



U.S.
Labor-Energy Input Survey
sample

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U.S. LABOR-ENERGY INPUT SURVEY

SAMPLE

The following analysis is prepared by the Portland Cement Association's Market Intelligence Group based on data sources believed to be reliable; however, accuracy cannot be guaranteed. This report is not intended to represent the viewpoint of Portland Cement Association member companies. The Portland Cement Association assumes no legal responsibility for the outcome of decisions or commitments made on the basis of this information.



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U.S. Labor-Energy Input Survey

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Executive Summary

Labor Efficiency

U.S. labor productivity increased in XXXX with an industry average of 3.09 metric tons of cement being produced per employee hour (mtph) . a 1.6% increase in labor efficiency since XXXX. Productivity ranged from 1.03 mtph to 7.10 mtph. Productivity in wet process plants dropped 13.4%, while dry process plants reported a 2.6% increase in labor efficiency.

Energy Efficiency

The amount of energy, measured in BTU¢ per metric ton, required to produce one ton of cement averaged 4.432 million BTU/ton in XXXX, a slight increase from XXXX levels. Individual plant energy efficiencies ranged from 3.10 million BTU/ton to 10.86 million BTU/ton. On average, wet process plants required 7.696 million BTU to produce one ton of cement in comparison to dry process plant energy requirements of 4.281 million BTU. Throughout the past decade, wet plant capacity has been in decline due to an increase in the rate of wet kiln retirements. The wet process now comprises less than 5% of the capacity represented in this survey. As a result, energy efficiency rates may be volatile as individual plant¢ share of the wet process total is greater.

The cement production process in the U.S. is fueled by a combination of coal and petroleum coke which represents 64.7% of the fuel consumption mix. Following a sizable increase in XXXX, natural gas consumption slightly declined to 9.0% of the fuel mix. Electricity consumption declined to a 10.9% share of the fuel matrix, while alternative energy consumption increased in XXXX. Over 14% of all cement manufacturing energy needs are achieved through the use of alternative fuel and 73% of all U.S. plants now incorporate alternative fuels in their energy strategy. The U.S. cement industry efficiently burned approximately 453,000 tons of tire derived fuel in XXXX. Other alternative fuels used in XXXX include waste oil, solvents, other solids, and renewable energy such as wood and biomass.

Survey Overview

The **U.S. Labor-Energy Input Survey** presents information compiled by the Portland Cement Association on labor and energy usage in the U.S. cement industry. Results in the accompanying tables report **average** measures of labor and energy efficiency in addition to comparisons over time. However, direct comparisons over time should be made with the understanding that differences in the reporting base and reporting accuracy can affect changes in operating efficiencies from year to year. It is for this reason that the overall trends in labor productivity and energy efficiency are viewed to be of more significance. Survey results are reported in **metric units**.

Only clinker-producing cement plants are eligible to participate in this program. Individual plant confidentiality is strictly maintained and only responding member companies are eligible to receive their individual plant and company summaries. White cement plants and Grinding Only operations are not included in this program.

Equivalent Labor and Energy Tons

Because a plant's clinker production may be disproportionate to its finished cement production, unit energy usage in this report is expressed in terms of **equivalent tons (tonnes) of production** to assure that comparable averages are being analyzed.

Energy consumed in the quarry, drying, raw grinding, and kiln stages of the manufacturing process corresponds directly to the production of clinker. Historical survey data indicates that production of clinker, on average, accounts for 92% of a plant's total energy consumption. The remaining 8% is used in the production of finished cement and generally reflects electrical energy usage. Similarly for labor consumption, 85% of labor consumed is allocated to clinker production with the remaining 15% allocated to finished cement production.

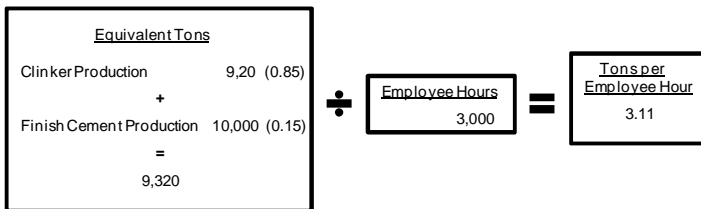
Beginning in XXXX, PCA added questions to the Labor-Energy Input Survey in order to validate the labor and energy weights. According to the current year's survey, approximately 90% of energy and 81% of labor is consumed in the production of clinker. In order to compare year-to-year rates, PCA continues to use the historical weighting for equivalent labor and energy tons. Also in the 2013 survey, respondents were asked the clinker content of the cement produced at each plant. **The industry average, weighted by production, of clinker-to-finished cement content stands at 91.7%.**

In this report, the weights for an equivalent labor ton are 85% clinker and 15% finished cement production. The weights for an equivalent energy ton are 92% clinker and 8% finished cement production. A table of the calculations is below.

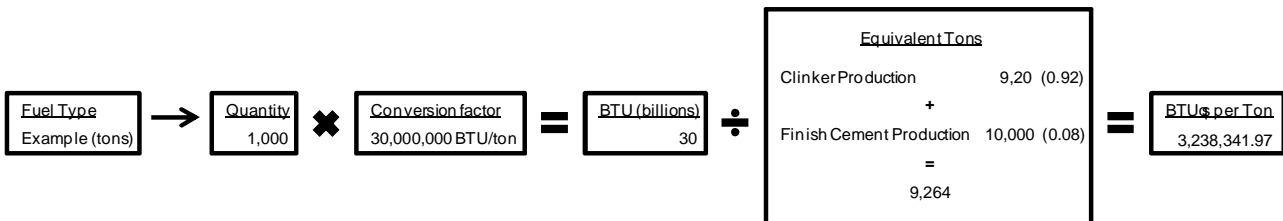
Equivalent Labor and Energy Tons

Clinker Production	9,20
Finish Cement Production	10,000

Labor:



Energy:



United States

Cement Industry

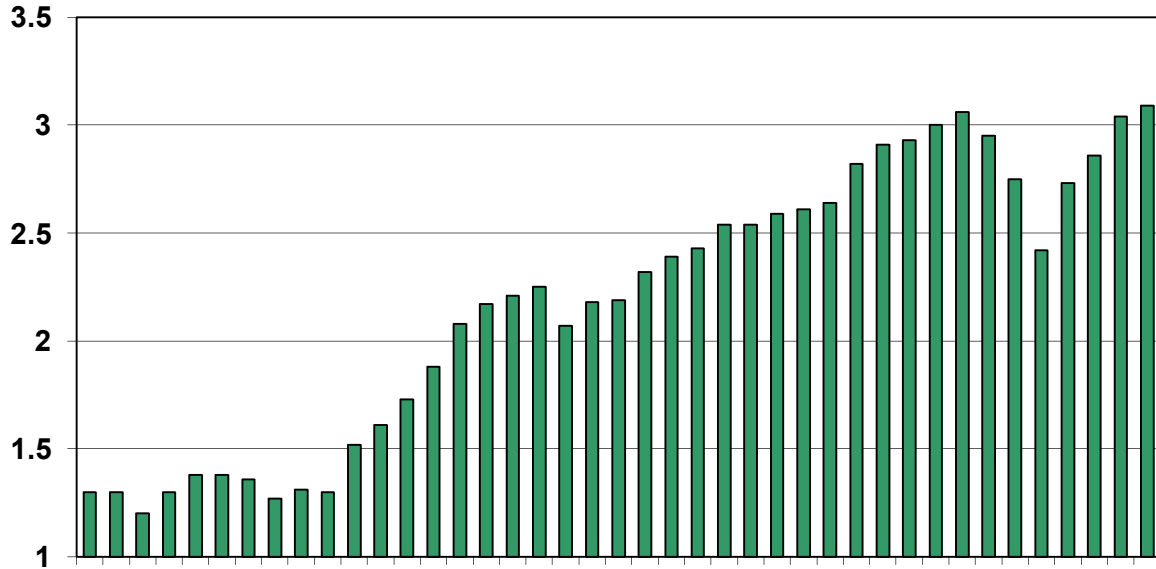
Labor Statistics
Portland Cement Industry Historical Summary

<u>Year</u>	<u>Clinker Capacity Utilization</u>	<u>Employee-Hours per 1000 Metric Tons</u>			<u>Production (Metric Tons) per Employee-Hour</u>
		<u>Direct</u>	<u>Indirect</u>	<u>Total</u>	

1972	93%	568	213	781	1.28
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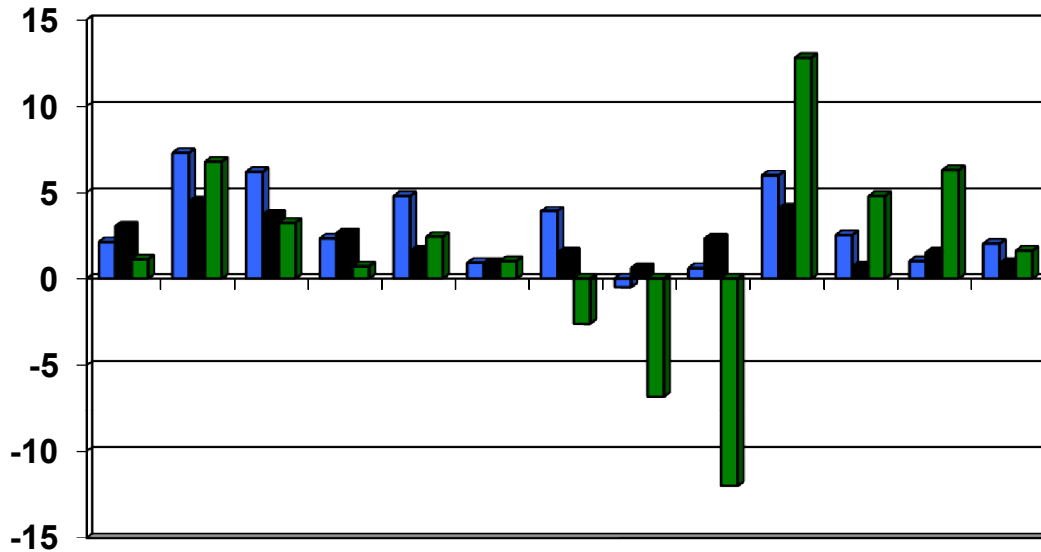
Labor Efficiency U.S. Cement Industry

Metric Tons per
Employee Hour



Output Per Employee Hour

Year-Year
Percent Change



■ Manufacturing
 ■ Non-Farm Business
 ■ Cement

United States

Portland Cement Industry Tables

U.S. Labor Productivity
(Equivalent Tons ⁽¹⁾ per Employee Hour)

	<u>1972</u>								% Change	% Change
All Plants*	1.17	2.91	2.71	2.38	2.66	2.86	3.04	3.09	164.1%	1.6%
Wet Process	1.15	2.09	1.97	1.74	1.85	2.18	2.53	2.19	90.4%	-13.4%
Dry Process	1.21	3.09	2.86	2.45	2.74	2.91	3.07	3.15	160.3%	2.6%

⁽¹⁾ Metric tons used to measure labor efficiency are an equivalent ton measure composed of 85% clinker production plus 15% finished cement production

* Grinding only and white cement plants not included

Energy Consumption by Type of U.S. Cement Plant
(Million BTU per Equivalent Tons ⁽¹⁾)

	<u>1972</u>								% Change	% Change
All Plants*	7.436	4.703	4.641	4.535	4.453	4.479	4.402 _R	4.432	-40.4%	0.7%
Wet Process	7.978	6.485	6.448	6.359	6.714	7.043	6.981 _R	7.696	-3.5%	10.2%
Dry Process	6.669	4.434	4.384	4.383	4.303	4.332	4.269	4.281	-35.8%	0.3%
No Preheater		5.717	5.575	5.541	6.065	5.967	5.886	5.692		-3.3%
Preheater		4.646	4.556	4.774	4.714	5.050	4.676	4.577		-2.1%
Precalciner		4.151	4.165	4.193	4.101	4.110	4.094	4.170		1.9%
Preheater/Precalciner**		4.235	4.227	4.275	4.180	4.224	4.162	4.217		1.3%

⁽¹⁾ Metric tons used to measure energy efficiency are an equivalent ton measure composed of 92% clinker production plus 8% finished cement production

* Grinding only and white cement plants not included

** Includes plants that are Preheater only

_R Revised

Distribution of Energy Consumption*
(U.S. Cement Plants)

	<u>1972</u>									
Coal and Coke	36.1%									
Natural Gas	45.1%									
Petroleum Products	12.2%									
Electricity	6.6%									
Alternative Fuels	0.0%									
Total Fuel	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%	100.0%

* Based on Btu's consumed

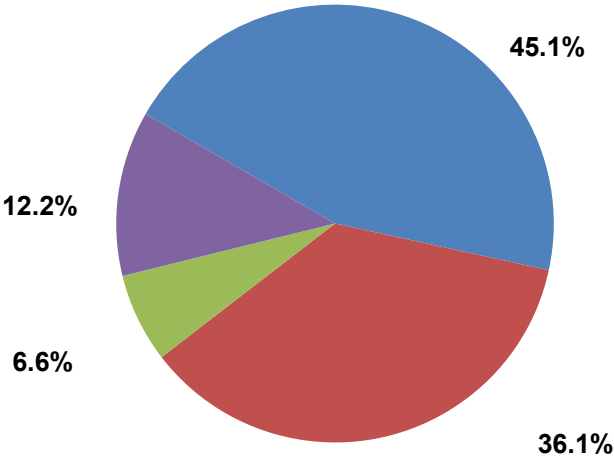
Alternative Fuel Summary
(U.S. Cement Plants)

	<u>XXXX</u>									
Total Plants Reporting	96	96	98	98	97	90	88	84	84	83
Plants using Alternative Fuels	62	64	65	64	66	63	64	62	63	61
<i>Percent</i>	65%	67%	66%	65%	68%	70%	73%	74%	75%	73%
Types of Alternative Fuels Utilized*										
Tire Derived	44	52	47	41	43	40	39	37	36	34
Waste Oil	16	17	16	15	18	18	16	11	11	16
Solvents	12	11	10	10	11	11	11	9	9	12
Other	28	36	40	39	42	43	45	49	67	69

*Plants may use more than one type of alternative fuel; Renewable fuels included as 'Other'

U.S. Energy Consumption
Percent Distribution
(Based on BTU's consumed)

1972



XXXX

Total Labor Productivity and Energy Efficiency
XXXX
(U.S. Cement Plants)

Tons⁽¹⁾ per
Employee Hour **Million BTU per**
Metric Ton⁽²⁾

All Plants*

Less than 500,000 tons capacity
500,000 tons or more capacity

Built or Modernized

Between 1960-1971
1972 and After

Wet Process

Less than 500,000 tons capacity
500,000 tons or more capacity

Dry Process

Less than 500,000 tons capacity
500,000 tons or more capacity
No Preheater
Preheater
Precalciner
Preheater or Precalciner

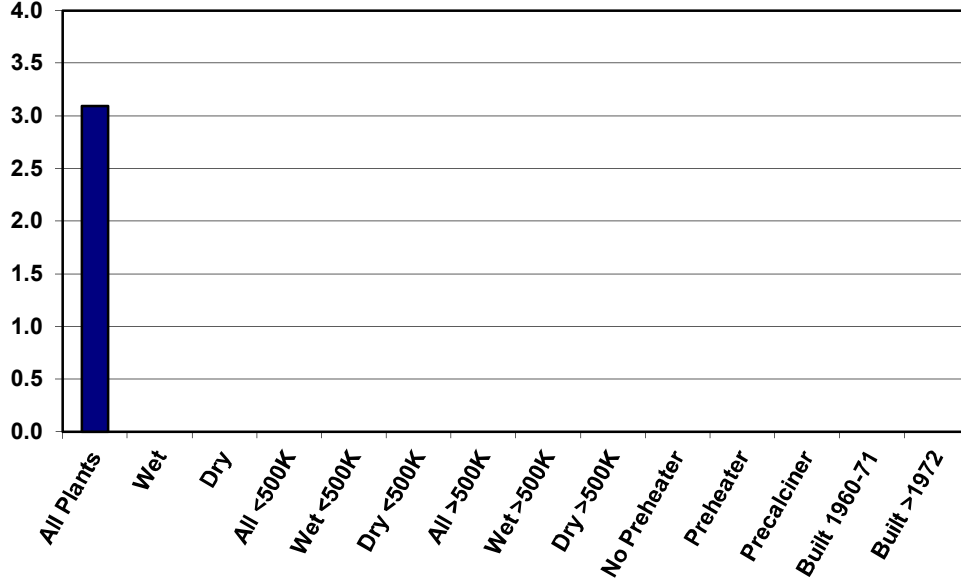
⁽¹⁾ *Metric tons used to measure labor efficiency are an equivalent ton measure composed of 85% clinker production plus 15% finished cement production*

⁽²⁾ *Metric tons used to measure energy efficiency are an equivalent ton measure composed of 92% clinker production plus 8% finished cement production*

* *Grinding only and white cement plants not included*

U.S. Labor Productivity

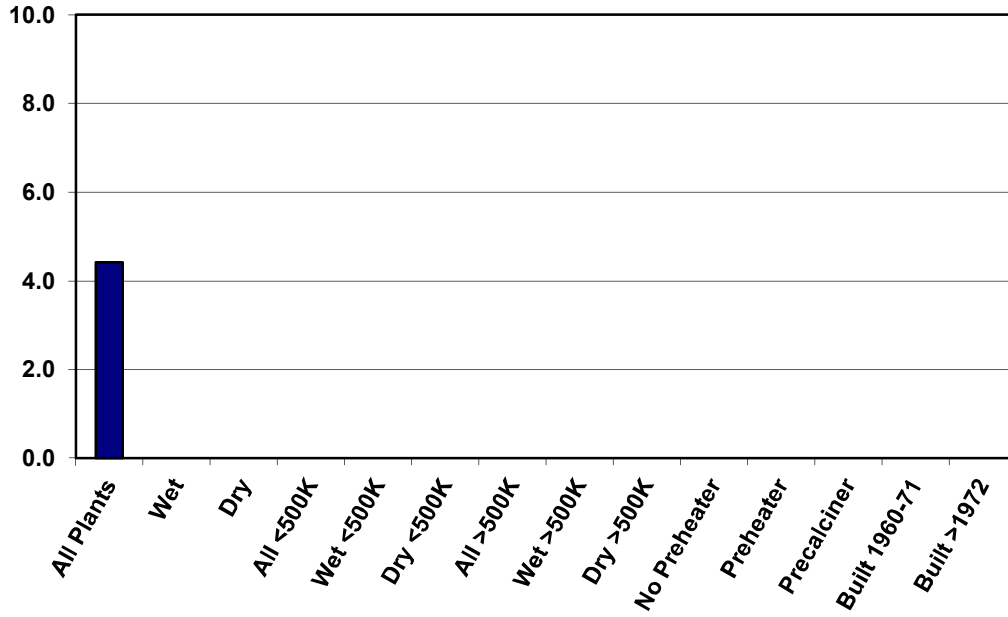
Metric Tons ⁽¹⁾
Per Employee Hour



⁽¹⁾ Equivalent Labor Ton per definition

U.S. Energy Efficiency

Million BTU Per
Metric Ton ⁽²⁾



⁽²⁾ Equivalent Energy Ton per definition

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

All Plants

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production	65,562,424
Finish Cement Production	71,346,134
Annual Practical Clinker Capacity	89,778,592
Capacity Utilization Rate (%)	73.0

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor	8,530	16,875,610	3.94
Indirect Labor	2,477	4,632,951	14.34
Total Labor	11,007	21,508,561	3.09
Hourly Labor	6,864	14,168,777	4.69
Salaried Labor	2,654	5,218,549	12.73
Contract Labor	1,489	2,163,475	30.71

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)	6,359,201	144,945.39	2,195,306.61
Petroleum Coke (tons)	1,502,648	43,973.30	666,008.61
Natural Gas (millions cu. ft.)	25,637	26,262.26	397,761.59
Middle Distillates - Diesel	18,959,849	2,455.30	37,187.37
Middle Distillates - Fuel Oil	3,699,732	518.56	7,854.02
Gasoline (gallons)	965,796	120.79	1,829.50
LPG (gallons)	231,419	19.87	300.93
Alternative Fuel - Oil		661.18	10,014.14
Alternative Fuel - Solvents		14,950.41	226,435.23
Alternative Fuel - Tire Derived		11,622.67	176,034.04
Alternative Fuel - Other Solid		12,601.74	190,862.74
Alternative Fuel - Misc.		1,983.69	30,044.40
	Total Fuel:	260,115.16	3,939,639.17
Electricity (1000 kWh)	9,626,576	32,544.90	492,916.90
	Total:	292,660.06	4,432,556.08

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Less Than 500,000 Clinker Capacity

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor	_____		
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Solvents			
Alternative Fuel - Tire Derived			
Alternative Fuel - Other Solid			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

500,000 and Greater Clinker Capacity

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor			
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
LPG (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Solvents			
Alternative Fuel - Tire Derived			
Alternative Fuel - Other Solid			
Alternative Fuel - Misc.			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Built or Modernized Between 1960-1971

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor			
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Solvents			
Alternative Fuel - Tire Derived			
Alternative Fuel - Other Solid			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Built or Modernized 1972 and After

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor			
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
LPG (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Solvents			
Alternative Fuel - Tire Derived			
Alternative Fuel - Other Solid			
Alternative Fuel - Misc.			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Wet Process

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor	_____		
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Solvents			
Alternative Fuel - Tire Derived			
Alternative Fuel - Other Solid			
Alternative Fuel - Misc.			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Wet Process - Less Than 500,000 Clinker Capacity

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor	_____		
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Solvents			
Alternative Fuel - Other Solid			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Wet Process - 500,000 and Greater Clinker Capacity

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor	_____		
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Gasoline (gallons)			
Alternative Fuel - Tire Derived			
Alternative Fuel - Misc.			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Dry Process

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor			
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
LPG (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Solvents			
Alternative Fuel - Tire Derived			
Alternative Fuel - Other Solid			
Alternative Fuel - Misc.			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Dry Process - Less Than 500,000 Clinker Capacity

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor			
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Gasoline (gallons)			
Alternative Fuel - Tire Derived			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Dry Process - 500,000 and Greater Clinker Capacity

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor			
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
LPG (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Solvents			
Alternative Fuel - Tire Derived			
Alternative Fuel - Other Solid			
Alternative Fuel - Misc.			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Dry Process - No Preheater

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor			
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Tire Derived			
Alternative Fuel - Other Solid			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Dry Process - Preheater

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor			
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Tire Derived			
Alternative Fuel - Other Solid			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Dry Process - Precalciner

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor			
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
LPG (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Solvents			
Alternative Fuel - Tire Derived			
Alternative Fuel - Other Solid			
Alternative Fuel - Misc.			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

U.S. LABOR AND ENERGY SURVEY - SUMMARY REPORT

Dry Process - Preheater or Preclinker

I. INDUSTRY INFORMATION

Metric Tons

Clinker Production
Finish Cement Production
Annual Practical Clinker Capacity
Capacity Utilization Rate (%)

II. LABOR INFORMATION

	<u>Number of Employees</u>	<u>Employee Hours</u>	<u>Tons per Employee Hour</u>
Direct Labor			
Indirect Labor			
Total Labor			
Hourly Labor			
Salaried Labor			
Contract Labor			

III. ENERGY INFORMATION

<u>Fuel Type</u>	<u>Quantity</u>	<u>BTUs (Billions)</u>	<u>BTUs per Ton</u>
Coal (tons)			
Petroleum Coke (tons)			
Natural Gas (millions cu. ft.)			
Middle Distillates - Diesel			
Middle Distillates - Fuel Oil			
Gasoline (gallons)			
LPG (gallons)			
Alternative Fuel - Oil			
Alternative Fuel - Solvents			
Alternative Fuel - Tire Derived			
Alternative Fuel - Other Solid			
Alternative Fuel - Misc.			
	Total Fuel:		
Electricity (1000 kWh)			
	Total:		

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APPENDIX

Contract Employee Count

If contract employee count was not provided, but contract employee hours were indicated, the prior year's industry average for hours/contract employee was applied and the total employee count adjusted accordingly.

Annual Clinker Production

If annual clinker production was not provided, the value calculated from daily clinker capacity and reported down days provided in the annual Plant Information Survey was recorded.

Heat Content Values

Changes to default values based on updated information from the Energy Information Administration are indicated in the accompanying table.

U.S. Labor-Energy Survey

Default Heat Content Values

<u>U.S.</u>	<u>Conversion Factor</u> ⁽¹⁾ (Btu per Unit - High Heat Value)
Gasoline	125,071/gallon
Middle Distillates	138,690/gallon
Coal	22,565,000/ton
Residual Oil	149,690/gallon
Natural Gas	1,030,000,000/mmft ³
Petroleum Coke	30,120,000/ton
LPG	85,857/gallon
Electricity	3,412,000/ ⁰⁰⁰ kWh
Alternative Fuel-Oil	Specified by respondent - Range: 95-150,000/gallon
Alternative Fuel-Solvents	Specified by respondent - Range: 85-100,000/gallon
Alternative Fuel-Tire Derived	Specified by respondent - Range: 22-35,000,000/ton
Alternative Fuel-Other Solid	Specified by respondent
Alternative Fuel-Other	Specified by respondent

⁽¹⁾ Energy Information Administration, Manufacturing Consumption of Energy - 1994

High and Low Heat Value

In Canada, and most other parts of the world, energy consumption is based on %low heat value.+ In the U.S., by contrast, energy consumption is based on %high heat value.+ Low heat value discounts the heat losses incurred by evaporation of fuel moisture as well as the water generated from the combustion of hydrogen. The difference in high and low heat values ranges from 3% to 7%.

LABOR-ENERGY GLOSSARY

ALTERNATIVE FUEL: An industrial byproduct or waste material that contains sufficient energy to either supplement or partially replace the materials normally used to fuel kiln and calciner combustion.

CEMENT: Any chemical binder, such as glue, paste, etc., used to permanently join unique and separate materials into a uniform and monolithic matrix.

CLINKER: The fused product of a kiln which is ground to make cement. (see portland Cement)

CLINKER CAPACITY: Daily capacity is the normal clinker capacity output a kiln can produce per day given a realistic work pattern. Annual capacity is daily capacity multiplied by 365 less normal downtime days. Normal downtime days are the number of days of downtime required for maintenance, repair or clean-up. Clinker capacity is reported in tons of clinker, not tons of cement.

COAL: A readily combustible black or brownish-black rock whose composition, including inherent moisture, consists of more than 50 percent by weight and more than 70 percent by volume of carbonaceous material. It is formed from plant remains that have been compacted, hardened, chemically altered, and metamorphosed by heat and pressure over geologic time.

DIESEL: A liquid petroleum-derived fuel in which ignition takes place as a result of compression.

DIRECT LABOR: Includes salaried, hourly, and contracted labor involved in raw material handling, production, distribution, and maintenance.

DRY PROCESS: Process for cement manufacture in which the raw materials are ground, conveyed, blended and stored in a dry form.

FINISH GRINDING: The grinding of clinker into finished cement usually with the addition gypsum and limestone.

GASOLINE: A liquid consisting mostly of organic compounds obtained by fractional distillation of petroleum.

INDIRECT LABOR: Includes salaried, hourly, and contracted labor not allocated to a specific department; such as plant manager, superintendent, foreman, computer control personnel, clerks, watchmen, and laboratory work involved in quality control. Laboratory time allotted for research is not considered indirect labor.

KILN: Equipment in which a raw mix is dried, calcined, and burned into clinker at a temperature of about 1450 degrees C.

LPG: Liquefied petroleum gas; also referred to as propane or butane are flammable mixtures of hydrocarbon gases used as fuel.

NATURAL GAS: A combustible gas issuing from the earth's crust through natural openings or bored wells. Consists essentially of methane with small amounts of ethane, propane, butane, hydrogen, oxide of carbon, nitrogen, helium, hydrogen sulfide, etc.

OIL: A mixture of hydrocarbons usually existing in the liquid state in natural underground pools or reservoirs, broadly defined as a class of liquid hydrocarbon mixtures. Included are crude oil, lease condensate, unfinished oils, refined products obtained from the processing of crude oil, and natural gas plant liquids. Note: Volumes of finished petroleum products include non hydrocarbon compounds, such as additives and detergents, after they have been blended into the products.

PETROLEUM COKE: A residue high in carbon content and low in hydrogen that is the final product of thermal decomposition in the condensation process in cracking.

PRECALCINER: Utilizes preheated combustion air from the clinker cooler and/or kiln exit gases with separate burners to effect up to 95% calcination of the raw material. Also known as flash furnace, calciner, calcining furnace.

PREHEATER: Installation for heating raw meal or slurry ahead of their entry into rotary kiln proper to improve over-all fuel economy. Preheaters for raw meal can be of the following types: (1) Suspension Parallel Flow Cyclonic, (2) Suspension Counter Flow, (3) Fixed Bed, (4) Traveling Bed or Grate, (5) Fluidized Bed, and (6) Sprouted Bed. Slurry preheaters can be: (1) Heated Tumbling Beds, (2) Chains, or (3) Crosses.

SOLVENTS: Materials characterized by their ability to solubilize or mobilize other constituents. Example applications include degreasing, cleaning, fabric scouring, use as diluents, and use as an extractant.

TIRE DERIVED FUEL: A fossil fuel composed of shredded tires.

WET PROCESS: The cement manufacturing method whereby grinding, blending, mixing and pumping cement raw materials is done with water. Wet process is chosen where raw materials are extremely wet and sticky, which would make drying before crushing and grinding difficult and costly.

PORTLAND CEMENT ASSOCIATION

MEMBER COMPANIES

Alamo Cement Company
American Cement Company, LLC
Argos USA Corporation
Ash Grove Cement Company
Buzzi Unicem USA Inc.
CalPortland
Capitol Aggregates, Ltd.
CEMEX
Continental Cement
Drake Cement LLC
Essroc Cement Corp.
Federal White Cement Ltd.
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Lafarge North America Inc
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National Cement Company of Alabama
National Cement Company of California
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