CALIFORNIA COMMERCIAL END-USE SURVEY

APPENDICES A-J

CONSULTANT REPORT

Prepared For:
California Energy Commission

Prepared By:
Itron, Inc.

March 2006
CEC-400-2006-005-APA

This report is dedicated to the memory of Alan Fields, who served as the project manager until his death on February 3, 2004. Alan was a valued colleague and dear friend. He will be missed by his associates at Itron, the California Energy Commission, and the energy industry.

Prepared By:
Itron, Inc.
Subcontractors:
KEMA
ADM Associates
James J. Hirsch & Associates
Contract No. 300-00-002

Prepared For:
California Energy Commission

Peg A. Pigeon-Bergmann
Contract Manager

Mohsen Abrishami
Mark Ciminelli
Project Managers

Sylvia Bender
Manager
Demand Analysis Office

Valerie Hall
Deputy Director
Energy Efficiency & Demand Analysis Division

B.B. Blevins
Executive Director

TABLE OF CONTENTS

Appendices for Publication CEC-400-2006-005

Appendix A: Basic Survey Instrument A-1

Appendix B: Annotated Survey Instrument B-1

Appendix C: End-Use Mappings C-1

C.1 Introduction C-1
C.2 DRCEUS End Uses C-1
C.3 Non-HVAC Equipment C-2
C.4 HVAC Equipment C-8

Appendix D: Recruitment Letter D-1

Appendix E: Recruitment Script E-1

Appendix F: Short-Term Metering Protocols F-1

F.1 Overall STM Objectives F-1
F.2 STM Targets F-2
F.3 General Issues/Protocols F-6
F.4 Lighting Logger Protocols F-7
Premise Sampling Protocol Rules F-7
F.5 Application of Lighting Logger Data F-9
What We Hope To Do With the Data F-10
F.6 HVAC Fan Logger Protocols F-11
Premise Sampling Protocol Rules F-11
F.7 Application of HVAC Fan Logger Data F-12
How We Hope To Use the Data F-13
F.8 STM Data QC Requirements and Deliverables F-14
Logger Data QC Requirements F-14
Deliverables F-15
F.9 STM Data Miscellaneous Support Notes F-16
Data Loggers/Equipment F-16
Visualization/Qualitative Assessment and Comparisons F-17
Example Data Formats F-18
F.10 Subcontractor Logger Installation Protocols F-20
ADM Lighting Logger Installation Protocols F-21
ADM HVAC Fan Motor Logger Installation Protocols F-22
Xenergy Lighting Logger Installation Protocols F-23

Appendix G: Survey Database Layout G-1

Appendix H: Non-HVAC End-Use Algorithms H-1

H.1 Non-HVAC Simulation Framework H-1
Non-HVAC Simulation Conceptual Framework H-1
The DrCEUS Site Processor Simulation Process H-4
H.2 Water Heating Algorithm H-5
H.3 Cooking Equipment Algorithm H-7
H.4 Refrigeration Algorithms H-8
Self-Contained Refrigeration Algorithm H-8
Remote Refrigeration Algorithm H-9
H.5 Indoor Lighting Algorithm H-11
H.6 Office Equipment Algorithm H-12
H.7 Outdoor/Exterior Lighting Algorithm H-12
H.8 Miscellaneous Equipment Algorithm H-13
H.9 Process Equipment Algorithm H-13
H.10 Motor Algorithms H-14
H.11 Air Compressor Algorithm H-16
H.12 DrCEUS Non-HVAC Algorithm Support Files H-17
Non-HVAC Visual Basic Scripts H-17
Non-HVAC Techdata/DrCEUS Support Database H-18

Appendix I: Description of Forecasting Climate Zone Results Database I-1

I.1 Database Subsets and Segment Definitions I-3
I.2 DrCEUS Graphics Result Tables I-4

Appendix J: SIC Code to CEUS building type mapping table J-1

APPENDIX A: BASIC SURVEY INSTRUMENT

Site ID Number

CALIFORNIA COMMERCIAL END-USE SURVEY (CCEUS) 2002/2003

Rev. 10/17/02

Site Contact Information:

Business Name: __

Street Address: __

City, State: __ , __ __

Zip Code: __ __ __ __ __ - __ __ __ __

Contact Name: __

Contact Title: __

Contact Phone #: (__ __ __) __ __ __ - __ __ __ __ ext. __ __ __ __ __

Contact Name 2: __

Contact Title 2: __

Contact Phone 2: (__ __ __) __ __ __ - __ __ __ __ ext. __ __ __ __ __

Email Address: __

FAX #: (__ __ __) __ __ __ - __ __ __ __

Survey Tracking Information:

Survey Team (circle one) **ADM** **Xen** **VT**

	Date:	**Initials**
Field suvey completed:	__ __ / __ __ / __ __	__ __ __
Survey received from surveyor:	__ __ / __ __ / __ __	__ __ __
Quality Control check completed:	__ __ / __ __ / __ __	__ __ __
Data entry completed:	__ __ / __ __ / __ __	__ __ __
Survey received at RER:	__ __ / __ __ / __ __	__ __ __

☐ QC

Table of Contents

Premise-Level Forms **Form #**
Premise-Level General Information 1
Business/Building Type Codes ..... BT
Electric and Natural Gas Accounts and Meters 2
Other Energy Service Accounts and On-Site Power Generation 3
Shared Services and/or Meters 4
Recent Energy-Efficiency Measures 5
Premise/Site-Plan Sketch 6a
Premise/Component-Plan Sketch 6b
Premise/Component Survey Planning Worksheet 7
Component Location with Premise 8
Premise-Level Schedule Definitions (Holidays and Seasonal Operation Periods) 9
Schedule Set Definitions (Primary/Seasonal/HVAC/Hourly Primary/Seasonal) 10a/10e
Building Shell Construction Codes 11a/11c
Component-Level Forms
Component: General Information 12
Component: Footprint Shapes ..... FP
Component: Footprint, Adiabatic Walls, and Windows/Doors 13
Component: Actual Floor Plan/Elevation Sketch 14a
Component: Thermal Zoning/Building Simulation Sketch 14b
Component: Activity Area and Thermal Zone Definitions 15
Component: Activity Area Type Codes ..... AA
Component: Daylighting 16
Equipment Inventory Forms
HVAC - Single Zone Systems 17
HVAC - Multiple Zone Systems and Controls 18a/18b
HVAC Code Descriptions ..... HC
Chillers and Circulation Pumps for Chillers 19
Heat Rejection (Built-up) and Thermal (Cool) Storage Systems 20
Boilers and Hot Water Circulation Pumps 21
HVAC Equipment Manufacturer and Model Number Information 22
Exhaust Fans and Make-Up Air Units 23
Water Heating Equipment 24
Service Hot Water Use (General and Building-Type Specific) 25
Swimming Pool/Spa 26
Outdoor Lighting 27
Indoor Lighting (2 identical sheets) 28
Office Equipment 29
Cooking/Food Service Equipment 30
Self-Contained Refrigeration Equipment - 31
Remote Refrigeration Equipment – Display Cases and Walk-Ins 32a
Remote Refrigeration Equipment – Compressors and Condensers 32b
Miscellaneous Equipment 33
Motors/Engines (Process Related) 34
Air Compressors 35
Process Equipment (Non-Motor) 36
General Comments 37
Site Photo Log 38
Short-Term Metered Data 39

Premise-Level General Information

PRIMARY BUSINESS TYPE CODE: _ _ _ *(Use codes from the Business Type table, Form BT)*

Premise Business Type Description

Uniqueness: Give a brief description about the type of work and/or primary product/service. What makes this premise unique from other businesses of this type? _____

Recent Survey Area Changes: Give a brief description about any changes made to this site since Jan. 2001 that significantly impacted energy usage. _____

Premise General Information

What kind of premise is this?: **P** = Part of a bldg **B** = 1 building, single footprint **MF** = 1 building w/multiple footprints **SM** = Small multi-building (all bldgs surveyed) **CM** = Campus (multi-bldg, subsampled bldgs) **OT** = Other _____	P B MF SM CM OT
What is the total occupied floor area of this premise (excluding enclosed parking garage area)?	_____ ft^2
-- If the premise has an enclosed parking garage, what is the floor area?	_____ ft^2
How many buildings are part of this premise?	_____
Is this premise owner-occupied (**O**) or leased (**L**)?	O L
What year was this business established at this location?	__ __ __ __
What year was the majority of the facility built?	__ __ __ __
How many full-time equivalent employees work at this premise?	_____
Sample segment identifier (2-digit code)	__ __
Sample frame SIC Code (4-digit)	__ __ __ __
Is interval metered (load research) electric data available for this premise?	Y N
Was short-term metering performed for this premise (see Form 39)?	Y N

Business-Type Specific Information

Lodging:	Total number of usable rooms/residential units	_____
	Average % of rooms occupied	_____ %
Office:	Average % of occupied (non-vacant) space	_____ %
Hospital:	Number of beds in hospital	_____
	Average % of beds occupied	_____ %
Education:	Average number of enrolled students (e.g. ADA)	_____

Business/Building Type Codes

Business Type	Code	Business Type	Code	Business Type	Code
Offices (Non-Medical):		**Retail Store:**		**Lodging:**	
Administration and management	011	Department / Variety Store	041	Hotel	081
Financial / Legal	012	Retail Warehouse/Clubs	042	Motel	082
Insurance/Real Estate	013	Shop in Enclosed Mall	043	Resort	083
Data Processing/Computer Center	014	Shop in Strip Mall	044	Other Lodging	084
Mixed-Use/Multi-tenant	015	Auto Sales	045	**Public Assembly:**	
Lab/R&D Facility	016	Other Retail Store	046	Religious Assembly (worship only)	091
Software Development	017	**Warehouse:**		Religious Assembly (mixed use)	092
Government Services	018	Refrigerated Warehouse	051	Health/Fitness Center	093
Other Office	019	Unconditioned Warehouse, High Bay	052	Movie Theaters	094
Restaurant/Food Service*:		Unconditioned Warehouse, Low Bay	053	Theater / Performing Arts	095
Fast Food or Self Service	021	Conditioned Warehouse, High Bay	054	Library / Museum	096
Specialty/Novelty Food Service	022	Conditioned Warehouse, Low Bay	055	Conference/Convention Center	097
Table Service	023	**Health Care:**		Community Center	098
Bar/Tavern/Nightclub/Other	024	Hospital	061	Other Recreational/Public Assembly	099
Other Food Service	025	Nursing Home	062	**Services:**	
Food Stores :		Medical/Dental Office	063	Gas Station / Auto Repair	101
Supermarkets	031	Clinic/Outpatient Care	064	Gas Station w/Convenience Store**	102
Small General Grocery	032	Medical/Dental Lab	065	Repair (Non-Auto)	103
Specialty/Ethnic Grocery	033	**Education:**		Other Service Shop	104
Convenience Store**	034	Daycare or Preschool	071	**Miscellaneous:**	
Liquor Store	035	Elementary School	072	Assembly / Light Mfg.	111
Other Food Store	036	Middle / Secondary School	073	Police / Fire Stations	112
		College or University	074	Post Office	113
		Vocational or Trade School	075	**Other** *Describe on Form 1*	130

* *For Restaurant/Food Service businesses, be sure to complete # of meals (Breakfast/Lunch/Dinner) on Form 25.*

** *Convenience stores that do not sell gasoline should be coded as 034; convenience stores that do sell gasoline should be coded as 102.*

Electric Accounts and Meters

Utility/Provider	SDG&E PG&E SCE SMUD LADWP Other _____

Item #	Meter Number:	Account Number:	Meter Status Code
E1	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
E2	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
E3	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
E4	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
E5	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
E6	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
E7	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
E8	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
E9	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
E10	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT

Natural Gas Accounts and Meters

Utility/Provider	SDG&E PG&E SCG Other _____

Item #	Meter Number:	Account Number:	Meter Status Code
G1	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
G2	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
G3	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
G4	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
G5	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
G6	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
G7	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
G8	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
G9	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT
G10	__ __ __ __ __ __ __ __ __ __ __	__ __ __ __ __ __ __ __ __ __ __ __	V A D NI ND OT

Meter Status Codes

V	Verified: Meter is listed on the Customer Contact sheet and was verified during the onsite visit
A	Add this meter: It was found onsite but was not listed on the Customer Contact sheet
D	Delete this meter: It was listed on the Customer Contact sheet but does not exist or does not service the surveyed area
NI	Meter not verified, Inaccessible: Explain why in comments
ND	Meter not verified, Access Denied: Explain why in comments
OT	Other situation: describe in comments block

Electric/Gas Account Notes:

Other Energy Service Accounts ☐ N/A

(If bills are available, attach copy to survey form)

Item #	Fuel Type	Bills Available?	Meter/Account /Identification Number:	Utility / Provider	AvgAnnual Usage&Units*
O1	Bottled Gas (LPG)	Y N	__ __ __ __ __ __ __ __ __		
O2	Purchased Chilled Water	Y N	__ __ __ __ __ __ __ __ __		
O3	Purchased Steam	Y N	__ __ __ __ __ __ __ __ __		
O4	Other _____	Y N	__ __ __ __ __ __ __ __ __		

* Units of usage should be whatever appears on the bill, for example therms, ft^3, gallons, etc.

On-Site Power Generation ☐ N/A

Cogeneration, self-generation, solar cell/photovoltaic system, and emergency generators.

Item #	#__	#__
Type: **I** = Internal Combustion Engine **G** = Gas Turbine **M** = Micro-turbine **C** = Combined Cycle **S** = Solar array/Photovoltaic **O** = Other _____	I G M C S O	I G M C S O
Is this an emergency generator (check box if yes)?	☐	☐
-- How often is it tested? (then skip to Manufacturer)		
What is the plant generation capacity? (kW)		
Fossil Fuel Type (if applicable): **G** = Natural Gas **D** = Diesel Fuel **F** = Fuel Oil **O** = Other _____	G D F O	G D F O
Use for generated power: **P** = Peak Shaving **B** = Base load **O** = Other_____	P B O	P B O
What percent of generated electricity is sold back to the utility?	%	%
Average operating hours per day (If seasonal, describe operation below)		
Number of operating days per year		
Use of waste heat: **S** = Space ht **W** = Water ht **P** = Pool **N** = None **O** = Other_____	S W P O	S W P O
Average heat output (kBtu/hr)		
What fraction of the waste heat is utilized?	%	%
Manufacturer:		
Model:		
Location (Component and Area ID)		
Components Served		

Other Energy Services/Generation Notes:

Shared Services and/or Electric/Gas Meters ☐ N/A

Off-Site Central Equipment Providing Service to Surveyed Premise ☐ N/A

Complete this table when the premise is receiving heating or cooling from a central system which is not part of the premise being surveyed (i.e. the heating/cooling equipment - boilers and chillers - are connected to a utility service meter other than those serving the premise).

Item #	# ___	# ___	# ___
Equipment Type: **C** = Chiller **B** = Boiler **O** = Other _____	C B O	C B O	C B O
Equipment Fuel Type: **E** = Electricity **G** = Natural Gas **F** = Fuel Oil **L** = LPG	E G F L	E G F L	E G F L
Total Capacity -7			
Units for Capacity **T** = Tons **B** = kBtuh **W**=kW **H**=HP	T B W H	T B W H	T B W H
Percent of total capacity utilized by survey area -7	%	%	%

Surveyed Premise Central Equipment Serving Non-Surveyed Areas ☐ N/A

Complete this table when equipment that predominantly serves the surveyed premise provides services to an area that is not part of the surveyed premise. Provide some basic information about the non-surveyed area that will be used to estimate its impact on the survey areas shared equipment.

#	Bldg Type Code (Form BT)	Elec/Gas Meter Item # (E,G)	Non-Surveyed Area Floor Area (Sq. Ft.)	% Heated	% Cooled	Shared Equipment/Comments
1				%	%	
2				%	%	
3				%	%	
4				%	%	
5				%	%	

Shared Meters ☐ N/A

For shared electric and gas meters (i.e. also serve non-surveyed areas), estimate the % of metered energy used by the surveyed site.

#	Elec/Gas Meter Item # (E,G)	Percent used by Surveyed Premise	Non-Surveyed Area Bldg Type Code	End Uses Shared/Comments
1		%		
2		%		
3		%		
4		%		
5		%		
6		%		

Recent Energy-Efficiency Measures ☐ N/A

Ask your site contact about energy efficiency measures installed after January 2001. Provide a brief description of the measure, an Enduse Code, and any additional relevant comments (building/space where installed, why installed, etc.). Before leaving the premise, ask your contact about any additional measures observed during the onsite survey. For reference, a table of typical energy-efficiency measures by end use is presented on the facing page.

Item #	Measure Description	Enduse Code	Comments (where, why, when?)

Recent Energy Efficiency Measures (cont.)

Energy-Efficiency Measures - Reference Table

LIGHTING EQUIPMENT (EnduseCode=LT)
- T-8, T-5, or equivalent high-efficiency fluorescent lamps
- Super T-8 lamps
- Hard-wired 1 or 2 lamp Compact Fluorescent fixtures
- Low-power electronic ballasts
- Specular reflectors
- Pulse-start metal halide lamps/ballasts
- Other non-fluorescent high-efficiency lighting systems
- Timeclocks
- Daylighting controls
- Occupancy controlled hi-low switching
- Programmable controllers
- Delamping
- LED exit signs

HVAC EQUIPMENT (EnduseCode=HV)
- High efficiency unitary/package equipment
- High efficiency chiller(s)
- VSD/ASD chillers, pumps, or fans
- High Efficiency HVAC pumps
- High Efficiency fan motors
- Ground-source heat pumps
- Water-cooled unitary/package equipment
- Economizers (air-side or water-side)
- Evaporative condensers
- Thermal storage system
- Low temperature air distribution system
- Conversion to VAV from CV system

HVAC CONTROLS (EnduseCode=HC)
- Energy Management/Control system
- Optimal start/stop
- Chiller sequencing/optimization
- Static pressure reset on HVAC system demand
- Outside air intake control (CO2, VOC, or other sensor)
- Chilled water / hot water reset
- Night ventilation
- Demand controlled ventilation

BOILERS (EndUseCode=BO)
- High efficiency boilers
- VSD on feedwater pumps
- VSD on draft fans w/auto pressure control

MOTORS (EndUseCode=MO)
- High efficiency process (non-HVAC) motors
- VSD process (non-HVAC) motors

COMMERCIAL REFRIG. (EndUseCode=RF)
- Multiplex rack systems to replace conventional system
- High-efficiency (T8s) case lighting
- Ambient or mechanical subcooling
- Evaporative and/or oversized condensers
- VSD condenser fan
- Scroll compressors
- Heaterless doors (triple pane)
- Heat pipe on HVAC unit with coil bypass
- Low temperature air distribution
- Electronically controlled Thermal Expansion Valves
- Distributed refrigeration systems

MISCELLANEOUS EQUIPMENT (EndUseCode=MI)
- Ultrasonic Humidifiers
- VSD Fume hoods
- Fume hood measures other than VSD
- CO sensors for garage exhaust fans

WHOLE-BUILDING (EndUseCode=WB)
- Optimized building system design
- Energy management/control system

BUILDING ENVELOPE (EndUseCode=BE)
- Low-e windows
- Low-e^2 (spectral LowE) windows
- Tinted/Reflective windows
- Dual Pane windows
- Gas-filled windows
- Above-code roof or wall insulation

OTHER (EndUseCode=OT)

Premise/Site-Plan Sketch

This sketch should provide a high-level view of the premise and it's surroundings as it is actually configured. Attach site plans and floor plans available from other sources. Sketch all buildings and the closest streets/roadways in both directions. Mark the orientation of True North. For multiple building sites, indicate where meters are located, and the boundaries of different Component Survey areas. Indicate any significant shading provided by adjacent trees or buildings. Use multiple sheets/drawings if necessary. Also indicate the "front" or primary entrance for each building.

Premise/Site-Plan sketch comments:

Premise/Component-Plan Sketch

This sketch should provide a view of the premise as represented by components. Sketch the components and their orientation to other components. Reference the previous sketch and indicate which buildings have been modeled as components. Indicate Plan North (PN) for each component as well as the orientation of True North. Use multiple sheets/drawings if necessary. Also indicate the "front" or primary entrance for each building/component.

Premise/Component sketch comments:

Premise/Component Survey Planning Worksheet ☐ N/A

Complete this worksheet for every component on the premise. Identify all components, provide a brief description, record Total Surveyed Floor Area, the Total Floor Area represented by the survey area, the Component Weight, assign a Schedule Set # (from Form 10), and provide any additional comments.

Item #	Component ID (A – Z)	Surveyor's Description of Business / Activity Type	Total Surveyed Floor Area, ft^2 (A)	Total Floor Area Represented, ft^2 (B)*	Component Weight (B/A)	Form 10 Schedule Set #
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
		Totals				

* Total Floor Area Represented will not be equal to Total Surveyed Floor Area only in a subsampling situation.

Comments:

Component Location within Premise ☐ N/A

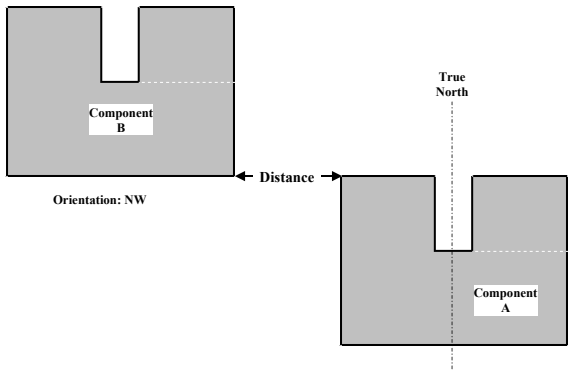
Choose one of the two methods (Orientation & Distance or Exact Coordinates) to indicate a component's location within the premise, with respect to another component.

Item #	Component ID (A – Z)	Position this Component relative to Component….	Orientation & Distance: Specify orientation and the closest distance between these components		Exact Coordinates: Specify the xyz coordinates of the left-most points with respect to Plan North		
			Orientation *	Distance (ft)	x (ft)	y (ft)	z (ft)
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							

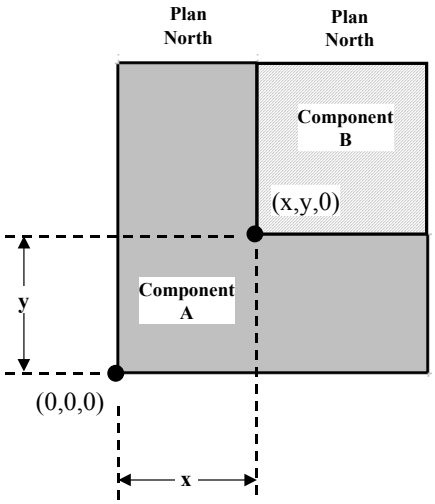
* Orientation here is with respect to True North, not Plan North, e.g. **N**, **S**, **E**, **W**, **ENE**, **NE**, **SSE**, etc. Other options: Use "**A**" to position a component directly above or "**B**" to position a component directly below the reference component, or "**ST**" to represent a stand-alone building distant from other buildings (i.e. a default Distance will be used).

Component Location Methods

Orientation and Distance Method



Exact Coordinate Method



Premise-Level Schedule Definitions

Standard Holidays *(check all that apply)* ☐ N/A

Indicate below which, if any, standard holidays that the business is closed or operation deviates drastically from normal/typical operations, and indicate on Form 10a and 10b what the holiday operation hours are. Indicate any additional holidays in the comment block.

New Year's Eve	☐	July 4th Celebrated	☐
New Year's Day	☐	Labor Day	☐
New Year's Day Celebrated	☐	Columbus Day	☐
Martin Luther King Day	☐	Veterans' Day	☐
Presidents' Day	☐	Thanksgiving	☐
St. Patrick's Day	☐	Thanksgiving Friday	☐
Easter Sunday	☐	Christmas Eve	☐
Memorial Day	☐	Christmas Day	☐
Flag Day	☐	Christmas Day Celebrated	☐
July 4th	☐	Caesar Chavez Day*	☐

** Not currently included in building simulations.*

Seasonal Operation Periods ☐ N/A

Define seasonal operation periods for significant periods of time where business hours and/or equipment operation differs significantly from normal or typical business hours and/or equipment operation. To indicate seasonal operation periods, provide a brief description of the period (e.g. "spring break", "winter break", "summer break", "extended holiday hours"), and list the beginning/ending months (1-12) and days for up to three time periods.

TIME PERIOD 1			TIME PERIOD 2			TIME PERIOD 3		
Description _____			Description _____			Description _____		
Begin Month/Day			Begin Month/Day			Begin Month/Day		
End Month/Day			End Month/Day			End Month/Day		

Holiday and Seasonal Operation Comments:

Schedule Set #: ____ Primary Schedules (1/5)

Description _____

Specify up to 3 schedule sets (i.e. Forms 10a through 10e as needed) per premise. Schedule sets are assigned to components on the Premise/Component Survey Planning Worksheet.

Primary Business Hours

Define typical operation for <u>all</u> Day Types listed below and specify hours in military time (00 to 24). For partial (i.e. not full) operation days, also indicate the approximate % of full operation as Partial Op %.

Day Type	Business Hours	Closed All Day?	Open 24 hrs?	PartialOp%
Monday	from __ __ to __ __	☐	☐	
Tuesday	from __ __ to __ __	☐	☐	
Wednesday	from __ __ to __ __	☐	☐	
Thursday	from __ __ to __ __	☐	☐	
Friday	from __ __ to __ __	☐	☐	
Saturday	from __ __ to __ __	☐	☐	
Sunday	from __ __ to __ __	☐	☐	
Holidays	from __ __ to __ __	☐	☐	

Primary Occupancy and Equipment Operation Schedules

Define operation schedules as listed below for all schedule types applicable to the surveyed area. Draw a line through those schedules that do not apply to the surveyed area. If equipment operation varies significantly from business hours, then check "Hrly Sched" box and specify equipment operation using the optional hourly schedules on Form 10d.

Schedule Type	Parameter	Value <u>during</u> Bus. Hours	Value <u>outside</u> of Bus. Hours*	<u>OR</u> Hrly Sched
Occupancy (applied to occupants on Form 15)	**% of typical max hourly occup.**	__ __ %	__ __ %	☐
Indoor Lighting* **	**% of Equip On**	__ __ %	__ __ %	☐
Office Equipment	**% of Equip On**	__ __ %	__ __ %	☐
Miscellaneous Equipment	**% of Equip On**	__ __ %	__ __ %	☐
Cooking Equipment	**% of Equip On**	__ __ %	__ __ %	☐
Motors/Air Compressors/Process Equipment	**% of Equip On**	__ __ %	__ __ %	☐
Outdoor Lighting** **PHOTOCELL** ☐ <u>OR</u> Specify typical operating hours	**Hour (1-24) that lights….**	**go off:**** hr __ __	**come on:**** hr __ __	☐
HVAC Schedule => Complete Form 10c				

* Do not use a value of zero (0) unless ALL equipment is really off as verified by site contact.
** If <u>all</u> outdoor lighting is photocell controlled, check the photocell block and leave the on/off hours blank.
*** Use the hourly schedule option for lighting whenever it is possible to obtain detailed operation information.

Schedule Set #: ____ Seasonal Schedules (2/5)

If seasonal operation is indicated on Form 9, specify the corresponding seasonal business hours, occupancy, HVAC, and equipment operation for each schedule set.

☐ **Check box if seasonal periods indicated on Form 9 are <u>not</u> applicable to this schedule set**

Seasonal Operation Business Hours

Define typical operation for <u>all</u> Day Types listed below and specify hours in military time (00 to 24). For partial (i.e. not full) operation days, also indicate the approximate % of full operation as Partial Op %.

Day Type	Business Hours	Closed All Day?	Open 24 hrs?	PartialOp%
Monday	from __ __ to __ __	☐	☐	
Tuesday	from __ __ to __ __	☐	☐	
Wednesday	from __ __ to __ __	☐	☐	
Thursday	from __ __ to __ __	☐	☐	
Friday	from __ __ to __ __	☐	☐	
Saturday	from __ __ to __ __	☐	☐	
Sunday	from __ __ to __ __	☐	☐	
Holidays	from __ __ to __ __	☐	☐	

Seasonal Occupancy and Equipment Operation Schedules

Define operation schedules as listed below for all schedule types applicable to the surveyed area. Draw a line through those schedules that do not apply to the surveyed area. Use hourly schedules if indicated on Form 10a.

Schedule Type	Parameter	Value <u>during</u> Bus. Hours	Value <u>outside</u> of Bus. Hours*
Occupancy (applied to occupants on Form 15)	**% of typical max hourly occup.**	__ __ %	__ __ %
Indoor Lighting	**% of Equip On**	__ __ %	__ __ %
Office Equipment	**% of Equip On**	__ __ %	__ __ %
Miscellaneous Equipment	**% of Equip On**	__ __ %	__ __ %
Cooking Equipment	**% of Equip On**	__ __ %	__ __ %
Motors/Air Compressors/Process Equipment	**% of Equip On**	__ __ %	__ __ %
Outdoor Lighting** **PHOTOCELL** ☐ <u>OR</u> Specify typical operating hours	**Hour (1-24) that lights….**	**go off:**** hr __ __	**come on:**** hr __ __

* Do not use a value of zero (0) unless ALL equipment is really off as verified by site contact.

** If <u>all</u> outdoor lighting is photocell controlled, check the photocell block and leave the on/off hours blank.

Schedule Set #: ____ HVAC Schedules (3/5)

Specify at least 1 HVAC schedule for each schedule set, and assign these schedules at the HVAC system level. Use additional pages if more than 2 schedules are needed. For 100% unconditioned components, this form may be left blank. ***Note:*** *Unless 7/24 operation is indicated, values for all fields must be entered in both the "Occupied" and "Unoccupied (setback/setup)" columns.*

HVAC Schedule #: ___ Description _____

Primary Schedule

Description	Occupied	Unoccupied (setback/setup)
Cooling Setpoints (90 = Off)	__ __ °F	__ __ °F
Heating Setpoints (50 = Off)	__ __ °F	__ __ °F
Fan Operation (on/off): Occupied temps apply	__ **# of hours before opening***	__ **# of hours after closing****
Fan Control: **A** = Always on/continuous **C** = Cycles w/HeatCool **O** = Off **M** = Manual/as-needed **N** = Night cycling	A C M	A C O M N

Seasonal Operation Schedule

Description	Occupied	Unoccupied (setback/setup)
Cooling Setpoints (90 = Off)	__ __ °F	__ __ °F
Heating Setpoints (50 = Off)	__ __ °F	__ __ °F
Fan Operation (on/off): Occupied temps apply	__ **# of hours before opening***	__ **# of hours after closing****
Fan Control: **A** = Always on/continuous **C** = Cycles w/HeatCool **O** = Off **M** = Manual/as-needed **N** = Night cycling	A C M	A C O M N

* Use a value of 24 to indicate 7/24 operation.

** Use a negative value to indicate # of hours before close.

HVAC Schedule #: ___ Description _____

Primary Schedule

Description	Occupied	Unoccupied (setback/setup)
Cooling Setpoints (90 = Off)	__ __ °F	__ __ °F
Heating Setpoints (50 = Off)	__ __ °F	__ __ °F
Fan Operation (on/off): Occupied temps apply	__ **# of hours before opening***	__ **# of hours after closing****
Fan Control: **A** = Always on/continuous **C** = Cycles w/HeatCool **O** = Off **M** = Manual/as-needed **N** = Night cycling	A C M	A C O M N

Seasonal Operation Schedule

Description	Occupied	Unoccupied (setback/setup)
Cooling Setpoints (90 = Off)	__ __ °F	__ __ °F
Heating Setpoints (50 = Off)	__ __ °F	__ __ °F
Fan Operation (on/off): Occupied temps apply	__ **# of hours before opening***	__ **# of hours after closing****
Fan Control: **A** = Always on/continuous **C** = Cycles w/HeatCool **O** = Off **M** = Manual/as-needed **N** = Night cycling	A C M	A C O M N

Schedule Set #: ____ Hourly Primary Schedules (4/5)

Use this form if equipment operation is independent of Business Hours as indicated on Form 10a/b. Use one block for each end use. Indicate the applicable daytypes for each day type schedule, and account for all day types including holidays. Specify the % of max. occupancy or equipment-on for all time periods, and be sure to accurately capture transition periods.

Hour		**12-1**	**1-2**	**2-3**	**3-4**	**4-5**	**5-6**	**6-7**	**7-8**	**8-9**	**9-10**	**10-11**	**11-12**

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		**% of MaxOccupancy or Equipment On**											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		**% of MaxOccupancy or Equipment On**											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		**% of MaxOccupancy or Equipment On**											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

Schedule Set #: ____ Hourly Seasonal Schedules (5/5)

Use this form if equipment operation is independent of Business Hours as indicated on Form 10a/b and seasonal operation is used. Use one block for each end use. Indicate the applicable daytypes for each day type schedule, and account for all day types including holidays. Specify the % of max. occupancy or equipment-on for all time periods, and be sure to accurately capture transition periods.

Hour		12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		% of MaxOccupancy or Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		% of MaxOccupancy or Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		% of MaxOccupancy or Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

Building Shell Construction Codes

Roof & Ceiling Construction

		Roof /Ceiling Code	# ___	# ___	# ___
Roof Construction type	*From Roof/Wall Construction Codes table*		WF MF CWC CNO ADB	WF MF CWC CNO ADB	WF MF CWC CNO ADB
-- Attic / No Attic/ Mixed?	**A** = Attic **N** = No Attic **M** = Mixed		A N M	A N M	A N M
-- Sloped / Flat / Mixed Roof?	**S** = Sloped **F** = Flat **M** = Mixed		S F M	S F M	S F M
Exterior Insulation: R-Value	**0** = Uninsulated/None	-7			
External Surface Finish/ Material	*From Roof/Wall Construction Codes table*				
Roof Color	**C**=CoolRoof **D**=Dark **M**=Medium **L**=Light		C D M L	C D M L	C D M L
-- If cool/white roof, describe material					
Interior Insulation: R-Value	**0** = Uninsulated/None	-7			
Radiant barrier present?	**Y** = Yes **N** = No	-7			
Suspended Ceiling?	**Y** = Yes **N** = No		Y N	Y N	Y N
Ceiling Insulation: R-Value	**0** = Uninsulated/None	-7			
OR Matl. Type	*From Roof/Wall Construction Codes table*				

Exterior Wall Construction

		Exterior Wall Code	# ___	# ___
External Wall Construction type	*From Roof/Wall Construction Codes table*	-7		
Exterior Wall dimension(s) in inches	Example: 2X4, 2X6, 4, 6, 12, etc			
-- For masonry walls: Furred Interior type	**W** = Wood **M** = Metal **N** = None		W M N	W M N
Wall Color	**D** = Dark **M** = Medium **L** = Light		D M L	D M L
External Surface finish type	*From Roof/Wall Construction Codes table*			
Exterior Insulation: R-value	**0** = Uninsulated/None	-7		
Material	*From Roof/Wall Construction Codes table*			
Cavity Insulation: R-value	**0** = Uninsulated/None	-7		
Material	*From Roof/Wall Construction Codes table*			
Interior Insulation: R-value	**0** = Uninsulated/None	-7		
Material	*From Roof/Wall Construction Codes table*			

Below-Grade Wall Construction ☐ N/A

		Below-Grade Wall Code	# __	# __
Below-grade Wall Construction type	*From Roof/Wall Construction Codes table*	-7		
-- For masonry walls: Furred Interior type	**W** = Wood **M** = Metal **N** = None		W M N	W M N
Exterior Insulation: R-value	**0** = Uninsulated/None	-7		
Material	*From Roof/Wall Construction Codes table*			
Cavity Insulation: R-value	**0** = Uninsulated/None	-7		
Material	*From Roof/Wall Construction Codes table*			
Interior Insulation: R-value	**0** = Uninsulated/None	-7		
Material	*From Roof/Wall Construction Codes table*			

Building Shell Construction Codes (cont'd)

Roof/Wall Construction Codes

Code	Roof/Wall Const Types	Code	Exterior Surface Types	Code	Insulation Types	(R/in)
WF	Wood Frame	BU	Built-up surface	BAT	Batt or Blanket	3.3
MF	Metal Frame	AS	Asphalt Roll/shingle	LSF	Loose fill	2.7
CON	Solid Concrete	CT	Clay/cement tile	XPE	Expanded perlite	2.8
CWC	Concrete w/ Cap	RB	Rubber (urethane, etc.)	XPS	Expanded polystyrene	3.8-5.0
CNO	Concrete w/o Cap	WS	Wood/fiberglass shingle	RDG	Rigid board	2.8-4.0
BLOC	Concrete Block/CMU	MT	Metal/Steel	N	None	0
BRIC	Brick	BF	Bituminous felt	OT	Other _____	_____
AIR	Air	ST	Stucco/Gunite			
ADB	Adiabatic	RK	Rock/Stone/Marble			
OT	_____	SF	Surface finish (Paint, etc.)			
		UN	Unfinished/None			
		BR	Brick façade			
		GLS	Glass Curtain/Spandral			
		OT	Other _____			

Floor Construction

		Floor Code	# ___	# ___
Floor construction type	**S** = Slab-on-grade **G** = Slab above open garage **C** = Crawlspace **U** = Uncond. basement **ADB** = Adiabatic **OT** = Other _____			
Primary Finish Type:	**V** = Vinyl **C** = Carpet **S** = Stone/Ceramic **W** = Wood **N** = None **OT** = Other _____			
Perimeter Insulation: R-value	**0** = Uninsulated/None	-7		
Under-floor Insulation: R-value	**0** = Uninsulated/None	-7		
Material	*From Insulation Type table*			

External Doors

		Door Code	# __	# __	# __	# __	# __
Door design	**H** = Hinged **O** = Overhead/Rollup **S** = Sliding **R** = Revolving **A** = Air Lock Entry **OT** = Other _____		**H O S R A OT**	**H O S R A OT**	**H O S R A OT**	**H O S R A OT**	**H O S R A OT**
Material type	**G** = Glass** **S** = Steel **W** = Wood **O** = Other _____		**G S W O**	**G S W O**	**G S W O**	**G S W O**	**G S W O**
** For **G**lass doors, indicate Window Code							
Typical height, ft							
Typical width, ft							

Building Shell Construction Codes (cont'd):

Windows/Fenestration

Window Code		# __	# __	# __	# __	# __
Operable window?		Y N	Y N	Y N	Y N	Y N
Assembly type	**S**=SiteAssembled **M**=ManufacturedUnit	S M	S M	S M	S M	S M
Layers of glazing (1,2,3)						
Type of glazing	**C** = Clear **T** = Tinted **R** = Reflective **O** = Opaque **L** = LowE **S** = Spectral LowE **E** = Electrochromic **A** = Acrylic **P** = Polycarbonate	C T R O L S E A P	C T R O L S E A P	C T R O L S E A P	C T R O L S E A P	C T R O L S E A P
Window frame type	**M**=Metal **W**=Wood **V**=Vinyl **O**=Other_____	M W V O	M W V O	M W V O	M W V O	M W V O
-- Thermal break?		Y N	Y N	Y N	Y N	Y N
Typ. sill height, ft						
Typ. window height, ft						
Typ. window width, ft	(reference only, not used in simulations)					
Interior shading type	**F** = Fixed **M** = Moveable **N** = None	F M N	F M N	F M N	F M N	F M N

Skylights ☐ N/A

Skylight Code		# __	# __
Skylight shape	**D** = Domed **F** = Flat/Pyramid	D F	D F
Glazing Type	**G** = Glass **P** = Plastic	G P	G P
Color	**C** = Clear **W** = White **O** = Other _____	C W O	C W O
Edge Type	**C** = With a Curb **N** = Without a Curb	C N	C N
Typical Dimensions, ft	Diameter/Width 1		
	Width 2		
If applicable, Light well depth, ft			

Component ID ___ General Information

Component = Building, part of a building, one footprint of a multi-footprint building, etc.

Component Business/Building Type Code: __ __ __
(See Form BT. NOTE: Use the same business type/building type code for components within the same building)

Description: Briefly describe this component (e.g. Admin Office building of a large campus, kitchen for a fast-food restaurant, etc.). _____

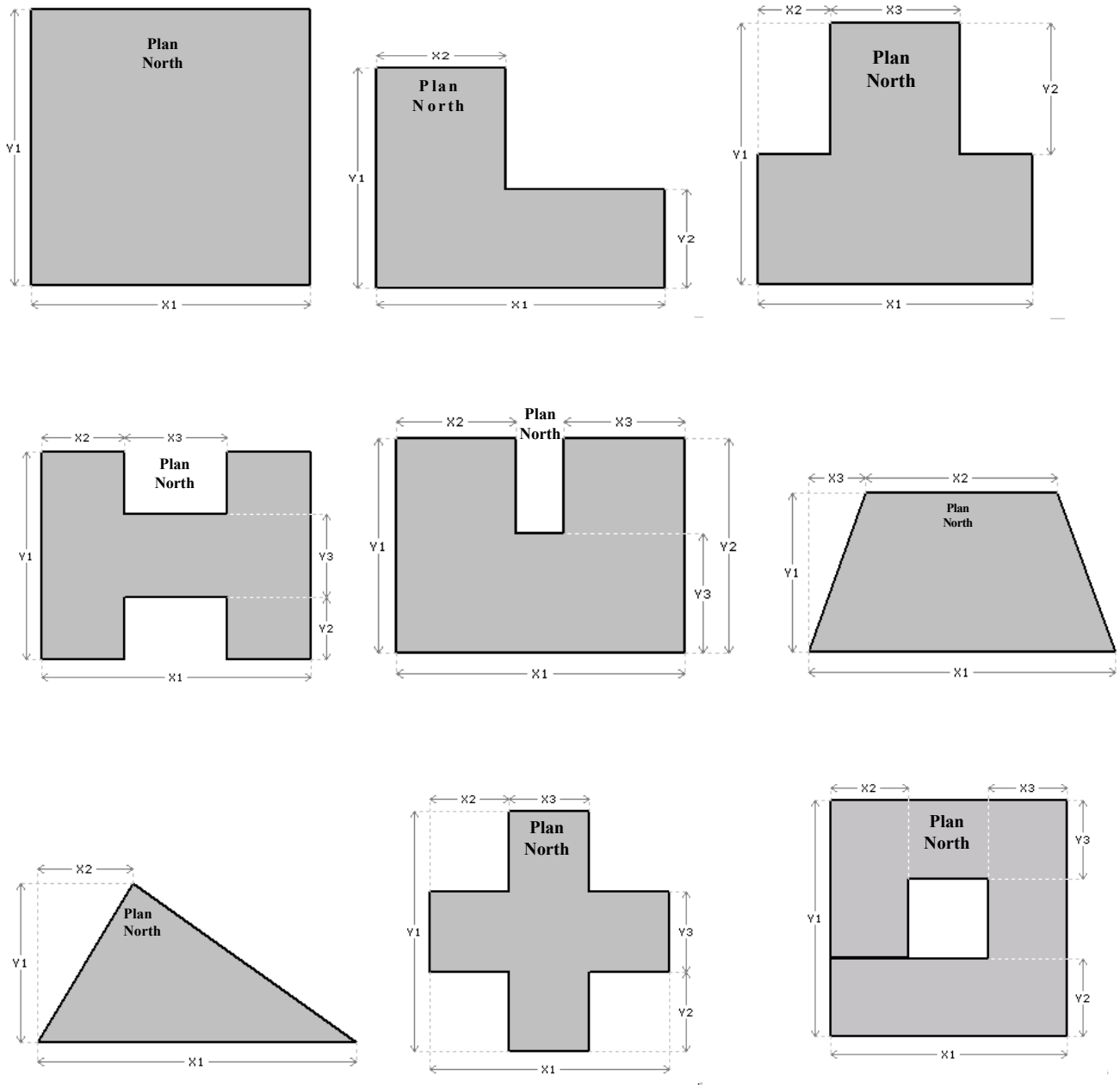
Recent Survey Area Changes: Give a brief description about any changes made to the surveyed area since Jan. 2001 that significantly impacted energy usage. _____

General Component Survey Information

Component Type: **B** = Stand-alone building **P** = Part of a building **F** = 1 footprint of a multi-footprint bldg **OT** = Other_____	B P F OT
What year was the majority of the component survey area built?	_____
Total surveyed floor area, ft^2	_____ ft^2
Number of floors *above grade*	_____
Number of floors *below grade*	_____
Is there a parking garage below the bottom floor?	Y N
Floor-to-floor (or floor-to-roof) height, ft (*do not leave blank*)	_____ ft
Floor-to-ceiling height, ft (*do not leave blank*)	_____ ft
Predominant HVAC Thermal Zoning Scheme: **PC** = Perimeter/Core **1F** = One Zone per Floor **ZA** = Zone by Actvity Area **MP** = MultiPerimeter/Core **UC** = Unconditioned	**PC 1F ZA MP UC**
-- If Perimeter/Core zoning, perimeter zone depth, ft **-7**	_____ ft
-- For **MP**, average number of rooms per floor	
Construction: Roof/Ceiling Code	
External Wall Code	
Below-Grade Wall Code	
Floor Code	
Skylight Code	
-- Number of Skylights	
-- Skylit Rooftop Zones: **A** = All **P** = Perimeter only **C** = Core only **O** = Other _____	**A P C O**
Daylighting?	**Y N**

Component Survey Footprint Shapes

Footprint X/Y Dimensions

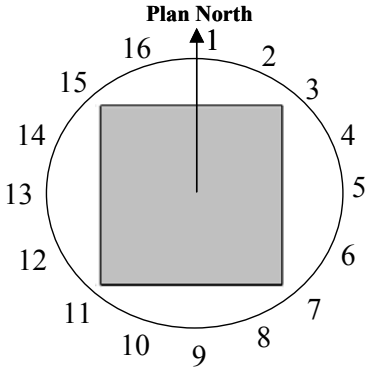


Component ID ___ Footprint, Adiabatic Walls, and Windows/Doors

Footprint/Shell Geometry *(see Form FP)*

Footprint Type Code: **R** = Rectangle **L** = L-shaped **T** = T-shaped **H** = H-shaped **U** = U-shaped **W** = Wedge/trapezoid **TR** = Triangular **P** = + plus sign **C** = Courtyard (atrium)		**R** **L** **T** **H** **U** **W** **TR** **P** **C**		
-- Is this an exact match (X) or a simplification (S) of actual shape?		**X** **S**		
Footprint Orientation: Direction of True North vs. Plan North		**1 2 3 4 5 6 7 8** **9 10 11 12 13 14 15 16**		
Footprint "X" dimensions (X1, X2, X3), ft	(##.#)	X1 ft	X2 ft	X3 ft
Footprint "Y" dimensions (Y1, Y2, Y3), ft	(##.#)	Y1 ft	Y2 ft	Y3 ft

Footprint Orientation: Sketch arrow to indicate True North



Adiabatic Walls

Indicate the percent of external wall area in each orientation that is adiabatic.

Orientation	Above	Below	Plan N	Plan S	Plan E	Plan W
Adiabatic Surface (% of exterior wall area)						

Exterior Window Shading (Overhangs and Sidefins)

Indicate the dimensions of any overhangs or sidefins for each orientation .

Orientation		Plan N	Plan S	Plan E	Plan W
Shade type	**Top Floor only?**	**Shade depths, ft**			
Overhangs	☐				
Fins	☐				

Window Percentages & Number of External Doors

For windows, indicate the window code (Form 11) and corresponding wall area percentages. For doors, indicate the door code (Form 11) and # of doors on each wall. No more than three window types and three door types can be specified.

Orientation		Plan N	Plan S	Plan E	Plan W
Type: Window or Door	**Window Code**	**% of Wall Area Covered by Windows**			
W					
W					
W					
	Door Code	**Number of Doors**			
D					
D					
D					

Component ID ___ Actual Floor Plan/Elevation Sketch

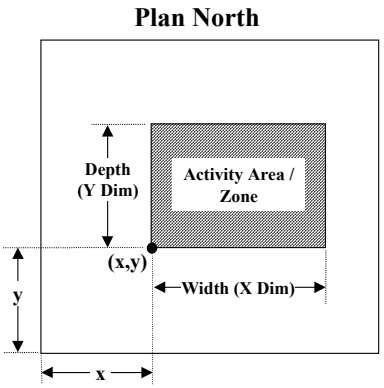
Sketch the plan and elevation views for the component as it is actually configured. Each floor of the surveyed area should have a representative plan sketch. Include building dimensions and show Plan North as well as the orientation of True North. Indicate on the drawing the boundaries of different activity areas and meters, windows, and doors. On the elevation sketch, indicate ceiling height and building height. Attach site plan and floor plan if available. Use multiple sheets/drawings if necessary.

Comments:

Component ID ___ Thermal Zoning/Building Simulation Sketch

Sketch the plan and elevation views for the component as it will be simulated, i.e. all dimensions needed for modeling components should be available from this sketch. Sketch the footprint and indicate Plan North, True North, and all X and Y dimensions. Floor plan sketches should show thermal zone boundaries and indicate applicable floor types (i.e. Bottom, Ground, Middle, Top). If the Zone-by-Activity-Area approach is used, also indicate dimensions needed to determine (x,y), Width, and Depth values (as indicated in figure below). Use multiple sheets/drawings if necessary.

Zone-by-Activity-Area Example



Component ID ___ Activity Area and Thermal Zone Definitions

Activity Area ID# Assignments *Identify an Area ID# for each distinct Activity Area type within the surveyed area. A maximum of eight Activity Area types can be specified. Use the codes on Form AA.*

Area ID#	Activity Area Code (Form AA)	Activity Area Survey Reference Description	Typical hourly max # of occupants	Activity Area Floor Area, ft^2	% of Total Surveyed Floor Area	% Cooled	% Heated	% Uncnd	% Refgd
1									
2									
3									
4									
5									
6									
7									
8									
		Totals (ref. only)							

Thermal Zone Assignments *Assign both a Floor Type and a Thermal Zoning Scheme Zone Type for the areas with the most restrictive locations. That is, the default assumption is that Activity Areas are distributed evenly throughout the floor types and thermal zones unless specified otherwise.*

Floor Type	**Area ID#:**	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Below Grade	(B)	☐	☐	☐	☐	☐	☐	☐	☐
1st Floor	(G)	☐	☐	☐	☐	☐	☐	☐	☐
Middle Floors	(M)	☐	☐	☐	☐	☐	☐	☐	☐
Top Floor	(T)	☐	☐	☐	☐	☐	☐	☐	☐

Thermal Zoning Scheme Zone Types								
*If Form 12 Thermal Zoning Scheme=**PC or MP:***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Perimeter	☐	☐	☐	☐	☐	☐	☐	☐
Core	☐	☐	☐	☐	☐	☐	☐	☐
*If Form 12 Thermal Zoning Scheme=**ZA:***	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Lower left corner (x,y) x-coord, ft								
Lower left corner (x,y) y-coord, ft								
Activity Area Width (X dimension), ft								
Activity Area Depth (Y dimension), ft								

Activity Area Notes/Comments:

Activity Area Type Codes

Activity Area Type Description	Activity Area Code
Auditorium	1
Auto Repair Workshop	2
Bank/Financial	3
Bar Cocktail Lounge	4
Barber/Beauty Shop	5
Casino/Gaming	6
Classroom/Lecture	7
Clean Room	8
Computer Room/Data Processing	9
Comm/Ind Work (General High Bay)	10
Comm/Ind Work (General Low Bay)	11
Comm/Ind Work (Precision)	12
Conference Room	13
Convention and Meeting Center	14
Copy Room	15
Corridor / Hallways	16
Courtrooms	17
Dining Area	18
Dry Cleaning	19
Exercise Centers/Gymnasium	20
Exhibit Display Area / Museum	21
Guest Rooms (Hotel/Motel)	22
Kitchen/Break room and Food Preparation	23
Laboratory	24
Laundry	25
Library	26
Loading Dock	27
Lobby (Hotel)	28
Lobby (Main Entry and Assembly)	29
Lobby (Office Reception/Waiting)	30
Locker and Dressing Room	31
Mall Arcade and Atrium	32
Mechanical/Electrical Room	33
Medical Offices and Exam Rooms	34
Office (Executive/Private)	35
Office (General)	36
Office (Open Plan)	37
Patient Rooms	38
Patio Area	39
Pool/Spa Area	40
Police/Fire Station	41
Religious Worship	42
Residential	43
Restrooms	44
Retail Sales/Showroom	45
Smoking Lounge	46
Storage (Conditioned)	47
Storage (Unconditioned)	48
Storage (Refrigerated/Freezer), Walk-in	49
Storage (Refrigerated/Freezer), Building	50
Surgery Rooms	51
Theater (Motion Picture)	52
Theater (Performance)	53
Unknown	54
Vacant (Conditioned)	55
Vacant (Unconditioned)	56
Vocational Areas	57
Other Unlisted Activity Types	**99**
Outside/Outdoor Area	**0**
Reference only, not used as an Activity Area	

Component ID ___ Daylighting ☐ N/A

Daylit Areas and Controls

Specify daylit areas and control types for up to 2 photosensors per control area.

Daylit Area Item #	__	__	__
Daylit Floors (circle one only) **G** = 1st floor **M** = Middle floors **T** = Top floor	G M T	G M T	G M T
Daylit from: **T** = Top **S** = Side/perimeter **B** = Both **O** = Other _____	T S B O	T S B O	T S B O
Control type: **C** = Continuous **CO** = Continuous/Off **S** = Stepped	C CO S	C CO S	C CO S
Maximum glare index			
For control type = **C** or **CO**:			
-- Minimum power, %	%	%	%
-- Minumum light, %	%	%	%
For control type = **S**:			
-- # of light control steps			
-- Light control probability			
# of photosensors per control zone	1 2	1 2	1 2
Photosensor #1 (1 photosensor per control zone)			
-- % of lights controlled	%	%	%
-- Design light level (footcandles)	fc	fc	fc
-- Height above floor, ft	ft	ft	ft
-- % of zone depth	%	%	%
Photosensor #2 (use only if 2 photosensors per control zone)			
-- % of lights controlled	%	%	%
-- Design light level (footcandles)	fc	fc	fc
-- Height above floor, ft	ft	ft	ft
-- % of zone depth	%	%	%

Daylighting Notes/Comments *(provide sketch or copy of control plan if available)**:***

HVAC – Single Zone Systems

Component ID	___	___	___
Single-Zone Item Ltr	Ltr ___	Ltr ___	Ltr ___
HVAC Schedule # from Form 10	# __	# __	# __
Activity Areas/Thermal Zones Served:			
Enter Area ID #(s) or A for all areas			
Floor type served *(Circle all that apply)*	B G M T	B G M T	B G M T
If perimeter/core, enter zones served *(Circle all that apply)*	P C	P C	P C
Distribution System Type:	SZ PSZ SSZ PTU UV 2PFC 4PFC BR ASHP GSHP WLHP	SZ PSZ SSZ PTU UV 2PFC 4PFC BR ASHP GSHP WLHP	SZ PSZ SSZ PTU UV 2PFC 4PFC BR ASHP GSHP WLHP
Number of units of this type			
Average Age (years) -7			
Temperature control type:	M A T E P	M A T E P	M A T E P
Optimal start/stop? (Y / N)	Y N	Y N	Y N
Indoor/Supply fan (hp/unit)			
-- Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium			
-- Quantity of Indoor Fans			
-- Supply air rate (CFM/fan) -7			
Return air path: **DI**=Direct **DU**=Ducted **P**=Plenum -7	DI DU P	DI DU P	DI DU P
% Outside air (minimum)			
Economizer Type: Other_____	N T E O	N T E O	N T E O
Return fan motor (hp/unit)			
-- Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium			
-- Quantity of Return Fans			
-- Return air rate (CFM) -7			
Cooling Equipment Type:	N D C E P	N D C E P	N D C E P
-- *If cooling type* **D** *and not air-cooled: water (W) or evap (E) cooled?*	W E	W E	W E
-- *If cooling type* **C,** *enter chilled water loop # and skip to heating equip.*	CWL # ___	CWL # ___	CWL # ___
Compressor rating: volts / amps (RLA) / phase (*circle one*)	/ / **1 3**	/ / **1 3**	/ / **1 3**
Number of compressors per unit			
Capacity output (nominal tons per unit)			
Equipment manufacturer/brand:			
-- Model number for unitary or split-system outdoor unit -7			
-- Model number for split-system coil -7			
Efficiency: **EER** -7			
Or **SEER** -7			
Heating Equipment Type or Other _____	N F HP B ER RH BB P OT	N F HP B ER RH BB P OT	N F HP B ER RH BB P OT
-- *If heating type* **B,** *enter hot water loop # and stop.*	HWL # ___	HWL # ___	HWL # ___
Fuel type	E G F L W	E G F L W	E G F L W
Input Rating			
Units of Input Rating (k**W** / k**B**tuh)	W B	W B	W B
Equipment manufacturer (if different from cooling equip)			
-- Model number			
Efficiency: (enter as % for AFUE and η) -7			
-- Efficiency units: **A**=AFUE **T**=Thermal η **H**=HSPF **C**=COP	A T H C	A T H C	A T H C
HP only: Supplemental heating capacity (kW)			
Soft start? (Y/N)	Y N	Y N	Y N

HVAC – Multiple Zone Systems *(enter make/model numbers for unitary systems on Form 22)*

Component ID	__	__	__
Multi-Zone Item #	# __	# __	# __
HVAC Schedule # from Form 10	__	__	__
Activity Areas/Thermal Zones Served:			
Enter Area ID #(s) or A for all areas			
Floor type served *(circle all that apply)*	B G M T	B G M T	B G M T
If perimeter/core, enter zones served *(circle all that apply)*	P C	P C	P C
Distribution System Type: or Other _____	CV MZ VAV DD DF OT	CV MZ VAV DD DF OT	CV MZ VAV DD DF OT
Average Age (years) -7			
Number of units of this type			
Temperature control type:	M A T E P	M A T E P	M A T E P
Optimum Start/Stop? (Y/N)	Y N	Y N	Y N
Hot deck temperature (°F)			
Hot deck supply air temp. control:	C O D	C O D	C O D
Cold deck temperature (°F)			
Cold deck supply air temp. control:	C O D	C O D	C O D
Supply Fans: (hp/fan)			
-- Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium			
-- Quantity of supply fans			
-- Supply fan type and control: (VAV only)	IA IF DF VA VS FC NC	IA IF DF VA VS FC NC	IA IF DF VA VS FC NC
-- Supply air rate (CFM/fan) -7			
Return air path: **DI**=Direct **DU**=Ducted **P**=Plenum	DI DU P	DI DU P	DI DU P
% Outside air (minimum)			
Return fans: (hp/fan)			
-- Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium			
-- Quantity of return fans:			
-- Return fan type and control: (VAV only)	IA IF DF VA VS FC NC	IA IF DF VA VS FC NC	IA IF DF VA VS FC NC
-- Return air rate (CFM/return fan) -7			
Economizer type Other_____	N T E O	N T E O	N T E O
Cooling Equipment Type:	N D C E P	N D C E P	N D C E P
-- *If cooling type* **D** *and not air-cooled: water (W) or evap (E) cooled?*	W E	W E	W E
-- *If cooling type* **C,** *enter chilled water loop # and skip to heating eq.*	CWL # ___	CWL # ___	CWL # ___
Number of compressors per unit			
Compressor rating: volts / amps (RLA) / phase (*circle one*)	/ / **1 3**	/ / **1 3**	/ / **1 3**
Capacity (*nominal tons per unit*)			
Efficiency: **EER** -7			
Cooling Lockout: Outside air temperature			
-- On in month (1-12) / Off in month (1-12)	/	/	/
Heating Equipment Type:	F B ER P OT	F B ER P OT	F B ER P OT
-- *If heating type* **B,** *enter hot water loop # and stop.*	HWL # ___	HWL # ___	HWL # ___
Fuel type	E G F L W	E G F L W	E G F L W
Input Rating			
Units of Input Rating (k**W**/k**B**tuh)	W B	W B	W B
Efficiency: (enter as %) -7			
-- Efficiency units: **T**=Thermal η **A**=AFUE	T A	T A	T A
Heating lockout: Outside air temperature			
-- On in month (1-12) / Off in month (1-12)	/	/	/

HVAC – Multiple Zone System Controls

Complete this table for all systems entered on Form 18a.

Multi-Zone Item # (match to Form 18a)	# _____	# _____	# _____
Are perimeter/interior controls the same? *(If yes, only complete Perimeter Zone Controls section.)*	Y N	Y N	Y N
Perimeter Zone Controls			
Terminal type:	CDD CRH VRH CO VVT PF SF I VDD	CDD CRH VRH CO VVT PF SF I VDD	CDD CRH VRH CO VVT PF SF I VDD
Reheat source fuel type:	N E HW ST	N E HW ST	N E HW ST
Supplemental Heat Source:	N EBB ERH HWRH HWBB	N EBB ERH HWRH HWBB	N EBB ERH HWRH HWBB
Capacity of Supplemental Heat Source (input)			
Units for Capacity (k**W**/k**B**tuh)	W B	W B	W B
VAV minimum CFM ratio (% of peak)			
Interior Zone Controls			
Terminal type	CDD CRH VRH CO VVT PF SF I VDD	CDD CRH VRH CO VVT PF SF I VDD	CDD CRH VRH CO VVT PF SF I VDD
Reheat source fuel type:	N E HW ST	N E HW ST	N E HW ST
VAV minimum CFM ratio (% of peak)			

HVAC – Code Descriptions

Single-Zone Distribution System Types	Temperature Control	Heating Equipment
SZ = Single Zone (built-up) PSZ = Pckg. Single Zone (Unitary) SSZ = Split-System Single Zone PTU = Pckg. Term. Unit (wall mounted) UV = Unit Ventilator or Heater 2PFC = 2-Pipe Fan Coil 4PFC = 4-Pipe Fan Coil BR = Baseboard or Radiant Heater ASHP = Air-Source Heat Pump GSHP = Ground Source Heat Pump WLHP = Water Loop/Source Heat Pump	M = Manual (heat/cool On only as needed) A = Always on, constant temperature T = Time Clock E = EMS P = Programmable Thermostat	N = None F = Furnace HP = Heat Pump B = Boiler (fan coil) ER = Electric Resistance RH = Radiant Heater BB = Baseboard Heater P = Purchased Steam OT = Other BX = Boiler (radiant/baseboard)

Cooling Equipment Types	Fuel Type	
N = None D = Direct Expansion C = Chilled Water E = Evaporative Cooler P = Purchased Chilled Water	E = Electricity G = Natural Gas F = Fuel Oil L = LPG HW = Hot Water W = Wood C = Coal/Coke WO = Waste Oil	D = Diesel Fuel GA = Gasoline ST = Steam SO = Solar SG = Solar w/gas backup HR = Heat Recovery O = Other

Multi-Zone Distribution System Types	Fan type and Control (VAV Only)	Terminal Type
CV = Constant Volume Reheat MZ = Multi Zone VAV = Variable Air Volume DD = Dual Duct DF = Dual Fan Dual Duct OT = Other _____	IA = inlet guide vanes, air foil fan/bkwd incln. IF = inlet guide vanes, forward curved fan DF = discharge damper, forward curved fan VA = vane axial fan w/ variable pitch VS = variable speed drive FC = forward curve NC = no control	CDD = dual duct or MZ dampers, CV CRH = constant volume reheat VRH = VAV reheat CO = cooling-only, VAV VVT = variable air volume and temp PF = parallel fan-powered SF = series fan-powered I = induction (non-powered) VDD = dual duct or MZ dampers, VAV

Supplemental Heat Source	Supply Air Temperature Control	Economizer Types
N = None EBB = Elec. Baseboard HWRH = Hot Water Radiant Heater ERH = Electric Radiant Heater HWBB = Hot Water Baseboard	C = Constant O = Reset OAT D = Reset Demand	N = None T = Temperature E = Enthalpy O = Other

HVAC Comments (Indicate deck temperature setpoints/reset schedules, or any other significant details such as high pressure air distribution.):

Chillers *(enter make/model/serial numbers on Form 22)* ☐ N/A

Chilled water loop (CWL) #	# ____	# ____	# ____
Component ID			
Chiller Item #	# ____	# ____	# ____
Site Equipment ID (*reference only*)			
Location, Area ID# (reference only)			
Component IDs of all components served			
Chiller type: **CENT** = Centrifugal **REC** = Reciprocating **SCRW** = Screw **SCRL** = Scroll **SABS** = Absorption steam **GABS** = Absorption, direct fired gas **OT** = Other _____	**CENT REC SCRW SCRL SABS GABS OT**	**CENT REC SCRW SCRL SABS GABS OT**	**CENT REC SCRW SCRL SABS GABS OT**
-- If steam absorption, one or two stage?	**1 2**	**1 2**	**1 2**
-- If direct-fired gas absorption, kBtuh input			
Fuel type: **E** = Elect **G** = Natural Gas **S** =Steam	**E G S**	**E G S**	**E G S**
Heat rejection type: **W** = Water-cooled **A** = Air-cooled	**W A**	**W A**	**W A**
Average Age (years) **-7**			
Number of units			
Number of units in backup mode			
VSD compressor control? (Y/N)	**Y N**	**Y N**	**Y N**
Chilled water setpoint temperature			
Chilled water reset (Y/N)	**Y N**	**Y N**	**Y N**
-- If Yes, chilled water reset temperature			
Compressor: Volts			
Amps (RLA)			
Phase (circle one)	**1 3**	**1 3**	**1 3**
Number of Compressors			
Capacity (nominal tons/unit)			
Efficiency – Full Load kW/ton, IPLV, or COP -7			
Efficiency Units	**kW COP IPLV**	**kW COP IPLV**	**kW COP IPLV**
Is chiller sequencing used? (If yes, explain in Comments)	**Y N**	**Y N**	**Y N**
Water-side economizer in use? (Free Cooling)	**Y N**	**Y N**	**Y N**
Cooling lockout: Outside air temperature			
On in month (1-12) Off in month (1-12)			
Serves Thermal Storage System Item #s			

Circulation Pumps – Chillers ☐ N/A

Component ID	__	__	__	__
Circulation pump Item #	# __	# __	# __	# __
Site Equipment ID (optional)				
Use type: **CHW** = Chilled Water **SCHW** = Secondary ChilledWater **CHHW** = Chilled/Hot Water (2-pipe system)	**CHW SCHW CHHW**	**CHW SCHW CHHW**	**CHW SCHW CHHW**	**CHW SCHW CHHW**
Average Age (years)				
Number of units				
Number of units in backup mode				
Pump power (hp)				
Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium				
Motor type: **O** = One Speed **T** = Two Speed **V** = Variable	**O T V**	**O T V**	**O T V**	**O T V**
Gallons per minute (-7)				
Feet of head (-7)				
Serves chilled water loop (CWL) #				

Heat Rejection (Built-Up) *(enter make/model numbers for cooling towers on Form 22)* ☐ N/A

Component ID			
Heat rejection device Item #	# ___	# ___	# ___
Site Equipment ID (optional)			
Type: **CW** = CondWater **AC** = AirCooledCond **EC** = Evap Condenser **ACP** = Air Cooled w/pre-cooler **CT** = Cooling Tower	**CW AC EC ACP CT**	**CW AC EC ACP CT**	**CW AC EC ACP CT**
Temperature control: **F** = Fixed Temperature **R** = Reset **S** = Setpoint	**F R S**	**F R S**	**F R S**
Condenser water setpoint temperature (°F)			
Cooling tower water setpoint temperature (°F)			
Cooling tower approach temperature (°F)			
Age of cooling tower (years) **-7**			
Fan motor size/power (hp/fan)			
-- Fan Type: **C** = Centrifugal **A** = Axial	**C A**	**C A**	**C A**
-- Number of fans			
-- Motor eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium			
-- Fan control: **O** = One Speed **T** = Two Speed **V** = Variable	**O T V**	**O T V**	**O T V**
Pump power (hp/pump)			
-- Number of pumps			
-- Motor eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium			
-- Pump control: **O** = One Speed **T** = Two Speed **V** = Variable	**O T V**	**O T V**	**O T V**
-- Gallons per minute (-7)			
-- Feet of head (-7)			
Chillers Served (Chiller Item#)			
Systems Served (SZ/MZ System Letter or Item#)			

Thermal (Cool) Storage Systems ☐ N/A

Comp ID	__	__	
Thermal storage system Item #	#__	#__	#__
Location, Area ID# (reference only)			
Serves chilled water loop (CWL) #	#__	#__	#__
Storage type **C** = Chilled Water **I** = Ice **O** = Other _____	**C I O**	**C I O**	**C I O**
Thermal storage total capacity (Ton-Hours)			
Total Number of Storage Units/Tanks			
System Design type **F** = Full storage **P** = Partial storage	**F P**	**F P**	**F P**
-- Storage provides what % of hottest day peak cooling load (of max. hour)			
Manufacturer			
Model #			
Storage is charged: from . . . . Use 24 hour (military time) to designate			
to . . . . . time period. (eg., 1 pm would be 13)			
Storage is discharged: from			
to			
Chiller serves BldgLoad: from			
to			

Boilers *(enter make/model/serial numbers on Form 22)* ☐ N/A

Hot water loop (HWL) #		# ___	# ___	# ___
Component ID				
Boiler Item #		# ____	# ____	# ____
Site Equipment ID (optional)				
Location, Area ID# (reference only)				
Component IDs of all components served				
Type: **W** = Water **S** = Steam **OT** = Other _____		**W S OT**	**W S OT**	**W S OT**
-- If steam, enter steam pressure (PSIG setpoint)				
-- If water, enter water temperature (setpoint)				
Primary fuel type: *(see codes on Form HC)* Other_____				
Secondary fuel (*use codes on Form HC*)				
Estimated year of installation (*specify year or category)*				
Number of units				
Number of units in backup mode				
Input Capacity (kBtu/hr/unit)				
Efficiency: (%) -7				
% of Boiler output to each end use:	Space Heat	%	%	%
	Water Heat	%	%	%
	Pool Heat	%	%	%
	Process	%	%	%
	Sum	***100%***	***100%***	***100%***
Space heat lockout:	Outside air temperature			
	On in Month (1-12)			
	Off in Month (1-12)			
Is HW temp reset? (Y / N)		**Y N**	**Y N**	**Y N**

Hot Water Circulation Pumps ☐ N/A

Component ID					
Circulation pump Item #	# __	# __	# __	# __	# __
Site Equipment ID (optional)					
Average Age (years)					
Number of units					
Number of units in backup mode					
Pump power (hp)					
-- Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium					
Motor type**:** **O** = One Speed **T** = Two Speed **V** = Variable	**O T V**	**O T V**	**O T V**	**O T V**	**O T V**
Gallons per minute					
Feet of head					
Serves hot water loop (HWL) #					

HVAC Equipment Manufacturer and Model Number Information

Manufacturer and Model Numbers for Unitary/Package Multizone Equipment ☐ N/A

Equip Type	Comp ID	Item #	Manufacturer	Model Number for Unitary or Split-system outdoor unit	Model Number for Split-System Coil	Heating System Model Number
MZ						
MZ						
MZ						
MZ						
MZ						
MZ						
MZ						
MZ						
MZ						

Manufacturer and Model Numbers for Built-Up HVAC Equipment ☐ N/A

Equip Type*	Comp ID	Item #	Manufacturer	Model Number	Serial Number
C B CT					
C B CT					
C B CT					
C B CT					
C B CT					
C B CT					
C B CT					

* C = Chiller (Form 19), B=Boiler (Form 21) CT=Cooling tower (Form 20)

Comments *Indicate any unique features of built-up equipment that would assist in modeling energy use such as: operating characteristics, configuration, etc.*

Exhaust Fans ☐ N/A

Comp ID				
Exhaust fan Item #	#__	#__	#__	#__
Site Equipment ID (optional)				
Type: **K** = Kitchen exhaust hoods **F** = Fume hoods	**K F**	**K F**	**K F**	**K F**
Number of units				
Fan motor size/power (hp / unit)				
-- Motor Eff: **Nom.%** OR **S**=Std. **H**=HiEff **P**=Prem				
Fan capacity (CFM / unit) -7				
Schedule: **C** = Continuous **D** = Demand controlled ventilation **W** = With air handler **M** = Manual **O** = Other _____	**C** **D** **W M** **O**	**C** **D** **W M** **O**	**C** **D** **W M** **O**	**C** **D** **W M** **O**
-- If **W**, then HVAC system # or Ltr				
Hours per week				
Activity Areas/Thermal Zones Served:				
Enter Area ID #(s) or A for all areas				
Floor type served	**B G M T**	**B G M T**	**B G M T**	**B G M T**
If Perimeter/Core, enter zones served	**P C**	**P C**	**P C**	**P C**

Make-Up Air Units *(supply non-conditioned air)* ☐ N/A

Comp ID				
Make-up air unit Item #	#__	#__	#__	#__
Site Equipment ID				
Number of units				
Fan motor size/power (hp / unit)				
-- Motor Eff: **Nom.%** OR **S**=Std. **H**=HiEff **P**=Prem				
Fan capacity (CFM / unit) -7				
Schedule: **C** = Continuous **D** = Demand controlled ventilation **W** = With air handler **M** = Manual **O** = Other _____	**C** **D** **W M** **O**	**C** **D** **W M** **O**	**C** **D** **W M** **O**	**C** **D** **W M** **O**
-- If **W** then HVAC system # or Ltr				
Hours per week				
Activity Areas/Thermal Zones Served:				
Enter Area ID #(s) or A for all areas				
Floor type served	**B G M T**	**B G M T**	**B G M T**	**B G M T**
If Perimeter/Core, enter zones served	**P C**	**P C**	**P C**	**P C**

Water Heating Equipment

Comp ID			
Water heating Item #	# ____	# ____	# ____
Location, Area ID# (reference only)			
Equipment type: **S** = Standard/Storage water heater **I** = Instantaneous (tankless) **B** = Boiler **DWB** = Dishwasher booster heater **PHW** = Purchased hot water **PS** = Purchased steam **HP** = Heat pump water heater **OT** = Other _____	**S** **I** **B** **DWB** **PHW** **PS** **HP** **OT**	**S** **I** **B** **DWB** **PHW** **PS** **HP** **OT**	**S** **I** **B** **DWB** **PHW** **PS** **HP** **OT**
-- If boiler, enter boiler # (from Form 21) and skip to tank capacity			
Fuel type: (If not boiler) **E** = Electricity **G** = Natural Gas **F** = Fuel Oil **L** = LPG **W** = Wood **SO** = Solar **SG** = Solar w/gas backup **HR** = Heat Recovery **OT** = Other_____	**E** **G** **F** **L** **W** **S** **SG** **HR** **OT**	**E** **G** **F** **L** **W** **S** **SG** **HR** **OT**	**E** **G** **F** **L** **W** **S** **SG** **HR** **OT**
Number of units			
Make			
Model			
Age of water heater (years) -7			
Tank capacity/volume (*gallons*) -7			
Rated input capacity -7			
-- Units of rated input capacity: **B** = kBtuh **W** = kW	**B W**	**B W**	**B W**
Efficiency rating -7			
Efficiency units: **E** = Energy Factor **T** = Thermal efficiency **A** = AFUE **C** = COP	**E T A C**	**E T A C**	**E T A C**
Tank internal insulation R-value (enter 0 if uninsulated)			
Does the hot water tank have an external insulation jacket?	**Y N**	**Y N**	**Y N**
Average hot water temperature (°F) -7			
Are hot water pipes insulated?	**Y N**	**Y N**	**Y N**
Recirculation pump (Y/N)	**Y N**	**Y N**	**Y N**
-- Recirc pump control type (circle all that apply): **C** = Continous **TP** = Temperature **TM** = Timer **D** = Demand **OT** = Other _____	**C TP TM** **D OT**	**C TP TM** **D OT**	**C TP TM** **D OT**
-- Pump operations (*hours per week*)			

Service Hot Water Use (General and Building-Type Specific)

If service water heating equipment is present on Form 21 or Form 24, then at least one of the usage fields below must have a value. Building-type specific usage values must be completed for the building types indicated. For food service businesses, an estimate of the number of meals served is required.

			Component ID	__	__	__
Other Hot Water Uses? (Gals/Day)						
All Activity Types:	Number of lavatories with hot water:					
	Pounds of laundry washed per day? (lb)					
	Number of showers per day *(except for lodging and hospitals)*					
If both electric and gas water heating equipment are used on site, estimate the % of water heated by gas equipment.				___%	___%	___%
ACTIVITY-TYPE-SPECIFIC HOT WATER USE						
Food service:	Number of meals prepared per day:	Breakfast				
		Lunch				
		Dinner				
	Number of seats in the food service area:					
	Disposable Dishes?			Y N	Y N	Y N
Lodging:	Number of usable rooms *(in hotels, motels, dorms, etc.)*					
	Average # of rooms occupied					
	Number of Apartments					
Office:	Average % of occupied (Non-vacant) space in office buildings			___%	___%	___%
Hospital:	Number of actual beds in hospital					
	Average % of beds occupied in hospital (avg. from census)			___%	___%	___%
Education:	Average number of enrolled students in schools (e.g., ADA)					
Nursing Home:	Number of beds					
	Average % of beds occupied			___%	___%	___%
Prisons:	Number of inmates					

Service Hot Water Use Notes:

Swimming Pool/Spa ☐ N/A

Comp ID			
Pool/Spa Item #	# 1	# 2	# 3
Location (Activity Area ID or if Outdoors = 0)			
Type: **P** = Swimming Pool **S** = Spa/Hot Tub **O** = Other_____	**P S O**	**P S O**	**P S O**
Estimated year of installation *(specify year or category)*			
What is the size of the pool (sq. ft.)?			
What is the average depth of the pool (ft.)?			
If heated by a boiler, specify boiler # from Form 21			
Fuel Type: **N** = Not Heated **E** = Electricity **G** = Natural Gas **L** = LPG **SO** = Solar **SG** = Solar w/backup fuel **O** = Other _____	**N E G L SO SG O**	**N E G L SO SG O**	**N E G L SO SG O**
Heater Capacity (kBtu/hr or kW)			
-- Units of capacity: W = kW B = kBtu/hr	**W B**	**W B**	**W B**
Solar Backup Fuel Type: **N** = None **E** = Electricity **G** = Natural Gas **L** = LPG **O** = Other _____	**N E G L O**	**N E G L O**	**N E G L O**
Solar collector area in use (ft^2)			
Pool Cover in use?	**Y N**	**Y N**	**Y N**
Circulation Pump power (hp)			
-- Average pump run-hours per day			
-- Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium			
Motor type**:** **O** = One Speed **T** = Two Speed **V** = Variable	**O T V**	**O T V**	**O T V**
Months heated: Start... (1…12)			
Stop... (1…12)			

Swimming Pool Notes (If installed recently then comment):

Outdoor Lighting

Comp ID							
Item #	#____	#____	#____	#____	#____	#____	#____
Use type: **S** = General/Security **A** = Advertising **P** = Parking lot **G** = Parking garage **F** = Bldg façade **L** = Landscape **OT** = Other_____	S A P G F L OT	S A P G F L OT	S A P G F L OT	S A P G F L OT	S A P G F L OT	S A P G F L OT	S A P G F L OT
Mount type: **A** = Attached to bldg **P** = Pole **O**=Other	A P O	A P O	A P O	A P O	A P O	A P O	A P O
Control type: **PC** = Photocell **S** = Manual on/off-switch **TC** = Timeclock **E** = EMS **TW** = Twist-timer **PT** = Photocell/Timelock **MS** = Motion Sensor	PC S TC E TW PT MS	PC S TC E TW PT MS	PC S TC E TW PT MS	PC S TC E TW PT MS	PC S TC E TW PT MS	PC S TC E TW PT MS	PC S TC E TW PT MS
Total number of fixtures (Total <u>length</u> if Neon)							
Number of lamps per fixture (Enter 1 if Neon)							
Watts per lamp (Enter 10 if Neon)							
-- *Check box if lamp watts were estimated**	☐	☐	☐	☐	☐	☐	☐
Hours per week							
Lamp Type and Lamp-Specific Details							
LED = LEDs	LED	LED	LED	LED	LED	LED	LED
E = Electrodless/Induction	E	E	E	E	E	E	E
Q = Quartz/Halogen	Q	Q	Q	Q	Q	Q	Q
IP = Incandescent PAR	IP	IP	IP	IP	IP	IP	IP
IR = Incandescent Reflector/Flood	IR	IR	IR	IR	IR	IR	IR
I = Incandescent	I	I	I	I	I	I	I
CFs applicable?(medium/screw base)	Y N	Y N	Y N	Y N	Y N	Y N	Y N
F = Fluorescent Tube	F	F	F	F	F	F	F
UT = Fluorescent U-tube	UT	UT	UT	UT	UT	UT	UT
OF = Other Fluorescent	OF	OF	OF	OF	OF	OF	OF
For Fluor. tubes: Length in ft. (e.g., 1.5, 2, 4, 8)							
Diameter (T5 T8 T10 T12)							
CF = Compact Fluorescent **CIR** = Circline Fluorescent	CF CIR	CF CIR	CF CIR	CF CIR	CF CIR	CF CIR	CF CIR
CF/CIR base type: P=Pin-base S=Screw-base	P S	P S	P S	P S	P S	P S	P S
MV = Mercury Vapor	MV	MV	MV	MV	MV	MV	MV
MH = Standard Metal Halide	MH	MH	MH	MH	MH	MH	MH
PS = Pulse-start Metal Halide	PS	PS	PS	PS	PS	PS	PS
H = High Pressure Sodium Vapor	H	H	H	H	H	H	H
L = Low Pressure Sodium Vapor	L	L	L	L	L	L	L
N = Neon	N	N	N	N	N	N	N
For ballasted lamp types: Ballast type: **M** = Std Magnetic **H** = HighEff magnetic **E** = Std Electronic **A** = Advanced Electronic	M H E A	M H E A	M H E A	M H E A	M H E A	M H E A	M H E A
-- Number of ballasts per fixture							
Field notes: (*Count/comments*)							

* Do not estimate lamp watts until all other methods of establishing wattage have been exhausted, and then explain in comments why lamp wattage could not be obtained.

Comments:

Indoor Lighting

Component ID							
Item #	# ___	# ___	# ___	# ___	# ___	# ___	# ___
Area ID #							
Use Type: **A** = Area **T** = Task **X**= Exit **K** = Track **D** = Display/Advertising **O**= Other _____	A T X K D O	A T X K D O	A T X K D O	A T X K D O	A T X K D O	A T X K D O	A T X K D O
Mounting: **R** = Recessed **H** = Hanging/Suspended **S** = Surface-mount **O** =Other _____	R H S O	R H S O	R H S O	R H S O	R H S O	R H S O	R H S O
Specular (**S**) or White (**W**) reflector?	S W	S W	S W	S W	S W	S W	S W
Control type: **N** = None/Continuous **B** = Bi-level **S** = Manual on/off-switch **TC** = Timeclock **E** = EMS **PC** = Photocell **PT** = Photocell/Timelock **MS** = Motion Sensor **DM** = Dimmer **DL** = Daylighting controls	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL
Total number of fixtures (Total length if **N**eon)							
Number of lamps per fixture (Enter 1 if **N**eon)							
Watts per lamp (Enter 10 if **N**eon)							
Hours per week							
Lamp Type and Lamp-Specific Details:							
LED = LEDs	LED	LED	LED	LED	LED	LED	LED
ER = Self/battery powered exit signs	ER	ER	ER	ER	ER	ER	ER
Q = Quartz/Halogen	Q	Q	Q	Q	Q	Q	Q
E = Electrodeless/Induction	E	E	E	E	E	E	E
IP = Incandescent PAR	IP	IP	IP	IP	IP	IP	IP
IR = Incandescent Reflector/Flood	IR	IR	IR	IR	IR	IR	IR
I = Incandescent	I	I	I	I	I	I	I
CFs applicable? (medium/screw base)	Y N	Y N	Y N	Y N	Y N	Y N	Y N
F = Fluorescent Tube	F	F	F	F	F	F	F
UT = Fluorescent U-tube	UT	UT	UT	UT	UT	UT	UT
OF = Other Fluorescent	OF	OF	OF	OF	OF	OF	OF
For Fluorescent tubes: Length in ft. (e.g. 1.5 2 4 8)							
Diameter (T5 T8 T10 T12)							
CF = Compact Fluorescent	CF	CF	CF	CF	CF	CF	CF
CIR = Circline Fluorescent	CIR	CIR	CIR	CIR	CIR	CIR	CIR
CF/CIR Base type: P=Pin-base S=Screw-base	P S	P S	P S	P S	P S	P S	P S
MV = Mercury Vapor	MV	MV	MV	MV	MV	MV	MV
MH = Standard Metal halide	MH	MH	MH	MH	MH	MH	MH
PS = Pulse-Start Metal Halide	PS	PS	PS	PS	PS	PS	PS
H = High Pressure Sodium Vapor	H	H	H	H	H	H	H
L = Low Pressure Sodium Vapor	L	L	L	L	L	L	L
N = Neon	N	N	N	N	N	N	N
For ballasted lamp types: Ballast type: **M** = Magnetic **H** = High Eff Magnetic **E** = Std Electronic **A** = Advanced Electronic	M H E A	M H E A	M H E A	M H E A	M H E A	M H E A	M H E A
-- Number of ballasts per fixture							
Field Notes: (Counts)							

Indoor Lighting

Component ID							
Item #	# ___	# ___	# ___	# ___	# ___	# ___	# ___
Area ID #							
Use Type: **A** = Area **T** = Task **X**= Exit **K** = Track **D** = Display/Advertising **O**= Other _____	A T X K D O	A T X K D O	A T X K D O	A T X K D O	A T X K D O	A T X K D O	A T X K D O
Mounting: **R** = Recessed **H** = Hanging/Suspended **S** = Surface-mount **O** =Other _____	R H S O	R H S O	R H S O	R H S O	R H S O	R H S O	R H S O
Specular (**S**) or White (**W**) reflector?	S W	S W	S W	S W	S W	S W	S W
Control type: **N** = None/Continuous **B** = Bi-level **S** = Manual on/off-switch **TC** = Timeclock **E** = EMS **PC** = Photocell **PT** = Photocell/Timelock **MS** = Motion Sensor **DM** = Dimmer **DL** = Daylighting controls	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL
Total number of fixtures (Total length if **N**eon)							
Number of lamps per fixture (Enter 1 if **N**eon)							
Watts per lamp (Enter 10 if **N**eon)							
Hours per week							
Lamp Type and Lamp-Specific Details:							
LED = LEDs	LED	LED	LED	LED	LED	LED	LED
ER = Self/battery powered exit signs	ER	ER	ER	ER	ER	ER	ER
Q = Quartz/Halogen	Q	Q	Q	Q	Q	Q	Q
E = Electrodeless/Induction	E	E	E	E	E	E	E
IP = Incandescent PAR	IP	IP	IP	IP	IP	IP	IP
IR = Incandescent Reflector/Flood	IR	IR	IR	IR	IR	IR	IR
I = Incandescent	I	I	I	I	I	I	I
CFs applicable? (medium/screw base)	Y N	Y N	Y N	Y N	Y N	Y N	Y N
F = Fluorescent Tube	F	F	F	F	F	F	F
UT = Fluorescent U-tube	UT	UT	UT	UT	UT	UT	UT
OF = Other Fluorescent	OF	OF	OF	OF	OF	OF	OF
For Fluorescent tubes: Length in ft. (e.g. 1.5 2 4 8)							
Diameter (T5 T8 T10 T12)							
CF = Compact Fluorescent	CF	CF	CF	CF	CF	CF	CF
CIR = Circline Fluorescent	CIR	CIR	CIR	CIR	CIR	CIR	CIR
CF/CIR Base type: P=Pin-base S=Screw-base	P S	P S	P S	P S	P S	P S	P S
MV = Mercury Vapor	MV	MV	MV	MV	MV	MV	MV
MH = Standard Metal halide	MH	MH	MH	MH	MH	MH	MH
PS = Pulse-Start Metal Halide	PS	PS	PS	PS	PS	PS	PS
H = High Pressure Sodium Vapor	H	H	H	H	H	H	H
L = Low Pressure Sodium Vapor	L	L	L	L	L	L	L
N = Neon	N	N	N	N	N	N	N
For ballasted lamp types: Ballast type: **M** = Magnetic **H** = High Eff Magnetic **E** = Std Electronic **A** = Advanced Electronic	M H E A	M H E A	M H E A	M H E A	M H E A	M H E A	M H E A
-- Number of ballasts per fixture							
Field Notes: (Counts)							

Office Equipment

Comp ID	Item #	Area ID	Equipment Code	Equipment Description	kW	ENERGY STAR?	Total # of units	Avg hrs per week*
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		

* “Avg hrs per week” must be completed only if equipment operation differs drastically from that shown on schedule.

Equip Code	Equipment Description	Equip Code	Equipment Description	Equip Code	Equipment Description
PCD	Personal Computer – Desktop	MON	Monitor/Terminal	TYP	Typewriter
PCL	Personal Computer – Laptop	MAIN	Computer – Mainframe	HOLE	Hole Punch
JET	Printer – Ink Jet	VAX	Computer – Minicomputer (VAX)	SHRD	Shredder
LSR	Printer – Laser	WORK	Workstation	PROJ	Video Projector/Projection System
PDOT	Printer – Dot Matrix	SERV	Servers	OT	Other (describe)
UPS	Uninterruptible Power Supply	SWEQ	Switching Equipment		
SC	Small Copier	FAX	FAX machine		
MC	Medium Copier	TEL	Telephone System		
LC	Large Copier	POS	Point-of-sale terminals		
BP	Blueprint Machine	REG	Cash Registers		

Cooking/Food Service Equipment

Comp ID	Item #	Area ID	Equip Code	Equipment Description	Total # Electric Units	kW	Total # of Gas Units	kBtuh	Avg hrs per Week

* "Avg hrs per week" must be completed only if equipment operation differs drastically from that shown on schedule.

ID	Equipment Type	ID	Equipment Type	ID	Equipment Type	ID	Equipment Type
BR	Broiler, Conventional	GD	Garbage Disposal	MW	Oven, Microwave	SP	Soup Pots
BI	Broiler, Infrared	GR	Griddle	PC	Oven, Pizza, Counter-top	SK	Steam Kettle
CB	Charbroiler (32" x 36" ref)	HT	Hot Food Table (4 holes ref)	PL	Oven, Pizza, Large	TC	Toaster, Conveyor-type
CM	Coffee Maker	HP	Hot Plates (2 burners ref)	PM	Popcorn Maker	TS	Toaster, Slotted-type
DW	Dishwasher	IN	Induction Cooktop (2 burner ref)	PF	Proofers/Holding Cabinet	TR	Trash Compacter
FS	Food Steamer	MX	Mixer, Large	RL	Range, Large (6 burners)	OT	Other (describe)
FW	Food Warmer/Well/Lamp	OV	Oven (in Range or standalone)	RM	Range, Medium (4 burners)		
FC	Fryer, Counter-type	CO	Oven, Convection	RS	Range, Small (2 burners)		
FF	Fryer, Floor-type	FO	Oven, Finishing/Toaster	RO	Rotisserie (3 spits reference)		
FI	Fryer, Induction (1 vat ref)	FB	Oven, FlashBake	SL	Slicer (Meat, Cheese, etc)		

Self-Contained Refrigeration Equipment

Non-Commercial/Residential-Type Refrigerator/Freezers ☐ N/A

Comp ID	Item #	Area ID	Equip Code	Equipment Description	Temp. Service	kW per unit	Energy Star	Total # of Units	Average Age (years)
			1D	Single-door	R/F R		☐		
			2D	Two-door	R/F R		☐		
			3D	Three-door	R/F R		☐		
			UC	Undercounter/Compact	R/F R		☐		
			CH	Chest	R/F R		☐		
			OT	*(describe)*_____	R/F R		☐		
					R/F R		☐		

Commercial Refrigeration Equipment ☐ N/A

Comp ID	Item #	Area ID	Equip Code	Open/ Closed	Temp. Service Type	Length, ft	# of Doors	Remote Cond Unit	*Amps @ 120V	*Amps @ 208V	Total # of units
				O C	R F			☐			
				O C	R F			☐			
				O C	R F			☐			
				O C	R F			☐			
				O C	R F			☐			
				O C	R F			☐			
				O C	R F			☐			
				O C	R F			☐			

*Note: Amps listed should not include defrost heater amperage.

Self-Contained Commercial Refrigeration Equipment Codes

Equip Code	Equipment Description	Size of Default	Default Amps@ 120V	208V
ID	Ice cream/frozen yogurt dispenser	1 unit	12	7
DD	Refrigerated drink dispenser (soda, slushees, etc.)	1 unit	17	10
CT	Cold/chilled food table	1 unit	13	8
WC	Refrigerated water cooler	1 unit	4	2
RV	Refrigerated vending machine	1 unit	8	4
GD	Glass door beverage merchandiser (e.g. vendor supplied) from 2 to 4 doors	3 doors	9	5
OU	Open upright display case (pizza, juice, etc.) usually 4,5,6 ft lengths	5 ft	15	9
IC	Island case (cheese, sometimes produce or juice) from 8 to 16 ft long	12 ft	16	9
SC	Service case (bakery, sometimes deli) from 4 to 8 ft long	6 ft	7	4
CD	Closed/solid door storage case, one to three doors	2 doors	7	4
UG	Upright glass door freezer cases from one to three doors	2 doors	10	6
CF	Coffin type glass top freezer cases (usually ice cream) typically 6 or 8 ft	7 ft	8	5
IB	Ice storage boxes	1 unit	8	5
IS	Ice maker, Small (< 10 amps)	1 unit	7	4
IM	Ice maker, Medium (10 to 15 amps)	1 unit	12	7
IL	Ice maker, Large (>15 amps)	1 unit	17	10
OT	Other: self-contained refrigeration not listed above	1 unit	12	7

Remote Refrigeration Equipment – Display Cases and Walk-Ins

Display Cases ☐ N/A

Component ID					
Display case Item #	# __	# __	# __	# __	# __
Fixture Reference ID (from Refg Sched)					
Served by Compressor System Item #					
Area ID					
Type/Suction Temperature: IC = Ice Cream/Frozen Juices (-35 °F) FF = Frozen Food/Meat/Bakery (-25 °F) MD = Fresh Meat/Deli-Meat (+10 °F) DP = Dairy/Produce/Beverage (+20 °F)	**IC** **FF** **MD** **DP**	**IC** **FF** **MD** **DP**	**IC** **FF** **MD** **DP**	**IC** **FF** **MD** **DP**	**IC** **FF** **MD** **DP**
Defrost control type *(req'd for all)*: E = Electric G = Hot Gas T = Timed-off N = None	**E G** **T N**	**E G** **T N**	**E G** **T N**	**E G** **T N**	**E G** **T N**
Anti-sweat heater control?	**Y N**	**Y N**	**Y N**	**Y N**	**Y N**
-- Control type: **C**=Cycling **H**=Humidistat	**C H**	**C H**	**C H**	**C H**	**C H**
External liquid-suction heat exchangers?	**Y N**	**Y N**	**Y N**	**Y N**	**Y N**
High-efficiency evaporator fan motors?	**Y N**	**Y N**	**Y N**	**Y N**	**Y N**
T-8 case lighting?	**Y N**	**Y N**	**Y N**	**Y N**	**Y N**
Size (length or # of doors)					
Single-Deck display cases:					
Open single-deck Lin. ft.					
Closed service case Lin. ft.					
Island coffin/tub (shop-around) Lin. ft.					
Coffin/tub (one-side shopping) Lin. ft.					
Multi-Deck (vertical) display cases:					
Open/reach-in multi-deck Lin. ft.					
Glass-door cases # of doors					
-- High-performance glass doors?	**Y N**	**Y N**	**Y N**	**Y N**	**Y N**

Walk-Ins and Preparation Areas ☐ N/A

Component ID					
Walk-in/Prep Area Item #	# __	# __	# __	# __	# __
Fixture Reference ID (from Refg Sched)					
Served by Compressor System Item #					
Area ID					
Suction temp. range: **F** = Freezer (0 to -10 °F) **C** = Cooler (30 to 40 °F) **P** = PrepArea (50 to 55 °F)	**F** **C P**	**F** **C P**	**F** **C P**	**F** **C P**	**F** **C P**
Floor area (ft^2)					
Ceiling height (ft)					
Defrost control type: **E** = Electric **G** = Hot Gas **T** = Timed-off **N** = None	**E G** **T N**	**E G** **T N**	**E G** **T N**	**E G** **T N**	**E G** **T N**
Strip curtains?	**Y N**	**Y N**	**Y N**	**Y N**	**Y N**
High-efficiency evaporator fan motors?	**Y N**	**Y N**	**Y N**	**Y N**	**Y N**
Display case type: **N** = None, storage only **G** = Glass Doors **R** = Rear-load Roll-In	**N** **G R**	**N** **G R**	**N** **G R**	**N** **G R**	**N** **G R**
-- For G or R types, display case Item #					

Remote Refrigeration Equipment – Compressors and Condensers

Compressor Systems ☐ N/A

Component ID					
Compressor System Item #	# __	# __	# __	# __	# __
System Reference ID (from Refg Sched)					
Served by Condenser Item #					
Area ID					
Type: **C** = Conventional **S** = Two-stage multiplex **T** = Twins **M** = Multiplex **R** = Remote Cond. Unit **O** = Other _____	C S T M R O	C S T M R O	C S T M R O	C S T M R O	C S T M R O
ManufCode: **C** = Carlyle **S** = Copeland Std. **D** = Copeland Discus **O** = Other _____	C S D O	C S D O	C S D O	C S D O	C S D O
Number of compressors in rack/system					
-- Total rack/system hp					
-- Size of all compressors hp (#-#-#…)					
High-efficiency (scroll) compressors?	Y N	Y N	Y N	Y N	Y N
Control Type: **C** = Conventional **S** = SolidState **E** = EMS **O** = Other _____	C S E O	C S E O	C S E O	C S E O	C S E O
Unloader or VSD compressors?	U V	U V	U V	U V	U V
Subcooling Type: **A** = Ambient **M** = Mechanical **N** = None	A M N	A M N	A M N	A M N	A M N
Floating head pressure (FHP) control?	Y N	Y N	Y N	Y N	Y N
-- Very low head pressure (VLHP) control?	Y N	Y N	Y N	Y N	Y N
Heat recovery type: **N** = None **S** = Space heating/Reheat **W** = Water heating **O** = Other _____	N S W O	N S W O	N S W O	N S W O	N S W O

Condensers ☐ N/A

Component ID					
Condenser Item #	# __	# __	# __	# __	# __
Area ID					
Type: A = Air-cooled W = Water-cooled P = Air-cooled w/precooler C = Close-approach/Oversized	A W P C	A W P C	A W P C	A W P C	A W P C
Total fan horsepower (all types)					
-- Motor Eff.: Nom. % OR S=Std. H=HiEff P=Premium					
-- VSD fan?	Y N	Y N	Y N	Y N	Y N
Pump motor hp (water-cooled units only)					
-- Motor Eff.: Nom. % OR S=Std. H=HiEff P=Premium					
-- VSD fan?	Y N	Y N	Y N	Y N	Y N

Miscellaneous Equipment

Comp ID	Item #	Area ID	Equip Code	Equipment Description (*Required only if Equip Code = OT*)	Fuel Type	Survey kW/kBtuh	Avg hrs per week	Total # of units
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			

ID	Equipment Type	Ref. kW (kBtuh)	ID	Equipment Type	Ref. kW (kBtuh)	ID	Equipment Type	Ref. kW (kBtuh)
	Other/Unlisted			**Electronics**			**Shop Equipment**	
OT	Describe in Equip. Desc.	1.0 (10)	E1	Broadcasting Equipment	0.7	S1	Forklifts	7.5 (50)
			E2	Stereo System	0.25	S2	Hand Truck/Pallet Lifts	2.5 (15)
			E3	Television	0.28	S3	Non-Forklift Elec. Vehicles	10
	Building Equipment		E4	Video Recorder (VCR) or DVD	0.5	S4	Other Electric Transport	10
B1	Air Hand Dryers	2.3				S5	Battery Chargers	1.5
B2	Alarm System	2.0		**Service/Retail**		S6	Electric Crane	3.4
B3	Automatic Door	0.5	R1	ATM Machine	1.0	S7	Portable Shop Tools	0.9
B4	Battery Charger	3.2	R2	Change Machine	0.4	S8	Shop Equipment	0.7
B5	Janitorial Equipment	1.2	R3	Conveyor (check-out)	0.1	S9	Soldering Gun or Iron	0.1
B6	Vacuum Cleaner	0.7	R4	Film Processing	3.0	S10	Welder	30 (120)
			R5	Photo Equipment	1.7			
	Medical/Hospital		R6	Pinball or Video Game	0.5		**Laundry**	
M1	Autoclave	1.2	R7	Hair Dryers	1.0	L1	Clothes Dryer, Residl.	1.4 (15)
M2	CAT Scan Machine	75	R8	Exercise Equipment	1.0	L2	Clothes Washer, Residl.	0.9
M3	Centrifuge	4.2	R9	Industrial Compactor	2.8	L3	Clothes Dryer, Commcl.	5 (28)
M4	Chromatograph, analyzer	1.5	R10	Vending Machine, Hot Food	0.8	L4	Clother Washer, Commcl	8.5
M5	Cytometer, blood analyzer	2.0	R11	Vending Machine, Non-Refrig.	0.4	L5	Dry Cleaning Unit	14
M6	Dentist Chair	0.5	R12	Water Vending Machine	0.6	L6	Sewing Machine	0.1
M7	EKG Machine	0.3						
M8	Hot Plate, Lab Equipment	2.5 (20)					**Space Comfort**	
M9	Incubator	1.5				C1	Air Cleaner	0.5
M10	Laboratory Oven	1.5 (15)				C2	Ceiling or Portable Fan	0.2
M11	Laboratory, other equip.	1 (10)				C3	Dehumidifier	0.6
M12	Sterilizer	1.0 (10)				C4	Humidifier	0.5
M13	X-Ray Machine	4.6				C5	Portable Heater	1.4 (10)

Motors/Engines

								Nameplate Data						
Comp ID	**Item #**	**Area ID**	**Process/Application Type**	**Service Type**	**Control Type**	**Drive Type**	**# of motors**	**Size (hp)**	**RPM**	**NEMA Encl. Type**	**NEMA Nom. Eff.****	**Load Type**	**Avg Age (yrs)**	**Avg run hrs per week***

* "Avg run hrs per week" estimate is required for each motor item.

** Enter Nominal Efficiency as a % or if not available, use: **S**=Standard **H**=High-efficiency **P**=Premium-eff.

*** Avg run hrs per week for escalators\elevators is the approx # of hours that the system is being used to transport people. Estimate from business hours and approx. usage type (high/medium/low) or absolute # of hours used.

Motor Codes

Service Type	Control Type	Drive Type	NEMA Encl. Type	Load Type
P : Pump	**T** : Throttled	**AC** : AC	**O** =Open drip-proof	**C** : Constant
F : Fan/Blower	**D** : Outlet damper	**DCS** : DC w/ SCR	**T** =Totally enclosed	**V** : Variable
M: Material Handling/conveyor	**M** : Mechanical VSD	**DCM** : DC w/ MGS	fan-cooled	**I** : Intermittent
T : Machine Tool	**E** : Electronic VSD	**EG** : Nat gas driven	**OT** = Other	
G : Grinding/milling	**C** : Constant Speed	**FG** : Fossil driven		
E : Escalator***	**I** : Inlet vane	**SD** : Steam driven		
PE : Passenger Elevator***	**O** : Other _____			
FE : Freight Elevator***				
S : Separation				
O : Other _____				

Air Compressors

Does the facility have a Leak Reduction Maintenance Program? ☐ YES ☐ NO

									Nameplate Data					
Comp ID	**Item #**	**Area ID**	**Description**	**Comp Type**	**Appl Type**	**Control Type**	**Drive Type**	**# of units**	**Size (hp)**	**RPM**	**NEMA Encl. Type**	**NEMA Nom. Eff.****	**Avg Age (yrs)**	**Avg run hrs per week***

* "Avg run hrs per week" estimate is required for each air compressor item
** Enter Nominal Efficiency as a % or if not available, use: **S**=Standard **H**=High-efficiency **P**=Premium-efficiency

Air Compressor Codes

Compressor Type	Application Types	Control Type	Drive Type
RTD: Reciprocating (Two-stage, Double-acting)	**C**: Cleaning	**S**: Start/Stop	**AC**
RSD: Reciprocating (Single-stage, Double-acting)	**T**: Drives tools	**L**: Load/Unload	**DCS**: DC w/ SCR
RTS: Reciprocating (Two-stage, Single-acting)	**H**: HVAC Pneumatic	**V**: VSD Throttling	**DCM:** DC w/ MGS
RSS: Reciprocating (Single-stage, Single-acting)	**O**: Other _____	**T**: Throttling	**EG**: Nat gas driven
ST: Rotary Screw, Two-stage		**O**: Other _____	**FG**: Fossil driven
SS: Rotary Screw, Single-stage			**SD**: Steam driven
C: Centrifugal			
O: Other _____			

Process Equipment (Non-Motor)

								Primary Fuel		Secondary Fuel			
Comp ID	Item #	Area ID	Process Equip Code	Product Produced	Boiler #	# of units	Avg Unit Capacity** kW/kBtuh	Fuel	% of Annual Btu	Fuel	% of Annual Btu	Avg Age (yrs)	Avg hrs per week*
								E G O	%	E G O	%		
								E G O	%	E G O	%		
								E G O	%	E G O	%		
								E G O	%	E G O	%		
								E G O	%	E G O	%		
								E G O	%	E G O	%		
								E G O	%	E G O	%		
								E G O	%	E G O	%		

* "Avg hrs per week" estimate is required for each process equipment item.
** Specify kW for electric equipment, kBtuh for all others.

Process Equipment Codes

Heat Processing:	
Direct Fired Gas Heating	DFGH
Direct Fired Oil Heating	DFOH
Blanchers	BLNCH
Microwave	MICROHP
Sterilizers	STER
Pasteurizers	PAST
Induction Heating	INDCTHTG
Induction Melting	INDCTMLT
Radio Frequency	RFHP
Indirect Resistance	INDIRES
Direct Resistance	DIRRES
Encased Resistance	ENCRES
Plasma Processing	PLSMHP
Electric Arc Furnace	ELARCFRN
Ion Nitriding	IONNIT
Laser Hardening	LASER
Cupola	CUPOLA
Dehydration:	
Convection Dryer	CONVDR
Infrared Dryer	IRDR
ElectricResistanceDrying	ELRESDH
Microwave Dryer	MICRODH
Material Preparation:	
Arc Welding	ARCWLD
Laser Cutting	LASERCT
Water Jet Cutting	WTRJET
Electron Beam Welding	EBWMP
Laser Welding	LASERWLD
Plasma Cutting	PLSMMP
Filtration:	
Pressure Filters	PRESFLT
Vacuum Filters	VACFLTR
Finishing:	
Ovens	OVENF
Electroplating	ELPLT
Hot Dip Galvanizing	HDG

Pulping:	
Batch Digesters	DIGST
Stock Refiners	STKREF
Paper Preparation:	
Pulpers	PULP
Refiners	REFNR
Stock Mixers	STKMXR
Separation and Distillation:	
Thermal Distillation Column	THRMDC
Freeze Concentration	FRZCON
Vacuum Condensation	VACCON
Membrane Separation	MEMSEP
Pressure Swing Absorption	PSA
Vacuum Concentration	VACCNTR
Ultra Filtration	ULTRAFLT
Reverse Osmosis	REVOS
Evaporators	EVAP
Solid-Liquid Extraction:	
Single Stage Extractors	SSEXT
Multi-Stage, Static Bed Extractors	MLTEXT
Continuous Moving-Bed Extractors	CONBED
Plastic Molding:	
Injection Molding	INJMLD
Extrusion Molding	EXTMLD
Blow Molding	BLWMLD
Rotational Molding	ROTMLD
Compression Molding	COMPMLD
Thermoforming	THRMFRM
Washing and Drying:	
Rotary Kilns	ROTKLN
Cascade Dryer	CASCDR
Fluidized Bed Dryer	FBD
Suspension Dryer	SUSPDR

Drying/Curing/Baking:	
Ovens	OVENDCB
Microwave	MICRODCB
Infrared	IR
Electric Resistance	ELRES
Steam from Process Boiler	STM
Ultraviolet	UV
Kiln	KILN
Radio Frequency	RFDCB
Electron Beam	EBDCB
Refrigeration/Freezing:	
Forced Air Cooling	FORAIR
Blast Freezing	BLSTFRZ
Hydrocooling	HYDRCL
Belt Freezing	BLTFRZ
Plate Freezing	PLTFRZ
Vacuum Cooling	VACCL
Immersion Freezing	IMMFRZ
Mixing and Emulsification:	
Pressure Homogenizers	PRSHOM
Ultrasonic Emulsification Devices	ULTRAEMD
Fiber Preparation:	
Dye Tanks	DYE
Crystallization:	
Oil Winterization	OILWNTR
Freeze Concentration	FRZCONC
Ice Crystallization	ICECRYS
Lactose Crystallization	LACCRYS
Fat Crystallization	FATCRYS
Screening and Separation:	
Froth Floatation Baths	FRTH
Exploration and Drilling:	
Engine Driven Boring Equipment	ENGBOR
Emission Reduction Equipment:	
Standard Thermal Oxidizer	STHOX
Recuperative Thermal Oxidizer	RTHOX
OTHER	OT

General Comments

CompID	Form #	Item #	Comments

Site Photo Log

Record site photo information here including the PhotoID (i.e. digital file name) and a brief description of the photo where needed. Refer to the training manual for protocols on what photos to take and photo/file naming conventions.

Item #	PhotoID	Description/Comments
1		
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

Short-Term Metered Data

Installation date/time _____ **Extraction date/time** _____ **Duration (days)** _____

Item #	End Use / Type L=Ltg F=Fan	Logger ID#	Survey Form System Reference		# of Contrld Fixtures – or – % Cond	Location / Notes / Comments
			Comp ID	Item#'s – or – System Ltr / #		
1	L F					
2	L F					
3	L F					
4	L F					
5	L F					
6	L F					

Additional Comments:

APPENDIX B: ANNOTATED SURVEY INSTRUMENT

Site ID Number
SiteID

CALIFORNIA COMMERCIAL END-USE SURVEY (CCEUS) 2002/2003

Rev. 10/17/02

Site Contact Information: tblSITEINFO

Business Name: __*BusName*__ __

Street Address: __ *Street*__ __

City, State: __ *City*__ , *State*

Zip Code: __ *Zip*__ __ __ __ - *Zip4*__ __ __ __

Contact Name: __ *Contact*__ __ __ __ __ __ __ __ *ContactLast*__ __ __ __ __ __ __ __ __

Contact Title: __ *Title*__ __

Contact Phone #: *(Phone)* __ __ - __ __ __ __ ext. *PhoneExt*__

Contact Name 2: __ *Contact2*__ __ __ __ __ __ __ __ *ContactLast2*__ __ __ __ __ __ __ __ __

Contact Title 2: __ *Title2*__ __

Contact Phone 2: *(Phone2)*_ __ - __ __ __ __ ext. *PhoneExt2*__

Email Address: __ *email*__ __

FAX #: (*Fax*) __ __ __- __ __ __ __

Blue Text = Data incorporated into the building simulation model
Red Text = Data not used in the building simulation model

Survey Tracking Information: tblTRACK

Survey Team (circle one) **ADM** **Xen** **VT** *survcomp*

	Date:	**Initials**
Field survey completed:	*SurveyD*	*SurveyI*
Survey received from surveyor:	*SurRecD*	*SurRecI*
Quality Control check completed:	*QualityD*	*QualityI*
Data entry completed:	*RERDataD*	*RERDataI*
Survey received at RER:	*RERSurvD*	*RERSurvI*

☐ QC

Table of Contents

Premise-Level Forms **Form #**
Premise-Level General Information 1
Business/Building Type Codes ..... BT
Electric and Natural Gas Accounts and Meters 2
Other Energy Service Accounts and On-Site Power Generation 3
Shared Services and/or Meters 4
Recent Energy-Efficiency Measures 5
Premise/Site-Plan Sketch 6a
Premise/Component-Plan Sketch 6b
Premise/Component Survey Planning Worksheet 7
Component Location with Premise 8
Premise-Level Schedule Definitions (Holidays and Seasonal Operation Periods) 9
Schedule Set Definitions (Primary/Seasonal/HVAC/Hourly Primary/Seasonal) 10a/10e
Building Shell Construction Codes 11a/11c
Component-Level Forms
Component: General Information 12
Component: Footprint Shapes ..... FP
Component: Footprint, Adiabatic Walls, and Windows/Doors 13
Component: Actual Floor Plan/Elevation Sketch 14a
Component: Thermal Zoning/Building Simulation Sketch 14b
Component: Activity Area and Thermal Zone Definitions 15
Component: Activity Area Type Codes ..... AA
Component: Daylighting 16
Equipment Inventory Forms
HVAC - Single Zone Systems 17
HVAC - Multiple Zone Systems and Controls 18a/18b
HVAC Code Descriptions ..... HC
Chillers and Circulation Pumps for Chillers 19
Heat Rejection (Built-up) and Thermal (Cool) Storage Systems 20
Boilers and Hot Water Circulation Pumps 21
HVAC Equipment Manufacturer and Model Number Information 22
Exhaust Fans and Make-Up Air Units 23
Water Heating Equipment 24
Service Hot Water Use (General and Building-Type Specific) 25
Swimming Pool/Spa 26
Outdoor Lighting 27
Indoor Lighting (2 identical sheets) 28
Office Equipment 29
Cooking/Food Service Equipment 30
Self-Contained Refrigeration Equipment - 31
Remote Refrigeration Equipment – Display Cases and Walk-Ins 32a
Remote Refrigeration Equipment – Compressors and Condensers 32b
Miscellaneous Equipment 33
Motors/Engines (Process Related) 34
Air Compressors 35
Process Equipment (Non-Motor) 36
General Comments 37
Site Photo Log 38
Short-Term Metered Data 39

tblSITEINFO

Premise-Level General Information

PRIMARY BUSINESS TYPE CODE: SiteCode *(Use codes from the Business Type table, Form BT)*

Premise Business Type Description

Uniqueness: Give a brief description about the type of work and/or primary product/service. What makes this premise unique from other businesses of this type?

___SiteBTDesc_____

Recent Survey Area Changes: Give a brief description about any changes made to this site since Jan. 2001 that significantly impacted energy usage.

____SurveyAreaChgs_____

Premise General Information

What kind of premise is this?: **P** = Part of a bldg **B** = 1 building, single footprint **MF** = 1 building w/multiple footprints **SM** = Small multi-building (all bldgs surveyed) **CM** = Campus (multi-bldg, subsampled bldgs) **OT** = Other __SiteTypeOther_____	SiteType
What is the total occupied floor area of this premise (excluding enclosed parking garage area)?	sqft* ft^2
-- If the premise has an enclosed parking garage, what is the floor area?	parkarea ft^2
How many buildings are part of this premise?	NumBuild
Is this premise owner-occupied (**O**) or leased (**L**)?	OwnOcc_Lease
What year was this business established at this location? (MM/YY)	YrEstab
What year was the majority of the facility built? (MM/YY)	YrBuilt
How many full-time equivalent employees work at this premise?	Employees
Sample segment identifier (2-digit code)	stratum
Sample frame SIC Code (4-digit)	SIC4
Is interval metered (load research) electric data available for this premise?	LR_Site
Was short-term metering performed for this premise (see Form 39)?	St_Meter

** Total premise floor area is computed from component-level totals, but is compared to this number.*

Business-Type Specific Information

Lodging:	Total number of usable rooms/residential units	*NumUnits*
	Average % of rooms occupied	*PctOcc* %
Office:	Average % of occupied (non-vacant) space	*PctOcc* %
Hospital:	Number of beds in hospital	*NumUnits*
	Average % of beds occupied	*PctOcc* %
Education:	Average number of enrolled students (e.g. ADA)	*NumUnits*

Business/Building Type Codes

Business Type	Code	Business Type	Code	Business Type	Code
Offices (Non-Medical):		**Retail Store:**		**Lodging:**	
Administration and management	011	Department / Variety Store	041	Hotel	081
Financial / Legal	012	Retail Warehouse/Clubs	042	Motel	082
Insurance/Real Estate	013	Shop in Enclosed Mall	043	Resort	083
Data Processing/Computer Center	014	Shop in Strip Mall	044	Other Lodging	084
Mixed-Use/Multi-tenant	015	Auto Sales	045	**Public Assembly:**	
Lab/R&D Facility	016	Other Retail Store	046	Religious Assembly (worship only)	091
Software Development	017	**Warehouse:**		Religious Assembly (mixed use)	092
Government Services	018	Refrigerated Warehouse	051	Health/Fitness Center	093
Other Office	019	Unconditioned Warehouse, High Bay	052	Movie Theaters	094
Restaurant/Food Service*:		Unconditioned Warehouse, Low Bay	053	Theater / Performing Arts	095
Fast Food or Self Service	021	Conditioned Warehouse, High Bay	054	Library / Museum	096
Specialty/Novelty Food Service	022	Conditioned Warehouse, Low Bay	055	Conference/Convention Center	097
Table Service	023	**Health Care:**		Community Center	098
Bar/Tavern/Nightclub/Other	024	Hospital	061	Other Recreational/Public Assembly	099
Other Food Service	025	Nursing Home	062	**Services:**	
Food Stores:		Medical/Dental Office	063	Gas Station / Auto Repair	101
Supermarkets	031	Clinic/Outpatient Care	064	Gas Station w/Convenience Store**	102
Small General Grocery	032	Medical/Dental Lab	065	Repair (Non-Auto)	103
Specialty/Ethnic Grocery	033	**Education:**		Other Service Shop	104
Convenience Store**	034	Daycare or Preschool	071	**Miscellaneous:**	
Liquor Store	035	Elementary School	072	Assembly / Light Mfg.	111
Other Food Store	036	Middle / Secondary School	073	Police / Fire Stations	112
		College or University	074	Post Office	113
		Vocational or Trade School	075	**Other** *Describe on Form 1*	130

* *For Restaurant/Food Service businesses, be sure to complete # of meals (Breakfast/Lunch/Dinner) on Form 25.*

** *Convenience stores that do not sell gasoline should be coded as 034; convenience stores that do sell gasoline should be coded as 102.*

Electric Accounts and Meters tblEACCOUNTS

Utility/Provider Eutility	SDG&E	PG&E	SCE	SMUD	LADWP	Other *EUtility_other*

Item # Item	**Meter Number:**	**Account Number:**	**Meter Status Code**
E1	MeterNum	AcctNum	mtr_stat_cd
E2	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
E3	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
E4	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
E5	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
E6	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
E7	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
E8	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
E9	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
E10	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT

Natural Gas Accounts and Meters tblGACCOUNTS

Utility/Provider gutility	SDG&E	PG&E	SCG	Other gutility_other

Item # Item	**Meter Number:**	**Account Number:**	**Meter Status Code**
G1	MeterNum	AcctNum	mtr_stat_cd
G2	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
G3	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
G4	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
G5	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
G6	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
G7	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
G8	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
G9	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT
G10	_ _ _ _ _ _ _ _ _ _ _ _	_ _ _ _ _ _ _ _ _ _ _ _	V A D NI ND OT

Meter Status Codes

V	Verified: Meter is listed on the Customer Contact sheet and was verified during the onsite visit
A	Add this meter: It was found onsite but was not listed on the Customer Contact sheet
D	Delete this meter: It was listed on the Customer Contact sheet but does not exist or does not service the surveyed area
NI	Meter not verified, Inaccessible: Explain why in comments
ND	Meter not verified, Access Denied: Explain why in comments
OT	Other situation: describe in comments block

Electric/Gas Account Notes: tblComment2.Form2

Other Energy Service Accounts tblOTHERACCTS ☐ N/A

(If bills are available, attach copy to survey form)

Item #	Fuel Type	Bills Available?	Meter/Account /Identification Number:	Utility / Provider	AvgAnnual Usage&Units*
Item	FuelType	BillsAvailable	MeterNum	Utility	AvgUsage
O1	Bottled Gas (LPG)	Y N	__ __ __ __ __ __ __ __ __		
O2	Purchased Chilled Water	Y N	__ __ __ __ __ __ __ __ __		
O3	Purchased Steam	Y N	__ __ __ __ __ __ __ __ __		
O4	Other _____	Y N	__ __ __ __ __ __ __ __ __		

* Units of usage should be whatever appears on the bill, for example therms, ft^3, gallons, etc.

On-Site Power Generation tblONSITGEN ☐ N/A

Cogeneration, self-generation, solar cell/photovoltaic system, and emergency generators.

Item #	# Item	#
Type: **I** = Internal Combustion Engine **G** = Gas Turbine **M** = Micro-turbine **C** = Combined Cycle **S** = Solar array/Photovoltaic **O** = Other PlntType_oth	PlntType	I G M C S O
Is this an emergency generator (check box if yes)?	EmerGen	☐
-- How often is it tested? (then skip to Manufacturer)	TestInterval	
What is the plant generation capacity? (kW)	PlntCap	
Fossil Fuel Type (if applicable): **G** = Natural Gas **F** = Fuel Oil **O** = Other Fuel_Oth	FuelType	G F O
Use for generated power: **P** = Peak Shaving **B** = Base load **O** = Other UseOther	Use	P B O
What percent of generated electricity is sold back to the utility?	SoldBack	%
Average operating hours per day (If seasonal, describe operation below)	AveHrs	
Number of operating days per year	NoOfDays	
Use of waste heat: **S** = Space ht **W** = Water ht **P** = Pool **N** = None **O** = Other WasteOth	WasteHt	S W P O
Average heat output (kBtu/hr)	HeatOut	
What fraction of the waste heat is utilized?	FracUtil	%
Manufacturer:	Manuf	
Model:	Model	
Location (Component and Area ID)	Loc_Area	
Components Served	CompServ	

Other Energy Services/Generation Notes: tblComment2.Form3

Shared Services and/or Electric/Gas Meters ☐ N/A

Off-Site Central Equipment Providing Service to Surveyed Premise ☐ N/A

Complete this table when the premise is receiving heating or cooling from a central system which is not part of the premise being surveyed (i.e. the heating/cooling equipment - boilers and chillers - are connected to a utility service meter other than those serving the premise).

tblSHARCNTR	Item #	# *Item*	# ___	# ___
Equipment Type: **C** = Chiller **B** = Boiler **O** = Other *EqDesc*		EquipTyp	C B O	C B O
Equipment Fuel Type: **E** = Electricity **G** = Natural Gas **F** = Fuel Oil **L** = LPG		FuelType	E G F L	E G F L
Total Capacity	-7	Cap		
Units for Capacity **T** = Tons **B** = kBtuh **W**=kW **H**=HP		CapUnit	T B W H	T B W H
Percent of total capacity utilized by survey area	-7	CapPer	%	%

Surveyed Premise Central Equipment Serving Non-Surveyed Areas ☐ N/A

Complete this table when equipment that predominantly serves the surveyed premise provides services to an area that is not part of the surveyed premise. Provide some basic information about the non-surveyed area that will be used to estimate its impact on the survey areas shared equipment.

tblSHARCOMM

#	Bldg Type Code (Form BT)	Elec/Gas Meter Item # (E,G)	Non-Surveyed Area Floor Area (Sq. Ft.)	% Heated	% Cooled	Shared Equipment/Comments
Item	ActCode	AcctItem	FlrArea	PctHeat	PctCool	Comment
2				%	%	
3				%	%	
4				%	%	
5				%	%	

Shared Meters ☐ N/A

For shared electric and gas meters (i.e. also serve non-surveyed areas), estimate the % of metered energy used by the surveyed site.

tblSHAREMTR

#	Elec/Gas Meter Item # (E,G)	Percent used by Surveyed Premise	Non-Surveyed Area Bldg Type Code	End Uses Shared/Comments
Item	MtrItemNum	Pct_used	NonSurvBTCode	EUShar_Cmt
2		%		
3		%		
4		%		
5		%		
6		%		

Recent Energy-Efficiency Measures tblEE_MEASURE ☐ N/A

Ask your site contact about energy efficiency measures installed after January 2002. Provide a brief description of the measure, an Enduse Code, and any additional relevant comments (building/space where installed, why installed, etc.). Before leaving the premise, ask your contact about any additional measures observed during the onsite survey. For reference, a table of typical energy-efficiency measures by end use is presented on the facing page.

Item #	Measure Description	Enduse Code	Comments (where, why, when?)
Item	measure	EndUseCode	Comments

Recent Energy Efficiency Measures (cont.)

Energy-Efficiency Measures - Reference Table

LIGHTING EQUIPMENT (EnduseCode=LT)
- T-8, T-5, or equivalent high-efficiency fluorescent lamps
- Super T-8 lamps
- Hard-wired 1 or 2 lamp Compact Fluorescent fixtures
- Low-power electronic ballasts
- Specular reflectors
- Pulse-start metal halide lamps/ballasts
- Other non-fluorescent high-efficiency lighting systems
- Timeclocks
- Daylighting controls
- Occupancy controlled hi-low switching
- Programmable controllers
- Delamping
- LED exit signs

HVAC EQUIPMENT (EnduseCode=HV)
- High efficiency unitary/package equipment
- High efficiency chiller(s)
- VSD/ASD chillers, pumps, or fans
- High Efficiency HVAC pumps
- High Efficiency fan motors
- Ground-source heat pumps
- Water-cooled unitary/package equipment
- Economizers (air-side or water-side)
- Evaporative condensers
- Thermal storage system
- Low temperature air distribution system
- Conversion to VAV from CV system

HVAC CONTROLS (EnduseCode=HC)
- Energy Management/Control system
- Optimal start/stop
- Chiller sequencing/optimization
- Static pressure reset on HVAC system demand
- Outside air intake control (CO2, VOC, or other sensor)
- Chilled water / hot water reset
- Night ventilation
- Demand controlled ventilation

BOILERS (EndUseCode=BO)
- High efficiency boilers
- VSD on feedwater pumps
- VSD on draft fans w/auto pressure control

MOTORS (EndUseCode=MO)
- High efficiency process (non-HVAC) motors
- VSD process (non-HVAC) motors

COMMERCIAL REFRIG. (EndUseCode=RF)
- Multiplex rack systems to replace conventional system
- High-efficiency (T8s) case lighting
- Ambient or mechanical subcooling
- Evaporative and/or oversized condensers
- VSD condenser fan
- Scroll compressors
- Heaterless doors (triple pane)
- Heat pipe on HVAC unit with coil bypass
- Low temperature air distribution
- Electronically controlled Thermal Expansion Valves
- Distributed refrigeration systems

MISCELLANEOUS EQUIPMENT (EndUseCode=MI)
- Ultrasonic Humidifiers
- VSD Fume hoods
- Fume hood measures other than VSD
- CO sensors for garage exhaust fans

WHOLE-BUILDING (EndUseCode=WB)
- Optimized building system design
- Energy management/control system

BUILDING ENVELOPE (EndUseCode=BE)
- Low-e windows
- Low-e^2 (spectral LowE) windows
- Tinted/Reflective windows
- Dual Pane windows
- Gas-filled windows
- Above-code roof or wall insulation

OTHER (EndUseCode=OT)

Premise/Site-Plan Sketch

This sketch should provide a high-level view of the premise and its surroundings as it is actually configured. Attach site plans and floor plans available from other sources. Sketch all buildings and the closest streets/roadways in both directions. Mark the orientation of True North. For multiple building sites, indicate where meters are located, and the boundaries of different Component Survey areas. Indicate any significant shading provided by adjacent trees or buildings. Use multiple sheets/drawings if necessary. Also indicate the "front" or primary entrance for each building.

Premise/Site-Plan sketch comments: tblCOMMENT2.Form6a

Premise/Component-Plan Sketch

This sketch should provide a view of the premise as represented by components. Sketch the components and their orientation to other components. Reference the previous sketch and indicate which buildings have been modeled as components. Indicate Plan North (PN) for each component as well as the orientation of True North. Use multiple sheets/drawings if necessary. Also indicate the "front" or primary entrance for each building/component.

Premise/Component sketch comments: tblCOMMENT2.Form6b

Premise/Component Survey Planning Worksheet * ☐ N/A

Complete this worksheet for every component on the premise. Identify all components, provide a brief description, record Total Surveyed Floor Area, the Total FloorArea represented by the survey area, the Component Weight, assign a Schedule Set # (from Form 10), and provide any additional comments.

tblSHELLCMPINFO

Item #	Component ID (A – Z)	Surveyor's Description of Business / Activity Type	Total Surveyed Floor Area, ($ft^{2)}$ (A)	Total Floor Area Represented, ($ft^{2)}$ (B)*	Component Weight (B/A)	Form 10 Schedule Set #
1	ShellCmpID	Actvty_typ	** SCTotSurvFlrArea	SCTotFlrArea	CmpMult	SchdSetNumber
2						
3						
4						
5						
6						
7						
8						
9						
10						
		Totals				

* Total Floor Area Represented will not be equal to Total Surveyed Floor Area only in a subsampling situation.

Comments: tblComment2.Form7

** The data here is the same as the corresponding data on Form 12; they are linked via the data entry system.*

*** SCTotSurvFlrArea is used in eQ as component Floor Area*

Component Location within Premise

Choose one of the two methods (Orientation & Distance or Exact Coordinates) to indicate a component's location within the premise, with respect to another component.

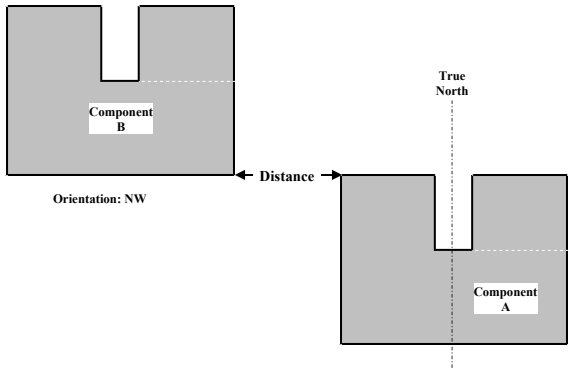
tblSHELLCMPINFO

Item #	Component ID (A – Z)	Position this Component relative to Component….	Orientation & Distance: Specify orientation and the closest distance between these components		Exact Coordinates: Specify the xyz coordinates of the left-most points with respect to Plan North		
			Orientation*	Distance (ft)	x (ft)	y (ft)	z (ft)
	ShellCmpID	RelPos	RelOrient	Distance	ExactX	ExactY	ExactZ
1		*RelatedComponent*					
2							
3					↑[If using these then don't need RelOrient and Distance]		
4							
5							
6							
7	A	A or --	--	--	--	--	--
8	B	(A)	N	100	--	--	--
9	C	(B)	--	--	10	200	50
10					↑[E > 0]		

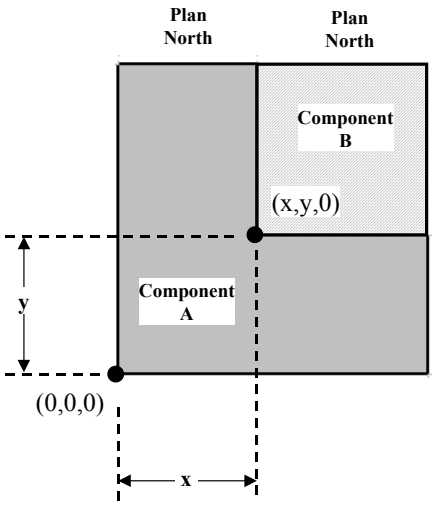
* Orientation here is with respect to True North, not Plan North, e.g. **N**, **S**, **E**, **W**, **ENE**, **NE**, **SSE**, etc. Other options: Use "**A**" to position a component directly above or "**B**" to position a component directly below the reference component, or ("**ST**") to represent a stand-alone building distant from other buildings (i.e. a default Distance will be used).

Component Location Methods

Orientation and Distance Method



Exact Coordinate Method



Premise-Level Schedule Definitions

Standard Holidays *(check all that apply)* tblHolidays ☐ N/A

Indicate below which, if any, standard holidays that the business is closed or operation deviates drastically from normal/typical operations, and indicate on Form 10a and 10b what the holiday operation hours are. Indicate any additional holidays in the comment block.

New Year's Eve Hol20		☐	July 4th Celebrated Hol11		☐
New Year's Day	Hol1	☐	Labor Day	Hol12	☐
New Year's Day Celebrated	Hol2	☐	Columbus Day Hol13		☐
Martin Luther King Day	Hol3	☐	Veterans' Day	Hol14	☐
Presidents' Day	Hol4	☐	Thanksgiving Hol15		☐
St. Patrick's Day	Hol5	☐	Thanksgiving Friday	Hol16	☐
Easter Sunday	Hol7	☐	Christmas Eve	Hol17	☐
Memorial Day	Hol8	☐	Christmas Day	Hol18	☐
Flag Day	Hol9	☐	Christmas Day Celebrated Hol19		☐
July 4th	Hol10	☐	Caesar Chavez Day*	Hol6	☐

** Not currently included in building simulations.*

Seasonal Operation Periods tblSITEINFO ☐ N/A

Define seasonal operation periods for significant periods of time where business hours and/or equipment operation differs significantly from normal or typical business hours and/or equipment operation. To indicate seasonal operation periods, provide a brief description of the period (e.g., "spring break", "winter break", "summer break", "extended holiday hours"), and list the beginning/ending months (1-12) and days for up to three time periods.

TIME PERIOD 1			TIME PERIOD 2			TIME PERIOD 3		
Description (SeasOpDesc1)			Description (SeasOpDesc2)			Description (SeasOpDesc3)		
Begin Month/Day	BegMo1	BegDay1	Begin Month/Day	BegMo2	BegDay2	Begin Month/Day	BegMo3	BegDay3
End Month/Day	EndMo1	EndDay1	End Month/Day	EndMo2	EndDay2	End Month/Day	EndMo3	EndDay3

Holiday and Seasonal Operation Comments: Comment2.Form9

Schedule Set #: *tblSCHEDSET.SchdSetNumber* Primary Schedules (1/5)

Description _____ *tblSCHEDSET.SS_Desc*_____

Specify up to 3 schedule sets (i.e. Forms 10a through 10e as needed) per premise. Schedule sets are assigned to components on the Premise/Component Survey Planning Worksheet.

Primary Business Hours *tblOPERSCHD.Season = 1 (for primary schedule)*

Define typical operation for all Day Types listed below and specify hours in military time (00 to 24). For partial (i.e. not full) operation days, also indicate the approximate % of full operation as Partial Op %.

Day Type DayType	Business Hours	Closed All Day?	Open 24 hrs?	PartialOp%
Monday *(1)*	from *FromHour* to *ToHour*	*IsClosed* ☐	*Open24* ☐	*PartOpPct*
Tuesday *(2)*	from __ __ to __ __	☐	☐	
Wednesday *(3)*	from __ __ to __ __	☐	☐	
Thursday *(4)*	from __ __ to __ __	☐	☐	
Friday *(5)*	from __ __ to __ __	☐	☐	
Saturday *(6)*	from __ __ to __ __	☐	☐	
Sunday *(7)*	from __ __ to __ __	☐	☐	
Holidays *(8)*	from __ __ to __ __	☐	☐	

Primary Occupancy and Equipment Operation Schedules *tblSCHEDULE.Season = 1*

Define operation schedules as listed below for all schedule types applicable to the surveyed area. Draw a line through those schedules that do not apply to the surveyed area. If equipment operation varies significantly from business hours, then check "Hrly Sched" box and specify equipment operation using the optional hourly schedules on Form 10d.

Schedule Type	Parameter	Value during Bus. Hours	Value outside of Bus. Hours*	OR Hrly Sched
Occupancy (applied to occupants on Form 15)	% of typical max hourly occup.	*AvgHrOccPct*	*AvgHrUnoccPct*	*AvgHrOcc_Hrly*
Indoor Lighting* **	% of Equip On	*ILightOccPct*	*ILightUnoccPct*	*ILight_Hrly*
Office Equipment	% of Equip On	*OffEquipOccPct*	*OffEquipUnoccPct*	*OffEquip_Hrly*
Miscellaneous Equipment	% of Equip On	*MiscOccPct*	*MiscUnoccPct*	*Misc_Hrly*
Cooking Equipment	% of Equip On	*CookOccPct*	*CookUnoccPct*	*Cook_Hrly*
Motors/Air Compressors/Process Equipment	% of Equip On	*ProcessOccPct*	*ProcessUnoccPct*	*Process_Hrly*
Outdoor Lighting** PHOTOCELL ☐ OR Specify typical operating hours	Hour (1-24) that lights….	go off:** *OlightHrOff*	come on:** *OlightHrOn*	*Olight_Hrly*
HVAC Schedule => Complete Form 10c				

* Do not use a value of zero (0) unless ALL equipment is really off as verified by site contact.
** If all outdoor lighting is photocell controlled, check the photocell block and leave the on/off hours blank.
*** Use the hourly schedule option for lighting whenever it is possible to obtain detailed operation information.

SeeForm10a

Schedule Set #: tblSCHEDSET.*SchedSetNumber* Seasonal Schedules (2/5)

If seasonal operation is indicated on Form 9, specify the corresponding seasonal business hours, occupancy, HVAC, and equipment operation for each schedule set.

Sec_NA ☐ **Check box if seasonal periods indicated on Form 9 are <u>not</u> applicable to this schedule set**

Seasonal Operation Business Hours tblOPERSCHD.*Season = 2 (for seasonal schedule)*

Define typical operation for <u>all</u> Day Types listed below and specify hours in military time (00 to 24). For partial (i.e. not full) operation days, also indicate the approximate % of full operation as Partial Op %.

Day Type	Business Hours	Closed All Day?	Open 24 hrs?	PartialOp%
Monday	from __ __ to __ __	☐	☐	
Tuesday	from __ __ to __ __	☐	☐	
Wednesday	from __ __ to __ __	☐	☐	
Thursday	from __ __ to __ __	☐	☐	
Friday	from __ __ to __ __	☐	☐	
Saturday	from __ __ to __ __	☐	☐	
Sunday	from __ __ to __ __	☐	☐	
Holidays	from __ __ to __ __	☐	☐	

Seasonal Occupancy and Equipment Operation Schedules tblSCHEDULE.*Season = 2*

Define operation schedules as listed below for all schedule types applicable to the surveyed area. Draw a line through those schedules that do not apply to the surveyed area. Use hourly schedules if indicated on Form 10a.

Schedule Type	Parameter	Value <u>during</u> Bus. Hours	Value <u>outside</u> of Bus. Hours*
Occupancy (applied to occupants on Form 15)	**% of typical max hourly occup.**	__ __ %	__ __ %
Indoor Lighting	**% of Equip On**	__ __ %	__ __ %
Office Equipment	**% of Equip On**	__ __ %	__ __ %
Miscellaneous Equipment	**% of Equip On**	__ __ %	__ __ %
Cooking Equipment	**% of Equip On**	__ __ %	__ __ %
Motors/Air Compressors/Process Equipment	**% of Equip On**	__ __ %	__ __ %
Outdoor Lighting** **PHOTOCELL** ☐ <u>OR</u> Specify typical operating hours	**Hour (1-24) that lights….**	**go off:**** hr __ __	**come on:**** hr __ __

* Do not use a value of zero (0) unless ALL equipment is really off as verified by site contact.

** If <u>all</u> outdoor lighting is photocell controlled, check the photocell block and leave the on/off hours blank.

Schedule Set #: *SchdSetNumber* HVAC Schedules (3/5)

Specify at least 1 HVAC schedule for each schedule set, and assign these schedules at the HVAC system level. Use additional pages if more than 2 schedules are needed. For 100% unconditioned components, this form may be left blank. ***Note:*** *Unless 7/24 operation is indicated, values for all fields must be entered in both the "Occupied" and "Unoccupied (setback/setup)" columns.*

tblSCHDHVAC

HVAC Schedule #: *HVACSched* **Description** *HVACSchedDesc*_____

Primary Schedule (*Season = 1*)

Description	Occupied Condition	Unoccupied (setback/setup)
Cooling Setpoints (90 = Off)	*CoolOccTemp* °F	*CoolUnoccTemp* °F
Heating Setpoints (50 = Off)	*HeatOccTemp* °F	*HeatUnoccTemp* °F
Fan Operation (on/off): Occupied temps apply	*FanOnBefore* __ **# of hours before opening***	*FanOffAfter* __ **# of hours after closing****
Fan Control: **A** = Always on/continuous **C** = Cycles w/HeatCool **O** = Off **M** = Manual/as-needed **N** = Night cycling	*Fan_Ctrl_Occ* A C M	*Fan_Ctrl_Unocc* A C O M N

Seasonal Operation Schedule (*Season=2*)

Description	Occupied Condition	Unoccupied (setback/setup)
Cooling Setpoints (90 = Off)	__ __ °F	__ __ °F
Heating Setpoints (50 = Off)	__ __ °F	__ __ °F
Fan Operation (on/off): Occupied temps apply	**# of ___ hours before opening***	**# of ___ hours after closing****
Fan Control: **A** = Always on/continuous **C** = Cycles w/HeatCool **O** = Off **M** = Manual/as-needed **N** = Night cycling	A C M	A C O M N

* Use a value of 24 to indicate 7/24 operation

** Use a negative value to indicate # of hours before close.

HVAC Schedule #: ___ **Description** _____

Primary Schedule

Description	Occupied Condition	Unoccupied (setback/setup)
Cooling Setpoints (90 = Off)	__ __ °F	__ __ °F
Heating Setpoints (50 = Off)	__ __ °F	__ __ °F
Fan Operation (on/off): Occupied temps apply	**# of ___ hours before opening***	**# of ___ hours after closing****
Fan Control: **A** = Always on/continuous **C** = Cycles w/HeatCool **O** = Off **M** = Manual/as-needed **N** = Night cycling	A C M	A C O M N

Seasonal Operation Schedule

Description	Occupied Condition	Unoccupied (setback/setup)
Cooling Setpoints (90 = Off)	__ __ °F	__ __ °F
Heating Setpoints (50 = Off)	__ __ °F	__ __ °F
Fan Operation (on/off): Occupied temps apply	**# of ___ hours before opening***	**# of ___ hours after closing****
Fan Control: **A** = Always on/continuous **C** = Cycles w/HeatCool **O** = Off **M** = Manual/as-needed **N** = Night cycling	A C M	A C O M N

tblSCHDENDUSE Season=1

Schedule Set #: *SchedSetNumber* Hourly Primary Schedules (4/5)

Use this form if equipment operation is independent of Business Hours as indicated on Form 10a/b. Use one block for each end use. Indicate the applicable daytypes for each day type schedule, and account for all day types including holidays. Specify the % of max. occupancy or equipment-on for all time periods, and be sure to accurately capture transition periods.

Hour		12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT *EndUse*

Applicable DayTypes		% of MaxOccupancy or Equipment On											
M T W T F S S H	AM	*pct_1*	*pct_2*	*pct_3*	*pct_4*	*pct_5*	*pct_6*	*pct_7*	*pct_8*	*pct_9*	*pct_10*	*pct_11*	*pct_12*
	PM	*pct_13*	*pct_14*	*pct_15*	*pct_16*	*pct_17*	*pct_18*	*pct_19*	*pct_20*	*pct_21*	*pct_22*	*pct_23*	*pct_24*
M T W T F S S H	AM	←[checkboxes for each spelled out]											
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		% of MaxOccupancy or Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		% of MaxOccupancy or Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

tblSCHDENDUSE Season=2

Schedule Set #: ____ Hourly Seasonal Schedules (5/5)

Use this form if equipment operation is independent of Business Hours as indicated on Form 10a/b and seasonal operation is used. Use one block for each end use. Indicate the applicable daytypes for each day type schedule, and account for all day types including holidays. Specify the % of max. occupancy or equipment-on for all time periods, and be sure to accurately capture transition periods.

Hour		12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		% of MaxOccupancy or Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		% of MaxOccupancy or Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		% of MaxOccupancy or Equipment On											
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												
M T W T F S S H	AM												
	PM												

Building Shell Construction Codes

Roof & Ceiling Construction

tblROOF

		Roof /Ceiling Code	Item	# ___	# ___
Roof Construction type	*From Roof/Wall Construction Codes table*		*RfType*	WF MF CWC CNO ADB	WF MF CWC CNO ADB
-- Attic / No Attic/ Mixed?	**A** = Attic **N** = No Attic **M** = Mixed		*AtType*	A N M	A N M
-- Sloped / Flat / Mixed Roof?	**S** = Sloped **F** = Flat **M** = Mixed		*RfSlope*	S F M	S F M
Exterior Insulation: R-Value	**0** = Uninsulated/None	-7	*RfExtInsRVal*		
External Surface Finish/ Material	*From Roof/Wall Construction Codes table*		*RfSurface*		
Roof Color	**C**=CoolRoof **D**=Dark **M**=Medium **L**=Light		*RfColor*	C D M L	C D M L
-- If cool/white roof, describe material			*RfCoolMat1*		
Interior Insulation R-Value	**0** = Uninsulated/None	-7	*RfIntInsRVal*		
Radiant barrier present?	**Y** = Yes **N** = No	-7	*RfRadBar*		
Suspended Ceiling?	**Y** = Yes **N** = No		*RfCeil*	Y N	Y N
Ceiling Insulation: R-Value	**0** = Uninsulated/None	-7	*RfCeilInsRVal*		
OR Matl. Type	*From Roof/Wall Construction Codes table*		*RfMType*		

Exterior Wall Construction

tblEXTWALL

		Exterior Wall Code	Item	# ___
External Wall Construction type	*From Roof/Wall Construction Codes table*	-7	*ExtType*	
Exterior Wall Dimension(s) in inches	Example: 2X4, 2X6, 4, 6, 12, etc		*FrameDim*	
-- For masonry walls: Furred Interior type	**W** = Wood **M** = Metal **N** = None		*FurredIntType*	W M N
Wall Color	**D** = Dark **M** = Medium **L** = Light		*ExtColor*	D M L
External Surface finish type	*From Roof/Wall Construction Codes table*		*ExtFinish*	
Exterior Insulation: R-value	**0** = Uninsulated/None	-7	*ExtRVal*	
Material	*From Roof/Wall Construction Codes table*		*ExtMType*	
Cavity Insulation: R-value	**0** = Uninsulated/None	-7	*ExtCavityRVal*	
Material	*From Roof/Wall Construction Codes table*		*ExtCavMType*	
Interior Insulation: R-value	**0** = Uninsulated/None	-7	*ExtIntRVal*	
Material	*From Roof/Wall Construction Codes table*		*ExtIntMType*	

Below-Grade Wall Construction

tblBGWall

		Below-Grade Wall Code	Item	# __
Below-grade Wall Construction type	*From Roof/Wall Construction Codes table*	-7	BgType	
-- For masonry walls: Furred Interior type	**W** = Wood **M** = Metal **N** = None		BgFIType	W M N
Exterior Insulation: R-value	**0** = Uninsulated/None	-7	BgExtRval	
Material	*From Roof/Wall Construction Codes table*		BgExtMType	
Cavity Insulation: R-value	**0** = Uninsulated/None	-7	BgCavRVal	
Material	*From Roof/Wall Construction Codes table*		BgCavMType	
Interior Insulation: R-value	**0** = Uninsulated/None	-7	BgIntRVal	
Material	*From Roof/Wall Construction Codes table*		BgIntMType	

Building Shell Construction Codes (cont'd)

Roof/Wall Construction Codes

Code	Roof/Wall Const Types	Code	Exterior Surface Types	Code	Insulation Types	(R/in)
WF	Wood Frame	BU	Built-up surface	BAT	Batt or Blanket	3.3
MF	Metal Frame	AS	Asphalt Roll/shingle	LSF	Loose fill	2.7
CON	Solid Concrete	CT	Clay/cement tile	XPE	Expanded perlite	2.8
CWC	Concrete w/ Cap [roof only]	RB	Rubber (urethane, etc.)	XPS	Expanded polystyrene	3.8-5.0
CNO	Concrete w/o Cap [roof only]	WS	Wood/fiberglass shingle	RDG	Rigid board	2.8-4.0
BLOC	Concrete Block/CMU	MT	Metal/Steel	N	None	0
BRIC	Brick	BF	Bituminous felt	OT	Other _____	_____
AIR	Air	ST	Stucco/Gunite			
ADB	Adiabatic	RK	Rock/Stone/Marble			
OT	_____	SF	Surface finish (Paint, etc.)			
		UN	Unfinished/None			
		BR	Brick façade			
		GLS	Glass Curtain/Spandral			
		OT	Other _____			

Floor Construction tblFLOOR

		Floor Code	Item	# ___
Floor construction type	**S** = Slab-on-grade **G** = Slab above open garage **C** = Crawlspace **U** = Uncond. basement **ADB** = Adiabatic **OT** = Other _ FlrTypeDesc_		FlrType	
Primary Finish Type:	**V** = Vinyl **C** = Carpet **S** = Stone/Ceramic **W** = Wood **N** = None **OT** = Other ___FlrFtypDesc_____		FlrFTyp	
Perimeter Insulation: R-value **S** = Slab-on-grade [ConsType = 6" concrete]	**0** = Uninsulated/None -7		FlrPRVal	
Under-floor Insulation: R-value	**0** = Uninsulated/None -7 **G** = Slab above open garage **C** = Crawlspace **U** = Unconditioned **ADB** = Adiabatic **OT** = Other _ FlrTypeDesc_		FlrMRVal	
Material	*From Insulation Type table*		FlrMTyp	

External Door tblDOORS

		Door Code	Item	# __	# __	# __
Door design	**H** = Hinged **O** = Overhead/Rollup **S** = Sliding **R** = Revolving **A** = Air Lock Entry **OT** = Other __ DoorTypeOth_____		DoorType		**H O S R A OT**	**H O S R A OT**
Material type	**G** = Glass** **S** = Steel **W** = Wood **O** = Other ___ DoorMaterialOth _____		DoorMaterial		**G S W O**	**G S W O**
** For **G**lass door, indicate Window Code			GlazingItem			
Typical height, (ft)			DoorHeight			
Typical width, (ft)			DoorWidth			

Building Shell Construction Codes (cont'd):

Windows/Fenestration tblGLAZING

	Window Code	Item	# __	# __	# __	# __
Operable window?		GOpen	Y N	Y N	Y N	Y N
Assembly type	**S**=SiteAssembled **M**=ManufacturedUnit	GSiteOrManuf	S M	S M	S M	S M
Layers of glazing (1,2,3)		GLayer				
Type of glazing	**C** = Clear **T** = Tinted **R** = Reflective **O** = Opaque **L** = LowE **S** = Spectral LowE **E** = Electrochromic (A) = Acrylic (P) = Polycarbonate	GType	C T R O L S E A P	C T R O L S E A P	C T R O L S E A P	C T R O L S E A P
Window frame type	**M**=Metal **W**=Wood **V**=Vinyl **O**=Other_____ GFrameOth _____	GFrame	M W V O	M W V O	M W V O	M W V O
-- Thermal break?		GThermBrk	Y N	Y N	Y N	Y N
Typ. sill height, (ft)		GSillHeight				
Typ. window height, (ft)		GHeight				
Typ. window width, (ft)	(reference only, not used in simulations)	GWidth				
Interior shading type	**F** = Fixed **M** = Moveable **N** = None	GShade	F M N	F M N	F M N	F M N

Skylights tblSKYLT

	Skylight Code	Item	
Skylight Shape	**D** = Domed **F** = Flat/Pyramid	SkyLtShape	
Glazing Type	**G** = Glass **P** = Plastic	SkyLtType	
Color * SkyltColorDesc	**C** = Clear **W** = White **O** = Other ___ *____	SkyLtColor	
Edge Type	**C** = With a Curb **N** = Without a Curb	SkyLtEdge	
Typical Dimensions (ft):	Diameter/Width 1	SkyLtW1	
	Width 2	SkyLtW2	
If applicable, Light well depth, ft		SkyLtDepth	

Component ID _ ShellCmpID ___ tblSHELLCMPINFO General Information

Component = Building, part of a building, one footprint of a multi-footprint building, etc.

Component Business/Building Type Code: SiteCode
(See Form BT. NOTE: Use the same business type/building type code for components within the same building)

Description: Briefly describe this component (e.g. Admin Office building of a large campus, kitchen for a fast-food restaurant, etc.). _____SCBTDesc_____

Recent Survey Area Changes: Give a brief description about any changes made to the surveyed area since Jan. 2002 that significantly impacted energy usage. _____SCSurvAreaChgs_____

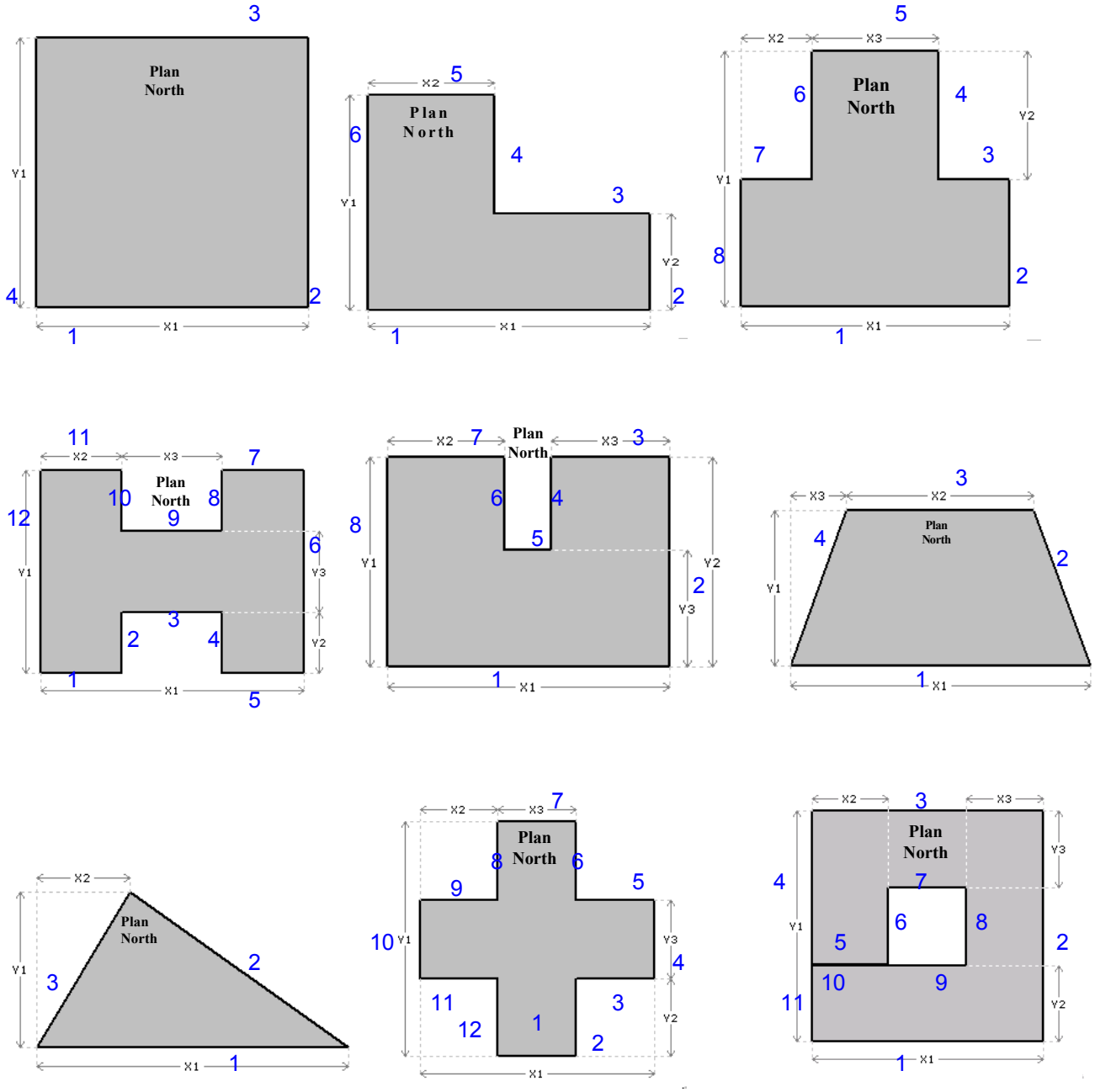
General Component Survey Information tblSHELLCMPINFO

Component Type: **B** = Stand-alone building **P** = Part of a building **F** = 1 footprint of a multi-footprint bldg **OT** = Other_ SCTypeDesc	*SCType*
What year was the majority of the component survey area built?	*YrBuilt*
Total surveyed floor area, ft^2	*FlrArea*
Number of floors *above grade*	*FlrAbove*
Number of floors *below grade*	*FlrBelow*
Is there a parking garage below the bottom floor?	*GarBelow*
Floor-to-floor (or floor-to-roof) height, ft (*do not leave blank*)	*FlrToFlr*
Floor-to-ceiling height, ft (*do not leave blank*)	*FlrToCeil*
Predominant HVAC Thermal Zoning Pattern: **PC** = Perimeter/Core **1F** = One Zone per Floor **ZA** = Zone by Activity Area **MP** = MultiPerimeter/Core **UC** = Unconditioned SCHVACZoneDesc	*SCHVACZone*
-- If Perimeter/Core zoning, perimeter zone depth, ft **-7**	*PZDepth*
-- For **MP**, average number of rooms per floor	*MPRoomPerFlr*
Construction: Roof/Ceiling Code [(only pick one)]	*# RoofCode*
External Wall Code	*# ExtWallCode*
Below-Grade Wall Code	*# BGWallCode*
Floor Code	*# FlrCode*
Skylight Code	*SkyLtCode [from tblSkyLt Item]*
-- Number of Skylights	*SkyLtNum*
-- Skylit Rooftop Zones: **A** = All **P** = Perimeter only **C** = Core only **O** = Other __ SkyLtZonesDesc _____	*SkyLtZones*
Daylighting?	*Daylight**

**Daylighting simulation keys off of a record being present in tblDAYLIGHT, not the value of this field.*

Component Survey Footprint Shapes

Footprint X/Y Dimensions

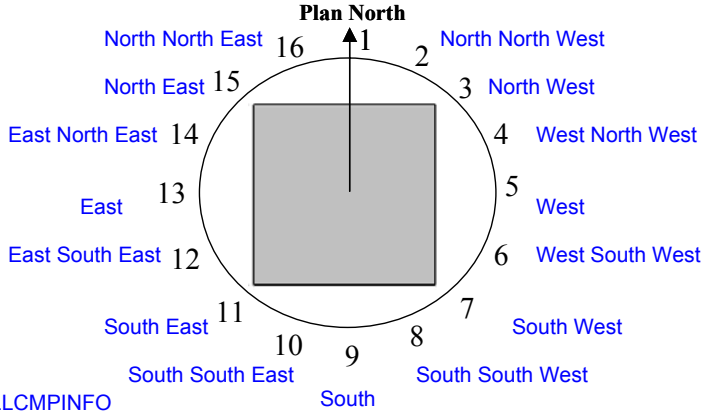


Component ID ShellCmpID____ Footprint, Adiabatic Walls, and Windows/Doors

Footprint/Shell Geometry *(see Form FP)* tblSHELLCMPINFO

Footprint Type Code: **R** = Rectangle **L** = L-shaped **T** = T-shaped **H** = H-shaped **U** = U-shaped **W** = Wedge/trapezoid **TR** = Triangular **P** = + plus sign **C** = Courtyard (atrium)		Footprint				
-- Is this an exact match (X) or a simplification (S) of actual shape?		MatchType				
Footprint Orientation: Direction of True North vs. Plan North		Orientation				
Footprint "X" dimensions (X1, X2, X3), ft	(##,#)	*X1*	ft	*X2*	ft	*X3*	ft
Footprint "Y" dimensions (Y1, Y2, Y3), ft	(##,#)	*Y1*	ft	*Y2*	ft	*Y3*	ft

Footprint Orientation: Sketch arrow to indicate True North



[Answers the question where is Plan North pointing when True North is pointing in a given direction]

Adiabatic Walls tblSHELLCMPINFO

Indicate the percent of external wall area in each orientation that is adiabatic.

Orientation	Above	Below	Plan N	Plan S	Plan E	Plan W
Adiabatic Surface (% of exterior wall area)	AdiabAbove	AdiabBelow	AdiabN	AdiabS	AdiabE	AdiabW

Exterior Window Shading (Overhangs and Sidefins)

Indicate the dimensions of any overhangs or sidefins for each orientation. tblOVERHANG

Orientation		Plan N	Plan S	Plan E	Plan W
Shade Type	**Top Floor only?**	**Shade depths, ft**			
Type **Overhangs**	*Toponly* ☐	*PlanN*	*PlanS*	*PlanE*	*PlanW*
Fins	☐				

Window Percentages & Number of External Doors tblWALLCONS

For windows, Indicate the window code(Form 11) and corresponding wall area percentages. For doors, indicate the door code (Form 11) and # of doors on each wall. No more than three window types and three door types can be specified.

Orientation		Plan N	Plan S	Plan E	Plan W
Type: Window or **D**oor	**Window Code**	**% of Wall Area or # of Doors**			
Type **W**	*Item 1*	*PlanN*	*PlanS*	*PlanE*	*PlanW*
W	*2*				
W	*3*				
	Door Code	**Number of Doors**			
D	*1*				
D	*2*				
D	*3*				

Component ID ___ Actual Floor Plan/Elevation Sketch

Sketch the plan and elevation views for the component as it is actually configured. Each floor of the surveyed area should have a representative plan sketch. Include building dimensions and show Plan North was well as the orientation of True North. Indicate on the drawing the boundaries of different activity areas and meters, windows, and doors. On the elevation sketch, indicate ceiling height and building height. Attach site plan and floor plan if available. Use multiple sheets/drawings if necessary.

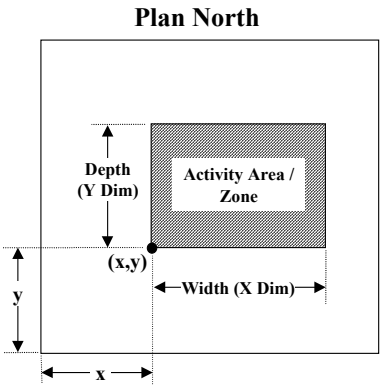
Comments:

tblCOMMENT3.Form14a

Component ID ___ Thermal Zoning/Building Simulation Sketch

Sketch the plan and elevation views for the component as it will be simulated, i.e. all dimensions needed for modeling components should be available from this sketch. Sketch the footprint and indicate Plan North, True North, and all X and Y dimensions. Floor plan sketches should show thermal zone boundaries and indicate applicable floor types (i.e. Bottom, Ground, Middle, Top). If the Zone-by-Activity-Area approach is used, also indicate dimensions needed to determine (x,y), Width, and Depth values (as indicated in figure below). Use multiple sheets/drawings if necessary.

Zone-by-Activity-Area Example



tblSPACEUT
Component ID __ShellCmpID

Activity Area and Thermal Zone Definitions

Activity Area ID# Assignments *Identify an Area ID# for each distinct Activity Area type within the surveyed area. A maximum of eight Activity Area types can be specified. Use the codes on Form AA.*

Area ID#	Activity Area Code (Form AA)	Activity Area Survey Reference Description	Typical hourly max # of occupants	Activity Area Floor Area, ft^2	% of Total Surveyed Floor Area	% Cooled	% Heated	% Uncnd	% Refgd
AreaID	ActCode	SpActvty	MaxOcc	ActAreaSqFt	SpEstPct	SpClPct	SpHtPct	SpUcPct	SpRfPct
2									
3									
4									
5									
6									
7									
8									
Totals (ref. only)									

Thermal Zone Assignments *Assign both a Floor Type and a Thermal Zoning Scheme Zone Type for the areas with the most restrictive locations. That is, the default assumption is that Activity Areas are distributed evenly throughout the floor types and thermal zones unless specified otherwise. [Boxes checked below depend on tblSHELLCMPINFO.SCHVACZone]*

Floor Type		Area ID#:	1	2	3	4	5	6	7	8
Below Grade	(B)		BelowGrade	☐	☐	☐	☐	☐	☐	☐
Ground Floor	(G)		GroundFloor	☐	☐	☐	☐	☐	☐	☐
Middle Floors	(M)		MiddleFloors	☐	☐	☐	☐	☐	☐	☐
Top Floor	(T)		TopFloor	☐	☐	☐	☐	☐	☐	☐

Thermal Zoning Scheme Zone Types									
*If Form 12 Thermal Zoning Scheme=**PC or MP:***	1	2	3	4	5	6	7	8
Perimeter	Perimeter	☐	☐	☐	☐	☐	☐	☐
Core	Core	☐	☐	☐	☐	☐	☐	☐
*If Form 12 Thermal Zoning Scheme=**ZA:***								
Lower left corner (x,y) x-coord, ft	X							
Lower left corner (x,y) y-coord, ft	Y							
Activity Area Width (X dimension), ft	WidthX							
Activity Area Depth (Y dimension), ft	WidthY							

Activity Area Notes/Comments:

tblCOMMENT3.Form15

Activity Area Type Codes

Activity Area Type Description	Activity Area Code
Auditorium	1
Auto Repair Workshop	2
Bank/Financial	3
Bar Cocktail Lounge	4
Barber/Beauty Shop	5
Casino/Gaming	6
Classroom/Lecture	7
Clean Room	8
Computer Room/Data Processing	9
Comm/Ind Work (General High Bay)	10
Comm/Ind Work (General Low Bay)	11
Comm/Ind Work (Precision)	12
Conference Room	13
Convention and Meeting Center	14
Copy Room	15
Corridor / Hallways	16
Courtrooms	17
Dining Area	18
Dry Cleaning	19
Exercise Centers/Gymnasium	20
Exhibit Display Area / Museum	21
Guest Rooms (Hotel/Motel)	22
Kitchen/Break Room and Food Preparation	23
Laboratory	24
Laundry	25
Library	26
Loading Dock	27
Lobby (Hotel)	28
Lobby (Main Entry and Assembly)	29
Lobby (Office Reception/Waiting)	30
Locker and Dressing Room	31
Mall Arcade and Atrium	32
Mechanical/Electrical Room	33
Medical Offices and Exam Rooms	34
Office (Executive/Private)	35
Office (General)	36
Office (Open Plan)	37
Patient Rooms	38
Patio Area	39
Pool/Spa Area	40
Police/Fire Station	41
Religious Worship	42
Residential	43
Restrooms	44
Retail Sales/Showroom	45
Smoking Lounge	46
Storage (Conditioned)	47
Storage (Unconditioned)	48
Storage (Refrigerated/Freezer), Walk-in	49
Storage (Refrigerated/Freezer), Building	50
Surgery Rooms	51
Theater (Motion Picture)	52
Theater (Performance)	53
Unknown	54
Vacant (Conditioned)	55
Vacant (Unconditioned)	56
Vocational Areas	57
Other Unlisted Activity Types	**99**
Outside/Outdoor Area Reference only, not used as an Activity Area	**0**

Component ID __ *ShellCmpID* _ Daylighting ☐ N/A

Daylit Areas and Controls tblDAYLT

Specify daylit areas and control types for up to 2 photosensors per control area.

Daylit Area Item #	*Item*	__	__
Daylit Floors (circle one only *[per Item]*) **G** = 1st floor **M** = Middle floors **T** = Top floor	*DayltFlrs**	G M T	G M T
Daylit from: **T** = Top 3 **S** = Side/perimeter 2 **B** = Both 3 **O** = Other __DayltFromDesc_	*DayltFrom*	T S B O	T S B O
Control type: **C** = Continuous **CO** = Continuous/Off **S** = Stepped	*DayltCntrl*	C CO S	C CO S
Maximum glare index	*DayltMaxGlare*		
For control type = **C** or **CO**:			
-- Minimum power, %	*DayltMinPwrPct*	%	%
-- Minumum light, %	*DayltMinLtPct*	%	%
For control type = **S**:			
-- # of light control steps	*DayltNumSteps*		
-- Light control probability	*DayltCntrlProb*		
# of photosensors per control zone	*DayltNum*	1 2	1 2 **
C1 Photosensor #1 (1 photosensor per control zone)			
C1 -- % of lights controlled	*DayltPctCntrld1*	%	%
C1 -- Design light level (footcandles)	*DayltDesign1*	fc	fc
C1 -- Height above floor, ft	*DayltHeight1*	ft	*[Control height]*
C1 -- % of zone depth	*DayltPctDpth1*	%	%
C2 Photosensor #2 *(use only if 2 photosensors per control zone)*			
C2 -- % of lights controlled	*DayltPctCntrld2*	%	%
C2 -- Design light level (footcandles)	*DayltDesign2*	fc	fc
C2 -- Height above floor, ft	*DayltHeight2*	ft	ft
C2 -- % of zone depth	*DayltPctDpth2*	%	%

C1 = column 1; C2 = column 2 denotes columns in eQUEST DD Wizard

Daylighting Notes/Comments *(provide sketch or copy of control plan if available)**:***

tblCOMMENT3.Form16

* Daylit Floors options are a function of # of floor types for the component, as follows:

Ground, Middle, Top only available w/ 3 or more floors

Ground, Top 2 floors

Top 1 floor

*** [Have Second Ctrl] Need to set this in eQUEST Wizard*

HVAC – Single Zone Systems

tblSNGLZONE

Component ID	ShellCmpID	___	___
Single-Zone Item Ltr	Item	Ltr___	Ltr___
HVAC Schedule # from Form 10	HVACSchdNum	# __	# __
Activity Areas/Thermal Zones Served:			
Enter Area ID #(s) or A for all areas	AreaID1-8		
Floor type served *(Circle all that apply)*	FlrTyp_B_G_M_T	B G M T	B G M T
If perimeter/core, enter zones served *(Circle all that apply)*	ZoneServed_P_C	P C	P C
Distribution System Type:	DistType	SZ PSZ SSZ PTU UV 2PFC 4PFC BR ASHP GSHP WLHP	SZ PSZ SSZ PTU UV 2PFC 4PFC BR ASHP GSHP WLHP
Number of units of this type	DistUnit		
Average Age (years) -7	AvgAge		
Temperature control type:	TempControl	M A T E P	M A T E P
Optimal start/stop? (Y / N)	OptStart	Y N	Y N
Indoor/Supply fan (hp/unit)	SpHPUnit	[Missing FanonBefore FanonAfter (See Form 10c)]	
-- Motor Eff.: **(Nom. %)** OR **(S**=Std. **H**=HiEff **P**=Premium)	SpMtrEffStr		
-- Quantity of Indoor Fans	SpFanQty		
-- Supply air rate (CFM/fan) -7	SuppCFM		
Return air path: **DI**=Direct **DU**=Ducted **P**=Plenum -7	RtAirPath	DI DU P	DI DU P
% Outside air (minimum)	PctOA		
Economizer Type: Other__ EconoTypeOther _____	EconoType	N (T E) O	N T E O
Return fan motor (hp/unit)	RtHPUnit		
-- Motor Eff.: **(Nom. %)** OR **(S**=Std. **H**=HiEff **P**=Premium)	RtMtrEffStr		
-- Quantity of Return Fans	RtFanQty		
-- Return air rate (CFM) -7	RtCFM		
Cooling Equipment Type:	CoolType	N D C E P	N D C E P
-- *If cooling type* **D** *and not air-cooled: water (W) or evap (E) cooled?*	EvapType	W E	W E
-- *If cooling type* = **C,** *enter chilled water loop # and skip to heating equip.*	ChWLNum	CWL # ___	CWL # ___
Compressor rating: volts / amps (RLA) / phase (*circle one*)	CompVolt	CompAmps	CompPhase
Number of compressors per unit	NumComp	[Purchased Cool & Heat]	
Capacity output (nominal tons per unit)	CoolTons		
Equipment manufacturer/brand:	Make		
-- Model number for unitary or split-system outdoor unit -7	Model		
-- Model number for split-system coil -7	Model_Coil		
Efficiency: **EER** -7	CoolEER		
Or **SEER** -7	CoolSEER		
Heating Equipment Type or Other _____	HeatType HeatTypeDesc	N F HP B ER RH BB P OT	N F HP B ER RH BB P OT
-- *If heating type* = **B,** *enter hot water loop # and stop.*	HWLNum	HWL # ___	HWL # ___
Fuel type	HeatFuel	E G F L W	E G F L W
Input Rating	HeatkBtuh		
Units of Input Rating (k**W** / k**B**tuh)	HeatUnit	W B	W B
Equipment manufacturer (if different from cooling equip)	HeatMake		
-- Model number	HeatModel		
Efficiency: (enter as % for AFUE and η) -7	HeatEff		
-- Efficiency units: **A**=AFUE **T**=Thermal η **H**=HSPF **C**=COP	HeatEffType	A T H C	A T H C
HP only: Supplemental heating capacity (kW)	HpSuppHt		
Soft start? (Y/N)	HpSoftStart	Y N	Y N

tblMULTZONE

HVAC – Multiple Zone Systems *(enter make/model numbers for unitary systems on Form 22)*

Component ID	ShellCmpID	__	__
Multi-Zone Item #	Item	# __	# __
HVAC Schedule # from Form 10	HVACSchdNum	__	__
Activity Areas/Thermal Zones Served:			
Enter Area ID #(s) or A for all areas	AreaID1-8		
Floor type served *(circle all that apply)*	FloorType_B_G_M_T	B G M T	B G M T
If perimeter/core, enter zones served *(circle all that apply)*	ZoneServed_P_C	P C	P C
Distribution System Type: or Other _____	DistType DistTypeOther	CV MZ VAV DD DF OT	CV MZ VAV DD DF OT
Average Age (years) -7	AvgAge		
Number of units of this type	DistUnit		
Temperature control type:	TempControl	M A T E P	M A T E P
Optimum Start/Stop? (Y/N)	OptStart	Y N	Y N
Hot deck temperature (°F)	HotDeckTemp		
Hot deck supply air temp. control:	HotDeck	C O D	C O D
Cold deck temperature (°F)	ColdDeckTemp		
Cold deck supply air temp. control:	ColdDeck	C O D	C O D
Supply Fans: (hp/fan)	SpHpUnit		
-- Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium	SpMtrEffStr		
-- Quantity of supply fans	SpFanQty		
-- Supply fan type and control: (VAV only)	SpFanTyp	IA IF DF VA VS FC NC	IA IF DF VA VS FC NC
-- Supply air rate (CFM/fan) -7	SuppCFM		
Return air path: **DI**=Direct **DU**=Ducted **P**=Plenum	RtAirPath	DI DU P	DI DU P
% Outside air (minimum)	PctOA		
Return fans: (hp/fan)	RtHPUnit		
-- Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium	RtMtrEffStr		
-- Quantity of return fans:	RtFanQty		
-- Return fan type and control: (VAV only)	RtFanTyp	IA IF DF VA VS FC NC	IA IF DF VA VS FC NC
-- Return air rate (CFM/return fan) -7	RtCFM		
Economizer type Other__EconoOther_____	EconoType	N T E O	N T E O
Cooling Equipment Type:	CoolType	N D C E P	N D C E P
-- *If cooling type* **D** ***and not air-cooled:*** *water (W) or evap (E) cooled?*	EvapType	W E	W E
-- *If cooling type* **C,** *enter chilled water loop # and skip to heating eq.*	ChWLNum	CWL # ___	CWL # ___
Number of compressors per unit	CoolQty		
Compressor rating: volts / amps (RLA) / phase (*circle one*)	CompVolt	CompAmps	CompPhase
Capacity (*nominal tons per unit*)	CoolTons		
Efficiency: **EER** -7	CoolEER		
Cooling Lockout: Outside air temperature	ClkTemp		
-- On in month (1-12) / Off in month (1-12)	CLkOn / CLkOff	/	/
Heating Equipment Type:	HeatType	F B ER P OT	F B ER P OT
-- *If heating type*=**B,** *enter hot water loop # and stop.*	HWLNum	HWL # ___	HWL # ___
Fuel type	HeatFuel	E G F L W	E G F L W
Input Rating	HeatkBtu		
Units of Input Rating (k**W**/k**B**tuh)	HeatUnit	W B	W B
Efficiency: (enter as %) -7	HeatEff		
-- Efficiency units: **T**=Thermal η **A**=AFUE	HeatEffType	T A	T A
Heating lockout: Outside air temperature	HLKTemp		
-- On in month (1-12) / Off in month (1-12)	HLKOn / HLKOff	/	/

HVAC – Multiple Zone System Controls tblMULTZONE

Complete this table for all systems entered on Form 18a.

Multi-Zone Item # (match to Form 18a)		# _____	# _____
Are perimeter/interior controls the same? *(If yes, only complete Perimeter Zone Controls section.)*	*PISame*	Y N	Y N
Perimeter Zone Controls			
Terminal type:	*PTrmType*	CDD CRH VRH CO VVT PF SF I VDD	CDD CRH VRH CO VVT PF SF I VDD
Reheat source fuel type:	*PReheat*	N E HW ST	N E HW ST
Supplemental Heat Source:	*PSuppHT*	N EBB ERH HWRH HWBB	N EBB ERH HWRH HWBB
Capacity of Supplemental Heat Source (input)	*PSuppCap*		
Units for Capacity (k**W**/k**B**tuh)	*PCapUnit*	W B	W B
VAV minimum CFM ratio (% of peak)	*PPctPeak*		
Interior Zone Controls			
Terminal type	*ITrmType*	CDD CRH VRH CO VVT PF SF I VDD	CDD CRH VRH CO VVT PF SF I VDD
Reheat source fuel type:	*IReheat*	N E HW ST	N E HW ST
VAV minimum CFM ratio (% of peak)	*IPctPeak*		

HVAC – Code Descriptions

Single-Zone Distribution System Types	Temperature Control	Heating Equipment
SZ = Single Zone (built-up) PSZ = Pckg. Single Zone (Unitary) SSZ = Split-System Single Zone PTU = Pckg. Term. Unit (wall mounted) UV = Unit Ventilator or Heater 2PFC = 2-Pipe Fan Coil 4PFC = 4-Pipe Fan Coil BR = Baseboard or Radiant Heater ASHP = Air-Source Heat Pump GSHP = Ground Source Heat Pump WLHP = Water Loop/Source Heat Pump	M = Manual (heat/cool On only as needed) A = Always on, constant temperature T = Time Clock E = EMS P = Programmable Thermostat	N = None F = Furnace HP = Heat Pump B = Boiler (fan coil) ER = Electric Resistance RH = Radiant Heater BB = Baseboard Heater P = Purchased Steam OT = Other BX = Boiler (radiant/baseboard)

Cooling Equipment Types	Fuel Type	
N = None D = Direct Expansion C = Chilled Water E = Evaporative Cooler P = Purchased Chilled Water	E = Electricity G = Natural Gas F = Fuel Oil L = LPG HW = Hot Water W = Wood C = Coal/Coke WO = Waste Oil	D = Diesel GA = Gasoline ST = Steam SO = Solar SG = Solar w/gas backup HR = Heat Recovery O = Other

Multi-Zone Distribution System Types	Fan type and Control (VAV Only)	Terminal Type
CV = Constant Volume Reheat MZ = Multi Zone VAV = Variable Air Volume DD = Dual Duct DF = Dual Fan Dual Duct OT = Other _____	IA = inlet guide vanes, air foil fan/bkwd incln. IF = inlet guide vanes, forward curved fan DF = discharge damper, forward curved fan VA = vane axial fan w/ variable pitch VS = variable speed drive FC = forward curve NC = no control	CDD = dual duct or MZ dampers, CV CRH = constant volume reheat VRH = VAV reheat CO = cooling-only, VAV VVT = variable air volume and temp PF = parallel fan-powered SF = series fan-powered I = induction (non-powered) VDD = dual duct or MZ dampers, VAV

Supplemental Heat Source	Supply Air Temperature Control	Economizer Types
N = None EBB = Elec. Baseboard HWRH = Hot Water Radiant Heater ERH = Electric Radiant Heater HWBB = Hot Water Baseboard	C = Constant O = Reset OAT D = Reset Demand	N = None T = Temperature E = Enthalpy O = Other

HVAC Comments (Indicate deck temperature setpoints/reset schedules, or any other significant details such as high pressure air distribution.):

tblCOMMENT2.FormHC

Chillers *(enter make/model/serial numbers on Form 22)*

tblCHILLERS ☐ N/A

Chilled water loop (CWL) #	ChWLNum	# ____	# ____
Component ID	ShellCmpID		
Chiller Item #	Item	# ____	# ____
Site Equipment ID (*reference only*)	EquipID		
Location, Area ID# (reference only)	AreaID		
Component IDs of all components served	OthCmpServed	↓ [SCRL FPLU Dist 1-3]	
Chiller type: **CENT** = Centrifugal **REC** = Reciprocating **SCRW** = Screw **SCRL** = Scroll **SABS** = Absorption steam **GABS** = Absorption, direct fired gas **OT** = Other _*CoolTypeOther*	CoolType*	**CENT REC SCRW SCRL SABS GABS OT**	**CENT REC SCRW SCRL SABS GABS OT**
-- If steam absorption, one or two stage?	Stage	**1 2**	**1 2**
-- If direct-fired gas absorption, kBtuh input	DFBtuIn		
Fuel type: **E** = Elect **G** = Natural Gas **S** =Steam	FuelType	**E G S**	**E G S**
Heat rejection type: **W** = Water-cooled **A** = Air-cooled	HtRjType	**W A**	**W A**
Average Age (years) -7	AvgAge		
Number of units	CoolQty		
Number of units in backup mode	CoolQtyBU		
VSD compressor control? (Y/N)	VSD_Comp	**Y N**	**Y N**
Chilled water setpoint temperature	ChWSetPt		
Chilled water reset (Y/N)	Reset	**Y N**	**Y N**
-- If Yes, chilled water reset temperature	ChWResetTemp		
Compressor: Volts	CompVolt		
Amps (RLA)	CompAmps		
Phase (circle one)	CompPhase	**1 3**	**1 3**
Number of Compressors	Num_Comp		
Capacity (nominal tons/unit)	CoolTons		
Efficiency – Full Load kW/ton, IPLV, or COP -7	Efficiency	*KWTon*	
Efficiency Units	EffUnits	**kW COP IPLV**	**kW COP IPLV**
Is chiller sequencing used? (If yes, explain in Comments)	Sequencing	**Y N**	**Y N**
Water-side economizer in use? (Free Cooling)	Econ	**Y N**	**Y N**
Cooling lockout: Outside air temperature	ClkTemp		
On in month (1-12) Off in month (1-12)	ClkOn ClkOff		
Serves Thermal Storage System Item #s	Serv_TES		

Circulation Pumps – Chillers

tblCHILLPUMP ☐ N/A

Component ID	*ShellCmpID*	__	__	__
Circulation pump Item #	*Item*	# __	# __	# __
Site Equipment ID (optional)	*EquipID*			
Use type: **CHW** = Chilled Water **SCHW** = Secondary ChilledWater **CHHW** = Chilled/Hot Water (2-pipe system)	*PUse*	**CHW SCHW CHHW**	**CHW SCHW CHHW**	**CHW SCHW CHHW**
Average Age (years)	*AvgAge*			
Number of units	*PQty*			
Number of units in backup mode	*PNumBackup*			
Pump power (hp)	*PHP*			
Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium	*PMotorEff*			
Motor type: **O** = One Speed **T** = Two Speed **V** = Variable	*PMotor*	**O T V**	**O T V**	**O T V**
Gallons per minute (-7)	*PGPM*			
Feet of head (-7)	*PHead*			
Serves chilled water loop (CWL) #	*CHWLNum*			

* *ChillerType code "PCHW" added to simulate purchased chiller water systems*

tblHTREJECT

Heat Rejection (Built-Up) *(enter make/model numbers for cooling towers on Form 22)* ☐ N/A

Component ID	ShellCmpID		
Heat rejection device Item #	Item	# ___	# ___
Site Equipment ID (optional)	EquipID		
Type: **CW** = CondWater **AC** = AirCooledCond **EC** = Evap Condenser **ACP** = Air Cooled w/pre-cooler **CT** = Cooling Tower	RjType	CW AC EC ACP CT	CW AC EC ACP CT
Temperature control: **F** = Fixed Temperature **R** = Reset **S** = Setpoint	RjTempCtrl	F R S	F R S
Condenser water setpoint temperature (°F)	CondWtrSetptTemp		
Cooling tower water setpoint temperature (°F)	TowerWtrSetptTemp		
Cooling tower approach temperature (°F)	Approach		
Age of cooling tower (years) -7	AvgAge		
Fan motor size/power (hp/fan)	RjFanHP		
-- Fan Type: **C** = Centrifugal **A** = Axial	RjFanTyp	C A	C A
-- Number of fans	RjFanQty		
-- Motor eff:: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium	RjFanEff		
-- Fan control: **O** = One Speed **T** = Two Speed **V** = Variable	RjFanCtr	O T V	O T V
Pump power (hp)	PumpHP		
-- Number of pumps	PumpQty		
-- Motor eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium	PumpEff		
-- Pump control: **O** = One Speed **T** = Two Speed **V** = Variable	PumpCtr	O T V	O T V
-- Gallons per minute (-7)	Pump_gpm		
-- Feet of head (-7)	Pump_head		
Chillers Served (Chiller Item#)	Chiller1		
	Chiller2		
	Chiller3		
Systems Served (SZ/MZ System Letter or Item#)	Dist1		
	Dist2		
	Dist3		

Thermal (Cool) Storage Systems tblTES *[TBD, anticipated fields to use are marked]* ☐ N/A

Comp ID	ShellCmpID	__	
Thermal storage system Item #	Item	#__	#__
Location, Area ID# (reference only)	AreaID		
Serves chilled water loop (CWL) #	ChWLNum	#__	#__
Storage type **C** = Chilled Water **I** = Ice **O** = Other ___ TESStorOther _	TESStorType		C I O
Thermal storage total capacity (Ton-Hours)	TESCapacity		
Total Number of Storage Units/Tanks	TESSNumTanks		
System Design type **F** = Full storage **P** = Partial storage	TESType	F P	F P
-- Storage provides what % of hottest day peak cooling load (of max. hour)	TESPctLoad		
Manufacturer	TESManuf		
Model #	TESModel		
Storage is charged: from . . . . Use 24 hour (military time) to designate	TESChgFrom		
to . . . . . time period. (eg., 1 pm would be 13)	TESChgTo		
Storage is discharged: from	TESDisFrom		
to	TESDisTo		
Chiller serves BldgLoad: from	ChilServFrom		
to	ChilServTo		

Boilers *(enter make/model/serial numbers on Form 22)*

tblBOILERS

☐ N/A

Hot water loop (HWL) #		HWLNum	# ___	# ___
Component ID		ShellCmpID		
Boiler Item #		Item	# ____	# ____
Site Equipment ID (optional)		EquipID		
Location, Area ID# (reference only)		AreaID		
Component IDs of all components served		OthComps		
Type: **W** = Water **S** = Steam **OT** = Other ___ BtypeOther		Btype*		**W S OT**
-- If steam, enter steam pressure (PSIG setpoint)		SetPoint		
-- If water, enter water temperature (setpoint)				
Primary fuel type: (see codes on Form HC) Other__ PFuelOther _		PFuel		
Secondary fuel (*use codes from Primary Fuel Type*)		SFuel		
Estimated year of installation (*specify year or category*)		yr_install		
Number of units		Qty		
Number of units in backup mode		Qty_BU		
Input Capacity (kBtu/hr/unit)		CapkBtu		
Efficiency: (%) -7		EffPct		
% of Boiler output to each end use:	Space Heat	PctSpcHt	%	%
	Water Heat	PctDHW	%	%
	Pool Heat	PctPoolHt	%	%
	Process	PctProcs	%	%
	Sum	***100%***	***100%***	***100%***
Space heat lockout:	Outside air temperature	BLKTemp		
	On in Month (1-12)	BLKOn		
	Off in Month (1-12)	BLKOff		
Is HW temp reset? (Y / N)		HW_reset	**Y N**	**Y N**

** Type code "P" added to simulate purchased hot water used for space heating.*

Hot Water Circulation Pumps

tblHWTRPUMP

☐ N/A

Component ID	ShellCmpID				
Circulation pump Item #	Item	# __	# __	# __	# __
Site Equipment ID (optional)	EquipID				
Average Age (years)	AvgAge				
Number of units	PQty				
Number of units in backup mode	PNumBackup				
Pump power (hp)	PHp				
-- Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium	PMotorEff				
Motor type: **O** = One Speed **T** = Two Speed **V** = Variable	PMotor	**O T V**	**O T V**	**O T V**	**O T V**
Gallons per minute	PGPM				
Feet of head	PHead				
Serves hot water loop (HWL) #	HWLNum				

HVAC Equipment Manufacturer and Model Number Information

tblMAKEMODEL_MZ

Manufacturer and Model Numbers for Unitary/Package Multizone Equipment ☐ N/A

Equip Type	Comp ID	Item #	Manufacturer	Model Number for Unitary or Split-system outdoor unit	Model Number for Split-System Coil	Heating System Model Number
MZ	ShellCmpID	Item	Manufacturer	Model_Outdoor	Model_Coil	Model_Heat
MZ						
MZ						
MZ						
MZ						
MZ						
MZ						

Manufacturer and Model Numbers for Built-Up HVAC Equipment tblMAKEMODEL_BU N/A

Equip Type*	Comp ID	Item #	Manufacturer	Model Number	Serial Number
EquipType	ShellCmpID	Item	Manufacturer	Model	SerialNum
C B CT					
C B CT					
C B CT					
C B CT					
C B CT					

* C = Chiller (Form 19), B=Boiler (Form 21) CT=Cooling tower (Form 20)

Comments *Indicate any unique features of built-up equipment that would assist in modeling energy use such as: operating characteristics, configuration, etc.*

tblCOMMENT2.Form22

Exhaust Fans tblFANS ☐ N/A

Comp ID	*ShellCmpID*			
Exhaust fan Item #	*Item*	#__	#__	#__
Site Equipment ID (optional)	*EquipID*			
Type: **K** = Kitchen exhaust hoods **F** = Fume hoods	*FnType*	**K F**	**K F**	**K F**
Number of units	*FnQty*			
Fan motor size/power (hp / unit)	*FnHP*			
-- Motor Eff: **Nom.%** OR **S**=Std. **H**=HiEff **P**=Prem	*FnEff*			
Fan capacity (CFM / unit) -7	*FnCFM*			
Schedule: **C** = Continuous **D** = Demand controlled ventilation **W** = With air handler **O** = Other ____ *FnSchedOther* __	*FnSched*		**C** **D** **W** **O**	**C** **D** **W** **O**
-- If **W**, then system # or Ltr	*FnSystem*			
Hours per week	*FnHours*			
Activity Areas/Thermal Zones Served:				
Enter Area ID #(s) or A for all areas	AreaID1-8			
Floor type served	FlrTypSrv_B, _G, _M, _T		**B G M T**	**B G M T**
If Perimeter/Core, enter zones served	ZoneTypSrv_P_C		**P C**	**P C**

Make-Up Air Units *(supply non-conditioned air)* tblMAKEUP ☐ N/A

Comp ID	ShellCmpID			
Make-up air unit Item #	Item	#__	#__	#__
Site Equipment ID	EquipID			
Number of units	FnQty			
Fan motor size/power (hp / unit)	FnHp			
-- Motor Eff: **Nom.%** OR **S**=Std. **H**=HiEff **P**=Prem	FnEff			
Fan capacity (CFM / unit) -7	FnCFM			
Schedule: **C** = Continuous **D** = Demand controlled ventilation **W** = With air handler **O** = Other ___ *FnSchedOther*	FnSched		**C** **D** **W** **O**	**C** **D** **W** **O**
-- If **W** then HVAC system # or Ltr	FnSystem			
Hours per week	FnHours			
Activity Areas/Thermal Zones Served:				
Enter Area ID #(s) or A for all areas	AreaID1-8			
Floor type served	FlrTypSrv_B_G_M_T		**B G M T**	**B G M T**
If Perimeter/Core, enter zones served	ZoneTypSrv_P_C		**P C**	**P C**

Water Heating Equipment tblWATER

Comp ID	*ShellCmpID*		
Water heating Item #	*Item*	# ____	# ____
Location, Area ID# (reference only)	*AreaID*		
Equipment type: **S** = Standard/Storage water heater **I** = Instantaneous (tankless) **B** = Boiler **DWB** = Dishwasher booster heater **PHW** = Purchased hot water **PS** = Purchased steam **HP** = Heat pump water heater **OT** = Other _____ *Code_Other* ___	*Code*		**S** **I** **B** **DWB** **PHW** **PS** **HP** **OT**
-- *If boiler, enter boiler # (from Form 21) and skip to tank capacity*	*Boiler*		
Fuel type: (If not boiler) (**E** = Electricity **G** = Natural Gas) only in eQ **F** = Fuel Oil **L** = LPG **W** = Wood **SO** = Solar **SG** = Solar w/gas backup **HR** = Heat Recovery **OT** = Other_____ *Fuel_Other* _____	*Fuel*		**E** **G** **F** **L** **W** **S** **SG** **HR** **OT**
Number of units	*Qty*		
Make	*Make*		
Model	*Model*		
Age of water heater (years) -7	*Age*		
Tank capacity/volume (*gallons*) -7	*WtTank*		
Rated input capacity -7	*Capacity*		
-- Units of rated input capacity: **B** = kBtuh **W** = kW	*WtCapUnit*	**B W**	**B W**
Efficiency rating -7	*WtEF*		
Efficiency units: **E** = Energy Factor **T** = Thermal efficiency **A** = AFUE **C** = COP	*WtEFUnits*	**E T A C**	**E T A C**
Tank internal insulation R-value (enter ~~0~~ if uninsulated)	*WtRVal*		
Does the hot water tank have an external insulation jacket?	*WtExtIns*	**Y N**	**Y N**
Average hot water temperature (°F) -7	*WtTemp*		
Are hot water pipes insulated?	*WtPipeIns*	**Y N**	**Y N**
Recirculation pump (Y/N)	*WtRPump*	**Y N**	**Y N**
-- Recirc pump control type (circle all that apply): **C** = Continuous **TP** = Temperature **TM** = Timer **D** = Demand **OT** = Other ___*WtRPumpCtrlOth*	*WtRPumpCtrl*	**C TP TM D OT**	**C TP TM D OT**
-- Pump operations (*hours per week*)	*WtHours*		

Service Hot Water Use (General and Building-Type Specific) tblWATERUSE

If service water heating equipment is present on Form 21 or Form 24, then at least one of the usage fields below must have a value. Building-type specific usage values must be completed for the building types indicated. For food service businesses, an estimate of the number of meals served is required.

		Component ID	ShellCmpID	__
Other Hot Water Uses? (Gals/Day)			ODHWUse	
All Activity Types:	Number of lavatories with hot water:		Lavatory	
	Pounds of laundry washed per day? (lb)		Laundry	
	Number of showers per day *(except for lodging and hospitals)*		Showers	
If both electric and gas water heating equipment are used on site, estimate the % of water heated by gas equipment.			PctGas	___%
ACTIVITY-TYPE-SPECIFIC HOT WATER USE				
Food service:	Number of meals prepared per day:	Breakfast	Brkfast	
		Lunch	Lunch	
		Dinner	Dinner	
	Number of seats in the food service area:		SeatsNum	
	Disposable Dishes?		DispDish	Y N
Lodging:	Number of usable rooms *(in hotels, motels, dorms, etc.)*		UsableRm	
	Average # of rooms occupied		OccupRm	
	Number of Apartments		AptNum	
Office:	Average % of occupied (Non-vacant) space in office buildings		OccuPct	___%
Hospital:	Number of actual beds in hospital		HNumBeds	
	Average % of beds occupied in hospital (avg. from census)		HPctBeds	___%
Education:	Average number of enrolled students in schools (e.g., ADA)		Students	
Nursing Home:	Number of beds		NNumBeds	
	Average % of beds occupied		NPctBeds	___%
Prisons:	Number of inmates		Inmates	

Service Hot Water Use Notes:

tblCOMMENT2.Form25

Swimming Pool/Spa tblPOOL

na_flag ☐ **N/A**

Comp ID	*ShellCmpID*		
Pool/Spa Item #	*Item*	# 2	# 3
Location (Activity Area ID or if Outdoors = 0)	*AreaID*		
Type: **P** = Swimming Pool **S** = Spa/Hot Tub **O** = Other___ *STypeOther*	*SType*	**P S O**	**P S O**
Estimated year of installation *(specify year or category)*	*Yr_Install*		
What is the size of the pool (sq. ft.)?	*SSize*		
What is the average depth of the pool (ft.)?	*SDepth*		
If heated by a boiler, specify boiler # from Form 21	*Boiler*		
Fuel Type: **N** = Not Heated **E** = Electricity **G** = Natural Gas **L** = LPG **SO** = Solar **SG** = Solar w/backup fuel **O** = Other ___ *SFuelOther*	*SFuel*	**N E G L SO SG O**	**N E G L SO SG O**
Heater Capacity (kBtu/hr or kW)	*SHtCap*		
Units of capacity: W = kW B = kBtu/hr	*SHtUnits*	**W B**	**W B**
Solar Backup Fuel Type: **N** = None **E** = Electricity **G** = Natural Gas **L** = LPG **O** = Other _ *SFuel_BUOther* _	*SFuel_BU*	**N E G L O**	**N E G L O**
Solar collector area in use (ft^2)	*Solar*		
Pool Cover in use?	*Cover*	**Y N**	**Y N**
Circulation Pump power (hp)	*SPump*		
-- Average pump run-hours per day	*SHrPerDay*		
-- Motor Eff.: **Nom. %** OR **S**=Std. **H**=HiEff **P**=Premium	*SPumpEff*		
Motor type: **O** = One Speed **T** = Two Speed **V** = Variable	*SMotorType*	**O T V**	**O T V**
Months heated: Start... (1…12)	*HtStart*		
Stop... (1…12)	*HtStop*		

Swimming Pool Notes (If installed recently then comment):

tblCOMMENT2.Form26

Outdoor Lighting tblOUTLIGHT

Comp ID	ShellCmpID				
Item #	Item	#____	#____	#____	#____
Use type: **S** = General/Security **A** = Advertising **P** = Parking lot **G** = Parking garage **F** = Bldg façade **L** = Landscape **OT** = Other____ *UseTypeOth*	UseType	S A P G F L OT	S A P G F L OT	S A P G F L OT	S A P G F L OT
Mount type: **A** = Attached to bldg **P** = Pole **O**=Other (*MountType_Other*)	MountType	A P O	A P O	A P O	A P O
Control type: **PC** = Photocell **S** = Manual on/off-switch **TC** = Timeclock **E** = EMS **TW** = Twist-timer **PT** = Photocell/Timelock **MS** = Motion Sensor	CtrlType	PC S TC E TW PT MS	PC S TC E TW PT MS	PC S TC E TW PT MS	PC S TC E TW PT MS
Total number of fixtures (Total length if Neon)	Qty				
Number of lamps per fixture (Enter 1 if Neon)	LampFix				
Watts per lamp (Enter 10 if Neon)	WattLamp				
-- *Check box if lamp watts were estimated**	EstWatts	☐	☐	☐	☐
Hours per week	HourWeek				
Lamp Type and Lamp-Specific Details	LampType				
LED = LEDs		LED	LED	LED	LED
E = Electrodless/Induction		E	E	E	E
Q = Quartz/Halogen		Q	Q	Q	Q
IP = Incandescent PAR		IP	IP	IP	IP
IR = Incandescent Reflector		IR	IR	IR	IR
I = Incandescent		I	I	I	I
CFs applicable?(medium/screw base)	CFApplic	Y N	Y N	Y N	Y N
F = Fluorescent Tube **UT** = Fluorescent U-tube **OF** = Other Fluorescent		F UT OF	F UT OF	F UT OF	F UT OF
For Fluor. tubes: Length in ft. (e.g., 1.5, 2, 4, 8)	TubeLgth				
Diameter (T5 T8 T10 T12)	TubeDiam				
CF = Compact Fluorescent **CIR** = Circline Fluorescent		CF CIR	CF CIR	CF CIR	CF CIR
CF/CIR base type: P=Pin-base S=Screw-base	BaseType	P S	P S	P S	P S
MV = Mercury Vapor **MH** = Standard Metal Halide **PS** = Pulse-start Metal Halide **H** = High Pressure Sodium Vapor **L** = Low Pressure Sodium Vapor **N** = Neon		MV MH PS H L N	MV MH PS H L N	MV MH PS H L N	MV MH PS H L N
For ballasted lamp types: Ballast type: **M** = Std Magnetic **H** = HighEff magnetic **E** = Std Electronic **A** = Advanced Electronic	BallastType	M H E A	M H E A	M H E A	M H E A
-- Number of ballasts per fixture	BlstFix				
Field notes: (*Count/comments*)					

* Do not estimate lamp watts until all other methods of establishing wattage have been exhausted, and then explain in comments why lamp wattage could not be obtained.

Comments:

tblCOMMENT2.Form27

Indoor Lighting

tblINLIGHT

Component ID	*ShellCmpID*				
Item #	*Item*	#___	#___	#___	#___
Area ID #	*AreaID*				
Use Type: **A** = Area **T** = Task **X**= Exit **K** = Track **D** = Display/Advertising **O**= Other_____	*UseType* *UseTypeOth*	**A T X K D O**	**A T X K D O**	**A T X K D O**	**A T X K D O**
Mounting: **R** = Recessed **H** = Hanging/Suspended **S** = Surface-mount **O** =Other _____	*MountType* *MountType_Other*	**R H S O**	**R H S O**	**R H S O**	**R H S O**
Specular (**S**) or White (**W**) reflector?	*SpecReflec*	**S W**	**S W**	**S W**	**S W**
Control type: **N** = None/Continuous **B** = Bi-level **S** = Manual on/off-switch **TC** = Timeclock **E** = EMS **PC** = Photocell **PT** = Photocell/Timelock **MS** = Motion Sensor **DM** = Dimmer **DL** = Daylighting controls	*CtrlType*	**N B S TC E PC PT MS DM DL**	**N B S TC E PC PT MS DM DL**	**N B S TC E PC PT MS DM DL**	**N B S TC E PC PT MS DM DL**
Total number of fixtures (Total length if **N**eon)	*Qty*				
Number of lamps per fixture (Enter 1 if **N**eon)	*LampFix*				
Watts per lamp (Enter 10 if **N**eon)	*WattLamp*				
Hours per week	*HourWeek*				
Lamp Type and Lamp-Specific Details:	*LampType*				
LED = LEDs		**LED**	**LED**	**LED**	**LED**
ER = Self/battery powered exit signs		**ER**	**ER**	**ER**	**ER**
Q = Quartz/Halogen		**Q**	**Q**	**Q**	**Q**
E = Electrodeless/Induction		**E**	**E**	**E**	**E**
IP = Incandescent PAR		**IP**	**IP**	**IP**	**IP**
IR = Incandescent Reflector		**IR**	**IR**	**IR**	**IR**
I = Incandescent		**I**	**I**	**I**	**I**
CFs applicable? (medium/screw base)	*CFApplic*	**Y N**	**Y N**	**Y N**	**Y N**
F = Fluorescent Tube **UT** = Fluorescent U-tube **OF** = Other Fluorescent		**F** **UT** **OF**	**F** **UT** **OF**	**F** **UT** **OF**	**F** **UT** **OF**
For Fluorescent tubes: Length in ft. (e.g. 1.5 2 4 8)	*TubeLgth*				
Diameter (T5 T8 T10 T12)	*TubeDiam*				
CF = Compact Fluorescent **CIR** = Circline Fluorescent		**CF** **CIR**	**CF** **CIR**	**CF** **CIR**	**CF** **CIR**
CF/CIR Base type: P=Pin-base S=Screw-base	*BaseType*	**P S**	**P S**	**P S**	**P S**
MV = Mercury Vapor **MH** = Standard Metal halide **PS** = Pulse-Start Metal Halide **H** = High Pressure Sodium Vapor **L** = Low Pressure Sodium Vapor		**MV** **MH** **PS** **H** **L**	**MV** **MH** **PS** **H** **L**	**MV** **MH** **PS** **H** **L**	**MV** **MH** **PS** **H** **L**
N = Neon		**N**	**N**	**N**	**N**
For ballasted lamp types: Ballast type: **M** = Magnetic **H** = High Eff Magnetic **E** = Std Electronic **A** = Advanced Electronic	*BallastType*	**M H E A**	**M H E A**	**M H E A**	**M H E A**
-- Number of ballasts per fixture					
Field Notes: (Counts)					

Indoor Lighting

Component ID							
Item #	# ___	# ___	# ___	# ___	# ___	# ___	# ___
Area ID #							
Use Type: **A** = Area **T** = Task **X**= Exit **K** = Track **D** = Display/Advertising **O**= Other _____	A T X K D O	A T X K D O	A T X K D O	A T X K D O	A T X K D O	A T X K D O	A T X K D O
Mounting: **R** = Recessed **H** = Hanging/Suspended **S** = Surface-mount **O** =Other _____	R H S O	R H S O	R H S O	R H S O	R H S O	R H S O	R H S O
Specular (**S**) or White (**W**) reflector?	S W	S W	S W	S W	S W	S W	S W
Control type: **N** = None/Continuous **B** = Bi-level **S** = Manual on/off-switch **TC** = Timeclock **E** = EMS **PC** = Photocell **PT** = Photocell/Timelock **MS** = Motion Sensor **DM** = Dimmer **DL** = Daylighting controls	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL	N B S TC E PC PT MS DM DL
Total number of fixtures (Total length if **N**eon)							
Number of lamps per fixture (Enter 1 if **N**eon)							
Watts per lamp (Enter 10 if **N**eon)							
Hours per week							
Lamp Type and Lamp-Specific Details:							
LED = LEDs	LED	LED	LED	LED	LED	LED	LED
ER = Self/battery powered exit signs	ER	ER	ER	ER	ER	ER	ER
Q = Quartz/Halogen	Q	Q	Q	Q	Q	Q	Q
E = Electrodeless/Induction	E	E	E	E	E	E	E
IP = Incandescent PAR	IP	IP	IP	IP	IP	IP	IP
IR = Incandescent Reflector	IR	IR	IR	IR	IR	IR	IR
I = Incandescent	I	I	I	I	I	I	I
CFs applicable? (medium/screw base)	Y N	Y N	Y N	Y N	Y N	Y N	Y N
F = Fluorescent Tube **UT** = Fluorescent U-tube **OF** = Other Fluorescent	F UT OF	F UT OF	F UT OF	F UT OF	F UT OF	F UT OF	F UT OF
For Fluorescent tubes: Length in ft. (e.g. 1.5 2 4 8)							
Diameter (T5 T8 T10 T12)							
CF = Compact Fluorescent **CIR** = Circline Fluorescent	CF CIR	CF CIR	CF CIR	CF CIR	CF CIR	CF CIR	CF CIR
CF/CIR Base type: P=Pin-base S=Screw-base	P S	P S	P S	P S	P S	P S	P S
MV = Mercury Vapor **MH** = Standard Metal halide **PS** = Pulse-Start Metal Halide **H** = High Pressure Sodium Vapor **L** = Low Pressure Sodium Vapor	MV MH PS H L	MV MH PS H L	MV MH PS H L	MV MH PS H L	MV MH PS H L	MV MH PS H L	MV MH PS H L
N = Neon	N	N	N	N	N	N	N
For ballasted lamp types: Ballast type: **M** = Magnetic **H** = High Eff Magnetic **E** = Std Electronic **A** = Advanced Electronic	M H E A	M H E A	M H E A	M H E A	M H E A	M H E A	M H E A
-- Number of ballasts per fixture							
Field Notes: (Counts)							

Office Equipment tblOFFEQUIP

Comp ID	Item #	Area ID	Equipment Code	Equipment Description	kW	ENERGY STAR?	Total # of units	Avg hrs per week*
ShellCmpID	Item	AreaID	Code	Descrip	Capacity	EnergyStar	Qty	HourWeek
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		
						☐		

* "Avg hrs per week" must be completed only if equipment operation differs drastically from that shown on schedule.

Equip Code	Equipment Description	Equip Code	Equipment Description	Equip Code	Equipment Description
PCD	Personal Computer – Desktop	MON	Monitor/Terminal	TYP	Typewriter
PCL	Personal Computer – Laptop	MAIN	Computer – Mainframe	HOLE	Hole Punch
JET	Printer – Ink Jet	VAX	Computer – Minicomputer (VAX)	SHRD	Shredder
LSR	Printer – Laser	WORK	Workstation	PROJ	Video Projector/Projection System
PDOT	Printer – Dot Matrix	SERV	Servers	OT	Other (describe)
UPS	Uninterruptible Power Supply	SWEQ	Switching Equipment		
SC	Small Copier	FAX	FAX machine		
MC	Medium Copier	TEL	Telephone System		
LC	Large Copier	POS	Point-of-sale terminals		
BP	Blueprint Machine	REG	Cash Registers		

Cooking/Food Service Equipment tblCOOK

Comp ID	Item #	Area ID	Equip Code	Equipment Description	Total # Electric Units	kW	Total # of Gas Units	kBtuh	Avg hrs per Week
ShellCmpID	*Item*	*AreaID*	*Code*	*Descrip*	*EQty*	*kW*	*GQty*	*kBtuh*	*HourWeek*

* "Avg hrs per week" must be completed only if equipment operation differs drastically from that shown on schedule.

ID	Equipment Type	ID	Equipment Type	ID	Equipment Type	ID	Equipment Type
BR	Broiler, Conventional	GD	Garbage Disposal	MW	Oven, Microwave	SP	Soup Pots
BI	Broiler, Infrared	GR	Griddle	PC	Oven, Pizza, Counter-top	SK	Steam Kettle
CB	Charbroiler (32" x 36" ref)	HT	Hot Food Table (4 holes ref)	PL	Oven, Pizza, Large	TC	Toaster, Conveyor-type
CM	Coffee Maker	HP	Hot Plates (2 burners ref)	PM	Popcorn Maker	TS	Toaster, Slotted-type
DW	Dishwasher	IN	Induction Cooktop (2 burner ref)	PF	Proofers/Holding Cabinet	TR	Trash Compacter
FS	Food Steamer	MX	Mixer, Large	RL	Range, Large (6 burners)	OT	Other (describe)
FW	Food Warmer/Well/Lamp	OV	Oven (in Range or standalone)	RM	Range, Medium (4 burners)		
FC	Fryer, Counter-type	CO	Oven, Convection	RS	Range, Small (2 burners)		
FF	Fryer, Floor-type	FO	Oven, Finishing/Toaster	RO	Rotisserie (3 spits reference)		
FI	Fryer, Induction (1 vat ref)	FB	Oven, FlashBake	SL	Slicer (Meat, Cheese, etc)		

Self-Contained Refrigeration Equipment

Non-Commercial/Residential-Type Refrigerator/Freezers tblREFRIGEQ ☐ N/A

Comp ID	Item #	Area ID	Equip Code	Equipment Description	Temp. Service	kW per unit	Energy Star	Total # of Units	Average Age (years)
ShellCmpID		*AreaID*	*Code*	*Descrip*	*TempSvc*	*Capacity*	*EnergyStar*	*Qty*	*AvgAge*
	Item		1D	Single-door	R/F R		☐		
			2D	Two-door	R/F R		☐		
			3D	Three-door	R/F R		☐		
			UC	Undercounter/Compact	R/F R		☐		
			CH	Chest	R/F R		☐		
			OT	*(describe)*_____	R/F R		☐		

Commercial Refrigeration Equipment tblSCREFRIG ☐ N/A

Comp ID	Item #	Area ID	Equip Code	Open/ Closed	Temp. Service Type	Length, ft	# of Doors	Remote Cond Unit	*Amps @ 120V	*Amps @ 208V	Total # of units
ShellCmpID		*AreaID*	*Code*	*OpenClosed*		*ScLength*	*ScGlass*		*ScA120*	*ScA208*	*Qty*
	Item			*O C*	*TempSv*			*RCU*			
				O C	R F			☐			
				O C	R F			☐			
				O C	R F			☐			
				O C	R F			☐			

*Note: Amps listed should not include defrost heater amperage.

Self-Contained Commercial Refrigeration Equipment Codes

Equip Code	Equipment Description	Size of Default	Default Amps@ 120V	208V
ID	Ice cream/frozen yogurt dispenser	1 unit	12	7
DD	Refrigerated drink dispenser (soda, slushees, etc.)	1 unit	17	10
CF	Cold/chilled food table	1 unit	13	8
WC	Refrigerated water cooler	1 unit	4	2
RV	Refrigerated vending machine	1 unit	8	4
GD	Glass door beverage merchandiser (e.g. vendor-supplied) from 2 to 4 doors	3 doors	9	5
OU	Open upright display case (pizza, juice, etc.) usually 4,5,6 ft lengths	5 ft	15	9
IC	Island case (cheese, sometimes produce or juice) from 8 to 16 ft long	12 ft	16	9
SC	Service case (bakery, sometimes deli) from 4 to 8 ft long	6 ft	7	4
CD	Closed/solid door storage case, one to three doors	2 doors	7	4
UG	Upright glass door freezer cases from one to three doors	2 doors	10	6
CF	Coffin type glass top freezer cases (usually ice cream) typically 6 or 8 ft	7 ft	8	5
IB	Ice storage boxes	1 unit	8	5
IS	Ice maker, Small (< 10 amps)	1 unit	7	4
IM	Ice maker, Medium (10 to 15 amps)	1 unit	12	7
IL	Ice maker, Large (>15 amps)	1 unit	17	10
OT	Other: self-contained refrigeration not listed above	1 unit	12	7

Remote Refrigeration Equipment – Display Cases and Walk-Ins

Display Cases tblREMOTE ☐ N/A

Component ID	*ShellCmpID*				
Display case Item #	*Item*	# __	# __	# __	# __
Fixture Reference ID (from Refg Sched)	*FixRefID*				
Served by Compressor System Item #	*CompNum*				
Area ID	*AreaID*				
Type/Suction Temperature: IC = Ice Cream/Frozen Juices (-35 °F) FF = Frozen Food/Meat/Bakery (-25 °F) MD = Fresh Meat/Deli-Meat (+10 °F) DP = Dairy/Produce/Beverage (+20 °F)	*CaseTemp*	**IC FF MD DP**	**IC FF MD DP**	**IC FF MD DP**	**IC FF MD DP**
Defrost control type *(req'd for all)*: E = Electric G = Hot Gas T = Timed-off N = None	*Control*	**E G T N**	**E G T N**	**E G T N**	**E G T N**
Anti-sweat heater control?	*AntiSweat*	**Y N**	**Y N**	**Y N**	**Y N**
-- Control type: **C**=Cycling **H**=Humidistat	*AntiSweatType*	**C H**	**C H**	**C H**	**C H**
External liquid-suction heat exchangers?	*ExtLSHX*	**Y N**	**Y N**	**Y N**	**Y N**
High-efficiency evaporator fan motors?	*HEEvapFan*	**Y N**	**Y N**	**Y N**	**Y N**
T-8 case lighting?	*T8CaseLtg*	**Y N**	**Y N**	**Y N**	**Y N**
Size (length or # of doors)					
Single-Deck display cases:					
Open single-deck Lin. ft.	*SLength*				
Closed service case Lin. ft.	*CSLength*				
Island coffin/tub (shop-around) Lin. ft.	*DLength*				
Coffin/tub (one-side shopping) Lin. ft.	*CLength*				
Multi-Deck (vertical) display cases:					
Open/reach-in multi-deck Lin. ft.	*MLength*				
Glass-door cases # of doors	*GDoors*				
-- High-performance glass doors?	*EEGlass*	**Y N**	**Y N**	**Y N**	**Y N**

Walk-Ins and Preparation Areas tblWALKIN ☐ N/A

Component ID	*ShellCmpID*				
Walk-in/Prep Area Item #	*Item*	# __	# __	# __	# __
Fixture Reference ID (from Refg Sched)	*FixRefID*				
Served by Compressor System Item #	*CompNum*				
Area ID	*AreaID*				
Suction temp. range: **F** = Freezer (0 to -10 °F) **C** = Cooler (30 to 40 °F) **P** = PrepArea (50 to 55 °F)	*WkTemp*	**F C P**	**F C P**	**F C P**	**F C P**
Floor area (ft^2)	*FlrArea*				
Ceiling height (ft)	*Ceiling*				
Defrost control type: **E** = Electric **G** = Hot Gas **T** = Timed-off **N** = None	*Control*	**E G T N**	**E G T N**	**E G T N**	**E G T N**
Strip curtains?	*Strip*	**Y N**	**Y N**	**Y N**	**Y N**
High-efficiency evaporator fan motors?	*HEEvapFan*	**Y N**	**Y N**	**Y N**	**Y N**
Display case type: **N** = None, storage only **G** = Glass Doors **R** = Rear-load Roll-In	*DispCase*	**N G R**	**N G R**	**N G R**	**N G R**
-- For G or R types, display case Item #	*DispCaseItemNum*				

Remote Refrigeration Equipment – Compressors and Condensers

Compressor Systems

tblCOMPRESS

☐ N/A

Component ID	*ShellCmpID*				
Compressor System Item #	*Item*	# __	# __	# __	# __
System Reference ID (from Refg Sched)	*FixRefID*				
Served by Condenser Item #	*ServedBy*				
Area ID	*AreaID*				
Type: **C** = Conventional (**S** = Two-stage multiplex **T** = Twins **M** = Multiplex **R** = Remote Cond. Unit **O** = Other ____ *CompDesc* _____)	*CompType*	C S T M R O	C S T M R O	C S T M R O	C S T M R O
ManufCode: **C** = Carlyle **S** = Copeland Std. **D** = Copeland Discus **O** = Other ___ *Manuf* ___	*ManufCode*	C S D O	C S D O	C S D O	C S D O
Number of compressors in rack/system	*CompQty*				
-- Total rack/system hp	*CompHP*				
-- Size of all compressors hp (#-#-#…)	*CompSize*				
High-efficiency (scroll) compressors?	*HEScrollComp*	Y N	Y N	Y N	Y N
Control Type: **C** = Conventional **S** = SolidState **E** = EMS **O** = Other __*CtrlTypeOth* _	*CtrlType*	C S E O	C S E O	C S E O	C S E O
Unloader or VSD compressors?	*CompVSD*	U V	U V	U V	U V
Subcooling Type: **A** = Ambient **M** = Mechanical **N** = None	*SubCool*	A M N	A M N	A M N	A M N
Floating head pressure (FHP) control?	*SFloat*	[Y="FL" N=" "]	Y N	Y N	Y N
-- Very low head pressure (VLHP) control?	*VLHPC*	Y N	Y N	Y N	Y N
Heat recovery type: **N** = None **S** = Space heating/Reheat **W** = Water heating **O** = Other ___ *HtRcDesc* _	*HtRecov*	N S W O	N S W O	N S W O	N S W O

Condensers

tblCONDENSE

☐ N/A

Component ID	*ShellCmpID*			
Condenser Item #	*Item*	# __	# __	# __
Area ID	*AreaID*			
Type: A = Air-cooled (*W = Water-cooled P = Air-cooled w/precooler C = Close-approach/Oversized)	*CdType*	A W P C	A W P C	A W P C
Total fan horsepower (all types)	*CdFanHP*			
-- Motor Eff.: Nom. % OR S=Std. H=HiEff P=Premium	*CdFanEff*			
-- VSD fan?	*CdFanVSD*	Y N	Y N	Y N
Pump motor hp (water-cooled units only)	*CdPumpHp*			
-- Motor Eff.: Nom. % OR S=Std. H=HiEff P=Premium	*CdPumpEff*			
-- VSD fan?	*CdPumpVSD*	Y N	Y N	Y N

** Modeled as "Evap"*

Miscellaneous Equipment tblMISCEQ

Comp ID	Item #	Area ID	Equip Code	Equipment Description (*Required only if Equip Code = OT*)	Fuel Type	Survey kW/kBtuh	Avg hrs per week	Total # of units
ShellCmpID	*Item*	*AreaID*	*Code*	*Descrip*	*Fuel*	*Capacity*	*HourWeek*	*Qty*
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			
					E G O			

ID	Equipment Type	Ref. kW (kBtuh)
	Other/Unlisted	
OT	Describe in Equip. Desc.	1.0 (10)
	Building Equipment	
B1	Air Hand Dryers	2.3
B2	Alarm System	2.0
B3	Automatic Door	0.5
B4	Battery Charger	3.2
B5	Janitorial Equipment	1.2
B6	Vacuum Cleaner	0.7
	Medical/Hospital	
M1	Autoclave	1.2
M2	CAT Scan Machine	75
M3	Centrifuge	4.2
M4	Chromatograph, analyzer	1.5
M5	Cytometer, blood analyzer	2.0
M6	Dentist Chair	0.5
M7	EKG Machine	0.3
M8	Hot Plate, Lab Equipment	2.5 (20)
M9	Incubator	1.5
M10	Laboratory Oven	1.5 (15)
M11	Laboratory, other equip.	1 (10)
M12	Sterilizer	1.0 (10)
M13	X-Ray Machine	4.6

ID	Equipment Type	Ref. kW (kBtuh)
	Electronics	
E1	Broadcasting Equipment	0.7
E2	Stereo System	0.25
E3	Television	0.28
E4	Video Recorder (VCR)	0.5
	Service/Retail	
R1	ATM Machine	1.0
R2	Change Machine	0.4
R3	Conveyor (check-out)	0.1
R4	Film Processing	3.0
R5	Photo Equipment	1.7
R6	Pinball or Video Game	0.5
R7	Hair Dryers	1.0
R8	Exercise Equipment	1.0
R9	Industrial Compactor	2.8
R10	Vending Machine, Hot Food	0.8
R11	Vending Machine, Non-Refrig.	0.4
R12	Water Vending Machine	0.6

ID	Equipment Type	Ref. kW (kBtuh)
	Shop Equipment	
S1	Forklifts	7.5 (50)
S2	Hand Truck/Pallet Lifts	2.5 (15)
S3	Non-Forklift Elec. Vehicles	10
S4	Other Electric Transport	10
S5	Battery Chargers	1.5
S6	Electric Crane	3.4
S7	Portable Shop Tools	0.9
S8	Shop Equipment	0.7
S9	Soldering Gun or Iron	0.1
S10	Welder	30 (120)
	Laundry	
L1	Clothes Dryer, Residl.	1.4 (15)
L2	Clothes Washer, Residl.	0.9
L3	Clothes Dryer, Commcl.	5 (28)
L4	Clother Washer, Commcl	8.5
L5	Dry Cleaning Unit	14
L6	Sewing Machine	0.1
	Space Comfort	
C1	Air Cleaner	0.5
C2	Ceiling or Portable Fan	0.2
C3	Dehumidifier	0.6
C4	Humidifier	0.5
C5	Portable Heater	1.4 (10)

Motors/Engines tblMOTORS

								Nameplate Data						
Comp ID	Item #	Area ID	Process/Application Type	Service Type	Control Type	Drive Type	# of motors	Size (hp)	RPM	NEMA Encl. Type	NEMA Nom. Eff.**	Load Type	Avg Age (yrs)	Avg run hrs per week*
ShellCmpID	*Item*	*Area*	*MSDesc*	*Servic*	*Control*	*MDrive*	*Qty*	*HpSize*	*RPM*	*NEMAType*	*MEff*	*MLoad*	*Mage*	*HourWeek*

* "Avg run hrs per week" estimate is required for each motor item.

** Enter Nominal Efficiency as a % or if not available, use: **S**=Standard **H**=High-efficiency **P**=Premium-eff.

*** Avg run hrs per week for escalators\elevators is the approx # of hours that the system is being used to transport people. Estimate from business hours and approx. usage type (high/medium/low) or absolute # of hours used.

Motor Codes

Service Type	Control Type	Drive Type	NEMA Encl. Type	Load Type
P : Pump	**T** : Throttled	**AC** : AC	**O** =Open drip-proof	**C** : Constant
F : Fan/Blower	**D** : Outlet damper	**DCS** : DC w/ SCR	**T** =Totally enclosed	**V** : Variable
M: Material Handling/conveyor	**M** : Mechanical VSD	**DCM** : DC w/ MGS	fan-cooled	**I** : Intermittent
T : Machine Tool	**E** : Electronic VSD	**EG** : Nat gas driven	**OT** = Other	
G : Grinding/milling	**C** : Constant Speed	**FG** : Fossil driven		
E : Escalator***	**I** : Inlet vane	**SD** : Steam driven		
PE : Passenger Elevator***	**O** : Other _*ControlOther*			
FE : Freight Elevator***				
S : Separation				
O : Other __*ServiceOther*___				

Air Compressors tblAIRCOMP

Does the facility have a Leak Reduction Maintenance Program? ☐ **YES** ☐ **NO** *tblSITEINFO.ACLeakProg*

									Nameplate Data					
Comp ID	**Item #**	**Area ID**	**Description**	**Comp Type**	**Appl Type**	**Control Type**	**Drive Type**	**# of units**	**Size (hp)**	**RPM**	**NEMA Encl. Type**	**NEMA Nom. Eff.****	**Avg Age (yrs)**	**Avg run hrs per week***
ShellCmpID	*Item*	*AreaID*	*AcDesc*	*AcComp*	*AcAppl*	*Control*	*AcDrive*	*Qty*	*HPSize*	*RPM*	*NEMAType*	*AcEff*	*AcAge*	*HourWeek*

* "Avg run hrs per week" estimate is required for each air compressor item
** Enter Nominal Efficiency as a % or if not available, use: **S**=Standard **H**=High-efficiency **P**=Premium-efficiency

Air Compressor Codes

Compressor Type	Application Types	Control Type	Drive Type
RTD: Reciprocating (Two-stage, Double-acting)	**C**: Cleaning	**S**: Start/Stop	**AC**
RSD: Reciprocating (Single-stage, Double-acting)	**T**: Drives tools	**L**: Load/Unload	**DCS**: DC w/ SCR
RTS: Reciprocating (Two-stage, Single-acting)	**H**: HVAC Pneumatic	**V**: VSD Throttling	**DCM:** DC w/ MGS
RSS: Reciprocating (Single-stage, Single-acting)	**O**: Other *AcApplDesc*	**T**: Throttling	**EG**: Nat gas driven
ST: Rotary Screw, Two-stage		**O**: Other *AcCtrlDesc*	**FG**: Fossil driven
SS: Rotary Screw, Single-stage			**SD**: Steam driven
C: Centrifugal			
O: Other __*AcCompDesc*_____			

Process Equipment (Non-Motor) tblPROCESS

								Primary Fuel		Secondary Fuel			
Comp ID	Item #	Area ID	Process Equip Code	Product Produced	Boiler #	# of units	Avg Unit Capacity** kW/kBtuh	Fuel	% of Annual Btu	Fuel	% of Annual Btu	Avg Age (yrs)	Avg hrs per week*
ShellCmpID	*Item*	*AreaID*	*PProc*	*PProduct*	*PBoiler*	*Qty*	*Capacity*	*PFuel1*	*PBtu1*	*PFuel2*	*PBtu2*	*AvgAge*	*HourWeek*
								E G O	%	E G O	%		
								E G O	%	E G O	%		
								E G O	%	E G O	%		
								E G O	%	E G O	%		
								E G O	%	E G O	%		
								E G O	%	E G O	%		
								E G O	%	E G O	%		

* "Avg hrs per week" estimate is required for each process equipment item.
** Specify kW for electric equipment, kBtuh for all others.

Process Equipment Codes

Heat Processing:		**Pulping:**		**Drying/Curing/Baking:**	
Direct Fired Gas Heating	DFGH	Batch Digesters	DIGST	Ovens	OVENDCB
Direct Fired Oil Heating	DFOH	Stock Refiners	STKREF	Microwave	MICRODCB
Blanchers	BLNCH	**Paper Preparation:**		Infrared	IR
Microwave	MICROHP	Pulpers	PULP	Electric Resistance	ELRES
Sterilizers	STER	Refiners	REFNR	Steam from Process Boiler	STM
Pasteurizers	PAST	Stock Mixers	STKMXR	Ultraviolet	UV
Induction Heating	INDCTHTG	**Separation and Distillation:**		Kiln	KILN
Induction Melting	INDCTMLT	Thermal Distillation Column	THRMDC	Radio Frequency	RFDCB
Radio Frequency	RFHP	Freeze Concentration	FRZCON	Electron Beam	EBDCB
Indirect Resistance	INDIRES	Vacuum Condensation	VACCON	**Refrigeration/Freezing:**	
Direct Resistance	DIRRES	Membrane Separation	MEMSEP	Forced Air Cooling	FORAIR
Encased Resistance	ENCRES	Pressure Swing Absorption	PSA	Blast Freezing	BLSTFRZ
Plasma Processing	PLSMHP	Vacuum Concentration	VACCNTR	Hydrocooling	HYDRCL
Electric Arc Furnace	ELARCFRN	Ultra Filtration	ULTRAFLT	Belt Freezing	BLTFRZ
Ion Nitriding	IONNIT	Reverse Osmosis	REVOS	Plate Freezing	PLTFRZ
Laser Hardening	LASER	Evaporators	EVAP	Vacuum Cooling	VACCL
Cupola	CUPOLA	**Solid-Liquid Extraction:**		Immersion Freezing	IMMFRZ
Dehydration:		Single Stage Extractors	SSEXT	**Mixing and Emulsification:**	
Convection Dryer	CONVDR	Multi-Stage, Static Bed Extractors	MLTEXT	Pressure Homogenizers	PRSHOM
Infrared Dryer	IRDR	Continuous Moving-Bed Extractors	CONBED	Ultrasonic Emulsification Devices	ULTRAEMD
ElectricResistanceDrying	ELRESDH	**Plastic Molding:**		**Fiber Preparation:**	
Microwave Dryer	MICRODH	Injection Molding	INJMLD	Dye Tanks	DYE
Material Preparation:		Extrusion Molding	EXTMLD	**Crystallization:**	
Arc Welding	ARCWLD	Blow Molding	BLWMLD	Oil Winterization	OILWNTR
Laser Cutting	LASERCT	Rotational Molding	ROTMLD	Freeze Concentration	FRZCONC
Water Jet Cutting	WTRJET	Compression Molding	COMPMLD	Ice Crystallization	ICECRYS
Electron Beam Welding	EBWMP	Thermoforming	THRMFRM	Lactose Crystallization	LACCRYS
Laser Welding	LASERWLD			Fat Crystallization	FATCRYS
Plasma Cutting	PLSMMP	**Washing and Drying:**		**Screening and Separation:**	
Filtration:		Rotary Kilns	ROTKLN	Froth Floatation Baths	FRTH
Pressure Filters	PRESFLT	Cascade Dryer	CASCDR	**Exploration and Drilling:**	
Vacuum Filters	VACFLTR	Fluidized Bed Dryer	FBD	Engine Driven Boring Equipment	ENGBOR
Finishing:		Suspension Dryer	SUSPDR	**Emission Reduction Equipment:**	
Ovens	OVENF			Standard Thermal Oxidizer	STHOX
Electroplating	ELPLT			Recuperative Thermal Oxidizer	RTHOX
Hot Dip Galvanizing	HDG			OTHER	OT

General Comments tblCOMMENTS

CompID	Form #	Item #	Comments
ShellCmpID	*FormNum*	*ItemNum*	*Comments*

Site Photo Log

tblPHOTOLOG*

Record site photo information here, including the PhotoID (ie., digital file name) and a brief description of the photo where needed. Refer to the training manual for protocols on what photos to take and photo/file naming conventions..

Item #	PhotoID	Description/Comments
Item	*PhotoID*	*Description*
2		
3		
4		
5		
6		
7		
8		
9		
10		
11		
12		
13		
14		
15		
16		
17		
18		
19		
20		
21		
22		
23		
24		
25		
26		
27		
28		
29		
30		

* *"Path" is an additional field included in this table, the value of which provides the path to where the photos are located.*

Short-Term Metered Data

tblSTMETER

Installation date/time __*InstDate*____ **Extraction date/time** ____*ExtrDate*____**Duration (days)** ___*DaysMetered*__

Item #	End Use / Type L=Ltg F=Fan	Logger ID#	Survey Form System Reference		# of Contrid Fixtures – or - % Cond	Location / Notes / Comments
			Comp ID	Item#s - or – System Ltr / #		
ItemNum	*MtrEndUse*	*LoggerID*	*CompID*	*EquipItem*	*NumControl*	*Location*
1	L F					
2	L F					
3	L F					
4	L F					
5	L F					
6	L F					

Additional Comments:

tblCOMMENT2.Form39

APPENDIX C: END-USE MAPPINGS

C.1 Introduction

Mapping of equipment to specific end uses was deemed a critical issue. Previous CEUS surveys often did not use a common set of end uses, and sometimes the same piece of equipment might be mapped to a different end use based on building type. Examples of past problems/issues included:

- **Building Type variations:** Microwaves, refrigerators, and coffee makers in offices and other non-Restaurant type buildings were noted as Miscellaneous equipment. For this study, even in office this equipment is entered as Cooking equipment.
- **Miscellaneous end use as a dumping ground:** Past surveys might focus only on HVAC, lighting, and a few other key end uses, but then put everything else into the Miscellaneous end use. Sometimes the end uses collected would even vary by building type, so "Miscellaneous" equipment would even be different within the same survey across building types.

Itron's approach to addressing this issue was to offer enough end-use fidelity by using 10 non-HVAC end uses and to clearly map specific equipment to each end use. These mappings were incorporated into the survey instrument. Generally, the equipment for a specific end use is confined to a single table, a single page, or, if multiple pages, grouped together sequentially. Although this is primarily an issue for non-HVAC end uses, mapping of HVAC/DOE2 end uses to DrCEUS end uses is also discussed in this appendix.

C.2 DRCEUS End Uses

DRCEUS utilizes seven electric-only end uses and six end uses that can be either electric or natural gas. There are three HVAC end uses (1 – 3) and 10 non-HVAC end uses (4 – 13), as listed below:

1. Space Heating (Electric & Gas)
2. Space Cooling (Electric & Gas)
3. Ventilation
4. Water Heating (Electric & Gas)
5. Outdoor Lighting
6. Indoor Lighting
7. Office Equipment
8. Cooking (Electric & Gas)
9. Refrigeration
10. Motors
11. Process (Electric & Gas)
12. Miscellaneous (Electric & Gas)
13. Air Compressors

Simulation of the Non-HVAC end uses is primarily handled by DrCEUS (see Appendix H), while simulation of the HVAC end uses is handled by eQUEST/DOE-2.2.

C.3 Non-HVAC Equipment

Mapping non-HVAC equipment to DrCEUS end uses is a relatively straightforward process. Each piece of energy-using equipment was examined to determine which end use was appropriate. Lists of equipment encompassed by each end use are presented in Table C-1 through Table C-10.

Table C-1: Domestic/Service Water Heating Equipment

Water Heater (boiler, standard, instantaneous)
Swimming Pool/Spa Heater

Table C-2: Outside Lighting

Parking Lot Lighting
Parking Garage Lighting
Building Façade Lighting
Advertising Lighting

Table C-3: Indoor Lighting

Area Lighting
Task Lighting
Exit Signs
Track Lighting
Display/Advertising Lighting

Table C-4: Office Equipment

Personal Computer – Desktop
Personal Computer – Laptop
Printer – Ink Jet
Printer – Laser
Uninterruptible Power Supply
Small Copier
Medium Copier
Large Copier
Blueprint Machine
Monitor/Terminal
Computer – Mainframe
Printer – Mainframe
Workstation
Servers
Switching Equipment
FAX machine
Telephone System
Point-of-sale terminals
Cash Registers
Typewriter
Hole Punch
Shredder
Other office equipment

Table C-5: Cooking Equipment

Broiler, Conventional
Broiler, Infrared
Charbroiler (32” X 36” reference)
Coffee Maker
Cold Food Table
Dishwasher
Dishwasher Booster Heater
Drink Dispenser (Refrigerated)
Food Steamer
Food Warmer/Well
Fryer, Counter-type
Fryer, Floor-type
Fryer, Induction (1 vat reference)
Garbage Disposal
Griddle
Hot Food Table (4 holes reference)
Hot Plates (2 burners reference)
Ice Cream Dispenser
Induction Cooktop (2 burner ref)
Mixer, Large
Oven (in Range or standalone)
Oven, Convection
Oven, Finishing/Toaster
Oven, FlashBake
Oven, Microwave
Oven, Pizza, Counter-top
Oven, Pizza, Large
Popcorn Maker
Proofers/Holding Cabinet
Range, Large (6 burners)
Range, Medium (4 burners)
Range, Small (2 burners)
Rotisserie (3 spits reference)
Slicer (Meat, Cheese, etc)
Soup Pots
Steam Kettle
Toaster, Conveyor-type
Toaster, Slotted-type
Trash Compacter
Other (describe)

Table C-6: Refrigeration Equipment

Non-Commercial Refrigerators/Freezers
Single-door
Two-door
Three-door
Under counter/compact
Chest
Other (describe)_____
Commercial Refrigeration Equipment (Self-Contained)
Glass door beverage cases (e.g. vendor supplied) from 2 to 4 doors
Open upright display cases (pizza, juice, etc.) usually 4,5,6 ft lengths
Island cases (cheese, sometimes produce or juice) from 8 to 16 ft long
Service cases (bakery, sometimes deli) from 4 to 8 ft long
Closed door storage cases, one to three doors
Upright glass door freezer cases from one to three doors
Coffin type glass top freezer cases (usually ice cream) typically 6 or 8 ft
Ice storage boxes
Other: self-contained refrigeration not listed above
Ice vending machines (hotel-sized icemaker)
Remote Refrigeration
Display Cases (and all peripherals like fans, lights, etc.)
Walk-Ins/Prep Areas (and all peripherals like fans, lights, etc.)
Compressors
Condensers

Table C-7: Motors (non-HVAC)

Pumps
Fan/Blower
Material Handling/conveyor
Machine Tool
Grinding/milling
Escalator
Passenger Elevator
Freight Elevator
Separation
Other _____
Hot Water Circulation Pumps
Swimming Pool/Spa Pump
Swimming Pool/Spa Circulation Pump

Table C-8: Process Equipment

Heat Processing:	**Pulping:**	**Drying/Curing/Baking:**
Direct Fired Gas Heating	Batch Digesters	Ovens
Direct Fired Oil Heating	Stock Refiners	Microwave
Blanchers	Paper Preparation:	Infrared
Microwave	Pulpers	Electric Resistance
Sterilizers	Refiners	Steam from Process Boiler
Pasteurizers	Stock Mixers	Ultraviolet
Induction Heating	**Separation and Distillation:**	Kiln
Induction Melting	Thermal Distillation Column	Radio Frequency
Radio Frequency	Freeze Concentration	Electron Beam
Indirect Resistance	Vacuum Condensation	**Refrigeration/Freezing:**
Direct Resistance	Membrane Separation	Forced Air Cooling
Encased Resistance	Pressure Swing Absorption	Blast Freezing
Plasma Processing	Vacuum Concentration	Hydrocooling
Electric Arc Furnace	Ultra Filtration	Belt Freezing
Ion Nitriding	Reverse Osmosis	Plate Freezing
Laser Hardening	Evaporators	Vacuum Cooling
Cupola	**Solid-Liquid Extraction:**	Immersion Freezing
Dehydration:	Single Stage Extractors	**Mixing and Emulsification:**
Convection Dryer	Multi-Stage, Static Bed Extractors	Pressure Homogenizers
Infrared Dryer	Continuous Moving-Bed Extractors	Ultrasonic Emulsification Devices
ElectricResistanceDrying	**Plastic Molding:**	**Fiber Preparation:**
Microwave Dryer	Injection Molding	Dye Tanks
Material Preparation:	Extrusion Molding	**Crystallization:**
Arc Welding	Blow Molding	Oil Winterization
Laser Cutting	Rotational Molding	Freeze Concentration
Water Jet Cutting	Compression Molding	Ice Crystallization
Electron Beam Welding	Thermoforming	Lactose Crystallization
Laser Welding		Fat Crystallization
Plasma Cutting	**Washing and Drying:**	**Screening and Separation:**
Filtration:	Rotary Kilns	Froth Floatation Baths
Pressure Filters	Cascade Dryer	**Exploration and Drilling:**
Vacuum Filters	Fluidized Bed Dryer	Engine Driven Boring Equipment
Finishing:	Suspension Dryer	**Emission Reduction Equipment:**
Ovens		Standard Thermal Oxidizer
Electroplating		Recuperative Thermal Oxidizer
Hot Dip Galvanizing		**Other**

Table C-9: Miscellaneous Equipment

Building Equipment	Electronics	Shop Equipment
Air Hand Dryers	Broadcasting Equipment	Forklifts
Alarm System	Stereo System	Hand Truck/Pallet Lifts
Automatic Door	Television	Non-Forklift Elec. Vehicles
Battery Charger	Video Recorder (VCR)	Other Electric Transport
Janitorial Equipment		Battery Chargers
Vacuum Cleaner	**Service/Retail**	Electric Crane
	ATM Machine	Portable Shop Tools
	Change Machine	Shop Equipment
	Conveyor (check-out)	Soldering Gun or Iron
	Film Processing	Welder
	Photo Equipment	
Medical/Hospital	Pinball or Video Game	**Laundry**
Autoclave	Hair Dryers	Clothes Dryer, Residl.
CAT Scan Machine	Exercise Equipment	Clothes Washer, Residl.
Centrifuge	Industrial Compactor	Clothes Dryer, Commcl.
Chromatograph, analyzer	Vending Machine, Hot Food	Clother Washer, Commcl
Cytometer, blood analyzer	Vending Machine, Refrig.	Dry Cleaning Unit
Dentist Chair	Vending Machine, Non-Refr.	Sewing Machine
EKG Machine	Water Vending Machine	
Hot Plate, Lab Equipment		**Space Comfort**
Incubator	**Other**	Air Cleaner
Laboratory Oven	Describe	Ceiling or Portable Fan
Laboratory, other equip.		Dehumidifier
Sterilizer		Humidifier
X-Ray Machine		Portable Heater

Table C-10: Air Compressors

Cleaning
Drive Tools
HVAC Pneumatic
Other

C.4 HVAC Equipment

For HVAC equipment, there are three elements of the mapping process that must be considered: HVAC equipment from the survey data, eQUEST/ DOE-2.2, and DRCEUS. As represented in Table C-11, the survey data HVAC equipment (first column) is simulated as six HVAC DOE-2.2 end uses (second column), which are condensed into three DrCEUS HVAC end uses (third column). For most HVAC end uses, the mapping is straight-forward. For example, as shown in Table C-11:

- *Cooling source equipment* (DX units, chillers, etc.) is simulated under the DOE-2.2 *SPACE COOLING* end use, which is allocated to the DrCEUS *Cooling* end use.
- *Heat rejection equipment* is simulated under the DOE-2.2 *HEAT REJECT* end use, which is allocated to the DrCEUS *Cooling* end use.
- *AHU Supply & Return fans* are simulated under the DOE-2.2 *VENT FANS* end use, which is allocated to the DrCEUS *Ventilation* end use.

The only mapping that is not straightforward is for the DOE-2.2 PUMPS & AUX end use. DOE-2 Pump and Auxiliary energy is portioned out to DrCEUS Space Heating or Space Cooling energy usage depending on which hourly end use is active.

Table C-11: Mapping of HVAC Equipment to End Use

Survey Data HVAC Equipment	eQUEST/DOE-2.2 End Uses[1]	DrCEUS End Use
Space Cooling		
Cooling source equipment	SPACE COOLING	Cooling
Chilled water circulation pumps	PUMPS & AUX	Cooling
Heat rejection equipment	HEAT REJECT	Cooling
Space Heating		
Heating source equipment	SPACE HEATING	Heating
Hot water circulation pumps	PUMPS & AUX	Heating
Supplemental heat pump heating	HT PUMP SUPPLEM	Heating
Ventilation		
AHU Supply & Return fans	VENT FANS	Ventilation
Exhaust fans	VENT FANS	Ventilation
Make-up air fans	VENT FANS	Ventilation

[1] The end-use descriptions listed here are the labels used for these end uses in the DOE-2 simulation reports, for example the PS-F, BEPS, and BEPU reports.

APPENDIX D: RECRUITMENT LETTER

April 23, 2002

Customer Name
Customer Organization
Customer Address
Customer City and ZIP

Dear Contact Person:

The California Energy Commission and [Utility] are conducting a major study of the ways in which commercial customers use energy. This study, known as the California Commercial End-Use Survey, will be used to support the Energy Commission's efforts to forecast future energy needs and to ensure that these needs are met in a prudent manner.

As a central part of the study, [data collection subcontractor name] has been retained to conduct a comprehensive on-site survey of commercial establishments in the [utility] service area. The survey will be used to collect information on commercial building characteristics, equipment inventories, and usage patterns.

Your organization has been randomly selected as a potential participant in the study. In the near future, [data collection subcontractor name] will contact you to request your participation in the survey at one of your places of business. If you agree to take part, [data collection subcontractor name] will send a representative to this site to conduct the survey. The survey will have two parts:

- A brief interview with someone from your organization who is knowledgeable about energy use at the site, and
- A physical inspection of the facility.

If you agree to participate in the survey, [utility] will provide information on your recent energy usage to the study team (the Energy Commission and its contractors, and [utility]). This information and the information collected during the survey will be kept in the strictest confidence, and will not be released to anyone in a form that could allow the identification of any business, individual or facility.

If you have any questions, feel free to call [designated utility coordinator] at [telephone number] or the Energy Commission's Hotline at (800) 772-3300. You may also find additional information regarding this survey on the Energy Commission's website at www.energy.ca.gov/end-use. Thank you for considering our request to participate in this valuable research.

Sincerely,

Project Manager
California Energy Commission

APPENDIX E: RECRUITMENT SCRIPT

1. FINDING A VALID CONTACT, AND PREMISE VALIDATION

To the person who answers the phone when there is no known contact name:

Hello. I am calling on behalf of The California Energy Commission and [*Utility*]. Could you please tell me the name of the (manager, building engineer, property manager) for your business at this location [*service address]*? Are they available?

To the person who answers the phone and there is a known contact name:

Hello. Is *Contact Name* available?

To Contact Person:

Hello, my name is _____ with [*on-site survey contractor*]. I'm calling on behalf of the California Energy Commission and [*Utility*]. The Energy Commission sent you a letter recently about a survey of your commercial establishment. Did you receive it? (if no, then offer to FAX them a copy after you end the phone call).

The Energy Commission is conducting equipment and facility surveys of commercial customers in the area. This will provide the Energy Commission with information so they can plan future energy needs for California. Would you be interested in participating in this study?

If the site contact does not want to participate, note the reason.

If the site contact wishes to participate but wants to talk to a utility representative then give the following contact information and tell them to reference the CEC CEUS project:

CEC Website: www.energy.ca.gov/end-use
[UTILITY]: [Utility Contact Name] 800-555-1212

If the site contact wishes to participate, ask the pre-qualification questions.

Thank you for agreeing to participate in the study. I would now like to ask you a few specific questions about your business.
(Verify the business name and location)
Is the name of your business [*Business Name*]? _____

Is your business located at [*Service Address*]? _____

If the customer name is different but service address is the same (i.e., business has changed):
I'm sorry, but your site does not meet the requirements for the survey. Thank you for your time. (Note the disposition as "different business/customer" and explain in comments)

2. PRE-QUALIFICATION SCREENS

Now establish if the site meets the "minimum building criteria", i.e., commercial building and not a non-building (e.g. stand-alone parking garage, radio tower, pump, etc.):

Is more than 50% of this floor area devoted to industrial, agricultural, or residential activities?
_____

Is the space occupied by your business greater than 100 square feet? _____

If the above site does not meet both of these criteria, i.e., >50% commercial space (non-commercial building) or is less than 101 square feet floor area (non-building):

I'm sorry, but your site is outside the scope of this study. Thank you for your time. (Disposition the site as a non-commercial or non-building site, and explain in comments)

Next ask the site contact about site accessibility, criteria is that more than 50% of site must be accessible to surveyors:
To do the survey, an engineer from [*on-site survey contractor*] and possibly a [*utility*] representative will come to your facility. They will be collecting information on your facility's operation, construction, site activities, and equipment. This is a comprehensive survey, so we will need to see any rooftop equipment, and will also need access to all mechanical rooms. We would also like to have some time to talk with the building technical staff or maintenance people, if possible.

Is the majority of your site accessible to a surveyor (i.e., no high-security or limited access areas such as clean rooms)?

If the above site would not be accessible to a surveyor, i.e., more than 50% of site must be accessible:
I'm sorry, but your site is outside the scope of this survey. Thank you for your time. (Disposition the site as a this site had limited access.)

3. SCHEDULE THE APPOINTMENT

If the site passes the above screens:

I would like to set up an appointment to survey your business.

I have an opening in my schedule for _____ or _____. Would one of these times be better for you?

Set up an appointment date, time, and place and then verify the following with the contact:

Contact name spelling
Contact telephone number(s)
Contact email address
Business name and spelling
Service address
Special instructions for the site visit *(where to meet, badging required, etc)*

4. GET ADDITIONAL INFORMATION NEEDED TO ASSESS SURVEY TIME

Ask about site configuration:
I just have two more questions to ask you. Which of the following best characterizes your site:

a) A suite or suite in a strip-mall
b) Tenant in a multi-floor/high-rise building
c) An entire building
d) A multiple building business park or campus
e) Building owner with some space leased to tenants
f) Other (describe) _____

Get estimate of business size/total floor area:
Can you give me a floor area estimate for the space your business occupies? _____

Before ending the conversation, request that blueprints and a copy of one month's energy bills are available on the day of the survey. Energy bills will be used to validate our multiple accounts grouping.

Also, make sure they have a copy of the Recruitment Letter, and if they don't be sure to FAX them a copy.

APPENDIX F: SHORT-TERM METERING PROTOCOLS

F.1 Overall STM Objectives

Reliable estimates of hourly energy use depend strongly on surveyor estimates of equipment operating hours and usage patterns (i.e., percent of equipment on), as captured in the on-site survey form schedules. However, schedules are usually the most subjective and difficult site characteristics to assess. In an attempt to improve the accuracy of the schedules for inside lighting and HVAC systems – which are significant end uses for almost all building types – TOU data loggers were used to gather short-term metering (STM) data for these two end uses for a small subset of the on-site survey premises. The STM data were used to improve, or at least qualitatively evaluate, the operation schedules reported on the survey form, which are ultimately incorporated into the building simulation models.

In addition to improving schedules using the STM data alone, a special effort was made to examine the effectiveness of using STM data in conjunction with whole-building interval-metered data. Conventional practice might suggest screening interval-metered premises from the pool of sites eligible for STM, on the assumption that more information about premise-level operation can be gleaned from the interval-metered data than from STM data. However, as an experiment, the Energy Commission requested that at least 10% of the STM premises also have interval-metered data, in order to examine if operation information gleaned from the STM data could be used to complement and supplement observations from the interval-metered data.

Short-term metering will be conducted on a sub-sample of 500 premises. Details of the short-term metering effort are addressed in the following sections:

- **F.2 STM Targets.** This section presents the STM targets by building type and size, and contains a description of how the STM targets were determined.
- **F.3 General Issues/Protocols.** General issues and protocols applicable to the overall STM process and both end uses are presented in this section.
- **F.4 Lighting Logger Protocols.** These protocols would be used to decide where to place the lighting loggers and what information is required.
- **F.5 Application of Lighting Logger Data.** This is a discussion of how the logger data might be used to validate the on-site survey data.
- **F.6 HVAC Fan Logger Protocols.** These protocols would be used to decide where to place HVAC fan loggers and what information is required.

- **F.7 Application of HVAC Fan Logger Data.** This is a discussion of how the logger data might be used to validate the on-site survey data.
- **F.8 STM Data QC Requirements and Deliverables.** Defines the data and formats in which the short-term metered data will be delivered.
- **F.9 STM Data Miscellaneous Support Notes.** This section contains reference material used to decide the format for deliverables and illustrates the format of data retrieved from the loggers using the software provided by logger manufacturer.

F.2 STM Targets

Targets by building type and size are presented in Table F-1. The *OVERALL* column presents the total number of STM sites required. The *Xenergy* and *ADM* columns present the targets for each survey team. The *IM sites* column denotes the number of STM sites that are expected to be interval-metered sites, based on the statistics of IM sites within the primary and secondary recruitment samples, as shown in Table F-2. The criteria used to establish these targets, as developed in consultation with the CEC, were as follows.

- Five hundred premises will be sampled.
- STM targets, presented in Table F-1, were distributed following the process described below:
  - Census premises were excluded,
  - Large hospitals (health care-large) and hotels (hotels-large) were excluded, and
  - STM targets were distributed proportionally to the remaining on-site targets.

  The initial proportional distributions were further modified as follows:
  - Excluded small and medium hotels and reduced the number of large miscellaneous targets from 50 to 10 premises,
  - Re-allocated the targets from the two steps above (54 total—10 hotels and 40 large miscellaneous points) proportionally to all other small and medium sized categories, and
  - Overall targets were proportioned out to KEMA and ADM targets.
- The Energy Commission requested that approximately 10% of the STM sites (i.e., 50 sites) should be known interval-metered data premises. As mentioned in the overview, this effort was being pursued as an experiment to determine whether STM data can be used to complement the interval-metered data. This requirement was not strictly enforced as a hard target. Instead, based on the presence of interval-metered sites in the recruitment

sample (16%), it was hoped that this requirement would be met naturally by random sampling.

- Although the STM targets were not established on a climate zone basis, a "balanced approach" regarding climate zone was still desired. However, the logistics of extracting loggers from remote areas was recognized and as such, loggers were not installed in remote areas of the state.
- Itron provided a modified sample on which known interval-metered sites were "tagged," so that a premise's IM status could be appropriately tracked. This was necessary in order to request the IM data to be used for analysis in DrCEUS.
- An STM tracking system was needed to track dispositions related to STM metering for STM sites, including information related to installation, extraction, processing, and receipt of these data. These data were used to create a status report for the STM efforts.

Table F-1: Short-Term Metering Targets

BldgType	Size	Overall	Xenergy	ADM	IM Sites
1. Small Office	1. Small	9	6	3	1
1. Small Office	2. Medium	25	14	11	4
1. Small Office	3. Large	37	20	17	1
2. Large Office	1. Small	15	8	7	5
2. Large Office	2. Medium	12	7	5	6
2. Large Office	3. Large	11	7	4	6
2. Large Office	4. Census	0	0	0	0
3. Restaurant	1. Small	12	8	4	1
3. Restaurant	2. Medium	17	10	7	1
3. Restaurant	3. Large	14	8	6	1
4. Retail Store	1. Small	21	12	9	3
4. Retail Store	2. Medium	44	24	20	2
4. Retail Store	3. Large	35	18	17	12
4. Retail Store	4. Census	0	0	0	0
5. Food/Liquor	1. Small	15	11	4	0
5. Food/Liquor	2. Medium	27	18	9	1
5. Food/Liquor	3. Large	13	7	6	3
5. Food/Liquor	4. Census	0	0	0	0
6. Unref Warehouse	1. Small	11	7	4	1
6. Unref Warehouse	2. Medium	19	12	7	1
6. Unref Warehouse	3. Large	16	10	6	7
6. Unref Warehouse	4. Census	0	0	0	0
7. School	1. Small	9	6	3	0
7. School	2. Medium	9	6	3	1
7. School	3. Large	8	5	3	4
8. College	1. Small	4	3	1	0
8. College	2. Medium	6	4	2	1
8. College	3. Large	3	2	1	1
8. College	4. Census	0	0	0	0
9. Health Care	1. Small	11	8	3	0
9. Health Care	2. Medium	9	5	4	2
9. Health Care	3. Large	0	0	0	0
9. Health Care	4. Census	0	0	0	0
10. Hotel	1. Small	0	0	0	0
10. Hotel	2. Medium	0	0	0	0
10. Hotel	3. Large	0	0	0	0
10. Hotel	4. Census	0	0	0	0
11. Misc	1. Small	13	8	5	1
11. Misc	2. Medium	55	33	22	4
11. Misc	3. Large	10	6	4	2
11. Misc	4. Census	0	0	0	0
25. Refr Warehouse	1. Small	4	3	1	0
25. Refr Warehouse	2. Medium	4	3	1	1
25. Refr Warehouse	3. Large	2	1	1	1
25. Refr Warehouse	4. Census	0	0	0	0

Table F-2: Interval-Metered Data Site Statistics

		Interval-Metered Sites			On-Site		IntvMtrd
BldgType	Size	Primary	Secondary	Total	Target	%	%OfOn-site
1. Small Office	1. Small	5	13	18	31	11%	17%
1. Small Office	2. Medium	22	30	52	91		16%
1. Small Office	3. Large	11	8	19	162		3%
2. Large Office	1. Small	20	44	64	55	9%	33%
2. Large Office	2. Medium	16	64	80	45		51%
2. Large Office	3. Large	22	72	94	50		54%
2. Large Office	4. Census	42	-	42	69		17%
3. Restaurant	1. Small	4	9	13	43	7%	9%
3. Restaurant	2. Medium	6	8	14	58		7%
3. Restaurant	3. Large	6	4	10	62		5%
4. Retail Store	1. Small	11	23	34	80	16%	12%
4. Retail Store	2. Medium	11	12	23	162		4%
4. Retail Store	3. Large	44	136	180	156		33%
4. Retail Store	4. Census	3	-	3	14		6%
5. Food/Liquor	1. Small	2	3	5	55	9%	3%
5. Food/Liquor	2. Medium	4	13	17	98		5%
5. Food/Liquor	3. Large	12	31	43	56		22%
5. Food/Liquor	4. Census	-	-	-	9		0%
6. Unref Warehouse	1. Small	4	4	8	42	8%	5%
6. Unref Warehouse	2. Medium	6	6	12	70		5%
6. Unref Warehouse	3. Large	24	76	100	69		41%
6. Unref Warehouse	4. Census	2	-	2	9		6%
7. School	1. Small	-	-	-	36	4%	0%
7. School	2. Medium	4	11	15	36		12%
7. School	3. Large	15	44	59	36		47%
8. College	1. Small	-	-	-	17	3%	0%
8. College	2. Medium	4	9	13	18		21%
8. College	3. Large	3	7	10	15		19%
8. College	4. Census	2	-	2	24		2%
9. Health Care	1. Small	-	-	-	38	6%	0%
9. Health Care	2. Medium	4	17	21	35		17%
9. Health Care	3. Large	14	40	54	34		45%
9. Health Care	4. Census	17	-	17	53		9%
10. Hotel	1. Small	-	1	1	27	4%	1%
10. Hotel	2. Medium	5	10	15	36		12%
10. Hotel	3. Large	17	39	56	33		48%
10. Hotel	4. Census	6	-	6	14		12%
11. Misc	1. Small	6	13	19	50	21%	11%
11. Misc	2. Medium	29	19	48	203		7%
11. Misc	3. Large	44	147	191	219		25%
11. Misc	4. Census	28	-	28	47		17%
25. Refr Warehouse	1. Small	-	-	-	13	2%	0%
25. Refr Warehouse	2. Medium	1	6	7	14		14%
25. Refr Warehouse	3. Large	6	9	15	11		39%
25. Refr Warehouse	4. Census	2	-	2	5		11%

F.3 General Issues/Protocols

These protocols do not address instructions governing the actual installation, extraction, and downloading of data from the loggers, which will be left up to the CEUS survey team members. Only the targets, high-level objectives, protocols, and deliverables are addressed herein. However, the actual installation protocols used by each survey team were obtained from them, and are included in section F.10 for reference.

General issues and protocols include the following.

- The surveyor was allowed considerable discretion in deciding how best to install the loggers in order to optimize the lighting and HVAC operation information that can be captured for a premise. This is in recognition that the protocols cannot specifically address every unique situation.
- General guidelines for how many loggers to use for each end use included, but were not limited to, the following:
    1) Six loggers were to be used for every premise, unless operation could be characterized using fewer loggers (i.e., for very small sites or single-control point sites).
    2) The number of lighting loggers needed to obtain adequate representation of non-continuous (i.e., not always on) lighting was determined, and the balance was used for HVAC fans.
    3) Typically, every premise had at least one of each type of logger, unless a premise was completely unconditioned or HVAC system logging was not useful (see detailed protocols below). However, there were some instances where only HVAC loggers were warranted (for example, 7/24 lighting or an HVAC system/fan that cycles on/off as space conditioning is needed).
- Loggers were not installed if most of the premise was closed during the entire monitoring period, such as schools on winter/spring break. However, if a premise had a seasonally varying schedule and both schedules could be captured during the logger installation period, those distinct periods were noted on the final data set.
- For multi-component sites, the focus was on the primary objective—gaining some insight into the premise-level lighting and HVAC schedules—to determine where loggers should be placed for maximum usefulness.
- Every strata (BldgType X Size) for which a non-zero target number of sites is specified in Table F-1 had to have loggers applied to at least one site, even if the detailed lighting and HVAC fan protocols dictated otherwise. Itron was to be consulted immediately if it was shown for any strata that the protocols would prevent installing loggers on any of the premises within that strata (for example, all premises have EMS systems or 7/24 operation). Actions that were taken included the following:

1) Ignoring the detailed lighting and HVAC protocols that would normally prohibit logger installation (EMS, 7/24, etc.) for more than just one site.

2) Reallocating a portion of the targets for such strata to another strata.

- Itron worked with KEMA and ADM on a case-by-case basis on the implementation of this protocol.

F.4 Lighting Logger Protocols

Premise-Level Objective. The premise-level objective was to characterize the inside lighting operation schedule for the premise (and/or each premise Schedule Set) for non-continuous lighting by logging a representative sample of the lighting systems in a premise. Logger results were not used to directly create a premise-level shape, but instead were used in a more qualitative approach, to characterize operation of the most significant portions of the premise, primarily those areas or lighting systems that represent a significant percent of lighting energy use. Logger data were used primarily to verify Business Hours and daily operation, rather than build a shape.

Premise Sampling Protocol Rules

- Complete survey Form 39 as instructed in the training manual.
- Connected load and hours per week are the key characteristics to consider when determining where to place loggers. In general, loggers should be applied to fixtures that can be used to represent a significant kWh that is either: 1) a significant percent of total kW or 2) kW in combination with extended hours of operation (but not continuous – i.e., always on - operation).
- In determining where to place the loggers, try to think in terms of "usage groups," i.e., lighting systems with similar operating schedules (e.g., "Hours per week," control type) and functional uses (e.g., activity area types served).
- Only Area (i.e., not Task, Track, Display, etc.) lighting fixtures should be logged, unless a significant portion of the total connected lighting load is not Area lighting.
- Consider using loggers to validate assumptions about operation of lighting systems in sub-sampled areas.
- Consider space diversity. If lighting systems in a multi-floor building all supposedly operate on the same schedule, install loggers on multiple floors rather than just a single floor, to validate this assumption.
- **EMS (or timeclock)-controlled systems.** There are several levels and scenarios for EMS control. Protocols for dealing with the most common situations are as follows:

  - **High-confidence in EMS system operation.** For sites where the functionality and schedule settings of the EMS system can be physically confirmed, or where the site contact is the one who actually operates the EMS, loggers do not need to be installed.
  - **Remote-controlled EMS systems.** For sites that have EMS systems controlled by a corporate office or other remote facility, rather than in the facility itself, loggers should be installed.
  - **Questionable EMS system operation**. If there is any question about the validity of the EMS operation schedule whatever the source, loggers should be installed to confirm the EMS operation. A prime example is when the only source of information is the site contact and he does not have direct contact/access to the EMS system.

- **7/24 operation.** As with EMS systems, there are several issues to consider with sites that operate on a 7/24 schedule. Protocols for dealing with the most common situations are as follows:
  - **Fixtures without on/off switches or that are continuously on.** Do not install loggers on fixtures that are on continuously, unless there is some doubt about whether or not they really are on 7/24 and they are a significant percentage of the premise's total lighting demand and/or energy use.
  - **Business hours are 7/24 but lighting is not**. Loggers should be installed at sites where a significant portion of the lights are not operated on a 7/24 schedule, such as often occurs in a supermarket that is open 7/24 (i.e., they may dim 1/3 of the lights after 10-11 pm, or daylighting controls may dim or shut off the area lights completely during the day).
- Do not install loggers under the following circumstances:
  - On fixtures operated intermittently and sporadically (i.e., no set pattern or schedule) unless they are a significant percent of the total lighting kW and are turned on enough hours to have an impact on the total kWh for the site (such as stage lights in a theater).
  - On lights controlled by a dimmer (loggers only have a single lighting level on/off setting, so they would not be able to accurately indicate on/off times).
  - Where lighting kW, fixtures, and operation are so distinctly different and varied that premise-level operation cannot be adequately characterized even with the maximum available number of loggers. This should almost never be the case, because even for these sites a few well-placed loggers can yield significant insights.

- If bi-level switched and each switch controls a different bank of fixtures, then install a logger on each fixture and note that these are linked to the same switch box, and note percent of total lighting that each represents. Typically there are “high wattage” (a majority of the area lighting) and “low wattage” (less than 50% of the area lighting) fixture banks.

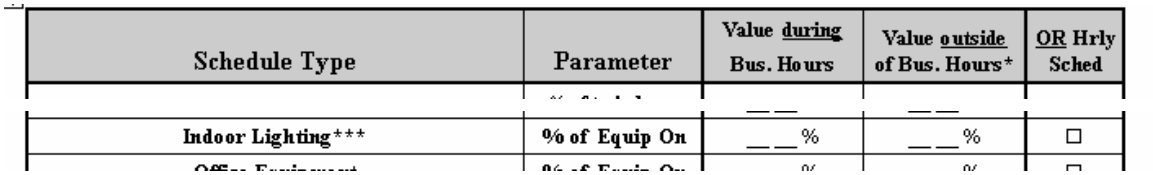
The on-site information to be recorded for each logger is described in Section 4, Form 39 of the On-Site Survey Training Manual.

F.5 Application of Lighting Logger Data

Data Objectives and Issues. Use the logger data to compare/validate/revise the lighting schedule information used for the simulation. Main issues to keep in mind are:

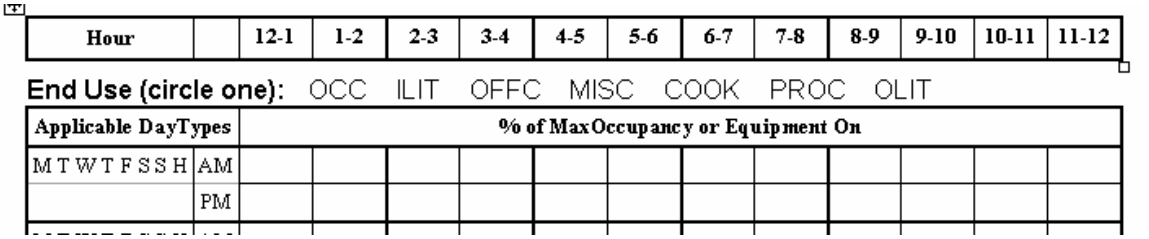
- The basis of the logger data and survey schedules is inherently different:
  - Loggers capture percent of time that a specific piece of equipment is on
  - Survey form schedules represent the percent of a load (premise-level kW and/or Schedule Set kW) that is on.
- On the survey form, the schedule is linked to a building shell component(s), not Activity Areas.
- Lighting schedules can be specified two ways:
  1) Percent of Equip On during and outside of Business Hours (Figure F-1).
     - If specified in this manner, starter shapes are utilized
     - Starter shapes, percentages, and Business Hours are fed into eQUEST and shifted
     - Business Hour, “from” hour is hour starting, “to” hour is hour ending, but logger data will all be on an hour-ending basis.
  2) Hourly schedule: Specify percent vs. hour X 24 X Sun-Sat & Hol (Figure F-2).
- Every inside lighting system has an “Hour per week” value, which can be used as one basis for grouping and estimating the percent of premise-level lighting that each logger represents. Where “Hours per week” is blank, the lighting systems on/off times and weekly operation corresponds to business hours.
- Consider kW, controls, and typical operating hours when determining how many and where to place loggers.

Figure F-1: Lighting Schedule: Business Hours & "% of Equip On" Approach



Schedule Type	Parameter	Value during Bus. Hours	Value outside of Bus. Hours*	OR Hrly Sched
		__ __	__ __	
Indoor Lighting***	% of Equip On	__ __ %	__ __ %	☐

Figure F-2: Lighting Schedule: Hourly Percent Equipment On Approach



Hour		12-1	1-2	2-3	3-4	4-5	5-6	6-7	7-8	8-9	9-10	10-11	11-12

End Use (circle one): OCC ILIT OFFC MISC COOK PROC OLIT

Applicable DayTypes		% of MaxOccupancy or Equipment On											
M T W T F S S H	AM												
	PM												

What We Hope To Do With the Data

Potential uses for this data include, but are not limited to, the following:

1) Obtain transition period operation (i.e., 0% and 100% times, and duration of the ramp up/ramp down), although only if able to weight and sum multiple logger results (for individual loggers, there will never be more than a single transition hour).
2) Compare Business Hours and/or lighting operation hours versus logger transition time and hourly time-series data (lights on/off times is usually a good indicator of business hours).
3) Compare daily operation/Business Hours versus logger hourly time-series data.
4) For daylighting, obtain typical usage pattern, might be able to check this against the eQUEST simulation results.
5) Where both high and low watt fixtures are monitored in a bi-level configuration, we might be able to establish use pattern for bi-level lighting and revise the lighting schedule used for the simulation.
6) Obtain a good approximation of the premise-level lighting schedule using logger data and survey data to generate a lighting schedule that can be compared to the schedule from the survey form.
    a) Weight up the logger shapes
    b) Add in 7/24 lighting from the survey form
    c) Sum a) and b)

d) Compare the logger-derived premise-level schedule to the survey-form schedule and decide if the survey-form schedule should be revised.

7) Potentially (but not probable) revise our starter shapes if percentages or transition periods in the shapes are shown to be inconsistent with what we observe in the logger data.

F.6 HVAC Fan Logger Protocols

Premise-Level Objective. To characterize the HVAC system fan operation for HVAC fan systems that do not operate continuously (i.e., are always on) by logging a sample of the HVAC system fans at a premise.

Premise Sampling Protocol Rules

- Loggers can be attached either to the exterior of the motor housing or inside the disconnect switchbox serving the indoor fan motor.
- **7/24 operation** only install a logger if the fan for a given HVAC system operates in a cycling mode at any time (i.e., when open or closed), that is the fan/system only comes on when heating or cooling is needed. If the fan is on 7/24/365, then there is no need to install a logger
- **EMS (or time clock)-controlled systems.** There are several levels and scenarios for EMS control. Protocols for dealing with the most common situations are as follows:
  - **High-confidence in EMS system operation.** For sites where the functionality and schedule settings of the EMS system can be physically confirmed, or where the site contact is the one who actually operates the EMS, loggers do not need to be installed.
  - **Remote-controlled EMS systems.** For sites with EMS systems controlled by a corporate office or other remote facility, rather than in the facility itself, loggers should be installed.
  - **Questionable EMS system operation.** If there is any question about the validity of the EMS operation schedule whatever the source, loggers should be installed to confirm the EMS operation. A prime example is when the only source of information is the site contact and he does not have direct contact/access to the EMS system.
- Don't install loggers under the following circumstances:
  - On HVAC units where the fan is known to be on 7/24 (equivalent of manual thermostat fan switch being in the "On" setting instead of the "Auto" setting).

  - On HVAC units that cannot be confirmed as being functional and actively used by occupants.

- If a Zone-by-Activity-Area (ZA) zoning scheme is used for the premise, use one logger for each conditioned Activity Area where HVAC is a significant contributor to the total HVAC use for the premise.
- For other than ZA zoning schemes, try to place loggers to capture diversity of operation within the extremes of each zone. For instance, for a 2-story perimeter/core zoned building:
  - If two available loggers, put one logger on the HVAC unit serving the bottom floor core and another logger on the unit serving the top-floor, western-most corner.
  - If three available loggers, install as indicated above and put one more on the unit serving the top South or southwest zone.
- If a premise has multiple HVAC system types, try to log one of each type that contributes significantly to the total HVAC load for the premise.
- If there are multiple HVAC schedules indicated on the survey form, install a logger on one representative unit for each schedule.

The on-site information to be recorded for each logger is described in Section 4, Form 39 of the On-Site Survey Training Manual.

F.7 Application of HVAC Fan Logger Data

Data Objectives and Issues. Use the logger data to compare/validate/revise the fan operation and potentially the heating/cooling temperature schedules that are used for the simulation. Main issues to keep in mind are:

- Most logging will be taking place during the winter/spring, so for most premises we are unlikely to collect any significant information on cooling loads/operation.
- On the survey form, a building shell Component is linked to a Schedule Set, and there can be multiple HVAC system schedules per Schedule Set.
- Individual HVAC systems are linked to a specific HVAC schedule, as limited by the Component that they serve.
- **Fan operation** (Figure F-3) is linked to Business Hours => "***Fan Operation (on/off): Occupied temperatures*** [and fan control] ***apply***":

  __ # of hours before opening

  __ # of hours after closing

  Of course, if the business is open 7/24 and no holidays, then these fields are irrelevant.

- **Fan control** (Figure F-3) can be specified for two periods - Occupied and Unoccupied. Control methods are as follows:
  - Always on/Continuous
  - Cycles with heating/cooling (i.e., similar to Auto mode on a residential HVAC system, i.e., fan/system only comes on when heating or cooling are needed as determined by the thermostat.)
  - Off
  - Manual/as-needed (fan/system is only manually turned on by occupant as needed)
  - Night cycling
- Looking at HVAC schedule (Figure F-3), the only useful information we can hope to obtain is:
  - System on/off times versus Business Hours, but only if system is turned off or on setback.
  - If cycling or manual type control, percent of time that system is actually on during and after Business Hours.
  - If setback, percent of time that system is on in setback periods.
- Zoning schemes should be a sampling concern, for instance if perimeter/core, would probably want two perimeter units and one core unit. Multiple floors could be an issue as well.
- This data may not be very useful. After doing a few of these and reviewing the data, we might want to reconsider the value of this effort; it might be better to concentrate on lighting.

Figure F-3 HVAC Schedule

Description	Occupied	Unoccupied (setback/setup)
Cooling Setpoints (90 = Off)	__ __ °F	__ __ °F
Heating Setpoints (50 = Off)	__ __ °F	__ __ °F
Fan Operation (on/off): Occupied temps apply	__ **# of hours before opening***	__ **# of hours after closing****
Fan Control: **A** = Always on/continuous **C** = Cycles w/HeatCool **O** = Off **M** = Manual/as-needed **N** = Night cycling	A C M	A C O M N

How We Hope To Use the Data

Potential uses for this data include, but are not limited to, the following:

1) If fan is not on continuously, will be able to see when the fan/system is turned off/on in relation to business hours and confirm versus survey form data.

2) Establish/confirm HVAC fan system control as indicated on the survey form for certain situations:
    a) "Always on" is not really "Cycles with Heat/Cool", or vice-a-versa, or completely off.
    b) If system is manually operated, when is it typically on and in what mode does it operate (i.e., Cycles with Heat/Cool or Always On)
3) Where multiple HVAC schedules are given for a Schedule Set, validate the different HVAC schedules.
4) Where there are multiple HVAC units, examine operation of the units serving the most extreme thermal zones (i.e., highest and lowest expected thermal loads and/or run-times).
5) If fans are not "Always On," we can maybe capture the diversity of operation in thermal zones (i.e., core versus perimeter) or Activity Areas.
6) If lighting loggers and HVAC loggers are installed in the same space, and the space is relatively small, we might be able to observe HVAC reaction/response to lighting.

F.8 STM Data QC Requirements and Deliverables

Logger Data QC Requirements

Logger data must be properly QCed either while downloading data from the logger (the best place to do it) or after the data is downloaded. That is, *the data cannot just be downloaded from the logger and passed off to Itron*. Someone must look at the data and verify that it is "good" data, i.e., there is data present, the data is only applicable to the monitoring period, etc. Situations to watch out for and deal with are:

- Sometimes loggers are not properly set-up at installation (reset not initiated, the correct time is not set, the logger is not calibrated, etc.) and data for the monitoring period has to be manually extracted from the complete data set and further manipulated.
- Unexpected things happen to installed loggers – loggers fall off or they are reset by curious customers or maintenance staff, etc.
- Post-extraction problems - batteries go dead or logger is non-responsive when you try to download, etc.

Observations made during the downloading and processing of the data must be saved and included as part of the logger data summary report.

Deliverables

Deliverables will come in hardcopy and electronic files as described and illustrated below:

1) (Hardcopy) A completed Form 39 of the on-site survey form. Note that this is where any observations resulting from the logger data QC process would also be recorded.
2) (Hardcopy) Any additional logger installation forms or notes created by the survey teams, which might include the data described in Sections and F.6 , and shown in Table F-3 and Table F-4. Any sketches, diagrams, and notes associated with location of the loggers should also be included with this submittal.
3) (Electronic) Logger installation data (i.e., Form 39 data) in electronic format, either an Excel or Access table, to ultimately reside in the Access survey database.
4) (Electronic) The logger data files in column delimited text (*.txt) files (without headers, only data). The data should be in two formats, as illustrated by the examples shown in Figure F-4 and. Logger ID should be used as the file names, and the file extensions should be as indicated below:
   - Transition data (####.TG) shown in Figure F-4.
   - Hourly time-series data (####.HS) shown in Figure F-5.

Figure F-4: Example of Transition Data Format

```
07/24/1999  13:01:37   Was OFF
07/24/1999  13:01:43   Turned ON
07/24/1999  13:01:50   Turned OFF
07/24/1999  13:01:52   Turned ON
07/24/1999  14:25:18   Turned OFF
.......................
.......................
08/18/1999  11:56:51   Turned ON
08/18/1999  11:56:52   Turned OFF
08/18/1999  11:56:56   Turned ON
08/18/1999  12:00:50   Was ON
```

Figure F-5: Example of Hourly Time-Series Data Format

7/25/99	0:00:00	0:59:59	0.0
7/25/99	1:00:00	1:59:59	0.0
7/25/99	2:00:00	2:59:59	0.0
7/25/99	3:00:00	3:59:59	0.0
7/25/99	4:00:00	4:59:59	0.0
7/25/99	5:00:00	5:59:59	0.0
7/25/99	6:00:00	6:59:59	0.0
7/25/99	7:00:00	7:59:59	0.0
7/25/99	8:00:00	8:59:59	36.5
7/25/99	9:00:00	9:59:59	100.0
7/25/99	10:00:00	10:59:59	88.9
7/25/99	11:00:00	11:59:59	0.0
7/25/99	12:00:00	12:59:59	0.0
7/25/99	13:00:00	13:59:59	0.0
……			
……			
8/14/99	13:00:00	13:59:59	0.0
8/14/99	14:00:00	14:59:59	0.0
8/14/99	15:00:00	15:59:59	0.0
8/14/99	16:00:00	16:59:59	0.0
8/14/99	17:00:00	17:59:59	0.0
8/14/99	18:00:00	18:59:59	80.5
8/14/99	19:00:00	19:59:59	100.0
8/14/99	20:00:00	20:59:59	100.0
8/14/99	21:00:00	21:59:59	100.0
8/14/99	22:00:00	22:59:59	18.5

F.9 STM Data Miscellaneous Support Notes

Data Loggers/Equipment

For Lighting. Pacific Science and Technology (PS&T, now Dent Instruments) TOU Lighting Loggers will be utilized by both Xenergy and ADM.

HVAC Fans. Xenergy will utilize PS&T TOU Motor Loggers, and ADM will utilize HOBO Motor On/Off loggers.

If loggers will be installed by someone other than the surveyor. Will need to work out a system such that the surveyor identifies while he's there which lighting and fan systems are to be logged (sketch, description, and identifying dots placed on the equipment so that installer can locate them?).

Will subs have enough loggers? We may need to consider cutting the monitoring period down in order to not require subs to have a zillion loggers out at any one time.

Figure F-6 TOU Lighting & Motor Data Loggers

Visualization/Qualitative Assessment and Comparisons

Here is a list of the ways we might want to look at the logger data and compare it to the schedule information:

Day Type Configurations

- Average Week day/Weekend Day
- Average Week day/Saturday/Sunday
- Average week (Mon-Sun)
- All data (entire monitoring period, display date and day type (Mon, Tue, etc.) for each day)

Data to Display

- Show all survey data schedules (hour-% basis) versus all logger data.
- Show overall premise-level normalized schedule (only relevant for multiple-schedule set premises, weighted schedules) versus all logger data
- Show overall premise-level normalized schedule (only relevant for multiple-schedule set premises, weighted schedules) versus weighted logger data.

Example Data Formats

Figure F-7: Illustration of Data Logger Function

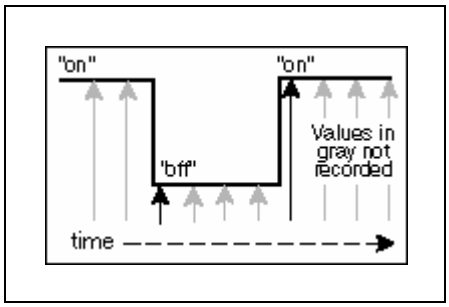


Figure F-8: Raw Logger Transition Data Example

```
07/24/1999  13:01:37   Was OFF
07/24/1999  13:01:43   Turned ON
07/24/1999  13:01:50   Turned OFF
07/24/1999  13:01:52   Turned ON
07/24/1999  14:25:18   Turned OFF
.......................
.......................
08/18/1999  11:56:51   Turned ON
08/18/1999  11:56:52   Turned OFF
08/18/1999  11:56:56   Turned ON
08/18/1999  12:00:50   Was ON
```

Figure F-9: Hourly Time-Series Logger Data

7/25/99	0:00:00	0:59:59	0.0
7/25/99	1:00:00	1:59:59	0.0
7/25/99	2:00:00	2:59:59	0.0
7/25/99	3:00:00	3:59:59	0.0
7/25/99	4:00:00	4:59:59	0.0
7/25/99	5:00:00	5:59:59	0.0
7/25/99	6:00:00	6:59:59	0.0
7/25/99	7:00:00	7:59:59	0.0
7/25/99	8:00:00	8:59:59	36.5
7/25/99	9:00:00	9:59:59	100.0
7/25/99	10:00:00	10:59:59	88.9
7/25/99	11:00:00	11:59:59	0.0
7/25/99	12:00:00	12:59:59	0.0
7/25/99	13:00:00	13:59:59	0.0
.....			
.....			
8/14/99	13:00:00	13:59:59	0.0
8/14/99	14:00:00	14:59:59	0.0
8/14/99	15:00:00	15:59:59	0.0
8/14/99	16:00:00	16:59:59	0.0
8/14/99	17:00:00	17:59:59	0.0
8/14/99	18:00:00	18:59:59	80.5
8/14/99	19:00:00	19:59:59	100.0
8/14/99	20:00:00	20:59:59	100.0
8/14/99	21:00:00	21:59:59	100.0
8/14/99	22:00:00	22:59:59	18.5

1) Note that percent represents the average time on for a given hour NOT the percent of lights on during that hour.
2) We want only complete days worth of data, not start and end periods of data.

Table F-3: Final Raw Transition Data Output Format (?)

SiteID	LoggerID	EndUse	Date	Time	OnOffStatus
PS01289993	1223456	ILIT	12/24/02	13:01:37	Was OFF
PS01289993	1223456	ILIT	12/24/02	13:01:43	Turned ON
PS01289993	1223456	ILIT	12/24/02	13:01:50	Turned OFF
PS01289993	1223456	ILIT	12/24/02	13:01:52	Turned ON
PS01289993	1223456	ILIT	12/24/02	14:25:18	Turned OFF
PS01289993	1223456	ILIT	12/24/02	15:05:00	Turned ON
PS01289993	1223456	ILIT	12/24/02	16:25:02	Was ON

Table F-4: Final Hourly Time-Series Data Output Format (?)

SiteID	LoggerID	EndUse	Date	DayType	Hol	Hr1	Hr2	…..	Hr23	Hr24
PS01289993	1223456	ILIT	12/24/02	2		0	0	100	100	100
PS01289993	1223456	ILIT	12/25/02	3	8	0	0	0	0	0
PS01289993	1223456	ILIT	12/26/02	4		0	0	100	100	100
PS01289993	1223456	ILIT	12/27/02	5		0	0	100	100	100
PS01289993	1223456	FAN	12/24/02	2		10	20	80	100	100
PS01289993	1223456	FAN	12/25/02	3	8	0	0	0	0	0
PS01289993	1223456	FAN	12/26/02	4		20	20	50	100	100
PS01289993	1223456	FAN	12/27/02	5		10	20	60	100	100

EndUse. Values are either ILIT or FAN
DayType. Values are 1 through 8 where 1 = Mon, 2=Tue, 3=Wed, 4=Thu, 5=Fri, 6=Sat, 7=Sun
Hol. Enter a value of “8” if the day is a known Holiday for the premise
Hr#. Enter the 24 hourly values

F.10 Subcontractor Logger Installation Protocols

The actual installation protocols used by the subcontractors - ADM and Xenergy - to install light and HVAC fan motor loggers are contained in this section. ADM provided installation protocols for both lighting and HVAC motor loggers. However, Xenergy only provided a lighting logger installation protocol; only a select few of the surveyors were trained to do this, so no protocols were developed.

ADM Lighting Logger Installation Protocols

The general procedure is to determine how many area types are in the building and install at least one lighting logger in each area type. Then find a fixture that is representative of an area and can have a lighting logger installed. Install the loggers and fill out Form 39. For this projects, install 2 to 5 lighting loggers per site. For sites with many distinctive area types with different use patterns place a maximum of 6 lighting loggers. Schedule a return visit to collect the loggers 2 weeks after installation (longer if there are holidays during the installed period). The procedures are:

1. **Find a fixture** that will have hours of operation that will be representative of a space type.
2. If the fixture has a **wall switch, turn it off and on**. This is done to confirm it is on the switch and not a security fixture that will operate 24 hours.
3. **Visually inspect the fixture**. If necessary, open the fixture. Take care not to damage the lens or fixture. If there appears to be any kind of previous damage or problem with the fixture notify the site contact person so they are aware of any pre-existing conditions.
4. **Adjust lighting level threshold** (sensitivity) on lighting logger by holding it about 2 feet from the lamp. Using a small flat screwdriver, slowly adjust so lighting logger just turns on at that lighting level.
5. **Press the reset button** on the logger prior to installation, all previous data will be lost. Only a trained ADM engineer should reset the logger after data has been collected using a computer.
6. **Place lighting logger in fixture**. While loggers can be placed in many fixtures using the magnetic strip on the logger, double-sided tape may need to be used with other types of fixtures to hold the logger in the fixture. Take care with reflective fixtures not to diminish the reflective qualities. Many fixtures have lens covers that need to be opened up to place the loggers; for such fixtures, the loggers are placed so that the light sensor is looking at the lamp. Too much heat can damage the logger. As a guide, if you can hold your hand there for a minute then the logger should be OK.
7. After the logger has been placed in the fixture **confirm the logger display shows "ON"** when the lights are on.
8. **Record the logger serial number, component Id and Item #'s, date & time, # of fixtures controlled, and location** in building, onto Form 39. Describe the location of the logger so someone else can find it and so it identifies the area usage type. On the form identify the space type in which the logger has been placed and what percentage of the building the logger represents. Account for as much of the building as possible. Also note any special conditions such as occupancy sensors, daylight area, only used at night, etc.

9. **Place a colored sticker** on the outside of the fixture frame so it can be identified as someone walks up to it.

10. Make sure someone at the site knows where the lighting loggers have been placed and will keep an eye out until you return to remove them. Write their name on the Installation Form.

ADM HVAC Fan Motor Logger Installation Protocols

The general procedure is to determine how many area types are in the building and install at least one motor logger in each area type. Then find an air handler that is representative of an area and can have a motor logger installed. Install the loggers and fill out Form 39. For this projects, install 1 to 3 motor loggers per site. For sites with many distinctive area types with different use patterns place a maximum of 4 motor loggers. Schedule a return visit to collect the loggers 2 weeks after installation (longer if there are holidays during the installed period). The procedures are:

1. **Find an air handler** that will have hours of operation that will be representative of a space type.

2. Open up the unit to **gain access to the motor**.

3. **Visually inspect the air handler**. If there appears to be any kind of previous damage or problem notify the site contact person so they are aware of any pre-existing conditions.

4. **Attach Motor On/Off Logger** to side of motor.

5. After the logger has been placed on the motor **confirm the logger blinks green when motor is running and red when motor is off**. If necessary adjust position of motor logger so it blinks green when motor is running.

6. **Record the logger serial number, component Id and System Letter #'s, date & time, % conditioned, and location** in building, onto Form 39. Describe the location of the logger so someone else can find it and so it identifies the area usage type. On the form identify the space type in which the logger has been placed and what percentage of the building the logger represents. Account for as much of the building as possible. Also note any special conditions.

7. **Place a colored sticker** on the outside of the motor cabinet so it can be identified as someone walks up to it.

8. Make sure someone at the site knows where the motor loggers have been placed and will keep an eye out until you return to remove them. Write their name on the Installation Form.

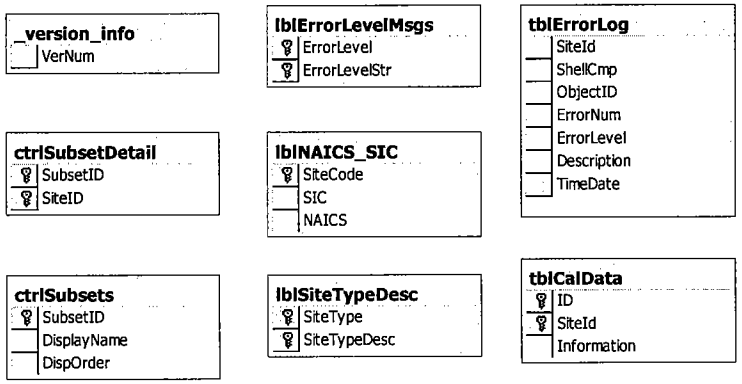
Xenergy Lighting Logger Installation Protocols

As is the case with installing any type of monitoring device, it is essential to make sure that the logger is installed and operating correctly. Obviously, it defeats the purpose to leave a logger in place if it is not operating properly. The PS&T TOU Lighting Loggers are very simple and easy to use. Refer to the attached installation instructions provided by PS&T on installation of these lighting loggers. In addition the following steps should be taken to insure proper installation for gathering complete and accurate data:

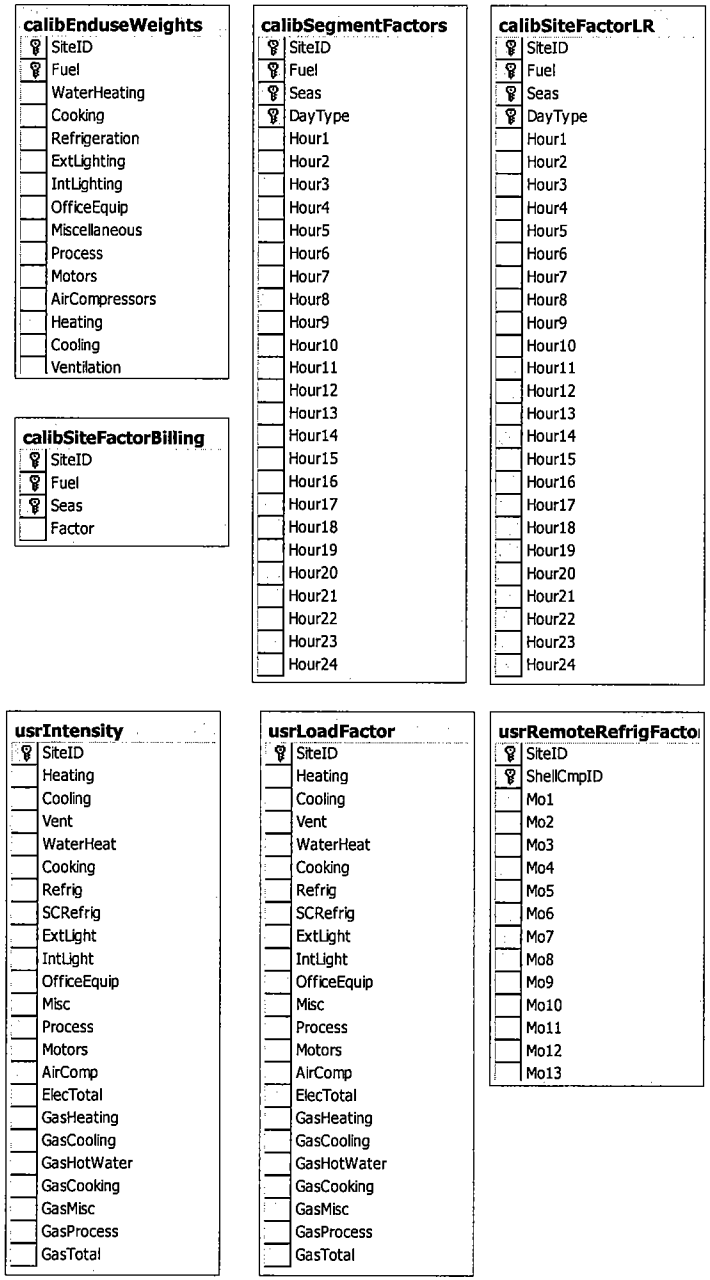
1. Identify the fixture groups accurately before deciding on which groups to monitor. This includes the control device for that fixture group.
2. Within a fixture group identify which, if any, fixtures are emergency fixtures that stay on 24 hours. Do not install a logger on these fixtures.
3. Identify ambient light sources. Do not install loggers on fixtures that may be subject to "false" recordings due to ambient light triggering the logger. Be sure to consider the ambient light exposure throughout the day. The sun may not be a problem at the time of installation, but could have a negative effect during a different period of the day.
4. Adjust the sensitivity of the logger so that the display reads "on" only when the fixture is on. This is done by setting the sensitivity low and slowly adjusting it until the logger is triggered. Turn the sensitivity approximately 1/4 turn past that point.
5. Test the logger operation by turning off the fixture and checking that the logger reads "off". Turn it back on and check the display for "on". Hint: If you can not operate the fixture control, for example, an occupancy sensor controls the light, you can many times remove one of the lamps to disable the light depending on the wiring scheme of the ballast's.
6. When the logger is properly installed, before closing the fixture, **RESET THE LOGGER!**
7. Mark the outside of the fixture with one of the supplied stickers so that you or someone else can quickly retrieve the logger.

APPENDIX G: SURVEY DATABASE LAYOUT

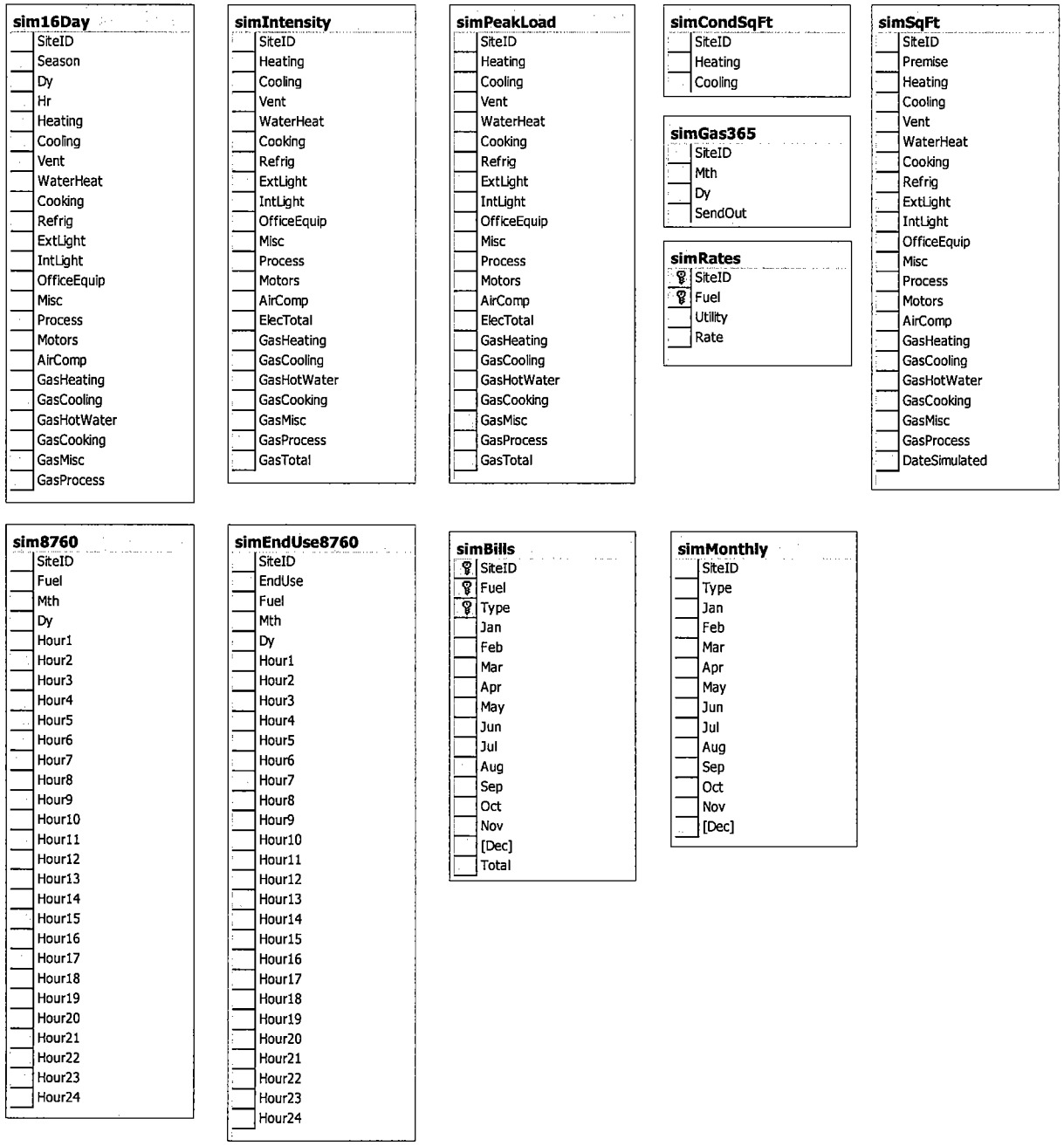
System Control Tables, Labels and Logs



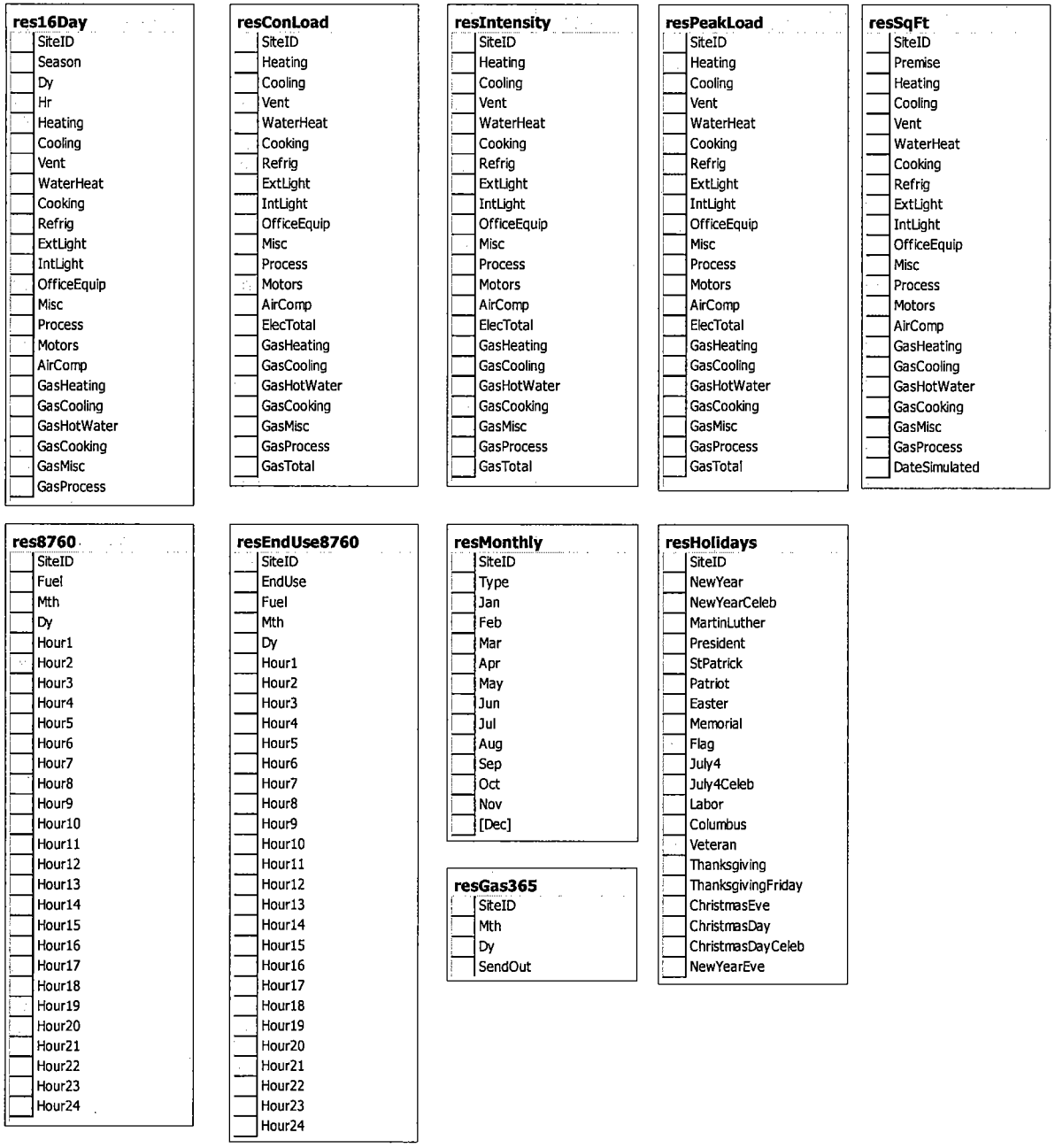
Calibration and Adjustment Factor Tables



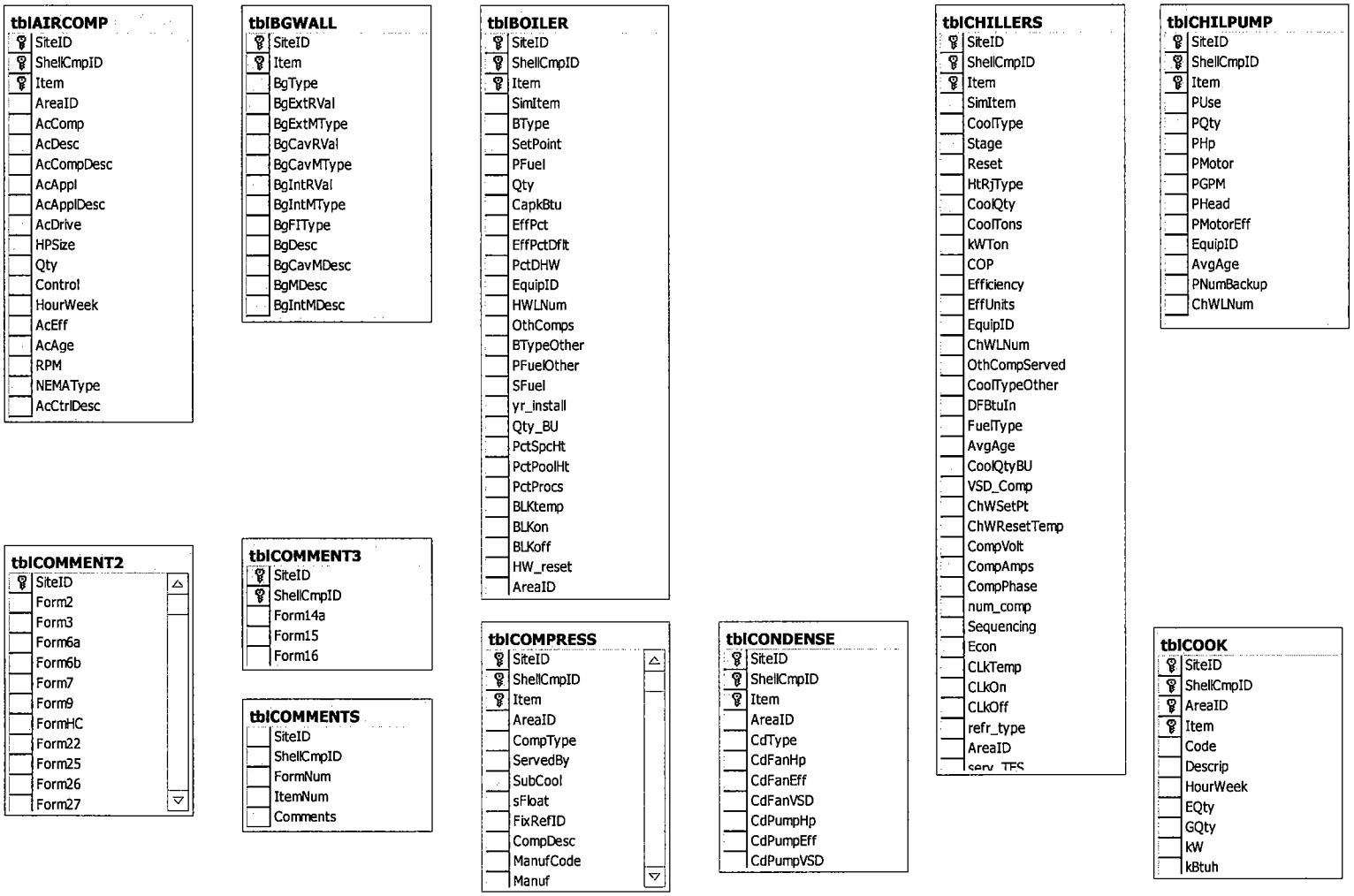
Result Tables (1 of 2)

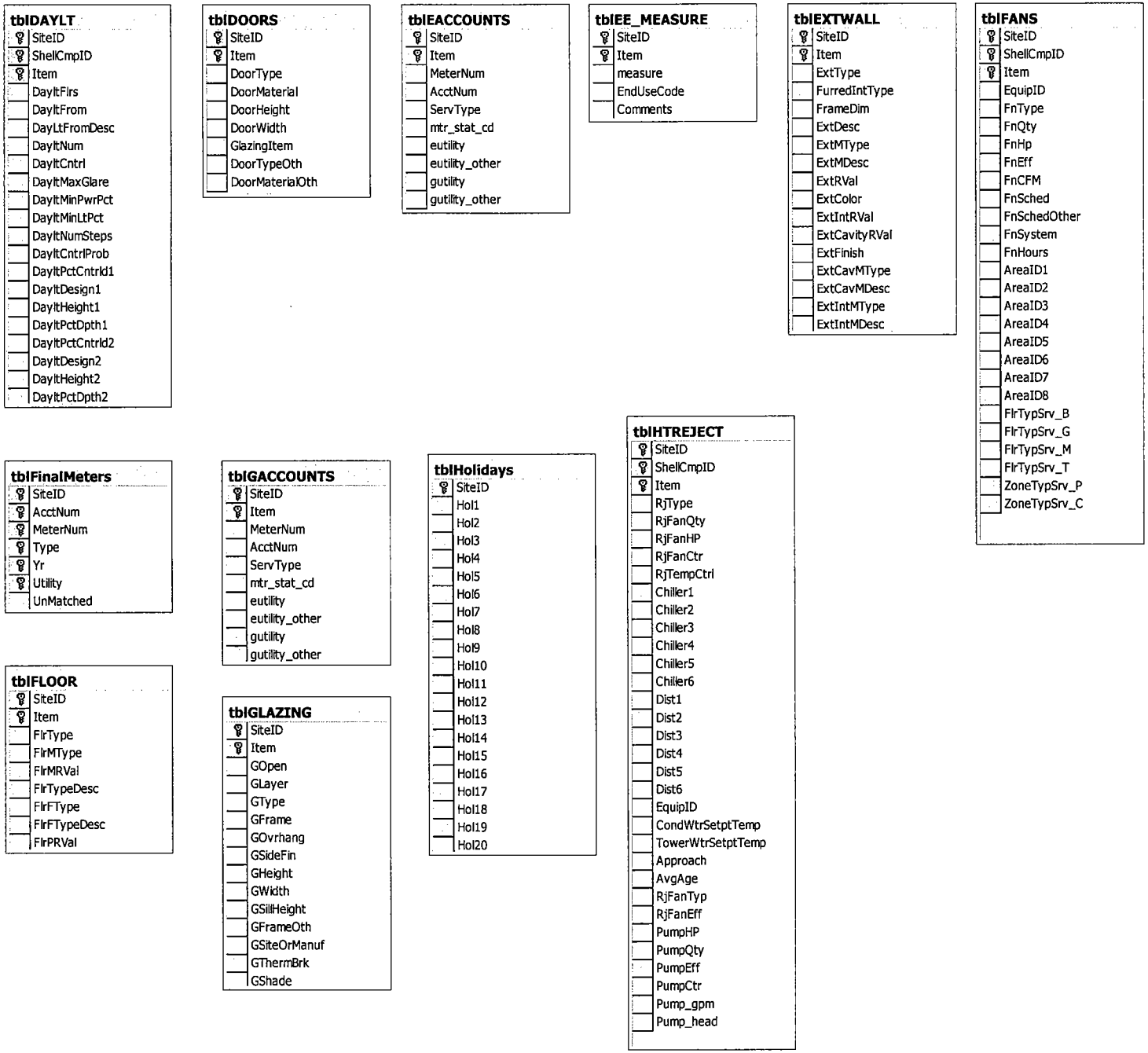


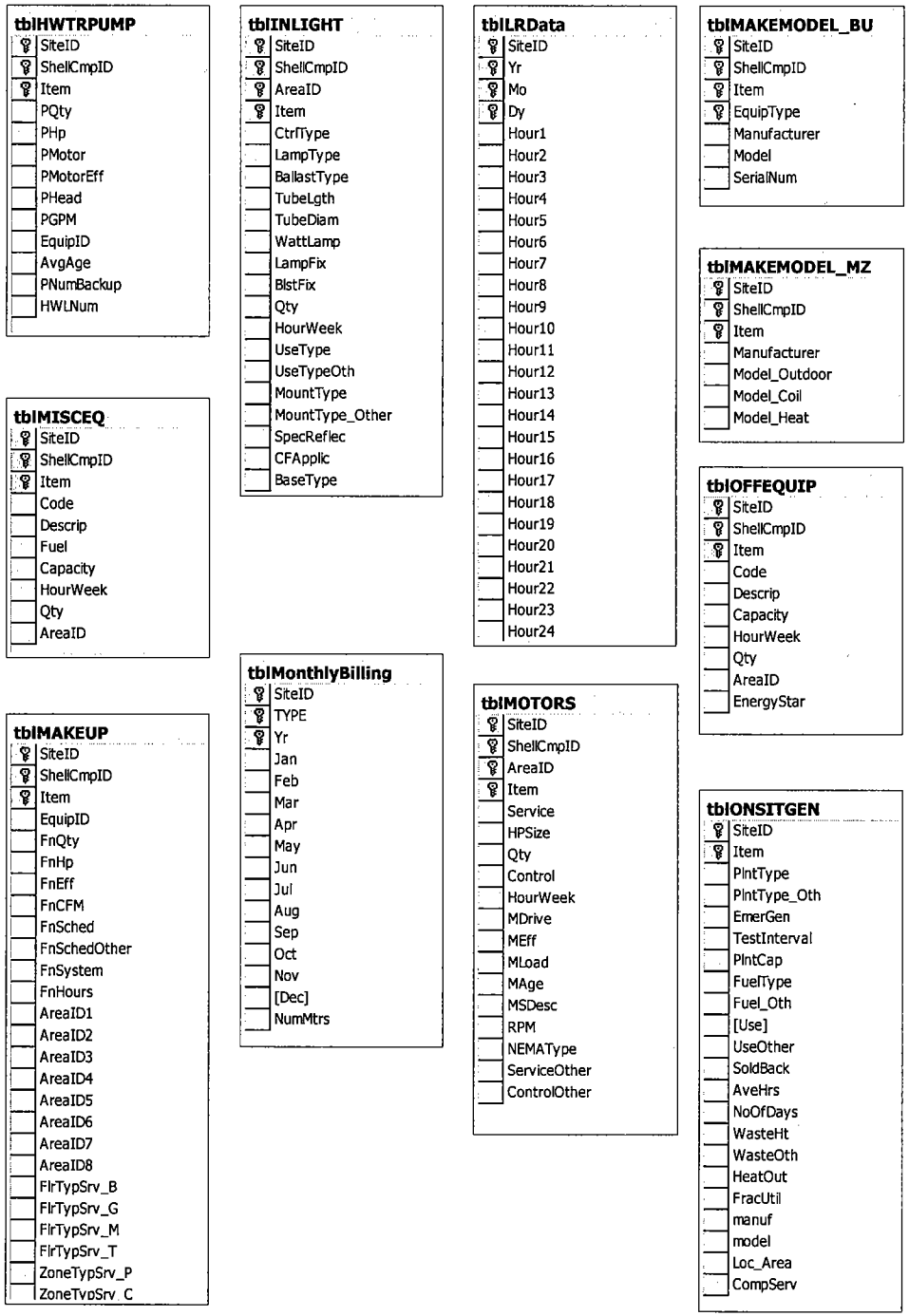
Result Tables (2 of 2)



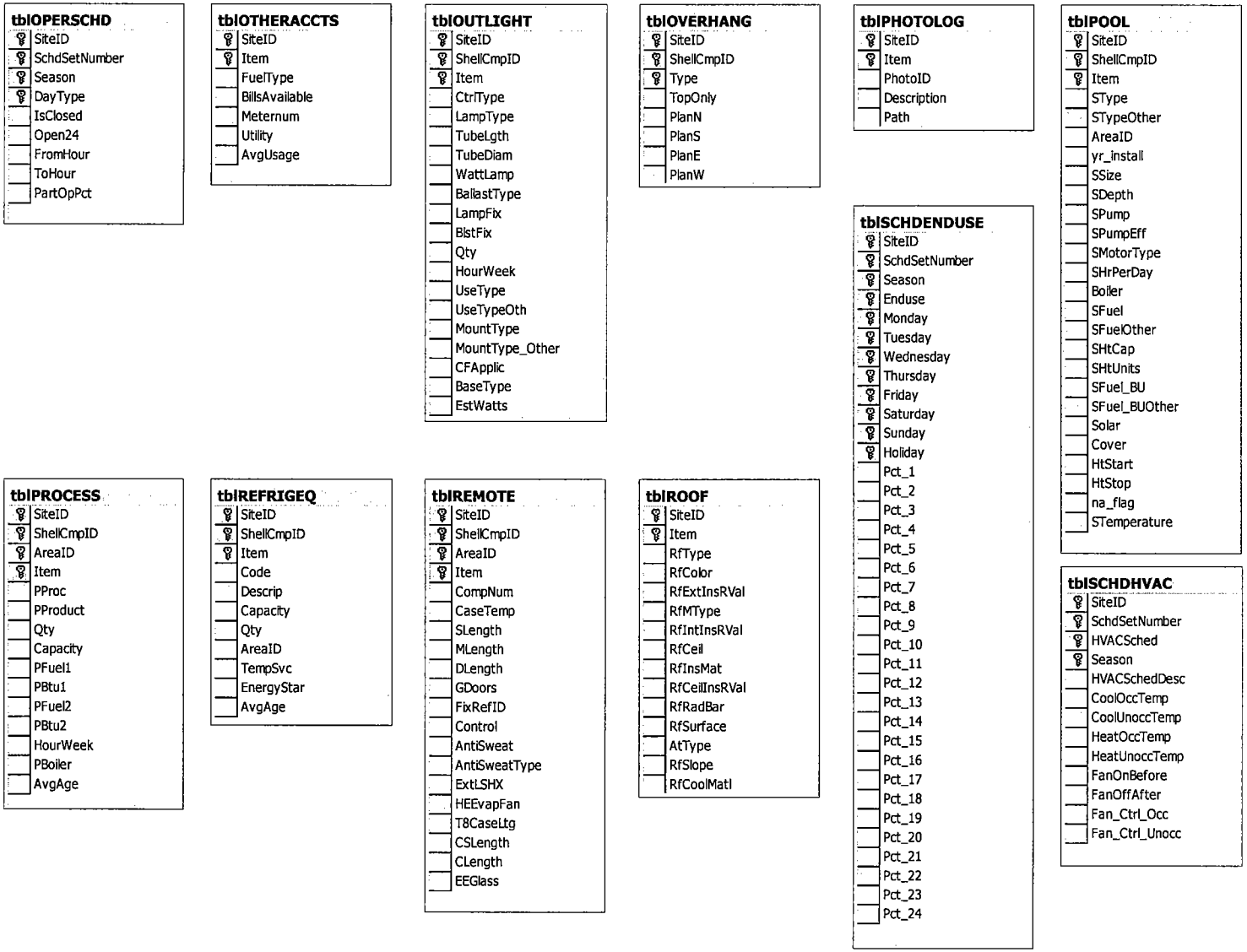
Survey Tables (1 of 7)

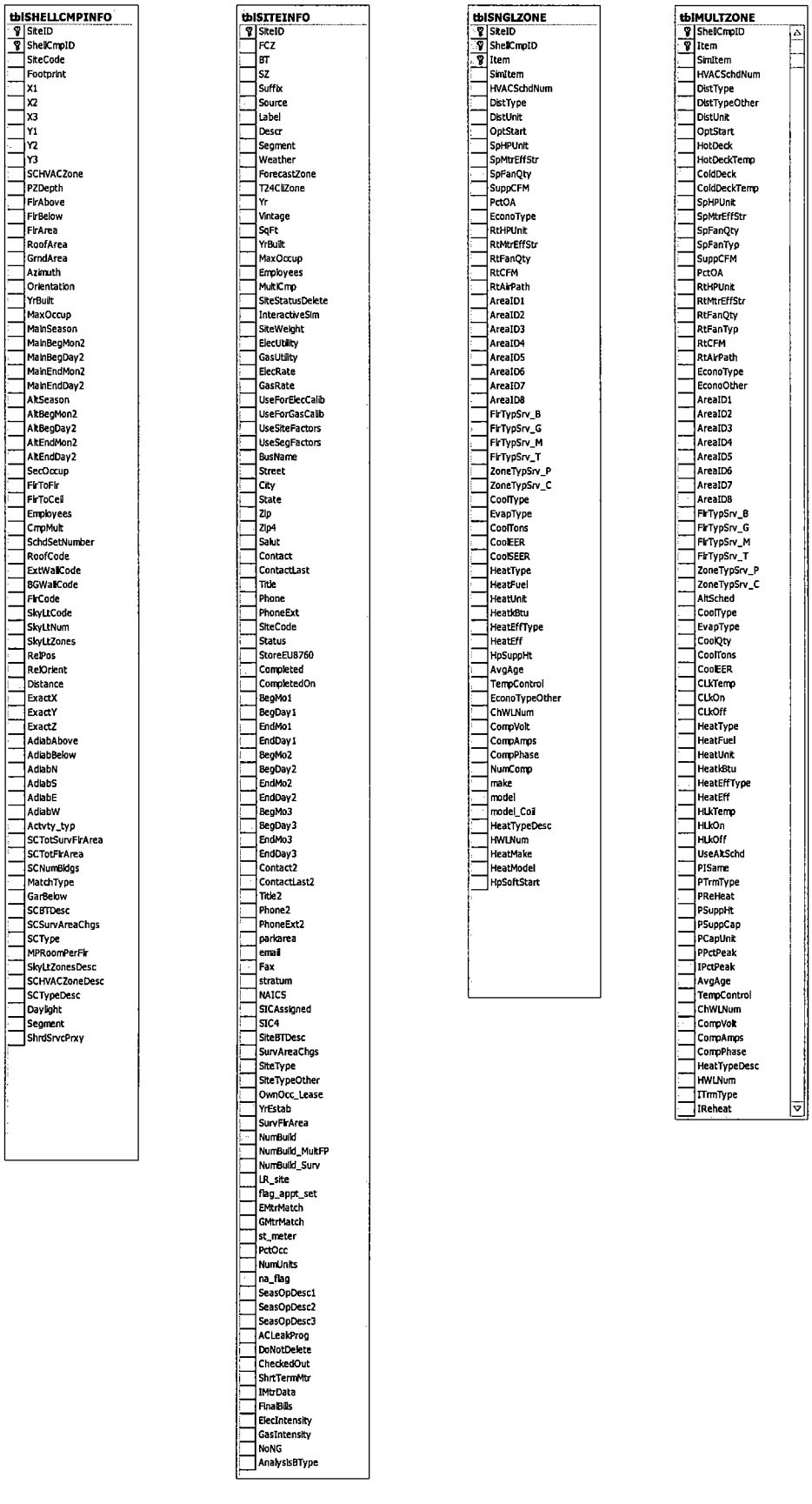



tblDAYLT
SiteID
ShellCmpID
Item
DayltFlrs
DayltFrom
DayLtFromDesc
DayltNum
DayltCntrl
DayltMaxGlare
DayltMinPwrPct
DayltMinLtPct
DayltNumSteps
DayltCntrlProb
DayltPctCntrld1
DayltDesign1
DayltHeight1
DayltPctDpth1
DayltPctCntrld2
DayltDesign2
DayltHeight2
DayltPctDpth2
tblDOORS
SiteID
Item
DoorType
DoorMaterial
DoorHeight
DoorWidth
GlazingItem
DoorTypeOth
DoorMaterialOth
tblEACCOUNTS
SiteID
Item
MeterNum
AcctNum
ServType
mtr_stat_cd
eutility
eutility_other
gutility
gutility_other
tblEE_MEASURE
SiteID
Item
measure
EndUseCode
Comments
tblEXTWALL
SiteID
Item
ExtType
FurredIntType
FrameDim
ExtDesc
ExtMType
ExtMDesc
ExtRVal
ExtColor
ExtIntRVal
ExtCavityRVal
ExtFinish
ExtCavMType
ExtCavMDesc
ExtIntMType
ExtIntMDesc
tblFANS
SiteID
ShellCmpID
Item
EquipID
FnType
FnQty
FnHp
FnEff
FnCFM
FnSched
FnSchedOther
FnSystem
FnHours
AreaID1
AreaID2
AreaID3
AreaID4
AreaID5
AreaID6
AreaID7
AreaID8
FlrTypSrv_B
FlrTypSrv_G
FlrTypSrv_M
FlrTypSrv_T
ZoneTypSrv_P
ZoneTypSrv_C
tblFinalMeters
SiteID
AcctNum
MeterNum
Type
Yr
Utility
UnMatched
tblGACCOUNTS
SiteID
Item
MeterNum
AcctNum
ServType
mtr_stat_cd
eutility
eutility_other
gutility
gutility_other
tblHolidays
SiteID
Hol1
Hol2
Hol3
Hol4
Hol5
Hol6
Hol7
Hol8
Hol9
Hol10
Hol11
Hol12
Hol13
Hol14
Hol15
Hol16
Hol17
Hol18
Hol19
Hol20
tblIHTREJECT
SiteID
ShellCmpID
Item
RjType
RjFanQty
RjFanHP
RjFanCtr
RjTempCtrl
Chiller1
Chiller2
Chiller3
Chiller4
Chiller5
Chiller6
Dist1
Dist2
Dist3
Dist4
Dist5
Dist6
EquipID
CondWtrSetptTemp
TowerWtrSetptTemp
Approach
AvgAge
RjFanTyp
RjFanEff
PumpHP
PumpQty
PumpEff
PumpCtr
Pump_gpm
Pump_head
tblFLOOR
SiteID
Item
FlrType
FlrMType
FlrMRVal
FlrTypeDesc
FlrFType
FlrFTypeDesc
FlrPRVal
tblGLAZING
SiteID
Item
GOpen
GLayer
GType
GFrame
GOvrhang
GSideFin
GHeight
GWidth
GSillHeight
GFrameOth
GSiteOrManuf
GThermBrk
GShade

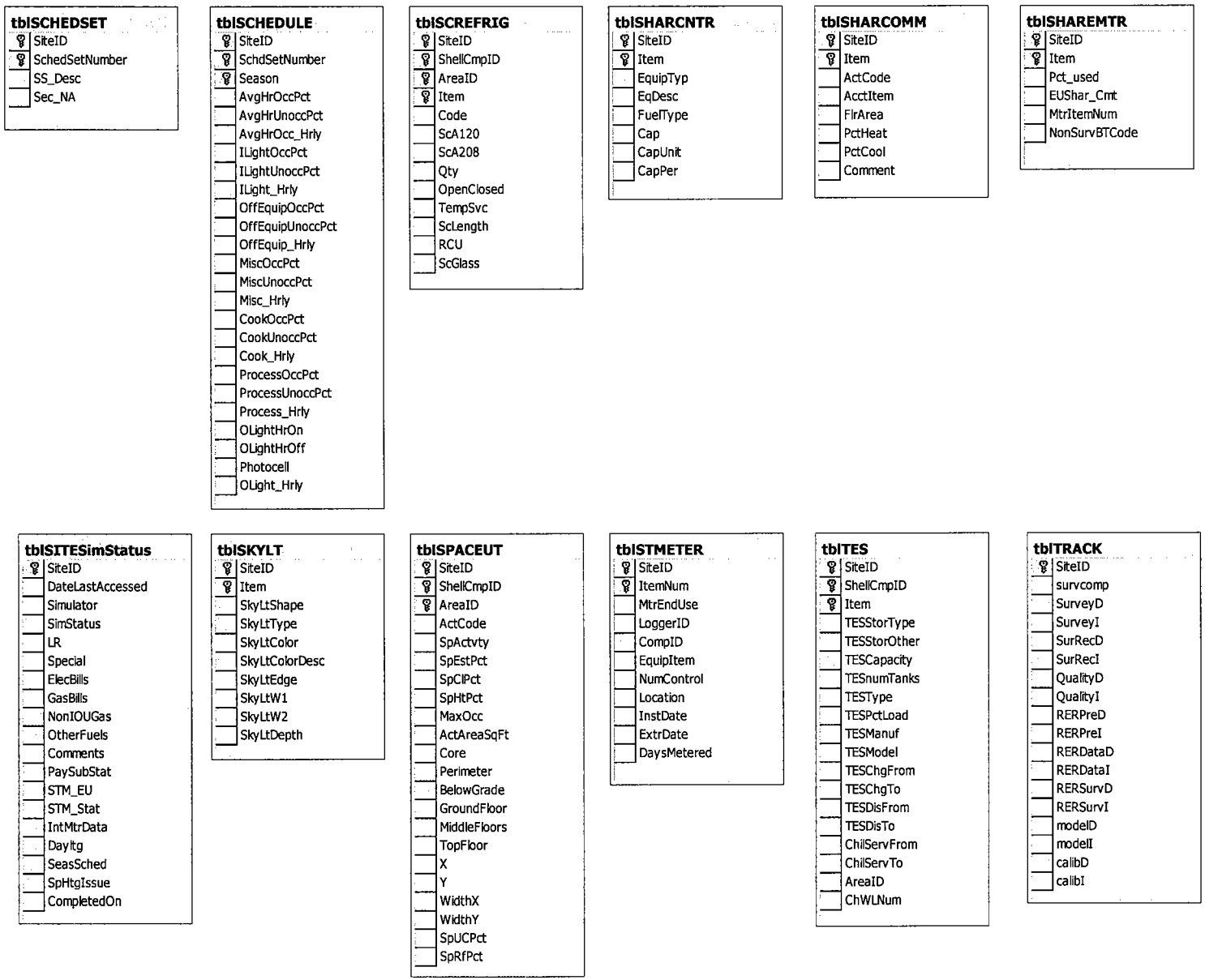

tblHWTRPUMP
SiteID
ShellCmpID
Item
PQty
PHp
PMotor
PMotorEff
PHead
PGPM
EquipID
AvgAge
PNumBackup
HWLNum
tblMISCEQ
SiteID
ShellCmpID
Item
Code
Descrip
Fuel
Capacity
HourWeek
Qty
AreaID
tblMAKEUP
SiteID
ShellCmpID
Item
EquipID
FnQty
FnHp
FnEff
FnCFM
FnSched
FnSchedOther
FnSystem
FnHours
AreaID1
AreaID2
AreaID3
AreaID4
AreaID5
AreaID6
AreaID7
AreaID8
FlrTypSrv_B
FlrTypSrv_G
FlrTypSrv_M
FlrTypSrv_T
ZoneTypSrv_P
ZoneTypSrv_C
tblINLIGHT
SiteID
ShellCmpID
AreaID
Item
CtrlType
LampType
BallastType
TubeLgth
TubeDiam
WattLamp
LampFix
BlstFix
Qty
HourWeek
UseType
UseTypeOth
MountType
MountType_Other
SpecReflec
CFApplic
BaseType
tblMonthlyBilling
SiteID
TYPE
Yr
Jan
Feb
Mar
Apr
May
Jun
Jul
Aug
Sep
Oct
Nov
[Dec]
NumMtrs
tblLRData
SiteID
Yr
Mo
Dy
Hour1
Hour2
Hour3
Hour4
Hour5
Hour6
Hour7
Hour8
Hour9
Hour10
Hour11
Hour12
Hour13
Hour14
Hour15
Hour16
Hour17
Hour18
Hour19
Hour20
Hour21
Hour22
Hour23
Hour24
tblMOTORS
SiteID
ShellCmpID
AreaID
Item
Service
HPSize
Qty
Control
HourWeek
MDrive
MEff
MLoad
MAge
MSDesc
RPM
NEMAType
ServiceOther
ControlOther
tblMAKEMODEL_BU
SiteID
ShellCmpID
Item
EquipType
Manufacturer
Model
SerialNum
tblMAKEMODEL_MZ
SiteID
ShellCmpID
Item
Manufacturer
Model_Outdoor
Model_Coil
Model_Heat
tblOFFEQUIP
SiteID
ShellCmpID
Item
Code
Descrip
Capacity
HourWeek
Qty
AreaID
EnergyStar
tblONSITGEN
SiteID
Item
PlntType
PlntType_Oth
EmerGen
TestInterval
PlntCap
FuelType
Fuel_Oth
[Use]
UseOther
SoldBack
AveHrs
NoOfDays
WasteHt
WasteOth
HeatOut
FracUtil
manuf
model
Loc_Area
CompServ

Survey Tables (4 of 7)

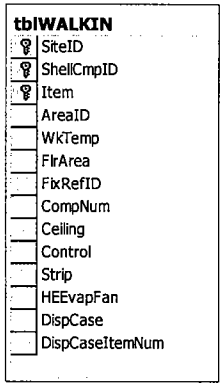


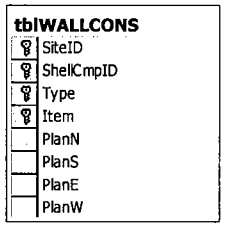

tblSHELLCMPINFO
SiteID
ShellCmpID
SiteCode
Footprint
X1
X2
X3
Y1
Y2
Y3
SCHVACZone
PZDepth
FlrAbove
FlrBelow
FlrArea
RoofArea
GrndArea
Azimuth
Orientation
YrBuilt
MaxOccup
MainSeason
MainBegMon2
MainBegDay2
MainEndMon2
MainEndDay2
AltSeason
AltBegMon2
AltBegDay2
AltEndMon2
AltEndDay2
SecOccup
FlrToFlr
FlrToCeil
Employees
CmpMult
SchdSetNumber
RoofCode
ExtWallCode
BGWallCode
FlrCode
SkyLtCode
SkyLtNum
SkyLtZones
RelPos
RelOrient
Distance
ExactX
ExactY
ExactZ
AdiabAbove
AdiabBelow
AdiabN
AdiabS
AdiabE
AdiabW
Actvty_typ
SCTotSurvFlrArea
SCTotFlrArea
SCNumBldgs
MatchType
GarBelow
SCBTDesc
SCSurvAreaChgs
SCType
MPRoomPerFlr
SkyLtZonesDesc
SCHVACZoneDesc
SCTypeDesc
Daylight
Segment
ShrdSrvcPrxy
tblSITEINFO
SiteID
FCZ
BT
SZ
Suffix
Source
Label
Descr
Segment
Weather
ForecastZone
T24CliZone
Yr
Vintage
SqFt
YrBuilt
MaxOccup
Employees
MultiCmp
SiteStatusDelete
InteractiveSim
SiteWeight
ElecUtility
GasUtility
ElecRate
GasRate
UseForElecCalib
UseForGasCalib
UseSiteFactors
UseSegFactors
BusName
Street
City
State
Zip
Zip4
Salut
Contact
ContactLast
Title
Phone
PhoneExt
SiteCode
Status
StoreEUI8760
Completed
CompletedOn
BegMo1
BegDay1
EndMo1
EndDay1
BegMo2
BegDay2
EndMo2
EndDay2
BegMo3
BegDay3
EndMo3
EndDay3
Contact2
ContactLast2
Title2
Phone2
PhoneExt2
parkarea
email
Fax
stratum
NAICS
SICAssigned
SIC4
SiteBTDesc
SurvAreaChgs
SiteType
SiteTypeOther
OwnOcc_Lease
YrEstab
SurvFlrArea
NumBuild
NumBuild_MultFP
NumBuild_Surv
LR_site
flag_appt_set
EMtrMatch
GMtrMatch
st_meter
PctOcc
NumUnits
na_flag
SeasOpDesc1
SeasOpDesc2
SeasOpDesc3
ACLeakProg
DoNotDelete
CheckedOut
ShrtTermMtr
IMtrData
FinalBills
ElecIntensity
GasIntensity
NoNG
AnalysisBType
tblSNGLZONE
SiteID
ShellCmpID
Item
SimItem
HVACSchdNum
DistType
DistUnit
OptStart
SpHPUnit
SpMtrEffStr
SpFanQty
SuppCFM
PctOA
EconoType
RtHPUnit
RtMtrEffStr
RtFanQty
RtCFM
RtAirPath
AreaID1
AreaID2
AreaID3
AreaID4
AreaID5
AreaID6
AreaID7
AreaID8
FlrTypSrv_B
FlrTypSrv_G
FlrTypSrv_M
FlrTypSrv_T
ZoneTypSrv_P
ZoneTypSrv_C
CoolType
EvapType
CoolTons
CoolEER
CoolSEER
HeatType
HeatFuel
HeatUnit
HeatkBtu
HeatEffType
HeatEff
HpSuppHt
AvgAge
TempControl
EconoTypeOther
ChWLNum
CompVolt
CompAmps
CompPhase
NumComp
make
model
model_Coil
HeatTypeDesc
HWLNum
HeatMake
HeatModel
HpSoftStart
tblMULTZONE
ShellCmpID
Item
SimItem
HVACSchdNum
DistType
DistTypeOther
DistUnit
OptStart
HotDeck
HotDeckTemp
ColdDeck
ColdDeckTemp
SpHPUnit
SpMtrEffStr
SpFanQty
SpFanTyp
SuppCFM
PctOA
RtHPUnit
RtMtrEffStr
RtFanQty
RtFanTyp
RtCFM
RtAirPath
EconoType
EconoOther
AreaID1
AreaID2
AreaID3
AreaID4
AreaID5
AreaID6
AreaID7
AreaID8
FlrTypSrv_B
FlrTypSrv_G
FlrTypSrv_M
FlrTypSrv_T
ZoneTypSrv_P
ZoneTypSrv_C
AltSched
CoolType
EvapType
CoolQty
CoolTons
CoolEER
CLkTemp
CLkOn
CLkOff
HeatType
HeatFuel
HeatUnit
HeatkBtu
HeatEffType
HeatEff
HLkTemp
HLkOn
HLkOff
UseAltSchd
PISame
PTrmType
PReHeat
PSuppHt
PSuppCap
PCapUnit
PPctPeak
IPctPeak
AvgAge
TempControl
ChWLNum
CompVolt
CompAmps
CompPhase
HeatTypeDesc
HWLNum
ITrmType
IReheat

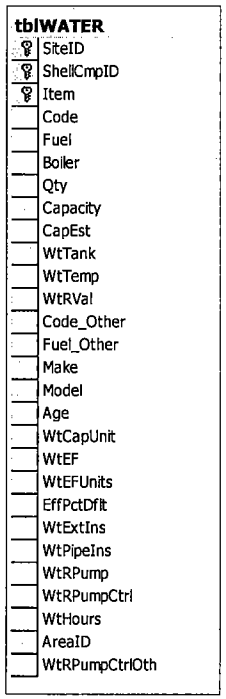
Survey Tables (6 of 7)

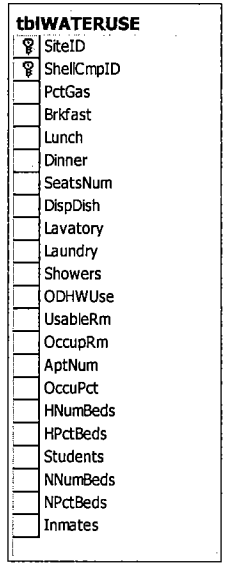


Survey Tables (7 of 7)









APPENDIX H: NON-HVAC END-USE ALGORITHMS

This chapter presents an overview of the DrCEUS simulation framework and the algorithms that are used to simulate the 10 non-HVAC end uses that are utilized in DrCEUS. The algorithms are incorporated into the DrCEUS Site Processor[1] via a number of Visual Basic scripts (VBScript or just "script"), as will be described. The non-HVAC end uses simulated in DrCEUS are as follows:

Water Heating	Outdoor/Exterior Lighting
Cooking Equipment	Miscellaneous Equipment
Refrigeration Equipment	Process Equipment
Indoor Lighting	Motors
Office Equipment	Air Compressors

An overview of the non-HVAC simulation framework is presented first, followed by a more detailed discussion of the algorithms for each end use, and finally a summary of the DrCEUS non-HVAC algorithm support files. Note that this document is a high-level, *descriptive* overview of the algorithms, rather than a detailed presentation of equations and programming code. Actual implementation and calculation details (i.e., what survey data is used, table/field names, etc.) are contained in the previously mentioned VBScript, which can be reviewed directly if more information about the algorithms is desired.

H.1 Non-HVAC Simulation Framework

Understanding the algorithms requires understanding how they are implemented in the DrCEUS system. Toward that goal, both the conceptual framework and the physical implementation in DrCEUS are discussed in this section. The conceptual framework for simulating non-HVAC loads is needed to understand the algorithm concepts, components, and process, while the physical framework of the DrCEUS implementation is needed to understand *where* the algorithm components are located and how they are used for the simulation.

Non-HVAC Simulation Conceptual Framework

The general conceptual framework for simulating non-HVAC loads is illustrated in Figure H-1. The process can be summarized as follows:

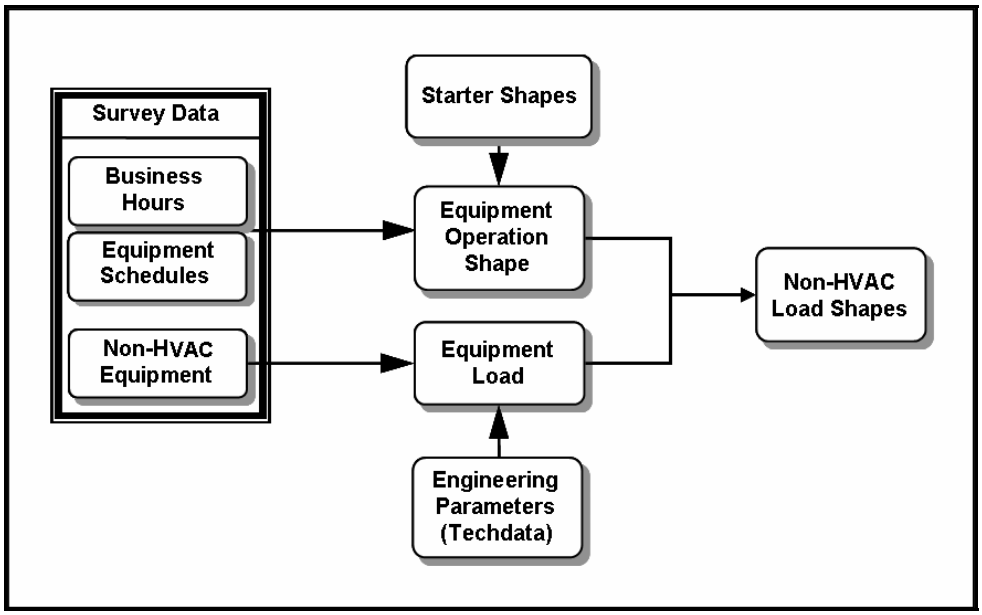
1. From the *Survey Data*, obtain the *Business Hours* and *Equipment Operating Schedules*, then combine with *Starter Shapes* to develop the

[1] See the affiliated CEUS project report "Site Processor User's Guide" for more information.

Equipment Operation Shape. The resultant shape is a percentage of equipment on for each hour.

2. Again from the *Survey Data*, obtain the *Non-HVAC Equipment* data (equipment type, nameplate loads, quantity, etc.), then obtain and apply the *Engineering Parameters* (or Techdata) to develop the *Equipment Load*, that is, the load that will be applied to the *Equipment Operation Shape*.
3. The *Equipment Load* and the *Equipment Operation Shape* become inputs for the simulation engine, and are used to produce the final *Non-HVAC (end-use) Load Shapes*, which are premise-level, 8760-hour shapes.

Figure H-1: Non-HVAC Conceptual Simulation Framework



The system components shown in Figure H-1 are described below. Location of these elements within the DrCEUS Site Processor framework is described in the section that follows.

Survey Data: Business Hours and Equipment Schedules. Information about business hours and the percent of equipment operating during specific hours is gathered as part of the on-site survey. There are two methods for specifying the percent of equipment on. For the "business hour" method, only two percentages are specified: "during" and "after" business hours. The second method is the "hourly end-use schedule" approach in which a percentage is specified for all 24 hours and all day types for a specific end use.

Survey Data: Non-HVAC Equipment. This is the end-use characteristic data collected on the survey. At least one table in the survey database contains the data for each non-HVAC end use. Parameters include equipment type, quantity,

actual nameplate loads, location (component/Activity Area, which is critical for internal gains), and other end-use specific information.

Starter Shapes. Starter shapes are used to render a realistic shape (versus simple on/off block shapes) to the non-HVAC end uses. A unique set of starter shapes is used for each end use and each basic building type. These shapes are the synthesis of previous CEUS studies and end-use metering studies performed by Itron.

Equipment Operation Shape. There are two approaches used to specify equipment operation shapes: the "business hour" approach and the "hourly end-use schedule" approach. Under the business hour approach, hourly shapes are produced by combining starter shapes with the business hours and equipment schedules (e.g., percent of equipment on during business hours) from the survey data. Business hours are used to shift the starter shape open/close times, and equipment schedules are used to adjust the percent of equipment on during and after business hours. For the hourly end-use schedule approach, the percent of equipment on is directly specified for every hour for eight-day types, so the shape is used exactly as specified on the survey form.

Equipment Load. This is the capacity in kW or kBtuh that is applied to the equipment operation shape to yield hourly kW or kBtuh usage values. It can be either the full connected load—as in the case of lighting)—or more typically it is the diversified connected load—that is connected load derated for various reasons, e.g., nameplate-to-actual use, cycling/periodic use, etc.

Engineering Parameters (Techdata). Most end uses require some specific modifications to the basic capacity/size ratings gathered as part of the survey data. For instance, for computer equipment the actual wattage used by the computer when operating is much different from the rated/nameplate value. In addition, default values are needed whenever a nameplate rating cannot be obtained. Engineering parameters, referred to hereafter as "Techdata," contain such values, that is, default capacities, diversity factors[2], ballast factors for lighting, and equipment efficiencies. These values are obtained via lookup or mapping tables that use equipment characteristics from the survey data.

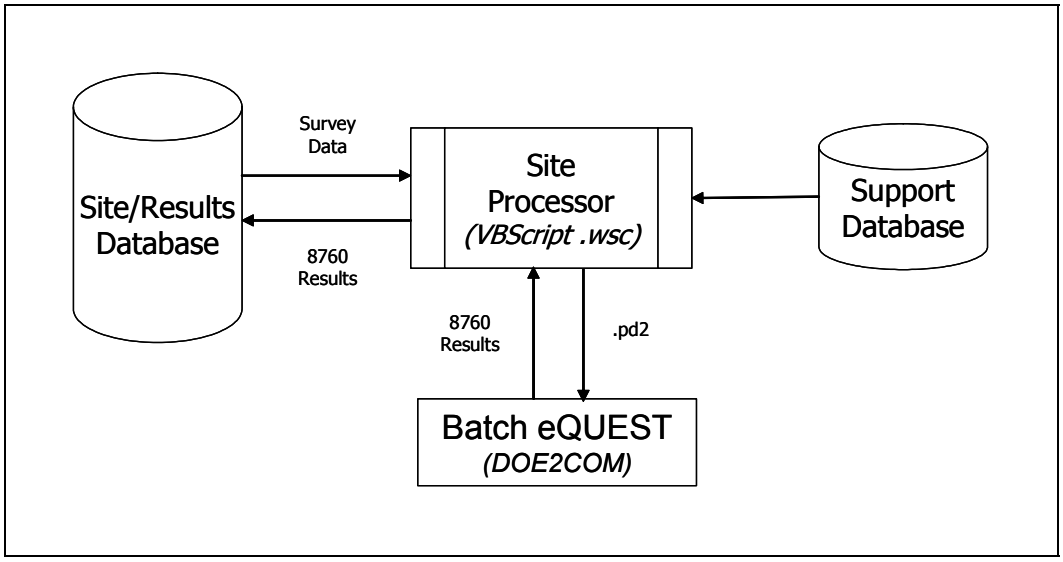
Non-HVAC Load Shapes. These are the final, premise-level, end-use load shapes produced by the simulation. They are hourly kW or kBtuh shapes for every day of the week.

[2] Diversity factors as used in DrCEUS are adjustment factors that are applied to derate nameplate/connected loads to reflect actual operating loads and diversity of use. The factors used in DrCEUS were developed by Itron from a variety of sources, and have been further refined via previous CEUS efforts.

The DrCEUS Site Processor Simulation Process

An overview of the DrCEUS Site Processor[3] simulation process is illustrated in Figure H-2. The Site Processor utilizes a set of Microsoft VBScript (Visual Basic script programming language, .wsc file extension) files to produce both the HVAC and non-HVAC inputs required for the simulation. The non-HVAC end-use algorithms are encoded into the VBScript files.

Figure H-2: DrCEUS Site Processor Flowchart



The Site Processor simulation process can be summarized as follows:

1. The *Site Processor* extracts the survey data from the *Site/Results Database* and corresponding techdata from *Support Database*.
2. The *Site Processor* uses the *VBScript* (including the non-HVAC algorithms) to convert the survey and support data into an eQUEST *pd2* input file, then activates the *Batch eQUEST* mode to execute the building simulation.
3. The *Site Processor* retrieves the premise-level, 8760 end-use results from *Batch eQUEST* and stores those results back into the *Site/Results Database*.

The DrCEUS Site Processor system elements, and the location of the previously discussed conceptual framework elements within this system, are described below.

[3] Section 6 of the Site Processor User's Guide for a detailed description of the simulation system.

Site Processor. The Site Processor combines all of the inputs needed for simulation, uses them to create the simulation input file, executes the simulation, stores the simulation results, and of course enables viewing of the results. The Site Processor touches all of the elements of the conceptual framework (Figure H-1), and utilizes the *VBScript* in which the non-HVAC algorithms are encoded. The *Equipment Operation Shape* and *Equipment Load* are assembled by the Site Processor and used as an input for the eQUEST pd2 file, and it produces the final *Non-HVAC Load Shapes*, which are represented in Figure H-2 as "8760 Results". .

Site/Results Database. The survey data and simulation results are stored in this database. Elements of the conceptual framework (Figure H-1) that are stored here include the *Survey Data* and the final *Non-HVAC Load Shapes*, which are represented in Figure H-2 as "8760 Results".

Support Database. This database contains a variety of additional engineering parameters that are needed to create and run the simulation. Elements of the conceptual framework (Figure H-1) that are stored here include the *Starter Shapes* and the *Engineering Parameters (Techdata)*.

Batch eQUEST. This is the batch (or COM) version of eQUEST which can be run by the DrCEUS Site Processor module. Its input is the pd2 file and its output is premise-level, 8760 hourly end-use shapes.

This concludes the discussion of the non-HVAC simulation framework. With the conceptual framework and physical location of the system elements explained, the non-HVAC algorithms can now be addressed. For consistency, the end-use algorithms are discussed in the order in which they appear on the DrCEUS Annual Summary graphic; Water Heating, Cooking, Refrigeration, Indoor Lighting, Office Equipment, Outdoor Lighting, Miscellaneous Equipment, Process Equipment, Motors, and Air Compressors.

H.2 Water Heating Algorithm

This algorithm is contained in the *SPComHotWaterModel.wsc* VBScript. The algorithm used for simulating water heating is quite different from the other end uses in that it is based on estimated water use rather than a load applied to an operation schedule. Steps in the calculation process are outlined below.

- ***Daily Water Use.*** Compute total water use in gallons from the number of meals, number of bathrooms, etc., indicated on *Form 25 Service Hot Water Use* of the survey form via a Techdata mapping table. If both electric and gas water heating exist, use the "…% of water heated by gas equipment" from Form 25 to apportion the gallons of hot water to each fuel type.

- ***Inlet/Outlet Temperatures.*** From Techdata, obtain the inlet water temperature for each month, as derived from the weather files, i.e., each weather station has unique monthly water inlet temperatures. From the survey data, obtain the average hot water temperature or use a default of 140°F if no temperatures were provided.
- ***Monthly Energy Use.*** Compute the daily electric and gas use from the fuel-specific gallons, the inlet water temperature, the hot water temperature, and the average hot water heater efficiency (or a default efficiency if missing) using this equation:

$$\begin{aligned} &\textit{Gallons/day} \times \textit{8.25 lbs/gal} \times \textit{1.0 Btu/lb - F} \\ &\times \frac{(\textit{Hot water temperature}\,°F - \textit{Inlet temperature}\,°F) \times (\textit{kBtu / 1000 Btu})}{\eta(\textit{efficiency})} \end{aligned}$$

  and if electric multiply by an additional term of $1kW/3.412\ kBtu$.

- ***Pool Water Heating.*** A different algorithm is utilized for pool water heating. The monthly energy use required to heat pools and spas is calculated from the pool surface area, the run time per day and the hot water temperature for the pool/spa heater as indicated on the survey form, and the inlet water temperature from Techdata. Both gas and electric energy use are computed and these values are added to the monthly energy use computed for service water heating.
- ***Equipment Loads.*** Electric and gas connected loads are calculated from all water heating equipment including storage/instantaneous water heating equipment, boilers that provide service hot water or pool heating, and pool/spa heaters, as described below.

  – ***Water Heating Equipment Loads.*** From the *Water Heating Equipment* section (Form 24) of the survey form, obtain the equipment code, quantity, boiler number, rated input capacity, efficiency rating and units, and fuel type for each line item. The total connected load is calculated simply as (input capacity X quantity).

  – ***(Service) Hot Water Boiler Equipment Loads.*** From the *Boilers* section (Form 21) of the survey form, any boilers that provide "Hot Water" or "Pool Heating" service are also associated with the water heating end use. The fields used for the algorithm are primary fuel type, quantity, input capacity, efficiency, and the estimated percent of boiler output that serves hot water for each line item. The hot water boiler equipment loads (input capacity X quantity) are then added to those already calculated for water heating equipment.

  - ***Pool/Spa Heater Equipment Loads.*** From the *Swimming Pool/Spa* section (Form 26) of the survey form, obtain the heater capacity and fuel type for each record. Because each pool heater is listed as a separate record, the total connected load by fuel type is simply calculated as the sum of all heater capacities. This load is added to the loads calculated for water heating equipment and boilers.

- ***Equipment Operation Shapes.*** For restaurants, a special approach is used. The water heating starter shape is dependent on the number and type of meals (i.e., breakfast, lunch, or dinner) served. Options are one meal, two meals, three meals, and the starter shapes show corresponding "humps" in usage around the hours associated with each meal type. The hourly end-use schedule approach is not an option for water heating.
- ***Final Water Heating Load Shape.*** Electric and gas monthly energy use and the water heating starter shapes are provided to eQUEST at the component-level. eQUEST calculates the maximum load (a fraction of the Equipment Load) from the annual energy and hours from the shape, that is, it fits the shape to the energy use rather than calculating energy use from the shape, as is done for most other end uses. The premise-level 8760 water heating load shape is then stored in the results database.

H.3 Cooking Equipment Algorithm

This algorithm is contained in the *SPComCookModel.wsc* VBScript. The algorithm used for simulation closely follows the simulation framework laid out in Figure H-1. Steps in the calculation process are outlined below.

- ***Connected Load.*** From the *Cooking/Food Service Equipment* section data (Form 30) of the survey form, obtain the quantity, capacity, and fuel type for each line item. From Techdata, obtain a diversity factor and, if capacity is null or missing, a default capacity. Note that two tiers of values are used for cooking equipment in Techdata—one for food service and one for non-food service type establishments—to reflect the real-world differences in usage and equipment sizes.
- ***Equipment Loads.*** Calculate the diversified or maximum equipment loads for each record and then sum these by fuel type (electric/gas) to component-level equipment loads.
- ***Equipment Operation Shapes.*** Like water heating, a special approach is used for restaurants. The cooking starter shape is dependent on the number and type of meals (i.e., breakfast, lunch, or dinner) served. Options are one meal, two meals, three meals, and the starter shapes show corresponding "humps" in usage around the hours associated with each meal type.

- ***Final Cooking Load Shapes.*** Cooking equipment load shapes are provided to eQUEST at the component level, and equipment loads are entered at the activity area level. eQUEST applies the equipment loads to the shape to simulate energy on an 8760 hour basis. The premise-level cooking load shape is then stored in the results database.

H.4 Refrigeration Algorithms

The algorithms used to model refrigeration systems are more complex than for other end uses. For example, although there is only a single refrigeration end use, there are two basic refrigeration system types: self-contained and remote refrigeration systems. The self-contained refrigeration systems are simulated as presented in the general framework discussion. However, the remote refrigeration algorithm is unique, as explained in the following sections.

Self-Contained Refrigeration Algorithm

This algorithm is contained in the *SPComScRefrigModel.wsc* VBScript. The algorithm used for self-contained refrigeration closely follows the simulation framework presented out in Figure H-1. There are two types of self-contained refrigeration: residential-type refrigerator/freezers and commercial cases. The algorithms vary only in the calculation of the equipment load. Steps in the calculation process are outlined below.

- ***Residential-Type Refrigeration Equipment Loads.*** From the *Non-Commercial/Residential-Type Refrigerators/Freezers* section of Form 31 of the survey form, obtain the equipment code, kW per unit, and quantity for each line item. From Techdata, obtain a diversity factor and, if kW per unit is null or missing, find a default kW rating. Calculate the diversified or maximum equipment loads for each record and then sum these to activity area level equipment loads for each component.
- ***Commercial Refrigeration Equipment Loads.*** From the *Commercial Refrigeration Equipment* section of Form 31 of the survey form, obtain the equipment code, amps (120V or 208V), and quantity for each line item. From Techdata, obtain a diversity factor and, if neither of the amp ratings has a value, also obtain a default rating. Calculate the diversified or maximum equipment load for each record, and then add these loads to the residential refrigerator loads to get the equipment loads by Activity Area for each component.
- ***Equipment Operation Shapes.*** For self-contained refrigeration, this is the Starter Shape as derived from the Support Database. Only the business hour/starter shape approach is used for this equipment, that is, an hourly end-use schedule approach can not be used.

- ***Final Self-Contained Refrigeration Equipment Load Shapes.*** The equipment loads and shapes are provided to eQUEST. The shapes are entered at the component level and equipment loads are entered at the activity area level. eQUEST applies the equipment loads to the shape to simulate energy on an 8760 hour basis. The premise-level self-contained refrigeration results are then combined with the remote refrigeration results and stored in the results database as the *single* DrCEUS refrigeration end use.

Remote Refrigeration Algorithm

This algorithm is contained in the *SPComScRefrigModel.wsc* VBScript. The algorithm used for remote refrigeration is a unique approach[4] derived from and used on previous CEUS projects[5]. Under this approach, refrigeration demand and energy use is developed from case loads, rather than from compressor horsepower sizes and assumed run-times. As such, the simulation is performed outside of DOE2 and the refrigeration system loads do not have interactive effects on the space. This is a simplified assumption, but given the uncertainty and complexity of modeling the space-refrigerated case interaction, this was determined from previous CEUS surveys to be an acceptable approach. A general description of the remote refrigeration algorithm is given below.

Refrigeration loads (kBtuh) are developed for display cases and walk-ins. Display cases and walk-ins are linked on the survey form to the compressor/condenser systems that serve them. This information is used to create a Compressor/Condenser System Type (CCST) code that is used, along with the case/walk-in temperature and weather station, to obtain from Techdata a set (monthly and peak day) of the following:

- Average daily load conversion factors (kWh/kBtuh), which are applied to the refrigeration loads to develop the average daily electric use.
- Average daily profile of fractional use per hour.

Both the load conversion factor and the hourly profiles are derived from weather data and the various combinations of CCST and temperature. Specific steps in the calculation process are outlined below.

---

[4] The original concept and modeling system was developed in consultation with RER/Itron by Doug Scott of VaCom Technologies, as an improvement over the DOE-2.1 simulation of remote refrigeration systems. A new tool – DOE2.3 – that can do a rigorous simulation of remote refrigeration systems including space interactions, is currently under development by VaCom and JJ Hirsch Associates.

[5] PG&E Commercial Building Survey Report generated from 1992/1993 CEUS onsite survey; http://www.pge.com/docs/pdfs/biz/energy_tools_resources/building_survey/cbs97.pdf

- ***Develop the CCST Code.*** The CCST code is derived from compressor type condenser type, subcooling type, and floating head pressure control values. These characteristics are used to create CCST codes. For example, a CCST code of "ARMULTMECHFL" would indicate:
  - AR = Air-cooled condenser
  - MULT = Multiplex compressor system
  - MECH = Mechanically sub-cooled
  - FL = Floating head pressure control

  On the survey form, display cases and walk-ins are linked to compressors, and compressors are associated with condensers, so linking each display case or walk-in to a compressor also links it to a CCST. The CCST codes and corresponding system types that were simulated for this CEUS project are shown in Table H-1.

Table H-1: Remote Refrigeration System Type Codes

CCST Codes	Refrigeration System Type Description
ARCONV	Basic (no measures) *Air-cooled* condenser, *Conventional* (stand-alone) compressor
ARMULT	Basic (no measures) *Air-cooled* condenser, *Multiplex* compressor
ARMULTMECH	ARMULT + *Mechanical sub-cooling*
ARMULTMECHFL	ARMULTMECH + *Floating head pressure control*
ARVFDMULTMECHFL	ARMULTMECHFL with *VFD* condenser
EVCONV	Basic (no measures) *Evaporatively-cooled* condenser, *Conventional* (stand-alone) compressor
EVMULT	Basic (no measures) Evaporatively -cooled condenser, Multiplex compressor
EVMULTMECH	EVMULT + *Mechanical sub-cooling*
EVMULTMECHFL	EVMULTMECH + *Floating head pressure control*
EVOVMULTMECHFL	EVMULTMECHFL with *over-sized condenser*
EVVFDMULTMECHFL	EVMULTMECHFL with *VFD* condenser

- ***Display Case Equipment Loads and Shapes.*** From the *Display Cases* section of Form 32a of the survey form, obtain the compressor system number, suction temperature, display case type, and the case size (length or number of doors) for each line item. Use the display case type and suction temperature to obtain from Techdata the refrigeration load per linear foot (or per door for glass doors). Then, multiply the load-per-ft/door by the size to obtain the refrigerated case load for each item. Next, use the weather

station, CCST, and suction temperature to obtain the set of average daily load conversion factors and single day use hourly profiles.

- ***Walk-in Equipment Loads and Shapes.*** From the *Walk-Ins and Preparation Areas* section of Form 32a of the survey form, obtain the compressor system item number, suction temperature range, and floor area. Use the temperature range to obtain from Techdata the refrigeration load per square foot, and then multiply by the floor area to obtain refrigeration load for each item. Next, use the weather station, CCST, and temperature range to obtain the set of average daily load conversion factors and single day use hourly profiles. Finally, multiply the refrigeration loads and the daily load conversion factors, apply the result to the hourly profiles, and sum together.
- ***Remote Refrigeration Equipment Loads and Shapes.*** Display case and walk-in equipment loads are combined and provided to eQUEST at the component-level as a set of monthly peak load (kW) values and daily hourly use profiles (i.e. 24 hour usage profile). eQUEST applies the equipment loads to the shape to simulate energy on an 8760 hour basis. The premise-level remote refrigeration results are then combined with the self-contained results and stored in the results database as the *single* DrCEUS refrigeration end use.

H.5 Indoor Lighting Algorithm

This algorithm is contained in the *SPComInLightModel.wsc* VBScript. The algorithm used for simulating indoor lighting closely follows the simulation framework laid out in Figure H-1. Steps in the calculation process are outlined below.

- ***System Watts/Equipment Loads.*** From the *Indoor Lighting* section (Form 28*)* of the survey form, obtain the lamp type, tube length, tube diameter, watts per lamp, number of lamps per fixture, ballast type, and number of lamps for each line item. From Techdata, find the “system watts” for each fixture configuration. The “system watts” value accounts for the number of lamps per fixture and ballast type (e.g., magnetic, electronic) to yield ballast-adjusted fixture wattage (only for ballasted lamp types). Multiply the fixture *system watts* by the number of fixtures to obtain the equipment load for each line item. Lighting loads are summed within activity areas at the component-level.
- ***Equipment Operation Shape.*** The load shape used will be either the business hour approach or the hourly end-use schedule approach specified on the survey form.
- ***Final Indoor Lighting Load Shapes.*** Indoor lighting load shapes are provided to eQUEST at the component level, and equipment loads are entered at the activity area level. eQUEST applies the equipment loads to

the shape to simulate energy on an 8760 hour basis. The premise-level indoor lighting load shape is then stored in the results database.

H.6 Office Equipment Algorithm

This algorithm is contained in the *SPComOfficeEquipModel.wsc* VBScript. The algorithm used for simulating office equipment closely follows the simulation framework laid out in Figure H-1. Steps in the calculation process are outlined below.

- ***Connected Load.*** From the *Office Equipment* section (Form 29) of the survey form, obtain the quantity and capacity for each line item. From Techdata, obtain a diversity factor and, if capacity is null or missing, a default capacity.
- ***Equipment Loads.*** Calculate the diversified or maximum equipment loads for each record and then sum these within activity areas at the component level.
- ***Equipment Operation Shapes.*** The load shape used will be either the business hour approach or the hourly end-use schedule approach specified for Office Equipment on the survey form.
- ***Final Office Equipment Load Shapes.*** Office equipment load shapes are provided to eQUEST at the component level, and equipment loads are entered at the activity area level. eQUEST applies the equipment loads to the shape to simulate energy on an 8760 hour basis. The premise-level office load shape is then stored in the results database.

H.7 Outdoor/Exterior Lighting Algorithm

This algorithm is contained in the *SPComOutLightModel.wsc* VBScript. The algorithm used for simulating outdoor lighting is the same as indoor lighting for the determination of equipment loads, but the operation is, of course, quite different. Steps in the calculation process for outdoor lighting are outlined below.

- ***System Watts/Equipment Loads.*** From the *Outdoor Lighting* section (Form 27) of the survey form, obtain the lamp type, tube length, tube diameter, watts per lamp, number of lamps per fixture, ballast type, and number of lamps for each line item. From Techdata, find the “system watts” for each fixture configuration. The “system watts” value accounts for the number of lamps per fixture and ballast type (e.g., magnetic, electronic) to yield a realistic ballast-adjusted fixture wattage. Multiply the fixture system watts by the number of fixtures to obtain the equipment load for each line item. Outdoor lighting loads are summed at the component level.

- ***Equipment Operation Shapes.*** Outside lighting shapes are a modified form of the business hour approach. First, instead of day type shapes, there is one 24-hour schedule per month. Instead, of business hours, the times used for the monthly schedules are based on either photocell control or the Outside Lighting on/off hours specified on the survey form. Photocell control is simulated using the average sunrise/sunset hours for each weather station for each month. In either control scenario, the specified hours are used to shift the outside lighting starter shape accordingly. The hourly end-use schedule approach cannot be used for outside lighting.
- ***Final Outdoor Lighting Load Shapes.*** Unlike other non-HVAC end uses, outdoor lighting equipment loads and load shapes are provided to eQUEST at the component-level. eQUEST applies the equipment loads to the shape to simulate energy on an 8760 hour basis. The premise-level outdoor lighting load shape is then stored in the results database.

H.8 Miscellaneous Equipment Algorithm

This algorithm is contained in the *SPComMiscModel.wsc* VBScript. The algorithm used for simulating miscellaneous equipment closely follows the simulation framework laid out in Figure H-1. Steps in the calculation process are outlined below.

- ***Connected Load.*** From the *Miscellaneous Equipment* section (Form 33*)* of the survey form, obtain the equipment code, quantity, capacity, and fuel type for each line item. From Techdata, obtain a diversity factor and, if capacity is null or missing, a default capacity.
- ***Equipment Loads.*** Calculate the diversified or maximum equipment loads for each record and then sum these by fuel type to activity area level equipment loads.
- ***Equipment Operation Shapes.*** The load shape used will be either the business hour approach or the hourly end-use schedule approach specified on the survey form.
- ***Final Miscellaneous Equipment Load Shapes.*** Miscellaneous equipment load shapes are provided to eQUEST at the component level, and equipment loads are entered at the activity area level. eQUEST applies the equipment loads to the shape to simulate energy on an 8760 hour basis. The premise-level miscellaneous equipment load shape is then stored in the results database.

H.9 Process Equipment Algorithm

This algorithm is contained in the *SPComProcessModel.wsc* VBScript. The algorithm used for simulation of process equipment closely follows the simulation

framework laid out in Figure H-1. Simulated process equipment loads come from two sources: process equipment and process boilers. Steps in the calculation process are outlined below.

- ***Process Equipment Loads.*** From the *Process Equipment* section (*Form 36)* of the survey form, obtain the process equipment code, boiler number, quantity, capacity, and primary and secondary fuel types and percentages for each line item. From Techdata, obtain a diversity factor and, if capacity is null or missing, a default capacity. If the process equipment is served by a boiler (boiler number is >0), then the line item is ignored because the process load will be accounted for by the boiler algorithm (explained in next step). Calculate the diversified or maximum equipment load for each record for both primary and secondary (if present) fuel types, and then sum these by fuel type to activity area level equipment loads.
- ***Process Boiler Equipment Loads.*** From the *Boilers* section (Form 21) of the survey form, if there are any boilers that serve the "Process" end use, this capacity is also associated with the process end use. The fields used for the algorithm are primary fuel type, quantity, input capacity, efficiency, and the estimated percent of boiler output that serves process equipment for each line item. Calculate the diversified or maximum equipment load for each record for the primary fuel type by multiplying these values together, and then adding the loads to those already calculated for process equipment not served by a boiler.
- ***Equipment Operation Shapes.*** The load shape used will be either the business hour approach (process schedule), or the hourly end-use schedule (process end use) approach, as specified on the survey form. Note that only a single schedule is used for motors, air compressors, and process equipment because the emphasis of the study was on commercial buildings.
- ***Final Process Equipment Load Shapes.*** Process equipment load shapes are provided to eQUEST at the component-level, and equipment loads are entered at the activity area level. eQUEST applies the equipment loads to the shape to simulate energy on an 8760 hour basis. The premise-level process equipment load shape is then stored in the results database.

H.10 Motor Algorithms

This algorithm is contained in the *SPComMotorsModel.wsc* VBScript. The algorithm used for simulation of motors generally follows the simulation framework laid out in Figure H-1; however numerous engineering parameters are used due to the complexity of motor operation (loading, efficiency, etc.). Steps in the calculation process are outlined below.

- ***Equipment Parameters.*** For motors, this step is discussed separately from the equipment load calculation because the process is quite complex. From the *Motors/Engines* section (Form 34*)* of the survey form, obtain the service type, control type, quantity, available nameplate data (motor size in hp, RPM, NEMA enclosure type, and nominal efficiency), and load type. From Techdata, obtain the following engineering parameters:
  - Convert any numerical motor efficiency to a motor efficiency class (i.e., Standard, High, or Premium) using motor size, enclosure type, and motor speed (RPM). This action is taken because other look-ups are done by efficiency class rather than the actual efficiency.
  - In Techdata, look up a load factor using the service type.
  - Obtain a motor part-load elasticity value from Techdata using service type and control type (e.g., throttled, VSD). The elasticity is used to account for the differences in part-load performance of the different motor control types.
  - Obtain motor efficiency from Techdata. First, look up full-load motor efficiency using motor size, NEMA enclosure type, efficiency class, and RPM. Next, look up a full-load efficiency adjustment factor using the motor size, the load factor, and the efficiency class. Motor efficiency is computed by applying the full-load adjustment factor to the full-load efficiency.
- ***Connected and Equipment Loads.*** For each motor, the connected load is calculated as

  $$ConnectedLoad = (hp \times 0.746 \times Quantity \div (efficiency / 100))$$

  And the diversified equipment load in kW is calculated as:

$$EquipmentLoad = (hp \times 0.746 \times Quantity \div (efficiency / 100)) \times LoadFactor\text{^}\, elasticity$$

- ***Pool Pump Motors.*** The equipment loads for pool pump motors are calculated in a more simplified manner using a default efficiency of 0.85, and the equipment load (kW) is simply added to existing equipment loads computed for the motors.
- ***Motors Located Outside of Buildings.*** Motors located outside of a building, such as pool pump motors, can be indicated as such on the survey form by specifying an AreaID of zero. The algorithm deals with such motors by placing them into Activity Area 1, adding the outside motor load to the existing motor load for Activity Area 1, and then decreasing the sensible heat fraction such that the outside motor load will not contribute to internal gains.
- ***Equipment Operation Shapes.*** The load shape used will be either the business hour approach (process schedule) or the hourly end-use schedule (process end use) approach, as specified on the survey form. Note that there is only a single equipment schedule used for motors, air compressors,

and process equipment because the emphasis of the study was on commercial buildings.

- ***Final Motor Load Shapes.*** Motor load shapes are provided to eQUEST at the component level, and equipment loads are entered at the activity area level. eQUEST applies the equipment loads to the shape to simulate energy on an 8760 hour basis. The premise-level motor load shape is then stored in the results database.

H.11 Air Compressor Algorithm

This algorithm is contained in the *SPComAirCompModel.wsc* VBScript. The algorithm used for simulation of air compressors is somewhat similar to the motors algorithm and uses many of the same steps, since air compressors are motor driven. Steps in the calculation process are outlined below.

- ***Equipment Parameters.*** As for compressors, this step is discussed separately from the Equipment Load calculation because the process is quite complex. From the *Air Compressors* section (Form 35) of the survey form, obtain the compressor type, control type, drive type, quantity, and available nameplate data (size in hp, RPM, NEMA enclosure type, and nominal efficiency). From Techdata, obtain the following engineering parameters.
  - Convert any numerical motor efficiency to an efficiency class (i.e. Standard, High, or Premium) using size in hp, enclosure type, and RPM. This action is taken because other look-ups are done by efficiency class rather than the actual efficiency.
  - Obtain motor part-load elasticity and load factor from Techdata using motor size, compressor type, and control type (e.g., throttled, VSD). The elasticity is used to account for the differences in part-load performance of the different compressor\control types.
  - Obtain motor efficiency from Techdata. First, look up full-load motor efficiency using motor size, NEMA enclosure type, efficiency class, and RPM. Next, look up a full-load efficiency adjustment factor using the motor size, the load factor, and the efficiency class. Motor efficiency is computed by applying the full-load adjustment factor to the full-load efficiency.
- ***Connected and Equipment Loads.*** For each air compressor, the connected load is calculated as

$$ConnectedLoad = (hp \times 0.746 \times Quantity \div (efficiency / 100))$$

And the diversified equipment load in kW is calculated as:

$$EquipmentLoad = (hp \times 0.746 \times Quantity \div (efficiency / 100)) \times LoadFactor\text{^}elasticity$$

- ***Air Compressors Located Outside of Buildings.*** Air compressors located outside are treated the same as outside motors. The algorithm places them into Activity Area 1, adds the air compressor kW to any existing air compressor equipment load in Area 1, and then decreases the sensible heat fraction such that the outside air compressor load will not contribute to internal gains.
- ***Equipment Operation Shapes.*** The load shape used will be either the business hour approach (process schedule) or the hourly end-use schedule (process end use) approach, as specified on the survey form. Note that there is only a single equipment schedule used for motors, air compressors, and process equipment, because the emphasis of the study was on commercial buildings.
- ***Final Air Compressor Load Shapes.*** Air compressor equipment load shapes are provided to eQUEST at the component-level, and equipment loads are entered at the activity area level. eQUEST applies the equipment loads to the shape to simulate energy on an 8760 hour basis. The premise-level air compressor load shape is then stored in the results database.

H.12 DrCEUS Non-HVAC Algorithm Support Files

This section provides a brief summary of where the non-HVAC VBScript and Techdata tables are located and how they are designated.

Non-HVAC Visual Basic Scripts

The Visual Basic scripts (VBScript) contain the code that is used by DrCEUS to create the inputs for the eQUEST pd2 file, as well as other functions such as error generation. These VBScript should be consulted when a comprehensive knowledge of the non-HVAC algorithms beyond what is reported here is desired. The VBScript are contained in the "\scripts" subdirectory of the main DrCEUS directory. A summary of the end use VBScript is presented in Table H-2.

Table H-2: Non-HVAC Visual Basic Script Summary

DrCEUS End Use Label	Non-HVAC End Use	VBScript File Name
Hot Water	Water Heating	SPComHotWaterModel.wsc
Cooking	Cooking	SPComCookModel.wsc
Refrig	Refrigeration: Self-Contained Refrigeration: Remote	SPComScRefrigModel.wsc SPComRefrigModel.wsc
Lighting	Indoor Lighting	SPComInLightModel.wsc
Office Eqp	Office Equipment	SPComOfficeEquipModel.wsc
Ext Light	Outdoor Lighting	SPComOutLightModel.wsc
Misc	Miscellaneous	SPComMiscModel.wsc
Process	Process Equipment	SPComProcessModel.wsc
Motors	Motors	SPComMotorsModel.wsc
Air Comp	Air Compressors	SPComAirCompModel.wsc

Non-HVAC Techdata/DrCEUS Support Database

The Techdata as described earlier in this document are all contained in the DrCEUS support database. These engineering parameters are used to determine equipment loads, as described in the previous sections of this Appendix. The DrCEUS support database is separate from the survey data, and it can be either a SQL database or an Access database. It is located in the "DrCEUS\data" subdirectory of the main DrCEUS directory. A summary of the Techdata tables used for each end use is presented in Table H-3.

Table H-3: DrCEUS Support Database Non-HVAC Techdata Tables

Non-HVAC End Use	Table Name	Function/Description
All End Uses (Starter Shapes)	StarterShapes	Contains the starter shapes for 43 different building type/configurations, 8 end uses and occupancy, and 8 day types (Sun through Sat, Holiday and Closed day).
	StarterMap	Maps DrCEUS "Segment" names to StarterShapes
Water Heating	DHWGallons	Provides daily gallons of usage corresponding to water use characteristics (e.g. number of lavatories, number of meals) specified on the Service Hot Water Use form (Form 25). Values vary by 13 building types.
	DHWInletTemp	Provides monthly average inlet water temperatures in °F derived from weather file data, so there is one record for each weather file that is used in DrCEUS.
	StorageWHEfficiency	Provides default efficiencies by type and fuel for storage water heater equipment recorded on the Water Heating Equipment form (Form 24).

Table H-3 (cont'd): DrCEUS Support Database Non-HVAC Techdata Tables

Non-HVAC End Use	Table Name	Function/Description
Cooking	CookingElec	Provides diversity factors and default connected loads in kW by equipment type for electric cooking equipment (Form 30, Cooking Food Service Equipment).
	CookingGas	Provides diversity factors and default connected loads in kBtuh by equipment type for gas cooking equipment (Form 30, Cooking Food Service Equipment).
	DivFactorAssignment	Mapping table used to determine whether the typical use (Restaurant) or lower use (Other) diversity factors are used. Restaurant or Other is determined by the DrCEUS "Segment".
Refrigeration (Self-Contained, Residential-type)	FoodRefrig	Provides diversity factors and default connected loads in kW by equipment type for residential-type refrigerators (Form 31, Non-Commercial/Residential-Type Refrigerator/Freezers).
Refrigeration (Self-Contained, Residential-type)	SCRefrigeration	Provides diversity factors and default connected loads in kW by equipment type self-contained commercial equipment (Form 31, Commercial Refrigeration Equipment).
Refrigeration (Remote)	RefCaseLoad	Used to obtain refrigerated case loads. Provides display case and walk-in loads in kBtuh per linear foot, per door for glass door cases, or per ft2 for walk-ins. It also provides default fan, anti-sweat heater, lights, and electric defrost wattages, which are given in Watts per foot/door/ft2. These parameters are a function of display case type or walk-in, and service temperature. Note that these values do not vary by weather station.
	RefDailyLoads	Used to convert case loads from RefCaseLoad to average daily electric use. Values are expressed as [kWh/day per kBtuh of case load], and are provided for each month (Mth=1-12) and the peak day of the year (Mth=13). Values are a function of weather station, compressor/condenser system type (CCST), and service temperature.
	RefProfiles	Used to fan out the daily energy use from RefDailyLoads to an hourly load shape. Provides a profile that is the fraction of daily energy use per hour for 24 hours. Thirteen daily profiles are provided for each weather station; one for each month and one for a peak day that is based on the highest daily-average temperature during the year. Values are a function of weather station, compressor/condenser system type (CCST), and service temperature.
Inside Lighting	TechLighting*	Provides system wattage values for indoor lighting (Form 28) from inputs of lamp type, lamp watts, tube length, tube diameter, and number of lamps per fixture. Primarily used to obtain ballast-adjusted fixture wattages for ballasted lighting systems. However, it also acts as a QC control on allowable lamp types, because the survey data must match up exactly to a record in this table in order to be simulated in DrCEUS.
Office Equipment	Office	Provides diversity factors and default connected loads in kW by equipment type for office equipment (Form 29, Office Equipment).
Outside Lighting	TechLighting*	See the explanation provided under Inside Lighting for this table.
	OutsideLightHours	Provides monthly average sunrise and sunset hours for each weather station, based on latitude and longitude of the weather station. The sunrise/sunset hour values are applied to the outside lighting starter shape and used to simulate photocell control.
Miscellaneous	Miscellaneous	Provides diversity factors and default connected loads in kW and kBtuh by equipment type for miscellaneous equipment (Form 33, Miscellaneous Equipment).
Process	TechProcess	Provides load factors and default connected loads in kW and kBtuh by equipment type for process equipment (Form 36, Process Equipment).

Table H-3 (cont'd): DrCEUS Support Database Non-HVAC Techdata Tables

Non-HVAC End Use	Table Name	Function/Description
Motors	MotorLoadFactors	Motor load factors versus service code (e.g. Escalator, Pump).
	MotorEffFullLoad*	Used to obtain motor full load efficiency from motor hp, NEMA enclosure type, efficiency class (Standard, High, Premium), and speed (RPM).
	MotorEffAdj*	Used to adjust motor full load efficiency as a function of motor hp, load factor, and efficiency class.
	MotorElasticities*	Provides part-load elasticity factors describing the slope of the power curve for each control type option (e.g. constant speed, VSD).
Air Compressors	AirCompressors	Provides part-load elasticity factors describing the slope of the power curve for each air compressor configuration which includes compressor size in hp, compressor type (e.g. Rotary Screw), and control type (e.g. Load/Unload).
	MotorEffFullLoad*	See the explanation provided under Motors for this table.
	MotorEffAdj*	See the explanation provided under Motors for this table.

* Indicates that this table is used for multiple end uses.

APPENDIX I: DESCRIPTION OF FORECASTING CLIMATE ZONE RESULTS DATABASE

As with the statewide and utility segment level results, the DrCEUS Segment Processor was used to develop results on a Forecasting Climate Zone (FCZ) basis; Forecasting Climate Zones are illustrated in Table I-1 and Figure I-1. However, when expanded to a Forecasting Climate Zone basis the results were so voluminous, that it was not feasible to provide a hardcopy in this report[1]. Instead, the results are only available electronically in a Microsoft Access database that was delivered to the Energy Commission.

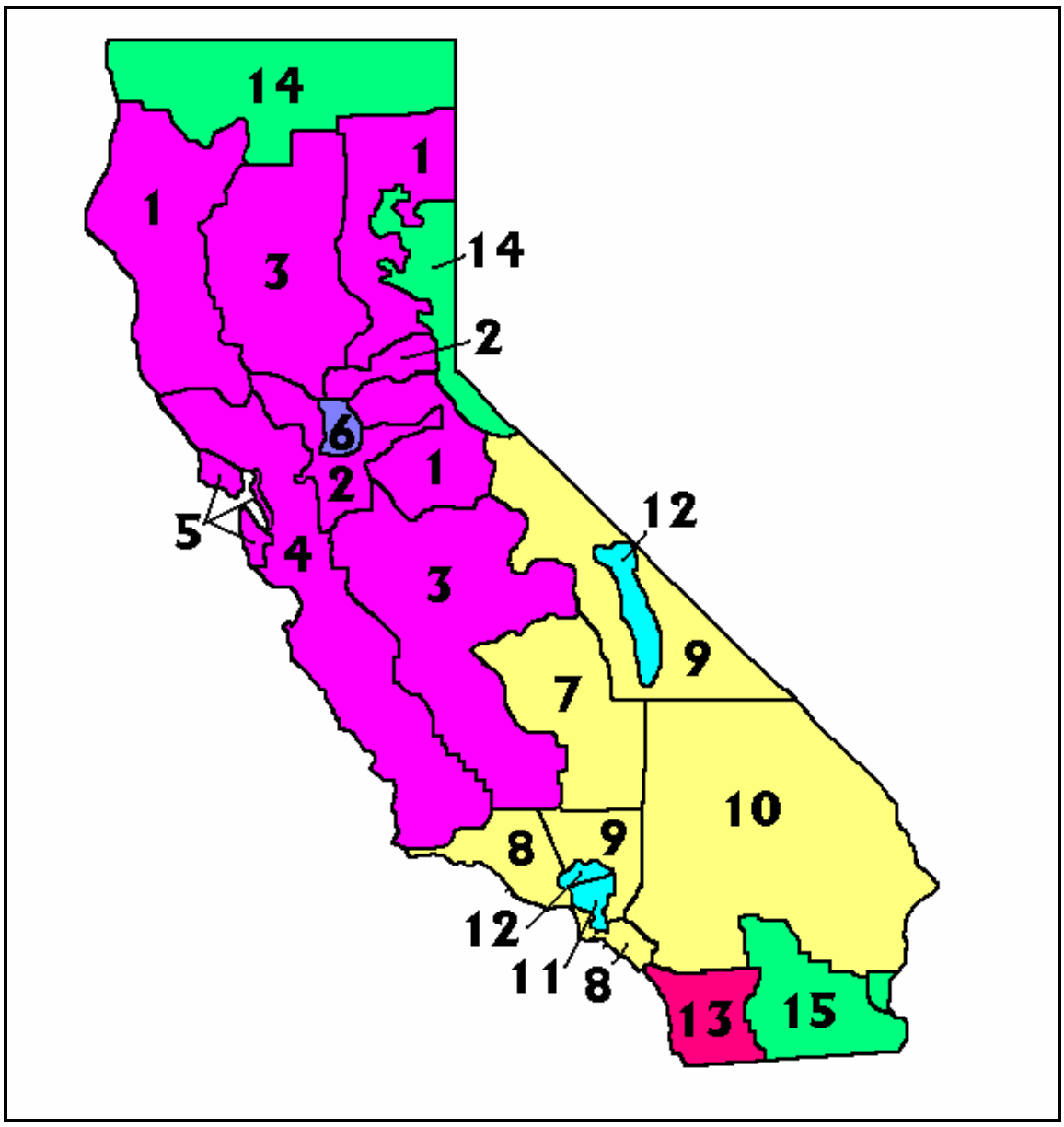
A brief discussion of the format of these results is provided in this appendix. First, the general configuration of the subsets and segments that were used to create the results are described, and then the result tables associated with each DrCEUS graphical view are presented.

Table I-1: CEC Forecasting Climate Zone to Utility Mapping

Forecasting Climate Zones	Utility
1, 2, 3, 4, 5	PG&E
6	SMUD
7, 8, 9, 10	SCE
11, 12	LADWP
13	SDG&E
14, 15	Other
16	BGP[2]

[1] Results were generated for more than just the 11 basic Forecasting Climate Zones encompassed by the utility service area covered by the CEUS study, and the 12 basic building types, which further increased the size of the database. Two more building types were used; “All Warehouses” and “All Offices.” In addition, results were generated for two sub-zones of FCZ 13 (SDG&E service area).

Figure I-1: CEC Forecasting Climate Zones[2]



[2] Due to its small size, BGP (Burbank, Glendale, Pasadena) is not represented on this figure. It is located along the northeastern/eastern edge of the LADWP 11/12 region.

I.1 Database Subsets and Segment Definitions

Two subsets were created and used to generate the Forecasting Climate Zone results. The first subset contains results for the *entire Commercial segment* in each FCZ; it is the equivalent of the "All Commercial" building type in the segment-level result sections of the full report. As shown in Table I-2, this subset is labeled as "ForecastingCZ," and there are 13 segments (Segment ID) defined.

Note that for the SDG&E service area, there are two segments that are not true forecasting climate zones: FCZ13S07 and FCZ13S10. For the CEUS study, the single SDG&E forecasting climate zone was analyzed as "coastal" and "inland" sub-zones, designated as "S07" and "S10" respectively. The S07 sub-group includes SDG&E premises located in Standards climate zones 6, 7 and 8, while the S10 sub-zone encompasses SDG&E premises located in Standards climate zones 10, 14, and 15. This approach was used in recognition of the varying climate regions within the SDG&E service territory, and they were included for use in determining if the current single SDG&E FCZ is adequate or should be further subdivided. A complete description of this approach is provided in the affiliated CEUS project *Weather and Data Normalization* report.

Table I-2: Forecasting Climate Zone Segment Identifiers and Descriptions

Subset Name	Segment ID	Description
ForecastingCZ	FCZ01	Forecasting CZ01 (PG&E:Ukiah)
ForecastingCZ	FCZ02	Forecasting CZ02 (PG&E:Sacramento)
ForecastingCZ	FCZ03	Forecasting CZ03 (PG&E:Fresno)
ForecastingCZ	FCZ04	Forecasting CZ04 (PG&E:San Jose)
ForecastingCZ	FCZ05	Forecasting CZ05 (PG&E:San Francisco)
ForecastingCZ	FCZ06	Forecasting CZ06 (SMUD:Sacramento)
ForecastingCZ	FCZ07	Forecasting CZ07 (SCE:Fresno)
ForecastingCZ	FCZ08	Forecasting CZ08 (SCE:Long Beach)
ForecastingCZ	FCZ09	Forecasting CZ09 (SCE:Burbank)
ForecastingCZ	FCZ10	Forecasting CZ10 (SCE:Riverside)
ForecastingCZ	FCZ13	Forecasting CZ13 (SDG&E:San Diego)
ForecastingCZ	FCZ13S07	Forecasting CZ13/S07 (SDG&E Coastal)
ForecastingCZ	FCZ13S10	Forecasting CZ13/S10 (SDG&E Inland)

The second subset contains the *building type* level results for *each* FCZ. This subset is denoted as "FCZByBldgType" and there are 14 building type segments. The building types and the subset/segment structure are illustrated in Table I-3 for a *single* forecasting climate zone, FCZ1; this format is repeated for all other FCZs. Note that when the CEUS results were split into forecasting climate zones, some segments (i.e. FCZ and building type) were not represented, and

some had only a few sites. For example, there were no unrefrigerated warehouses surveyed in either FCZ1 or FCZ7, so there are no CEUS results for these two segments.

Table I-3: Building Type Segment Identifiers and Descriptions for FCZ1

Subset Name	Segment ID	Description
FCZByBldgType	FCZ01_AOFF	FCZ01 (PG&E) All Offices
FCZByBldgType	FCZ01_AWHS	FCZ01 (PG&E) All Warehouses
FCZByBldgType	FCZ01_COLL	FCZ01 (PG&E) College
FCZByBldgType	FCZ01_GROC	FCZ01 (PG&E) Food Store
FCZByBldgType	FCZ01_HLTH	FCZ01 (PG&E) Health
FCZByBldgType	FCZ01_LODG	FCZ01 (PG&E) Lodging
FCZByBldgType	FCZ01_LOFF	FCZ01 (PG&E) Large Office (>=30k ft2)
FCZByBldgType	FCZ01_MISC	FCZ01 (PG&E) Miscellaneous
FCZByBldgType	FCZ01_REFW	FCZ01 (PG&E) Refrigerated Warehouse
FCZByBldgType	FCZ01_REST	FCZ01 (PG&E) Restaurant
FCZByBldgType	FCZ01_RETL	FCZ01 (PG&E) Retail
FCZByBldgType	FCZ01_SCHL	FCZ01 (PG&E) School
FCZByBldgType	FCZ01_SOFF	FCZ01 (PG&E) Small Office (<30k ft2)
FCZByBldgType	FCZ01_WRHS	FCZ01 (PG&E) Unrefrigerated Warehouse

I.2 DrCEUS Graphics Result Tables

The following graphics are available in the Results View of the Segment Processor. Included in this list are the tables in which these data can be found. Note that all of the data stored in the database can be exported to Microsoft Excel workbooks for use in other software and analysis.

- ***Summary Sheet*** shows a combination of intensities, shares, and EUIs along with whole segment 16-day load shapes and monthly consumption for the segment. The associated data tables are *expIntensity*, *expEUI*, *exp16Day*, *expSqFt* and *expMonthly*.
- ***Annual Summary*** shows the segment intensity and peak load as well as segment-level connected load and full load hours. The associated data tables are *expIntensity*, *expPeakLoad*, *expConLoad,* and *expSqFt*.
- ***Shares and EUIs*** shows the segment-level shares, EUIs, and intensities as well as overall annual usage by the segment. The associated data tables are *expEUI*, *expIntensity* and *expSqFt*.

- ***Monthly Usage*** shows a set of bar charts depicting energy usage and maximum demand by month for the segment. The associated data table is *expMonthly*.
- ***16-Day Whole Segment*** shows a set of 16 graphs of whole segment usage by hour for each season and day type defined for this level of aggregation. The associated data table is *exp16Day*.
- ***16-Day End Use*** shows a set of 16 graphs of segment usage for each end use by hour for each season and day type defined for this level of aggregation. The associated data table is *exp16Day*.
- ***Month Day Type (End Use)*** shows a set of four load shapes for each month by end use. These shapes include Average Weekday, Saturday, Sunday and Peak Day. Peak Day is defined as the day with the highest load for each month. The associated data table is *expMnthDT*.
- ***Month Day Type (Hot/Cold)*** shows a set of two load shapes for each month by end use. These graphs present shapes for the hottest and coldest weekday of the month. The associated data table is *expMnthDT*.
- ***8760 Shapes*** shows whole segment hourly consumption for the simulation year as well as end-use-level detail presented in the same format. A drop-down control allows the user to select the desired information to be displayed in the graph. The associated data tables are *exp8760* and *expEndUse8760*.
- ***Select-A-Day*** allows the user to select a specific day within the simulation year and display an end-use graph of usage for 24 hours. The associated data table is *expEndUse8760*.

APPENDIX J: SIC CODE TO CEUS BUILDING TYPE MAPPING TABLE

Sector	Building Type	4-digit SIC	Description
1. Commercial	1. Office	0740	VETERINARY SERVICES
1. Commercial	1. Office	0741	VETERINARY SERVICES FARM LIVESTOCK
1. Commercial	1. Office	0742	VETERINARY SERVICES SPECIALTIES
1. Commercial	1. Office	0760	FARM LABOR AND MANAGEMENT SERVICES
1. Commercial	1. Office	0761	FARM LABOR CONTRACTORS
1. Commercial	1. Office	0762	FARM MANAGEMENT SERVICES
1. Commercial	1. Office	0780	LANDSCAPE AND HORTICULTURAL SERVICES
1. Commercial	1. Office	0781	LANDSCAPE COUNSELING AND PLANNING
1. Commercial	1. Office	0782	LAWN AND GARDEN SERVICES
1. Commercial	1. Office	0783	ORNAMENTAL SHRUB AND TREE SERVICES
1. Commercial	1. Office	6000	BANKING
1. Commercial	1. Office	6010	FEDERAL RESERVE BANKS
1. Commercial	1. Office	6011	FEDERAL RESERVE BANKS
1. Commercial	1. Office	6019	CENTRAL RESERVE DEPOSITORY NEC
1. Commercial	1. Office	6020	COMMERCIAL AND STOCK SAVINGS BANKS
1. Commercial	1. Office	6021	NATIONAL COMMERCIAL BANKS
1. Commercial	1. Office	6022	STATE COMMERCIAL BANKS
1. Commercial	1. Office	6023	STATE BANKS NOT FED RESERVE FDIC
1. Commercial	1. Office	6024	STATE BANKS NOT FED RES NOT FDIC
1. Commercial	1. Office	6025	NATIONAL BANKS FEDERAL RESERVE
1. Commercial	1. Office	6026	NATIONAL BANKS NOT FED RES FDIC
1. Commercial	1. Office	6027	NATIONAL BANKS NOT FDIC
1. Commercial	1. Office	6028	PRIVATE BANKS NOT INCORP NOT FDIC
1. Commercial	1. Office	6029	COMMERCIAL BANK NEC
1. Commercial	1. Office	6030	MUTUAL SAVINGS BANKS
1. Commercial	1. Office	6032	MUTUAL SAVINGS BANKS FEDERAL RESERVE
1. Commercial	1. Office	6033	MUTUAL SAVINGS BANKS NEC
1. Commercial	1. Office	6034	MUTUAL SAVINGS BANKS NOT FDIC
1. Commercial	1. Office	6035	FEDERAL SAVINGS INSTITUTIONS
1. Commercial	1. Office	6036	SAVINGS INSTITUTION EX. FED.
1. Commercial	1. Office	6040	TRUST COMPANIES NONDEPOSIT
1. Commercial	1. Office	6042	NONDEPOSIT TRUSTS FEDERAL RESERVE
1. Commercial	1. Office	6044	NONDEPOSIT TRUSTS NOT FDIC
1. Commercial	1. Office	6050	FUNCTIONS CLOSELY RELATED TO BANKING
1. Commercial	1. Office	6052	FOREIGN EXCHANGE ESTABLISHMENTS
1. Commercial	1. Office	6054	SAFE DEPOSIT COMPANIES
1. Commercial	1. Office	6055	CLEARINGHOUSE ASSOCIATIONS
1. Commercial	1. Office	6056	CORPORATIONS FOR BANKING ABROAD
1. Commercial	1. Office	6059	FUNCTIONS RELATED TO BANKING NEC
1. Commercial	1. Office	6060	CREDIT UNIONS
1. Commercial	1. Office	6061	FEDERAL CREDIT UNION
1. Commercial	1. Office	6062	STATE CREDIT UNION
1. Commercial	1. Office	6080	FOREIGN BANK & BRANCHES
1. Commercial	1. Office	6081	FOREIGN BANK AND BRANCHES
1. Commercial	1. Office	6082	FOREIGN TRADE AND INT BANKS
1. Commercial	1. Office	6090	BANKING FUNCTIONS
1. Commercial	1. Office	6091	NONDEPOSIT TRUST FACILITIES
1. Commercial	1. Office	6099	DEPOSIT BANKING FUNCTIONS
1. Commercial	1. Office	6100	NONDEPOSITORY INSTITUTIONS
1. Commercial	1. Office	6110	FED. AND FED. SPONSORED CREDIT
1. Commercial	1. Office	6111	FED. AND FED. SPONSORED CREDIT
1. Commercial	1. Office	6112	REDISCOUNTING NOT FOR AGRICULTURAL
1. Commercial	1. Office	6113	REDISCOUNTING FOR AGRICULTURAL
1. Commercial	1. Office	6120	SAVINGS AND LOAN ASSOCIATIONS
1. Commercial	1. Office	6122	FEDERAL SAVINGS & LOAN ASSOCIATIONS
1. Commercial	1. Office	6123	STATE ASSOCIATIONS INSURED
1. Commercial	1. Office	6124	STATE ASSOCIATIONS NONINSURED FHLB
1. Commercial	1. Office	6125	STATE ASSOCIATIONS NONINSURED NEC

Sector	Building Type	4-digit SIC	Description
1. Commercial	1. Office	6130	AGRICULTURAL CREDIT INSTITUTIONS
1. Commercial	1. Office	6131	AGRICULTURAL CREDIT INSTITUTIONS
1. Commercial	1. Office	6140	PERSONAL CREDIT INSTITUTIONS
1. Commercial	1. Office	6141	PERSONAL CREDIT INSTITUTIONS
1. Commercial	1. Office	6142	FEDERAL CREDIT UNIONS
1. Commercial	1. Office	6143	STATE CREDIT UNIONS
1. Commercial	1. Office	6144	NONDEPOSIT INDUSTRIAL LOAN COMPANIES
1. Commercial	1. Office	6145	LICENSED SMALL LOAN LENDERS
1. Commercial	1. Office	6146	INSTALLMENT SALES FINANCE COMPANIES
1. Commercial	1. Office	6149	MISC PERSONAL CREDIT INSTITUTIONS
1. Commercial	1. Office	6150	BUSINESS CREDIT INSTITUTIONS
1. Commercial	1. Office	6153	SHORT-TERM BUSINESS CREDIT
1. Commercial	1. Office	6159	MISC BUSINESS CREDIT INSTITUTIONS
1. Commercial	1. Office	6160	MORTGAGE BANKERS AND BROKERS
1. Commercial	1. Office	6162	MORTGAGE BANKERS AND CORRESPONDENTS
1. Commercial	1. Office	6163	LOAN BROKERS
1. Commercial	1. Office	6200	SECURITY COMMODITY BROKERS & SERVICES
1. Commercial	1. Office	6210	SECURITY BROKERS AND DEALERS
1. Commercial	1. Office	6211	SECURITY BROKERS AND DEALERS
1. Commercial	1. Office	6220	COMMODITY CONTRACTS BROKERS DEALERS
1. Commercial	1. Office	6221	COMMODITY CONTRACTS BROKERS DEALERS
1. Commercial	1. Office	6230	SECURITY AND COMMODITY EXCHANGES
1. Commercial	1. Office	6231	SECURITY AND COMMODITY EXCHANGES
1. Commercial	1. Office	6280	SECURITY AND COMMODITY SERVICES
1. Commercial	1. Office	6281	SECURITY AND COMMODITY SERVICES
1. Commercial	1. Office	6282	INVESTMENT ADVICE
1. Commercial	1. Office	6289	SECURITY AND COMMODITY SERVICES
1. Commercial	1. Office	6300	INSURANCE CARRIERS
1. Commercial	1. Office	6310	LIFE INSURANCE
1. Commercial	1. Office	6311	LIFE INSURANCE
1. Commercial	1. Office	6320	MEDICAL SERVICE AND HEALTH INSURANCE
1. Commercial	1. Office	6321	ACCIDENT AND HEALTH INSURANCE
1. Commercial	1. Office	6324	HOSPITAL AND MEDICAL SERVICE PLANS
1. Commercial	1. Office	6330	FIRE MARINE AND CASUALTY INSURANCE
1. Commercial	1. Office	6331	FIRE MARINE AND CASUALTY INSURANCE
1. Commercial	1. Office	6350	SURETY INSURANCE
1. Commercial	1. Office	6351	SURETY INSURANCE
1. Commercial	1. Office	6360	TITLE INSURANCE
1. Commercial	1. Office	6361	TITLE INSURANCE
1. Commercial	1. Office	6370	PENSION HEALTH AND WELFARE FUNDS
1. Commercial	1. Office	6371	PENSION HEALTH AND WELFARE FUNDS
1. Commercial	1. Office	6390	INSURANCE CARRIERS NEC
1. Commercial	1. Office	6399	INSURANCE CARRIERS NEC
1. Commercial	1. Office	6400	INSURANCE AGENTS BROKERS & SERVICE
1. Commercial	1. Office	6410	INSURANCE AGENTS BROKERS & SERVICE
1. Commercial	1. Office	6411	INSURANCE AGENTS BROKERS & SERVICE
1. Commercial	1. Office	6500	REAL ESTATE
1. Commercial	1. Office	6510	REAL ESTATE OPERATORS AND LESSORS
1. Commercial	1. Office	6512	NONRESIDENTIAL BUILDING OPERATORS
1. Commercial	1. Office	6513	APARTMENT BUILDING OPERATORS
1. Commercial	1. Office	6514	DWELLING OPERATORS EXC APARTMENTS
1. Commercial	1. Office	6515	MOBILE HOME SITE OPERATORS
1. Commercial	1. Office	6517	RAILROAD PROPERTY LESSORS
1. Commercial	1. Office	6519	REAL PROPERTY LESSORS NEC
1. Commercial	1. Office	6520	PGE SINGLE/MULTI TENANT OFFICE
1. Commercial	1. Office	6521	PGE SINGLE TENANT OFFICE
1. Commercial	1. Office	6522	PGE MULTI TENANT OFFICE
1. Commercial	1. Office	6530	REAL ESTATE AGENTS AND MANAGERS
1. Commercial	1. Office	6531	REAL ESTATE AGENTS AND MANAGERS
1. Commercial	1. Office	6540	TITLE ABSTRACT OFFICES
1. Commercial	1. Office	6541	TITLE ABSTRACT OFFICES
1. Commercial	1. Office	6550	SUBDIVIDERS AND DEVELOPERS
1. Commercial	1. Office	6552	SUBDIVIDERS AND DEVELOPERS NEC
1. Commercial	1. Office	6553	CEMETERY SUBDIVIDERS AND DEVELOPERS

Sector	Building Type	4-digit SIC	Description
1. Commercial	1. Office	6560	PGE VACANT BUILDING - NO TENANT
1. Commercial	1. Office	6561	PGE VACANT BUILDING - NO TENANT
1. Commercial	1. Office	6600	PGE COMBINED REAL ESTATE DEVELOPER ETC
1. Commercial	1. Office	6610	PGE COMBINED REAL ESTATE INSURANCE
1. Commercial	1. Office	6611	PGE COMBINED REAL ESTATE INSURANCE
1. Commercial	1. Office	6620	PGE COMBINED REAL ESTATE DEVELOPER ETC
1. Commercial	1. Office	6621	PGE COMBINED REAL ESTATE DEVELOPER ETC
1. Commercial	1. Office	6700	HOLDING AND OTHER INVESTMENT OFFICES
1. Commercial	1. Office	6710	HOLDING OFFICES
1. Commercial	1. Office	6711	HOLDING OFFICES
1. Commercial	1. Office	6712	BANK HOLDING COMPANIES
1. Commercial	1. Office	6719	HOLDING COMPANIES, NEC
1. Commercial	1. Office	6720	INVESTMENT OFFICES
1. Commercial	1. Office	6722	MANAGEMENT INVESTMENT OPEN-END
1. Commercial	1. Office	6723	MANAGEMENT INVESTMENT CLOSED-END
1. Commercial	1. Office	6724	UNIT INVESTMENT TRUSTS
1. Commercial	1. Office	6725	FACE-AMOUNT CERTIFICATE OFFICES
1. Commercial	1. Office	6726	INVESTMENT OFFICES NEC
1. Commercial	1. Office	6730	TRUSTS
1. Commercial	1. Office	6732	EDUCATIONAL RELIGIOUS ETC TRUSTS
1. Commercial	1. Office	6733	TRUSTS NEC
1. Commercial	1. Office	6790	MISCELLANEOUS INVESTING
1. Commercial	1. Office	6792	OIL ROYALTY TRADERS
1. Commercial	1. Office	6793	COMMODITY TRADERS
1. Commercial	1. Office	6794	PATENT OWNERS AND LESSORS
1. Commercial	1. Office	6798	REAL ESTATE INVESTMENT TRUSTS
1. Commercial	1. Office	6799	INVESTORS NEC
1. Commercial	1. Office	7291	TAX PREPARATION SERVICES
1. Commercial	1. Office	7300	BUSINESS SERVICES
1. Commercial	1. Office	7310	ADVERTISING
1. Commercial	1. Office	7311	ADVERTISING AGENCIES
1. Commercial	1. Office	7312	OUTDOOR ADVERTISING SERVICES
1. Commercial	1. Office	7313	RADIO TV PUBLISHER REPRESENTATIVES
1. Commercial	1. Office	7318	RADIO TV PUBLISHER REPRESENTATIVES
1. Commercial	1. Office	7319	ADVERTISING NEC
1. Commercial	1. Office	7320	CREDIT REPORTING AND COLLECTION
1. Commercial	1. Office	7321	CREDIT REPORTING AND COLLECTION
1. Commercial	1. Office	7322	ADJUSTMENT AND COLLECTION SERV.
1. Commercial	1. Office	7323	CREDIT REPORTING SERVICES
1. Commercial	1. Office	7330	MAILING REPRODUCTION STENOGRAPHIC
1. Commercial	1. Office	7331	DIRECT MAIL ADVERTISING SERVICES
1. Commercial	1. Office	7332	BLUEPRINTING AND PHOTOCOPYING
1. Commercial	1. Office	7333	COMMERCIAL PHOTOGRAPHY AND ART
1. Commercial	1. Office	7334	PHOTOCOPY AND DUPLICATION
1. Commercial	1. Office	7335	COMMERCIAL PHOTOGRAPHY
1. Commercial	1. Office	7336	COMMERCIAL PHOTOGRAPHY AND ART
1. Commercial	1. Office	7338	SECRETARIAL AND COURT REPORTING
1. Commercial	1. Office	7339	STENOGRAPHIC AND REPRODUCTION NEC
1. Commercial	1. Office	7340	SERVICES TO BUILDINGS
1. Commercial	1. Office	7341	WINDOW CLEANING
1. Commercial	1. Office	7342	DISINFECTING AND EXTERMINATING
1. Commercial	1. Office	7343	DISINFECTING AND EXTERMINATING
1. Commercial	1. Office	7349	BUILDING MAINTENANCE SERVICES NEC
1. Commercial	1. Office	7350	MISC. EQUIPMENT RENTAL
1. Commercial	1. Office	7351	NEWS SYNDICATES
1. Commercial	1. Office	7352	MEDICAL EQUIPMENT RENTS
1. Commercial	1. Office	7353	HEAVY CONSTR. EQUIPMENT
1. Commercial	1. Office	7359	EQUIPMENT RENTAL & LEASING NEC
1. Commercial	1. Office	7360	PERSONNEL SUPPLY SERVICES
1. Commercial	1. Office	7361	EMPLOYMENT AGENCIES
1. Commercial	1. Office	7362	TEMPORARY HELP SUPPLY SERVICES
1. Commercial	1. Office	7363	HELP SUPPLY SERVICES
1. Commercial	1. Office	7369	PERSONNEL SUPPLY SERVICES NEC
1. Commercial	1. Office	7370	COMPUTER AND DATA PROCESSING SERVICES

Sector	Building Type	4-digit SIC	Description
1. Commercial	1. Office	7371	CUSTOM COMPUTER PROGRAMMING
1. Commercial	1. Office	7372	PREPACKAGED COMPUTER SOFTWARE
1. Commercial	1. Office	7373	COMPUTER SYSTEM DESIGN
1. Commercial	1. Office	7374	DATA PROCESSING AND PREPARATION
1. Commercial	1. Office	7375	INFORMATION RETRIEVAL SERVICES
1. Commercial	1. Office	7376	COMPUTER FACILITY MANAGEMENT
1. Commercial	1. Office	7377	COMPUTER RENTAL
1. Commercial	1. Office	7378	COMPUTER MAINTENANCE & REPAIR
1. Commercial	1. Office	7379	COMPUTER RELATED SERVICES NEC
1. Commercial	1. Office	7380	MISC. BUSINESS SERVICES
1. Commercial	1. Office	7381	DETECTIVE AND ARMORED CAR
1. Commercial	1. Office	7382	SECURITY SYSTEMS SERVICES
1. Commercial	1. Office	7383	NEWS SYNDICATES
1. Commercial	1. Office	7389	BUSINESS SERVICES NEC
1. Commercial	1. Office	7820	MOTION PICTURE DISTRIBUTION AND SERVIC
1. Commercial	1. Office	7822	MOVIE AND TAPE DISTRIBUTION
1. Commercial	1. Office	7823	MOTION PICTURE FILM EXCHANGES
1. Commercial	1. Office	7824	FILM OR TAPE DISTRIBUTION FOR TV
1. Commercial	1. Office	7829	MOTION PICTURE DISTRIBUTION SERVICES
1. Commercial	1. Office	8010	OFFICES OF PHYSICIANS
1. Commercial	1. Office	8011	OFFICES AND CLINICS OF PHYSICIANS
1. Commercial	1. Office	8020	OFFICES AND CLINICS OF DENTISTS
1. Commercial	1. Office	8021	OFFICES AND CLINICS OF DENTISTS
1. Commercial	1. Office	8030	OFFICES OF OSTEOPATHIC PHYSICIANS
1. Commercial	1. Office	8031	OFFICES OF OSTEOPATHIC PHYSICIANS
1. Commercial	1. Office	8040	OFFICES OF OTHER HEALTH PRACTITIONERS
1. Commercial	1. Office	8041	OFFICES OF CHIROPRACTORS
1. Commercial	1. Office	8042	OFFICES OF OPTOMETRISTS
1. Commercial	1. Office	8043	PODIATRIST OFFICES AND CLINICS
1. Commercial	1. Office	8049	OFFICES OF HEALTH PRACTITIONERS NEC
1. Commercial	1. Office	8100	LEGAL SERVICES
1. Commercial	1. Office	8110	LEGAL SERVICES
1. Commercial	1. Office	8111	LEGAL SERVICES
1. Commercial	1. Office	8320	INDIVIDUAL AND FAMILY SERVICES
1. Commercial	1. Office	8321	INDIVIDUAL AND FAMILY SERVICES
1. Commercial	1. Office	8322	INDIVIDUAL AND FAMILY SERVICES
1. Commercial	1. Office	8330	JOB TRAINING AND RELATED SERVICES
1. Commercial	1. Office	8331	JOB TRAINING AND RELATED SERVICES
1. Commercial	1. Office	8390	SOCIAL SERVICES NEC
1. Commercial	1. Office	8399	SOCIAL SERVICES NEC
1. Commercial	1. Office	8610	BUSINESS ASSOCIATIONS
1. Commercial	1. Office	8611	BUSINESS ASSOCIATIONS
1. Commercial	1. Office	8620	PROFESSIONAL ORGANIZATIONS
1. Commercial	1. Office	8621	PROFESSIONAL ORGANIZATIONS
1. Commercial	1. Office	8630	LABOR ORGANIZATIONS
1. Commercial	1. Office	8631	LABOR ORGANIZATIONS
1. Commercial	1. Office	8650	POLITICAL ORGANIZATIONS
1. Commercial	1. Office	8651	POLITICAL ORGANIZATIONS
1. Commercial	1. Office	8700	ENGINEER AND MGMT. SERVICES
1. Commercial	1. Office	8710	ENGINEERING AND ARCHITECTSERV.
1. Commercial	1. Office	8711	ENGINEER SERVICES
1. Commercial	1. Office	8712	ARCHITECT SERVICES
1. Commercial	1. Office	8713	SURVEYING
1. Commercial	1. Office	8720	ACCOUNTING AUDITING ETC.
1. Commercial	1. Office	8721	ACCOUNTING AUDITING ETC.
1. Commercial	1. Office	8732	COMMERCIAL NON-PHYSICAL RESEARCH
1. Commercial	1. Office	8733	NON COMMERCIAL RESEARCH ORGANIZ.
1. Commercial	1. Office	8740	MANAGEMENT AND PUBLIC RELATIONS
1. Commercial	1. Office	8741	MANAGEMENT SERV.
1. Commercial	1. Office	8742	MANAGEMENT CONSULTANT SERVICES
1. Commercial	1. Office	8743	PUBLIC RELATIONS SERVICES
1. Commercial	1. Office	8748	BUSINESS CONSULTING NEC
1. Commercial	1. Office	9100	EXECUTIVE LEGISLATIVE AND GENERAL
1. Commercial	1. Office	9110	EXECUTIVE OFFICES

Sector	Building Type	4-digit SIC	Description
1. Commercial	1. Office	9111	EXECUTIVE OFFICES
1. Commercial	1. Office	9120	LEGISLATIVE BODIES
1. Commercial	1. Office	9121	LEGISLATIVE BODIES
1. Commercial	1. Office	9130	EXECUTIVE AND LEGISLATIVE COMBINED
1. Commercial	1. Office	9131	EXECUTIVE AND LEGISLATIVE COMBINED
1. Commercial	1. Office	9190	GENERAL GOVERNMENT NEC
1. Commercial	1. Office	9199	GENERAL GOVERNMENT NEC
1. Commercial	1. Office	9200	JUSTICE PUBLIC ORDER AND SAFETY
1. Commercial	1. Office	9210	COURTS
1. Commercial	10. Misc	9211	COURTS
1. Commercial	1. Office	9222	LEGAL COUNSEL AND PROSECUTION
1. Commercial	1. Office	9300	FINANCE TAXATION & MONETARY POLICY
1. Commercial	1. Office	9310	FINANCE TAXATION & MONETARY POLICY
1. Commercial	1. Office	9311	FINANCE TAXATION & MONETARY POLICY
1. Commercial	1. Office	9400	ADMINISTRATION OF HUMAN RESOURCES
1. Commercial	1. Office	9410	ADMIN OF EDUCATIONAL PROGRAMS
1. Commercial	1. Office	9411	ADMIN OF EDUCATIONAL PROGRAMS
1. Commercial	1. Office	9430	ADMIN OF PUBLIC HEALTH PROGRAMS
1. Commercial	1. Office	9431	ADMIN OF PUBLIC HEALTH PROGRAMS
1. Commercial	1. Office	9440	ADMIN OF SOCIAL & MANPOWER PROGRAM
1. Commercial	1. Office	9441	ADMIN OF SOCIAL & MANPOWER PROGRAM
1. Commercial	1. Office	9450	ADMINISTRATION OF VETERANS AFFAIRS
1. Commercial	1. Office	9451	ADMINISTRATION OF VETERANS AFFAIRS
1. Commercial	1. Office	9500	ENVIRONMENTAL QUALITY AND HOUSING
1. Commercial	1. Office	9510	ENVIRONMENTAL QUALITY
1. Commercial	1. Office	9511	AIR WATER & SOLID WASTE MANAGEMENT
1. Commercial	1. Office	9512	LAND MINERAL WILDLIFE CONSERVATION
1. Commercial	1. Office	9530	HOUSING AND URBAN DEVELOPMENT
1. Commercial	1. Office	9531	HOUSING PROGRAMS
1. Commercial	1. Office	9532	URBAN AND COMMUNITY DEVELOPMENT
1. Commercial	1. Office	9600	ADMINISTRATION OF ECONOMIC PROGRAMS
1. Commercial	1. Office	9610	ADMIN OF GENERAL ECONOMIC PROGRAMS
1. Commercial	1. Office	9611	ADMIN OF GENERAL ECONOMIC PROGRAMS
1. Commercial	1. Office	9620	REGULATION ADMIN OF TRANSPORTATION
1. Commercial	1. Office	9621	REGULATION ADMIN OF TRANSPORTATION
1. Commercial	1. Office	9630	REGULATION ADMIN OF UTIITIES
1. Commercial	1. Office	9631	REGULATION ADMIN OF UTIITIES
1. Commercial	1. Office	9640	REGULATION OF AGRICULTURAL MARKETING
1. Commercial	1. Office	9641	REGULATION OF AGRICULTURAL MARKETING
1. Commercial	1. Office	9650	REGULATION MISC COMMERCIAL SECTORS
1. Commercial	1. Office	9651	REGULATION MISC COMMERCIAL SECTORS
1. Commercial	1. Office	9720	INTERNATIONAL AFFAIRS
1. Commercial	1. Office	9721	INTERNATIONAL AFFAIRS
1. Commercial	10. Misc	5540	GASOLINE SERVICE STATIONS
1. Commercial	10. Misc	5541	GASOLINE SERVICE STATIONS
1. Commercial	10. Misc	7030	CAMPS AND TRAILERING PARKS
1. Commercial	10. Misc	7032	SPORTING AND RECREATIONAL CAMPS
1. Commercial	10. Misc	7033	TRAILERING PARKS FOR TRANSIENTS
1. Commercial	10. Misc	7200	PERSONAL SERVICES
1. Commercial	10. Misc	7210	LAUNDRY CLEANING & GARMENT SERVICES
1. Commercial	10. Misc	7211	POWER LAUNDRIES FAMILY & COMMERCIAL
1. Commercial	10. Misc	7212	GARMENT PRESSING & CLEANERS AGENTS
1. Commercial	10. Misc	7213	LINEN SUPPLY
1. Commercial	10. Misc	7214	DIAPER SERVICE
1. Commercial	10. Misc	7215	COIN-OPERATED LAUNDRIES AND CLEANING
1. Commercial	10. Misc	7216	DRY CLEANING PLANTS EXCEPT RUG
1. Commercial	10. Misc	7217	CARPET AND UPHOLSTERY CLEANING
1. Commercial	10. Misc	7218	INDUSTRIAL LAUNDERERS
1. Commercial	10. Misc	7219	LAUNDRY AND GARMENT SERVICES NEC
1. Commercial	10. Misc	7220	PHOTOGRAPHIC STUDIOS PORTRAIT
1. Commercial	10. Misc	7221	PHOTOGRAPHIC STUDIOS PORTRAIT
1. Commercial	10. Misc	7230	BEAUTY SHOPS
1. Commercial	10. Misc	7231	BEAUTY SHOPS
1. Commercial	10. Misc	7240	BARBER SHOPS

Sector	Building Type	4-digit SIC	Description
1. Commercial	10. Misc	7241	BARBER SHOPS
1. Commercial	10. Misc	7250	SHOE REPAIR AND HAT CLEANING SHOPS
1. Commercial	10. Misc	7251	SHOE REPAIR AND HAT CLEANING SHOPS
1. Commercial	10. Misc	7260	FUNERAL SERVICE AND CREMATORIES
1. Commercial	10. Misc	7261	FUNERAL SERVICE AND CREMATORIES
1. Commercial	10. Misc	7290	MISCELLANEOUS PERSONAL SERVICES
1. Commercial	10. Misc	7299	MISCELLANEOUS PERSONAL SERVICES
1. Commercial	10. Misc	7384	PHOTO FINISHING
1. Commercial	10. Misc	7500	AUTO REPAIR SERVICES AND GARAGES
1. Commercial	10. Misc	7510	AUTOMOTIVE RENTALS WITHOUT DRIVERS
1. Commercial	10. Misc	7512	PASSENGER CAR RENTAL AND LEASING
1. Commercial	10. Misc	7513	TRUCK RENTAL AND LEASING
1. Commercial	10. Misc	7514	PASSENGER CAR RENTAL
1. Commercial	10. Misc	7515	PASSENGER CAR LEASING
1. Commercial	10. Misc	7519	UTILITY TRAILER RENTAL
1. Commercial	10. Misc	7520	AUTOMOBILE PARKING
1. Commercial	10. Misc	7521	AUTOMOBILE PARKING
1. Commercial	10. Misc	7530	AUTOMOTIVE REPAIR SHOPS
1. Commercial	10. Misc	7531	TOP AND BODY REPAIR SHOPS
1. Commercial	10. Misc	7532	TOP & BODY REPAIR & PAINT SHOPS
1. Commercial	10. Misc	7533	AUTO EXHAUST SHOPS
1. Commercial	10. Misc	7534	TIRE RETREADING AND REPAIR SHOPS
1. Commercial	10. Misc	7535	PAINT SHOPS
1. Commercial	10. Misc	7536	AUTO GLASS SHOPS
1. Commercial	10. Misc	7537	AUTO TRANSMISSION SHOPS
1. Commercial	10. Misc	7538	GENERAL AUTOMOTIVE REPAIR SHOPS
1. Commercial	10. Misc	7539	AUTOMOTIVE REPAIR SHOPS NEC
1. Commercial	10. Misc	7540	AUTOMOTIVE SERVICES EXCEPT REPAIR
1. Commercial	10. Misc	7542	CAR WASHES
1. Commercial	10. Misc	7549	AUTOMOTIVE SERVICES NEC
1. Commercial	10. Misc	7600	MISCELLANEOUS REPAIR SERVICES
1. Commercial	10. Misc	7620	ELECTRICAL REPAIR SHOPS
1. Commercial	10. Misc	7622	RADIO AND TELEVISION REPAIR
1. Commercial	10. Misc	7623	REFRIGERATION SERVICE AND REPAIR
1. Commercial	10. Misc	7629	ELECTRICAL REPAIR SHOPS NEC
1. Commercial	10. Misc	7630	WATCH CLOCK AND JEWELRY REPAIR
1. Commercial	10. Misc	7631	WATCH CLOCK AND JEWELRY REPAIR
1. Commercial	10. Misc	7640	REUPHOLSTERY AND FURNITURE REPAIR
1. Commercial	10. Misc	7641	REUPHOLSTERY AND FURNITURE REPAIR
1. Commercial	10. Misc	7690	MISCELLANEOUS REPAIR SHOPS
1. Commercial	10. Misc	7692	WELDING REPAIR
1. Commercial	10. Misc	7694	ARMATURE REWINDING SHOPS
1. Commercial	10. Misc	7699	REPAIR SERVICES NEC
1. Commercial	10. Misc	7800	MOTION PICTURES
1. Commercial	10. Misc	7810	MOTION PICTURE PRODUCTION & SERVICES
1. Commercial	10. Misc	7812	MOTION PICTURE & VIDEO PRODUCTION
1. Commercial	10. Misc	7813	MOTION PICTURE PRODUCTION EXCEPT TV
1. Commercial	10. Misc	7814	MOTION PICTURE PRODUCTION FOR TV
1. Commercial	10. Misc	7819	SERVICES ALLIED TO MOTION PICTURES
1. Commercial	10. Misc	7830	MOTION PICTURE THEATERS
1. Commercial	10. Misc	7832	MOTION PICTURE THEATERS EX DRIVE-IN
1. Commercial	10. Misc	7833	DRIVE-IN MOTION PICTURE THEATERS
1. Commercial	10. Misc	7840	VIDEO TAPE RENTAL
1. Commercial	10. Misc	7841	VIDEO TAPE RENTAL
1. Commercial	10. Misc	7900	AMUSEMENT & RECREATION SERVICES
1. Commercial	10. Misc	7910	DANCE HALLS STUDIOS AND SCHOOLS
1. Commercial	10. Misc	7911	DANCE HALLS STUDIOS AND SCHOOLS
1. Commercial	10. Misc	7920	PRODUCERS ORCHESTRAS ENTERTAINERS
1. Commercial	10. Misc	7922	THEATRICAL PRODUCERS AND SERVICES
1. Commercial	10. Misc	7929	ENTERTAINERS & ENTERTAINMENT GROUPS
1. Commercial	10. Misc	7930	BOWLING AND BILLIARD ESTABLISHMENTS
1. Commercial	10. Misc	7932	BILLIARD AND POOL ESTABLISHMENTS
1. Commercial	10. Misc	7933	BOWLING ALLEYS
1. Commercial	10. Misc	7940	COMMERCIAL SPORTS

Sector	Building Type	4-digit SIC	Description
1. Commercial	10. Misc	7941	SPORTS CLUBS AND PROMOTERS
1. Commercial	10. Misc	7948	RACING INCLUDING TRACK OPERATION
1. Commercial	10. Misc	7990	MISC AMUSEMENT RECREATIONAL SERVICES
1. Commercial	10. Misc	7991	PHYSICAL FITNESS FACILITIES
1. Commercial	10. Misc	7992	PUBLIC GOLF COURSES
1. Commercial	10. Misc	7993	COIN-OPERATED AMUSEMENT DEVICES
1. Commercial	10. Misc	7996	AMUSEMENT PARKS
1. Commercial	10. Misc	7997	MEMBERSHIP SPORTS & RECREATION CLUBS
1. Commercial	10. Misc	7999	AMUSEMENT AND RECREATION NEC
1. Commercial	10. Misc	8000	HEALTH SERVICES
1. Commercial	10. Misc	8230	LIBRARIES AND INFORMATION CENTERS
1. Commercial	10. Misc	8231	LIBRARIES AND INFORMATION CENTERS
1. Commercial	10. Misc	8300	SOCIAL SERVICES
1. Commercial	10. Misc	8400	MUSEUMS BOTANICAL ZOOLOGICAL GARDENS
1. Commercial	10. Misc	8410	MUSEUMS AND ART GALLERIES
1. Commercial	10. Misc	8411	MUSEUMS AND ART GALLERIES
1. Commercial	10. Misc	8412	MUSEUMS AND ART GALLERIES
1. Commercial	10. Misc	8420	BOTANICAL AND ZOOLOGICAL GARDENS
1. Commercial	10. Misc	8421	BOTANICAL AND ZOOLOGICAL GARDENS
1. Commercial	10. Misc	8422	BOTANICAL AND ZOOLOGICAL GARDENS
1. Commercial	10. Misc	8600	MEMBERSHIP ORGANIZATIONS
1. Commercial	10. Misc	8640	CIVIC AND SOCIAL ASSOCIATIONS
1. Commercial	10. Misc	8641	CIVIC AND SOCIAL ASSOCIATIONS
1. Commercial	10. Misc	8660	RELIGIOUS ORGANIZATIONS
1. Commercial	10. Misc	8661	RELIGIOUS ORGANIZATIONS
1. Commercial	10. Misc	8690	MEMBERSHIP ORGANIZATIONS NEC
1. Commercial	10. Misc	8699	MEMBERSHIP ORGANIZATIONS NEC
1. Commercial	10. Misc	8730	RESEARCH AND TESTING SERVICES
1. Commercial	10. Misc	8731	COMMERCIAL PHYSICAL RESEARCH
1. Commercial	10. Misc	8734	TESTING LABORATORIES
1. Commercial	10. Misc	8744	FACILITIES SUPPORT SERVICES
1. Commercial	10. Misc	8900	SERVICES NEC
1. Commercial	10. Misc	8990	SERVICES NEC
1. Commercial	10. Misc	8999	SERVICES NEC
1. Commercial	10. Misc	9220	PUBLIC ORDER AND SAFETY
1. Commercial	10. Misc	9221	POLICE PROTECTION
1. Commercial	10. Misc	9223	CORRECTIONAL INSTITUTIONS
1. Commercial	10. Misc	9224	FIRE PROTECTION
1. Commercial	10. Misc	9228	PGE DECORATIVE LANDSCAPE LIGHTING
1. Commercial	10. Misc	9229	PUBLIC ORDER AND SAFETY NEC
1. Commercial	10. Misc	9660	SPACE RESEARCH AND TECHNOLOGY
1. Commercial	10. Misc	9661	SPACE RESEARCH AND TECHNOLOGY
1. Commercial	2. Restaurant	5800	EATING AND DRINKING PLACES
1. Commercial	2. Restaurant	5810	EATING AND DRINKING PLACES
1. Commercial	2. Restaurant	5812	EATING PLACES
1. Commercial	2. Restaurant	5813	DRINKING PLACES
1. Commercial	24. Refr Warehouse	4222	REFRIGERATED WAREHOUSING
1. Commercial	24. Refr Warehouse	5142	FROZEN FOODS
1. Commercial	24. Refr Warehouse	5143	DAIRY PRODUCTS
1. Commercial	24. Refr Warehouse	5144	POULTRY AND POULTRY PRODUCTS
1. Commercial	24. Refr Warehouse	5146	FISH AND SEAFOODS
1. Commercial	24. Refr Warehouse	5147	MEATS AND MEAT PRODUCTS
1. Commercial	24. Refr Warehouse	5193	FLOWERS & FLORIST SUPPLIES
1. Commercial	3. Retail Store	5200	BUILDING MATERIALS & GARDEN SUPPLIES
1. Commercial	3. Retail Store	5210	LUMBER AND OTHER BUILDING MATERIALS
1. Commercial	3. Retail Store	5211	LUMBER AND OTHER BUILDING MATERIALS
1. Commercial	3. Retail Store	5230	PAINT GLASS AND WALLPAPER STORES
1. Commercial	3. Retail Store	5231	PAINT GLASS AND WALLPAPER STORES
1. Commercial	3. Retail Store	5250	HARDWARE STORES
1. Commercial	3. Retail Store	5251	HARDWARE STORES
1. Commercial	3. Retail Store	5260	RETAIL NURSERIES AND GARDEN STORES
1. Commercial	3. Retail Store	5261	RETAIL NURSERIES AND GARDEN STORES
1. Commercial	3. Retail Store	5270	MOBILE HOME DEALERS
1. Commercial	3. Retail Store	5271	MOBILE HOME DEALERS

Sector	Building Type	4-digit SIC	Description
1. Commercial	3. Retail Store	5300	GENERAL MERCHANDISE STORES
1. Commercial	3. Retail Store	5310	DEPARTMENT STORES W OVER 50 EMPL
1. Commercial	3. Retail Store	5311	DEPARTMENT STORES W OVER 50 EMPL
1. Commercial	3. Retail Store	5318	SCE SHOPPING CENTER
1. Commercial	3. Retail Store	5330	VARIETY STORES
1. Commercial	3. Retail Store	5331	VARIETY STORES
1. Commercial	3. Retail Store	5390	MISC GENERAL MERCHANDISE STORES
1. Commercial	3. Retail Store	5399	MISC GENERAL MERCHANDISE STORES
1. Commercial	3. Retail Store	5500	AUTOMOTIVE DEALERS & SERVICE STATIONS
1. Commercial	3. Retail Store	5510	NEW AND USED CAR DEALERS
1. Commercial	3. Retail Store	5511	NEW AND USED CAR DEALERS
1. Commercial	3. Retail Store	5520	USED CAR DEALERS
1. Commercial	3. Retail Store	5521	USED CAR DEALERS
1. Commercial	3. Retail Store	5530	AUTO AND HOME SUPPLY STORES
1. Commercial	3. Retail Store	5531	AUTO AND HOME SUPPLY STORES
1. Commercial	3. Retail Store	5550	BOAT DEALERS
1. Commercial	3. Retail Store	5551	BOAT DEALERS
1. Commercial	3. Retail Store	5560	RECREATION & UTILITY TRAILER DEALERS
1. Commercial	3. Retail Store	5561	RECREATION VEHICLE DEALERS
1. Commercial	3. Retail Store	5570	MOTORCYCLE DEALERS
1. Commercial	3. Retail Store	5571	MOTORCYCLE DEALERS
1. Commercial	3. Retail Store	5590	AUTOMOTIVE DEALERS NEC
1. Commercial	3. Retail Store	5599	AUTOMOTIVE DEALERS NEC
1. Commercial	3. Retail Store	5600	APPAREL AND ACCESSORY STORES
1. Commercial	3. Retail Store	5610	MENS & BOYS CLOTHING & FURNISHINGS
1. Commercial	3. Retail Store	5611	MENS & BOYS CLOTHING & FURNISHINGS
1. Commercial	3. Retail Store	5620	WOMENS READY-TO-WEAR STORES
1. Commercial	3. Retail Store	5621	WOMENS READY-TO-WEAR STORES
1. Commercial	3. Retail Store	5630	WOMENS ACCESSORY AND SPECIALTY STORES
1. Commercial	3. Retail Store	5631	WOMENS ACCESSORY AND SPECIALTY STORES
1. Commercial	3. Retail Store	5632	WOMENS ACCESSORY AND SPECIALTIES
1. Commercial	3. Retail Store	5640	CHILDRENS AND INFANTS WEAR STORES
1. Commercial	3. Retail Store	5641	CHILDRENS AND INFANTS WEAR STORES
1. Commercial	3. Retail Store	5650	FAMILY CLOTHING STORES
1. Commercial	3. Retail Store	5651	FAMILY CLOTHING STORES
1. Commercial	3. Retail Store	5660	SHOE STORES
1. Commercial	3. Retail Store	5661	SHOE STORES
1. Commercial	3. Retail Store	5680	FURRIERS AND FUR SHOPS
1. Commercial	3. Retail Store	5681	FURRIERS AND FUR SHOPS
1. Commercial	3. Retail Store	5690	MISCELLANEOUS APPAREL & ACCESSORIES
1. Commercial	3. Retail Store	5699	MISCELLANEOUS APPAREL & ACCESSORIES
1. Commercial	3. Retail Store	5700	FURNITURE AND HOME FURNISHINGS STORES
1. Commercial	3. Retail Store	5710	HOME FURNITURE AND FURNISHING STORES
1. Commercial	3. Retail Store	5712	FURNITURE STORES
1. Commercial	3. Retail Store	5713	FLOOR COVERING STORES
1. Commercial	3. Retail Store	5714	DRAPERY AND UPHOLSTERY STORES
1. Commercial	3. Retail Store	5719	MISC HOME FURNISHINGS STORES
1. Commercial	3. Retail Store	5720	HOUSEHOLD APPLIANCE STORES
1. Commercial	3. Retail Store	5722	HOUSEHOLD APPLIANCE STORES
1. Commercial	3. Retail Store	5730	RADIO TELEVISION AND MUSIC STORES
1. Commercial	3. Retail Store	5731	RADIO TV AND ELECTRON. STORES
1. Commercial	3. Retail Store	5732	RADIO AND TELEVISION STORES
1. Commercial	3. Retail Store	5733	MUSIC STORES
1. Commercial	3. Retail Store	5734	COMPUTER AND SOFTWARE STORES
1. Commercial	3. Retail Store	5735	RECORD AND TAPES STORES
1. Commercial	3. Retail Store	5736	MUSICAL INSTRUMENTS
1. Commercial	3. Retail Store	5900	MISCELLANEOUS RETAIL
1. Commercial	3. Retail Store	5910	DRUG STORES AND PROPRIETARY STORES
1. Commercial	3. Retail Store	5912	DRUG STORES AND PROPRIETARY STORES
1. Commercial	3. Retail Store	5930	USED MERCHANDISE STORES
1. Commercial	3. Retail Store	5931	USED MERCHANDISE STORES
1. Commercial	3. Retail Store	5932	USED MERCHANDISE STORES
1. Commercial	3. Retail Store	5940	MISCELLANEOUS SHOPPING GOODS STORES
1. Commercial	3. Retail Store	5941	SPORTING GOODS AND BICYCLE SHOPS

Sector	Building Type	4-digit SIC	Description
1. Commercial	3. Retail Store	5942	BOOK STORES
1. Commercial	3. Retail Store	5943	STATIONERY STORES
1. Commercial	3. Retail Store	5944	JEWELRY STORES
1. Commercial	3. Retail Store	5945	HOBBY TOY AND GAME SHOPS
1. Commercial	3. Retail Store	5946	CAMERA & PHOTOGRAPHIC SUPPLY STORES
1. Commercial	3. Retail Store	5947	GIFT NOVELTY AND SOUVENIR SHOPS
1. Commercial	3. Retail Store	5948	LUGGAGE AND LEATHER GOODS STORES
1. Commercial	3. Retail Store	5949	SEWING NEEDLEWORK AND PIECE GOODS
1. Commercial	3. Retail Store	5960	NONSTORE RETAILERS
1. Commercial	3. Retail Store	5961	MAIL ORDER HOUSES
1. Commercial	3. Retail Store	5962	MERCHANDISING MACHINE OPERATORS
1. Commercial	3. Retail Store	5963	DIRECT SELLING ORGANIZATIONS
1. Commercial	3. Retail Store	5980	FUEL DEALERS
1. Commercial	3. Retail Store	5982	FUEL AND ICE DEALERS NEC
1. Commercial	3. Retail Store	5983	FUEL OIL DEALERS
1. Commercial	3. Retail Store	5984	LIQUEFIED PETROLEUM GAS DEALERS
1. Commercial	3. Retail Store	5989	FUEL DEALERS NEC
1. Commercial	3. Retail Store	5990	RETAIL STORES NEC
1. Commercial	3. Retail Store	5992	FLORISTS
1. Commercial	3. Retail Store	5993	TOBACCO STORES AND STANDS
1. Commercial	3. Retail Store	5994	NEWS DEALERS AND NEWSSTANDS
1. Commercial	3. Retail Store	5995	OPTICAL GOODS STORES
1. Commercial	3. Retail Store	5999	MISCELLANEOUS RETAIL STORES NEC
1. Commercial	4. Food/Liquor	5400	FOOD STORES
1. Commercial	4. Food/Liquor	5410	GROCERY STORES
1. Commercial	4. Food/Liquor	5411	GROCERY STORES
1. Commercial	4. Food/Liquor	5420	MEAT MARKETS AND FREEZER PROVISIONERS
1. Commercial	4. Food/Liquor	5421	MEAT & FISH MARKETS
1. Commercial	4. Food/Liquor	5422	FREEZER AND LOCKER MEAT PROVISIONERS
1. Commercial	4. Food/Liquor	5423	MEAT AND FISH (SEAFOOD) MARKETS
1. Commercial	4. Food/Liquor	5430	FRUIT STORES AND VEGETABLES MARKETS
1. Commercial	4. Food/Liquor	5431	FRUIT STORES AND VEGETABLES MARKETS
1. Commercial	4. Food/Liquor	5440	CANDY NUT AND CONFECTIONERY STORES
1. Commercial	4. Food/Liquor	5441	CANDY NUT AND CONFECTIONERY STORES
1. Commercial	4. Food/Liquor	5450	DAIRY PRODUCTS STORES
1. Commercial	4. Food/Liquor	5451	DAIRY PRODUCTS STORES
1. Commercial	4. Food/Liquor	5460	RETAIL BAKERIES
1. Commercial	4. Food/Liquor	5461	RETAIL BAKERIES
1. Commercial	4. Food/Liquor	5462	RETAIL BAKERIES-BAKING AND SELLING
1. Commercial	4. Food/Liquor	5463	RETAIL BAKERIES-SELLING ONLY
1. Commercial	4. Food/Liquor	5490	MISCELLANEOUS FOOD STORES
1. Commercial	4. Food/Liquor	5499	MISCELLANEOUS FOOD STORES
1. Commercial	4. Food/Liquor	5920	LIQUOR STORES
1. Commercial	4. Food/Liquor	5921	LIQUOR STORES
1. Commercial	5. Warehouse	4214	LOCAL TRUCKING AND STORAGE
1. Commercial	5. Warehouse	4220	PUBLIC WAREHOUSING
1. Commercial	5. Warehouse	4221	FARM PRODUCT WAREHOUSING AND STORAGE
1. Commercial	5. Warehouse	4224	HOUSEHOLD GOODS WAREHOUSING
1. Commercial	5. Warehouse	4225	GENERAL WAREHOUSING AND STORAGE
1. Commercial	5. Warehouse	4226	SPECIAL WAREHOUSING AND STORAGE NEC
1. Commercial	5. Warehouse	5000	WHOLESALE TRADE-DURABLE GOODS
1. Commercial	5. Warehouse	5010	MOTOR VEHICLES & AUTOMOTIVE EQUIPMENT
1. Commercial	5. Warehouse	5012	AUTOMOBILES AND OTHER MOTOR VEHICLES
1. Commercial	5. Warehouse	5013	NEW AUTO PARTS AND SUPPLIES
1. Commercial	5. Warehouse	5014	TIRES AND TUBES
1. Commercial	5. Warehouse	5015	USED MOTOR VEHICLE PARTS
1. Commercial	5. Warehouse	5020	FURNITURE AND HOME FURNISHINGS
1. Commercial	5. Warehouse	5021	FURNITURE
1. Commercial	5. Warehouse	5023	HOME FURNISHINGS
1. Commercial	5. Warehouse	5030	LUMBER AND CONSTRUCTION MATERIALS
1. Commercial	5. Warehouse	5031	LUMBER PLYWOOD AND MILLWORK
1. Commercial	5. Warehouse	5032	BRICK,STONE, ETC
1. Commercial	5. Warehouse	5033	ROOFING, SIDING & INSULATION
1. Commercial	5. Warehouse	5039	CONSTRUCTION MATERIALS NEC

Sector	Building Type	4-digit SIC	Description
1. Commercial	5. Warehouse	5040	SPORTING GOODS TOYS AND HOBBY GOODS
1. Commercial	5. Warehouse	5041	SPORTING AND RECREATIONAL GOODS
1. Commercial	5. Warehouse	5042	TOYS AND HOBBY GOODS AND SUPPLIES
1. Commercial	5. Warehouse	5043	PHOTOGRAPHIC EQUIPMENT AND SUPPLIES
1. Commercial	5. Warehouse	5044	OFFICE EQUIPMENT
1. Commercial	5. Warehouse	5045	COMPUTERS, PERIPH. & SOFTWARE
1. Commercial	5. Warehouse	5046	COMMERCIAL EQUIP, NEC
1. Commercial	5. Warehouse	5047	MEDICAL & HOSP. EQUIPMENT
1. Commercial	5. Warehouse	5048	OPHTALMIC GOODS
1. Commercial	5. Warehouse	5049	PROF. EQUIPMENT NEC
1. Commercial	5. Warehouse	5050	METALS AND MINERALS EXCEPT PETROLEUM
1. Commercial	5. Warehouse	5051	METALS SERVICE CENTERS AND OFFICES
1. Commercial	5. Warehouse	5052	COAL AND OTHER MINERALS AND ORES
1. Commercial	5. Warehouse	5060	ELECTRICAL GOODS
1. Commercial	5. Warehouse	5063	ELECTRICAL APPARATUS AND EQUIPMENT
1. Commercial	5. Warehouse	5064	ELECTRICAL APPLIANCES TV AND RADIOS
1. Commercial	5. Warehouse	5065	ELECTRONIC PARTS AND EQUIPMENT
1. Commercial	5. Warehouse	5070	HARDWARE PLUMBING & HEATING EQUIPMENT
1. Commercial	5. Warehouse	5072	HARDWARE
1. Commercial	5. Warehouse	5074	PLUMBING & HYDRONIC HEATING SUPPLIES
1. Commercial	5. Warehouse	5075	WARM AIR HEATING & AIR CONDITIONING
1. Commercial	5. Warehouse	5078	REFRIGERATION EQUIPMENT AND SUPPLIES
1. Commercial	5. Warehouse	5080	MACHINERY EQUIPMENT AND SUPPLIES
1. Commercial	5. Warehouse	5081	COMMERCIAL MACHINES AND EQUIPMENT
1. Commercial	5. Warehouse	5082	CONSTRUCTION AND MINING MACHINERY
1. Commercial	5. Warehouse	5083	FARM MACHINERY AND EQUIPMENT
1. Commercial	5. Warehouse	5084	INDUSTRIAL MACHINERY AND EQUIPMENT
1. Commercial	5. Warehouse	5085	INDUSTRIAL SUPPLIES
1. Commercial	5. Warehouse	5086	PROFESSIONAL EQUIPMENT AND SUPPLIES
1. Commercial	5. Warehouse	5087	SERVICE ESTABLISHMENT EQUIPMENT
1. Commercial	5. Warehouse	5088	TRANSPORTATION EQUIPMENT & SUPPLIES
1. Commercial	5. Warehouse	5090	MISCELLANEOUS DURABLE GOODS
1. Commercial	5. Warehouse	5091	SPORT AND RECREATIONAL GOODS
1. Commercial	5. Warehouse	5092	TOYS AND HOBBIES SUPPLIES
1. Commercial	5. Warehouse	5093	SCRAP AND WASTE MATERIALS
1. Commercial	5. Warehouse	5094	JEWELRY WATCHES & PRECIOUS STONES
1. Commercial	5. Warehouse	5099	DURABLE GOODS NEC
1. Commercial	5. Warehouse	5100	WHOLESALE TRADE-NONDURABLE GOODS
1. Commercial	5. Warehouse	5110	PAPER AND PAPER PRODUCTS
1. Commercial	5. Warehouse	5111	PRINTING AND WRITING PAPER
1. Commercial	5. Warehouse	5112	STATIONERY SUPPLIES
1. Commercial	5. Warehouse	5113	INDUSTRIAL & PERSONAL SERVICE PAPER
1. Commercial	5. Warehouse	5120	DRUGS PROPRIETARIES AND SUNDRIES
1. Commercial	5. Warehouse	5122	DRUGS PROPRIETARIES AND SUNDRIES
1. Commercial	5. Warehouse	5130	APPAREL PIECE GOODS AND NOTIONS
1. Commercial	5. Warehouse	5131	PIECE GOODS AND NOTIONS
1. Commercial	5. Warehouse	5133	PIECE GOODS
1. Commercial	5. Warehouse	5134	NOTIONS AND OTHER DRY GOODS
1. Commercial	5. Warehouse	5136	MENS AND BOYS CLOTHING
1. Commercial	5. Warehouse	5137	WOMENS AND CHILDRENS CLOTHING
1. Commercial	5. Warehouse	5139	FOOTWEAR
1. Commercial	5. Warehouse	5140	GROCERIES AND RELATED PRODUCTS
1. Commercial	5. Warehouse	5141	GROCERIES GENERAL LINE
1. Commercial	5. Warehouse	5145	CONFECTIONERY
1. Commercial	5. Warehouse	5148	FRESH FRUITS AND VEGETABLES
1. Commercial	5. Warehouse	5149	GROCERIES AND RELATED PRODUCTS NEC
1. Commercial	5. Warehouse	5150	FARM-PRODUCT RAW MATERIALS
1. Commercial	5. Warehouse	5152	COTTON
1. Commercial	5. Warehouse	5153	GRAIN
1. Commercial	5. Warehouse	5154	LIVESTOCK
1. Commercial	5. Warehouse	5159	FARM-PRODUCT RAW MATERIALS NEC
1. Commercial	5. Warehouse	5160	CHEMICALS AND ALLIED PRODUCTS
1. Commercial	5. Warehouse	5161	CHEMICALS AND ALLIED PRODUCTS
1. Commercial	5. Warehouse	5162	PLASTICS MATERIALS/BASIC SHAPES

Sector	Building Type	4-digit SIC	Description
1. Commercial	5. Warehouse	5169	CHEMICAL AND ALLIED NEC
1. Commercial	5. Warehouse	5170	PETROLEUM AND PETROLEUM PRODUCTS
1. Commercial	5. Warehouse	5171	PETROLEUM BULK STATIONS & TERMINALS
1. Commercial	5. Warehouse	5172	PETROLEUM PRODUCTS NEC
1. Commercial	5. Warehouse	5180	BEER WINE AND DISTILLED BEVERAGES
1. Commercial	5. Warehouse	5181	BEER AND ALE
1. Commercial	5. Warehouse	5182	WINES AND DISTILLED BEVERAGES
1. Commercial	5. Warehouse	5190	MISCELLANEOUS NONDURABLE GOODS
1. Commercial	5. Warehouse	5191	FARM SUPPLIES
1. Commercial	5. Warehouse	5192	BOOKS, PERIODICALS & NEWSPAPERS
1. Commercial	5. Warehouse	5194	TOBACCO AND TOBACCO PRODUCTS
1. Commercial	5. Warehouse	5198	PAINTS VARNISHES AND SUPPLIES
1. Commercial	5. Warehouse	5199	NONDURABLE GOODS NEC
1. Commercial	6. School	8200	EDUCATIONAL SERVICES
1. Commercial	6. School	8210	ELEMENTARY AND SECONDARY SCHOOLS
1. Commercial	6. School	8211	ELEMENTARY AND SECONDARY SCHOOLS
1. Commercial	6. School	8212	PGE SECONDARY SCHOOLS -PUBLIC
1. Commercial	6. School	8213	PGE ELEMENTARY SCHOOLS -PRIVATE
1. Commercial	6. School	8214	PGE SECONDARY SCHOOLS -PRIVATE
1. Commercial	6. School	8215	PGE JR. HIGH SCH. -PUBLIC
1. Commercial	6. School	8216	PGE JR. HIGH SCH. -PRIVATE
1. Commercial	6. School	8217	PGE COMBINED ELEM. & HIGH SCH.
1. Commercial	6. School	8218	PGE JR. & HIGH SCH. COMBINED
1. Commercial	6. School	8219	PGE SCH.DIST. NON-CLASSROOM BLDG.
1. Commercial	6. School	8350	CHILD DAY CARE SERVICES
1. Commercial	6. School	8351	CHILD DAY CARE SERVICES
1. Commercial	7. College	8220	COLLEGES AND UNIVERSITIES
1. Commercial	7. College	8221	COLLEGES AND UNIVERSITIES NEC
1. Commercial	7. College	8222	JUNIOR COLLEGES
1. Commercial	7. College	8223	PGE PRIVATE COLL UNIV & PROFSNL SCH.
1. Commercial	7. College	8224	PGE PRIVATE J.C. AND TECH. INSTIT.
1. Commercial	7. College	8240	CORRESPONDENCE AND VOCATIONAL SCHOOLS
1. Commercial	7. College	8241	CORRESPONDENCE SCHOOLS
1. Commercial	7. College	8243	DATA PROCESSING SCHOOLS
1. Commercial	7. College	8244	BUSINESS AND SECRETARIAL SCHOOLS
1. Commercial	7. College	8249	VOCATIONAL SCHOOLS NEC
1. Commercial	7. College	8290	SCHOOLS & EDUCATIONAL SERVICES NEC
1. Commercial	7. College	8299	SCHOOLS & EDUCATIONAL SERVICES NEC
1. Commercial	8. Health Care	8050	NURSING AND PERSONAL CARE FACILITIES
1. Commercial	8. Health Care	8051	SKILLED NURSING CARE FACILITIES
1. Commercial	8. Health Care	8052	INTERMEDIATE CARE FACILITIES
1. Commercial	8. Health Care	8059	NURSING AND PERSONAL CARE NEC
1. Commercial	8. Health Care	8060	HOSPITALS
1. Commercial	8. Health Care	8061	PGE MED/SURG HOSP WITH LT 100 BEDS
1. Commercial	8. Health Care	8062	GENERAL MEDICAL & SURGICAL HOSPITALS
1. Commercial	8. Health Care	8063	PSYCHIATRIC HOSPITALS
1. Commercial	8. Health Care	8064	PGE MED/SURG HOSP WITH GE 100 BEDS
1. Commercial	8. Health Care	8065	PGE PSYCH HOSP WITH LT 100 BEDS
1. Commercial	8. Health Care	8066	PGE PSYCH HOSP WITH GE 100 BEDS
1. Commercial	8. Health Care	8067	PGE SPECIALTY HOSP LT 100 BEDS
1. Commercial	8. Health Care	8068	PGE SPECIALTY HOS GE 100 BEDS
1. Commercial	8. Health Care	8069	SPECIALTY HOSPITALS EXC PSYCHIATRIC
1. Commercial	8. Health Care	8070	MEDICAL AND DENTAL LABORATORIES
1. Commercial	8. Health Care	8071	MEDICAL LABORATORIES
1. Commercial	8. Health Care	8072	DENTAL LABORATORIES
1. Commercial	8. Health Care	8080	OUTPATIENT CARE FACILITIES
1. Commercial	8. Health Care	8081	OUTPATIENT CARE FACILITIES
1. Commercial	8. Health Care	8082	HOME HEALTH CARE
1. Commercial	8. Health Care	8090	HEALTH AND ALLIED SERVICES NEC
1. Commercial	8. Health Care	8091	HEALTH AND ALLIED SERVICES NEC
1. Commercial	8. Health Care	8092	KIDNEY DIALYSIS CENTERS
1. Commercial	8. Health Care	8093	SPECIAL OUTPATIENT CLINICS
1. Commercial	8. Health Care	8099	HEALTH AND ALLIED SERVICES NEC
1. Commercial	8. Health Care	8360	RESIDENTIAL CARE

Sector	Building Type	4-digit SIC	Description
1. Commercial	8. Health Care	8361	RESIDENTIAL CARE
1. Commercial	9. Hotel	7000	HOTELS AND OTHER LODGING PLACES
1. Commercial	9. Hotel	7010	HOTELS MOTELS AND TOURIST COURTS
1. Commercial	9. Hotel	7011	HOTELS MOTELS AND TOURIST COURTS
1. Commercial	9. Hotel	7020	ROOMING AND BOARDING HOUSES
1. Commercial	9. Hotel	7021	ROOMING AND BOARDING HOUSES
1. Commercial	9. Hotel	7040	MEMBERSHIP-BASIS ORGANIZATION HOTELS
1. Commercial	9. Hotel	7041	MEMBERSHIP-BASIS ORGANIZATION HOTELS
10. Residential	23. Residential	8800	PRIVATE HOUSEHOLDS
10. Residential	23. Residential	8810	PRIVATE HOUSEHOLDS
10. Residential	23. Residential	8811	PRIVATE HOUSEHOLDS
10. Residential	23. Residential	RE00	RESIDENTIAL NFC
10. Residential	23. Residential	RE10	RESIDENTIAL INDV. METERED NFC
10. Residential	23. Residential	RE11	RESIDENTIAL INDV. METERED SNGL FMLY
10. Residential	23. Residential	RE12	RESIDENTIAL INDV. METERED MULT FMLY
10. Residential	23. Residential	RE13	RESIDENTIAL INDV. METERED OTHER
10. Residential	23. Residential	RE20	RESIDENTIAL MSTR. METERED NFC
10. Residential	23. Residential	RE21	RESIDENTIAL MSTR. METERED SNGL FMLY
10. Residential	23. Residential	RE22	RESIDENTIAL MSTR. METERED MULT FMLY
10. Residential	23. Residential	RE23	RESIDENTIAL MSTR. METERED OTHER
11. National Security	14. National Security	9700	NATIONAL SECURITY AND INTL AFFAIRS
11. National Security	14. National Security	9710	NATIONAL SECURITY
11. National Security	14. National Security	9711	NATIONAL SECURITY
2. Industrial	22. Industrial	2000	FOOD PRODUCT
2. Industrial	22. Industrial	2010	MEAT PRODUCTS
2. Industrial	22. Industrial	2011	MEAT PACKING PLANTS
2. Industrial	22. Industrial	2013	SAUSAGES AND OTHER PREPARED MEATS
2. Industrial	22. Industrial	2015	POULTRY SLAUGHTER AND PROCESS
2. Industrial	22. Industrial	2016	POULTRY DRESSING PLANTS
2. Industrial	22. Industrial	2017	POULTRY AND EGG PROCESSING
2. Industrial	22. Industrial	2020	DAIRY PRODUCTS
2. Industrial	22. Industrial	2021	CREAMERY BUTTER
2. Industrial	22. Industrial	2022	CHEESE NATURAL AND PROCESSED
2. Industrial	22. Industrial	2023	CONDENSED AND EVAPORATED MILK
2. Industrial	22. Industrial	2024	ICE CREAM AND FROZEN DESERTS
2. Industrial	22. Industrial	2026	FLUID MILK
2. Industrial	22. Industrial	2030	PRESERVED FRUITS AND VEGETABLES
2. Industrial	22. Industrial	2032	CANNED SPECIALTIES-NO FISH
2. Industrial	22. Industrial	2033	CANNED FRUITS AND VEGETABLES
2. Industrial	22. Industrial	2034	DEHYDRATED FRUITS VEGETABLES SOUPS
2. Industrial	22. Industrial	2035	DEHYDRATED FRUITS VEGETABLES SOUPS
2. Industrial	22. Industrial	2037	FROZEN FRUITS AND VEGETABLES
2. Industrial	22. Industrial	2038	FROZN SPECIAL. NOT BAKERY PRODS.
2. Industrial	22. Industrial	2040	GRAIN MILL PRODUCTS
2. Industrial	22. Industrial	2041	FLOUR AND OTHER GRAIN MILL PRODUCTS
2. Industrial	22. Industrial	2043	CEREAL BREAKFAST FOODS
2. Industrial	22. Industrial	2044	RICE MILLING
2. Industrial	22. Industrial	2045	BLENDED AND PREPARED FLOUR
2. Industrial	22. Industrial	2046	WET CORN MILLING
2. Industrial	22. Industrial	2047	DOG AND CAT FOOD
2. Industrial	22. Industrial	2048	PREPARED FEEDS NEC
2. Industrial	22. Industrial	2050	BAKERY PRODUCTS
2. Industrial	22. Industrial	2051	BREAD CAKE AND RELATED PRODUCTS
2. Industrial	22. Industrial	2052	COOKIES AND CRACKERS
2. Industrial	22. Industrial	2053	FRZN BAKE PRO. EXCL. BREAD
2. Industrial	22. Industrial	2060	SUGAR AND CONFECTIONERY PRODUCTS
2. Industrial	22. Industrial	2061	RAW CANE SUGAR
2. Industrial	22. Industrial	2062	CANE SUGAR REFINING
2. Industrial	22. Industrial	2063	BEET SUGAR
2. Industrial	22. Industrial	2064	CANDY AND OTHER CONFECTION
2. Industrial	22. Industrial	2065	CONFECTIONERY PRODUCTS
2. Industrial	22. Industrial	2066	CHOCOLATE AND COCOA PRODUCTS
2. Industrial	22. Industrial	2067	CHEWING GUM
2. Industrial	22. Industrial	2068	SALTED AND ROAST NUTS & SEEDS

Sector	Building Type	4-digit SIC	Description
2. Industrial	22. Industrial	2070	FATS AND OILS
2. Industrial	22. Industrial	2074	COTTONSEED OIL MILLS
2. Industrial	22. Industrial	2075	SOYBEAN OIL MILLS
2. Industrial	22. Industrial	2076	VEGETABLE OIL MILLS NEC
2. Industrial	22. Industrial	2077	ANIMAL AND MARINE FATS AND OILS
2. Industrial	22. Industrial	2079	SHORTENING AND COOKING OILS
2. Industrial	22. Industrial	2080	BEVERAGES
2. Industrial	22. Industrial	2082	MALT BEVERAGES
2. Industrial	22. Industrial	2083	MALT
2. Industrial	22. Industrial	2084	WINES BRANDY AND BRANDY SPIRITS
2. Industrial	22. Industrial	2085	DISTILLED LIQUOR EXCEPT BRANDY
2. Industrial	22. Industrial	2086	BOTTLED AND CANNED SOFT DRINKS
2. Industrial	22. Industrial	2087	FLAVORING EXTRACTS AND SIRUPS NEC
2. Industrial	22. Industrial	2090	MISC FOODS AND KINDRED PRODUCTS
2. Industrial	22. Industrial	2091	CANNED AND CURED SEAFOODS
2. Industrial	22. Industrial	2092	FRESH OR FROZEN PACKAGED FISH
2. Industrial	22. Industrial	2095	ROASTED COFFEE
2. Industrial	22. Industrial	2096	POTATO CHPS & SIMILAR
2. Industrial	22. Industrial	2097	MANUFACTURED ICE
2. Industrial	22. Industrial	2098	MACARONI AND SPAGHETTI
2. Industrial	22. Industrial	2099	FOOD PREPARATIONS NEC
2. Industrial	22. Industrial	2100	TOBACCO MANUFACTURES
2. Industrial	22. Industrial	2110	CIGARETTES
2. Industrial	22. Industrial	2111	CIGARETTES
2. Industrial	22. Industrial	2120	CIGARS
2. Industrial	22. Industrial	2121	CIGARS
2. Industrial	22. Industrial	2130	CHEWING AND SMOKING TOBACCO
2. Industrial	22. Industrial	2131	CHEWING AND SMOKING TOBACCO
2. Industrial	22. Industrial	2140	TOBACCO STEMMING AND REDRYING
2. Industrial	22. Industrial	2141	TOBACCO STEMMING AND REDRYING
2. Industrial	22. Industrial	2200	TEXTILE MILL PRODUCTS
2. Industrial	22. Industrial	2210	WEAVING MILLS COTTON
2. Industrial	22. Industrial	2211	WEAVING MILLS COTTON
2. Industrial	22. Industrial	2220	WEAVING MILLS SYNTHETICS
2. Industrial	22. Industrial	2221	WEAVING MILLS SYNTHETICS
2. Industrial	22. Industrial	2230	WEAVING AND FINISHING MILLS WOOL
2. Industrial	22. Industrial	2231	WEAVING AND FINISHING MILLS WOOL
2. Industrial	22. Industrial	2240	NARROW FABRIC MILLS
2. Industrial	22. Industrial	2241	NARROW FABRIC MILLS
2. Industrial	22. Industrial	2250	KNITTING MILLS
2. Industrial	22. Industrial	2251	WOMENS HOSIERY EXCEPT SOCKS
2. Industrial	22. Industrial	2252	HOSIERY NEC
2. Industrial	22. Industrial	2253	KNIT OUTERWEAR MILLS
2. Industrial	22. Industrial	2254	KNIT OUTERWEAR MILLS
2. Industrial	22. Industrial	2257	CIRCULAR KNIT FABRIC MILLS
2. Industrial	22. Industrial	2258	LACE AND WARP KNIT FABRIC MILLS
2. Industrial	22. Industrial	2259	KNITTING MILLS NEC
2. Industrial	22. Industrial	2260	TEXTILE FINISHING EXCEPT WOOL
2. Industrial	22. Industrial	2261	FINISHING PLANTS COTTON
2. Industrial	22. Industrial	2262	FINISHING PLANTS SYNTHETICS
2. Industrial	22. Industrial	2269	FINISHING PLANTS NEC
2. Industrial	22. Industrial	2270	FLOOR COVERING MILLS
2. Industrial	22. Industrial	2271	WOVEN CARPETS AND RUGS
2. Industrial	22. Industrial	2272	TUFTED CARPETS AND RUGS
2. Industrial	22. Industrial	2273	CARPETS AND RUGS
2. Industrial	22. Industrial	2279	CARPETS AND RUGS NEC
2. Industrial	22. Industrial	2280	YARN AND THREAD MILLS
2. Industrial	22. Industrial	2281	YARN SPINNING
2. Industrial	22. Industrial	2282	THROWING AND WINDING MILLS
2. Industrial	22. Industrial	2283	WOOL YARN MILLS
2. Industrial	22. Industrial	2284	THREAD MILLS
2. Industrial	22. Industrial	2290	MISCELLANEOUS TEXTILE GOODS
2. Industrial	22. Industrial	2291	FELT GOODS EXC WOVEN FELTS & HATS
2. Industrial	22. Industrial	2292	LACE GOODS

Sector	Building Type	4-digit SIC	Description
2. Industrial	22. Industrial	2293	PADDINGS AND UPHOLSTERY FILLING
2. Industrial	22. Industrial	2294	PROCESSED TEXTILE WASTE
2. Industrial	22. Industrial	2295	COATED FABRICS NOT RUBBERIZED
2. Industrial	22. Industrial	2296	TIRE-CORD AND FABRIC
2. Industrial	22. Industrial	2297	NONWOVEN FABRICS
2. Industrial	22. Industrial	2298	CORDAGE AND TWINE
2. Industrial	22. Industrial	2299	TEXTILE GOODS NFC INCL WASTE/PADS
2. Industrial	22. Industrial	2300	APPAREL AND OTHER TEXTILE PRODUCTS
2. Industrial	22. Industrial	2310	MENS AND BOYS SUITS AND COATS
2. Industrial	22. Industrial	2311	MENS AND BOYS SUITS AND COATS
2. Industrial	22. Industrial	2320	MENS AND BOYS FURNISHINGS
2. Industrial	22. Industrial	2321	MENS AND BOYS SHIRTS NOT NIGHTWEAR
2. Industrial	22. Industrial	2322	MENS AND BOYS UNDERWEAR & NITEWEAR
2. Industrial	22. Industrial	2323	MENS AND BOYS NECKWEAR
2. Industrial	22. Industrial	2325	MENS AND BOYS TROUSERS & SLACKS
2. Industrial	22. Industrial	2326	MENS AND BOYS WORK CLOTHING
2. Industrial	22. Industrial	2327	MENS AND BOYS SEPARATE TROUSERS
2. Industrial	22. Industrial	2328	MENS AND BOYS WORK CLOTHING
2. Industrial	22. Industrial	2329	MENS AND BOYS CLOTHING NEC
2. Industrial	22. Industrial	2330	WOMENS AND MISSES OUTERWEAR
2. Industrial	22. Industrial	2331	WOMENS & MISSES BLOUSES & WAISTS
2. Industrial	22. Industrial	2335	WOMENS AND MISSES DRESSES
2. Industrial	22. Industrial	2337	WOMENS AND MISSES SUITS AND COATS
2. Industrial	22. Industrial	2339	WOMENS AND MISSES OUTERWEAR NEC
2. Industrial	22. Industrial	2340	WOMENS AND CHILDRENS UNDERGARMENTS
2. Industrial	22. Industrial	2341	WOMENS AND CHILDRENS UNDERWEAR
2. Industrial	22. Industrial	2342	BRASSIERES AND ALLIED GARMENTS
2. Industrial	22. Industrial	2343	PGE SEWING CONTRACTOR JOB SHOP
2. Industrial	22. Industrial	2350	HATS CAPS AND MILLINERY
2. Industrial	22. Industrial	2351	MILLINERY
2. Industrial	22. Industrial	2352	HATS AND CAPS EXCEPT MILLINERY
2. Industrial	22. Industrial	2353	HATS,CAPS,MILLINERY
2. Industrial	22. Industrial	2360	CHILDRENS OUTERWEAR
2. Industrial	22. Industrial	2361	CHILDRENS DRESSES AND BLOUSES
2. Industrial	22. Industrial	2363	GIRL, CHILDREN, AND INFANT OUTWEAR NEC
2. Industrial	22. Industrial	2369	GIRL, CHILDREN, AND INFANT OUTWEAR NEC
2. Industrial	22. Industrial	2370	FUR GOODS
2. Industrial	22. Industrial	2371	FUR GOODS
2. Industrial	22. Industrial	2380	MISCELLANEOUS APPAREL AND ACCESSORIES
2. Industrial	22. Industrial	2381	FABRIC DRESS AND WORK GLOVES
2. Industrial	22. Industrial	2384	ROBES AND DRESSING GOWNS
2. Industrial	22. Industrial	2385	WATERPROOF OUTERGARMENTS
2. Industrial	22. Industrial	2386	LEATHER AND SHEEP LINED CLOTHING
2. Industrial	22. Industrial	2387	APPAREL BELTS
2. Industrial	22. Industrial	2389	APPAREL AND ACCESSORIES NEC
2. Industrial	22. Industrial	2390	MISC FABRICATED TEXTILE PRODUCTS
2. Industrial	22. Industrial	2391	CURTAINS AND DRAPERIES
2. Industrial	22. Industrial	2392	HOUSE FURNISHINGS NEC
2. Industrial	22. Industrial	2393	TEXTILE BAGS
2. Industrial	22. Industrial	2394	CANVAS AND RELATED PRODUCTS
2. Industrial	22. Industrial	2395	PLEATING AND STITCHING
2. Industrial	22. Industrial	2396	AUTOMOTIVE AND APPAREL TRIMMINGS
2. Industrial	22. Industrial	2397	SCHIFFI MACHINE EMBROIDERIES
2. Industrial	22. Industrial	2399	FABRICATED TEXTILE PRODUCTS NEC
2. Industrial	22. Industrial	2400	LUMBER AND WOOD PRODUCTS
2. Industrial	22. Industrial	2410	LOGGING CAMPS & LOGGING CONTRACTORS
2. Industrial	22. Industrial	2411	LOGGING
2. Industrial	22. Industrial	2420	SAWMILLS AND PLANING MILLS
2. Industrial	22. Industrial	2421	SAWMILLS AND PLANING MILLS GENERAL
2. Industrial	22. Industrial	2426	HARDWOOD DIMENSION AND FLOORING
2. Industrial	22. Industrial	2429	SPECIAL PRODUCT SAWMILLS NEC
2. Industrial	22. Industrial	2430	MILLWORK PLYWOOD & STRUCTURAL MEMBERS
2. Industrial	22. Industrial	2431	MILLWORK
2. Industrial	22. Industrial	2434	WOOD KITCHEN CABINETS

Sector	Building Type	4-digit SIC	Description
2. Industrial	22. Industrial	2435	HARDWOOD VENEER AND PLYWOOD
2. Industrial	22. Industrial	2436	SOFTWOOD VENEER AND PLYWOOD
2. Industrial	22. Industrial	2439	STRUCTURAL WOOD MEMBERS NEC
2. Industrial	22. Industrial	2440	WOOD CONTAINERS
2. Industrial	22. Industrial	2441	NAILED WOOD BOXES AND SHOOK
2. Industrial	22. Industrial	2448	WOOD PALLETS AND SKIDS
2. Industrial	22. Industrial	2449	WOOD CONTAINERS NEC
2. Industrial	22. Industrial	2450	WOOD BUILDINGS AND MOBILE HOMES
2. Industrial	22. Industrial	2451	MOBILE HOMES
2. Industrial	22. Industrial	2452	PREFABRICATED WOOD BUILDINGS
2. Industrial	22. Industrial	2490	MISCELLANEOUS WOOD PRODUCTS
2. Industrial	22. Industrial	2491	WOOD PRESERVING
2. Industrial	22. Industrial	2492	PARTICLEBOARD
2. Industrial	22. Industrial	2493	RECONST. WOOD PRODUCTS
2. Industrial	22. Industrial	2499	WOOD PRODUCTS EXCL RECONST.
2. Industrial	22. Industrial	2500	FURNITURE AND FIXTURES
2. Industrial	22. Industrial	2510	HOUSEHOLD FURNITURE
2. Industrial	22. Industrial	2511	WOOD HOUSEHOLD FURNITURE
2. Industrial	22. Industrial	2512	UPHOLSTERED HOUSEHOLD FURNITURE
2. Industrial	22. Industrial	2514	METAL HOUSEHOLD FURNITURE
2. Industrial	22. Industrial	2515	MATTRESSES AND BEDSPRINGS
2. Industrial	22. Industrial	2517	WOOD TV AND RADIO CABINETS
2. Industrial	22. Industrial	2519	HOUSEHOLD FURNITURE NEC
2. Industrial	22. Industrial	2520	OFFICE FURNITURE
2. Industrial	22. Industrial	2521	WOOD OFFICE FURNITURE
2. Industrial	22. Industrial	2522	NON-WOOD OFFICE FURNITURE
2. Industrial	22. Industrial	2530	PUBLIC BUILDING & RELATED FURNITURE
2. Industrial	22. Industrial	2531	PUBLIC BUILDING & RELATED FURNITURE
2. Industrial	22. Industrial	2540	PARTITIONS AND FIXTURES
2. Industrial	22. Industrial	2541	WOOD PARITIONS AND FIXTURES
2. Industrial	22. Industrial	2542	PARTITIONS AND FIXTURES NOT WOOD
2. Industrial	22. Industrial	2590	MISCELLANEOUS FURNITURE AND FIXTURES
2. Industrial	22. Industrial	2591	DRAPERY HARDWARE & BLINDS & SHADES
2. Industrial	22. Industrial	2599	FURNITURE AND FIXTURES NEC
2. Industrial	22. Industrial	2600	PAPER AND ALLIED PRODUCTS
2. Industrial	22. Industrial	2610	PULP MILLS
2. Industrial	22. Industrial	2611	PULP MILLS
2. Industrial	22. Industrial	2620	PAPER MILLS EXCEPT BUILDING PAPER
2. Industrial	22. Industrial	2621	PAPER MILLS
2. Industrial	22. Industrial	2630	PAPERBOARD MILLS
2. Industrial	22. Industrial	2631	PAPERBOARD MILLS EXCL. PULP MILLS
2. Industrial	22. Industrial	2640	CONVERTED PAPER
2. Industrial	22. Industrial	2641	PAPER COATING AND GLAZING
2. Industrial	22. Industrial	2642	ENVELOPES
2. Industrial	22. Industrial	2643	BAGS EXCEPT TEXTILE BAGS
2. Industrial	22. Industrial	2645	DIE-CUT PAPER AND BOARD
2. Industrial	22. Industrial	2646	PRESSED AND MOLDED PULP GOODS
2. Industrial	22. Industrial	2647	SANITARY PAPER PRODUCTS
2. Industrial	22. Industrial	2648	STATIONERY PRODUCTS
2. Industrial	22. Industrial	2649	CONVERTED PAPER PRODUCTS NEC
2. Industrial	22. Industrial	2650	PAPERBOARD CONTAINERS AND BOXES
2. Industrial	22. Industrial	2651	FOLDING PAPERBOARD BOXES
2. Industrial	22. Industrial	2652	SET-UP PAPERBOARD BOXES
2. Industrial	22. Industrial	2653	CORRUGATED AND SOLID FIBER BOXES
2. Industrial	22. Industrial	2654	SANITARY FOOD CONTAINERS
2. Industrial	22. Industrial	2655	FIBER CANS DRUMS & SIMILAR PRODUCTS
2. Industrial	22. Industrial	2656	SANITARY FOOD CONTAINERS
2. Industrial	22. Industrial	2657	FOLDING PAPERBOARD BOXES
2. Industrial	22. Industrial	2660	BUILDING PAPER AND BOARD MILLS
2. Industrial	22. Industrial	2661	BUILDING PAPER AND BOARD MILLS
2. Industrial	22. Industrial	2670	MISC. CONVERTED PAPER PROD.
2. Industrial	22. Industrial	2671	PAPER COATED & LAMINATED
2. Industrial	22. Industrial	2672	PAPER COATED & LAMINATED NEC
2. Industrial	22. Industrial	2673	BAGS PLASTIC, LAM & COATED

Sector	Building Type	4-digit SIC	Description
2. Industrial	22. Industrial	2674	BAGS UNCOATED PAPER & MULTI
2. Industrial	22. Industrial	2675	DIE-CUT PAPER AND BOARD
2. Industrial	22. Industrial	2676	SANITARY PAPER PRODUCTS
2. Industrial	22. Industrial	2677	ENVELOPES
2. Industrial	22. Industrial	2678	STATIONERY PRODUCTS
2. Industrial	22. Industrial	2679	CONVERTED PAPER PRODS.
2. Industrial	22. Industrial	2700	PRINTING AND PUBLISHING
2. Industrial	22. Industrial	2710	NEWSPAPERS
2. Industrial	22. Industrial	2711	NEWSPAPERS
2. Industrial	22. Industrial	2720	PERIODICALS
2. Industrial	22. Industrial	2721	PERIODICALS
2. Industrial	22. Industrial	2730	BOOKS
2. Industrial	22. Industrial	2731	BOOK PUBLISHING
2. Industrial	22. Industrial	2732	BOOK PRINTING
2. Industrial	22. Industrial	2740	MISCELLANEOUS PUBLISHING
2. Industrial	22. Industrial	2741	MISCELLANEOUS PUBLISHING
2. Industrial	22. Industrial	2750	COMMERCIAL PRINTING
2. Industrial	22. Industrial	2751	COMMERCIAL PRINTING LETTERPRESS
2. Industrial	22. Industrial	2752	COMMERCIAL PRINTING LITHOGRAPHIC
2. Industrial	22. Industrial	2753	ENGRAVING AND PLATE PRINTING
2. Industrial	22. Industrial	2754	COMMERCIAL PRINTING BRAVURE
2. Industrial	22. Industrial	2759	COMMERCIAL PRINTING NEC
2. Industrial	22. Industrial	2760	MANIFOLD BUSINESS FORMS
2. Industrial	22. Industrial	2761	MANIFOLD BUSINESS FORMS
2. Industrial	22. Industrial	2770	GREETING CARD PUBLISHING
2. Industrial	22. Industrial	2771	GREETING CARD PUBLISHING
2. Industrial	22. Industrial	2780	BLANKBOOKS AND BOOKBINDING
2. Industrial	22. Industrial	2782	BLANKBOOKS AND LOOSELEAF BINDERS
2. Industrial	22. Industrial	2789	BOOKBINDING AND RELATED WORK
2. Industrial	22. Industrial	2790	PRINTING TRADE SERVICES
2. Industrial	22. Industrial	2791	TYPESETTING
2. Industrial	22. Industrial	2793	PHOTOENGRAVING
2. Industrial	22. Industrial	2794	ELECTROTYPING AND STEREOTYPING
2. Industrial	22. Industrial	2795	LITHOGRAPHIC PLATEMAKING SERVICES
2. Industrial	22. Industrial	2796	PLATEMAKING SERVICES
2. Industrial	22. Industrial	2800	CHEMICALS AND ALLIED PRODUCTS
2. Industrial	22. Industrial	2810	INDUSTRIAL INORGANIC CHEMICALS
2. Industrial	22. Industrial	2812	ALKALIES AND CHLORINE
2. Industrial	22. Industrial	2813	INDUSTRIAL GASES
2. Industrial	22. Industrial	2816	INORGANIC PIGMENTS
2. Industrial	22. Industrial	2819	INDUSTRIAL INORGANIC CHEMICALS NEC
2. Industrial	22. Industrial	2820	PLASTICS MATERIALS AND SYNTHETICS
2. Industrial	22. Industrial	2821	PLASTICS MATERIALS AND RESINS
2. Industrial	22. Industrial	2822	SYNTHETIC RUBBER
2. Industrial	22. Industrial	2823	CELLULOSIC MAN-MADE FIBERS
2. Industrial	22. Industrial	2824	ORGANIC FIBERS NONCELLULOSIC
2. Industrial	22. Industrial	2830	DRUGS
2. Industrial	22. Industrial	2831	BIOLOGICAL PRODUCTS
2. Industrial	22. Industrial	2833	MEDICINALS AND BOTANICALS
2. Industrial	22. Industrial	2834	PHARMACEUTICAL PREPARATIONS
2. Industrial	22. Industrial	2835	DIAGNOSTIC SUBSTANCES
2. Industrial	22. Industrial	2836	BIOLOGICAL PROD.EXCL. DIAGNOST
2. Industrial	22. Industrial	2840	SOAP CLEANERS AND TOILET GOODS
2. Industrial	22. Industrial	2841	SOAP AND OTHER DETERGENTS
2. Industrial	22. Industrial	2842	POLISHES AND SANITATION GOODS
2. Industrial	22. Industrial	2843	SURFACE ACTIVE AGENTS
2. Industrial	22. Industrial	2844	TOILET PREPARATIONS
2. Industrial	22. Industrial	2850	PAINTS AND ALLIED PRODUCTS
2. Industrial	22. Industrial	2851	PAINTS AND ALLIED PRODUCTS
2. Industrial	22. Industrial	2860	INDUSTRIAL ORGANIC CHEMICALS
2. Industrial	22. Industrial	2861	GUM AND WOOD CHEMICALS
2. Industrial	22. Industrial	2865	CYCLIC CRUDES AND INTERMEDIATES
2. Industrial	22. Industrial	2869	INDUST ORGANIC CHEM EXCL HYDRAZ
2. Industrial	22. Industrial	2870	AGRICULTURAL CHEMICALS

Sector	Building Type	4-digit SIC	Description
2. Industrial	22. Industrial	2873	NITROGENOUS FERTILIZERS
2. Industrial	22. Industrial	2874	PHOSPHATIC FERTILIZERS
2. Industrial	22. Industrial	2875	FERTILIZERS MIXING ONLY
2. Industrial	22. Industrial	2879	AGRICULTURAL CHEMICALS NEC
2. Industrial	22. Industrial	2890	MISCELLANEOUS CHEMICAL PRODUCTS
2. Industrial	22. Industrial	2891	ADHESIVES AND SEALANTS
2. Industrial	22. Industrial	2892	EXPLOSIVES
2. Industrial	22. Industrial	2893	PRINTING INK
2. Industrial	22. Industrial	2895	CARBON BLACK
2. Industrial	22. Industrial	2899	CHEMICAL PREPARATIONS NEC
2. Industrial	22. Industrial	2900	PETROLEUM AND COAL PRODUCTS
2. Industrial	22. Industrial	2910	PETROLEUM REFINING
2. Industrial	22. Industrial	2911	PETROLEUM REFINING
2. Industrial	22. Industrial	2950	PAVING AND ROOFING MATERIALS
2. Industrial	22. Industrial	2951	PAVING MIXTURES AND BLOCKS
2. Industrial	22. Industrial	2952	ASPHALT FELTS AND COATINGS
2. Industrial	22. Industrial	2990	MISC PETROLEUM AND COAL PRODUCTS
2. Industrial	22. Industrial	2992	LUBRICATING OILS AND GREASES
2. Industrial	22. Industrial	2999	PETROLEUM AND COAL PRODUCTS NEC
2. Industrial	22. Industrial	3000	RUBBER AND MISC PLASTICS PRODUCTS
2. Industrial	22. Industrial	3010	TIRES AND INNER TUBES
2. Industrial	22. Industrial	3011	TIRES AND INNER TUBES
2. Industrial	22. Industrial	3020	RUBBER AND PLASTICS FOOTWEAR
2. Industrial	22. Industrial	3021	RUBBER AND PLASTICS FOOTWEAR
2. Industrial	22. Industrial	3030	RECLAIMED RUBBER
2. Industrial	22. Industrial	3031	RECLAIMED RUBBER
2. Industrial	22. Industrial	3040	RUBBER AND PLASTICS HOSE AND BELTING
2. Industrial	22. Industrial	3041	RUBBER AND PLASTICS HOSE AND BELTING
2. Industrial	22. Industrial	3050	HOSE, BELTING, GASKETS, PACKING
2. Industrial	22. Industrial	3052	RUBBER, PLASTI HOSE & BELTING
2. Industrial	22. Industrial	3053	GASKETS PACKING AND SEALING DEVICES
2. Industrial	22. Industrial	3060	FABRICATED RUBBER PRODUCTS NEC
2. Industrial	22. Industrial	3061	MECHANICAL RUBBER GOODS
2. Industrial	22. Industrial	3069	FABR RUBBER PROD EXCL MECH RUB GDS
2. Industrial	22. Industrial	3070	MISCELLANEOUS PLASTICS PRODUCTS
2. Industrial	22. Industrial	3079	MISCELLANEOUS PLASTICS PRODUCTS
2. Industrial	22. Industrial	3080	MISC PLASTIC PRODS
2. Industrial	22. Industrial	3081	PLASTICS UNSUPPORTED FILM
2. Industrial	22. Industrial	3082	PLASTICS UNSUPPORTED PROFILE
2. Industrial	22. Industrial	3083	PLASTICS LAMINATED PLATE
2. Industrial	22. Industrial	3084	PLASTIC PIPE
2. Industrial	22. Industrial	3085	PLASTIC BOTTLES
2. Industrial	22. Industrial	3086	PLASTIC FOAM PROD
2. Industrial	22. Industrial	3087	CUSTOM COMPOUND PURCH. RESINS
2. Industrial	22. Industrial	3088	PLASTIC PLUMBING FIXTURES
2. Industrial	22. Industrial	3089	PLASTIC PRODUCTS
2. Industrial	22. Industrial	3100	LEATHER AND LEATHER PRODUCTS
2. Industrial	22. Industrial	3110	LEATHER TANNING AND FINISHING
2. Industrial	22. Industrial	3111	LEATHER TANNING AND FINISHING
2. Industrial	22. Industrial	3130	BOOT AND SHOE CUT STOCK AND FINDINGS
2. Industrial	22. Industrial	3131	BOOT AND SHOE CUT STOCK AND FINDINGS
2. Industrial	22. Industrial	3140	FOOTWEAR EXCEPT RUBBER
2. Industrial	22. Industrial	3142	HOUSE SLIPPERS
2. Industrial	22. Industrial	3143	MENS FOOTWEAR EXCEPT ATHLETIC
2. Industrial	22. Industrial	3144	WOMENS FOOTWEAR EXCEPT ATHLETIC
2. Industrial	22. Industrial	3149	FOOTWEAR EXCEPT RUBBER NEC
2. Industrial	22. Industrial	3150	LEATHER GLOVES AND MITTENS
2. Industrial	22. Industrial	3151	LEATHER GLOVES AND MITTENS
2. Industrial	22. Industrial	3160	LUGGAGE
2. Industrial	22. Industrial	3161	LUGGAGE
2. Industrial	22. Industrial	3170	HANDBAGS AND PERSONAL LEATHER GOODS
2. Industrial	22. Industrial	3171	WOMENS HANDBAGS AND PURSES
2. Industrial	22. Industrial	3172	PERSONAL LEATHER GOODS NEC
2. Industrial	22. Industrial	3190	LEATHER GOODS NEC

Sector	Building Type	4-digit SIC	Description
2. Industrial	22. Industrial	3199	LEATHER GOODS NEC
2. Industrial	22. Industrial	3200	STONE CLAY GLASS CEMENT
2. Industrial	22. Industrial	3210	FLAT GLASS
2. Industrial	22. Industrial	3211	FLAT GLASS
2. Industrial	22. Industrial	3220	GLASS AND GLASSWARE PRESSED OR BLOWN
2. Industrial	22. Industrial	3221	GLASS CONTAINERS
2. Industrial	22. Industrial	3229	PRESSED AND BLOWN GLASS NEC
2. Industrial	22. Industrial	3230	PRODUCTS OF PURCHASED GLASS
2. Industrial	22. Industrial	3231	PRODUCTS OF PURCHASED GLASS
2. Industrial	22. Industrial	3240	CEMENT HYDRAULIC
2. Industrial	22. Industrial	3241	CEMENT HYDRAULIC
2. Industrial	22. Industrial	3250	STRUCTURAL CLAY PRODUCTS
2. Industrial	22. Industrial	3251	BRICK AND STRUCTURAL CLAY TILE
2. Industrial	22. Industrial	3253	CERAMIC WALL AND FLOOR TILE
2. Industrial	22. Industrial	3255	CLAY REFRACTORIES
2. Industrial	22. Industrial	3259	STRUCTURAL CLAY PRODUCTS NEC
2. Industrial	22. Industrial	3260	POTTERY AND RELATED PRODUCTS
2. Industrial	22. Industrial	3261	VITREOUS PLUMBING FIXTURES
2. Industrial	22. Industrial	3262	VITREOUS CHINA FOOD UTENSILS
2. Industrial	22. Industrial	3263	FINE EARTHENWARE FOOD UTENSILS
2. Industrial	22. Industrial	3264	PORCELAIN AND FERRITE ELECTRIC SUPP.
2. Industrial	22. Industrial	3269	POTTERY PRODUCTS NEC
2. Industrial	22. Industrial	3270	CONCRETE GYPSUM AND PLASTER PRODUCTS
2. Industrial	22. Industrial	3271	CONCRETE BLOCK AND BRICK
2. Industrial	22. Industrial	3272	CONCRETE PRODUCTS NEC
2. Industrial	22. Industrial	3273	READY-MIXED CONCRETE
2. Industrial	22. Industrial	3274	LIME
2. Industrial	22. Industrial	3275	GYPSUM PRODUCTS
2. Industrial	22. Industrial	3280	CUT STONE AND STONE PRODUCTS
2. Industrial	22. Industrial	3281	CUT STONE AND STONE PRODUCTS
2. Industrial	22. Industrial	3290	MISC NONMETALLIC MINERAL PRODUCTS
2. Industrial	22. Industrial	3291	ABRASIVE PRODUCTS
2. Industrial	22. Industrial	3292	ASBESTOS PRODUCTS
2. Industrial	22. Industrial	3293	GASKETS PACKING AND SEALING DEVICES
2. Industrial	22. Industrial	3295	MINERALS GROUND OR TREATED
2. Industrial	22. Industrial	3296	MINERAL WOOL
2. Industrial	22. Industrial	3297	NONCLAY REFRACTORIES
2. Industrial	22. Industrial	3299	NONMETALLIC MINERAL PRODUCTS NEC
2. Industrial	22. Industrial	3300	PRIMARY METAL INDUSTRIES
2. Industrial	22. Industrial	3310	BLAST FURNACE AND BASIC STEEL PRODUCTS
2. Industrial	22. Industrial	3312	BLAST FURNACES AND STEEL MILLS
2. Industrial	22. Industrial	3313	ELECTROMETALLURGICAL PRODUCTS
2. Industrial	22. Industrial	3315	STEEL WIRE AND RELATED PRODUCTS
2. Industrial	22. Industrial	3316	COLD FINISHING OF STEEL SHAPES
2. Industrial	22. Industrial	3317	STEEL PIPE AND TUBES
2. Industrial	22. Industrial	3320	IRON AND STEEL FOUNDRIES
2. Industrial	22. Industrial	3321	GRAY IRON FOUNDRIES
2. Industrial	22. Industrial	3322	MALLEABLE IRON FOUNDRIES
2. Industrial	22. Industrial	3324	STEEL INVESTMENT FOUNDRIES
2. Industrial	22. Industrial	3325	STEEL FOUNDRIES NEC
2. Industrial	22. Industrial	3330	PRIMARY NONFERROUS METALS
2. Industrial	22. Industrial	3331	PRIMARY COPPER
2. Industrial	22. Industrial	3332	PRIMARY LEAD
2. Industrial	22. Industrial	3333	PRIMARY ZINC
2. Industrial	22. Industrial	3334	PRIMARY ALUMINUM
2. Industrial	22. Industrial	3339	PRIMARY NONFERROUS METALS NFC
2. Industrial	22. Industrial	3340	SECONDARY NONFERROUS METALS
2. Industrial	22. Industrial	3341	SECONDARY NONFERROUS METALS
2. Industrial	22. Industrial	3350	NONFERROUS ROLLING AND DRAWING
2. Industrial	22. Industrial	3351	COPPER ROLLING AND DRAWING
2. Industrial	22. Industrial	3353	ALUMINUM SHEET PLATE AND FOIL
2. Industrial	22. Industrial	3354	ALUMINUM EXTRUDED PRODUCTS
2. Industrial	22. Industrial	3355	ALUMINUM ROLLING AND DRAWING NEC
2. Industrial	22. Industrial	3356	NONFERROUS ROLLING AND DRAWING NEC

Sector	Building Type	4-digit SIC	Description
2. Industrial	22. Industrial	3357	NONFERROUS WIRE DRAWING & INSULATING
2. Industrial	22. Industrial	3360	NONFERROUS FOUNDRIES
2. Industrial	22. Industrial	3361	ALUMINUM FOUNDRIES
2. Industrial	22. Industrial	3362	BRASS BRONZE AND COPPER FOUNDRIES
2. Industrial	22. Industrial	3363	DIE CASTINGS - ALUMINUM
2. Industrial	22. Industrial	3364	DIE CASTINGS EXCL. ALUM & FERROUS
2. Industrial	22. Industrial	3365	ALUMINUM FOUNDRIES
2. Industrial	22. Industrial	3366	COPPER FOUNDRIES
2. Industrial	22. Industrial	3369	NONFERROUS FOUNDRIES NEC
2. Industrial	22. Industrial	3390	MISCELLANEOUS PRIMARY METAL PRODUCTS
2. Industrial	22. Industrial	3398	METAL HEAT TREATING
2. Industrial	22. Industrial	3399	PRIMARY METAL PRODUCTS NEC
2. Industrial	22. Industrial	3400	FABRICATED METAL PRODUCTS
2. Industrial	22. Industrial	3410	METAL CANS AND SHIPPING CONTAINERS
2. Industrial	22. Industrial	3411	METAL CANS
2. Industrial	22. Industrial	3412	METAL BARRELS DRUMS AND PAILS
2. Industrial	22. Industrial	3420	CUTLERY HAND TOOLS AND HARDWARE
2. Industrial	22. Industrial	3421	CUTLERY
2. Industrial	22. Industrial	3423	HAND AND EDGE TOOLS NEC
2. Industrial	22. Industrial	3425	HAND SAWS AND SAW BLADES
2. Industrial	22. Industrial	3429	HARDWARE NEC
2. Industrial	22. Industrial	3430	PLUMBING AND HEATNG EXCEPT ELECTRIC
2. Industrial	22. Industrial	3431	METAL SANITARY WARE
2. Industrial	22. Industrial	3432	FIXTURE FITTINGS AND TRIM
2. Industrial	22. Industrial	3433	HEATING EQUIPMET EXCEPT ELECTRIC & AIR
2. Industrial	22. Industrial	3440	FABRICATED STRUCTURAL METAL PRODUCTS
2. Industrial	22. Industrial	3441	FABRICATED STRUCTURAL METAL
2. Industrial	22. Industrial	3442	METAL DOORS, SASH, FRAMES, MOLDING, TRIM
2. Industrial	22. Industrial	3443	FABRICATED PLATE WORK (BOILER SHOPS)
2. Industrial	22. Industrial	3444	SHEET METAL WORK EXCL. CURTAIN WALL
2. Industrial	22. Industrial	3446	ARCHITECTURAL METAL WORK
2. Industrial	22. Industrial	3448	PREFABRICATED METAL BUILDINGS
2. Industrial	22. Industrial	3449	MISCELLANEOUS METAL WORK
2. Industrial	22. Industrial	3450	SCREW MACHINE PRODUCTS BOLTS ETC
2. Industrial	22. Industrial	3451	SCREW MACHINE PRODUCTS
2. Industrial	22. Industrial	3452	BOLTS NUTS RIVETS AND WASHERS
2. Industrial	22. Industrial	3460	METAL FORGINGS AND STAMPINGS
2. Industrial	22. Industrial	3462	IRON AND STEEL FORGINGS
2. Industrial	22. Industrial	3463	NONFERROUS FORGINGS
2. Industrial	22. Industrial	3465	AUTOMOTIVE STAMPINGS
2. Industrial	22. Industrial	3466	CROWNS AND CLOSURES
2. Industrial	22. Industrial	3469	METAL STAMPINGS NEC
2. Industrial	22. Industrial	3470	METAL SERVICES NEC
2. Industrial	22. Industrial	3471	PLATING AND POLISHING
2. Industrial	22. Industrial	3479	METAL COATING AND ALLIED SERVICES
2. Industrial	22. Industrial	3480	ORDNANCE AND ACCESSORIES NEC
2. Industrial	22. Industrial	3482	SMALL ARMS AMMUNITION
2. Industrial	22. Industrial	3483	AMMUNITION EXC FOR SMALL ARMS NEC
2. Industrial	22. Industrial	3484	SMALL ARMS
2. Industrial	22. Industrial	3489	ORDNANCE AND ACCESSORIES NEC
2. Industrial	22. Industrial	3490	MISC FABRICATED METAL PRODUCTS
2. Industrial	22. Industrial	3491	INDUSTRIAL VALVES
2. Industrial	22. Industrial	3492	FLUID POWER VALVES
2. Industrial	22. Industrial	3493	STEEL SPRINGS EXCEPT WIRE
2. Industrial	22. Industrial	3494	VALVES AND PIPE FITTINGS
2. Industrial	22. Industrial	3495	WIRE SPRINGS
2. Industrial	22. Industrial	3496	MISC FABRICATED WIRE PRODUCTS
2. Industrial	22. Industrial	3497	METAL FOIL AND LEAF
2. Industrial	22. Industrial	3498	FABRICATED PIPE AND FITTINGS
2. Industrial	22. Industrial	3499	FABRICATED METAL PRODUCTS NEC
2. Industrial	22. Industrial	3500	MACHINERY EXCEPT ELECTRICAL
2. Industrial	22. Industrial	3510	ENGINES AND TURBINES
2. Industrial	22. Industrial	3511	TURBINES AND TURBINE GENERATOR SETS
2. Industrial	22. Industrial	3519	INTERNAL COMBUSTION ENGINES NEC

Sector	Building Type	4-digit SIC	Description
2. Industrial	22. Industrial	3520	FARM AND GARDEN MACHINERY
2. Industrial	22. Industrial	3523	FARM MACHINERY AND EQUIPMENT
2. Industrial	22. Industrial	3524	LAWN AND GARDEN EQUIPMENT
2. Industrial	22. Industrial	3530	CONSTRUCTION AND RELATED MACHINERY
2. Industrial	22. Industrial	3531	CONSTRUCTION MACHINERY
2. Industrial	22. Industrial	3532	MINING MACHINERY
2. Industrial	22. Industrial	3533	OIL FIELD MACHINERY
2. Industrial	22. Industrial	3534	ELEVATORS AND MOVING STAIRWAYS
2. Industrial	22. Industrial	3535	CONVEYORS AND CONVEYING EQUIPMENT
2. Industrial	22. Industrial	3536	HOISTS CRANES AND MONORAILS
2. Industrial	22. Industrial	3537	INDUSTRIAL TRUCKS AND TRACTORS
2. Industrial	22. Industrial	3540	METALWORKING MACHINERY
2. Industrial	22. Industrial	3541	MACHINE TOOLS METAL CUTTING TYPES
2. Industrial	22. Industrial	3542	MACHINE TOOLS METAL FORMING TYPES
2. Industrial	22. Industrial	3543	INDUSTRIAL PATTERNS
2. Industrial	22. Industrial	3544	SPECIAL DIES TOOLS JIGS & FIXTURES
2. Industrial	22. Industrial	3545	MACHINE TOOL ACCESSORIES
2. Industrial	22. Industrial	3546	POWER DRIVEN HAND TOOLS
2. Industrial	22. Industrial	3547	ROLLING MILL MACHINERY
2. Industrial	22. Industrial	3548	WELDING APPARATUS
2. Industrial	22. Industrial	3549	METALWORKING MACHINERY NEC
2. Industrial	22. Industrial	3550	SPECIAL INDUSTRY MACHINERY
2. Industrial	22. Industrial	3551	FOOD PRODUCTS MACHINERY
2. Industrial	22. Industrial	3552	TEXTILE MACHINERY
2. Industrial	22. Industrial	3553	WOODWORKING MACHINERY
2. Industrial	22. Industrial	3554	PAPER INDUSTRIES MACHINERY
2. Industrial	22. Industrial	3555	PRINTING TRADES MACHINERY
2. Industrial	22. Industrial	3556	FOOD PRODUCTS MACHINERY
2. Industrial	22. Industrial	3559	SPECIAL INDUSTRY MACHINERY NEC
2. Industrial	22. Industrial	3560	GENERAL INDUSTRIAL MACHINERY
2. Industrial	22. Industrial	3561	PUMPS AND PUMPING EQUIP
2. Industrial	22. Industrial	3562	BALL AND ROLLER BEARINGS
2. Industrial	22. Industrial	3563	AIR AND GAS COMPRESSORS
2. Industrial	22. Industrial	3564	BLOWERS AND FANS
2. Industrial	22. Industrial	3565	PACKAGING MACHINERY
2. Industrial	22. Industrial	3566	SPEED CHANGERS DRIVES AND GEARS
2. Industrial	22. Industrial	3567	INDUSTRIAL FURNACES AND OVENS
2. Industrial	22. Industrial	3568	POWER TRANSMISSION EQUIPMENT NEC
2. Industrial	22. Industrial	3569	GENERAL INDUSTRIAL MACHINERY NEC
2. Industrial	22. Industrial	3570	OFFICE AND COMPUTING MACHINES
2. Industrial	22. Industrial	3571	ELECTRONIC COMPUTERS
2. Industrial	22. Industrial	3572	COMPUTER STORAGE DEVICES
2. Industrial	22. Industrial	3573	ELECTRONIC COMPUTING EQUIPMENT
2. Industrial	22. Industrial	3574	CALCULATING AND ACCOUNTING MACHINES
2. Industrial	22. Industrial	3575	COMPUTER TERMINALS
2. Industrial	22. Industrial	3576	SCALES AND BALANCES EXC LABORATORY
2. Industrial	22. Industrial	3577	COMPUTER PERIPHERALS NEC
2. Industrial	22. Industrial	3578	CALCULATORS & ACCOUNTING
2. Industrial	22. Industrial	3579	OFFICE MACHINES NEC
2. Industrial	22. Industrial	3580	REFRIGERATION AND SERVICE MACHINERY
2. Industrial	22. Industrial	3581	AUTOMATIC MERCHANDISING MACHINES
2. Industrial	22. Industrial	3582	COMMERCIAL LAUNDRY EQUIPMENT
2. Industrial	22. Industrial	3585	REFRIGERATION AND HEATING EQUIPMENT
2. Industrial	22. Industrial	3586	MEASURING AND DISPENSING PUMPS
2. Industrial	22. Industrial	3589	SERVICE INDUSTRY MACHINERY NEC
2. Industrial	22. Industrial	3590	MISC MACHINERY EXCEPT ELECTRICAL
2. Industrial	22. Industrial	3592	CARBURETORS PISTONS RINGS VALVES
2. Industrial	22. Industrial	3593	FLUID POWER CYLINDERS
2. Industrial	22. Industrial	3594	FLUID POWER PUMPS
2. Industrial	22. Industrial	3596	SCALES & BALANCES EXCL. LAB
2. Industrial	22. Industrial	3599	MACHINERY EXCEPT ELECTRICAL NEC
2. Industrial	22. Industrial	3600	ELECTRONIC AND OTHER ELECTRIC EQUIP
2. Industrial	22. Industrial	3610	ELECTRIC DISTRIBUTING EQUIPMENT
2. Industrial	22. Industrial	3612	TRANSFORMERS

Sector	Building Type	4-digit SIC	Description
2. Industrial	22. Industrial	3613	SWITCHGEAR AND SWITCHBOARD APPARATUS
2. Industrial	22. Industrial	3620	ELECTRICAL INDUSTRIAL APPARATUS
2. Industrial	22. Industrial	3621	MOTORS AND GENERATORS
2. Industrial	22. Industrial	3622	INDUSTRIAL CONTROLS
2. Industrial	22. Industrial	3623	WELDING APPARATUS ELECTRIC
2. Industrial	22. Industrial	3624	CARBON AND GRAPHITE PRODUCTS
2. Industrial	22. Industrial	3625	RELAYS AND INDUSTRIAL CONTROLS
2. Industrial	22. Industrial	3629	ELECTRICAL INDUSTRIAL APPARATUS NEC
2. Industrial	22. Industrial	3630	HOUSEHOLD APPLIANCES
2. Industrial	22. Industrial	3631	HOUSEHOLD COOKING EQUIPMENT
2. Industrial	22. Industrial	3632	HOUSEHOLD REFRIGERATORS AND FREEZERS
2. Industrial	22. Industrial	3633	HOUSEHOLD LAUNDRY EQUIPMENT
2. Industrial	22. Industrial	3634	ELECTRIC HOUSEWARES AND FANS
2. Industrial	22. Industrial	3635	HOUSEHOLD VACUUM CLEANERS
2. Industrial	22. Industrial	3636	SEWING MACHINES
2. Industrial	22. Industrial	3639	HOUSEHOLD APPLIANCES NEC
2. Industrial	22. Industrial	3640	ELECTRIC LIGHTING AND WIRING EQUIPMENT
2. Industrial	22. Industrial	3641	ELECTRIC LAMPS
2. Industrial	22. Industrial	3643	CURRENT-CARRYING WIRING DEVICES
2. Industrial	22. Industrial	3644	NONCURRENT-CARRYING WIRING DEVICES
2. Industrial	22. Industrial	3645	RESIDENTIAL LIGHTING FIXTURES
2. Industrial	22. Industrial	3646	COMMERCIAL LIGHTING FIXTURES
2. Industrial	22. Industrial	3647	VEHICULAR LIGHTING EQUIPMENT
2. Industrial	22. Industrial	3648	LIGHTING EQUIPMENT NEC
2. Industrial	22. Industrial	3650	RADIO AND TV RECEIVING EQUIPMENT
2. Industrial	22. Industrial	3651	RADIO AND TV RECEIVING SETS
2. Industrial	22. Industrial	3652	PHONOGRAPH RECORDS
2. Industrial	22. Industrial	3660	COMMUNICATION EQUIPMENT
2. Industrial	22. Industrial	3661	TELEPHONE AND TELEGRAPH APPARATUS
2. Industrial	22. Industrial	3662	RADIO AND TV COMMUNICATION EQUIPMENT
2. Industrial	22. Industrial	3663	RADIO AND TV COMMUNICATION EQUIPMENT
2. Industrial	22. Industrial	3669	COMMUNICATION EQUIPMENT NEC
2. Industrial	22. Industrial	3670	ELECTRONIC COMPONENTS AND ACCESSORIES
2. Industrial	22. Industrial	3671	ELECTRON TUBES
2. Industrial	22. Industrial	3672	CATHODE RAY TELEVISION PICTURE TUBES
2. Industrial	22. Industrial	3673	ELECTRON TUBES TRANSMITTING
2. Industrial	22. Industrial	3674	SEMICONDUCTORS AND RELATED DEVICES
2. Industrial	22. Industrial	3675	ELECTRONIC CAPACITORS
2. Industrial	22. Industrial	3676	ELECTRONIC RESISTORS
2. Industrial	22. Industrial	3677	ELECTRONIC COILS AND TRANSFORMERS
2. Industrial	22. Industrial	3678	ELECTRONIC CONNECTORS
2. Industrial	22. Industrial	3679	ELECTRONIC COMPONENTS NEC
2. Industrial	22. Industrial	3690	MISC ELECTRICAL EQUIPMENT & SUPPLIES
2. Industrial	22. Industrial	3691	STORAGE BATTERIES
2. Industrial	22. Industrial	3692	PRIMARY BATTERIES DRY AND WET
2. Industrial	22. Industrial	3693	X-RAY APPARATUS AND TUBES
2. Industrial	22. Industrial	3694	ENGINE ELECTRICAL EQUIPMENT
2. Industrial	22. Industrial	3695	MAGNET. & OPTIC RECORDING EQUIP
2. Industrial	22. Industrial	3699	ELECTRICAL EQUIPMENT & SUPPLIES NEC
2. Industrial	22. Industrial	3700	TRANSPORTATION EQUIPMENT
2. Industrial	22. Industrial	3710	MOTOR VEHICLES AND EQUIPMENT
2. Industrial	22. Industrial	3711	MOTOR VEHICLES AND CAR BODIES
2. Industrial	22. Industrial	3713	TRUCK AND BUS BODIES
2. Industrial	22. Industrial	3714	MOTOR VEHICLE PARTS AND ACCESSORIES
2. Industrial	22. Industrial	3715	TRUCK TRAILERS
2. Industrial	22. Industrial	3716	MOTOR HOMES
2. Industrial	22. Industrial	3720	AIRCRAFT AND PARTS
2. Industrial	22. Industrial	3721	AIRCRAFT
2. Industrial	22. Industrial	3724	AIRCRAFT ENGINES AND ENGINE PARTS
2. Industrial	22. Industrial	3728	AIRCRAFT EQUIPMENT NEC
2. Industrial	22. Industrial	3730	SHIP AND BOAT BUILDING AND REPAIRING
2. Industrial	22. Industrial	3731	SHIP BUILDING AND REPAIRING
2. Industrial	22. Industrial	3732	BOAT BUILDING AND REPAIRING
2. Industrial	22. Industrial	3740	RAILROAD EQUIPMENT

Sector	Building Type	4-digit SIC	Description
2. Industrial	22. Industrial	3743	RAILROAD EQUIPMENT
2. Industrial	22. Industrial	3750	MOTORCYCLES BICYCLES AND PARTS
2. Industrial	22. Industrial	3751	MOTORCYCLES BICYCLES AND PARTS
2. Industrial	22. Industrial	3760	GUIDED MISSILES SPACE VEHICLES PARTS
2. Industrial	22. Industrial	3761	GUIDED MISSILES AND SPACE VEHICLES
2. Industrial	22. Industrial	3764	SPACE PROPULSION UNITS AND PARTS
2. Industrial	22. Industrial	3769	SPACE VEHICLE EQUIPMENT NEC
2. Industrial	22. Industrial	3790	MISCELLANEOUS TRANSPORTATION EQUIPMENT
2. Industrial	22. Industrial	3792	TRAVEL TRAILERS AND CAMPERS
2. Industrial	22. Industrial	3795	TANKS AND TANK COMPONENTS
2. Industrial	22. Industrial	3799	TRANSPORTATION EQUIPMENT NEC
2. Industrial	22. Industrial	3800	INSTRUMENTS AND RELATED PRODUCTS
2. Industrial	22. Industrial	3810	ENGINEERING & SCIENTIFIC INSTRUMENTS
2. Industrial	22. Industrial	3811	ENGINEERING & SCIENTIFIC INSTRUMENTS
2. Industrial	22. Industrial	3812	SEARCH & NAV. EQUIPMENT
2. Industrial	22. Industrial	3820	MEASURING AND CONTROLLING DEVICES
2. Industrial	22. Industrial	3821	LABORATORY APPARATUS & FURNITURE
2. Industrial	22. Industrial	3822	ENVIRONMENTAL CONTROLS
2. Industrial	22. Industrial	3823	PROCESS CONTROL INSTRUMENTS
2. Industrial	22. Industrial	3824	FLUID METERS AND COUNTING DEVICES
2. Industrial	22. Industrial	3825	INSTRUMENTS TO MEASURE ELECTRICITY
2. Industrial	22. Industrial	3826	ANALYTICAL INSTRUMENTS
2. Industrial	22. Industrial	3827	OPTICAL INSTRUMENTS
2. Industrial	22. Industrial	3829	MEASURING & CONTROLLING DEVICES NEC
2. Industrial	22. Industrial	3830	OPTICAL INSTRUMENTS AND LENSES
2. Industrial	22. Industrial	3832	OPTICAL INSTRUMENTS AND LENSES
2. Industrial	22. Industrial	3840	MEDICAL INSTRUMENTS AND SUPPLIES
2. Industrial	22. Industrial	3841	SURGICAL AND MEDICAL INSTRUMENTS
2. Industrial	22. Industrial	3842	SURGICAL APPLIANCES AND SUPPLIES
2. Industrial	22. Industrial	3843	DENTAL EQUIPMENT AND SUPPLIES
2. Industrial	22. Industrial	3844	XRAY APPARATUS & TUBES
2. Industrial	22. Industrial	3845	ELECTROMEDICAL EQUIPMENT
2. Industrial	22. Industrial	3850	OPHTHALMIC GOODS
2. Industrial	22. Industrial	3851	OPHTHALMIC GOODS
2. Industrial	22. Industrial	3860	PHOTOGRAPHIC EQUIPMENT AND SUPPLIES
2. Industrial	22. Industrial	3861	PHOTOGRAPHIC EQUIPMENT AND SUPPLIES
2. Industrial	22. Industrial	3870	WATCHES CLOCKS AND WATCHCASES
2. Industrial	22. Industrial	3873	WATCHES CLOCKS AND WATCHCASES
2. Industrial	22. Industrial	3900	MISCELLANEOUS MANUFACTURING INDUSTRIES
2. Industrial	22. Industrial	3910	JEWELRY SILVERARE AND PLATED WARE
2. Industrial	22. Industrial	3911	JEWELRY PRECIOUS METAL
2. Industrial	22. Industrial	3914	SILVERWARE AND PLATED WARE
2. Industrial	22. Industrial	3915	JEWELERS MATERIALS & LAPIDARY WORK
2. Industrial	22. Industrial	3930	MUSICAL INSTRUMENTS
2. Industrial	22. Industrial	3931	MUSICAL INSTRUMENTS
2. Industrial	22. Industrial	3940	TOYS AND SPORTING GOODS
2. Industrial	22. Industrial	3942	DOLLS
2. Industrial	22. Industrial	3944	GAMES TOYS AND CHILDRENS VEHICLES
2. Industrial	22. Industrial	3949	SPORTING AND ATHLETIC GOODS NEC
2. Industrial	22. Industrial	3950	PENS PENCILS OFFICE AND ART SUPPLIES
2. Industrial	22. Industrial	3951	PENS AND MECHANICAL PENCILS
2. Industrial	22. Industrial	3952	LEAD PENCILS AND ART GOODS
2. Industrial	22. Industrial	3953	MARKING DEVICES
2. Industrial	22. Industrial	3955	CARBON PAPER AND INKED RIBBONS
2. Industrial	22. Industrial	3960	COSTUME JEWELRY AND NOTIONS
2. Industrial	22. Industrial	3961	COSTUME JEWELRY
2. Industrial	22. Industrial	3962	ARTIFICIAL FLOWERS
2. Industrial	22. Industrial	3963	BUTTONS
2. Industrial	22. Industrial	3964	NEEDLES PINS AND FASTENERS
2. Industrial	22. Industrial	3965	FASTENERS, BUTTONS, NEEDLES
2. Industrial	22. Industrial	3990	MISCELLANEOUS MANUFACTURES
2. Industrial	22. Industrial	3991	BROOMS AND BRUSHES
2. Industrial	22. Industrial	3993	SIGNS AND ADVERTISING DISPLAYS
2. Industrial	22. Industrial	3995	BURIAL CASKETS

Sector	Building Type	4-digit SIC	Description
2. Industrial	22. Industrial	3996	HARD SURFACE FLOOR COVERINGS
2. Industrial	22. Industrial	3999	MANUFACTURING INDUSTRIES NEC
3. Unclassified	16. Unclassified	0000	
3. Unclassified	16. Unclassified	0011	
3. Unclassified	16. Unclassified	0012	
3. Unclassified	16. Unclassified	0013	
3. Unclassified	16. Unclassified	0014	
3. Unclassified	16. Unclassified	0016	
3. Unclassified	16. Unclassified	0017	
3. Unclassified	16. Unclassified	0019	
3. Unclassified	16. Unclassified	0020	
3. Unclassified	16. Unclassified	0021	
3. Unclassified	16. Unclassified	0022	
3. Unclassified	16. Unclassified	0023	
3. Unclassified	16. Unclassified	0024	
3. Unclassified	16. Unclassified	0027	
3. Unclassified	16. Unclassified	0029	
3. Unclassified	16. Unclassified	0030	
3. Unclassified	16. Unclassified	0031	
3. Unclassified	16. Unclassified	0032	
3. Unclassified	16. Unclassified	0033	
3. Unclassified	16. Unclassified	0034	
3. Unclassified	16. Unclassified	0037	
3. Unclassified	16. Unclassified	0039	
3. Unclassified	16. Unclassified	9900	UNCLASSIFIED ESTABLISHMENTS
3. Unclassified	16. Unclassified	9980	
3. Unclassified	16. Unclassified	9981	PGE BROKEN LOCKS
3. Unclassified	16. Unclassified	9982	PGE SET LOCKS
3. Unclassified	16. Unclassified	9983	PGE TEMPORARY SERVICE
3. Unclassified	16. Unclassified	9990	UNCLASSIFIED ESTABLISHMENTS
3. Unclassified	16. Unclassified	9991	UNCLASSIFIED ESTABLISHMENTS
3. Unclassified	16. Unclassified	9999	NONCLASSIFIABLE ESTABLISHMENTS
4. Ag & Pumping	15. Ag & Pumping	0100	AGRICULTURAL PRODUCTION-CROPS
4. Ag & Pumping	15. Ag & Pumping	0110	CASH GRAINS
4. Ag & Pumping	15. Ag & Pumping	0111	WHEAT
4. Ag & Pumping	15. Ag & Pumping	0112	RICE
4. Ag & Pumping	15. Ag & Pumping	0115	CORN
4. Ag & Pumping	15. Ag & Pumping	0116	SOYBEANS
4. Ag & Pumping	15. Ag & Pumping	0119	CASH GRAINS NEC
4. Ag & Pumping	15. Ag & Pumping	0130	FIELD CROPS EXCEPT CASH GRAINS
4. Ag & Pumping	15. Ag & Pumping	0131	COTTON
4. Ag & Pumping	15. Ag & Pumping	0132	TOBACCO
4. Ag & Pumping	15. Ag & Pumping	0133	SUGAR CROPS
4. Ag & Pumping	15. Ag & Pumping	0134	IRISH POTATOES
4. Ag & Pumping	15. Ag & Pumping	0139	FIELD CROPS EXCEPT CASH GRAINS NEC
4. Ag & Pumping	15. Ag & Pumping	0160	VEGETABLES AND MELONS
4. Ag & Pumping	15. Ag & Pumping	0161	VEGETABLES AND MELONS
4. Ag & Pumping	15. Ag & Pumping	0170	FRUITS AND TREE NUTS
4. Ag & Pumping	15. Ag & Pumping	0171	BERRY CROPS
4. Ag & Pumping	15. Ag & Pumping	0172	GRAPES
4. Ag & Pumping	15. Ag & Pumping	0173	TREE NUTS
4. Ag & Pumping	15. Ag & Pumping	0174	CITRUS FRUITS
4. Ag & Pumping	15. Ag & Pumping	0175	DECIDUOUS TREE FRUITS
4. Ag & Pumping	15. Ag & Pumping	0179	FRUITS AND TREE NUTS NEC
4. Ag & Pumping	15. Ag & Pumping	0180	HORTICULTURAL SPECIALTIES
4. Ag & Pumping	15. Ag & Pumping	0181	ORNAMENTAL NURSERY PRODUCTS
4. Ag & Pumping	15. Ag & Pumping	0182	FOOD CROPS GROWN UNDER COVER
4. Ag & Pumping	15. Ag & Pumping	0189	HORTICULTURAL SPECIALTIES NEC
4. Ag & Pumping	15. Ag & Pumping	0190	GENERAL FARMS PRIMARILY CROP
4. Ag & Pumping	15. Ag & Pumping	0191	GENERAL FARMS PRIMARILY CROP
4. Ag & Pumping	15. Ag & Pumping	0200	AGRICULTURAL PRODUCTION-LIVESTOCK
4. Ag & Pumping	15. Ag & Pumping	0210	LIVESTOCK EXC DAIRY POULTRY ETC
4. Ag & Pumping	15. Ag & Pumping	0211	BEEF CATTLE FEEDLOTS
4. Ag & Pumping	15. Ag & Pumping	0212	BEEF CATTLE EXCEPT FEEDLOTS

Sector	Building Type	4-digit SIC	Description
4. Ag & Pumping	15. Ag & Pumping	0213	HOGS
4. Ag & Pumping	15. Ag & Pumping	0214	SHEEP AND GOATS
4. Ag & Pumping	15. Ag & Pumping	0219	GENERAL LIVESTOCK NEC
4. Ag & Pumping	15. Ag & Pumping	0240	DAIRY FARMS
4. Ag & Pumping	15. Ag & Pumping	0241	DAIRY FARMS
4. Ag & Pumping	15. Ag & Pumping	0250	POULTRY AND EGGS
4. Ag & Pumping	15. Ag & Pumping	0251	BROILER FRYER AND ROASTER CHICKENS
4. Ag & Pumping	15. Ag & Pumping	0252	CHICKEN EGGS
4. Ag & Pumping	15. Ag & Pumping	0253	TURKEYS AND TURKEY EGGS
4. Ag & Pumping	15. Ag & Pumping	0254	POULTRY HATCHERIES
4. Ag & Pumping	15. Ag & Pumping	0259	POULTRY AND EGGS NEC
4. Ag & Pumping	15. Ag & Pumping	0270	ANIMAL SPECIALTIES
4. Ag & Pumping	15. Ag & Pumping	0271	FUR-BEARING ANIMALS AND RABBITS
4. Ag & Pumping	15. Ag & Pumping	0272	HORSES AND OTHER EQUINES
4. Ag & Pumping	15. Ag & Pumping	0273	ANIMAL AQUACULTURE
4. Ag & Pumping	15. Ag & Pumping	0279	ANIMAL SPECIALTIES NEC
4. Ag & Pumping	15. Ag & Pumping	0290	GENERAL FARMS PRIMARILY LIVESTOCK
4. Ag & Pumping	15. Ag & Pumping	0291	GENERAL FARMS PRIMARILY LIVESTOCK
4. Ag & Pumping	15. Ag & Pumping	0700	AGRICULTURAL SERVICES
4. Ag & Pumping	15. Ag & Pumping	0710	SOIL PREPARATION SERVICES
4. Ag & Pumping	15. Ag & Pumping	0711	SOIL PREPARATION SERVICES
4. Ag & Pumping	15. Ag & Pumping	0720	CROP SERVICES
4. Ag & Pumping	15. Ag & Pumping	0721	CROP PLANTING AND PROTECTION
4. Ag & Pumping	15. Ag & Pumping	0722	CROP HARVESTING
4. Ag & Pumping	15. Ag & Pumping	0723	CROP PREPARATION SERVICES FOR MARKET
4. Ag & Pumping	15. Ag & Pumping	0724	COTTON GINNING
4. Ag & Pumping	15. Ag & Pumping	0729	GENERAL CROP SERVICES
4. Ag & Pumping	15. Ag & Pumping	0750	ANIMAL SERVICES EXCEPT VETERINARY
4. Ag & Pumping	15. Ag & Pumping	0751	LIVESTOCK SERVICES EXC SPECIALTIES
4. Ag & Pumping	15. Ag & Pumping	0752	ANIMAL SPECIALTY SERVICES
5. Forestry	19. Forestry	0800	FORESTRY
5. Forestry	19. Forestry	0810	TIMBER TRACTS
5. Forestry	19. Forestry	0811	TIMBER TRACTS
5. Forestry	19. Forestry	0820	FOREST NURSERIES/SEED GATHERING
5. Forestry	19. Forestry	0821	FOREST NURSERIES/SEED GATHERING
5. Forestry	19. Forestry	0830	FOREST NURSERIES/PRODUCT GATHERING
5. Forestry	19. Forestry	0831	FOREST NURSERIES/PRODUCT GATHERING
5. Forestry	19. Forestry	0840	GATHERING OF MISC FOREST PRODUCTS
5. Forestry	19. Forestry	0843	EXTRACTION OF PINE GUM
5. Forestry	19. Forestry	0849	GATHERING OF FOREST PRODUCTS NEC
5. Forestry	19. Forestry	0850	FORESTRY SERVICES
5. Forestry	19. Forestry	0851	FORESTRY SERVICES
6. Fishing	20. Fishing	0900	FISHING HUNTING AND TRAPPING
6. Fishing	20. Fishing	0910	COMMERCIAL FISHING
6. Fishing	20. Fishing	0912	FINFISH
6. Fishing	20. Fishing	0913	SHELLFISH
6. Fishing	20. Fishing	0919	MISCELLANEOUS MARINE PRODUCTS
6. Fishing	20. Fishing	0920	FISH HATCHERIES AND PRESERVES
6. Fishing	20. Fishing	0921	FISH HATCHERIES AND PRESERVES
6. Fishing	20. Fishing	0970	HUNTING TRAPPING GAME PROPAGATION
6. Fishing	20. Fishing	0971	HUNTING TRAPPING GAME PROPAGATION
7. Mining & Extraction	21. Mining & Extraction	1000	METAL MINING
7. Mining & Extraction	21. Mining & Extraction	1010	IRON ORES
7. Mining & Extraction	21. Mining & Extraction	1011	IRON ORES
7. Mining & Extraction	21. Mining & Extraction	1020	COPPER ORES
7. Mining & Extraction	21. Mining & Extraction	1021	COPPER ORES
7. Mining & Extraction	21. Mining & Extraction	1030	LEAD AND ZINC ORES
7. Mining & Extraction	21. Mining & Extraction	1031	LEAD AND ZINC ORES
7. Mining & Extraction	21. Mining & Extraction	1040	GOLD AND SILVER ORES
7. Mining & Extraction	21. Mining & Extraction	1041	GOLD ORES
7. Mining & Extraction	21. Mining & Extraction	1044	SILVER ORES
7. Mining & Extraction	21. Mining & Extraction	1050	BAUXITE AND OTHER ALUMINUM ORES
7. Mining & Extraction	21. Mining & Extraction	1051	BAUXITE AND OTHER ALUMINUM ORES
7. Mining & Extraction	21. Mining & Extraction	1060	FERROALLOY ORES EXCEPT VANADIUM

Sector	Building Type	4-digit SIC	Description
7. Mining & Extraction	21. Mining & Extraction	1061	FERROALLOY ORES EXCEPT VANADIUM
7. Mining & Extraction	21. Mining & Extraction	1080	METAL MINING SERVICES
7. Mining & Extraction	21. Mining & Extraction	1081	METAL MINING SERVICES
7. Mining & Extraction	21. Mining & Extraction	1090	MISC METAL ORES
7. Mining & Extraction	21. Mining & Extraction	1092	MERCURY ORES
7. Mining & Extraction	21. Mining & Extraction	1094	URANIUM-RADIUM-VANADIUM ORES
7. Mining & Extraction	21. Mining & Extraction	1099	METAL ORES NFC
7. Mining & Extraction	21. Mining & Extraction	1100	ANTHRACITE MINING
7. Mining & Extraction	21. Mining & Extraction	1110	ANTHRACITE MINING
7. Mining & Extraction	21. Mining & Extraction	1111	ANTHRACITE
7. Mining & Extraction	21. Mining & Extraction	1112	ANTHRACITE MINING SERVICES
7. Mining & Extraction	21. Mining & Extraction	1200	COAL AND LIGNITE MINING
7. Mining & Extraction	21. Mining & Extraction	1210	BITUMINOUS COAL AND LIGNITE MINING
7. Mining & Extraction	21. Mining & Extraction	1211	BITUMINOUS COAL AND LIGNITE
7. Mining & Extraction	21. Mining & Extraction	1213	BITUMINOUS & LIGNITE MINING SERVICES
7. Mining & Extraction	21. Mining & Extraction	1220	BITUM. COAL + LIGNITE
7. Mining & Extraction	21. Mining & Extraction	1221	BITUM. COAL + LIGNITE SURFACE
7. Mining & Extraction	21. Mining & Extraction	1222	BITUM. COAL + LIGNITE UNDERGR
7. Mining & Extraction	21. Mining & Extraction	1230	ANTHRACITE MINE
7. Mining & Extraction	21. Mining & Extraction	1231	ANTHRACITE MINE
7. Mining & Extraction	21. Mining & Extraction	1240	COAL MINING SERVICES
7. Mining & Extraction	21. Mining & Extraction	1241	COAL MINING SERVICES
7. Mining & Extraction	21. Mining & Extraction	1300	OIL AND GAS EXTRACTION
7. Mining & Extraction	21. Mining & Extraction	1310	CRUDE PETROLEUM AND NATURAL GAS
7. Mining & Extraction	21. Mining & Extraction	1311	CRUDE PETROLEUM AND NATURAL GAS
7. Mining & Extraction	21. Mining & Extraction	1320	NATURAL GAS LIQUIDS
7. Mining & Extraction	21. Mining & Extraction	1321	NATURAL GAS LIQUIDS
7. Mining & Extraction	21. Mining & Extraction	1380	OIL AND GAS FIELD SERVICES
7. Mining & Extraction	21. Mining & Extraction	1381	DRILLING OIL AND GAS WELLS
7. Mining & Extraction	21. Mining & Extraction	1382	OIL AND GAS EXPLORATION SERVICES
7. Mining & Extraction	21. Mining & Extraction	1389	OIL AND GAS FIELD SERVICES NEC
7. Mining & Extraction	21. Mining & Extraction	1400	NONMETALLIC MINERALS EXCEPT FUELS
7. Mining & Extraction	21. Mining & Extraction	1410	DIMENSION STONE
7. Mining & Extraction	21. Mining & Extraction	1411	DIMENSION STONE
7. Mining & Extraction	21. Mining & Extraction	1420	CRUSHED AND BROKEN STONE
7. Mining & Extraction	21. Mining & Extraction	1422	CRUSHED AND BROKEN LIMESTONE
7. Mining & Extraction	21. Mining & Extraction	1423	CRUSHED AND BROKEN GRANITE
7. Mining & Extraction	21. Mining & Extraction	1429	CRUSHED AND BROKEN STONE NEC
7. Mining & Extraction	21. Mining & Extraction	1440	SAND AND GRAVEL
7. Mining & Extraction	21. Mining & Extraction	1442	CONSTRUCTION SAND AND GRAVEL
7. Mining & Extraction	21. Mining & Extraction	1446	INDUSTRIAL SAND
7. Mining & Extraction	21. Mining & Extraction	1450	CLAY AND RELATED MINERALS
7. Mining & Extraction	21. Mining & Extraction	1452	BENTONITE
7. Mining & Extraction	21. Mining & Extraction	1453	FIRE CLAY
7. Mining & Extraction	21. Mining & Extraction	1454	FULLERS EARTH
7. Mining & Extraction	21. Mining & Extraction	1455	KAOLIN AND BALL CLAY
7. Mining & Extraction	21. Mining & Extraction	1459	CLAY AND RELATED MINERALS NEC
7. Mining & Extraction	21. Mining & Extraction	1470	CHEMICAL AND FERTILIZER MINERALS
7. Mining & Extraction	21. Mining & Extraction	1472	BARITE
7. Mining & Extraction	21. Mining & Extraction	1473	FLUORSPAR
7. Mining & Extraction	21. Mining & Extraction	1474	POTASH, SODA, AND BORATE MINERAL
7. Mining & Extraction	21. Mining & Extraction	1475	PHOSPHATE ROCK
7. Mining & Extraction	21. Mining & Extraction	1476	ROCK SALT
7. Mining & Extraction	21. Mining & Extraction	1477	SULFUR
7. Mining & Extraction	21. Mining & Extraction	1479	CHEMICAL AND FERTILIZER MINING
7. Mining & Extraction	21. Mining & Extraction	1480	NONMETALLIC MINERALS SERVICES
7. Mining & Extraction	21. Mining & Extraction	1481	NONMETALLIC MINERALS SERVICES
7. Mining & Extraction	21. Mining & Extraction	1490	MISCELLANEOUS NONMETALLIC MINERALS
7. Mining & Extraction	21. Mining & Extraction	1492	GYPSUM
7. Mining & Extraction	21. Mining & Extraction	1496	TALC SOAPSTONE AND PYROPHYLLITE
7. Mining & Extraction	21. Mining & Extraction	1499	MISC. NONMETAL MINERALS
8. Construction	12. Construction	1500	GENERAL BUILDING CONTRACTORS
8. Construction	12. Construction	1520	RESIDENTIAL BUILDING CONSTRUCTION
8. Construction	12. Construction	1521	SINGLE-FAMILY HOUSING CONSTRUCTION

Sector	Building Type	4-digit SIC	Description
8. Construction	12. Construction	1522	RESIDENTIAL CONSTRUCTION NEC
8. Construction	12. Construction	1530	OPERATIVE BUILDERS
8. Construction	12. Construction	1531	OPERATIVE BUILDERS
8. Construction	12. Construction	1540	NONRESIDENTIAL BUILDING CONSTRUCTION
8. Construction	12. Construction	1541	INDUSTRIAL BUILDINGS AND WAREHOUSES
8. Construction	12. Construction	1542	NONRESIDENTIAL CONSTRUCTION NEC
8. Construction	12. Construction	1543	PGE TEMPORARY SERVICES FOR CONS.
8. Construction	12. Construction	1600	HEAVY CONSTRUCTION CONTRACTORS
8. Construction	12. Construction	1610	HIGHWAY AND STREET CONSTRUCTION
8. Construction	12. Construction	1611	HIGHWAY AND STREET CONSTRUCTION
8. Construction	12. Construction	1620	HEAVY CONSTRUCTION EXCEPT HIGHWAY
8. Construction	12. Construction	1622	BRIDGE TUNNEL & ELEVATED HIGHWAY
8. Construction	12. Construction	1623	WATER SEWER AND UTILITY LINES
8. Construction	12. Construction	1629	HEAVY CONSTRUCTION NEC
8. Construction	12. Construction	1700	SPECIAL TRADE CONTRACTORS
8. Construction	12. Construction	1710	PLUMBING HEATING AIR CONDITIONING
8. Construction	12. Construction	1711	PLUMBING HEATING AIR CONDITIONING
8. Construction	12. Construction	1720	PAINTING PAPER HANGING DECORATING
8. Construction	12. Construction	1721	PAINTING PAPER HANGING DECORATING
8. Construction	12. Construction	1730	ELECTRICAL WORK
8. Construction	12. Construction	1731	ELECTRICAL WORK
8. Construction	12. Construction	1740	MASONRY STONEWORK AND PLASTERING
8. Construction	12. Construction	1741	MASONRY AND OTHER STONEWORK
8. Construction	12. Construction	1742	PLASTERING DRYWALL AND INSULATION
8. Construction	12. Construction	1743	TERRAZZO TILE MARBLE MOSAIC WORK
8. Construction	12. Construction	1750	CARPENTERING AND FLOORING
8. Construction	12. Construction	1751	CARPENTERING
8. Construction	12. Construction	1752	FLOOR LAYING AND FLOOR WORK NEC
8. Construction	12. Construction	1760	ROOFING AND SHEET METAL WORK
8. Construction	12. Construction	1761	ROOFING AND SHEET METAL WORK
8. Construction	12. Construction	1770	CONCRETE WORK
8. Construction	12. Construction	1771	CONCRETE WORK
8. Construction	12. Construction	1780	WATER WELL DRILLING
8. Construction	12. Construction	1781	WATER WELL DRILLING
8. Construction	12. Construction	1790	MISC SPECIAL TRADE CONTRACTORS
8. Construction	12. Construction	1791	STRUCTURAL STEEL ERECTION
8. Construction	12. Construction	1793	GLASS AND GLAZING WORK
8. Construction	12. Construction	1794	EXCAVATING AND FOUNDATION WORK
8. Construction	12. Construction	1795	WRECKING AND DEMOLITION WORK
8. Construction	12. Construction	1796	INSTALLING BUILDING EQUIPMENT NEC
8. Construction	12. Construction	1799	SPECIAL TRADE CONTRACTORS NEC
9. TCU	18. TCU	4000	RAILROAD TRANSPORTATION
9. TCU	18. TCU	4010	RAILROADS
9. TCU	18. TCU	4011	RAILROADS LINE-HAUL OPERATING
9. TCU	18. TCU	4013	SWITCHING AND TERMINAL SERVICES
9. TCU	18. TCU	4018	PGE RR SWITCHING AND SIGNALS
9. TCU	18. TCU	4040	RAILWAY EXPRESS SERVICE
9. TCU	18. TCU	4041	RAILWAY EXPRESS SERVICE
9. TCU	18. TCU	4100	LOCAL AND INTERURBAN PASSENGER TRANSIT
9. TCU	18. TCU	4110	LOCAL AND SUBURBAN TRANSPORTATION
9. TCU	18. TCU	4111	LOCAL AND SUBURBAN TRANSIT
9. TCU	18. TCU	4119	LOCAL PASSENGER TRANSPORTATION NEC
9. TCU	18. TCU	4120	TAXICABS
9. TCU	18. TCU	4121	TAXICABS
9. TCU	18. TCU	4130	INTERCITY HIGHWAY TRANSPORTATION
9. TCU	18. TCU	4131	INTERCITY HIGHWAY TRANSPORTATION
9. TCU	18. TCU	4140	TRANSPORTATION CHARTER SERVICE
9. TCU	18. TCU	4141	LOCAL PASSENGER CHARTER SERVICE
9. TCU	18. TCU	4142	CHARTER SERVICE EXCEPT LOCAL
9. TCU	18. TCU	4150	SCHOOL BUSES
9. TCU	18. TCU	4151	SCHOOL BUSES
9. TCU	18. TCU	4170	BUS TERMINAL AND SERVICE FACILITIES
9. TCU	18. TCU	4171	BUS TERMINAL FACILITIES
9. TCU	18. TCU	4172	BUS SERVICE FACILITIES

Sector	Building Type	4-digit SIC	Description
9. TCU	18. TCU	4173	BUS TERMINALS AND SERVICE
9. TCU	18. TCU	4200	TRUCKING AND WAREHOUSING
9. TCU	18. TCU	4210	TRUCKING LOCAL AND LONG DISTANCE
9. TCU	18. TCU	4212	LOCAL TRUCKING WITHOUT STORAGE
9. TCU	18. TCU	4213	TRUCKING EXCEPT LOCAL
9. TCU	18. TCU	4215	COURIER EXCL BY AIR
9. TCU	18. TCU	4230	TRUCKING TERMINAL FACILITIES
9. TCU	18. TCU	4231	TRUCKING TERMINAL FACILITIES
9. TCU	18. TCU	4300	US POSTAL SERVICE
9. TCU	18. TCU	4310	US POSTAL SERVICE
9. TCU	18. TCU	4311	US POSTAL SERVICE
9. TCU	18. TCU	4400	WATER TRANSPORTATION
9. TCU	18. TCU	4410	DEEP SEA FOREIGN TRANSPORTATION
9. TCU	18. TCU	4411	DEEP SEA FOREIGN TRANSPORTATION
9. TCU	18. TCU	4412	DEEP SEA FOREIGN TRANS OF FREIGHT
9. TCU	18. TCU	4420	DEEP SEA DOMESTIC TRANSPORTATION
9. TCU	18. TCU	4421	NONCONTIGUOUS AREA TRANSPORTATION
9. TCU	18. TCU	4422	COASTWISE TRANSPORTATION
9. TCU	18. TCU	4423	INTERCOASTAL TRANSPORTATION
9. TCU	18. TCU	4424	DEEP SEA DOMES. TRANS OF FREIGHT
9. TCU	18. TCU	4430	GREAT LAKES TRANSPORTATION
9. TCU	18. TCU	4431	GREAT LAKES TRANSPORTATION
9. TCU	18. TCU	4432	GREAT LAKES TRANSPORT
9. TCU	18. TCU	4440	TRANSPORTATION ON RIVERS AND CANALS
9. TCU	18. TCU	4441	TRANSPORTATION ON RIVERS AND CANALS
9. TCU	18. TCU	4449	FREIGHT TRANS OVER WATER
9. TCU	18. TCU	4450	LOCAL WATER TRANSPORTATION
9. TCU	18. TCU	4452	FERRIES
9. TCU	18. TCU	4453	LIGHTERAGE
9. TCU	18. TCU	4454	TOWING AND TUGBOAT SERVICE
9. TCU	18. TCU	4459	LOCAL WATER TRANSPORTATION NEC
9. TCU	18. TCU	4460	WATER TRANSPORTATION SERVICES
9. TCU	18. TCU	4463	MARINE CARGO HANDLING
9. TCU	18. TCU	4464	CANAL OPERATION
9. TCU	18. TCU	4469	WATER TRANSPORTATION SERVICES NEC
9. TCU	18. TCU	4480	WATER TRANS OF PASSENGERS
9. TCU	18. TCU	4481	DEEP SEA PASSENGER TRANS NOT FERRY
9. TCU	18. TCU	4482	FERRIES
9. TCU	18. TCU	4489	WATER TRANS OF PASSENGERS NEC
9. TCU	18. TCU	4490	WATER TRANS SERVICE
9. TCU	18. TCU	4491	MARINE CARGO HANDLING
9. TCU	18. TCU	4492	TOWING AND TUGBOAT SERVICE
9. TCU	18. TCU	4493	MARINAS
9. TCU	18. TCU	4499	WATER TRANS SERVICES NEC
9. TCU	18. TCU	4500	TRANSPORTATION BY AIR
9. TCU	18. TCU	4510	CERTIFICATED AIR TRANSPORTATION
9. TCU	18. TCU	4511	CERTIFICATED AIR TRANSPORTATION
9. TCU	18. TCU	4512	AIR TRANS SCHEDULED
9. TCU	18. TCU	4513	AIR COURIERS
9. TCU	18. TCU	4520	SCHEDULED AIR TRANSPORTATION
9. TCU	18. TCU	4521	NONCERTIFICATED AIR TRANSPORTATION
9. TCU	18. TCU	4522	AIR TRANS. NONSCHEDULED
9. TCU	18. TCU	4580	AIRPORTS AND SERVICES
9. TCU	18. TCU	4581	AIRPORTS AND SERVICES
9. TCU	18. TCU	4582	AIRPORTS AND FLYING FIELDS
9. TCU	18. TCU	4583	AIRPORT TERMINAL SERVICES
9. TCU	18. TCU	4600	PIPE LINES EXCEPT NATURAL GAS
9. TCU	18. TCU	4610	PIPE LINES EXCEPT NATURAL GAS
9. TCU	18. TCU	4612	CRUDE PETROLEUM PIPE LINES
9. TCU	18. TCU	4613	REFINED PETROLEUM PIPE LINES
9. TCU	18. TCU	4619	PIPE LINES NEC
9. TCU	18. TCU	4700	TRANSPORTATION SERVICES
9. TCU	18. TCU	4710	FREIGHT FORWARDING
9. TCU	18. TCU	4712	FREIGHT FORWARDING

Sector	Building Type	4-digit SIC	Description
9. TCU	18. TCU	4720	ARRANGEMENT OF TRANSPORTATION
9. TCU	18. TCU	4722	PASSENGER TRANSPORTATION ARRANGEMENT
9. TCU	18. TCU	4723	FREIGHT TRANSPORTATION ARRANGEMENT
9. TCU	18. TCU	4724	TRAVEL AGENCIES
9. TCU	18. TCU	4725	TOUR OPERATORS
9. TCU	18. TCU	4729	PASSENGER TRANS ARRANGEMENT
9. TCU	18. TCU	4730	FREIGHT TRANS. ARRANGEMENT
9. TCU	18. TCU	4731	FREIGHT TRANS. ARRANGEMENT
9. TCU	18. TCU	4740	RENTAL OF RAILROAD CARS
9. TCU	18. TCU	4741	RENTAL OF RAILROAD CARS
9. TCU	18. TCU	4742	RAILROAD CAR RENTAL WITH SERVICE
9. TCU	18. TCU	4743	RAILROAD CAR RENTAL WITHOUT SERVICE
9. TCU	18. TCU	4780	MISCELLANEOUS TRANSPORTATION SERVICES
9. TCU	18. TCU	4782	INSPECTION AND WEIGHING SERVICES
9. TCU	18. TCU	4783	PACKING AND CRATING
9. TCU	18. TCU	4784	FIXED FACILITIES FOR VEHICLES NEC
9. TCU	18. TCU	4785	INSPECTION AND FIXED FACILITIES
9. TCU	18. TCU	4789	TRANSPORTATION SERVICES NEC
9. TCU	18. TCU	4800	COMMUNICATION
9. TCU	18. TCU	4810	TELEPHONE COMMUNICATION
9. TCU	18. TCU	4811	TELEPHONE COMMUNICATION
9. TCU	18. TCU	4812	RADIOTELEPHONE COMMUNIC.
9. TCU	18. TCU	4813	TELEPHONE COMMUNICATION
9. TCU	18. TCU	4820	TELEGRAPH COMMUNICATION
9. TCU	18. TCU	4821	TELEGRAPH COMMUNICATION
9. TCU	18. TCU	4822	TELEGRAPH AND OTHER COMMUNICATION
9. TCU	18. TCU	4830	RADIO AND TELEVISION BROADCASTING
9. TCU	18. TCU	4832	RADIO BROADCASTING
9. TCU	18. TCU	4833	TELEVISION BROADCASTING EXCL SUBSC.
9. TCU	18. TCU	4840	CABLE AND PAY TV
9. TCU	18. TCU	4841	CABLE AND PAY TV
9. TCU	18. TCU	4890	COMMUNICATION SERVICES NEC
9. TCU	18. TCU	4899	COMMUNICATION SERVICES NEC
9. TCU	18. TCU	4900	ELECTRIC GAS AND SANITARY SERVICES
9. TCU	18. TCU	4910	ELECTRIC SERVICES
9. TCU	18. TCU	4911	ELECTRIC SERVICES
9. TCU	18. TCU	4912	PGE INVESTOR OWNED UTILITY-RESALE
9. TCU	18. TCU	4913	PGE COOP OWNED UTILITY-RESALE
9. TCU	18. TCU	4914	PGE MUNICIPAL OWNED UTLITY-RESALE
9. TCU	18. TCU	4915	PGE SPECIAL DIST UTILITY-RESALE
9. TCU	18. TCU	4916	PGE FEDERAL AGENCY UTILITY-RESALE
9. TCU	18. TCU	4917	PGE STATE AGENCY UTILITY-RESALE
9. TCU	18. TCU	4918	PGE OTHER UTILITY-RESALE
9. TCU	18. TCU	4919	PGE INTERDEPARTMENTAL ELECTRIC
9. TCU	18. TCU	4920	GAS PRODUCTION AND DISTRIBUTION
9. TCU	18. TCU	4922	NATURAL GAS TRANSMISSION
9. TCU	18. TCU	4923	GAS TRANSMISSION AND DISTRIBUTION
9. TCU	18. TCU	4924	NATURAL GAS DISTRIBUTION
9. TCU	18. TCU	4925	GAS PRODUCTION AND/OR DISTRIBUTION
9. TCU	18. TCU	4926	PGE INVESTR OWNED GAS UTILITY-RESALE
9. TCU	18. TCU	4927	PGE MUNI OWNED GAS UTILITY-RESALE
9. TCU	18. TCU	4928	PGE OTHER
9. TCU	18. TCU	4930	COMBINATION UTILITY SERVICES
9. TCU	18. TCU	4931	ELECTRIC AND OTHER SERVICES COMBINED
9. TCU	18. TCU	4932	GAS AND OTHER SERVICES COMBINED
9. TCU	18. TCU	4933	PGE DOMSTC WATER & OTHR COMBND
9. TCU	18. TCU	4934	PGE COMMUNITY SERVICES
9. TCU	18. TCU	4935	PGE ELEC & OTHER SERVICES COMBND
9. TCU	18. TCU	4937	
9. TCU	18. TCU	4939	COMBINATION UTILITY SERVICES NEC
9. TCU	18. TCU	4940	WATER SUPPLY
9. TCU	18. TCU	4941	WATER SUPPLY
9. TCU	18. TCU	4949	
9. TCU	18. TCU	4950	SANITARY SERVICES

Sector	Building Type	4-digit SIC	Description
9. TCU	18. TCU	4952	SEWERAGE SYSTEMS
9. TCU	18. TCU	4953	REFUSE SYSTEMS
9. TCU	18. TCU	4959	SANITARY SERVICES NEC
9. TCU	18. TCU	4960	STEAM AND A/C SUPPLY
9. TCU	18. TCU	4961	STEAM AND A/C SUPPLY
9. TCU	18. TCU	4970	IRRIGATION SYSTEMS
9. TCU	18. TCU	4971	IRRIGATION SYSTEMS
9. TCU	18. TCU	4980	PGE SMALL ELECTICITY PRODUCERS
9. TCU	18. TCU	4981	PGE ELECTICITY FROM WASTE PRODUCTS
9. TCU	18. TCU	4982	PGE ELECTRICITY FROM FOSSIL FUEL
9. TCU	18. TCU	4983	
9. TCU	18. TCU	4988	PGE ELECTRICITY FROM WIND
9. TCU	Street Light	9225	PGE TRAFFIC CONTROL (9250)
9. TCU	Street Light	9226	PGE STREETLIGHTS (9250)
9. TCU	Street Light	9227	PGE PUBLIC PARK LOTS(9250)