Title

Integrated Estimation of Commercial Sector End-Use Load Shapes and En ergy Use Intensities in the PG&E Service Area 2

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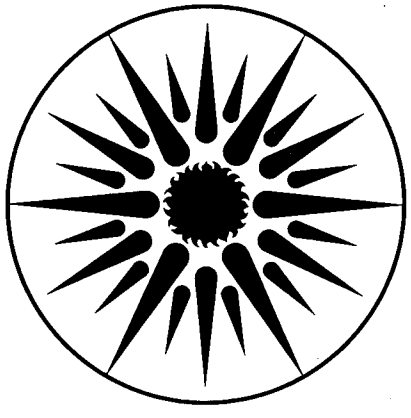

ENERGY & ENVIRONMENT DIVISION

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Glossary of HVAC System Types

Abbreviation	HVAC System Type
DD	Dual Duct
FPFC	Four Pipe Fan Coil
PMZ	Packaged Multi Zone
PSZ	Packaged Single Zone
PTAC	Packaged Terminal Air Conditioner
PVAV	Packaged Variable Air Volume
RHF	Reheat Fan
SZRH	Single Zone Reheat
TPFC	Two Pipe Fan Coil
VAV	Variable Air Volume

Integrated Estimation of Commercial Sector End-use Load Shapes and Energy Use Intensities in PG&E Service Area

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Abstract

This project represents a unique research effort to address the commercial sector end-use energy forecasting data needs of the Pacific Gas and Electric Company (PG&E) and the California Energy Commission (CEC). The object of the project was to develop an updated set of commercial sector end-use energy use intensity (EUI) data that has been fully reconciled with measured data. The research was conducted in two stages. First, we developed reconciled electricity end-use EUIs and load shapes for each of the 11 building types in the inland and coastal regions of the PG&E service territory using information collected in 1986. Second, we developed procedures to translate these results into a consistent set of commercial sector forecasting model inputs recognizing the separate modeling conventions used by PG&E and CEC. EUIs have been developed for: 11 commercial building types; up to 10 end uses; up to 3 fuel types; 2 and 5 sub-service territory forecasting regions (as specified by the PG&E and CEC forecasting models, respectively); and up to 2 distinct vintages corresponding to the period prior to and immediately following the adoption of the first generation of California building and equipment standards. For the electricity end uses, 36 sets of daily load shapes have been developed representing average weekday, average weekend, and peak weekday electricity use for each month of the year by building type for both the inland and coastal climate zones.

Executive Summary

End-use electricity demand forecasts are the critical link between supply- and demand-side planning activities in support of integrated resource planning. End-use information on the structure of electricity demand is especially important for utility and state planners considering explicit interventions to modify future demands (also known as demand-side management). Yet, historically, the empirical basis to support end-use forecasts and demand-side planning has been weak compared to the information available to support supply-side planning. Not surprisingly, the resulting uncertainties associated with demand-side data have led to significant differences of opinion between utility and state planners regarding the future demand for electricity.

This project represents a unique research effort to address the commercial sector end-use energy forecasting data needs of the Pacific Gas and Electric Company (PG&E) and the California Energy Commission (CEC) in a cost-effective and coordinated manner.

Cost savings have been achieved through the implementation of a new method for combining information from detailed on-site surveys, mail surveys, and hourly class load research and weather data to develop a consistent set of end-use energy use intensities (EUIs) and load shapes, which have been reconciled to measured loads. Coordination has been achieved through the development of a common base set of end-use EUIs and load shapes that is then adjusted in a transparent fashion for direct incorporation into existing PG&E and CEC forecasting models.

The object of the research is to develop an updated set of commercial sector end-use energy use forecasting inputs that has been fully reconciled with measured data. The EUIs have been developed to support five stages of disaggregation within the forecasting models (See Table EX-1): 11 commercial building types; up to 10 end uses; up to 3 fuel types; 2 and 5 sub-service territory forecasting regions (as specified by the PG&E and CEC forecasting models, respectively); and up to 2 distinct vintages corresponding to the period prior to and immediately following the adoption of the first generation of California building and equipment standards. For the electricity end uses, 36 sets of daily load shapes have been developed representing average weekday, average weekend, and peak weekday electricity use for each month of the year by building type for both the inland and coastal climate zones.

The research was conducted in two stages: First, we developed up to 10 reconciled electricity end-use EUIs and load shapes for each of the 11 building types in the inland and coastal regions of the PG&E service territory using information collected in 1986. Second, we developed procedures to translate these results into a consistent set of commercial sector forecasting model inputs recognizing the separate modeling conventions used by PG&E and CEC.

Table EX-1. Summary of Project Scope

Building Types	End Uses	Fuels	Regions PGE	Regions CEC	Vintages
Large Office	Space Cooling	Electricity	Inland	Region 1	pre-1979
Small Office	Space Heating	Natural Gas	Coastal	Region 2	post-1978
Retail	Ventilation	Other		Region 3	
Foodstore	Indoor Lighting			Region 4	
Warehouse	Outdoor Lighting			Region 5	
Restaurant	Water Heating				
School	Cooking				
College	Refrigeration				
Health	Office Equipment				
Lodging	Miscellaneous				
Miscellaneous					

The first stage of the research relied on detailed examination of nearly 900 on-site surveys and almost 6,000 mail surveys. The intermediate output of this stage of the research is a set of up to 3 DOE-2 building prototypes[1] to estimate preliminary end-use hourly electricity load shapes for each of the 11 building types. Next we processed hourly data from over 1,300 class load research accounts to develop whole-building electricity load shapes by building type and climate region. The preliminary end-use load shapes from the simulations are then reconciled by building type for each hour of the year to a whole-building electricity load shapes. Use of the class load research data, therefore, represents an important constraint on the preliminary, engineering-based load shape estimates. End-use EUIs and average load shapes are developed through simple integration of the reconciled hourly end-use load shapes.

At the end of the first stage of the research, we have a set of reconciled end-use EUIs and load shapes that represent aggregate end-use electricity consumption, by building type for the inland and coastal climate region, for 1986. In the second stage of the research, the reconciled data are further disaggregated and transformed into inputs for the PG&E and CEC end-use forecasting models.

[1] Distinct prototypes were used to represent sub-building types for multi-building classes of buildings (e.g., refrigerated and non-refrigerated warehouses, fast-food and sit-down restaurants, large hotel and small motel for lodging) and to represent diverse building functions within a single building category (e.g., lab/office/classroom, library, and dormitory for the college building type). We also specified multiple, function-based zones within the hospital, restaurant, warehouse, foodstore, lodging building types.

Six distinct effects are treated in this second stage: 1) price effects between 1986 and the 1975 model base year are removed; 2) office equipment energy use is separated from miscellaneous electricity use; 3) fuel saturations are accounted for explicitly; 4) for space-conditioning end uses, the effects of different eras of building and equipment minimum energy efficiency standards are represented[2]; 5) space-conditioning end-use EUIs are developed for all 5 climate regions used by CEC to forecast energy use for the PG&E service territory; and 6) several EUIs that cannot be estimated directly with our reconciliation methodology, including electric space heating (except for lodging) and all non-electric end uses (space heating, water heating, cooking, and miscellaneous), are developed through direct analysis of the on-site and mail survey data.

The results from this final stage of the research are put into a format according to the forecasting model input data specifications used by PG&E and CEC. These results, presented in Chapter 5 of the report, are designed to facilitate direct comparison to current model inputs and incorporation of project results into future forecasting efforts.

This project is a unique collaborative research project sponsored jointly by PG&E and CEC. Its success was based largely on the ability of the sponsors to provide the research team with timely and consensual direction at critical junctures in the project. We believe consensus was achieved because of a shared commitment by all parties to report information in an un-biased fashion and to make joint decisions on this basis. We firmly believe that it provides an important model for future collaborative research in areas where there is a need for better information by the resource planning process. In doing so, it will allow resource planners to focus their attention on areas where there are real differences of opinion, rather than on acknowledged absences of data.

[2] The CEC model treats building and equipment efficiency effects separately.

Chapter 1

Introduction

The Pacific Gas and Electric Company (PG&E) and California Energy Commission (CEC), through the California Institute for Energy Efficiency (CIEE), have contracted with the Lawrence Berkeley Laboratory (LBL) to develop a set of commercial building sector load shapes (LSs) and energy-use intensities (EUIs) to support PG&E and CEC forecasts for the PG&E service territory. The overall objectives of this multi-year CIEE-sponsored project are:

- To apply an end-use load-shape estimation model to develop a common set of hourly end-use load shapes and annual EUIs for commercial buildings by building type, vintage, and climate region. The results will be compatible with PG&E's and CEC's energy and peak demand forecasting models. Load shapes are developed for typical weekdays, weekend days, and peak days, by month or by season.

- To evaluate the adequacy of the estimated load-shapes and EUIs for the PG&E and CEC energy and peak demand forecasting models.

- To analyze measured end-use load data in commercial buildings collected by California utilities such as PG&E and SCE and to validate an end-use load-shape estimation model that was developed at LBL.

The specific goals of the current project are:

- To apply the LBL's end-use load-shape estimation model to obtain a common set of reconciled hourly end-use load shapes and annual EUIs for 11 commercial buildings types.

- To work with PG&E and CEC to resolve issues related to the transformation of data for application in forecasting models.

Table 1-1 is a matrix of all the building types and end uses of interest to PG&E and CEC. The project addresses both electric EUIs and electric load shapes, as well as non-electric EUIs. Within these broad categories of EUIs, two further disaggregations are also treated explicitly for the space conditioning end uses (heating, cooling, and ventilation): climate and the effects of the first generation of building and equipment minimum energy performance standards (or vintage).

Table 1-1. Building Types and End Uses.

End-use EUIs are developed by vintage and climate zone for weather-dependent end uses.

	End use / Building type	Space heating	Space cooling	Ventilation	Lighting Indoor	Lighting Outdoor	Water heating	Refrigeration	Cooking	Office Equipment	Misc.
Phase I											
1	Small office	X	X	X	X	X	X			X	X
2	Large office	X	X	X	X	X	X			X	X
3	Retail store†	X	X	X	X	X					X
	Large retail store										
	Small retail store										
Phase II											
4	Restaurant†	X	X	X	X	X	X	X	X		X
	Sit-in restaurant										
	Fast food restaurant										
5	Food Stores	X	X	X	X	X	X	X	X		X
6	Warehouse†	X	X	X	X	X		X			X
	Refrig. warehouse										
	Non-refrig. warehouse										
7	School†	X	X	X	X	X	X	X	X	X	X
	Primary School										
	Secondary School										
8	College†	X	X	X	X	X	X	X	X	X	X
	Office/Lab/Classroom										
	Library										
	Dormitory										
9	Health†	X	X	X	X	X	X	X	X	X	X
	Hospital										
	Nursing home										
10	Lodging†	X	X	X	X	X	X	X	X		X
	Large Hotel										
	Small Hotel/Motel										
11	Miscellaneous	X	X	X	X	X	X	X			X

† Initial estimates of end-use EUIs and LSs are developed by weighted average of the component building types.

The project is organized around the seven tasks, as outlined in **Table 1-2.**

Table 1-2. Project Tasks

TASK 1:	Develop detailed work plan
TASK 2:	Input Data Analysis
TASK 3:	Data Base Integration
TASK 4:	DOE-2 Prototype Development
TASK 5:	End-Use EUI and Load Shape Estimation
TASK 6:	Adjustment to Reconciled EUIS for PG&E and CEC Forecasting Models
TASK 7:	Final Report

This report is organized into five chapters. Chapter 2 discusses our methodology, which consists of two major parts: 1) reconciliation of initial end-use load-shape estimates with measured whole-building load data to produce intermediate EUIs and load shapes; and 2) data transfer procedures to transform intermediate outputs into a revised set of inputs for the CEC and PG&E forecasting models (Part of Task 6). Chapter 2 describes each step involved in both phases of the methodology. Chapter 2 also describes the overall use of data to implement the methodology.

Chapter 3 covers the work performed under Tasks 2 and 3. Task 2 consists of preparing data for use in the project. The core data for the project are outlined in **Table 1-3**. The primary data for the project are detailed, on-site surveys for a total of 855 buildings in the PG&E service territory, load research data for 1,374 PG&E accounts, commercial sector mail survey data, and historical north-coastal and north-central California weather data. Task 3 consists of integrating the various data sets. The objective of this task is not a literal integration of the data sets into one common (and extremely large) data base, but rather identification of important linkages for subsequent analyses. For example, a major component of this task is identifying outlier buildings and creating a clean data base for prototypical building development. The outcome of Task 3 is an overall assessment of the quality of data for use in developing building prototypes and in estimating a preliminary set of EUIs and LSs.

Chapter 4 discusses the intermediate project results consisting of DOE-2 prototype development (Task 4) and end-use EUI and LS estimation (Task 5). In Task 4, we develop prototypes for all building types considered. These prototypes are based primarily on PG&E's on-site and mail survey data. On those occasions where the PG&E data were not sufficient to develop prototypes, we modified the existing prototypical building description developed earlier at LBL. Then, using a new method developed by LBL, we reconcile simulation results with whole-building load shapes (Task 5).

Table 1-3. Input Data

	Data Set
1.	PG&E on-site survey data of 855 buildings including billing data and weights
2.	Load research short-interval (30-minute) load data of over 1400 accounts for two years (1985-1986)
3.	The 1988 PG&E commercial sector end-use mail surveys (~6000 responses)
4.	Hourly weather data for five CEC climate zones

The reconciled EUIs are developed for the average stock of the buildings for 1986. The reconciled EUIs must be modified to meet the specification of the PG&E and CEC forecasting models. Both PG&E and CEC models separately account for the impact of technologies, vintages, and price changes. In Chapter 5, we use the methodology discussed in Chapter 2 for these modifications to develop a complete set of forecasting model inputs.

Chapter 2

Methodology

The methodology consists of two major parts: 1) reconciliation of initial end-use load-shape estimates with measured whole-building load data to produce intermediate EUIs and load shapes; and 2) data transfer procedures to transform intermediate outputs into a revised set of inputs for CEC and PG&E forecasting models. This chapter describes the steps involved in each part of the methodology. Chapter 3 describes the development of data to implement the methodology.

Part 1. Reconciliation Methodology

The major analytical advance of our methodology is the reconciliation of estimated end-use load shape with measured whole-building load shape data. There are three major steps in this process: 1) *initial engineering estimates of end-use load shapes*; 2) *average measured whole-building load shapes*; and 3) *reconciliation of 1 with 2*. **Figure 2-1** illustrates the primary data sources and relationships between these steps.

Initial Estimates of End-Use Load Shapes

In the first step of the reconciliation, we make initial estimates of end-use load shapes for each building type. These estimates are developed using one or more prototypes to represent each building type. For HVAC end uses (heating, cooling, ventilation), the initial estimates result from simulation of the prototype using the DOE-2.1D building energy simulation program (BESG 1990). For non-HVAC end uses (lighting, equipment, cooking, etc.), the estimates result from engineering analysis of data on reported schedules and installed capacities. The schedules and capacities are taken from the on-site and mail surveys, which are used as input to the Non-HVAC EUI/LS and DOE-2 Input Generator (NELDIG).

As indicated, due to diversity within some building types, multiple prototypes were sometimes required to represent a single building type. **Table 2-1** identifies the prototypes developed for each building type.

The prototypes were developed through an analysis of approximately 850 detailed, on-site surveys, nearly 6000 mail survey responses, and previous prototypes developed by LBL and others for the commercial sector. The analysis of the on-site and mail survey data is described in Chapter 3, and the final prototype descriptions are presented with the individual building results in Chapter 4.

Initially two simulations of each prototype are performed. The first uses Oakland/Alameda weather to develop an initial estimate of energy use for the Coastal weather zone. The second uses Sacramento weather to develop an initial estimate of energy use for the Inland weather zone.

Figure 2-1. Integrated Commercial LS and EUI Estimation Methodology. The method consists of three parts: 1) development of preliminary EUIs and LSs using NELDIG and DOE-2, 2) construction of average whole-building type, and 3) reconciliation of the preliminary EUIs and LSs with average whole-building hourly load, using EDA.

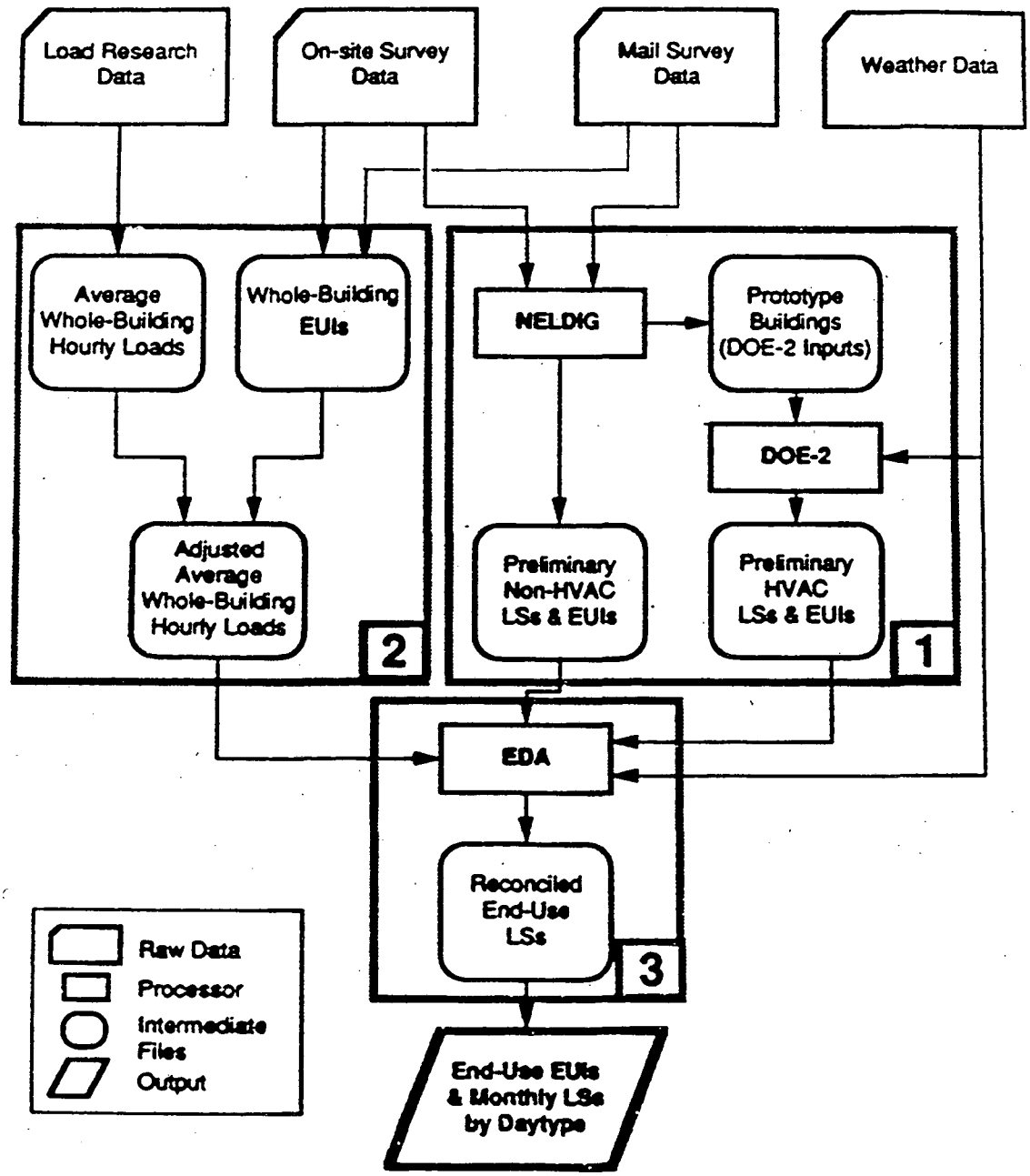

Table 2-1. Prototype Identification by Building Type

BUILDING TYPE	Prototype(s)
SMALL OFFICE	Small Office
LARGE OFFICE	Large Office
RETAIL	Large Retail Small Retail
RESTAURANT	Fast Food Sit-Down
FOOD STORES	Food Store
WAREHOUSE	Refrigerated Non-Refrigerated
SCHOOL	Primary School Secondary School
COLLEGE	Office/Lab/Classroom Library Dormitory
HEALTH	Hospital Nursing Home
LODGING	Large Hotel Small Hotel/Motel
MISCELLANEOUS	Miscellaneous

Average Whole-Building Electricity Use Profiles

In the second step of the reconciliation, we construct average whole-building electricity use profiles for each building type. These profiles provide control totals against which our initial estimates are reconciled. Two sources of data are used: Load research data (LRD) are used to develop the prototypical whole-building load *shape*, while supplementary data on total commercial sector energy use intensity by building type (also known as whole building EUIs) are used to determine *magnitude* (which is expressed as a total EUI for the building type or $kWh/ft^2.yr$). The analysis of the LRD to develop whole-building load shapes is described in Chapter 3. The final whole-building load shapes and EUIs are presented separately for each building in Chapter 4.

The whole-building EUI is used to normalize the whole-building load shapes such that integration of the adjusted whole-building load shape for the year equals the whole-building EUI. Consequently, the whole-building EUI is an extremely important input to the reconciliation process because it largely determines the magnitude of the reconciled end-use EUIs; thus, the sum of the reconciled EUIs must exactly equal the whole-building EUI. following extensive discussions with the CEC and PG&E forecasting staff. The basic data used was an in-house analysis by PG&E. A detailed discussion of the development of these EUIs is presented in Chapter 3 as part of the analysis of data used in the project.

Reconciliation of Initial Estimates to Whole-Building Electricity Use Profiles

In the third step of the reconciliation, we apply the End-use Disaggregation Algorithm (EDA) to obtain reconciled end-use LSs. Technical aspects of EDA are documented in Akbari, et al. (1988). The corresponding end-use EUIs are simply the integration of the end-use LSs for the entire year. The results of the reconciliations are presented in Chapter 4.

Part 2. Developing PG&E and CEC Forecasting Model Inputs from Reconciled EUIs

The end-use LSs and EUIs developed through the reconciliation procedures represent a snapshot of 1986 electricity use by building type and end-use for two regions of the PG&E service territory. For each building type, this snap-shot represents an aggregation over important distinctions that are explicitly represented within CEC and PG&E forecasting models. These distinctions include price effects between 1986 and the 1975 model base year, office equipment energy use as a distinct element of miscellaneous electricity use, fuel saturations, and, for space conditioning end uses, the effects of different eras of building and equipment minimum energy efficiency standards. The CEC, in addition, models 5 distinct climate regions within the PG&E service territory, rather than the 2 we examined in Part I. Finally for both models, there are several EUIs that cannot be estimated with our reconciliation methodology, including electric space heating (except for lodging) and all non-electric end uses (space heating, water heating, cooking, and miscellaneous).

For the second phase of our methodology, we have developed procedures that combine reconciled EUIs (from application of EDA) with additional analysis of the DOE-2 prototypes and additional information from the mail and on-site surveys to specify a complete set of revised energy use inputs for both the CEC and PG&E models. The basic approach is to start with the reconciled EUIs as a true representation of 1986 energy use and develop adjustment factors that disaggregate these EUIs in a manner that is consistent with CEC's and PG&E's current forecasting procedures.

It is useful to organize our discussion in a series of sequential steps: 1) Development of 1986 EUIs for end-uses not estimated through application of EDA (electric heating, and all non-electric end uses); 2) Re-specification of all 1986 EUIs to a 1975 base year through application of the short-run price elasticity of demand and historic energy prices; 3) Removal of fuel saturation effects for all reconciled electric end uses, except those for which, by definition, the saturation is 100% (indoor and outdoor lighting, and miscellaneous). 4) Incorporate previous LBL work to further disaggregate the electric miscellaneous EUI into distinct categories for office equipment and miscellaneous; 5) For the space conditioning end uses, account explicitly for the effects of the first generation of mandatory minimum building energy efficiency standards; 6) For the space conditioning end use specification used by the CEC model, account separately for the impacts of equipment energy efficiency; 7) Finally, for the space conditioning end use specification used by the CEC model, account separately for the additional variations in energy use for the 5 sub-regions represented by the 2 regions for which explicit reconciliations were performed.

Developing EUIs for Electric Heating, and Non-Electric End Uses

The first step toward developing revised forecasting model inputs for the CEC and PG&E models is to complete the development of all EUIs required by the models. There are several classes of EUIs that cannot be estimated using the LBL reconciliation procedure. They include electric space heating, and non-electric space heating, water heating, cooking, and miscellaneous end uses. Electric space heating has a very low saturation in the PG&E service territory; we did not, for example, detect the presence of electric space heating in our analysis of the LRD (except for the lodging building type). Accordingly, we could not extract profiles for these end uses using our reconciliation procedures. Non-electric space heating, water heating, cooking, and miscellaneous energy use were not estimated using the reconciliation process for the obvious reason that they are not electric end uses.

Our approach for developing EUIs for these end uses is to estimate them directly from the on-site and mail survey data. For the non-electric, non-space conditioning end uses (water heating, cooking, and miscellaneous), this is a straightforward application of various engineering factors to the installed capacity and utilization information reported in the survey data. For the space conditioning end uses (electric and non-electric space heating), we relied on simulations of the same DOE-2 prototypes used to estimate initial conditions for the EDA reconciliations for electric cooling and ventilation.

It is important to note that EUIs estimated in this fashion, since they are not reconciled to a control total, are 100% saturation estimates for these EUIs. Therefore, there are no saturation effects to remove, as must be done for the electric EUIs emerging from EDA (to be described below).

Expressing Reconciled EUIs Relative to a 1975 Base Year

Having now completed the development of a full set of EUIs for all end uses for 1986, we next re-specify these EUIs relative to the 1975 base year used by both CEC and PG&E in their forecasting models. The re-specification consists of taking into account the effects of energy price changes between 1975 and 1986, which is based on both a measure of the short-run price elasticity of demand and the historic price series. Note that we will account separately for both non-price impacts on the space conditioning EUIs (i.e., the effects of minimum energy performance standards) and technological change on office equipment EUIs.

CEC and PG&E currently rely on different estimates of the short-run price elasticity of demand. In order to respect these differences, we have developed separate price adjustment factors. The price elasticities and resulting price adjustment factors are summarized on separate tables for CEC and PG&E in order to facilitate subsequent modification of the price elasticities by CEC or PG&E, see **Tables 2-2 and 2-3**. The price elasticity of demand is a dimensionless number that relates percentage changes in price to percentage changes in demand for a given fuel and building type (in the case of CEC) or for a given fuel and end use (in the case of PG&E). The price adjustment factors represent the cumulative effect on consumption of these price elasticities and the prices of energy between 1986 and 1975. When these adjustment factors are multiplied by 1986 energy use, they produce an estimate of 1975 energy use for a given fuel/building type or fuel/end use.

Accounting for Fuel Saturation Effects

The whole-building EUI or control total used in the reconciliation process reflected the aggregate impact of the various saturations of electricity end uses in the PG&E service territory. Since the CEC and PG&E forecasting models account for fuel saturations separately by end use, the effects of the observed aggregate saturations embedded in the reconciled EUIs must be removed. We developed saturation estimates through analysis of the mail survey data See **Tables 2-4 and 2-5**. (Additional analysis of the mail survey data is presented in Chapter 3.) Saturations for the other end uses are either 100% (for electric indoor lighting, outdoor lighting, and miscellaneous) or are already accounted for in the estimation process (for heating and all non-electric end uses, see above).

Table 2-2. Short-Run Price Elasticity and Price Adjustment Factors - CEC

Building Type	Short Run Price Elasticity			1986 to 1975 Price Adjustment Factor		
	Elec	Gas	Othr	Elec	Gas	Othr
Small Office	0.200	0.075	0.090	1.28	1.09	0.99
Large Office	0.200	0.075	0.090	1.28	1.09	0.99
Retail	0.210	0.075	0.090	1.29	1.09	0.99
Restaurant	0.140	0.075	0.090	1.18	1.09	0.99
Food Store	0.230	0.075	0.090	1.33	1.09	0.99
Warehouse	0.120	0.075	0.090	1.15	1.09	0.99
School	0.130	0.075	0.090	1.16	1.09	0.99
College	0.170	0.075	0.090	1.23	1.09	0.99
Health	0.180	0.075	0.090	1.24	1.09	0.99
Lodging	0.110	0.075	0.090	1.14	1.09	0.99
Miscellaneous	0.130	0.075	0.090	1.16	1.09	0.99

Table 2-3. Short-Run Price Elasticity and Price Adjustment Factors - PG&E

Building Type	Short-Run Price Elasticity		1986-1975 Price Adjustment Factor	
	Elec	Gas	Elec	Gas
Heating	0.13	0.17	1.14	1.32
Cooling	0.11	-	1.11	-
Ventilation	0.01	-	1.01	-
Hot Water	0.19	0.19	1.20	1.37
Cooking	0.01	0.01	1.01	1.01
Refrigeration	0.01	-	1.01	-
In-Lights	0.01	-	1.01	-
Out-Lights	0.01	-	1.01	-
Office Equip	0.01	-	1.01	-
Miscellaneous	0.01	0.19	1.01	1.37

Table 2-4. Mail Survey Electricity Saturations by End Use [%] - Coastal
(Source: PG&E 1988 Mail Survey)

	Heat	Cool	Vent	Cook	Refr	HotH2O
Small Office	13.3	69.9	69.9	52.6	73.4	45.7
Large Office	7.3	86.6	86.6	61.7	79.2	20.3
Retail	18.5	59.0	59.0	60.0	75.4	24.6
Restaurant	20.1	68.9	68.9	44.9	98.5	15.3
Food	3.7	76.0	76.0	67.5	97.8	14.5
Warehouse	14.5	47.8	47.8	66.5	89.3	52.8
School	2.2	77.2	77.2	53.3	95.5	14.0
College	22.1	52.3	52.3	76.8	100.0	8.2
Health	0.3	85.4	85.4	52.8	99.8	0.9
Lodging	18.7	69.4	69.4	73.3	89.1	2.7
Miscellaneous	2.6	27.2	27.2	70.3	96.7	21.0

Table 2-5. Mail Survey Electricity Saturations by End Use [%] - Inland
(Source: PG&E 1988 Mail Survey)

	Heat	Cool	Vent	Cook	Refr	HotH2O
Small Office	19.0	80.0	80.0	52.6	73.4	45.7
Large Office	1.7	91.7	91.7	61.7	79.2	20.3
Retail	9.1	76.4	76.4	60.0	75.4	24.6
Restaurant	11.2	84.3	84.3	44.9	98.5	15.3
Food	9.7	69.5	69.5	67.5	97.8	14.5
Warehouse	7.8	51.1	51.1	66.5	92.2	52.8
School	0.0	82.8	82.8	53.3	95.5	14.0
College	1.8	94.6	94.6	76.8	100.0	8.2
Health	0.9	78.3	78.3	52.8	99.8	0.9
Lodging	18.0	95.7	95.7	77.3	89.1	2.7
Miscellaneous	3.7	77.3	77.3	70.3	96.7	21.0

Accounting Separately for Office Equipment EUIs

Office equipment energy use has been an important new component of commercial sector load growth. Both CEC and PG&E now explicitly represent this end use in their forecasting models. Previously, it was treated jointly with other miscellaneous electricity use. The data used in our project also reflect this older, more aggregated view of miscellaneous equipment. Accordingly, application of the EDA reconciliation procedure yields only a single EUI for electric miscellaneous.

The importance of the office equipment end use led to CIEE sponsorship (with CEC and PG&E funding) of a detailed examination of office equipment energy use trends in the PG&E service territory by LBL (Piette, et. al. 1991). We have taken this work as the current best estimate of the EUI for this end use and subtracted these EUIs from the miscellaneous EUI estimated with EDA. Therefore, the electric miscellaneous EUI represents the residual of the original miscellaneous EUI and LBL's previous analysis of office equipment EUI (all in base year 1975). **Table 2-6** presents the 1975 office equipment EUIs derived from the LBL study.

Table 2-6. Office Equipment EUIs [kWh/sqft/yr] and Annual Percentage Growth (Source: Piette *et. al.* 1991)

Building	1983 EUI	Annual % Growth 83-86	1975 EUI
Small Office	0.66	15.4	0.21
Large Office	1.03	15.3	0.33
Retail	0.14	17.0	0.04
Restaurant	0.05	6.6	0.03
Food	0.04	9.1	0.02
Warehouse	0.12	25.1	0.02
School	0.09	14.7	0.03
College	0.13	15.9	0.04
Health	0.55	13.5	0.20
Lodging	0.03	14.7	0.01
Miscellaneous	0.10	12.1	0.04

Disaggregating Reconciled EUIs by Building and Equipment Vintage

The CEC and PG&E commercial sector energy demand forecasting models separately tracked energy use by several different vintages for a given building type. These vintages were intended to reflect different eras of building construction practices and equipment choice. For the time period under consideration, the most important vintages correspond to the time immediately prior to and after the enactment of the first generation of mandatory building and appliance minimum efficiency standards by the state of California. **Table 2-7** illustrates the relationship between these eras. In this project, we estimate the quantities labeled "U75" and "EUI79," which are the titles used by CEC in their forecasting model for these building and equipment vintages.

Table 2-7. Building and Equipment Vintages

Building Vintage	Equipment Vintage	
	before 1979	**after 1979**
before 1979	U75	treated separately by CEC & PG&E
after 1979	n/a	EUI79

Note: U75 is energy-use intensity used by CEC model for the base year 1975. EUI79 is energy-use intensity used by both CEC and PG&E models for the base year 1979. This project has developed the corresponding vintage prototypes.

The basic idea is to rely on additional DOE-2 simulations to provide ratios that then modify the reconciled EUIs. In this case, the prototypes themselves are modified to reflect conditions unique to each vintage. The challenge for implementing this procedure is the absence of high quality data to support the development of unique prototypes corresponding to each vintage. That is, there are very few buildings represented in either the on-site survey or mail survey built after 1978.

In addition to available on-site and mail survey data, we rely primarily on California's energy performance standards (Titles 24 and 20) and on ASHRAE standards 90/75 and 90.2P. Notably, some aspects of the California standards do not apply to several of the building prototypes examined including nursing homes, both primary and secondary schools, hotels and motels, and colleges.

The resulting prototype modifications are summarized in Chapter 4 following the presentation of the basic (i.e., un-vintaged) prototypes used in the reconciliation.

The structure of the CEC forecasting model treats building thermal loads separately from equipment energy conversion efficiency. Thus, we adopt CEC's energy conversion equipment shares and efficiencies and work primarily with the ratios of DOE-2 simulations of the loads placed on this equipment. Specifically:

$$EUI_{U75} = \frac{EUI_{reconciled} \times \frac{Price\_Effect}{Electric\_Saturation} \times \frac{Load_{original\_protoype}}{EUI_{original\_prototype}} \times \frac{Load_{U75\_prototype}}{Load_{original\_prototype}}}{CEC\_Energy\_Conversion\_Equipment\_Efficiency_{vintage\_65-78}} \quad [1]$$

or

$$EUI_{U75} = \frac{EUI_{reconciled} \times \frac{Price\_Effect}{Electric\_Saturation} \times \frac{Load_{U75\_prototype}}{EUI_{original\_prototype}}}{CEC\_Energy\_Conversion\_Equipment\_Efficiency_{vintage\_65-78}} \quad [2]$$

The CEC model also expresses EUI79 as a relative percentage of U75 and does not include the effects of HVAC equipment efficiency. Consequently, EUI79-CEC (EUI79 used by CEC model) is calculated using the ratio of loads from the simulations of the prototypes developed to represent U75 and EUI79.

$$EUI79\text{–}CEC = \frac{Load_{EUI79\_prototype}}{Load_{U75\_prototype}} \quad [3]$$

The PG&E model does include the effects of HVAC equipment efficiency in its specification of the equivalent post-standards EUI. Accordingly, EUI79-PG&E (EUI79 used by PG&E model) is calculated using EUI79-CEC adjusted for CEC HVAC equipment conversion efficiencies.

$$EUI79\text{–}PG\&E = EUI_{U75} \times EUI79\text{–}CEC \times CEC\_ECEE\_RATIO \quad [4]$$

where

$$CEC\_ECEE\_RATIO = \frac{CEC\_Energy\_Conversion\_Equipment\_Efficiency_{vintage\_65-78}}{CEC\_Energy\_Conversion\_Equipment\_Efficiency_{vintage\_79-83}} \quad [5]$$

The CEC energy conversion equipment efficiency and shares are presented in **Table 2-8** and **Table 2-9**. **Table 2-10** presents the weighted average energy conversion efficiencies.

Table 2-8. CEC Energy Conversion Efficiency by Vintage and Energy Source

	Heating Equipment				Cooling Equipment			
	Boiler (η)	Furnace (η)	Heat Pump (COP)	Other (η)	Chiller (COP)	Pkg. Mult (COP)	Pkg. Term (COP)	Heat Pump (COP)
Electricity								
Vintage 65-78	0.95	0.95	1.90	1.00	4.20	2.04	1.76	1.76
Vintage 79-83	0.95	0.95	2.40	1.00	4.25	2.34	2.41	2.43
Natural Gas								
Vintage 65-78	0.66	0.66	3.00	0.66	0.59	0.36	0.20	0.20
Vintage 79-83	0.75	0.75	3.00	0.66	0.75	0.65	0.20	0.20

Table 2-9. CEC Equipment Saturations (%) by Fuel Type

	Heating Equipment				Cooling Equipment			
	Boiler	Furnace	Heat Pump	Other	Chiller	Pkg. Mult	Pkg. Term	Heat Pump
SMALL OFFICE								
Electricity	0.0	66.3	33.2	0.5	19.3	72.2	2.4	6.1
Natural Gas	20.6	73.5	0.0	5.8	75.0	25.0	0.0	0.0
Other	0.0	81.0	0.0	19.0	75.0	25.0	0.0	0.0
LARGE OFFICE								
Electricity	0.0	100.0	0.0	0.0	89.6	4.9	5.5	0.0
Natural Gas	97.5	2.5	0.0	0.0	89.6	4.9	5.5	0.0
Other	100.0	0.0	0.0	0.0	89.6	4.9	5.5	0.0
RESTAURANT								
Electricity	0.0	69.9	11.5	18.6	7.2	89.4	2.0	1.4
Natural Gas	0.7	90.5	0.0	8.8	37.0	63.0	0.0	0.0
Other	0.0	0.0	0.0	100.0	37.0	63.0	0.0	0.0
RETAIL								
Electricity	0.0	37.3	54.1	8.6	56.4	40.0	0.1	3.5
Natural Gas	61.5	35.7	0.0	2.8	100.0	0.0	0.0	0.0
Other	14.0	36.0	0.0	50.0	100.0	0.0	0.0	0.0
FOOD STORE								
Electricity	0.0	41.6	18.8	39.6	0.0	96.6	0.0	3.4
Natural Gas	0.0	58.9	0.0	41.1	0.0	100.0	0.0	0.0
Other	0.0	0.1	0.0	99.9	0.0	100.0	0.0	0.0
WAREHOUSE								
Electricity	0.0	0.0	0.0	100.0	6.8	93.2	0.0	0.0
Natural Gas	0.0	62.1	0.0	37.9	30.0	70.0	0.0	0.0
Other	0.0	62.1	0.0	37.9	30.0	70.0	0.0	0.0
SCHOOL								
Electricity	0.0	90.6	9.4	0.0	0.0	97.6	0.5	1.9
Natural Gas	71.8	28.2	0.0	0.0	0.0	65.0	35.0	0.0
Other	90.0	9.0	0.0	1.0	0.0	100.0	0.0	0.0
COLLEGE								
Electricity	31.0	42.0	6.0	21.0	40.0	31.0	18.0	11.0
Natural Gas	100.0	0.0	0.0	0.0	56.0	44.0	0.0	0.0
Other	100.0	0.0	0.0	0.0	56.0	44.0	0.0	0.0
HEALTH								
Electricity	0.0	0.0	100.0	0.0	89.3	10.4	0.1	0.2
Natural Gas	93.8	6.2	0.0	0.0	89.3	10.4	0.3	0.0
Other	93.8	6.2	0.0	0.0	89.3	10.4	0.3	0.0
LODGING								
Electricity	0.0	0.0	84.4	15.6	95.6	0.0	0.0	4.4
Natural Gas	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
Other	33.0	0.0	0.0	67.0	100.0	0.0	0.0	0.0
MISCELLANEOUS								
Electricity	0.0	2.4	54.0	43.6	22.3	59.1	5.0	16.3
Natural Gas	47.5	38.1	0.0	14.4	22.3	59.0	18.7	0.0
Other	56.0	1.0	0.0	43.0	22.3	59.0	18.7	0.0

Table 2-10. CEC Weighted Average Energy Conversion Efficiencies by Fuel and Vintage

	Vintage 65-78		Vintage 79-83	
	Heating	Cooling	Heating	Cooling
SMALL OFFICE				
Electricity	1.266	2.433	1.432	2.716
Natural Gas	0.659	0.533	0.744	0.725
Other	0.660	0.533	0.733	0.725
LARGE OFFICE				
Electricity	0.950	3.960	0.950	4.055
Natural Gas	0.660	0.557	0.750	0.715
Other	0.660	0.557	0.750	0.715
RESTAURANT				
Electricity	1.069	2.186	1.126	2.480
Natural Gas	0.660	0.445	0.742	0.687
Other	0.660	0.445	0.660	0.687
RETAIL				
Electricity	1.486	3.248	1.739	3.420
Natural Gas	0.660	0.590	0.747	0.750
Other	0.660	0.590	0.705	0.750
FOOD STORE				
Electricity	1.148	2.030	1.242	2.343
Natural Gas	0.660	0.360	0.713	0.650
Other	0.660	0.360	0.660	0.650
WAREHOUSE				
Electricity	1.000	2.187	1.000	2.470
Natural Gas	0.660	0.429	0.716	0.680
Other	0.660	0.429	0.716	0.680
SCHOOL				
Electricity	1.039	2.033	1.086	2.342
Natural Gas	0.660	0.304	0.750	0.493
Other	0.660	0.360	0.749	0.650
COLLEGE				
Electricity	1.018	2.823	1.048	3.127
Natural Gas	0.660	0.489	0.750	0.706
Other	0.660	0.489	0.750	0.706
HEALTH				
Electricity	1.900	3.968	2.400	4.046
Natural Gas	0.660	0.565	0.750	0.738
Other	0.660	0.565	0.750	0.738
LODGING				
Electricity	1.760	4.093	2.182	4.170
Natural Gas	0.660	0.590	0.750	0.750
Other	0.660	0.590	0.690	0.750
MISCELLANEOUS				
Electricity	1.485	2.470	1.755	2.782
Natural Gas	0.660	0.381	0.737	0.588
Other	0.660	0.381	0.737	0.588

Non-HVAC End-Uses

Non-HVAC electric end-uses (cooking, hot water, indoor lighting, outdoor lighting, miscellaneous equipment, and refrigeration) for the 1975 Vintaged EUIs (U75) are calculated by removing the saturation effect from the 1986 EUI and then adjusting this result by the price effect.

$$U75 = \frac{EUI \times Price\_Effect}{Electric\_Saturation} \quad [6]$$

Non-HVAC gas end-uses (cooking, hot water, and miscellaneous equipment) for the 1975 Vintaged EUIs are calculated by adjusting the 1986 EUI for the price effect.

$$U75 = EUI \times Price\_Effect \quad [7]$$

Climatic Impacts on Space-Conditioning EUIs

Space-conditioning EUIs (cooling, ventilation, and heating) are influenced by climate. Within the PG&E service territory, the CEC forecasts energy use separately for five climatic regions. Generally speaking, different premises of the same building type would experience different heating, cooling, and ventilation loads (and, therefore, EUIs) depending on which of these regions they were located.

In principle, these differences could be estimated directly with separate reconciliations. That is, one can develop unique initial estimates of end-use EUIs and LSs for each region and reconcile them separately for each region. This approach could not be used because sufficient quantities of LRD were not always available to support the development of unique average whole-building electricity use profiles for each region (see Chapter 3).

Instead, a hybrid approach was taken. Separate reconciliations were made for the coastal and inland regions where sufficient data were available. For the remaining CEC forecasting regions, a separate set of DOE-2 simulations were run for each prototype using weather data from each region. The *ratios of simulated energy use* for cooling, ventilation, and heating from these simulations to those used in the reconciliations were then used to *adjust the reconciled HVAC EUIs* to produce a unique value for each region. See equation 8:

$$EUI_{CEC-region} = EUI_{original\_region} \times \frac{EUI\_prototype\_simulation_{CEC-region}}{EUI\_prototype\_simulation_{original\_region}} \quad [8]$$

Table 2-11 identifies the weather stations used to represent each climate region.

Table 2-11. Weather Stations

PG&E Climate Region	Weather Station	CEC Climate Region	Weather Station
Coastal	Oakland	Region 5 Region 1	Oakland Blue Canyon
Inland	Sacramento	Region 2 Region 3 Region 4	Sacramento Fresno San Jose

Chapter 3

Input Data Base Analysis and Integration

The data inputs to this project are of varying quality and come in many different formats. The primary building and load shape data for the project include the on-site surveys of 855 buildings, the whole-building load research data of 1,374 commercial accounts, and PG&E's 1988 Commercial Energy Use Survey (referred to as the mail survey) of over 6000 accounts (See **Table 1-3**).

Tasks 2 and 3 (see **Table 1-2**) initially assumed that the data had been thoroughly scrutinized and edited. In several cases, however, we have had to perform extensive analyses of the data and remove questionable values. In this section, we discuss this process of data review and database preparation for each of the four input data sets. We also summarize our efforts to review the data for application in developing end-use load shapes and EUIs. The results of these analyses were used in development of prototypical buildings and prototypical whole-building load shapes.

On-Site Survey Data Base

As part of PG&E and CEC's on-going efforts to characterize energy end use in the commercial sector, a detailed on-site survey of 855 commercial buildings across the PG&E service area has been completed (ADM 1987). A summary of the on-site survey buildings is presented in **Table 3-1.**

We received a computer tape of these data from CEC. Each premise (record) was characterized by 1,135 variables describing the building location, shape, construction, floor-space utilization, indoor and outdoor lighting, HVAC system, electric and non-electric equipment, water heating, cooking equipment, refrigeration systems, and a variety of schedules describing the operation of the premise and its equipment. In addition to building characteristics, the database also contains a year of utility billing data for most premises.

Table 3-1. Climate Zone Distribution of 1986 PG&E On-Site Survey Data
(Number of Buildings)

Premise Type	Climate Zone						Total
	IA	IIA	IIB	III	IV	OTHER	
Low Rise Office[a]	5	4	19	45	43	2	118
High Rise Office[a]	0	1	2	4	48	0	55
Retail Stores	8	9	27	42	46	1	133
Food Stores	3	11	23	21	30	0	88
Warehouses							
Refrigerated	0	3	3	2	6	0	14
Non-Refrigerated	0	4	4	7	5	2	22
School[b]	2	4	12	24	9	2	53
College[c]	0	0	0	0	1	0	1
Health	3	5	16	32	29	5	90
Restaurants							
Sit-Down	6	3	5	27	19	3	63
Fast-Food	1	1	7	4	7	2	22
Lodging	3	2	5	10	14	0	34
Miscellaneous	16	22	32	42	48	2	162
Total	47	69	155	260	305	19	855

a The on-site survey divides the office building into low rises (number of floors ≤ 5) and high rises (Number of Floors > 5).

b All Schools are primary schools; the survey has not compiled data for secondary schools. We used other data sources for prototype development.

c Only one college building was surveyed. We used other data sources for prototype development.

The on-site survey classifies premises by their primary SIC category, but also contains fields which specify the amount of floor space used for various activities such as office, retail, food store, refrigerated and non-refrigerated storage, dining, health cooking, etc. These fields were used to check that premises classified by SIC did in fact use a majority of their floor space for that purpose. We reviewed all of the on-site survey data and constructed a revised data base based on the following two criteria:

1. Excluded all the buildings from a premise type (as specified by SIC) whose major floor-area activity does not correspond with that premise type (< 50%); and
2. Included all the buildings from other other premise types (as specified by SIC) whose major floor-area activity corresponds with that premise type (> 50%).

With this modification, the number of buildings was changed in almost all the premise types. The revised number of buildings in all the premise types is summarized in **Table 3-2.**

We performed statistical analysis for several key variables to assess the quality of the data for developing a prototypical building. The primary variables selected for this analysis included building size (gross floor area), fraction of heated and cooled floor area, number of floors, window-to-wall ratio, wall and roof R-values, number of standard days per week, number of operating hours on standard days, floor area per person, indoor and outdoor lighting intensities, other equipment usage such as hot water, cooking, refrigeration, and office equipment. **Table 3-3** summarizes the result of this analysis for all the buildings. The statistics shown include an overall population average of the variable, the variable mean, median, standard deviation, maximum, and minimum values. The population average values are calculated for intensity variables by summing and dividing by the total population. For example, the population average of the fraction of heated floor area is calculated by dividing the total heated floor area of the population by the total gross floor area of the population, while mean fraction of heated floor area is calculated by taking average of fractions of heated floor area in individual buildings.

Despite our extensive efforts to remove all questionable values from the on-site survey, there are a few outliers. Most noticeable among them are the maximum window-to-wall ratios (office, retail, food store, non-refrigerated warehouse, primary school, health, sit-down restaurants, lodging and miscellaneous buildings) and minimum floor area per person (small office, food store, primary school, sit-down restaurant and miscellaneous buildings).

Table 3-2. Statistics of the 1986 PG&E On-Site Survey
(Number of Buildings)

Distribution of PG&E On-Site Survey Data				
Premise Type	Initial number	# Dropped Out	# Moved In	Net Total
Office	173	23	12	162
Retail	133	29	13	117
Food Stores	88	2	4	90
Warehouse				
Refrigerated	14	1	0	13
Non-refrigerated	22	2	2	22
School				
Primary Schools	51	0	0	51
Secondary Schools	0	0	0	0
Vocational	2	0	0	2
College	1	0	0	1
Health*				
Hospitals	56	2	0	54
Nursing Homes	9	0	1	10
Restaurant				
Sit down	63	3	5	65
Fast food	22	0	0	22
Lodging				
Small Hotel/Motel	21	0	1	22
Large Hotel	12	0	0	12
Miscellaneous	162	10	3	155
Total	829	72	41	798

* Clinics are included in office buildings.

Table 3-3. Summary of Building Characteristics in the 1986 PG&E On-Site Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
			Gross Floor Area (ft^2)				
Office							
Small	N/A	3421.0	5855.0	5499.0	112500.0	700.0	76
Large	N/A	98085.0	272500.0	157128.0	1400000.0	1325.0	72
Retail							
Small	N/A	3237.0	3832.0	4315.0	44439.0	280.0	80
Large	N/A	98351.0	80105.0	142003.0	800800.0	4680.0	26
Food Stores	N/A	4431.5	3250.0	7545.4	150000.0	124.0	90
Warehouse							
Refrigerated	N/A	53200.2	34000.0	59884.5	512258.0	2200.0	13
Non-Refrigerated	N/A	6040.2	12480.0	13219.5	96000.0	940.0	22
Primary Schools	N/A	6361.7	6500.0	8292.3	46500.0	676.0	51
College	N/A	21380.0	21380.0	0.0	21380.0	21380.0	1
Vocational	N/A	6045.4	9554.0	3900.1	14800.0	4308.0	2
Health							
Hospitals	N/A	132036.2	192500.0	136359.4	560211.0	7680.0	54
Nursing Home	N/A	38362.1	29775.0	13411.9	54600.0	10000.0	10
Restaurants							
Sit Down	N/A	3024.6	3056.0	2166.6	21600.0	670.0	65
Fast Food	N/A	1649.8	1762.5	906.8	5250.0	576.0	22
Lodging							
Small Hotel/Motel	N/A	8304.4	15762.0	9030.0	50900.0	1473.0	22
Large Hotel	N/A	205328.6	445065.0	209996.6	1018085.0	63000.0	12
Miscellaneous	N/A	8826.0	6000.0	23147.8	945570.0	180.0	155
			Fraction of Floor Area Heated				
Office							
Small	0.9	0.9	1.0	0.2	1.0	0.2	76
Large	0.9	0.9	1.0	0.2	1.0	0.0	72
Retail							
Small	0.8	0.8	1.0	0.3	1.0	0.0	80
Large	0.9	0.9	1.0	0.3	1.0	0.0	26
Food Stores	0.7	0.7	0.8	0.4	1.0	0.0	90
Warehouse							
Refrigerated	0.0	0.2	0.1	0.2	0.6	0.0	13
Non-Refrigerated	0.5	0.7	0.3	0.4	1.0	0.0	22
Primary Schools	1.0	1.0	1.0	0.0	1.0	0.9	51
College	1.0	1.0	1.0	0.0	1.0	1.0	1
Vocational	1.0	1.0	1.0	0.0	1.0	1.0	2
Health							
Hospitals	1.0	1.0	1.0	0.0	1.0	0.8	54
Nursing Home	0.9	0.9	1.0	0.1	1.0	0.8	10
Restaurants							
Sit Down	0.9	0.8	1.0	0.3	1.0	0.0	65
Fast Food	0.8	0.7	1.0	0.4	1.0	0.0	22
Lodging							
Small Hotel/Motel	1.0	1.0	1.0	0.0	1.0	0.8	22
Large Hotel	1.0	1.0	1.0	0.1	1.0	0.7	12
Miscellaneous	0.8	0.7	1.0	0.4	1.0	0.0	155

Table 3-3 (Continued). Summary of Building Characteristics in the 1986 PG&E On-Site Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
Fraction of Floor Area Cooled							
Office							
Small	0.9	0.8	1.0	0.4	1.0	0.0	76
Large	0.9	0.9	1.0	0.2	1.0	0.3	72
Retail							
Small	0.7	0.7	1.0	0.5	1.0	0.0	80
Large	1.0	0.9	1.0	0.2	1.0	0.0	26
Food Stores	0.7	0.6	0.8	0.4	1.0	0.0	90
Warehouse							
Refrigerated	0.0	0.2	0.1	0.2	0.6	0.0	13
Non-Refrigerated	0.2	0.2	0.1	0.4	1.0	0.0	22
Primary Schools	0.6	0.7	1.0	0.5	1.0	0.0	51
College	0.0	0.0	0.0	0.0	0.0	0.0	1
Vocational	1.0	1.0	1.0	0.0	1.0	1.0	2
Health							
Hospitals	0.9	1.0	1.0	0.1	1.0	0.0	54
Nursing Home	0.7	0.7	0.1	0.4	1.0	0.0	10
Restaurants							
Sit Down	0.7	0.7	0.9	0.4	1.0	0.0	65
Fast Food	0.8	0.7	0.9	0.3	1.0	0.0	22
Lodging							
Small Hotel/Motel	0.4	0.4	0.5	0.5	1.0	0.0	22
Large Hotel	0.9	0.8	1.0	0.3	1.0	0.0	12
Miscellaneous	0.5	0.4	0.5	0.4	1.0	0.0	155
Window to Wall Ratio							
Office							
Small	0.2	0.3	0.2	0.2	1.9	0.0	74
Large	0.6	1.0	0.7	2.1	19.4	0.0	70
Retail							
Small	0.2	0.4	0.2	0.5	2.5	0.0	74
Large	0.3	0.2	0.1	0.2	1.1	0.0	24
Food Stores	0.1	0.5	0.2	1.0	5.4	0.0	87
Warehouse							
Refrigerated	0.0	0.1	0.1	0.1	0.6	0.0	8
Non-Refrigerated	0.1	0.4	0.1	0.5	2.0	0.0	21
Primary Schools	0.2	0.3	0.2	0.3	2.2	0.0	49
College	0.5	0.5	0.5	0.0	0.5	0.5	1
Vocational	0.3	0.3	0.3	0.0	0.4	0.3	2
Health							
Hospitals	0.4	0.5	0.4	0.5	4.0	0.0	52
Nursing Home	0.2	0.3	0.3	0.2	1.0	0.0	10
Restaurants							
Sit Down	0.1	0.3	0.1	0.4	2.8	0.0	62
Fast Food	0.2	0.4	0.3	0.3	0.9	0.0	20
Lodging							
Small Hotel/Motel	0.1	0.1	0.1	0.2	1.2	0.0	22
Large Hotel	1.1	1.0	0.6	0.9	2.3	0.2	12
Miscellaneous	1.3	11.9	0.1	75.9	525.0	0.0	139

Table 3-3 (Continued). Summary of Building Characteristics in the 1986 PG&E On-Site Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
			Wall R-Value				
Office							
Small	N/A	6.9	4.0	4.9	16.4	1.6	75
Large	N/A	6.8	5.3	5.2	23.2	1.3	70
Retail							
Small	N/A	4.5	3.0	4.1	20.5	1.7	75
Large	N/A	5.0	3.6	4.3	22.5	1.7	25
Food Stores	N/A	3.7	3.3	2.4	12.8	1.6	89
Warehouse							
Refrigerated	N/A	13.6	8.0	9.2	35.6	0.8	13
Non-Refrigerated	N/A	4.5	3.5	2.5	16.4	1.7	22
Primary Schools	N/A	7.1	3.3	5.7	27.3	1.6	51
College	N/A	2.5	2.5	0.0	2.5	2.5	1
Vocational	N/A	5.3	8.2	3.3	12.7	3.8	2
Health							
Hospitals	N/A	5.6	5.1	4.8	42.9	0.9	54
Nursing Home	N/A	4.9	3.6	2.6	13.6	2.6	10
Restaurants							
Sit Down	N/A	4.9	3.2	3.7	14.7	1.5	65
Fast Food	N/A	7.1	4.1	4.5	15.2	2.0	21
Lodging							
Small Hotel/Motel	N/A	5.3	5.2	3.1	16.4	1.5	22
Large Hotel	N/A	7.8	4.2	7.3	18.8	2.0	12
Miscellaneous	N/A	5.2	3.3	4.0	28.4	0.9	151
			Roof R-Value				
Office							
Small	N/A	10.2	12.8	7.3	51.1	1.8	75
Large	N/A	9.6	10.0	7.1	27.7	1.7	69
Retail							
Small	N/A	8.6	8.4	7.5	37.6	1.2	74
Large	N/A	11.7	11.2	6.5	43.5	1.2	24
Food Stores	N/A	8.6	10.0	6.4	32.9	1.0	83
Warehouse							
Refrigerated	N/A	17.2	13.6	13.6	40.8	1.2	13
Non-Refrigerated	N/A	9.5	6.9	7.0	27.4	1.8	22
Primary Schools	N/A	24.0	6.9	75.3	380.1	1.2	50
College	N/A	13.7	13.7	0.0	13.7	13.7	1
Vocational	N/A	4.2	7.9	4.1	13.4	2.4	2
Health							
Hospitals	N/A	10.9	9.1	6.4	37.1	1.2	54
Nursing Home	N/A	11.4	14.2	7.5	70.8	3.1	10
Restaurants							
Sit Down	N/A	9.8	8.3	7.6	26.2	1.5	59
Fast Food	N/A	12.2	10.2	9.1	24.4	1.9	21
Lodging							
Small Hotel/Motel	N/A	10.2	9.4	5.9	25.1	2.3	22
Large Hotel	N/A	17.9	9.0	11.3	29.2	3.4	12
Miscellaneous	N/A	9.0	5.8	7.9	28.5	0.9	149

Table 3-3 (Continued). Summary of Building Characteristics in the 1986 PG&E On-Site Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
			No. of Standard Days				
Office							
Small	N/A	5.3	5.0	0.9	7.0	4.0	76
Large	N/A	5.3	5.0	0.7	7.0	5.0	72
Retail							
Small	N/A	5.3	5.0	0.8	7.0	3.0	80
Large	N/A	5.3	5.0	0.9	7.0	3.0	26
Food Stores	N/A	6.5	7.0	0.7	7.0	3.0	90
Warehouse							
Refrigerated	N/A	5.1	5.0	0.5	7.0	5.0	13
Non-Refrigerated	N/A	5.4	5.0	1.4	7.0	3.0	22
Primary Schools	N/A	5.0	5.0	0.1	6.0	5.0	51
College	N/A	5.0	5.0	0.0	5.0	5.0	1
Vocational	N/A	5.0	5.0	0.0	5.0	5.0	2
Health							
Hospitals	N/A	6.9	7.0	0.4	7.0	5.0	54
Nursing Home	N/A	7.0	7.0	0.0	7.0	7.0	10
Restaurants							
Sit Down	N/A	6.3	7.0	0.9	7.0	4.0	65
Fast Food	N/A	6.2	7.0	0.9	7.0	5.0	22
Lodging							
Small Hotel/Motel	N/A	7.0	7.0	0.0	7.0	7.0	22
Large Hotel	N/A	7.0	7.0	0.0	7.0	7.0	12
Miscellaneous	N/A	5.1	5.0	1.6	7.0	1.0	155
			Standard Day Hours				
Office							
Small	N/A	9.5	9.0	2.3	18.0	5.0	76
Large	N/A	11.9	10.0	5.3	24.0	5.0	72
Retail							
Small	N/A	8.9	10.0	2.5	24.0	1.0	80
Large	N/A	11.6	11.0	1.9	17.0	8.0	26
Food Stores	N/A	13.5	13.0	4.1	24.0	1.0	90
Warehouse							
Refrigerated	N/A	9.6	9.0	4.6	24.0	6.0	13
Non-Refrigerated	N/A	8.1	9.0	3.1	24.0	2.0	22
Primary Schools	N/A	9.2	9.0	1.6	17.0	7.0	51
College	N/A	9.0	9.0	0.0	9.0	9.0	1
Vocational	N/A	11.5	10.5	1.1	12.0	9.0	2
Health							
Hospitals	N/A	22.8	24.0	3.8	24.0	8.0	54
Nursing Home	N/A	24.0	24.0	0.5	24.0	15.0	10
Restaurants							
Sit Down	N/A	10.3	12.0	4.6	24.0	0.0	64
Fast Food	N/A	13.9	12.0	5.0	24.0	8.0	22
Lodging							
Small Hotel/Motel	N/A	20.0	24.0	6.8	24.0	8.0	22
Large Hotel	N/A	24.0	24.0	0.5	24.0	18.0	12
Miscellaneous	N/A	9.7	10.0	5.2	24.0	0.0	154

Table 3-3 (Continued). Summary of Building Characteristics in the 1986 PG&E On-Site Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
Floor Area per Person (ft^2)							
Office							
Small	73.1	209.6	155.7	260.9	1260.0	3.6	76
Large	198.1	210.2	242.9	140.5	1145.7	20.7	72
Retail							
Small	102.0	180.3	175.9	211.1	1269.7	12.7	80
Large	267.6	358.5	270.4	385.0	1792.3	18.3	26
Food Stores	72.4	160.7	144.5	151.8	883.3	3.0	90
Warehouse							
Refrigerated	1078.3	1152.5	1090.9	1490.2	6500.0	184.6	13
Non-Refrigerated	464.5	691.2	539.7	1850.6	24000.0	67.1	22
Primary Schools	26.9	100.9	39.2	211.8	1440.0	1.0	50
College	237.6	237.6	237.6	0.0	237.6	237.6	1
Vocational	39.9	37.3	50.6	14.8	70.5	30.8	2
Health							
Hospitals	190.4	250.3	234.6	196.0	1156.1	42.4	54
Nursing Home	273.4	307.1	203.2	150.0	666.7	140.2	10
Restaurants							
Sit Down	38.0	57.1	43.2	53.6	290.0	6.4	65
Fast Food	43.4	58.2	46.0	35.0	132.4	13.7	22
Lodging							
Small Hotel/Motel	212.0	408.4	218.5	440.7	1187.5	17.0	22
Large Hotel	411.6	422.6	436.0	123.0	737.3	87.5	12
Miscellaneous	236.3	373.2	248.9	620.2	4173.3	3.8	155
Indoor Lighting Intensity (W/ft^2)							
Office							
Small	2.2	2.1	2.1	1.3	7.5	0.0	76
Large	1.6	1.8	1.5	0.9	4.6	0.5	72
Retail							
Small	2.2	2.4	2.1	1.4	9.5	0.5	80
Large	1.8	2.0	1.8	1.1	7.1	0.8	26
Food Stores	1.7	1.6	2.0	0.9	4.3	0.4	90
Warehouse							
Refrigerated	0.5	0.6	0.6	0.4	1.7	0.2	13
Non-Refrigerated	1.0	1.0	1.1	0.5	5.5	0.1	22
Primary Schools	1.9	2.5	1.7	1.3	5.1	0.4	51
College	1.5	1.5	1.5	0.0	1.5	1.5	1
Vocational	1.2	1.0	1.2	0.2	1.4	1.0	2
Health							
Hospitals	1.8	2.0	1.3	1.2	3.9	0.4	54
Nursing Home	0.9	0.9	0.9	0.3	1.6	0.3	10
Restaurants							
Sit Down	1.3	1.4	1.3	1.0	6.5	0.3	65
Fast Food	2.3	2.3	2.4	1.1	4.3	0.2	22
Lodging							
Small Hotel/Motel	1.0	0.9	1.0	0.6	2.8	0.3	22
Large Hotel	0.9	1.3	1.1	0.8	2.7	0.3	12
Miscellaneous	0.9	1.3	1.1	1.4	38.0	0.1	152

Table 3-3 (Continued). Summary of Building Characteristics in the 1986 PG&E On-Site Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
Outdoor Lighting Intensity (W/ft^2)							
Office							
Small	0.3	0.4	0.2	0.4	2.0	0.0	62
Large	0.1	0.2	0.1	0.3	1.2	0.0	55
Retail							
Small	0.1	0.4	0.2	0.8	7.7	0.0	51
Large	0.1	0.3	0.1	0.8	3.3	0.0	19
Food Stores	0.2	0.4	0.3	0.4	2.1	0.0	80
Warehouse							
Refrigerated	0.1	0.1	0.1	0.1	0.6	0.0	12
Non-Refrigerated	0.1	0.1	0.1	0.1	0.5	0.0	14
Primary Schools	0.1	0.2	0.1	0.2	1.3	0.0	41
College	0.0	0.0	0.0	0.0	0.0	0.0	1
Vocational	0.3	0.2	0.3	0.1	0.4	0.1	2
Health							
Hospitals	0.1	0.1	0.1	0.1	0.4	0.0	54
Nursing Home	0.1	0.1	0.1	0.0	0.1	0.0	10
Restaurants							
Sit Down	0.4	0.6	0.4	0.7	4.1	0.0	51
Fast Food	0.9	1.2	1.3	1.1	3.9	0.1	17
Lodging							
Small Hotel/Motel	0.2	0.1	0.1	0.1	0.6	0.0	19
Large Hotel	0.1	0.2	0.0	0.2	0.5	0.0	10
Miscellaneous	0.1	0.4	0.2	0.8	8.2	0.0	136
Equipment Intensity (W/ft^2)							
Office							
Small	1.9	2.1	1.3	1.5	6.8	0.0	76
Large	1.4	1.6	1.2	1.8	10.5	0.1	71
Retail							
Small	0.8	1.4	0.5	2.4	16.8	0.0	77
Large	2.1	0.7	0.4	1.2	5.1	0.1	26
Food Stores	1.4	3.0	1.1	5.1	27.5	0.0	89
Warehouse							
Refrigerated	0.5	2.0	1.2	2.0	10.7	0.0	12
Non-Refrigerated	1.7	0.8	0.4	1.2	13.4	0.1	21
Primary Schools	0.9	1.4	0.7	1.1	5.8	0.0	47
College	0.8	0.8	0.8	0.0	0.8	0.8	1
Vocational	1.0	1.0	1.0	0.0	1.0	1.0	2
Health							
Hospitals	2.7	3.3	1.3	3.8	10.4	0.0	53
Nursing Home	1.3	1.1	0.8	0.6	1.8	0.1	10
Restaurants							
Sit Down	2.3	3.1	1.9	3.0	15.1	0.1	64
Fast Food	3.6	4.1	2.8	1.9	6.8	0.4	21
Lodging							
Small Hotel/Motel	1.1	1.7	1.0	1.5	4.1	0.1	22
Large Hotel	1.3	1.5	1.2	0.5	2.2	0.4	12
Miscellaneous	3.5	11.8	2.3	66.6	5023.3	0.1	153

Table 3-3 (Continued). Summary of Building Characteristics in the 1986 PG&E On-Site Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
Water Use Intensity (Gal/1000ft^2/Day)							
Office							
Small	3.7	4.7	3.0	3.5	22.2	0.0	71
Large	4.2	12.4	3.5	42	315.0	0.1	71
Retail							
Small	2.4	7.4	1.6	18.9	83.3	0.0	61
Large	0.9	1.0	0.6	1.3	16.6	0.1	26
Food Stores	3.7	7.4	4.2	9.2	38.1	0.0	85
Warehouse							
Refrigerated	1.4	6.5	0.8	14.3	56.2	0.2	11
Non-Refrigerated	0.6	0.6	0.2	1.0	3.8	0.0	21
Primary Schools	33.1	58.7	11.9	106.7	400.0	0.0	46
College	4.7	4.7	4.7	0.0	4.7	4.7	1
Vocational	20.3	25.4	18.2	8.0	29.0	7.4	2
Health							
Hospitals	24.5	30.9	17.3	31.0	225.2	1.5	54
Nursing Home	53.2	54.1	39.7	25.3	86.1	10.0	10
Restaurants							
Sit Down	73.2	94.0	50.7	148.6	851.1	0.1	64
Fast Food	165.3	133.5	32.5	265.0	1019.6	8.8	22
Lodging							
Small Hotel/Motel	36.0	37.0	40.7	28.0	138.0	2.1	22
Large Hotel	28.7	32.9	26.9	16.5	59.2	11.3	12
Miscellaneous	9.4	16.9	3.2	66.4	2033.9	0.0	131
Cooking Intensity (W/ft^2)							
Office							
Small	0.2	0.8	0.3	0.6	2.5	0.0	32
Large	0.2	0.2	0.1	0.3	1.0	0.0	35
Retail							
Small	0.0	0.8	0.9	0.4	1.2	0.0	7
Large	0.0	0.3	0.1	0.3	0.7	0.0	8
Food Stores	0.6	2.2	1.1	2.9	14.3	0.2	36
Warehouse							
Refrigerated	0.0	0.2	0.2	0.1	0.3	0.0	2
Non-Refrigerated	0.0	0.3	0.0	0.1	0.4	0.0	3
Primary Schools	0.7	3.0	1.0	4.1	12.5	0.1	19
College	N.D						
Vocational	2.9	4.9	4.9	0.0	4.9	4.9	1
Health							
Hospitals	0.2	0.4	0.2	0.5	1.6	0.0	40
Nursing Home	1.6	1.8	0.6	1.9	4.3	0.2	9
Restaurants							
Sit Down	4.5	8.0	3.5	13.3	127.8	0.2	54
Fast Food	5.2	7.4	6.5	6.6	20.3	0.6	20
Lodging							
Small Hotel/Motel	0.2	1.3	1.0	0.8	2.9	0.4	5
Large Hotel	0.1	0.3	0.0	0.2	1.0	0.0	9
Miscellaneous	0.2	1.6	0.4	3.3	17.7	0.0	43

Table 3-3 (Continued). Summary of Building Characteristics in the 1986 PG&E On-Site Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
Refrigeration Intensity (W/ft^2)							
Office							
Small	0.1	0.3	0.2	0.2	0.8	0.0	55
Large	0.1	0.1	0.0	0.1	0.5	0.0	50
Retail							
Small	0.3	1.1	0.5	1.8	13.0	0.0	48
Large	0.1	0.6	0.1	1.6	6.8	0.0	18
Food Stores	5.5	6.5	5.8	4.9	23.3	0.5	90
Warehouse							
Refrigerated	8.5	9.6	11.4	3.9	31.2	1.1	13
Non-Refrigerated	0.1	0.2	0.1	0.3	2.7	0.0	11
Primary Schools	0.3	0.7	0.2	0.7	3.5	0.0	31
College	0.1	0.1	0.1	0.0	0.1	0.1	1
Vocational	N.D.						
Health							
Hospitals	0.1	0.4	0.2	0.5	2.0	0.0	52
Nursing Home	0.1	0.2	0.2	0.1	1.1	0.1	10
Restaurants							
Sit Down	2.9	3.8	3.0	2.5	11.9	0.5	64
Fast Food	4.8	6.5	4.4	5.5	20.5	2.1	22
Lodging							
Small Hotel/Motel	0.5	0.7	0.3	0.4	1.7	0.1	20
Large Hotel	0.3	0.5	0.1	0.5	1.5	0.0	12
Miscellaneous	0.2	0.8	0.3	1.5	8.0	0.0	106

Four aspects of the analysis should be noted in Table 3-3:

1. We have calculated a variety of statistics for each key variable.
2. Several of these variables will directly influence the development of the prototypes.
3. We have partitioned the office and retail on-site survey data† into small and large categories based on the total electricity use of greater or less than 500 MWh/year for offices and 400 MWh/year for retail stores.
4. Lodging was divided into "Large Hotel" and "Small Hotel/Motel" based on the total floor area of greater or less than 60,000 ft^2.

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† In the First Interim Report, we partitioned both office and retail on-site survey data into small and large categories based the following four criteria:

1. Total electricity use of greater or less than 500 MWh/year for offices and 400 MWh/year for retail stores,
2. Gross floor area of greater or less than 50,000 ft^2,
3. Gross floor area of greater or less than 30,000 ft^2, and
4. Number of floors of greater of less than 5.

The EDA reconciliation for Retail Stores, however, was carried out for the combined large and small retail. We developed prototypes for both large and small retail and combined the simulation results to develop initial condi-

The heating and cooling system types, hot water system, and fuel types for the on-site survey buildings are summarized in **Table 3-4.** As Table 3-4 shows most small offices and fast food restaurants have single zone package systems, while large offices and hospitals have both single and multi-zone package and central systems. Large hotels follow the pattern of large offices and hospitals except that large hotels have predominantly single zone ducting systems. Approximately 20% of all large offices and large hotels have variable air volume (VAV) air distribution systems. The percentage of buildings having economizers is high in the case of hospitals and large hotels (about 50%) while in case of small offices/retails, food stores, warehouse (refrigerated and non-refrigerated), primary schools, sit-down/fast food restaurants, and small hotels/motels, percentage of buildings equipped with economizers ranges from 2-10%. The heating fuel is predominantly gas for all the buildings except large hotels; the cooling fuel is electricity. Domestic hot water systems are fueled by both electricity and gas while most large hotels make use of gas and some hotels/motels also use oil.

To a certain extent, HVAC systems for retail stores are similar to those of the offices (Table 3-4). A major exception is the lower saturation of VAV systems observed in the retail stores.

tions for EDA calculations. We follow the same procedure for Warehouses (Refrigerated and Non-Refrigerated), Schools (Primary and Secondary), Health (Hospitals and Nursing homes), Restaurants (Sit Down and Fast Food), and Lodging (Small Hotel/Motel and Large Hotel).

Table 3-4. Saturation of Heating, Cooling, System Type, Water Heating for Onsite Survey Buildings

a) Ducted System Type

	None	Single zone	Multi-zone	Dual duct	2-pipe	4-pipe	Induction	VAV single	VAV dual	Other
Office										
Small	12.2	78.7	9.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Large	4.4	41.9	32.0	1.0	0.5	0.0	0.82	18.1	1.2	0.0
Retail										
Small	41.5	56.0	0.3	0.0	0.0	0.3	0.0	0.0	0.0	1.9
Large	4.5	52.4	35.8	0.0	0.0	0.2	0.0	7.0	0.0	0.0
Food Stores	54.6	45.0	0.4	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Warehouse										
Refrigerated	65.9	34.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Non-Refrigerated	48.9	51.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Schools										
Primary 20.6	69.2	7.6	2.1	0.6	0.0	0.0	0.0	0.0	0.0	
Vocational	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
College	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health										
Hospitals	0.6	33.5	50.3	5.7	0.8	4.3	0.5	4.2	0.0	0.0
Nursing Home	4.4	56.7	4.4	0.0	34.5	0.0	0.0	0.0	0.0	0.0
Restaurants										
Sit Down	30.3	65.2	2.2	0.0	2.2	0.0	0.0	0.0	0.0	0.0
Fast Food	18.3	81.7	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Lodging										
SmallHotel/Motel	92.7	7.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
LargeHotel	14.8	56.6	1.9	0.0	1.0	4.8	0.0	20.9	0.0	0.0
Miscellaneous	45.1	51.4	3.2	0.0	0.0	0.0	0.0	0.2	0.0	0.0

Table 3-4 (Continued). Saturation of Heating, Cooling, System Type, Water Heating for Onsite Survey Buildings

b) Heating Equipment Type

	None	Furnace	Baseboard	HW Boiler	Steam Boiler	Air to Air HP	Water to Air HP	Unit Heater	Radiant	Other
Office										
Small	0.0	71.1	0.1	0.6	0.1	11.4	0.2	12.4	4.1	0.0
Large	5.0	33.0	0.0	51.7	7.9	0.3	0.0	0.0	0.0	2.1
Retail										
Small	11.4	41.3	0.2	0.3	0.0	11.2	0.0	29.2	3.5	2.9
Large	7.4	57.9	0.0	0.2	17.8	5.7	0.0	11.0	0.0	0.0
Food Stores	24.0	26.7	0.0	0.0	0.0	2.9	0.0	34.7	10.9	0.8
Warehouse										
Refrigerated	42.8	32.8	0.0	0.0	0.0	0.8	0.0	23.6	0.0	0.0
Non-Refrigerated	0.9	42.2	16.7	0.0	0.0	6.3	0.0	19.2	14.7	0.0
Schools										
Primary 0.0	75.3	0.0	17.1	4.7	1.8	0.0	1.1	0.0	0.0	
Vocational	0.0	83.4	0.0	16.6	0.0	0.0	0.0	0.0	0.0	0.0
College	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0
Health										
Hospitals	0.6	28.3	0.0	15.3	55.7	0.0	0.0	0.0	0.0	0.0
Nursing Home	0.0	17.5	4.4	77.8	0.3	0.0	0.0	0.0	0.0	0.0
Restaurants										
Sit Down	10.9	61.8	2.6	2.2	0.0	2.2	0.0	15.3	2.6	2.6
Fast Food	18.4	64.2	0.0	0.0	0.0	8.7	0.0	7.9	0.8	0.0
Lodging										
SmallHotel/Motel	0.0	8.9	0.0	7.9	2.2	3.7	0.0	77.3	0.0	0.0
LargeHotel	0.0	20.9	0.0	21.7	19.5	35.7	0.0	0.0	0.0	2.2
Miscellaneous	15.8	42.9	1.1	1.7	1.0	5.2	0.0	25.2	4.5	2.6

Table 3-4 (Continued). Saturation of Heating, Cooling, System Type, Water Heating for Onsite Survey Buildings

c) Cooling Equipment Type

	None	Window Unit	Open Centrif	Hermetic Centrif	Open Recip	Hermetic Recip	One-stage Absorption	Two-stage Absorption	Double Bundle	DX	Direct Evap	Indirect Evap	Other
Office													
Small	22.2	4.2	0.0	0.2	0.3	0.3	0.0	0.0	0.0	72.9	0.0	0.0	0.0
Large	0.0	9.6	10.5	17.1	0.4	5.0	0.5	0.0	0.2	56.8	0.0	0.0	0.0
Retail													
Small	30.6	9.7	0.0	0.2	0.0	0.0	0.0	0.0	0.0	57.3	2.3	0.0	0.0
Large	4.5	0.0	0.0	12.7	5.7	5.7	0.2	0.0	0.0	64.9	0.0	0.0	0.4
Food Stores	31.2	8.2	0.0	0.0	0.4	0.0	0.0	0.0	0.0	41.8	18.3	0.0	0.0
Warehouse													
Refrigerated	41.9	32.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	25.1	0.8	0.0	0.0
Non-Refrigerated	63.4	0.0	0.0	0.0	0.0	0.6	0.0	0.0	0.0	36.1	0.0	0.0	0.0
Schools													
Primary 30.2	1.9	0.6	0.5	0.0	0.0	0.0	0.0	0.0	66.7	0.0	0.0	0.0	
Vocational	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0
College	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Health													
Hospitals	1.2	0.0	4.9	48.2	3.3	8.0	7.0	1.3	0.0	25.7	0.0	0.0	0.5
Nursing Home	13.4	0.0	0.0	0.0	34.5	34.5	0.0	0.0	0.0	13.2	4.4	0.0	0.0
Restaurants													
Sit Down	24.9	12.5	0.0	0.0	0.0	2.8	0.0	0.0	0.0	43.1	16.8	0.0	0.0
Fast Food	12.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	80.1	7.6	0.0	0.0
Lodging													
SmallHotel/Motel	64.2	28.3	0.0	0.0	0.0	0.0	0.0	0.0	0.0	6.4	1.1	0.0	0.0
LargeHotel	0.0	14.8	0.0	6.6	20.9	0.0	1.1	0.0	0.0	56.6	0.0	0.0	0.0
Miscellaneous	39.0	8.7	0.1	0.0	0.0	0.1	0.0	0.0	0.0	39.2	13.0	0.0	0.0

Table 3-4 (Continued). Saturation of Heating, Cooling, System Type, Water Heating for On-Site Survey Buildings

d) Distribution System Type (%)

	None	Package	Built-up	Both
Office				
Small	12.2	87.0	0.4	0.3
Large	0.2	50.7	28.7	20.5
Retail				
Small	41.5	57.5	0.2	0.9
Large	4.5	69.9	13.7	11.9
Food Stores	54.6	43.0	1.6	.8
Warehouse				
Refrigerated	65.6	34.4	0.0	0.0
Non-Refrigerated	39.6	60.4	0.0	0.0
Primary Schools	17.2	75.7	5.4	1.8
College	0.0	0.0	100.0	0.0
Vocational	0.0	100.0	0.0	0.0
Health				
Hospitals	1.2	21.9	23.7	53.2
Nursing Home	4.4	21.9	69.3	4.4
Restaurants				
Sit Down	27.8	64.6	7.6	0.0
Fast Food	18.3	81.7	0.0	0.0
Lodging				
SmallHotel/Motel	87.1	12.9	0.0	0.0
LargeHotel	14.8	35.7	27.8	21.7
Miscellaneous	41.0	54.8	2.1	2.1

e) Economizer (%)

	No	Yes
Office		
Small	94.2	5.8
Large	67.3	32.5
Retail		
Small	93.6	6.3
Large	68.5	31.5
Food Stores	93.1	6.9
Warehouse		
Refrigerated	92.7	7.3
Non-Refrigerated	99.2	0.8
Primary Schools	94.0	5.5
College	0.0	100.0
Vocational	100.0	0.0
Health		
Hospitals	46.5	53.5
Nursing Home	61.1	38.9
Restaurants		
Sit Down	90.5	9.5
Fast Food	92.4	7.6
Lodging		
SmallHotel/Motel	97.8	2.2
LargeHotel	51.6	48.4
Miscellaneous	93.7	6.3

Table 3-4 (Continued). Saturation of Heating, Cooling, System Type, Water Heating for On-Site Survey Buildings

f) Water Heating Equipment Type (%)

	None	Central Boiler	Individual	Instantaneous	Other
Office					
Small	14.1	0.1	85.8	0.0	0.0
Large	0.2	17.7	75.7	1.1	5.3
Retail					
Small	57.3	0.0	42.5	0.2	0.0
Large	6.0	6.8	86.6	0.0	0.5
Food Stores	25.8	0.0	73.8	0.4	0.0
Warehouse					
Refrigerated	6.9	0.0	93.1	0.0	0.0
Non-Refrigerated	56.2	0.0	43.8	0.0	
Primary Schools	33.0	10.1	56.2	0.6	0.0
College	0.0	100.0	0.0	0.0	0.0
Vocational	0.0	0.0	100.0	0.0	0.0
Health					
Hospitals	4.8	59.0	35.9	0.0	0.0
Nursing Home	0.0	38.9	60.8	0.3	0.0
Restaurants					
Sit Down	2.6	2.2	95.2	0.0	0.0
Fast Food	0.0	1.8	98.2	0.0	0.0
Lodging					
SmallHotel/Motel	0.0	12.2	86.7	0.0	1.1
LargeHotel	0.0	64.3	35.7	0.0	0.0
Miscellaneous	30.0	1.0	67.3	1.6	0.1

g) Heating Equipment Fuel (%)

	Electric	Gas	Oil	LPG	Wood	Solar	Other
Office							
Small	23.8	70.3	5.9	0.0	0.0	0.0	0.0
Large	6.3	92.5	0.7	0.0	0.0	0.0	0.0
Retail							
Small	27.2	70.7	0.0	2.1	0.0	0.0	0.0
Large	12.6	87.4	0.0	0.0	0.0	0.0	0.0
Food Stores	34.3	42.4	0.0	23.3	0.0	0.0	0.0
Warehouse							
Refrigerated	42.7	57.3	0.0	0.0	0.0	0.0	0.0
Non-Refrigerated	37.4	62.6	0.0	0.0	0.0	0.0	0.0
Primary Schools	3.0	92.2	0.0	4.9	0.0	0.0	0.0
College	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Vocational	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Health							
Hospitals	3.3	96.5	0.0	0.3	0.0	0.0	0.0
Nursing Home	4.4	95.6	0.0	0.0	0.0	0.0	0.0
Restaurants							
Sit Down	9.6	84.5	0.2	5.7	0.0	0.0	0.0
Fast Food	11.7	86.1	0.0	2.2	0.0	0.0	0.0
Lodging							
SmallHotel/Motel	34.3	41.9	0.0	23.8	0.0	0.0	0.0
LargeHotel	56.6	41.2	0.0	0.0	0.0	0.0	0.0
Miscellaneous	24.2	69.4	0.4	3.1	3.0	0.0	0.0

Table 3-4 (Continued). Saturation of Heating, Cooling, System Type, Water Heating for On-Site Survey Buildings

h) Cooling Equipment Fuel (%)

	Electricity	Gas	Steam	Other
Office				
Small	100.0	0.0	0.0	0.0
Large	98.8	0.7	0.4	0.0
Retail				
Small	100.0	0.0	0.0	0.0
Large	99.2	0.8	0.0	0.0
Food Stores	100.0	0.0	0.0	0.0
Warehouse				
Refrigerated	100.0	0.0	0.0	0.0
Non-Refrigerated	100.0	0.0	0.0	0.0
Primary Schools	100.0	0.0	0.0	0.0
College	0.0	0.0	0.0	0.0
Vocational	100.0	0.0	0.0	0.0
Health				
Hospitals	91.3	7.7	1.0	0.0
Nursing Home	100.0	0.0	0.0	0.0
Restaurants				
Sit Down	99.2	0.0	0.0	0.0
Fast Food	100.0	0.0	0.0	0.0
Lodging				
SmallHotel/Motel	100.0	0.0	0.0	0.0
LargeHotel	98.9	0.0	0.0	0.0
Miscellaneous	100.0	0.0	0.0	0.0

i) Water Heating Equipment Fuel (%)

	Electricity	Gas	Oil	LPG	Solar	Steam	Other
Office							
Small	60.8	39.2	0.0	0.0	0.0	0.0	0.0
Large	26.7	66.3	0.4	0.0	4.8	1.7	0.0
Retail							
Small	45.0	55.0	0.0	0.0	0.0	0.0	0.0
Large	39.3	59.8	0.0	0.0	0.5	0.4	0.0
Food Stores	54.4	40.2	0.0	5.4	0.0	0.0	0.0
Warehouse							
Refrigerated	27.2	72.8	0.0	0.0	0.0	0.0	0.0
Non-Refrigerated	68.7	31.3	0.0	0.0	0.0	0.0	0.0
Primary Schools	37.3	56.9	0.0	5.8	0.0	0.0	0.0
College	0.0	100.0	0.0	0.0	0.0	0.0	0.0
Vocational	83.4	16.6	0.0	0.0	0.0	0.0	0.0
Health							
Hospitals	1.0	85.8	3.4	0.0	0.0	9.8	0.0
Nursing Home	0.0	100.0	0.0	0.0	0.0	0.0	0.1
Restaurants							
Sit Down	7.2	85.5	0.0	7.3	0.0	0.0	0.0
Fast Food	9.4	88.8	0.0	1.8	0.0	0.0	0.0
Lodging							
SmallHotel/Motel	3.3	49.0	23.8	23.9	0.0	0.0	0.0
LargeHotel	0.8	98.2	0.0	0.0	0.0	0.0	0.0
Miscellaneous	35.1	60.7	0.0	4.1	0.0	0.1	0.0

We conclude our analysis of the on-site survey data by reviewing the statistical results of the whole-building EUIs. **Table 3-5** shows the result of this analysis for all building types. Like the statistics of the other on-site survey parameters, for most building types, the population average and mean EUIs are significantly different. Also, the range and standard deviation of EUIs is fairly high, making statistical differences between EUIs insignificant. Since, whole-building EUIs are very critical control measures for EDA reconciliation, they will be discussed in further detail later on this chapter.

Table 3-5. Summary of Commercial Building EUIs in the 1986 PG&E On-Site Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
			Energy Use Intensity (kWh/ft^2/year)				
Office							
Small	13.2	12.6	14.8	9.9	91.5	1.1	68
Large	16.8	23.9	18.6	21.1	174.5	4.7	53
Retail							
Small	11.9	14.4	14.8	18.7	275.4	0.1	76
Large	11.5	19.3	16.5	17.2	91.1	5.7	22
Food Stores	45.1	41.5	55.2	27.5	144.3	6.3	84
Warehouse							
Refrigerated	29.0	31.3	33.9	14.3	127.4	2.9	13
Non-Refrigerated	5.2	5.8	3.9	5.3	58.7	1.1	21
Primary Schools†	31.6	56.3	24.9	114.6	620.0	0.3	43
College	4.3	4.3	4.3	0.0	4.3	4.3	1
Vocational	22.1	13.2	25.5	13.7	44.0	7.1	2
Health							
Hospitals	28.8	45.3	31.6	84.9	1359.7	2.7	47
Nursing Home	11.2	10.9	9.7	8.9	171.5	4.9	10
Restaurants							
Sit Down	27.8	29.4	31.7	18.0	155.5	2.6	58
Fast Food	68.7	68.1	74.2	31.9	187.7	27.2	19
Lodging							
Small Hotel/Motel	11.2	12.8	9.7	29.7	282.9	2.4	21
Large Hotel	11.3	12.2	14.2	6.2	22.2	5.5	12
Miscellaneous	6.5	11.0	11.8	22.0	1441.7	0.0	128

† The EUI for the school building is exceptionally high, indicating that the total floor area of all the buildings served by the same meter might not have been surveyed on the 1986 on-site survey.

Load Research Data

Load research data (LRD) are routinely collected by PG&E's load research group for all customer classes for rate making purposes. We used these data to develop whole-building load shapes against which we reconcile our initial estimates of end-use load shapes. For this project, we received a subset of the LRD collected by PG&E for its commercial accounts. Data collected in both 1985 and 1986 were received, but our initial analysis has focused only on data collected in 1986. The decision to focus on 1986 data is intended to ensure consistency with our other primary source of data, the on-site survey, which was also collected in 1986. The PG&E load research group also provided us with a data file containing information that would allow us to assign individual accounts to climate zones.

The LRD were transferred to us in two files: 1) a file consisting of an account code, date, 48 fields of half-hourly whole-building electricity consumption, for 365 days and for all LRD accounts; 2) a file consisting of the account code with some additional information such as local weather station, account class, building SIC code, and weighting factor describing each LRD account. The weighting factor indicates the number of buildings the LRD account represents. Prior to our review, we aggregated the half-hourly observations and produced an hourly file of LRD. We then used data from the second file to generate several statistics from the data, including number of accounts by rate class and climate zone for each building type. The LRD were separated into building types based on the assigned SIC codes and building definition.

Offices required a split into large and small sizes.† We examined two methods for making this split. We first reviewed the numbers of accounts by rate class. While commercial customers have some flexibility in the choice of rate class, this choice is often dictated by the amount of electricity consumed, which is a good proxy for building size. The A1 rate class is for small buildings, A12 is for small and medium size buildings with demand meter, and A21 and A22 are large (> 500 kW) time-of-use meters. There is no guarantee that large buildings will only have A21 and A22 time-of-use meters, and small buildings only A1 and A12. Therefore, a second method of splitting the accounts was necessary, where annual electricity use for each account was calculated by integrating the hourly LRD consumption for the entire year.

Table 3-6 summarizes the number of LRD accounts by these rate classes, where the small office is defined as less than 500 kW and the large office is 500 kW or greater.

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† Retail stores were also split into small and large sizes for the first interim report. The split was made at 400 kW, however the reconciliation was not made at this disaggregated level. Therefore, this information previously included in the first interim report is not reported here.

Table 3-6. Account Class of 1986 PG&E Load Research Data
(Number of Buildings)

Building Type	Account Class					Total
	A1	A12	A21	A22	PBL	
Small office	75	11	2	2	0	90
Large office	19	10	57	159	0	245
Retail store	82	11	45	27	0	165
Restaurant	33	9	0	1	0	43
Food store	18	18	3	1	0	40
Warehouse	25	14	16	33	0	88
School	19	8	18	6	0	51
College	1	0	12	37	1	51
Health	3	6	10	43	0	62
Lodging	12	0	15	11	0	38
Miscellaneous	26	7	5	5	0	43
Total	313	94	183	325	1	916

Notes:

1. A1: Small commercial general service (< 100,000 kWh/year)
   A12: General commercial demand meter
   A21: Medium general time-of-use service (> 500 kW demand)
   A22: Large general time-of-use service (> 1000 kW demand)
   PBL: Others (not buildings)
2. Some of the current account codes are different from those of 1986.

Table 3-7 presents the number of the LRD accounts by building type for each of the five PG&E climate zones. We used the information presented in **Table 3-8** to map the LRD accounts to the five climate zones. Of the 916 LRD there are 335 offices (both large and small) and 165 retails. Of the 335 offices, 294 (88%) are located in climate zones III and IV (San Francisco bay area). The percentage of retail accounts in climate zones III and IV is somewhat lower (69% or 114 out of 165). As is the case with offices and retail stores, the majority of accounts for the other building types are located in the San Francisco bay area.

Table 3-7. Climate Zone Distribution of 1986 PG&E Load Research Data (Number of Buildings)

Building Type	Climate Zone					Total
	IA	IIA	IIB	III	IV	
Small office	2	11	11	40	26	90
Large office	0	4	13	78	150	245
Retail store	6	19	26	68	46	165
Restaurant	3	3	8	13	16	43
Food store	3	8	4	15	10	40
Warehouse	4	10	12	37	25	88
School	2	4	17	24	4	51
College	2	3	9	21	16	51
Health	0	4	13	21	24	62
Lodging	2	3	3	8	22	38
Miscellaneous	2	4	9	20	8	43
Total	26	73	125	345	347	916

Table 3-8. Climate Zone Mapping of Load Research Data by Building Type†

CEC Forecasting Zone	IA	IIA	IIB	III	IV
CEC Climate Zone	CZ01	CZ02	CZ03,CZ07	CZ04	CZ05
Energy Weather Station	Ukiah	Sacramento	Fresno	San Jose	SF Airport
Peak Weather Station	Blue Canyon	Sacramento	Fresno	San Jose	SF Airport
PG&E WTHRCITY	Angels Camp	Auburn	Bakersfield	Concord	Belmont
	Eureka	Sacramento	Chico	Cupertino	Colma
	Ukiah	Stockton	Fresno	Milpitas	Oakland
			Marysville	Paso Robles	Potrero
			Red Bluff	Salinas	San Rafael
				San Ramon	Santa Cruz
				Santa Maria	
				Santa Rosa	

† We are reasonably comfortable with most of the mapping assumptions except for one area: the split between zones III and IV. All the maps we have show that climate zone IV is around the bay area and include Marin and Santa Cruz counties, while climate zone III is inland and southern coastal. The tables we have however map Oakland and Milpitas into climate zone III while we would assume they should be in climate zone IV. We have decided to place Oakland into climate zone IV.

We identified and deleted questionable records using visual and other analysis of the hourly profiles plotted for each account. **Figure 3-1** shows one of these plots. Criteria used in this process included: cross-checks between the reported SIC codes and building definition, spurious load shapes, and excess missing data. The quantity of missing data was determined through a statistical review. In the upper left and right corners of Figure 3-1, we show the key information describing the LRD account. The left uppermost is a seven digit account code, which is unique to each account. Below this is the four digit SIC code. Beneath this is a weighting factor indicating the number of buildings the account represents. To the immediate right is the rate class. In the right uppermost corner is the climate region to which the account belongs. Underneath this is the annual energy consumption. Directly below this is the quantity of missing data expressed as a percentage. The load shape in Figure 3-1 is described by dotted lines which indicate the minimum and maximum values, a solid line which describes the mean average, a dashed line which indicates the median, and solid vertical bars which represent the interquartile range.

The individual LRD accounts were weighted together into a single hourly load shape for each building type and climate region. **Figure 3-2** shows an example of a weighted load shape. The LRD accounts had anywhere from 0 to 100 percent of missing data. Accounts in excess of a fixed percentage of missing data were excluded. This upper limit on missing data was determined by visually examining the weighted LRD hourly profiles, which were plotted with varying degrees of missing data (10%, 15%, 20%, 25%, 30%). We observed that with each increase in missing data the the net effect on the load shape was negligible. Therefore, based on this criteria the upper limit on missing data was set at 30%. Offices and retail stores were excluded if the quantity of missing data exceeded 20%, where phase II building accounts were excluded if it exceeded 30%.

Additionally, 3-dimensional, weighted, yearly load shapes were plotted for each building type and climate region. **Figure 3-3** shows an example of a 3-dimensional, weighted, yearly load shape.

Load shapes were also plotted for day types (Monday through Sunday and holidays) and seasons (summer, winter). **Figure 3-4** shows an example of a day type-seasonal load shape.

Table 3-9 summarizes the total number of LRD accounts provided and the number actually used.

Figure 3-1. Sample Inspection Plot of the Load Research Data.

The upper left number is a seven-digit code of the LRD account, followed by four digit SIC code, and a weighting factor indicating the number of buildings the account represents. To the immediate right of weighting factor is the rate class. In the right uppermost corner is the climate region, followed by the annual energy consumption, and percentage of missing data. Hourly minimum, maximum, 25% quartile, mean (solid continuous line), median, and 75% quartile are shown.

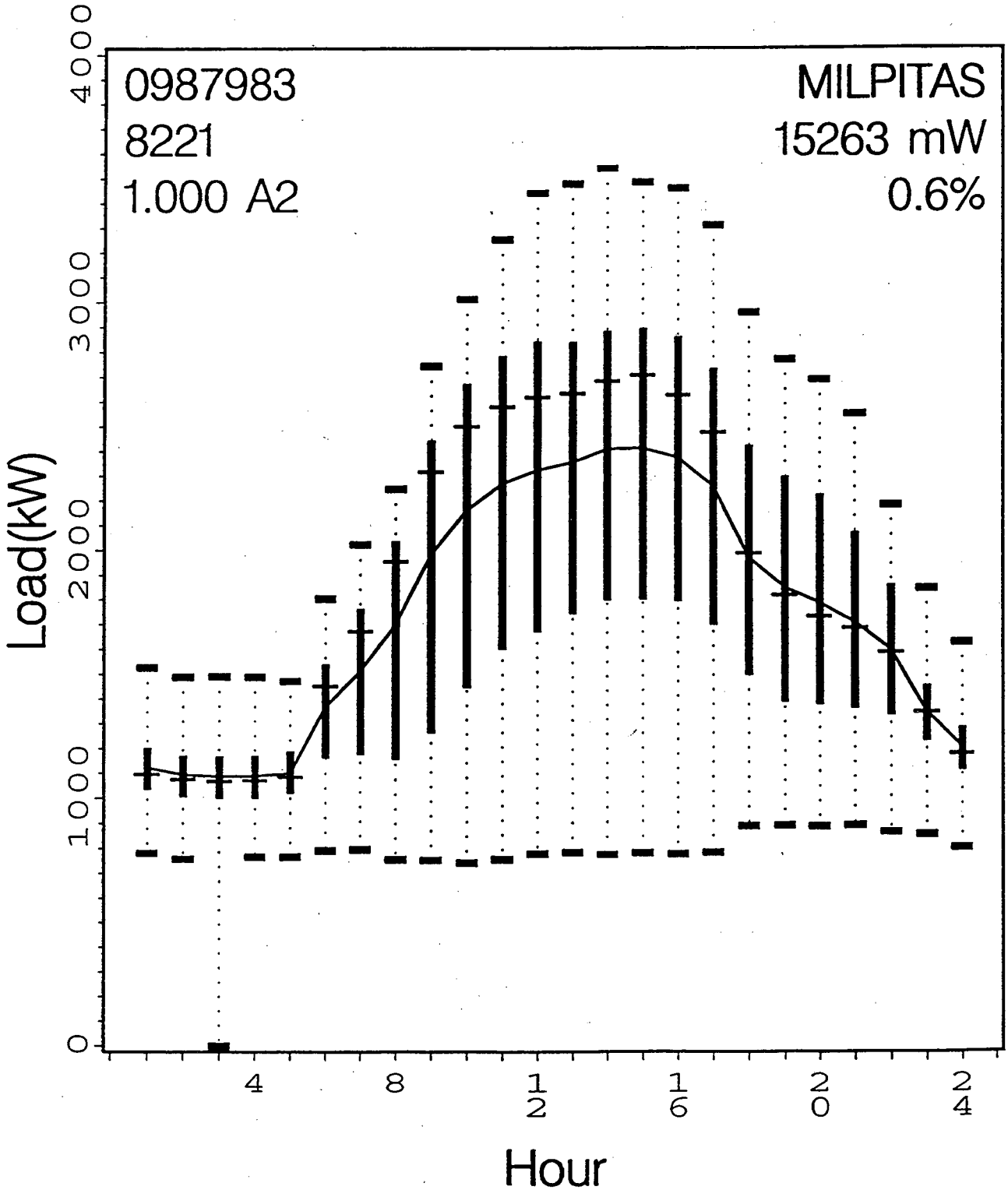

Figure 3-2. Weighted Average Load Shape for College Buildings in Coastal Areas.

Hourly minimum, maximum, 25% quartile, mean (solid continuous line), median, and 75% quartile are shown.

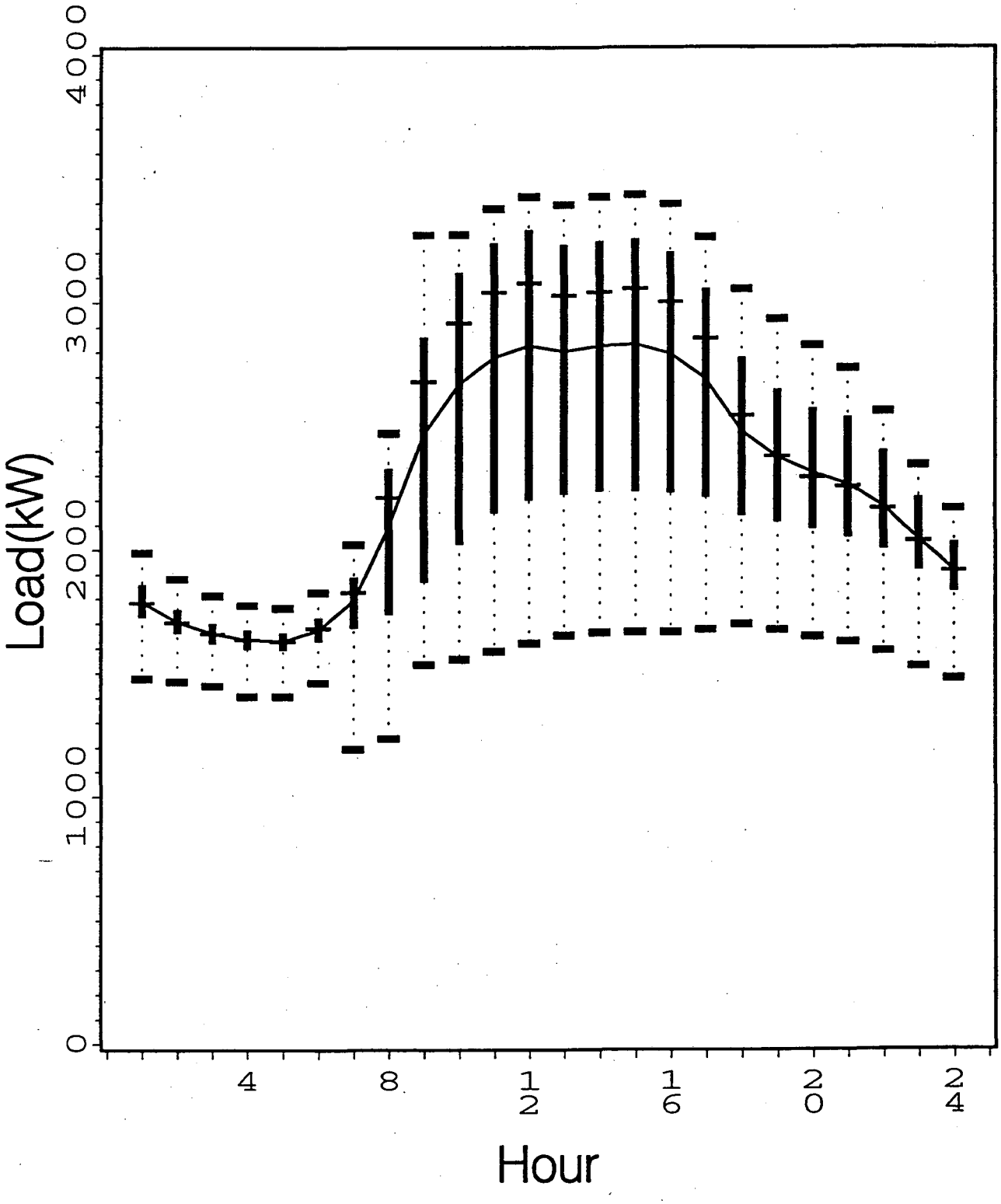

Figure 3-3. Three Dimensional Plot of the Weighted Average Load Shape for Colleges in Coastal Areas.

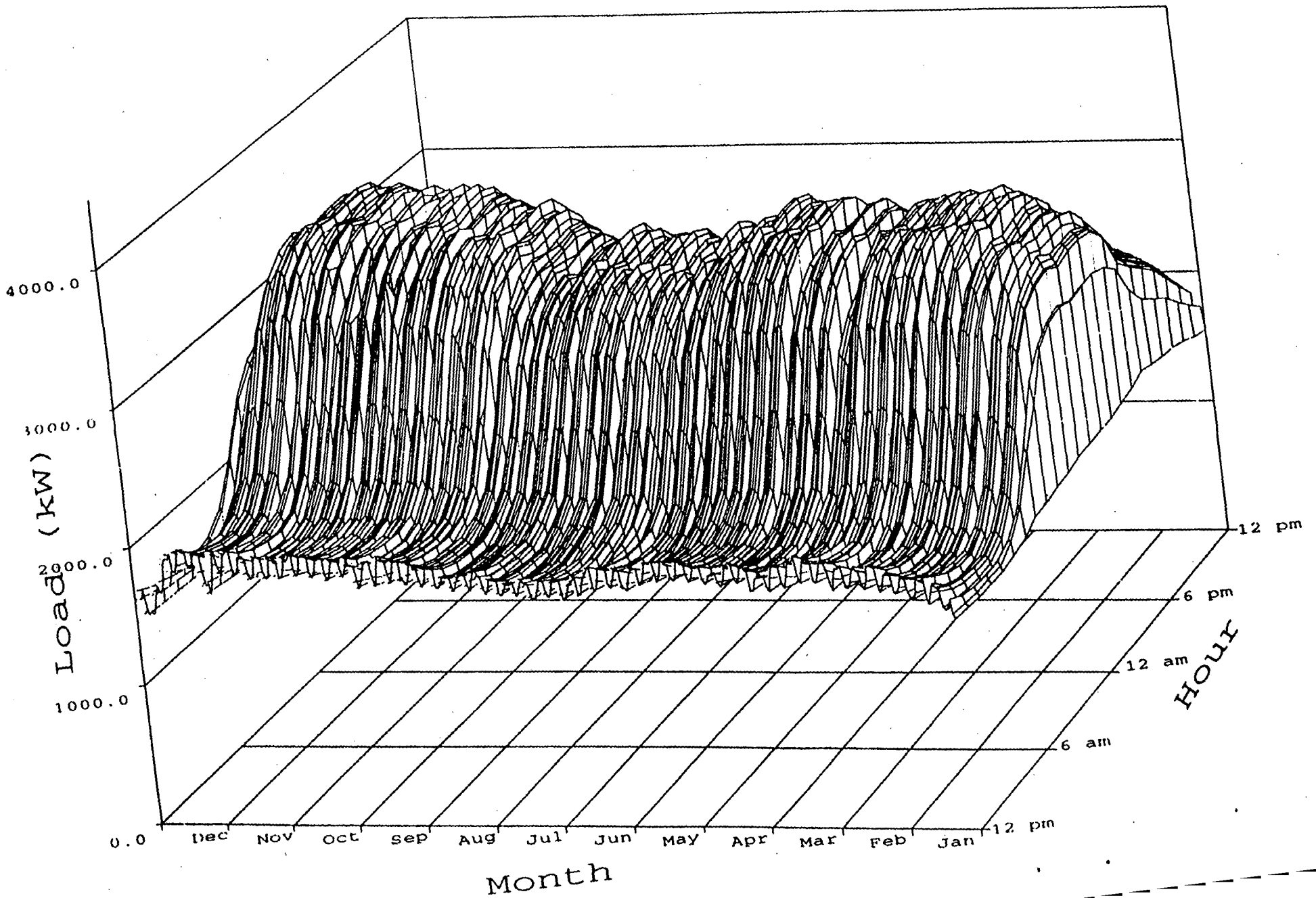

Figure 3-4. Weighted Average Load Shapes by Type of the Day for Colleges in Coastal Areas.

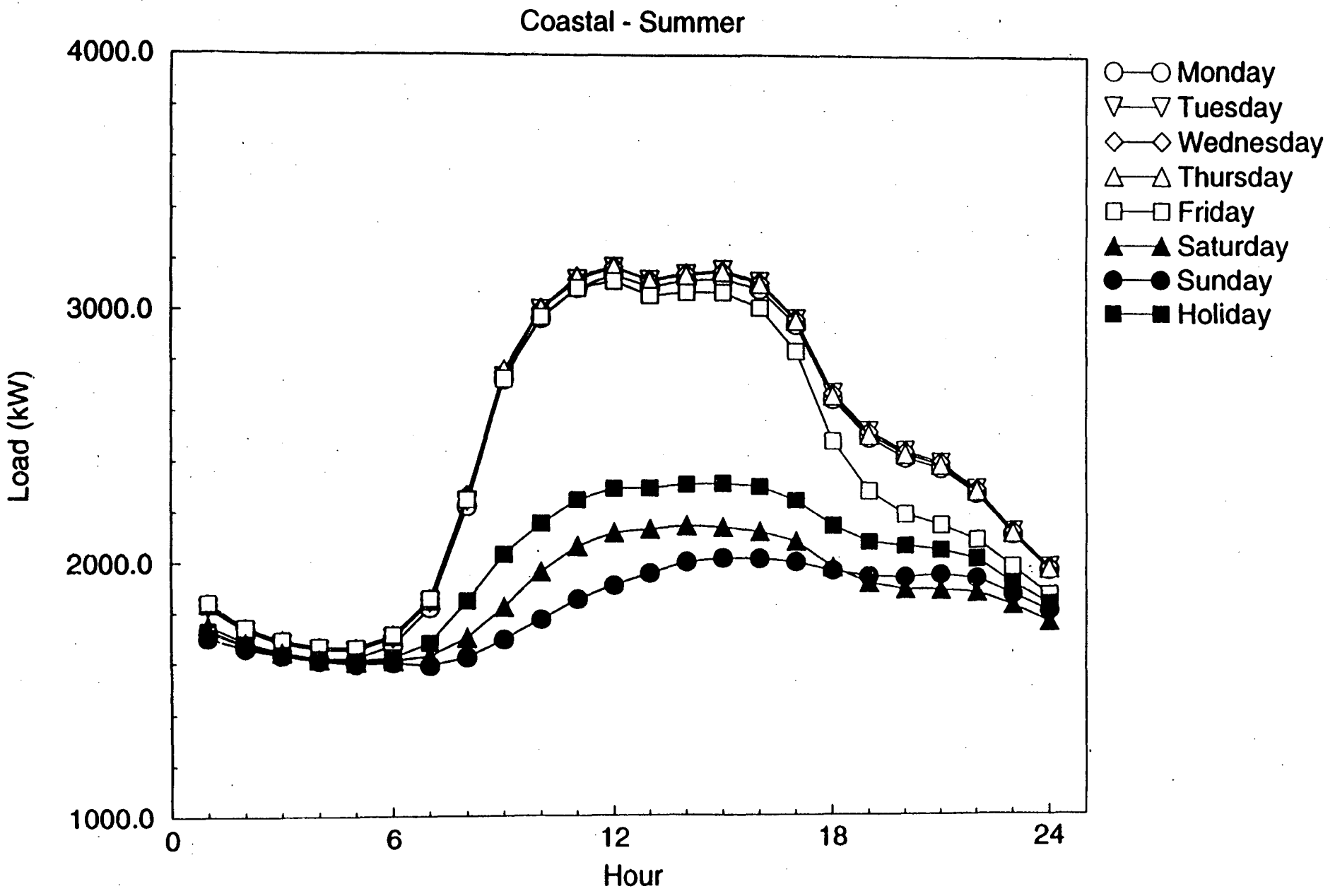

Table 3-9. Load Research Data Building Summary

Building Type	Climate Zone	LRD Files Total	LRD Files Used
Small office	Coastal	28	27
	Inland	62	59
Large office	Coastal	150	137
	Inland	95	64
Retail store	Coastal	52	47
	Inland	113	94
Restaurant	Coastal	19	18
	Inland	24	24
Food store	Coastal	13	12
	Inland	27	19
Warehouse	Coastal	29	25
	Inland	59	53
School	Coastal	6	6
	Inland	45	37
College	Coastal	18	16
	Inland	33	31
Health	Coastal	24	22
	Inland	38	34
Lodging	Coastal	23	23
	Inland	14	12
Miscellaneous	Coastal	10	6
	Inland	33	24

1988 Mail Survey

PG&E routinely collects mail survey data from approximately 6,000 commercial buildings on a three year cycle. We used data from a recent mail survey as an important secondary data source for this project. The mail survey data were used in three ways:

1. To evaluate the representativeness of selected features of the prototypes to be developed;
2. To provide information and guidance on features of the commercial buildings that are poorly represented in the on-site survey data; and
3. To provide another source of estimates for whole-building EUI development.

In this analysis we used the 1988 mail survey. **Table 3-10** shows the number of commercial buildings in each climate zone by building type. We found a small number of buildings that could not be unambiguously assigned to one of these zones and have labeled them as "other."

Table 3-10. Climate Zone Distribution of 1988 PG&E Mail Survey Data
(Number of Buildings)

Premise Type	Climate Zone						Total
	IA	IIA	IIB	III	IV	OTHER	
Office	56	104	143	395	199	34	931
Nonfood Retail	53	132	228	470	222	22	1127
Food Retail	26	54	68	147	74	6	375
Warehouse	20	59	83	210	95	30	497
Restaurant	33	65	98	220	117	11	544
Health Services	31	50	81	179	70	10	421
School	29	42	46	143	58	2	320
Services	67	132	176	526	237	31	1169
Comm. Services	32	60	100	202	88	15	497
Other	10	11	22	35	12	2	92
Total	357	709	1045	2527	1172	163	5973

In order to bring the building types of mail survey in conformity with the building types for which we are going to develop prototype modes, we regrouped the buildings according to the functionality of each building. **Table 3-11** describes the mapping of the mail survey buildings into the prototype buildings for this study.

Table 3-11. Mapping of the Mail Survey buildings into prototype buildings. The number in parenthesis denotes the number of buildings in the 1988 Mail Survey.

Premise Type	Component Premise	No. of Buildings
Office	OFFICE(Administration/Management(376), Banking/ Finance(200), Insurance/Real State(111), Legal /Social(30), City Hall/ Court(28), Medical Office(7), Other Offices(85), No response (95)), HEALTH SERVICES(Medical Offices(102), Medical Lab(20)) , SERVICES(Business Service(40)), COMMUNITY SERVICE(Post Office (35), Telephone Co.(6), Transport Office/Terminal(40))	1175
Fast Food	RESTAURANTS(Fast Food or SS(112))	112
Sit-Down	RESTAURANT(Table Service(409), Tavern/Bar(20))	429
Retail	SALES(Non-Food Retail(1128), Non-Food Wholesale(3))	1131
Food Stores	SALES(Food Retail(375), Food Wholesale(0))	375
Refrigerated Warehouse	WAREHOUSE(Refrigerated Warehouse(341))	341
Non-Refrigerated Warehouse	WAREHOUSE(Non-Refrigerated Warehouse(157))	157
Primary School	SCHOOL(Elementary(64))	64
Secondary School	SCHOOL(Jr. or Sr. High(124), Trade or Special(24))	148
College	SCHOOL(College or university(55))	55
Hospital	HEALTH SERVICES(Acute Care Hospital(130))	130
Nursing Care	HEALTH SERVICES(Nursing Care(138))	138
Lodging	SERVICES(Hotel/Motel(256))	256
Miscellaneous	RESTAURANTS(Not Applicable(3)), HEALTH SERVICES(Not Applicable(31)), SCHOOL(Not Applicable(28), Day Care Center(25)) SERVICES(Entertainment(18), TV or Radio(25), Personal Service(559), Gas/Auto Repair(117), Other Repair(30), Funeral/Morgue (53), Lab/Research(1), Not Applicable(70)), COMMUNITY SERVICES(Library/ Museum(11), Police or Fire(25), Church/Civic(248), Outdoor Recreation(46), Indoor Recreation (83), Not Applicable(3)), OTHER(92)	1468
TOTAL		5979

We further grouped the Offices (1175) into Small Office (722) and Large Office (334) based on the total electricity use of greater or less than 500 MW/year.† Similarly, Retail (1131) was grouped into Small(651) and Large Retail(339) based on the total electricity use of greater or less than 400 MW/year. For Lodging(194), we used the basis of gross floor area (greater or less than 60,000 ft^2) to form Large Hotel(100) and Small Hotel/Motel(94) categories.†

As with the on-site survey, we received a computer tape of all the mail survey buildings from CEC. The mail survey characterizes each building (record) by 417 variables describing various characteristics of the building. However, being a mail survey, the quality and depth of the data collected are not as high as those found in the on-site survey.

Since the mail survey data base is used as a secondary data source, we did not review and clean this data base as extensively as we did with the on-site survey. We only performed an analysis of outliers for exclusion from further building characteristic analyses. **Table 3-12** (equivalent to Table 3-3 for the on-site survey) summarizes some of the key statistics of the mail survey data for the office and retail buildings.

We observe several potentially important differences between the characteristics of buildings found in the mail survey and those found in the on-site survey. The mean and median floor areas for small offices and small retails are larger than those found in the on-site survey data. Finally, the mail survey's mean and median floor area per occupant, for both retails and offices, are two to three times larger than those of the on-site survey.

Some other useful statistics obtained from the mail survey data are summarized in **Table 3-13** (equivalent to Table 3-4 for on-site survey data). The statistics shown in these tables mainly concern the heating and cooling systems, type of domestic water heating, and fuel types.

† Buildings with zero or negative electricity use or zero gross floor were omitted from the data base.

Table 3-12. Summary of Building Characteristics in the 1988 PG&E Mail Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
Gross Floor Area (ft^2)							
Small Office	N/A	7484.7	10500.0	32863.1	1367769.0	200.0	654
Large Office	N/A	132439.0	67886.9	197181.6	2085550.0	1170.0	303
Restaurants							
Fast Food	N/A	14568.0	3848.5	109772.7	1367769.0	585.0	84
Sit-Down	N/A	4995.7	4000.0	6148.6	67886.9	300.0	375
Small Retail	N/A	7789.4	13842.1	33200.8	1367769.0	300.0	576
Large Retail	N/A	83424.1	54000.0	107021.3	1500000.0	1000.0	303
Food Stores	N/A	6880.2	10000.0	14635.2	195097.4	200.0	336
Warehouse							
Refrigerated	N/A	16221.2	30715.3	34120.3	816000.0	1000.0	301
Non-Refrigerated	N/A	27101.6	58634.0	47432.7	1367769.0	1000.0	148
Schools							
Primary	N/A	94796.0	35075.5	76943.1	215841.0	3848.5	54
Secondary	N/A	108655.0	100000.0	205752.0	1367769.0	1400.0	130
College	N/A	473663.6	205614.0	1280556.0	15000000.0	10560.0	53
Health							
Hospital	N/A	162639.3	100000.0	194675.8	3180000.0	1250.0	117
Nursing Care	N/A	22446.7	30715.3	70797.9	1367769.0	1200.0	120
Lodging							
Large Hotel	N/A	196364.0	195097.4	281429.7	1800000.0	62000.0	100
Small Hotel	N/A	10264.1	20000.0	9511.1	60000.0	2100.0	94
Miscellaneous	N/A	23607.0	10000.0	149570.0	3510000.0	200.0	1299
Number of Stories							
Small Office	N/A	1.3	1.0	0.7	12.0	1.0	498
Large Office	N/A	5.2	3.0	7.1	52.0	1.0	220
Restaurants							
Fast Food	N/A	1.1	1.0	0.3	3.0	1.0	87
Sit-Down	N/A	1.3	1.0	0.4	4.0	1.0	298
Small Retail	N/A	1.2	1.0	0.5	5.0	1.0	388
Large Retail	N/A	1.6	1.0	1.0	10.0	1.0	222
Food Stores	N/A	1.1	1.0	0.4	4.0	1.0	262
Warehouse							
Refrigerated	N/A	1.6	1.0	1.2	6.0	1.0	216
Non-Refrigerated	N/A	1.1	1.0	0.3	7.0	1.0	109
Schools							
Primary	N/A	1.6	1.0	0.7	3.0	1.0	14
Secondary	N/A	1.9	1.0	1.1	9.0	1.0	29
College	N/A	2.7	2.0	2.0	9.0	1.0	11
Health							
Hospital	N/A	2.2	2.0	1.7	12.0	1.0	69
Nursing Care	N/A	1.4	1.0	0.8	6.0	1.0	112
Lodging							
Large Hotel	N/A	6.8	5.0	7.0	35.0	1.0	59
Small Hotel	N/A	1.6	2.0	1.0	8.0	1.0	57
Miscellaneous	N/A	1.2	1.0	0.9	40.0	1.0	805

Table 3-12 (Continued). Summary of Building Characteristics in the 1988 PG&E Mail Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
Number of Buildings at Facility							
Small Office	N/A	106.2	3.0	635.8	4100.0	2.0	65
Large Office	N/A	3.7	3.0	2.4	15.0	2.0	60
Restaurants							
Fast Food	N/A	2.7	2	2.0	14	2	10
Sit-Down	N/A	3.0	2.5	0.7	6.0	2.0	4
Small Retail	N/A	2.6	2.0	1.0	7.0	2.0	73
Large Retail	N/A	3.1	2.0	1.6	8.0	2.0	26
Food Stores	N/A	2.7	2.0	2.0	14.0	2.0	10
Warehouse							
Refrigerated	N/A	3.3	3.0	2.2	44.0	2.0	58
Non-Refrigerated	N/A	4.1	3.0	10.4	130.0	2.0	20
Schools							
Primary	N/A	4.6	5.0	1.6	15.0	2.0	35
Secondary	N/A	10.4	9.0	11.1	90.0	2.0	86
College	N/A	40.6	20.0	100.7	600.0	2.0	32
Health							
Hospital	N/A	5.2	4.0	2.5	30.0	2.0	47
Nursing Care	N/A	6.5	4.5	4.3	14.0	2.0	16
Lodging							
Large Hotel	N/A	8.4	5.0	12.7	56.0	2.0	35
Small Hotel	N/A	8.9	3.0	6.7	17.0	2.0	22
Miscellaneous	N/A	7.9	4.0	27.2	720.0	2.0	234
Weekday Hours							
Small Office	N/A	10.2	9.0	4.1	24.0	0.0	358
Large Office	N/A	12.3	10.5	4.9	24.0	6.0	183
Restaurants							
Fast Food	N/A	14.8	17.5	3.8	24.0	5.0	22
Sit-Down	N/A	12.5	14.5	3.7	24.0	6.0	112
Small Retail	N/A	9.9	10.5	2.9	24.0	0.0	226
Large Retail	N/A	13.1	12.8	3.1	24.0	7.5	128
Food Stores	N/A	13.6	14.0	3.8	24.0	8.5	118
Warehouse							
Refrigerated	N/A	17.0	17.0	0.5	24.0	9.0	190
Non-Refrigerated	N/A	17.0	17.0	0.4	17.0	9.0	94
Schools							
Primary	N/A	10.3	9.0	2.0	24.0	5.5	39
Secondary	N/A	10.1	9.2	3.1	24.0	6.5	95
College	N/A	13.1	14.5	4.5	24.0	5.0	39
Health							
Hospital	N/A	23.5	24.0	2.6	24.0	8.5	91
Nursing Care	N/A	20.4	24.0	6.4	24.0	8.5	72
Lodging							
Large Hotel	N/A	17.0	17.0	0.0	17.0	17.0	63
Small Hotel	N/A	17.0	17.0	0.0	17.0	17.0	47
Miscellaneous	N/A	12.5	17.0	4.8	24.0	0.0	712

Table 3-12 (Continued). Summary of Building Characteristics in the 1988 PG&E Mail Survey

Type	Population Avg	Mean	Median	Std Dev	Max	Min	N
Floor Area per Occupant (ft^2)							
Small Office	813.1	623.3	297.1	1292.7	13577.4	28.6	349
Large Office	605.9	1503.0	318.7	4906.5	50350.6	2.2	176
Restaurants							
Fast Food	1297.6	154.3	88.6	187.7	922.8	6.3	18
Sit-Down	216.8	97.7	57.4	121.9	2000.0	4.0	106
Small Retail	946.2	584.4	457.1	1563.4	39019.5	2.2	221
Large Retail	611.2	689.0	431.4	777.8	5736.7	4.6	120
Food Stores	313.2	365.2	360.0	361.3	2666.7	1.7	111
Warehouse							
Refrigerated	332.6	861.2	877.6	2119.2	43560.0	28.6	165
Non-Refrigerated	2007.9	1767.8	1243.3	2728.7	39019.5	24.6	88
Schools							
Primary	362.7	606.7	81.9	511.6	1422.8	13.7	39
Secondary	228.7	330.5	111.5	1436.1	18236.9	22.9	92
College	541.1	600.2	248.0	936.1	5000.0	21.4	40
Health							
Hospital	300.4	328.3	364.4	267.5	3000.0	64.7	89
Nursing Care	444.6	302.2	201.5	363.3	6143.1	22.0	68
Lodging							
Large Hotel	891.0	786.0	514.3	957.7	5574.2	65.0	59
Small Hotel	148.9	445.1	184.6	472.0	2768.4	4.6	35
Miscellaneous	390.9	1141.7	305.5	9438.8	273553.8	5.3	607
Floor Area per Employee (ft^2)							
Small Office	1325.3	1302.4	389.8	8180.3	195097.4	20.1	333
Large Office	1399.5	8788.7	500.0	21557.7	283500.0	40.1	161
Restaurants							
Fast Food	3562.3	300.9	170.0	372.1	1064.8	41.9	19
Sit-Down	994.4	375.4	176.4	322.8	4000.0	6.2	108
Small Retail	2847.0	1349.1	684.1	2214.7	48774.3	77.4	214
Large Retail	1622.9	2142.8	638.3	8864.4	98122.5	80.0	111
Food Stores	1725.1	674.5	541.6	550.1	4064.5	30.0	106
Warehouse							
Refrigerated	332.6	1079.2	856.7	3051.6	103500.0	34.5	156
Non-Refrigerated	2952.7	2605.8	1212.5	2263.4	24387.2	160.0	83
Schools							
Primary	4221.7	6029.4	877.6	5193.2	11476.3	120.0	37
Secondary	2294.6	1495.8	1357.7	1798.5	16680.1	122.9	87
College	1120.3	1870.6	805.2	3874.0	24000.0	105.2	37
Health							
Hospital	223.3	284.9	327.3	333.2	2735.5	76.8	83
Nursing Care	817.5	736.1	340.1	864.2	5419.4	24.0	64
Lodging							
Large Hotel	2752.9	5040.6	1625.8	12112.6	65032.5	246.2	59
Small Hotel	3080.2	1588.9	1080.6	1644.3	8000.0	128.3	42
Miscellaneous	1194.0	2355.5	772.9	9018.8	227961.5	3.4	578

Table 3-13. 1988 PG&E Mail Survey Statistics on Heating, Cooling, System Type, and Water Heating for PG&E Mail Survey Buildings

a) Percent Buildings by Heated Floor Space

% floor area	25%	50%	75%	All	Don't know	% missing data
Small Office	5.40	7.10	16.20	71.40	0.00	50.32
Large Office	5.00	4.20	16.70	74.20	0.00	47.00
Restaurants						
Fast Food	9.40	5.10	2.00	83.50	0.00	71.90
Sit-Down	6.50	18.20	18.30	56.90	0.00	70.80
Small Retail	4.80	27.10	21.70	46.30	0.00	62.38
Large Retail	7.10	11.40	21.10	60.30	0.00	61.37
Food Stores	7.70	14.60	30.70	46.90	0.00	71.77
Warehouse						
Refrigerated	39.40	11.60	13.10	35.40	0.40	49.63
Non-Refrigerated	14.80	1.30	50.60	28.00	5.30	36.59
Schools						
Primary	0.00	0.00	54.40	45.60	0.00	60.44
Secondary	2.40	0.00	7.60	90.10	0.00	64.52
College	0.00	10.60	6.60	82.70	0.00	30.02
Health						
Hospital	0.00	0.00	1.40	98.60	0.00	31.58
Nursing Care	0.00	0.50	2.40	97.00	0.00	51.88
Lodging						
Large Hotel	8.30	0.00	9.80	81.90	0.00	42.16
Small Hotel	0.80	15.60	12.60	71.00	0.00	72.02
Miscellaneous	9.40	6.20	19.30	65.00	0.00	57.22

b) Percent Buildings by Cooled Floor Space

% floor area	25%	50%	75%	All	Don't know	% missing data
Small Office	4.70	12.60	16.90	65.80	0.00	63.71
Large Office	8.30	2.10	16.50	73.10	0.00	49.70
Restaurants						
Fast Food	0.00	22.00	2.20	75.70	0.00	78.93
Sit-Down	14.00	15.80	20.60	49.70	0.00	76.82
Small Retail	8.80	9.80	27.80	52.70	0.90	81.20
Large Retail	6.00	10.00	20.90	63.10	0.00	57.21
Food Stores	8.10	8.10	40.70	43.10	0.00	80.23
Warehouse						
Refrigerated	38.60	15.30	0.70	45.10	0.30	62.42
Non-Refrigerated	28.90	56.10	7.40	7.10	0.50	43.25
Schools						
Primary	3.50	16.20	6.70	73.60	0.00	88.39
Secondary	14.50	1.40	23.20	60.90	0.00	82.80
College	6.10	17.90	2.10	73.90	0.00	44.87
Health						
Hospital	2.20	1.80	67.60	28.50	0.00	33.51
Nursing Care	27.00	0.30	4.90	67.70	0.00	60.30
Lodging						
Large Hotel	8.60	0.00	30.60	57.90	2.90	47.60
Small Hotel	0.00	4.60	4.00	91.40	0.00	85.53
Miscellaneous	12.60	6.20	29.20	51.60	0.50	76.22

Table 3-13 (Continued). 1988 PG&E Mail Survey Statistics on Heating, Cooling, System Type, and Water Heating for PG&E Mail Survey Buildings

c) Percent Buildings by Glass Cover of Exterior Walls

% glass	0 To 10%	11 To 25%	26 To 50%	51 To 75%	76% Or More	% missing data
Small Office	45.90	33.40	17.80	2.00	0.90	50.78
Large Office	19.00	18.70	34.70	19.70	7.80	46.53
Restaurants						
Fast Food	34.00	41.50	21.10	3.20	0.30	63.47
Sit-Down	53.60	33.00	9.80	1.80	1.90	70.66
Small Retail	31.60	26.90	4.50	33.30	3.70	59.61
Large Retail	63.50	27.10	6.70	2.70	0.00	54.74
Food Stores	42.90	30.40	18.30	4.20	4.20	64.68
Warehouse						
Refrigerated	69.80	14.90	14.90	0.40	0.00	41.49
Non-Refrigerated	97.30	1.40	0.60	0.60	0.00	27.18
Schools						
Primary	61.90	21.70	16.40	0.00	0.00	59.81
Secondary	39.40	37.50	21.70	1.40	0.00	64.93
College	35.40	27.70	31.50	5.40	0.00	32.10
Health						
Hospital	5.90	85.40	8.00	0.70	0.00	32.81
Nursing Care	60.80	23.60	11.40	3.40	0.80	53.35
Lodging						
Large Hotel	32.30	32.20	17.00	13.20	5.30	38.81
Small Hotel	56.00	22.70	19.50	1.30	0.40	64.33
Miscellaneous	51.90	28.40	10.30	4.80	3.20	53.72

d) Primary Space Heat System Types

	Steam/ Hot Water	Forced Air Furnace	Rooftop Units	Wall/Floor Heaters	Solar Panels	Other	% missing data
Small Office	5.40	40.60	29.10	21.70	0.00	3.10	57.48
Large Office	49.70	5.80	40.60	3.20	0.00	0.70	52.56
Restaurants							
Fast Food	22.60	0.40	35.60	38.90	0.00	2.50	71.64
Sit-Down	12.80	29.20	30.30	24.30	0.00	3.30	73.96
Small Retail	8.50	24.90	17.70	46.30	0.00	2.60	64.31
Large Retail	12.90	16.70	59.50	8.90	0.00	1.90	63.54
Food Stores	9.10	27.80	33.90	26.60	0.00	2.60	72.62
Warehouse							
Refrigerated	14.90	26.90	36.90	13.70	0.20	7.20	51.00
Non-Refrigerated	54.50	11.50	22.10	11.40	0.00	0.50	40.66
Schools							
Primary	23.70	54.60	17.50	4.20	0.00	0.00	59.81
Secondary	44.90	20.80	26.30	5.50	0.00	2.50	64.53
College	57.30	16.90	13.40	12.40	0.00	0.00	37.99
Health							
Hospital	93.20	1.00	5.80	0.00	0.00	0.00	32.40
Nursing Care	22.10	18.90	38.70	20.30	0.00	0.00	52.06
Lodging							
Large Hotel	46.20	12.40	28.20	13.20	0.00	0.00	44.41
Small Hotel	24.70	15.30	6.40	53.70	0.00	0.00	65.69
Miscellaneous	13.20	45.40	18.60	15.90	0.00	6.90	61.01

Table 3-13 (Continued). 1988 PG&E Mail Survey Statistics on Heating, Cooling, System Type, and Water Heating for PG&E Mail Survey Buildings

e) Air Conditioning System (%)

	Packaged A-C with Heating	Packaged A-C Only	Chilled Water	Window/Wall Unit	Other	% missing data
Small Office	67.90	19.40	1.20	10.00	1.40	69.00
Large Office	44.70	8.40	43.80	0.00	3.00	55.04
Restaurants						
Fast Food	70.20	29.80	0.00	0.00	0.00	80.48
Sit-Down	56.20	27.70	0.50	6.20	9.40	81.61
Small Retail	50.30	28.70	0.30	16.10	4.70	81.77
Large Retail	61.10	20.10	18.10	0.70	0.00	61.86
Food Stores	46.30	50.20	0.00	0.30	3.20	82.28
Warehouse						
Refrigerated	58.40	14.10	11.90	4.40	11.20	64.68
Non-Refrigerated	91.60	7.50	0.10	0.50	0.40	46.48
Schools						
Primary	53.10	19.60	4.90	0.00	22.40	89.61
Secondary	66.70	10.20	13.90	6.00	3.30	83.26
College	31.30	24.40	41.80	2.50	0.00	51.66
Health						
Hospital	19.20	0.90	79.90	0.00	0.00	33.91
Nursing Care	53.70	11.20	11.10	24.10	0.00	60.67
Lodging						
Large Hotel	43.30	6.70	41.00	9.10	0.00	50.95
Small Hotel	8.20	2.10	6.70	37.60	45.40	87.07
Miscellaneous	42.00	32.80	4.80	10.40	9.90	77.31

f) Distribution Type for Water/Steam Systems (%)

	Hydronic Heat Pump	Fan Coil Unit	Coils/ Other	Coils/ Heat Pump	Radiators	Radiators Coils	Other	% missing data
Small Office	5.20	65.30	0.00	7.00	17.60	0.50	0.50	4.40
Large Office	5.60	60.40	0.50	2.30	11.00	8.90	8.90	11.30
Restaurants								
Fast Food	87.20	12.80	0.00	0.00	0.00	0.00	0.00	93.60
Sit-Down	0.00	46.40	0.00	0.00	53.60	0.00	0.00	98.15
Small Retail	28.00	4.10	0.00	2.10	22.90	0.00	42.90	97.50
Large Retail	0.00	69.50	0.00	0.00	9.70	9.70	11.10	95.30
Food Stores	0.00	68.40	0.00	0.00	15.50	0.00	16.10	99.74
Warehouse								
Refrigerated	1.60	48.60	0.00	0.00	0.70	46.40	2.80	92.70
Non-Refrigerated	0.20	1.80	0.00	0.00	97.60	0.10	0.20	67.68
Schools								
Primary	0.00	69.70	0.00	0.00	13.60	0.00	16.70	93.41
Secondary	5.70	49.90	0.00	0.00	40.90	0.00	3.50	84.79
College	6.70	67.20	0.00	0.00	22.80	3.30	0.00	64.49
Health								
Hospital	1.10	92.00	0.40	0.60	3.50	1.90	0.60	37.94
Nursing Care	5.50	44.80	0.00	5.70	35.20	3.00	5.90	90.19
Lodging								
Large Hotel	3.10	49.50	0.00	25.90	17.30	0.00	4.10	74.34
Small Hotel	1.20	5.90	0.00	0.00	1.60	0.00	91.30	91.63
Miscellaneous	5.20	29.00	0.20	0.00	32.20	1.20	32.10	95.74

Table 3-13 (Continued). 1988 PG&E Mail Survey Statistics on Heating, Cooling, System Type, and Water Heating for PG&E Mail Survey Buildings

g) Water Heating Equipment Type (%)

	Central Boiler	Water Tank	Instant Heater	Other	% missing data
Small Office	1.80	91.50	6.50	0.30	63.61
Large Office	18.00	76.80	3.10	2.00	53.40
Restaurants					
Fast Food	7.20	90.10	0.00	2.70	74.05
Sit-Down	14.40	84.10	1.60	0.00	73.55
Small Retail	8.30	84.20	3.70	3.80	83.60
Large Retail	4.30	80.60	12.70	2.40	59.62
Food Stores	6.10	89.20	4.50	0.30	71.30
Warehouse					
Refrigerated	11.90	84.20	2.90	1.10	57.54
Non-Refrigerated	0.60	98.10	1.20	0.10	40.20
Schools					
Primary	9.20	90.80	0.00	0.00	60.15
Secondary	22.50	77.30	0.20	0.00	67.65
College	44.70	49.20	4.00	2.00	39.65
Health					
Hospital	88.60	10.90	0.20	0.30	32.52
Nursing Care	13.10	66.40	0.30	20.20	51.62
Lodging					
Large Hotel	45.90	52.20	1.30	0.70	42.88
Small Hotel	26.70	67.00	2.30	4.00	66.35
Miscellaneous	16.10	79.90	1.50	2.50	66.35

h) Space Heating Fuel Type (%)

	Natural Gas	Electricity	Fuel Oil Only	Gas with Oil Backup	Steam	Propane/ Butane	Other	Don't Know	% missing data
Small Office	62.10	31.70	0.00	0.00	0.00	0.00	5.30	0.80	50.69
Large Office	74.60	16.60	0.00	3.40	3.40	0.00	1.00	1.00	48.10
Restaurants									
Fast Food	62.40	27.90	0.00	0.00	0.00	0.00	9.70	0.00	68.78
Sit-Down	68.70	21.70	0.00	0.10	0.00	0.00	9.50	0.00	69.71
Small Retail	69.70	28.30	0.30	0.00	0.00	0.00	0.60	1.10	62.32
Large Retail	67.90	27.40	0.60	0.90	1.20	0.00	1.40	0.70	61.15
Food Stores	78.00	15.60	0.00	0.20	0.00	0.00	3.00	3.20	69.15
Warehouse									
Refrigerated	68.80	26.90	0.20	0.10	0.00	0.20	3.80	0.00	53.91
Non-Refrigerated	82.80	16.60	0.50	0.10	0.00	0.00	0.00	0.00	36.93
Schools									
Primary	88.90	1.90	1.20	0.00	5.20	0.00	2.80	0.00	59.59
Secondary	92.20	0.70	0.40	0.80	1.70	0.00	4.20	0.00	63.90
College	74.80	19.50	0.00	2.60	0.00	0.00	1.30	1.70	30.02
Health									
Hospital	91.50	0.40	0.50	6.40	0.80	0.00	0.40	0.00	31.58
Nursing Care	72.10	22.50	0.00	0.70	1.30	0.00	3.10	0.40	52.95
Lodging									
Large Hotel	72.90	17.40	0.00	2.00	5.10	0.00	2.60	0.00	41.19
Small Hotel	61.00	13.30	0.00	0.00	0.20	0.00	12.40	13.00	64.87
Miscellaneous	72.40	9.40	1.10	0.40	0.60	0.00	7.20	8.80	56.80

Table 3-13 (Continued). 1988 PG&E Mail Survey Statistics on Heating, Cooling, System Type, and Water Heating for PG&E Mail Survey Buildings

i) Air Conditioning Fuel Type (%)

	Electricity	Natural Gas	Other	% missing data
Small Office	86.90	8.60	4.50	63.35
Large Office	94.90	3.80	1.30	49.66
Restaurants				
Fast Food	72.30	27.70	0.00	77.94
Sit-Down	97.90	2.10	0.00	75.95
Small Retail	92.30	5.90	1.80	81.17
Large Retail	94.70	5.30	0.00	58.73
Food Stores	85.20	14.80	0.00	77.95
Warehouse				
Refrigerated	94.30	5.70	0.00	63.51
Non-Refrigerated	99.40	0.30	0.30	42.80
Schools				
Primary	80.40	12.40	7.20	88.80
Secondary	98.00	2.00	0.00	83.05
College	91.50	8.50	0.00	52.59
Health				
Hospital	99.50	0.30	0.30	33.36
Nursing Care	95.70	4.30	0.00	61.23
Lodging				
Large Hotel	90.0	8.60	1.40	47.21
Small Hotel	99.30	0.70	0.00	85.47
Miscellaneous	89.00	8.00	3.00	76.20

j) Water Heating Fuel Type (%)

	Natural Gas	Electricity	Purchased Steam	Fuel Oil	Propane/ Butane	Solar	Other	% missing data
Small Office	57.20	42.30	0.00	0.00	0.30	0.20	0.00	58.55
Large Office	64.90	30.90	3.20	0.00	1.00	0.00	0.00	48.94
Restaurants								
Fast Food	75.70	19.20	0.00	0.00	5.10	0.00	0.00	72.02
Sit-Down	72.90	18.10	0.00	0.00	9.00	0.00	0.00	69.16
Small Retail	68.60	30.20	0.00	0.00	1.20	0.00	0.00	82.09
Large Retail	55.50	42.80	0.00	0.00	0.00	1.70	0.00	57.42
Food Stores	71.20	25.70	0.00	0.00	2.90	0.00	0.10	67.62
Warehouse								
Refrigerated	53.30	41.70	0.00	0.10	4.00	0.00	0.90	56.92
Non-Refrigerated	31.40	68.60	0.00	0.00	0.00	0.00	0.00	39.58
Schools								
Primary	36.80	58.90	0.00	1.20	2.90	0.20	0.00	61.01
Secondary	81.50	18.00	0.00	0.00	0.00	0.40	0.00	66.88
College	65.70	28.90	0.00	0.00	1.50	2.00	1.90	39.39
Health								
Hospital	97.50	0.20	0.90	0.50	0.40	0.00	0.50	31.60
Nursing Care	75.10	23.50	0.00	0.00	0.80	0.60	0.00	50.84
Lodging								
Large Hotel	91.80	2.00	3.00	0.00	2.50	0.00	0.60	38.42
Small Hotel	65.70	5.00	0.00	0.00	28.70	0.00	0.60	64.36
Miscellaneous	75.50	20.00	0.00	0.10	2.60	0.00	1.80	62.81

The whole-building EUIs obtained from the analysis of the mail survey data are presented in **Table 3-14.**

Table 3-14. Summary of Whole-building EUIs in the 1988 PG&E Mail Survey

Type	Population Avg.	Mean	Median	Std. Dev.	Max	Min	N
			Energy Use Intensity (kWh/ft^2)				
Small Office	7.3	8.3	12.5	8.4	97.9	1.0	627
Large Office	16.9	22.2	19.2	14.2	93.5	1.2	294
Restaurants							
Fast Food	15.6	25.5	30.3	20.9	92.1	2.1	55
Sit-Down	16.5	23.7	31.6	19.2	99.0	1.1	298
Small Retail	6.7	8.9	10.8	10.0	98.1	1.1	541
Large Retail	14.3	19.2	17.4	11.9	96.2	1.3	291
Food Stores	32.1	34.7	45.5	21.8	96.0	2.0	274
Warehouse							
Refrigerated	8.2	8.3	10.1	9.3	86.7	1.1	247
Non-Refrigerated	6.2	7.4	7.9	9.2	76.5	1.0	120
Schools							
Primary	5.6	5.7	5.0	4.2	40.3	1.6	40
Secondary	4.8	9.3	5.3	16.9	85.9	1.0	101
College	8.6	10.5	10.4	7.0	49.5	1.3	40
Health							
Hospital	42.1	36.5	23.0	20.6	82.9	1.0	91
Nursing Care	9.4	9.1	10.2	9.3	95.4	1.3	96
Lodging							
Large Hotel	7.2	7.1	7.1	5.7	28.5	1.1	85
Small Hotel/Motel	7.1	6.9	8.6	11.7	90.3	1.2	85
Miscellaneous	5.1	8.2	9.7	12.0	99.5	1.0	1054

Whole-Building EUIs

Whole-building EUIs play a critical role in LBL's methodology to reconcile simulation and engineering estimates with measured whole-building load research data. Historically, project sponsors (CEC, PG&E, and, previously, SCE) have participated actively in decisions regarding the development of these data. In Phase I of the project, whole-building EUIs were developed by PG&E (Mr. J. DeValois's memo dated 4 Feb. 1992) for all of the building types considered by the project. LBL used the whole-building EUIs developed for large office, small office, and retail buildings in completing Phase I project deliverables. Subsequently, discussions were held that led to re-examination of the whole building EUIs.[1]

The goal of the analysis is to develop whole-building EUIs, by building type, for both a coastal and non-coastal climate region for the Phase II buildings. Where appropriate, the whole-building EUI is based on a combination of whole-building EUIs from two constituent, sub-building types (e.g., restaurants are a combination of fast-food and sit-down establishments). For these cases, whole-building EUIs are required both by sub-building type and by climate region. In addition, weighting factors to combine the sub-building type EUIs into a single building type EUI (separately by climate region) are also required.

Our approach was based on several important assumptions. First, the highest quality data for determining whole-building EUIs are those contained in the on-site survey, followed by the mail survey. Second, despite this preference for reliance on the on-site survey, use of the on-site survey may not be appropriate for some building types due to the small number of buildings surveyed. Third, in any case, the mail survey, due its much larger sample size, is a more appropriate source of information for developing weighting factors to combine whole-building EUIs from sub-building types into a single EUI for a building type and region.

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[1] In conjunction with the filing of PG&E's preliminary forecast, PG&E developed a second set of whole-building EUIs for use in the project (J. DeValois's memo dated 2 Jun. 1993). At a meeting held on 2 July 1993 to discuss the second interim report for the project, PG&E (J. DeValois) presented the methods used to develop these new EUIs, as well as further modifications leading to a third set of whole-building EUIs.

A second meeting was held on 21 July 1993 to address these issues, as well as to discuss independent work conducted by CEC to develop an alternative (or fourth) set of whole-building EUIs. A basic focus of the discussion was the wisdom of relying on data from the Quarterly Fuels and Electricity Report (QFER) to develop whole-building EUIs; QFER data were the basis for both the most recent two PG&E proposals as well as the CEC proposal. A concern was raised that reliance on these, rather than on an independent set of data, would yield mis-leadingly self-consistent results, since the forecasts are also calibrated to QFER data.

The outcome of the second meeting was agreement on two issues:

(1) LBL would not revisit the three building types already analyzed in Phase I of the project.

(2) LBL would prepare a new set of whole-building EUIs based on more detailed analysis of the on-site and mail survey data.

Table 3-15 summarizes LBL's analysis of whole-building EUIs, along with information on the underlying values and sources used to develop them. There are three steps in the process. First, develop service area-wide whole-building EUIs for each sub-building type. Second, develop distinct, sub-building type whole-building EUIs for each climate zone, using simulations of the prototypes. Third, combine sub-building type, climate-zone specific whole-building EUIs into a single whole-building EUI for each building type and climate zone.

Step 1: We relied on whole-building EUIs developed from the on-site survey data, whenever the sample size (by sub-building type) exceeded about 15. This was possible for all building types, except secondary school, college, nursing, and lodging. In using the mail survey to develop EUIs for these remaining buildings, we made an effort to address data quality concerns by first eliminating the highest and lowest 5% of values (10% total), before calculating the resulting "trimmed" mean. These are labeled on Table 3-15 as "raw EUIs." Their source is indicated as either "on-site" or "mail trim," as is the number of surveyed data contributing to the EUI.

Step 2: We introduced, but bounded the use of, engineering judgement into the development of separate whole-building EUIs for the coastal and non-coastal climate regions. That is, we used simulations of the prototypes, adjusted for the saturation (separately for coastal and non-coastal) of end uses (electric cooling, water heating, and space heating) and relative floor areas (coastal versus non-coastal) to develop coastal and non-coastal adjustment factors, which we then applied to the whole-building EUIs previously developed on a service area wide basis. These are labeled on Table 3-15 as "region adjustments."

Step 3: We combined sub-building type and climate-specific whole-building EUIs, within each climate region, using floor area weights developed from the mail survey. In this case, the weights refer to the relative floor area of sub-building types to a single building category. These are labeled on Table 3-15 as "weights."

Application of this procedure leads to somewhat counter-intuitive results for one whole-building EUI (warehouse) and for one sub-building EUI (primary school). However, we believe both results are well-supported by the data. In the case of Warehouse, a higher proportion of the more energy-intensive, refrigerated warehouses in the coastal region leads to a larger whole-building EUI for the warehouse building type for the coastal region than for the non-coastal region. Similarly, in the case of the primary school sub-building type, higher electric saturations for cooling and water heating leads to a higher coastal whole-building EUI than non-coastal EUI. Nevertheless, when combined on a floor-area-weighted basis with the secondary school, the trend is reversed (consistent with intuition); the overall whole-building EUI for the school is larger for non-coastal than for coastal.

Table 3-16 summarizes the mail survey floor area weights and the whole-building EUIs for each aggregate prototype in the coastal and inland climate regions.

Table 3-15. LBL Analysis of Whole-Building EUIs (kWh/sqft.yr). EUIs for each sub building type and climate region is calculated by multiplying the Raw EUIs by the corresponding adjustment factors. The aggregate EUIs are calculated by weight-averaging the component buildings.

Building Type	Raw EUI	N	Source†	Coastal			Inland		
				Adj. fact	Weight	Adj. EUI	Adj. fact	Weight	Adj. EUI
Restaurant						**36.5**			**37.2**
sitdown	28.0	57	OS	1.00	0.79	28.0	1.00	0.77	28.0
fastfood	68.7	19	OS	1.00	0.21	68.7	0.99	0.23	68.0
Food Store	45.1	84	OS	0.98	1.00	**44.2**	1.03	1.00	**46.5**
Warehouse						**18.4**			**13.5**
refrigerated	29.0	13	OS	0.99	0.57	28.7	1.01	0.34	29.3
non-refrigerated	5.2	21	OS	0.92	0.43	4.8	1.04	0.66	5.4
School						**4.5**			**4.8**
primary	6.2	43	OS	1.02	0.21	6.3	0.96	0.19	6.0
secondary	4.2	104	MS	0.96	0.79	4.0	1.07	0.81	4.5
College	6.0	42	MS	0.88	1.00	**5.3**	1.17	1.00	**7.0**
Health						**25.5**			**27.1**
hospital	28.3	45	OS	0.99	0.87	28.0	1.01	0.92	28.6
nursing	9.8	90	MS	0.91	0.13	8.9	1.08	0.08	10.5
Lodging						**6.4**			**7.7**
small hotel	6.6	79	MS	0.93	0.18	6.1	1.07	0.52	7.1
large hotel	6.8	80	MS	0.95	0.82	6.5	1.23	0.48	8.4
Miscellaneous	6.5	126	OS	0.93	1.00	**6.1**	1.15	1.00	**7.5**

† OS: On-Site Survey; MS: Trimmed Mail Survey

Table 3-16. Mail Survey Floor Area Weighting Factors and Whole Building EUIs

BUILDING TYPE Prototype	Weighting Factors Coastal	 Inland	Whole-Building EUIs† Coastal	 Inland
SMALL OFFICE	1.0	1.0	9.7	13.1
LARGE OFFICE	1.0	1.0	20.4	26.4
RETAIL			8.4	12.6
Large	0.24	0.19		
Small	0.76	0.81		
RESTAURANT			36.5	37.2
Fast Food	0.21	0.23		
Sit-Down	0.79	0.77		
FOOD STORES	1.0	1.0	44.2	46.5
WAREHOUSE			18.4	13.5
Refrigerated	0.57	0.34		
Non-Refrigerated	0.43	0.66		
SCHOOL			4.5	4.8
Primary School	0.21	0.19		
Secondary School	0.79	0.81		
COLLEGE			5.3	7.0
Office/Lab/Classroom	0.75	0.75		
Library	0.05	0.05		
Dormitory	0.20	0.20		
HEALTH			25.5	27.1
Hospital	0.87	0.92		
Nursing Home	0.13	0.08		
LODGING			6.4	7.7
Large Hotel	0.82	0.48		
Small Hotel/Motel	0.18	0.52		
MISCELLANEOUS	1.0	1.0	6.0	7.5

Weather Data

The final set of data required for the project was historic weather data for each California climate zone. We obtained a set of historic weather data from the CEC for each representative weather station used by CEC in forecasting.

Two activities were carried out using weather data. The first was assignment of PG&E load research data to the five climate zones used by the CEC in forecasting. This activity, whose outcome was reported on previously, was completed using supplementary data provided by PG&E on weather city assignment to each LRD account. A summary of these assignments is presented in Table 3-8.

The second activity has been analysis of the historic weather data. **Tables 3-17** and **18** summarize the weather data found for each of the two coastal and three non-coastal weather stations in 1986. The weather parameters summarized include statistics on dry-bulb and wet-bulb temperature and on heating and cooling degree days. These parameters are averaged in two ways. The simple average is the linear average of the weather stations parameters. The weighted average parameters are calculated using the number of LRD small office buildings in each climate zone with weights shown in Table 3-6.

Since the number of LRD accounts in climate zones IA, IIA, and IIB is very small, statistically meaningful prototypical whole-building load shapes cannot be developed for these climate regions. Therefore, it was decided to combine LRD from climate zones IA and IV into a coastal zone, and to combine LRD from zones IIA, IIB, and III into a non-coastal zone. Also, it was decided that the Oakland/Alameda weather station would represent the coastal climate zone. (see memo "Weather Stations for Analysis of Load Research Data", 10/1/91, Akbari). This decision is based on the averages presented in Table 3-17, where both the simple and weighted average parameters are almost identical to those of the Oakland weather station.

Looking at Table 3-18 it is observed that the simple average parameters are usually very close to those of the Sacramento and the weighted average parameters are close to San Jose weather. Having used the number of retail stores as weights, the weighted parameters would still be close to San Jose. Therefore, for all practical purposes, the choice for a "representative" weather station should be between Sacramento and San Jose. Since, San Jose is in the Bay Area and it usually does not reflect the weather characteristics of the interior valley, we recommended Sacramento, out of the three given weather stations, to represent the non-coastal climate.

Table 3-17. Weather data summary for Oakland and Blue Canyon

Parameter	Oakland	Blue Canyon	Average	
			Simple	Weighted
Avg. Drybulb Temp. (F)	56	51	54	56
Max. Drybulb Temp. (F)	90	85	88	90
Min. Drybulb Temp. (F)	40	22	31	40
Avg. Wetbulb Temp. (F)	52	41	47	52
Max. Wetbulb Temp. (F)	67	65	66	67
min. Wetbulb Temp. (F)	38	17	28	38
Heating Deg. Days (Base 55)	324	2578	1451	347
Heating Deg. Days (Base 60)	1120	3781	2451	1147
Heating Deg. Days (Base 65)	2629	5167	3898	2654
Cooling Deg. Days (Base 55)	1369	1435	1402	1370
Cooling Deg. Days (Base 60)	340	813	577	345
Cooling Deg. Days (Base 65)	24	374	199	28

Table 3-18. Weather data summary for San Jose, Sacramento, and Fresno

Parameter	San Jose	Sacramento	Fresno	Average	
				Simple	Weighted
Avg. Drybulb Temp. (F)	61	60	65	62	61
Max. Drybulb Temp. (F)	97	103	107	102	99
Min. Drybulb Temp. (F)	34	32	33	33	34
Avg. Wetbulb Temp. (F)	54	53	55	54	54
Max. Wetbulb Temp. (F)	75	82	76	78	76
min. Wetbulb Temp. (F)	32	31	31	31	32
Heating Deg. Days (Base 55)	203	586	447	412	263
Heating Deg. Days (Base 60)	683	1233	974	963	763
Heating Deg. Days (Base 65)	1536	2237	1772	1848	1621
Cooling Deg. Days (Base 55)	3015	3010	4400	3475	3180
Cooling Deg. Days (Base 60)	1670	1832	3102	2201	1854
Cooling Deg. Days (Base 65)	698	1011	2075	1261	888

Chapter 4

Results

This chapter summarizes the results of our analyses in developing end-use EUIs and load shapes for all building types studied, using the methodology discussed in Chapter 2. In the following sections we summarize the results for each building type.

The presentation of the results for each building type are organized in the following order:

1. Table of the building prototype and vintage characteristics,
2. A table of DOE-2 simulated and EDA-reconciled end-use EUIs,
3. Two plots of average standard day DOE-2 simulated end-use LSs for coastal and inland climates,
4. Two scatter plots of hourly whole-building EUIs against drybulb temperature for standard days of coastal and inland climates ("+" sign denotes winter days and "small square" sign denotes summer days),
5. Four plots of average standard and nonstandard day EDA reconciled end-use LSs for coastal and inland climates.

See the Glossary of HVAC System Types at the beginning of this report for system type definitions.

Small Office

The small office prototype is modeled as a 3,900 ft^2 single zone, single story building. The building is conditioned with a Packaged Single Zone system, and hot water and heating are provided by a gas furnace.

Major characteristics of the prototypical building are summarized in **Table 4-1**. The vintage and technology options are summarized in **Table 4-2**.

Table 4-3 shows the DOE-2 simulation and EDA-reconciled end-use EUI summaries for the Small Office category of the coastal and inland climate regions. DOE-2 simulated average standard day end-use LSs for the coastal and inland climate zones are shown in **Figure 4-1**. Scatter plots of hourly whole-building EUIs against drybulb temperature for annual standard days of coastal and inland climates are shown in **Figure 4-2**. The inland plot demonstrates significant summer cooling for during the late morning and afternoon, whereas the coastal plot illustrates a weaker correlation between whole-building-load and dry bulb temperature during the afternoon. EDA reconciled average standard and nonstandard day end-use LSs for coastal and inland climates are shown in **Figure 4-3**. The LSs indicate that indoor lighting constitutes the majority of the load, and lesser loads of equal magnitude are cooling, ventilation, office equipment, miscellaneous equipment, and outdoor lighting. Peak operation occurs on weekdays during 8 am to 5 pm.

Note: Packaged Single Zone (PSZ)

Table 4-1. Small Office Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	3.9
Number of Floors	1
Ceiling Insulation R-value	11.5
Wall Insulation R-value	8.9
Window shading coefficient	0.69
Window/wall ratio	0.13
Loads	
Occupancy (ft^2/person)	189
Lights (W/ft^2)	2.0
Equipment (W/ft^2)	0.7
Refrigeration (W/ft^2)	0.02
Cooking (W/ft^2)	0.05
Hot Water ($Btu/hr/ft^2$)	0.2
Schedule	
Standard Days	5
Start	8
Stop	17
Non-Standard Days	2
Start	9
Stop	18
System	
System Type	PSZ
COP	2.4
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Outside Air / Person (CFM)	15
Heat Setpoint	71°F
Cool Setpoint	73°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Furnace

Table 4-2. Small Office Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	11.5	18.9
Wall Insulation R-value	8.9	9.2
Indoor Lighting (W/ft^2)	2.4	2.2
Equipment (W/ft^2)	0.5	0.5
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	PSZ	PSZ

Table 4-3a. Small Office Simulated and EDA-Reconciled EUIs—Coastal (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.58)										
5.82	0.89	1.25	1.20	0.17	0.06	0.15	0.00	0.54	1.75	11.83
Unconditioned (Weight=0.42)										
5.82	0.89	1.25	1.20	0.17	0.06	0.15	0.00	0.00	0.00	9.54
Weighted Average										
5.82	**0.89**	**1.25**	**1.20**	**0.17**	**0.06**	**0.15**	**0.00**	**0.31**	**1.02**	**10.87**
Reconciled										
4.62	**1.54**	**1.39**	**1.11**	**0.17**	**0.03**	**0.12**	**0.05**	**0.22**	**0.82**	**9.69**

Table 4-3b. Small Office Simulated and EDA-Reconciled EUIs—Inland (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.92)										
5.82	0.89	1.25	1.20	0.17	0.06	0.15	0.00	0.82	3.51	13.87
Unconditioned (Weight=0.08)										
5.82	0.89	1.25	1.20	0.17	0.06	0.15	0.00	0.00	0.00	9.54
Weighted Average										
5.82	**0.89**	**1.25**	**1.20**	**0.17**	**0.06**	**0.15**	**0.00**	**0.75**	**3.22**	**13.51**
Reconciled										
4.62	**1.54**	**1.39**	**1.11**	**0.17**	**0.03**	**0.12**	**0.05**	**0.57**	**3.13**	**13.09**

Figure 4-1a. Small Office Simulated Average Standard Day LS - Coastal

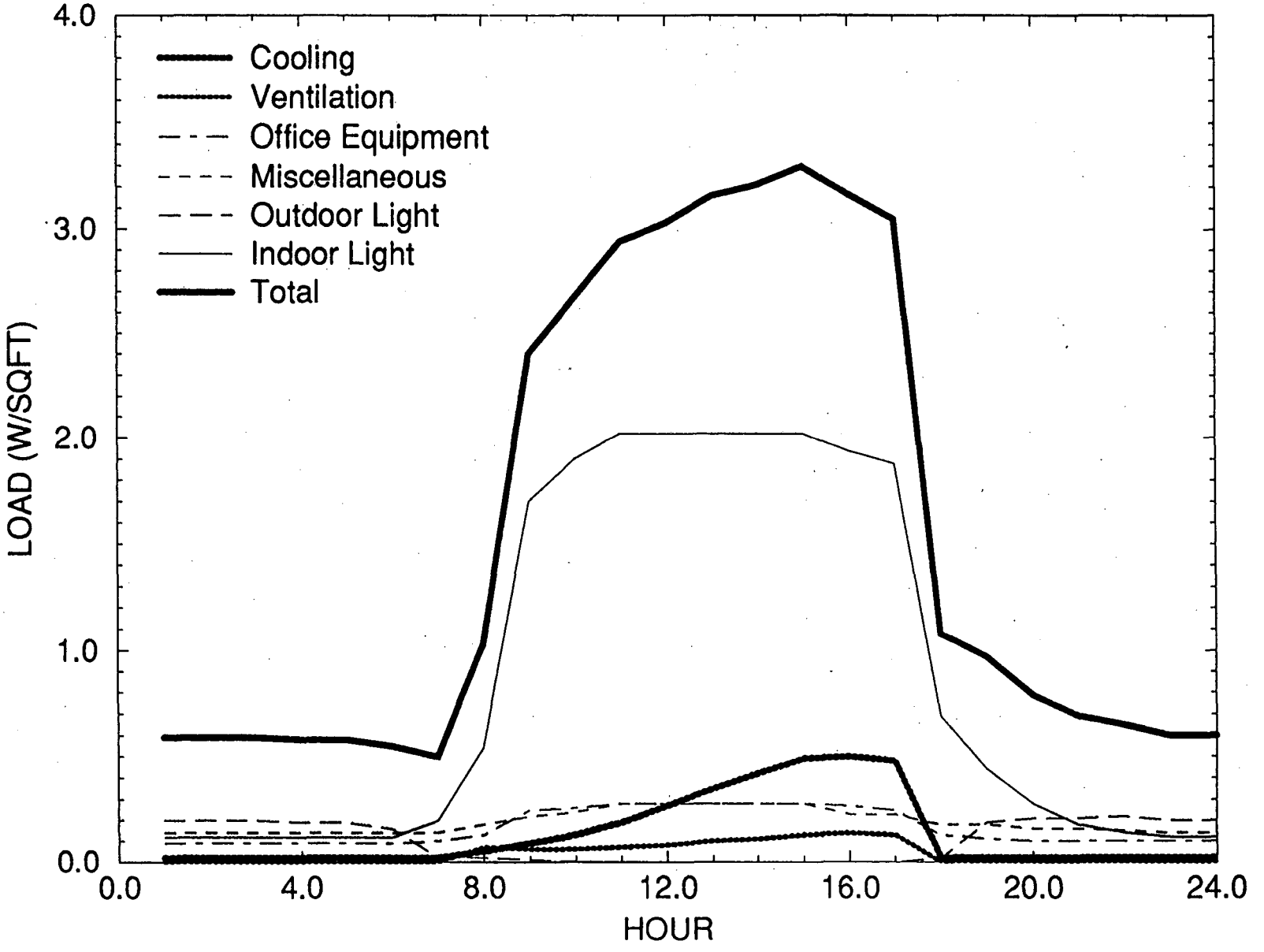


Figure 4-1b. Small Office Simulated Average Standard Day LS - Inland

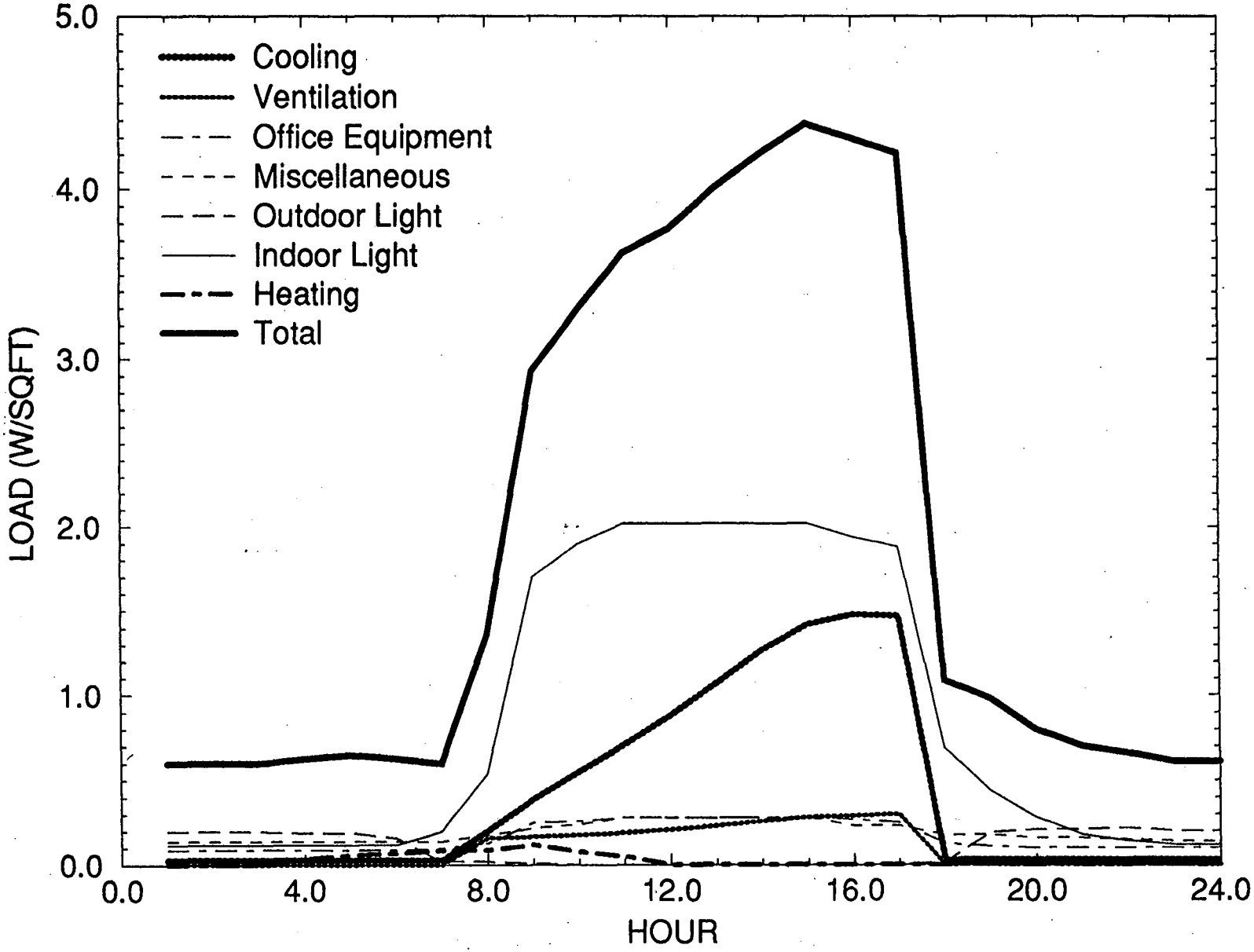


Figure 4-2a. Small Office Whole Building Load vs. Drybulb Temperature for Standard Day - Coastal

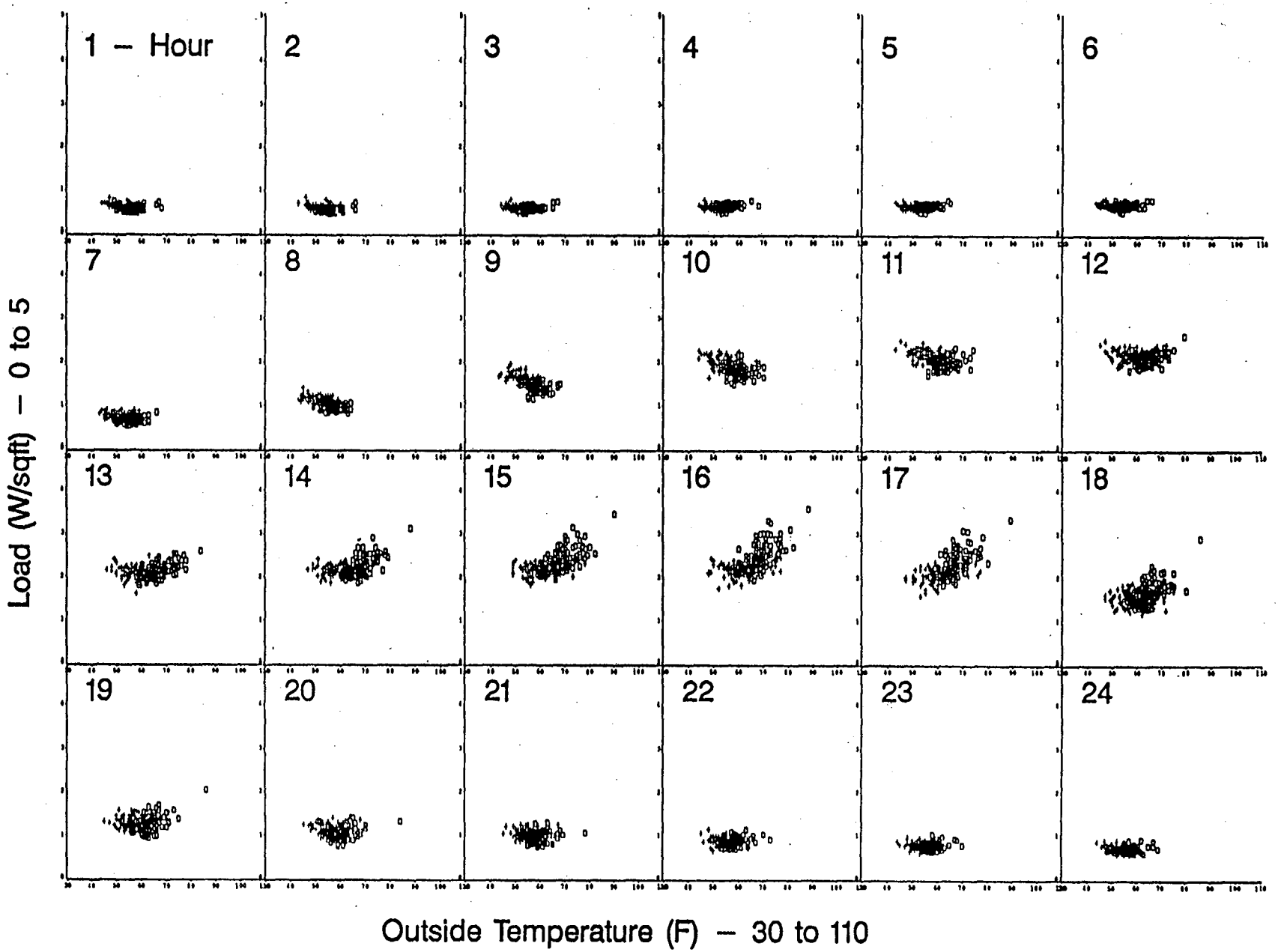


Figure 4-2b. Small Office Whole Building Load vs. Drybulb Temperature for Standard Day - Inland

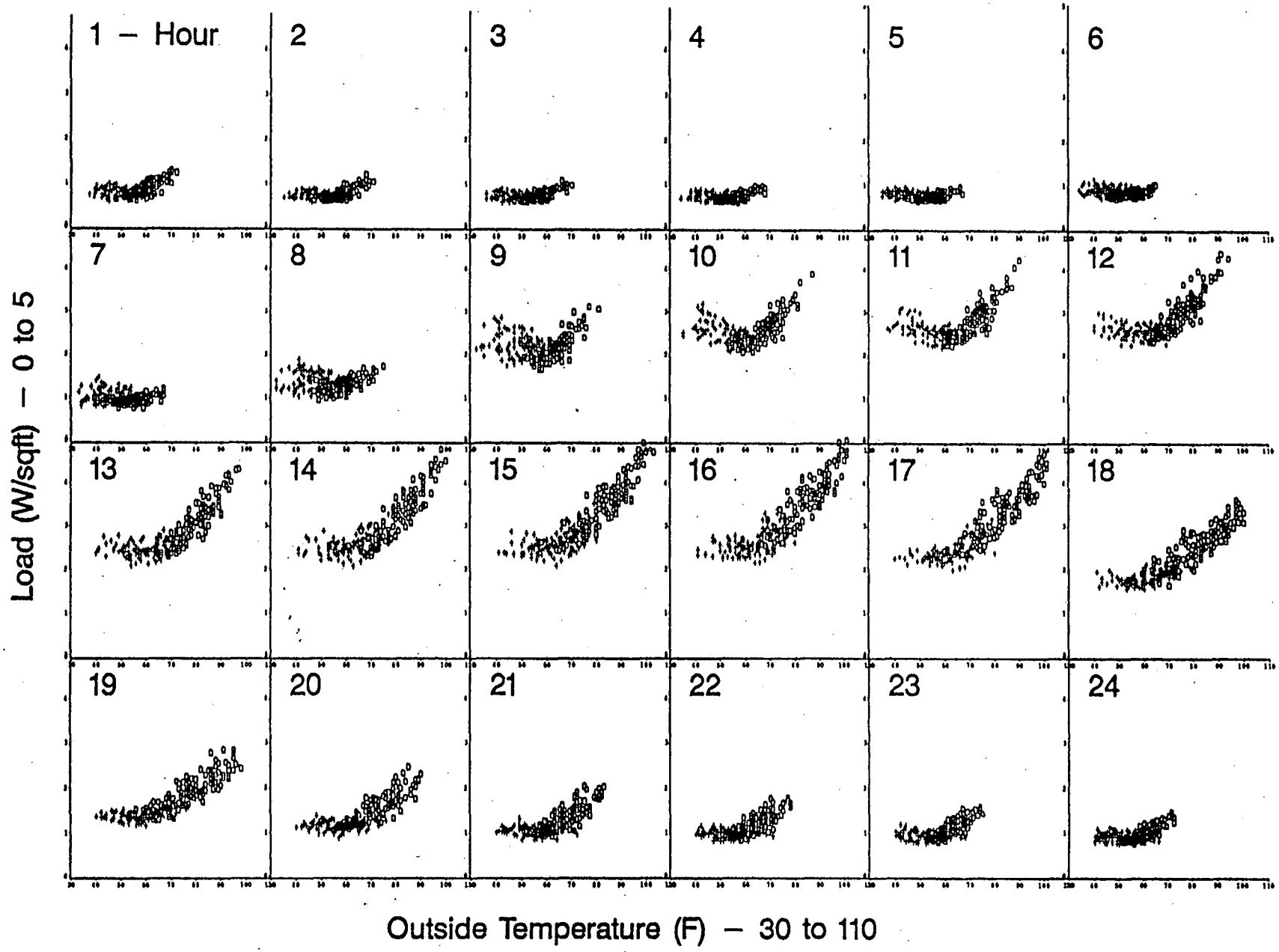


Figure 4-3a. Small Office Reconciled Standard Day Annual End-Use LS - Coastal

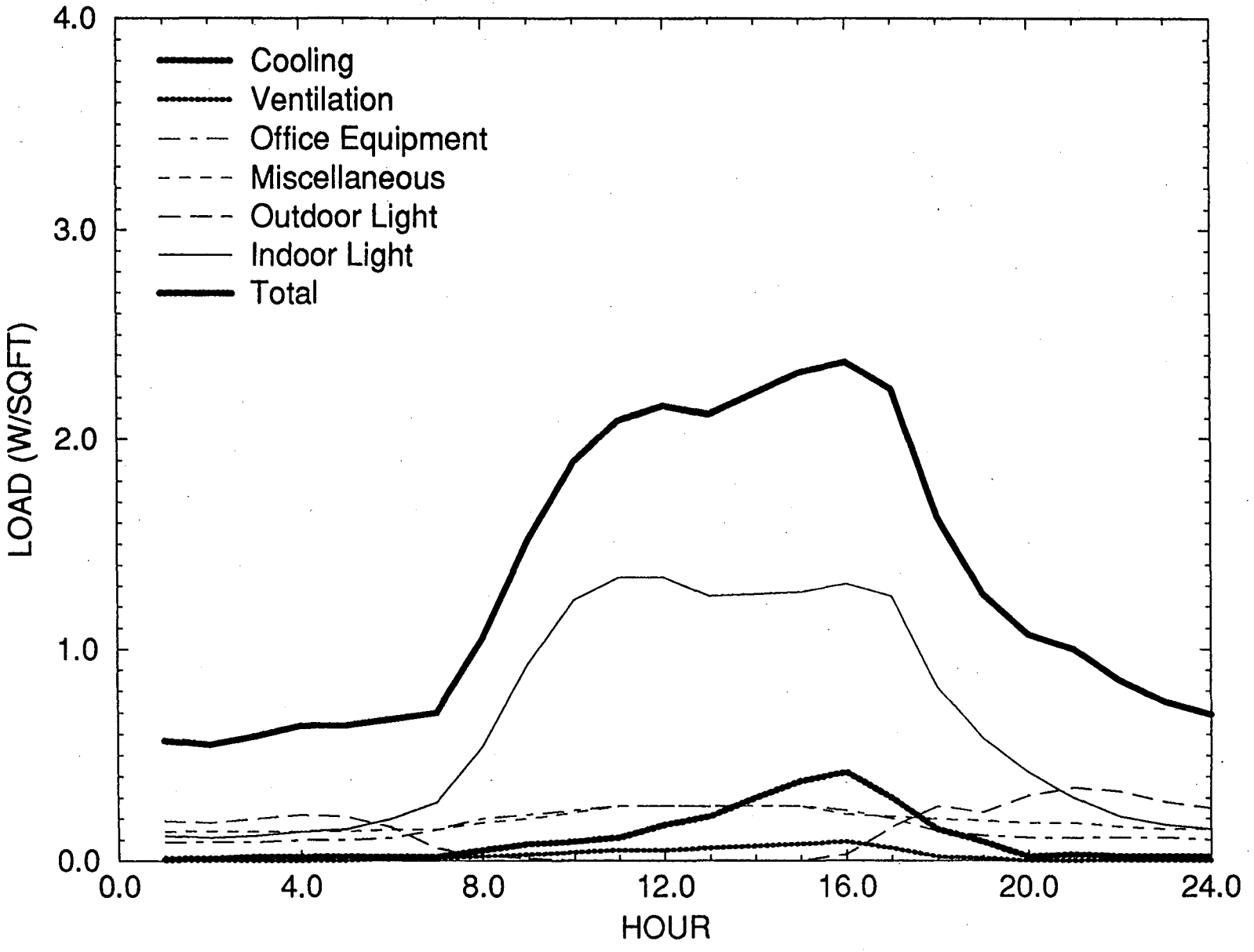


Figure 4-3b. Small Office Reconciled Standard Day Annual End-Use LS - Inland

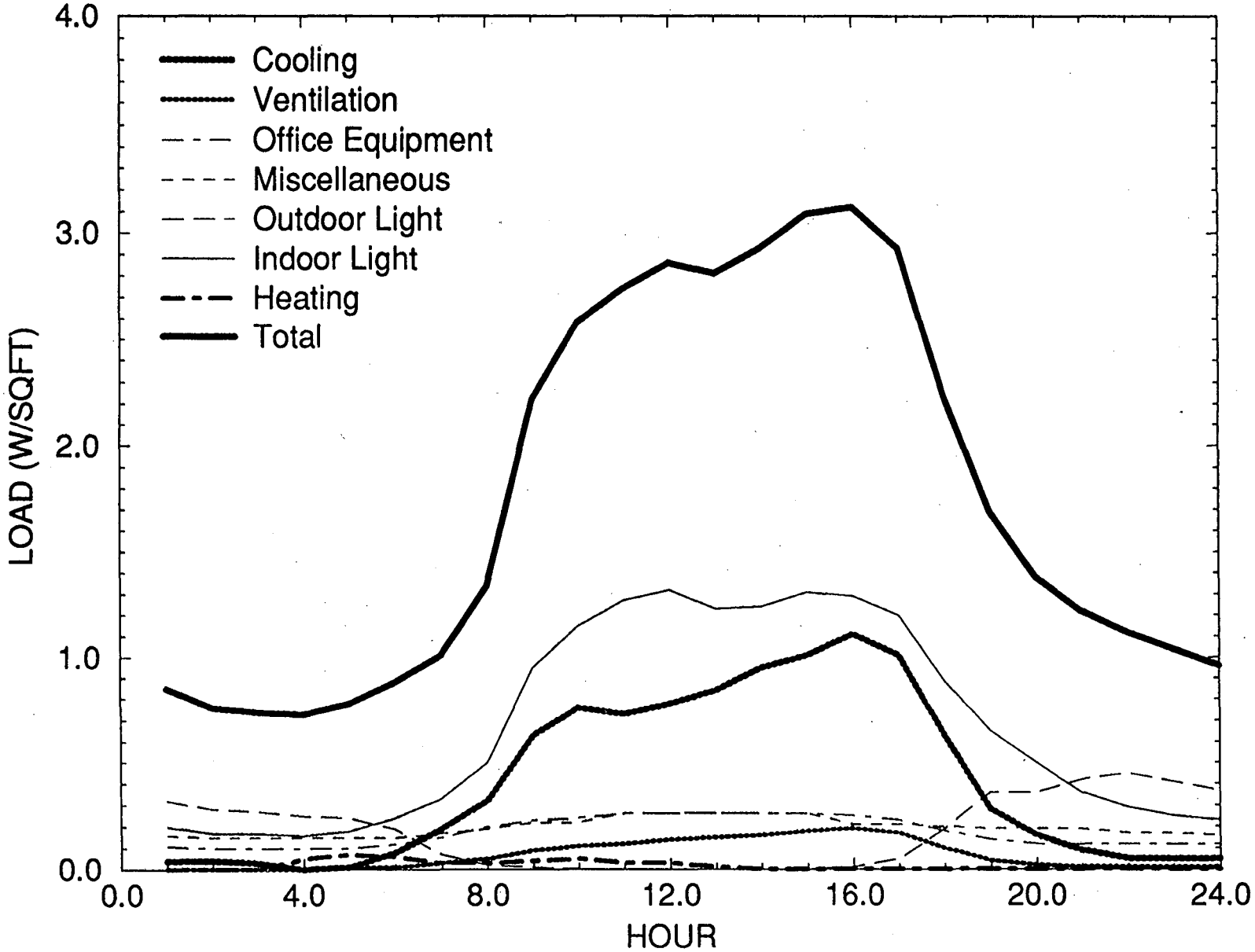


Figure 4-3c. Small Office Reconciled Nonstandard Day Annual End-Use LS - Coastal

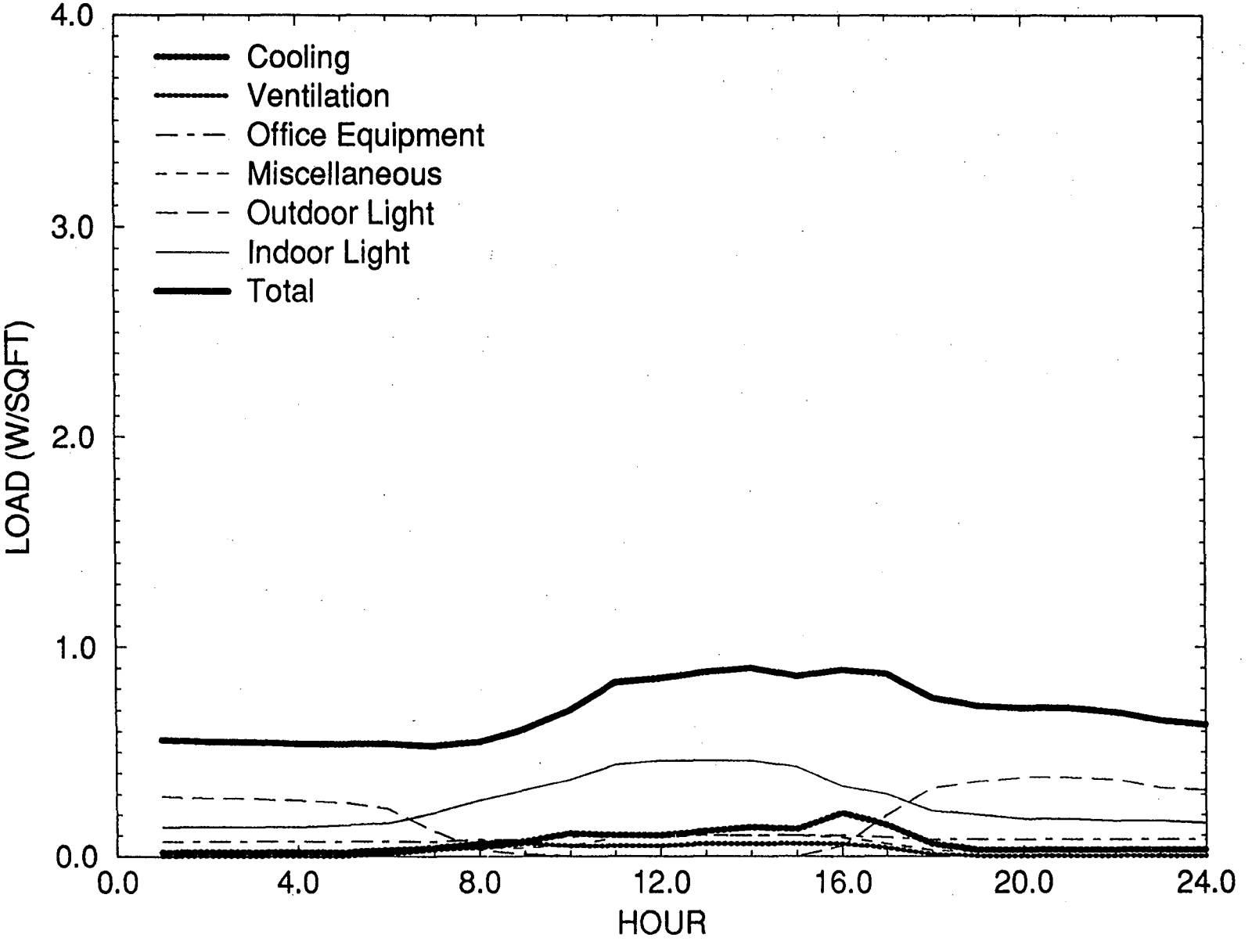
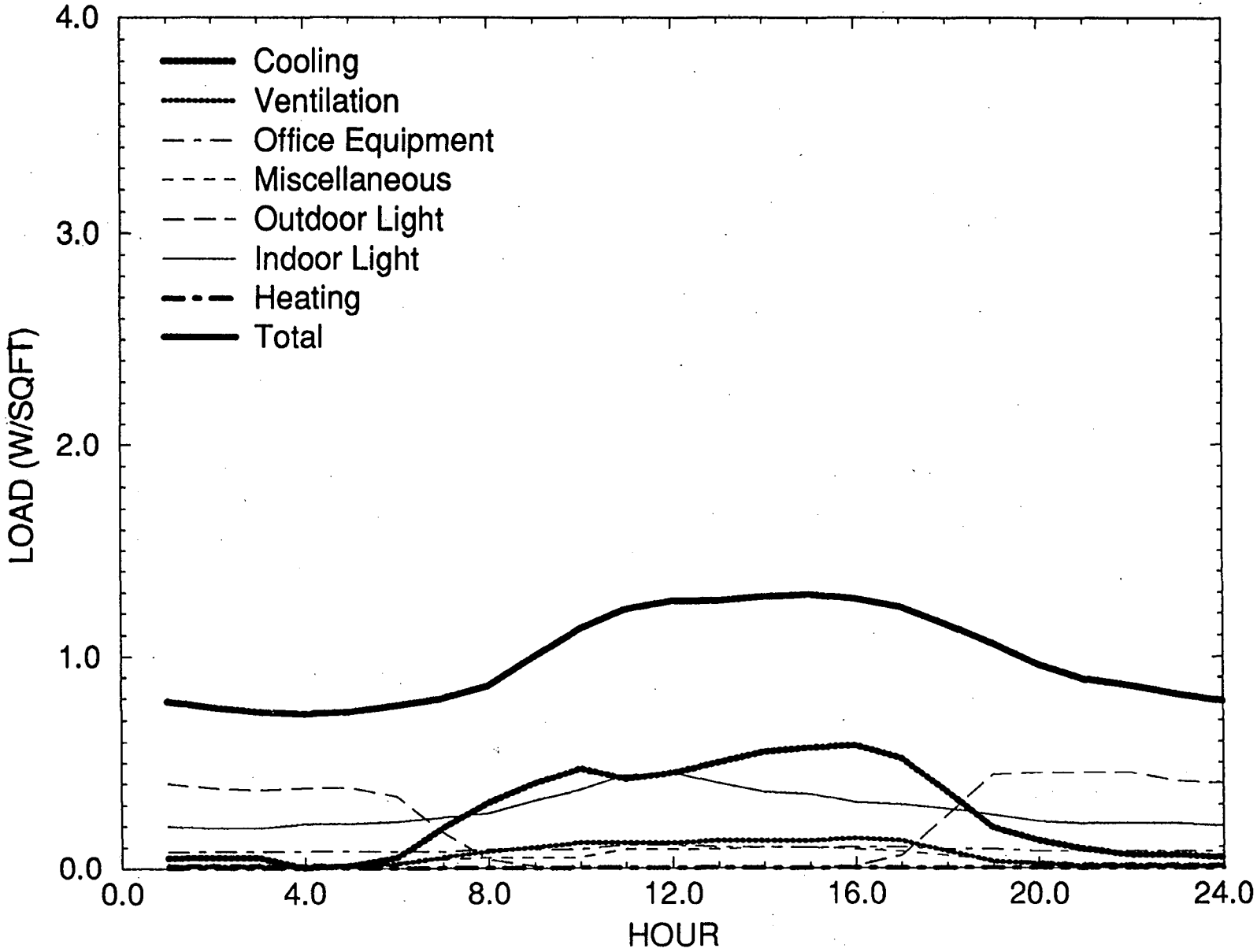


Figure 4-3d. Small Office Reconciled Nonstandard Day Annual End-Use LS - Inland



Large Office

The large office prototype is a 99,600 ft^2 five story building modeled with five identical zones. The prototype is conditioned with a Single Zone Reheat system for the central system and a Packaged Single Zone system for the packaged system. Hot water is provided by a gas furnace, and heating is provided by a gas boiler. For the central system, cooling is provided by hermetic centrifugal chillers.

Major characteristics of the prototypical building are summarized in **Table 4-4**. The vintage and technology options are summarized in **Table 4-5**.

Table 4-6 shows the simulation and EDA-reconciled end-use EUI summaries for the Large Office category of the coastal and inland climate regions. DOE-2 simulated average standard day end-use LSs for the coastal and inland climate zones are shown in **Figure 4-4**. Indoor lighting account for most of the load. Scatter plots of hourly whole-building EUIs against drybulb temperature for annual standard days of coastal and inland climates are shown in **Figure 4-5**. These plots reveal a cooling dependent load during business hours. EDA reconciled average standard and nonstandard day end-use LSs for coastal and inland climates are shown in **Figure 4-6**. The LSs indicate that indoor lighting constitutes the majority of the load, and lesser loads of equal magnitude are cooling, ventilation, office equipment, miscellaneous equipment, and outdoor lighting. Peak operation occurs on weekdays during 8 am to 5 pm.

Note: Packaged Single Zone (PSZ)
Packaged Multi Zone (PMZ)
Single Zone Reheat (SZRH)
Variable Air Volume (VAV)

Table 4-4. Large Office Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	99.6
Number of Floors	5
Ceiling Insulation R-value	12.4
Wall Insulation R-value	9.0
Window shading coefficient	0.59
Window/wall ratio	0.13
Loads	
Occupancy (ft^2/person)	273
Lights (W/ft^2)	1.5
Equipment (W/ft^2)	0.7
Refrigeration (W/ft^2)	0.01
Cooking (W/ft^2)	0.05
Hot Water ($Btu/hr/ft^2$)	0.04
Schedule	
Standard Days	5
Start	6
Stop	20
Non-Standard Days	2
Start	9
Stop	19
System	
System Type	Packaged: PSZ Central: SZRH
COP	2.5
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Outside Air / Person (CFM)	15
Heat Setpoint	70°F
Cool Setpoint	72°F
Plant	
Heating	Gas Boiler
Cooling	Packaged: Direct Expansion Central: Hermetic Centrifugal Chiller
Hot Water	Gas Furnace

Table 4-5. Large Office Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	12.4	18.9
Wall Insulation R-value	6.3	9.2
Indoor Lighting (W/ft^2)	1.6	1.6
Equipment (W/ft^2)	0.5	0.5
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	Packaged: PMZ Central: SZRH	PSZ VAV

Table 4-6a. Large Office Simulated and EDA-Reconciled EUIs—Coastal (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Packaged (Weight=0.51)										
6.77	0.23	1.57	1.21	0.08	0.09	0.04	0.00	0.87	2.71	13.57
Central (Weight=0.49)										
6.77	0.23	1.57	1.21	0.08	0.09	0.04	0.00	3.84	2.83	16.66
Weighted Average										
6.77	**0.23**	**1.57**	**1.21**	**0.08**	**0.09**	**0.04**	**0.00**	**2.33**	**2.77**	**15.09**
Reconciled										
10.48	**0.44**	**2.14**	**1.73**	**0.09**	**0.15**	**0.05**	**0.00**	**2.98**	**3.88**	**20.40**

Table 4-6b. Large Office Simulated and EDA-Reconciled EUIs—Inland (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Packaged (Weight=0.51)										
6.77	0.23	1.57	1.21	0.08	0.09	0.04	0.00	1.03	3.71	14.73
Central (Weight=0.49)										
6.77	0.23	1.57	1.21	0.08	0.09	0.04	0.00	4.43	3.85	18.27
Weighted Average										
6.77	**0.23**	**1.57**	**1.21**	**0.08**	**0.09**	**0.04**	**0.00**	**2.71**	**3.78**	**16.48**
Reconciled										
10.48	**0.44**	**2.14**	**1.73**	**0.09**	**0.15**	**0.05**	**0.00**	**4.03**	**5.71**	**26.36**

Figure 4-4a. Large Office Simulated Average Standard Day LS - Coastal

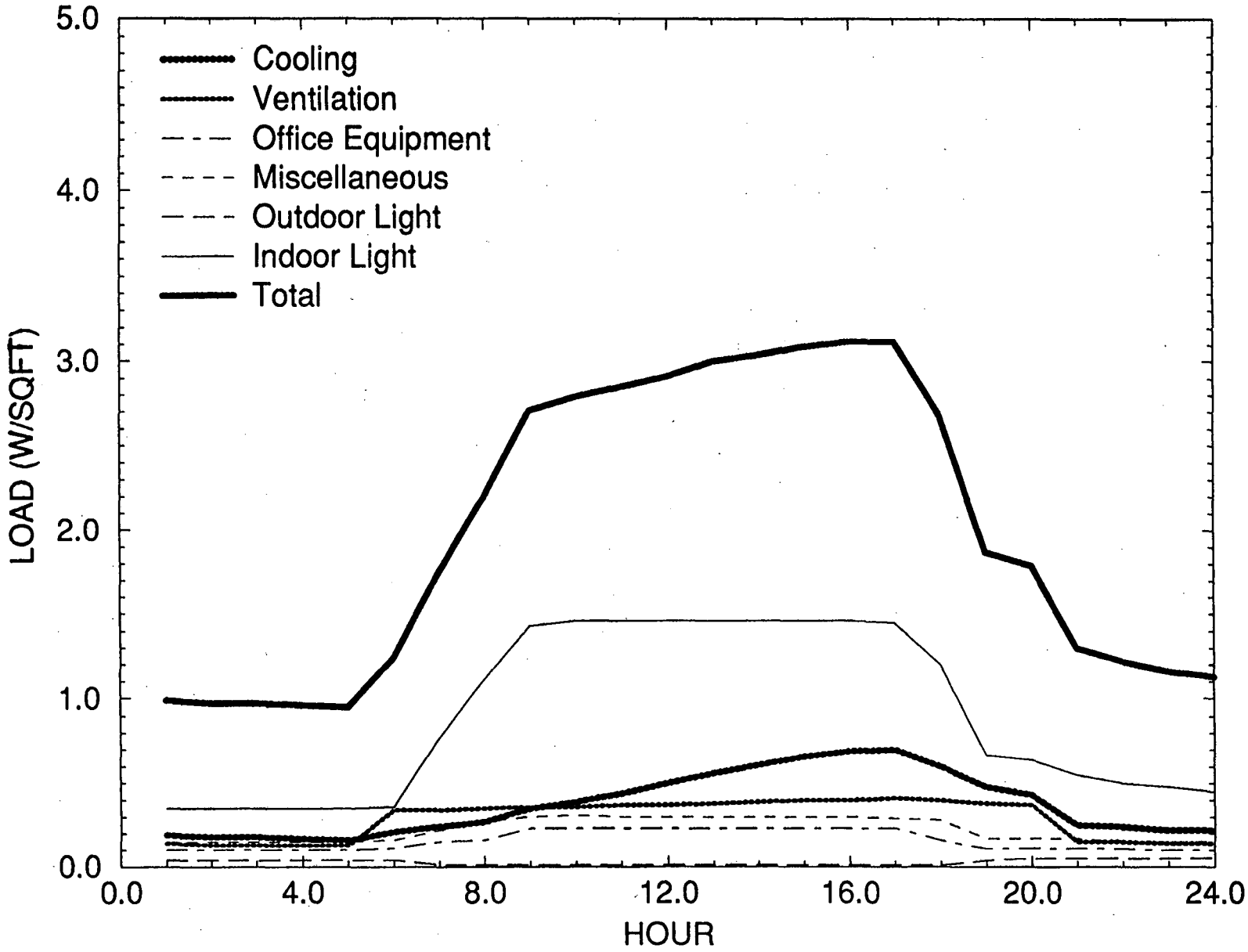


Figure 4-4b. Large Office Simulated Average Standard Day LS - Inland

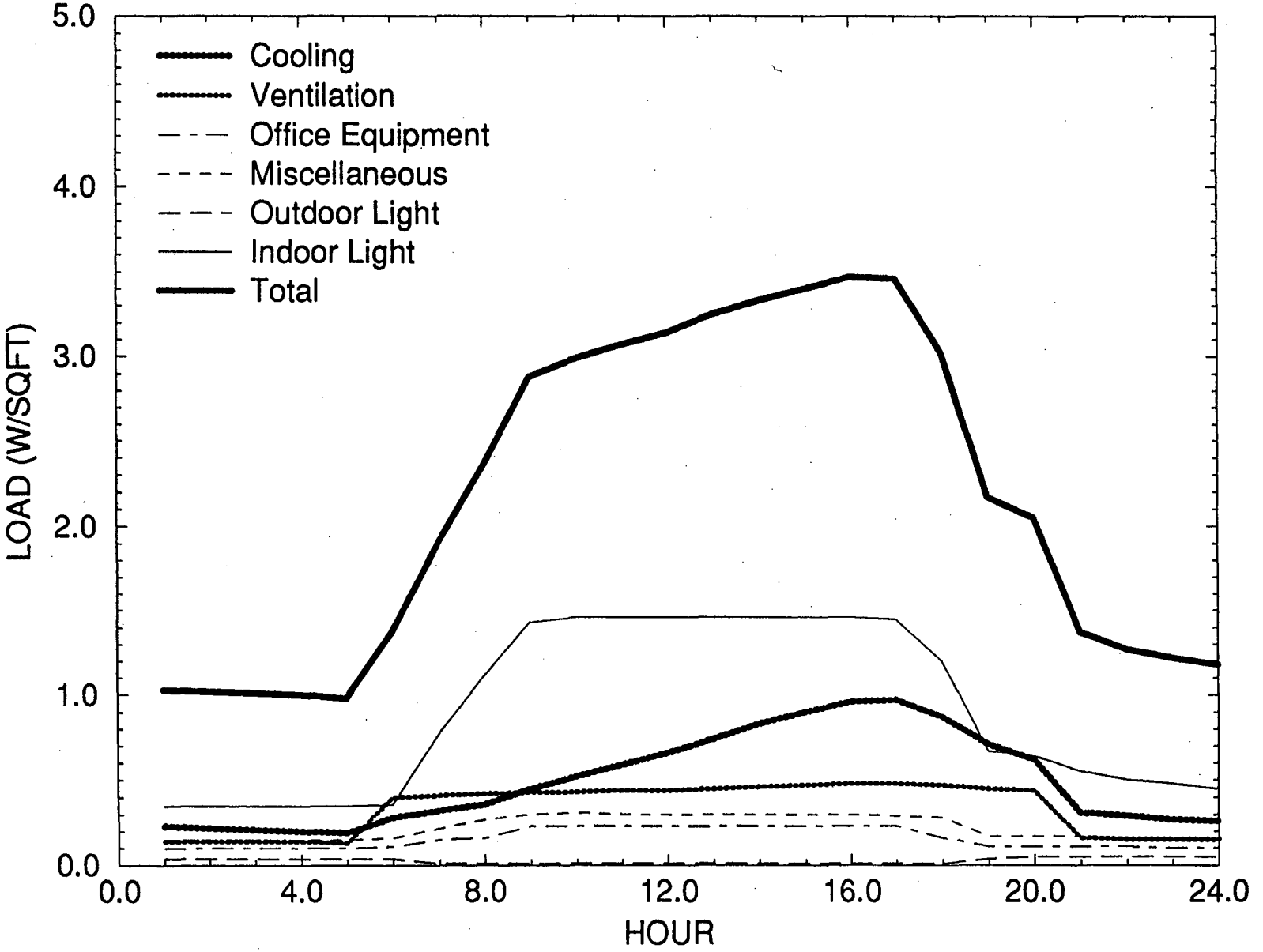


Figure 4-5a. Large Office Whole Building Load vs. Drybulb Temperature for Standard Day - Coastal

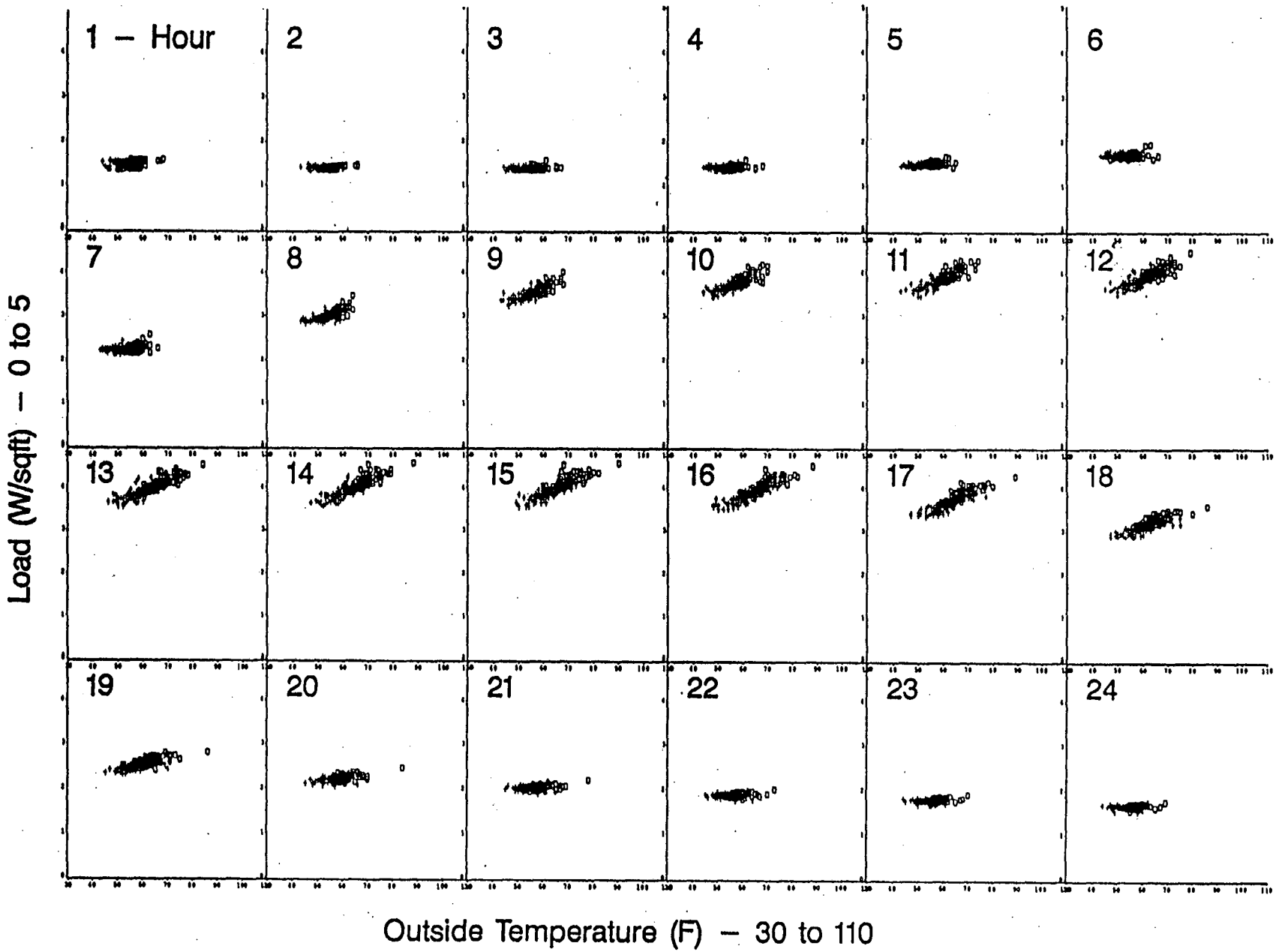


Figure 4-5b. Large Office Whole Building Load vs. Drybulb Temperature for Standard Day - Inland

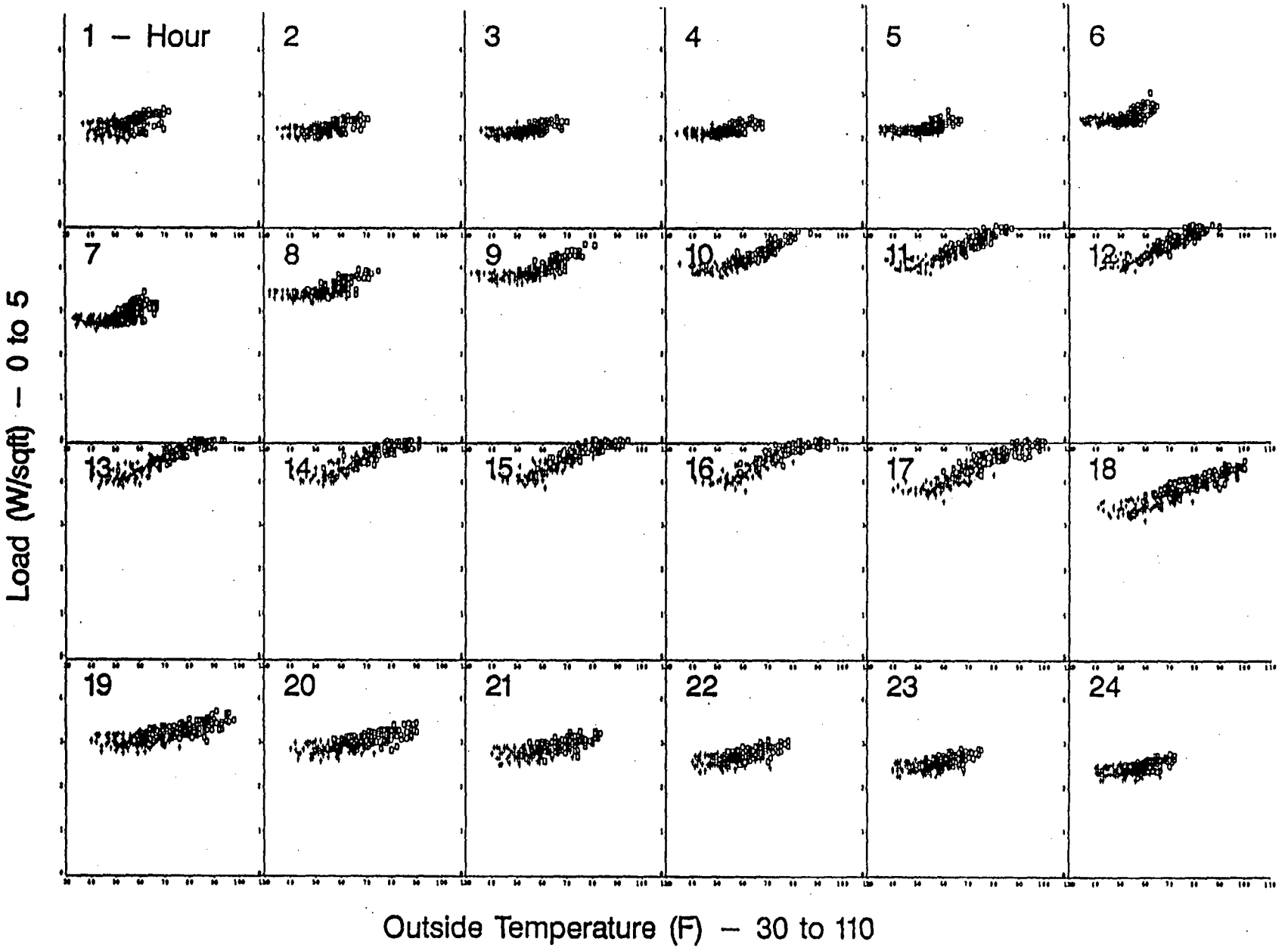


Figure 4-6a. Large Office Reconciled Standard Day Annual End-Use LS - Coastal

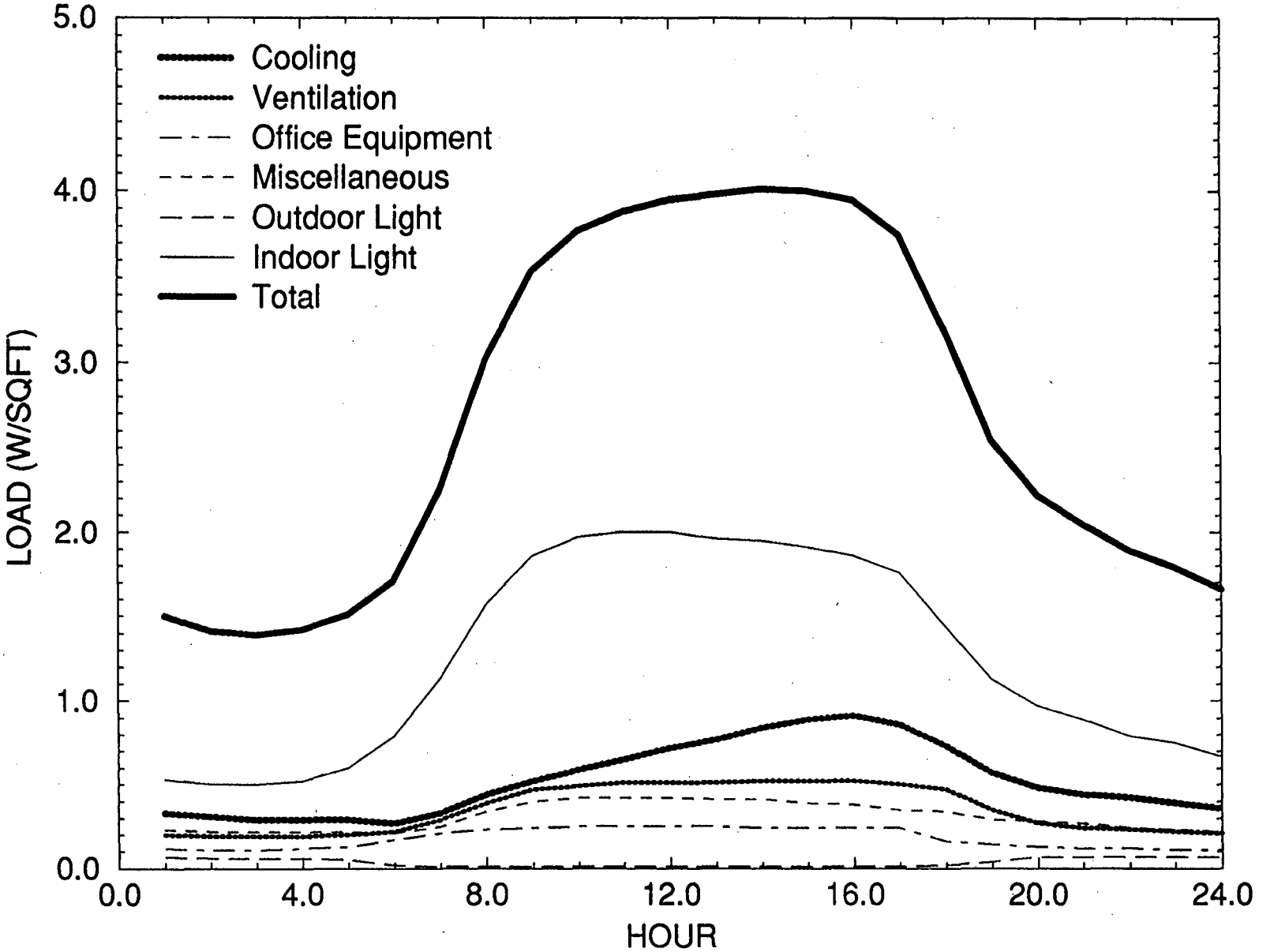


Figure 4-6b. Large Office Reconciled Standard Day Annual End-Use LS - Inland

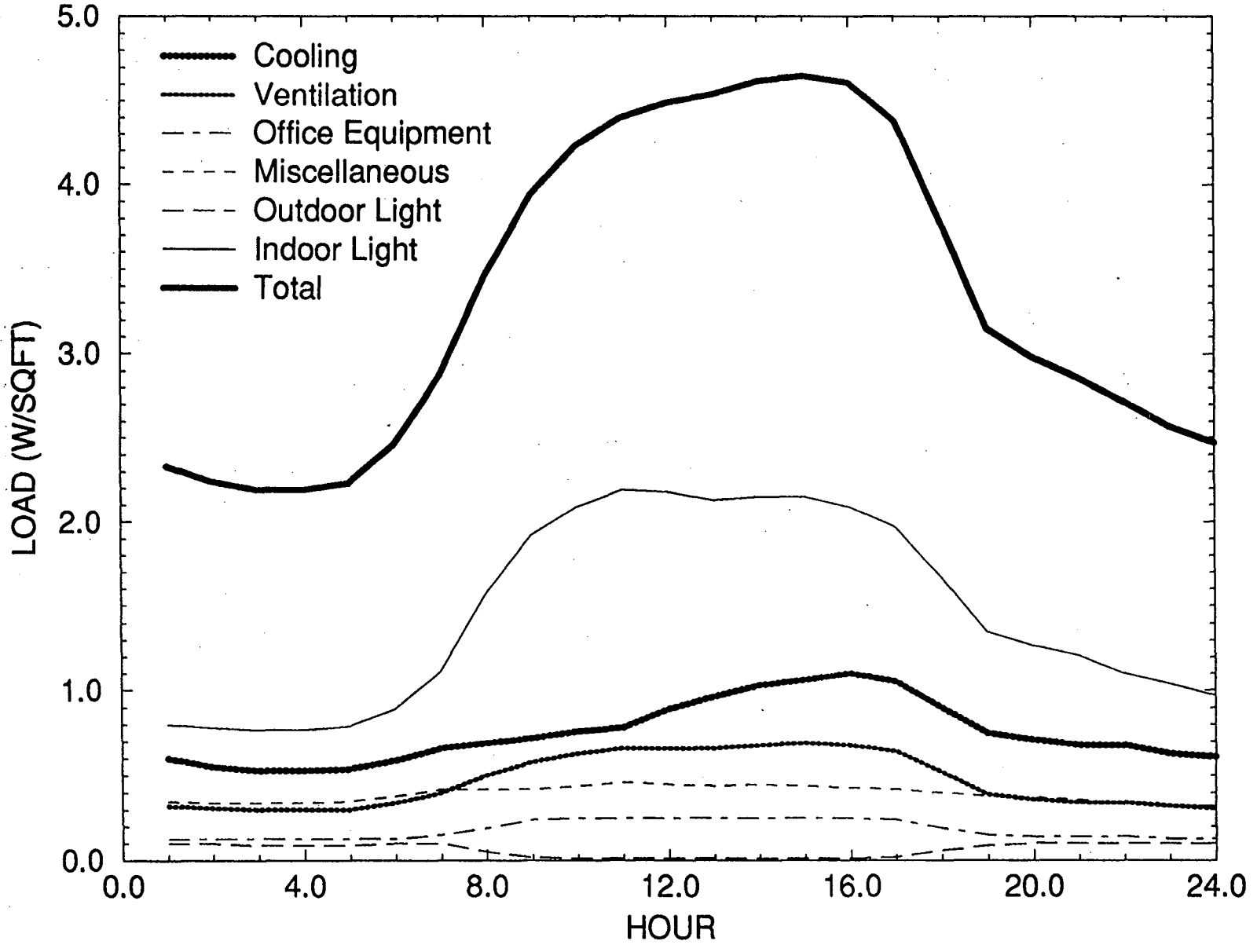


Figure 4-6c. Large Office Reconciled Nonstandard Day Annual End-Use LS - Coastal

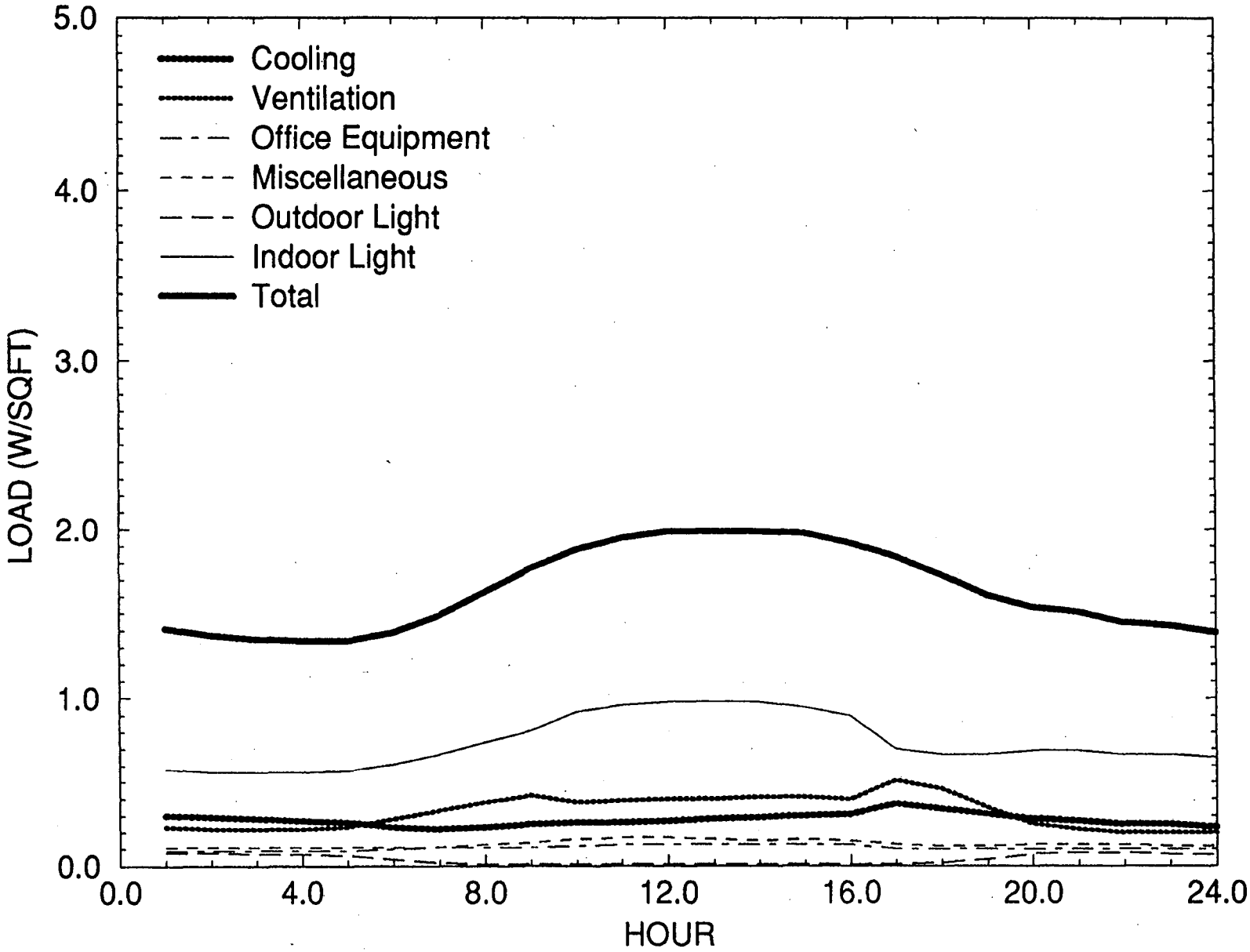
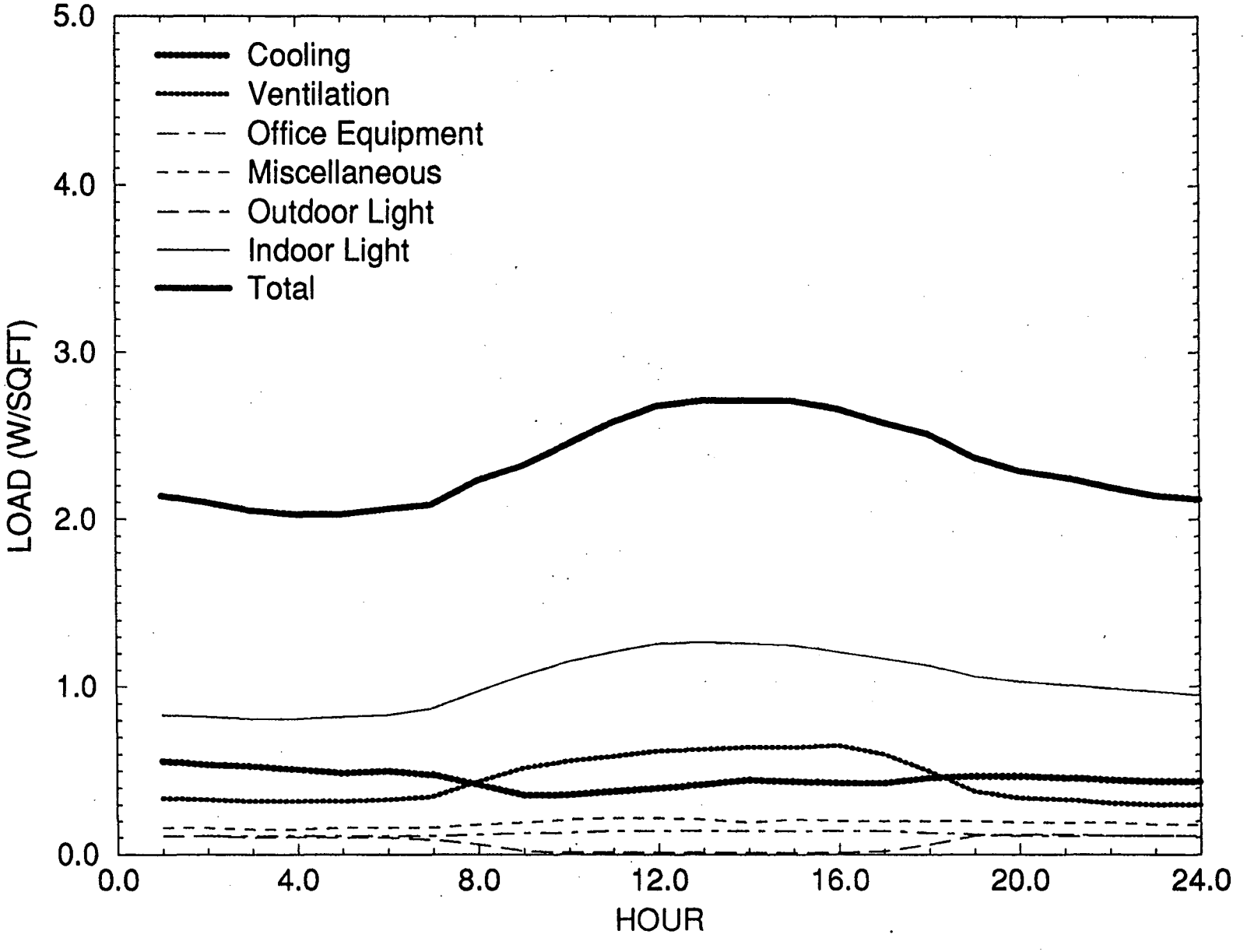


Figure 4-6d. Large Office Reconciled Nonstandard Day Annual End-Use LS - Inland



Retail Store

The retail store prototype is a combination of small and large types.

Small Retail

The small retail prototype is a 3,100 ft^2 single story building modeled with a single zone and conditioned with a Packaged Single Zone system. Hot water and heating are provided by a gas furnace.

Major characteristics of the prototypical building are summarized in **Table 4-7**. The vintage and technology options are summarized in **Table 4-8**.

Large Retail

The large retail prototype is a 97,000 ft^2 single story building modeled with five identical zones. The central version is conditioned with a Single Zone Reheat system and the packaged version is conditioned with a Packaged Single Zone system. Hot water and heating are provided by a gas furnace, and cooling is provided by hermetic centrifugal chillers for the central system.

Major characteristics of the prototypical building are summarized in **Table 4-9**. The vintage and technology options are summarized in **Table 4-10**.

Retail Store

Table 4-11 shows the simulation and EDA-reconciled end-use EUI summaries for the Retail Store of the coastal and inland climate regions. DOE-2 simulated average standard day end-use LSs for the coastal and inland climate zones are shown in **Figure 4-7**. Scatter plots of hourly whole-building EUIs against drybulb temperature for annual standard days of coastal and inland climates are shown in **Figure 4-8**. The inland plot demonstrates significant summer cooling during the late morning and afternoon, whereas the coastal plot shows no correlation between whole-building-load and dry bulb temperature. EDA reconciled average standard and nonstandard day end-use LSs for coastal and inland climates are shown in **Figure 4-9**. The LSs indicate that indoor lighting constitutes the majority of the load, and lesser loads of equal magnitude are cooling, ventilation, miscellaneous equipment, and outdoor lighting (note inland cooling is approximately two times greater than coastal). Peak operation occurs on weekdays during 9 am to 9 pm and on weekends from 10 am to 6 pm.

Note: Packaged Single Zone (PSZ)
Single Zone Reheat (SZRH)
Variable Air Volume (VAV)

Table 4-7. Small Retail Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	3.1
Number of Floors	1
Ceiling Insulation R-value	8.1
Wall Insulation R-value	6.9
Window shading coefficient	0.82
Window/wall ratio	0.08
Loads	
Occupancy (ft^2/person)	159
Lights (W/ft^2)	2.0
Equipment (W/ft^2)	0.4
Refrigeration (W/ft^2)	0.06
Cooking (W/ft^2)	0.01
Hot Water ($Btu/hr/ft^2$)	0.02
Schedule	
Standard Days	5
Start	10
Stop	17
Non-Standard Days	2
Start	10
Stop	17
System	
System Type	PSZ
COP	2.4
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Outside Air / Person (CFM)	15
Heat Setpoint	70°F
Cool Setpoint	74°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Furnace

Table 4-8. Small Retail Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	8.1	18.9
Wall Insulation R-value	6.9	9.2
Indoor Lighting (W/ft^2)	2.0	2.1
Equipment (W/ft^2)	0.3	0.3
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	PSZ	PSZ

Table 4-9. Large Retail Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	97.0
Number of Floors	1
Ceiling Insulation R-value	16.3
Wall Insulation R-value	7.8
Window shading coefficient	0.62
Window/wall ratio	0.2
Loads	
Occupancy (ft^2/person)	337
Lights (W/ft^2)	1.7
Equipment (W/ft^2)	0.4
Refrigeration (W/ft^2)	0.01
Cooking (W/ft^2)	0.01
Hot Water ($Btu/hr/ft^2$)	0.01
Schedule	
Standard Days	5
Start	8
Stop	20
Non-Standard Days	2
Start	9
Stop	19
System	
System Type	Packaged: PSZ Central: SZRH
COP	2.6
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Outside Air / Person (CFM)	15
Heat Setpoint	70°F
Cool Setpoint	73°F
Plant	
Heating	Gas Furnace
Cooling	Packaged: Direct Expansion Central: Hermetic Centrifugal Chiller
Hot Water	Gas Furnace

Table 4-10. Large Retail Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	16.3	33.3
Wall Insulation R-value	7.8	9.2
Indoor Lighting (W/ft^2)	2.1	1.9
Equipment (W/ft^2)	0.3	0.3
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	Packaged: PSZ Central: SZRH	PSZ VAV

Table 4-11a. Retail Store Simulated and EDA-Reconciled EUIs—Coastal (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Small Retail (Weight=0.76)										
Conditioned (Weight=0.57)										
6.48	0.41	0.78	0.00	0.52	0.03	0.05	0.00	0.53	1.62	10.42
Unconditioned (Weight=0.43)										
6.48	0.41	0.78	0.00	0.52	0.03	0.05	0.00	0.00	0.00	8.27
Weighted Average										
6.48	0.41	0.78	0.00	0.52	0.03	0.05	0.00	0.30	0.92	9.49
Large Retail (Weight=0.24)										
Packaged (Weight=0.70)										
7.12	0.20	1.21	0.00	0.12	0.04	0.01	0.00	0.66	1.88	11.24
Central (Weight=0.30)										
7.12	0.20	1.21	0.00	0.12	0.04	0.01	0.00	2.08	1.59	12.37
Weighted Average										
7.12	0.20	1.21	0.00	0.12	0.04	0.01	0.00	1.09	1.79	11.58
Weighted Average										
6.63	**0.36**	**0.88**	**0.00**	**0.42**	**0.03**	**0.04**	**0.00**	**0.49**	**1.13**	**9.98**
Reconciled										
5.12	**0.78**	**0.54**	**0.24**	**0.44**	**0.03**	**0.03**	**0.00**	**0.34**	**0.84**	**8.36**

Table 4-11b. Retail Store Simulated and EDA-Reconciled EUIs—Inland (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Small Retail (Weight=0.81)										
Conditioned (Weight=0.74)										
6.48	0.41	0.78	0.00	0.52	0.03	0.05	0.00	0.59	2.86	11.72
Unconditioned (Weight=0.26)										
6.48	0.41	0.78	0.00	0.52	0.03	0.05	0.00	0.00	0.00	8.27
Weighted Average										
6.48	0.41	0.78	0.00	0.52	0.03	0.05	0.00	0.44	2.12	10.83
Large Retail (Weight=0.19)										
Packaged (Weight=0.70)										
7.12	0.20	1.21	0.00	0.12	0.04	0.01	0.00	0.73	2.77	12.20
Central (Weight=0.30)										
7.12	0.20	1.21	0.00	0.12	0.04	0.01	0.00	2.35	2.28	13.33
Weighted Average										
7.12	0.20	1.21	0.00	0.12	0.04	0.01	0.00	1.22	2.62	12.54
Weighted Average										
6.60	**0.37**	**0.86**	**0.00**	**0.45**	**0.03**	**0.04**	**0.00**	**0.71**	**2.80**	**11.86**
Reconciled										
7.05	**0.82**	**0.75**	**0.24**	**0.47**	**0.03**	**0.04**	**0.12**	**0.80**	**2.24**	**12.56**

Figure 4-7a. Retail Store Simulated Average Standard Day LS - Coastal

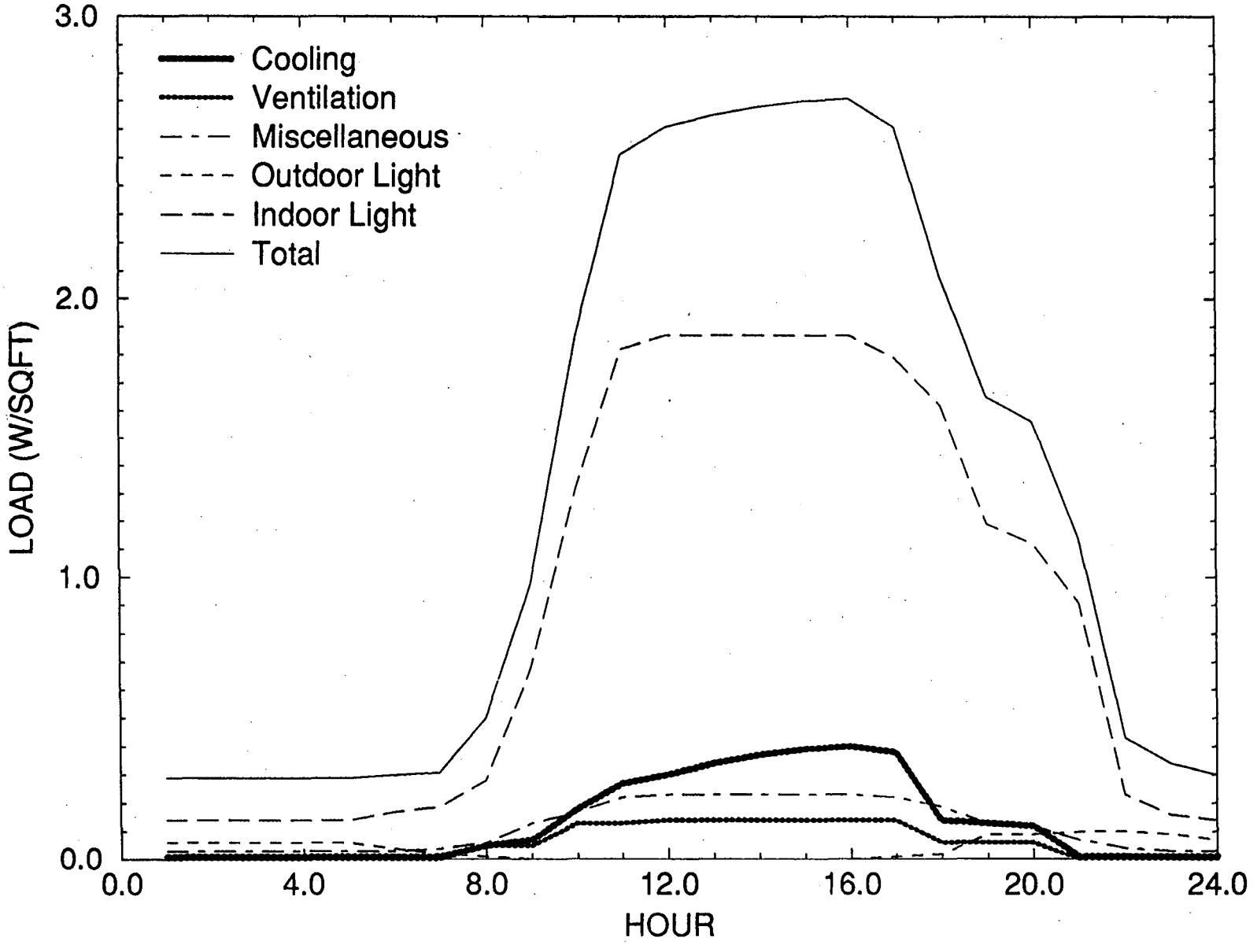


Figure 4-7b. Retail Store Simulated Average Standard Day LS - Inland

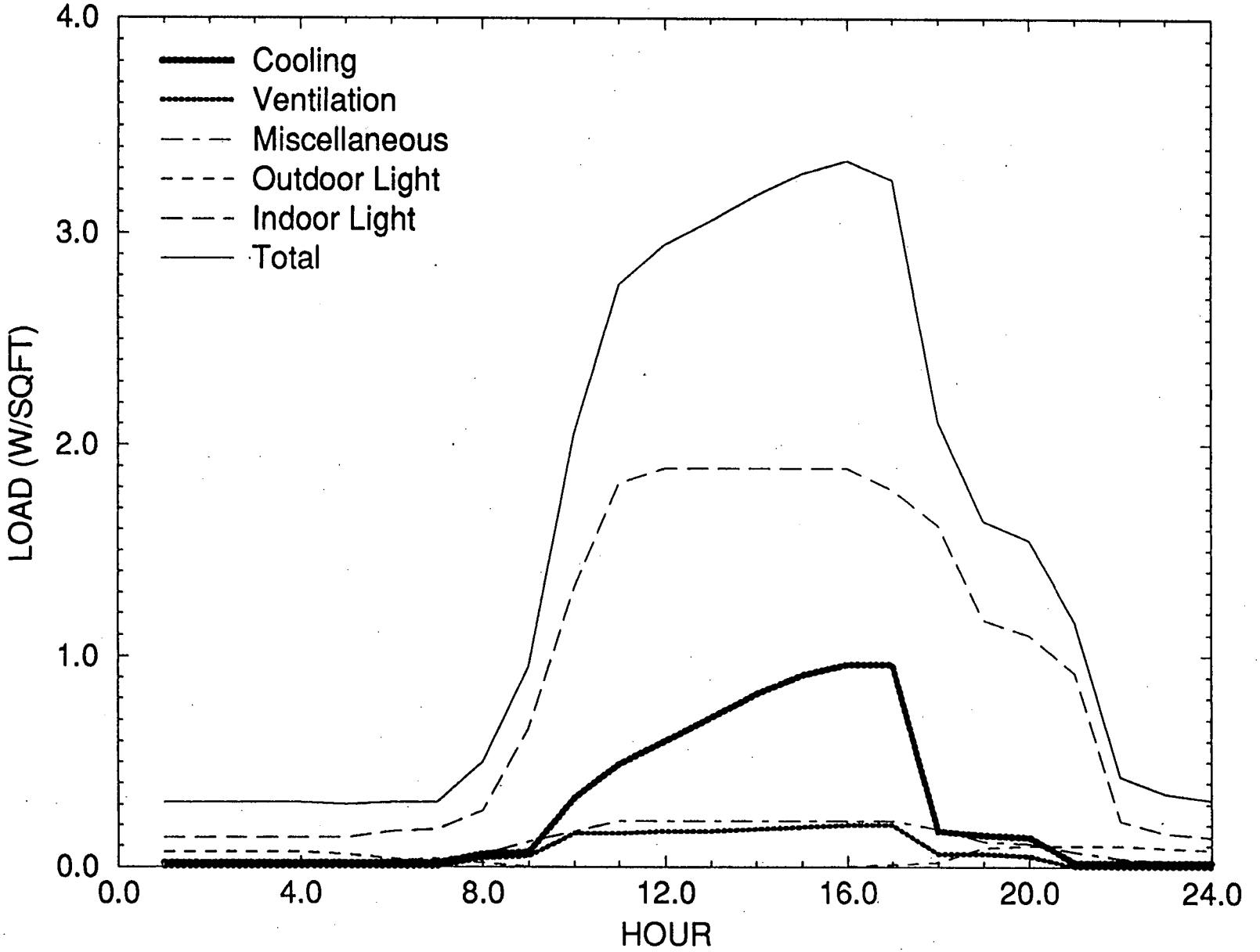


Figure 4-8a. Retail Store Whole Building Load vs. Drybulb Temperature for Standard Day - Coastal

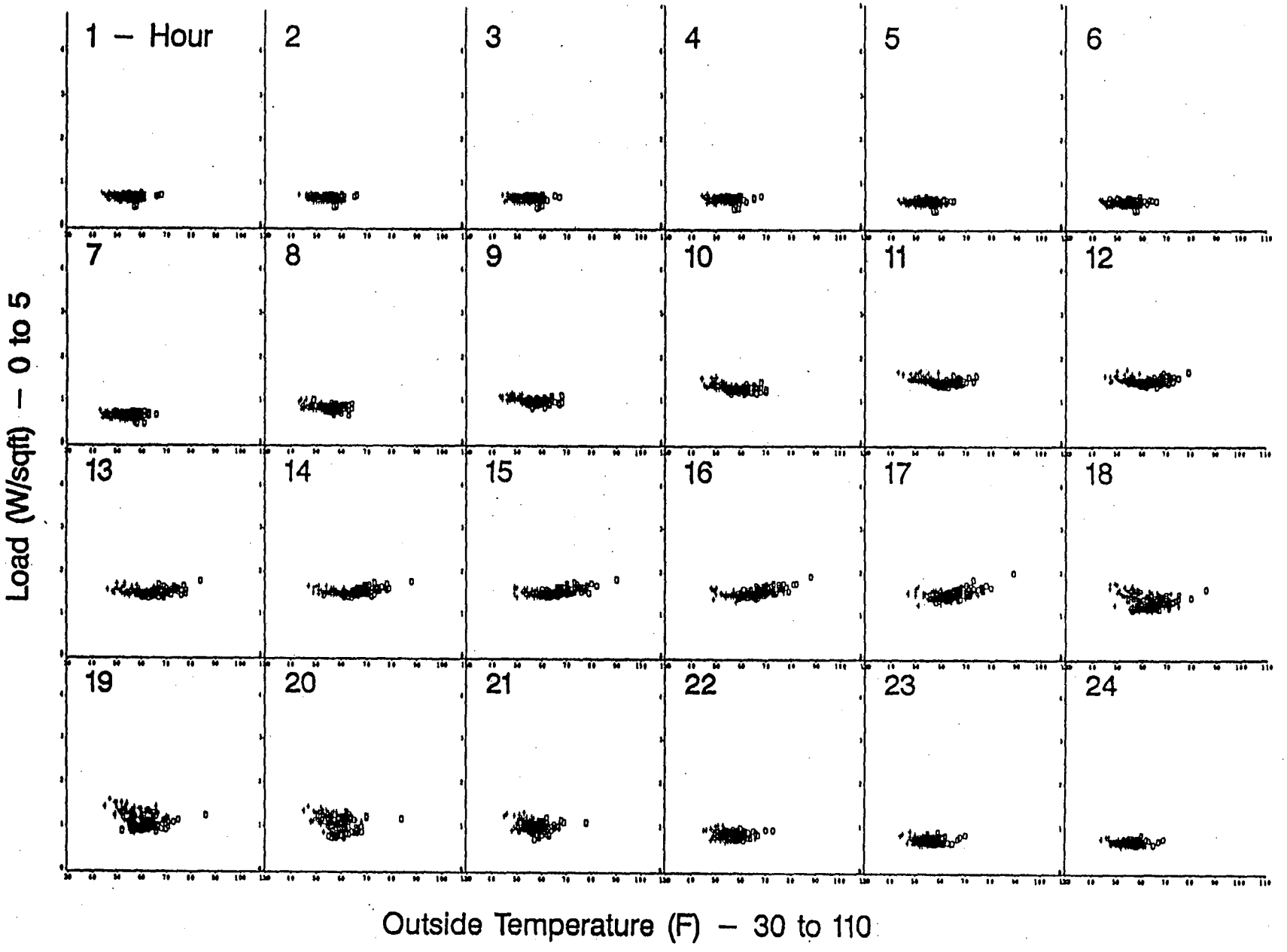


Figure 4-8b. Retail Store Whole Building Load vs. Drybulb Temperature for Standard Day - Inland

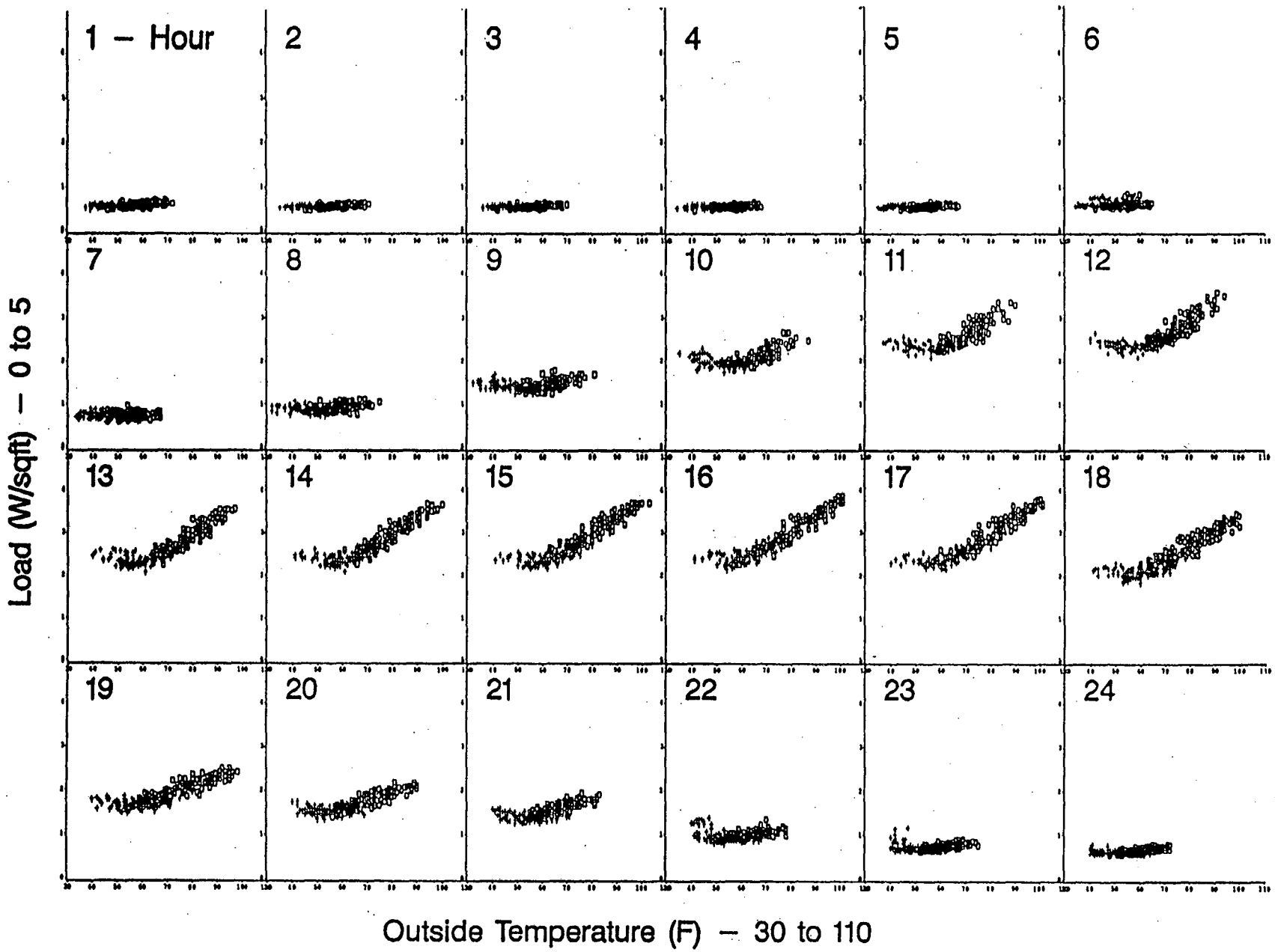


Figure 4-9a. Retail Store Reconciled Standard Day Annual End-Use LS - Coastal

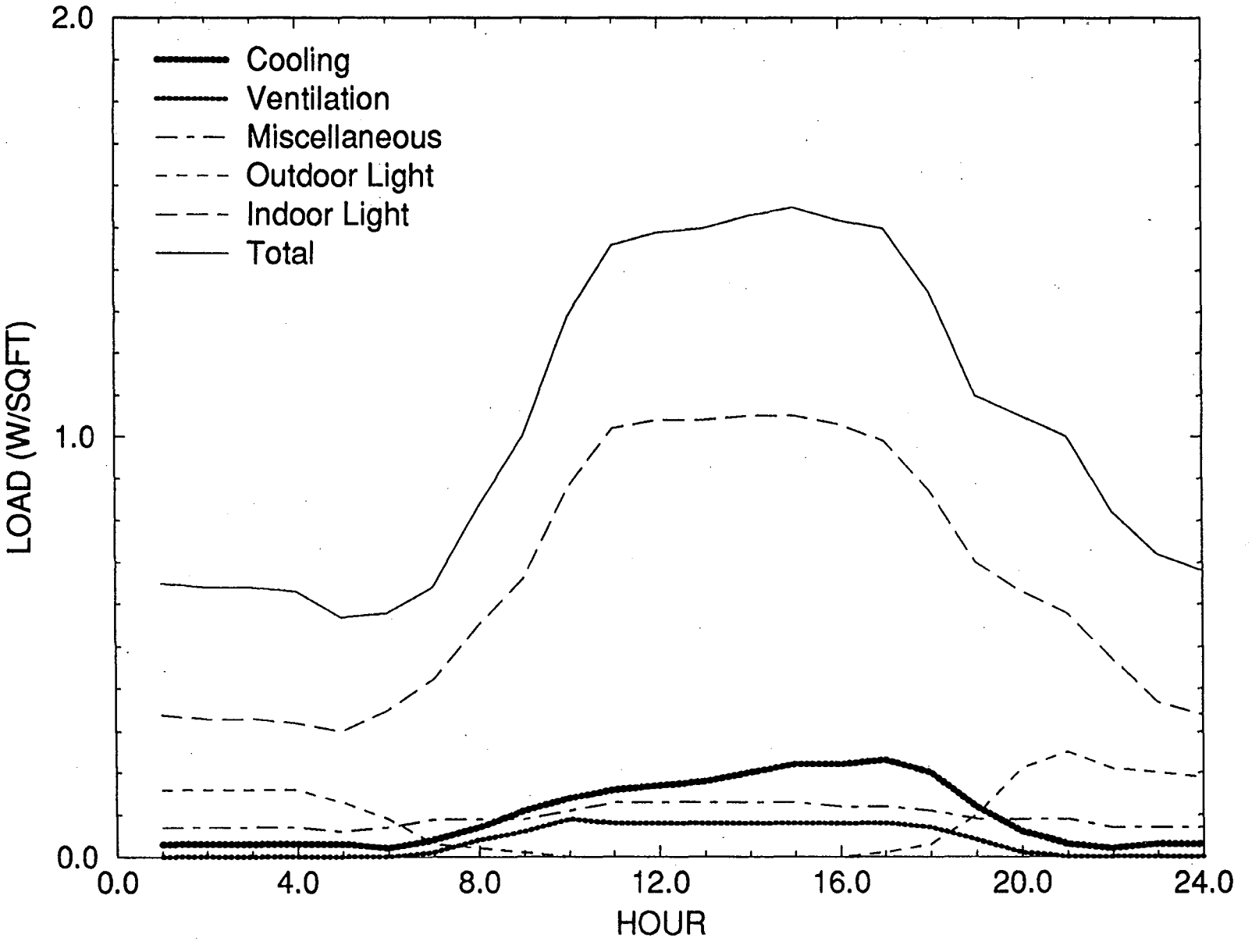


Figure 4-9b. Retail Store Reconciled Standard Day Annual End-Use LS - Inland

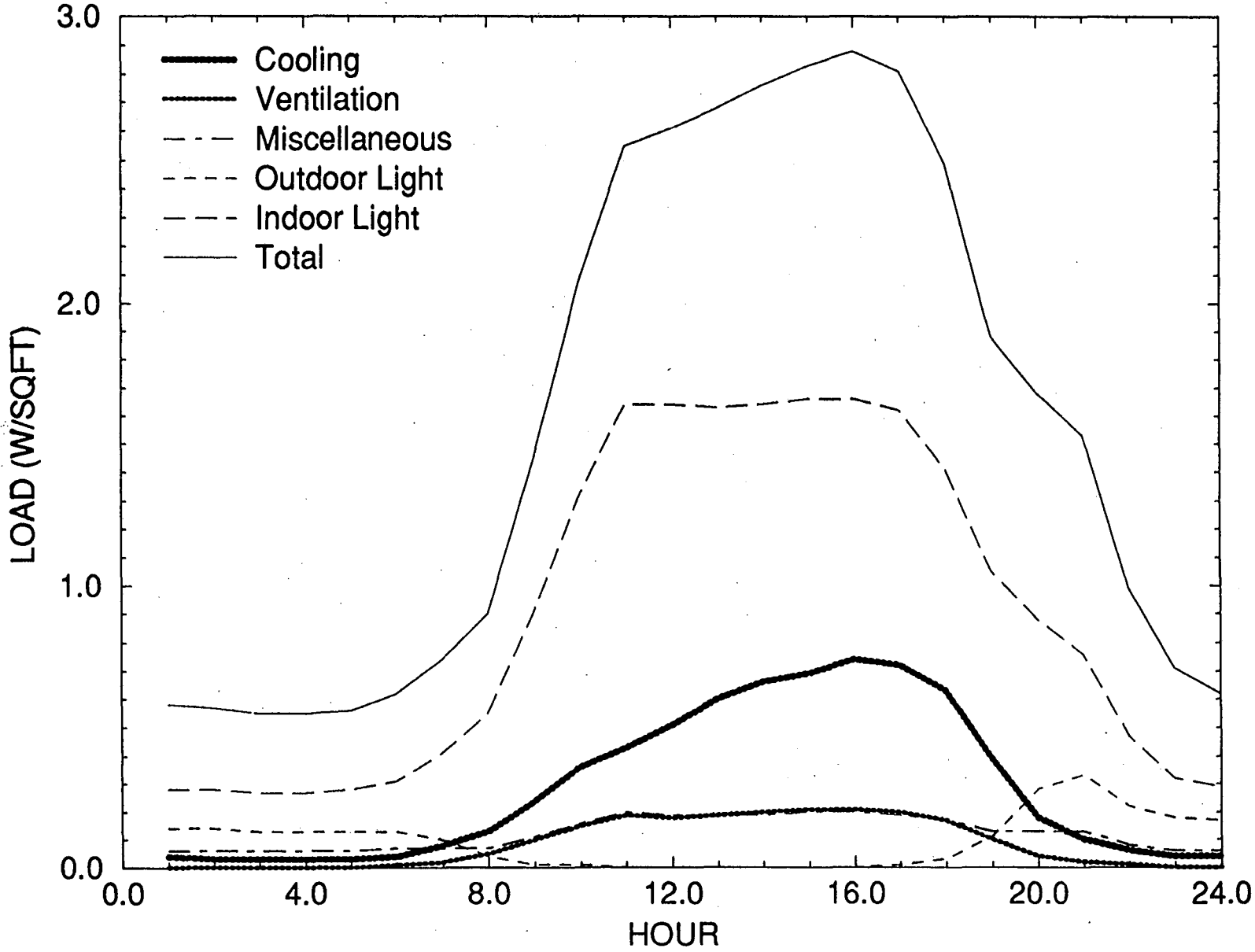


Figure 4-9c. Retail Store Reconciled Nonstandard Day Annual End-Use LS - Coastal

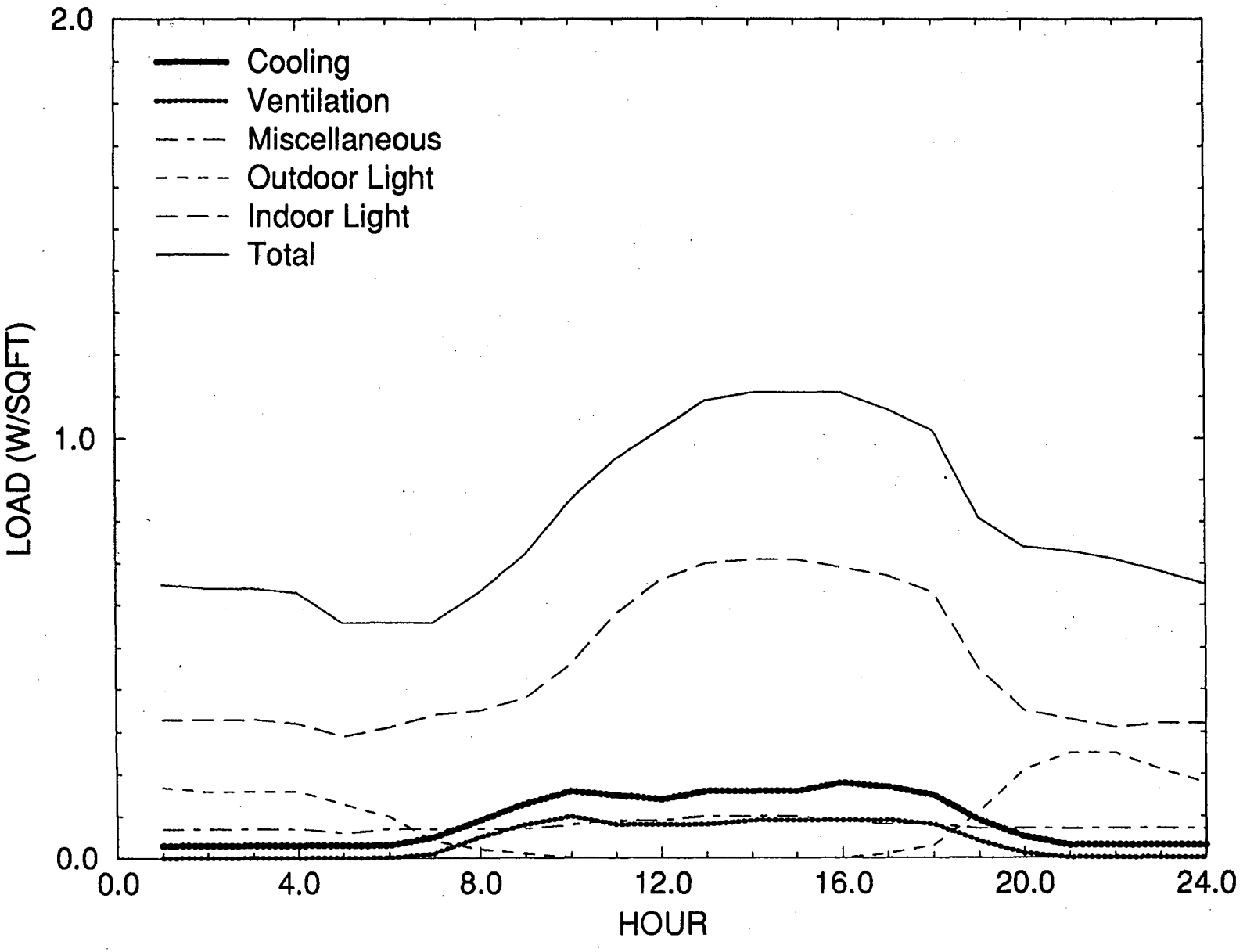
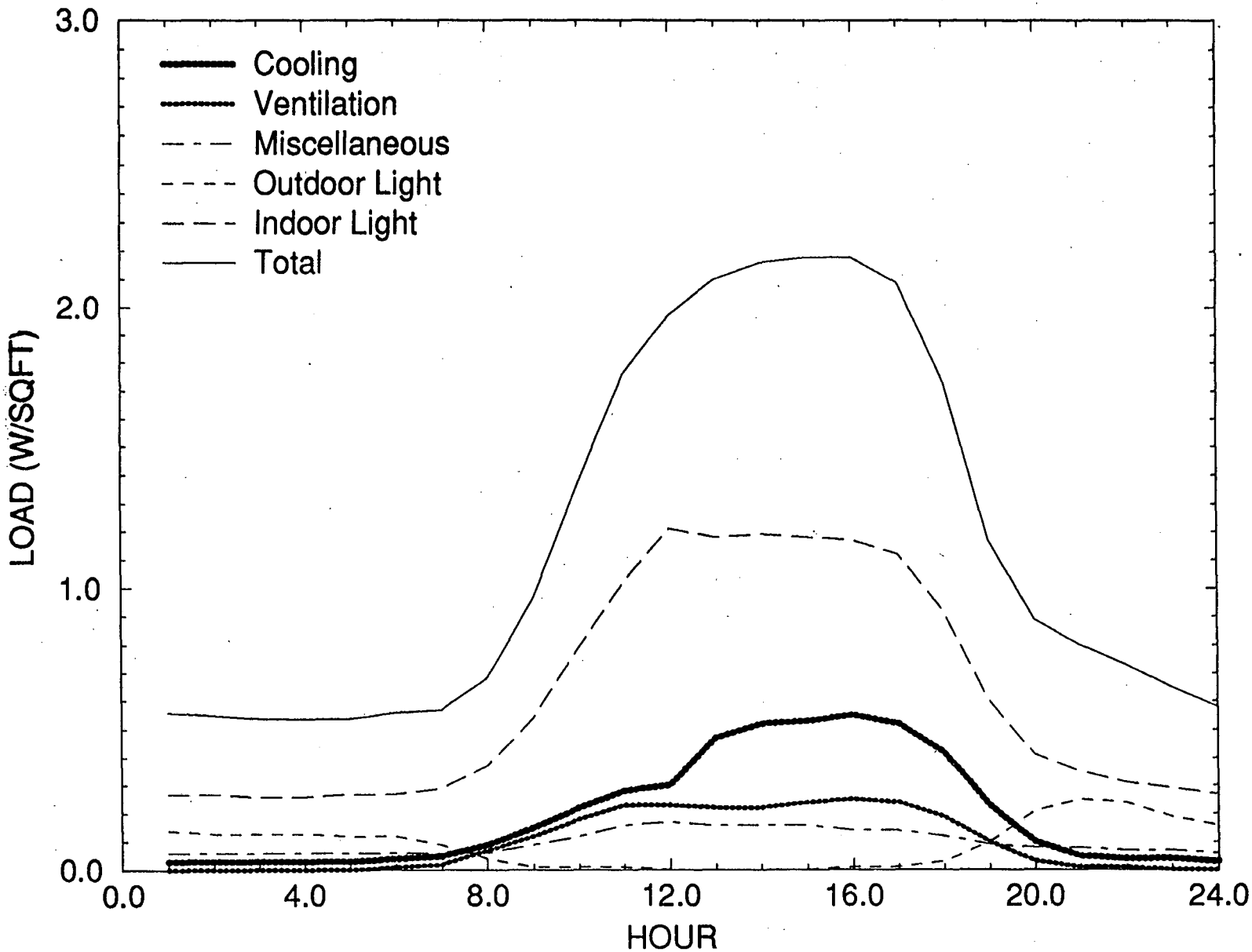


Figure 4-9d. Retail Store Reconciled Nonstandard Day Annual End-Use LS - Inland



Restaurant

The Restaurant prototype is a combination of sitdown and fastfood types.

Sitdown Restaurant

The sitdown restaurant prototype is a 3,000 ft^2 single story building modeled with two zones, a 900 ft^2 kitchen and a 2,100 ft^2 dining area. The building is conditioned with a Packaged Single Zone system, where hot water and heating are provided by a gas furnace.

Major characteristics of the prototypical building are summarized in **Table 4-12a** and **Table 4-12b**. The vintage and technology options are summarized in **Table 4-13**.

Fastfood Restaurant

The fastfood restaurant prototype is a 1,700 ft^2 single story building modeled with a kitchen and dining area of equal size. The zones are conditioned with a Packaged Single Zone system and heated with a gas furnace.

Major characteristics of the prototypical building are summarized in **Table 4-14a** and **Table 4-14b**. The vintage and technology options are summarized in **Table 4-15**.

Restaurant

Table 4-16 shows the DOE-2 simulation and EDA-reconciled end-use EUI summaries for the Restaurant category of the coastal and inland climate regions. DOE-2 simulated average standard day end-use LSs for the coastal and inland climate zones are shown in **Figure 4-10**. Scatter plots of hourly whole-building EUIs against drybulb temperature for annual standard days of coastal and inland climates are shown in **Figure 4-11**. The coastal plots depict no correlation between whole-building-load and dry bulb temperature, however the inland plots illustrate some correlation from late morning through the evening in the summer. EDA reconciled average standard and nonstandard day (Coastal standard day only) end-use LSs for coastal and inland climates are shown in **Figure 4-12**. The LSs indicate that cooling, ventilation, cooking, refrigeration, miscellaneous equipment, and indoor lighting are of about equal magnitude, where outdoor lighting and electric hot water heating sum to a small percentage. Peak operation occurs on weekdays and weekends from 10 am to 12 am.

Note: Packaged Single Zone (PSZ)

Table 4-12a. Sitdown Restaurant Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	3.0
Number of Floors	1
Ceiling Insulation R-value	7.9
Wall Insulation R-value	6.3
Window shading coefficient	0.78
Window/wall ratio	0.08
Loads	
Occupancy (ft^2/person)	67
Refrigeration (W/ft^2)	2.9
Schedule	
Coastal	
Standard Days	7
Start	5
Stop	24
Non-Standard Days	-
Start	-
Stop	-
Inland	
Standard Days	5
Start	5
Stop	24
Non-Standard Days	2
Start	5
Stop	24
System	
System Type	PSZ
COP	2.3
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Heat Setpoint	72°F
Cool Setpoint	74°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Furnace

Table 4-12b. Sitdown Restaurant Building Prototype Zone Description

	Dining	Kitchen
Floor Area (% total)	70	30
Outside Air (ACH)	-	6.6
Outside Air / Person (CFM)	15	-
Indoor Lighting (W/ft^2)	1.2	1.5
Equipment (W/ft^2)	0.1	7.5
Cooking (W/ft^2)	-	15.0
Hot Water ($Btu/hr/ft^2$)	-	40

Table 4-13. Sitdown Restaurant Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	7.3	14.6
Wall Insulation R-value	5.8	13.0
Indoor Lighting (W/ft^2)	1.4	1.3
Equipment (W/ft^2)	1.9	2.1
Cooking (W/ft^2)	12.0	13.4
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	PSZ	PSZ

Table 4-14a. Fastfood Restaurant Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	1.7
Number of Floors	1
Ceiling Insulation R-value	11.8
Wall Insulation R-value	9.0
Window shading coefficient	0.79
Window/wall ratio	0.09
Loads	
Refrigeration (W/ft^2)	4.8
Schedule	
Coastal	
Standard Days	7
Start	5
Stop	24
Non-Standard Days	-
Start	-
Stop	-
Inland	
Standard Days	5
Start	5
Stop	24
Non-Standard Days	2
Start	5
Stop	24
System	
System Type	PSZ
COP	2.3
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Heat Setpoint	65°F
Cool Setpoint	73°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Furnace

Table 4-14b. Fastfood Restaurant Building Prototype Zone Description

	Dining	Kitchen
Floor Area (% total)	50	50
Occupancy (ft^2/person)	34	114
Outside Air (ACH)	-	7.3
Outside Air / Person (CFM)	15	-
Indoor Lighting (W/ft^2)	1.7	2.5
Equipment (W/ft^2)	-	7.2
Cooking (W/ft^2)	-	10.4
Hot Water ($Btu/hr/ft^2$)	-	20

Table 4-15. Fastfood Restaurant Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	9.5	14.6
Wall Insulation R-value	7.7	13.0
Indoor Lighting (W/ft^2)	2.1	2.2
Equipment (W/ft^2)	5.8	6.4
Cooking (W/ft^2)	8.3	9.3
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	PSZ	PSZ

Table 4-16a. Restaurant Simulated and EDA-Reconciled EUIs—Coastal (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.69)										
6.89	1.62	5.32	0.00	6.30	3.32	0.24	0.00	2.66	3.49	29.84
Unconditioned (Weight=0.31)										
6.89	1.62	5.32	0.00	6.30	3.32	0.24	0.00	0.00	0.00	23.69
Weighted Average										
6.89	**1.62**	**5.32**	**0.00**	**6.30**	**3.32**	**0.24**	**0.00**	**1.84**	**2.41**	**27.94**
Reconciled										
8.56	**2.17**	**6.72**	**0.07**	**7.57**	**4.24**	**0.31**	**0.00**	**4.35**	**2.51**	**36.50**

Table 4-16b. Restaurant Simulated and EDA-Reconciled EUIs—Inland (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.84)										
7.02	1.66	5.38	0.00	6.37	3.34	0.24	0.00	3.03	8.01	35.05
Unconditioned (Weight=0.16)										
7.02	1.66	5.38	0.00	6.37	3.34	0.24	0.00	0.00	0.00	24.01
Weighted Average										
7.02	**1.66**	**5.38**	**0.00**	**6.37**	**3.34**	**0.24**	**0.00**	**2.55**	**6.73**	**33.29**
Reconciled										
7.63	**1.97**	**5.87**	**0.07**	**6.80**	**3.69**	**0.26**	**0.00**	**5.73**	**5.17**	**37.19**

Figure 4-10a. Restaurant Simulated Average Standard Day LS - Coastal

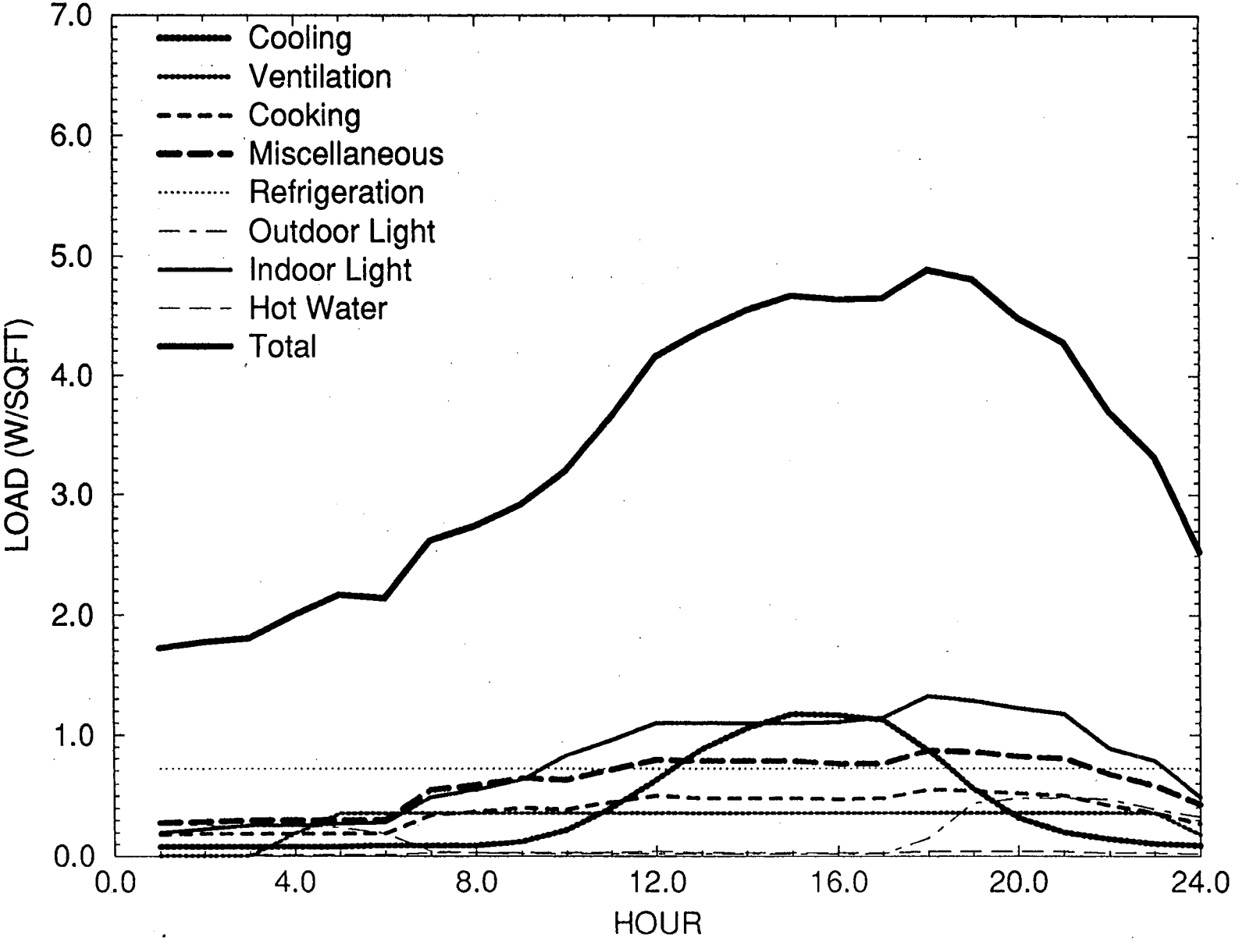


Figure 4-10b. Restaurant Simulated Average Standard Day LS - Inland

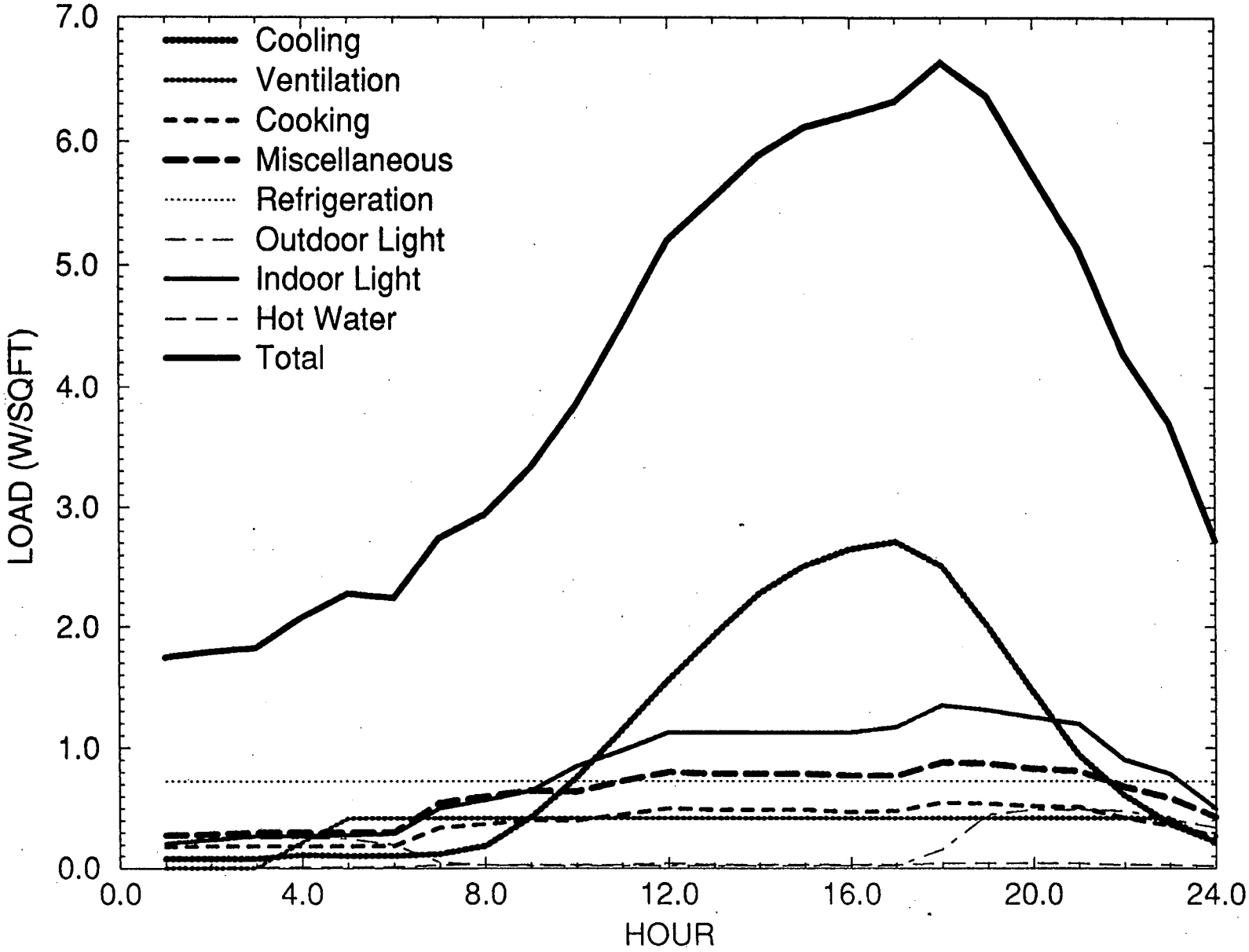


Figure 4-11a. Restaurant Whole Building Load vs. Drybulb Temperature for Standard Day - Coastal

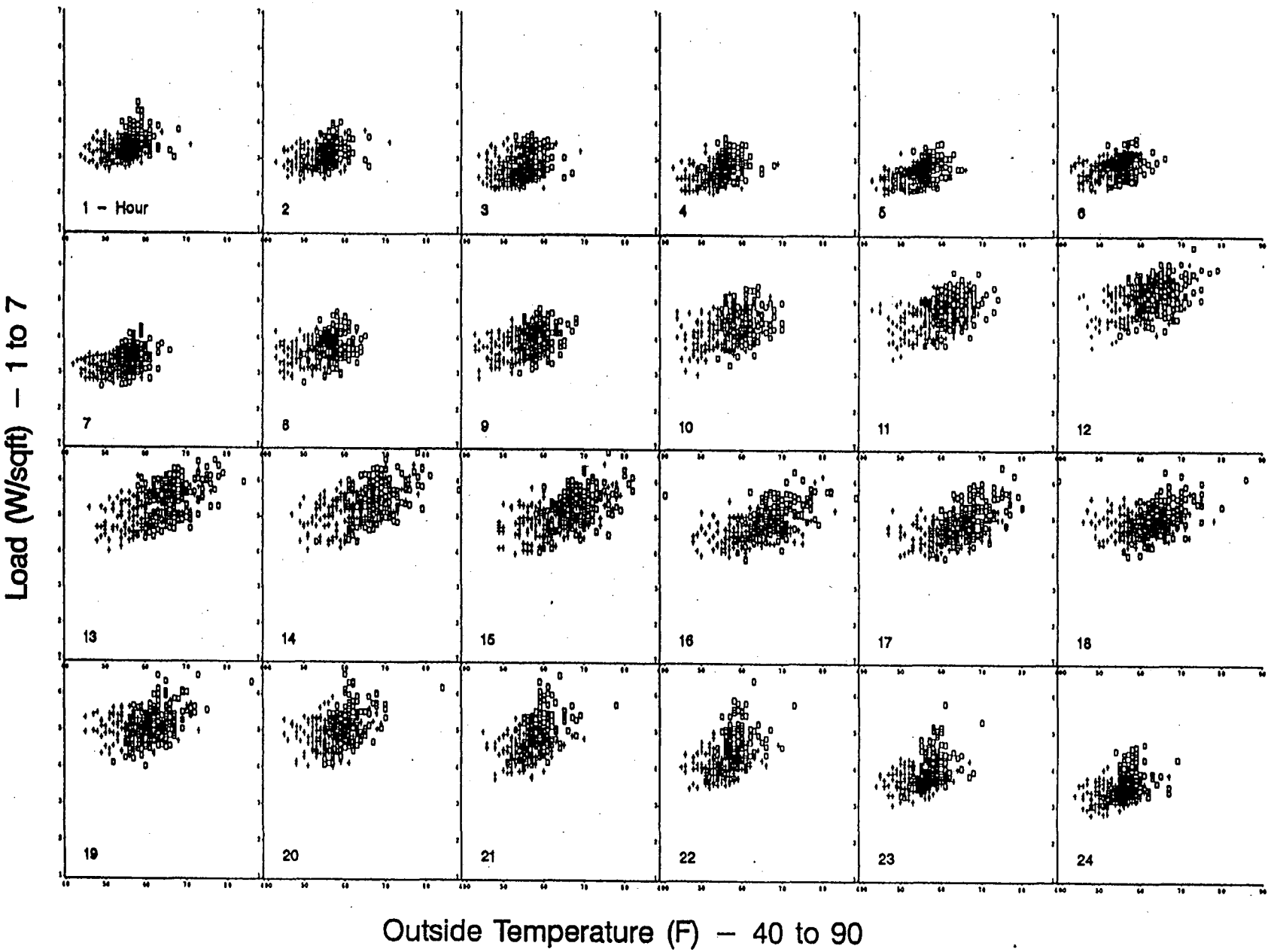


Figure 4-11b. Restaurant Whole Building Load vs. Drybulb Temperature for Standard Day - Inland

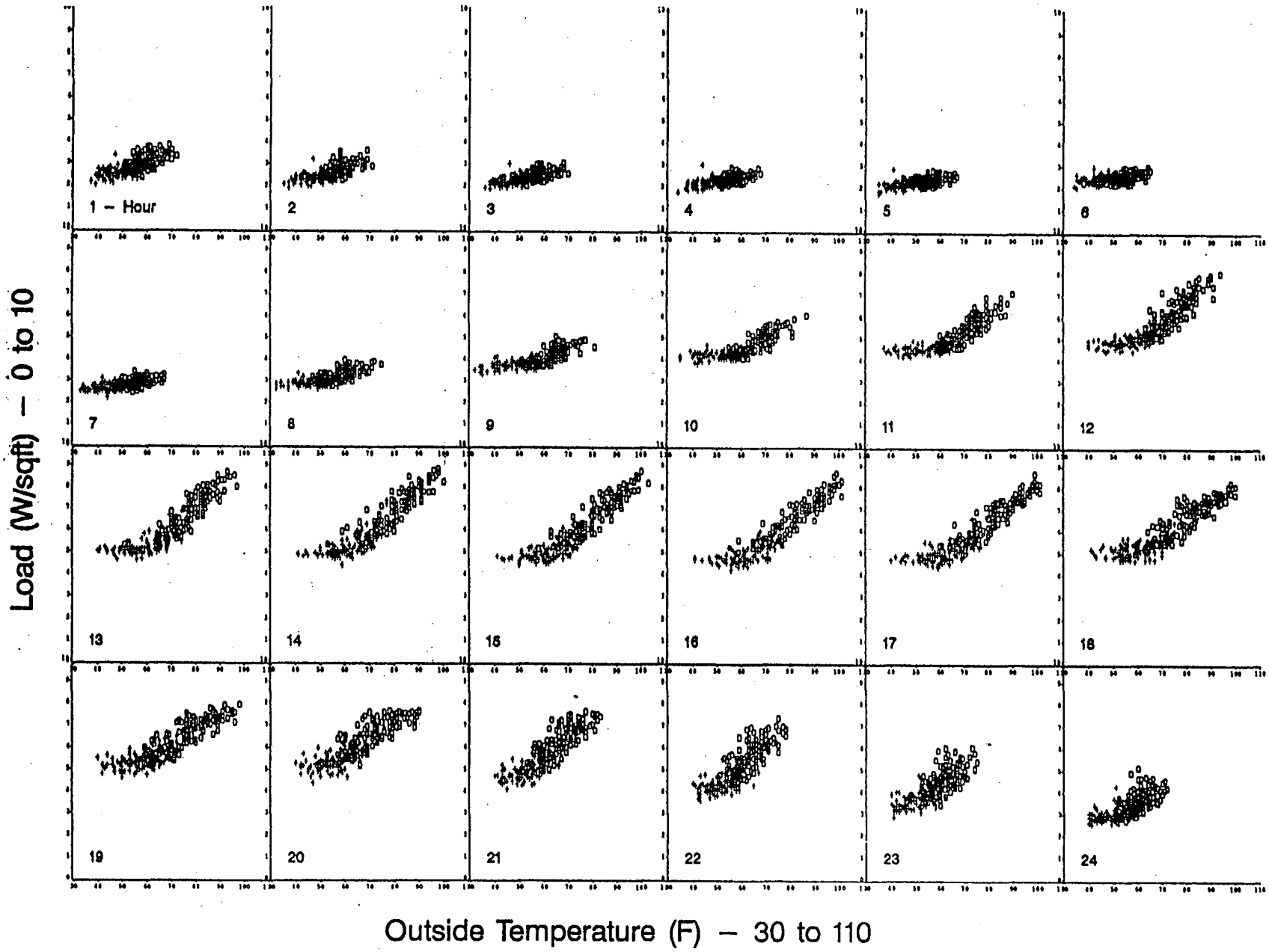


Figure 4-12a. Restaurant Reconciled Standard Day Annual End-Use LS - Coastal

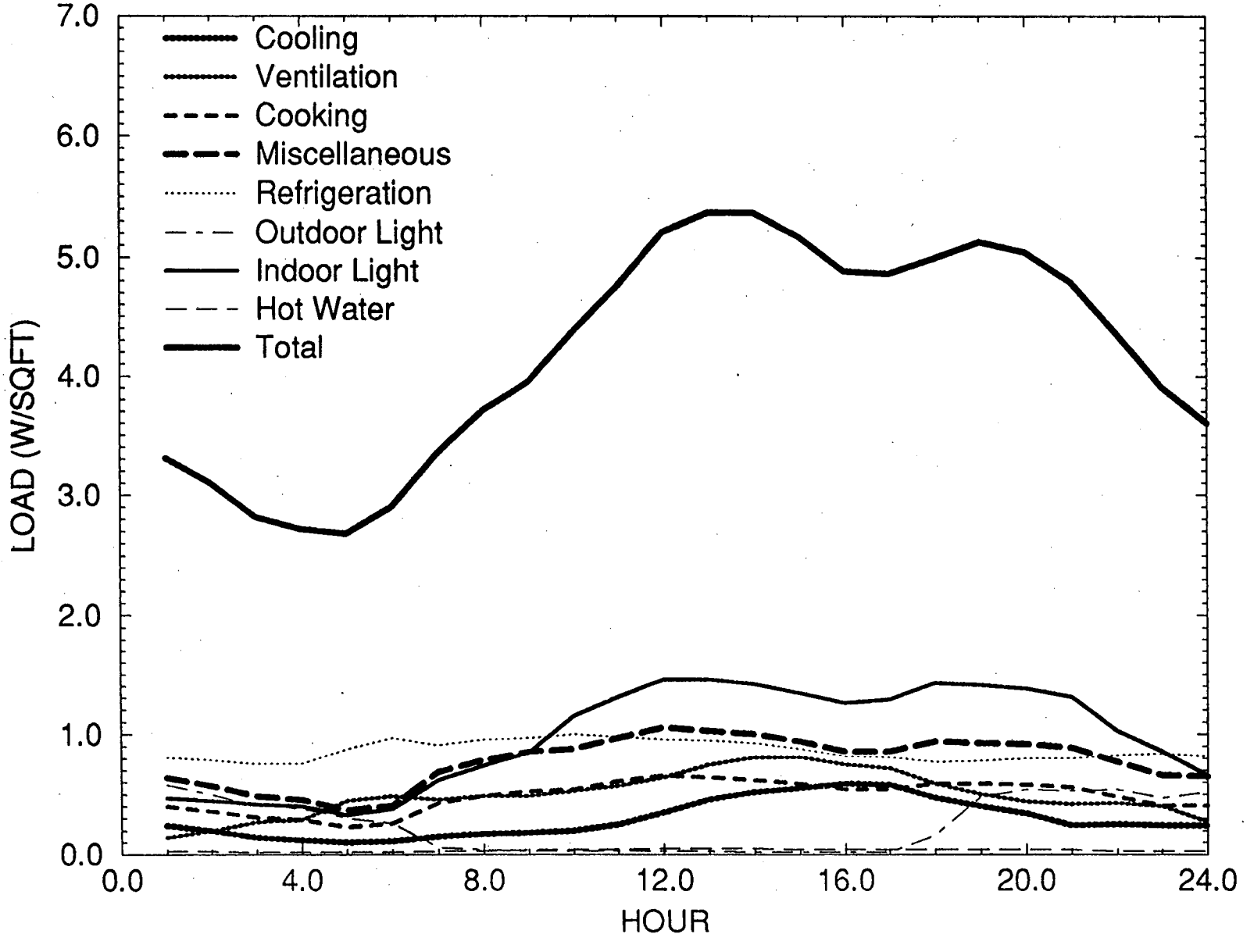


Figure 4-12b. Restaurant Reconciled Standard Day Annual End-Use LS - Inland

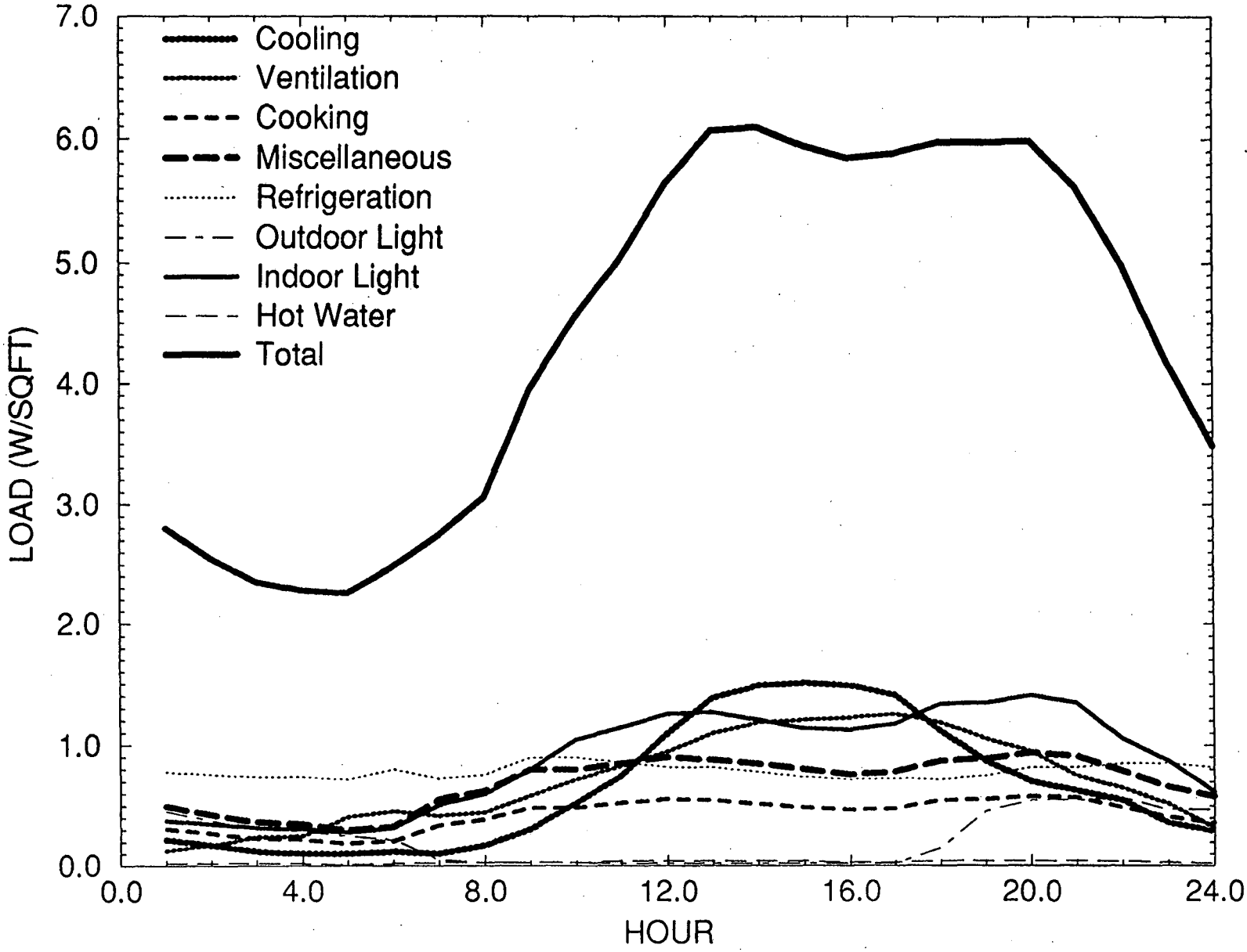
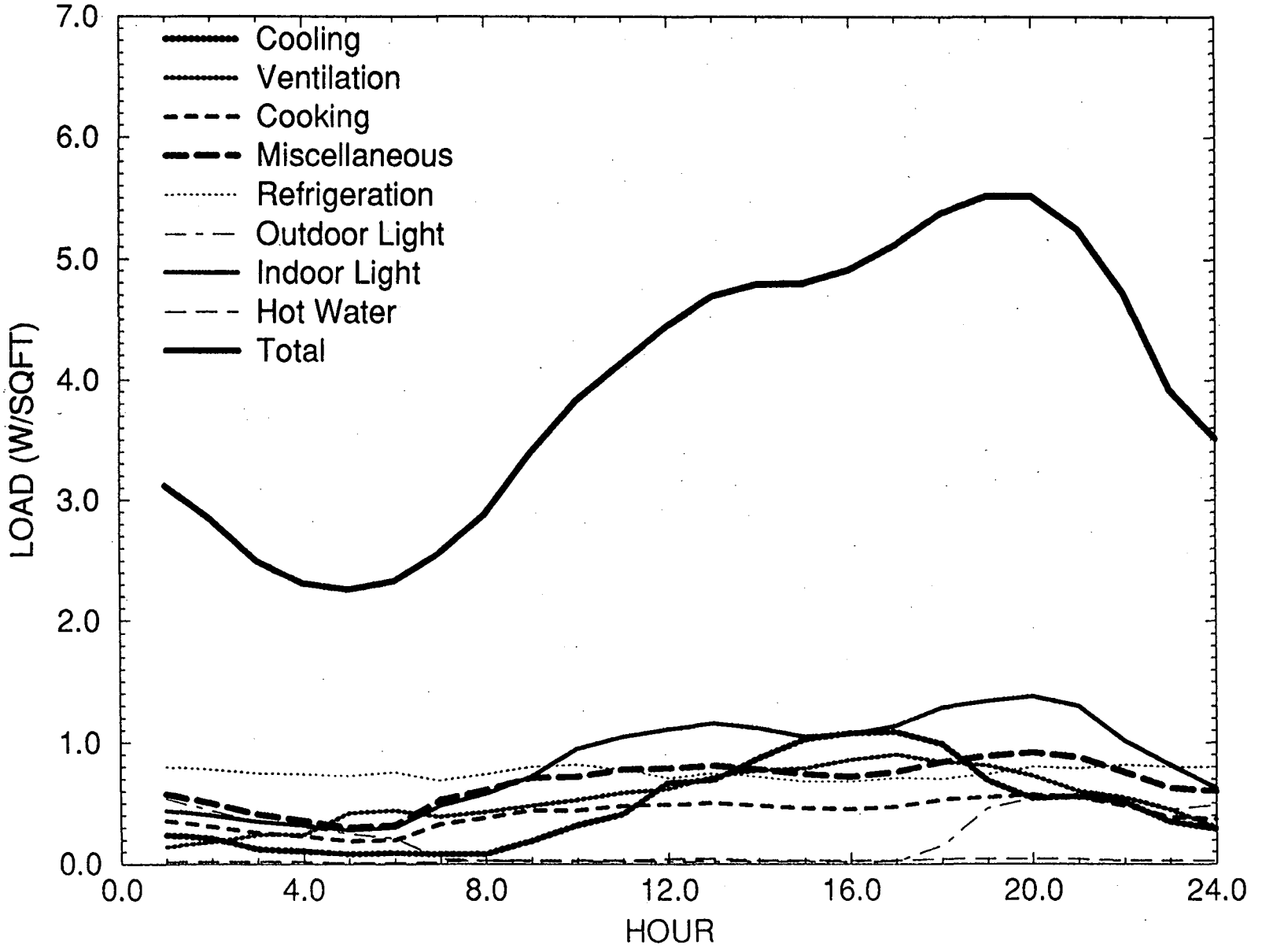


Figure 4-12c. Restaurant Reconciled Nonstandard Day Annual End-Use LS - Inland



Food Store

The food store prototype is a 4,400 ft^2 building modeled with five zones, which are 2,700 ft^2 of sales, 200 ft^2 of deli, 500 ft^2 of bakery, 100 ft^2 of office, and 900 ft^2 of dry storage. Each are conditioned with a Packaged Single Zone system, hot water and heating are provided by a gas furnace.

Major characteristics of the prototypical building are summarized in **Table 4-17a** and **Table 4-17b**. The vintage and technology options are summarized in **Table 4-18**.

Table 4-19 shows the DOE-2 simulation and EDA-reconciled end-use EUI summaries for the Food Store category of the coastal and inland climate regions. DOE-2 simulated average standard day end-use LSs for the coastal and inland climate zones are shown in **Figure 4-13**. Scatter plots of hourly whole-building EUIs against drybulb temperature for annual standard days of coastal and inland climates are shown in **Figure 4-14**. The inland plot demonstrates a weak correlation during summer between whole-building-load and dry bulb temperature through the entire day, but the coastal plot depicts no correlation. EDA reconciled average standard day end-use LSs for coastal and inland climate regions are shown in **Figure 4-15**. The LSs indicate that indoor lighting and refrigeration are the largest end-uses, cooling, ventilation, and miscellaneous equipment share the next greatest load, and cooking, outdoor lighting, and hot water heating make up the smallest percentage. Peak operation occurs on weekdays and weekends from 7 am to 9 pm.

Note: Packaged Single Zone (PSZ)

Table 4-17a. Food Store Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	4.4
Number of Floors	1
Ceiling Insulation R-value	10.8
Wall Insulation R-value	5.8
Window shading coefficient	0.81
Window/wall ratio	0.07
Loads	
Refrigeration (W/ft^2)	5.5
Hot Water ($Btu/hr/ft^2$)	4.0
Schedule	
Standard Days	7
Start	6
Stop	2
Non-Standard Days	-
Start	-
Stop	-
System	
System Type	PSZ
COP	2.3
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Heat Setpoint	70°F
Cool Setpoint	75°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Furnace

Table 4-17b. Food Store Building Prototype Zone Description

	Office	Dry Storage	Bakery	Deli	Sale
Floor Area (% total)	3	20	12	5	
Occupancy (ft^2/person)	130	880	220	220	325
Outside Air (ACH)	-	-	5.6	-	-
Outside Air / Person (CFM)	15	15	-	15	15
Indoor Lighting (W/ft^2)	1.7	1.0	1.7	1.7	1.7
Equipment (W/ft^2)	0.5	0.4	7.5	3.8	0.4
Cooking (W/ft^2)	-	-	5.0	-	-

Table 4-18. Food Store Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	10.8	10.8
Wall Insulation R-value	5.6	8.7
Indoor Lighting (W/ft^2)	1.7	1.6
Equipment (W/ft^2)	1.1	1.3
Cooking (W/ft^2)	.5	.5
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	PSZ	PSZ

Table 4-19a. Food Store Simulated and EDA-Reconciled EUIs—Coastal (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.76)										
8.88	0.91	4.57	0.00	11.49	0.37	0.07	0.00	1.92	1.17	29.38
Unconditioned (Weight=0.24)										
8.88	0.91	4.57	0.00	11.49	0.37	0.07	0.00	0.00	0.00	26.29
Weighted Average										
8.88	**0.91**	**4.57**	**0.00**	**11.49**	**0.37**	**0.07**	**0.00**	**1.46**	**0.89**	**28.64**
Reconciled										
14.26	**1.43**	**6.97**	**0.06**	**14.66**	**0.54**	**0.11**	**0.00**	**3.41**	**2.76**	**44.20**

Table 4-19b. Food Store Simulated and EDA-Reconciled EUIs—Inland (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.69)										
8.88	0.91	4.57	0.00	11.49	0.37	0.07	0.00	2.38	2.70	31.37
Unconditioned (Weight=0.31)										
8.88	0.91	4.57	0.00	11.49	0.37	0.07	0.00	0.00	0.00	26.29
Weighted Average										
8.88	**0.91**	**4.57**	**0.00**	**11.49**	**0.37**	**0.07**	**0.00**	**1.64**	**1.86**	**29.79**
Reconciled										
13.97	**1.29**	**6.40**	**0.06**	**15.15**	**0.50**	**0.11**	**0.00**	**4.43**	**4.61**	**46.52**

Figure 4-13a. Food Store Simulated Average Standard Day LS - Coastal

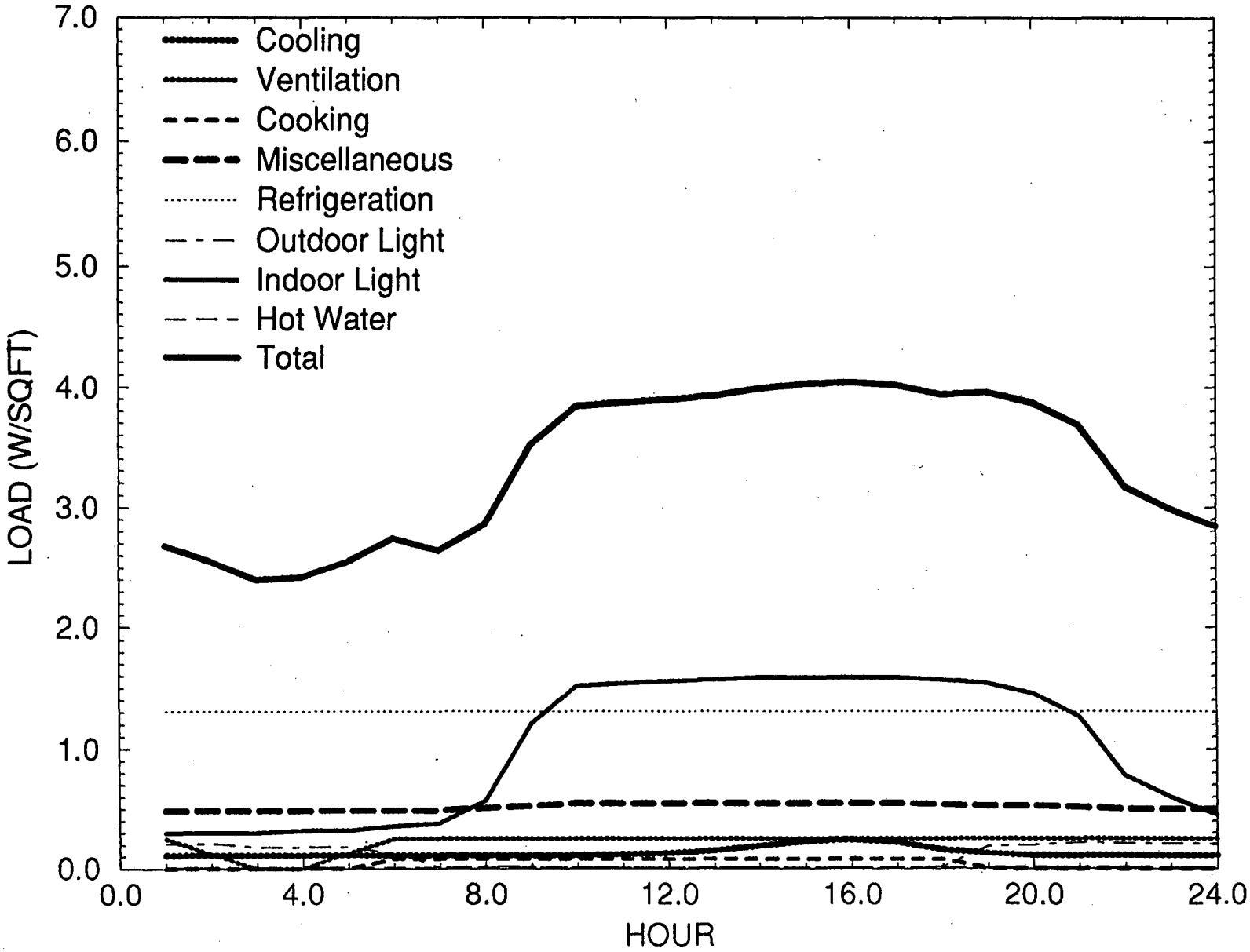


Figure 4-13b. Food Store Simulated Average Standard Day LS - Inland

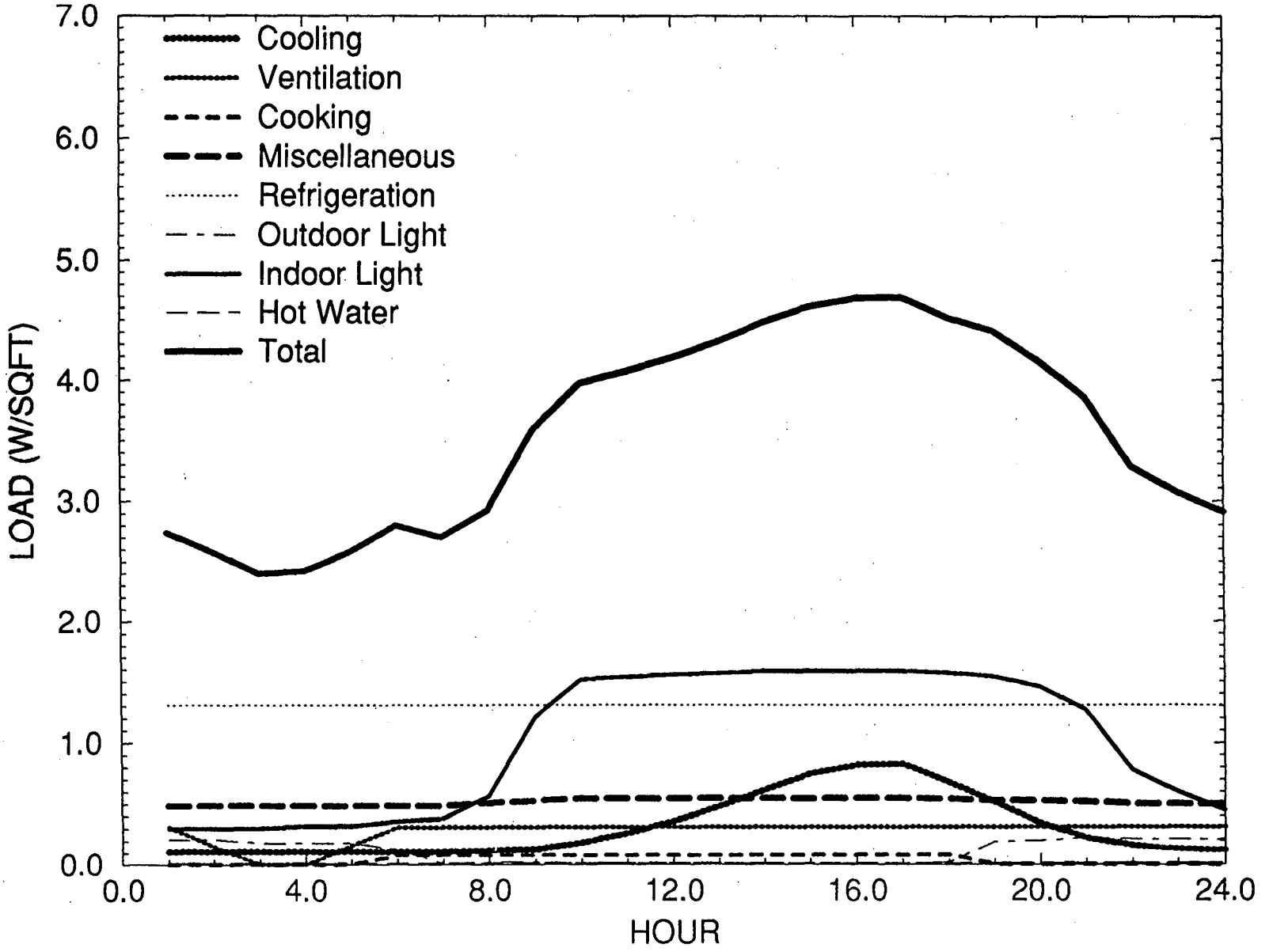


Figure 4-14a. Food Store Whole Building Load vs. Drybulb Temperature for Standard Day - Coastal

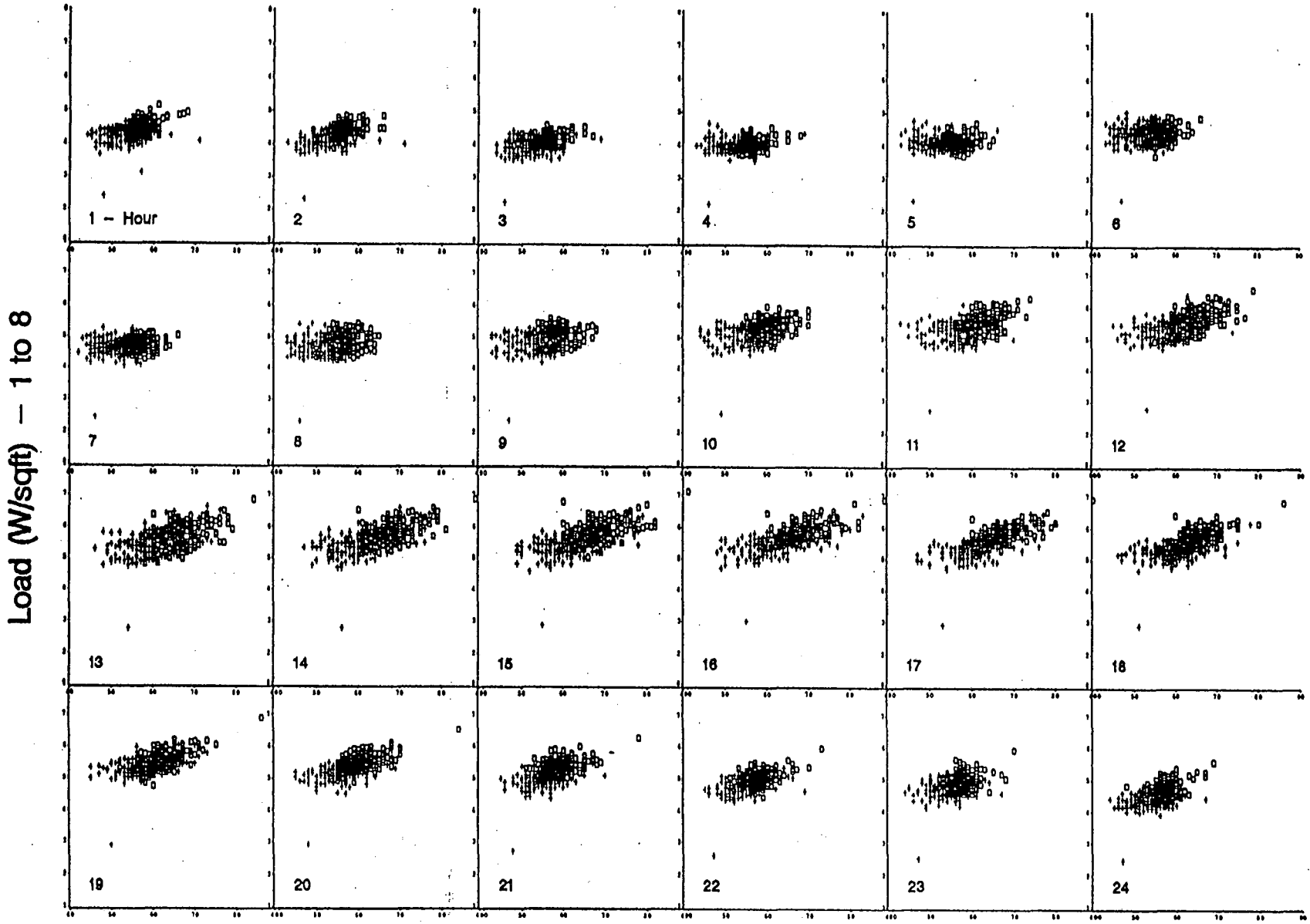


Figure 4-14b. Food Store Whole Building Load vs. Drybulb Temperature for Standard Day - Inland

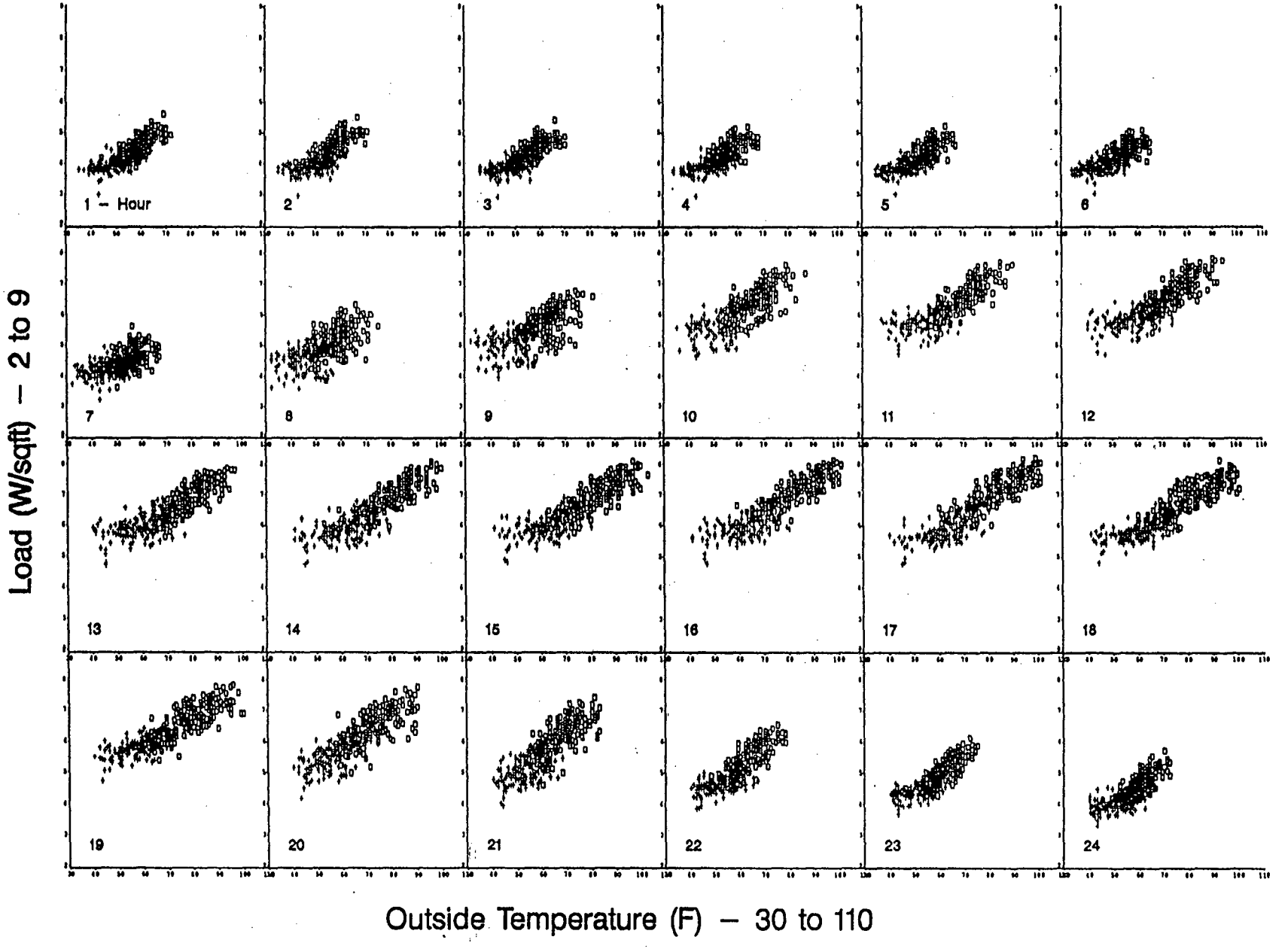


Figure 4-15a. Food Store Reconciled Standard Day Annual End-Use LS - Coastal

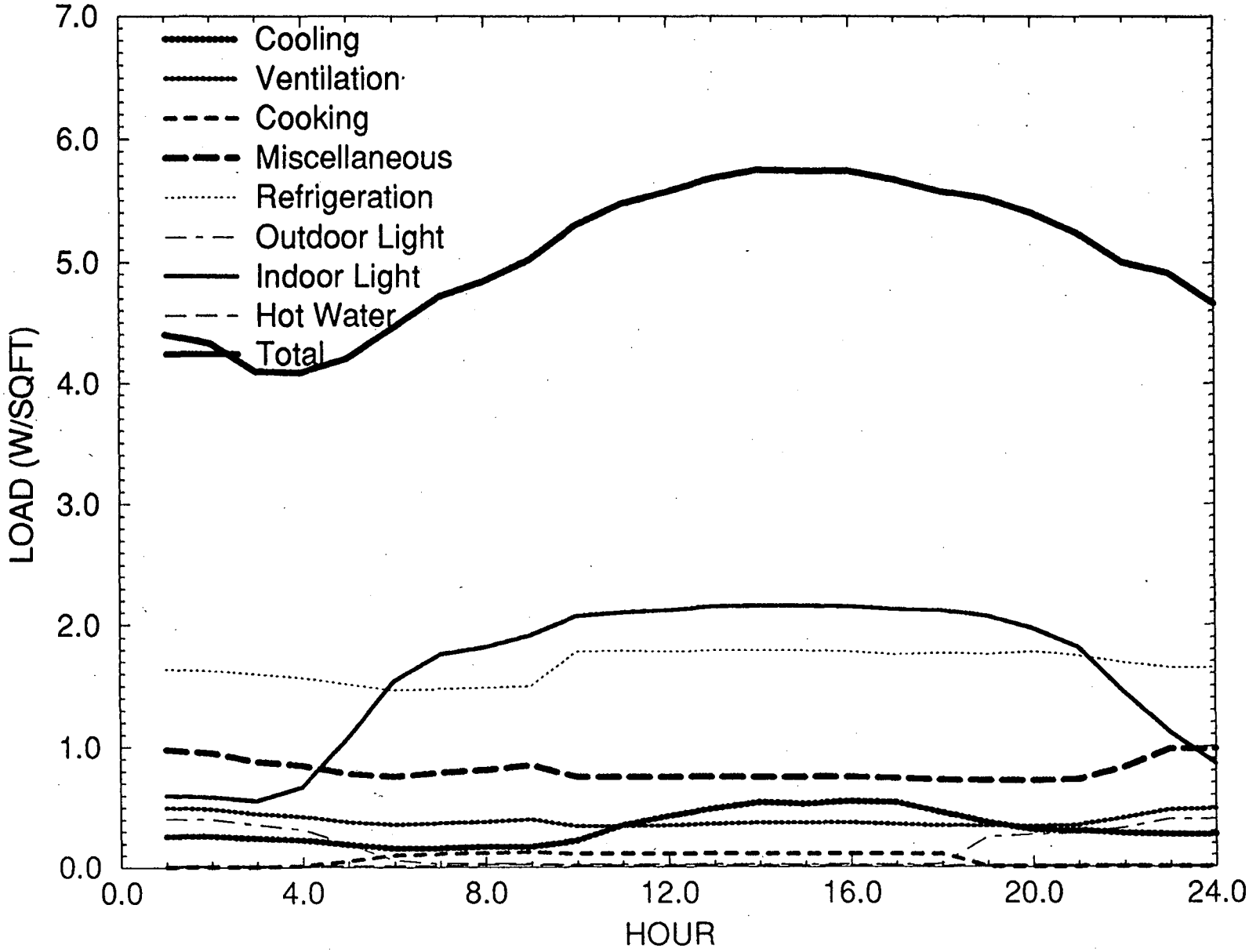
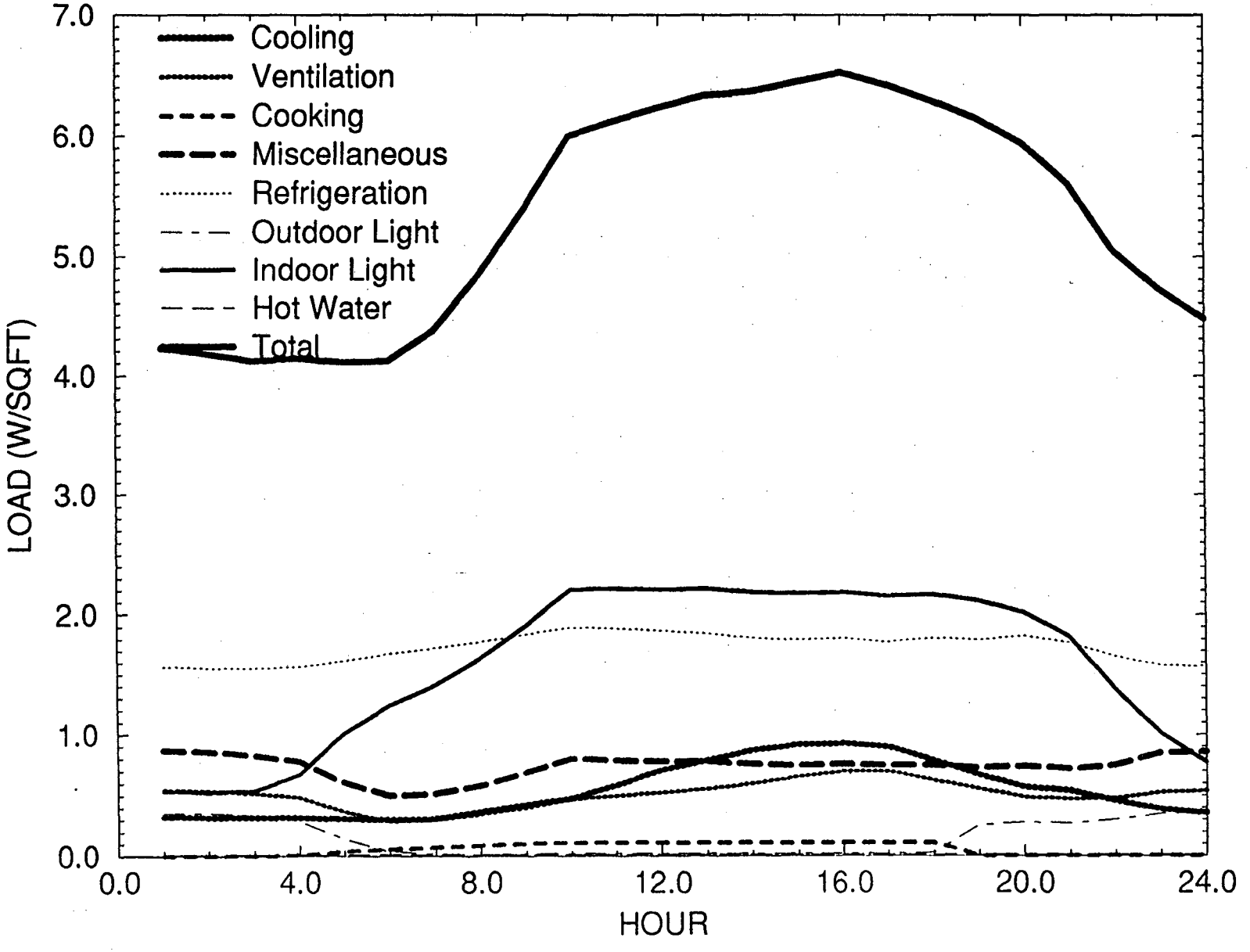


Figure 4-15b. Food Store Reconciled Standard Day Annual End-Use LS - Inland



Warehouse

The Warehouse prototype is a combination of nonrefrigerated and refrigerated types.

Nonrefrigerated Warehouse

The nonrefrigerated warehouse prototype is a 6,000 ft^2 single story building modeled with a single zone, which is conditioned with a Packaged Single Zone system. Hot water and heating are provided by a gas furnace.

Major characteristics of the prototypical building are summarized in **Table 4-20a** and **Table 4-20b**. The vintage and technology options are summarized in **Table 4-21**.

Refrigerated Warehouse

The refrigerated warehouse prototype is a 53,200 ft^2 single story building modeled with a single zone, which is conditioned with a Packaged Single Zone system. Hot water and heat are provided with a gas furnace.

Major characteristics of the prototypical building are summarized in **Table 4-22a** and **Table 4-22b**. The vintage and technology options are summarized in **Table 4-23**.

Warehouse

Table 4-24 shows the DOE-2 simulation and EDA-reconciled end-use EUI summaries for the Warehouse category of the coastal and inland climate regions. DOE-2 simulated average standard day end-use LSs for the coastal and inland climate zones are shown in **Figure 4-16**. Scatter plots of hourly whole-building EUIs against drybulb temperature for annual standard days of coastal and inland climates are shown in **Figure 4-17**. Both plots depict no correlation between whole-building-load and dry bulb temperature. EDA reconciled average standard and nonstandard day end-use LSs for coastal and inland climates are shown in **Figure 4-18**. The coastal LSs illustrate that refrigeration is the major end-use, miscellaneous equipment and indoor lighting are the next greatest energy consumers, ventilation consumes yet a smaller percentage, and cooling and outdoor lighting are of the smallest order. The inland LSs show that refrigeration, miscellaneous equipment and indoor lighting are the largest demand, cooling and ventilation require a smaller percentage, and outdoor lighting represents the least load. Peak operation occurs on weekdays during 8 am to 5 pm.

Note: Packaged Single Zone (PSZ)

Table 4-20a. Nonrefrigerated Warehouse Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	6.0
Number of Floors	1
Ceiling Insulation R-value	8.2
Wall Insulation R-value	5.5
Window shading coefficient	0.72
Window/wall ratio	0.05
Loads	
Refrigeration (W/ft^2)	0.1
Cooking (W/ft^2)	-
Hot Water ($Btu/hr/ft^2$)	0.5
Schedule	
Standard Days	5
Start	6
Stop	22
Non-Standard Days	2
Start	6
Stop	22
System	
System Type	PSZ
COP	2.3
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Outside Air / Person (CFM)	15
Heat Setpoint	70°F
Cool Setpoint	74°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Furnace

Table 4-20b. Nonrefrigerated Warehouse Building Prototype Zone Description

	Office	Storage
Floor Area (% total)	30	70
Occupancy (ft^2/person)	180	1150
Indoor Lighting (W/ft^2)	1.0	0.9
Equipment (W/ft^2)	1.0	1.4

Table 4-21. Nonrefrigerated Warehouse Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	7.9	17.3
Wall Insulation R-value	5.3	6.6
Indoor Lighting (W/ft^2)	1.0	1.0
Equipment (W/ft^2)	1.0	1.1
Refrigeration	0.1	0.1
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	PSZ	PSZ

Table 4-22a. Refrigerated Warehouse Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	53.2
Number of Floors	1
Ceiling Insulation R-value	8.2
Wall Insulation R-value	5.5
Window shading coefficient	0.73
Window/wall ratio	0.01
Loads	
Refrigeration (W/ft^2)	8.5
Cooking (W/ft^2)	-
Hot Water ($Btu/hr/ft^2$)	0.5
Schedule	
Standard Days	5
Start	6
Stop	22
Non-Standard Days	2
Start	6
Stop	22
System	
System Type	PSZ
COP	2.3
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Outside Air / Person (CFM)	15
Heat Setpoint	69°F
Cool Setpoint	74°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Furnace

Table 4-22b. Refrigerated Warehouse Building Prototype Zone Description

	Office	Refrigerated Storage
Floor Area (% total)	5	95
Occupancy (ft^2/person)	250	1426
Indoor Lighting (W/ft^2)	1.0	0.5
Equipment (W/ft^2)	1.0	0.5

Table 4-23. Refrigerated Warehouse Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	8.2	17.3
Wall Insulation R-value	5.5	6.6
Indoor Lighting (W/ft^2)	0.4	0.5
Equipment (W/ft^2)	0.4	0.5
Refrigeration	6.8	7.6
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	PSZ	PSZ

Table 4-24a. Warehouse Simulated and EDA-Reconciled EUIs—Coastal (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.48)										
2.06	0.36	2.16	0.00	11.98	0.00	0.01	0.00	1.37	0.41	18.35
Unconditioned (Weight=0.52)										
2.06	0.36	2.16	0.00	11.98	0.00	0.01	0.00	0.00	0.00	16.57
Weighted Average										
2.06	**0.36**	**2.16**	**0.00**	**11.98**	**0.00**	**0.01**	**0.00**	**0.66**	**0.20**	**17.43**
Reconciled										
2.26	**0.39**	**2.80**	**0.22**	**11.52**	**0.00**	**0.01**	**0.00**	**1.09**	**0.11**	**18.40**

Table 4-24b. Warehouse Simulated and EDA-Reconciled EUIs—Inland (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.51)										
2.14	0.35	2.39	0.00	7.18	0.00	0.01	0.00	1.50	1.31	14.88
Unconditioned (Weight=0.49)										
2.14	0.35	2.39	0.00	7.18	0.00	0.01	0.00	0.00	0.00	12.07
Weighted Average										
2.14	**0.35**	**2.39**	**0.00**	**7.18**	**0.00**	**0.01**	**0.00**	**0.77**	**0.67**	**13.51**
Reconciled										
1.81	**0.52**	**2.31**	**0.22**	**6.97**	**0.00**	**0.01**	**0.00**	**0.92**	**0.74**	**13.50**

Figure 4-16a. Warehouse Simulated Average Standard Day LS - Coastal

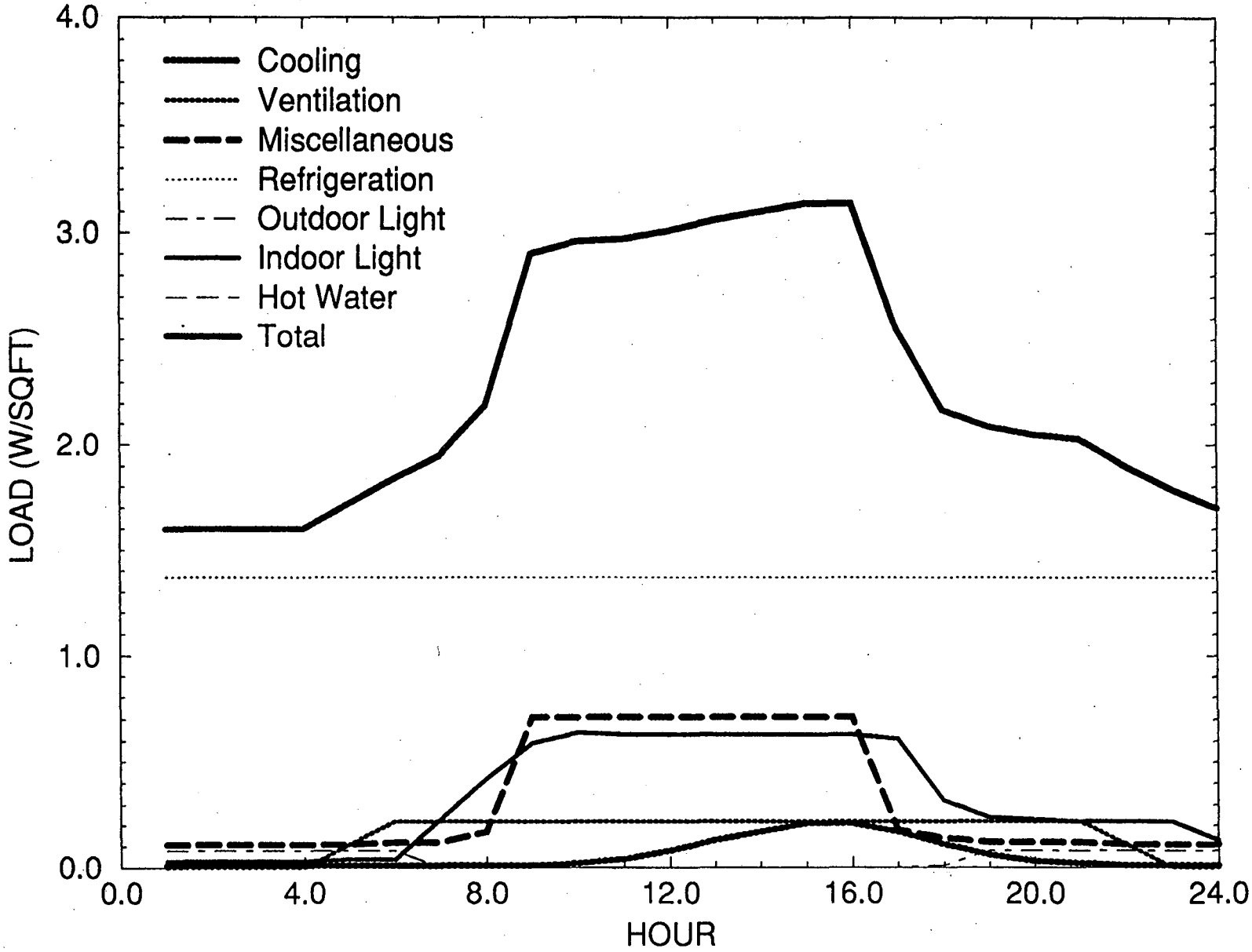


Figure 4-16b. Warehouse Simulated Average Standard Day LS - Inland

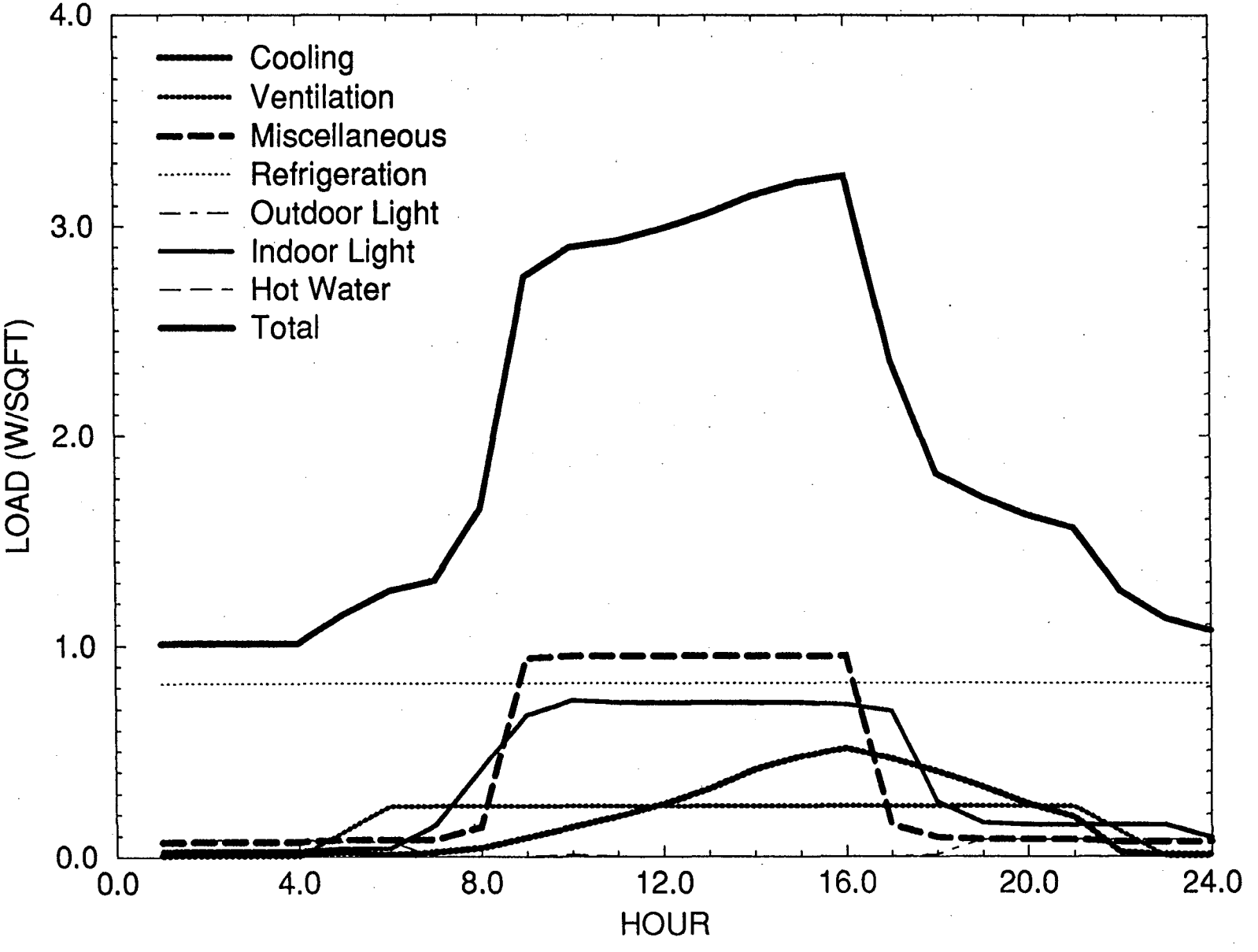


Figure 4-17a. Warehouse Whole Building Load vs. Drybulb Temperature for Standard Day - Coastal

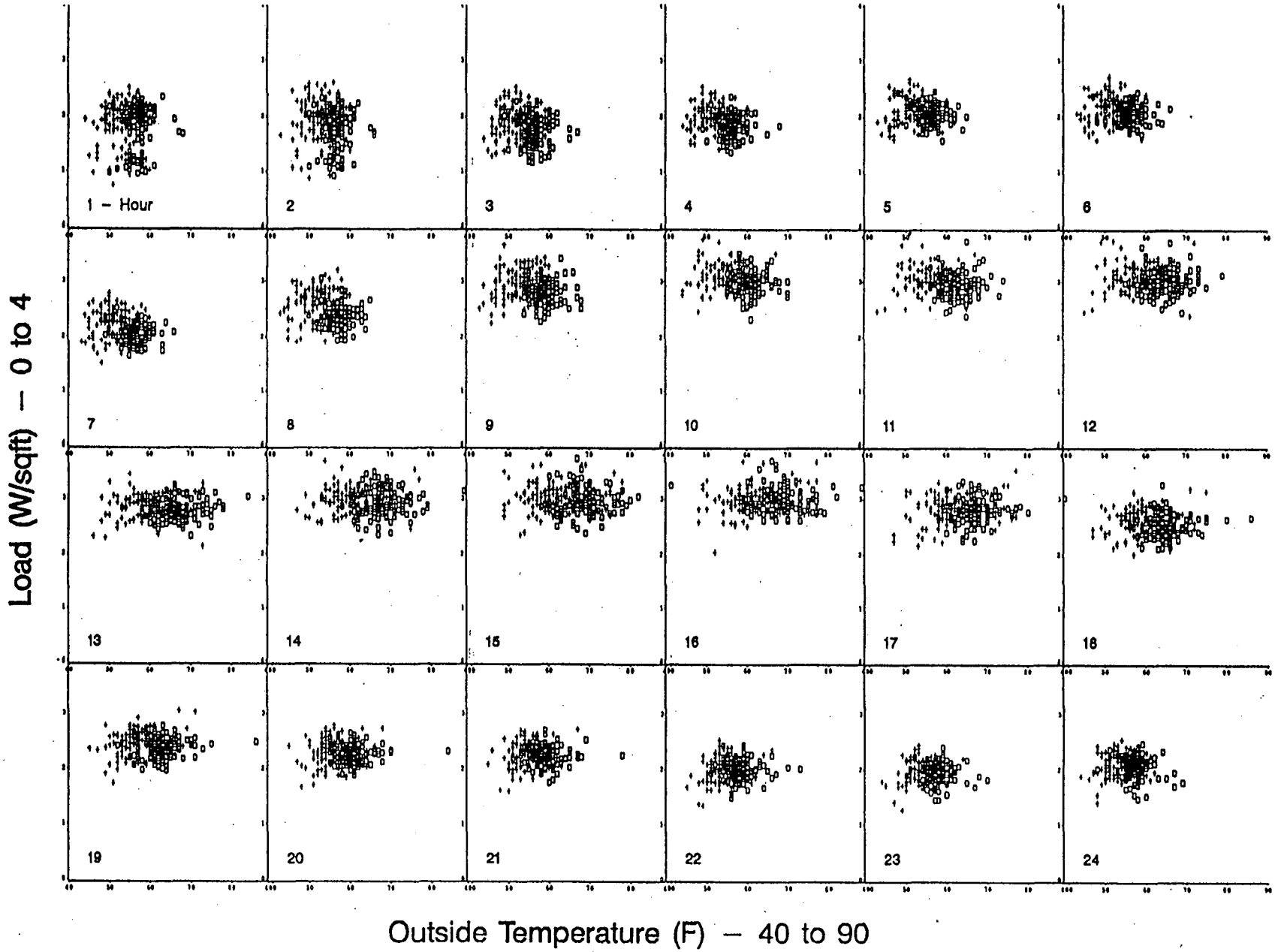


Figure 4-17b. Warehouse Whole Building Load vs. Drybulb Temperature for Standard Day - Inland

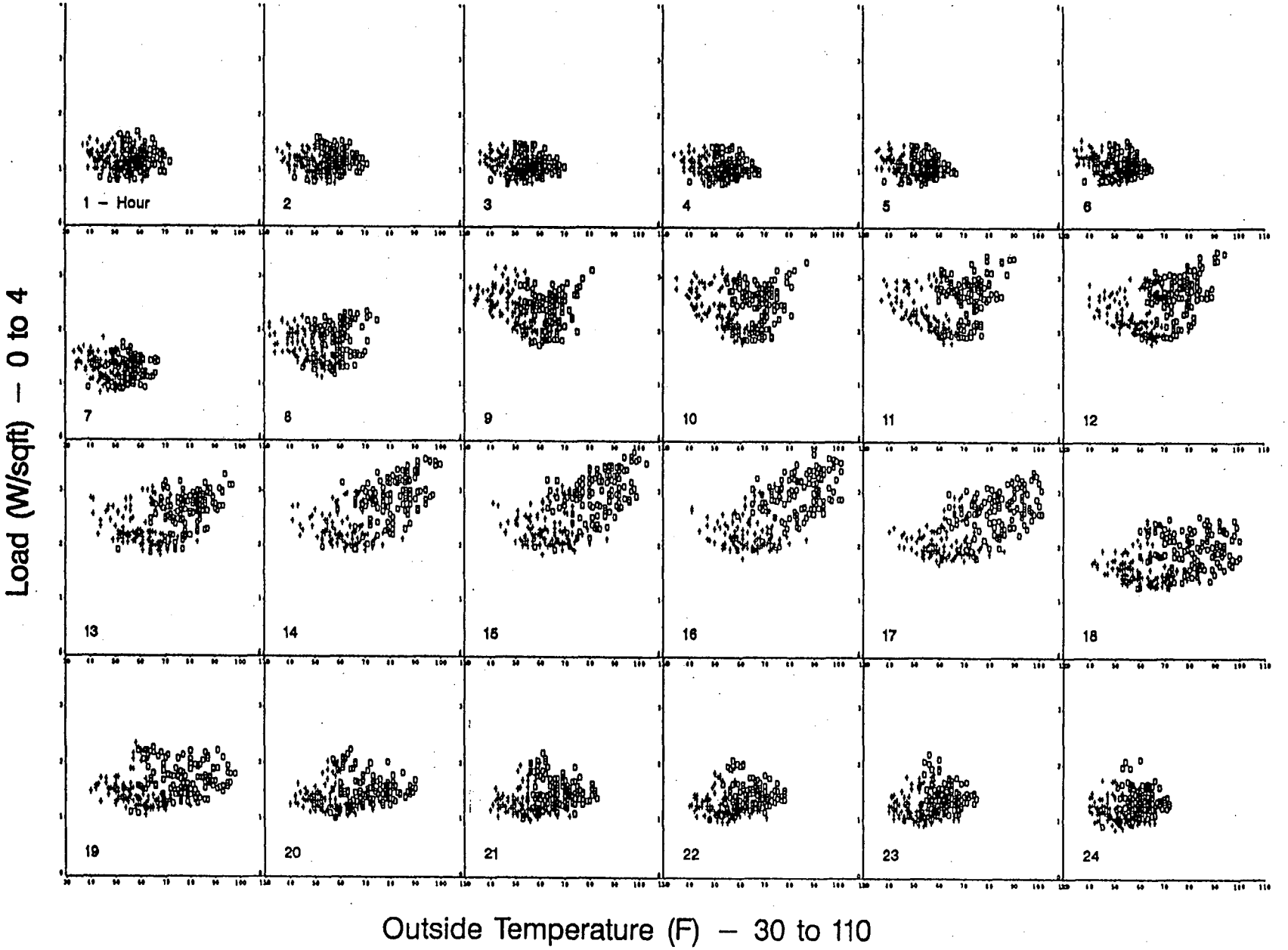


Figure 4-18a. Warehouse Reconciled Standard Day Annual End-Use LS - Coastal

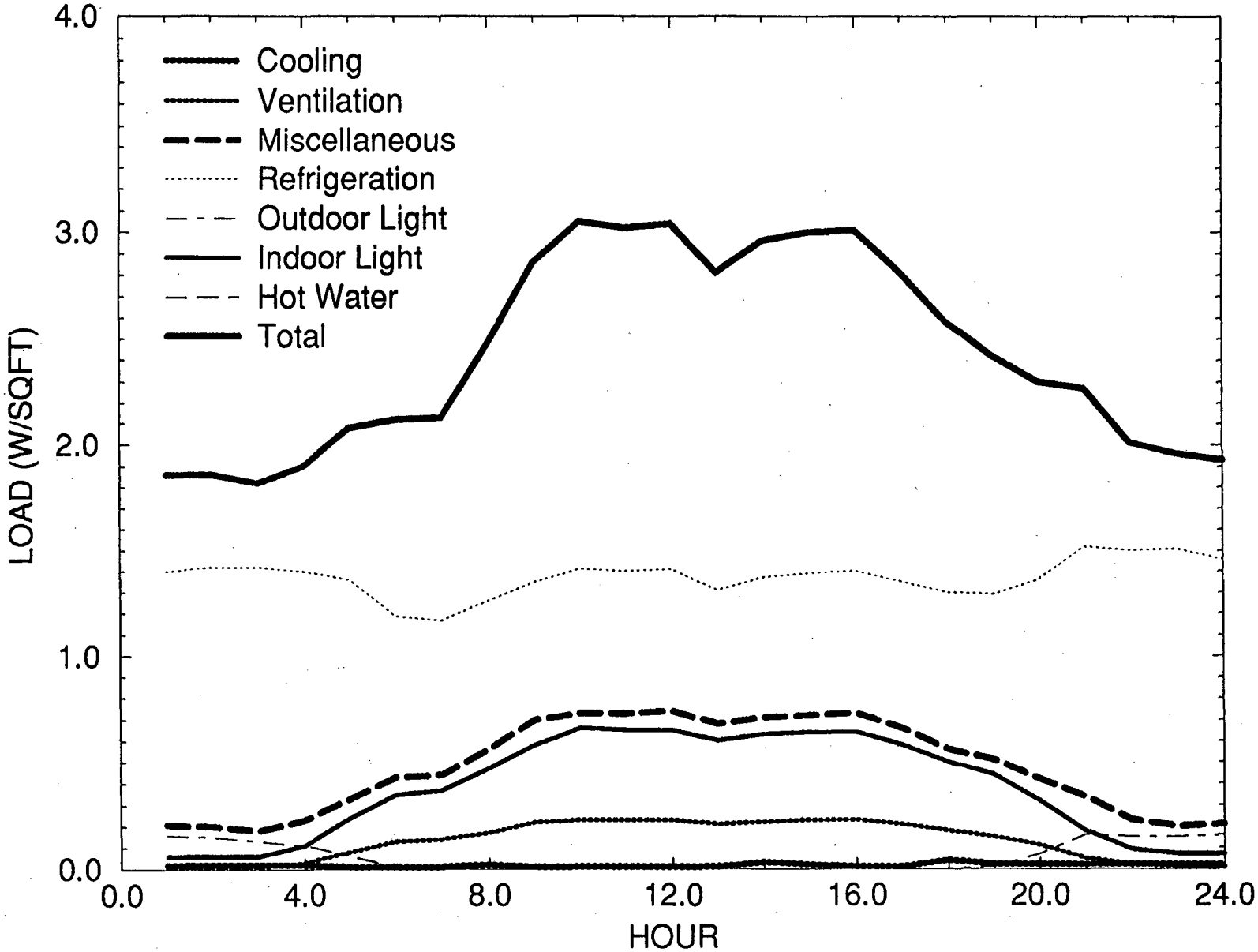


Figure 4-18b. Warehouse Reconciled Standard Day Annual End-Use LS - Inland

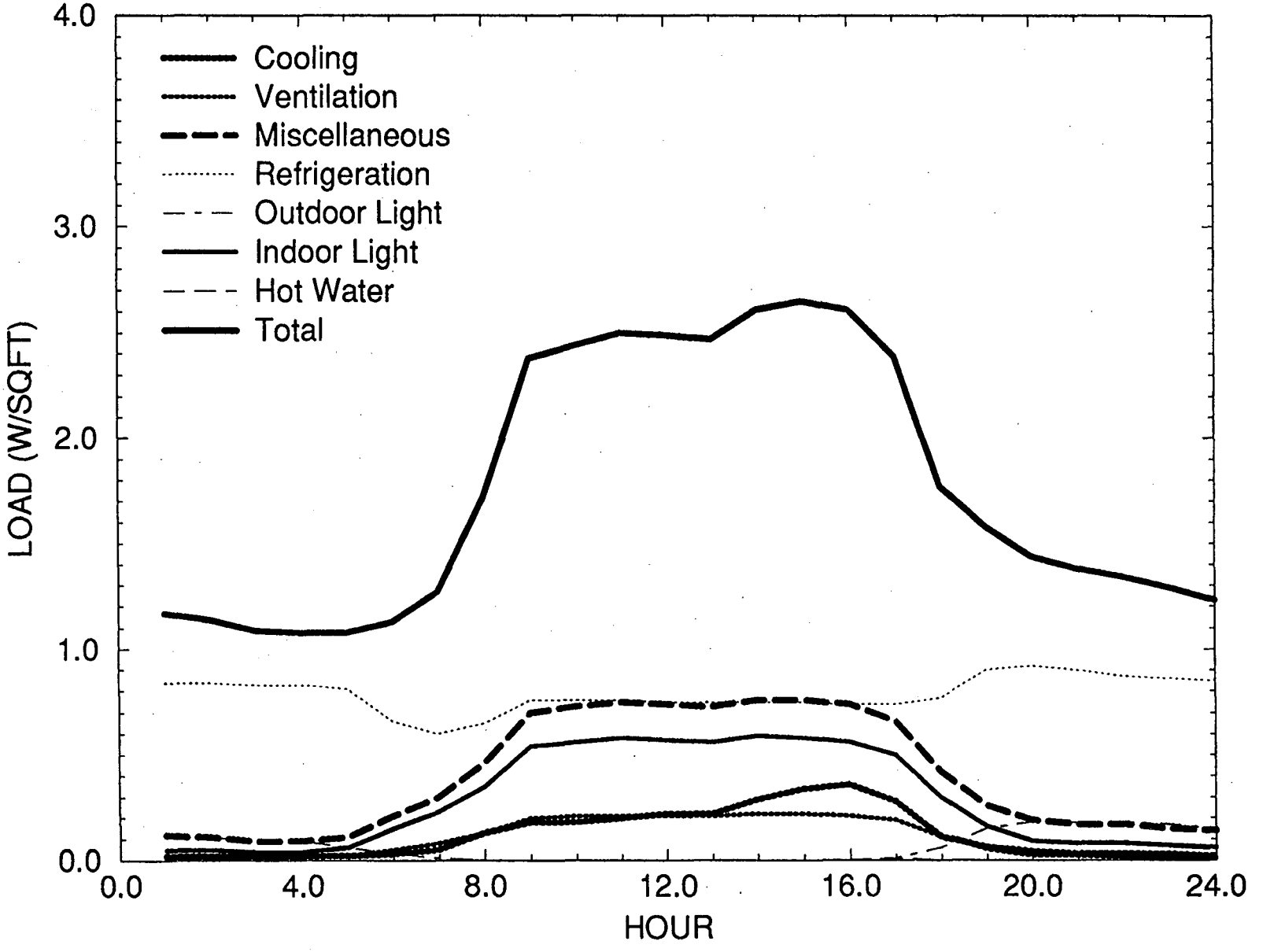


Figure 4-18c. Warehouse Reconciled Nonstandard Day Annual End-Use LS - Coastal

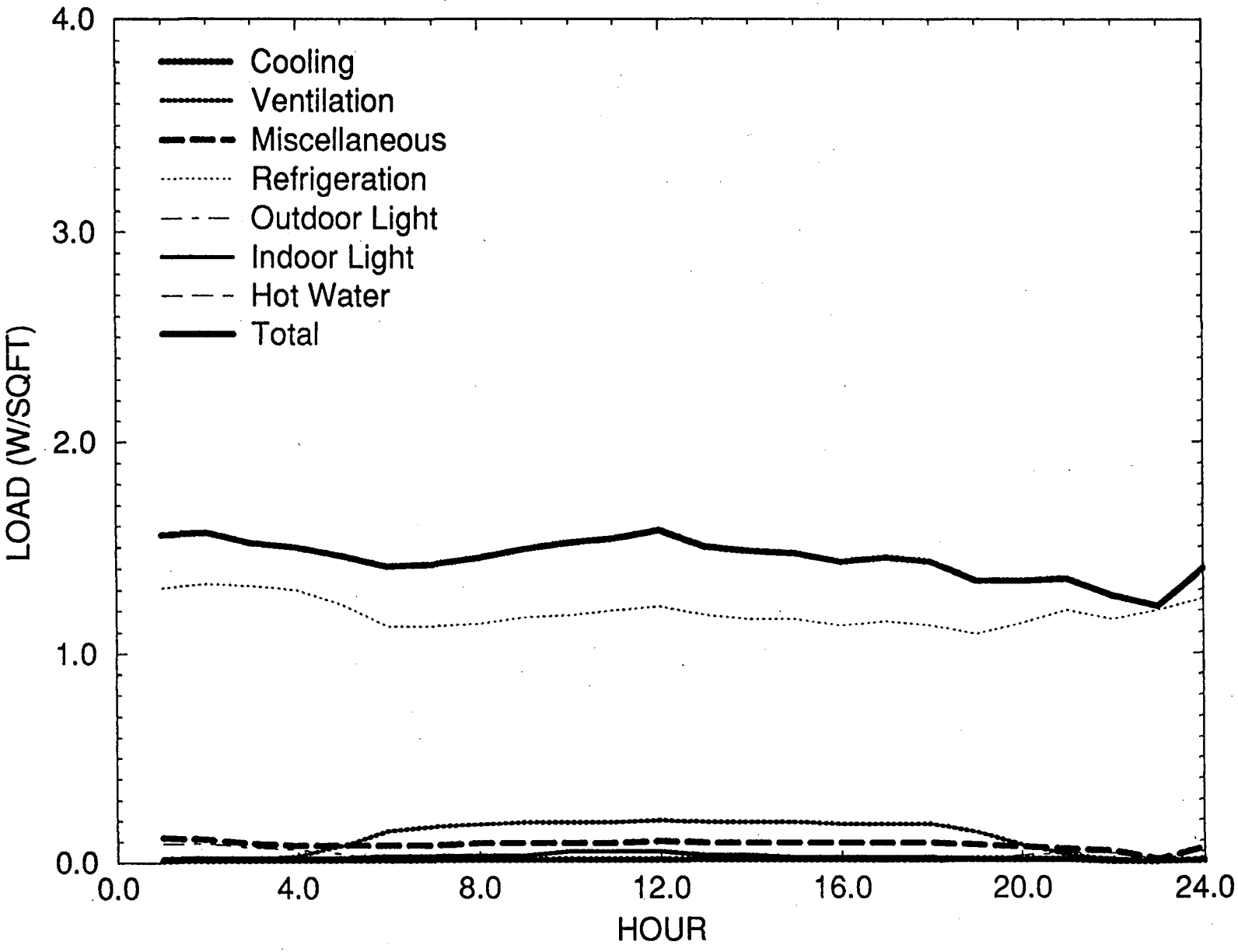
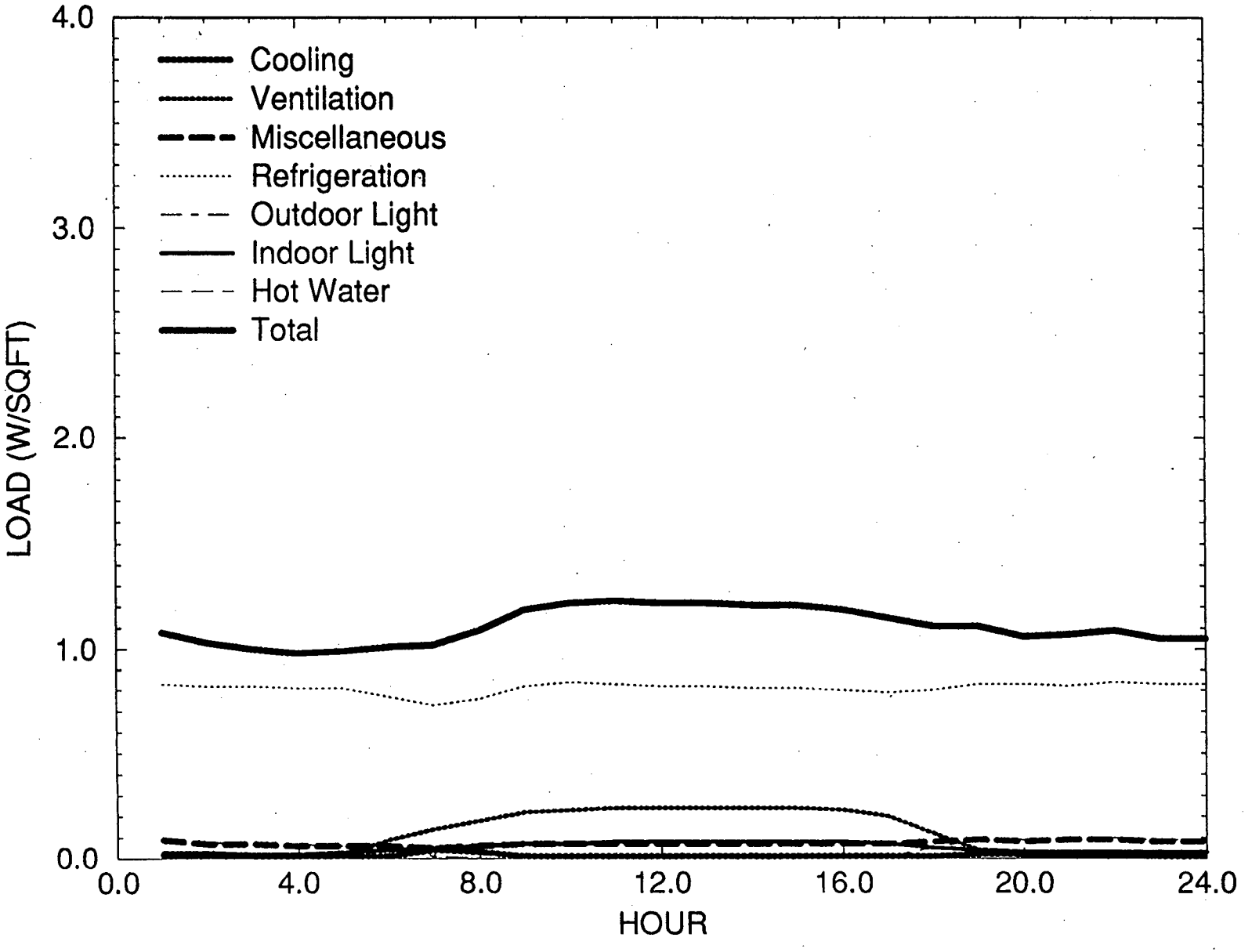


Figure 4-18d. Warehouse Reconciled Nonstandard Day Annual End-Use LS - Inland



School

The school category consists of primary schools (grades K through 6) and secondary schools (junior and senior highs).

Primary

The primary school prototype is a 35,000 ft^2, single story building consisting of fifteen 1,800 ft^2 classrooms, a 4,900 ft^2 library/multipurpose room, and a 3,200 ft^2 kitchen. The zones are conditioned with a Packaged Single Zone system. Heating and hot water are provided by a gas furnace.

Major characteristics of the prototypical building are summarized in **Table 4-25a** and **Table 4-25b**. The onsite survey reported an average floor area of 6,400 ft^2 within a range of 700 ft^2 to 46,500 ft^2, and the mail survey reports 35,000 ft^2. We felt that the mail survey result more accurately represented the floor area of the primary school. The mail survey does not provide numbers on lighting, equipment, and occupancy loads, so onsite data was used for consistency. The vintage and technology options are summarized in **Table 4-26**.

Secondary

The secondary school is a three-story, 100,000 ft^2 building consisting of six zones: thirty-three 1,800 ft^2 classrooms, a 13,000 ft^2 library, a 13,000 ft^2 gymnasium, a 8,000 ft^2 auditorium, a 2,000 ft^2 kitchen, and a 4,000 ft^2 dining room. The zones are conditioned with a Packaged Single Zone system. Heating is provided with a gas furnace and hot water through a gas boiler.

Major characteristics of the prototypical building are summarized in **Table 4-27a** and **Table 4-27b**. There was no onsite survey data for the secondary school, therefore mail survey data was used. The vintage and technology options are summarized in **Table 4-28**.

School

Table 4-29 shows the DOE-2 simulation and EDA-reconciled end-use EUI summaries for the School category of the coastal and inland climate regions. DOE-2 simulated average standard day end-use LSs for the coastal and inland climate zones are shown in **Figure 4-19**. Scatter plots of hourly whole-building EUIs against drybulb temperature for annual standard days of coastal and inland climates are shown in **Figure 4-20**. The coastal plots depict no correlation between whole-building-load and dry bulb temperature, however the inland plots illustrate some correlation during summer from late morning through the afternoon. EDA reconciled average standard and nonstandard day end-use LSs for coastal and inland climate regions are shown in **Figure 4-21**. The LSs indicate that indoor lighting constitutes the majority of the load, and lesser loads are ventilation, miscellaneous equipment, and hot water heating, and cooking, refrigeration, cooling, and outdoor lighting are the smallest consumers of electricity. Peak operation occurs on weekdays during 8 am to 5 pm.

Table 4-25a. Primary School Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	35.0
Number of Floors	1
Ceiling Insulation R-value	12.1
Wall Insulation R-value	8.4
Window shading coefficient	0.79
Window/wall ratio	0.13
Loads	
Refrigeration (W/ft^2)	0.3
Schedule	
Standard Days	5
Start	6
Stop	24
Non-Standard Days	2
Start	6
Stop	24
System	
System Type	PSZ
COP	2.3
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Heat Setpoint	71°F
Cool Setpoint	74°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Furnace

Table 4-25b. Primary School Building Prototype Zone Description

	Class	Library	Kitchen
Floor Area (% total)	77	17	6
Occupancy (ft^2/person)	90	78	208
Outside Air (ACH)	-	-	2.9
Outside Air / Person (CFM)	15	15	-
Indoor Lighting (W/ft^2)	1.8	1.2	1.4
Equipment (W/ft^2)	0.5	0.5	38
Cooking (W/ft^2)	-	-	11.7
Hot Water ($Btu/hr/ft^2$)	-	-	150

Table 4-26. Primary School Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	12.1	12.1
Wall Insulation R-value	8.4	8.7
Indoor Lighting (W/ft^2)	1.7	1.7
Equipment (W/ft^2)	2.8	2.8
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	PMZ	PSZ

Note: Packaged Single Zone (PSZ)
Packaged Multi Zone (PMZ)

Table 4-27a. Secondary School Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	100
Number of Floors	3
Ceiling Insulation R-value	11.0
Wall Insulation R-value	7.0
Window shading coefficient	0.85
Window/wall ratio	0.29
Loads	
Refrigeration (W/ft^2)	0.5
Schedule	
Standard Days	5
Start	6
Stop	24
Non-Standard Days	2
Start	6
Stop	24
System	
System Type	PSZ
COP	2.3
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Heat Setpoint	75°F
Cool Setpoint	78°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Boiler

Table 4-27b. Secondary School Building Prototype Zone Description

	Library	Class	Gym	Auditorium	Kitchen	Dining
Floor Area (% total)	13	60	13	8	2	4
Occupancy (ft^2/person)	100	90	180	100	300	20
Outside Air (ACH)	-	-	-	-	3.0	-
Outside Air / Person (CFM)	15	15	15	15	-	15
Indoor Lighting (W/ft^2)	1.5	2.2	0.7	0.8	1.7	1.7
Equipment (W/ft^2)	0.5	0.5	0.5	0.5	38	0.5
Cooking (W/ft^2)	-	-	-	-	12.0	-
Hot Water ($Btu/hr/ft^2$)	-	-	-	-	150	-

Table 4-28. Secondary School Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	4.9	11.0
Wall Insulation R-value	1.0	7.0
Indoor Lighting (W/ft^2)	1.8	1.8
Equipment (W/ft^2)	1.3	1.3
Cooking (W/ft^2)	0.2	0.2
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	PMZ	PSZ

Table 4-29a. School Simulated and EDA-Reconciled EUIs—Coastal (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC		Total	
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.77)										
5.36	0.50	0.58	0.00	0.48	0.10	0.27	0.00	0.88	0.52	8.69
Unconditioned (Weight=0.23)										
5.36	0.50	0.58	0.00	0.48	0.10	0.27	0.00	0.00	0.00	7.29
Weighted Average										
5.36	**0.50**	**0.58**	**0.00**	**0.48**	**0.10**	**0.27**	**0.00**	**0.68**	**0.40**	**8.37**
Reconciled										
2.91	**0.31**	**0.15**	**0.15**	**0.27**	**0.06**	**0.15**	**0.00**	**0.46**	**0.05**	**4.51**

Table 4-29b. School Simulated and EDA-Reconciled EUIs—Inland (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.83)										
5.38	0.50	0.58	0.00	0.48	0.11	0.27	0.00	0.95	1.37	9.64
Unconditioned (Weight=0.17)										
5.38	0.50	0.58	0.00	0.48	0.11	0.27	0.00	0.00	0.00	7.32
Weighted Average										
5.38	**0.50**	**0.58**	**0.00**	**0.48**	**0.11**	**0.27**	**0.00**	**0.79**	**1.14**	**9.25**
Reconciled										
3.06	**0.28**	**0.17**	**0.15**	**0.25**	**0.07**	**0.16**	**0.00**	**0.62**	**0.05**	**4.81**

Figure 4-19a. School Simulated Average Standard Day LS - Coastal

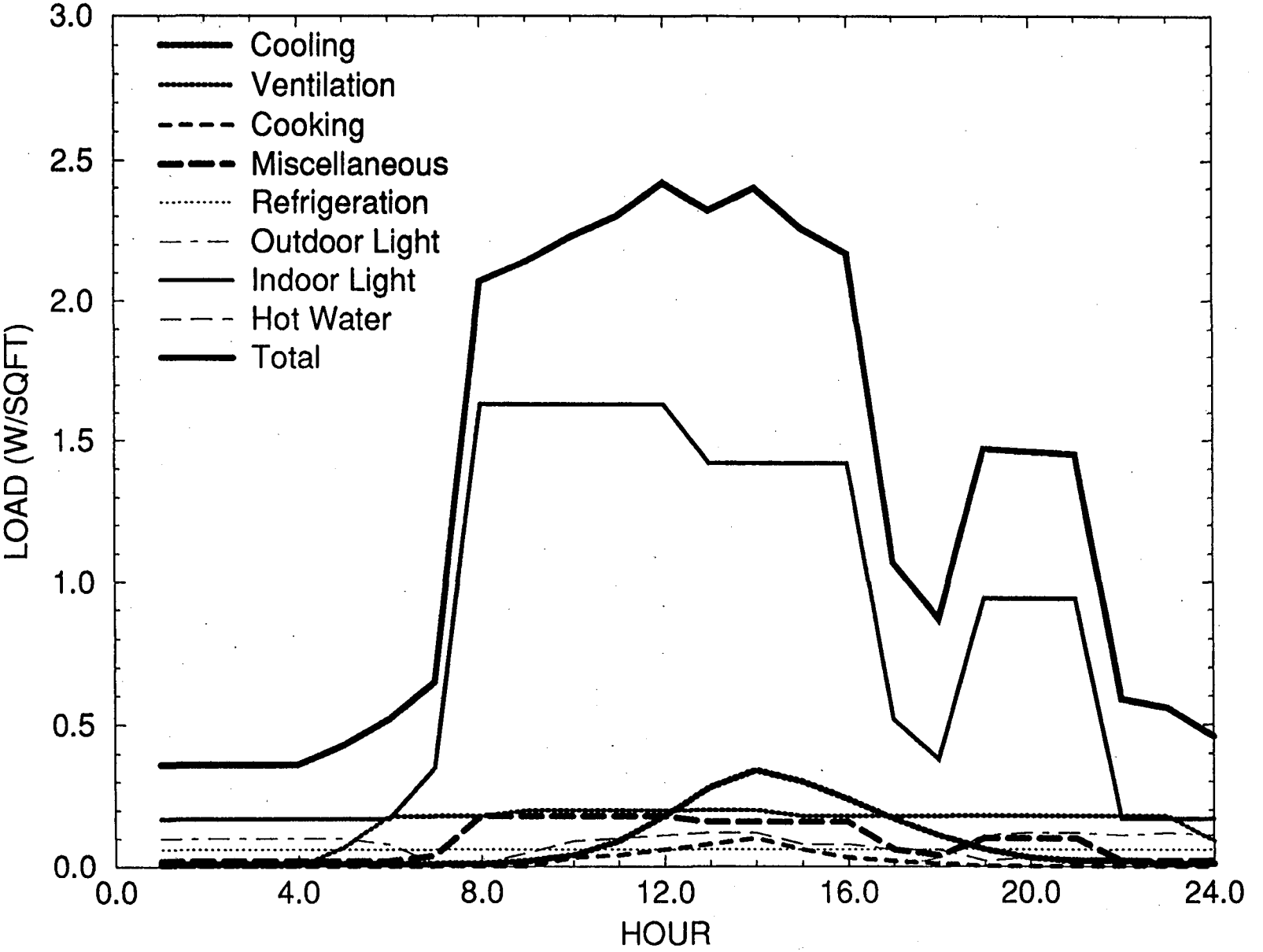


Figure 4-19b. School Simulated Average Standard Day LS - Inland

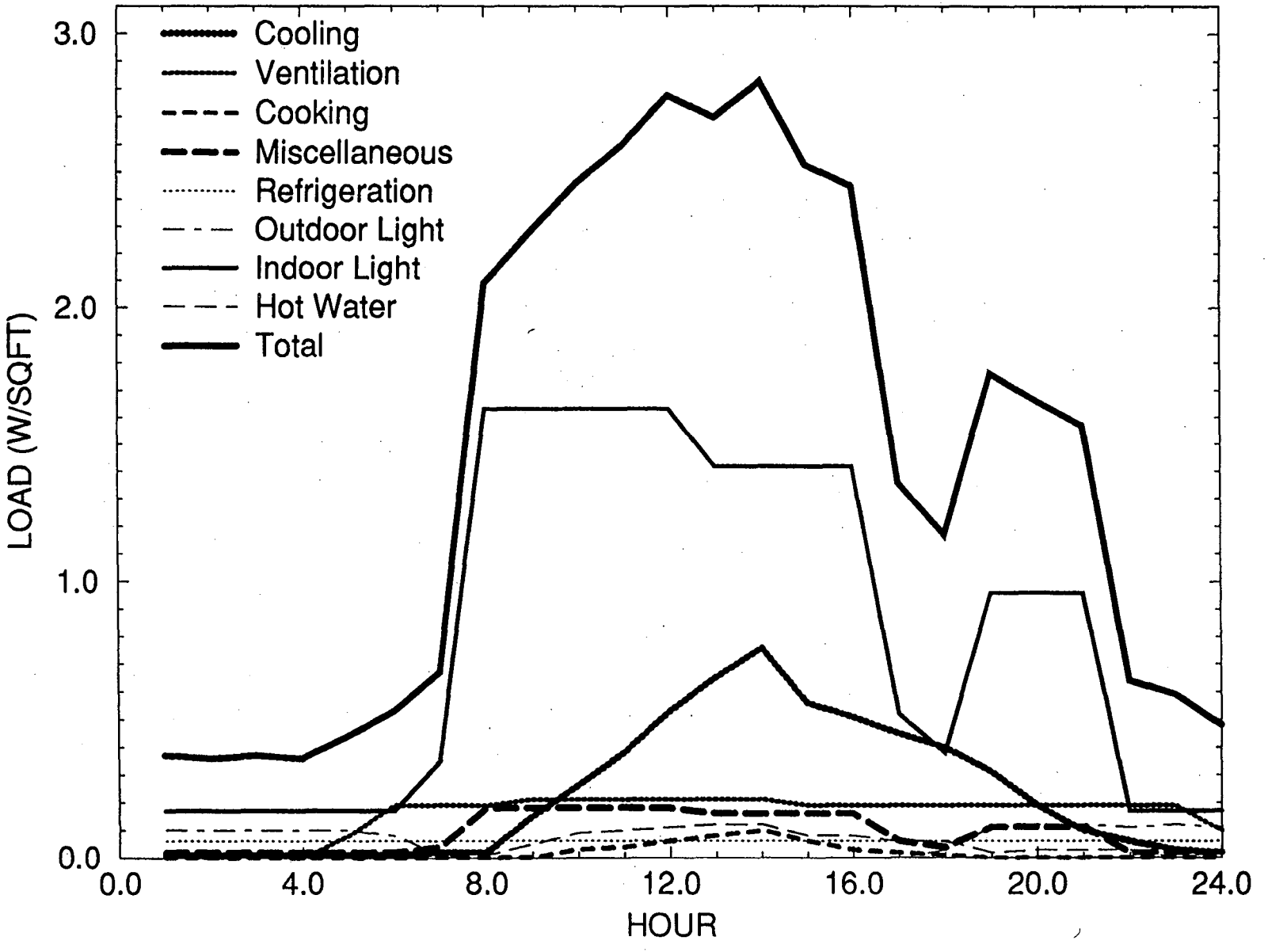


Figure 4-20a. School Whole Building Load vs. Drybulb Temperature for Standard Day - Coastal

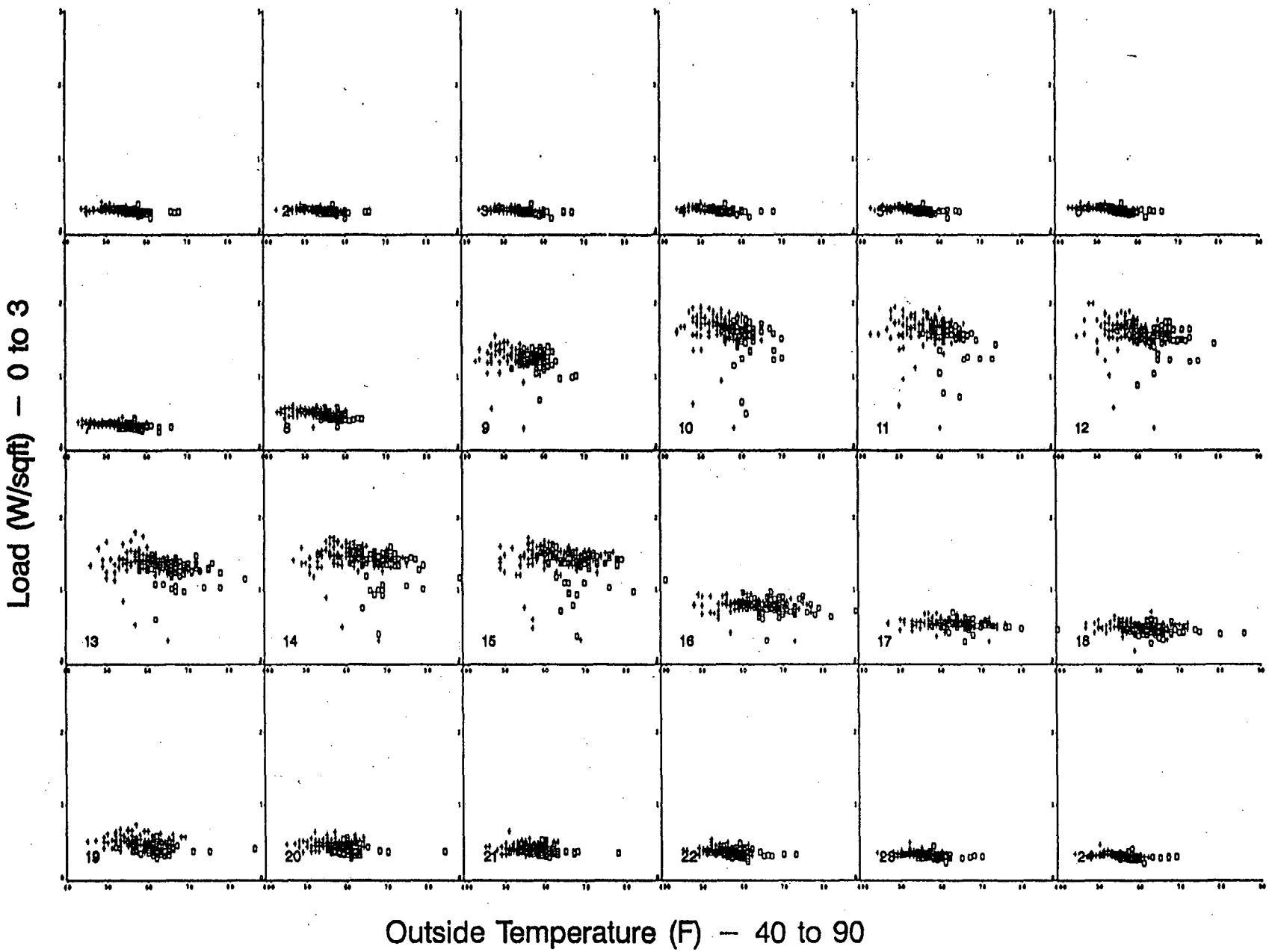


Figure 4-20b. School Whole Building Load vs. Drybulb Temperature for Standard Day - Inland

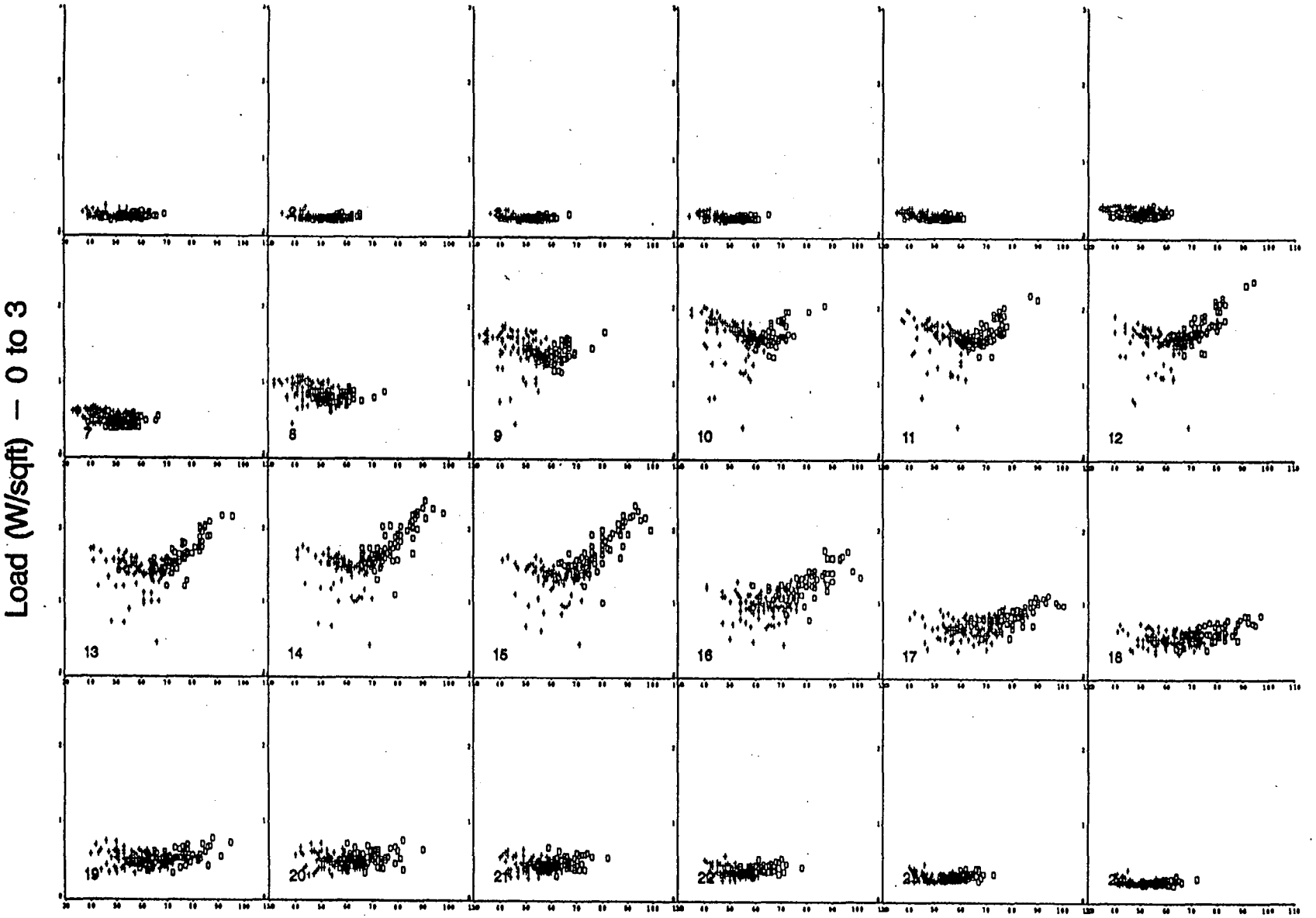


Figure 4-21a. School Reconciled Standard Day Annual End-Use LS - Coastal

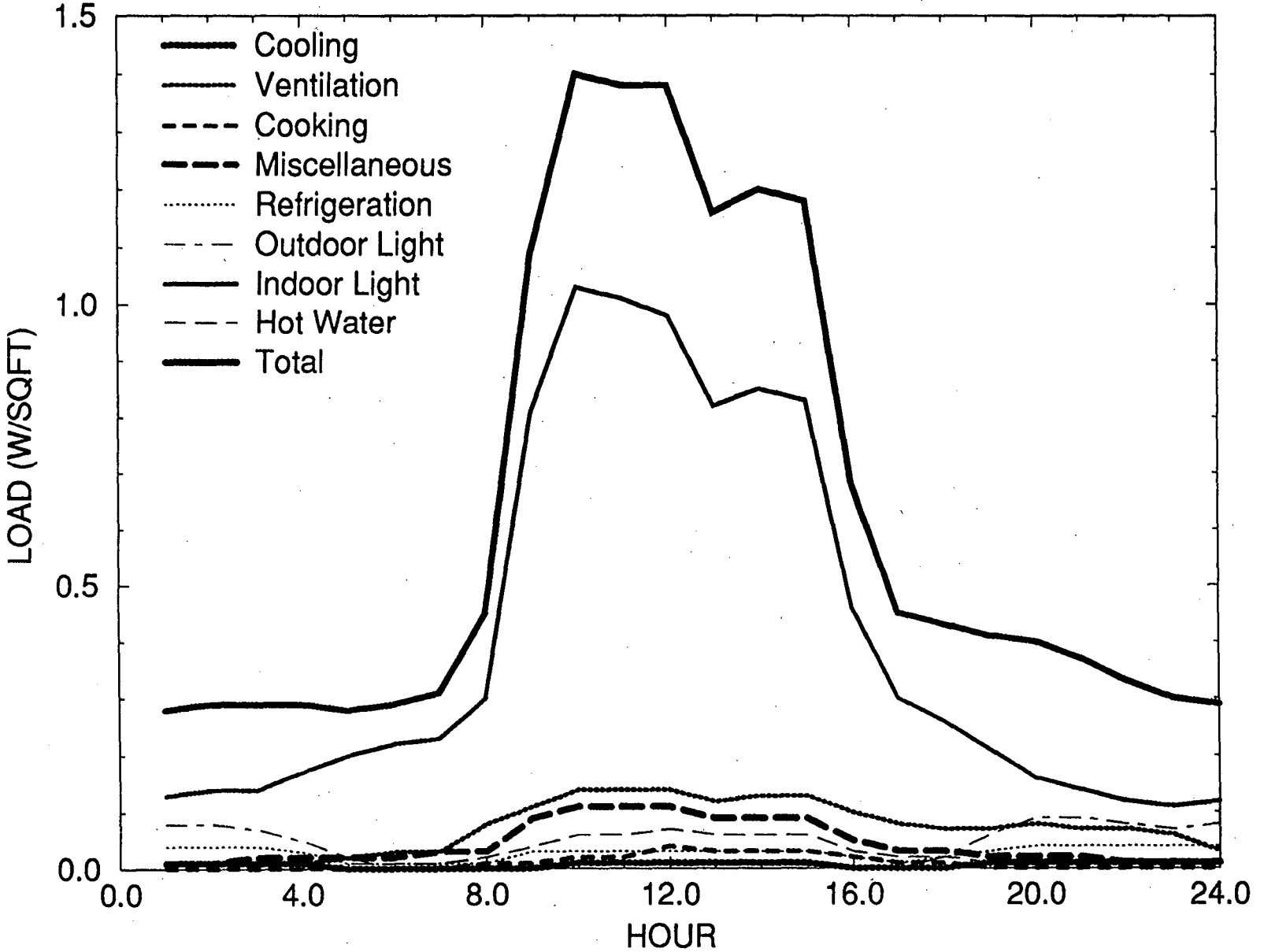


Figure 4-21b. School Reconciled Standard Day Annual End-Use LS - Inland

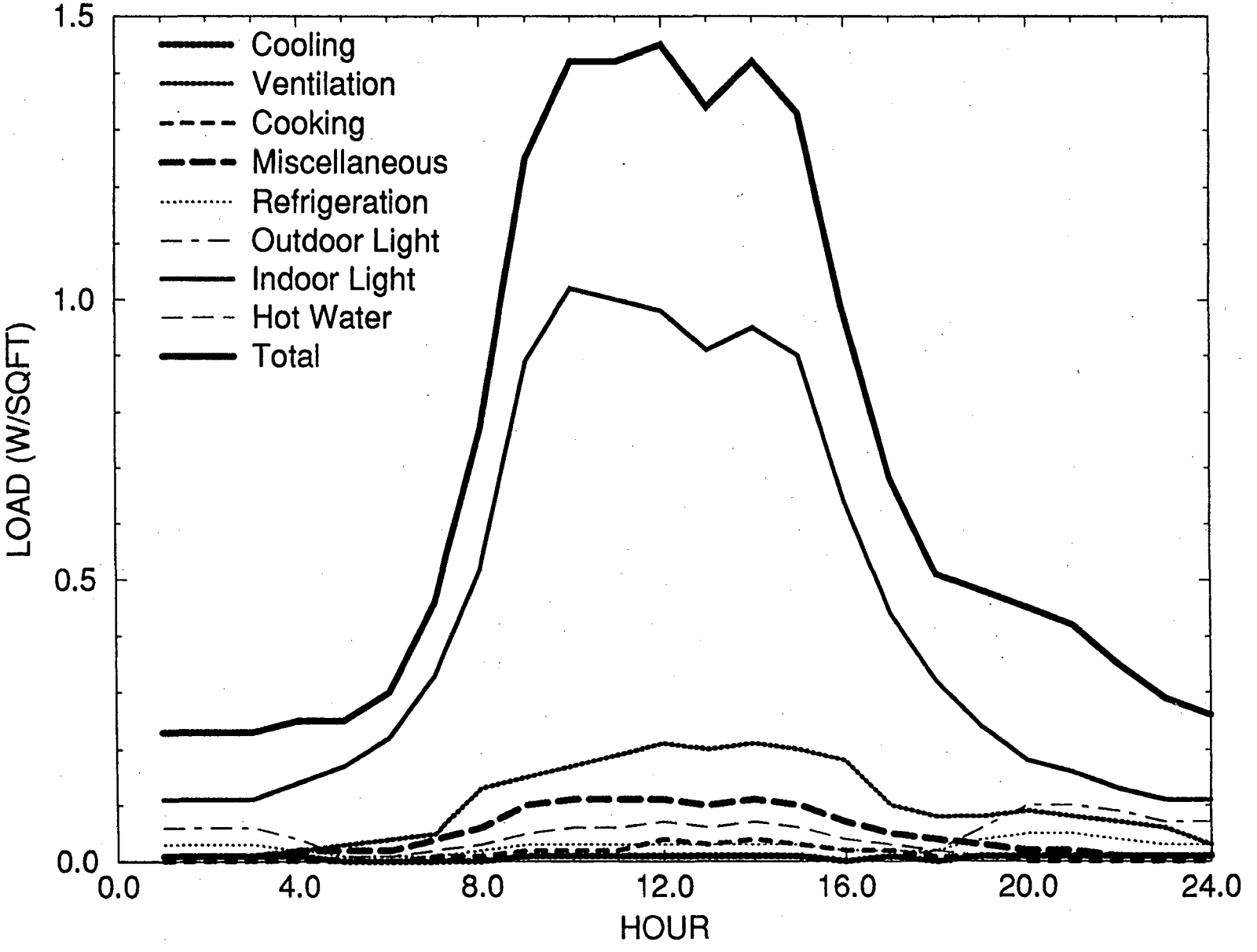


Figure 4-21c. School Reconciled Nonstandard Day Annual End-Use LS - Coastal

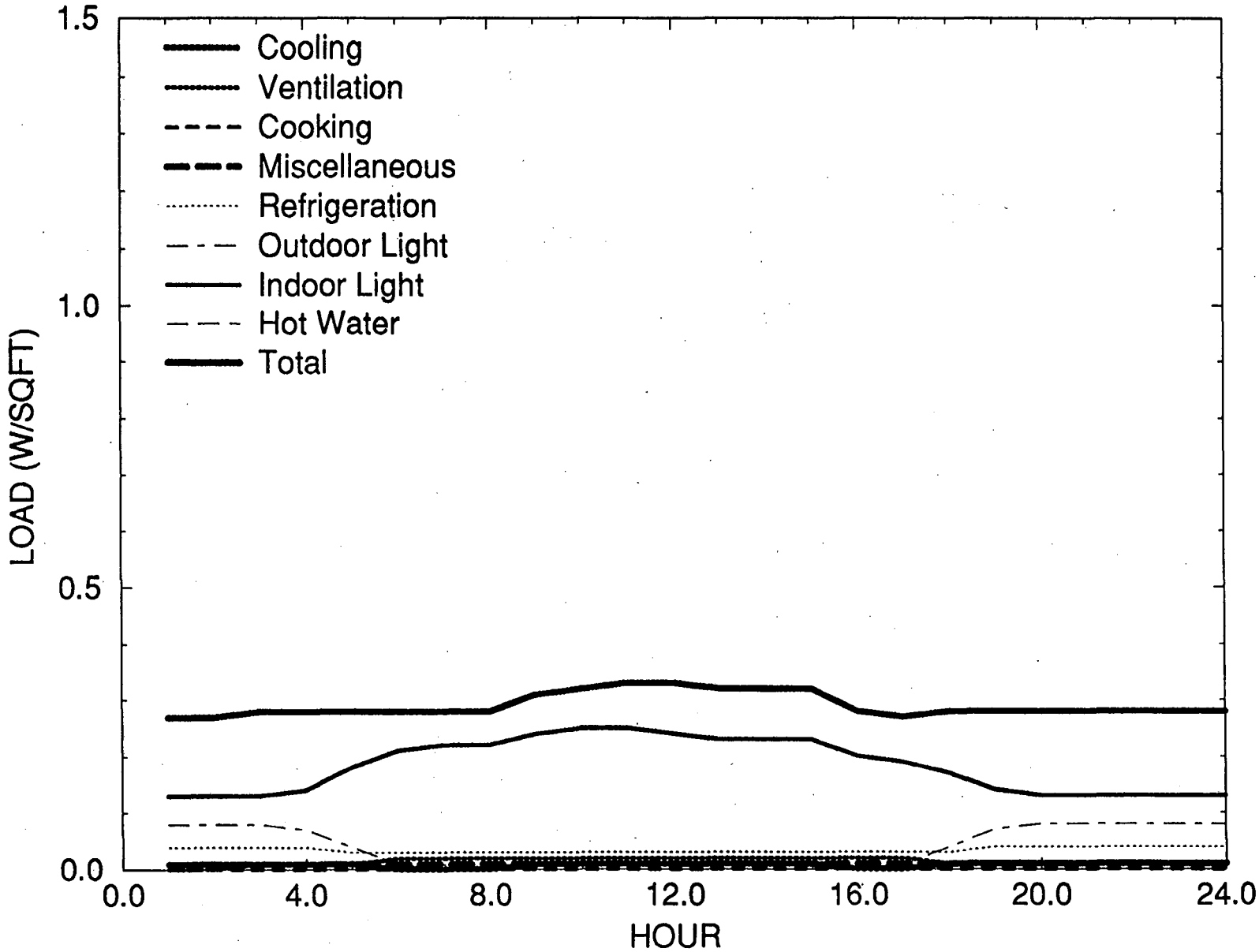
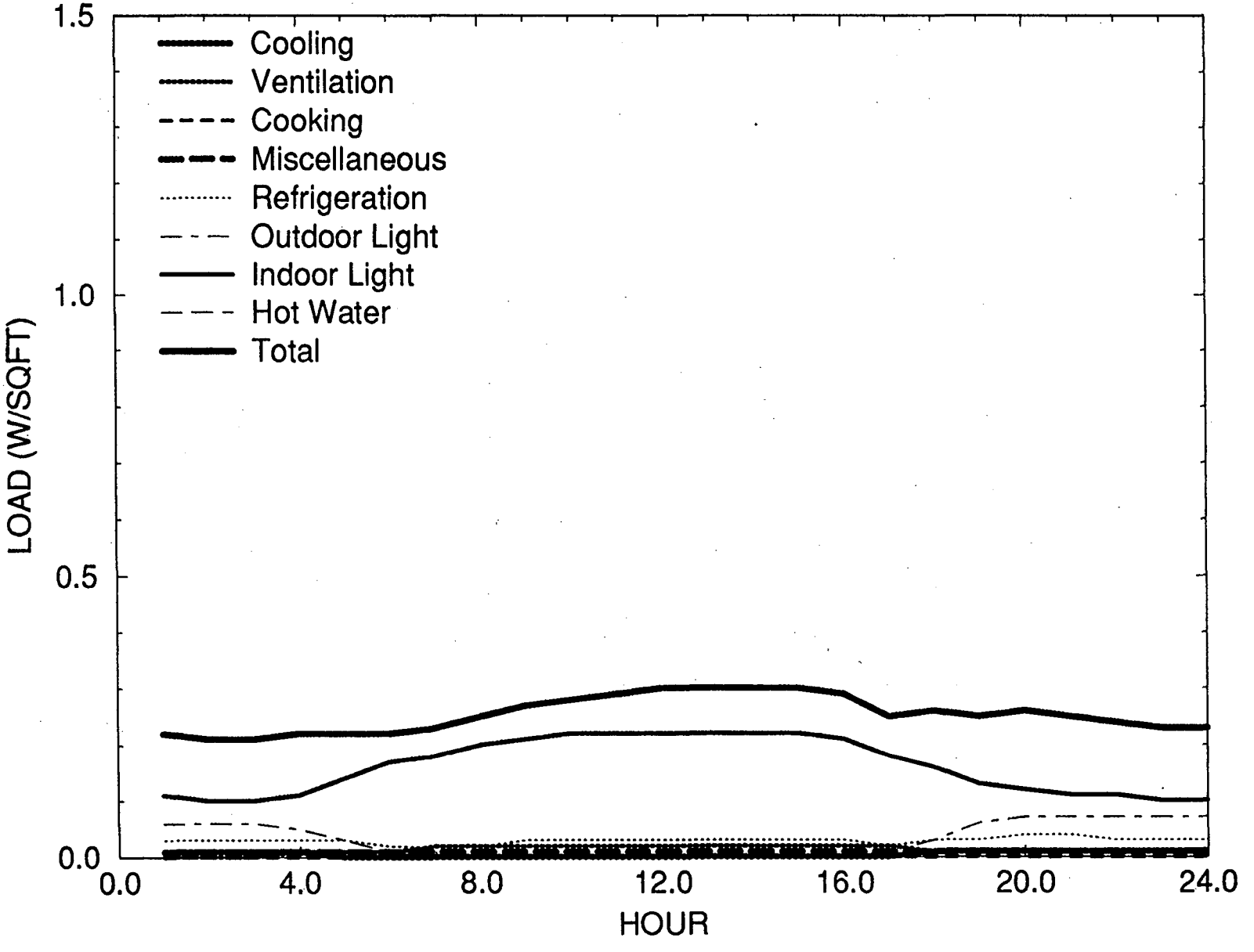


Figure 4-21d. School Reconciled Nonstandard Day Annual End-Use LS - Inland



College

The college prototype is modeled with three buildings, which are classroom/lab/office, dormitory, and library. The mail survey data does not provide any information of the fraction of college buildings that are dormitories and libraries. We have reviewed available sources of information such as CBECS (EIA 1989) for this data. The rather scarce data sources suggest that about 20 percent of college campus floor area consists of dormitories and 5 percent consists of libraries. The remaining 75 percent is made up of classrooms, labs and offices.

Classrooms/Labs/Offices

The Classrooms/Labs/Offices are modeled with two conditioned zones and an unconditioned basement zone as a four story concrete building with 205,600 ft^2 of floor area. The bottom floor consists of 110,000 ft^2 of classrooms and lecture halls served by a Single Zone Reheat system. Beneath the bottom floor is an unconditioned basement space. The upper floors contain one-hundred-ninety-two 500 ft^2 individual offices served by a Reheat Fan system. Both systems are supplied with heating and cooling by a central gas boiler and a hermetic centrifugal chiller with cooling tower.

Major characteristics of the prototypical building are summarized in **Table 4-30a** and **Table 4-30b**. The onsite survey includes only one sample for college, therefore mail survey data was used for the floor area. The mail survey does not provide numbers on lighting, equipment, and occupancy loads, so onsite data was used for consistency. The vintage and technology options are summarized in **Table 4-31**.

Dormitory

The dormitory building is modeled with four zones as a five story concrete building with 52,000 ft^2 of floor area. The bottom floor consists of a 2,600 ft^2 kitchen, and a 7,000 ft^2 dining area, and is conditioned with a Single Zone Reheat system. The fifty 500 ft^2 rooms are on the upper floors with a common bath room and shower facilities, and are only heated with a Two Pipe Fan Coil system. Corridors on the upper floors represent 2,400 ft^2 and are conditioned with a Single Zone Reheat system. Both heating and hot water energy source is a gas boiler.

Major characteristics of the prototypical building are summarized in **Table 4-32a** and **Table 4-32b**. There was no onsite or mail survey data available for the dorm prototype. The vintage and technology options are summarized in **Table 4-33**.

Library

The library building is modeled as a single story concrete building with 40,000 ft^2 of floor area divided into four equally sized zones. The building is heated and cooled with a Reheat Fan system. The heating energy source is s gas boiler and the cooling energy source is a hermetic

centrifugal chiller. There is no hot water.

Major characteristics of the prototypical building are summarized in **Table 4-34**. There was no onsite or mail survey data available for the library prototype. The vintage and technology options are summarized in **Table 4-35**.

College

Table 4-36 shows the DOE-2 simulation and EDA-reconciled end-use EUI summaries for the College category of the coastal and inland climate regions. DOE-2 simulated average standard day end-use LSs for the coastal and inland climate zones are shown in **Figure 4-22**. Scatter plots of hourly whole-building EUIs against drybulb temperature for annual standard days of coastal and inland climates are shown in **Figure 4-23**. Both sets of plots depict no correlation between whole-building-load and dry bulb temperature. EDA reconciled average standard and nonstandard day end-use LSs for coastal and inland climates are shown in **Figure 4-24**. The LSs indicate that indoor lighting constitutes the majority of the load, and ventilation, cooling, and miscellaneous equipment create a lesser demand, and cooking, refrigeration, and outdoor lighting demand a very small portion of electricity. Peak operation occurs on weekdays during 9 am to 6 pm.

Note: Reheat Fan (RHF)
Single Zone Reheat (SZRH)
Two Pipe Fan Coil (TPFC)
Variable Air Volume (VAV)

Table 4-30a. Classroom/Lab/Office Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	205.6
Number of Floors	4
Ceiling Insulation R-value	5.8
Wall Insulation R-value	2.6
Window shading coefficient	0.6
Window/wall ratio	0.32
Loads	
Refrigeration (W/ft^2)	-
Cooking (W/ft^2)	-
Hot Water ($Btu/hr/ft^2$)	1.2
Schedule	
Standard Days	5
Start	5
Stop	24
Non-Standard Days	2
Start	5
Stop	24
System	
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Outside Air / Person (CFM)	15
Heat Setpoint	72°F
Cool Setpoint	76°F
Plant	
Heating	Gas Boiler
Cooling	Hermetic Centrifugal Chiller
Hot Water	Gas Boiler

Table 4-30b. Classroom/Lab/Office Building Prototype Zone Description

	Office	Classroom
Floor Area (% total)	47	53
Occupancy (ft^2/person)	250	81
Indoor Lighting (W/ft^2)	1.0	1.5
Equipment (W/ft^2)	0.6	-
System Type	RHF	SZRH

Table 4-31. Classroom/Lab/Office Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	5.8	9.0
Wall Insulation R-value	2.6	4.0
Indoor Lighting (W/ft^2)	1.3	1.3
Equipment (W/ft^2)	0.3	0.3
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type		
Office	RHF	VAV
Class	SZRH	VAV

Table 4-32a. Dormitory Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	52.0
Number of Floors	5
Ceiling Insulation R-value	5.8
Wall Insulation R-value	2.6
Window shading coefficient	0.6
Window/wall ratio	0.2
Loads	
Refrigeration (W/ft^2)	0.3
Schedule	
Standard Days	5
Start	5
Stop	24
Non-Standard Days	2
Start	5
Stop	24
System	
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Heat Setpoint	72°F
Cool Setpoint	85°F
Plant	
Heating	Gas Boiler
Cooling	-
Hot Water	Gas Boiler

Table 4-32b. Dormitory Building Prototype Zone Description

	Corridor	Kitchen	Dining	Room
Floor Area (% total)	5	5	13	77
Occupancy (ft^2/person)	240	260	17.5	100
Outside Air (ACH)	-	2.9	-	-
Outside Air / Person (CFM)	15	-	15	15
Indoor Lighting (W/ft^2)	1.5	2.0	1.5	1.0
Equipment (W/ft^2)	-	3.0	-	0.6
Cooking (W/ft^2)	-	5.0	-	-
Hot Water ($Btu/hr/ft^2$)	-	50	-	-
System Type	TPFC	SZRH	SZRH	TPFC

Table 4-33. Dormitory Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	5.8	9.0
Wall Insulation R-value	2.6	4.0
Indoor Lighting (W/ft^2)	1.1	1.1
Equipment (W/ft^2)	0.6	0.6
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type		
Room/Corridor	TPFC	VAV
Kitchen/Dining	SZRH	SZRH

Table 4-34. Library Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	40.0
Number of Floors	1
Ceiling Insulation R-value	4.9
Wall Insulation R-value	1.0
Window shading coefficient	0.6
Window/wall ratio	0.1
Loads	
Occupancy (ft^2/person)	333
Indoor Lighting (W/ft^2)	1.7
Equipment (W/ft^2)	0.5
Refrigeration (W/ft^2)	-
Cooking (W/ft^2)	-
Hot Water ($Btu/hr/ft^2$)	-
Schedule	
Standard Days	5
Start	5
Stop	24
Non-Standard Days	2
Start	5
Stop	24
System	
System Type	RHF
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Outside Air / Person (CFM)	15
Heat Setpoint	72°F
Cool Setpoint	78°F
Plant	
Heating	Gas Boiler
Cooling	Hermetic Centrifugal Chiller
Hot Water	-

Table 4-35. Library Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	4.9	9.0
Wall Insulation R-value	1.0	4.0
Indoor Lighting (W/ft^2)	1.7	1.7
Equipment (W/ft^2)	0.5	0.5
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	RHF	VAV

Table 4-36a. College Simulated and EDA-Reconciled EUIs—Coastal (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.52)										
4.30	0.11	0.50	0.00	0.02	0.06	0.06	0.00	1.92	1.76	8.73
Unconditioned (Weight=0.48)										
4.30	0.11	0.50	0.00	0.02	0.06	0.06	0.00	0.00	0.00	5.05
Weighted Average										
4.30	**0.11**	**0.50**	**0.00**	**0.02**	**0.06**	**0.06**	**0.00**	**1.00**	**0.92**	**6.97**
Reconciled										
2.90	**0.15**	**0.20**	**0.22**	**0.06**	**0.04**	**0.04**	**0.00**	**1.06**	**0.63**	**5.30**

Table 4-36b. College Simulated and EDA-Reconciled EUIs—Inland (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.95)										
4.30	0.11	0.50	0.00	0.02	0.06	0.06	0.00	1.93	2.63	9.61
Unconditioned (Weight=0.05)										
4.30	0.11	0.50	0.00	0.02	0.06	0.06	0.00	0.00	0.00	5.05
Weighted Average										
4.30	**0.11**	**0.50**	**0.00**	**0.02**	**0.06**	**0.06**	**0.00**	**1.83**	**2.50**	**9.38**
Reconciled										
3.59	**0.11**	**0.23**	**0.22**	**0.04**	**0.04**	**0.05**	**0.00**	**1.43**	**1.29**	**7.00**

Figure 4-22a. College Simulated Average Standard Day LS - Coastal

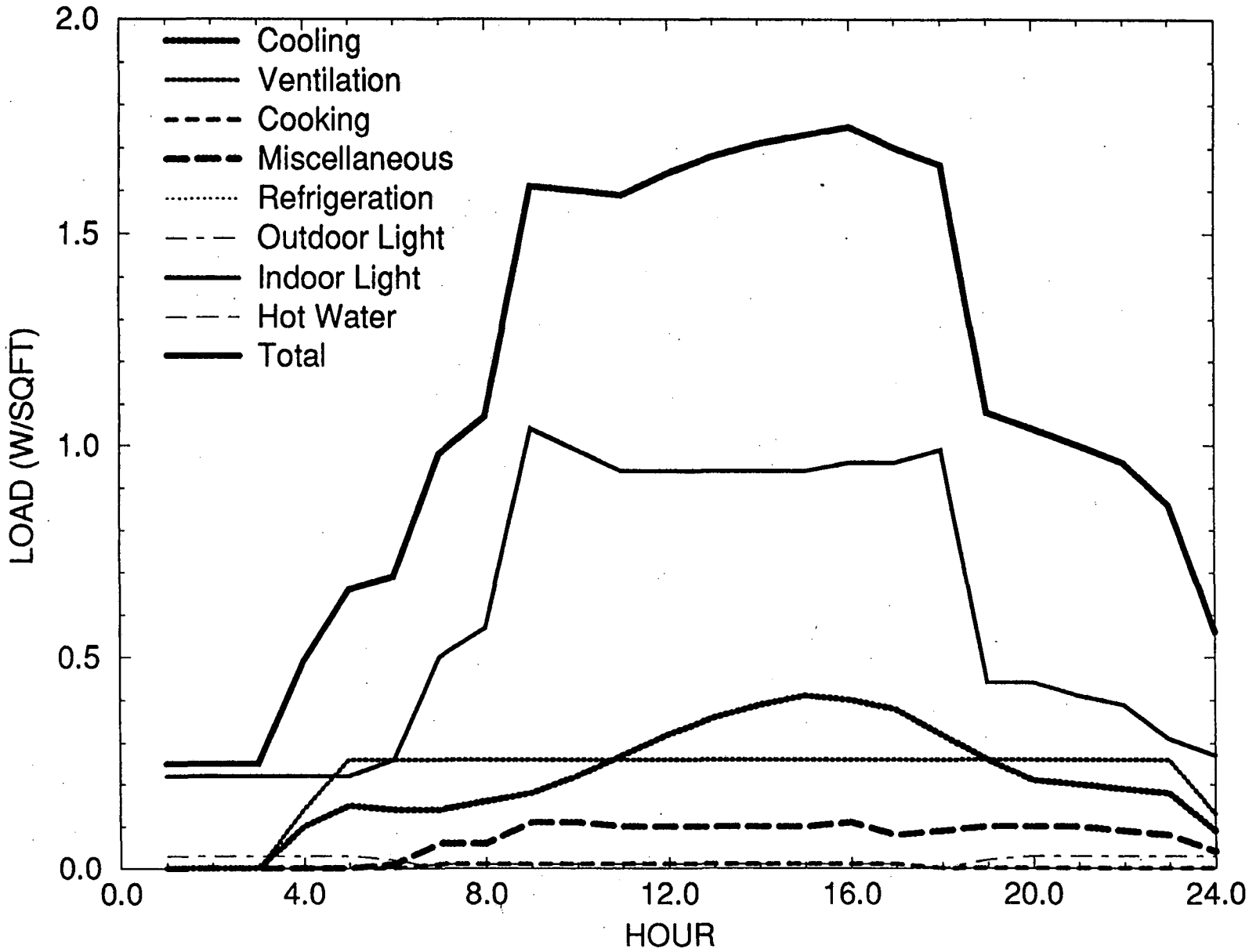


Figure 4-22b. College Simulated Average Standard Day LS - Inland

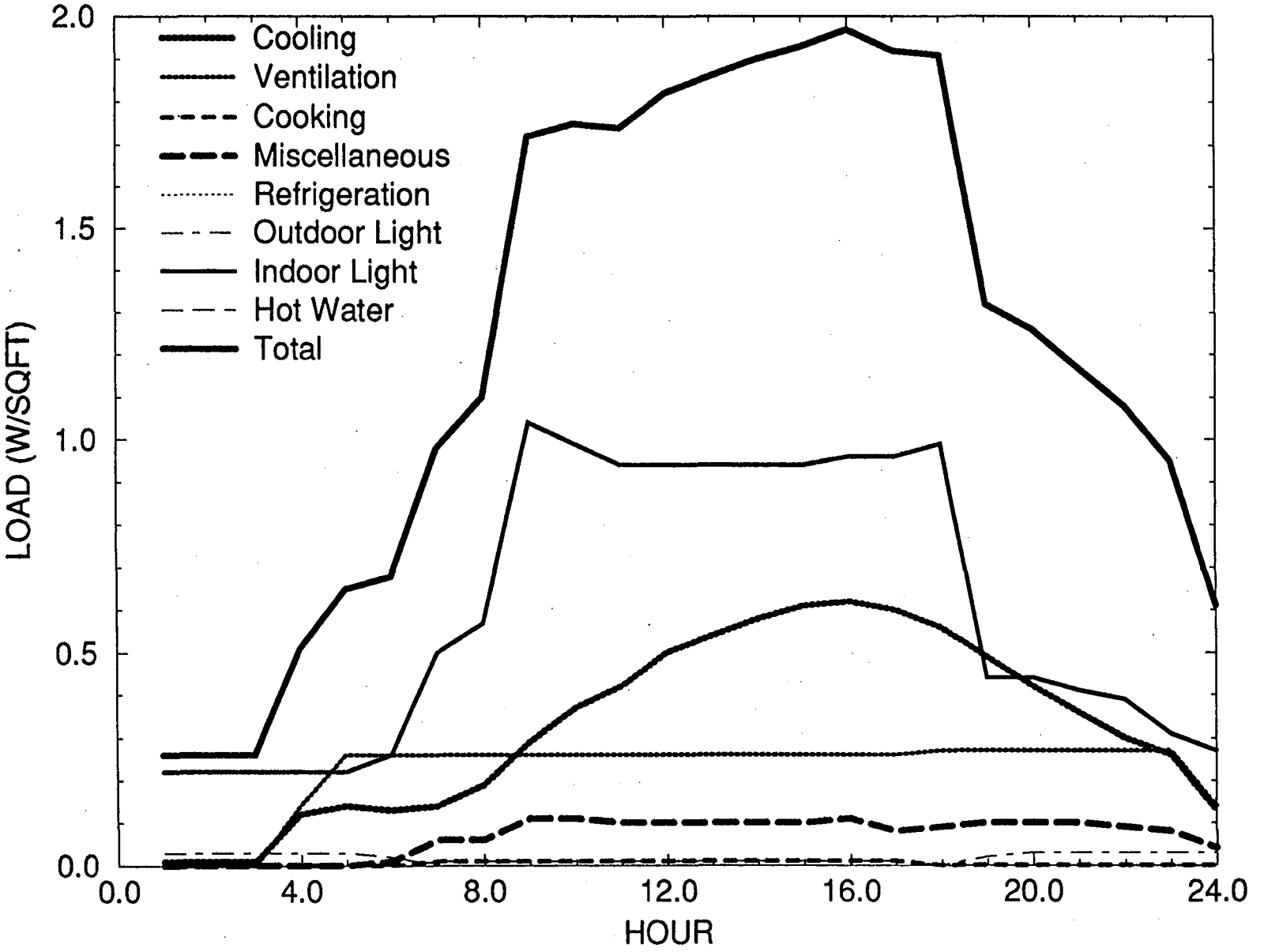


Figure 4-23a. College Whole Building Load vs. Drybulb Temperature for Standard Day - Coastal

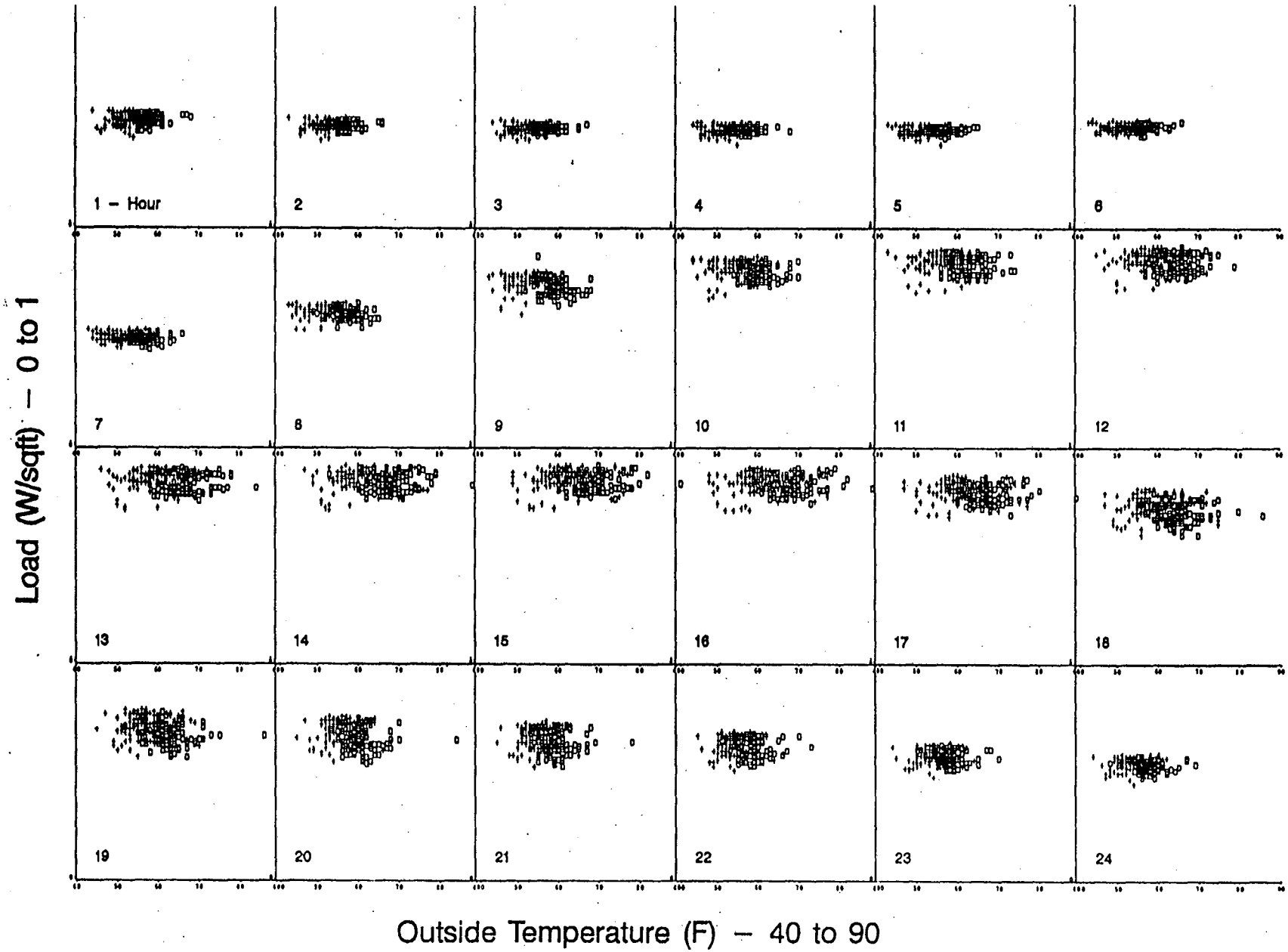


Figure 4-23b. College Whole Building Load vs. Drybulb Temperature for Standard Day - Inland

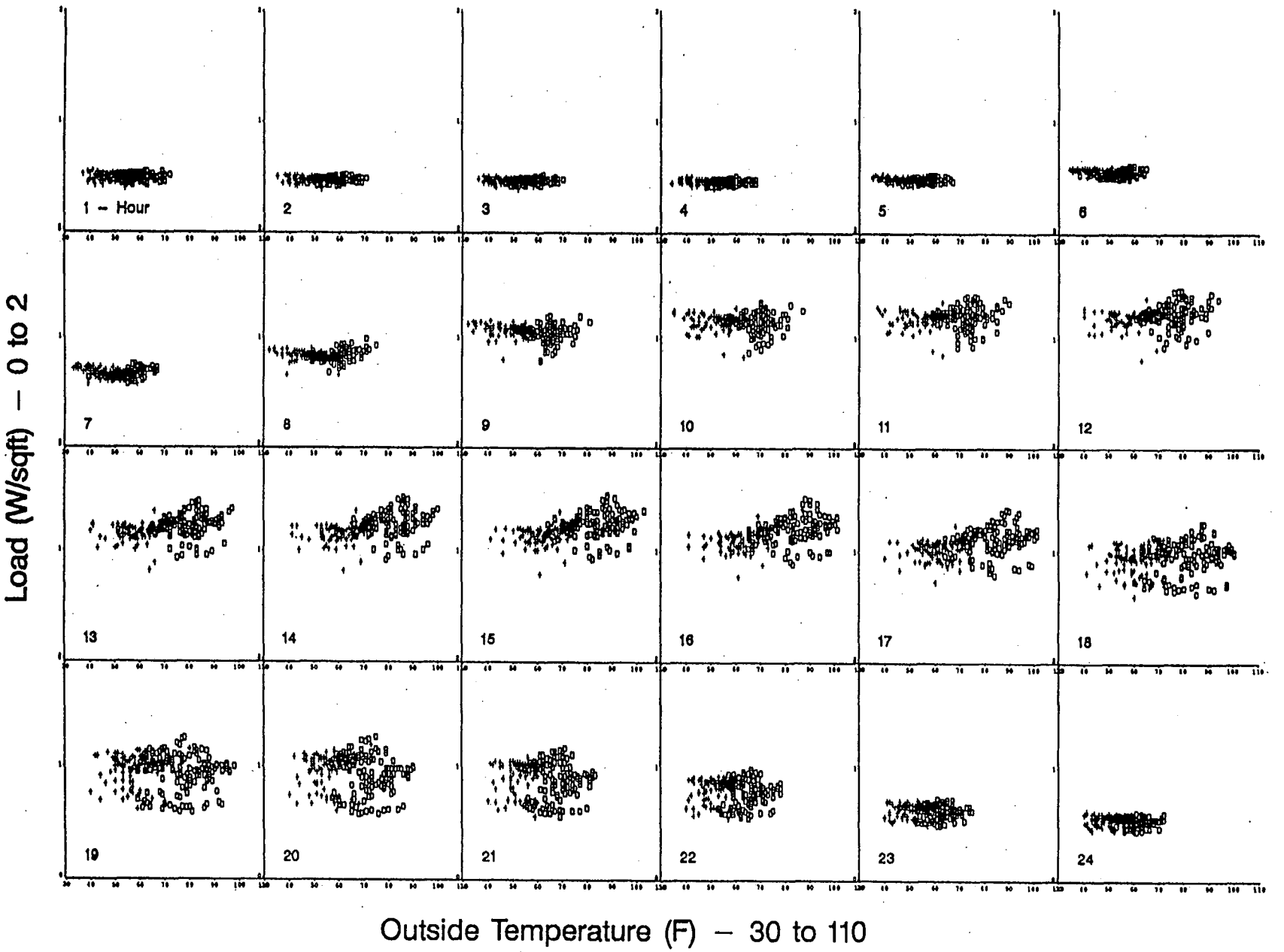


Figure 4-24a. College Reconciled Standard Day Annual End-Use LS - Coastal

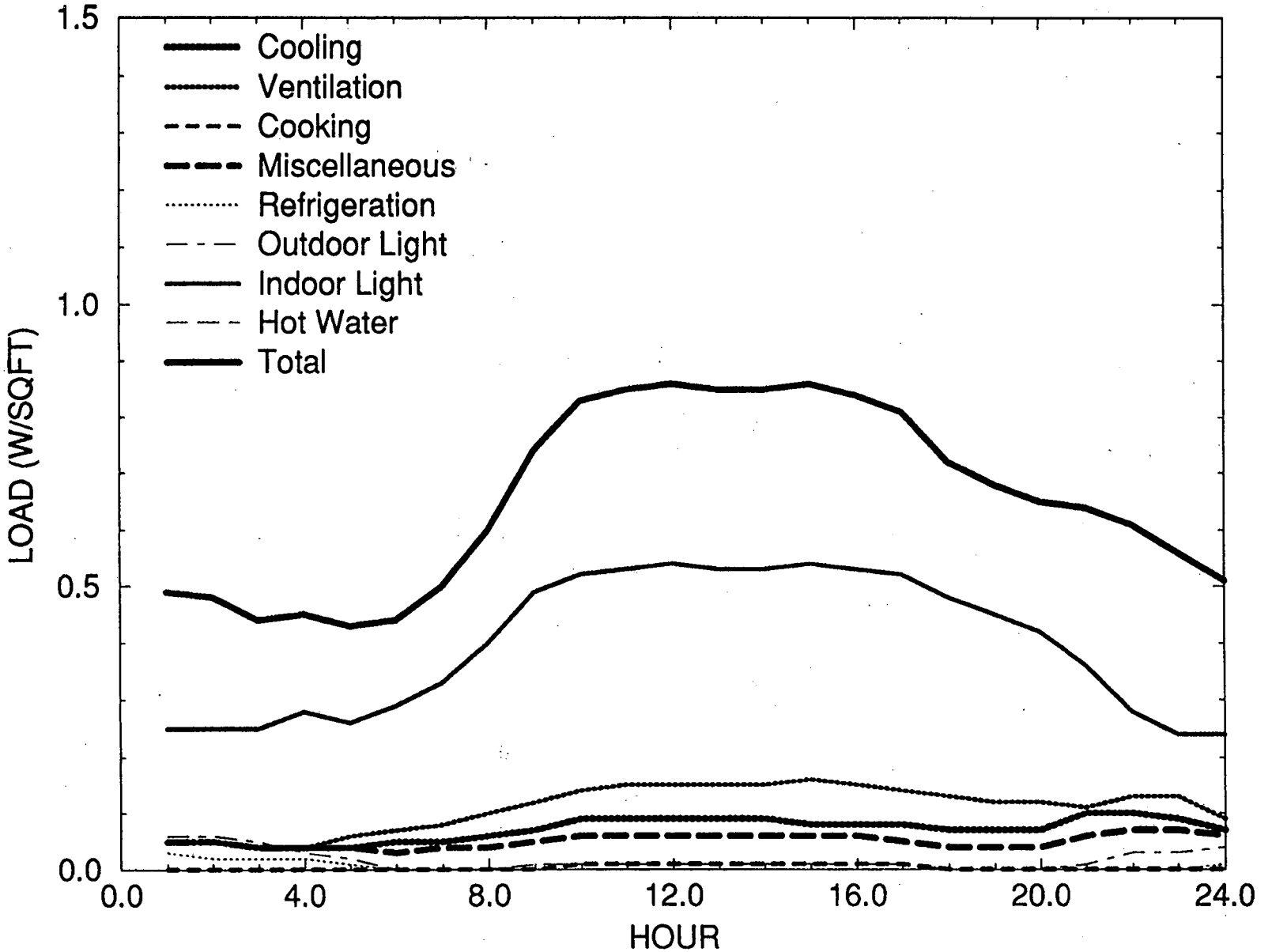


Figure 4-24b. College Reconciled Standard Day Annual End-Use LS - Inland

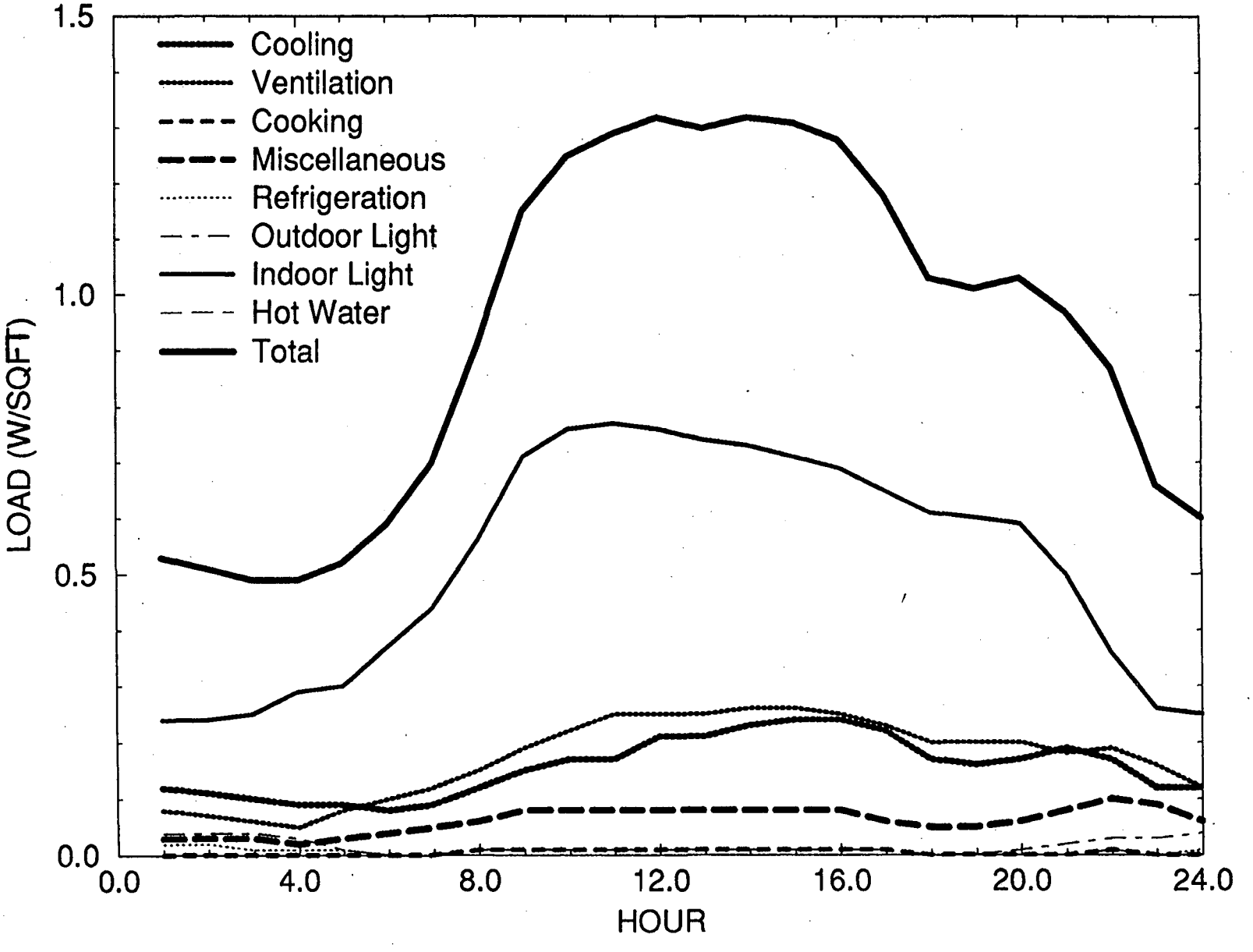


Figure 4-24c. College Reconciled Nonstandard Day Annual End-Use LS - Coastal

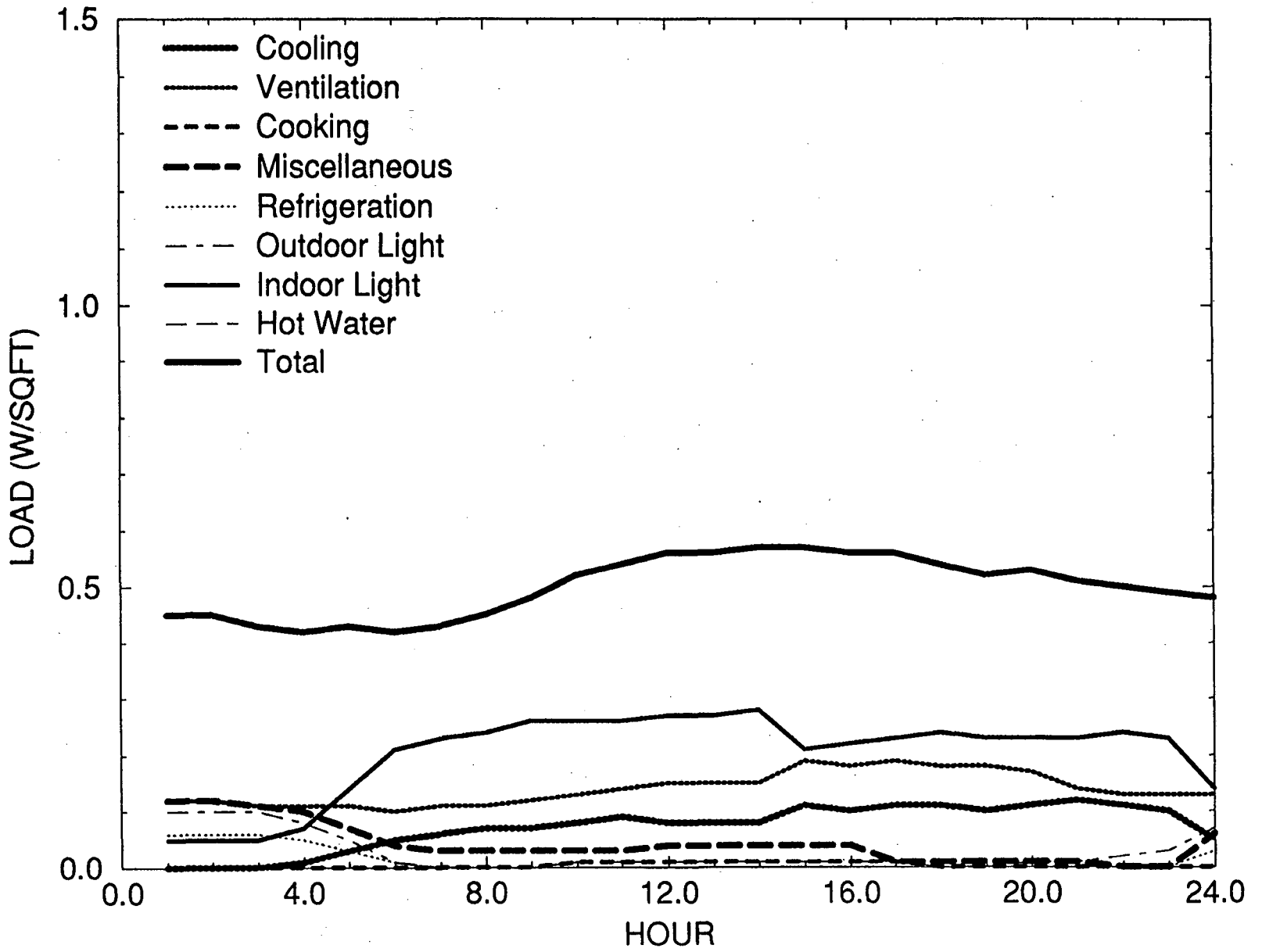
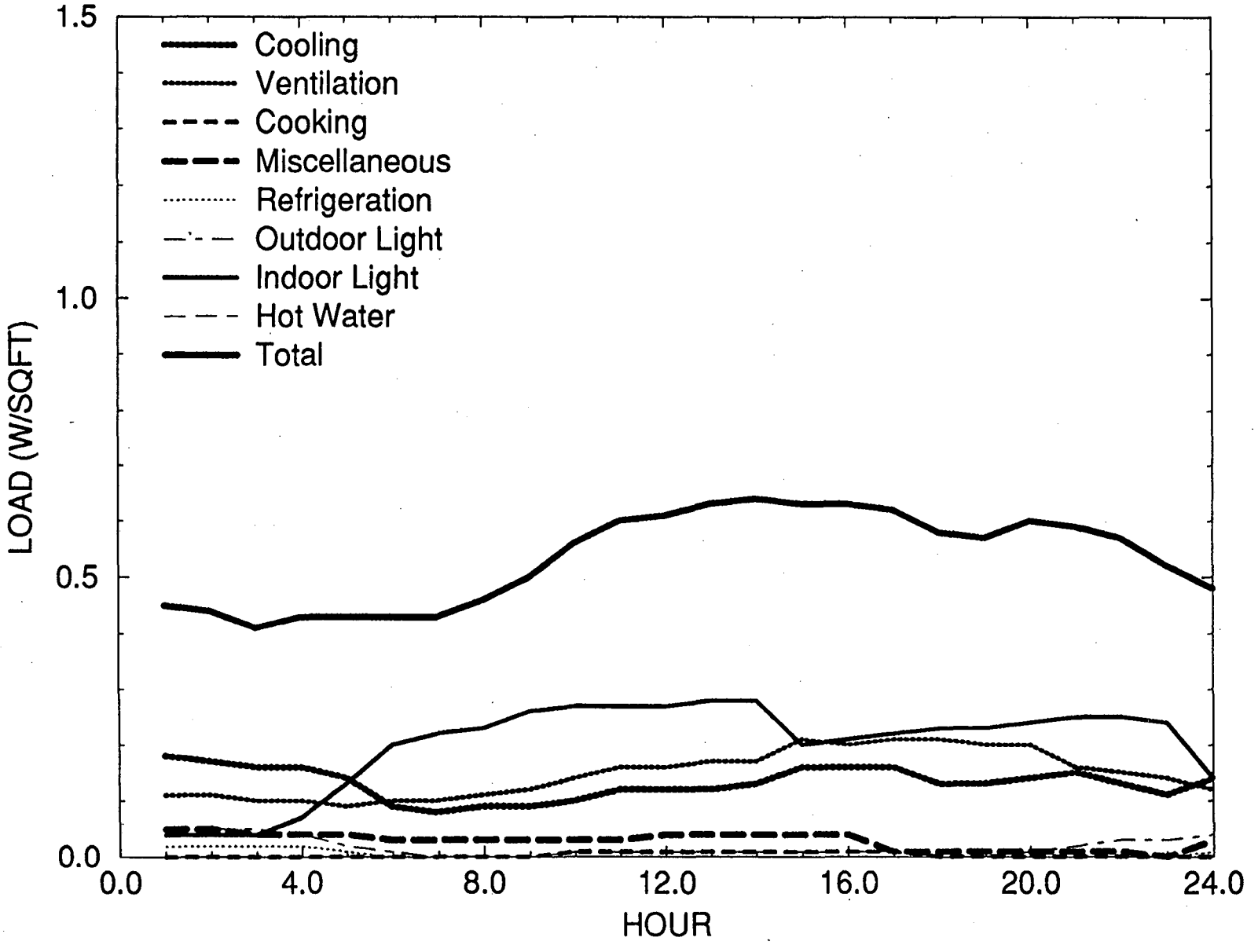


Figure 4-24d. College Reconciled Nonstandard Day Annual End-Use LS - Inland



Health

The Health classification is made up of acute care hospitals and skilled nursing homes/residential care. Some studies also place medical offices in this category while others place medical offices in with conventional offices. The only difference between medical office and conventional office should be the equipment intensities and possibly some added ventilation.

Hospital

The hospital prototype is a 132,000 ft^2, seven story building modeled with five conditioned zones and an unconditioned basement zone. The conditioned zones are a 33,000 ft^2 clinic, a 46,000 ft^2 core/public zone, a 20,000 ft^2 perimeter, a 6,600 ft^2 kitchen, and a 26,400 ft^2 hallway; conditioned with Dual Duct, Variable Air Volume, Four Pipe Fan Coil, Single Zone Reheat, and Four Pipe Fan Coil systems respectively. Hot water and heating are provided by gas boilers and cooling is provided by hermetic centrifugal chillers.

Major characteristics of the prototypical building are summarized in **Table 4-37a** and **Table 4-37b**. The vintage and technology options are summarized in **Table 4-38**.

Nursing Home

The nursing home prototype is a 38,400 ft^2, modeled with three zones as a single story building with 96 beds. The zones consists of forty-eight, 600 ft^2 rooms, a 1,900 ft^2 kitchen, and a 7,700 ft^2 multipurpose room. The rooms have Packaged Air Conditioning units with gas heaters. The kitchen and multipurpose room are conditioned by a Packaged Single Zone system, where heating is provided by a gas furnace. Hot water for the entire building is provided by a gas furnace.

Major characteristics of the prototypical building are summarized in **Table 4-39a** and **Table 4-39b**. The vintage and technology options are summarized in **Table 4-40**.

Health

Table 4-41 shows the DOE-2 simulation and EDA-reconciled end-use EUI summaries for the Health category of the coastal and inland climate regions. DOE-2 simulated average standard day end-use LSs for the coastal and inland climate zones are shown in **Figure 4-25**. Scatter plots of hourly whole-building EUIs against drybulb temperature for annual standard days of coastal and inland climates are shown in **Figure 4-26**. Both sets of plots depict no correlation between whole-building-load and dry bulb temperature. EDA reconciled average standard and nonstandard day end-use LSs for coastal and inland climates are shown in **Figure 4-27**. These graphs show that indoor lighting, ventilation, cooling, and miscellaneous equipment are the major end-uses.

Table 4-37a. Hospital Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	132.0
Number of Floors	7
Ceiling Insulation R-value	11.4
Wall Insulation R-value	6.6
Window shading coefficient	0.65
Window/wall ratio	0.28
Loads	
Refrigeration (W/ft^2)	0.1
Hot Water ($Btu/hr/ft^2$)	7.0
Schedule	
Standard Days	5
Start	1
Stop	24
Non-Standard Days	2
Start	1
Stop	24
System	
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Heat Setpoint	73°F
Cool Setpoint	73°F
Plant	
Heating	Gas Boiler
Cooling	Hermetic Centrifugal Chiller
Hot Water	Gas Boiler

Table 4-37b. Hospital Building Prototype Zone Description

	Clinic	Core	Perimeter	Kitchen	Hallway
Floor Area (% total)	25	35	15	5	20
Occupancy (ft^2/person)	289	289	150	321	578
Outside Air (ACH)	-	-	-	1.8	-
Outside Air / Person (CFM)	15	15	15	-	15
Indoor Lighting (W/ft^2)	2.1	1.6	1.6	2.1	0.8
Equipment (W/ft^2)	4.0	1.3	1.3	9.0	
Cooking (W/ft^2)	-	-	-	4.0	-
System Type	DD	VAV	FPFC	SZRH	VAV

Table 4-38. Hospital Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	11.3	17.21
Wall Insulation R-value	6.5	6.6
Indoor Lighting (W/ft^2)	1.6	1.1
Equipment (W/ft^2)	2.1	2.1
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type		
Clinic	DD	DD
Core	RHF	VAV
Perimeter	FPFC	FPFC
Kitchen	SZRH	SZRH
Hallway	RHF	VAV

Note: Packaged Single Zone (PSZ)
Single Zone Reheat (SZRH)
Reheat Fan (RHF)
Dual Duct (DD)
Four Pipe Fan Coil (FPFC)
Variable Air Volume (VAV)
Packaged Variable Air Volume (PVAV)
Packaged Terminal Air Conditioner (PTAC)

Table 4-39a. Nursing Home Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	38.4
Number of Floors	1
Ceiling Insulation R-value	21.8
Wall Insulation R-value	9.1
Window shading coefficient	0.51
Window/wall ratio	0.17
Loads	
Refrigeration (W/ft^2)	0.1
Hot Water ($Btu/hr/ft^2$)	3.0
Schedule	
Standard Days	7
Start	1
Stop	24
Non-Standard Days	-
Start	-
Stop	-
System	
COP	2.3
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Heat Setpoint	70°F
Cool Setpoint	75°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Furnace

Table 4-39b. Nursing Home Building Prototype Zone Description

	Multiple	Room	Kitchen
Floor Area (% total)	20	75	5
Occupancy (ft^2/person)	50	300	190
Outside Air (ACH)	-	-	3.9
Outside Air / Person (CFM)	15	15	-
Indoor Lighting (W/ft^2)	1.2	0.8	1.3
Equipment (W/ft^2)	-	1.3	6.5
Cooking (W/ft^2)	-	-	32.0
System Type	PSZ	PTAC	PSZ

Table 4-40. Nursing Home Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	21.8	21.8
Wall Insulation R-value	9.1	9.1
Indoor Lighting (W/ft^2)	0.9	0.9
Equipment (W/ft^2)	1.3	1.3
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type		
Multiple	PSZ	PVAV
Room	PTAC	PTAC
Kitchen	PSZ	PVAV

Table 4-41a. Health Simulated and EDA-Reconciled EUIs—Coastal (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.85)										
12.57	0.43	9.22	0.00	0.29	0.19	0.01	0.00	1.92	3.62	28.25
Unconditioned (Weight=0.15)										
12.57	0.43	9.22	0.00	0.29	0.19	0.01	0.00	0.00	0.00	22.71
Weighted Average										
12.57	**0.43**	**9.22**	**0.00**	**0.29**	**0.19**	**0.01**	**0.00**	**1.65**	**3.11**	**27.47**
Reconciled										
11.15	**0.36**	**7.28**	**0.90**	**0.26**	**0.17**	**0.01**	**0.00**	**2.02**	**3.34**	**25.49**

Table 4-41b. Health Simulated and EDA-Reconciled EUIs—Inland (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.78)										
12.98	0.44	9.61	0.00	0.28	0.19	0.01	0.00	2.15	4.91	30.57
Unconditioned (Weight=0.22)										
12.98	0.44	9.61	0.00	0.29	0.19	0.01	0.00	0.00	0.00	23.51
Weighted Average										
12.98	**0.44**	**9.61**	**0.00**	**0.29**	**0.19**	**0.01**	**0.00**	**1.68**	**3.83**	**29.02**
Reconciled										
10.98	**0.36**	**7.23**	**0.90**	**0.24**	**0.16**	**0.01**	**0.00**	**2.49**	**4.74**	**27.11**

Figure 4-25a. Health Simulated Average Standard Day LS - Coastal

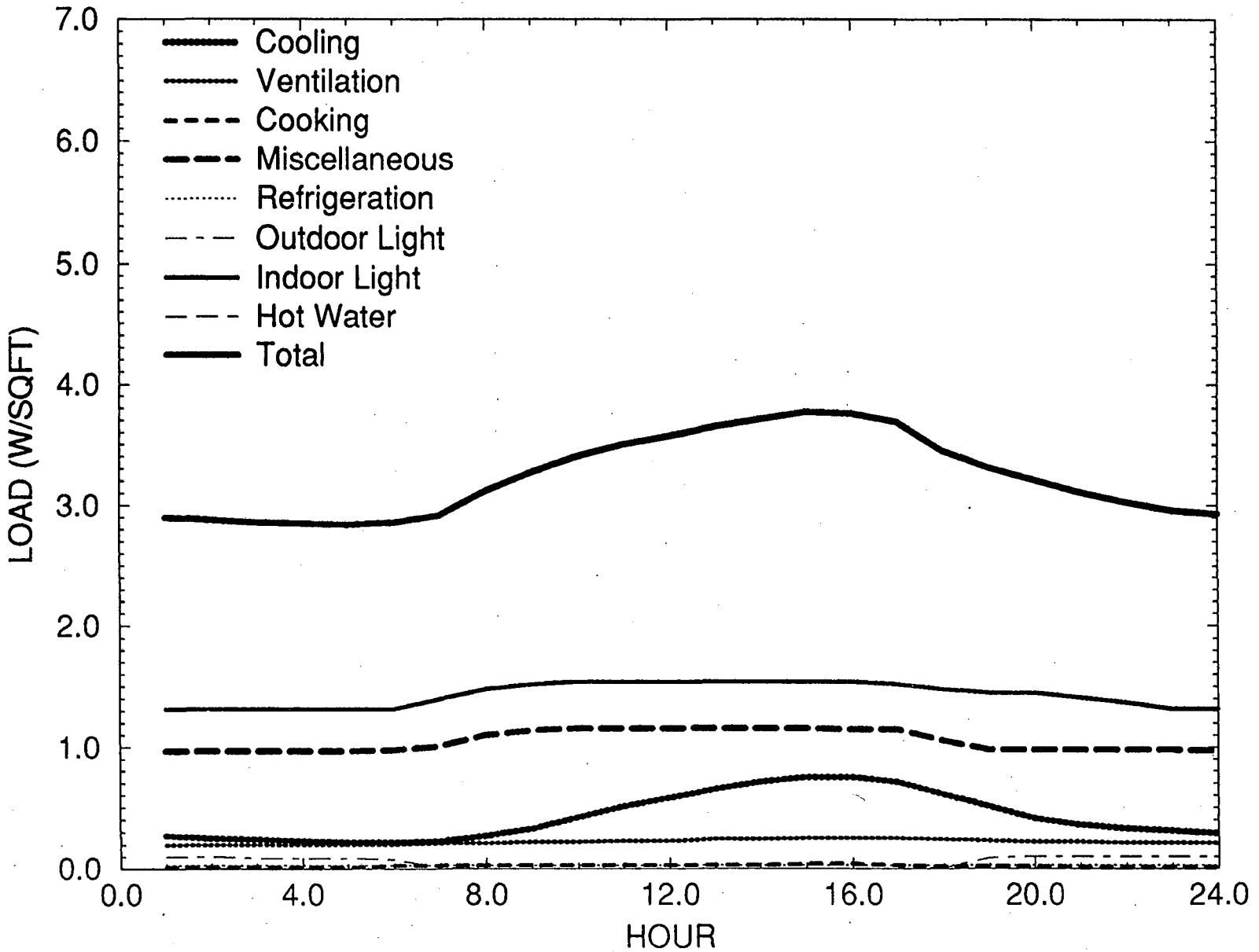


Figure 4-25b. Health Simulated Average Standard Day LS - Inland

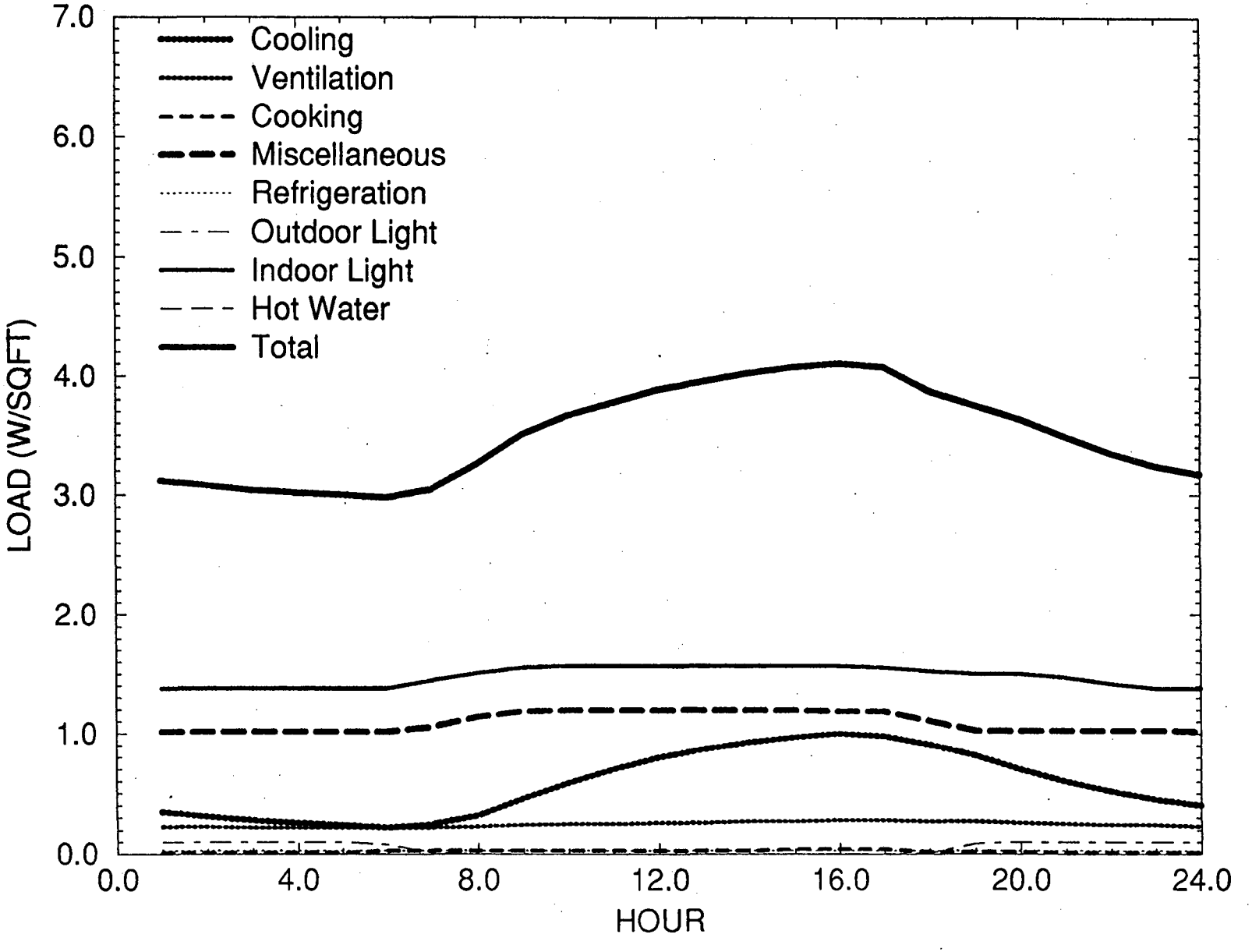


Figure 4-26a. Health Whole Building Load vs. Drybulb Temperature for Standard Day - Coastal

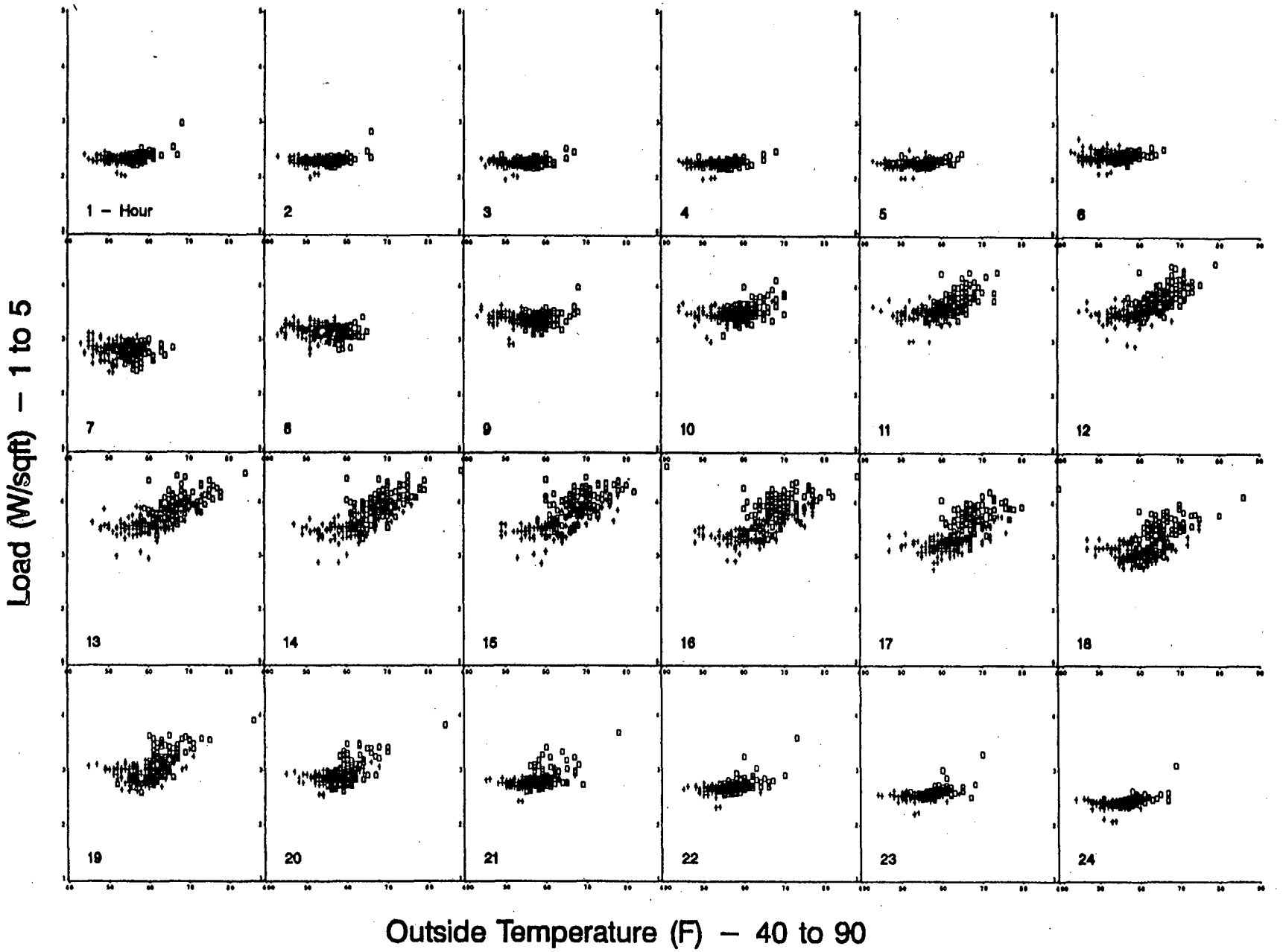


Figure 4-26b. Health Whole Building Load vs. Drybulb Temperature for Standard Day - Inland

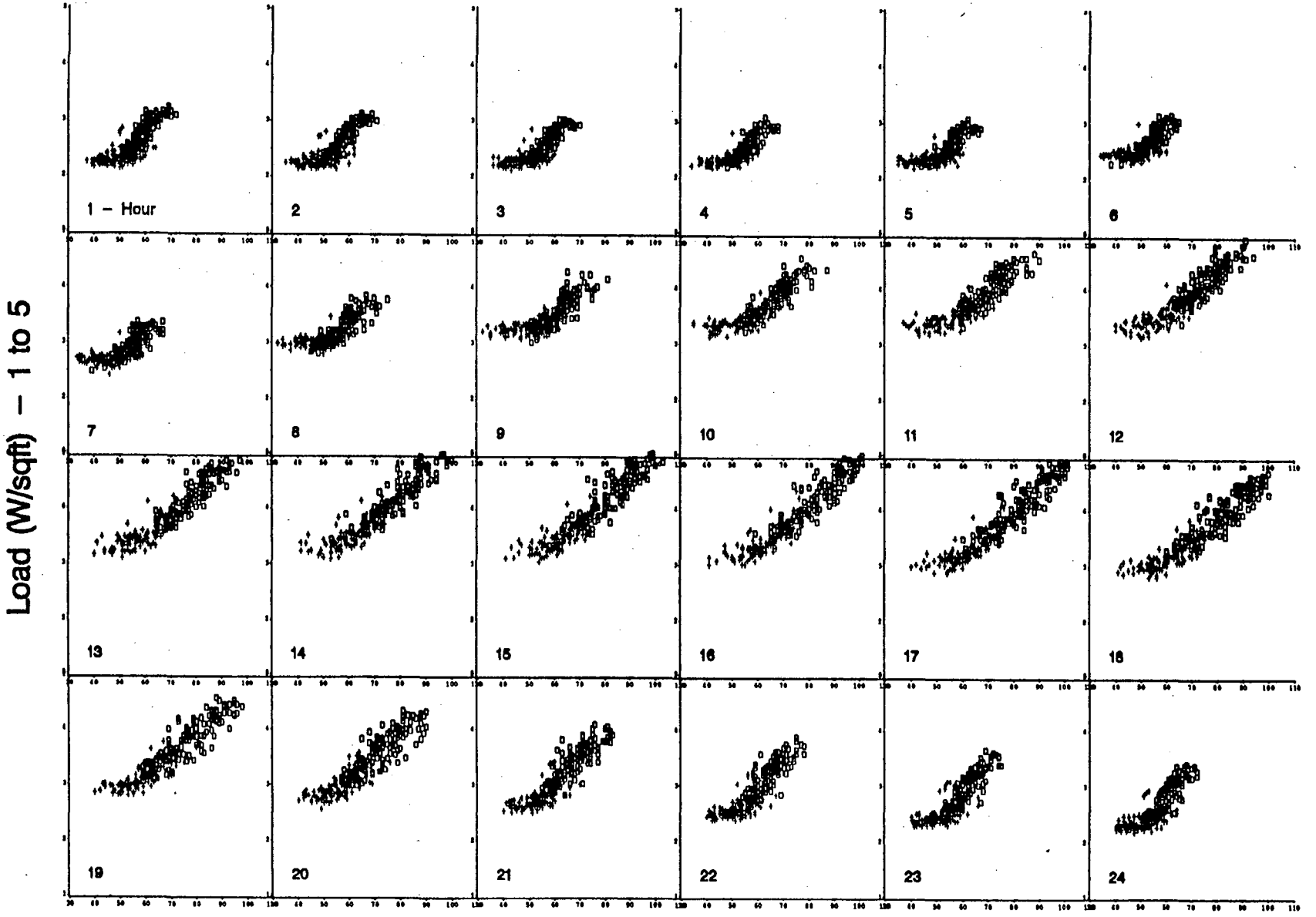


Figure 4-27a. Health Reconciled Standard Day Annual End-Use LS - Coastal

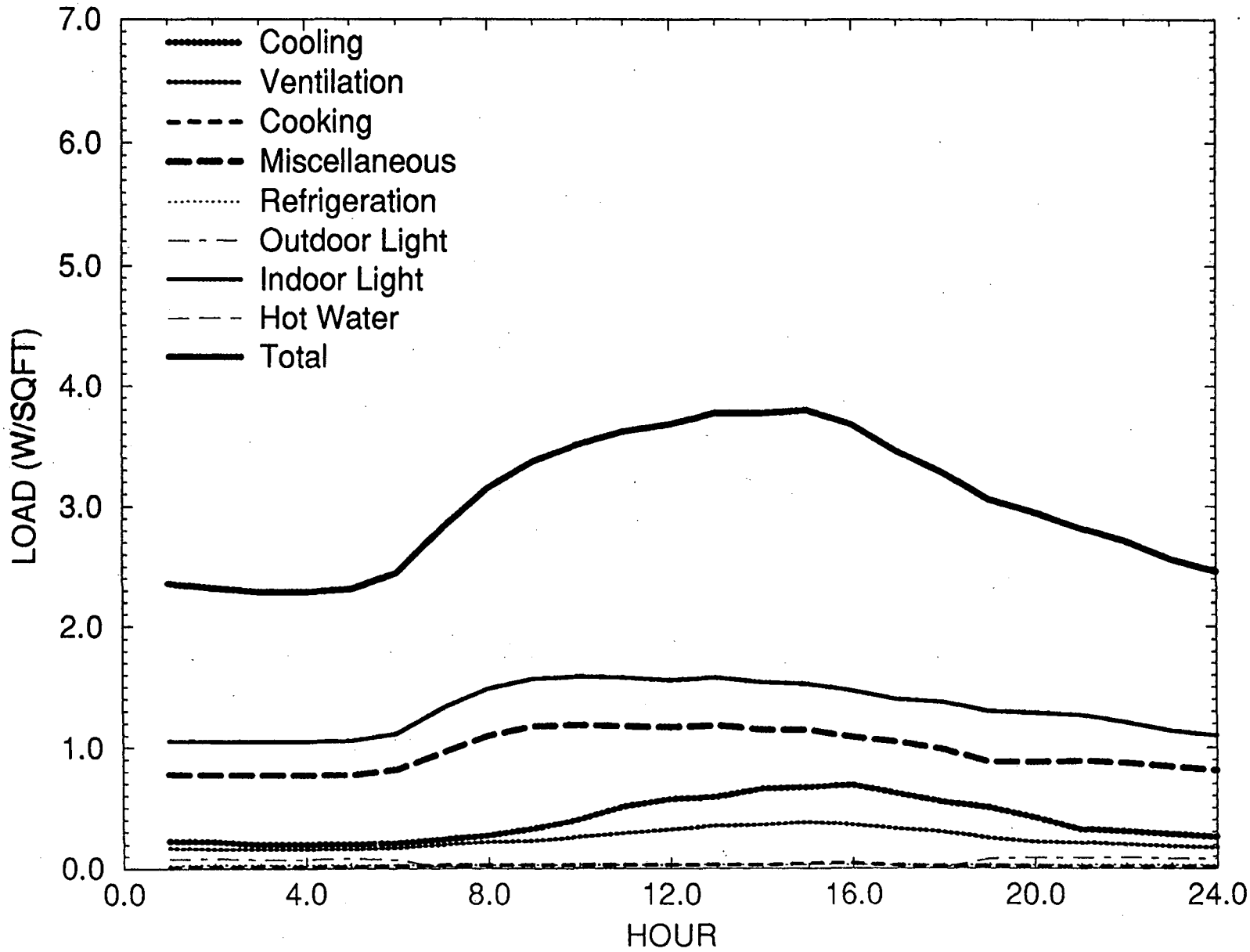


Figure 4-27b. Health Reconciled Standard Day Annual End-Use LS - Inland

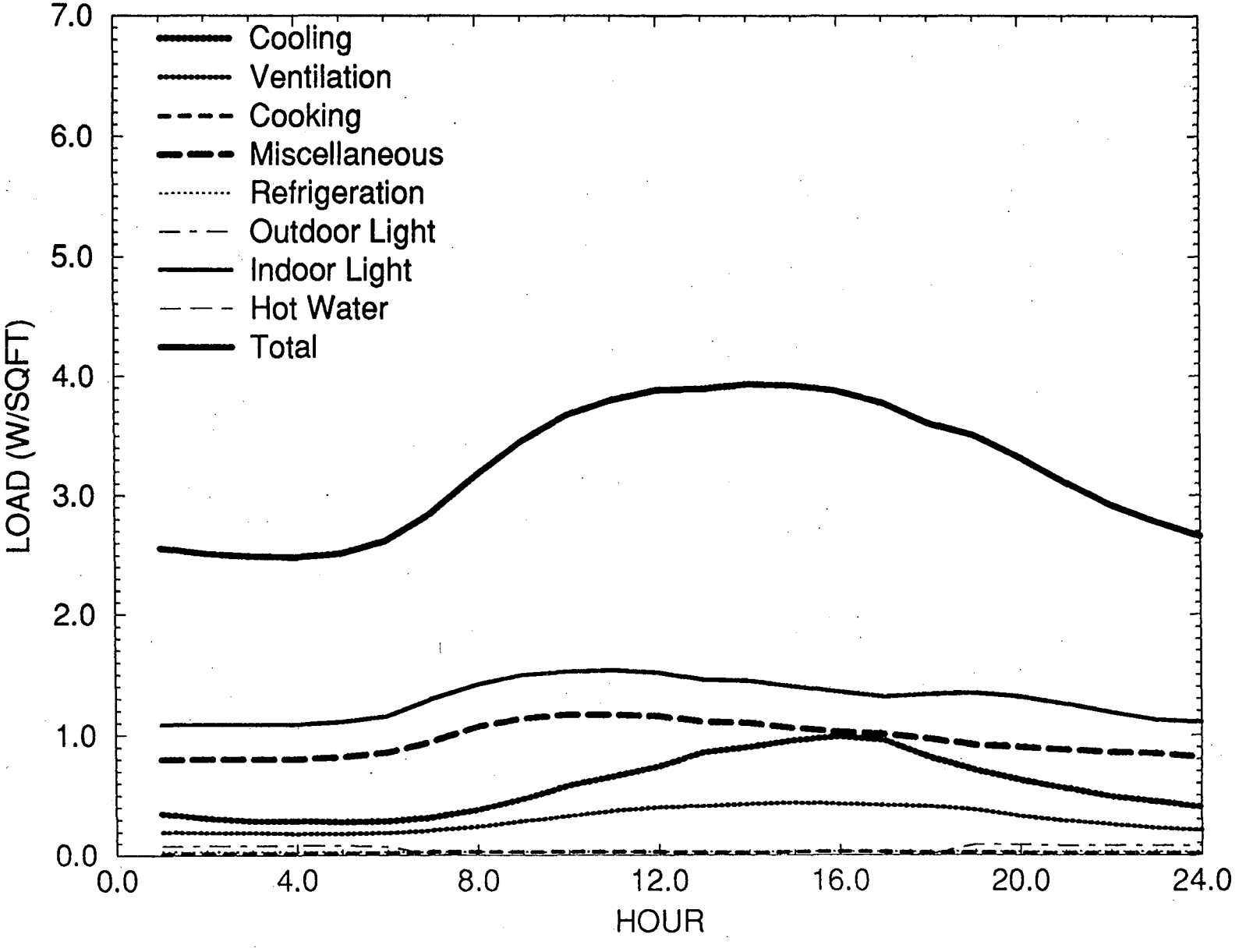


Figure 4-27c. Health Reconciled Nonstandard Day Annual End-Use LS - Coastal

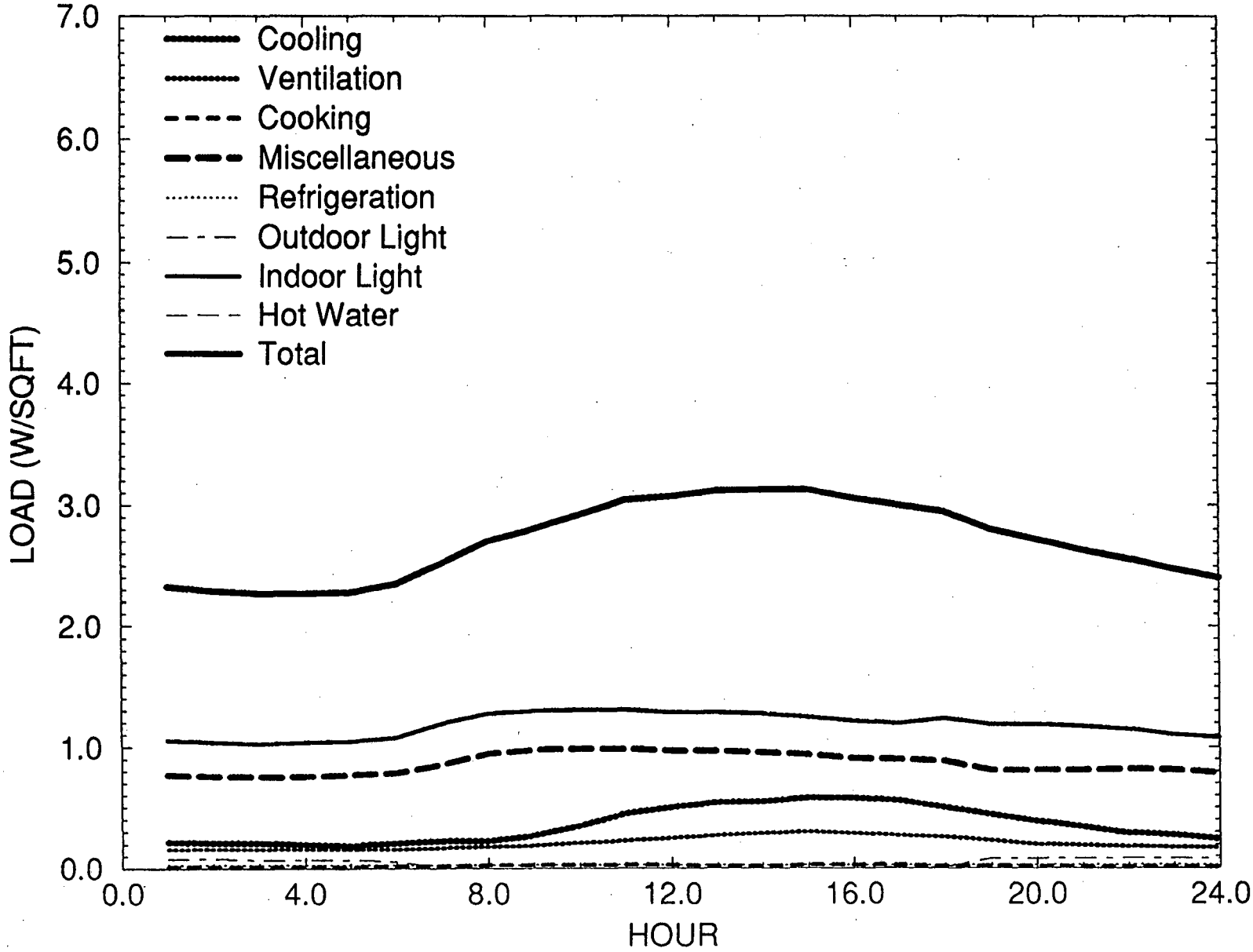
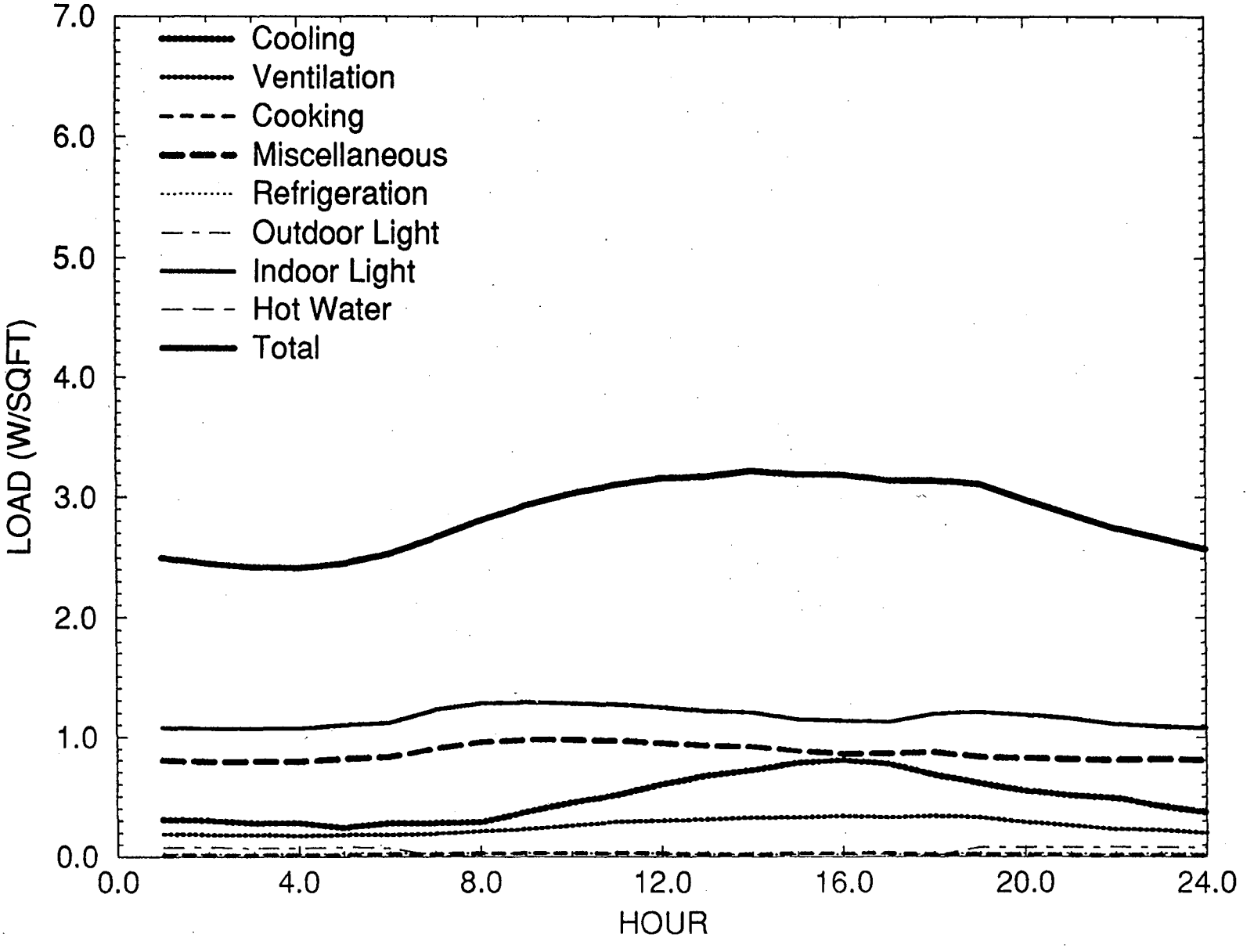


Figure 4-27d. Health Reconciled Nonstandard Day Annual End-Use LS - Inland



Lodging

The Lodging category consists of large hotels and small hotels as described below.

Large Hotel

The large hotel is a seven story, 205,000 ft^2 building modeled using three conditioned zones; three hundred sixty 400 ft^2 guest rooms, 51,000 ft^2 of lobby/conference rooms, and 10,000 ft^2 of kitchen/laundry, and an unconditioned basement zone. Guest rooms are heated and cooled with Four Pipe Fan Coil system. The other zones are conditioned by Variable Air Volume systems. Heating is supplied by gas boilers, cooling by hermetic centrifugal chillers, and hot water by a gas furnace.

Major characteristics of the prototypical building are summarized in **Table 4-42a** and **Table 4-42b**. The vintage and technology options are summarized in **Table 4-43**.

Small Hotel

The small hotel is a two story, 20,000 ft^2 building modeled with three zones: one hundred twenty 150 ft^2 guest rooms, a 1,000 ft^2 lobby, and a 1,000 ft^2 laundry. The guest rooms are cooled with Packaged Air Conditioning units and heated with unit heaters. The lobby and laundry are conditioned with Packaged Single Zone units, with heating provided by a gas furnace. Hot water is provided by a gas furnace.

Major characteristics of the prototypical building are summarized in **Table 4-44a** and **Table 4-44b**. The onsite survey reported an average floor area of 8,300 ft^2 within a range of 1,500 ft^2 to 50,900 ft^2, and the mail survey reports 20,000 ft^2. We felt that the mail survey result more accurately represented the floor area of the small hotel. The mail survey does not provide numbers on lighting, equipment, and occupancy loads, so onsite data was used for consistency. The vintage and technology options are summarized in **Table 4-45**.

Lodging

Table 4-46 shows the DOE-2 simulation and EDA-reconciled end-use EUI summaries for the Lodging category of the coastal and inland climate regions. DOE-2 simulated average standard day end-use LSs for the coastal and inland climate zones are shown in **Figure 4-28**. Scatter plots of hourly whole-building EUIs against drybulb temperature for annual standard days of coastal and inland climates are shown in **Figure 4-29**. Inland Lodging plots for winter depict strong correlation between whole-building-load and dry bulb temperature from 6:00 pm. to 9:00 am. EDA reconciled average standard and nonstandard day end-use LSs for coastal and inland climates are shown in **Figure 4-30**. These graphs show that indoor lighting, ventilation, cooling, and miscellaneous equipment are the major end-uses.

Table 4-42a. Large Hotel Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	205.0
Number of Floors	7
Ceiling Insulation R-value	20.6
Wall Insulation R-value	6.3
Window shading coefficient	0.63
Window/wall ratio	0.52
Loads	
Refrigeration (W/ft^2)	0.3
Schedule	
Standard Days	7
Start	1
Stop	24
Non-Standard Days	-
Start	-
Stop	-
System	
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Heat Setpoint	70°F
Cool Setpoint	75°F
Plant	
Heating	Gas Boiler
Cooling	Hermetic Centrifugal Chiller
Hot Water	Gas Furnace

Table 4-42b. Large Hotel Building Prototype Zone Description

	Lobby	Room	Kitchen/Laundry
Floor Area (% total)	25	70	5
Occupancy (ft^2/person)	1000	600	400
Outside Air (ACH)	-	-	1.8
Outside Air / Person (CFM)	15	15	-
Indoor Lighting (W/ft^2)	0.8	0.6	1.1
Equipment (W/ft^2)	-	0.9	4.5
Cooking (W/ft^2)	-	-	2.0
Hot Water ($Btu/hr/ft^2$)	-	10	20
System Type	VAV	FPFC	SZRH

Table 4-43. Large Hotel Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	16.6	26.3
Wall Insulation R-value	5.6	9.8
Indoor Lighting (W/ft^2)	0.7	0.7
Equipment (W/ft^2)	0.9	0.9
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type		
Lobby	SZRH	VAV
Room	FPFC	FPFC
Kitchen	SZRH	SZRH

Note: Packaged Single Zone (PSZ)
Single Zone Reheat (SZRH)
Four Pipe Fan Coil (FPFC)
Variable Air Volume (VAV)
Packaged Variable Air Volume (PVAV)
Packaged Terminal Air Conditioner (PTAC)

Table 4-44a. Small Hotel Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	20.0
Number of Floors	2
Ceiling Insulation R-value	13.2
Wall Insulation R-value	7.8
Window shading coefficient	0.66
Window/wall ratio	0.1
Loads	
Refrigeration (W/ft^2)	0.5
Schedule	
Standard Days	7
Start	1
Stop	24
Non-Standard Days	-
Start	-
Stop	-
System	
COP	2.3
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Heat Setpoint	70°F
Cool Setpoint	75°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Furnace

Table 4-44b. Small Hotel Building Prototype Zone Description

	Lobby	Room	Laundry
Floor Area (% total)	5	90	5
Occupancy (ft^2/person)	104	300	140
Outside Air (ACH)	-	-	1.0
Outside Air / Person (CFM)	15	15	-
Indoor Lighting (W/ft^2)	1.0	0.7	1.2
Equipment (W/ft^2)	-	1.0	4.8
Cooking (W/ft^2)	-	-	4.0
Hot Water ($Btu/hr/ft^2$)	-	-	20
System Type	PSZ	PTAC	PSZ

Table 4-45. Small Hotel Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	13.2	13.2
Wall Insulation R-value	7.7	9.8
Indoor Lighting (W/ft^2)	0.7	0.7
Equipment (W/ft^2)	1.1	1.1
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type		
Lobby	PSZ	PVAV
Room	PTAC	PTAC
Laundry	PSZ	PVAV

Table 4-46a. Lodging Simulated and EDA-Reconciled EUIs—Coastal (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.69)										
4.43	0.30	2.01	0.00	0.44	0.10	0.02	0.00	0.71	1.55	9.56
Unconditioned (Weight=0.31)										
4.43	0.30	2.01	0.00	0.44	0.10	0.02	0.00	0.00	0.00	7.30
Weighted Average										
4.43	**0.30**	**2.01**	**0.00**	**0.44**	**0.10**	**0.02**	**0.00**	**0.49**	**1.07**	**8.86**
Reconciled										
2.76	**0.21**	**1.18**	**0.05**	**0.30**	**0.06**	**0.01**	**0.32**	**0.60**	**0.90**	**6.39**

Table 4-46b. Lodging Simulated and EDA-Reconciled EUIs—Inland (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.96)										
3.85	0.45	1.48	0.00	0.64	0.08	0.02	0.00	0.82	4.15	11.49
Unconditioned (Weight=0.04)										
3.85	0.45	1.48	0.00	0.64	0.08	0.02	0.00	0.00	0.00	6.52
Weighted Average										
3.85	**0.45**	**1.48**	**0.00**	**0.64**	**0.08**	**0.02**	**0.00**	**0.79**	**3.98**	**11.29**
Reconciled										
2.78	**0.41**	**0.98**	**0.05**	**0.53**	**0.04**	**0.00**	**0.43**	**1.27**	**1.33**	**7.82**

Figure 4-28a. Lodging Simulated Average Standard Day LS - Coastal

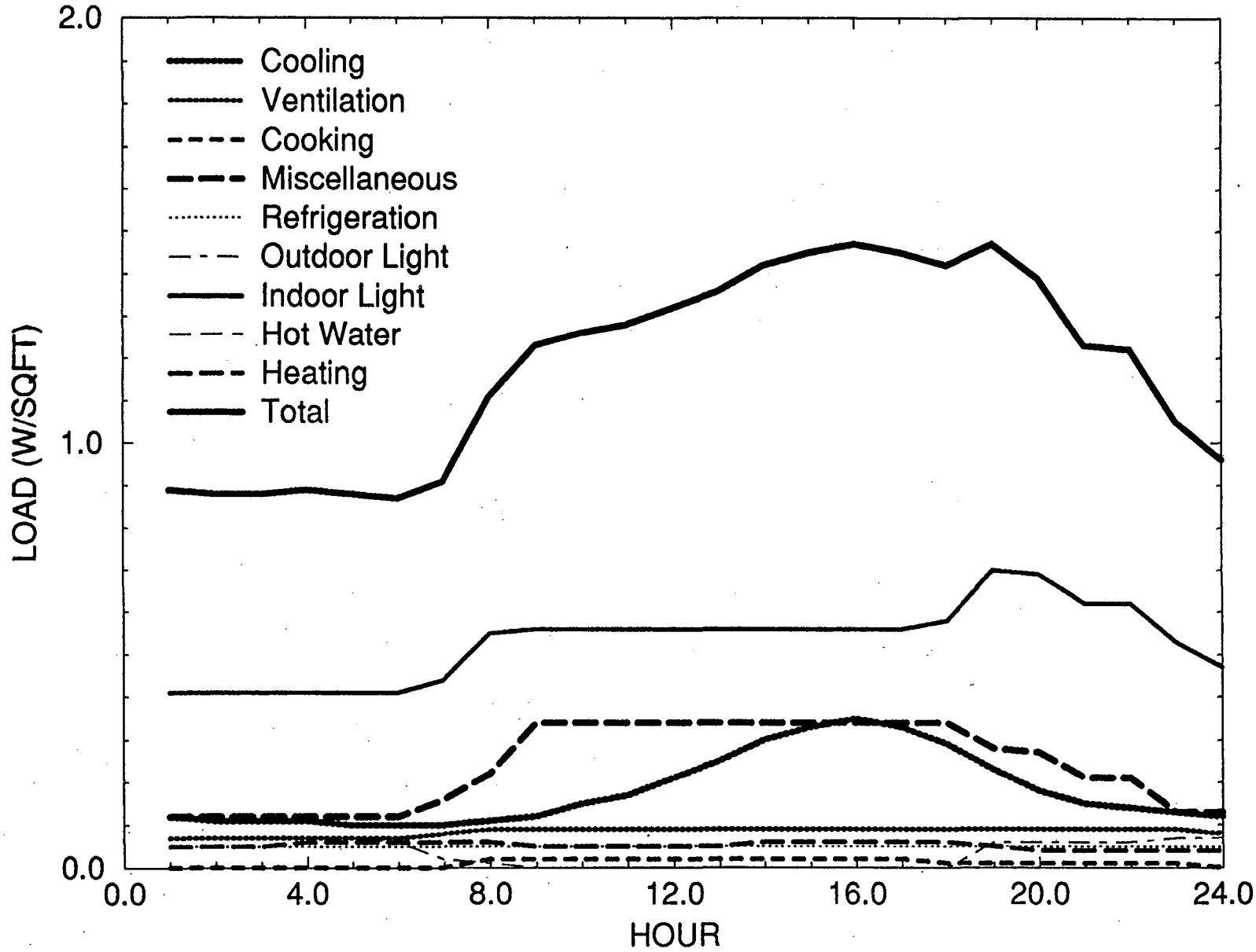


Figure 4-28b. Lodging Simulated Average Standard Day LS - Inland

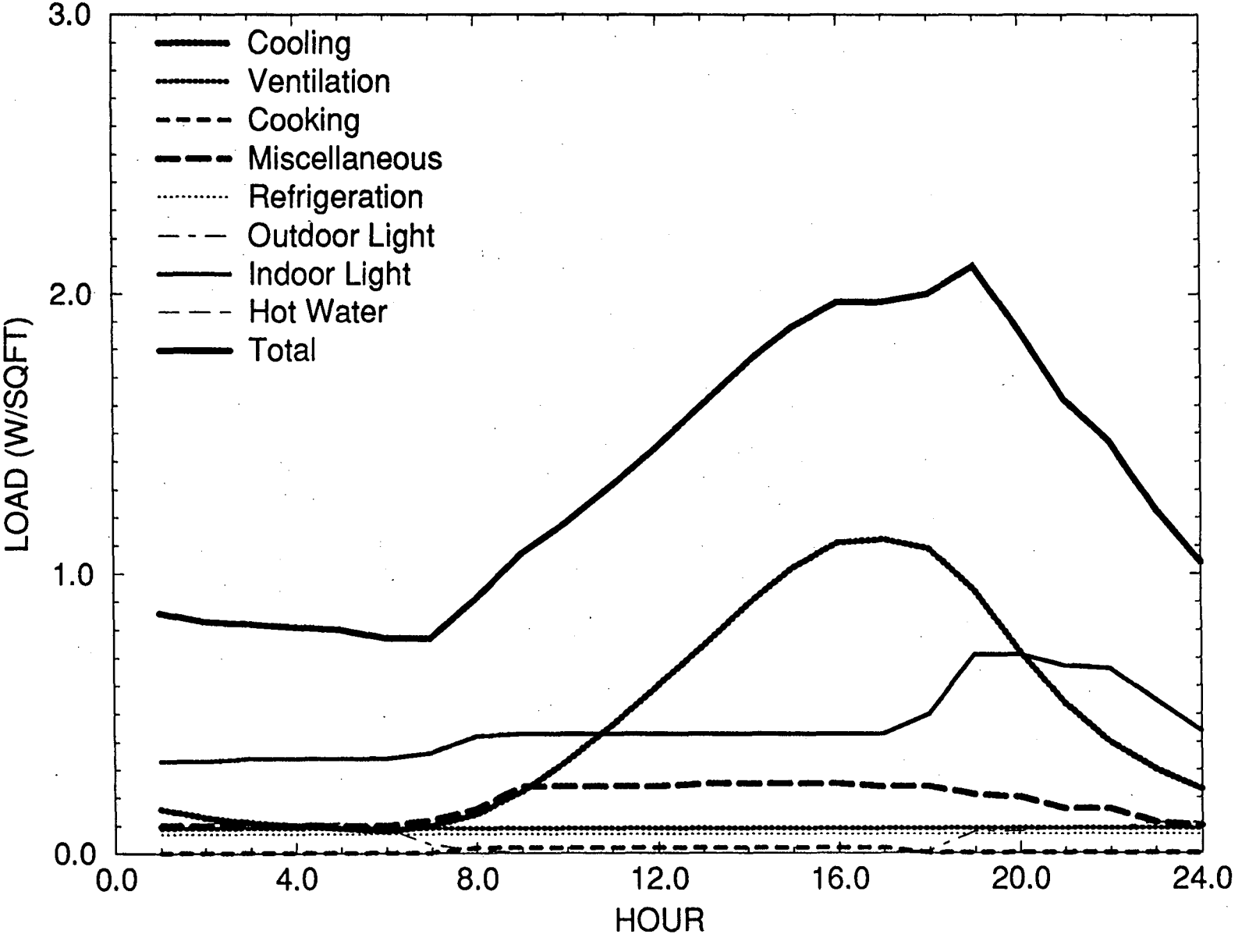


Figure 4-29a. Lodging Whole Building Load vs. Drybulb Temperature for Standard Day - Coastal

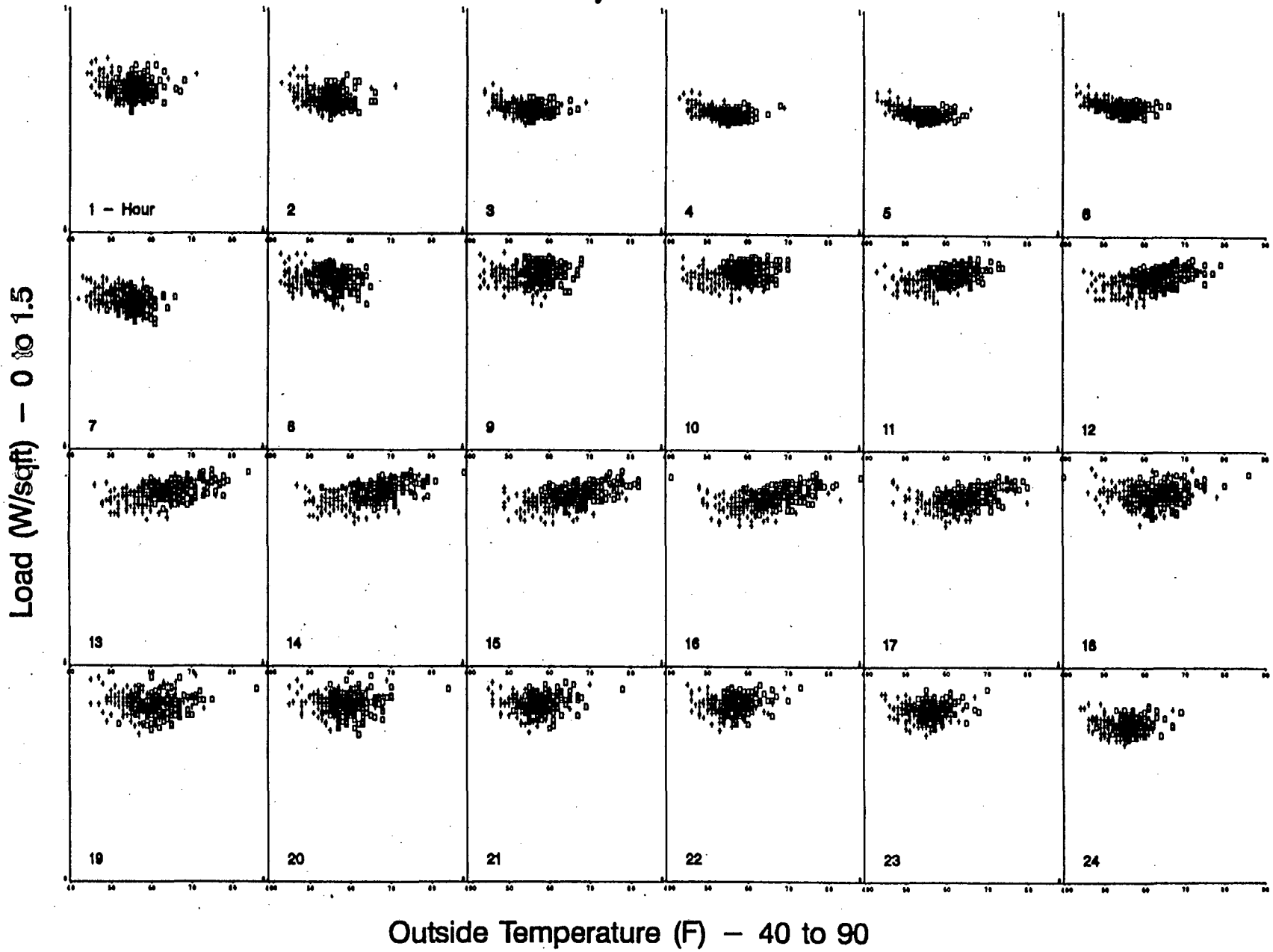


Figure 4-29b. Lodging Whole Building Load vs. Drybulb Temperature for Standard Day - Inland

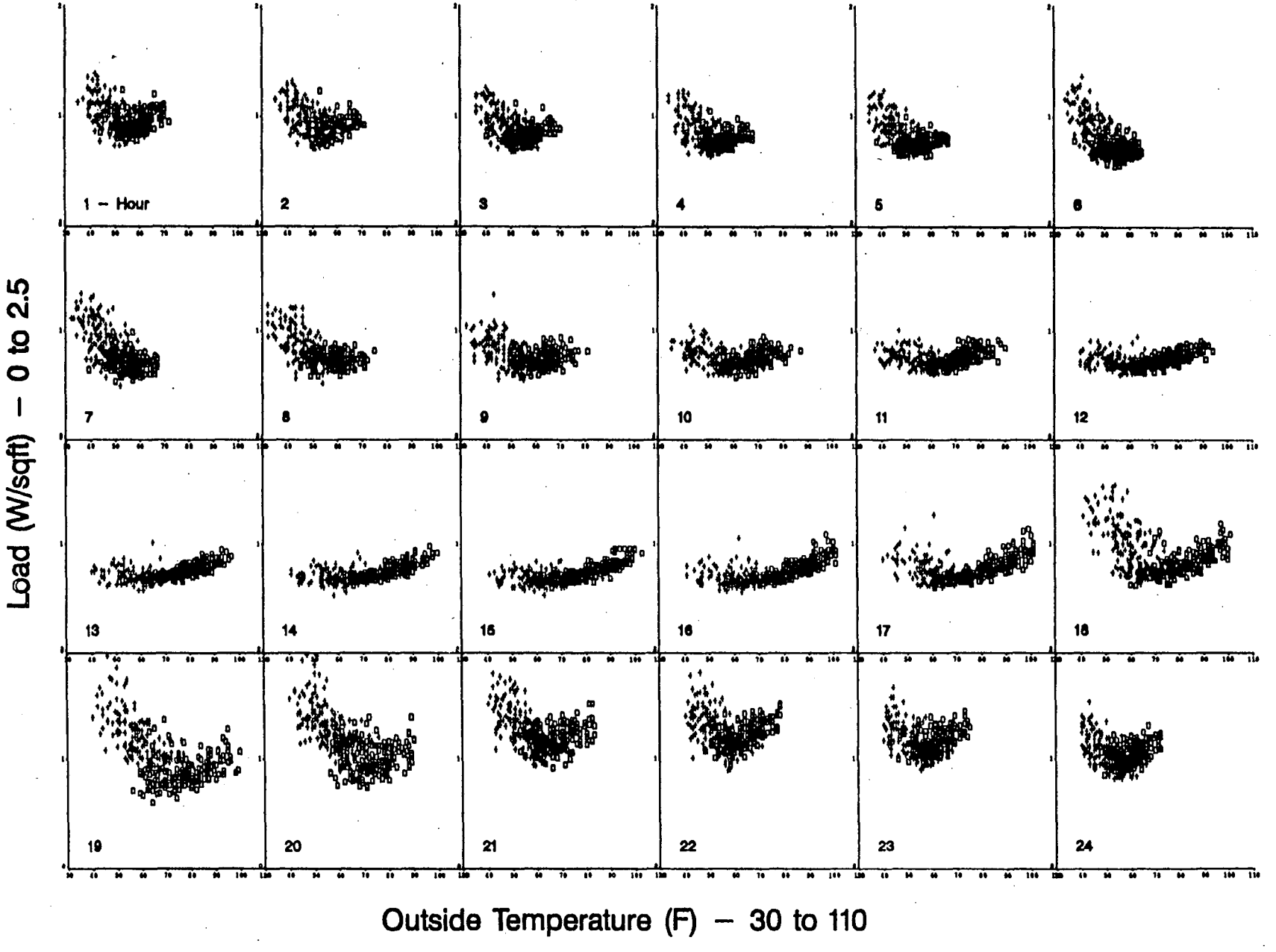


Figure 4-30a. Lodging Reconciled Standard Day Annual End-Use LS - Coastal

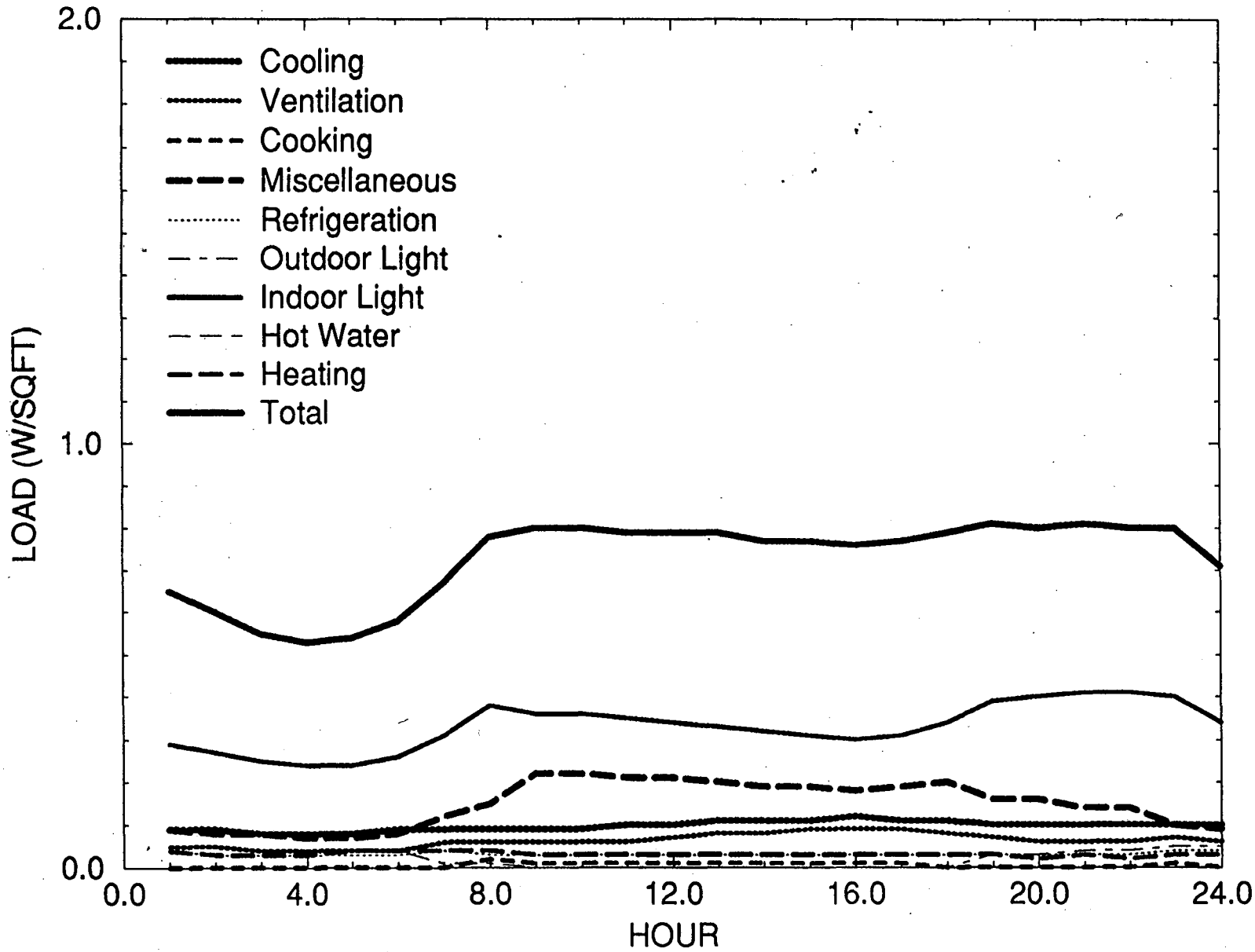
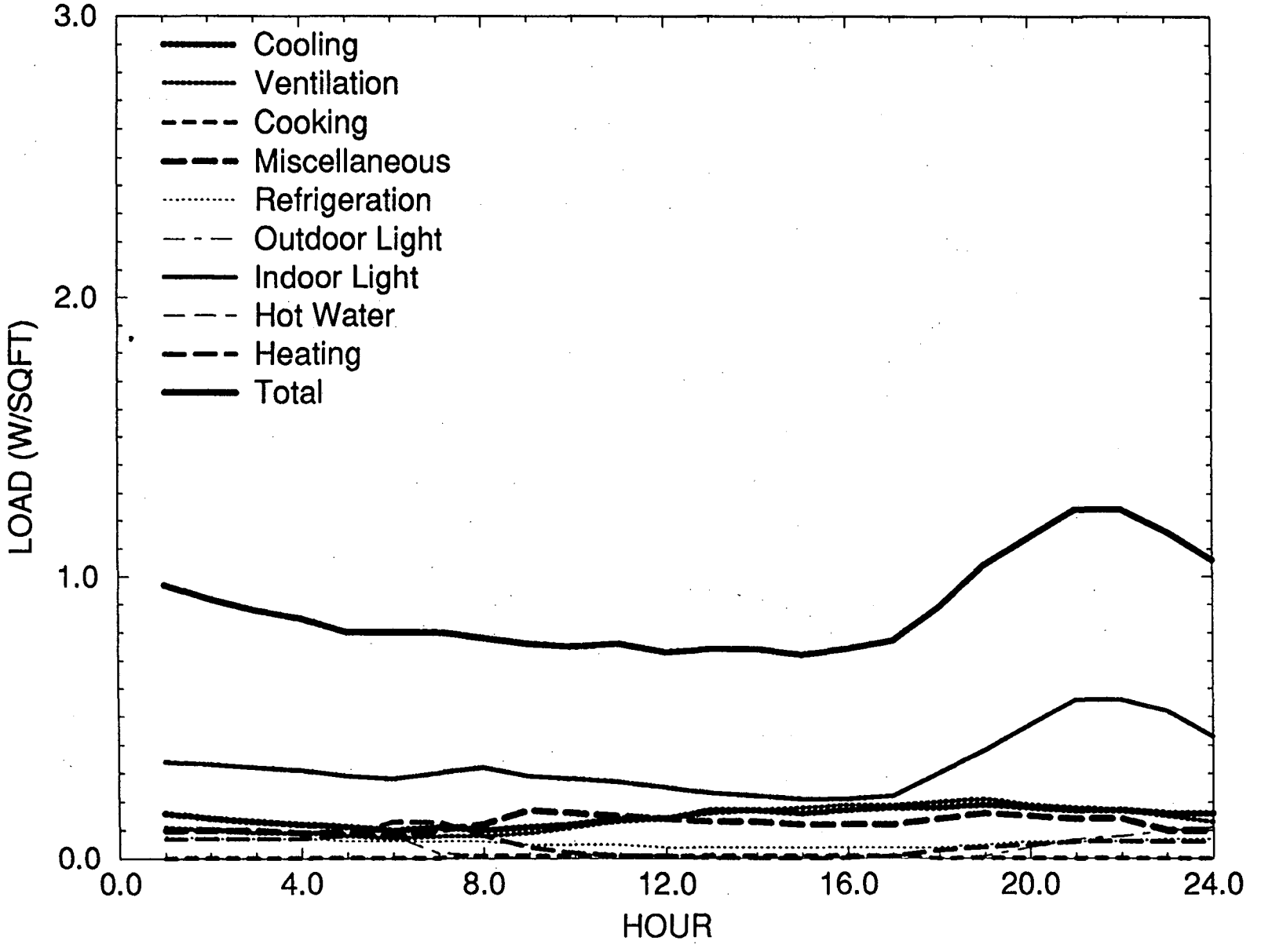


Figure 4-30b. Lodging Reconciled Standard Day Annual End-Use LS - Inland



Miscellaneous

The miscellaneous prototype is a 8,800 ft^2 single story building modeled with a single zone and conditioned with a Packaged Single Zone system. Hot water and heating are provided by gas furnaces.

Major characteristics of the prototypical building are summarized in **Table 4-47**. The vintage and technology options are summarized in **Table 4-48**.

Table 4-49 shows the DOE-2 simulation and EDA-reconciled end-use EUI summaries for the Miscellaneous category of the coastal and inland climate regions. DOE-2 simulated average standard day end-use LSs for the coastal and inland climate zones are shown in **Figure 4-31**. Indoor lighting, miscellaneous equipment, ventilation and refrigeration are the dominant loads in coastal buildings while inland ones have high cooling loads in addition to these. Scatter plots of hourly whole-building EUIs against drybulb temperature for annual standard days of coastal and inland climates are shown in **Figure 4-32**. Both sets of plots depict no correlation between whole-building-load and dry bulb temperature. EDA reconciled average standard and nonstandard day end-use LSs for coastal and inland climates are shown in **Figure 4-33**. These graphs show that indoor lighting, ventilation, cooling, and miscellaneous equipment are the major end-uses.

Note: Packaged Single Zone (PSZ)

Table 4-47. Miscellaneous Building Prototype Characteristics

Shell	
Floor Area (1000 ft^2)	8.8
Number of Floors	1
Ceiling Insulation R-value	8.6
Wall Insulation R-value	6.1
Window shading coefficient	0.78
Window/wall ratio	0.02
Loads	
Refrigeration (W/ft^2)	0.2
Occupancy (ft^2/person)	606
Indoor Lighting (W/ft^2)	0.6
Equipment (W/ft^2)	2.5
Cooking (W/ft^2)	0.2
Hot Water ($Btu/hr/ft^2$)	1.0
Schedule	
Standard Days	5
Start	6
Stop	24
Non-Standard Days	2
Start	6
Stop	24
System	
System Type	PSZ
COP	2.3
Supply Air (cfm/ft^2)	0.7
Economizer Limit Temperature	65°F
Thermostat Type	Proportional
Outside Air Control	Temperature
Outside Air / Person (CFM)	15
Heat Setpoint	70°F
Cool Setpoint	75°F
Plant	
Heating	Gas Furnace
Cooling	Direct Expansion
Hot Water	Gas Furnace

Table 4-48. Miscellaneous Building Vintage Characteristics

Technology	Pre-1978	Post-1978
Ceiling Insulation R-value	8.4	12.5
Wall Insulation R-value	6.1	6.6
Indoor Lighting (W/ft^2)	0.6	0.7
Equipment (W/ft^2)	2.0	2.2
Cooking (W/ft^2)	0.2	0.2
Thermostat Type	Proportional	Reverse Action
Outside Air Control	Fixed	Temperature
System Type	PSZ	PSZ

Table 4-49a. Miscellaneous Simulated and EDA-Reconciled EUIs—Coastal (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.27)										
2.48	0.55	3.39	0.00	0.31	0.00	0.03	0.00	1.46	0.32	8.54
Unconditioned (Weight=0.73)										
2.48	0.55	3.39	0.00	0.31	0.00	0.03	0.00	0.00	0.00	6.76
Weighted Average										
2.48	**0.55**	**3.39**	**0.00**	**0.31**	**0.00**	**0.03**	**0.00**	**0.40**	**0.09**	**7.25**
Reconciled										
1.46	**0.42**	**1.90**	**0.16**	**0.45**	**0.00**	**0.00**	**0.00**	**1.07**	**0.53**	**5.99**

Table 4-49b. Miscellaneous Simulated and EDA-Reconciled EUIs—Inland (kWh/ft^2/yr)

Non-HVAC End Uses							HVAC			Total
Indoor Lighting	Outdoor Lighting	Misc. Equip.	Office Equip.	Refrig	Cooking	Water Heating	Heating	Fans	Cooling	
Simulation										
Conditioned (Weight=0.77)										
2.82	0.55	3.76	0.00	0.31	0.00	0.03	0.00	1.46	0.85	9.78
Unconditioned (Weight=0.23)										
2.82	0.55	3.76	0.00	0.31	0.00	0.03	0.00	0.00	0.00	7.47
Weighted Average										
2.82	**0.55**	**3.76**	**0.00**	**0.31**	**0.00**	**0.03**	**0.00**	**1.12**	**0.65**	**9.24**
Reconciled										
1.84	**0.39**	**2.45**	**0.16**	**0.43**	**0.00**	**0.00**	**0.00**	**1.13**	**1.10**	**7.50**

Figure 4-31a. Miscellaneous Simulated Average Standard Day LS - Coastal

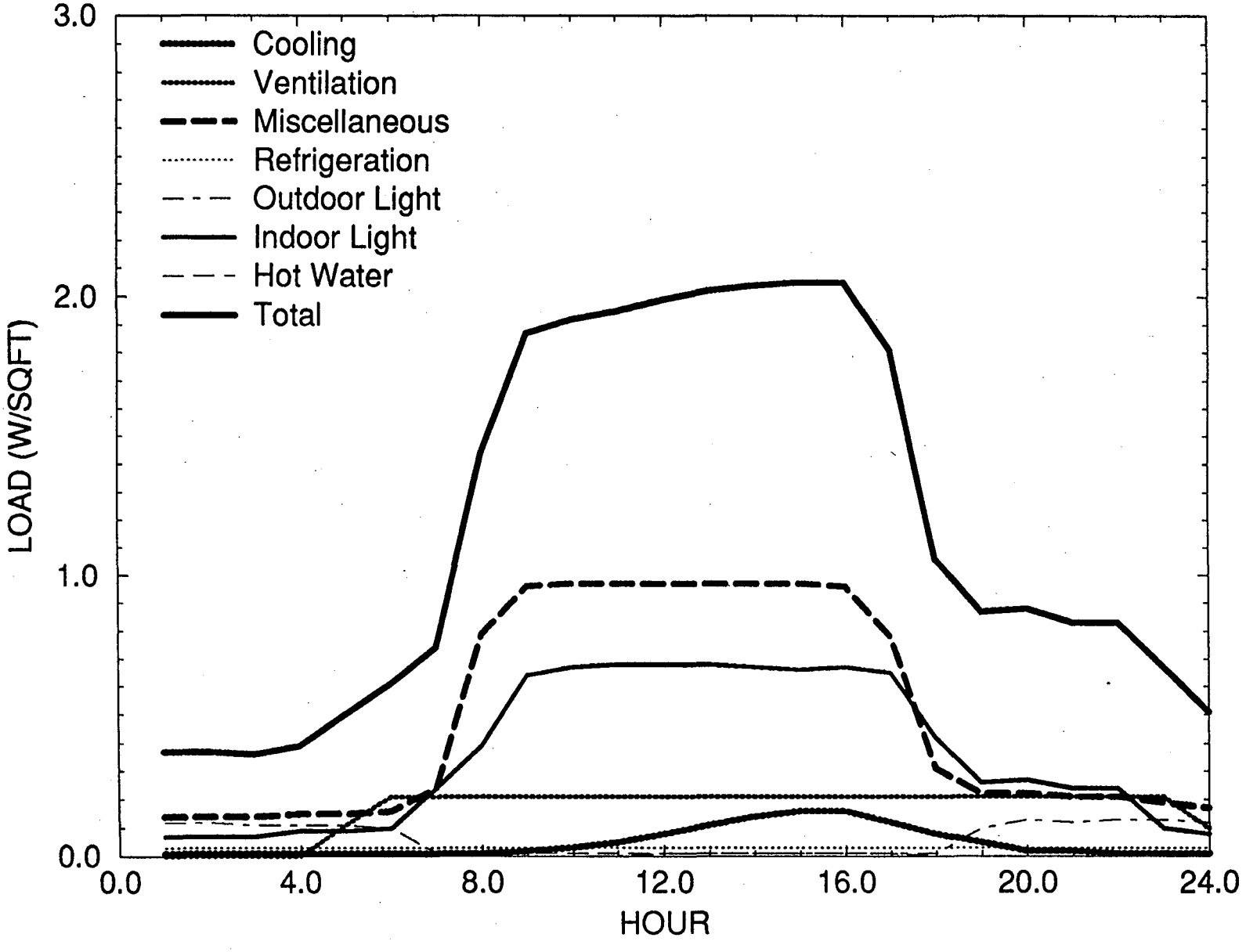


Figure 4-31b. Miscellaneous Simulated Average Standard Day LS - Inland

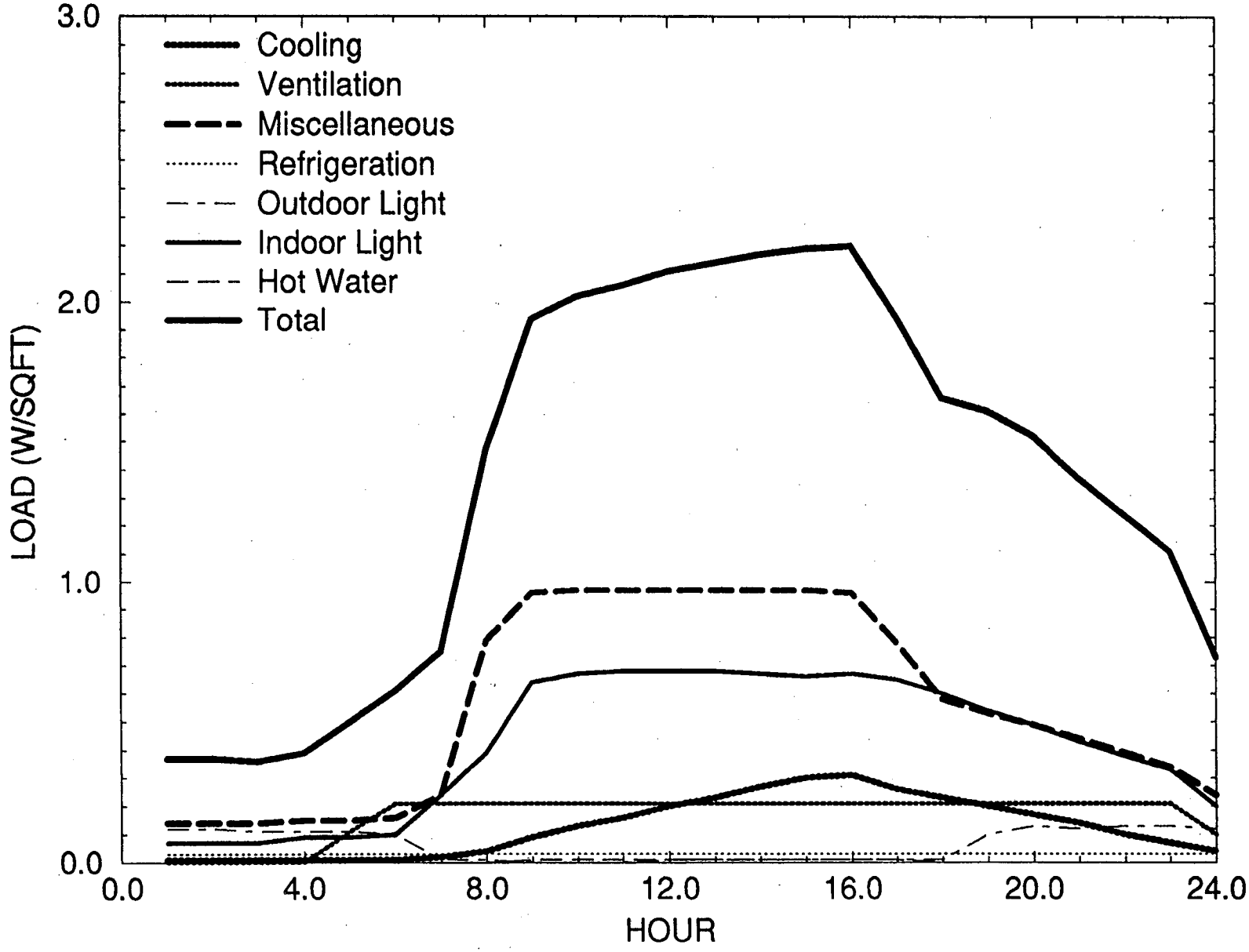


Figure 4-32a. Miscellaneous Whole Building Load vs. Drybulb Temperature for Standard Day - Coastal

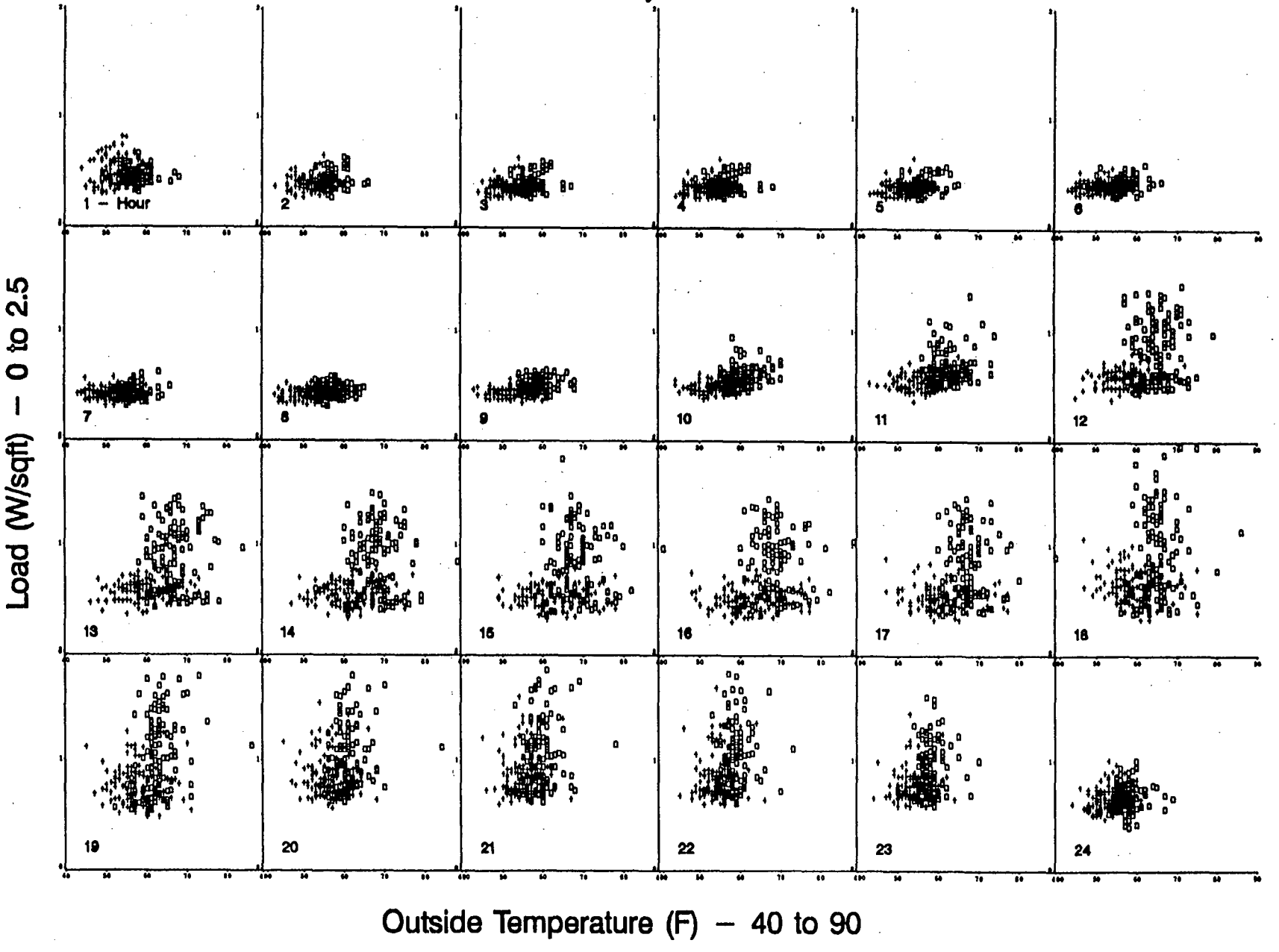


Figure 4-32b. Miscellaneous Whole Building Load vs. Drybulb Temperature for Standard Day - Inland

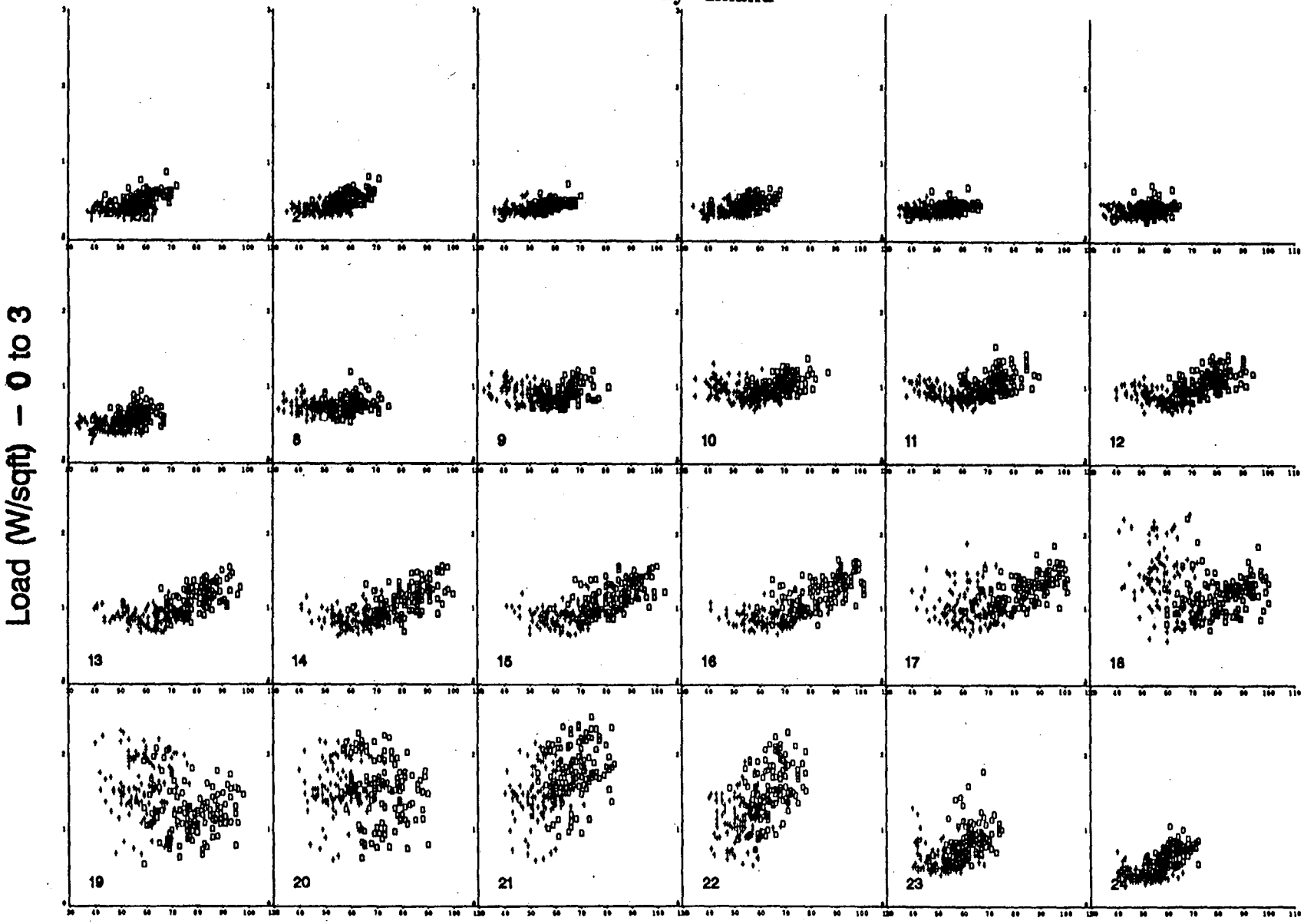


Figure 4-33a. Miscellaneous Reconciled Standard Day Annual End-Use LS - Coastal

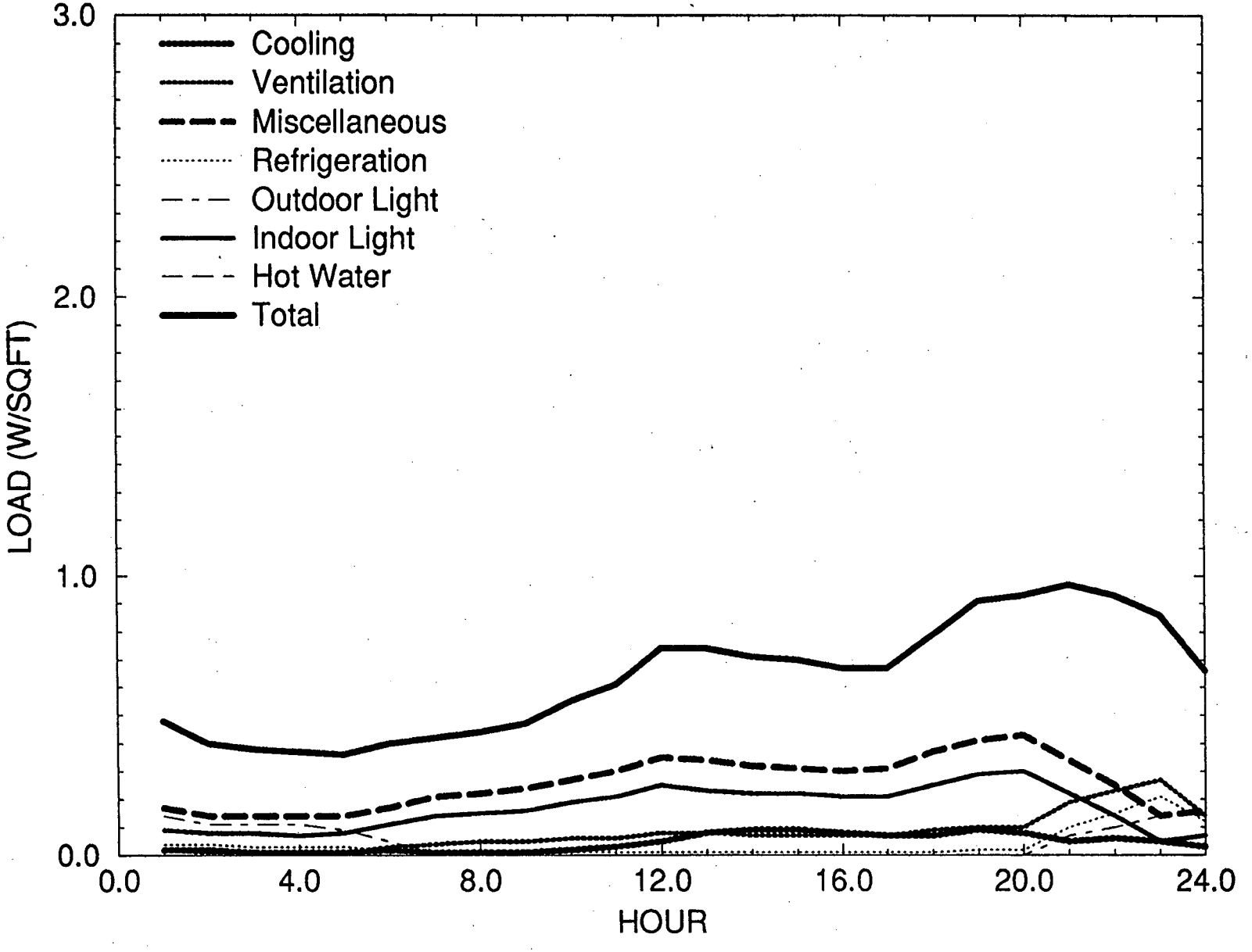


Figure 4-33b. Miscellaneous Reconciled Standard Day Annual End-Use LS - Inland

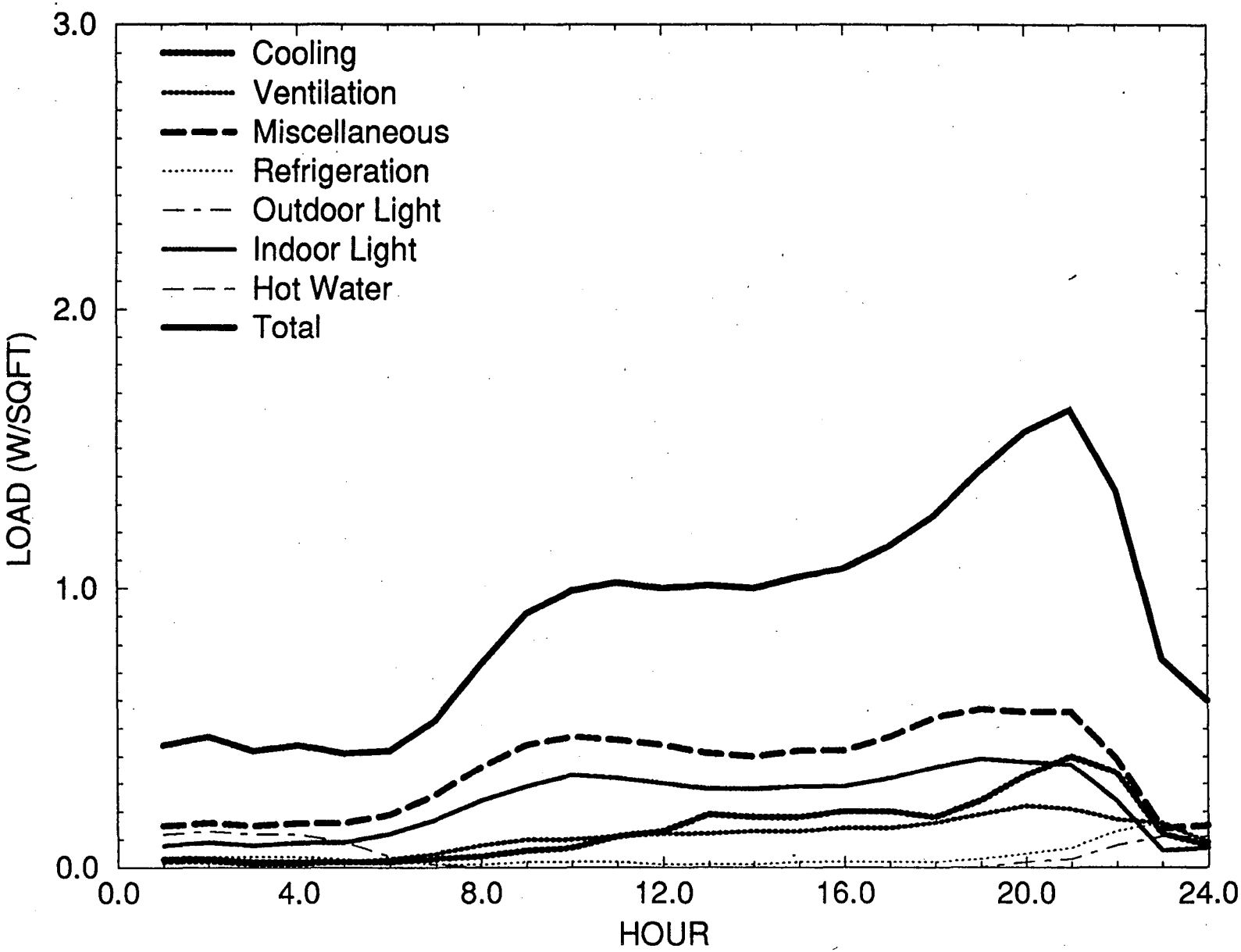


Figure 4-33c. Miscellaneous Reconciled Nonstandard Day Annual End-Use LS-Coastal

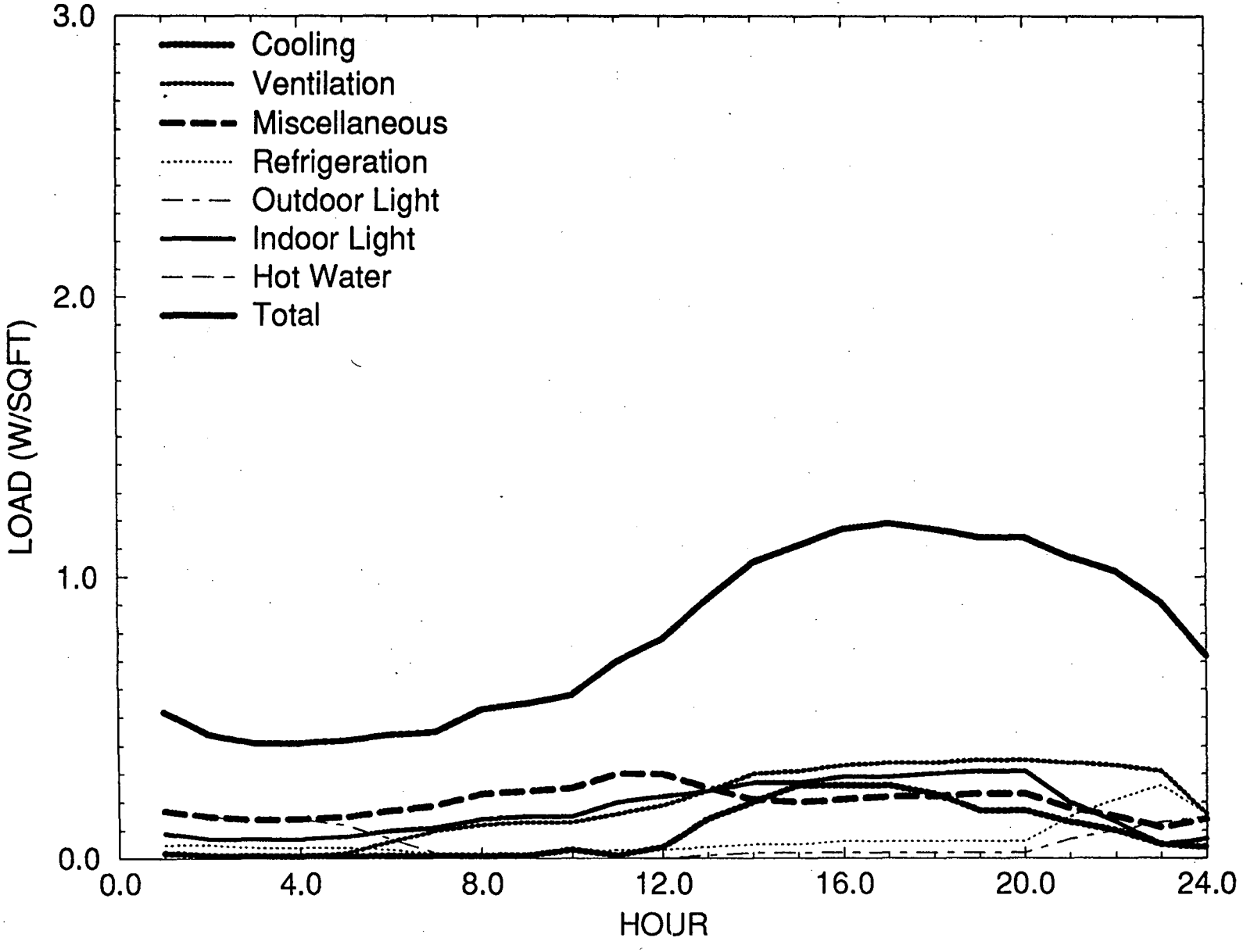
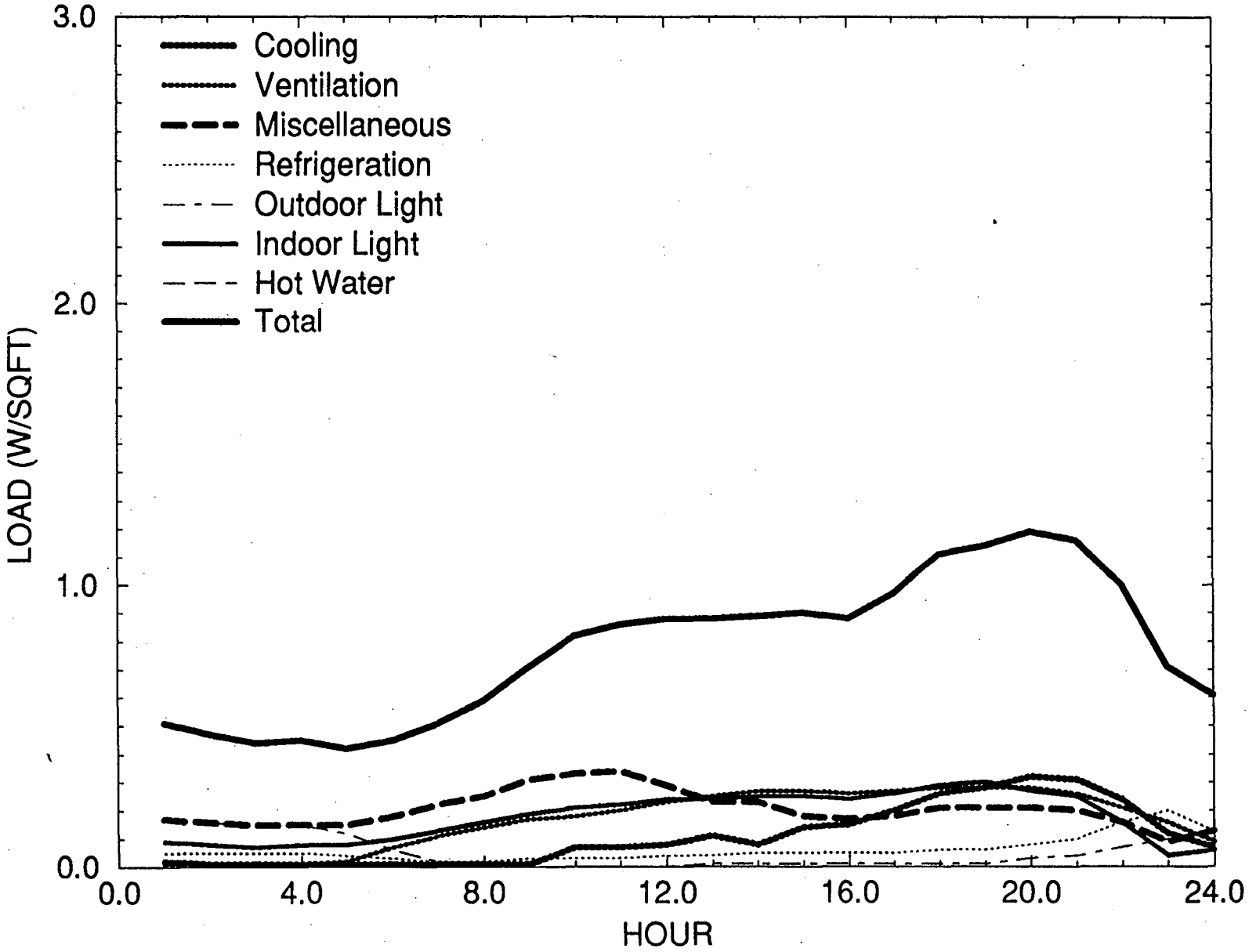


Figure 4-33d. Miscellaneous Reconciled Nonstandard Day Annual End-Use LS-Inland



Chapter 5

Forecasting Model Energy Inputs

This chapter describes the implementation of the methods developed to create a complete set of revised energy inputs for commercial forecasting models used by CEC and PG&E. The method, which was described in Chapter 2, relies on the reconciled EUIs described in the previous chapter and additional information from the mail and on-site surveys. Based on our current understanding of the CEC and PG&E models, the revised model inputs we develop, which have also been formatted in tables according to the specifications of the CEC and PG&E forecasting models, can be used to replace the current set of CEC and PG&E model inputs.

Recall that the end-use LSs and EUIs developed through the reconciliation procedures represent a snap-shot of 1986 electricity use by building type and end-use for two regions of the PG&E service territory. For each building type, this snap-shot represents an aggregation over important distinctions that are explicitly represented within CEC and PG&E forecasting models. These distinctions include price effects between 1986 and the 1975 model base year, office equipment energy use as a distinct element of miscellaneous electricity use, fuel saturations, and, for space conditioning end uses, the effects of different eras of building and equipment minimum energy efficiency standards. The CEC, in addition, models five distinct climate regions within the PG&E service territory, rather than the two we have examined. Finally for both models, there are several EUIs that could not be estimated with our reconciliation methodology, including electric space heating (except for lodging) and all non-electric end uses (space heating, water heating, cooking, and miscellaneous).

Chapter 2 described our seven step approach for developing new energy inputs for the CEC and PG&E model: 1) Development of 1986 EUIs for end-uses not estimated through application of EDA (electric heating, and all non-electric end uses); 2) Re-specification of all 1986 EUIs to a 1975 base year through application of the short price elasticity of demand and the historical prices of energy; 3) Removal of fuel saturation effects for all reconciled electric end uses, except those for which, by definition, the saturation is 100% (indoor and outdoor lighting, and miscellaneous); 4) Incorporation of previous LBL work to further disaggregate the electric miscellaneous EUI into office equipment and other miscellaneous; 5) For the space conditioning end uses, accounting explicitly for the effects of the first generation of mandatory minimum building energy efficiency standards; 6) For the space conditioning end use specification used by the CEC model, accounting separately for the impacts of equipment energy efficiency; and 7) Finally, for the space conditioning end use specification used by the CEC model, accounting separately for the additional variations in energy use for the 5 sub-regions represented in aggregate by the 2 regions for which explicit reconciliations were performed.

Intermediate Results for Space Conditioning End Uses

The final three steps of the method address the treatment of space conditioning end uses by the CEC and PG&E models.

For the CEC model, **Tables 5-1, 5-2, and 5-3** show the development of U75 and EUI79-CEC for the two primary climate regions (additional climate regions are treated separately) for the space cooling, space heating, and ventilation end uses, respectively. **Table 5-4** shows the DOE-2 simulation adjusted HVAC EUIs for the additional climate regions represented in the CEC model.

For the PG&E model, **Tables 5-5, 5-6, and 5-7** show the development of 1975 and 1979 EUIs for the two PG&E climate regions for the space cooling, space heating, and ventilation end uses, respectively.

As seen in **Tables 5-1 and 5-5** the cooling EUI for the school prototype is the same for both coastal and inland climate regions. The DOE-2 simulations predict more cooling inland than coastal, however the EDA whole-building-load vs dry-bulb-temperature regression correlations indicate that the cooling EUIs for this building is small.

Final Results for Non-Space Conditioning End Uses

Non-hvac electric EUIs and U75s for CEC are shown in **Tables 5-8, 5-9, 5-10, 5-11, 5-12, and 5-13** for cooking, hot water, indoor lighting, outdoor lighting, miscellaneous equipment, and refrigeration, respectively. Non-hvac gas EUIs and U75s for CEC are shown in **Tables 5-14, 5-15, and 5-16** for cooking, hot water, and miscellaneous equipment, respectively. Non-hvac electric EUIs for PG&E are shown in **Tables 5-17, 5-18, 5-19, 5-20, 5-21, and 5-22** for cooking, hot water, indoor lighting, outdoor lighting, miscellaneous equipment, and refrigeration, respectively. Non-hvac gas EUIs for PG&E are shown in **Tables 5-23, 5-24, and 5-25** for cooking, hot water, and miscellaneous equipment, respectively.

Note that all non-space conditioning EUIs are the same for the two climate regions with one exception, the warehouse refrigeration end-use, which reflects differences in the proportion of refrigerated versus non-refrigerated warehouses in these regions.

Note in **Tables 5-1 through 5-25** the following abbreviations are utilized. Sat: Electricity Saturation, Eff: Equipment Efficiency, A/P: Ratio of Simulated Loads 1975 Vintage to 1986 Prototype, CECe: Weighted Average Energy Conversion Efficiency 1975 Vintage, PrEf: Price Effect, C/A: Ratio of Simulated Loads 1979 Vintage to 1986 Prototype, EffR: Ratio of Weighted Average Energy Conversion Efficiency 1975 Vintage to Weighted Average Energy Conversion Efficiency 1979 Vintage (not used for CEC).

Revised CEC and PG&E Forecasting Model Inputs

A final set of tables summarize all project results in the formats used to specify input files for the CEC and PG&E forecasting models.

Tables 5-26, 5-27, 5-28, 5-29, and 5-30 summarize CEC Vintage 1975 EUIs (U75) for climate regions 1 (Blue Canyon), 2 (Sacramento), 3 (Fresno), 4 (San Jose), and 5 (Oakland), respectively. **Tables 5-31, 5-32, 5-33, 5-34, and 5-35** summarize CEC Vintage 1979 EUIs (EUI79-CEC) for climate regions 1 (Blue Canyon), 2 (Sacramento), 3 (Fresno), 4 (San Jose), and 5 (Oakland), respectively. **Tables 5-36 and 5-37** summarize PG&E Vintage 1975 EUIs for climate regions Coastal (Oakland) and Inland (Sacramento), respectively. **Tables 5-38 and 5-39** summarize PG&E Vintage 1979 EUIs for climate regions Coastal (Oakland) and Inland (Sacramento), respectively.

CEC U75 and PG&E 1975 EUIs are in units of [kBtu/sqft/yr]. EUI79-CEC does not include equipment conversion efficiencies and is expressed as a percentage. PG&E 1979 EUIs include the equipment conversion efficiencies and is expressed in [kBtu/sqft/yr]. Refer to Chapter 2 for definitions of U75, EUI79-CEC, and PG&E 1975 and 1979 EUIs.

Table 5-1. CEC Cooling EUIs for 1975 and 1979 Vintages [kBtu/sqft/yr]

Building	Region	Fuel	EUI	Sat	Eff	A/P	CECe	PrEf	U75	C/A	EffR	EUI79
SmOffice	OAK	elec	2.80	0.699	2.34	1.08	2.43	1.28	5.32	0.51	0.90	0.51
		ngas	ne	1.000	2.34	1.08	0.53	1.09	14.46	0.51	0.74	0.51
		othr	ne	1.000	2.34	1.08	0.53	0.99	13.13	0.51	0.74	0.51
SmOffice	SAC	elec	10.68	0.800	2.30	1.04	2.43	1.28	16.80	0.82	0.90	0.82
		ngas	ne	1.000	2.30	1.04	0.53	1.09	52.24	0.82	0.74	0.82
		othr	ne	1.000	2.30	1.04	0.53	0.99	47.45	0.82	0.74	0.82
LgOffice	OAK	elec	13.24	0.866	3.13	1.56	3.96	1.28	24.13	0.28	0.98	0.28
		ngas	ne	1.000	3.13	1.56	0.56	1.09	126.50	0.28	0.78	0.28
		othr	ne	1.000	3.13	1.56	0.56	0.99	114.89	0.28	0.78	0.28
LgOffice	SAC	elec	19.48	0.917	2.90	1.45	3.96	1.28	28.88	0.45	0.98	0.45
		ngas	ne	1.000	2.90	1.45	0.56	1.09	160.32	0.45	0.78	0.45
		othr	ne	1.000	2.90	1.45	0.56	0.99	145.61	0.45	0.78	0.45
Retail	OAK	elec	2.87	0.590	1.78	1.10	3.25	1.29	3.78	0.93	0.95	0.93
		ngas	ne	1.000	1.78	1.10	0.59	1.09	10.37	0.93	0.79	0.93
		othr	ne	1.000	1.78	1.10	0.59	0.99	9.42	0.93	0.79	0.93
Retail	SAC	elec	7.64	0.764	2.22	1.04	3.25	1.29	9.17	0.79	0.95	0.79
		ngas	ne	1.000	2.22	1.04	0.59	1.09	32.60	0.79	0.79	0.79
		othr	ne	1.000	2.22	1.04	0.59	0.99	29.61	0.79	0.79	0.79
Restrnt	OAK	elec	8.56	0.689	2.20	1.16	2.19	1.18	17.12	0.53	0.88	0.53
		ngas	ne	1.000	2.20	1.16	0.45	1.09	53.53	0.53	0.65	0.53
		othr	ne	1.000	2.20	1.16	0.45	0.99	48.62	0.53	0.65	0.53
Restrnt	SAC	elec	17.64	0.843	2.21	0.83	2.19	1.18	20.72	0.67	0.88	0.67
		ngas	ne	1.000	2.21	0.83	0.45	1.09	79.26	0.67	0.65	0.67
		othr	ne	1.000	2.21	0.83	0.45	0.99	71.99	0.67	0.65	0.67
FoodStr	OAK	elec	9.42	0.760	1.43	1.31	2.03	1.33	15.21	0.84	0.87	0.84
		ngas	ne	1.000	1.43	1.31	0.36	1.09	53.43	0.84	0.55	0.84
		othr	ne	1.000	1.43	1.31	0.36	0.99	48.53	0.84	0.55	0.84
FoodStr	SAC	elec	15.73	0.695	1.46	1.10	2.03	1.33	23.81	0.91	0.87	0.91
		ngas	ne	1.000	1.46	1.10	0.36	1.09	76.49	0.91	0.55	0.91
		othr	ne	1.000	1.46	1.10	0.36	0.99	69.47	0.91	0.55	0.91
Warehse	OAK	elec	0.38	0.478	2.20	1.53	2.19	1.15	1.39	0.61	0.89	0.61
		ngas	ne	1.000	2.20	1.53	0.43	1.09	3.21	0.61	0.63	0.61
		othr	ne	1.000	2.20	1.53	0.43	0.99	2.92	0.61	0.63	0.61
Warehse	SAC	elec	2.52	0.511	2.14	1.24	2.19	1.15	6.89	0.84	0.89	0.84
		ngas	ne	1.000	2.14	1.24	0.43	1.09	17.02	0.84	0.63	0.84
		othr	ne	1.000	2.14	1.24	0.43	0.99	15.46	0.84	0.63	0.84
School	OAK	elec	0.17	0.772	2.25	10.33	2.03	1.16	2.93	0.10	0.87	0.10
		ngas	ne	1.000	2.25	10.33	0.30	1.09	14.22	0.10	0.62	0.10
		othr	ne	1.000	2.25	10.33	0.36	0.99	10.90	0.10	0.55	0.10
School	SAC	elec	0.17	0.828	2.34	4.65	2.03	1.16	1.28	0.22	0.87	0.22
		ngas	ne	1.000	2.34	4.65	0.30	1.09	6.66	0.22	0.62	0.22
		othr	ne	1.000	2.34	4.65	0.36	0.99	5.10	0.22	0.55	0.22

Table 5-1. CEC Cooling EUIs for 1975 and 1979 Vintages [kBtu/sqft/yr] (Continued)

Building	Region	Fuel	EUI	Sat	Eff	A/P	CECe	PrEf	U75	C/A	EffR	EUI79
College	OAK	elec	2.15	0.523	3.60	1.60	2.82	1.23	10.31	0.21	0.90	0.21
		ngas	ne	1.000	3.60	1.60	0.49	1.09	27.60	0.21	0.69	0.21
		othr	ne	1.000	3.60	1.60	0.49	0.99	25.07	0.21	0.69	0.21
College	SAC	elec	4.40	0.946	3.45	1.30	2.82	1.23	9.09	0.28	0.90	0.28
		ngas	ne	1.000	3.45	1.30	0.49	1.09	44.00	0.28	0.69	0.28
		othr	ne	1.000	3.45	1.30	0.49	0.99	39.97	0.28	0.69	0.28
Health	OAK	elec	11.40	0.854	3.51	2.20	3.97	1.24	32.20	0.52	0.98	0.52
		ngas	ne	1.000	3.51	2.20	0.56	1.09	169.77	0.52	0.77	0.52
		othr	ne	1.000	3.51	2.20	0.56	0.99	154.20	0.52	0.77	0.52
Health	SAC	elec	16.17	0.783	3.60	1.88	3.97	1.24	43.69	0.55	0.98	0.55
		ngas	ne	1.000	3.60	1.88	0.56	1.09	211.17	0.55	0.77	0.55
		othr	ne	1.000	3.60	1.88	0.56	0.99	191.79	0.55	0.77	0.55
Lodging	OAK	elec	3.07	0.694	2.33	1.69	4.09	1.14	4.85	0.40	0.98	0.40
		ngas	ne	1.000	2.33	1.69	0.59	1.09	22.34	0.40	0.79	0.40
		othr	ne	1.000	2.33	1.69	0.59	0.99	20.29	0.40	0.79	0.40
Lodging	SAC	elec	4.54	0.957	2.03	0.75	4.09	1.14	2.01	0.31	0.98	0.31
		ngas	ne	1.000	2.03	0.75	0.59	1.09	12.76	0.31	0.79	0.31
		othr	ne	1.000	2.03	0.75	0.59	0.99	11.59	0.31	0.79	0.31
Miscellns	OAK	elec	1.81	0.272	1.75	2.74	2.47	1.16	14.97	0.58	0.89	0.58
		ngas	ne	1.000	1.75	2.74	0.38	1.09	24.81	0.58	0.65	0.58
		othr	ne	1.000	1.75	2.74	0.38	0.99	22.53	0.58	0.65	0.58
Miscellns	SAC	elec	3.75	0.773	2.01	1.75	2.47	1.16	8.02	0.82	0.89	0.82
		ngas	ne	1.000	2.01	1.75	0.38	1.09	37.77	0.82	0.65	0.82
		othr	ne	1.000	2.01	1.75	0.38	0.99	34.30	0.82	0.65	0.82

Table 5-2. CEC Heating EUIs for 1975 and 1979 Vintages [kBtu/sqft/yr]

Building	Region	Fuel	EUI	Eff	A/P	CECe	PrEf	U75	C/A	EffR	EUI79
SmOffice	OAK	elec	ne	0.52	0.97	1.27	1.28	4.65	0.75	0.88	0.75
		ngas	9.11	0.52	0.97	0.66	1.09	7.60	0.75	0.89	0.75
		othr	ne	0.52	0.97	0.66	0.99	6.89	0.75	0.90	0.75
SmOffice	SAC	elec	ne	0.57	0.99	1.27	1.28	7.63	0.76	0.88	0.76
		ngas	13.38	0.57	0.99	0.66	1.09	12.49	0.76	0.89	0.76
		othr	ne	0.57	0.99	0.66	0.99	11.33	0.76	0.90	0.76
LgOffice	OAK	elec	ne	0.80	5.83	0.95	1.28	13.45	0.75	1.00	0.75
		ngas	2.14	0.80	5.83	0.66	1.09	16.48	0.75	0.88	0.75
		othr	ne	0.80	5.83	0.66	0.99	14.97	0.75	0.88	0.75
LgOffice	SAC	elec	ne	0.73	4.23	0.95	1.28	15.81	0.77	1.00	0.77
		ngas	3.80	0.73	4.23	0.66	1.09	19.38	0.77	0.88	0.77
		othr	ne	0.73	4.23	0.66	0.99	17.60	0.77	0.88	0.77
Retail	OAK	elec	ne	0.59	0.96	1.47	1.29	5.68	0.56	0.84	0.56
		ngas	11.42	0.59	0.96	0.66	1.09	10.68	0.56	0.88	0.56
		othr	ne	0.59	0.96	0.66	0.99	9.70	0.56	0.94	0.56
Retail	SAC	elec	ne	0.60	0.96	1.47	1.29	8.75	0.57	0.84	0.57
		ngas	17.29	0.60	0.96	0.66	1.09	16.45	0.57	0.88	0.57
		othr	ne	0.60	0.96	0.66	0.99	14.94	0.57	0.94	0.57
Restrnt	OAK	elec	ne	0.46	0.89	1.07	1.18	11.04	0.54	0.95	0.54
		ngas	24.42	0.46	0.89	0.66	1.09	16.51	0.54	0.89	0.54
		othr	ne	0.46	0.89	0.66	0.99	15.00	0.54	1.00	0.54
Restrnt	SAC	elec	ne	0.52	0.86	1.07	1.18	16.56	0.56	0.95	0.56
		ngas	33.55	0.52	0.86	0.66	1.09	24.78	0.56	0.89	0.57
		othr	ne	0.52	0.86	0.66	0.99	22.51	0.56	1.00	0.56
FoodStr	OAK	elec	ne	0.54	0.98	1.15	1.33	28.48	0.96	0.92	0.96
		ngas	46.54	0.54	0.98	0.66	1.09	40.68	0.96	0.93	0.96
		othr	ne	0.54	0.98	0.66	0.99	36.94	0.96	1.00	0.96
FoodStr	SAC	elec	ne	0.44	0.98	1.15	1.33	23.26	0.96	0.92	0.96
		ngas	46.65	0.44	0.98	0.66	1.09	33.22	0.96	0.93	0.96
		othr	ne	0.44	0.98	0.66	0.99	30.17	0.96	1.00	0.96
Warehse	OAK	elec	ne	0.53	1.46	1.00	1.15	13.09	0.79	1.00	0.79
		ngas	14.71	0.53	1.46	0.66	1.09	18.80	0.79	0.92	0.79
		othr	ne	0.53	1.46	0.66	0.99	17.07	0.79	0.92	0.79
Warehse	SAC	elec	ne	0.55	1.53	1.00	1.15	17.21	0.80	1.00	0.80
		ngas	17.78	0.55	1.53	0.66	1.09	24.71	0.80	0.92	0.80
		othr	ne	0.55	1.53	0.66	0.99	22.44	0.80	0.92	0.80
School	OAK	elec	ne	0.60	5.25	1.04	1.16	53.49	0.20	0.96	0.20
		ngas	15.21	0.60	5.25	0.66	1.09	79.13	0.20	0.88	0.20
		othr	ne	0.60	5.25	0.66	0.99	71.87	0.20	0.88	0.20
School	SAC	elec	ne	0.61	5.00	1.04	1.16	58.54	0.20	0.96	0.20
		ngas	17.19	0.61	5.00	0.66	1.09	86.59	0.20	0.88	0.20
		othr	ne	0.61	5.00	0.66	0.99	78.64	0.20	0.88	0.20

Table 5-2. CEC Heating EUIs for 1975 and 1979 Vintages [kBtu/sqft/yr] (Continued)

Building	Region	Fuel	EUI	Eff	A/P	CECe	PrEf	U75	C/A	EffR	EUI79
College	OAK	elec	ne	0.74	0.69	1.02	1.23	9.02	0.20	0.97	0.20
		ngas	14.62	0.74	0.69	0.66	1.09	12.33	0.20	0.88	0.20
		othr	ne	0.74	0.69	0.66	0.99	11.20	0.20	0.88	0.20
College	SAC	elec	ne	0.73	0.71	1.02	1.23	9.06	0.20	0.97	0.20
		ngas	14.46	0.73	0.71	0.66	1.09	12.38	0.20	0.88	0.20
		othr	ne	0.73	0.71	0.66	0.99	11.24	0.20	0.88	0.20
Health	OAK	elec	ne	0.67	8.06	1.90	1.24	12.90	0.15	0.79	0.15
		ngas	3.66	0.67	8.06	0.66	1.09	32.64	0.15	0.88	0.15
		othr	ne	0.67	8.06	0.66	0.99	29.65	0.15	0.88	0.15
Health	SAC	elec	ne	0.71	5.16	1.90	1.24	13.25	0.21	0.79	0.21
		ngas	5.54	0.71	5.16	0.66	1.09	33.52	0.21	0.88	0.21
		othr	ne	0.71	5.16	0.66	0.99	30.44	0.21	0.88	0.21
Lodging	OAK	elec	5.83	0.55	1.19	1.76	1.14	2.47	0.57	0.81	0.57
		ngas	23.50	0.55	1.19	0.66	1.09	25.40	0.57	0.88	0.57
		othr	ne	0.55	1.19	0.66	0.99	23.07	0.57	0.96	0.57
Lodging	SAC	elec	8.15	0.61	0.69	1.76	1.14	2.22	0.33	0.81	0.33
		ngas	37.54	0.61	0.69	0.66	1.09	26.09	0.33	0.88	0.33
		othr	ne	0.61	0.69	0.66	0.99	23.70	0.33	0.96	0.33
Miscellns	OAK	elec	ne	0.44	2.38	1.49	1.16	6.18	0.31	0.85	0.31
		ngas	7.55	0.44	2.38	0.66	1.09	13.06	0.31	0.90	0.31
		othr	ne	0.44	2.38	0.66	0.99	11.86	0.31	0.93	0.31
Miscellns	SAC	elec	ne	0.48	2.29	1.49	1.16	7.01	0.35	0.85	0.35
		ngas	8.16	0.48	2.29	0.66	1.09	14.81	0.35	0.90	0.35
		othr	ne	0.48	2.29	0.66	0.99	13.45	0.35	0.93	0.35

Table 5-3. CEC Ventilation EUIs for 1975 and 1979 Vintages [kBtu/sqft/yr]

Building	Region	EUI	Sat	A/P	PrEf	U75	EUI79
SmOffice	OAK	0.75	0.699	1.00	1.28	1.37	1.00
	SAC	1.94	0.800	1.05	1.28	3.27	0.89
LgOffice	OAK	10.17	0.866	1.09	1.28	16.38	0.64
	SAC	13.75	0.917	1.10	1.28	21.11	0.64
Retail	OAK	1.16	0.590	1.00	1.29	2.54	0.96
	SAC	2.73	0.764	1.01	1.29	4.65	0.87
Restrnt	OAK	14.84	0.689	0.77	1.18	19.57	0.73
	SAC	19.55	0.843	0.75	1.18	20.52	0.70
FoodStr	OAK	11.63	0.760	1.03	1.33	20.97	0.97
	SAC	15.12	0.695	1.03	1.33	29.79	0.95
Warehse	OAK	3.72	0.478	0.98	1.15	8.77	0.95
	SAC	3.14	0.511	1.08	1.15	7.63	0.92
School	OAK	1.57	0.772	1.23	1.16	2.90	0.82
	SAC	2.12	0.828	1.36	1.16	4.03	0.75
College	OAK	3.62	0.523	0.80	1.23	6.80	0.25
	SAC	4.88	0.946	0.82	1.23	5.20	0.29
Health	OAK	6.89	0.854	1.22	1.24	12.21	0.80
	SAC	8.50	0.783	1.23	1.24	16.55	0.80
Lodging	OAK	2.05	0.694	1.19	1.14	4.00	0.56
	SAC	4.33	0.957	0.68	1.14	3.51	0.34
Miscellns	OAK	3.65	0.272	1.00	1.16	15.57	1.00
	SAC	3.86	0.773	1.00	1.16	5.79	1.00

Table 5-4. CEC Regional 1986 HVAC EUIs [kBtu/sqft/yr]

Building	Region	End-Use	EUI	DOE-2 Simulation Ratio			Regional EUI		
				1/5	3/2	4/2	Reg_1	Reg_3	Reg_4
SMALLOFFICE	Coastal	Cool	2.80	0.26	-	-	0.72	-	-
	(Reg_5)	Heat	9.11	2.00	-	-	18.24	-	-
		Vent	0.75	1.00	-	-	0.75	-	-
	Inland	Cool	10.68	-	1.43	0.57	-	15.28	6.08
	(Reg_2)	Heat	13.38	-	1.44	0.96	-	19.27	12.82
		Vent	1.94	-	1.09	0.93	-	2.13	1.82
LARGEOFFICE	Coastal	Cool	13.24	0.64	-	-	8.47	-	-
	(Reg_5)	Heat	2.14	2.78	-	-	5.95	-	-
		Vent	10.17	0.96	-	-	9.81	-	-
	Inland	Cool	19.48	-	1.11	0.76	-	21.56	14.88
	(Reg_2)	Heat	3.80	-	1.76	0.97	-	6.70	3.68
		Vent	13.75	-	1.02	0.96	-	13.97	13.24
RETAIL	Coastal	Cool	2.87	0.45	-	-	1.30	-	-
	(Reg_5)	Heat	11.42	1.79	-	-	20.48	-	-
		Vent	1.16	1.00	-	-	1.16	-	-
	Inland	Cool	7.64	-	1.49	0.42	-	11.42	3.24
	(Reg_2)	Heat	17.29	-	1.35	0.93	-	23.39	16.01
		Vent	2.73	-	1.05	0.85	-	2.86	2.32
RESTAURANT	Coastal	Cool	8.56	0.28	-	-	2.36	-	-
	(Reg_5)	Heat	24.42	2.48	-	-	60.63	-	-
		Vent	14.84	0.91	-	-	13.55	-	-
	Inland	Cool	17.64	-	1.35	0.55	-	23.90	9.74
	(Reg_2)	Heat	33.55	-	1.20	0.96	-	40.18	32.09
		Vent	19.55	-	1.13	0.96	-	22.05	18.85
GROCERY	Coastal	Cool	9.42	0.84	-	-	7.91	-	-
	(Reg_5)	Heat	46.54	1.86	-	-	86.39	-	-
		Vent	11.63	1.15	-	-	13.42	-	-
	Inland	Cool	15.73	-	1.83	0.58	-	28.74	9.08
	(Reg_2)	Heat	46.65	-	1.12	1.07	-	52.33	49.99
		Vent	15.12	-	1.18	0.97	-	17.89	14.60
WAREHOUSE	Coastal	Cool	0.38	0.22	-	-	0.08	-	-
	(Reg_5)	Heat	14.71	2.33	-	-	34.28	-	-
		Vent	3.72	0.93	-	-	3.45	-	-
	Inland	Cool	2.52	-	1.89	0.58	-	4.78	1.46
	(Reg_2)	Heat	17.78	-	0.99	1.07	-	17.53	19.07
		Vent	3.14	-	1.19	0.94	-	3.75	2.95
SCHOOL	Coastal	Cool	0.17	0.22	-	-	0.04	-	-
	(Reg_5)	Heat	15.21	2.24	-	-	34.08	-	-
		Vent	1.57	1.00	-	-	1.57	-	-
	Inland	Cool	0.17	-	1.71	0.49	-	0.29	0.08
	(Reg_2)	Heat	17.19	-	1.25	1.10	-	21.48	18.83
		Vent	2.12	-	1.10	0.95	-	2.32	2.00

Table 5-4. CEC Regional 1986 HVAC EUIs [kBtu/sqft/yr] (Continued)

Building	Region	End-Use	EUI	DOE-2 Simulation Ratio			Regional EUI		
				1/5	3/2	4/2	Reg_1	Reg_3	Reg_4
COLLEGE	Coastal	Cool	2.15	0.45	-	-	0.96	-	-
	(Reg_5)	Heat	14.62	1.53	-	-	22.39	-	-
		Vent	3.62	0.99	-	-	3.59	-	-
	Inland	Cool	4.40	-	1.05	0.76	-	4.64	3.33
	(Reg_2)	Heat	14.46	-	1.03	1.06	-	14.94	15.38
		Vent	4.88	-	1.01	0.93	-	4.93	4.52
HEALTH	Coastal	Cool	11.40	0.47	-	-	5.32	-	-
	(Reg_5)	Heat	3.66	2.55	-	-	9.33	-	-
		Vent	6.89	0.87	-	-	5.97	-	-
	Inland	Cool	16.17	-	1.13	0.85	-	18.25	13.70
	(Reg_2)	Heat	5.54	-	1.52	1.02	-	8.41	5.65
		Vent	8.50	-	1.04	0.97	-	8.80	8.22
LODGING	Coastal	Cool	3.07	0.35	-	-	1.07	-	-
	(Reg_5)	Heat	23.50	1.81	-	-	42.54	-	-
		Heat_e	5.83	1.81	-	-	10.55	-	-
		Vent	2.05	0.84	-	-	1.72	-	-
	Inland	Cool	4.54	-	1.30	0.56	-	5.89	2.52
	(Reg_2)	Heat	37.54	-	1.08	1.08	-	40.54	40.54
		Heat_e	8.15	-	1.08	1.08	-	8.80	8.80
		Vent	4.33	-	0.86	0.83	-	3.72	3.59
MISCELLNS	Coastal	Cool	1.81	0.33	-	-	0.60	-	-
	(Reg_5)	Heat	7.55	2.66	-	-	20.05	-	-
		Vent	3.65	1.00	-	-	3.65	-	-
	Inland	Cool	3.75	-	2.17	0.66	-	8.16	2.49
	(Reg_2)	Heat	8.16	-	1.09	0.99	-	8.88	8.04
		Vent	3.86	-	1.00	1.00	-	3.86	3.86

Table 5-5. PG&E Cooling EUIs for 1975 and 1979 Vintages [kBtu/sqft/yr]

Building	Region	Fuel	EUI	Sat	Eff	A/P	CECe	PrEf	1975 EUI	C/A	EffR	1979 EUI
SmOffice	OAK	elec	2.80	0.699	2.34	1.08	2.43	1.11	4.61	0.51	0.90	2.11
		ngas	ne	1.000	2.34	1.08	0.53	1.00	13.27	0.51	0.74	4.97
		othr	ne	1.000	2.34	1.08	0.53	1.00	13.27	0.51	0.74	4.97
SmOffice	SAC	elec	10.68	0.800	2.30	1.04	2.43	1.11	14.57	0.82	0.90	10.70
		ngas	ne	1.000	2.30	1.04	0.53	1.00	47.93	0.82	0.74	28.89
		othr	ne	1.000	2.30	1.04	0.53	1.00	47.93	0.82	0.74	28.89
LgOffice	OAK	elec	13.24	0.866	3.13	1.56	3.96	1.11	20.92	0.28	0.98	5.72
		ngas	ne	1.000	3.13	1.56	0.56	1.00	116.05	0.28	0.78	25.31
		othr	ne	1.000	3.13	1.56	0.56	1.00	116.05	0.28	0.78	25.31
LgOffice	SAC	elec	19.48	0.917	2.90	1.45	3.96	1.11	25.04	0.45	0.98	11.00
		ngas	ne	1.000	2.90	1.45	0.56	1.00	147.08	0.45	0.78	51.56
		othr	ne	1.000	2.90	1.45	0.56	1.00	147.08	0.45	0.78	51.56
Retail	OAK	elec	2.87	0.590	1.78	1.10	3.25	1.11	3.25	0.93	0.95	2.87
		ngas	ne	1.000	1.78	1.10	0.59	1.00	9.51	0.93	0.79	6.96
		othr	ne	1.000	1.78	1.10	0.59	1.00	9.51	0.93	0.79	6.96
Retail	SAC	elec	7.64	0.764	2.22	1.04	3.25	1.11	7.89	0.79	0.95	5.92
		ngas	ne	1.000	2.22	1.04	0.59	1.00	29.91	0.79	0.79	18.59
		othr	ne	1.000	2.22	1.04	0.59	1.00	29.91	0.79	0.79	18.59
Restrnt	OAK	elec	8.56	0.689	2.20	1.16	2.19	1.11	16.11	0.53	0.88	7.52
		ngas	ne	1.000	2.20	1.16	0.45	1.00	49.11	0.53	0.65	16.86
		othr	ne	1.000	2.20	1.16	0.45	1.00	49.11	0.53	0.65	16.86
Restrnt	SAC	elec	17.64	0.843	2.21	0.83	2.19	1.11	19.49	0.67	0.88	11.51
		ngas	ne	1.000	2.21	0.83	0.45	1.00	72.71	0.67	0.65	31.56
		othr	ne	1.000	2.21	0.83	0.45	1.00	72.71	0.67	0.65	31.56
FoodStr	OAK	elec	9.42	0.760	1.43	1.31	2.03	1.11	12.70	0.84	0.87	9.28
		ngas	ne	1.000	1.43	1.31	0.36	1.00	49.02	0.84	0.55	22.65
		othr	ne	1.000	1.43	1.31	0.36	1.00	49.02	0.84	0.55	22.65
FoodStr	SAC	elec	15.73	0.695	1.46	1.10	2.03	1.11	19.87	0.91	0.87	15.67
		ngas	ne	1.000	1.46	1.10	0.36	1.00	70.17	0.91	0.55	35.37
		othr	ne	1.000	1.46	1.10	0.36	1.00	70.17	0.91	0.55	35.37
Warehse	OAK	elec	0.38	0.478	2.20	1.53	2.19	1.11	1.34	0.61	0.89	0.72
		ngas	ne	1.000	2.20	1.53	0.43	1.00	2.94	0.61	0.63	1.13
		othr	ne	1.000	2.20	1.53	0.43	1.00	2.94	0.61	0.63	1.13
Warehse	SAC	elec	2.52	0.511	2.14	1.24	2.19	1.11	6.65	0.84	0.89	4.95
		ngas	ne	1.000	2.14	1.24	0.43	1.00	15.62	0.84	0.63	8.28
		othr	ne	1.000	2.14	1.24	0.43	1.00	15.62	0.84	0.63	8.28
School	OAK	elec	0.17	0.772	2.25	10.33	2.03	1.11	2.80	0.10	0.87	0.24
		ngas	ne	1.000	2.25	10.33	0.30	1.00	13.04	0.10	0.62	0.80
		othr	ne	1.000	2.25	10.33	0.36	1.00	11.01	0.10	0.55	0.61
School	SAC	elec	0.17	0.828	2.34	4.65	2.03	1.11	1.22	0.22	0.87	0.23
		ngas	ne	1.000	2.34	4.65	0.30	1.00	6.11	0.22	0.62	0.83
		othr	ne	1.000	2.34	4.65	0.36	1.00	5.16	0.22	0.55	0.63

Table 5-5. PG&E Cooling EUIs for 1975 and 1979 Vintages [kBtu/sqft/yr] (Continued)

Building	Region	Fuel	EUI	Sat	Eff	A/P	CECe	PrEf	1975 EUI	C/A	EffR	1979 EUI
College	OAK	elec	2.15	0.523	3.60	1.60	2.82	1.11	9.31	0.21	0.90	1.76
		ngas	ne	1.000	3.60	1.60	0.49	1.00	25.32	0.21	0.69	3.68
		othr	ne	1.000	3.60	1.60	0.49	1.00	25.32	0.21	0.69	3.68
College	SAC	elec	4.40	0.946	3.45	1.30	2.82	1.11	8.21	0.28	0.90	2.07
		ngas	ne	1.000	3.45	1.30	0.49	1.00	40.37	0.28	0.69	7.83
		othr	ne	1.000	3.45	1.30	0.49	1.00	40.37	0.28	0.69	7.83
Health	OAK	elec	11.40	0.854	3.51	2.20	3.97	1.11	28.83	0.52	0.98	14.70
		ngas	ne	1.000	3.51	2.20	0.56	1.00	155.75	0.52	0.77	62.01
		othr	ne	1.000	3.51	2.20	0.56	1.00	155.75	0.52	0.77	62.01
Health	SAC	elec	16.17	0.783	3.60	1.88	3.97	1.11	39.11	0.55	0.98	21.09
		ngas	ne	1.000	3.60	1.88	0.56	1.00	193.73	0.55	0.77	81.57
		othr	ne	1.000	3.60	1.88	0.56	1.00	193.73	0.55	0.77	81.57
Lodging	OAK	elec	3.07	0.694	2.33	1.69	4.09	1.11	4.73	0.40	0.98	1.86
		ngas	ne	1.000	2.33	1.69	0.59	1.00	20.49	0.40	0.79	6.45
		othr	ne	1.000	2.33	1.69	0.59	1.00	20.49	0.40	0.79	6.45
Lodging	SAC	elec	4.54	0.957	2.03	0.75	4.09	1.11	1.96	0.31	0.98	0.60
		ngas	ne	1.000	2.03	0.75	0.59	1.00	11.71	0.31	0.79	2.86
		othr	ne	1.000	2.03	0.75	0.59	1.00	11.71	0.31	0.79	2.86
Miscellns	OAK	elec	1.81	0.272	1.75	2.74	2.47	1.11	14.33	0.58	0.89	7.38
		ngas	ne	1.000	1.75	2.74	0.38	1.00	22.76	0.58	0.65	8.55
		othr	ne	1.000	1.75	2.74	0.38	1.00	22.76	0.58	0.65	8.55
Miscellns	SAC	elec	3.75	0.773	2.01	1.75	2.47	1.11	7.68	0.82	0.89	5.59
		ngas	ne	1.000	2.01	1.75	0.38	1.00	34.65	0.82	0.65	18.41
		othr	ne	1.000	2.01	1.75	0.38	1.00	34.65	0.82	0.65	18.41

Table 5-6. PG&E Heating EUIs for 1975 and 1979 Vintages [kBtu/sqft/yr]

Building	Region	Fuel	EUI	Eff	A/P	CECe	PrEf	1975 EUI	C/A	EffR	1979 EUI
SmOffice	OAK	elec	ne	0.52	0.97	1.27	1.14	4.14	0.75	0.88	2.74
		ngas	9.11	0.52	0.97	0.66	1.32	9.20	0.75	0.89	6.11
		othr	ne	0.52	0.97	0.66	1.00	6.96	0.75	0.90	4.70
SmOffice	SAC	elec	ne	0.57	0.99	1.27	1.14	6.80	0.76	0.88	4.57
		ngas	13.38	0.57	0.99	0.66	1.32	15.12	0.76	0.89	10.18
		othr	ne	0.57	0.99	0.66	1.00	11.44	0.76	0.90	7.83
LgOffice	OAK	elec	ne	0.80	5.83	0.95	1.14	11.98	0.75	1.00	8.98
		ngas	2.14	0.80	5.83	0.66	1.32	19.96	0.75	0.88	13.17
		othr	ne	0.80	5.83	0.66	1.00	15.12	0.75	0.88	9.98
LgOffice	SAC	elec	ne	0.73	4.23	0.95	1.14	14.08	0.77	1.00	10.84
		ngas	3.80	0.73	4.23	0.66	1.32	23.47	0.77	0.88	15.90
		othr	ne	0.73	4.23	0.66	1.00	17.78	0.77	0.88	12.05
Retail	OAK	elec	ne	0.59	0.96	1.47	1.14	5.02	0.56	0.84	2.37
		ngas	11.42	0.59	0.96	0.66	1.32	12.94	0.56	0.88	6.40
		othr	ne	0.59	0.96	0.66	1.00	9.80	0.56	0.94	5.14
Retail	SAC	elec	ne	0.60	0.96	1.47	1.14	7.73	0.57	0.84	3.72
		ngas	17.29	0.60	0.96	0.66	1.32	19.92	0.57	0.88	10.03
		othr	ne	0.60	0.96	0.66	1.00	15.09	0.57	0.94	8.05
Restrnt	OAK	elec	ne	0.46	0.89	1.07	1.14	10.66	0.54	0.95	5.47
		ngas	24.42	0.46	0.89	0.66	1.32	20.00	0.54	0.89	9.60
		othr	ne	0.46	0.89	0.66	1.00	15.15	0.54	1.00	8.18
Restrnt	SAC	elec	ne	0.52	0.86	1.07	1.14	16.00	0.56	0.95	8.51
		ngas	33.55	0.52	0.86	0.66	1.32	30.01	0.56	0.89	15.21
		othr	ne	0.52	0.86	0.66	1.00	22.73	0.56	1.00	12.73
FoodStr	OAK	elec	ne	0.54	0.98	1.15	1.14	24.46	0.96	0.92	21.60
		ngas	46.54	0.54	0.98	0.66	1.32	49.26	0.96	0.93	45.40
		othr	ne	0.54	0.98	0.66	1.00	37.32	0.96	1.00	35.83
FoodStr	SAC	elec	ne	0.44	0.98	1.15	1.14	19.97	0.96	0.92	17.64
		ngas	46.65	0.44	0.98	0.66	1.32	40.23	0.96	0.93	35.92
		othr	ne	0.44	0.98	0.66	1.00	30.48	0.96	1.00	29.26
Warehse	OAK	elec	ne	0.53	1.46	1.00	1.14	12.98	0.79	1.00	10.25
		ngas	14.71	0.53	1.46	0.66	1.32	22.77	0.79	0.92	16.58
		othr	ne	0.53	1.46	0.66	1.00	17.25	0.79	0.92	12.56
Warehse	SAC	elec	ne	0.55	1.53	1.00	1.14	17.06	0.80	1.00	13.65
		ngas	17.78	0.55	1.53	0.66	1.32	29.92	0.80	0.92	22.07
		othr	ne	0.55	1.53	0.66	1.00	22.67	0.80	0.92	16.72
School	OAK	elec	ne	0.60	5.25	1.04	1.14	52.57	0.20	0.96	10.06
		ngas	15.21	0.60	5.25	0.66	1.32	95.82	0.20	0.88	16.86
		othr	ne	0.60	5.25	0.66	1.00	72.59	0.20	0.88	12.79
School	SAC	elec	ne	0.61	5.00	1.04	1.14	57.53	0.20	0.96	11.01
		ngas	17.19	0.61	5.00	0.66	1.32	104.86	0.20	0.88	18.46
		othr	ne	0.61	5.00	0.66	1.00	79.44	0.20	0.88	14.00

Table 5-6. PG&E Heating EUIs for 1975 and 1979 Vintages [kBtu/sqft/yr] (Continued)

Building	Region	Fuel	EUI	Eff	A/P	CECe	PrEf	1975 EUI	C/A	EffR	1979 EUI
College	OAK	elec	ne	0.74	0.69	1.02	1.14	8.36	0.20	0.97	1.62
		ngas	14.62	0.74	0.69	0.66	1.32	14.93	0.20	0.88	2.63
		othr	ne	0.74	0.69	0.66	1.00	11.31	0.20	0.88	1.99
College	SAC	elec	ne	0.73	0.71	1.02	1.14	8.39	0.20	0.97	1.63
		ngas	14.46	0.73	0.71	0.66	1.32	14.99	0.20	0.88	2.64
		othr	ne	0.73	0.71	0.66	1.00	11.36	0.20	0.88	2.00
Health	OAK	elec	ne	0.67	8.06	1.90	1.14	11.86	0.15	0.79	1.41
		ngas	3.66	0.67	8.06	0.66	1.32	39.53	0.15	0.88	5.22
		othr	ne	0.67	8.06	0.66	1.00	29.95	0.15	0.88	3.95
Health	SAC	elec	ne	0.71	5.16	1.90	1.14	12.18	0.21	0.79	2.02
		ngas	5.54	0.71	5.16	0.66	1.32	40.59	0.21	0.88	7.50
		othr	ne	0.71	5.16	0.66	1.00	30.75	0.21	0.88	5.68
Lodging	OAK	elec	5.83	0.55	1.19	1.76	1.14	2.47	0.57	0.81	1.14
		ngas	23.50	0.55	1.19	0.66	1.32	30.76	0.57	0.88	15.43
		othr	ne	0.55	1.19	0.66	1.00	23.30	0.57	0.96	12.75
Lodging	SAC	elec	8.15	0.61	0.69	1.76	1.14	2.22	0.33	0.81	0.59
		ngas	37.54	0.61	0.69	0.66	1.32	31.60	0.33	0.88	9.18
		othr	ne	0.61	0.69	0.66	1.00	23.94	0.33	0.96	7.58
Miscellns	OAK	elec	ne	0.44	2.38	1.49	1.14	6.07	0.31	0.85	1.59
		ngas	7.55	0.44	2.38	0.66	1.32	15.81	0.31	0.90	4.39
		othr	ne	0.44	2.38	0.66	1.00	11.98	0.31	0.93	3.45
Miscellns	SAC	elec	ne	0.48	2.29	1.49	1.14	6.89	0.35	0.85	2.04
		ngas	8.16	0.48	2.29	0.66	1.32	17.94	0.35	0.90	5.62
		othr	ne	0.48	2.29	0.66	1.00	13.59	0.35	0.93	4.42

Table 5-7. PG&E Ventilation EUIs for 1975 and 1979 Vintages [kBtu/sqft/yr]

Building	Region	EUI	Sat	A/P	PrEf	1975 EUI	1979 EUI
SmOffice	OAK	0.75	0.699	1.00	1.01	1.08	1.00
	SAC	1.94	0.800	1.05	1.01	2.58	0.89
LgOffice	OAK	10.17	0.866	1.09	1.01	12.93	0.64
	SAC	13.75	0.917	1.10	1.01	16.66	0.64
Retail	OAK	1.16	0.590	1.00	1.01	1.99	0.96
	SAC	2.73	0.764	1.01	1.01	3.64	0.87
Restrnt	OAK	14.84	0.689	0.77	1.01	16.75	0.73
	SAC	19.55	0.843	0.75	1.01	17.57	0.70
FoodStr	OAK	11.63	0.760	1.03	1.01	15.93	0.97
	SAC	15.12	0.695	1.03	1.01	22.62	0.95
Warehse	OAK	3.72	0.478	0.98	1.01	7.70	0.95
	SAC	3.14	0.511	1.08	1.01	6.70	0.92
School	OAK	1.57	0.772	1.23	1.01	2.53	0.82
	SAC	2.12	0.828	1.36	1.01	3.51	0.75
College	OAK	3.62	0.523	0.80	1.01	5.59	0.25
	SAC	4.88	0.946	0.82	1.01	4.27	0.29
Health	OAK	6.89	0.854	1.22	1.01	9.94	0.80
	SAC	8.50	0.783	1.23	1.01	13.48	0.80
Lodging	OAK	2.05	0.694	1.19	1.01	3.55	0.56
	SAC	4.33	0.957	0.68	1.01	3.11	0.34
Miscellns	OAK	3.65	0.272	1.00	1.01	13.56	1.00
	SAC	3.86	0.773	1.00	1.01	5.04	1.00

Table 5-8. CEC Electric Cooking EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	U75
SmOffice	OAK	0.10	0.526	1.28	0.25
	SAC	0.10	0.526	1.28	0.25
LgOffice	OAK	0.51	0.617	1.28	1.06
	SAC	0.51	0.617	1.28	1.06
Retail	OAK	0.10	0.600	1.29	0.22
	SAC	0.10	0.600	1.29	0.22
Restaurant	OAK	13.55	0.449	1.18	35.60
	SAC	13.55	0.449	1.18	35.60
FoodStr	OAK	1.77	0.675	1.33	3.50
	SAC	1.77	0.675	1.33	3.50
Warehouse	OAK	0.00	0.665	1.15	0.00
	SAC	0.00	0.665	1.15	0.00
School	OAK	0.24	0.533	1.16	0.52
	SAC	0.24	0.533	1.16	0.52
College	OAK	0.14	0.768	1.23	0.22
	SAC	0.14	0.768	1.23	0.22
Health	OAK	0.55	0.528	1.24	1.28
	SAC	0.55	0.528	1.24	1.28
Lodging	OAK	0.17	0.733	1.14	0.27
	SAC	0.17	0.733	1.14	0.27
Miscellns	OAK	0.00	0.703	1.16	0.00
	SAC	0.00	0.703	1.16	0.00

f3Table 5-9. CEC Electric Hot Water EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	U75
SmOffice	OAK	0.41	0.457	1.28	1.15
	SAC	0.41	0.457	1.28	1.15
LgOffice	OAK	0.17	0.203	1.28	1.08
	SAC	0.17	0.203	1.28	1.08
Retail	OAK	0.10	0.246	1.29	0.54
	SAC	0.10	0.246	1.29	0.54
Restaurant	OAK	0.96	0.153	1.18	7.37
	SAC	0.96	0.153	1.18	7.37
FoodStr	OAK	0.38	0.145	1.33	3.44
	SAC	0.38	0.145	1.33	3.44
Warehouse	OAK	0.03	0.528	1.15	0.07
	SAC	0.03	0.528	1.15	0.07
School	OAK	0.55	0.140	1.16	4.52
	SAC	0.55	0.140	1.16	4.52
College	OAK	0.17	0.082	1.23	2.56
	SAC	0.17	0.082	1.23	2.56
Health	OAK	0.03	0.009	1.24	4.70
	SAC	0.03	0.009	1.24	4.70
Lodging	OAK	0.03	0.027	1.14	1.44
	SAC	0.03	0.027	1.14	1.44
Miscellns	OAK	0.00	0.210	1.16	0.00
	SAC	0.00	0.210	1.16	0.00

Table 5-10. CEC Electric Indoor Lighting EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	U75
SmOffice	OAK	15.76	1.000	1.28	20.18
	SAC	15.76	1.000	1.28	20.18
LgOffice	OAK	35.76	1.000	1.28	45.77
	SAC	35.76	1.000	1.28	45.77
Retail	OAK	20.78	1.000	1.29	26.81
	SAC	20.78	1.000	1.29	26.81
Restaurant	OAK	27.64	1.000	1.18	32.61
	SAC	27.64	1.000	1.18	32.61
FoodStr	OAK	48.18	1.000	1.33	64.08
	SAC	48.18	1.000	1.33	64.08
Warehouse	OAK	6.96	1.000	1.15	8.00
	SAC	6.96	1.000	1.15	8.00
School	OAK	10.20	1.000	1.16	11.83
	SAC	10.20	1.000	1.16	11.83
College	OAK	11.09	1.000	1.23	13.64
	SAC	11.09	1.000	1.23	13.64
Health	OAK	37.77	1.000	1.24	46.84
	SAC	37.77	1.000	1.24	46.84
Lodging	OAK	9.45	1.000	1.14	10.77
	SAC	9.45	1.000	1.14	10.77
Miscellns	OAK	5.63	1.000	1.16	6.53
	SAC	5.63	1.000	1.16	6.53

Table 5-11. CEC Electric Outdoor Lighting EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	U75
SmOffice	OAK	5.25	1.000	1.28	6.73
	SAC	5.25	1.000	1.28	6.73
LgOffice	OAK	1.50	1.000	1.28	1.92
	SAC	1.50	1.000	1.28	1.92
Retail	OAK	2.73	1.000	1.29	3.52
	SAC	2.73	1.000	1.29	3.52
Restaurant	OAK	7.06	1.000	1.18	8.33
	SAC	7.06	1.000	1.18	8.33
FoodStr	OAK	4.64	1.000	1.33	6.17
	SAC	4.64	1.000	1.33	6.17
Warehouse	OAK	1.57	1.000	1.15	1.80
	SAC	1.57	1.000	1.15	1.80
School	OAK	0.99	1.000	1.16	1.15
	SAC	0.99	1.000	1.16	1.15
College	OAK	0.44	1.000	1.23	0.55
	SAC	0.44	1.000	1.23	0.55
Health	OAK	1.23	1.000	1.24	1.52
	SAC	1.23	1.000	1.24	1.52
Lodging	OAK	1.06	1.000	1.14	1.21
	SAC	1.06	1.000	1.14	1.21
Miscellns	OAK	1.36	1.000	1.16	1.58
	SAC	1.36	1.000	1.16	1.58

Table 5-12. CEC Electric Miscellaneous Equipment EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	U75
SmOffice	OAK	4.74	1.000	1.28	6.07
	SAC	4.74	1.000	1.28	6.07
LgOffice	OAK	7.30	1.000	1.28	9.35
	SAC	7.30	1.000	1.28	9.35
Retail	OAK	2.22	1.000	1.29	2.86
	SAC	2.22	1.000	1.29	2.86
Restaurant	OAK	21.50	1.000	1.18	25.36
	SAC	21.50	1.000	1.18	25.36
FoodStr	OAK	22.83	1.000	1.33	30.36
	SAC	22.83	1.000	1.33	30.36
Warehouse	OAK	8.73	1.000	1.15	10.04
	SAC	8.73	1.000	1.15	10.04
School	OAK	0.55	1.000	1.16	0.63
	SAC	0.55	1.000	1.16	0.63
College	OAK	0.75	1.000	1.23	0.92
	SAC	0.75	1.000	1.23	0.92
Health	OAK	24.74	1.000	1.24	30.67
	SAC	24.74	1.000	1.24	30.67
Lodging	OAK	3.68	1.000	1.14	4.20
	SAC	3.68	1.000	1.14	4.20
Miscellns	OAK	7.44	1.000	1.16	8.63
	SAC	7.44	1.000	1.16	8.63

Table 5-13. CEC Electric Refrigeration EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	U75
SmOffice	OAK	0.58	0.734	1.28	1.01
	SAC	0.58	0.734	1.28	1.01
LgOffice	OAK	0.31	0.792	1.28	0.50
	SAC	0.31	0.792	1.28	0.50
Retail	OAK	1.54	0.754	1.29	2.63
	SAC	1.54	0.754	1.29	2.63
Restaurant	OAK	24.53	0.985	1.18	29.39
	SAC	24.53	0.985	1.18	29.39
FoodStr	OAK	50.87	0.978	1.33	69.18
	SAC	50.87	0.978	1.33	69.18
Warehouse	OAK	39.31	0.893	1.15	50.62
	SAC	23.78	0.922	1.15	29.66
School	OAK	0.89	0.955	1.16	1.08
	SAC	0.89	0.955	1.16	1.08
College	OAK	0.17	1.000	1.23	0.21
	SAC	0.17	1.000	1.23	0.21
Health	OAK	0.85	0.998	1.24	1.06
	SAC	0.85	0.998	1.24	1.06
Lodging	OAK	1.43	0.891	1.14	1.83
	SAC	1.43	0.891	1.14	1.83
Miscellns	OAK	1.50	0.967	1.16	1.80
	SAC	1.50	0.967	1.16	1.80

Table 5-14. CEC Gas Cooking EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	PrEff.	U75
SmOffice	OAK	0.01	1.09	0.01
	SAC	0.01	1.09	0.01
LgOffice	OAK	0.30	1.09	0.33
	SAC	0.30	1.09	0.33
Retail	OAK	0.04	1.09	0.04
	SAC	0.04	1.09	0.04
Restaurant	OAK	23.77	1.09	25.91
	SAC	23.77	1.09	25.91
FoodStr	OAK	1.27	1.09	1.38
	SAC	1.27	1.09	1.38
Warehouse	OAK	0.00	1.09	0.00
	SAC	0.00	1.09	0.00
School	OAK	1.00	1.09	1.09
	SAC	1.00	1.09	1.09
College	OAK	0.00	1.09	0.00
	SAC	0.00	1.09	0.00
Health	OAK	0.47	1.09	0.51
	SAC	0.47	1.09	0.51
Lodging	OAK	0.80	1.09	0.87
	SAC	0.80	1.09	0.87
Miscellns	OAK	0.20	1.09	0.22
	SAC	0.20	1.09	0.22

Table 5-15. CEC Gas Water Heating EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	PrEff.	U75
SmOffice	OAK	0.21	1.09	0.23
	SAC	0.21	1.09	0.23
LgOffice	OAK	0.25	1.09	0.27
	SAC	0.25	1.09	0.27
Retail	OAK	0.18	1.09	0.20
	SAC	0.18	1.09	0.20
Restaurant	OAK	8.76	1.09	9.55
	SAC	8.76	1.09	9.55
FoodStr	OAK	4.38	1.09	4.77
	SAC	4.38	1.09	4.77
Warehouse	OAK	0.09	1.09	0.10
	SAC	0.09	1.09	0.10
School	OAK	5.63	1.09	6.14
	SAC	5.63	1.09	6.14
College	OAK	2.26	1.09	2.46
	SAC	2.26	1.09	2.46
Health	OAK	1.92	1.09	2.09
	SAC	1.92	1.09	2.09
Lodging	OAK	1.80	1.09	1.96
	SAC	1.80	1.09	1.96
Miscellns	OAK	0.00	1.09	0.00
	SAC	0.00	1.09	0.00

Table 5-16. CEC Gas Miscellaneous Equipment for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	PrEff.	U75
SmOffice	OAK	0.00	1.09	0.00
	SAC	0.00	1.09	0.00
LgOffice	OAK	0.31	1.09	0.34
	SAC	0.31	1.09	0.34
Retail	OAK	0.24	1.09	0.26
	SAC	0.24	1.09	0.26
Restaurant	OAK	0.00	1.09	0.00
	SAC	0.00	1.09	0.00
FoodStr	OAK	14.00	1.09	15.26
	SAC	14.00	1.09	15.26
Warehouse	OAK	1.96	1.09	2.14
	SAC	1.96	1.09	2.14
School	OAK	0.00	1.09	0.00
	SAC	0.00	1.09	0.00
College	OAK	3.04	1.09	3.31
	SAC	3.04	1.09	3.31
Health	OAK	4.20	1.09	4.58
	SAC	4.20	1.09	4.58
Lodging	OAK	3.68	1.09	4.01
	SAC	3.68	1.09	4.01
Miscellns	OAK	5.00	1.09	5.45
	SAC	5.00	1.09	5.45

Table 5-17. PG&E Electric Cooking EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	1975 EUI
SmOffice	OAK	0.10	0.526	1.01	0.20
	SAC	0.10	0.526	1.01	0.20
LgOffice	OAK	0.51	0.617	1.01	0.84
	SAC	0.51	0.617	1.01	0.84
Retail	OAK	0.10	0.600	1.01	0.17
	SAC	0.10	0.600	1.01	0.17
Restaurant	OAK	13.55	0.449	1.01	30.47
	SAC	13.55	0.449	1.01	30.47
FoodStr	OAK	1.77	0.675	1.01	2.65
	SAC	1.77	0.675	1.01	2.65
Warehouse	OAK	0.00	0.665	1.01	0.00
	SAC	0.00	0.665	1.01	0.00
School	OAK	0.24	0.533	1.01	0.45
	SAC	0.24	0.533	1.01	0.45
College	OAK	0.14	0.768	1.01	0.18
	SAC	0.14	0.768	1.01	0.18
Health	OAK	0.55	0.528	1.01	1.04
	SAC	0.55	0.528	1.01	1.04
Lodging	OAK	0.17	0.733	1.01	0.24
	SAC	0.17	0.733	1.01	0.24
Miscellns	OAK	0.00	0.703	1.01	0.00
	SAC	0.00	0.703	1.01	0.00

Table 5-18. PG&E Electric Hot Water EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	1975 EUI
SmOffice	OAK	0.41	0.457	1.20	1.08
	SAC	0.41	0.457	1.20	1.08
LgOffice	OAK	0.17	0.203	1.20	1.01
	SAC	0.17	0.203	1.20	1.01
Retail	OAK	0.10	0.246	1.20	0.50
	SAC	0.10	0.246	1.20	0.50
Restaurant	OAK	0.96	0.153	1.20	7.49
	SAC	0.96	0.153	1.20	7.49
FoodStr	OAK	0.38	0.145	1.20	3.11
	SAC	0.38	0.145	1.20	3.11
Warehouse	OAK	0.03	0.528	1.20	0.08
	SAC	0.03	0.528	1.20	0.08
School	OAK	0.55	0.140	1.20	4.68
	SAC	0.55	0.140	1.20	4.68
College	OAK	0.17	0.082	1.20	2.50
	SAC	0.17	0.082	1.20	2.50
Health	OAK	0.03	0.009	1.20	4.55
	SAC	0.03	0.009	1.20	4.55
Lodging	OAK	0.03	0.027	1.20	1.52
	SAC	0.03	0.027	1.20	1.52
Miscellns	OAK	0.00	0.210	1.20	0.00
	SAC	0.00	0.210	1.20	0.00

Table 5-19. PG&E Electric Indoor Lighting EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	1975 EUI
SmOffice	OAK	15.76	1.000	1.01	15.92
	SAC	15.76	1.000	1.01	15.92
LgOffice	OAK	35.76	1.000	1.01	36.12
	SAC	35.76	1.000	1.01	36.12
Retail	OAK	20.78	1.000	1.01	20.99
	SAC	20.78	1.000	1.01	20.99
Restaurant	OAK	27.64	1.000	1.01	27.91
	SAC	27.64	1.000	1.01	27.91
FoodStr	OAK	48.18	1.000	1.01	48.66
	SAC	48.18	1.000	1.01	48.66
Warehouse	OAK	6.96	1.000	1.01	7.03
	SAC	6.96	1.000	1.01	7.03
School	OAK	10.20	1.000	1.01	10.30
	SAC	10.20	1.000	1.01	10.30
College	OAK	11.09	1.000	1.01	11.20
	SAC	11.09	1.000	1.01	11.20
Health	OAK	37.77	1.000	1.01	38.15
	SAC	37.77	1.000	1.01	38.15
Lodging	OAK	9.45	1.000	1.01	9.55
	SAC	9.45	1.000	1.01	9.55
Miscellns	OAK	5.63	1.000	1.01	5.69
	SAC	5.63	1.000	1.01	5.69

Table 5-20. PG&E Electric Outdoor Lighting EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	1975 EUI
SmOffice	OAK	5.25	1.000	1.01	5.31
	SAC	5.25	1.000	1.01	5.31
LgOffice	OAK	1.50	1.000	1.01	1.52
	SAC	1.50	1.000	1.01	1.52
Retail	OAK	2.73	1.000	1.01	2.76
	SAC	2.73	1.000	1.01	2.76
Restaurant	OAK	7.06	1.000	1.01	7.13
	SAC	7.06	1.000	1.01	7.13
FoodStr	OAK	4.64	1.000	1.01	4.69
	SAC	4.64	1.000	1.01	4.69
Warehouse	OAK	1.57	1.000	1.01	1.59
	SAC	1.57	1.000	1.01	1.59
School	OAK	0.99	1.000	1.01	1.00
	SAC	0.99	1.000	1.01	1.00
College	OAK	0.44	1.000	1.01	0.45
	SAC	0.44	1.000	1.01	0.45
Health	OAK	1.23	1.000	1.01	1.24
	SAC	1.23	1.000	1.01	1.24
Lodging	OAK	1.06	1.000	1.01	1.07
	SAC	1.06	1.000	1.01	1.07
Miscellns	OAK	1.36	1.000	1.01	1.38
	SAC	1.36	1.000	1.01	1.38

Table 5-21. PG&E Electric Miscellaneous Equipment EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	1975 EUI
SmOffice	OAK	4.74	1.000	1.01	4.79
	SAC	4.74	1.000	1.01	4.79
LgOffice	OAK	7.30	1.000	1.01	7.37
	SAC	7.30	1.000	1.01	7.37
Retail	OAK	2.22	1.000	1.01	2.24
	SAC	2.22	1.000	1.01	2.24
Restaurant	OAK	21.50	1.000	1.01	21.71
	SAC	21.50	1.000	1.01	21.71
FoodStr	OAK	22.83	1.000	1.01	23.05
	SAC	22.83	1.000	1.01	23.05
Warehouse	OAK	8.73	1.000	1.01	8.82
	SAC	8.73	1.000	1.01	8.82
School	OAK	0.55	1.000	1.01	0.55
	SAC	0.55	1.000	1.01	0.55
College	OAK	0.75	1.000	1.01	0.76
	SAC	0.75	1.000	1.01	0.76
Health	OAK	24.74	1.000	1.01	24.98
	SAC	24.74	1.000	1.01	24.98
Lodging	OAK	3.68	1.000	1.01	3.72
	SAC	3.68	1.000	1.01	3.72
Miscellns	OAK	7.44	1.000	1.01	7.51
	SAC	7.44	1.000	1.01	7.51

Table 5-22. PG&E Electric Refrigeration EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	Sat.	PrEff.	1975 EUI
SmOffice	OAK	0.58	0.734	1.01	0.80
	SAC	0.58	0.734	1.01	0.80
LgOffice	OAK	0.31	0.792	1.01	0.39
	SAC	0.31	0.792	1.01	0.39
Retail	OAK	1.54	0.754	1.01	2.06
	SAC	1.54	0.754	1.01	2.06
Restaurant	OAK	24.53	0.985	1.01	25.15
	SAC	24.53	0.985	1.01	25.15
FoodStr	OAK	50.87	0.978	1.01	52.54
	SAC	50.87	0.978	1.01	52.54
Warehouse	OAK	39.31	0.893	1.01	44.46
	SAC	23.78	0.922	1.01	26.05
School	OAK	0.89	0.955	1.01	0.94
	SAC	0.89	0.955	1.01	0.94
College	OAK	0.17	1.000	1.01	0.17
	SAC	0.17	1.000	1.01	0.17
Health	OAK	0.85	0.998	1.01	0.86
	SAC	0.85	0.998	1.01	0.86
Lodging	OAK	1.43	0.891	1.01	1.62
	SAC	1.43	0.891	1.01	1.62
Miscellns	OAK	1.50	0.967	1.01	1.57
	SAC	1.50	0.967	1.01	1.57

Table 5-23. PG&E Gas Cooking EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	PrEff.	1975 EUI
SmOffice	OAK	0.01	1.01	0.01
	SAC	0.01	1.01	0.01
LgOffice	OAK	0.30	1.01	0.30
	SAC	0.30	1.01	0.30
Retail	OAK	0.04	1.01	0.04
	SAC	0.04	1.01	0.04
Restaurant	OAK	23.77	1.01	24.01
	SAC	23.77	1.01	24.01
FoodStr	OAK	1.27	1.01	1.28
	SAC	1.27	1.01	1.28
Warehouse	OAK	0.00	1.01	0.00
	SAC	0.00	1.01	0.00
School	OAK	1.00	1.01	1.01
	SAC	1.00	1.01	1.01
College	OAK	0.00	1.01	0.00
	SAC	0.00	1.01	0.00
Health	OAK	0.47	1.01	0.47
	SAC	0.47	1.01	0.47
Lodging	OAK	0.80	1.01	0.81
	SAC	0.80	1.01	0.81
Miscellns	OAK	0.20	1.01	0.20
	SAC	0.20	1.01	0.20

Table 5-24. PG&E Gas Water Heating EUIs for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	PrEff.	1975 EUI
SmOffice	OAK	0.21	1.37	0.29
	SAC	0.21	1.37	0.29
LgOffice	OAK	0.25	1.37	0.34
	SAC	0.25	1.37	0.34
Retail	OAK	0.18	1.37	0.25
	SAC	0.18	1.37	0.25
Restaurant	OAK	8.76	1.37	12.00
	SAC	8.76	1.37	12.00
FoodStr	OAK	4.38	1.37	6.00
	SAC	4.38	1.37	6.00
Warehouse	OAK	0.09	1.37	0.12
	SAC	0.09	1.37	0.12
School	OAK	5.63	1.37	7.71
	SAC	5.63	1.37	7.71
College	OAK	2.26	1.37	3.10
	SAC	2.26	1.37	3.10
Health	OAK	1.92	1.37	2.63
	SAC	1.92	1.37	2.63
Lodging	OAK	1.80	1.37	2.47
	SAC	1.80	1.37	2.47
Miscellns	OAK	0.00	1.37	0.00
	SAC	0.00	1.37	0.00

Table 5-25. PG&E Gas Miscellaneous Equipment for 1975 Vintage [kBtu/sqft/yr]

Building	Region	EUI	PrEff.	1975 EUI
SmOffice	OAK	0.00	1.37	0.00
	SAC	0.00	1.37	0.00
LgOffice	OAK	0.31	1.37	0.42
	SAC	0.31	1.37	0.42
Retail	OAK	0.24	1.37	0.33
	SAC	0.24	1.37	0.33
Restaurant	OAK	0.00	1.37	0.00
	SAC	0.00	1.37	0.00
FoodStr	OAK	14.00	1.37	19.18
	SAC	14.00	1.37	19.18
Warehouse	OAK	1.96	1.37	2.69
	SAC	1.96	1.37	2.69
School	OAK	0.00	1.37	0.00
	SAC	0.00	1.37	0.00
College	OAK	3.04	1.37	4.16
	SAC	3.04	1.37	4.16
Health	OAK	4.20	1.37	5.75
	SAC	4.20	1.37	5.75
Lodging	OAK	3.68	1.37	5.04
	SAC	3.68	1.37	5.04
Miscellns	OAK	5.00	1.37	6.85
	SAC	5.00	1.37	6.85

Table 5-26. CEC 1975 EUIs for Region 1 (Blue Canyon) Climate Zone [kBtu/sqft/yr] - U75

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	10.84	0.79	1.37	1.15	0.25	1.01	6.73	20.18	0.72	6.07
	NGas	17.74	2.16	ne	0.23	0.01	ne	ne	ne	ne	0.00
	Othr	16.09	1.96	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	16.93	18.42	15.80	1.08	1.06	0.50	1.92	45.77	1.13	9.35
	NGas	20.75	96.59	ne	0.27	0.33	ne	ne	ne	ne	0.34
	Othr	18.84	87.73	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	10.60	0.74	2.54	0.54	0.22	2.63	3.52	26.81	0.14	2.86
	NGas	19.92	2.04	ne	0.20	0.04	ne	ne	ne	ne	0.26
	Othr	18.09	1.86	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	33.57	4.64	17.64	7.37	35.60	29.39	8.33	32.61	0.10	25.36
	NGas	50.23	14.52	ne	9.55	25.91	ne	ne	ne	ne	0.00
	Othr	45.62	13.19	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	52.87	12.77	23.49	3.44	3.50	69.18	6.17	64.08	0.07	30.36
	NGas	75.51	44.87	ne	4.77	1.38	ne	ne	ne	ne	15.26
	Othr	68.58	40.75	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	31.86	0.31	8.30	0.07	0.00	50.62	1.80	8.00	0.07	10.04
	NGas	45.76	0.72	ne	0.10	0.00	ne	ne	ne	ne	2.14
	Othr	41.56	0.66	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	69.40	2.32	2.83	4.52	0.52	1.08	1.15	11.83	0.10	0.63
	NGas	102.66	11.24	ne	6.14	1.09	ne	ne	ne	ne	0.00
	Othr	93.24	8.62	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	13.61	8.78	6.92	2.56	0.22	0.21	0.55	13.64	0.14	0.92
	NGas	18.61	23.48	ne	2.46	0.00	ne	ne	ne	ne	3.31
	Othr	16.90	21.33	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	20.63	26.84	11.79	4.70	1.28	1.06	1.52	46.84	0.68	30.67
	NGas	52.20	141.48	ne	2.09	0.51	ne	ne	ne	ne	4.58
	Othr	47.42	128.50	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	4.47	2.83	3.67	1.44	0.27	1.83	1.21	10.77	0.03	4.20
	NGas	45.98	13.02	ne	1.96	0.87	ne	ne	ne	ne	4.01
	Othr	41.76	11.82	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	16.15	3.11	15.57	0.00	0.00	1.80	1.58	6.53	0.14	8.63
	NGas	34.15	5.15	ne	0.00	0.22	ne	ne	ne	ne	5.45
	Othr	31.02	4.68	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-27. CEC 1975 EUIs for Region 2 (Sacramento) Climate Zone [kBtu/sqft/yr] - U75

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	7.63	16.80	3.27	1.15	0.25	1.01	6.73	20.18	0.72	6.07
	NGas	12.49	52.24	ne	0.23	0.01	ne	ne	ne	ne	0.00
	Othr	11.33	47.45	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	15.81	28.88	21.11	1.08	1.06	0.50	1.92	45.77	1.13	9.35
	NGas	19.38	160.32	ne	0.27	0.33	ne	ne	ne	ne	0.34
	Othr	17.60	145.61	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	8.75	9.17	4.65	0.54	0.22	2.63	3.52	26.81	0.14	2.86
	NGas	16.45	32.60	ne	0.20	0.04	ne	ne	ne	ne	0.26
	Othr	14.94	29.61	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	16.56	20.72	20.52	7.37	35.60	29.39	8.33	32.61	0.10	25.36
	NGas	24.78	79.26	ne	9.55	25.91	ne	ne	ne	ne	0.00
	Othr	22.51	71.99	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	23.26	23.81	29.79	3.44	3.50	69.18	6.17	64.08	0.07	30.36
	NGas	33.22	76.49	ne	4.77	1.38	ne	ne	ne	ne	15.26
	Othr	30.17	69.47	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	17.21	6.89	7.63	0.07	0.00	29.66	1.80	8.00	0.07	10.04
	NGas	24.71	17.02	ne	0.10	0.00	ne	ne	ne	ne	2.14
	Othr	22.44	15.46	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	58.54	1.28	4.03	4.52	0.52	1.08	1.15	11.83	0.10	0.63
	NGas	86.59	6.66	ne	6.14	1.09	ne	ne	ne	ne	0.00
	Othr	78.64	5.10	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	9.06	9.09	5.20	2.56	0.22	0.21	0.55	13.64	0.14	0.92
	NGas	12.38	44.00	ne	2.46	0.00	ne	ne	ne	ne	3.31
	Othr	11.24	39.97	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	13.25	43.69	16.55	4.70	1.28	1.06	1.52	46.84	0.68	30.67
	NGas	33.52	211.17	ne	2.09	0.51	ne	ne	ne	ne	4.58
	Othr	30.44	191.79	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	2.22	2.01	3.51	1.44	0.27	1.83	1.21	10.77	0.03	4.20
	NGas	26.09	12.76	ne	1.96	0.87	ne	ne	ne	ne	4.01
	Othr	23.70	11.59	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	7.01	8.02	5.79	0.00	0.00	1.80	1.58	6.53	0.14	8.63
	NGas	14.81	37.77	ne	0.00	0.22	ne	ne	ne	ne	5.45
	Othr	13.45	34.30	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-28. CEC 1975 EUIs for Region 3 (Fresno) Climate Zone [kBtu/sqft/yr] - U75

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	11.57	23.29	3.58	1.15	0.25	1.01	6.73	20.18	0.72	6.07
	NGas	18.93	72.42	ne	0.23	0.01	ne	ne	ne	ne	0.00
	Othr	17.17	65.77	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	18.57	31.04	21.45	1.08	1.06	0.50	1.92	45.77	1.13	9.35
	NGas	22.76	172.34	ne	0.27	0.33	ne	ne	ne	ne	0.34
	Othr	20.67	156.53	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	12.23	14.00	4.88	0.54	0.22	2.63	3.52	26.81	0.14	2.86
	NGas	22.99	49.76	ne	0.20	0.04	ne	ne	ne	ne	0.26
	Othr	20.88	45.20	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	19.98	27.77	23.46	7.37	35.60	29.39	8.33	32.61	0.10	25.36
	NGas	29.89	106.22	ne	9.55	25.91	ne	ne	ne	ne	0.00
	Othr	27.15	96.47	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	26.10	54.73	35.26	3.44	3.50	69.18	6.17	64.08	0.07	30.36
	NGas	37.27	175.79	ne	4.77	1.38	ne	ne	ne	ne	15.26
	Othr	33.85	159.67	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	16.96	13.31	9.28	0.07	0.00	49.03	1.80	8.00	0.07	10.04
	NGas	24.36	32.86	ne	0.10	0.00	ne	ne	ne	ne	2.14
	Othr	22.13	29.85	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	59.92	1.44	4.42	4.52	0.52	1.08	1.15	11.83	0.10	0.63
	NGas	88.64	7.51	ne	6.14	1.09	ne	ne	ne	ne	0.00
	Othr	80.50	5.76	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	9.23	9.96	5.32	2.56	0.22	0.21	0.55	13.64	0.14	0.92
	NGas	12.61	48.21	ne	2.46	0.00	ne	ne	ne	ne	3.31
	Othr	11.46	43.79	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	13.75	46.87	17.00	4.70	1.28	1.06	1.52	46.84	0.68	30.67
	NGas	34.80	226.54	ne	2.09	0.51	ne	ne	ne	ne	4.58
	Othr	31.61	205.76	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	2.40	2.79	3.19	1.44	0.27	1.83	1.21	10.77	0.03	4.20
	NGas	28.18	17.74	ne	1.96	0.87	ne	ne	ne	ne	4.01
	Othr	25.59	16.11	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	8.00	15.73	5.79	0.00	0.00	1.80	1.58	6.53	0.14	8.63
	NGas	16.90	74.09	ne	0.00	0.22	ne	ne	ne	ne	5.45
	Othr	15.35	67.29	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-29. CEC 1975 EUIs for Region 4 (San Jose) Climate Zone [kBtu/sqft/yr] - U75

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	7.11	10.09	2.91	1.15	0.25	1.01	6.73	20.18	0.72	6.07
	NGas	11.64	31.37	ne	0.23	0.01	ne	ne	ne	ne	0.00
	Othr	10.55	28.49	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	15.21	25.28	20.14	1.08	1.06	0.50	1.92	45.77	1.13	9.35
	NGas	18.64	140.35	ne	0.27	0.33	ne	ne	ne	ne	0.34
	Othr	16.93	127.47	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	8.10	3.71	3.92	0.54	0.22	2.63	3.52	26.81	0.14	2.86
	NGas	15.23	13.19	ne	0.20	0.04	ne	ne	ne	ne	0.26
	Othr	13.83	11.98	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	15.23	14.14	19.79	7.37	35.60	29.39	8.33	32.61	0.10	25.36
	NGas	22.79	54.09	ne	9.55	25.91	ne	ne	ne	ne	0.00
	Othr	20.70	49.13	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	24.93	9.61	28.78	3.44	3.50	69.18	6.17	64.08	0.07	30.36
	NGas	35.60	30.86	ne	4.77	1.38	ne	ne	ne	ne	15.26
	Othr	32.33	28.03	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	19.28	4.59	6.97	0.07	0.00	49.03	1.80	8.00	0.07	10.04
	NGas	27.69	11.33	ne	0.10	0.00	ne	ne	ne	ne	2.14
	Othr	25.15	10.29	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	57.09	0.99	3.47	4.52	0.52	1.08	1.15	11.83	0.10	0.63
	NGas	84.45	5.14	ne	6.14	1.09	ne	ne	ne	ne	0.00
	Othr	76.70	3.94	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	9.50	8.14	4.76	2.56	0.22	0.21	0.55	13.64	0.14	0.92
	NGas	12.98	39.38	ne	2.46	0.00	ne	ne	ne	ne	3.31
	Othr	11.79	35.76	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	13.23	41.48	16.01	4.70	1.28	1.06	1.52	46.84	0.68	30.67
	NGas	33.48	200.52	ne	2.09	0.51	ne	ne	ne	ne	4.58
	Othr	30.41	182.12	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	2.40	1.33	2.95	1.44	0.27	1.83	1.21	10.77	0.03	4.20
	NGas	28.18	8.47	ne	1.96	0.87	ne	ne	ne	ne	4.01
	Othr	25.59	7.70	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	7.17	5.99	5.79	0.00	0.00	1.80	1.58	6.53	0.14	8.63
	NGas	15.17	28.18	ne	0.00	0.22	ne	ne	ne	ne	5.45
	Othr	13.77	25.60	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-30. CEC 1975 EUIs for Region 5 (Oakland) Climate Zone [kBtu/sqft/yr] - U75

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	4.65	5.32	1.37	1.15	0.25	1.01	6.73	20.18	0.72	6.07
	NGas	7.60	14.46	ne	0.23	0.01	ne	ne	ne	ne	0.00
	Othr	6.89	13.13	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	13.45	24.13	16.38	1.08	1.06	0.50	1.92	45.77	1.13	9.35
	NGas	16.48	126.50	ne	0.27	0.33	ne	ne	ne	ne	0.34
	Othr	14.97	114.89	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	5.68	3.78	2.54	0.54	0.22	2.63	3.52	26.81	0.14	2.86
	NGas	10.68	10.37	ne	0.20	0.04	ne	ne	ne	ne	0.26
	Othr	9.70	9.42	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	11.04	17.12	19.57	7.37	35.60	29.39	8.33	32.61	0.10	25.36
	NGas	16.51	53.53	ne	9.55	25.91	ne	ne	ne	ne	0.00
	Othr	15.00	48.62	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	28.48	15.21	20.97	3.44	3.50	69.18	6.17	64.08	0.07	30.36
	NGas	40.68	53.43	ne	4.77	1.38	ne	ne	ne	ne	15.26
	Othr	36.94	48.53	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	13.09	1.39	8.77	0.07	0.00	50.62	1.80	8.00	0.07	10.04
	NGas	18.80	3.21	ne	0.10	0.00	ne	ne	ne	ne	2.14
	Othr	17.07	2.92	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	53.49	2.93	2.90	4.52	0.52	1.08	1.15	11.83	0.10	0.63
	NGas	79.13	14.22	ne	6.14	1.09	ne	ne	ne	ne	0.00
	Othr	71.87	10.90	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	9.02	10.31	6.80	2.56	0.22	0.21	0.55	13.64	0.14	0.92
	NGas	12.33	27.60	ne	2.46	0.00	ne	ne	ne	ne	3.31
	Othr	11.20	25.07	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	12.90	32.20	12.21	4.70	1.28	1.06	1.52	46.84	0.68	30.67
	NGas	32.64	169.77	ne	2.09	0.51	ne	ne	ne	ne	4.58
	Othr	29.65	154.20	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	2.47	4.85	4.00	1.44	0.27	1.83	1.21	10.77	0.03	4.20
	NGas	25.40	22.34	ne	1.96	0.87	ne	ne	ne	ne	4.01
	Othr	23.07	20.29	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	6.18	14.97	15.57	0.00	0.00	1.80	1.58	6.53	0.14	8.63
	NGas	13.06	24.81	ne	0.00	0.22	ne	ne	ne	ne	5.45
	Othr	11.86	22.53	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-31. CEC 1979 EUIs for Region 1 (Blue Canyon) Climate Zone [Ratio] - EUI79

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	0.81	0.08	1.00	ne	ne	ne	ne	ne	ne	ne
	NGas	0.81	0.08	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.81	0.08	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	0.80	0.11	0.64	ne	ne	ne	ne	ne	ne	ne
	NGas	0.80	0.11	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.80	0.11	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	0.66	0.80	0.96	ne	ne	ne	ne	ne	ne	ne
	NGas	0.66	0.80	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.66	0.80	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	0.58	0.22	0.77	ne	ne	ne	ne	ne	ne	ne
	NGas	0.58	0.22	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.58	0.22	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	0.96	0.40	0.97	ne	ne	ne	ne	ne	ne	ne
	NGas	0.96	0.40	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.96	0.40	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	0.81	0.18	1.00	ne	ne	ne	ne	ne	ne	ne
	NGas	0.81	0.18	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.81	0.18	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	0.35	0.01	0.83	ne	ne	ne	ne	ne	ne	ne
	NGas	0.35	0.01	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.35	0.01	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	0.28	0.42	0.22	ne	ne	ne	ne	ne	ne	ne
	NGas	0.28	0.42	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.28	0.42	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	0.24	0.33	0.73	ne	ne	ne	ne	ne	ne	ne
	NGas	0.24	0.33	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.24	0.33	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	0.65	0.18	0.52	ne	ne	ne	ne	ne	ne	ne
	NGas	0.65	0.18	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.65	0.18	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	0.43	0.20	1.00	ne	ne	ne	ne	ne	ne	ne
	NGas	0.43	0.20	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.43	0.20	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-32. CEC 1979 EUIs for Region 2 (Sacramento) Climate Zone [Ratio] - EUI79

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	0.76	0.82	0.89	ne	ne	ne	ne	ne	ne	ne
	NGas	0.76	0.82	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.76	0.82	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	0.77	0.45	0.64	ne	ne	ne	ne	ne	ne	ne
	NGas	0.77	0.45	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.77	0.45	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	0.57	0.79	0.87	ne	ne	ne	ne	ne	ne	ne
	NGas	0.57	0.79	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.57	0.79	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	0.56	0.67	0.70	ne	ne	ne	ne	ne	ne	ne
	NGas	0.57	0.67	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.56	0.67	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	0.96	0.91	0.95	ne	ne	ne	ne	ne	ne	ne
	NGas	0.96	0.91	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.96	0.91	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	0.80	0.84	0.92	ne	ne	ne	ne	ne	ne	ne
	NGas	0.80	0.84	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.80	0.84	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	0.20	0.22	0.75	ne	ne	ne	ne	ne	ne	ne
	NGas	0.20	0.22	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.20	0.22	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	0.20	0.28	0.29	ne	ne	ne	ne	ne	ne	ne
	NGas	0.20	0.28	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.20	0.28	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	0.21	0.55	0.80	ne	ne	ne	ne	ne	ne	ne
	NGas	0.21	0.55	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.21	0.55	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	0.33	0.31	0.34	ne	ne	ne	ne	ne	ne	ne
	NGas	0.33	0.31	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.33	0.31	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	0.35	0.82	1.00	ne	ne	ne	ne	ne	ne	ne
	NGas	0.35	0.82	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.35	0.82	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-33. CEC 1979 EUIs for Region 3 (Fresno) Climate Zone [Ratio] - EUI79

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	0.78	0.86	0.89	ne	ne	ne	ne	ne	ne	ne
	NGas	0.78	0.86	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.78	0.86	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	0.79	0.52	0.64	ne	ne	ne	ne	ne	ne	ne
	NGas	0.79	0.52	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.79	0.52	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	0.60	0.77	0.87	ne	ne	ne	ne	ne	ne	ne
	NGas	0.60	0.77	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.60	0.77	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	0.58	0.69	0.69	ne	ne	ne	ne	ne	ne	ne
	NGas	0.60	0.69	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.58	0.69	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	0.96	0.91	0.94	ne	ne	ne	ne	ne	ne	ne
	NGas	0.96	0.91	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.96	0.91	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	0.80	0.85	0.93	ne	ne	ne	ne	ne	ne	ne
	NGas	0.80	0.85	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.80	0.85	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	0.25	0.32	0.75	ne	ne	ne	ne	ne	ne	ne
	NGas	0.25	0.32	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.25	0.32	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	0.23	0.33	0.31	ne	ne	ne	ne	ne	ne	ne
	NGas	0.23	0.33	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.23	0.33	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	0.29	0.61	0.80	ne	ne	ne	ne	ne	ne	ne
	NGas	0.29	0.61	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.29	0.61	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	0.36	0.35	0.32	ne	ne	ne	ne	ne	ne	ne
	NGas	0.36	0.35	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.36	0.35	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	0.37	0.83	1.00	ne	ne	ne	ne	ne	ne	ne
	NGas	0.37	0.83	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.37	0.83	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-34. CEC 1979 EUIs for Region 4 (San Jose) Climate Zone [Ratio] - EUI79

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	0.78	0.67	1.00	ne	ne	ne	ne	ne	ne	ne
	NGas	0.78	0.67	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.78	0.67	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	0.77	0.34	0.64	ne	ne	ne	ne	ne	ne	ne
	NGas	0.77	0.34	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.77	0.34	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	0.60	0.87	0.97	ne	ne	ne	ne	ne	ne	ne
	NGas	0.60	0.87	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.60	0.87	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	0.55	0.58	0.70	ne	ne	ne	ne	ne	ne	ne
	NGas	0.60	0.58	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.55	0.58	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	0.96	0.85	0.95	ne	ne	ne	ne	ne	ne	ne
	NGas	0.96	0.85	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.96	0.85	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	0.79	0.73	0.95	ne	ne	ne	ne	ne	ne	ne
	NGas	0.79	0.73	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.79	0.73	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	0.23	0.13	0.81	ne	ne	ne	ne	ne	ne	ne
	NGas	0.23	0.13	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.23	0.13	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	0.20	0.23	0.26	ne	ne	ne	ne	ne	ne	ne
	NGas	0.20	0.23	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.20	0.23	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	0.20	0.51	0.80	ne	ne	ne	ne	ne	ne	ne
	NGas	0.20	0.51	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.20	0.51	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	0.34	0.25	0.33	ne	ne	ne	ne	ne	ne	ne
	NGas	0.34	0.25	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.34	0.25	ne	ne	ne	ne	ne	ne	ne	ne
MiscellIns	Elec	0.33	0.73	1.00	ne	ne	ne	ne	ne	ne	ne
	NGas	0.33	0.73	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.33	0.73	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-35. CEC 1979 EUIs for Region 5 (Oakland) Climate Zone [Ratio] - EUI79

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	0.75	0.51	1.00	ne	ne	ne	ne	ne	ne	ne
	NGas	0.75	0.51	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.75	0.51	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	0.75	0.28	0.64	ne	ne	ne	ne	ne	ne	ne
	NGas	0.75	0.28	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.75	0.28	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	0.56	0.93	0.96	ne	ne	ne	ne	ne	ne	ne
	NGas	0.56	0.93	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.56	0.93	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	0.54	0.53	0.73	ne	ne	ne	ne	ne	ne	ne
	NGas	0.54	0.53	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.54	0.53	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	0.96	0.84	0.97	ne	ne	ne	ne	ne	ne	ne
	NGas	0.96	0.84	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.96	0.84	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	0.79	0.61	0.95	ne	ne	ne	ne	ne	ne	ne
	NGas	0.79	0.61	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.79	0.61	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	0.20	0.10	0.82	ne	ne	ne	ne	ne	ne	ne
	NGas	0.20	0.10	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.20	0.10	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	0.20	0.21	0.25	ne	ne	ne	ne	ne	ne	ne
	NGas	0.20	0.21	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.20	0.21	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	0.15	0.52	0.80	ne	ne	ne	ne	ne	ne	ne
	NGas	0.15	0.52	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.15	0.52	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	0.57	0.40	0.56	ne	ne	ne	ne	ne	ne	ne
	NGas	0.57	0.40	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.57	0.40	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	0.31	0.58	1.00	ne	ne	ne	ne	ne	ne	ne
	NGas	0.31	0.58	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	0.31	0.58	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-36. PG&E 1975 EUIs for Coastal (Oakland) Climate Zone [kBtu/sqft/yr]

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	4.14	4.61	1.08	1.08	0.20	0.80	5.31	15.92	0.72	4.79
	NGas	9.20	13.27	ne	0.29	0.01	ne	ne	ne	ne	0.00
	Othr	6.96	13.27	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	11.98	20.92	12.93	1.01	0.84	0.39	1.52	36.12	1.13	7.37
	NGas	19.96	116.05	ne	0.34	0.30	ne	ne	ne	ne	0.42
	Othr	15.12	116.05	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	5.02	3.25	1.99	0.50	0.17	2.06	2.76	20.99	0.14	2.24
	NGas	12.94	9.51	ne	0.25	0.04	ne	ne	ne	ne	0.33
	Othr	9.80	9.51	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	10.66	16.11	16.75	7.49	30.47	25.15	7.13	27.91	0.10	21.71
	NGas	20.00	49.11	ne	12.00	24.01	ne	ne	ne	ne	0.00
	Othr	15.15	49.11	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	24.46	12.70	15.93	3.11	2.65	52.54	4.69	48.66	0.07	23.05
	NGas	49.26	49.02	ne	6.00	1.28	ne	ne	ne	ne	19.18
	Othr	37.32	49.02	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	12.98	1.34	7.70	0.08	0.00	44.46	1.59	7.03	0.07	8.82
	NGas	22.77	2.94	ne	0.12	0.00	ne	ne	ne	ne	2.69
	Othr	17.25	2.94	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	52.57	2.80	2.53	4.68	0.45	0.94	1.00	10.30	0.10	0.55
	NGas	95.82	13.04	ne	7.71	1.01	ne	ne	ne	ne	0.00
	Othr	72.59	11.01	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	8.36	9.31	5.59	2.50	0.18	0.17	0.45	11.20	0.14	0.76
	NGas	14.93	25.32	ne	3.10	0.00	ne	ne	ne	ne	4.16
	Othr	11.31	25.32	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	11.86	28.83	9.94	4.55	1.04	0.86	1.24	38.15	0.68	24.98
	NGas	39.53	155.75	ne	2.63	0.47	ne	ne	ne	ne	5.75
	Othr	29.95	155.75	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	2.47	4.73	3.55	1.52	0.24	1.62	1.07	9.55	0.03	3.72
	NGas	30.76	20.49	ne	2.47	0.81	ne	ne	ne	ne	5.04
	Othr	23.30	20.49	ne	ne	ne	ne	ne	ne	ne	ne
MiscellIns	Elec	6.07	14.33	13.56	0.00	0.00	1.57	1.38	5.69	0.14	7.51
	NGas	15.81	22.76	ne	0.00	0.20	ne	ne	ne	ne	6.85
	Othr	11.98	22.76	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-37. PG&E 1975 EUIs for Inland (Sacramento) Climate Zone [kBtu/sqft/yr]

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	6.80	14.57	2.58	1.08	0.20	0.80	5.31	15.92	0.72	4.79
	NGas	15.12	47.93	ne	0.29	0.01	ne	ne	ne	ne	0.00
	Othr	11.44	47.93	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	14.08	25.04	16.66	1.01	0.84	0.39	1.52	36.12	1.13	7.37
	NGas	23.47	147.08	ne	0.34	0.30	ne	ne	ne	ne	0.42
	Othr	17.78	147.08	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	7.73	7.89	3.64	0.50	0.17	2.06	2.76	20.99	0.14	2.24
	NGas	19.92	29.91	ne	0.25	0.04	ne	ne	ne	ne	0.33
	Othr	15.09	29.91	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	16.00	19.49	17.57	7.49	30.47	25.15	7.13	27.91	0.10	21.71
	NGas	30.01	72.71	ne	12.00	24.01	ne	ne	ne	ne	0.00
	Othr	22.73	72.71	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	19.97	19.87	22.62	3.11	2.65	52.54	4.69	48.66	0.07	23.05
	NGas	40.23	70.17	ne	6.00	1.28	ne	ne	ne	ne	19.18
	Othr	30.48	70.17	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	17.06	6.65	6.70	0.08	0.00	26.05	1.59	7.03	0.07	8.82
	NGas	29.92	15.62	ne	0.12	0.00	ne	ne	ne	ne	2.69
	Othr	22.67	15.62	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	57.53	1.22	3.51	4.68	0.45	0.94	1.00	10.30	0.10	0.55
	NGas	104.86	6.11	ne	7.71	1.01	ne	ne	ne	ne	0.00
	Othr	79.44	5.16	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	8.39	8.21	4.27	2.50	0.18	0.17	0.45	11.20	0.14	0.76
	NGas	14.99	40.37	ne	3.10	0.00	ne	ne	ne	ne	4.16
	Othr	11.36	40.37	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	12.18	39.11	13.48	4.55	1.04	0.86	1.24	38.15	0.68	24.98
	NGas	40.59	193.73	ne	2.63	0.47	ne	ne	ne	ne	5.75
	Othr	30.75	193.73	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	2.22	1.96	3.11	1.52	0.24	1.62	1.07	9.55	0.03	3.72
	NGas	31.60	11.71	ne	2.47	0.81	ne	ne	ne	ne	5.04
	Othr	23.94	11.71	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	6.89	7.68	5.04	0.00	0.00	1.57	1.38	5.69	0.14	7.51
	NGas	17.94	34.65	ne	0.00	0.20	ne	ne	ne	ne	6.85
	Othr	13.59	34.65	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-38. PG&E 1979 EUIs for Coastal (Oakland) Climate Zone [kBtu/sqft/yr]

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	2.74	2.11	1.08	ne	ne	ne	ne	ne	ne	ne
	NGas	6.11	4.97	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	4.70	4.97	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	8.98	5.72	8.27	ne	ne	ne	ne	ne	ne	ne
	NGas	13.17	25.31	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	9.98	25.31	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	2.37	2.87	1.91	ne	ne	ne	ne	ne	ne	ne
	NGas	6.40	6.96	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	5.14	6.96	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	5.47	7.52	12.23	ne	ne	ne	ne	ne	ne	ne
	NGas	9.60	16.86	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	8.18	16.86	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	21.60	9.28	15.45	ne	ne	ne	ne	ne	ne	ne
	NGas	45.40	22.65	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	35.83	22.65	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	10.25	0.72	7.32	ne	ne	ne	ne	ne	ne	ne
	NGas	16.58	1.13	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	12.56	1.13	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	10.06	0.24	2.07	ne	ne	ne	ne	ne	ne	ne
	NGas	16.86	0.80	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	12.79	0.61	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	1.62	1.76	1.40	ne	ne	ne	ne	ne	ne	ne
	NGas	2.63	3.68	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	1.99	3.68	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	1.41	14.70	7.96	ne	ne	ne	ne	ne	ne	ne
	NGas	5.22	62.01	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	3.95	62.01	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	1.14	1.86	1.99	ne	ne	ne	ne	ne	ne	ne
	NGas	15.43	6.45	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	12.75	6.45	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	1.59	7.38	13.56	ne	ne	ne	ne	ne	ne	ne
	NGas	4.39	8.55	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	3.45	8.55	ne	ne	ne	ne	ne	ne	ne	ne

Table 5-39. PG&E 1979 EUIs for Inland (Sacramento) Climate Zone [kBtu/sqft/yr]

Building	Fuel	Heat	Cool	Vent	HotW	Cook	Refr	OtLt	InLt	OfEq	Misc
SmOffice	Elec	4.57	10.70	2.29	ne	ne	ne	ne	ne	ne	ne
	NGas	10.18	28.89	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	7.83	28.89	ne	ne	ne	ne	ne	ne	ne	ne
LgOffice	Elec	10.84	11.00	10.66	ne	ne	ne	ne	ne	ne	ne
	NGas	15.90	51.56	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	12.05	51.56	ne	ne	ne	ne	ne	ne	ne	ne
Retail	Elec	3.72	5.92	3.17	ne	ne	ne	ne	ne	ne	ne
	NGas	10.03	18.59	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	8.05	18.59	ne	ne	ne	ne	ne	ne	ne	ne
Restaurant	Elec	8.51	11.51	12.30	ne	ne	ne	ne	ne	ne	ne
	NGas	15.21	31.56	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	12.73	31.56	ne	ne	ne	ne	ne	ne	ne	ne
FoodStr	Elec	17.64	15.67	21.49	ne	ne	ne	ne	ne	ne	ne
	NGas	35.92	35.37	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	29.26	35.37	ne	ne	ne	ne	ne	ne	ne	ne
Warehouse	Elec	13.65	4.95	6.16	ne	ne	ne	ne	ne	ne	ne
	NGas	22.07	8.28	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	16.72	8.28	ne	ne	ne	ne	ne	ne	ne	ne
School	Elec	11.01	0.23	2.63	ne	ne	ne	ne	ne	ne	ne
	NGas	18.46	0.83	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	14.00	0.63	ne	ne	ne	ne	ne	ne	ne	ne
College	Elec	1.63	2.07	1.24	ne	ne	ne	ne	ne	ne	ne
	NGas	2.64	7.83	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	2.00	7.83	ne	ne	ne	ne	ne	ne	ne	ne
Health	Elec	2.02	21.09	10.78	ne	ne	ne	ne	ne	ne	ne
	NGas	7.50	81.57	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	5.68	81.57	ne	ne	ne	ne	ne	ne	ne	ne
Lodging	Elec	0.59	0.60	1.06	ne	ne	ne	ne	ne	ne	ne
	NGas	9.18	2.86	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	7.58	2.86	ne	ne	ne	ne	ne	ne	ne	ne
Miscellns	Elec	2.04	5.59	5.04	ne	ne	ne	ne	ne	ne	ne
	NGas	5.62	18.41	ne	ne	ne	ne	ne	ne	ne	ne
	Othr	4.42	18.41	ne	ne	ne	ne	ne	ne	ne	ne

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