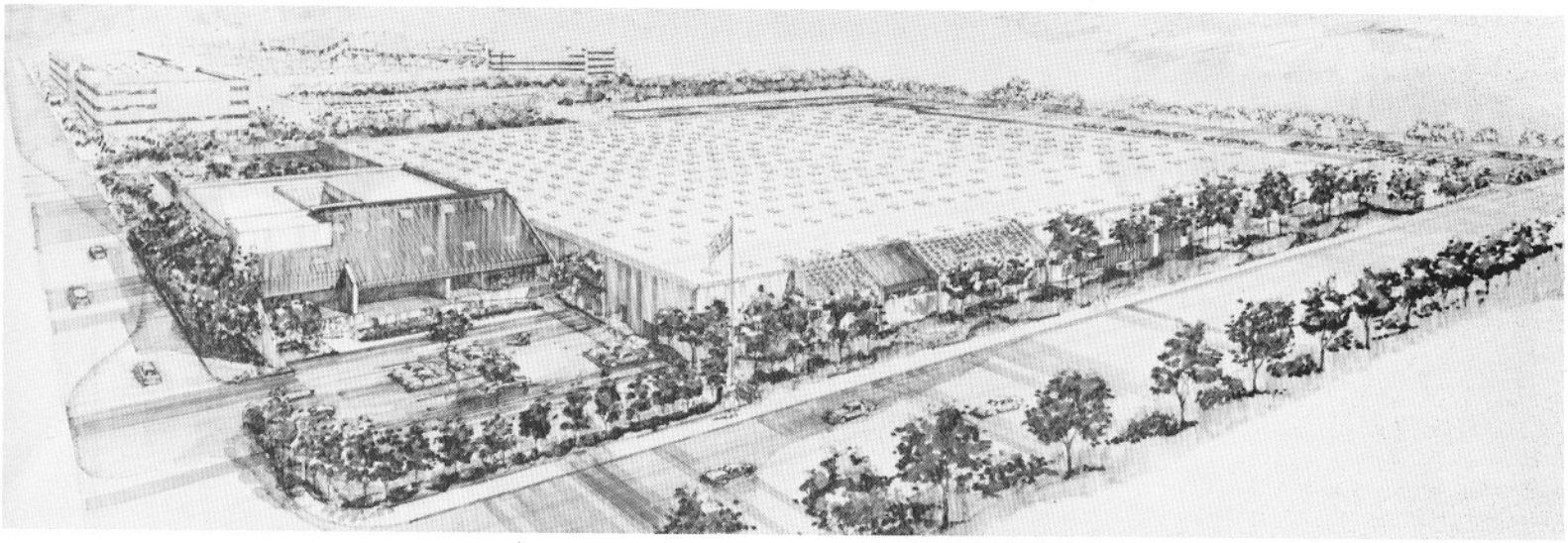
AUSTIN UPDATE

JANUARY 1982



Rendering of aerial view of proposed General Mail Facility shows extensive skylighting.

Ultimate energy study

A. E. Guntermann
Technical Services Division
and
Arthur M. Smith
Western District

The purpose of the energy study for the Santa Ana General Mail Facility at Santa Ana, California was to assist the United States Postal Service in developing cost-effective design guidelines for new postal facilities in 1985 and beyond. The goal was to reduce the building energy consumption by 45% from USPS pre-1975 design guidelines or 25% from their more recent design guidelines. The owner's commitment to energy conservation was clearly expressed by the substantial additional design fee appropriated for the study.

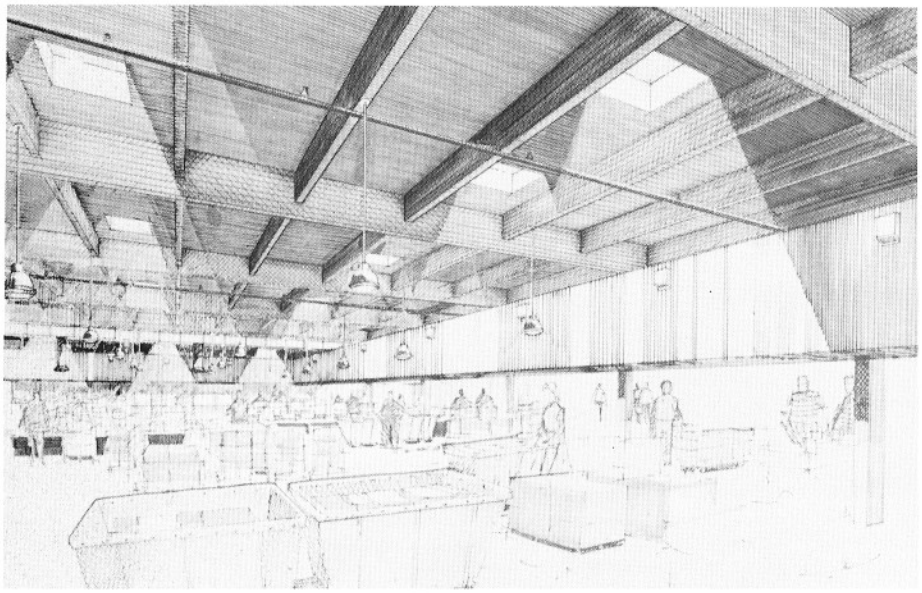
The Santa Ana energy study perhaps typifies the ultimate energy study. Austin used the latest energy analysis design tool, DOE 2.1A computer program, to perform numerous sensitivity analyses with about 250 computer runs (computer cost of approximately $60/run) to evaluate or optimize approximately 60 energy options. Manual energy calculations were sometimes necessary to evaluate alternatives which could not be analyzed with the large energy computer programs.

Essentially, each energy option was benchmarked to a "base" design to evaluate its annual energy savings. The energy savings were evaluated by comparing the alternative to base design initial cost and annual maintenance costs using an in-house Austin "cashflow" computer program ($10/run). Those alternatives which were found to be cost-effective were then combined in a final computer run to provide the total building annual energy consumption for all of the interactive subsystems. The final energy-efficient design was achieved using current technology and "off-the-shelf" equipment — an approach which should produce a reliable, low-maintenance building.

The study required an Austin task force of six to eight people (consisting of architects, mechanical and electrical design engineers and estimators) over a five-month period. The U.S. Postal Service employed the services of Argonne National Laboratory to evaluate Austin's results. After Argonne's review, the USPS was well satisfied that Austin had greatly exceeded the design goals.

continued on page 2

THE AUSTIN COMPANY
DESIGNERS
ENGINEERS
BUILDERS



Work room daylighting from skylights is augmented by high-reflectance floor surface.

continued from page 1

Of the 60 alternatives investigated, most of the savings were produced in a few areas: Lighting energy requirements were held to a minimum in the design; high pressure sodium lamps were specified, to provide 50 foot-candles of light in the workroom; a light-colored floor surface was specified; switching was provided to permit turning lights off in unoccupied areas during the three-shift operations day; daylighting through skylights and fenestration was augmented with a dimming system — which also provides for reduced lighting energy from constant light output over lamp life.

The design also specified a low-static, high-efficiency fan system which would reduce the total air conditioning energy demand by approximately 50%.

In addition to finding cost-effective energy conservation options, the study was also intended to find options which were not cost-effective in this particular installation. Among the alternatives studied which did not save energy in this location were evaporative cooling, double glazing, "super" insulation, increased thermal mass, building reorientation, cogeneration and heat pumps.

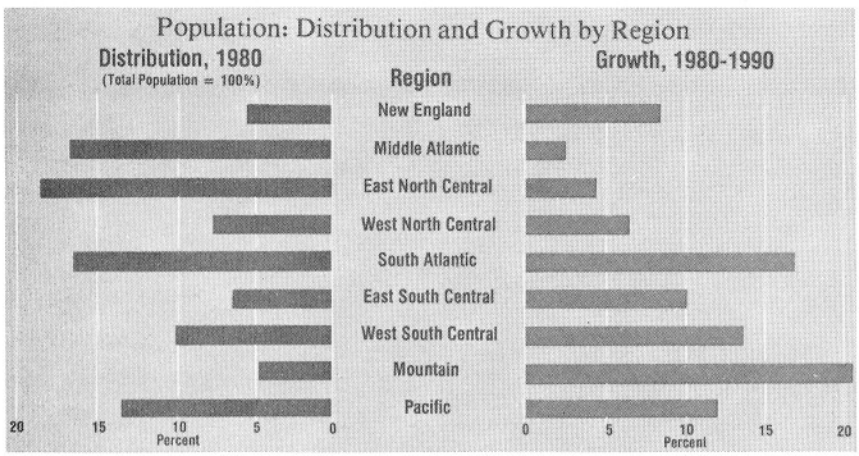
Plotkin to write for the Britannica

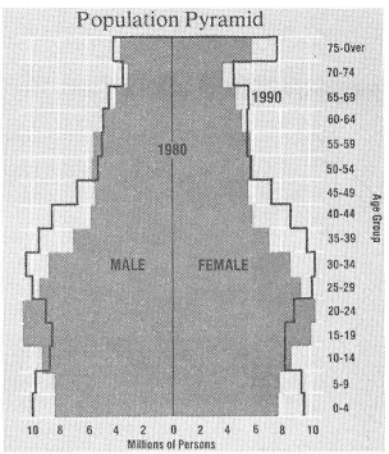
Manuel D. Plotkin, division vice president and group practice director of the Management Consulting Division of The Austin Company, was commissioned by the Encyclopedia Britannica to prepare an article for its 1982 *Book of the Year* on the subject "National Demographic Trends in the United States."

The Britannica asked Mr. Plotkin to author the article because he has written a number of articles on the subject, and when Director of the U.S. Bureau of the Census, he testified on the implications of these trends before committees of the U.S. Congress.

In the article, Mr. Plotkin concludes that "several important emerging trends in the U.S. population, including changes in migration patterns, age distributions, ethnic affiliations, household arrangements, and life styles of the American people have vast implications for our political institutions, social values, economic policies and business directions."

The Britannica also plans to publish a separate 16-page booklet featuring Mr. Plotkin's article and including tables of summary results from the 1980 Census.





Typical findings of the 1980 Census, and the extrapolation of data to establish population trends, are shown in these graphs by The Conference Board.

THE ULTIMATE ENERGY STUDY

A. E. Guntermann
Research Associate - Energy
Technical Services Division

The purpose of the energy study for the Santa Ana General Mail Facility at Santa Ana, California was to assist the United States Postal Service in developing cost-effective design guidelines for new postal facilities in 1985 and beyond. The goal was to reduce the building energy consumption by 45% from USPS pre-1975 design guidelines or 25% from their more recent design guidelines. The owner's commitment to energy conservation was clearly expressed by the $1/4 million additional design fee appropriated for the study.

The Santa Ana General Mail Facility energy study perhaps typifies the ultimate energy study. Austin used the latest energy analysis design tool, DOE 2.1A computer program, to perform numerous sensitivity analyses with about 250 computer runs (computer cost of approximately $60/run) to evaluate or optimize approximately 60 energy options. Manual energy calculations were sometimes necessary to evaluate alternatives which could not be analyzed with the large energy computer programs.

Essentially, each energy option was benchmarked to a "base" design to evaluate its annual energy savings. The energy savings were evaluated by comparing the alternative to base design initial cost and annual maintenance costs using an in-house Austin "cashflow" computer program ($10/run). Those alternatives which were found to be cost-effective were then combined in a final computer run to provide the total building annual energy consumption for all of the interactive subsystems. The final energy-efficient design was achieved using current technology and "off-the-shelf" equipment -- an approach which should produce a reliable, low-maintenance building.

The study required an Austin task force of six to eight people (consisting of architects, mechanical and electrical design engineers and estimators) over a five-month period. Its results are shown in Chart 1. It was the consensus of the Austin task force that the use of the DOE 2.1A computer program was a cost-effective design tool for providing accurate cost-effective energy calculations. The U. S. Postal Service employed the services of Argonne National Laboratory to evaluate Austin's results. After Argonne's review, the USPS was well satisfied that Austin had greatly exceeded the design goals. Further, it is the design task force's opinion that the final energy budget numbers are equal to or better than those for the most energy efficient air conditioned industrial building -- which is exceptional, particularly for a building that will operate continuously.

Of the 60 alternatives investigated, most of the savings were produced in a few areas:

A. Lighting Energy

BASE DESIGN	TOTAL LIGHTING MMBTU/YR
50fc/Metal Halide/10% floor reflectance	8578.2
ALTERNATE 1 - LIGHT COLORED FLOOR	
50fc/Metal Halide/30% floor reflectance	7662.7
ALTERNATE 2 - HIGH PRESSURE SODIUM LAMPS	
50fc/HPS/30% floor reflectance	6391.0
ALTERNATE 3 - OCCUPANCY SCHEDULES & DAYLIGHTING[1]	
50fc/HPS/30% floor reflectance	4251.0

B. HVAC System

A low-static, high-efficiency fan system reduced the total air conditioning energy by approximately 50%.

	BASE DESIGN[2] MMBTU/YR	ENERGY DESIGN[3] MMBTU/YR
Space Cooling	1523.0	808.4
HVAC Auxiliaries	2937.7	1410.4
FINAL ENERGY EFFICIENT DESIGN	4460.7	2218.8

1. Occupancy variations during the three shifts allow switching lights off in some areas. Daylighting provides lighting savings from skylights and fenestration by incorporating dimming/switching. The dimming system also provides for reduced lighting energy from constant light output over lamp life.
2. The "base" Space Cooling and HVAC Auxiliary MMBTU/YR includes the "base" lighting design a/c load.
3. Several minor additional energy conservation alternatives are lumped together with the high-efficiency, low-static energy design.

CHART 1

	BASE DESIGN			ENERGY DESIGN		
	TOTAL BUILDING		ENERGY BUDGET	TOTAL BUILDING		ENERGY BUDGET
	MMBTU'S/YR	COST/YR	(BTU/SF/YR)	MMBTU'S/YR	COST/YR	BTU/SF/YR
Annual Energy w/ Mechanization	18,469	$335,030	59,000	11,841	$211,930	37,800
Annual Energy w/o Mechanization	13,630	--	45,290	7,002	--	22,400

Initial Cost Energy Options = $925,570
First Year Annual Energy Savings = $123,100

NOTE: Building operates 24 hours/day, 365 days/year.

In addition to finding cost-effective energy conservation options, a second purpose was to list those which were not. Among those alternatives which did not save energy for this geographic location or were not cost-effective were evaporative cooling, passive or active solar heating, double-glazed windows, "super" insulation, increased thermal mass, building reorientation, cogeneration, and heat pumps.