3 | | | | 1.04 | 66 | .68 | A | |
| 26 | 1978 | 2 | 8.6 | 29.9 | 128.7 | 59.2 | 57.0 | | | | | | B | AIR COOLED CENTRIFUGAL CHILLER |
| 144 | 1977 | 7 | 10.5 | 72.4 | 212.4 | 108.1 | | | | | 98 | .69 | B | SQUARE FOOTAGE NEEDS RECONCILIATION |
| 160 | 1982 | 2 | 9.1 | 60.4 | 164.9 | 91.4 | | 3.1 | 3.4 | 0.66 | | | B | 40% BELOW GRADE |
| 168 | 1982 | 2 | 10.4 | 0.0 | 119.8 | 35.6 | | 5.4 | 5.4 | 0.53 | 75 | | A | ROCK BED STORAGE |
| 164 | 1980 | 4 | 21.7 | 0.0 | 249.8 | 74.1 | 51.0 | 2.9 | 3.1 | 0.24 | 45 | | C | RENOVATN, LARGE GLAZE AREA |
| 159 | | | 6.6 | 19.1 | 94.9 | 41.6 | | 3.2 | 2.8 | | | | A | AIRFLOW/EXTRACT AIR WINDOWS=OT |
| 53 | 1973 | | | | | 60.6 | | | | 0.35 | 64 | | C | |
| 69 | 1979 | 4 | 14.9 | 0.0 | 171.5 | 50.9 | | 5.3 | 5.2 | 1.03 | 83 | .92 | A | HEAT WHEEL STORAGE |
| 59 | 1977 | 2 | 12.4 | 0.0 | 143.0 | 42.4 | | | | 0.53 | 84 | .96 | A | HEAT RECOV FROM CMPTR |
| 75 | 1982 | 1 | 18.2 | 0.0 | 209.3 | 62.1 | | | | 0.98 | 57 | .96 | A | HEAT RECOV FROM CMPTR |
| 156 | 1979 | 5 | 9.4 | 0.0 | 107.6 | 31.9 | | 5.6 | 3.9 | 0.35 | 63 | | B | GOOD OCC RESPONSE |
| 40 | 1979 | 1 | 15.2 | 0.0 | 174.3 | 51.7 | | | | 0.72 | | | A | EFFICIENT HVAC EQUIP |
| 61 | 1974 | 9 | 15.7 | 14.0 | 194.9 | 67.7 | | | | | 63 | | B | |
| 39 | 1979 | 1 | 3.8 | 28.3 | 72.3 | 41.4 | | | | 0.36 | | | A | EFFICIENT HVAC EQUIP |
| 29 | 1978 | 4 | 11.2 | 0.0 | 128.7 | 38.2 | | | | 0.57 | 81 | | A | ICE MAKER HEAT PMPS, ICE/WTR STOR |
| 33 | | | 28.9 | 0.0 | 332.1 | 98.5 | | | | 1.28 | | | C | HALF OF ENRG LOADS: PROCS LOADS |
| 80 | | | | | | 26.3 | | | | | 75 | | C | BOTH ACTIVE AND PASSIVE SOLAR |
| 28 | 1979 | | 17.3 | 0.0 | 199.3 | 59.1 | | | | | | | B | SATISFIES ASHRAE STD 90-75 |
| 172 | 1983 | 1 | 27.9 | 0.0 | 320.8 | 95.2 | | | | | 96 | .81 | B | OFFICE, LAB, & MISC. |
| 54 | 1976 | 2 | 14.8 | 0.0 | 170.3 | 50.5 | | | | 0.56 | 84 | | C | WATER THERMAL STORAGE |
| 127 | 1982 | 1 | 12.0 | 0.0 | 138.1 | 41.0 | 61.0 | | | | 131 | | B | |
| 170 | 1978 | 6 | 2.7 | 22.3 | 53.2 | 31.5 | | 1.1 | 1.2 | 0.22 | | | A | WARE/OFFICE, SOLAR NOT OPERATNL |
| 64 | 1979 | 4 | 15.2 | 39.5 | 214.4 | 91.4 | | | | 1.35 | 103 | 1.00 | A | SOLAR COOLING PLANNED BUT NOT INSTALLED |
| 73 | 1980 | 2 | 5.4 | 30.8 | 92.7 | 49.2 | | | | 0.45 | 47 | | A | A/C IN COMPUTER ROOM ONLY |
| 83 | 1978 | 5 | 5.1 | 0.0 | 58.1 | 17.2 | 43.0 | 2.8 | 2.6 | 0.81 | 118 | | A | DATA INCLDS ACT SOLAR, NOW DOWN |
| 178 | 1980 | 4 | 9.6 | 66.2 | 176.3 | 98.9 | | 2.2 | 2.6 | 0.77 | 83 | 1.00 | B | ENERGY COSTS << COMPARISONS CENTERS |
| 31 | 1980 | 2 | 17.5 | 0.0 | 201.4 | 59.8 | | | | 1.01 | 103 | | A | BOTH ACTIVE AND PASSIVE SOLAR |
| 167 | 1981 | 2 | 18.1 | 0.0 | 208.5 | 61.9 | | | | | 64 | | C | OFFICE/WARE W/IR HEAT TOO |
| 44 | 1982 | | 6.1 | 0.0 | 69.9 | 20.8 | 17.0 | | | | 103 | .98 | B | |
| 132 | 1980 | 4 | 12.1 | 46.1 | 184.9 | 87.3 | | | | 1.21 | | 1.00 | B | |
| 45 | 1981 | | 19.7 | 0.0 | 226.9 | 67.3 | 39.3 | | | | 93 | .88 | B | |
| 46 | 1981 | | 10.7 | 0.0 | 123.0 | 36.5 | 28.5 | | | | 85 | .83 | B | POLICE USE 168HRS/WK,MOST 63HRS |
| 125 | 1982 | 3 | 7.9 | 35.0 | 125.7 | 61.9 | | | | 0.82 | 92 | 1.00 | B | REFLECTIVE COATING ON ROOF |
| 137 | 1983 | 1 | 7.3 | 11.5 | 95.3 | 36.3 | | | 6.7 | 0.59 | 68 | | A | PSYCHIATRISTS CLINIC/OFFICE |